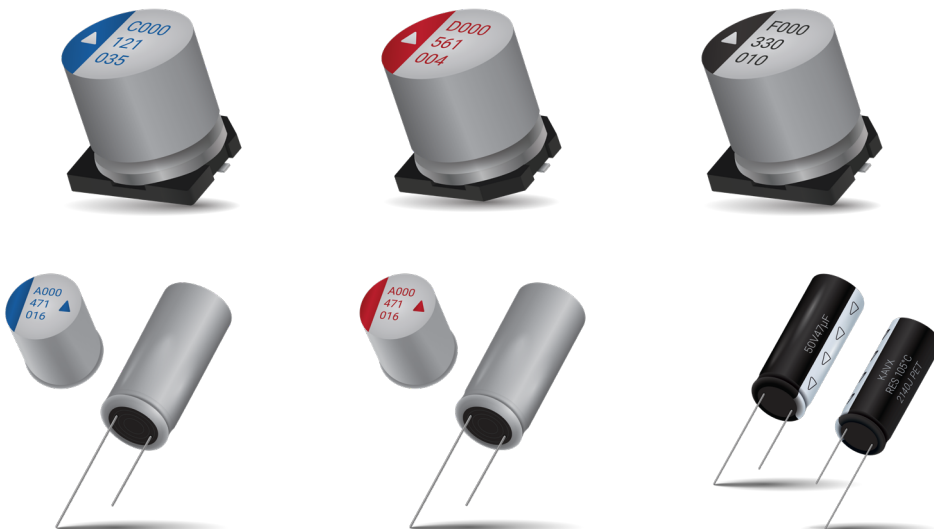




Aluminum Capacitors



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Aluminum Capacitors

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SMD Aluminum Electrolytic Capacitors

AEA Series



FEATURES

- Low Impedance, 105°C 2,000 - 5,000 hours
- Applicable to SMT Process
- RoHS Compliance



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

APPLICATIONS

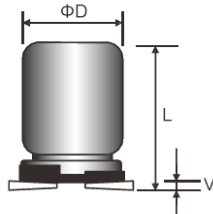
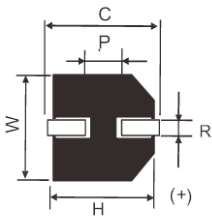
- Industrial/Consumer Electronics
- Lighting
- DC/DC Converters

HOW TO ORDER

	A	EA	0810	471	M	016	R	-	
Product Type Aluminum									Special No Code = std
Series Type									Packaging R = Pure Tin 15" Reel
Case Size See table below									Rated DC Voltage
Capacitance Code µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)									006 = 6.3Vdc 063 = 63Vdc 010 = 10Vdc 080 = 80Vdc 016 = 16Vdc 100 = 100Vdc 025 = 25Vdc 450 = 450Vdc 035 = 35Vdc 050 = 50Vdc
Tolerance M = ±20%									

CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max	Typical Weight (g)
0605	6.30 (0.248)	5.40 (0.213)	6.60 (0.260)	6.60 (0.260)	6.90 (0.271)	0.50 - 0.80 (0.020 - 0.031)	2.10 (0.082)	0.30 (0.012)	0.30
0810	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.75
1010	10.00 (0.394)	10.00 (0.394)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.37
1213	12.50 (0.492)	13.50 (0.531)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	2.67
1216	12.50 (0.492)	16.50 (0.650)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	3.09
1616	16.00 (0.630)	16.50 (0.650)	17.00 (0.669)	17.00 (0.669)	18.00 (0.709)	1.40 - 1.80 (0.055 - 0.071)	6.40 (0.252)	0.40 (0.016)	5.33

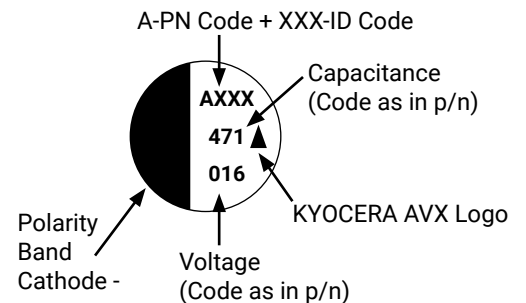


TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to + 105°C (6.3 - 100V), -40°C to +105°C (450V)	
Capacitance Range:	At 25°C, 120Hz	3.3µF to 6800µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor %	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below.
Leakage Current	After 2 minutes at rated working voltage at 25°C*	I ≤ 0.01CV or 3µA whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



SMD Aluminum Electrolytic Capacitors

AEA Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)									
μF	Code	6.3V	10V	16V	25V	35V	50V	63V	80V	100V	450V
3.3	3R3										1213
4.7	4R7										1213
10	100										1216
22	220									0810	1616
33	330								0810	1010	
47	470							0810	1010	1213	
56	560						0810	1010			
68	680						0810			1213	
100	101			0605		0607 0810	0810	1010 1213	1213	1616	
150	151				0810	0810	1010	1213	1213	1616	
220	221				0810	0810 1010	1010	1213			
330	331		0810	0810	0810		1010 1213	1616	1616		
470	471	0810	0810	0810	1010	1213	1616	1616			
680	681	0810	1010	1010	1213	1213	1616				
1000	102	0810	1010	1010, 1213	1213	1616	1616				
1500	152	1010	1213	1213	1616	1616					
2200	222	1213	1213		1616						
3300	332			1616							
4700	472		1616								
6800	682	1616									

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	100kHz RMS Current (mA)/105°C	Impedance 100kHz Max. (Ω)
6.3 Volt							
AEA0810471M006R	0810	470	6.3	30	30	600	0.17
AEA0810681M006R	0810	680	6.3	43	30	600	0.17
AEA0810102M006R	0810	1000	6.3	63	30	600	0.17
AEA1010152M006R	1010	1500	6.3	95	30	850	0.09
AEA1213222M006R	1213	2200	6.3	139	30	1100	0.06
AEA1616682M006R	1616	6800	6.3	428	30	1800	0.035
10 Volt							
AEA0810331M010R	0810	330	10	33	26	600	0.17
AEA0810471M010R	0810	470	10	47	26	600	0.17
AEA1010681M010R	1010	680	10	68	26	850	0.09
AEA1010102M010R	1010	1000	10	100	26	850	0.09
AEA1213152M010R	1213	1500	10	150	26	1100	0.06
AEA1213222M010R	1213	2200	10	220	26	1100	0.06
AEA1616472M010R	1616	4700	10	470	26	1800	0.035
16 Volt							
AEA0605101M016R	0605	100	16	16	22	230	0.44
AEA0810331M016R	0810	330	16	53	22	600	0.17
AEA0810471M016R	0810	470	16	75	22	600	0.17
AEA1010681M016R	1010	680	16	109	22	850	0.09
AEA1010102M016R	1010	1000	16	160	22	850	0.09
AEA1213102M016R	1213	1000	16	160	22	1100	0.06
AEA1213152M016R	1213	1500	16	240	22	1100	0.06
AEA1616332M016R	1616	3300	16	528	22	1800	0.035
25 Volt							
AEA0810151M025R	0810	150	25	37.5	16	600	0.17
AEA0810221M025R	0810	220	25	55	16	600	0.17
AEA0810331M025R	0810	330	25	82.5	16	600	0.17
AEA1010471M025R	1010	470	25	117.5	16	850	0.09

SMD Aluminum Electrolytic Capacitors

AEA Series

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	100kHz RMS Current (mA)/105°C	Impedance 100kHz Max. (Ω)
AEA1213681M025R	1213	680	25	170	16	1100	0.06
AEA1213102M025R	1213	1000	25	250	16	1100	0.06
AEA1616152M025R	1616	1500	25	375	16	1800	0.035
AEA1616222M025R	1616	2200	25	550	16	1800	0.035
35 Volt							
AEA0607101M035R	0607	100	35	35	12	300	0.30
AEA0810101M035R	0810	100	35	35	14	600	0.17
AEA0810151M035R	0810	150	35	53	14	600	0.17
AEA0810221M035R	0810	220	35	77	13	670	0.15
AEA1010221M035R	1010	220	35	77	14	850	0.09
AEA1213471M035R	1213	470	35	165	14	1100	0.06
AEA1213681M035R	1213	680	35	238	14	1100	0.06
AEA1616102M035R	1616	1000	35	350	14	1800	0.035
AEA1616152M035R	1616	1500	35	525	14	1800	0.035
50 Volt							
AEA0810560M050R	0810	56	50	28	14	330	0.34
AEA0810680M050R	0810	68	50	34	14	330	0.34
AEA0810101M050R	0810	100	50	50	14	330	0.34
AEA1010151M050R	1010	150	50	75	14	670	0.18
AEA1010221M050R	1010	220	50	110	14	670	0.18
AEA1010331M050R	1010	330	50	165	10	900	0.12
AEA1213331M050R	1213	330	50	165	14	900	0.12
AEA1616471M050R	1616	470	50	235	14	1610	0.073
AEA1616681M050R	1616	680	50	340	14	1610	0.073
AEA1616102M050R	1616	1000	50	500	14	1610	0.073
63 Volt							
AEA0810470M063R	0810	47	63	30	8	200	0.7
AEA1010560M063R	1010	56	63	35	8	369	0.48
AEA1010101M063R	1010	100	63	63	8	553	0.48
AEA1213101M063R	1213	100	63	63	8	800	0.16
AEA1213151M063R	1213	150	63	95	8	800	0.16
AEA1213221M063R	1213	220	63	139	8	800	0.16
AEA1616331M063R	1616	330	63	208	8	1410	0.082
AEA1616471M063R	1616	470	63	298	8	1410	0.082
80 Volt							
AEA0810330M080R	0810	33	80	26	8	130	1.88
AEA1010470M080R	1010	47	80	38	8	200	0.9
AEA1213101M080R	1213	100	80	80	8	500	0.32
AEA1213151M080R	1213	150	80	120	8	500	0.32
AEA1616331M080R	1616	330	80	264	8	793	0.17
100 Volt							
AEA0810220M100R	0810	22	100	22	7	130	1.88
AEA1010330M100R	1010	33	100	33	7	200	0.65
AEA1213470M100R	1213	47	100	47	7	500	0.32
AEA1213680M100R	1213	68	100	68	7	500	0.32
AEA1616101M100R	1616	100	100	100	7	793	0.17
AEA1616151M100R	1616	150	100	150	7	793	0.17
450 Volt							
AEA12133R3M450R	1213	3.3	450	159	25	60	*
AEA12134R7M450R	1213	4.7	450	184	25	67	*
AEA1216100M450R	1216	10	450	280	25	112	*
AEA1616220M450R	1616	22	450	496	25	127	*

*Note: Impedance values upon request

All technical data relates to an ambient temperature of +25C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts.

DCL is measured at rated voltage after 5 minutes.

SMD Aluminum Electrolytic Capacitors

AEA Series

Rated Voltage (Vdc)	50	120	300	1k	≥10k
450	0.70	1.00	1.17	1.36	1.5

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Capacitance Range	120 ≤ F(Hz) < 1K	1K ≤ F(Hz) < 10K	10K ≤ F(Hz) < 100K	100K(Hz) ≤ F
≤ 33	0.35	0.70	0.90	1.00
33 - 150	0.40	0.85	0.92	1.00
> 150	0.60	0.85	0.95	1.00

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise.

When long life performance is required in actual use, the rms ripple current has to be reduced.

QUALIFICATION TABLE

Test	AEA series (Temperature Range -55°C to +105°C (6.3-100V), -40°C to +105°C (450V))												
	Condition	Characteristics											
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	6.3	10	16	25	35	50	63	80	100	450	
		Z(-25°C) / Z(+20°C)	4	3	2	2	2	2	2	2	2	6	
		Z(-55°C) / Z(+20°C)	8	5	4	3	3	3	3	3	3	-	
		Z(-40°C) / Z(+20°C)	-	-	-	-	-	-	-	-	-	10	
Endurance	5000 hours, with application of rated voltage at 105°C	Rated Voltage (V)	6.3 - 100						450				
		Lifetime (h)	5000h						2000h				
		ΔC/C	Within ±30% of the initial limit						Within ±20% of the initial limit				
		DF	300% or less of the initial specified limit						200% or less of the initial specified limit				
		DCL	Initial specified limit or less										
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1000 hours 105°C without voltage applied. Before the measurement, the capacitor shall be preconditioned by applying voltage according to them 4.1 of JIS C5101-4.	Rated Voltage (V)	6.3 - 100						450				
		ΔC/C	Within ±30% of the initial limit						Within ±20% of the initial limit				
		DF	300% or less of the initial specified limit						200% or less of the initial specified limit				
		DCL	Initial specified limit or less										
Resistance to Soldering Heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature they meet the characteristics requirements listed at right.	ΔC/C	Within ±10% of the initial limit										
		DF	Initial specified limit										
		DCL	Initial specified limit or less										
Standards	JIS C 5101-4-1 (IEC 60384)												

REFLOW

Diameter (mm)	Φ8 - 16
Peak Temperature	245°C, 5 sec. max.
Preheat Temperature	150°C to 180°C, 120 sec. max.
Duration at 217°C or Higher	90 sec. max.
Reflow Number	Twice or less

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfuric acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage life: 2 years

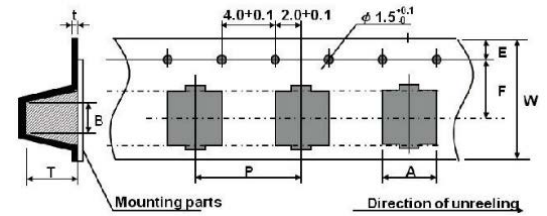
SMD Aluminum Electrolytic Capacitors

AEA Series

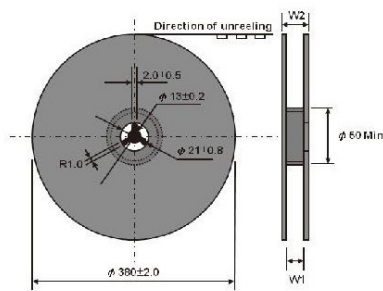
PACKAGE TAPE DIMENSIONS units (mm)

Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0605	7.0	7.0	16.0	7.5	1.75	12.0	0.4	6.5
0810	8.7	8.7	24.0	11.5	1.75	16.0	0.4	11.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1213	13.4/13.7(G)	13.4/13.7(G)	32.0	14.2	1.75	24.0	0.4	14.5
1216	13.4/13.7(G)	13.4/13.7(G)	32.0	14.2	1.75	24.0	0.4	17.5
1616	17.5	17.5	44.0	20.2	1.75	28.0	0.4	17.5

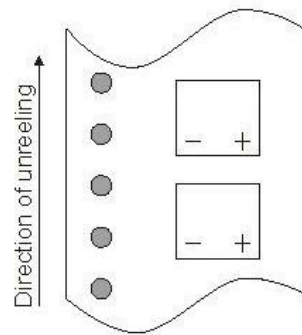
„(G)“ „Anti-vibration Structure“



REEL



POLARITY

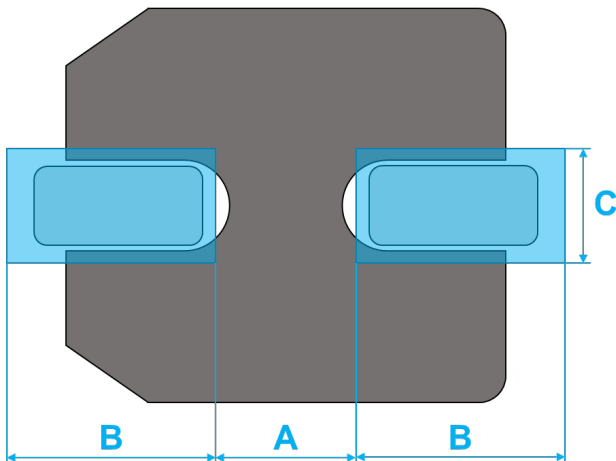


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0605	18.0	22.0	1000
0810	26.0	31.0	500
1010	26.0	31.0	500
1213	34.0	39.0	250
1216	34.0	39.0	200
1616	46.0	51.0	200

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0605	1.9	3.5	1.6
0810	3.0	3.5	2.5
1010	4.0	4.0	2.5
1213	4.3	5.8	2.5
1216	4.3	5.8	2.5
1616	6.6	6.5	5.0



SMD Aluminum Electrolytic Capacitors

AEF Series



FEATURES

- Endurance, 105°C, 6000 hours
- Designed for surface mounting on high density PC board
- RoHS Compliance
- AEC-Q200 Tested

APPLICATIONS

- Industrial
- Consumer electronics
- Lighting
- DC/DC converters



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

HOW TO ORDER

Product Type Aluminum

Series Type

Case Size See table below

Capacitance Code μ F code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance M = $\pm 20\%$

Special No Code = std

Packaging R = Pure Tin
13" Reel (D \geq 12.50mm)
15" Reel (D \leq 10.00mm)

Rated DC Voltage

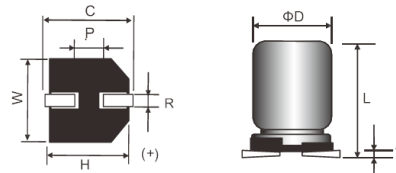
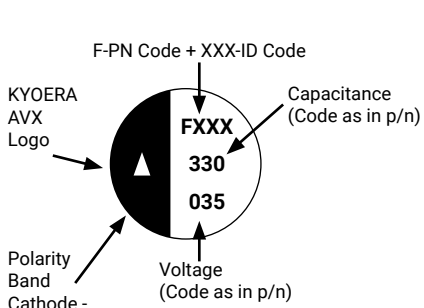
006 = 6.3Vdc	080 = 80Vdc
010 = 10Vdc	100 = 100Vdc
016 = 16Vdc	160 = 160Vdc
025 = 25Vdc	200 = 200Vdc
035 = 35Vdc	250 = 250Vdc
050 = 50Vdc	400 = 400Vdc
063 = 63Vdc	

Ordering code: **A EF 0608 330 M 035 R -**

CASE DIMENSIONS millimeters (inches)

Code	D ± 0.50 (0.020)	L ± 0.50 (0.020)	W ± 0.20 (0.008)	H ± 0.20 (0.008)	C ± 0.20 (0.008)	R	P ± 0.30 (0.012)	V max	Typical Weight (g)
0608	6.30 (0.248)	8.00 (0.315)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.41
0610	6.30 (0.248)	10.50 (0.413)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.90
0810	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.90
0812	8.00 (0.315)	12.50 (0.492)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.90
0813	8.00 (0.315)	13.50 (0.531)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.90
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.40
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.58
1013	10.00 (0.394)	13.50 (0.531)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.63
1016	10.00 (0.394)	16.50 (0.650)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	2.00
1213	12.50 (0.492)	13.50 (0.531)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	2.90
1216	12.50 (0.492)	16.00 (0.630)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	3.20

MARKING



SMD Aluminum Electrolytic Capacitors

AEF Series

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C (6.3 - 100V), -40°C to +105°C (160 - 400V)		
Capacitance Range:	At 25°C, 120Hz	2.2μF to 470μF	
Capacitance Tolerance:	At 25°C, 120Hz	±20%	
Dissipation Factor (%):	Measurement Frequency: 120Hz at 25°C	Please see the Ratings and Part Number Reference Table below	
Leakage Current:	Rated voltage at 25°C*	6.3 - 100V	160 - 400V
		$I \leq 0.03CV$ or 4μA, whichever is greater (2min)	$I \leq 0.04CV + 100\mu A$ (1min)

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)												
μF	Code	6.3V	10V	16V	25V	35V	50V	63V	80V	100V	160V	200V	250V	400V
2.2	2R2													0610
3.3	3R3													0810
4.7	4R7												0810	0812
5.6	5R6													0812
6.8	6R8													1013
10	100					0608			0608	0608	1010	0810	0812	1013
15	150										0812	0813		1016
22	220					0608	0608	0608	0810	0810			1016	
33	330					0608		0810	0810	1010	1013			
47	470				0608	0608	0810	0810	1010	1010	1016			
100	101	0608			0608	0810	1010	1010	1012	1213				
150	151		0608											
220	221	0608	0810	0810	0810	1010	1213	1213	1216					
330	331	0810	1010	0812	1010		1216							
470	471	0810	1010	1010										

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (Ω)	100kHz RMS Current (mA)
6.3 Volt							
AEF0608101M006R	0608	100	6.3	18	32	0.75	145
AEF0608221M006R	0608	220	6.3	39.6	32	0.75	180
AEF0810331M006R	0810	330	6.3	59.4	32	0.36	280
AEF0810471M006R	0810	470	6.3	84.6	32	0.36	360
10 Volt							
AEF0608151M010R	0608	150	10	45	28	0.75	105
AEF0810221M010R	0810	220	10	66	28	0.36	280
AEF1010331M010R	1010	330	10	99	28	0.23	400
AEF1010471M010R	1010	470	10	141	28	0.23	545
16 Volt							
AEF0810221M016R	0810	220	16	105.6	26	0.36	475
AEF0812331M016R	0812	330	16	158.4	26	0.36	510
AEF1010471M016R	1010	470	16	225.6	26	0.23	720
25 Volt							
AEF0608470M025R	0608	47	25	35.3	16	0.75	165
AEF0608101M025R	0608	100	25	75	16	0.75	175
AEF0810221M025R	0810	220	25	165	16	0.36	535
AEF1010331M025R	1010	330	25	247.5	16	0.23	750
35 Volt							
AEF0608100M035R	0608	10	35	10.5	14	0.75	145
AEF0608220M035R	0608	22	35	23.1	14	0.75	160
AEF0608330M035R	0608	33	35	34.7	14	0.75	175
AEF0608470M035R	0608	47	35	49.4	14	0.75	190
AEF0810101M035R	0810	100	35	105	14	0.36	560

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

SMD Aluminum Electrolytic Capacitors

AEF Series

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (Ω)	100kHz RMS Current (mA)
AEF1010221M035R	1010	220	35	231	14	0.23	800
50 Volt							
AEF0608220M050R	0608	22	50	33	14	1.5	145
AEF0810470M050R	0810	47	50	70.5	14	0.57	520
AEF1010101M050R	1010	100	50	150	14	0.4	680
AEF1213221M050R	1213	220	50	330	14	0.18	875
AEF1216331M050R	1216	330	50	495	14	0.17	1020
63 Volt							
AEF0608220M063R	0608	22	63	41.6	12	4.6	140
AEF0810330M063R	0810	33	63	62.4	12	1.36	320
AEF0810470M063R	0810	47	63	88.8	12	1.36	380
AEF1010101M063R	1010	100	63	189	12	0.73	530
AEF1213221M063R	1213	220	63	415.8	12	0.3	840
80 Volt							
AEF0608100M080R	0608	10	80	24	12	5.2	130
AEF0810220M080R	0810	22	80	52.8	12	2.2	360
AEF0810330M080R	0810	33	80	79.2	12	2.2	410
AEF1010470M080R	1010	47	80	112.8	12	1.4	490
AEF1012101M080R	1012	100	80	240	12	1.4	530
AEF1216221M080R	1216	220	80	528	12	0.49	1020
100 Volt							
AEF0608100M100R	0608	10	100	30	10	5.5	140
AEF0810220M100R	0810	22	100	66	10	2.7	320
AEF1010330M100R	1010	33	100	99	10	1.8	360
AEF1010470M100R	1010	47	100	141	10	1.8	540
AEF1213101M100R	1213	100	100	300	10	0.68	550
160 Volt							
AEF1010100M160R	1010	10	160	164	20	16	176
AEF0812150M160R	0812	15	160	196	20	14	204
AEF1013330M160R	1013	33	160	311.2	20	9	340
AEF1016470M160R	1016	47	160	400.8	20	8	420
200 Volt							
AEF0810100M200R	0810	10	200	180	20	16	170
AEF0813150M200R	0813	15	200	220	20	14	210
250 Volt							
AEF08104R7M250R	0810	4.7	250	147	20	30	90
AEF0812100M250R	0812	10	250	200	20	16	150
AEF1016220M250R	1016	22	250	320	20	12	312
400 Volt							
AEF06102R2M400R	0610	2.2	400	135.2	24	35	48
AEF08103R3M400R	0810	3.3	400	152.8	24	32	72
AEF08124R7M400R	0812	4.7	400	175.2	24	26	100
AEF08125R6M400R	0812	5.6	400	189.6	24	24	108
AEF10136R8M400R	1013	6.8	400	208.8	24	22	140
AEF1013100M400R	1013	10	400	260	24	18	194
AEF1016150M400R	1016	15	400	340	24	16	235

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (Vdc)	120 - 1K(Hz)	1K - 10K(Hz)	10K - 100K(Hz)	100K(Hz)
6.3 - 400	0.50	0.80	0.90	1.00

Internal heating produced by ripple current will reduce the lifetime of capacitors, at a rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current should be minimized.

SMD Aluminum Electrolytic Capacitors

AEF Series

QUALIFICATION TABLE

Test	AEF series (Temperature Range -55°C to +105°C (6.3-100V), -40°C to +105°C (160-400V))								
	Condition	Characteristics							
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	6.3	10	16	25	35 - 100	160 - 250	400
		Z(-25°C)/Z(+20°C)	4	3	2	2	2	6	6
		Z(-40°C)/Z(+20°C)	10	8	6	4	3	10	18
Endurance	The specifications shall be met when the capacitors are restored to 20°C after rated voltage is applied for 6,000 hours at 105°C.	Rated Voltage (V)	6.3 - 100				160 - 400		
		ΔC/C	≤±30% of the initial limit				≤±20% of the initial limit		
		DF	≤300% of the initial specified limit				≤200% of the initial specified limit		
		DCL	≤the initial specified limit				≤the initial specified limit		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 105°C for 1,000 hours.	Rated Voltage (V)	6.3 - 100				160 - 400		
		ΔC/C	≤±30% of the initial limit				≤±20% of the initial limit		
		DF	≤300% of the initial specified limit				≤200% of the initial specified limit		
		DCL	≤200% of the initial specified limit				≤200% of the initial specified limit		

REFLOW

Diameter (mm)	Φ6.3	Φ8	Φ10	Φ12.5
Peak Temperature	260°C, 5 sec. max.			
Preheat Temperature	100°C to 200°C, 180 sec. max.			100°C to 180°C, 150 sec. max.
Duration at 200°C or higher	90 sec. max.	90 sec. max.	60 sec. max.	60 sec. max.
Duration at 230°C or higher	40 sec. max.	30 sec. max.	30 sec. max.	30 sec. max.
Reflow Number	Twice* or less			

*if twice then need to be at least 2hrs between reflows

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (if between 35°C to 85°C, it should be less than three months) and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage time:
 - Before unseal: within 2 years after delivery

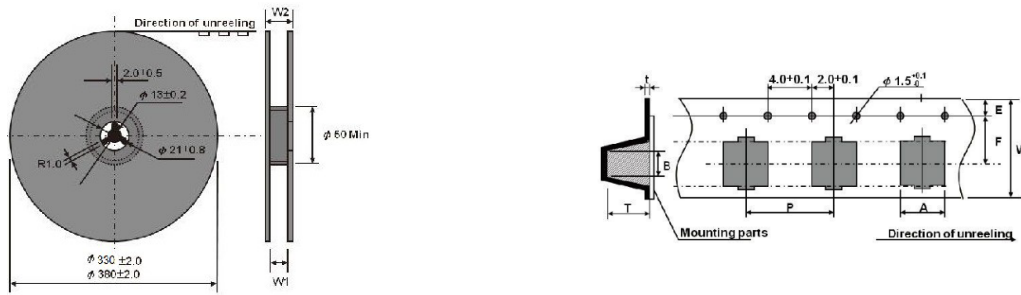
PACKAGE TAPE DIMENSIONS units (mm)

Size Code	A0±0.20	B0±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0608	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0610	7.0	7.0	16.0	7.5	1.75	12.0	0.4	11.0
0810	8.7	8.7	24.0	11.5	1.75	16.0	0.4	11.0
0812	8.7	8.7	24.0	11.5	1.75	16.0	0.4	13.0
0813	8.7	8.7	24.0	11.5	1.75	16.0	0.4	14.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0 - 13.5
1013	10.7	10.7	24.0	11.5	1.75	16.0	0.4	15.0
1016	10.7	10.7	24.0	11.5	1.75	16.0	0.4	17.5
1213	13.4	13.4	32.0	14.2	1.75	24.0	0.4	14.5
1216	13.4	13.4	32.0	14.2	1.75	24.0	0.4	16.5

SMD Aluminum Electrolytic Capacitors

AEF Series

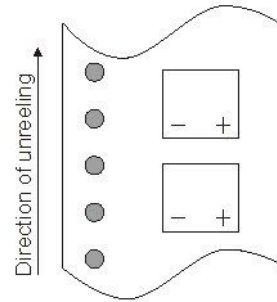
REEL



DIMENSIONS units (mm)

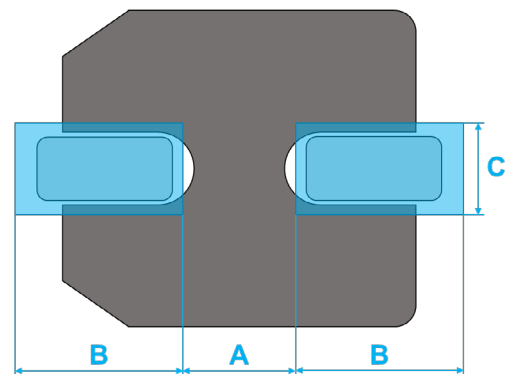
Size Code	W1±1.00	W2±1.00	Qty./Reel	Reel size (inch)
0608	18.0	22.0	1000	15
0610	18.0	22.0	1000	15
0810	18.0	22.0	550	15
0812	26.0	31.0	550	15
0813	26.0	31.0	550	15
1010	26.0	31.0	550	15
1012	26.0	31.0	500	15
1013	26.0	31.0	450	15
1016	26.0	31.0	350	15
1213	34.0	39.0	200	13
1216	34.0	39.0	150	13

POLARITY



RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0608	1.9	3.5	1.6
0610	1.9	3.5	1.6
0810	3.1	4.2	2.2
0812	3.1	4.2	2.2
0813	3.1	4.2	2.2
1010	4.5	4.4	2.2
1012	4.5	4.4	2.2
1013	4.5	4.4	2.2
1016	4.5	4.4	2.2
1213	4.0	5.7	2.5
1216	4.0	5.7	2.5



SMD Aluminum Electrolytic Capacitors

AEH Series



FEATURES

- Endurance: 125°C, 2000 to 5000 hours
- Designed for surface mounting on high density PC board
- RoHS Compliance
- AEC-Q200 Tested

APPLICATIONS

- DC/DC Convertors, for high density SMD boards and higher operation temperature environment applications



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

HOW TO ORDER

Product Type Aluminum

Series Type See table below

Case Size See table below

Capacitance Code μ F code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance M = $\pm 20\%$

Special No Code = std

Packaging R = Pure Tin
13" Reel (D \geq 12.50mm)
15" Reel (D \leq 10.00mm)

Rated DC Voltage
010 = 10Vdc 063 = 63Vdc
016 = 16Vdc 080 = 80Vdc
025 = 25Vdc 250 = 250Vdc
035 = 35Vdc 400 = 400Vdc
050 = 50Vdc 450 = 450Vdc

Part Number: **A EH 1010 470 M 010 R -**

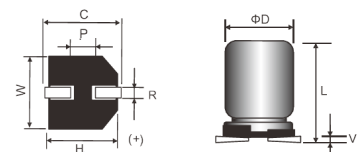
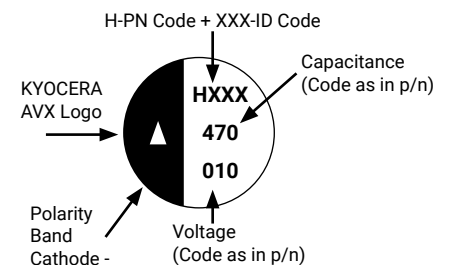
CASE DIMENSIONS millimeters (inches)

Code	D ± 0.50 (0.020)	L ± 0.50 (0.020)	W ± 0.20 (0.008)	H ± 0.20 (0.008)	C ± 0.20 (0.008)	R	P ± 0.30 (0.012)	V max	Typical Weight (g)
0608	6.30 (0.248)	8.00 (0.315)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.41
0810	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.85
0812	8.00 (0.315)	12.50 (0.492)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.90
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.14
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.41
1013	10.00 (0.394)	13.50 (0.531)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.40
1016	10.00 (0.394)	16.50 (0.650)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.50
1213	12.50 (0.492)	13.50 (0.531)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	2.70
1216	12.50 (0.492)	16.00 (0.630)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	3.30

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to + 125°C (10 - 80V), -40°C to + 125°C (250 - 450V)		
Capacitance Range	At 25°C, 120Hz	2.2 μ F to 470 μ F	
Capacitance Tolerance:	At 25°C, 120Hz	$\pm 20\%$	
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below	
Leakage Current	Rated voltage at 25°C	10 - 80V	
		0608 - 1013	1213 - 1616
		$I \leq 0.01CV$ or $3\mu A$, whichever is greater (2min)	$I \leq 0.03CV$ or $4\mu A$, whichever is greater (2min)
		250 - 450V	$I \leq 0.04CV + 100\mu A$ (1 minute)

MARKING



SMD Aluminum Electrolytic Capacitors

AEH Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)


Capacitance		Rated Voltage DC (V _R)									
μF	Code	10V	16V	25V	35V	50V	63V	80V	250V	400V	450V
2.2	2R2									0810	0810
3.3	3R3										0812
4.7	4R7								1010	1010	1010
6.8	6R8									1013	
10	100					0608				1016	
22	220					0608					
33	330					0608					
47	470			0608	0608	0810		1010			
100	101	0608	0608, 0810	0810	0810	1010	1012				
220	221			1010	1010	1012, 1213					
330	331			1010		1216					
470	471	1010	1012	1213	1216						

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	100kHz RMS Current (mA)
10 Volt					
AEH0608101M010R	0608	100	10	24	110
AEH1010471M010R	1010	470	10	24	296
16 Volt					
AEH0608101M016R	0608	100	16	20	110
AEH0810101M016R	0810	100	16	20	220
AEH1012471M016R	1012	470	16	20	340
25 Volt					
AEH0608470M025R	0608	47	25	16	110
AEH0810101M025R	0810	100	25	16	220
AEH1010221M025R	1010	220	25	16	296
AEH1010331M025R	1010	330	25	16	296
AEH1213471M025R	1213	470	25	16	750
35 Volt					
AEH0608470M035R	0608	47	35	14	110
AEH0810101M035R	0810	100	35	14	220
AEH1010221M035R	1010	220	35	14	296
AEH1216471M035R	1216	470	35	14	900
50 Volt					
AEH0608100M050R	0608	10	50	14	83
AEH0608220M050R	0608	22	50	14	83
AEH0608330M050R	0608	33	50	14	83
AEH0810470M050R	0810	47	50	14	160
AEH1010101M050R	1010	100	50	14	247
AEH1012221M050R	1012	220	50	14	350
AEH1213221M050R	1213	220	50	14	550
AEH1216331M050R	1216	330	50	14	700
63 Volt					
AEH1012101M063R	1012	100	63	12	270
80 Volt					
AEH1010470M080R	1010	47	80	12	245
250 Volt					
AEH10104R7M250R	1010	4.7	250	24	59
400 Volt					
AEH08102R2M400R	0810	2.2	400	30	30
AEH10104R7M400R	1010	4.7	400	30	65
AEH10136R8M400R	1013	6.8	400	30	90
AEH1016100M400R	1016	10	400	30	102
450 Volt					
AEH08102R2M450R	0810	2.2	450	30	30
AEH08123R3M450R	0812	3.3	450	30	32
AEH10104R7M450R	1010	4.7	450	30	40

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

 The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

SMD Aluminum Electrolytic Capacitors

AEH Series

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (Vdc)	Capacitance (μF)	120 - 1K (Hz)	1K - 10K (Hz)	10K - 100K (Hz)	100K(Hz)
10 - 80	Cap. < 220	0.40	0.75	0.90	1.00
	220 ≤ Cap. < 470	0.50	0.85	0.94	1.00
250 - 450	Cap. ≤ 33	0.55	0.83	0.97	1.00
	Cap. > 33	0.66	0.86	0.93	1.00

Internal heating produced by ripple current will reduce the lifetime of capacitors, at a rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current should be minimized.

REFLOW

Diameter (mm)	Φ6.3	Φ8	Φ10	Φ12.5
Peak Temperature	260°C, 5 sec. max.			
Preheat Temperature	100°C to 200°C, 180 sec. max.			100°C to 180°C, 150 sec. max.
Duration at 200°C or higher	90 sec. max.	90 sec. max.	60 sec. max.	60 sec. max.
Duration at 230°C or higher	40 sec. max.	30 sec. max.	30 sec. max.	30 sec. max.
Reflow Number	Twice* or less			

*if twice then need to be at least 2hrs between reflows

QUALIFICATION TABLE

Test	AEH series (-55°C to + 125°C (10 - 80V), -40°C to + 125°C (250 - 450V))												
	Condition	Characteristics											
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)		10	16	25	35	50	63	80	250	400-450	
		0608-1016	Z(-25°C)/Z(+20°C)	3	2	2	2	2	2	2	2	6	6
			Z(-40°C)/Z(+20°C)	6	4	4	3	3	3	3	3	10	18
		1213-1216	Z(-25°C)/Z(+20°C)	4	3	2	2	2	2	2	2	6	6
Z(-40°C)/Z(+20°C)	8		6	4	3	3	3	3	3	10	18		
Endurance	The specifications shall be met when the capacitors are restored to 20°C after rated voltage is applied for a specified period of time at 125°C. Load life: 0608 (10-50V) 1000 hours 0810-1016 (10-80V) 2000 hours 1213-1216 (10-80V) 5000 hours 0810-1216 (250-450V) 3000 hours	ΔC/C	≤ ±30% of the initial limit										
		DF	≤ 300% of the initial specified limit										
		DCL	≤ Initial specified limit										
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 125°C for 1,000 hours (450V: 500 hours)	ΔC/C	≤ ±30% of the initial limit										
		DF	≤ 300% of the initial specified limit										
		DCL	≤ 500% of the initial specified limit										

STORAGE

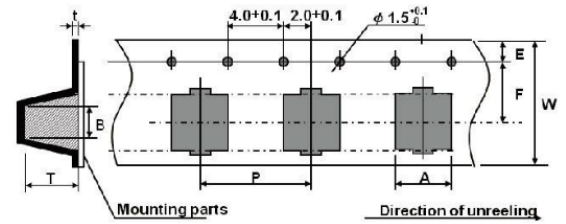
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage time:
 - Before unseal: within 2 years after delivery

SMD Aluminum Electrolytic Capacitors

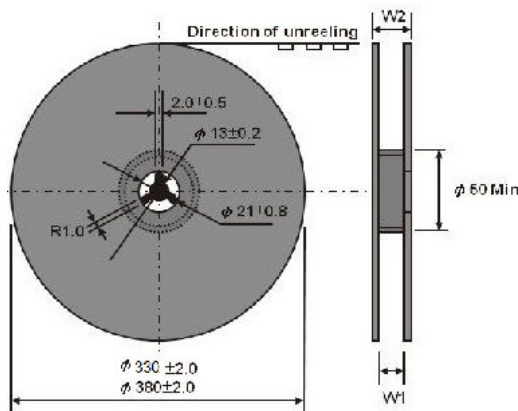
AEH Series

PACKAGE TAPE DIMENSIONS units (mm)

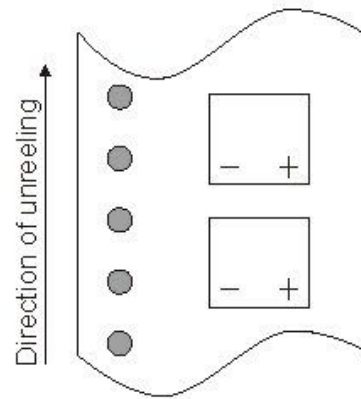
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0608	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0810	8.7	8.7	24.0	11.5	1.75	16.0	0.4	11.0
0812	8.7	8.7	24.0	11.5	1.75	16.0	0.4	13.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0 - 13.5
1013	10.7	10.7	24.0	11.5	1.75	16.0	0.4	15.0
1016	10.7	10.7	24.0	11.5	1.75	16.0	0.4	17.5
1213	13.4	13.4	32.0	14.2	1.75	24.0	0.4	14.5
1216	13.4	13.4	32.0	14.2	1.75	24.0	0.4	16.5



REEL



POLARITY

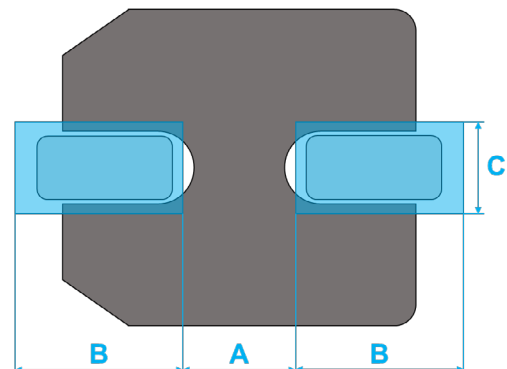


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel	Reel Size (inches)
0608	18.0	22.0	1000	15
0810	18.0	22.0	550	15
0812	26.0	31.0	550	15
1010	26.0	31.0	550	15
1012	26.0	31.0	500	15
1013	26.0	31.0	450	15
1016	26.0	31.0	350	15
1213	34.0	39.0	200	13
1216	34.0	39.0	150	13

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0608	1.9	3.5	1.6
0810	3.1	4.2	2.2
0812	3.1	4.2	2.2
1010	4.5	4.4	2.2
1012	4.5	4.4	2.2
1013	4.5	4.4	2.2
1016	4.5	4.4	2.2
1213	4.0	5.7	2.5
1216	4.0	5.7	2.5



SMD Aluminum Electrolytic Capacitors

AEK Series



FEATURES

- Endurance, 105°C, 2000 (6.3 - 100V) - 3000 hours (160 - 400V)
- Designed for surface mounting on high density PC board
- RoHS Compliance
- AEC-Q200 Tested

APPLICATIONS

- Industrial
- Commercial DC/DC
- Energy Storage



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

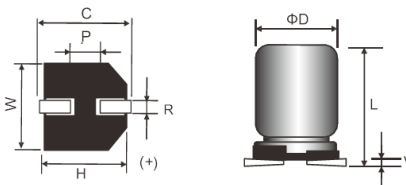
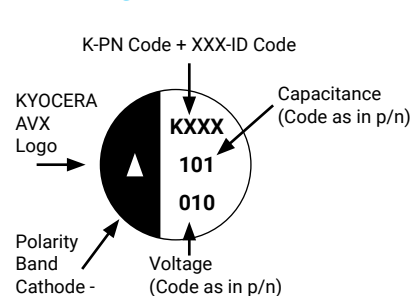
HOW TO ORDER

	A	EK	0608	101	M	010	R	-	
Product Type Aluminum									Special No Code = std
Series Type									Packaging R = Pure Tin 13" Reel (D ≥ 12.50mm) 15" Reel (D ≤ 10.00mm)
Case Size See table below									Rated DC Voltage 006 = 6.3Vdc 080 = 80Vdc 010 = 10Vdc 100 = 100Vdc 016 = 16Vdc 160 = 160Vdc 025 = 25Vdc 200 = 200Vdc 035 = 35Vdc 250 = 250Vdc 050 = 50Vdc 400 = 400Vdc 063 = 63Vdc
Capacitance Code µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)									
Tolerance M = ±20%									

CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max	Typical Weight (g)
0608	6.30 (0.248)	8.00 (0.315)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.42
0610	6.30 (0.248)	10.50 (0.413)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.50
0810	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.83
0812	8.00 (0.315)	12.50 (0.492)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.90
0813	8.00 (0.315)	13.50 (0.531)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.91
0815	8.00 (0.315)	15.50 (0.610)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.95
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.30
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.33
1013	10.00 (0.394)	13.50 (0.531)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.34
1016	10.00 (0.394)	16.50 (0.650)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	2.00
1213	12.50 (0.492)	13.50 (0.531)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	2.63
1216	12.50 (0.492)	16.00 (0.630)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10 - 1.40 (0.043 - 0.055)	4.50 (0.177)	0.40 (0.016)	3.02

MARKING



SMD Aluminum Electrolytic Capacitors

AEK Series

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C (6.3 - 100V), -40°C to +105°C (160 - 400V)	
Capacitance Range:	At 25°C, 120Hz	1.0µF to 1000µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the Ratings and Part Number Reference Table below
Leakage Current	Rated voltage at 25°C*	6.3 - 100V
		160 - 400V
		$I \leq 0.01CV$ or $3\mu A$, whichever is greater (2min)
		$I \leq 0.04CV + 100\mu A$ (1min)

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURE DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)												
µF	Code	6.3V	10V	16V	25V	35V	50V	63V	80V	100V	160V	200V	250V	400V
1.0	1R0													0608*
1.5	1R5													0610
2.2	2R2												0608*	0610
3.3	3R3												0608*	0810
4.7	4R7												0810	0812
5.6	5R6													0812
6.8	6R8													0813
8.2	8R2													0815
10	100							0608	0608	1010	0810	0812	0812	1013
15	150									0812	0813			1016
22	220						0608	0608	0810	0810	1012		1016	
33	330						0608	0810	0810	1010	1013			
47	470				0608	0608	0810	1010	1010	1010	1016			
100	101		0608	0608	0608	0810	1010	1010	1012	1213				
150	151			0608					1213					
220	221	0608	0608	0810	0810	1010		1213	1216					
330	331	0810	0810	0810	1010	1012	1216							
470	471		0810	1010	1012									
820	821		1010											
1000	102	1010												

Released ratings
* L dimensions (height) reduced to 7.70±0.50mm

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DF Max. (%)	ESR Max. @100kHz (Ω)	100kHz RMS Current (mA)
6.3 Volt						
AEK0608221M006R	0608	220	6.3	30	0.68	160
AEK0810331M006R	0810	330	6.3	40	0.3	340
AEK1010102M006R	1010	1000	6.3	40	0.28	860
10 Volt						
AEK0608101M010R	0608	100	10	24	0.68	175
AEK0608221M010R	0608	220	10	24	0.68	180
AEK0810331M010R	0810	330	10	30	0.3	340
AEK0810471M010R	0810	470	10	30	0.3	360
AEK1010821M010R	1010	820	10	30	0.28	860
16 Volt						
AEK0608101M016R	0608	100	16	20	0.68	175
AEK0608151M016R	0608	150	16	20	0.68	190
AEK0810221M016R	0810	220	16	26	0.3	500
AEK0810331M016R	0810	330	16	26	0.3	545
AEK1010471M016R	1010	470	16	26	0.28	800

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.
* L dimension (height) reduced to 7.70±0.50mm

SMD Aluminum Electrolytic Capacitors

AEK Series

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	ESR Max. @100kHz (Ω)	100kHz RMS Current (mA)
25 Volt						
AEK0608470M025R	0608	47	25	16	0.68	180
AEK0608101M025R	0608	100	25	16	0.68	205
AEK0810221M025R	0810	220	25	16	0.3	550
AEK1010331M025R	1010	330	25	16	0.28	780
AEK1012471M025R	1012	470	25	16	0.15	875
35 Volt						
AEK0608470M035R	0608	47	35	14	0.68	210
AEK0810101M035R	0810	100	35	14	0.3	575
AEK1010221M035R	1010	220	35	14	0.28	835
AEK1012331M035R	1012	330	35	14	0.15	900
50 Volt						
AEK0608220M050R	0608	22	50	12	1.36	175
AEK0608330M050R	0608	33	50	12	1.36	180
AEK0810470M050R	0810	47	50	12	0.6	540
AEK1010101M050R	1010	100	50	12	0.45	700
AEK1216331M050R	1216	330	50	12	0.15	1180
63 Volt						
AEK0608220M063R	0608	22	63	12	4.2	150
AEK0810330M063R	0810	33	63	12	1.16	375
AEK0810470M063R	0810	47	63	12	1.16	450
AEK1010101M063R	1010	100	63	12	0.67	575
AEK1213221M063R	1213	220	63	12	0.28	890
80 Volt						
AEK0608100M080R	0608	10	80	12	4.8	140
AEK0810220M080R	0810	22	80	12	1.95	375
AEK0810330M080R	0810	33	80	12	1.95	450
AEK1010470M080R	1010	47	80	12	1.24	575
AEK1012101M080R	1012	100	80	12	1.24	600
AEK1213151M080R	1213	150	80	12	0.54	800
AEK1216221M080R	1216	220	80	12	0.46	960
100 Volt						
AEK0608100M100R	0608	10	100	12	5	135
AEK0810220M100R	0810	22	100	12	2.5	345
AEK1010330M100R	1010	33	100	12	1.6	560
AEK1010470M100R	1010	47	100	12	1.6	575
AEK1213101M100R	1213	100	100	12	0.65	680
160 Volt						
AEK1010100M160R	1010	10	160	15	16	90
AEK0812150M160R	0812	15	160	15	14	136
AEK1012220M160R	1012	22	160	15	12	170
AEK1013330M160R	1013	33	160	15	9	215
AEK1016470M160R	1016	47	160	15	8	380
200 Volt						
AEK0810100M200R	0810	10	200	15	16	110
AEK0813150M200R	0813	15	200	15	14	170
250 Volt						
AEK06082R2M250R*	0608	2.2	250	15	35	52
AEK06083R3M250R*	0608	3.3	250	15	32	68
AEK08104R7M250R	0810	4.7	250	15	20	96
AEK0812100M250R	0812	10	250	15	16	166
AEK1016220M250R	1016	22	250	15	12	300
400 Volt						
AEK06081R0M400R*	0608	1	400	20	78	28
AEK06101R5M400R	0610	1.5	400	20	75	36
AEK06102R2M400R	0610	2.2	400	20	35	44
AEK08103R3M400R	0810	3.3	400	20	32	64
AEK08124R7M400R	0812	4.7	400	20	26	78
AEK08125R6M400R	0812	5.6	400	20	24	96
AEK08136R8M400R	0813	6.8	400	20	22	108
AEK08158R2M400R	0815	8.2	400	20	20	130
AEK1013100M400R	1013	10	400	20	18	140
AEK1016150M400R	1016	15	400	20	16	174

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

* L dimension (height) reduced to 7.70±0.50mm

SMD Aluminum Electrolytic Capacitors

AEK Series

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (Vdc)	120 - 1K (Hz)	1K - 10K (Hz)	10K - 100K (Hz)	100K (Hz)
6.3 - 400	0.50	0.80	0.90	1.00

Internal heating produced by ripple current will reduce the lifetime of capacitors, at a rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current should be minimized.

QUALIFICATION TABLE

Test	AEK series (-55°C to +105°C (6.3 - 100V), -40°C to +105°C (160 - 400V))								
	Condition	Characteristics							
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	6.3	10	16	25	35 - 100	160 - 250	400
		Z(-25°C)/Z(+20°C)	4	3	2	2	2	6	6
		Z(-40°C)/Z(+20°C)	10	8	6	4	3	10	18
Endurance	The specifications shall be met when the capacitors are restored to 20°C after rated voltage is applied for a specified period of time at 105°C.	ΔC/C	≤ ± 20% of the initial limit						
		DF	≤ 200% of the initial specified limit						
		DCL	≤ the initial specified limit						
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 105°C for 1,000 hours (6.3 - 100V: 500 hours).	ΔC/C	≤ ± 20% of the initial limit						
		DF	≤ 200% of the initial specified limit						
		DCL	≤ 200% of the initial specified limit						

REFLOW

Diameter (mm)	Φ6.3	Φ8	Φ10	Φ12.5
Peak Temperature	260°C, 5 sec. max.			
Preheat Temperature	100°C to 200°C, 180 sec. max.			100°C to 180°C, 150 sec. max.
Duration at 200°C or higher	90 sec. max.	90 sec. max.	60 sec. max.	60 sec. max.
Duration at 230°C or higher	40 sec. max.	30 sec. max.	30 sec. max.	30 sec. max.
Reflow Number	Twice* or less			

*if twice then need to be at least 2hrs between reflows

STORAGE

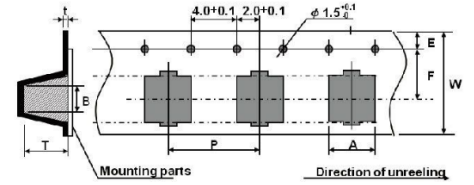
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.)
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation
 - Being exposed to acidic or alkaline solutions
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification
- Storage time:
 - Before unseal: within 2 years after delivery

SMD Aluminum Electrolytic Capacitors

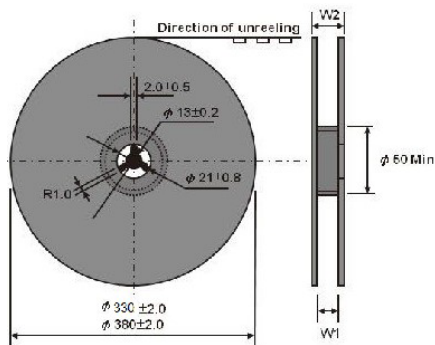
AEK Series

PACKAGE TAPE DIMENSIONS units (mm)

Size Code	A0±0.20	B0±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.05
0608	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0610	7.0	7.0	16.0	7.5	1.75	12.0	0.4	11.0
0810	8.7	8.7	24.0	11.5	1.75	16.0	0.4	11.0
0812	8.7	8.7	24.0	11.5	1.75	16.0	0.4	13.0
0813	8.7	8.7	24.0	11.5	1.75	16.0	0.4	14.0
0815	8.7	8.7	24.0	11.5	1.75	16.0	0.4	16.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0 - 13.5
1013	10.7	10.7	24.0	11.5	1.75	16.0	0.4	15.0
1016	10.7	10.7	24.0	11.5	1.75	16.0	0.4	17.5
1213	13.4	13.4	32.0	14.2	1.75	24.0	0.4	14.5
1216	13.4	13.4	32.0	14.2	1.75	24.0	0.4	16.5



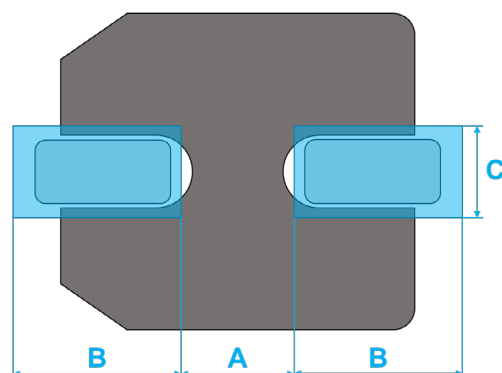
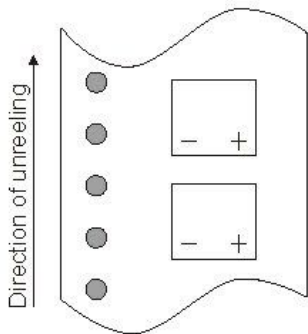
REEL



DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel	Reel size (inch)
0608	18.0	22.0	1000	15
0610	18.0	22.0	1000	15
0810	18.0	22.0	550	15
0812	26.0	31.0	550	15
0813	26.0	31.0	550	15
0815	26.0	31.0	550	15
1010	26.0	31.0	550	15
1012	26.0	31.0	500	15
1013	26.0	31.0	450	15
1016	26.0	31.0	350	15
1213	34.0	39.0	200	13
1216	34.0	39.0	150	13

POLARITY

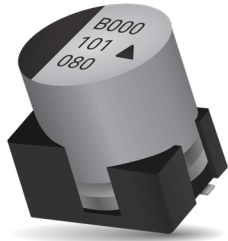


RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0608	1.9	3.5	1.6
0610	1.9	3.5	1.6
0810	3.1	4.2	2.2
0812	3.1	4.2	2.2
0813	3.1	4.2	2.2
0815	3.1	4.2	2.2
1010	4.5	4.4	2.2
1012	4.5	4.4	2.2
1013	4.5	4.4	2.2
1016	4.5	4.4	2.2
1213	4.0	5.7	2.5
1216	4.0	5.7	2.5

SMD Aluminum Electrolytic Vibration Proof Capacitors

AEB Series



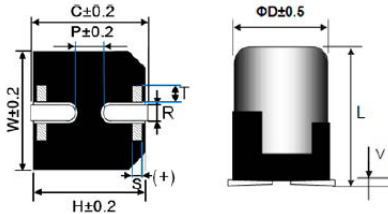
FEATURES

- Low impedance, 105°C, 5000 hours
- Vibration proof (30g)
- Application to SMT process
- RoHS Compliance

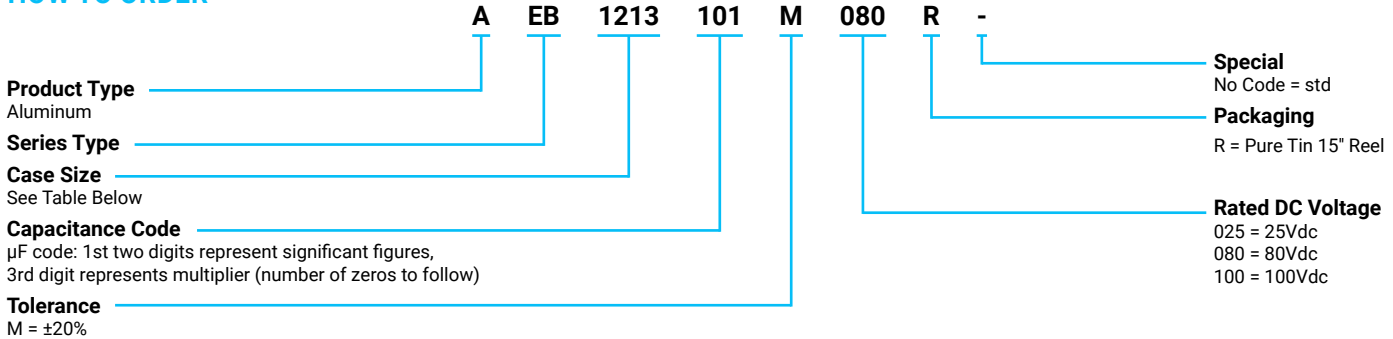


APPLICATIONS

- Industrial high vibration environment
- DC/DC converters



HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

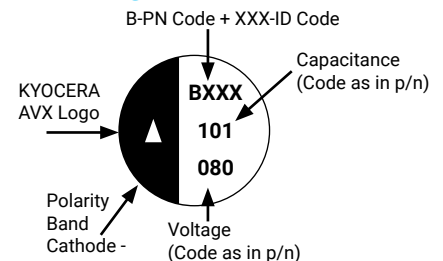
Code	D ± 0.50 (0.020)	L ± 0.50 (0.020)	W ± 0.20 (0.008)	H ± 0.20 (0.008)	C ± 0.20 (0.008)	R	P ± 0.20 (0.008)	S	T	V Max	Typical Weight (g)
0811	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.70 (0.028)	1.30 (0.051)	0.30 (0.012)	0.94
1213	12.50 (0.492)	13.50 (0.531)	13.00 (0.512)	13.00 (0.512)	13.70 (0.539)	1.10-1.40 (0.043-0.055)	4.50 (0.177)	2.00-2.40 (0.079-0.094)	2.20-2.60 (0.087-0.102)	0.40 (0.016)	2.67
1616	16.00 (0.630)	16.50 (0.650)	17.00 (0.669)	17.00 (0.669)	18.00 (0.709)	1.40-1.80 (0.055-0.071)	6.40 (0.252)	2.80-3.20 (0.110-0.126)	2.80-3.20 (0.110-0.126)	0.40 (0.016)	5.04

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	at 25°C, 120Hz	100 μF to 330 μF
Capacitance Tolerance:	at 25°C, 120Hz	$\pm 20\%$
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the Ratings and Part Number Reference Table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.01\text{CV}$ (μA) or 3 μA , whichever is greater

Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
 Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Code		Rated Voltage DC (V_R)		
μF	Code	25V	80V	100V
100	101		1213	1616
330	331	0811		

Released ratings

SMD Aluminum Electrolytic Vibration Proof Capacitors

AEB Series

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	00kHz RMS Current (mA)/105°C	Impedance 100kHz Max. (Ω)
25 Volt							
AEB0811331M025R	0811	330	25	82	16	600	0.17
80 Volt							
AEB1213101M080R	1213	100	80	80	8	500	0.32
100 Volt							
AEB1616101M100R	1616	100	100	100	7	793	0.17

All technical data relates to an ambient temperature of +20°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Capacitance Range	120 ≤ F(Hz) < 1K	1K ≤ F(Hz) < 10K	10K ≤ F(Hz) < 100K	100K (Hz) ≤ F
100	0.40	0.85	0.92	1.00
330	0.60	0.85	0.95	1.00

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use, the rms ripple current has to be reduced.

QUALIFICATION TABLE

Test	AEB Series (Temperature range -55°C to +105°C)				
	Condition	Characteristics			
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	25	80	100
		Z(-25°C) / Z(+20°C)	2	2	2
		Z(-55°C) / Z(+20°C)	3	3	3
Endurance	5000 hours, with application of rated voltage at 105°C	ΔC/C	Within ±30% of the initial limit		
		DF	300% or less of the initial specified limit		
		DCL	Initial specified limit or less		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1000 hours 105°C without voltage applied. Before the measurement, the capacitor shall be preconditioned by applying voltage according to them 4.1 of JIS C5101-4.	ΔC/C	Within ±30% of the initial limit		
		DF	300% or less of the initial specified limit		
		DCL	Initial specified limit or less		
30G Test	Capacitors with the high vibration base will pass a 30G acceleration test from 5 Hz to 2000 Hz with a max. amplitude of 5 mm (peak to peak) for 2 hours each in the X,Y and Z directions for a total of 6 hours. During the last 30 minutes of the test, the measured capacitance shall be stable.	ΔC/C	Within 5% of the initial value		
		DF	-		
		DCL	-		
Standards	JIS C 5101-4-1 (IEC 60384)				

REFLOW

Diameter (mm)	φ8-16
Peak Temperature	245°C, 5 sec. max.
Preheat Temperature	150°C to 180°C, 120 sec. max.
Duration at 217°C or higher	90 sec. max.
Reflow Number	Twice or less

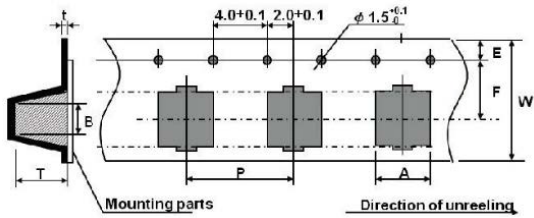
STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfuric acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage life: 2yrs

SMD Aluminum Electrolytic Vibration Proof Capacitors

AEB Series

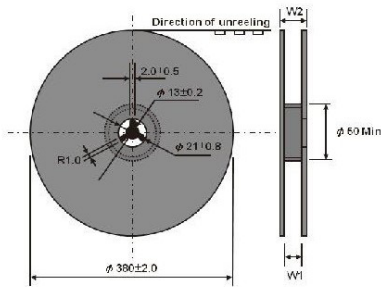
PACKAGE TAPE DIMENSIONS Unit (mm)



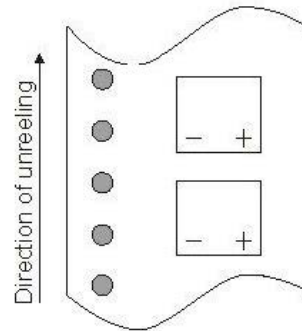
Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T ₂ ±0.20
0811	9.4	9.4	24.0	11.5	1.75	16.0	0.6 (max)	11.4
1213	13.4 / 13.7 (G)	13.4 / 13.7 (G)	32.0	14.2	1.75	24.0	0.4	14.5
1616	17.5	17.5	44.0	20.2	1.75	28.0	0.4	17.5

"(G)" "Anti-vibration Structure"

REEL



POLARITY

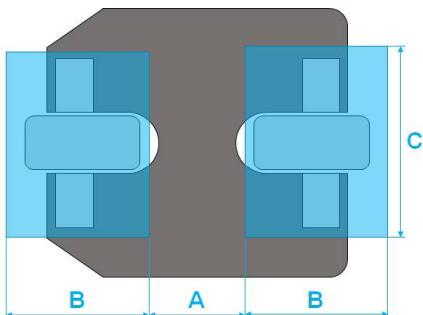


DIMENSIONS Unit (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0811	26.0	31.0	500
1213	34.0	39.0	250
1616	46.0	51.0	200

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0811	2.5	4.5	4.7
1213	3.8	6.1	6.9
1616	5.0	8.0	9.5



SMD Aluminum Hybrid Electrolytic Capacitors

AHA Series



FEATURES

- Low ESR
- High Voltage, Long Life
- 105°C, 5000 to 10,000 hours
- RoHS compliant

APPLICATIONS

- Industrial Equipment
- Base Station Equipment, etc.

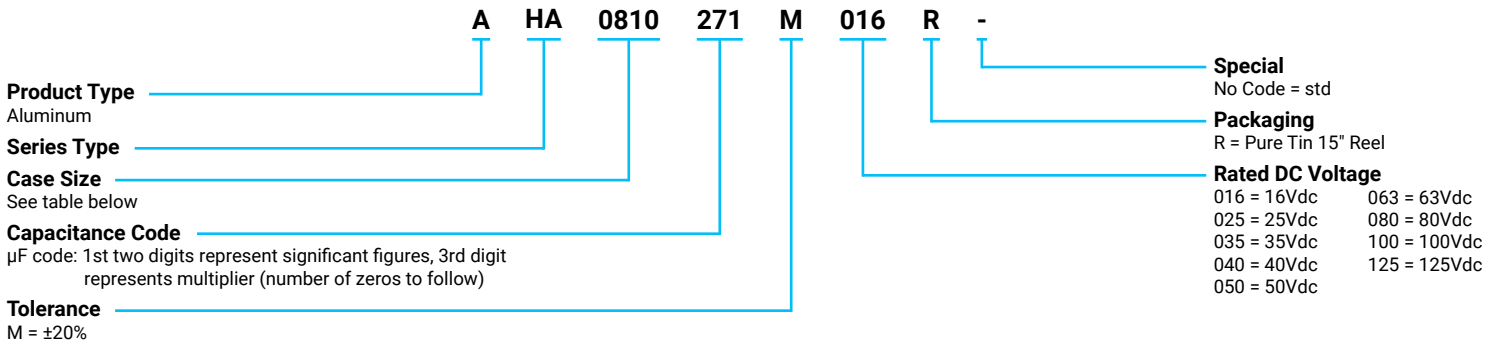


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

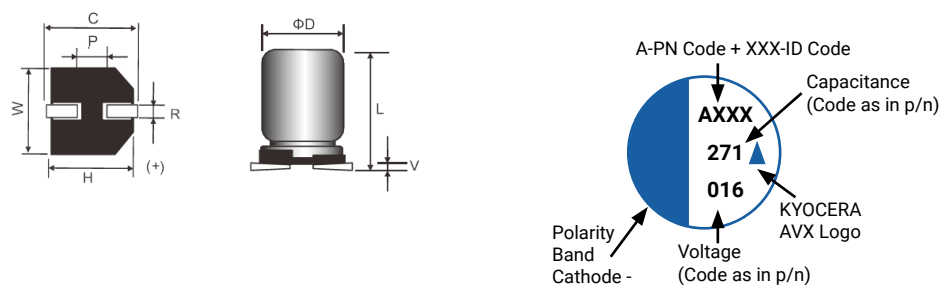
Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max	Typical Weight (g)
0608	6.30 (0.248)	8.00 (0.315)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.41
0810	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.87
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.38
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.38

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to + 105°C	
Capacitance Range:	At 25°C, 120Hz	10µF to 560µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%):	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	I ≤ 0.01CV or 3µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



SMD Aluminum Hybrid Electrolytic Capacitors

AHA Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)								
μF	Code	16V	25V	35V	40V	50V	63V	80V	100V	125V
10	100						0608		1010	1010
12	120							1010	1010	
15	150					0608		1010	1012	
18	180							1012		
22	220						0810			
27	270		0608		0608					
33	330					0810	0810, 1010			
39	390							1010		
47	470			0608			1010			
56	560				0810	1010	1012			
68	680		0608							
82	820					1012				
100	101			0810	1010					
120	121	0608			1012					
150	151		0810	1010						
220	221			1012						
270	271	0810	1010							
330	331		1012							
470	471	1010								
560	561	1012								

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/105°C
16 Volt							
AHA0608121M016R	0608	120	16	19	16	40	1500
AHA0810271M016R	0810	270	16	43	16	26	2000
AHA1010471M016R	1010	470	16	75	16	21	2600
AHA1012561M016R	1012	560	16	90	16	15	3000
25 Volt							
AHA0608270M025R	0608	27	25	7	16	70	1200
AHA0608680M025R	0608	68	25	17	16	45	1400
AHA0810151M025R	0810	150	25	38	16	27	1900
AHA1010271M025R	1010	270	25	68	16	22	2500
AHA1012331M025R	1012	330	25	83	16	16	2900
35 Volt							
AHA0608470M035R	0608	47	35	16	16	60	1300
AHA0810101M035R	0810	100	35	35	16	30	1800
AHA1010151M035R	1010	150	35	53	16	23	2400
AHA1012221M035R	1012	220	35	77	16	17	2800
40 Volt							
AHA0608270M040R	0608	27	40	11	16	70	1200
AHA0810560M040R	0810	56	40	22	16	32	1700
AHA1010101M040R	1010	100	40	40	16	24	2400
AHA1012121M040R	1012	120	40	48	16	18	2700
50 Volt							
AHA0608150M050R	0608	15	50	8	16	80	1200
AHA0810330M050R	0810	33	50	17	16	35	1600
AHA1010560M050R	1010	56	50	28	16	25	2300
AHA1012820M050R	1012	82	50	41	16	19	2600

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

SMD Aluminum Hybrid Electrolytic Capacitors

AHA Series

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/105°C
63 Volt							
AHA0608100M063R	0608	10	63	6	16	100	1000
AHA0810220M063R	0810	22	63	14	16	40	1500
AHA0810330M063R	0810	33	63	21	16	40	1500
AHA1010330M063R	1010	33	63	21	16	30	2100
AHA1010470M063R	1010	47	63	30	16	30	2100
AHA1012560M063R	1012	56	63	35	16	22	2400
80 Volt							
AHA1010120M080R	1010	12	80	10	16	70	1600
AHA1010150M080R	1010	15	80	12	16	70	1600
AHA1012180M080R	1012	18	80	14	16	50	1800
AHA1010390M080R	1010	39	80	31	16	70	1600
100 Volt							
AHA1010100M100R	1010	10	100	10	16	80	1400
AHA1010120M100R	1010	12	100	12	16	80	1400
AHA1012150M100R	1012	15	100	15	16	80	1600
125 Volt							
AHA1010100M125R	1010	10	125	13	16	90	1200

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Capacitance Range	100Hz ≤ F(Hz) < 1K	1K ≤ F(Hz) < 10K	10K ≤ F(Hz) < 100K	100K(Hz) ≤ F
4.7 < C ≤ 33	0.05	0.32	0.67	1.00
33 < C	0.10	0.35	0.70	1.00

QUALIFICATION TABLE

Test	AHA series (Temperature range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 5000 to 10,000 hours at 105°C. Φ6.3 = 5000hrs, D≥ Φ8 = 10,000hrs	Visual examination	no visible damage
		ΔC/C	≦ ±30% of the initial limit
		DF	≦ 200% of the initial specified limit
		ESR	≦ 200% of the initial specified limit
		DCL	≦ Initial specified limit or less
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjection them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≦ ±30% of the initial limit
		DF	≦ 200% of the initial specified limit
		ESR	≦ 200% of the initial specified limit
		DCL	≦ Initial specified limit or less
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 15-35°C for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≦ ±30% of the initial limit
		DF	≦ 200% of the initial specified limit
		ESR	≦ 200% of the initial specified limit
		DCL	≦ Initial specified limit or less

SMD Aluminum Hybrid Electrolytic Capacitors

AHA Series

REFLOW

Voltage Range (V)	16 - 63	80 - 125
Peak Temperature	260°C, 5 sec. max.	250°C, 5 sec. max.
Preheat Temperature	120°C, 120 sec. max.	
Duration at 200°C or higher	100 sec. max.	100 sec. max.
Duration at 220°C or higher	80 sec. max.	80 sec. max.
Duration at 230°C or higher	40 sec. max.	40 sec. max.
Reflow Number	Twice or less	Twice or less

STORAGE

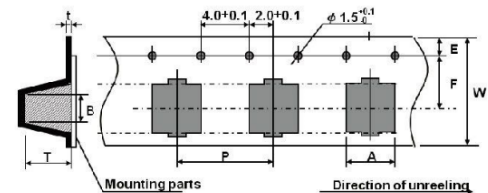
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.

Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

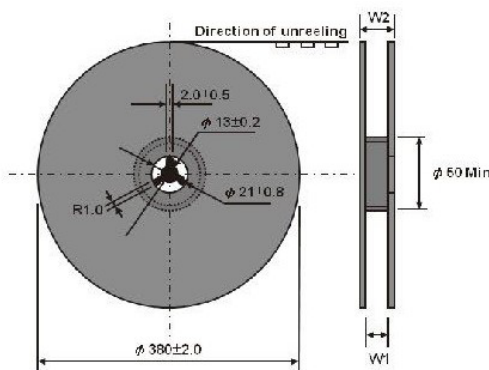
Remark: Re-aging condition depends on its own spec.

PACKAGE TAPE DIMENSIONS units (mm)

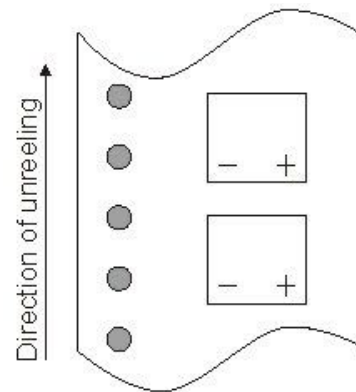
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0608	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0810	8.7	8.7	24.0	11.5	1.75	16.0	0.4	11.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0 - 13.5



REEL



POLARITY

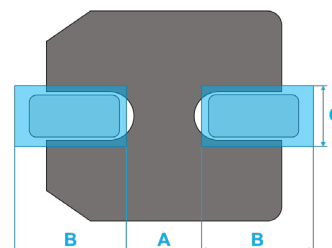


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0608	18.0	22.0	1000
0810	26.0	31.0	500
1010	26.0	31.0	500
1012	26.0	31.0	400

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0608	1.9	3.5	1.6
0810	3.0	3.5	2.5
1010	4.0	4.0	2.5
1012	4.0	4.0	2.5



SMD Aluminum Hybrid Electrolytic Capacitors

AHB Series



FEATURES

- Low ESR
- High Voltage, Long Life
- 125°C, 2000 to 4000hours
- RoHS compliant

APPLICATIONS

- Industrial Modules
- High Temperature Applications

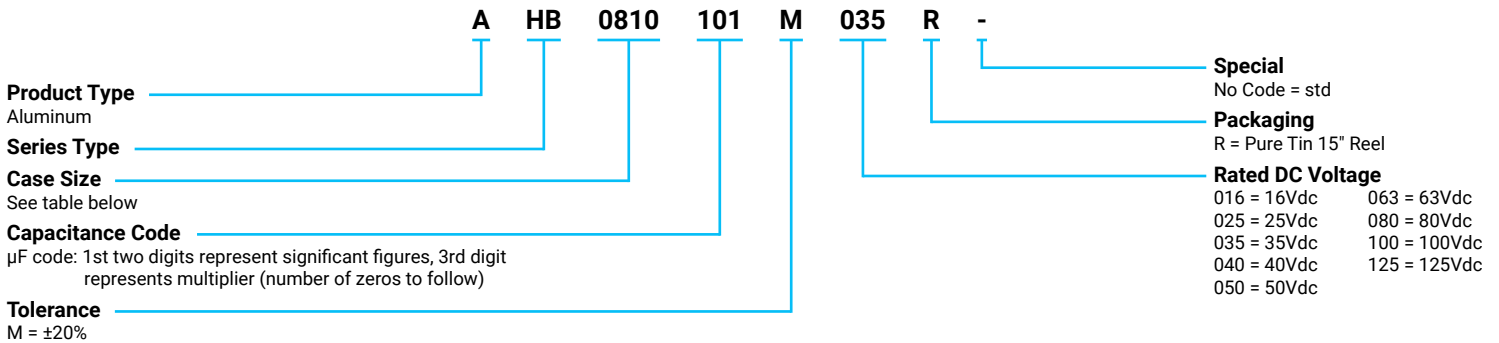


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

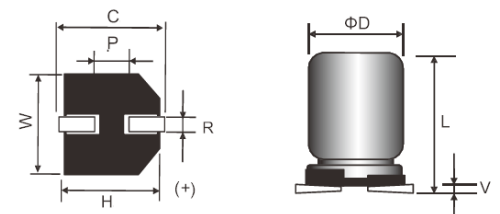
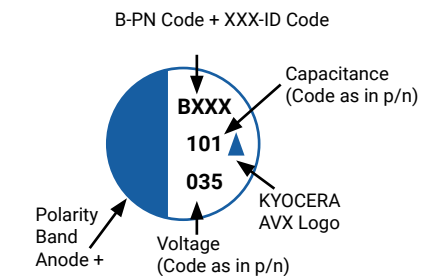
HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max
0608	6.30 (0.248)	8.00 (0.315)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)
0810	8.00 (0.315)	10.50 (0.413)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70-1.30 (0.028-0.051)	4.50 (0.177)	0.30 (0.012)
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70-1.30 (0.028-0.051)	4.50 (0.177)	0.30 (0.012)

MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +125°C	
Capacitance Range	At 20°C, 120Hz	10µF to 560µF
Capacitance Tolerance:	At 20°C, 120Hz	±20%
Surge Voltage:	At 15 - 35°C	Rated Voltage x 1.15
Dissipation Factor (%)	Measurement Frequency: 120Hz at 20°C	Please see the ratings and part number reference table below
Leakage Current	After 2 minutes at rated working voltage at 20°C*	$I \leq 0.01CV$ or $3\mu A$, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 125°C.

SMD Aluminum Hybrid Electrolytic Capacitors

AHB Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)								
μF	Code	16V	25V	35V	40V	50V	63V	80V	100V	125V
10	100						0608		1010	1010
12	120							1010	1010	
15	150					0608		1010	1012	
18	180							1012		
22	220						0810			
27	270				0608					
33	330					0810	0810,1010			
47	470			0608			1010			
56	560				0810	1010	1012			
68	680		0608							
82	820					1012				
100	101			0810	1010					
120	121	0608			1012					
150	151		0810	1010						
220	221			1012						
270	271	0810	1010							
330	331		1012							
470	471	1010								
560	561	1012								

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/125°C
16 Volt							
AHB0608121M016R	0608	120	16	19	16	40	1100
AHB0810271M016R	0810	270	16	43	16	26	1500
AHB1010471M016R	1010	470	16	75	16	21	2000
AHB1012561M016R	1012	560	16	90	16	15	2300
25 Volt							
AHB0608680M025R	0608	68	25	17	16	45	1000
AHB0810151M025R	0810	150	25	38	16	27	1300
AHB1010271M025R	1010	270	25	68	16	22	1500
AHB1012331M025R	1012	330	25	83	16	16	1700
35 Volt							
AHB0608470M035R	0608	47	35	16	16	60	900
AHB0810101M035R	0810	100	35	35	16	30	1200
AHB1010151M035R	1010	150	35	53	16	23	1400
AHB1012221M035R	1012	220	35	77	16	17	1700
40 Volt							
AHB0608270M040R	0608	27	40	11	16	70	900
AHB0810560M040R	0810	56	40	22	16	32	1200
AHB1010101M040R	1010	100	40	40	16	24	1400
AHB1012121M040R	1012	120	40	48	16	18	1600
50 Volt							
AHB0608150M050R	0608	15	50	8	16	80	800
AHB0810330M050R	0810	33	50	17	16	35	1100
AHB1010560M050R	1010	56	50	28	16	25	1300
AHB1012820M050R	1012	82	50	41	16	19	1500
63 Volt							
AHB0608100M063R	0608	10	63	6	16	100	700
AHB0810220M063R	0810	22	63	14	16	40	1000
AHB0810330M063R	0810	33	63	21	16	40	1000
AHB1010330M063R	1010	33	63	21	16	30	1200
AHB1010470M063R	1010	47	63	30	16	30	1200

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

SMD Aluminum Hybrid Electrolytic Capacitors

AHB Series

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/125°C
AHB1012560M063R	1012	56	63	35	16	22	1400
80 Volt							
AHB1010120M080R	1010	12	80	10	16	70	900
AHB1010150M080R	1010	15	80	12	16	70	900
AHB1012180M080R	1012	18	80	14	16	50	1100
100 Volt							
AHB1010100M100R	1010	10	100	10	16	80	800
AHB1010120M100R	1010	12	100	12	16	80	800
AHB1012150M100R	1012	15	100	15	16	60	1000
125 Volt							
AHB1010100M125R	1010	10	125	13	16	90	700

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Capacitance Range	100Hz ≤ F(Hz) < 1K	1K ≤ F(Hz) < 10K	10K ≤ F(Hz) < 100K	100K(Hz) ≤ F
4.7 < C ≤ 33	0.05	0.32	0.67	1.00
33 < C	0.10	0.35	0.70	1.00

QUALIFICATION TABLE

Test	AHB series (Temperature range -55°C to +125°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2000 to 4000 hours at 125°C. Φ6.3=2,000hrs, DΦ8=4,000hrs.	Visual examination	no visible damage
		ΔC/C	≦ ±30% of the initial limit
		DF	≦ 200% of the initial specified limit
		ESR	≦ 200% of the initial specified limit
		DCL	≦ Initial specified limit or less
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjection them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≦ ±30% of the initial limit
		DF	≦ 200% of the initial specified limit
		ESR	≦ 200% of the initial specified limit
		DCL	≦ Initial specified limit or less
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 15-35°C for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≦ ±30% of the initial limit
		DF	≦ 200% of the initial specified limit
		ESR	≦ 200% of the initial specified limit
		DCL	Initial specified limit or less

SMD Aluminum Hybrid Electrolytic Capacitors

AHB Series

STORAGE

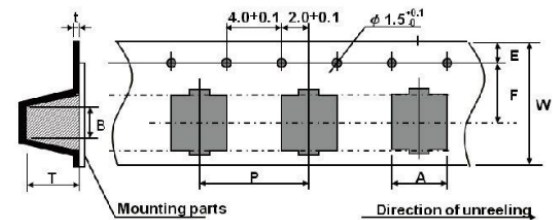
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
-

Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

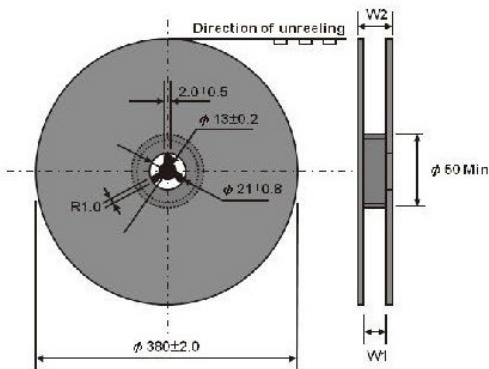
Remark: Re-aging condition depends on its own spec.

PACKAGE TAPE DIMENSIONS units (mm)

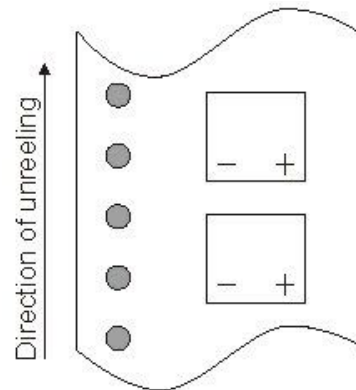
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0608	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0810	8.7	8.7	24.0	11.5	1.75	16.0	0.4	11.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0-13.5



REEL



POLARITY



DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0608	18.0	22.0	1000
0810	26.0	31.0	500
1010	26.0	31.0	500
1012	26.0	31.0	400

SMD Aluminum Hybrid Electrolytic Capacitors

AHC Series



FEATURES

- Low ESR
- High Ripple Current Resistance
- 125°C, 4000 hours
- RoHS compliant



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT

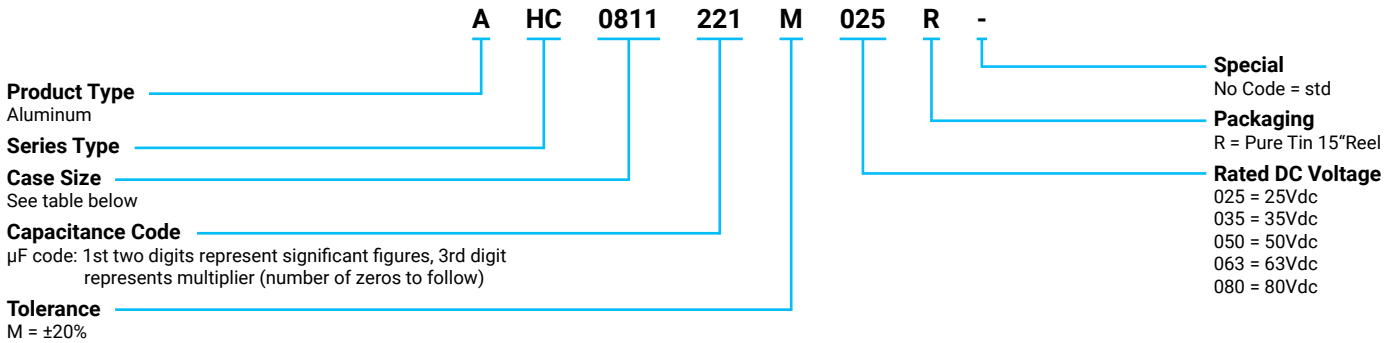


RoHS
COMPLIANT

APPLICATIONS

- Commercial/Industrial power supply applications requiring high capacitance in energy-dense, in small-volume packages with a low ESR

HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

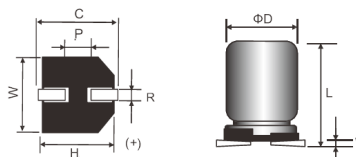
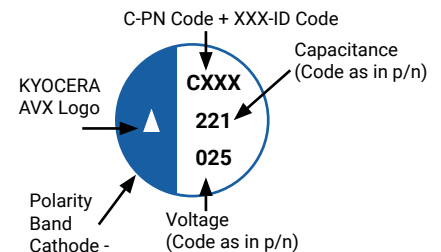
Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max	Typical Weight (g)
0609	6.30 (0.248)	9.30 (0.366)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.39
0811	8.00 (0.315)	11.50 (0.453)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	1.12
0812	8.00 (0.315)	12.00 (0.472)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	1.13
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.17
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.18

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to + 125°C	
Capacitance Range:	At 25°C, 120Hz	15µF to 470µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.01CV$ or $3\mu A$, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 125°C.

MARKING



SMD Aluminum Hybrid Electrolytic Capacitors

AHC Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)				
μF	Code	25V	35V	50V	63V	80V
15	150				0609	
22	220			0609	0609	
33	330			0609		
47	470		0609	0811		0812
68	680		0609			
100	101	0609				
220	221	0811	1012			
470	471	1010,1012				

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/125°C
25 Volt							
AHC0609101M025R	0609	100	25	25	12	30	1400
AHC0811221M025R	0811	220	25	55	12	27	1600
AHC1010471M025R	1010	470	25	117.5	12	20	2000
AHC1012471M025R	1012	470	25	117.5	12	25	2300
35 Volt							
AHC0609470M035R	0609	47	35	16.5	12	60	900
AHC0609680M035R	0609	68	35	23.8	12	40	1200
AHC1012221M035R	1012	220	35	77	12	30	1800
50 Volt							
AHC0609220M050R	0609	22	50	11	12	90	900
AHC0609330M050R	0609	33	50	16.5	12	40	1100
AHC0811470M050R	0811	47	50	23.5	12	35	1100
63 Volt							
AHC0609150M063R	0609	15	63	9.5	12	100	800
AHC0609220M063R	0609	22	63	13.9	12	80	800
80 Volt							
AHC0812470M080R	0812	47	80	37.6	12	40	1000

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz ≤ F(Hz) < 1K	1K ≤ F(Hz) < 10K	10K ≤ F(Hz) < 100K	100K(Hz) ≤ F
Coefficient	0.05	0.30	0.70	1.00

QUALIFICATION TABLE

Test	AHC series (Temperature range -55°C to +125°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to normal temperature after storing them for 2000 hours under no-load at 125±2°C. The rated voltage with ripple current is applied for 4000 hours at 125°C.	Visual Examination	no visible damage
		ΔC/C	≠ ±30% of the initial limit
		DF	≠ 200% of the initial specified limit
		ESR	≠ 200% of the initial specified limit
		DCL	≠ Initial specified limit or less
Humidity Resistance (On-Load)	The following specifications shall be satisfied when the rated voltage is applied for 2000 hours at 85±2°C and 85 to 90% RH.	Visual Examination	≠ no visible damage
		ΔC/C	≠ ±30% of the initial limit
		DF	≠ 200% of the initial specified limit
		ESR	≠ 200% of the initial specified limit
		DCL	≠ Initial specified limit or less

SMD Aluminum Hybrid Electrolytic Capacitors

AHC Series

REFLOW

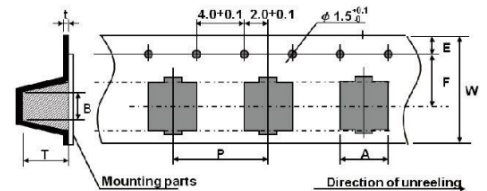
Peak Temperature	260°C, 10 sec. max.
Preheat Temperature	150°C to 180°C, 90 sec. max.
Duration at 200°C or higher	60 sec. max.
Duration at 230°C or higher	40 sec. max.
Reflow Number	Twice or less

STORAGE

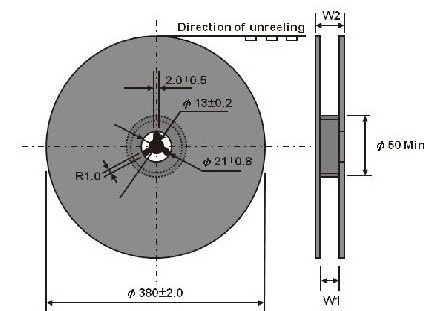
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage time:
 - Before unseal: within 1 year after delivery
 - After seal: within 1 month from opening

PACKAGE TAPE DIMENSIONS units (mm)

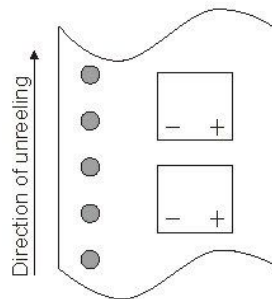
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0609	7.0	7.0	16.0	7.5	1.75	12.0	0.4	10.0
0811	8.7	8.7	24.0	11.5	1.75	16.0	0.4	12.0
0812	8.7	8.7	24.0	11.5	1.75	16.0	0.4	13.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0 - 13.5



REEL



POLARITY

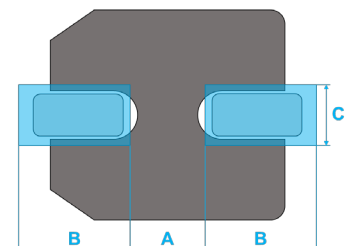


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0609	18.0	22.0	800
0811	26.0	31.0	500
0812	26.0	31.0	500
1010	26.0	31.0	500
1012	26.0	31.0	500

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0609	1.9	3.5	1.6
0811	3.1	4.2	2.2
0812	3.1	4.2	2.2
1010	4.5	4.4	2.2
1012	4.5	4.4	2.2



SMD Aluminum Conductive Polymer Electrolytic Capacitors

APA Series



FEATURES

- Super Low ESR
- Long Life
- 105°C, 5000 hours
- RoHS compliant

APPLICATIONS

- DC/DC Converters
- Voltage Regulators
- Decoupling
- Computer Motherboards, etc



HOW TO ORDER

Product Type Aluminum

Series Type See table below

Case Size See table below

Capacitance Code μF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance M = $\pm 20\%$

Special No Code = std

Packaging R = Pure Tin 15" Reel

Rated DC Voltage

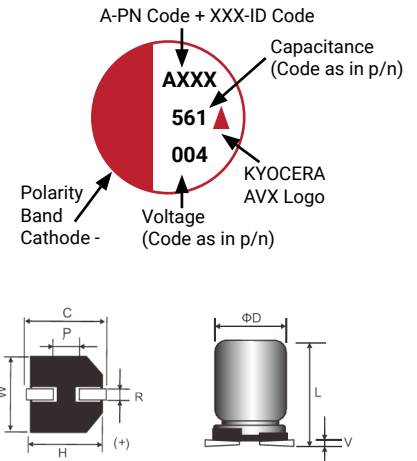
002 = 2.5Vdc	016 = 16Vdc
004 = 4Vdc	025 = 25Vdc
006 = 6.3Vdc	035 = 35Vdc
010 = 10Vdc	050 = 50Vdc

Ordering code example: **A PA 0807 561 M 004 R -**

CASE DIMENSIONS millimeters (inches)

Code	D ± 0.50 (0.020)	L ± 0.50 (0.020)	W ± 0.20 (0.008)	H ± 0.20 (0.008)	C ± 0.20 (0.008)	R	P ± 0.30 (0.012)	V max	Typical Weight (g)
0604	6.30 (0.248)	4.50 (0.177)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.24
0606	6.30 (0.248)	6.00 (0.236)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.32
0607	6.30 (0.248)	7.00 (0.276)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.41
0608	6.30 (0.248)	8.00 (0.315)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.41
0609	6.30 (0.248)	9.30 (0.366)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.42
0677	6.30 (0.248)	7.70 (0.303)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)	0.41
0807	8.00 (0.315)	7.00 (0.276)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.50 - 0.80 (0.020 - 0.031)	3.20 (0.126)	0.30 (0.012)	0.53
0809	8.00 (0.315)	9.50 (0.374)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.64
0812	8.00 (0.315)	12.00 (0.472)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.84
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.17
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.10 (0.028 - 0.043)	4.50 (0.177)	0.30 (0.012)	1.46

MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range:	At 25°C, 120Hz	10 μF to 2200 μF
Capacitance Tolerance:		$\pm 20\%$
Surge Voltage:	At 105°C	Rated voltage x 1.15
Dissipation Factor (%):	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.2\text{CV}$ or 300 μA , whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APA Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)							
μF	Code	2.5	4V	6.3V	10V	16V	25V	35V	50V
10	100								0606
15	150						0604		
22	220							0606	
33	330						0604		0609
47	470					0604	0606		0809
68	680				0606			0609	0812
82	820					0604			0812
100	101			0606	0604, 0606	0606	0609		1010, 1012
120	121							0809	
150	151							0812	
180	181						0809		1012
220	221	0604	0606	0604, 0606	0607, 0608	0609	0812	1010	
270	271							1012	
330	331	0604			0609	0809	1010		
470	471			0609		0812	1012		
560	561	0606	0609, 0807	0609	0809	0812			
680	681				0812	1010			
820	821	0677	0809	0809	1010	1012			
1000	102			0812	1010				
1200	122		0812	1010	1012				
1500	152		1010						
1800	182			1012					
2200	222		1012						

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/105°C
2.5 Volt							
APA0604221M002R	0604	220	2.5	300	12	20	2100
APA0604331M002R	0604	330	2.5	300	12	20	2400
APA0606561M002R	0606	560	2.5	300	12	10	2800
APA0677821M002R	0677	820	2.5	410	12	7	3000
4 Volt							
APA0606221M004R	0606	220	4	300	12	20	2800
APA0609561M004R	0609	560	4	448	12	20	3500
APA0807561M004R	0807	560	4	448	12	18	3700
APA0809821M004R	0809	820	4	656	12	15	4000
APA0812122M004R	0812	1200	4	960	12	15	4450
APA1010152M004R	1010	1500	4	1200	12	13	4500
APA1012222M004R	1012	2200	4	1760	12	13	5400
6.3 Volt							
APA0606101M006R	0606	100	6.3	300	12	22	2400
APA0604221M006R	0604	220	6.3	300	12	17	1500
APA0606221M006R	0606	220	6.3	300	12	22	2600
APA0609471M006R	0609	470	6.3	592	12	22	3200
APA0609561M006R	0609	560	6.3	705	12	22	3200
APA0809821M006R	0809	820	6.3	1033	12	20	3850
APA0812102M006R	0812	1000	6.3	1260	12	20	4250
APA1010122M006R	1010	1200	6.3	1512	12	18	4350
APA1012182M006R	1012	1800	6.3	2268	12	18	5200
10 Volt							
APA0606680M010R	0606	68	10	300	12	30	2400
APA0604101M010R	0604	100	10	300	12	40	1500

*+125°C operating temperature rating with 2000hrs endurance

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APA Series



RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	ESR Max. @ 100kHz (mΩ)	100kHz RMS Current (mA)/105°C
APA0606101M010R	0606	100	10	300	12	30	2400
APA0607221M010R	0607	220	10	440	12	30	2500
APA0608221M010R	0608	220	10	440	12	25	2500
APA0609331M010R	0609	330	10	660	12	30	3150
APA0809561M010R	0809	560	10	1120	12	25	3850
APA0812681M010R	0812	680	10	1360	12	25	4150
APA1010821M010R	1010	820	10	1640	12	20	4250
APA1010102M010R	1010	1000	10	2000	12	20	4250
APA1012122M010R	1012	1200	10	2400	12	20	5100
16 Volt							
APA0604470M016R	0604	47	16	300	12	50	1100
APA0604820M016R	0604	82	16	300	12	40	1500
APA0606101M016R*	0606	100	16	320	12	20	1500
APA0609221M016R	0609	220	16	704	12	30	3050
APA0809331M016R	0809	330	16	1056	12	20	3450
APA0812471M016R	0812	470	16	1504	12	20	4050
APA0812561M016R	0812	560	16	1792	12	20	4150
APA1010681M016R	1010	680	16	2176	12	20	4150
APA1012821M016R	1012	820	16	2624	12	20	5100
25 Volt							
APA0604150M025R	0604	15	25	300	12	45	930
APA0604330M025R	0604	33	25	300	12	100	1020
APA0606470M025R	0606	47	25	300	12	40	1500
APA0609101M025R	0609	100	25	500	12	35	2800
APA0809181M025R	0809	180	25	900	12	30	3250
APA0812221M025R	0812	220	25	1100	12	30	3900
APA1010331M025R	1010	330	25	1650	12	20	4100
APA1012471M025R	1012	470	25	2350	12	25	4500
35 Volt							
APA0606220M035R	0606	22	35	300	12	70	1450
APA0609680M035R	0609	68	35	476	12	60	1500
APA0809121M035R	0809	120	35	840	12	50	1800
APA0812151M035R	0812	150	35	1050	12	50	2850
APA1010221M035R	1010	220	35	1540	12	40	2950
APA1012271M035R	1012	270	35	1890	12	40	3200
50 Volt							
APA0606100M050R	0606	10	50	300	12	60	1400
APA0609330M050R	0609	33	50	330	12	30	1700
APA0809470M050R	0809	47	50	470	12	30	2000
APA0812680M050R	0812	68	50	680	12	28	2200
APA0812820M050R	0812	82	50	820	12	28	2300
APA1010101M050R	1010	100	50	1000	12	30	2300
APA1012101M050R	1012	100	50	1000	12	26	2650
APA1012181M050R	1012	180	50	1800	12	26	2950

*+125°C operating temperature rating with 2000hrs endurance

All technical data relates to an ambient temperature of +25C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APA Series



FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz ≤ F(Hz) < 1K	1K ≤ F(Hz) < 10K	10K ≤ F(Hz) < 100K	100K(Hz) ≤ F<500K
Coefficient	0.05	0.30	0.70	1.00

QUALIFICATION TABLE

Test	APA series (Temperature range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 5000 hours at 105°C.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit or less
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjection them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied.	Visual examination	≤ no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit or less
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 105°C for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	≤ no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit or less

REFLOW

Peak Temperature	260°C, 10 + 1 sec.	250°C, 10 + 1 sec.
Preheat Temperature	150°C to 180°C, 90 ± 3 sec. max.	
Duration at 200°C or higher	60 sec. max.	60 sec. max.
Duration at 220°C or higher	50 sec. max.	50 sec. max.
Duration at 230°C or higher	40 sec. max.	40 sec. max.
Reflow Number	Once	Twice or less

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
-

Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

Remark: Re-aging condition depends on its own spec.

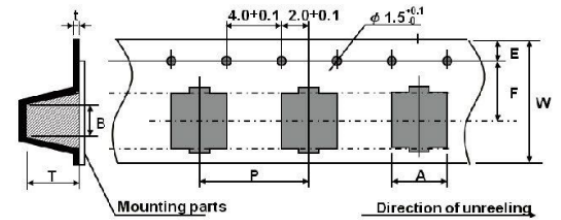
SMD Aluminum Conductive Polymer Electrolytic Capacitors

APA Series

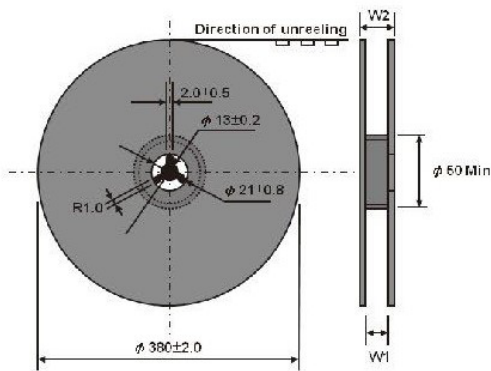


PACKAGE TAPE DIMENSIONS units (mm)

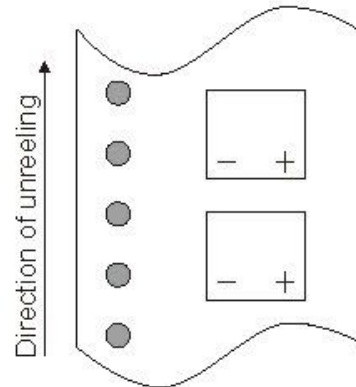
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0604	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0606	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0607-0608	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0609	7.0	7.0	16.0	7.5	1.75	12.0	0.4	10.0
0677	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.3
0807	8.7	8.7	24.0	11.5	1.75	16.0	0.4	8.8
0809	8.7	8.7	24.0	11.5	1.75	16.0	0.4	10.5
0812	8.7	8.7	24.0	11.5	1.75	16.0	0.4 <td 13.0	
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0 - 13.5



REEL



POLARITY

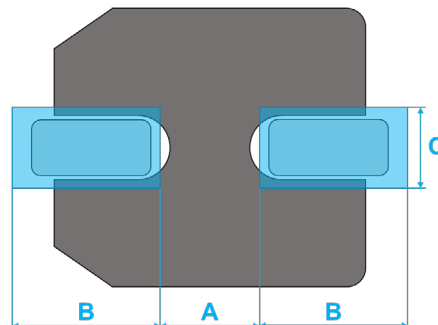


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0604	18.0	22.0	1200
0606-0608	18.0	22.0	1000
0609	18.0	22.0	800
0677	18.0	22.0	1000
0807-0809	26.0	31.0	500
1010	26.0	31.0	500
0812-1012	26.0	31.0	400

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0604	1.9	3.5	1.6
0606	1.9	3.5	1.6
0607	1.9	3.5	1.6
0608	1.9	3.5	1.6
0609	1.9	3.5	1.6
0677	1.9	3.5	1.6
0807	3.0	3.5	2.5
0809	3.0	3.5	2.5
0812	3.0	3.5	2.5
1010	4.0	4.0	2.5
1012	4.0	4.0	2.5



SMD Aluminum Conductive Polymer Electrolytic Capacitors

APD Series



FEATURES

- Endurance: 2000 hours at 105°C
- High Voltage
- RoHS compliant

APPLICATIONS

- Lamps
- LED
- Power Supply

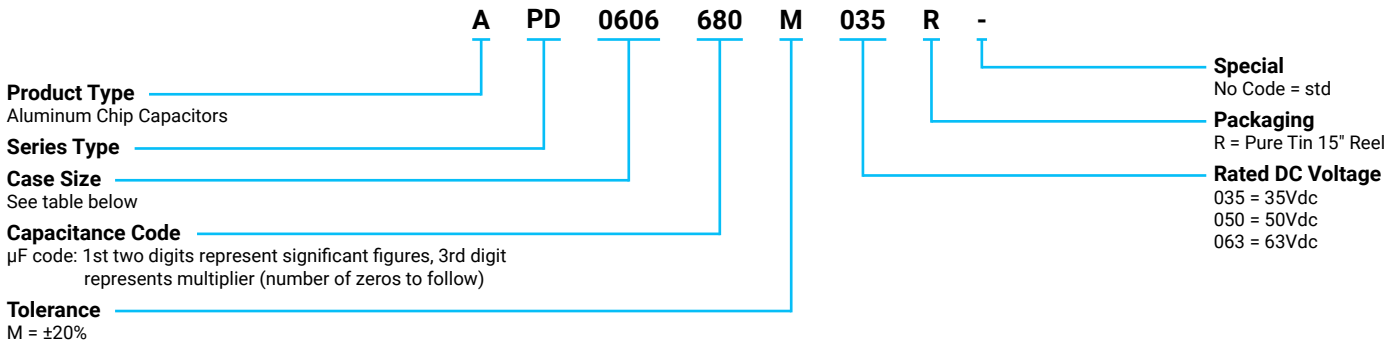


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

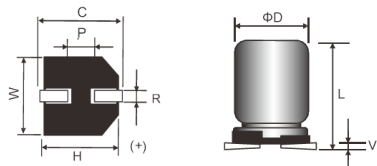
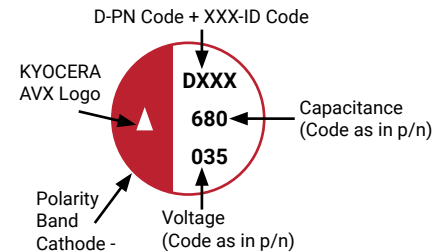
HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D ± 0.50 (0.020)	L ± 0.50 (0.020)	W ± 0.20 (0.008)	H ± 0.20 (0.008)	C ± 0.20 (0.008)	R	P ± 0.30 (0.012)	V max	Typical Weight (g)
0606	6.30 (0.248)	6.00 (0.236)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.27
0609	6.30 (0.248)	9.30 (0.366)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50 - 0.80 (0.020 - 0.031)	2.00 (0.080)	0.30 (0.012)	0.39
0809	8.00 (0.315)	9.50 (0.374)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.61
0811	8.00 (0.315)	11.50 (0.453)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70 - 1.10 (0.028 - 0.043)	3.20 (0.126)	0.30 (0.012)	0.75
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70 - 1.30 (0.028 - 0.051)	4.50 (0.177)	0.30 (0.012)	1.32

MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	At 25°C, 120Hz	22 μF to 470 μF
Capacitance Tolerance:	At 25°C, 120Hz	$\pm 20\%$
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.2\text{CV}$ or 500 μA , whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APD Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)		
μF	Code	35V	50V	63V
22	220	0606	0606	0606
27	270	0606		
33	330	0606	0606	0609
47	470	0606, 0609	0609	0809
56	560			0811
68	680	0606, 0609	0811	
82	820		0811, 1012	
100	101	0609, 0809, 0811	0809, 0811, 1012	1012
120	121		0811	
150	151	0811	1012	
220	221	0811	1012	
270	271	0811, 1012		
330	331	1012		
470	471	1012		

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
35 Volt							
APD0606220M035R	0606	22	35	500	12	54	1100
APD0606270M035R	0606	27	35	500	12	54	1100
APD0606330M035R	0606	33	35	500	12	54	1100
APD0606470M035R	0606	47	35	500	12	40	1100
APD0609470M035R	0609	47	35	500	12	45	1500
APD0606680M035R	0606	68	35	500	12	40	1100
APD0609680M035R	0609	68	35	500	12	36	1800
APD0609101M035R	0609	100	35	700	12	36	2200
APD0809101M035R	0809	100	35	700	12	36	2900
APD0811101M035R	0811	100	35	700	12	27	3100
APD0811151M035R	0811	150	35	1050	12	27	3100
APD0811221M035R	0811	220	35	1540	12	27	2500
APD0811271M035R	0811	270	35	1890	12	27	2600
APD1012271M035R	1012	270	35	1890	12	27	2800
APD1012331M035R	1012	330	35	2310	12	27	2800
APD1012471M035R	1012	470	35	3290	12	27	3100
50 Volt							
APD0606220M050R	0606	22	50	500	12	72	840
APD0606330M050R	0606	33	50	500	12	72	890
APD0609470M050R	0609	47	50	500	12	54	1400
APD0811680M050R	0811	68	50	680	12	27	2100
APD0811820M050R	0811	82	50	820	12	27	2100
APD1012820M050R	1012	82	50	820	12	27	2100
APD0809101M050R	0809	100	50	1000	12	54	1500
APD0811101M050R	0811	100	50	1000	12	27	2100
APD1012101M050R	1012	100	50	1000	12	27	2200
APD0811121M050R	0811	120	50	1200	12	27	2100
APD1012151M050R	1012	150	50	1500	12	27	2200
APD1012221M050R	1012	220	50	2200	12	27	2400
63 Volt							
APD0606220M063R	0606	22	63	500	12	72	520
APD0609330M063R	0609	33	63	500	12	54	520
APD0809470M063R	0809	47	63	592	12	54	1000
APD0811560M063R	0811	56	63	706	12	36	1000
APD1012101M063R	1012	100	63	1260	12	36	1600

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes.



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

TDS-ALUM-0006 | Rev 3

– ALUMINUM CAPACITORS –

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APD Series



FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz ≤ f(Hz) < 1kHz	1kHz ≤ f(Hz) < 10kHz	10kHz ≤ f(Hz) < 100kHz	100kHz ≤ f(Hz) < 500kHz
Coefficient	0.05	0.30	0.70	1.00

QUALIFICATION TABLE

Test	APD series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2000 hours at 105°C.	Visual examination	no visible damage
		ΔC/C	≅ ±20% of the initial limit
		DF	≅ 150% of the initial specified limit
		ESR	≅ 150% of the initial specified limit
		DCL	≅ Initial specified limit
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjection them to store at 60°C, 90 to 95% RH for 2000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≅ ±20% of the initial limit
		DF	≅ 150% of the initial specified limit
		ESR	≅ 150% of the initial specified limit
		DCL	≅ Initial specified limit
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at normal temperature for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≅ ±20% of the initial limit
		DF	≅ 150% of the initial specified limit
		ESR	≅ 150% of the initial specified limit
		DCL	≅ Initial specified limit

REFLOW

Peak Temperature	260°C, 10 sec. max
Preheat Temperature	150°C to 180°C, 90 sec. max.
Duration at 200°C or higher	60 sec. max.
Duration at 230°C or higher	40 sec. max.
Reflow Number	Twice or less

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gases (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage time:
 - Before unseal: within 1 year after delivery
 - After seal: within 1 month from opening

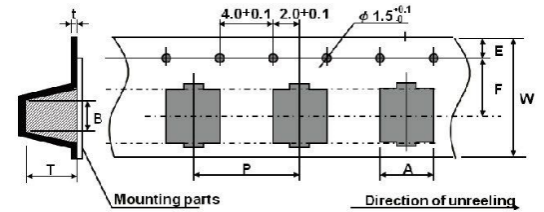
SMD Aluminum Conductive Polymer Electrolytic Capacitors

APD Series

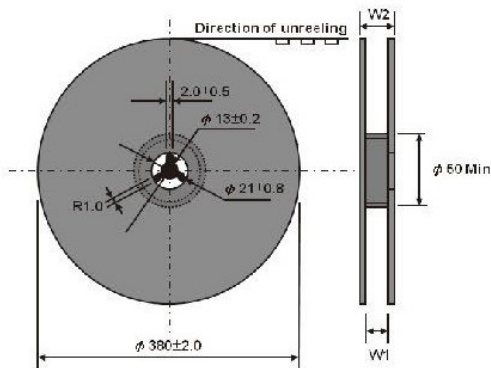


PACKAGE TAPE DIMENSIONS units (mm)

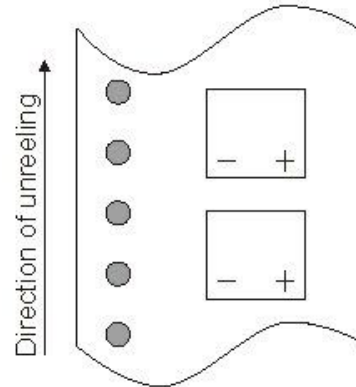
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0606	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0609	7.0	7.0	16.0	7.5	1.75	12.0	0.4	10.0
0809	8.7	8.7	24.0	11.5	1.75	16.0	0.4	10.5
0811	8.7	8.7	24.0	11.5	1.75	16.0	0.4	12.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0- 13.5



REEL



POLARITY

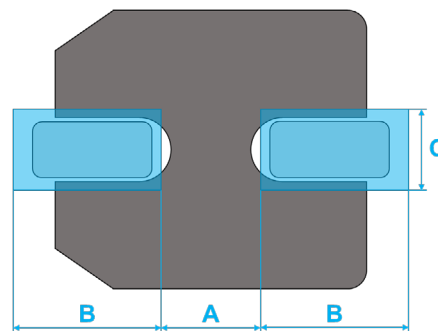


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0606	18.0	22.0	1000
0609	18.0	22.0	800
0809	26.0	30.0	600
0811	26.0	31.0	500
1012	26.0	31.0	500

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0606	1.9	3.5	1.6
0609	1.9	3.5	1.6
0809	3.1	4.2	2.2
0811	3.1	4.2	2.2
1012	4.5	4.4	2.2



SMD Aluminum Conductive Polymer Electrolytic Capacitors

APH Series



FEATURES

- Endurance: 2000hours at 105°C
- High Voltage
- Low ESR
- High ripple current capability
- RoHS compliant

APPLICATIONS

- LED Driver
- LED power Supply

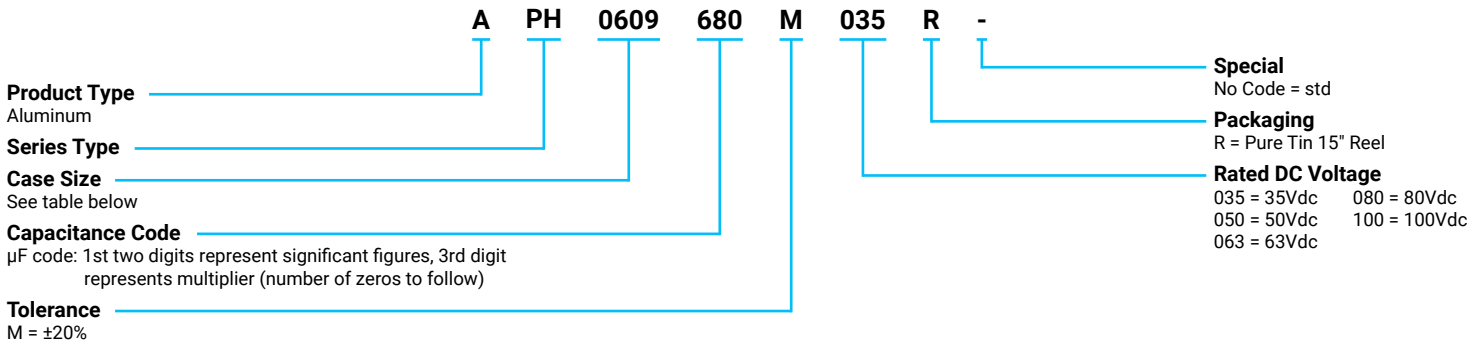


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

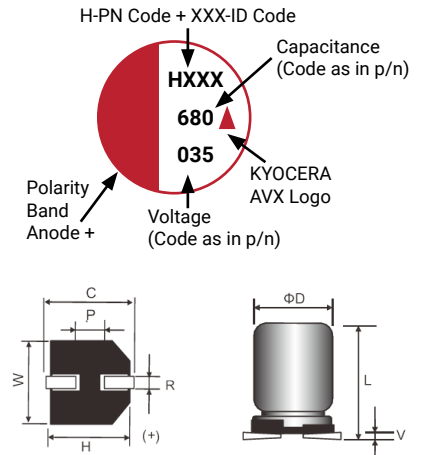
HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max
0606	6.30 (0.248)	6.00 (0.236)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)
0609	6.30 (0.248)	9.30 (0.366)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)
0807	8.00 (0.315)	7.00 (0.276)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.50-0.80 (0.020-0.031)	3.20 (0.126)	0.30 (0.012)
0809	8.00 (0.315)	9.50 (0.374)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)
0812	8.00 (0.315)	12.00 (0.472)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)
1010	10.00 (0.394)	10.50 (0.413)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70-1.30 (0.028-0.051)	4.50 (0.177)	0.30 (0.012)
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70-1.30 (0.028-0.051)	4.50 (0.177)	0.30 (0.012)

MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	At 25°C,120Hz	12µF to 220µF
Capacitance Tolerance:		±20%
Surge Voltage:	At 105°C	Rated voltage x 1.15
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	I ≤ 0.2CV or 300µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APH Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)				
μF	Code	35V	50V	63V	80V	100V
12	120		0606			
15	150					0812
22	220	0606		0609	0809	1012
27	270					1012
33	330		0609	0609	0812	
47	470		0809	0812	1010	
56	560	0609		1010		
68	680	0609, 0807			1012	
100	101	0812	1012	1012		
150	151			1012		
180	181		1012			
220	221	1012				

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
35 Volt							
APH0606220M035R	0606	22	35	300	12	80	1450
APH0609560M035R	0609	56	35	392	12	50	2300
APH0609680M035R	0609	68	35	476	12	50	2300
APH0807680M035R	0807	68	35	476	12	60	2500
APH0812101M035R	0812	100	35	700	12	28	2750
APH1012221M035R	1012	220	35	1540	12	28	3200
50 Volt							
APH0606120M050R	0606	12	50	300	12	100	1450
APH0609330M050R	0609	33	50	330	12	50	1800
APH0809470M050R	0809	47	50	470	12	45	2100
APH1012101M050R	1012	100	50	1000	12	28	2560
APH1012181M050R	1012	180	50	1800	12	28	2750
63 Volt							
APH0609220M063R	0609	22	63	300	12	50	1800
APH0609330M063R	0609	33	63	416	12	50	1800
APH0812470M063R	0812	47	63	592	12	36	2200
APH1010560M063R	1010	56	63	705	12	32	2350
APH1012101M063R	1012	100	63	1260	12	28	2550
APH1012151M063R	1012	150	63	1890	12	28	2550
80 Volt							
APH0809220M080R	0809	22	80	352	12	45	2100
APH0812330M080R	0812	33	80	528	12	45	2100
APH1010470M080R	1010	47	80	752	12	45	2250
APH1012680M080R	1012	68	80	1088	12	38	2550
100 Volt							
APH0812150M100R	0812	15	100	300	12	40	2050
APH1012220M100R	1012	22	100	440	12	38	2250
APH1012270M100R	1012	27	100	540	12	38	2250

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz ≤ f(Hz) < 1kHz	1kHz ≤ f(Hz) < 10kHz	10kHz ≤ f(Hz) < 100kHz	100kHz ≤ f(Hz) < 500kHz
Coefficient	0.05	0.30	0.70	1.00

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APH Series



QUALIFICATION TABLE

Test	APH series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2000 hours at 105°C.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjection them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 105°C for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gases (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
-

Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

Remark: Re-aging condition depends on its own spec.

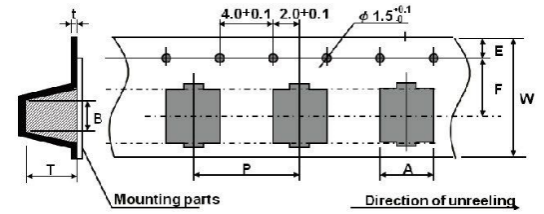
SMD Aluminum Conductive Polymer Electrolytic Capacitors

APH Series

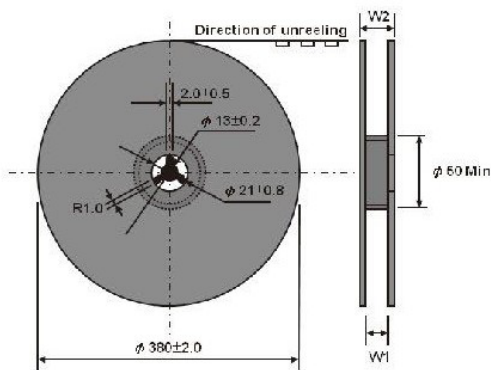


PACKAGE TAPE DIMENSIONS units (mm)

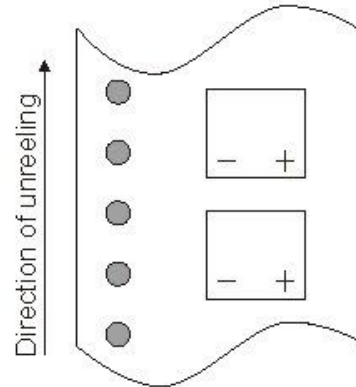
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0606	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0609	7.0	7.0	16.0	7.5	1.75	12.0	0.4	10.0
0807	8.7	8.7	24.0	11.5	1.75	16.0	0.4	8.8
0809	8.7	8.7	24.0	11.5	1.75	16.0	0.4	10.5
0812	8.7	8.7	24.0	11.5	1.75	16.0	0.4	13.0
1010	10.7	10.7	24.0	11.5	1.75	16.0	0.4	11.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0-13.5



REEL



POLARITY



DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0606	18.0	22.0	1000
0609	18.0	22.0	800
0807-0809	26.0	31.0	500
1010	26.0	31.0	500
0812-1012	26.0	31.0	400

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APV Series



FEATURES

- Endurance: 2000hours at 105°C
- Low ESR
- RoHS compliant

APPLICATIONS

- High order main board, server

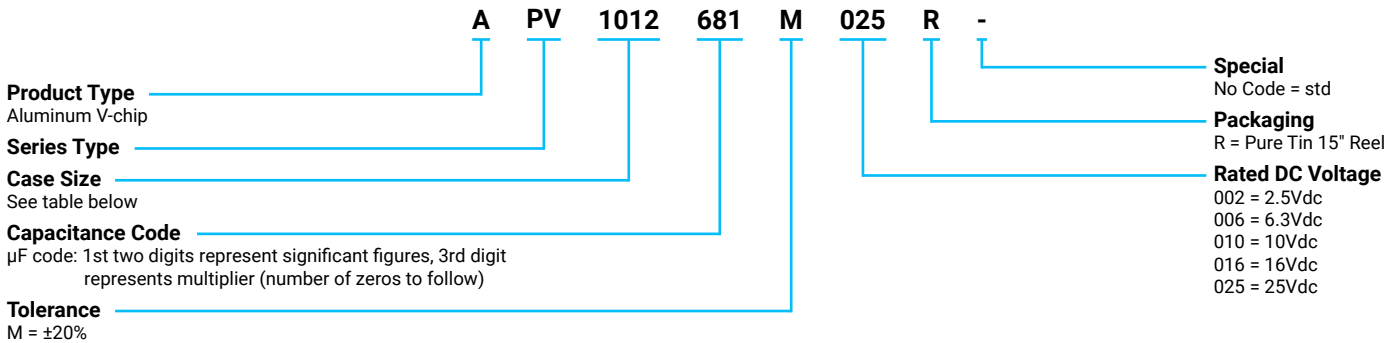


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

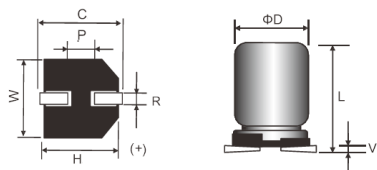
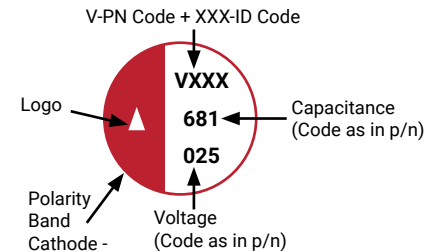
HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max	Typical Weight (g)
0606	6.30 (0.248)	6.00 (0.236)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)	0.28
0609	6.30 (0.248)	9.30 (0.366)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)	0.40
0809	8.00 (0.315)	9.50 (0.374)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)	0.68
0811	8.00 (0.315)	11.50 (0.453)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)	0.87
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70-1.30 (0.028-0.051)	4.50 (0.177)	0.30 (0.012)	1.28

MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	At 25°C,120Hz	27µF to 2200µF
Capacitance Tolerance:	At 25°C,120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.2CV$ or 500µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APV Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)				
μF	Code	2.5V	6.3V	10V	16V	25V
27	270					0606
47	470				0606	0606, 0609
56	560					0606
68	680			0606	0606	0606
100	101				0606	0606, 0609
120	121			0606		
150	151				0606, 0609	0609
180	181				0606, 0609	
220	221		0606	0606, 0609	0609	0609, 0811
270	271		0606		0609, 0809	
330	331	0606	0606	0609	0609, 0811, 1012	0811, 1012
390	391	0606				
470	471	0606	0609	0609		0811, 1012
560	561	0606	0609	0811, 1012	0811	1012
680	681	0609			1012	1012
1000	102		0811	0811, 1012	1012	
1500	152		0811	1012		
2200	222		1012			

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
2.5 Volts							
APV0606331M002R	0606	330	2.5	500	8	18	2800
APV0606391M002R	0606	390	2.5	500	8	18	2900
APV0606471M002R	0606	470	2.5	500	8	18	4000
APV0606561M002R	0606	560	2.5	500	8	18	4000
APV0609681M002R	0609	680	2.5	500	8	13	4500
6.3 Volt							
APV0606221M006R	0606	220	6.3	500	8	18	2900
APV0606271M006R	0606	270	6.3	500	8	18	3100
APV0606331M006R	0606	330	6.3	500	8	18	3200
APV0609471M006R	0609	470	6.3	592	8	13	3600
APV0609561M006R	0609	560	6.3	706	8	13	3800
APV0811102M006R	0811	1000	6.3	1260	8	13	4500
APV0811152M006R	0811	1500	6.3	1890	8	13	4600
APV1012222M006R	1012	2200	6.3	2772	8	13	5800
10 Volt							
APV0606680M010R	0606	68	10	500	12	45	2800
APV0606121M010R	0606	120	10	500	12	27	2800
APV0606221M010R	0606	220	10	500	12	27	2800
APV0609221M010R	0609	220	10	500	12	18	3100
APV0609331M010R	0609	330	10	660	12	18	3200
APV0609471M010R	0609	470	10	940	12	27	3500
APV0811561M010R	0811	560	10	1120	12	18	3700
APV1012561M010R	1012	560	10	1120	12	18	5200
APV0811102M010R	0811	1000	10	2000	12	13	4400
APV1012102M010R	1012	1000	10	2000	12	13	4600
APV1012152M010R	1012	1500	10	3000	12	13	4600
16 Volt							
APV0606470M016R	0606	47	16	500	12	36	1700
APV0606680M016R	0606	68	16	500	12	36	2100
APV0606101M016R	0606	100	16	500	12	27	2500
APV0606151M016R	0606	150	16	500	12	27	2500

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APV Series



Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
APV0609151M016R	0609	150	16	500	12	22	2700
APV0606181M016R	0606	180	16	576	12	54	2600
APV0609181M016R	0609	180	16	576	12	22	2800
APV0609221M016R	0609	220	16	704	12	22	2600
APV0609271M016R	0609	270	16	864	12	22	2700
APV0809271M016R	0809	270	16	864	12	22	2900
APV0609331M016R	0609	330	16	1056	12	22	2700
APV0811331M016R	0811	330	16	1056	12	18	4200
APV1012331M016R	1012	330	16	1056	12	18	5200
APV0811561M016R	0811	560	16	1792	12	18	3600
APV1012681M016R	1012	680	16	2176	12	18	4200
APV1012102M016R	1012	1000	16	3200	12	18	4300
25 Volt							
APV0606270M025R	0606	27	25	500	12	45	1100
APV0606470M025R	0606	47	25	500	12	45	1800
APV0609470M025R	0609	47	25	500	12	31	2100
APV0606560M025R	0606	56	25	500	12	45	1800
APV0606680M025R	0606	68	25	500	12	45	1800
APV0606101M025R	0606	100	25	500	12	27	2500
APV0609101M025R	0609	100	25	500	12	45	2200
APV0609151M025R	0609	150	25	750	12	27	2600
APV0609221M025R	0609	220	25	1100	12	27	2600
APV0811221M025R	0811	220	25	1100	12	27	2700
APV0811331M025R	0811	330	25	1650	12	19	2900
APV1012331M025R	1012	330	25	1650	12	27	2800
APV0811471M025R	0811	470	25	2350	12	27	2900
APV1012471M025R	1012	470	25	2350	12	19	3200
APV1012561M025R	1012	560	25	2800	12	19	3400
APV1012681M025R	1012	680	25	3400	12	19	3400

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz ≤ F(Hz) < 1kHz	1kHz ≤ F(Hz) < 10kHz	10kHz ≤ F(Hz) < 100kHz	100kHz ≤ F(Hz) < 500kHz
Coefficient	0.05	0.30	0.70	1.00

QUALIFICATION TABLE

Test	APV series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2000 hours at 105°C.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subsection them to store at 60°C, 90 to 95% RH for 2000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at normal temperature for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APV Series



REFLOW

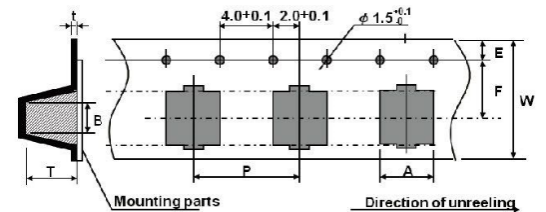
Peak Temperature	260°C, 10 sec. max.
Preheat Temperature	150°C to 180°C, 90 sec. max.
Duration at 200°C or higher	60 sec. max.
Duration at 230°C or higher	40 sec. max.
Reflow Number	Twice or less

STORAGE

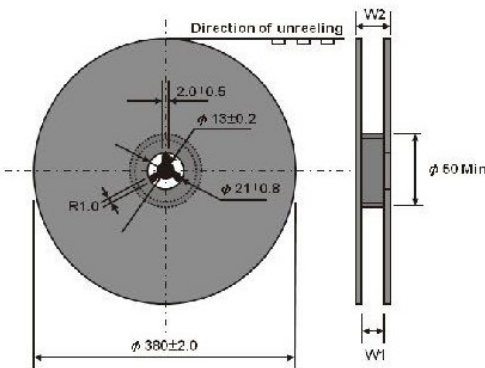
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gases (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage Time
 - Before unseal: within 1 year after delivery
 - After seal: within 1 month from opening

PACKAGE TAPE DIMENSIONS units (mm)

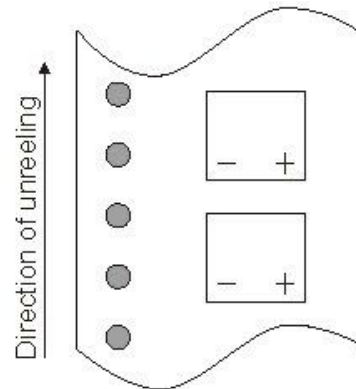
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0606	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0609	7.0	7.0	16.0	7.5	1.75	12.0	0.4	10.0
0809	8.7	8.7	24.0	11.5	1.75	16.0	0.4	10.5
0811	8.7	8.7	24.0	11.5	1.75	16.0	0.4	12.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0-13.5



REEL



POLARITY

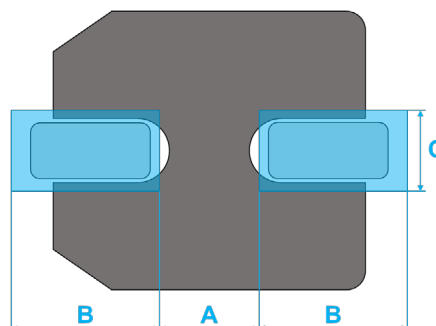


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0606	18.0	22.0	1000
0609	18.0	22.0	800
0809	26.0	30.0	600
0811	26.0	31.0	500
1012	26.0	31.0	500

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0606	1.9	3.5	1.6
0609	1.9	3.5	1.6
0809	3.1	4.2	2.2
0811	3.1	4.2	2.2
1012	4.5	4.4	2.2



SMD Aluminum Conductive Polymer Electrolytic Capacitors

APZ Series



FEATURES

- Endurance: 2000 hours at 105°C
- Standard Substance
- RoHS compliant

APPLICATIONS

- Displace Card and System Board

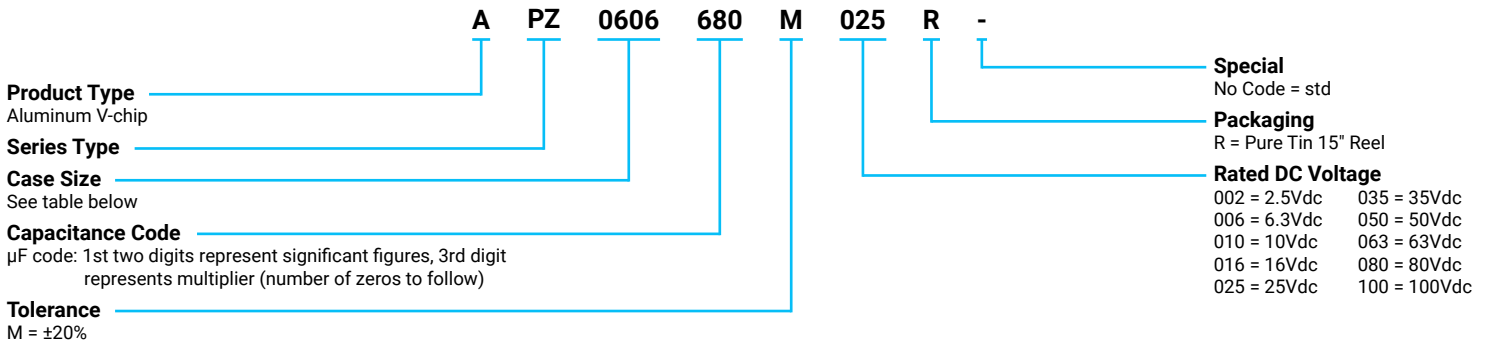


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

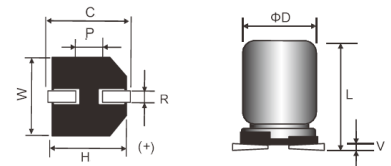
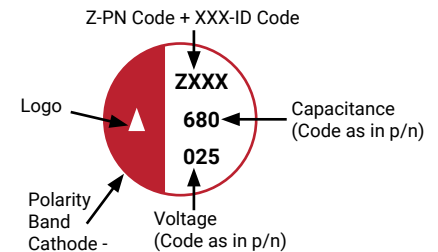
HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±0.50 (0.020)	W±0.20 (0.008)	H±0.20 (0.008)	C±0.20 (0.008)	R	P±0.30 (0.012)	V max	Typical Weight (g)
0606	6.30 (0.248)	6.00 (0.236)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)	0.28
0609	6.30 (0.248)	9.30 (0.366)	6.60 (0.260)	6.60 (0.260)	7.30 (0.287)	0.50-0.80 (0.020-0.031)	2.00 (0.080)	0.30 (0.012)	0.40
0809	8.00 (0.315)	9.50 (0.374)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)	0.68
0811	8.00 (0.315)	11.50 (0.453)	8.30 (0.327)	8.30 (0.327)	9.00 (0.354)	0.70-1.10 (0.028-0.043)	3.20 (0.126)	0.30 (0.012)	0.80
1012	10.00 (0.394)	12.50 (0.492)	10.30 (0.406)	10.30 (0.406)	11.00 (0.433)	0.70-1.30 (0.028-0.051)	4.50 (0.177)	0.30 (0.012)	1.28

MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to + 105°C	
Capacitance Range	At 25°C, 120Hz	22µF to 2200µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	I ≤ 0.2CV or 500µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APZ Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)									
μF	Code	2.5V	6.3V	10V	16V	25V	35V	50V	63V	80V	100V
22	220					0606	0606	0606	0606		0811
27	270					0606	0606			0811	
33	330						0606	0606	0609		
47	470				0606	0606, 0609	0606, 0609	0609	0809	1012	1012
56	560					0606			0811		
68	680				0606	0606	0606, 0609	0811		1012	
82	820							0811, 1012			
100	101				0606	0606, 0609	0609, 0809, 0811	0811, 1012	1012		
120	121			0606				0811			
150	151				0606, 0609	0609	0811	1012			
180	181				0606, 0609						
220	221		0606	0606, 0609	0609	0609, 0811	0811	1012			
270	271		0606		0609, 0809		0811, 1012				
330	331	0606	0606	0609	0609, 0811, 1012	0811, 1012	1012				
390	391	0606									
470	471	0606	0609	0609, 0809		0811, 1012	1012				
560	561	0606	0609	0811, 1012	0811	1012					
680	681	0609			1012	1012					
1000	102		0811	0811, 1012	1012						
1500	152		0811	1012							
2200	222		1012								

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
2.5 Volt							
APZ0606331M002R	0606	330	2.5	500	8	20	2700
APZ0606391M002R	0606	390	2.5	500	8	20	2800
APZ0606471M002R	0606	470	2.5	500	8	20	2900
APZ0606561M002R	0606	560	2.5	500	8	20	3000
APZ0609681M002R	0609	680	2.5	500	8	15	4300
6.3 Volt							
APZ0606221M006R	0606	220	6.3	500	8	20	2800
APZ0606271M006R	0606	270	6.3	500	8	20	3000
APZ0606331M006R	0606	330	6.3	500	8	20	2100
APZ0609471M006R	0609	470	6.3	592	8	15	3500
APZ0609561M006R	0609	560	6.3	706	8	15	3700
APZ0811102M006R	0811	1000	6.3	1260	8	15	4300
APZ0811152M006R	0811	1500	6.3	1890	8	15	4400
APZ1012222M006R	1012	2200	6.3	2772	8	15	5600
10 Volt							
APZ0606121M010R	0606	120	10	500	12	30	2700
APZ0606221M010R	0606	220	10	500	12	30	2700
APZ0609221M010R	0609	220	10	500	12	20	3000
APZ0609331M010R	0609	330	10	660	12	20	3100
APZ0609471M010R	0609	470	10	940	12	30	3400
APZ0809471M010R	0809	470	10	940	12	22	3400
APZ0811561M010R	0811	560	10	1120	12	20	3600
APZ1012561M010R	1012	560	10	1120	12	20	5000
APZ0811102M010R	0811	1000	10	2000	12	15	4200
APZ1012102M010R	1012	1000	10	2000	12	15	4400
APZ1012152M010R	1012	1500	10	3000	12	15	4400
16 Volt							
APZ0606470M016R	0606	47	16	500	12	40	1700

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APZ Series



Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
APZ0606680M016R	0606	68	16	500	12	40	2000
APZ0606101M016R	0606	100	16	500	12	30	2400
APZ0606151M016R	0606	150	16	500	12	30	2400
APZ0609151M016R	0609	150	16	500	12	25	2600
APZ0606181M016R	0606	180	16	576	12	60	2500
APZ0609181M016R	0609	180	16	576	12	25	2700
APZ0609221M016R	0609	220	16	704	12	25	2500
APZ0609271M016R	0609	270	16	864	12	25	2600
APZ0809271M016R	0809	270	16	864	12	25	2800
APZ0609331M016R	0609	330	16	1056	12	25	2600
APZ0811331M016R	0811	330	16	1056	12	20	4000
APZ1012331M016R	1012	330	16	1056	12	20	5000
APZ0811561M016R	0811	560	16	1792	12	20	3500
APZ1012681M016R	1012	680	16	2176	12	20	4000
APZ1012102M016R	1012	1000	16	3200	12	20	4100
25 Volt							
APZ0606220M025R	0606	22	25	500	12	80	1600
APZ0606270M025R	0606	27	25	500	12	50	1100
APZ0606470M025R	0606	47	25	500	12	50	1800
APZ0609470M025R	0609	47	25	500	12	35	2000
APZ0606560M025R	0606	56	25	500	12	50	1800
APZ0606680M025R	0606	68	25	500	12	50	1800
APZ0606101M025R	0606	100	25	500	12	50	2100
APZ0609101M025R	0609	100	25	500	12	30	2400
APZ0609151M025R	0609	150	25	750	12	30	2500
APZ0609221M025R	0609	220	25	1100	12	30	2500
APZ0811221M025R	0811	220	25	1100	12	30	2600
APZ0811331M025R	0811	330	25	1650	12	30	2700
APZ1012331M025R	1012	330	25	1650	12	22	2800
APZ0811471M025R	0811	470	25	2350	12	30	2800
APZ1012471M025R	1012	470	25	2350	12	22	3100
APZ1012561M025R	1012	560	25	2800	12	22	3300
APZ1012681M025R	1012	680	25	3400	12	22	3300
35 Volt							
APZ0606220M035R	0606	22	35	500	12	60	1100
APZ0606270M035R	0606	27	35	500	12	60	1100
APZ0606330M035R	0606	33	35	500	12	60	1100
APZ0606470M035R	0606	47	35	500	12	45	1100
APZ0609470M035R	0609	47	35	500	12	50	1500
APZ0606680M035R	0606	68	35	500	12	45	1100
APZ0609680M035R	0609	68	35	500	12	40	1800
APZ0609101M035R	0609	100	35	700	12	40	2100
APZ0809101M035R	0809	100	35	700	12	40	2800
APZ0811101M035R	0811	100	35	700	12	30	3000
APZ0811151M035R	0811	150	35	1050	12	30	3000
APZ0811221M035R	0811	220	35	1540	12	30	2400
APZ0811271M035R	0811	270	35	1890	12	30	2500
APZ1012271M035R	1012	270	35	1890	12	30	2700
APZ1012331M035R	1012	330	35	2310	12	30	2700
APZ1012471M035R	1012	470	35	3290	12	30	3000
50 Volt							
APZ0606220M050R	0606	22	50	500	12	80	800
APZ0606330M050R	0606	33	50	500	12	80	850
APZ0609470M050R	0609	47	50	500	12	60	1400
APZ0811680M050R	0811	68	50	680	12	30	2000
APZ0811820M050R	0811	82	50	820	12	30	2000
APZ1012820M050R	1012	82	50	820	12	30	2000
APZ0811101M050R	0811	100	50	1000	12	30	2000
APZ1012101M050R	1012	100	50	1000	12	30	2100
APZ0811121M050R	0811	120	50	1200	12	30	2000
APZ1012151M050R	1012	150	50	1500	12	30	2100
APZ1012221M050R	1012	220	50	2200	12	30	2300
63 Volt							
APZ0606220M063R	0606	22	63	500	12	80	450

SMD Aluminum Conductive Polymer Electrolytic Capacitors

APZ Series



Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)/105°C
APZ0609330M063R	0609	33	63	500	12	60	500
APZ0809470M063R	0809	47	63	592	12	60	1000
APZ0811560M063R	0811	56	63	706	12	40	1400
APZ1012101M063R	1012	100	63	1260	12	40	1600
80 Volt							
APZ0811270M080R	0811	27	80	500	12	50	600
APZ1012470M080R	1012	47	80	752	12	50	900
APZ1012680M080R	1012	68	80	1088	12	50	900
100 Volt							
APZ0811220M100R	0811	22	100	500	15	50	600
APZ1012470M100R	1012	47	100	940	15	50	900

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz ≤ F(Hz) < 1kHz	1kHz ≤ F(Hz) < 10kHz	10kHz ≤ F(Hz) < 100kHz	100kHz ≤ F(Hz) < 500kHz
Coefficient	0.05	0.30	0.70	1.00

QUALIFICATION TABLE

Test	APZ series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2000 hours at 105°C.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjection them to store at 60°C, 90 to 95% RH for 2000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at normal temperature for 30 seconds. Through a protective resistor (R = 1kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF	≤ 150% of the initial specified limit
		ESR	≤ 150% of the initial specified limit
		DCL	≤ Initial specified limit

REFLOW

Peak Temperature	260°C, 10 sec. max.
Preheat Temperature	150°C to 180°C, 90 sec. max.
Duration at 200°C or higher	60 sec. max.
Duration at 230°C or higher	40 sec. max.
Reflow Number	Twice or less

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gases (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage Time
 - Before unseal: within 1 year after delivery
 - After seal: within 1 month from opening

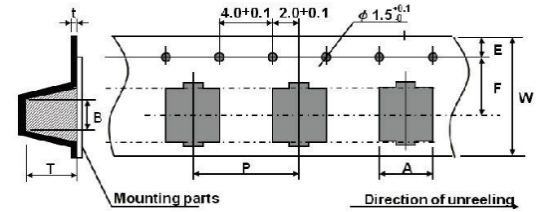
SMD Aluminum Conductive Polymer Electrolytic Capacitors

APZ Series

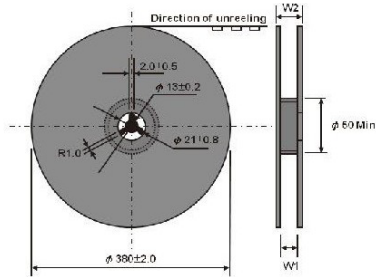


PACKAGE TAPE DIMENSIONS units (mm)

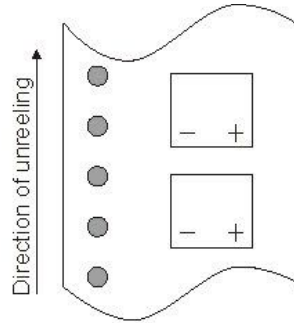
Size Code	A±0.20	B±0.20	W±0.30	F±0.10	E±0.10	P±0.10	t±0.10	T±0.20
0606	7.0	7.0	16.0	7.5	1.75	12.0	0.4	8.0
0609	7.0	7.0	16.0	7.5	1.75	12.0	0.4	10.0
0809	8.7	8.7	24.0	11.5	1.75	16.0	0.4	10.5
0811	8.7	8.7	24.0	11.5	1.75	16.0	0.4	12.0
1012	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0-13.5



REEL



POLARITY

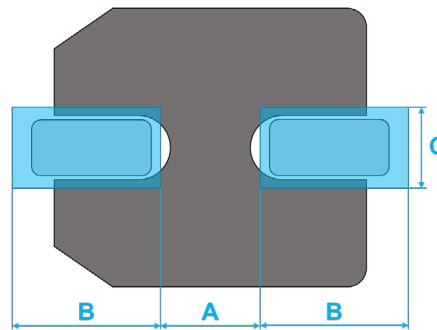


DIMENSIONS units (mm)

Size Code	W1±1.00	W2±1.00	Qty./Reel
0606	18.0	22.0	1000
0609	18.0	22.0	800
0809	26.0	30.0	600
0811	26.0	31.0	500
1012	26.0	31.0	500

RECOMMENDED LAND PATTERN DIMENSION OF PCB

Size Code	A (mm)	B (mm)	C (mm)
0606	1.9	3.5	1.6
0609	1.9	3.5	1.6
0809	3.1	4.2	2.2
0811	3.1	4.2	2.2
1012	4.5	4.4	2.2



Radial Leaded Aluminum Electrolytic Capacitors

Capacitors

REA Series



FEATURES

- Long Life
- Endurance: 3000 - 5000 hours at 105°C
- RoHS Compliance

APPLICATIONS

- Communications Equipment
- Industrial Equipment



HOW TO ORDER

Product Type Radial Aluminum

Series Type

Case Size See table below

Capacitance Code μF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance M = $\pm 20\%$

Special
No Code = std
Different lead cutting and forming upon request

Packaging
K = Ammo Pack
B = Bulk Pack

Rated DC Voltage

006 = 6.3Vdc	050 = 50Vdc	250 = 250Vdc
010 = 10Vdc	063 = 63Vdc	350 = 350Vdc
016 = 16Vdc	100 = 100Vdc	400 = 400Vdc
025 = 25Vdc	160 = 160Vdc	450 = 450Vdc
035 = 35Vdc	200 = 200Vdc	

Ordering Code Example: R EA 1013 471 M 016 K -

CASE DIMENSIONS millimeters (inches)

Code	D ± 0.50 (0.020)	L' ± 0.50 (0.020)	d ± 0.05 (0.002)	P ± 0.50 (0.020)	α	Typical Weight (g)	Code	D ± 0.50 (0.020)	L' ± 2.00 (0.079)	d ± 0.05 (0.002)	P ± 0.50 (0.020)	α	Typical Weight (g)
0511	5.00 (0.020)	11.00 (0.433)	0.50 (0.020)	2.00 (0.079)	1.00 (0.039)	0.43	1430	14.50 (0.571)	30.00 (1.181)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	7.62
0611	6.30 (0.248)	11.00 (0.433)	0.50 (0.020)	2.50 (0.098)	1.00 (0.039)	0.60	1440	14.50 (0.571)	40.00 (1.575)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	10.16
0812	8.00 (0.315)	12.00 (0.472)	0.50 (0.020)	3.50 (0.138)	1.00 (0.039)	0.98	1445	14.50 (0.571)	45.00 (1.772)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	13.00
0850	8.00 (0.315)	50.00 (1.969)	0.50 (0.020)	3.50 (0.138)	2.00 (0.079)	4.20	1450	14.50 (0.571)	50.00 (1.969)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	14.00
0861	8.00 (0.315)	61.00 (2.402)	0.50 (0.020)	3.50 (0.138)	2.00 (0.079)	5.20	1622	16.00 (0.630)	22.00 (0.866)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	6.20
1013	10.00 (0.394)	13.00 (0.512)	0.60 (0.024)	5.00 (0.020)	1.00 (0.039)	1.52	1626	16.00 (0.630)	26.00 (1.024)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	8.70
1016	10.00 (0.394)	16.00 (0.630)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	1.80	1632	16.00 (0.630)	32.00 (1.260)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	9.60
1020	10.00 (0.394)	20.00 (0.787)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	2.71	1635	16.00 (0.630)	35.00 (1.378)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	12.38
1040	10.00 (0.394)	40.00 (1.575)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	5.42	1636	16.00 (0.630)	36.00 (1.417)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	12.38
1045	10.00 (0.394)	45.00 (1.772)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	6.08	1640	16.00 (0.630)	40.00 (1.575)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	13.85
1050	10.00 (0.394)	50.00 (1.969)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	6.75	1645	16.00 (0.630)	45.00 (1.772)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	16.25
1060	10.00 (0.394)	60.00 (2.362)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	8.00	1650	16.00 (0.630)	50.00 (1.969)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	16.50
1321	13.00 (0.521)	21.00 (0.827)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	4.59	1825	18.00 (0.709)	25.00 (0.984)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	9.60
1325	13.00 (0.512)	25.00 (0.984)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	5.00	1832	18.00 (0.709)	32.00 (1.260)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	12.00
1330	13.00 (0.512)	30.00 (1.181)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	5.64	1835	18.00 (0.709)	35.00 (1.378)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	12.40
1335	13.00 (0.512)	35.00 (1.378)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	7.20	1840	18.00 (0.709)	40.00 (1.575)	0.80 (0.315)	7.50 (0.295)	2.00 (0.079)	16.00
1340	13.00 (0.512)	40.00 (1.575)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	8.96	2240	22.00 (0.866)	40.00 (1.575)	0.80 (0.315)	10.00 (0.394)	2.00 (0.079)	21.87
1350	13.00 (0.512)	50.00 (1.969)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	10.70	2250	22.00 (0.866)	50.00 (1.969)	0.80 (0.315)	10.00 (0.394)	2.00 (0.079)	23.20
1360	13.00 (0.512)	60.00 (2.362)	0.60 (0.024)	5.00 (0.020)	2.00 (0.079)	14.85	2550	25.00 (0.984)	50.00 (1.969)	1.00 (0.039)	12.50 (0.492)	2.00 (0.079)	34.60

MARKING



Radial Leaded Aluminum Electrolytic Capacitors

REA Series



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-40°C to +105°C (6.3-250V), -25°C to +105°C (350-450V)		
Capacitance Range	At 25°C, 120Hz	0.47µF – 22,000µF	
Capacitance Tolerance:	At 25°C, 120Hz	±20%	
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below	
Leakage Current:	After 2 minutes (6.3-100V), 3 minutes (160-250V) at rated working voltage at 25°C*	6.3-100V	160-450V
		≤0.01CV or 3µA, whichever is greater	≤0.03CV + 20µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment: Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)													
µF	Code	6.3V	10V	16V	25V	35V	50V	63V	100V	160V	200V	250V	350V	400V	450V
0.47	R47						0511								
1.0	1R0						0511								
2.2	2R2						0511		0511	0611	0611	0812	0812	0812	1013
3.3	3R3						0511		0511	0812	0812	0812	0812	0812	1013
4.7	4R7						0511		0511	0812	1013	0812	1013	1013	1016
10	100				0511	0511	0511	0511	0611	1013	1016	1016	1020	1020	1321
22	220				0511	0611	0611	0611	0812	1016	1020	1321	1321	0850 1325	1040 1622
33	330				0611	0611	0812	0812	1013	1020	1321	1321	1040 1325	0861 1040 1622	1050 1335 1626
39	390								1013	1020	1321	1325	1040 1330 1622	0861 1045 1335 1626	0861 1050 1340 1632
47	470			0511	0611	0812	0812	1013	1016	1321	1321	1325	1040 1335 1430 1626	1050 1340 1440 1632	1060 1350 1440 1825
53	530												1335	1350	1060
68	680								1020	1325	1325	1622	1060 1340 1626 1635	1350 1445 1635 1825	1360 1450 1640 1832
82	820								1321	1622	1626	1632	1350 1635 1825	1445 1640 1832	1450 1645 1835
100	101	0511	0511	0611	0812	0812	1013	1016	1321	1626	1632	1636	1640 1832	1450 1645 1835	1650 1840
120	121												1835	1840	
220	221	0611	0611	0812	1013	1013	1016	1020	1626	1835	1840				
330	331	0812	0812	0812	1013	1016	1020	1321	1626						
470	471	0812	0812	1013	1020	1321	1321	1626	1632						
560	561									2240	2250				
680	681									2250	2550				
820	821										2550				
1000	102	1013	1016	1020	1321	1325	1626	1632							
2200	222	1020	1321	1325	1626	1632	1835								
3300	332	1321	1325	1626	1632	1835	1840								
4700	472	1325	1626	1632	1835	1840									
6800	682	1626	1632	1835	1840										
10,000	103	1632	1835	1840											
15,000	153	1835	1840												
22,000	223	1840													

Released ratings

Radial Leaded Aluminum Electrolytic Capacitors

REA Series



RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	120Hz RMS Current (mA) / 105°C
6.3 Volt						
REA0511101M006*	0511	100	6.3	6.3	24	120
REA0611221M006*	0611	220	6.3	13.86	24	170
REA0812331M006*	0812	330	6.3	20.79	24	250
REA0812471M006*	0812	470	6.3	29.61	24	290
REA1013102M006*	1013	1000	6.3	63	24	490
REA1020222M006*	1020	2200	6.3	138.6	24	830
REA1321332M006*	1321	3300	6.3	207.9	24	1060
REA1325472M006*	1325	4700	6.3	296.1	24	1310
REA1626682M006B	1626	6800	6.3	428.4	24	1430
REA1632103M006B	1632	10000	6.3	630	24	1790
REA1835153M006B	1835	15000	6.3	945	24	1980
REA1840223M006B	1840	22000	6.3	1386	24	2290
10 Volt						
REA0511101M010*	0511	100	10	10	20	130
REA0611221M010*	0611	220	10	22	20	190
REA0812331M010*	0812	330	10	33	20	280
REA0812471M010*	0812	470	10	47	20	330
REA1016102M010*	1016	1000	10	100	20	580
REA1321222M010*	1321	2200	10	220	20	970
REA1325332M010*	1325	3300	10	330	20	1250
REA1626472M010B	1626	4700	10	470	20	1400
REA1632682M010B	1632	6800	10	680	20	1690
REA1835103M010B	1835	10000	10	1000	20	2010
REA1840153M010B	1840	15000	10	1500	20	2260
16 Volt						
REA0511470M016*	0511	47	16	7.52	17	85
REA0611101M016*	0611	100	16	16	17	140
REA0812221M016*	0812	220	16	35.2	17	240
REA0812331M016*	0812	330	16	52.8	17	310
REA1013471M016*	1013	470	16	75.2	17	380
REA1020102M016*	1020	1000	16	160	17	670
REA1325222M016*	1325	2200	16	352	17	1130
REA1626332M016B	1626	3300	16	528	17	1350
REA1632472M016B	1632	4700	16	752	17	1570
REA1835682M016B	1835	6800	16	1088	17	1930
REA1840103M016B	1840	10000	16	1600	17	2190
25 Volt						
REA0511100M025*	0511	10	25	2.5	15	45
REA0511220M025*	0511	22	25	5.5	15	60
REA0611330M025*	0611	33	25	8.25	15	90
REA0611470M025*	0611	47	25	11.75	15	105
REA0812101M025*	0812	100	25	25	15	185
REA1013221M025*	1013	220	25	55	15	290
REA1013331M025*	1013	330	25	82.5	15	350
REA1020471M025*	1020	470	25	117.5	15	465
REA1321102M025*	1321	1000	25	250	15	830
REA1626222M025B	1626	2200	25	550	15	1210
REA1632332M025B	1632	3300	25	825	15	1540
REA1835472M025B	1835	4700	25	1175	15	1870
REA1840682M025B	1840	6800	25	1700	15	2120
35 Volt						
REA0511100M035*	0511	10	35	3.5	12	48
REA0611220M035*	0611	22	35	7.7	12	78
REA0611330M035*	0611	33	35	11.55	12	100
REA0812470M035*	0812	47	35	16.45	12	130
REA0812101M035*	0812	100	35	35	12	190
REA1013221M035*	1013	220	35	77	12	320
REA1016331M035*	1016	330	35	115.5	12	420
REA1321471M035*	1321	470	35	164.5	12	580
REA1325102M035*	1325	1000	35	350	12	1000
REA1632222M035B	1632	2200	35	770	12	1450

Radial Leaded Aluminum Electrolytic Capacitors

REA Series



Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	120Hz RMS Current (mA) / 105°C
REA1835332M035B	1835	3300	35	1155	12	1830
REA1840472M035B	1840	4700	35	1645	12	2150
50 Volt						
REA0511R47M050*	0511	0.47	50	0.235	10	8
REA05111R0M050*	0511	1	50	0.5	10	17
REA05112R2M050*	0511	2.2	50	1.1	10	23
REA05113R3M050*	0511	3.3	50	1.65	10	31
REA05114R7M050*	0511	4.7	50	2.35	10	35
REA0511100M050*	0511	10	50	5	10	51
REA0611220M050*	0611	22	50	11	10	85
REA0812330M050*	0812	33	50	16.5	10	102
REA0812470M050*	0812	47	50	23.5	10	141
REA1013101M050*	1013	100	50	50	10	231
REA1016221M050*	1016	220	50	110	10	368
REA1020331M050*	1020	330	50	165	10	490
REA1321471M050*	1321	470	50	235	10	665
REA1626102M050B	1626	1000	50	500	10	1080
REA1835222M050B	1835	2200	50	1100	10	1695
REA1840332M050B	1840	3300	50	1650	10	2070
63 Volt						
REA0511100M063*	0511	10	63	6.3	9	56
REA0611220M063*	0611	22	63	13.86	9	95
REA0812330M063*	0812	33	63	20.79	9	122
REA1013470M063*	1013	47	63	29.61	9	152
REA1016101M063*	1016	100	63	63	9	250
REA1020221M063*	1020	220	63	138.6	9	415
REA1321331M063*	1321	330	63	207.9	9	550
REA1626471M063B	1626	470	63	296.1	9	725
REA1632102M063B	1632	1000	63	630	9	1135
100 Volt						
REA05112R2M100*	0511	2.2	100	2.2	8	28
REA05113R3M100*	0511	3.3	100	3.3	8	34
REA05114R7M100*	0511	4.7	100	4.7	8	40
REA0611100M100*	0611	10	100	10	8	66
REA0812220M100*	0812	22	100	22	8	112
REA1013330M100*	1013	33	100	33	8	155
REA1013390M100*	1013	39	100	39	8	160
REA1016470M100*	1016	47	100	47	8	190
REA1020680M100*	1020	68	100	68	8	210
REA1321820M100*	1321	82	100	82	8	240
REA1321101M100*	1321	100	100	100	8	310
REA1626221M100B	1626	220	100	220	8	540
REA1626331M100B	1626	330	100	330	8	660
REA1632471M100B	1632	470	100	470	8	880
160 Volt						
REA06112R2M160*	0611	2.2	160	10.56	15	28
REA08123R3M160*	0812	3.3	160	15.84	15	34
REA08124R7M160*	0812	4.7	160	22.56	15	43
REA1013100M160*	1013	10	160	48	15	75
REA1016220M160*	1016	22	160	105.6	15	130
REA1020330M160*	1020	33	160	158.4	15	170
REA1020390M160*	1020	39	160	187.2	15	190
REA1321470M160*	1321	47	160	225.6	15	230
REA1325680M160*	1325	68	160	326.4	15	260
REA1622820M160B	1622	82	160	393.6	15	320
REA1626101M160B	1626	100	160	480	15	350
REA1835221M160B	1835	220	160	1056	15	640
REA2240561M160B	2240	560	160	2688	15	1300
REA2250681M160B	2250	680	160	3264	15	1420
200 Volt						
REA06112R2M200*	0611	2.2	200	13.2	15	28
REA08123R3M200*	0812	3.3	200	19.8	15	35
REA10134R7M200*	1013	4.7	200	28.2	15	50
REA1016100M200*	1016	10	200	60	15	80
REA1020220M200*	1020	22	200	132	15	140

Radial Leaded Aluminum Electrolytic Capacitors

REA Series



Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	120Hz RMS Current (mA) / 105°C
REA1321330M200*	1321	33	200	198	15	200
REA1321390M200*	1321	39	200	234	15	220
REA1321470M200*	1321	47	200	282	15	250
REA1325680M200*	1325	68	200	408	15	280
REA1626820M200B	1626	82	200	492	15	350
REA1632101M200B	1632	100	200	600	15	480
REA1840221M200B	1840	220	200	1320	15	810
REA2250561M200B	2250	560	200	3360	15	1400
REA2550681M200B	2550	680	200	4080	15	1550
REA2550821M200B	2550	820	200	4920	15	1700
250 Volt						
REA08122R2M250*	0812	2.2	250	16.5	15	35
REA08123R3M250*	0812	3.3	250	24.75	15	50
REA08124R7M250*	0812	4.7	250	35.25	15	55
REA1016100M250*	1016	10	250	75	15	100
REA1321220M250*	1321	22	250	165	15	170
REA1321330M250*	1321	33	250	247.5	15	225
REA1325390M250*	1325	39	250	292.5	15	250
REA1325470M250*	1325	47	250	352.5	15	280
REA1622680M250B	1622	68	250	510	15	310
REA1632820M250B	1632	82	250	615	15	390
REA1636101M250B	1636	100	250	750	15	500
350 Volt						
REA08122R2M350*	0812	2.2	350	23.1	20	35
REA08123R3M350*	0812	3.3	350	34.65	20	44
REA10134R7M350*	1013	4.7	350	49.35	20	55
REA1020100M350*	1020	10	350	105	20	92
REA1321220M350*	1321	22	350	231	20	162
REA1040330M350B	1040	33	350	346.5	20	210
REA1325330M350*	1325	33	350	346.5	20	205
REA1040390M350B	1040	39	350	409.5	20	210
REA1330390M350B	1330	39	350	409.5	20	270
REA1622390M350B	1622	39	350	409.5	20	205
REA1040470M350B	1040	47	350	493.5	20	300
REA1335470M350B	1335	47	350	493.5	20	320
REA1430470M350B	1430	47	350	493.5	20	320
REA1626470M350B	1626	47	350	493.5	20	320
REA1335530M350B	1335	53	350	556.5	20	320
REA1060680M350B	1060	68	350	714	20	400
REA1340680M350B	1340	68	350	714	20	430
REA1626680M350B	1626	68	350	714	20	350
REA1635680M350B	1635	68	350	714	20	420
REA1350820M350B	1350	82	350	861	20	450
REA1635820M350B	1635	82	350	861	20	500
REA1825820M350B	1825	82	350	861	20	420
REA1640101M350B	1640	100	350	1050	20	530
REA1832101M350B	1832	100	350	1050	20	550
REA1835121M350B	1835	120	350	1260	20	650
400 Volt						
REA08122R2M400*	0812	2.2	400	26.4	20	35
REA08123R3M400*	0812	3.3	400	39.6	20	50
REA10134R7M400*	1013	4.7	400	56.4	20	60
REA1020100M400*	1020	10	400	120	20	100
REA0850220M400B	0850	22	400	264	20	135
REA1325220M400*	1325	22	400	264	20	190
REA0861330M400B	0861	33	400	396	20	280
REA1040330M400B	1040	33	400	396	20	260
REA1622330M400B	1622	33	400	396	20	240
REA0861390M400B	0861	39	400	468	20	280
REA1045390M400B	1045	39	400	468	20	300
REA1335390M400B	1335	39	400	468	20	310
REA1626390M400B	1626	39	400	468	20	300
REA1050470M400B	1050	47	400	564	20	330
REA1340470M400B	1340	47	400	564	20	350
REA1440470M400B	1440	47	400	564	20	370

Radial Leaded Aluminum Electrolytic Capacitors

REA Series



Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	120Hz RMS Current (mA) / 105°C
REA1632470M400B	1632	47	400	564	20	330
REA1350530M400B	1350	53	400	636	20	385
REA1350680M400B	1350	68	400	816	20	385
REA1445680M400B	1445	68	400	816	20	400
REA1635680M400B	1635	68	400	816	20	420
REA1825680M400B	1825	68	400	816	20	350
REA1445820M400B	1445	82	400	984	20	530
REA1640820M400B	1640	82	400	984	20	550
REA1832820M400B	1832	82	400	984	20	580
REA1450101M400B	1450	100	400	1200	20	700
REA1645101M400B	1645	100	400	1200	20	720
REA1835101M400B	1835	100	400	1200	20	660
REA1840121M400B	1840	120	400	1440	20	770
450 Volt						
REA10132R2M450*	1013	2.2	450	29.7	20	36
REA10133R3M450*	1013	3.3	450	44.55	20	48
REA10164R7M450*	1016	4.7	450	63.45	20	60
REA1321100M450*	1321	10	450	135	20	110
REA1040220M450B	1040	22	450	297	20	280
REA1622220M450B	1622	22	450	297	20	210
REA1050330M450B	1050	33	450	445.5	20	350
REA1335330M450B	1335	33	450	445.5	20	300
REA1626330M450B	1626	33	450	445.5	20	280
REA0861390M450B	0861	39	450	526.5	20	350
REA1050390M450B	1050	39	450	526.5	20	350
REA1340390M450B	1340	39	450	526.5	20	360
REA1632390M450B	1632	39	450	526.5	20	330
REA1060470M450B	1060	47	450	634.5	20	410
REA1350470M450B	1350	47	450	634.5	20	370
REA1440470M450B	1440	47	450	634.5	20	390
REA1825470M450B	1825	47	450	634.5	20	360
REA1060530M450B	1060	53	450	715.5	20	440
REA1360680M450B	1360	68	450	918	20	450
REA1450680M450B	1450	68	450	918	20	400
REA1640680M450B	1640	68	450	918	20	440
REA1832680M450B	1832	68	450	918	20	500
REA1450820M450B	1450	82	450	1107	20	600
REA1645820M450B	1645	82	450	1107	20	620
REA1835820M450B	1835	82	450	1107	20	600
REA1650101M450B	1650	100	450	1350	20	760
REA1840101M450B	1840	100	450	1350	20	720

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk Pack.

DF = When nominal capacitance exceeds 1000μF, add 0.02 to the value above for each 1000μF increase.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 3 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (V)	Capacitance (μF)	Frequency (Hz)			
		50	120	1K	≥ 10K
≤ 100	< 100	0.70	1.00	1.40	1.60
	100 - 4700	0.75	1.00	1.30	1.40
	> 4700	0.80	1.00	1.15	1.20
≥ 160	2.2 - 820	0.80	1.00	1.30	1.40

Radial Leaded Aluminum Electrolytic Capacitors

RE Series



QUALIFICATION TABLE

Test	RE Series (Temperature Range -40°C to +105°C (6.3-250V), -25°C to 105°C (350-450V))							
	Condition	Characteristics						
Temperature Stability (Max. Impedance Ratio)	120Hz	Rated Voltage (V)	6.3	10-16	25-100	160-250	350-400	450
		Z(-25°C) / Z(20°C)	4	3	2	4	8	15
		Z(-40°C) / Z(20°C)	8	6	4	6	-	-
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjected to DC voltage with the rated ripple current is applied for 5000 hours (D ≤ 8: 3000 hours; D=10: 4000 hours, D ≥ 13: 5000 hours) at 105°C.	ΔC/C	within ±20% of initial limit					
		DF	200% or less of initial specified limit					
		DCL	initial specified limit or less					
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1000 hours 105°C without voltage applied. Before the measurement, the capacitor shall be preconditioned by applying voltage according to them 4.1 of JIS C5101-4.	ΔC/C	within ±20% of initial limit					
		DF	200% or less of initial specified limit					
		DCL	initial specified limit or less					
Standard	JIS C 5101-4-1 (IEC 60384)							

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current has to be reduced.

STORAGE

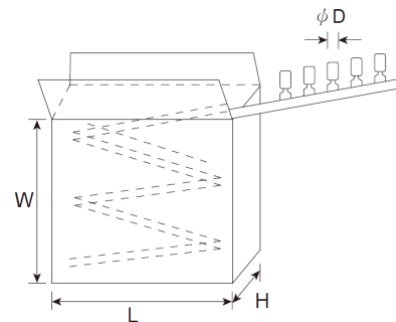
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
-

Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

PACKAGE TAPE DIMENSIONS

AMMO PACKING

Size Code	Ammo Pack					
	W±5 (mm)	L±5 (mm)	H±5 (mm)	Qty. (pcs)	G.W. kg/box	Box /Carton
0511	235	327	54	2000	0.99	10
0611	235	327	54	1500	1.12	10
0812	265	327	51	1000	1.48	10
1013/1016	235	330	57	600	1.29	10
1020	235	330	57	600	1.48	10
1321	280	315	65	400	1.95	6
1325	280	315	65	400	2.35	6



Radial Leaded Aluminum Electrolytic Capacitors

REA Series



BULK PACKING

Size Code	Bulk		Ammo Taping	
	Bag / Box		Box	Carton
0511	Bag	1000	20,000	20,000
0611	Bag	1000	16,000	15,000
0812	Bag	500	9000	9000
0850	Box	588	2352	-
0861	Box	588	2352	-
1013	Bag	200	4400	600
1016	Bag	200	3600	600
1020	Bag	200	3600	600
1040	Box	828	3312	-
1045	Box	828	3312	-
1050	Box	828	3312	-
1060	Box	828	3312	-
1321	Bag	150	2100	400
1325	Bag	150	1800	400
1330	Bag	100	1400	-
1335	Bag	100	1400	-
1340	Box	540	2160	-
1350	Box	540	2160	-
1360	Box	270	1080	-
1430	Box	448	1792	-
1440	Box	448	1792	-
1445	Box	448	1792	-
1450	Box	448	1792	-
1622	Box	390	1560	-
1626	Box	390	1560	-
1632	Box	390	1560	-
1635	Box	390	1560	-
1636	Box	390	1560	-
1640	Box	390	1560	-
1645	Box	390	1560	-
1650	Box	390	1560	-
1825	Box	286	1144	-
1832	Box	286	1144	-
1835	Box	286	1144	-
1840	Box	286	1144	-
2240	Box	198	792	-
2250	Box	198	792	-
2550	Box	144	576	-

Radial Leaded Aluminum Electrolytic Capacitors

REF Series



FEATURES

- Super Low Impedance, High ripple current capability
- Endurance: 3000 - 6000 hours at 105°C
- RoHS and Halogen Free Compliance

APPLICATIONS

- Power supplies, general industrial, filtering



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



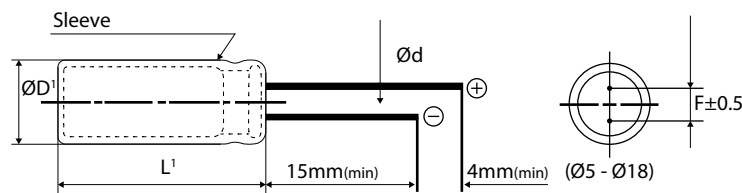
RoHS
COMPLIANT

HOW TO ORDER

	R	EF	0816	471	M	016	K	-	
Product Type Radial Aluminum									Special No Code = std Different lead cutting and forming upon request
Series Type See table below									Packaging K = Ammo Pack B = Bulk Pack
Capacitance Code µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)									Rated DC Voltage 006 = 6.3Vdc 050 = 50Vdc 010 = 10Vdc 063 = 63Vdc 016 = 16Vdc 080 = 80Vdc 025 = 25Vdc 100 = 100Vdc 035 = 35Vdc 120 = 120Vdc
Tolerance M = ±20%									

CASE DIMENSIONS millimeters (inches)

Code	D'+0.50 (0.020)	L'+2.00 (0.079)	d±0.05 (0.002)	F±0.50 (0.020)	Typical Weight (g)	Code	D'+0.50 (0.020)	L'+2.00 (0.079)	d±0.05 (0.002)	F±0.50 (0.020)	Typical Weight (g)
0511	5.00 (0.020)	11.00 (0.433)	0.50 (0.020)	2.00 (0.079)	0.43	1216	12.50 (0.492)	16.00 (0.630)	0.60 (0.024)	5.00 (0.020)	3.11
0512	5.00 (0.020)	12.00 (0.472)	0.50 (0.020)	2.00 (0.079)	1.05	1220	12.50 (0.492)	20.00 (0.787)	0.60 (0.024)	5.00 (0.020)	3.98
0609	6.30 (0.248)	9.00 (0.354)	0.50 (0.020)	2.50 (0.098)	0.54	1225	12.50 (0.492)	25.00 (0.984)	0.60 (0.024)	5.00 (0.020)	5.01
0611	6.30 (0.248)	11.00 (0.433)	0.50 (0.020)	2.50 (0.098)	0.61	1230	12.50 (0.492)	30.00 (1.181)	0.60 (0.024)	5.00 (0.020)	5.95
0612	6.30 (0.248)	12.00 (0.472)	0.50 (0.020)	2.50 (0.098)	0.69	1235	12.50 (0.492)	35.00 (1.378)	0.60 (0.024)	5.00 (0.020)	6.34
0811	8.00 (0.315)	11.00 (0.433)	0.50 (0.020)	3.50 (0.138)	0.95	1320	13.00 (0.512)	20.00 (0.787)	0.60 (0.024)	5.00 (0.020)	3.97
0812	8.00 (0.315)	12.00 (0.472)	0.50 (0.020)	3.50 (0.138)	1.02	1620	16.00 (0.630)	20.00 (0.787)	0.80 (0.315)	7.50 (0.295)	6.85
0816	8.00 (0.315)	16.00 (0.630)	0.50 (0.020)	3.50 (0.138)	1.34	1625	16.00 (0.630)	25.00 (0.984)	0.80 (0.315)	7.50 (0.295)	8.48
0820	8.00 (0.315)	20.00 (0.787)	0.50 (0.020)	3.50 (0.138)	1.72	1640	16.00 (0.630)	40.00 (1.575)	0.80 (0.315)	7.50 (0.295)	13.85
1009	10.00 (0.394)	9.00 (0.354)	0.60(0.024)	5.00 (0.020)	1.32	1820	18.00 (0.709)	20.00 (0.787)	0.80 (0.315)	7.50 (0.295)	9.00
1013	10.00 (0.394)	13.00 (0.512)	0.60(0.024)	5.00 (0.020)	1.65	1825	18.00 (0.709)	25.00 (0.984)	0.80 (0.315)	7.50 (0.295)	9.60
1016	10.00 (0.394)	16.00 (0.630)	0.60(0.024)	5.00 (0.020)	2.18	1830	18.00 (0.709)	30.00 (1.181)	0.80 (0.315)	7.50 (0.295)	12.00
1020	10.00 (0.394)	20.00 (0.787)	0.60(0.024)	5.00 (0.020)	2.58	1835	18.00 (0.709)	35.00 (1.378)	0.80 (0.315)	7.50 (0.295)	12.40
1025	10.00 (0.394)	25.00 (0.984)	0.60(0.024)	5.00 (0.020)	3.11	1840	18.00 (0.709)	40.00 (1.575)	0.80 (0.315)	7.50 (0.295)	16.00



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

Radial Leaded Aluminum Electrolytic Capacitors

REF Series

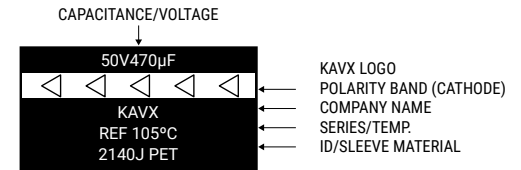


TECHNICAL SPECIFICATIONS

Category Temperature Range:	-40°C to +105°C	
Capacitance Range	At 25°C, 120Hz	6.8μF to 6800μF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.01CV$ or 3μA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment: Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)									
μF	Code	6.3V	10V	16V	25V	35V	50V	63V	80V	100V	120V
6.8	6R8									0511 0609	
10	100										0612
22	220						0512			0612	0812
27	270									1009	
33	330					0512			0611	1013	0816 1013
47	470				0511				0612	1013	1016
56	560						0612				1016
68	680									1016	1020
82	820							0812 1013			
100	101		0511 0609	0511	0511 0611	0612 0811	0812	0812 1013		1016	1025
120	121						0816	0816			1320
150	151	0511					1013	1013	1016	1020	1225
180	181						0820				
220	221	0611	0611	0611	0611 0812	0812 1009	1013	1016	1020	1320	1230 1620
270	271						1016				
330	331	0611		0812 1009	0816 1013	1016	1016	1020	1020	1225 1620	1825
470	471	0612	0812	0816 1013	0816	1016	1020	1320	1620	1625	
560	561				1016		1220	1320		1825	
680	681		0816 1013	0820 1016	1020	1220	1220	1620	1825	1640 1835	
820	821				1020		1620	1625		1840	
1000	102	0816	0820 1016	1020	1216	1225	1625	1625 1820	1640 1835		
1200	122	0802 1016		1025		1620					
1500	152	1016		1225	1225	1235		1830			
1800	182							1840			
2200	222	1020	1220	1225	1225						
2700	272			1230 1620	1625						
3300	332	1220	1225	1235 1625							
3900	392			1265							
4700	472	1225	1235								
5600	562		1625								
6800	682	1625									

Released ratings

Radial Leaded Aluminum Electrolytic Capacitors

REF Series



RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	Impedance Max. at 20°C @100kHz (Ω)	100kHz RMS Current (mA) / 105°C
6.3 Volt						
REF0511151M006*	0511	150	6.3	15	0.290	300
REF0611221M006*	0611	220	6.3	15	0.205	377
REF0611331M006*	0611	330	6.3	15	0.120	455
REF0612471M006*	0612	470	6.3	15	0.100	510
REF0816102M006*	0816	1000	6.3	15	0.052	1000
REF0820122M006*	0820	1200	6.3	15	0.040	1300
REF1016122M006*	1016	1200	6.3	15	0.037	1480
REF1016152M006*	1016	1500	6.3	15	0.037	1480
REF1020222M006*	1020	2200	6.3	15	0.021	2200
REF1220332M006*	1220	3300	6.3	15	0.020	2410
REF1225472M006*	1225	4700	6.3	15	0.015	3340
REF1625682M006B	1625	6800	6.3	15	0.015	3510
10 Volt						
REF0511101M010*	0511	100	10	14	0.290	300
REF0609101M010*	0609	100	10	14	0.290	300
REF0611221M010*	0611	220	10	14	0.120	455
REF0812471M010*	0812	470	10	14	0.071	810
REF0816681M010*	0816	680	10	14	0.055	1046
REF1013681M010*	1013	680	10	14	0.052	1080
REF0820102M010*	0820	1000	10	14	0.040	1300
REF1016102M010*	1016	1000	10	14	0.037	1480
REF1220222M010*	1220	2200	10	14	0.020	2410
REF1225332M010*	1225	3300	10	14	0.020	2820
REF1235472M010B	1235	4700	10	14	0.021	3450
REF1625562M010B	1625	5600	10	14	0.015	3510
16 Volt						
REF0511101M016*	0511	100	16	12	0.210	320
REF0611221M016*	0611	220	16	12	0.084	721
REF0812331M016*	0812	330	16	12	0.071	810
REF1009331M016*	1009	330	16	12	0.092	680
REF0816471M016*	0816	470	16	12	0.055	1045
REF1013471M016*	1013	470	16	12	0.052	1080
REF0820681M016*	0820	680	16	12	0.040	1300
REF1016681M016*	1016	680	16	12	0.040	1480
REF1020102M016*	1020	1000	16	12	0.023	1870
REF1025122M016*	1025	1200	16	12	0.021	2200
REF1220152M016*	1220	1500	16	12	0.029	2410
REF1225222M016*	1225	2200	16	12	0.021	2200
REF1230272M016*	1230	2700	16	12	0.015	3340
REF1620272M016B	1620	2700	16	12	0.017	3190
REF1235332M016B	1235	3300	16	12	0.014	3450
REF1625332M016B	1625	3300	16	12	0.016	3350
REF1625392M016B	1625	3900	16	12	0.015	3510
25 Volt						
REF0511470M025*	0511	47	25	10	0.290	300
REF0511101M025*	0511	100	25	10	0.260	320
REF0611101M025*	0611	100	25	10	0.140	455
REF0611221M025*	0611	220	25	10	0.150	455
REF0812221M025*	0812	220	25	10	0.078	810
REF0816331M025*	0816	330	25	10	0.055	1045
REF1013331M025*	1013	330	25	10	0.052	1080
REF0816471M025*	0816	470	25	10	0.045	1120
REF1016561M025*	1016	560	25	10	0.030	1675
REF1020681M025*	1020	680	25	10	0.036	1870
REF1020821M025*	1020	820	25	10	0.035	1900
REF1216102M025*	1216	1000	25	10	0.028	1920
REF1225152M025*	1225	1500	25	10	0.030	2750
REF1225222M025*	1225	2200	25	10	0.027	2820
REF1625272M025B	1625	2700	25	10	0.015	3510
35 Volt						
REF0512330M035*	0512	33	35	10	0.570	300

Radial Leaded Aluminum Electrolytic Capacitors

REF Series



Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DF Max. (%)	Impedance Max. at 20°C @100kHz (Ω)	100kHz RMS Current (mA) / 105°C
REF0612101M035*	0612	100	35	10	0.450	440
REF0811101M035*	0811	100	35	10	0.200	632
REF0812221M035*	0812	220	35	10	0.100	810
REF1009221M035*	1009	220	35	10	0.120	720
REF1016331M035*	1016	330	35	10	0.037	1480
REF1016471M035*	1016	470	35	10	0.055	1526
REF1220681M035*	1220	680	35	10	0.045	2410
REF1225102M035*	1225	1000	35	10	0.025	2820
REF1620122M035B	1620	1200	35	10	0.017	3190
REF1235152M035B	1235	1500	35	10	0.014	3450
50 Volt						
REF0512220M050*	0512	22	50	8	0.540	288
REF0612560M050*	0612	56	50	8	0.300	435
REF0812101M050*	0812	100	50	8	0.160	774
REF0816121M050*	0816	120	50	8	0.130	1000
REF1013151M050*	1013	150	50	8	0.110	1029
REF0820181M050*	0820	180	50	8	0.085	1240
REF1013221M050*	1013	220	50	8	0.130	1029
REF1016271M050*	1016	270	50	8	0.090	1020
REF1016331M050*	1016	330	50	8	0.045	1150
REF1020471M050*	1020	470	50	8	0.036	1500
REF1220561M050*	1220	560	50	8	0.035	2150
REF1220681M050*	1220	680	50	8	0.040	2100
REF1620821M050B	1620	820	50	8	0.022	2780
REF1625102M050B	1625	1000	50	8	0.025	3060
63 Volt						
REF0611330M063*	0611	33	63	8	1.200	126
REF0612470M063*	0612	47	63	8	0.800	150
REF0812820M063*	0812	82	63	8	0.480	320
REF1013820M063*	1013	82	63	8	0.420	420
REF0812101M063*	0812	100	63	8	0.500	280
REF1013101M063*	1013	100	63	8	0.300	420
REF0816121M063*	0816	120	63	8	0.350	350
REF1013151M063*	1013	150	63	8	0.300	400
REF1016221M063*	1016	220	63	8	0.160	480
REF1020331M063*	1020	330	63	8	0.160	640
REF1320471M063B	1320	470	63	8	0.100	880
REF1320561M063B	1320	560	63	8	0.086	1180
REF1620681M063B	1620	680	63	8	0.085	1250
REF1625821M063B	1625	820	63	8	0.057	1570
REF1625102M063B	1625	1000	63	8	0.045	1800
REF1820102M063B	1820	1000	63	8	0.050	1780
REF1830152M063B	1830	1500	63	8	0.036	2150
REF1840182M063B	1840	1800	63	8	0.032	2280
80 Volt						
REF1016151M080*	1016	150	80	8	0.240	600
REF1020221M080*	1020	220	80	8	0.150	680
REF1220331M080*	1220	330	80	8	0.120	750
REF1620471M080B	1620	470	80	8	0.007	1150
REF1825681M080B	1825	680	80	8	0.036	1750
REF1640102M080B	1640	1000	80	8	0.029	2200
REF1835102M080B	1835	1000	80	8	0.027	2200
100 Volt						
REF05116R8M100*	0511	6.8	100	8	1.400	86
REF06096R8M100*	0609	6.8	100	8	1.800	80
REF0612220M100*	0612	22	100	8	1.000	235
REF1009270M100*	1009	27	100	8	0.470	320
REF1013330M100*	1013	33	100	8	0.450	320
REF1013470M100*	1013	47	100	8	0.320	480
REF1016680M100*	1016	68	100	8	0.220	600
REF1016101M100*	1016	100	100	8	0.200	750
REF1020151M100*	1020	150	100	8	0.170	850
REF1320221M100B	1320	220	100	8	0.150	860
REF1225331M100*	1225	330	100	8	0.100	1000
REF1620331M100B	1620	330	100	8	0.070	1350

Radial Leaded Aluminum Electrolytic Capacitors

REF Series



Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	Impedance Max. at 20°C @100kHz (Ω)	100kHz RMS Current (mA) / 105°C
REF1625471M100B	1625	470	100	8	0.045	1640
REF1825561M100B	1825	560	100	8	0.050	1800
REF1640681M100B	1640	680	100	8	0.034	2200
REF1835681M100B	1835	680	100	8	0.034	2200
REF1840821M100B	1840	820	100	8	0.032	2700
120 Volt						
REF0612100M120*	0612	10	120	12	5.500	80
REF0812220M120*	0812	22	120	12	3.500	130
REF0816330M120*	0816	33	120	12	3.000	220
REF1013330M120*	1013	33	120	12	3.000	220
REF1016470M120*	1016	47	120	12	2.500	270
REF1016560M120*	1016	56	120	12	2.200	285
REF1020680M120*	1020	68	120	12	1.800	300
REF1025101M120*	1025	100	120	12	1.500	380
REF1320121M120B	1320	120	120	12	1.300	620
REF1225151M120*	1225	150	120	12	1.000	570
REF1230221M120*	1230	220	120	12	0.800	750
REF1620221M120B	1620	220	120	12	0.600	760
REF1825331M120B	1825	330	120	12	0.420	860

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk Pack.

DF = When nominal capacitance exceeds 1000μF, add 0.02 to the value above for each 1000μF increase.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes

RATED RIPPLE CURRENT MULTIPLIERS (FREQUENCY CORRECTION FACTOR FOR RIPPLE CURRENT)

Cap. (μF) \ Freq. (Hz)	120	1K	10K	100K
C < 220	0.40	0.75	0.90	1.00
220 ≤ C < 680	0.50	0.85	0.94	1.00
680 ≤ C < 2200	0.60	0.87	0.95	1.00
2200 ≤ C < 4700	0.75	0.90	0.95	1.00
C ≥ 4700	0.85	0.95	0.98	1.00

QUALIFICATION TABLE

Test	REF Series (Temperature Range -40°C to +105°C)						
	Condition	Characteristics					
Low Temperature Characteristic (Max. Impedance Ratio)	120Hz	Rated Voltage (V)	6.3	10	16	25-100	120
		Z(-25°C) / Z(20°C)	5	4	3	3	3
		Z(-40°C) / Z(20°C)	10	8	5	4	6
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after DC voltage plus rated ripple current is applied for a specified period of time at 105°C.	Visual examination	no visible damage				
		ΔC/C	≤ ±25% of the initial limit				
		DF:	≤ 200% of the initial specified limit				
		DCL:	≤ Initial specified limit				
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after DC voltage plus rated ripple current is applied for a specified period of time at 105°C.	Diameter (mm)	Load life (hours)				
		ØD≤6.3	3000				
		ØD=8	4000				
		ØD=10	5000				
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 105°C for 1000 hours.	Visual examination	no visible damage				
		ΔC/C	≤ ±25% of the initial limit				
		DF:	≤ 200% of the initial specified limit				
		DCL:	≤ 200% of the initial specified limit				

Radial Leaded Aluminum Electrolytic Capacitors

REF Series



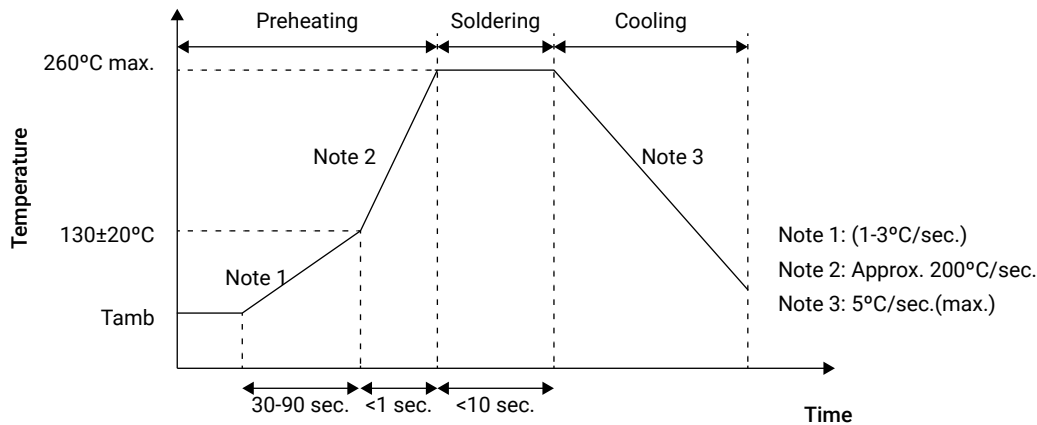
SOLDERING

1. When soldering with a soldering iron:

- Soldering conditions (temperature and time) should be within the limits prescribed in the catalogs or the product specifications.
- If the terminal spacing of a capacitor does not fit the terminal hole spacing of the PC board, reform the terminals in a manner to minimize a mechanical stress into the body of the capacitor.
- Remove the capacitors from the PC board, after the solder is completely melted, reworking by using a soldering iron minimizes the mechanical stress to the capacitors.
- Do not touch the capacitor body with the hot tip of the soldering iron.

2. Flow Soldering:

- Do not dip the body of a capacitor into the solder bath, only dip the terminals in. The soldering must be done on the reverse side of PC board.
- Do not apply flux to any part of capacitors other than their terminals.
- Make sure the capacitors do not come into contact with any other components while soldering.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the picture below.



STORAGE

- Store with the temperature range between 5 to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% without direct sunshine and store in the package states if possible.
- It is recommended that you open the bag just before use and use up as early as possible.
- Store the capacitors in places free from water, oil or salt water or in condensation status.
- Never store in any area filled with poisonous gases (including hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and ammonia).
- Store the capacitors in places free from ozone, ultraviolet rays or radiation:
 (Radial Lead Type)
 Before unseal: within 1 year after delivery
 After opening: within 1 month

PACKING

Size Code	Bulk Pack					Ammo Pack				
	Bags	Inner Box		Carton		Inner Box		Carton		
		Quantity	Bags Number	Quantity / pcs	Inner Box Number	Quantity / pcs	Quantity	Inner Box Size (LxWxH)	Inner Box Quantity	Carton Size (LxWxH)
0511	1000	12	12,000	4	48,000	2000	320x230x50	10	485x345x275	20,000
0512	1000	12	12,000	4	48,000	2000	320x230x50	10	485x345x275	20,000

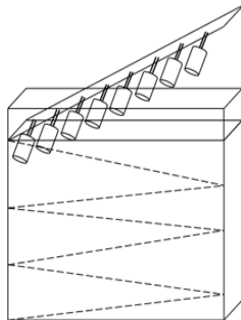
Radial Leaded Aluminum Electrolytic Capacitors

REF Series

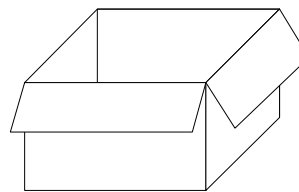


0609	500	10	5000	4	20,000	2000	340x290x48	10	600x354x265	20,000
0611	500	10	5000	4	20,000	2000	340x290x48	10	600x354x265	20,000
0612	500	10	5000	4	20,000	2000	340x290x48	10	600x354x265	20,000
0811	500	10	5000	4	20,000	950	320x230x50	6	485x345x275	5700
0812	500	10	5000	4	20,000	950	320x230x50	6	485x345x275	5700
0816	300	10	3000	4	12,000	950	320x230x55	6	485x345x300	5700
0820	300	10	3000	4	12,000	950	320x230x55	6	485x345x300	5700
1009	250	12	3000	4	12,000	600	320x230x50	6	485x345x275	3600
1013	250	10	2500	4	10,000	600	320x230x50	6	485x345x275	3600
1016	250	10	2500	4	10,000	600	320x230x55	6	485x345x300	3600
1020	200	10	2000	4	8000	600	320x230x55	6	485x345x300	3600
1025	150	10	1500	4	6000	600	320x230x68	8	485x345x300	4800
1216	100	14	1400	4	5600	500	330x290x55	5	345x305x315	2500
1220	100	12	1200	4	4800	500	330x290x55	5	345x305x315	2500
1225	100	10	1000	4	4000	500	330x290x55	5	345x305x315	2500
1230	100	10	1000	4	4000	500	330x230x68	4	345x305x315	2000
1235	-	-	440	5	2200	-	-	-	-	-
1320	100	12	1200	4	4800	-	-	-	-	-
1620	-	-	250	5	1250	-	-	-	-	-
1625	-	-	250	5	1250	-	-	-	-	-
1640	-	-	200	5	1000	-	-	-	-	-
1820	-	-	250	5	1250	-	-	-	-	-
1825	-	-	250	5	1250	-	-	-	-	-
1830	-	-	230	5	1150	-	-	-	-	-
1835	-	-	200	5	1000	-	-	-	-	-
1840	-	-	180	5	900	-	-	-	-	-

AMMO PACKING



BULK PACKING



Radial Leaded Aluminum Electrolytic Capacitors

REH Series



FEATURES

- High temperature, high ripple current capability, low impedance
- Endurance: 2000 - 5000 hours at 125°C
- RoHS and Halogen Free Compliance



APPLICATIONS

- Power supplies, general industrial, filtering

HOW TO ORDER

Product Type — Radial Aluminum

Series Type —

Case Size — See table below

Capacitance Code — μF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance — M = $\pm 20\%$

Special — No Code = std
Different lead cutting and forming upon request

Packaging — K = Ammo Pack
B = Bulk Pack

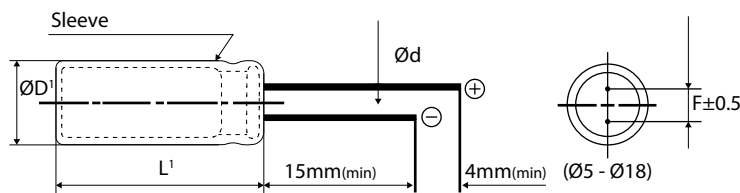
Rated DC Voltage

010 = 10Vdc	063 = 63Vdc	200 = 200Vdc
016 = 16Vdc	080 = 80Vdc	250 = 250Vdc
025 = 25Vdc	100 = 100Vdc	350 = 350Vdc
035 = 35Vdc	120 = 120Vdc	400 = 400Vdc
050 = 50Vdc	160 = 160Vdc	450 = 450Vdc

Code: R EH 0812 471 M 016 K -

CASE DIMENSIONS millimeters (inches)

Code	D $\pm 0.50(0.020)$	L $\pm 2.00(0.079)$	d $\pm 0.05(0.002)$	F $\pm 0.50(0.020)$	Typical Weight (g)	Code	D $\pm 0.50(0.020)$	L $\pm 2.00(0.079)$	d $\pm 0.05(0.002)$	F $\pm 0.50(0.020)$	Typical Weight (g)
0511	5.00 (0.197)	11.00 (0.433)	0.50 (0.020)	2.00 (0.079)	0.40	1220	12.50 (0.492)	20.00 (0.787)	0.60 (0.024)	5.00 (0.197)	4.33
0512	5.00 (0.197)	12.00 (0.472)	0.50 (0.020)	2.00 (0.079)	0.48	1222	12.50 (0.492)	22.00 (0.866)	0.60 (0.024)	5.00 (0.197)	5.21
0611	6.30 (0.248)	11.00 (0.433)	0.50 (0.020)	2.50 (0.098)	0.60	1225	12.50 (0.492)	25.00 (0.984)	0.60 (0.024)	5.00 (0.197)	5.32
0612	6.30 (0.248)	12.00 (0.472)	0.50 (0.020)	2.50 (0.098)	0.70	1235	12.50 (0.492)	35.00 (1.378)	0.60 (0.024)	5.00 (0.197)	7.21
0811	8.00 (0.315)	11.00 (0.433)	0.60 (0.024)	3.50 (0.138)	0.95	1320	13.00 (0.512)	20.00 (0.787)	0.60 (0.024)	5.00 (0.197)	4.90
0812	8.00 (0.315)	12.00 (0.472)	0.60 (0.024)	3.50 (0.138)	1.05	1325	13.00 (0.512)	25.00 (0.984)	0.60 (0.024)	5.00 (0.197)	5.21
0816	8.00 (0.315)	16.00 (0.630)	0.60 (0.024)	3.50 (0.138)	1.50	1618	16.00 (0.630)	18.00 (0.709)	0.80 (0.031)	7.50 (0.295)	6.78
1011	10.00 (0.394)	11.00 (0.433)	0.60 (0.024)	5.00 (0.197)	1.47	1620	16.00 (0.630)	20.00 (0.787)	0.80 (0.031)	7.50 (0.295)	6.91
1012	10.00 (0.394)	12.00 (0.472)	0.60 (0.024)	5.00 (0.197)	1.55	1625	16.00 (0.630)	25.00 (0.984)	0.80 (0.031)	7.50 (0.295)	8.57
1013	10.00 (0.394)	13.00 (0.512)	0.60 (0.024)	5.00 (0.197)	1.60	1630	16.00 (0.630)	30.00 (1.181)	0.80 (0.031)	7.50 (0.295)	9.88
1014	10.00 (0.394)	14.00 (0.551)	0.60 (0.024)	5.00 (0.197)	2.02	1635	16.00 (0.630)	35.00 (1.378)	0.80 (0.031)	7.50 (0.295)	10.20
1016	10.00 (0.394)	16.00 (0.630)	0.60 (0.024)	5.00 (0.197)	2.12	1820	18.00 (0.709)	20.00 (0.787)	0.80 (0.031)	7.50 (0.295)	9.50
1018	10.00 (0.394)	18.00 (0.709)	0.60 (0.024)	5.00 (0.197)	2.60	1825	18.00 (0.709)	25.00 (0.984)	0.80 (0.031)	7.50 (0.295)	18.25
1020	10.00 (0.394)	20.00 (0.787)	0.60 (0.024)	5.00 (0.197)	2.60	1830	18.00 (0.709)	30.00 (1.181)	0.80 (0.031)	7.50 (0.295)	13.49
1025	10.00 (0.394)	25.00 (0.984)	0.60 (0.024)	5.00 (0.197)	3.11	1835	18.00 (0.709)	35.00 (1.378)	0.80 (0.031)	7.50 (0.295)	13.50
1216	12.50 (0.492)	16.00 (0.630)	0.60 (0.024)	5.00 (0.197)	3.60	1840	18.00 (0.709)	40.00 (1.575)	0.80 (0.031)	7.50 (0.295)	16.00
1218	12.50 (0.492)	18.00 (0.709)	0.60 (0.024)	5.00 (0.197)	4.20						



Radial Leaded Aluminum Electrolytic Capacitors

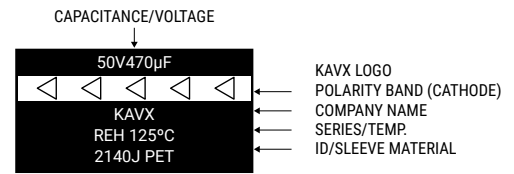
REH Series

TECHNICAL SPECIFICATIONS

Category Temperature Range:	-40°C to +125°C	
Capacitance Range:	At 25°C,120Hz	1.0μF - 4700μF
Capacitance Tolerance:	At 25°C,120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current	After 2 minutes at rated working voltage at 25°C*	(10-120V) $I \leq 0.01CV$ or $3\mu A$, whichever is greater
		($CV \leq 1000$ and 160-450V) $I \leq 0.03CV + 15\mu A$
		($CV > 1000$ and 160-450V) $I \leq 0.02CV + 25\mu A$

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 125°C.

MARKING



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)														
μF	Code	10V	16V	25V	35V	50V	63V	80V	100V	120V	160V	200V	250V	350V	400V	450V
1.0	1R0					0511										
2.2	2R2					0511 0811										
3.3	3R3					0511 0811										
4.7	4R7					0511 0811		0511	0511 0811							
10	100					0511 0811		0511	0611 0811		0816 1011	0816 1012	0816 1012	1012 1014	1014 1016	1018 1216
22	220					0512 0811		0611	0612 0812	0812	1012 1014	1014 1016	1018	1018	1018 1218	1320 1222
33	330					0611 0811	0612 0811	0612 0812	0812 1013	0816				1220 1222		
47	470			0511	0611	0611 0811	0812 1013		0816 1016	1016	1018 1216	1218	1220	1225 1618	1620 1625	1825 1630
56	560				0512					1016						
68	680			0512	0612			0812		1016						
82	820									1020	1220	1620	1235 1625	1820 1825	1825	1835
100	101	0511	0511	0611	0612 0811	0812 1013	0812 1016	0816	1016 1220		1225 1618	1625	1630 1825	1630 1825	1830	1840
120	121									1220						
150	151				0612			1016								
220	221		0611	0812	0812 1013	0816 1013	1016 1220	1020	1320 1625	1620						
270	271									1625						
330	331	0612 0811	0812	0812 1013	0816 1013 1016	1016 1220	1220 1225	1220	1625 1630	1825						
470	471	0812 1013	0812 1013	0816 1013	0820 1016 1020	1020 1225	1325 1625	1620	1830							
680	681	0812 1013			1220	1220 1620										
1000	102	1016 1020	1020	1020 1220	1220 1225	1225 1630	1630									
1200	122				1220											
1500	152				1225											
1800	182				1225											
2200	222	1225	1025 1225	1630	1635	1840										
3300	332	1625	1630	1635	1835											
4700	472	1630	1635													

Released ratings

Radial Leaded Aluminum Electrolytic Capacitors

REH Series

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DF Max. (%)	100kHz RMS Current (mA) / 125°C
10 Volt					
REH0511101M010*	0511	100	10	24	80
REH0612331M010*	0612	330	10	24	180
REH0811331M010*	0811	330	10	24	360
REH0812471M010*	0812	470	10	24	360
REH1013471M010*	1013	470	10	24	620
REH0812681M010*	0812	680	10	24	400
REH1013681M010*	1013	680	10	24	620
REH1016102M010*	1016	1000	10	24	660
REH1020102M010*	1020	1000	10	24	960
REH1225222M010*	1225	2200	10	24	1430
REH1625332M010B	1625	3300	10	24	1900
REH1630472M010B	1630	4700	10	24	2300
16 Volt					
REH0511101M016*	0511	100	16	20	90
REH0611221M016*	0611	220	16	20	125
REH0812331M016*	0812	330	16	20	360
REH0812471M016*	0812	470	16	20	360
REH1013471M016*	1013	470	16	20	620
REH1020102M016*	1020	1000	16	20	960
REH1025222M016*	1025	2200	16	20	980
REH1225222M016*	1225	2200	16	20	1430
REH1630332M016B	1630	3300	16	20	2300
REH1635472M016B	1635	4700	16	20	2550
25 Volt					
REH0511470M025*	0511	47	25	18	60
REH0512680M025*	0512	68	25	18	90
REH0611101M025*	0611	100	25	18	145
REH0812221M025*	0812	220	25	18	360
REH0812331M025*	0812	330	25	18	360
REH1013331M025*	1013	330	25	18	620
REH0816471M025*	0816	470	25	18	610
REH1013471M025*	1013	470	25	18	640
REH1020102M025*	1020	1000	25	18	960
REH1220102M025*	1220	1000	25	18	1100
REH1630222M025B	1630	2200	25	18	2300
REH1635332M025B	1635	3300	25	18	2550
35 Volt					
REH0611470M035*	0611	47	35	16	110
REH0512560M035*	0512	56	35	16	70
REH0612680M035*	0612	68	35	16	130
REH0612101M035*	0612	100	35	16	210
REH0811101M035*	0811	100	35	16	360
REH0612151M035	0612	150	35	16	210
REH0812221M035*	0812	220	35	16	375
REH1013221M035*	1013	220	35	16	620
REH0816331M035*	0816	330	35	16	550
REH1013331M035*	1013	330	35	16	620
REH1016331M035*	1016	330	35	16	800
REH0820471M035*	0820	470	35	16	620
REH1016471M035*	1016	470	35	16	705
REH1020471M035*	1020	470	35	16	960
REH1220681M035*	1220	680	35	16	990
REH1220102M035*	1220	1000	35	16	1180
REH1225102M035*	1225	1000	35	16	1430
REH1220122M035*	1220	1200	35	16	1200
REH1225152M035*	1225	1500	35	16	1430
REH1225182M035*	1225	1800	35	16	1700
REH1635222M035B	1635	2200	35	16	2550
REH1835332M035B	1835	3300	35	16	2800
50 Volt					
REH05111R0M050*	0511	1.0	50	14	26
REH05112R2M050*	0511	2.2	50	14	35

Radial Leaded Aluminum Electrolytic Capacitors

REH Series

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	100kHz RMS Current (mA) / 125°C
REH08112R2M050*	0811	2.2	50	14	50
REH05113R3M050*	0511	3.3	50	14	40
REH08113R3M050*	0811	3.3	50	14	70
REH05114R7M050*	0511	4.7	50	14	42
REH08114R7M050*	0811	4.7	50	14	100
REH0511100M050*	0511	10	50	14	90
REH0811100M050*	0811	10	50	14	200
REH0512220M050*	0512	22	50	14	110
REH0811220M050*	0811	22	50	14	260
REH0611330M050*	0611	33	50	14	150
REH0811330M050*	0811	33	50	14	300
REH0611470M050*	0611	47	50	14	180
REH0811470M050*	0811	47	50	14	300
REH0812101M050*	0812	100	50	14	340
REH1013101M050*	1013	100	50	14	520
REH0816221M050*	0816	220	50	14	520
REH1013221M050*	1013	220	50	14	520
REH1016331M050*	1016	330	50	14	530
REH1220331M050*	1220	330	50	14	1000
REH1020471M050*	1020	470	50	14	950
REH1225471M050*	1225	470	50	14	1200
REH1220681M050*	1220	680	50	14	1060
REH1620681M050B	1620	680	50	14	1250
REH1225102M050*	1225	1000	50	14	1500
REH1630102M050B	1630	1000	50	14	2180
REH1840222M050B	1840	2200	50	14	2800
63 Volt					
REH0612330M063*	0612	33	63	12	150
REH0811330M063*	0811	33	63	12	250
REH0812470M063*	0812	47	63	12	250
REH1013470M063*	1013	47	63	12	400
REH0812101M063*	0812	100	63	12	340
REH1016101M063*	1016	100	63	12	450
REH1016221M063*	1016	220	63	12	450
REH1220221M063*	1220	220	63	12	820
REH1220331M063*	1220	330	63	12	850
REH1225331M063*	1225	330	63	12	1000
REH1325471M063B	1325	470	63	12	1000
REH1625471M063B	1625	470	63	12	1500
REH1630102M063B	1630	1000	63	12	1850
80 Volt					
REH05114R7M080*	0511	4.7	80	12	26
REH0511100M080*	0511	10	80	12	68
REH0611220M080*	0611	22	80	12	105
REH0612330M080*	0612	33	80	12	105
REH0812330M080*	0812	33	80	12	250
REH0812680M080*	0812	68	80	12	250
REH0816101M080*	0816	100	80	12	400
REH1016151M080*	1016	150	80	12	450
REH1020221M080*	1020	220	80	12	750
REH1220331M080*	1220	300	80	12	850
REH1620471M080B*	1620	470	80	12	1200
100 Volt					
REH05114R7M100*	0511	4.7	100	10	40
REH08114R7M100*	0811	4.7	100	10	100
REH0611100M100*	0611	10	100	10	130
REH0811100M100*	0811	10	100	10	200
REH0612220M100*	0612	22	100	10	150
REH0812220M100*	0812	22	100	10	220
REH0812330M100*	0812	33	100	10	220
REH1013330M100*	1013	33	100	10	260
REH0816470M100*	0816	47	100	10	240
REH1016470M100*	1016	47	100	10	330
REH1016101M100*	1016	100	100	10	350
REH1220101M100*	1220	100	100	10	670

Radial Leaded Aluminum Electrolytic Capacitors

REH Series

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	100kHz RMS Current (mA) / 125°C
REH1320221M100B	1320	220	100	10	720
REH1625221M100B	1625	220	100	10	1100
REH1625331M100B	1625	330	100	10	1300
REH1630331M100B	1630	330	100	10	1300
REH1830471M100B	1830	470	100	10	1600
120 Volt					
REH0812220M120*	0812	22	120	12	115
REH0816330M120*	0816	33	120	12	200
REH1016470M120*	1016	47	120	12	240
REH1016560M120*	1016	56	120	12	255
REH1016680M120*	1016	68	120	12	255
REH1020820M120*	1020	82	120	12	270
REH1220121M120*	1220	120	120	12	465
REH1620221M120B	1620	220	120	12	630
REH1625271M120B	1625	270	120	12	720
REH1825331M120B	1825	330	120	12	775

* REH0612151M035 * has endurance 2000h

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk Pack.

DF = When nominal capacitance exceeds 1000μF, add 0.02 to the value above for each 1000μF increase

All technical data relates to an ambient temperature of +25C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes.

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	120Hz RMS Current (mA) / 125°C
160 Volt					
REH0816100M160*	0816	10	160	16	58
REH1011100M160*	1011	10	160	16	60
REH1012220M160*	1012	22	160	16	110
REH1014220M160*	1014	22	160	16	120
REH1018470M160*	1018	47	160	16	155
REH1216470M160*	1216	47	160	16	160
REH1220820M160*	1220	82	160	16	210
REH1225101M160*	1225	100	160	16	285
REH1618101M160B	1618	100	160	16	292
200 Volt					
REH0816100M200*	0816	10	200	16	82
REH1012100M200*	1012	10	200	16	90
REH1014220M200*	1014	22	200	16	115
REH1016220M200*	1016	22	200	16	120
REH1218470M200*	1218	47	200	16	165
REH1620820M200B	1620	82	200	16	240
REH1625101M200B	1625	100	200	16	310
250 Volt					
REH0816100M250*	0816	10	250	16	80
REH1012100M250*	1012	10	250	16	85
REH1018220M250*	1018	22	250	16	125
REH1220470M250*	1220	47	250	16	175
REH1235820M250B	1235	82	250	16	260
REH1625820M250B	1625	82	250	16	275
REH1630101M250B	1630	100	250	16	325
REH1825101M250B	1825	100	250	16	350
350 Volt					
REH1012100M350*	1012	10	350	24	80
REH1014100M350*	1014	10	350	24	85
REH1018220M350*	1018	22	350	24	125
REH1220330M350*	1220	33	350	24	145
REH1222330M350*	1222	33	350	24	160
REH1225470M350*	1225	47	350	24	175
REH1618470M350B	1618	47	350	24	185
REH1820820M350B	1820	82	350	24	260
REH1825820M350B	1825	82	350	24	275
REH1630101M350B	1630	100	350	24	325
REH1825101M350B	1825	100	350	24	350

Radial Leaded Aluminum Electrolytic Capacitors

REH Series

400 Volt					
REH1014100M400*	1014	10	400	24	80
REH1016100M400*	1016	10	400	24	85
REH1018220M400*	1018	22	400	24	125
REH1218220M400*	1218	22	400	24	130
REH1620470M400B	1620	47	400	24	200
REH1625470M400B	1625	47	400	24	210
REH1825820M400B	1825	82	400	24	325
REH1830101M400B	1830	100	400	24	395
450 Volt					
REH1018100M450*	1018	10	450	24	85
REH1216100M450*	1216	10	450	24	90
REH1320220M450B	1320	22	450	24	135
REH1222220M450*	1222	22	450	24	140
REH1825470M450B	1825	47	450	24	215
REH1630470M450B	1630	47	450	24	225
REH1835820M450B	1835	82	450	24	355

REH0612151M035 has endurance 2000h

*Used to denote packing type: "K" for Ammo Pack or "B" for Bulk Pack

DF = When nominal capacitance exceeds 1000µF, add 0.02 to the value above for each 1000µF increase

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

RATED RIPPLE CURRENT MULTIPLIERS (FREQUENCY CORRECTION FACTOR FOR RIPPLE CURRENT)

10 to 120 Vdc						160 to 400 Vdc						
Cap.(µF)	Freq.(Hz)	50/60	120	1K	10K	100K	Cap.(µF)	Freq.(Hz)	120	1K	10K	100K
C < 10		0.35	0.42	0.60	0.80	1.00	<100		0.15	0.30	0.45	0.65
10 ≤ C < 47		0.45	0.55	0.75	0.90	1.00	≥100		0.25	0.35	0.50	0.70
47 ≤ C < 470		0.60	0.70	0.85	0.95	1.00						
470 ≤ C < 2200		0.65	0.75	0.90	0.98	1.00						
C ≥ 2200		0.75	0.80	0.95	1.00	1.00						

QUALIFICATION TABLE

Test	REH Series (Temperature Range -40°C to +125°C)									
	Condition	Characteristics								
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	10	16	25-100	120	160-250	350-400	450	
		Z(-25°C)/Z(+20°C)	3	2	2	3	3	6	6	
		Z(-40°C)/Z(+20°C)	6	4	3	6	8	10	15	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after DC voltage plus rated ripple current is applied for a specified period of time at 125°C.	Visual Examination	no visible damage							
		ΔC/C	≤ ±30% of the initial limit							
		DF	≤ 300% of the initial specified limit							
		DCL	≤ the initial specified limit							
		Voltage: 10V-120V			Voltage: 160V-450V					
		Diameter (mm)	Load life (hours)		2000 hours					
		ØD≤6.3	2000							
ØD=8	3000									
ØD=10	4000									
ØD≥12.5	5000									
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 105°C for 1000 hours.	Voltage: 10V-120V			Voltage: 160V-450V					
		Visual Examination	no visible damage			no visible damage				
		ΔC/C	≤ ±30% of the initial limit			≤ ±20% of the initial limit				
		DF:	≤ 300% of the initial specified limit			≤ 200% of the initial specified limit				
DCL:	≤ 500 % of the initial specified limit			≤ 200 % of the initial specified limit						

Radial Leaded Aluminum Electrolytic Capacitors

REH Series

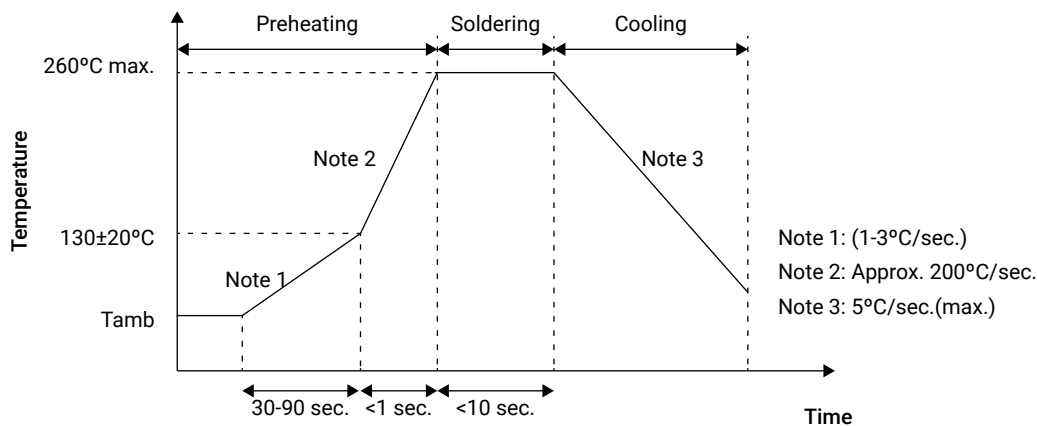
SOLDERING

1. When soldering with a soldering iron:

- Soldering conditions (temperature and time) should be within the limits prescribed in the catalogs or the product specifications.
- If the terminal spacing of a capacitor does not fit the terminal hole spacing of the PC board, reform the terminals in a manner to minimize a mechanical stress into the body of the capacitor.
- Remove the capacitors from the PC board, after the solder is completely melted, reworking by using a soldering iron minimizes the mechanical stress to the capacitors.
- Do not touch the capacitor body with the hot tip of the soldering iron.

2. Flow Soldering:

- Do not dip the body of a capacitor into the solder bath, only dip the terminals in. The soldering must be done on the reverse side of PC board.
- Do not apply flux to any part of capacitors other than their terminals.
- Make sure the capacitors do not come into contact with any other components while soldering.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the picture below.



STORAGE

- Store with the temperature range between 5 to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% without direct sunshine and store in the package states if possible.
- It is recommended that you open the bag just before use and use up as early as possible.
- Store the capacitors in places free from water, oil or salt water or in condensation status.
- Never store in any area filled with poisonous gases (including hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and ammonia).
- Store the capacitors in places free from ozone, ultraviolet rays or radiation:
 (Radial Lead Type)
 Before unseal: within 1 year after delivery
 After opening: within 1 month

PACKING

Size Code	Bulk Pack					Ammo Pack				
	Bags	Inner Box		Carton		Quantity	Inner Box Size	Carton		Whole Pieces
		(LxWxH) 290*212*155		(LxWxH) 455*310*350				Inner Box Quantity	Carton Size (LxWxH)	
Quantity	Bags Number	Quantity / pcs	Inner Box Number	Quantity / pcs	(LxWxH)	(LxWxH)				
0511	1000	12	12,000	4	48,000	2000	320x230x50	10	485x345x275	20,000
0512	1000	12	12,000	4	48,000	2000	320x230x50	10	485x345x275	20,000
0611	500	10	5000	4	20,000	2000	340x290x48	10	600x354x265	20,000
0612	500	10	5000	4	20,000	2000	340x290x48	10	600x354x265	20,000
0811	500	10	5000	4	20,000	950	320x230x50	10	485x345x275	9500

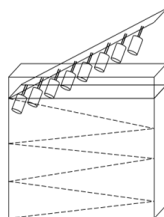
Radial Leaded Aluminum Electrolytic Capacitors

REH Series

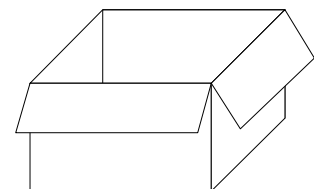
PACKING

Size Code	Bulk Pack					Ammo Pack				
	Bags	Inner Box		Carton		Quantity	Inner Box Size (LxWxH)	Inner Box Quantity	Carton Size (LxWxH)	Whole Pieces
		(LxWxH) 290*212*155		(LxWxH) 455*310*350						
	Quantity	Bags Number	Quantity / pcs	Inner Box Number	Quantity / pcs					
0812	500	10	5000	4	20,000	950	320x230x50	10	485x345x275	9500
0816	300	10	3000	4	12,000	950	320x230x55	10	485x345x300	9500
1011	250	10	2500	4	10,000	600	320x230x50	10	485x345x275	6000
1012	250	10	2500	4	10,000	600	320x230x50	10	485x345x275	6000
1013	250	10	2500	4	10,000	600	320x230x50	10	485x345x275	6000
1014	250	10	2500	4	10,000	600	320x230x50	10	485x345x275	6000
1016	250	10	2500	4	10,000	600	320x230x55	10	485x345x300	6000
1018	200	10	2000	4	8000	600	320x230x55	10	485x345x300	6000
1020	200	10	2000	4	8000	600	320x230x55	10	485x345x300	6000
1025	150	10	1500	4	6000	600	320x230x68	8	485x345x300	4800
1216	100	14	1400	4	5600	500	330x290x55	5	345x305x315	2500
1218	100	12	1200	4	4800	500	330x290x55	5	345x305x315	2500
1220	100	12	1200	4	4800	500	330x290x55	5	345x305x315	2500
1222	100	12	1200	4	4800	500	330x290x55	5	345x305x315	2500
1225	100	10	1000	4	4000	500	330x290x55	5	345x305x315	2500
1235	-	-	440	5	2200	-	-	-	-	-
1320	100	12	1200	4	4800	-	-	-	-	-
1325	100	10	1000	4	4000	-	-	-	-	-
1618	100	8	800	4	3200	-	-	-	-	-
1620	100	5	500	4	2000	-	-	-	-	-
1625	-	-	250	5	1250	-	-	-	-	-
1630	-	-	250	5	1250	-	-	-	-	-
1635	-	-	220	5	1100	-	-	-	-	-
1820	100	5	500	4	2000	-	-	-	-	-
1825	-	-	250	5	1250	-	-	-	-	-
1830	-	-	230	5	1150	-	-	-	-	-
1835	-	-	200	5	1000	-	-	-	-	-
1840	-	-	180	5	900	-	-	-	-	-

AMMO PACKING



BULK PACKING



Radial Leaded Aluminum Electrolytic Capacitors

RES Series



FEATURES

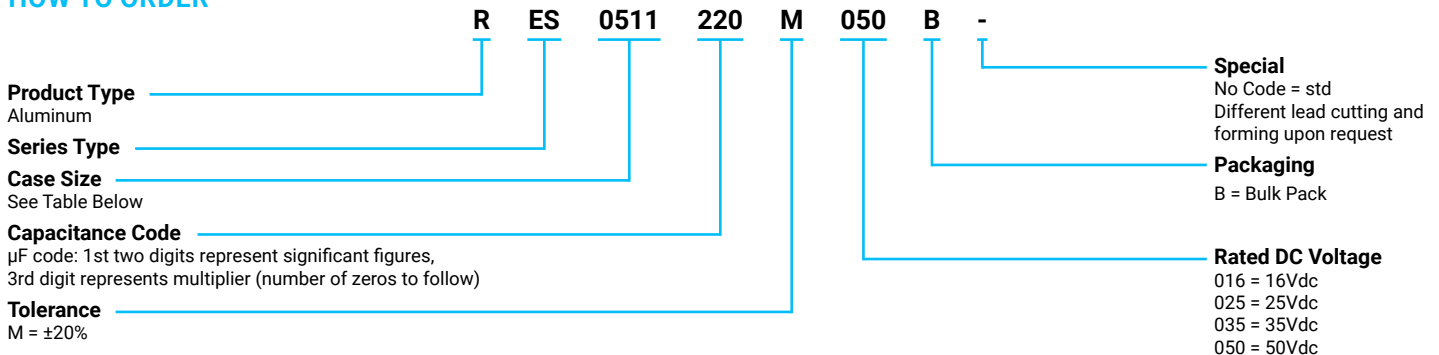
- Small size
- Long life and high ripple current
- Endurance: 5000 - 7000 hours at 105°C
- RoHS Compliance

APPLICATIONS

- Communications equipment
- Industrial equipment

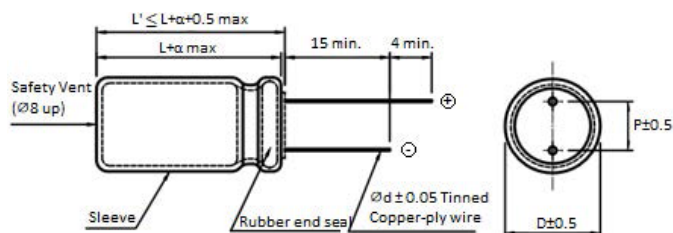


HOW TO ORDER

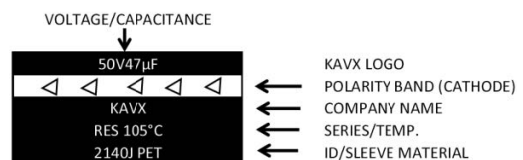


CASE DIMENSIONS millimeters (inches)

Code	D $\pm 0.50(0.020)$	L $\pm 0.50(0.020)$	d $\pm 0.05(0.002)$	P $\pm 0.50(0.020)$	α	Typical Weight (g)
0511	5.00 (0.020)	11.00 (0.433)	0.50 (0.020)	2.00 (0.079)	2.00 (0.079)	0.41
0611	6.30 (0.248)	11.00 (0.433)	0.50 (0.020)	2.50 (0.098)	2.00 (0.079)	0.68
0812	8.00 (0.315)	12.00 (0.472)	0.50 (0.020)	3.50 (0.138)	2.00 (0.079)	1.00
0816	8.00 (0.315)	16.00 (0.629)	0.50 (0.020)	3.50 (0.138)	2.00 (0.079)	1.33
0820	8.00 (0.315)	20.00 (0.787)	0.50 (0.020)	3.50 (0.138)	2.00 (0.079)	1.81



MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-40°C to +105°C	
Capacitance Range	at 25°C, 120Hz	2.2 μF to 1,000 μF
Capacitance Tolerance:	at 25°C, 120Hz	$\pm 20\%$
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the Ratings and Part Number Reference Table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C	I $\leq 0.01\text{CV}$ (μA) or 3 μA , whichever is greater

Radial Leaded Aluminum Electrolytic Capacitors

RES Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)			
μF	Code	16V	25V	35V	50V
2.2	2R2				0511
4.7	4R7				0511
10	100				0511
22	220				0511
47	470		0511		0611
100	101		0611		0812
220	221	0611	0812	0816	
330	331		0816		
470	471	0816	0820		
1000	102	0820			

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	Impedance @100kHz/20°C (Ω _{max})	100kHz RMS Current (mA)/105°C
16V							
RES0611221M016B	0611	220	16	35.2	16	0.140	450
RES0816471M016B	0816	470	16	75.2	16	0.087	850
RES0820102M016B	0820	1000	16	160.0	16	0.045	1250
25V							
RES0511470M025B	0511	47	25	11.8	14	0.570	210
RES0611101M025B	0611	100	25	25.0	14	0.210	350
RES0812221M025B	0812	220	25	55.0	14	0.130	660
RES0816331M025B	0816	330	25	82.5	14	0.086	850
RES0820471M025B	0820	470	25	117.5	14	0.069	1050
35V							
RES0816221M035B	0816	220	35	77.0	12	0.086	850
50V							
RES05112R2M050B	0511	2.2	50	1.1	10	2.500	57
RES05114R7M050B	0511	4.7	50	2.4	10	1.900	90
RES0511100M050B	0511	10	50	5.0	10	1.500	120
RES0511220M050B	0511	22	50	11.0	10	0.680	180
RES0611470M050B	0611	47	50	23.5	10	0.300	295
RES0812101M050B	0812	100	50	50.0	10	0.170	560

All technical data relates to an ambient temperature of +25°C

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (Vdc)	Frequency (Hz)			
	120	1K	10K	100K
Cap. < 220	0.40	0.75	0.90	1.00
220 ≤ Cap. < 470	0.50	0.85	0.94	1.00
470 ≤ Cap. < 1000	0.60	0.87	0.95	1.00

Radial Leaded Aluminum Electrolytic Capacitors

RES Series

QUALIFICATION TABLE

Test	RES Series (Temperature range -40°C to +105°C)					
	Condition		Characteristics			
Temperature Stability (Max. Impedance Ratio)	120Hz		Rated Voltage (V)	16 - 50		
			Z(-25°C) / Z(20°C)	2		
Load Life	Application of the rated voltage and the rated ripple current. Test temperature: 105 ± 2°C		ΔC/C	Within ±20% of initial limit		
			Diameter	Life Time (h)	DF	Not more than 200% of the specified limit
					φD≤6.3	5000
			φD=8	7000		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1000 hours 105°C without voltage applied.		ΔC/C	Within ±20% of initial limit		
			DF	200% or less of initial limit		
			DCL	Initial specified limit or less		

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current has to be reduced.

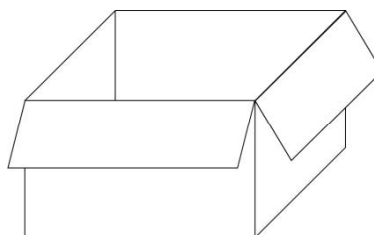
STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage life: 2yrs

PACKAGE DIMENSIONS (BULK PACKING)

Type of Product	Code	Bags / Inner Box	Quantity (Pcs/Carton)	Total Quantity (Pcs/Carton)	Wt (Kg/bag)	Size of Inner Box L x W x H (mm)	Size of Out Box L x W x H (mm)
Radial Classic	0511	12	1000	12000	0.43	267 X	546 x
	0611	8	1000	8000	0.60		
	0812	10	500	5000	0.49	260	279
	0816	10	300	3000	0.69	X	x
	0820	10	300	3000	0.71	135	160

Note: if you need more packing information, please contact your sales representative.



Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHA Series



FEATURES

- Low ESR
- Endurance: 105°C, 5000-10,000 hours
- RoHS Compliance

APPLICATIONS

- High Reliability applications
- Base station equipment



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



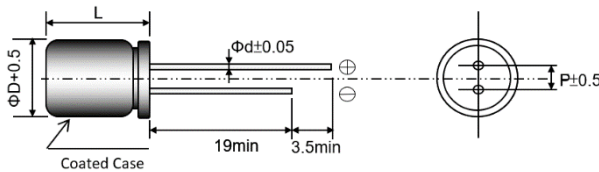
RoHS
COMPLIANT

HOW TO ORDER

	R	HA	1009	471	M	016	K	-	
Product Type Aluminum									Special No Code = std Different lead cutting and forming upon request
Series Type									Packaging K = Ammo Pack B = Bulk Pack
Case Size See table below									Rated DC Voltage 016 = 16Vdc 063 = 63Vdc 025 = 25Vdc 080 = 80Vdc 035 = 35Vdc 100 = 100Vdc 040 = 40Vdc 125 = 125Vdc 050 = 50Vdc
Capacitance Code µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)									
Tolerance M = ±20%									

CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±1.50 (0.060)	d±0.05 (0.002)	P±0.50 (0.020)	Typical Weight (g)
0607	6.30 (0.248)	7.20 (0.283)	0.50 (0.020)	2.50 (0.098)	0.45
0809	8.00 (0.315)	9.50 (0.374)	0.60 (0.024)	3.50 (0.138)	0.87
1009	10.00 (0.394)	9.50 (0.374)	0.60 (0.024)	5.00 (0.197)	1.34
1011	10.00 (0.394)	11.50 (0.453)	0.60 (0.024)	5.00 (0.197)	1.47

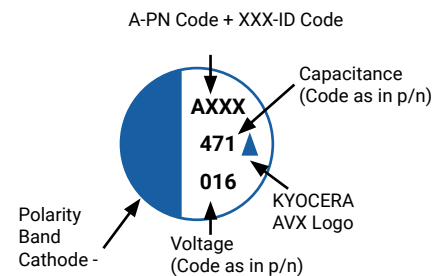


TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	At 25°C, 120Hz	10µF to 560µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Surge Voltage:	at 15 - 35°C	Rated voltage x 1.15
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	I ≤ 0.01 CV or 3µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment: Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



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Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHA Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)								
μF	Code	16V	25V	35V	40V	50V	63V	80V	100V	125V
10	100						0607		1009	1009
12	120							1009	1009	
15	150					0607		1009	1011	
18	180							1011		
22	220						0809			
27	270				0607					
33	330					0809	0809, 1009			
47	470			0607			1009			
56	560				0809	1009	1011			
68	680		0607							
82	820					1011				
100	101			0809	1009					
120	121	0607			1011					
150	151		0809	1009						
220	221			1011						
270	271	0809	1009							
330	331		1011							
470	471	1009								
560	561	1011								

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
16 Volt							
RHA0607121M016*	0607	120	16	19	16	40	1500
RHA0809271M016*	0809	270	16	43	16	26	2000
RHA1009471M016*	1009	470	16	75	16	21	2600
RHA1011561M016*	1011	560	16	90	16	15	3000
25 Volt							
RHA0607680M025*	0607	68	25	17	16	45	1400
RHA0809151M025*	0809	150	25	38	16	27	1900
RHA1009271M025*	1009	270	25	68	16	22	2500
RHA1011331M025*	1011	330	25	83	16	16	2900
35 Volt							
RHA0607470M035*	0607	47	35	16	16	60	1300
RHA0809101M035*	0809	100	35	35	16	30	1800
RHA1009151M035*	1009	150	35	53	16	23	2400
RHA1011221M035*	1011	220	35	77	16	17	2800
40 Volt							
RHA0607270M040*	0607	27	40	11	16	70	1200
RHA0809560M040*	0809	56	40	22	16	32	1700
RHA1009101M040*	1009	100	40	40	16	24	2400
RHA1011121M040*	1011	120	40	48	16	18	2700
50 Volt							
RHA0607150M050*	0607	15	50	8	16	80	1200
RHA0809330M050*	0809	33	50	17	16	35	1600
RHA1009560M050*	1009	56	50	28	16	25	2300
RHA1011820M050*	1011	82	50	41	16	19	2600

Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHA Series



RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
63 Volt							
RHA0607100M063*	0607	10	63	6	16	100	1000
RHA0809220M063*	0809	22	63	14	16	40	1500
RHA0809330M063*	0809	33	63	21	16	40	1500
RHA1009330M063*	1009	33	63	21	16	30	2100
RHA1009470M063*	1009	47	63	30	16	30	2100
RHA1011560M063*	1011	56	63	35	16	22	2400
80 Volt							
RHA1009120M080*	1009	12	80	10	16	70	1600
RHA1009150M080*	1009	15	80	12	16	70	1600
RHA1011180M080*	1011	18	80	14	16	50	1800
100 Volt							
RHA1009100M100*	1009	10	100	10	16	80	1400
RHA1009120M100*	1009	12	100	12	16	80	1400
RHA1011150M100*	1011	15	100	15	16	60	1600
125 Volt							
RHA1009100M125*	1009	10	125	13	16	90	1200

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Capacitance Range	100 ≤ F(Hz) <1K	1K ≤ F(Hz) <10K	10K ≤ F(Hz) <100K	100K ≤ F
4.7 < C ≤ 33	0.05	0.32	0.67	1.00
33 < C	0.10	0.35	0.70	1.00

Internal heating produced by ripple current will reduce the lifetime of capacitors, at a rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current should be minimized.

QUALIFICATION TABLE

Test	RHA Series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 5000 to 10,000 hours at 105°C. Φ6.3=5000hrs, D≥Φ8=10,000hrs.	Visual examination	no visible damage
		ΔC/C	≤ ±30% of the initial limit
		DF:	≤ 200% of the initial specified limit
		ESR:	≤ 200% of the initial specified limit
		DCL:	≤ Initial specified limit
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjecting them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied	Visual examination	no visible damage
		ΔC/C	≤ ±30% of the initial limit
		DF:	≤ 200% of the initial specified limit
		ESR:	≤ 200% of the initial specified limit
		DCL:	≤ Initial specified limit
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 15-35°C for 30 seconds through a protective resistor (R = 1 kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≤ ±30% of the initial limit
		DF:	≤ 200% of the initial specified limit
		ESR:	≤ 200% of the initial specified limit
		DCL:	≤ Initial specified limit

Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHA Series



STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
-

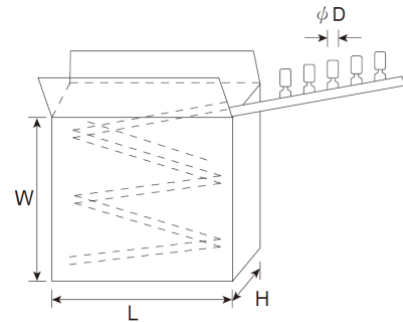
Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

Remark: Re-aging condition depends on its own spec.

PACKAGE TAPE DIMENSIONS units (mm)

AMMO PACKING

Ammo Pack						
Size Code	W±5	L±5	H±5	Qty. (pcs)	G.W. kg/box	Box /Carton
0607	235	327	54	1,500	1.12	10
0809	265	327	51	1,000	1.48	10
1009-1011	235	330	57	600	1.29	10



BULK PACKING

Package Box				
Size Code	Bags Inner box	Layer Quantity	Quantity (pcs/bag)	Total quantity (pcs/carton)
0607	9	2	1000	18,000
0809	10	2	500	10,000
1009-1011	11	2	200	4400

Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHD Series



FEATURES

- Low ESR, high ripple current resistant
- Endurance: 4000 hours at 125°C
- RoHS Compliance

APPLICATIONS

- Industrial electronics
- Base station equipment and power supplies

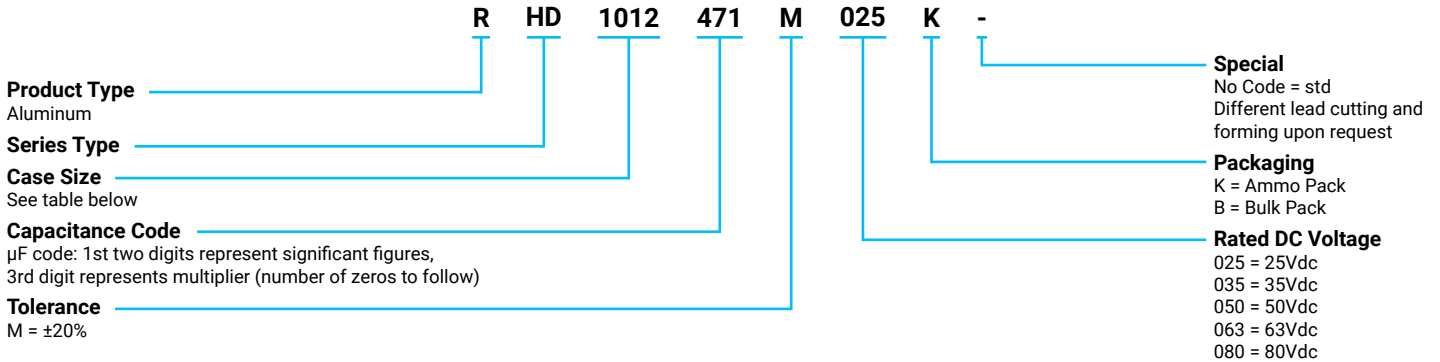


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



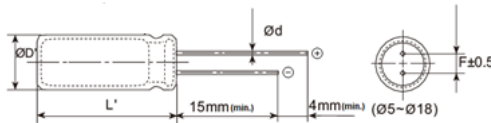
RoHS
COMPLIANT

HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D'-0.10(0.004)+0.50(0.020)	L'-0.50(0.020)+1.00(0.039)	d±0.05 (0.002)	F±0.50 (0.020)	Typical Weight (g)
0605	6.30 (0.248)	5.00 (0.197)	0.50 (0.020)	2.50 (0.098)	0.28
0607	6.30 (0.248)	7.00 (0.276)	0.50 (0.020)	2.50 (0.098)	0.38
0608	6.30 (0.248)	8.00 (0.315)	0.50 (0.020)	2.50 (0.098)	0.42
0810	8.00 (0.315)	10.00 (0.394)	0.60 (0.024)	3.50 (0.138)	0.72
0812	8.00 (0.315)	12.00 (0.472)	0.60 (0.024)	3.50 (0.138)	0.92
0814	8.00 (0.315)	14.00 (0.551)	0.60 (0.024)	3.50 (0.138)	0.92
1010	10.00 (0.394)	10.00 (0.394)	0.60 (0.024)	5.00 (0.197)	0.98
1012	10.00 (0.394)	12.00 (0.472)	0.60 (0.024)	5.00 (0.197)	1.06

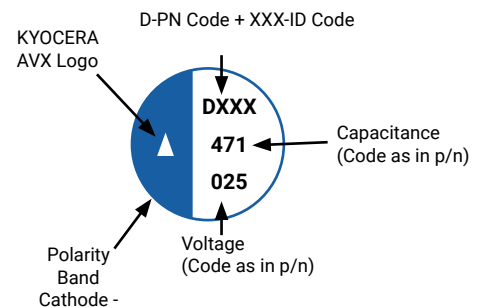


TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +125°C	
Capacitance Range	At 25°C, 120Hz	15µF to 470µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	I = 0.01CV or 3µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 125°C.

MARKING



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Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHD Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)				
μF	Code	25V	35V	50V	63V	80V
15	150				0608	
22	220			0608		
33	330				0810	
47	470		0605	0810		0814
56	560				1010	
68	680		0608			
100	101	0607		0812, 1010		
120	121		0810			
220	221	0810	1010			
330	331	1010				
470	471	1012				

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
25 Volt							
RHD0607101M025*	0607	100	25	25	12	35	1200
RHD0810221M025*	0810	220	25	55	12	27	1400
RHD1010331M025*	1010	330	25	82.5	12	25	1800
RHD1012471M025*	1012	470	25	117.5	12	20	2000
35 Volt							
RHD0605470M035*	0605	47	35	16.5	12	40	1100
RHD0608680M035*	0608	68	35	23.8	12	40	1200
RHD0810121M035*	0810	120	35	42	12	35	1400
RHD1010221M035*	1010	220	35	77	12	30	1800
50 Volt							
RHD0608220M050*	0608	22	50	11	12	90	900
RHD0810470M050*	0810	47	50	23.5	12	35	1100
RHD0812101M050*	0812	100	50	50	12	35	1400
RHD1010101M050*	1010	100	50	50	12	35	1400
63 Volt							
RHD0608150M063*	0608	15	63	9.5	12	100	800
RHD0810330M063*	0810	33	63	20.8	12	50	1000
RHD1010560M063*	1010	56	63	35.3	12	40	1200
80 Volt							
RHD0814470M080*	0814	47	80	37.6	12	40	1000

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk.

All technical data relates to an ambient temperature of +25C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes

Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHD Series



QUALIFICATION TABLE

Test	RHD Series (Temperature Range -55°C to +125°C)		
	Condition	Characteristics	
Temperature Characteristics (Impedance Ratio at 100kHz)	$Z(+125^{\circ}\text{C})/Z(+20^{\circ}\text{C}) \leq 1.5$ $Z(-55^{\circ}\text{C})/Z(+20^{\circ}\text{C}) \leq 2.0$		
Endurance	After applying rated voltage with rated ripple current for 4000 hours at $125^{\circ}\text{C} \pm 2^{\circ}\text{C}$, the capacitors shall meet the following requirements at normal temperature.	Visual examination	no visible damage
		$\Delta\text{C}/\text{C}$	$\leq \pm 30\%$ of the initial limit
		DF:	$\leq 200\%$ of the initial specified limit
		ESR:	$\leq 200\%$ of the initial specified limit
		DCL:	\leq Initial specified limit
High Temperature (No-Load)	The requirements for the Endurance characteristics listed above shall be satisfied when the capacitors are restored to normal temperature after storing them for 2000 hours under no-load at $125^{\circ}\text{C} \pm 2^{\circ}\text{C}$.		
Humidity Resistance (On-Load)	After applying rated voltage for 2000 hours at $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 85-90%RH, the capacitors shall meet the following requirements.	Visual examination	no visible damage
		$\Delta\text{C}/\text{C}$	$\leq \pm 30\%$ of the initial limit
		DF:	$\leq 200\%$ of the initial specified limit
		ESR:	$\leq 200\%$ of the initial specified limit
		DCL:	\leq Initial specified limit

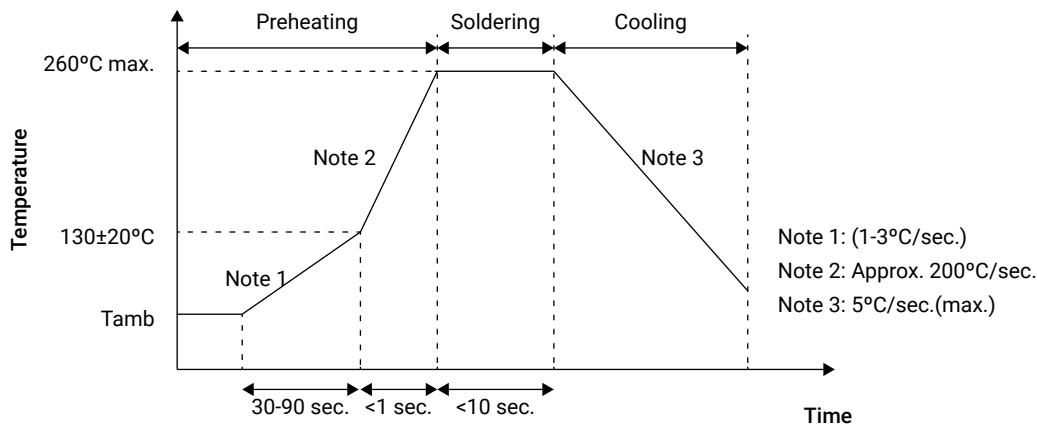
SOLDERING

1. When soldering with a soldering iron:

- Soldering conditions (temperature and time) should be within the limits prescribed in the catalogs or the product specifications.
- If the terminal spacing of a capacitor does not fit the terminal hole spacing of the PC board, reform the terminals in a manner to minimize a mechanical stress into the body of the capacitor.
- Remove the capacitors from the PC board, after the solder is completely melted, reworking by using a soldering iron minimizes the mechanical stress to the capacitors.
- Do not touch the capacitor body with the hot tip of the soldering iron.

2. Flow Soldering:

- Do not dip the body of a capacitor into the solder bath, only dip the terminals in. The soldering must be done on the reverse side of PC board.
- Do not apply flux to any part of capacitors other than their terminals.
- Make sure the capacitors do not come into contact with any other components while soldering.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the picture below.



Radial Leaded Aluminum Hybrid Electrolytic Capacitors

RHD Series



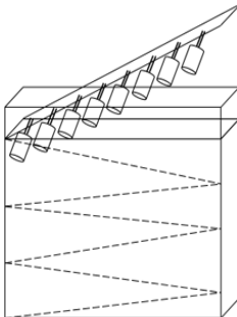
STORAGE

- Store with the temperature range between 5 to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% without direct sunshine and store in the package states if possible.
- It is recommended that you open the bag just before use and use up as early as possible.
- Store the capacitors in places free from water, oil or salt water or in condensation status.
- Never store in any area filled with poisonous gases (including hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and ammonia).
- Store the capacitors in places free from ozone, ultraviolet rays or radiation:
(Radial Lead Type)
Before unseal: within 1 year after delivery
After opening: within 1 month

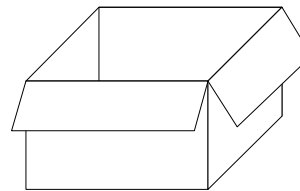
PACKING

Size Code	Bulk Pack					Ammo Pack				
	Bags	Inner Box		Carton		Quantity	Inner Box Size	Inner Box Quantity	Carton Size	Whole Pieces
		(LxWxH) 290*215*160		(LxWxH) 455*310*350						
	Quantity	Bags Number	Quantity / pcs	Inner Box Number	Quantity / pcs					
0605	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0607	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0608	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0810	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
0812	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
0814	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
1010	500	6	3000	4	12,000	600	320x230x50	10	485x345x275	6000
1012	500	6	3000	4	12,000	600	320x230x50	10	485x345x275	6000

AMMO PACKING



BULK PACKING



Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPA Series



FEATURES

- Super Low ESR, High ripple current capability
- Endurance: 105°C, 5000 hours
- RoHS and Halogen Free Compliance

APPLICATIONS

- Servers, APC/UPS power supply, power inverter, etc.

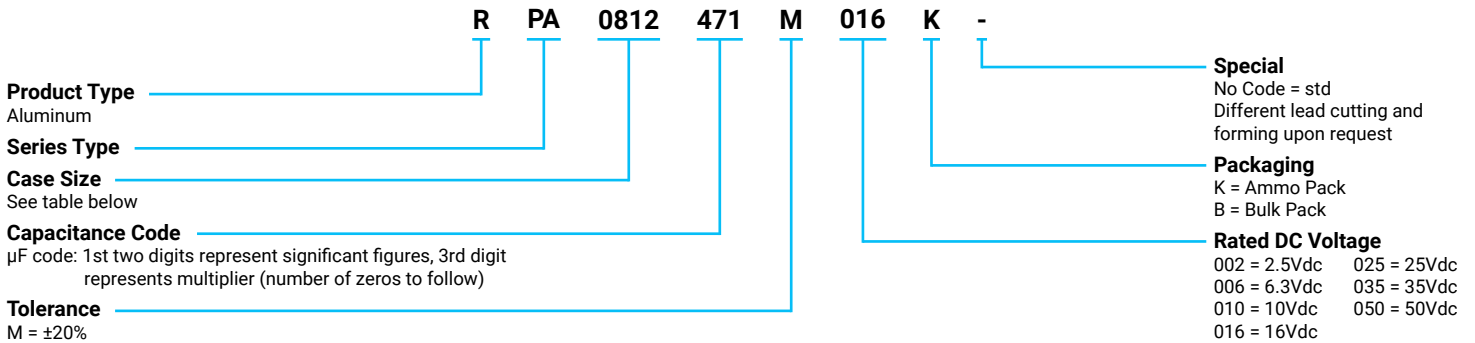


LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



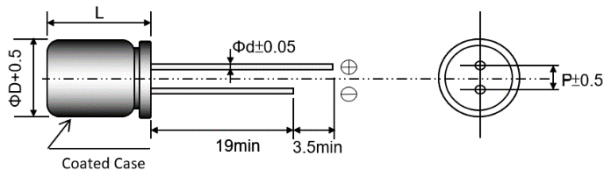
RoHS
COMPLIANT

HOW TO ORDER



CASE DIMENSIONS millimeters (inches)

Code	D±0.50 (0.020)	L±1.50 (0.060)	d±0.05 (0.002)	P±0.50 (0.020)	Typical Weight (g)
0606	6.30 (0.248)	6.00 (0.236)	0.45 (0.018)	2.50 (0.098)	0.25
0608	6.30 (0.248)	8.00 (0.315)	0.50 (0.020)	2.50 (0.098)	0.43
0609	6.30 (0.248)	9.00 (0.354)	0.50 (0.020)	2.50 (0.098)	0.45
0808	8.00 (0.315)	8.00 (0.315)	0.60 (0.024)	3.50 (0.138)	0.66
0812	8.00 (0.315)	12.00 (0.472)	0.60 (0.024)	3.50 (0.138)	0.85
1010	10.00 (0.394)	10.00 (0.394)	0.60 (0.024)	5.00 (0.197)	1.10
1012	10.00 (0.394)	12.00 (0.472)	0.60 (0.024)	5.00 (0.197)	1.25

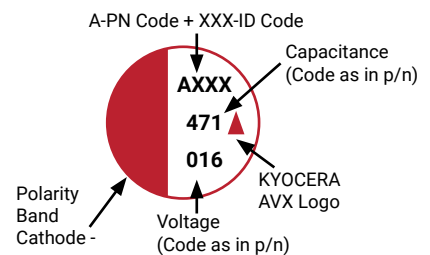


TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	At 25°C, 120Hz	10µF to 2200µF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	I ≤ 0.2CV or 300µA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment: Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



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Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPA Series



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)						
µF	Code	2.5V	6.3V	10V	16V	25V	35V	50V
10	100							0606
22	220						0606	
33	330							0608
47	470					0606		0808
68	680						0608	0812
82	820				0606			
100	101		0606		0608	0609		1010, 1012
120	121			0606			0808	
150	151						0812	
180	181		0606			0808		
220	221	0606			0608	0812	1010	
270	271						1012	
330	331			0608	0808	1010		
470	471		0608		0812, 1012	1012		
560	561	0608	0608, 0808	0808				
680	681		0808	0812	1010			
820	821				1012			
1000	102	0808	0812	1010	1012			
1200	122	0812	1010	1012				
1800	182	1012	1012					
2200	222	1012						

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
2.5 V							
RPA0606221M002*	0606	220	2.5	300	12	24	2400
RPA0608561M002*	0608	560	2.5	300	12	15	3200
RPA0808102M002*	0808	1000	2.5	500	12	15	3640
RPA0812122M002*	0812	1200	2.5	600	12	10	5200
RPA1012182M002*	1012	1800	2.5	900	12	10	5200
RPA1012222M002*	1012	2200	2.5	1100	12	10	5500
6.3 Volt							
RPA0606101M006*	0606	100	6.3	300	12	24	2400
RPA0606181M006*	0606	180	6.3	300	12	24	2400
RPA0608471M006*	0608	470	6.3	592	12	15	3500
RPA0608561M006*	0608	560	6.3	706	12	15	3500
RPA0808561M006*	0808	560	6.3	706	12	15	4100
RPA0808681M006*	0808	680	6.3	856	12	15	4300
RPA0812102M006*	0812	1000	6.3	1260	12	12	5000
RPA1010122M006*	1010	1200	6.3	1512	12	15	5200
RPA1012182M006*	1012	1800	6.3	2268	12	12	5500
10 Volt							
RPA0606121M010*	0606	120	10	300	12	24	2400
RPA0608331M010*	0608	330	10	660	12	15	3500
RPA0808561M010*	0808	560	10	1120	12	15	4000
RPA0812681M010*	0812	680	10	1360	12	15	4800
RPA1010102M010*	1010	1000	10	2000	12	15	4800
RPA1012122M010*	1012	1200	10	2400	12	12	5500
16V							
RPA0606820M016*	0606	82	16	300	12	24	2400
RPA0608101M016*	0608	100	16	320	12	15	3500
RPA0608221M016*	0608	220	16	704	12	15	3500
RPA0808331M016*	0808	330	16	1056	12	15	4200
RPA0812471M016*	0812	470	16	1504	12	12	4500
RPA1012471M016*	1012	470	16	1504	12	10	5100

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPA Series



RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DCL Max. (μA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
RPA1010681M016*	1010	680	16	2176	12	15	5100
RPA1012821M016*	1012	820	16	2624	12	15	5400
RPA1012102M016*	1012	1000	16	3200	12	15	5400
25 Volt							
RPA0606470M025*	0606	47	25	300	12	40	1500
RPA0609101M025*	0609	100	25	500	12	30	2500
RPA0808181M025*	0808	180	25	900	12	30	3260
RPA0812221M025*	0812	220	25	1100	12	30	3520
RPA1010331M025*	1010	330	25	1650	12	20	3850
RPA1012471M025*	1012	470	25	2350	12	25	4020
35 Volt							
RPA0606220M035*	0606	22	35	300	12	70	1450
RPA0608680M035*	0608	68	35	476	12	60	1520
RPA0808121M035*	0808	120	35	840	12	30	2100
RPA0812151M035*	0812	150	35	1050	12	26	2800
RPA1010221M035*	1010	220	35	1540	12	30	3050
RPA1012271M035*	1012	270	35	1890	12	26	3650
50 Volt							
RPA0606100M050*	0606	10	50	300	12	90	900
RPA0608330M050*	0608	33	50	330	12	60	1500
RPA0808470M050*	0808	47	50	470	12	32	2000
RPA0812680M050*	0812	68	50	680	12	28	2200
RPA1010101M050*	1010	100	50	1000	12	32	2350
RPA1012101M050*	1012	100	50	1000	12	28	2550

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120 ≤ F(Hz) <1k	1k ≤ F(Hz) <10k	10k ≤ F(Hz) <100k	100k ≤ F < 500kHz
Coefficient	0.05	0.30	0.70	1.00

QUALIFICATION TABLE

Test	RPA Series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 5000 hours at 105°C.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF:	≤ 150% of the initial specified limit
		ESR:	≤ 150% of the initial specified limit
		DCL:	≤ Initial specified limit
Damp Heat (Steady State)	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjecting them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF:	≤ 150% of the initial specified limit
		ESR:	≤ 150% of the initial specified limit
		DCL:	≤ Initial specified limit
Surge Voltage	The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 105°C for 30 seconds through a protective resistor (R = 1 kΩ) and discharge for 5 minutes 30 seconds.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF:	≤ 150% of the initial specified limit
		ESR:	≤ 150% of the initial specified limit
		DCL:	≤ Initial specified limit

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPA Series



STORAGE

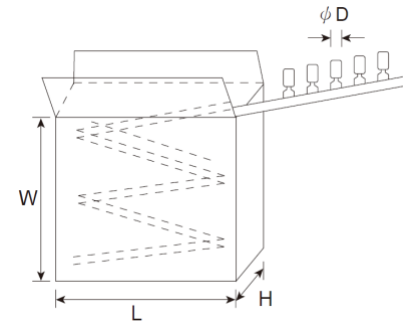
1. It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
2. Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Being exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- 3.

Category	Description	Storage Life
Mid-High Voltage	160V and above	2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging
Low Voltage	120V and below	2yrs

PACKAGE TAPE DIMENSIONS units (mm)

AMMO PACKING

Ammo Pack						
Size Code	W±5	L±5	H±5	Qty. (pcs)	G.W. kg/box	Box /Carton
0606-0609	235	327	54	1500	1.12	10
0808-0812	265	327	51	1000	1.48	10
1010-1012	235	330	57	600	1.29	10



BULK PACKING

Package Box				
Size Code	Bags Inner box	Layer Quantity	Quantity (pcs/bag)	Total quantity (pcs/carton)
0606	10	2	1000	20,000
0608-0609	9	2	1000	18,000
0808-0812	10	2	500	10,000
1010-1012	11	2	200	4400

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPF Series



FEATURES

- Long life time, low ESR
- Endurance: 5000 hours at 105°C
- RoHS Compliance

APPLICATIONS

- System board, graphic cards
- DC/DC Converter, game console, servers



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

HOW TO ORDER

Product Type Aluminum

Series Type See table below

Case Size See table below

Capacitance Code μF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance M = $\pm 20\%$

Special
No Code = std
Different lead cutting and forming upon request

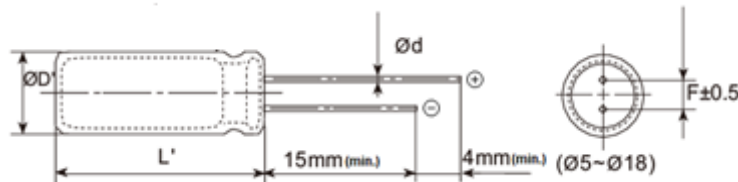
Packaging
K = Ammo Pack
B = Bulk Pack

Rated DC Voltage
006 = 6.3Vdc 050 = 50Vdc
010 = 10Vdc 063 = 63Vdc
016 = 16Vdc 080 = 80Vdc
025 = 25Vdc 100 = 100Vdc
035 = 35Vdc

Ordering code: R PF 0811 681 M 010 K -

CASE DIMENSIONS millimeters (inches)

Code	D'-0.30 (0.012) +0.50 (0.020)	L'-0.50 (0.020) +1.00 (0.039)	d ± 0.05 (0.002)	F ± 0.50 (0.020)	Typical Weight (g)	Code	D'-0.30 (0.012) +0.50 (0.020)	L'-0.50 (0.020) +1.00 (0.039)	d ± 0.05 (0.002)	F ± 0.50 (0.020)	Typical Weight (g)
0507	5.00 (0.197)	7.00 (0.276)	0.50 (0.020)	2.00 (0.079)	0.28	0811	8.00 (0.315)	11.00 (0.433)	0.60 (0.024)	3.50 (0.138)	0.82
0508	5.00 (0.197)	8.00 (0.315)	0.50 (0.020)	2.00 (0.079)	0.30	0813	8.00 (0.315)	13.00 (0.512)	0.60 (0.024)	3.50 (0.138)	0.91
0509	5.00 (0.197)	9.00 (0.354)	0.50 (0.020)	2.00 (0.079)	0.34	0814	8.00 (0.315)	14.00 (0.551)	0.60 (0.024)	3.50 (0.138)	1.05
0510	5.00 (0.197)	10.00 (0.394)	0.50 (0.020)	2.00 (0.079)	0.38	0816	8.00 (0.315)	16.00 (0.630)	0.60 (0.024)	3.50 (0.138)	1.14
5509	5.50 (0.217)	9.00 (0.354)	0.50 (0.020)	2.50 (0.098)	0.38	1012	10.00 (0.394)	12.00 (0.472)	0.60 (0.024)	5.00 (0.197)	1.22
0605	6.30 (0.248)	0.50 (0.020)	0.50 (0.020)	2.50 (0.098)	0.31	1013	10.00 (0.394)	13.00 (0.512)	0.60 (0.024)	5.00 (0.197)	1.35
0607	6.30 (0.248)	7.00 (0.276)	0.50 (0.020)	2.50 (0.098)	0.37	1014	10.00 (0.394)	14.00 (0.551)	0.60 (0.024)	5.00 (0.197)	1.55
0608	6.30 (0.248)	8.00 (0.315)	0.50 (0.020)	2.50 (0.098)	0.42	1015	10.00 (0.394)	15.00 (0.591)	0.60 (0.024)	5.00 (0.197)	1.62
0609	6.30 (0.248)	9.00 (0.354)	0.50 (0.020)	2.50 (0.098)	0.45	1016	10.00 (0.394)	16.00 (0.630)	0.60 (0.024)	5.00 (0.197)	1.74
0610	6.30 (0.248)	10.00 (0.394)	0.50 (0.020)	2.50 (0.098)	0.54	1017	10.00 (0.394)	17.00 (0.669)	0.60 (0.024)	5.00 (0.197)	1.88
0611	6.30 (0.248)	11.00 (0.433)	0.50 (0.020)	2.50 (0.098)	0.58	1018	10.00 (0.394)	18.00 (0.709)	0.60 (0.024)	5.00 (0.197)	1.93
0809	8.00 (0.315)	9.00 (0.354)	0.60 (0.024)	3.50 (0.138)	0.67						



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPF Series

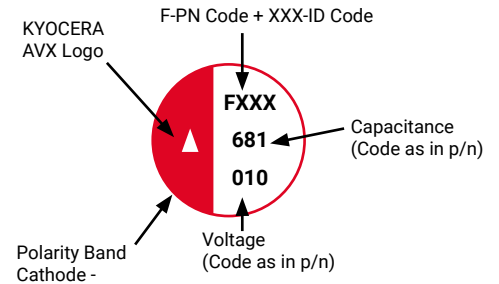


TECHNICAL SPECIFICATIONS

Category Temperature Range:	-55°C to +105°C	
Capacitance Range	At 25°C, 120Hz	4.7μF to 3300μF
Capacitance Tolerance:	At 25°C, 120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the ratings and part number reference table below
Leakage Current:	After 2 minutes at rated working voltage at 25°C*	$I \leq 0.2CV$ or 500μA, whichever is greater

* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment: Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

MARKING



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)								
μF	Code	6.3V	10V	16V	25V	35V	50V	63V	80V	100V
4.7	4R7									0608
10	100					0508	0508	0605		0610
15	150									0811
22	220					0509	0607		0610	
33	330					0509	0607	0608	0811	1014
47	470					0607	0608	0609	1012	
56	560						0608	0809		
68	680					0607	0610	0811		
82	820							0811		
100	101			0605		0608 0811	0811	1012	1014	
150	151				0610			1012		
180	181				0809					
220	221	0507	0509 0608		0811	0811 1012	1012	1015		
270	271	0507		0608 0809	0811		1013	1017		
330	331	0508 0605 0608	0608	5509	0811	1012	1015	1018		
390	391	0509								
470	471	0510 0608	0608	0611	0811 1012	1013	1018			
560	561	5509 0608	0610							
680	681	5509 0609 0809	0811	1012 0811		1016				
820	821	0609	0811	0813	0816 1018	1018				
1000	102	0610 0809 0811				1018				
1200	122	0811								
1500	152	0811 1012								
2200	222	0814								
3300	332	1014								

Released ratings

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPF Series



RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
6.3 Volt							
RPF0507221M006*	5007	220	6.3	500	8	22	3100
RPF0507271M006*	0507	270	6.3	500	8	22	3400
RPF0508331M006*	0508	330	6.3	500	8	22	3600
RPF0605331M006*	0605	330	6.3	500	8	27	2800
RPF0608331M006*	0608	330	6.3	500	8	16	3600
RPF0509391M006*	0509	390	6.3	500	8	22	3600
RPF0510471M006*	0510	470	6.3	592	8	22	3800
RPF0608471M006*	0608	470	6.3	592	8	16	3900
RPF5509561M006*	5509	560	6.3	706	8	22	3800
RPF0608561M006*	0608	560	6.3	706	8	22	4300
RPF5509681M006*	5509	680	6.3	857	8	22	4300
RPF0609681M006*	0609	680	6.3	857	8	22	4500
RPF0809681M006*	0809	680	6.3	857	8	22	4100
RPF0609821M006*	0609	820	6.3	1033	8	22	4500
RPF0610102M006*	0610	1000	6.3	1260	8	11	4600
RPF0809102M006*	0809	1000	6.3	1260	8	13	4300
RPF0811102M006*	0811	1000	6.3	1260	8	11	4600
RPF0811122M006*	0811	1200	6.3	1512	8	11	4700
RPF0811152M006*	0811	1500	6.3	1890	8	11	4800
RPF1012152M006*	1012	1500	6.3	1890	8	11	4900
RPF0814222M006*	0814	2200	6.3	2772	8	11	5100
RPF1014332M006*	1014	3300	6.3	4158	8	11	5300
10 Volt							
RPF0509221M010*	0509	220	10	500	12	22	2500
RPF0608221M010*	0608	220	10	500	12	16	2800
RPF0608331M010*	0608	330	10	660	12	22	2900
RPF0608471M010*	0608	470	10	940	12	22	3100
RPF0610561M010*	0610	560	10	1120	12	14	3200
RPF0811681M010*	0811	680	10	1360	12	13	3500
RPF0811821M010*	0811	820	10	1640	12	13	3600
16 Volt							
RPF0605101M016*	0605	100	16	500	12	27	1800
RPF0608271M016*	0608	270	16	864	12	22	2500
RPF0809271M016*	0809	270	16	864	12	22	2600
RPF5509331M016*	5509	330	16	1056	12	22	2600
RPF1012681M016*	1012	680	16	2176	12	13	3200
RPF0813821M016*	0813	820	16	2624	12	12	3100
RPF0611471M016*	0611	470	16	1504	12	16	2800
RPF0811681M016*	0811	680	16	2176	12	16	3000
25 Volt							
RPF0610151M025*	0610	150	25	750	12	22	2500
RPF0809181M025*	0809	180	25	900	12	33	2200
RPF0811221M025*	0811	220	25	1100	12	22	2700
RPF0811271M025*	0811	270	25	1350	12	22	2700
RPF0811331M025*	0811	330	25	1650	12	22	2700
RPF0811471M025*	0811	470	25	2350	12	22	2700
RPF1012471M025*	1012	470	25	2350	12	22	3600
RPF0816821M025*	0816	820	25	4100	12	22	3200
RPF1018821M025*	1018	820	25	4100	12	22	4000
35 Volt							
RPF0508100M035*	0508	10	35	500	12	66	1600
RPF0509220M035*	0509	22	35	500	12	110	1700
RPF0509330M035*	0509	33	35	500	12	55	1800
RPF0607470M035*	0607	47	35	500	12	55	1800
RPF0607680M035*	0607	68	35	500	12	55	1900
RPF0608101M035*	0608	100	35	700	12	55	2100
RPF0811101M035*	0811	100	35	700	12	44	2300
RPF0811221M035*	0811	220	35	1540	12	44	2500
RPF1012221M035*	1012	220	35	1540	12	33	2600

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPF Series



Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DCL Max. (µA)	DF Max. (%)	ESR Max. @100kHz (mΩ)	100kHz RMS Current (mA)
RPF1012331M035*	1012	330	35	2310	12	33	2700
RPF1013471M035*	1013	470	35	3290	12	22	2800
RPF1016681M035*	1016	680	35	4760	12	22	3000
RPF1018821M035*	1018	820	35	5000	12	22	3100
RPF1018102M035*	1018	1000	35	5000	12	22	3300
50 Volt							
RPF0508100M050*	0508	10	50	500	12	77	1400
RPF0607220M050*	0607	22	50	500	12	44	1700
RPF0607330M050*	0607	33	50	500	12	44	1800
RPF0608470M050*	0608	47	50	500	12	38	1800
RPF0608560M050*	0608	56	50	560	12	38	1900
RPF0610680M050*	0610	68	50	680	12	33	1900
RPF0811101M050*	0811	100	50	1000	12	33	2000
RPF1012221M050*	1012	220	50	2200	12	33	2400
RPF1013271M050*	1013	270	50	2700	12	22	2600
RPF1015331M050*	1015	330	50	3300	12	22	2700
RPF1018471M050*	1018	470	50	4700	12	22	2800
63 Volt							
RPF0605100M063*	0605	10	63	500	12	66	1400
RPF0608330M063*	0608	33	63	500	12	33	1500
RPF0609470M063*	0609	47	63	592	12	33	1700
RPF0809560M063*	0809	56	63	706	12	33	1600
RPF0811680M063*	0811	68	63	857	12	33	1800
RPF0811820M063*	0811	82	63	1033	12	33	1800
RPF1012101M063*	1012	100	63	1260	12	33	1900
RPF1012151M063*	1012	150	63	1890	12	33	2200
RPF1015221M063*	1015	220	63	2772	12	22	2300
RPF1017271M063*	1017	270	63	3402	12	22	2500
RPF1018331M063*	1018	330	63	4158	12	22	2600
80 Volt							
RPF0610220M080*	0610	22	80	500	12	66	1400
RPF0811330M080*	0811	33	80	528	12	38	1500
RPF1012470M080*	1012	47	80	752	12	38	1600
RPF1014101M080*	1014	100	80	1600	12	38	1800
100 Volt							
RPF060847M100*	0608	4.7	100	500	15	132	1200
RPF0610100M100*	0610	10	100	500	15	55	1300
RPF0811150M100*	0811	15	100	500	15	55	1300
RPF1014330M100*	1014	33	100	600	15	38	1400

* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 2 minutes

QUALIFICATION TABLE

Test	RPF Series (Temperature Range -55°C to +105°C)		
	Condition	Characteristics	
Temperature Characteristics (Impedance Ratio at 100kHz)	Z(+105°C)/Z(+20°C) ≤ 1.25 Z(-55°C)/Z(+20°C) ≤ 1.25		
Endurance	After applying rated voltage for 5000 hours at 105°C, the capacitors shall meet the following requirements.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF:	≤ 150% of the initial specified limit
		ESR:	≤ 150% of the initial specified limit
DCL:	≤ Initial specified limit		
Humidity Test	After subjecting to 90-95%RH for 2000 hours at 60°C without voltage applied, the capacitors shall meet the specified values for the Endurance characteristics listed above.		
Surge Test	After subjecting to 1000 cycles each consisting of charge with the surge voltage specified at normal temperature for 30 seconds through a protective resistor and discharge for 5 minutes 30 seconds, the capacitors shall meet the following requirements.	Visual examination	no visible damage
		ΔC/C	≤ ±20% of the initial limit
		DF:	≤ 150% of the initial specified limit
		ESR:	≤ 150% of the initial specified limit
DCL:	≤ Initial specified limit		

Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPF Series



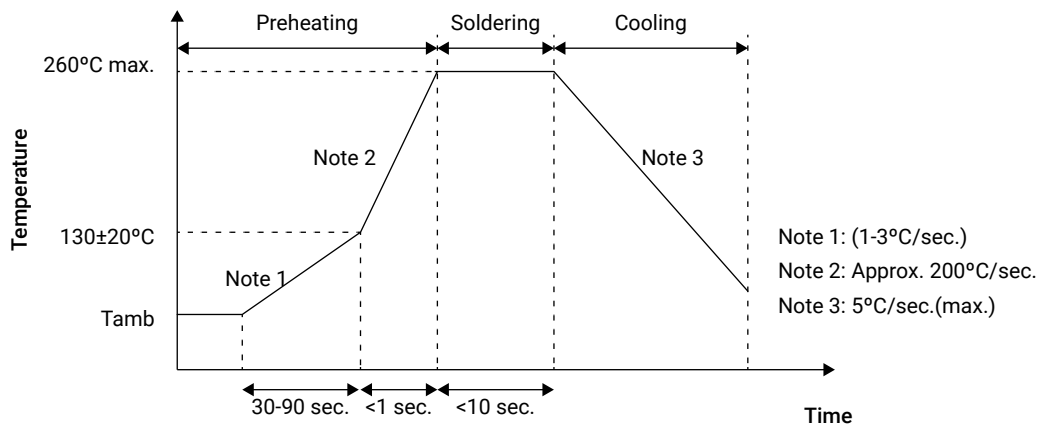
SOLDERING

1. When soldering with a soldering iron:

- Soldering conditions (temperature and time) should be within the limits prescribed in the catalogs or the product specifications.
- If the terminal spacing of a capacitor does not fit the terminal hole spacing of the PC board, reform the terminals in a manner to minimize a mechanical stress into the body of the capacitor.
- Remove the capacitors from the PC board, after the solder is completely melted, reworking by using a soldering iron minimizes the mechanical stress to the capacitors.
- Do not touch the capacitor body with the hot tip of the soldering iron.

2. Flow Soldering:

- Do not dip the body of a capacitor into the solder bath, only dip the terminals in. The soldering must be done on the reverse side of PC board.
- Do not apply flux to any part of capacitors other than their terminals.
- Make sure the capacitors do not come into contact with any other components while soldering.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the picture below.



STORAGE

- Store with the temperature range between 5 to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% without direct sunshine and store in the package states if possible.
- It is recommended that you open the bag just before use and use up as early as possible.
- Store the capacitors in places free from water, oil or salt water or in condensation status.
- Never store in any area filled with poisonous gases (including hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and ammonia).
- Store the capacitors in places free from ozone, ultraviolet rays or radiation:
(Radial Lead Type)
Before unseal: within 1 year after delivery
After opening: within 1 month

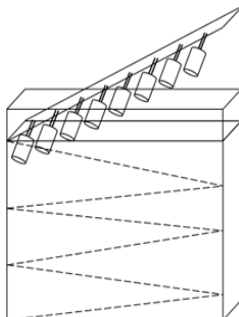
Radial Leaded Aluminum Conductive Polymer Electrolytic Capacitors

RPF Series

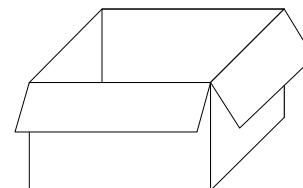


Size Code	Bulk Pack					Ammo Pack				
	Bags	Inner Box		Carton		Quantity	Inner Box Size (LxWxH)	Inner Box Quantity	Carton Size (LxWxH)	Whole Pieces
		(LxWxH) 290*212*160		(LxWxH) 450*310*350						
	Quantity	Bags Number	Quantity / pcs	Inner Box Number	Quantity / pcs	Quantity	Inner Box Size (LxWxH)	Inner Box Quantity	Carton Size (LxWxH)	Whole Pieces
0507	1000	9	9000	4	36,000	2000	320x230x50	10	485x345x275	20,000
0508	1000	9	9000	4	36,000	2000	320x230x50	10	485x345x275	20,000
0509	1000	9	9000	4	36,000	2000	320x230x50	10	485x345x275	20,000
0510	1000	9	9000	4	36,000	2000	320x230x50	10	485x345x275	20,000
5509	1000	8	8000	4	32,000	2000	320x230x50	10	485x345x275	20,000
0605	1000	8	8000	4	40,000	2000	340x290x48	10	600x354x265	20,000
0607	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0608	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0609	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0610	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0611	1000	8	8000	4	32,000	2000	340x290x48	10	600x354x265	20,000
0809	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
0811	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
0813	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
0814	500	8	4000	4	16,000	950	320x230x50	10	485x345x275	9500
0816	500	8	4000	4	16,000	950	320x230x55	10	485x345x300	9500
1012	500	6	3000	4	12,000	600	320x230x50	10	485x345x275	6000
1013	500	6	3000	4	12,000	600	320x230x50	10	485x345x275	6000
1014	500	6	3000	4	12,000	600	320x230x50	10	485x345x275	6000
1015	500	6	3000	4	12,000	600	320x230x50	10	485x345x275	6000
1016	500	6	3000	4	12,000	600	320x230x55	10	485x345x300	6000
1017	500	6	3000	4	12,000	600	320x230x55	10	485x345x300	6000
1018	500	6	3000	4	12,000	600	320x230x55	10	485x345x300	6000

AMMO PACKING



BULK PACKING



Snap in Aluminum Electrolytic Capacitors

SNA Series



FEATURES

- High temperature, high ripple current capability, longer life
- Endurance: 105°C, 5000 hours
- RoHS Compliance



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

APPLICATIONS

- Solar interters, frequency converters, power supplies, etc.

HOW TO ORDER

S NA H45 221 M 450 B * -

Product Type Aluminum

Series Type

Case Size See table below

Capacitance Code
µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance
M = ±20%

Special Request

Termination
K = 2 terminals
M = 4 terminals
Additional terminals upon request

Packaging
B = Bulk Pack

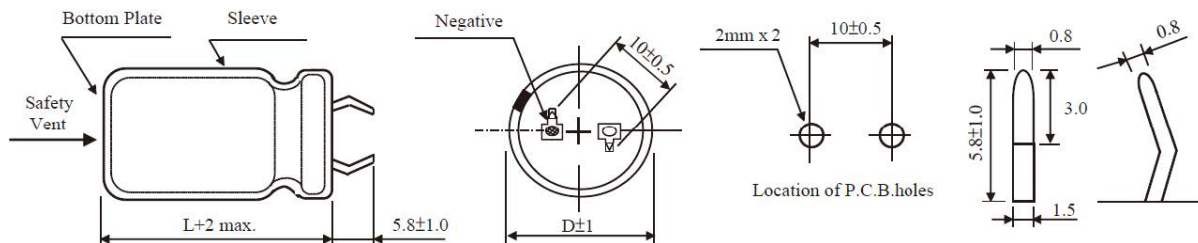
Rated DC Voltage
250 = 250Vdc
420 = 420Vdc
450 = 450Vdc

CASE DIMENSIONS millimeters (inches)

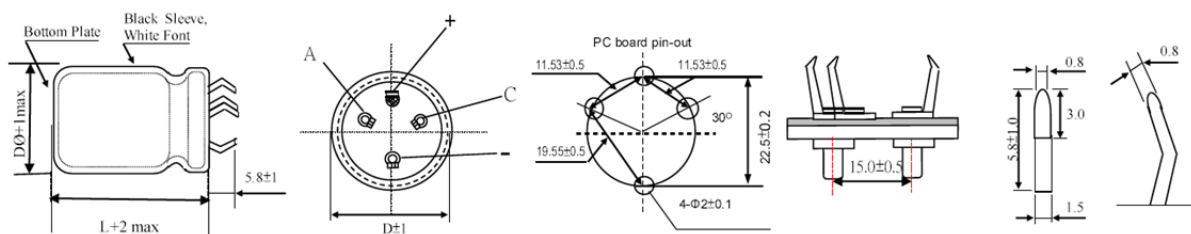
1st Character	D±1.00(0.039)	2nd & 3rd Character	L+2.00(0.079) Max.
G	22.00 (0.866)	25	25.00 (0.984)
H	25.00 (0.984)	30	30.00 (1.181)
I	30.00 (1.181)	35	35.00 (1.378)
J	35.00 (1.378)	40	40.00(1.575)
K	40.00 (1.574)	45	45.00 (1.772)
		50	50.00 (1.969)
		A0	100.00 (3.937)

Code	Typical Weight (g)	Code	Typical Weight (g)
G25	13.00	I25	24.00
G30	16.00	I30	27.00
G35	20.00	I35	36.00
G40	22.00	I40	40.00
G45	25.22	I45	45.00
G50	28.75	I50	50.00
H25	16.00	J25	33.20
H30	17.00	J30	36.00
H35	24.95	J35	39.47
H40	28.00	J40	59.30
H45	32.00	J45	52.00
H50	44.66	J50	61.00
		KA0	175.00

K TERMINAL CONFIGURATION



M TERMINAL CONFIGURATION



KYOCERA AVX The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

TDS-ALUM-0021 | Rev 2

— ALUMINUM CAPACITORS —

Snap in Aluminum Electrolytic Capacitors

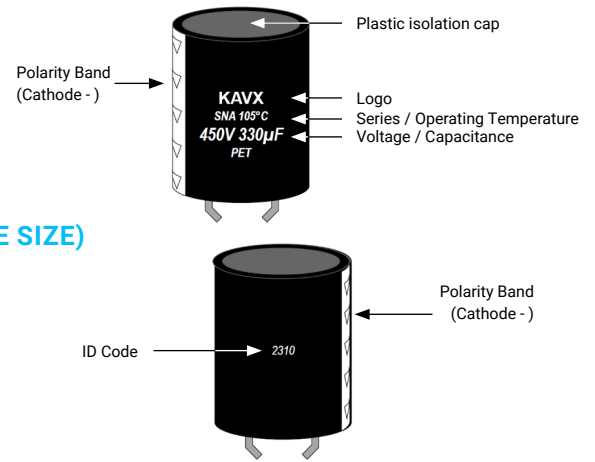
SNA Series



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-25°C to +105°C	
Capacitance Range	At 25°C,120Hz	82μF to 1800μF
Capacitance Tolerance:	At 25°C,120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the Ratings and Part Number Reference Table below
Leakage Current:	After 5 minutes at rated working voltage at 25°C	$I \leq 3VCV(\mu A)$

MARKING



CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)		
μF	Code	250V	420V	450V
82	820			G25
100	101		G25	G30, H25
120	121		G30, H25	G35
150	151		G35	G45, H35, I25
180	181		G45, H35, I25	G50, H40, I30, J25
220	221	G25	G50, H40, I30, J25	H45, I35, J30
270	271	G30	H45, I35, J30	H50, I40, J35
330	331	H30	H50, I40, J35	I45
390	391	G40, H30, I25	I45, J40	I50, J45
470	471	G45, H35, I30	I50, J45	J50
560	561	G50, H40, I35, J25	J50	
680	681	H45, I40, J30		
820	821	H50, I45, J35		
1000	102	I50, J40		
1200	122	J45		
1500	152	J50		
1800	182		KA0	

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	120Hz RMS Current (A) / 105°C
250 Volt					
SNAG25221M250BK	G25	220	250	15	1.01
SNAG30271M250BK	G30	270	250	15	1.20
SNAG30331M250BK	H30	330	250	15	1.32
SNAG40391M250BK	G40	390	250	15	1.44
SNAG30391M250BK	H30	390	250	15	1.43
SNAG25391M250BK	I25	390	250	15	1.50
SNAG45471M250BK	G45	470	250	15	1.62
SNAG35471M250BK	H35	470	250	15	1.70
SNAG30471M250BK	I30	470	250	15	1.74
SNAG50561M250BK	G50	560	250	15	1.84
SNAG40561M250BK	H40	560	250	15	1.78
SNAG35561M250BK	I35	560	250	15	1.83
SNAG25561M250BK	J25	560	250	15	1.90
SNAG45681M250BK	H45	680	250	15	2.04
SNAG40681M250BK	I40	680	250	15	2.06
SNAG30681M250BK	J30	680	250	15	2.14
SNAG50821M250BK	H50	820	250	15	2.28
SNAG45821M250BK	I45	820	250	15	2.38
SNAG35821M250BK	J35	820	250	15	2.37
SNAG50102M250BK	I50	1000	250	16	2.68
SNAG40102M250BK	J40	1000	250	16	2.71
SNAG45122M250BK	J45	1200	250	16	3.05
SNAG50152M250BK	J50	1500	250	16	3.49
420 Volt					
SNAG25101M420BK	G25	100	420	20	0.66

Snap in Aluminum Electrolytic Capacitors

SNA Series

Part No.	Case Size	Capacitance (µF)	Rated Voltage (V)	DF Max. (%)	120Hz RMS Current (A) / 105°C
SNAG30121M420BK	G30	120	420	20	0.76
SNAH25121M420BK	H25	120	420	20	0.77
SNAG35151M420BK	G35	150	420	20	0.86
SNAG45181M420BK	G45	180	420	20	0.98
SNAH35181M420BK	H35	180	420	20	1.01
SNAI25181M420BK	I25	180	420	20	1.02
SNAG50221M420BK	G50	220	420	20	1.11
SNAH40221M420BK	H40	220	420	20	1.13
SNAI30221M420BK	I30	220	420	20	1.14
SNAJ25221M420BK	J25	220	420	20	1.21
SNAH45271M420BK	H45	270	420	20	1.29
SNAI35271M420BK	I35	270	420	20	1.30
SNAJ30271M420BK	J30	270	420	20	1.37
SNAH50331M420BK	H50	330	420	20	1.45
SNAI40331M420BK	I40	330	420	20	1.48
SNAJ35331M420BK	J35	330	420	20	1.54
SNAI45391M420BK	I45	390	420	20	1.65
SNAJ40391M420BK	J40	390	420	20	1.73
SNAI50471M420BK	I50	470	420	20	1.85
SNAJ45471M420BK	J45	470	420	20	1.93
SNAJ50561M420BK	J50	560	420	20	2.17
SNAKA0182M420B*	KA0	1800	420	20	8.00
450 Volt					
SNAG25820M450BK	G25	82	450	20	0.60
SNAG30111M450BK	G30	100	450	20	0.69
SNAH25111M450BK	H25	100	450	20	0.70
SNAG35121M450BK	G35	120	450	20	0.76
SNAG45151M450BK	G45	150	450	20	0.90
SNAH35151M450BK	H35	150	450	20	0.92
SNAI25151M450BK	I25	150	450	20	0.93
SNAG50181M450BK	G50	180	450	20	1.01
SNAH40181M450BK	H40	180	450	20	1.02
SNAI30181M450BK	I30	180	450	20	1.03
SNAJ25181M450BK	J25	180	450	20	1.09
SNAH45221M450BK	H45	220	450	20	1.16
SNAI35221M450BK	I35	220	450	20	1.17
SNAJ30221M450BK	J30	220	450	20	1.23
SNAH50271M450BK	H50	270	450	20	1.31
SNAI40271M450BK	I40	270	450	20	1.33
SNAJ35271M450BK	J35	270	450	20	1.38
SNAI45331M450BK	I45	330	450	20	1.51
SNAI50391M450BK	I50	390	450	20	1.67
SNAJ45391M450BK	J45	390	450	20	1.76
SNAJ50471M450BK	J50	470	450	20	1.98

Note: ESR values upon request

All technical data relates to an ambient temperature of +25°C. Capacitance and DF measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (V)	Frequency (Hz)				
	50	120	1K	10K	50K
250	0.80	1.00	1.15	1.45	1.50
420 - 450	0.76	1.00	1.14	1.40	1.42

QUALIFICATION TABLE

Test	SNA Series (Temperature Range -25°C to +105°C)			
	Condition	Characteristics		
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	250	420 - 450
		Z(-25°C)/Z(+20°C)	4	8
Endurance	5000 hours, with application of rated voltage at 105°C	ΔC/C	≤±20% of the initial limit	
		DF	≤ 200% of Initial specified limit	
		DCL	≤ Initial specified limit	

Snap in Aluminum Electrolytic Capacitors

SNA Series

Test	SNA Series (Temperature Range -25°C to +105°C)		
	Condition	Characteristics	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 25°C after exposing them for 1000 hours 105°C without voltage applied. The capacitance shall be preconditioned by applying voltage according to the 4.1 of JIS C5101-4.	$\Delta C/C$	$\leq \pm 15\%$ of the initial limit
		DF	$\leq 200\%$ of Initial specified limit
		DCL	\leq Initial specified limit
Standards	JIS C 5101-4-1 (IEC 60384)		

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C.

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration or mechanical shock exceed the ranges of the specification.
- 2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging.

PACKING

Case Size	Dimension (D x L)	Quantity (pcs/Inner Box)	Layer Quantity	Total Quantity (pcs/Carton)	Gross (kg/Inner Box)	Size Inner Box (mm)	Size Out Box (mm)
G25	22x25	300	4	1200	4.11	272x272x146	564x282x312
G30	22x30	300	4	1200	5.01		
G35	22x35	200	4	800	4.21		
G40	22x40	200	4	800	4.61		
G45	22x45	200	4	800	4.81		
G50	22x50	200	4	800	6.21		
H25	25x25	300	4	1200	5.05	302x302x146	624x312x312
H30	25x30	300	4	1200	5.35		
H35	25x35	300	4	1200	6.85		
H40	25x40	200	4	800	5.85		
H45	25x45	200	4	800	6.65		
H50	25x50	200	4	800	7.25		
I25	30x25	75	4	300	1.92	179x179x146	378x189x312
I30	30x30	75	4	300	2.15		
I35	30x35	75	4	300	2.82		
I40	30x40	50	4	200	2.12		
I45	30x45	50	4	200	2.37		
I50	30x50	50	4	200	2.62		
J25	35x25	75	4	300	2.75	204x204x146	428x214x312
J30	35x30	75	4	300	2.87		
J35	35x35	75	4	300	3.06		
J40	35x40	50	4	200	2.44		
J45	35x45	50	4	200	2.82		
J50	35x50	50	4	200	3.19		
KA0	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Snap in Aluminum Electrolytic Capacitors

SNL Series



FEATURES

- Downsized
- Endurance: 105°C, 3000 hours
- RoHS Compliance
- AEC-Q200 tested

APPLICATIONS

- Converters, energy storage, power supplies



LEAD-FREE
LEAD-FREE COMPATIBLE
COMPONENT



RoHS
COMPLIANT

HOW TO ORDER

Product Type Aluminum

Series Type

Case Size See table below

Capacitance Code
µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

Tolerance
M = ±20%

Special Request

Termination
K = Standard
Additional terminals upon request

Packaging
B = Bulk Pack

Rated DC Voltage
35 = 35Vdc
160 = 160Vdc
200 = 200Vdc
250 = 250Vdc
350 = 350Vdc
400 = 400Vdc
450 = 450Vdc
500 = 500Vdc
550 = 550Vdc

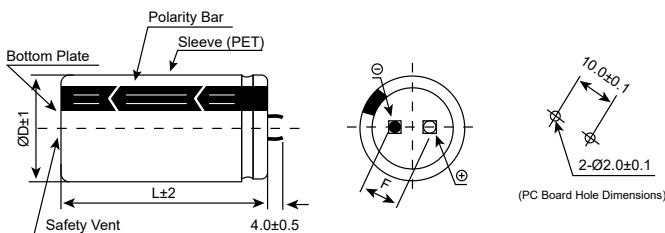
Ordering Code: S NL I35 221 M 450 B K -

CASE DIMENSIONS millimeters (inches)

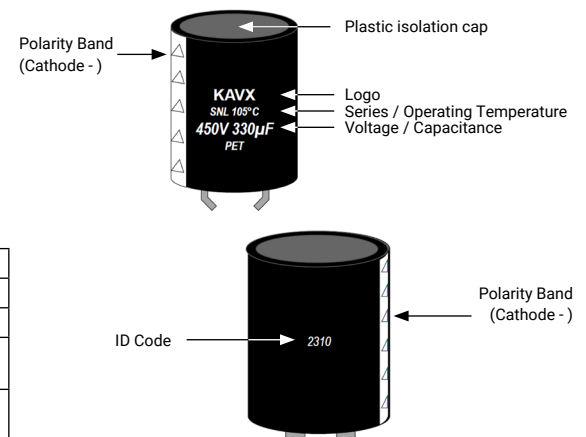
1st Character	D±1.00(0.039)	2nd & 3rd Character	L+2.00(0.079) Max.
G	22.00 (0.866)	20	20.00 (0.787)
H	25.00 (0.984)	25	25.00 (0.984)
I	30.00 (1.181)	30	30.00 (1.181)
J	35.00 (1.378)	35	35.00 (1.378)
		40	40.00(1.575)
		45	45.00 (1.772)
		50	50.00 (1.969)
		55	55.00 (2.165)
		60	60.00 (2.362)

Code	Typical Weight (g)	Code	Typical Weight (g)
G20	10.50	I30	33.50
G25	12.00	I35	40.00
G30	16.00	I40	46.50
G35	19.50	I45	53.00
G40	25.00	I50	61.00
H25	19.50	J25	38.00
H30	25.50	J30	46.00
H35	29.50	J35	54.00
H40	30.50	J40	64.50
H45	37.50	J45	68.00
H50	42.50	J50	80.50
I20	19.50	J55	90.50
I25	28.50	J60	94.00

Terminal Code : K (Ø22 to Ø35) : Standard



MARKING



TECHNICAL SPECIFICATIONS

Category Temperature Range:	-25°C to +105°C	
Capacitance Range	At 25°C,120Hz	68µF to 12,000µF
Capacitance Tolerance:	At 25°C,120Hz	±20%
Dissipation Factor (%)	Measurement Frequency: 120Hz at 25°C	Please see the Ratings and Part Number Reference Table below
Leakage Current:	After 5 minutes at rated working voltage at 25°C	$I \leq 3\sqrt{CV}(\mu A)$

Snap in Aluminum Electrolytic Capacitors

SNL Series

CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

Capacitance		Rated Voltage DC (V _R)								
μF	Code	35V	160V	200V	250V	350V	400V	450V	500V	550V
68	680						G25			
82	820					G25	G25			
100	101							G30, H25		
120	121					I20	G30	G35, I25		
150	151						H30	G40, H30		I35
180	181							I25, I30		I40
220	221		G20					H40, H45, I30, I35		
270	271			G25, I20			I35	H45, I30, I35, I40, J30	I40	
330	331		G25		G35		I35	H45, H50	J40	
390	391			H25						
470	471		G30	G35, G40	H30, H35, I25		J35	J40, I45	J60	
560	561			G40	H40, I30		I50, J45	H60, I50, J45, J50		
680	681			H35, J25	H40, H50		J50	J55		
820	821				I35		J60			
1,000	102			I35	I40					
1,200	122		H45							
1,500	152			I50	J50					
2,200	222		J45							
12,000	123	H40								

Released ratings

RATINGS & PART NUMBER REFERENCE

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	120Hz RMS Current (A) / 105°C	ESR Max. @120Hz (Ω)	ESR Max. @100kHz (Ω)
35 Volt							
SNLH40123M035BK	H40	12,000	35	4	3.28	0.044	0.041
160 Volt							
SNLG20221M160BK	G20	220	160	15	0.81	0.904	0.603
SNLG25331M160BK	G25	330	160	15	1.20	0.603	0.402
SNLG30471M160BK	G30	470	160	15	1.55	0.423	0.282
SNLH45122M160BK	H45	1200	160	15	2.49	0.166	0.111
SNLJ45222M160BK	J45	2200	160	15	3.50	0.090	0.060
200 Volt							
SNLG25271M200BK	G25	270	200	15	1.10	0.737	0.491
SNLI20271M200BK	I20	270	200	15	1.05	0.737	0.491
SNLH25391M200BK	H25	390	200	15	1.35	0.510	0.340
SNLG35471M200BK	G35	470	200	15	1.50	0.423	0.282
SNLG40471M200BK	G40	470	200	15	1.54	0.423	0.282
SNLG40561M200BK	G40	560	200	15	1.67	0.355	0.237
SNLH35681M200BK	H35	680	200	15	1.78	0.293	0.195
SNLJ25681M200BK	J25	680	200	15	1.78	0.293	0.195
SNLI35102M200BK	I35	1000	200	15	2.30	0.199	0.133
SNLI50152M200BK	I50	1500	200	15	3.08	0.133	0.088
250 Volt							
SNLG35331M250BK	G35	330	250	15	1.30	0.603	0.402
SNLH30471M250BK	H30	470	250	15	1.60	0.423	0.282
SNLH35471M250BK	H35	470	250	15	1.65	0.423	0.282
SNLI25471M250BK	I25	470	250	15	1.60	0.423	0.282
SNLH40561M250BK	H40	560	250	15	1.80	0.355	0.237
SNLI30561M250BK	I30	560	250	15	1.80	0.355	0.237
SNLH40681M250BK	H40	680	250	15	1.90	0.293	0.195
SNLH50681M250BK	H50	680	250	15	2.00	0.293	0.195
SNLI35821M250BK	I35	820	250	15	2.25	0.243	0.162
SNLI40102M250BK	I40	1000	250	15	2.00	0.199	0.133
SNLJ50152M250BK	J50	1500	250	15	3.00	0.133	0.088
350 Volt							
SNLG25820M350BK	G25	82	350	15	0.55	2.426	1.697
SNLI20121M350BK	I20	120	350	15	0.65	1.658	1.159

Snap in Aluminum Electrolytic Capacitors

SNL Series

Part No.	Case Size	Capacitance (μF)	Rated Voltage (V)	DF Max. (%)	120Hz RMS Current (A) / 105°C	ESR Max. @120Hz (Ω)	ESR Max. @100kHz (Ω)
400 Volt							
SNLG25680M400BK	G25	68	400	15	0.50	2.926	2.046
SNLG25820M400BK	G25	82	400	15	0.64	2.426	1.697
SNLG30121M400BK	G30	120	400	15	0.72	1.658	1.159
SNLH30151M400BK	H30	150	400	15	0.88	1.326	0.927
SNLI35271M400BK	I35	270	400	15	1.22	0.737	0.515
SNLI35331M400BK	I35	330	400	15	1.40	0.603	0.422
SNLJ35471M400BK	J35	470	400	15	1.80	0.423	0.296
SNLI50561M400BK	I50	560	400	15	2.05	0.355	0.248
SNLJ45561M400BK	J45	560	400	15	2.12	0.355	0.248
SNLJ50681M400BK	J50	680	400	15	2.27	0.293	0.205
SNLJ60821M400BK	J60	820	400	15	2.42	0.243	0.170
450 Volt							
SNLG30101M450BK	G30	100	450	20	0.69	2.653	1.855
SNLH25101M450BK	H25	100	450	20	0.69	2.653	1.855
SNLG35121M450BK	G35	120	450	20	0.80	2.210	1.546
SNLI25121M450BK	I25	120	450	20	0.80	2.210	1.546
SNLG40151M450BK	G40	150	450	20	0.88	1.768	1.237
SNLH30151M450BK	H30	150	450	20	0.88	1.768	1.237
SNLI25181M450BK	I25	180	450	20	0.92	1.474	1.031
SNLI30181M450BK	I30	180	450	20	1.00	1.474	1.031
SNLH40221M450BK	H40	220	450	20	1.12	1.206	0.843
SNLH45221M450BK	H45	220	450	20	1.18	1.206	0.843
SNLI30221M450BK	I30	220	450	20	1.08	1.206	0.843
SNLI35221M450BK	I35	220	450	20	1.12	1.206	0.843
SNLH45271M450BK	H45	270	450	20	1.18	0.982	0.687
SNLI30271M450BK	I30	270	450	20	1.10	0.982	0.687
SNLI35271M450BK	I35	270	450	20	1.26	0.982	0.687
SNLI40271M450BK	I40	270	450	20	1.28	0.982	0.687
SNLJ30271M450BK	J30	270	450	20	1.20	0.982	0.687
SNLH45331M450BK	H45	330	450	20	1.24	0.804	0.562
SNLH50331M450BK	H50	330	450	20	1.31	0.804	0.562
SNLI45471M450BK	I45	470	450	20	1.60	0.564	0.395
SNLJ40471M450BK	J40	470	450	20	1.70	0.564	0.395
SNLH60561M450BK	H60	560	450	20	1.85	0.474	0.331
SNLI50561M450BK	I50	560	450	20	1.72	0.474	0.331
SNLJ45561M450BK	J45	560	450	20	1.84	0.474	0.331
SNLJ50561M450BK	J50	560	450	20	1.91	0.474	0.331
SNLJ55681M450BK	J55	680	450	20	2.10	0.390	0.273
500 Volt							
SNLI40271M500BK	I40	270	500	20	1.15	0.982	0.687
SNLJ40331M500BK	J40	330	500	20	1.52	0.804	0.562
SNLJ60471M500BK	J60	470	500	20	1.76	0.564	0.395
550 Volt							
SNLI35151M550BK	I35	150	550	20	1.04	1.768	1.237
SNLI40181M550BK	I40	180	550	20	1.17	1.474	1.031

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Rated Voltage (V)	Frequency (Hz)			
	120	1K	10K	100K
35	1.00	1.03	1.05	1.08
160 - 250	1.00	1.32	1.45	1.50
350 - 550	1.00	1.30	1.41	1.43

The endurance of capacitors is shortened with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise. When long life Performance is required in actual use, the rms ripple current has to be reduced.

Snap in Aluminum Electrolytic Capacitors

SNL Series

QUALIFICATION TABLE

Test	SNL Series (Temperature Range -25°C to +105°C)				
	Condition	Characteristics			
Low Temperature Characteristics (Max. Impedance Ratio)	At 120Hz	Rated Voltage (V)	35	160 - 250	350 - 550
		Z(-25°C)/Z(+20°C)	3	4	8
		Z(-40°C)/Z(+20°C)	8	-	-
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after DC voltage plus the rated ripple current is applied for 3000 hours at 105°C.	ΔC/C	≤±20% of the initial limit		
		DF	≤ 200% of Initial specified limit		
		DCL	≤ Initial specified limit		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1000 hours at 105°C without voltage applied.	ΔC/C	≤±15% of the initial limit		
		DF	≤150% of the initial specified limit		
		DCL	≤200% of the initial specified limit		

STORAGE

- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
 - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
 - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
 - Exposed to acidic or alkaline solutions.
 - Under severe conditions where vibration or mechanical shock exceed the applicable ranges of the specification.
- 2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging.

PACKING

Case Size	Dimension (D x L)	Quantity (pcs/Inner Box)	Layer Quantity	Total Quantity (pcs/Carton)	Size Inner Box (mm)	Size Out Box (mm)
G20	22x20	135	8	1080	340x240x30	357x260x305
G25	22x25	135	6	810	340x240x43	357x260x290
G30	22x30	135	6	810	340x240x43	357x260x290
G35	22x35	135	5	675	340x240x50	357x260x290
G40	22x40	135	5	675	340x240x50	357x260x290
H25	25x25	104	6	624	340x240x43	357x260x290
H30	25x30	104	6	624	340x240x43	357x260x290
H35	25x35	104	5	520	340x240x50	357x260x290
H40	25x40	104	5	520	340x240x50	357x260x290
H45	25x45	104	5	520	340x240x60	357x260x290
H50	25x50	104	5	520	340x240x60	357x260x315
H60	25x60	104	4	416	340x240x70	357x260x290
I20	30x20	77	8	616	340x240x30	357x260x305
I25	30x25	77	6	462	340x240x43	357x260x290
I30	30x30	77	6	462	340x240x43	357x260x290
I35	30x35	77	5	385	340x240x50	357x260x290
I40	30x40	77	5	385	340x240x50	357x260x290
I45	30x45	77	5	385	340x240x60	357x260x290
I50	30x50	77	5	385	340x240x60	357x260x315
J25	35x25	35	6	210	340x240x43	357x260x290
J30	35x30	35	6	210	340x240x43	357x260x290
J35	35x35	35	5	175	340x240x50	357x260x290
J40	35x40	35	5	175	340x240x50	357x260x290
J45	35x45	35	5	175	340x240x55	357x260x290
J50	35x50	35	4	140	340x240x55	357x260x290
J55	35x55	35	4	140	340x240x55	357x260x290
J60	35x60	35	4	140	340x240x70	357x260x290



Technical Section

Technical Information

Aluminum Electrolytic Capacitors (Q&A)

1. Do aluminum capacitors have polarity?

Yes, Aluminum Electrolytic Capacitors are polarized, this means it has positive and negative electrodes identified by the body marking. If it is used with the polarity reversed or AC voltage, it will cause a short circuit or venting.

2. What are the operating condition safety precautions for capacitors?

Make sure that no excess voltage that is higher than the rated voltage is applied to the capacitor. The peak voltage, which is the DC voltage overlapped by ripple voltage, should not exceed the rated voltage.

A surge voltage value, which exceeds the full rated voltage, is prescribed in the catalogs, but is a restricted condition for especially short periods of time.

In cases where more than two aluminum electrolytic capacitors are used in series, please make sure that applied voltage will be lower than rated voltage and the voltage will be applied to each capacitor equally using a balancing resistor in parallel with the capacitors.

Do not apply excessive current which exceeds the allowable ripple current.

The capacitor shall not be used in an ambient temperature which exceed the operation temperature specified in the specification, the use of a capacitor outside the maximum rated category temperature will shorten the capacitor life or cause the capacitor to vent.

Select the capacitor that will meet the life requirement of the device.

The aluminum case, cathode lead wire, anode lead wire and circuit pattern must be isolated, the sleeve of capacitors is not recognized as an insulator, and therefore, the standard capacitor should not be used in a place where insulation is needed.

Do not use capacitor in circuits where heavy charge and discharge are frequently repeated, as these heavy cycles will result in decreasing capacitance and damage to the capacitor due to general heat.

Non- solid Aluminum Electrolytic Capacitor, in general have a lifetime which ends in an open circuit, the period is dependent upon temperature. Therefore, the capacitor lifetime may be extended by reducing the ambient temperature and/ or ripple current.

Do not short-circuit the terminals of a capacitor by letting it come into contact with any conductive object or any conductive liquid such as acid or alkaline solutions.

Do not use capacitors in circumstances where they can be exposed to any of the following materials:

- Oil, water, salty water or damp location.
- Direct sunlight
- Toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or its compounds, and ammonium.
- Ozone, ultraviolet rays, or radiation.
- Sever vibration or mechanical shock conditions beyond the limits described on the catalog or the product specification.

In case of venting a non-solid Aluminum Electrolytic Capacitor expels gas, it will discharge odors or smoke, or burn in the case of a short-circuit failure, if this happen immediately turn off the power supply of the device.

When venting, a non-solid Aluminum Electrolytic Capacitor blows out gas with a temperature over 100°C, a solid Aluminum Electrolytic Capacitor discharges decomposition gas or burning gas while the outer resin case is burning, never expose the face close to a venting capacitor.

If your eyes inadvertently become exposed to the spouting gas or you inhale it, immediately flush the open eye with large amounts of water and gargle with water respectively. If electrolyte is on the skin, wash the electrolyte from the skin with soap and plenty water. Do not lick the electrolyte of non-solid Aluminum Electrolytic Capacitors.

In addition, avoid the use of Conductive Polymer Aluminum Electrolytic Capacitor in the following type of circuits because leakage current may increase:

- (A) High-impedance circuits
- (B) Coupling circuits
- (C) Time constant circuits
- (D) Connection of two or more capacitors in series for higher withstand voltage

It is recommended to store the capacitors between 5°C to 35°C and a relative humidity of 75% or below.

Operating temperature must be under the category temperature range of specification.

Do not apply over voltage conditions or current that exceeds the rated ripple current as this might result in shorter life or short circuit due to internal heat increase.

Do not use aluminum electrolytic capacitor on sudden charge and discharge as an excessive current surge by sudden charge or discharge may result in a short circuit or a high leakage current and affect the capacitor reliability.

In order to retain the capacitor reliability, it is recommended the use of protection circuits in the following conditions:

- (A) If surge current value exceeds 10A it is recommended to use protected resistor in any of following condition
- (B) The rush current exceeds 10 times the rated ripple current

Note: If the rush current exceeds 10 times the rated ripple current, use a protection resistor of approximately 1kΩ resistor for charge and discharge the capacitor during leakage current measurement.

3. What are the considerations for mounting on board?

The electrolytic paper and the electrolytic conductive electrolyte in a non-solid Aluminum Electrolytic Capacitor are flammable, leaking electrolyte on a PCB can gradually erode the copper traces and possibly cause smoke or burning by short circuiting the copper traces.

Design the appropriate hole spacing to match the terminal spacing of the capacitors.

Ensure enough free space above the capacitor vent so that the vent can operate correctly, use the following recommended clearances:

Case Diameter	Clearance
6.3mm to 16mm	2mm minimum
18mm to 35mm	3mm minimum
40mm or more	5mm minimum

Do not place any copper wire or traces over the vent of the capacitor.

Do not design a circuit board so that the heat generating component are placed near an Aluminum Electrolytic Capacitor or reverse side of the PCB under the capacitor.

Do not print copper traces under the terminal side seal of a capacitor, the traces must pass 2 mm spaced apart from the side of the capacitor body.

Technical Information

Aluminum Electrolytic Capacitors (Q&A)

4. What are the cautions for assembling the capacitors?

Once a capacitor has been assembled and power applied, even if the capacitor is discharged, an electric potential may exist between the terminals.

Electric potential between positive and negative may exist as result of returned electromotive force, to discharge the capacitor use a 1KΩ resistor.

Leakage current of Aluminum Electrolytic Capacitors may be increased during long storage time. In this case, the capacitors should be subjected to rated voltage treatment a 1KΩ resistor before using.

Confirm the voltage and capacitance rating and polarity before installing capacitors to a PCB.

Do not drop capacitor on the floor or damage the capacitor.

Confirm that lead spacing of the capacitor matches the holes in the PCB prior installation.

If the capacitors are place and fixed by an automatic insertion machine, please verify that the clinch force is not too strong.

5. What are the different types of soldering methods?

Soldering with a soldering iron

Soldering conditions, temperature and time, should be within the limits in the catalog or the product specification.

The hot tip of the soldering iron should never touch the Aluminum Electrolytic Capacitor body.

If the terminal spacing of a capacitor does not fit the terminal hole spacing of the PCB, reform the terminals in a manner to minimize a mechanical stress into the body of the capacitor.

Remove the capacitors from the PCB after the solder is completely melted, reworking by using a soldering iron minimize the mechanical stress to the capacitors

Flow soldering

Do not dip the body of the capacitor into the solder bath, only dip the terminals, the soldering must be done on the reverse side of the PCB

The recommended flow soldering conditions should be under the following ranges:

Conditions	Temperature	Time
Preheating	120°C or less	120 sec. or less
Soldering Conditions	Max 260°C	10 sec. or less

Do not apply flow soldering to SMD type

Do not apply flux to any part of the capacitor other than the terminals and make sure the capacitor does not come in contact to any other components while soldering.

Reflow Soldering

See the individual datasheets.

6. How do you go about handling after soldering?

Do not apply any mechanical stress to the Aluminum Electrolytic Capacitor after soldering onto the PCB.

Do not lean or twist the body of the capacitor after soldering the capacitor onto the PCB.

Do not use the capacitor for lifting or carrying the assembly board.

Do not hit or poke the capacitor after soldering to the PCB.

When stacking the assembly boards, make sure that other components do not touch the Aluminum Electrolytic Capacitors.

Do not drop the assembly board.

7. How do you clean the PCB after mounting?

Do not wash the Aluminum Electrolytic Capacitors using any of the following cleaning agents:

- (A) Halogenated solvents: cause the capacitors to fail due to corrosion.
- (B) Alkali system solvents: corrode, dissolve, an aluminum case.
- (C) Petroleum and terpene system solvents: causes rubber seal material to deteriorate.
- (D) Xylene: causes the rubber seal material to deteriorate.
- (E) Acetone: erase marking.

Solvent- proof capacitors are only suitable for washing within the cleaning conditions described in the catalog or the product specification. Ultrasonic cleaning will accelerate damaging capacitors.

Monitor conductivity, PH, specific gravity and the water content of cleaning agents; contamination adversely affects these characteristics.

Do not keep the capacitors in an atmosphere containing the cleaning agent or in an airtight container

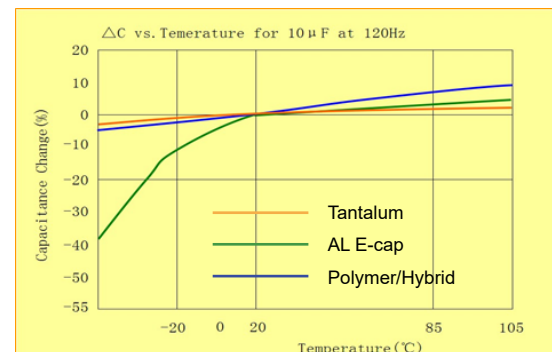
8. What is the de-rating by family?

Use up to 20% derating for high current and harsh environment applications, making sure not exceeding the rated voltage.

9. What is the difference between 125°C and 150°C rated parts?

Higher temperature parts (150°C) have high reliability components, higher anode foil VF, more stable on oxidation monomer, and higher temperature resistant characteristics of the rubber bung.

10. What is the relationship of capacitance and temperature for aluminum electrolytic, tantalum, and polymer/hybrid V-chip capacitors?



*typical data

Technical Information

Aluminum Electrolytic Capacitors (Q&A)

11. What solvents should not be used in a cleaning process?

Do not wash capacitors with these cleaning agents:

- Halogenated solvents: cause capacitors to fail due to corrosion.
- Alkali system solvents: corrode (dissolve) an aluminum case.
- Petroleum and terpene system solvents: cause the rubber seal material to deteriorate.
- Xylene: causes the rubber seal material to deteriorate.
- Acetone: erases markings.

We do not recommend using ultrasonic cleaning as it will damage capacitors.

12. What is the difference in life between radial and V-chip?

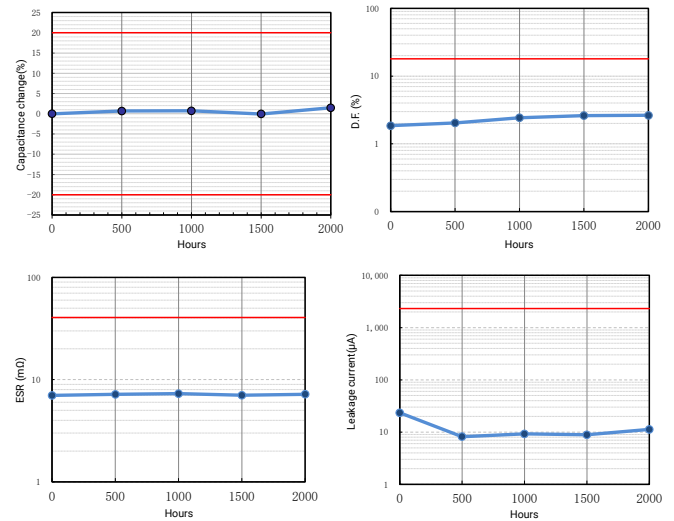
No difference

13. What is the response to high surge currents and voltage spike?

All three technologies: Electrolytic, Polymer, and Hybrid have a self-healing mechanism. The electrolytic and hybrid self heals by a electro-chemical reaction repairing the Aluminum Oxide Film Layer. The Polymer Cap self heals by peeling off the polymer layer creating insulation at the fault site.

14. What is aluminum polymer stability?

Test condition: 105°C with applied rated voltage (standard & hybrid electrolytic capacitors vary on electrolyte, hybrids offer similar capacitance and ESR stability as polymer).



*typical data

TECHNICAL PAPER

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

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Abstract

The uses of industrial control systems and robotics are expanding rapidly due to their positive impact on costs and quality. This paper will discuss Aluminum Electrolytic capacitor roles as an output filter capacitor to improve power quality in Brushless DC Motor (BLDC) motor controller & drives. Aluminum Electrolytic capacitors can be used to provide exacting drive voltage to motors. This in turn improves system reliability and performance. The case studied will be a 3-phase, 24V / 30 watt BLDC motor with a rated speed of 4000rpm and rated torque of 0.072 N-m.

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

INTRODUCTION

Both motors & actuators convert control signals into physical motion. Motors and actuators are of no use without being able to instruct their movement. Control of motors & actuators is commonly accomplished by low level ICs. Those ICs could be a simple Micro-controller, Microprocessor or FPGA – but regardless of the specific device, these ICs do not have sufficient output voltage to directly drive a motor. Thus the need for an interface between the control silicon and the motor load motor. Enter the motor controller.

A motor controller is a device that allows low level logic silicon control a motor. It essentially acts as an intermediate device between the silicon and the motors power source and the motor. Some motor controllers have enough processing power on board that they can control a motor directly. Hand adjusted variable speed motor drivers are a possible example of a motor controller having ample processing power on board. More complex feedback and control scenarios may require added processing power and potentially a data bus from control logic to a motor driver.

Motor controllers vary greatly depending upon the motor type, power level/size, level of control needed and a variety of other factors. Regardless of their exact configuration, motor controllers are an essential part of industrial controllers and robotics. The purpose of this investigation is to show the impact of properly sized Aluminum Electrolytic capacitors on the voltage drive lines to a common 3-phase motor used in robotics or industrial automation.

Motor types vary greatly and this study was based upon Brushless DC Motors (BLDC).

These motors are available in single-phase, two-phase and three-phase configurations. The 3-phase type is most commonly used and therefore the specific type investigated in this study.

BLDCs are used across a wide range of industries such as transportation, aerospace, appliances, consumer, instrumentation and industrial automation. Many times the voltage rating of the BLDC hints to its end use. BLDCs that are less than or equal to 48V are commonly used in automotive, robotics, small arm assists etc. In comparison, BLDCs that are >100V are commonly used in appliances and industrial automation.

At first glance, the most noted feature of BLDCs over other motor types is that BLDCs exhibit a higher ratio of torque relative to the motor size. This reduces the size of motor needed in many applications and makes BLDCs exceptionally useful in applications where volume and weight are at a premium.

However, BLDCs offer another major advantage – electrical efficiency. A BLDC can reduce energy consumption by 20 to 30 percent vs. traditional brushed motors given similar run & load conditions [1]. This is very significant and translates into an increase of 20 to 30 percent in run time assuming similar sized batteries. Alternatively – the battery for an end use BLDC can be 20 to 30% smaller thus making smaller, lighter products. The feature is particularly important in drones, hand held tools and robotics.

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

INTRODUCTION

Additional features guiding designers to BLDC and a comparison to brushed DC motors are shown in Figure 1 [1]:

FEATURE	BLDC MOTOR	BRUSHED DC MOTOR
Commutation	Electronic Commutation based upon Hall position sensors	Brushed commutation
Maintenance	Less required due to absence of brushes	Periodic maintenance is required
Life	Longer	Shorter
Speed / Torque Characteristics	Flat – Enables operation at all speeds with rated load	Moderately flat – At higher speeds, brush friction increases, thus reducing useful torque
Efficiency	High – No voltage drop across brushes	Moderate
Output Power / Frame Size	High – Reduced size due to superior thermal characteristics. Because BLDC has the windings on the stator, which is connected to the case, the heat dissipation is better	Moderate/Low – The heat produced by the armature is dissipated in the air gap, thus increasing the temperature in the air gap and limiting specs on the output power/ frame size
Rotor Inertia	Low, because it has permanent magnets on the rotor. This improves the dynamic response	Higher rotor inertia which limits the dynamic characteristics
Speed Range	Higher – No mechanical limitation imposed by brushes/commutator	Lower – Mechanical limitations by the brushes
Electric Noise Generation	Low	Arcs in the brushes will generate noise causing EMI in the equipment nearby
Cost of Building	Higher – Since it has permanent magnets, building costs are higher	Low
Control	Complex and expensive	Simple and inexpensive
Control Requirements	A controller is always required to keep the motor running. The same controller can be used for variable speed control	No controller is required for fixed speed. A controller is required only if variable speed is desired

Figure 1: BLDC Compared to Brushed DC Motor

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

INTRODUCTION

BLDC motors do not use brushes for commutation but instead utilize electronics to create a commutation function. Basically, the motor controller will create an electronically generated varying magnetic field by changing voltages and currents injected to the various phases of the motor.

Therefore a potential disadvantage of BLDCs is the added cost and complexity of motor controllers. However, costs of motor controllers are dropping based upon either:

1. Traditional & expected semiconductor cost reduction through efficiency optimization & volume growth
2. The integration of adequate power MCUs with potentially internal metal-oxide semiconductor field-effect transistors (MOSFETs). More powerful semiconductors can essentially act as a cost reduced System on Chip.

Numerous suppliers have created a wide array of motor controllers that are low cost & easy to implement. Modern motor controllers perform multiple functions of [2]:

- Regulates motor speed, torque, or power output
- Controls startup or soft starts
- Protects against circuit faults
- Smooths motor acceleration and deceleration
- Protects against overloads

To summarize, advances in semiconductor technology have delivered easy to use, powerful, cost effective motor controllers.

TEST PLATFORM

A major consideration for our testing a motor controller was to find one that's affordable, has high levels of reliability and supports a wide range of applications. An Allegro A4915 was chosen based upon our selection criteria.

The A4915 is a cost effective 3 phase BLDC motor driver that eliminates the need for a control microprocessor. The device's voltage rating and drive capability supports a wide range of motor loads with 5V minimum voltage & also offers an integrated sleep function. These features make it ideal for battery operated applications. The A4915 is suited for a variety of loads with gate drive voltages rated to 50 volts and supports to load currents up to 150 amps.

The A4915 has internal synchronous rectification control circuitry. It is provided to improve power dissipation in the external MOSFETs during PWM operation. Internal circuit protection includes latched thermal shutdown, dead time protection, and undervoltage lockout. Special power up sequencing is not required. The A4915 is supplied in a 28-pin TSSOP with an exposed thermal pad (suffix LP) and a 28-contact 5 × 5 mm QFN with an exposed thermal pad. [3]

The A4915 can be pulse width modulated (PWM) to control current. There are two methods by which PWM can be applied to the device:

- External PWM.
- Internal PWM – Speed controlled by applying a DC voltage to SPEED pin.

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

TEST PLATFORM

Our testing utilized the internal PWM method. The motor chosen was an Applied Motion Products 3 phase BLDC with 24V DC voltage rating and rated Torque of 0.072 N-M.

The motors small size, light weight (0.32 kg) and speed 4000 RPM rated with 5000 RPM maximum makes it an ideal candidate for a variety of portable applications.

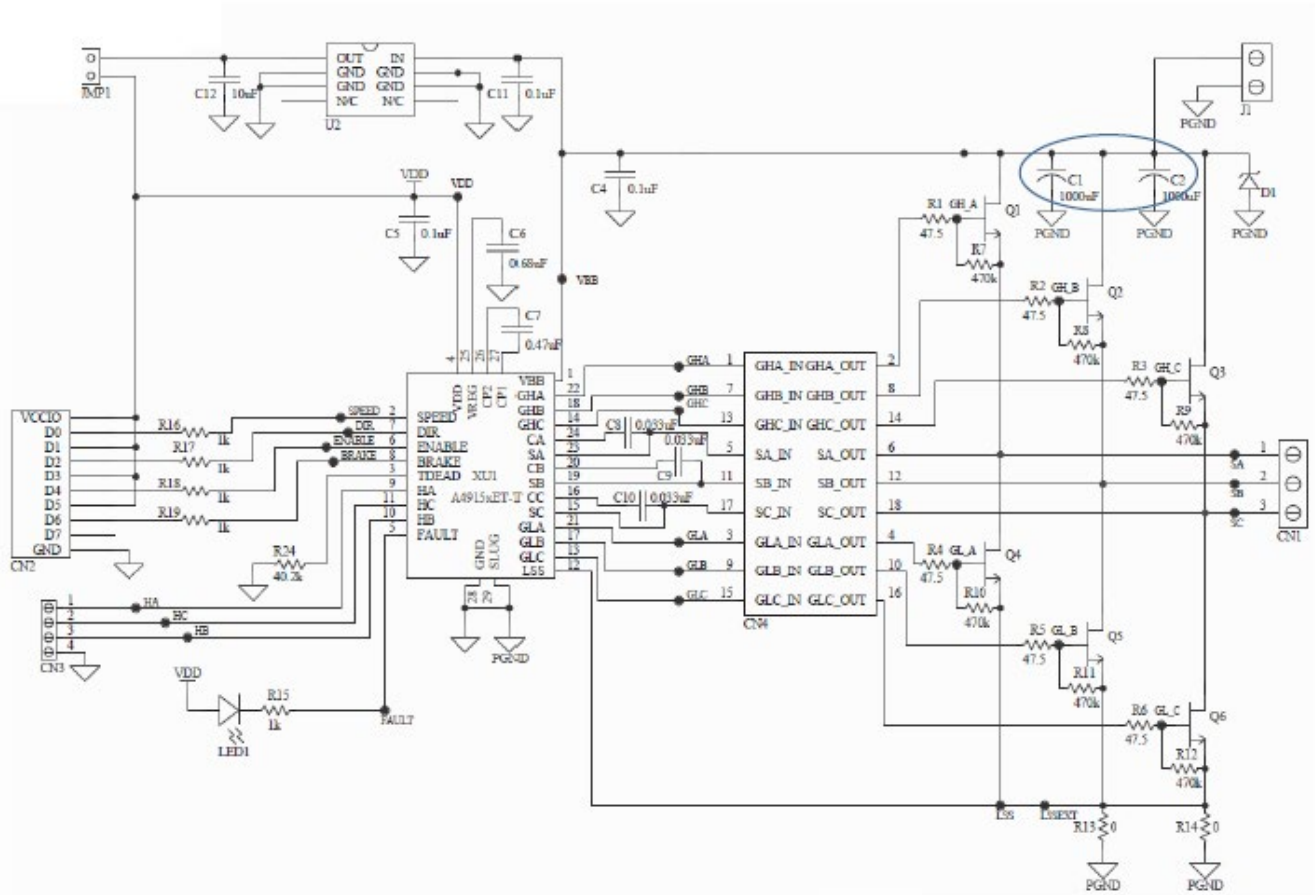


Figure 2: Allegro A4915 Evaluation Board Schematic [3]

TEST RESULTS AND DISCUSSIONS

Aluminum electrolytic capacitors are intended for applications where large capacitance values are required in relatively small, light packages. Tantalum capacitors technically offer a higher capacitance density but aluminum electrolytics meet the cost targets for general bulk capacitors required by all but the most miniature/micro sized BLDC motor drives.

Tests were conducted to illustrate the impact of the Aluminum electrolytic output capacitors effect under identical motor load conditions. In this test PWM output waveforms were captured at similar output driving ports.

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

TEST RESULTS AND DISCUSSIONS

Three output capacitor scenarios were evaluated for capacitors C1 and C2. The location of C1 and C2 can be found in the circled region of Figure 2. This schematic is an excerpt from documentation on the Allegro 4915 evaluation board [3]. *The test cases were:*

Case 1 – No capacitors populated at C1 and C2

Case 2 – C1 and C2 both 1000 μ F 50V Radial Electrolytic Capacitors

Case 3 – C1 and C2 both 1500 μ F 80V Radial Electrolytic Capacitors

Similar motor loading, RPM and run time was used in comparing the drive waveform integrity. As expected, the elimination of capacitors C1 and C2 effect the output waveform with the introduction of measurable ringing (approximately 8 volts). Such ringing could reduce the drive control response and integrity of the motor.

The introduction of two 1000 μ F capacitors placed at C1 and C2 reduced the ringing greatly to approximately 4 volts.

Finally, the replacement of C1 and C2 by 1500 μ F Aluminum Electrolytic resulted in a ringing of ~ 0.5 volts.

A summary of these test results are shown in Figure 3 - Output waveform quality vs bulk capacitor value.

Output capacitors value play a crucial role in the integrity of motor controllers. Specific capacitance values which are optimal for designs vary greatly since motor controllers come in various configurations and power levels intended to address the wide range of BLDCs and end applications.

Regardless of the exact value & capacitor configuration, aluminum electrolytic capacitors are ideal in these types of wide voltage range, low frequency pulsed applications. The capacitor should be sized such that surges do not exceed the rated DC voltage of the capacitor. As a general rule of thumb – aluminum electrolytic applications should be tolerant to excess capacitance values over the nominal value and in the case of polarized aluminum electrolytic capacitors – no reverse voltage should be applied.

The vast majority of motor controllers utilize Aluminum Electrolytic technology for output capacitors because of the above characteristics.

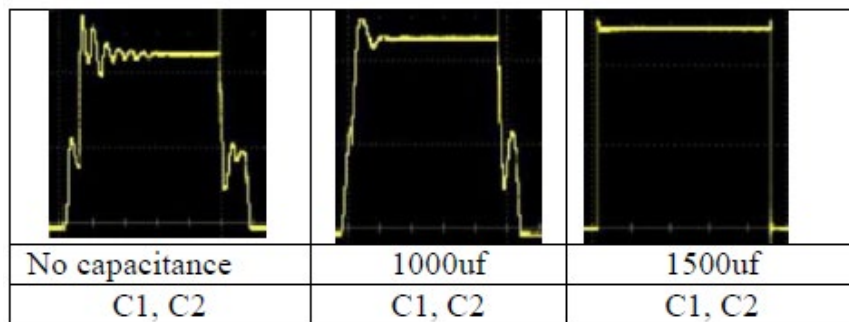


Figure 3: Output waveform quality vs. bulk capacitor value

Aluminum Electrolytic Capacitor Use in Three-Phase BLDC Motor Controllers

SUMMARY AND CONCLUSIONS

Brushless DC motors are experiencing widespread growth in across virtually all applications sectors. BLDCs are attractive to end users due to size efficiency and weight advantages over traditional brushed DC motors. Though motor controllers are needed for BLDC control – design costs and complexity can be kept to a minimum through a wide range of controllers available for virtually every type of BLDC and power level application. Further controller cost effectiveness is expected from accelerating advances in semiconductors used within BLDC controllers.

Output capacitors value play a crucial role in the integrity of motor controllers. Specific capacitance values which are optimal for designs vary greatly since motor controllers come in various configurations and power levels intended to address the wide range of BLDCs and end applications. Aluminum electrolytic capacitors are ideal for use in motor controllers due to their small size, light weight and attractive capacitance value range.

REFERENCES

- [1] MicroChip; AN885 - Brushless DC (BLDC) Motor Fundamentals, Padmaraja Yedamale, 2003; <https://ww1.microchip.com/downloads/en/appnotes/00885a.pdf>
- [2] David Schnauffer et al; Qorvo - Motor Control Fundamentals, ISBN 978-1-119-68172-4, John Wiley & Sons 2020
- [3] Allegro Microsystems; A4915 3-Phase MOSFET Driver data sheet; <https://www.allegromicro.com/en/products/motor-drivers/bldc-drivers/a4915>

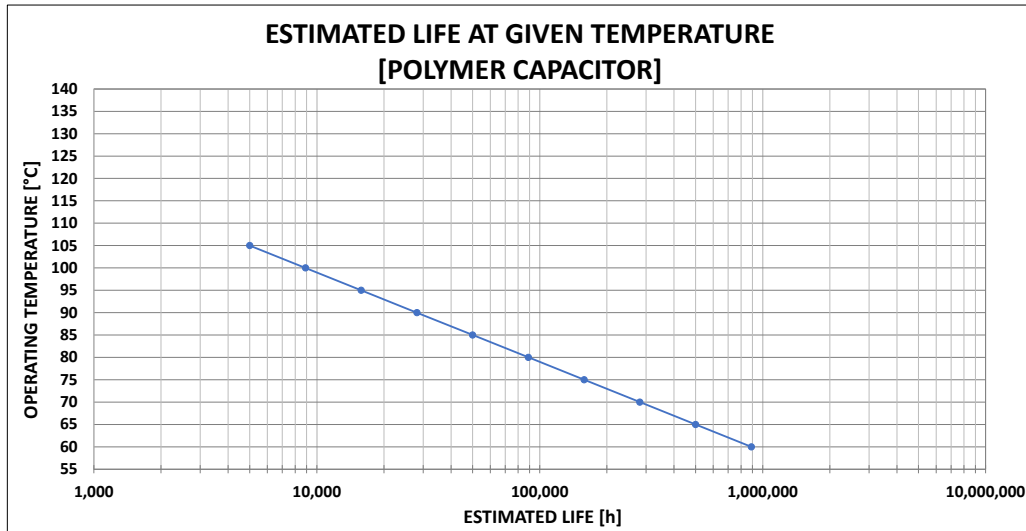


Lifetime Calculation

ALUMINUM POLYMER CAPACITOR ESTIMATED LIFE CALCULATOR

$$L_x = L_o \times 10^{(T_o - T)/20}$$

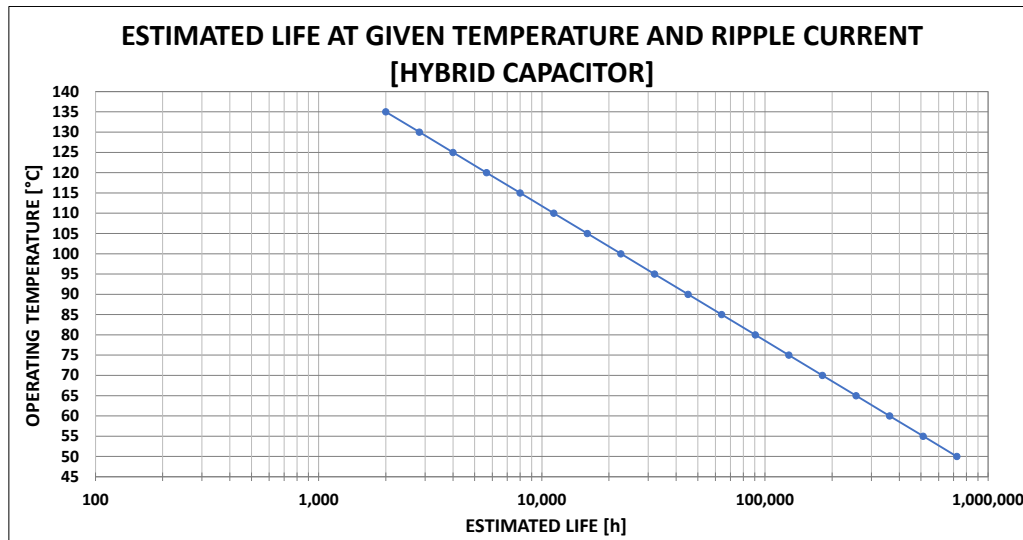
L: Expected life time (hrs) at given temperature
T: Temperatura del cuerpo del capacitor
To: Rated max. operating temperature (°C):
Lo: Estimated Life time at max. Temp (h):



ALUMINUM HYBRID CAPACITOR ESTIMATED LIFE CALCULATOR

$$L = L_0 \times 2^{(T_0 - T_x)/10} \times 2^{[1 - (I_x/I_0)^2] * \Delta T_0 / 10}$$

L: Expected life time (hrs) at given temperature and ripple current
T _x : Actual operating temperature (°C)
T ₀ : Rated maximum operating temperature (°C)
L ₀ : Estimated life time at maximum temperature (h)
I ₀ : Rated Ripple Current (mAr.m.s.)
I _x : Actual Ripple Current (mAr.m.s.)
ΔT ₀ : Rise of temperature when actual ripple current is applied (°C)***



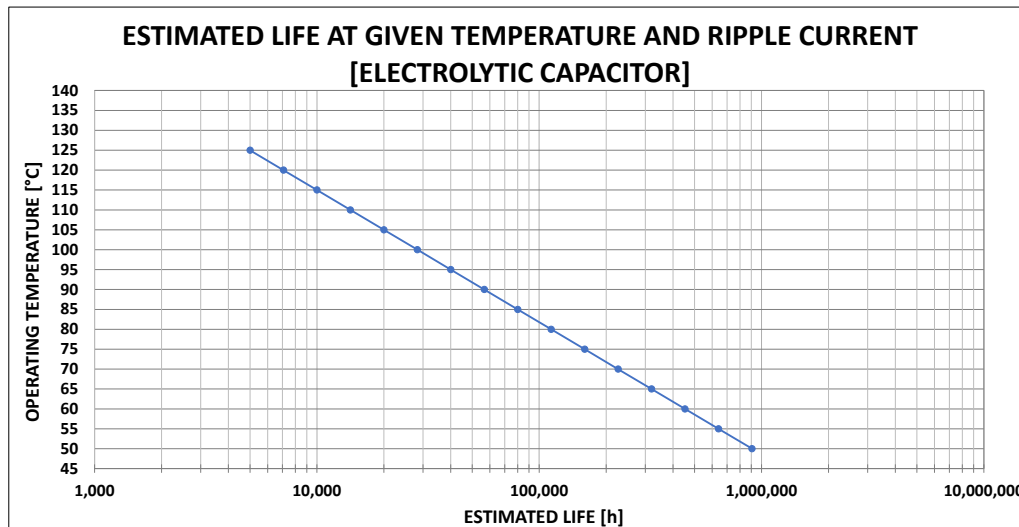
ALUMINUM ELECTROLYTIC CAPACITOR ESTIMATED LIFE CALCULATOR

$$L_x = L_0 \times 2^{(T_0 - T_x)/10} \times 2^{(\Delta T_0 - \Delta T_x)/5}$$

L_0 : Rated life time at max. Temperature (spec) [h]
T_0 : Rated max. operating temperature (spec) [°C]
I_0 : Rated Ripple Current (mAr.m.s.)
I_x : Actual Ripple Current (mAr.m.s.)
ΔT_0 : Rise of temperature due to rated ripple current [°C] related to rated operating temperature (see table 1)***
ΔT_x : $(\Delta T_0)(I_x/I_0)^2$: Actual rise in the core temperature of the capacitor due to ripple current***

*** Automatic calculation

Rated Operating Temperature [°C]	ΔT_0
85	10
105	5
125	5
130	5

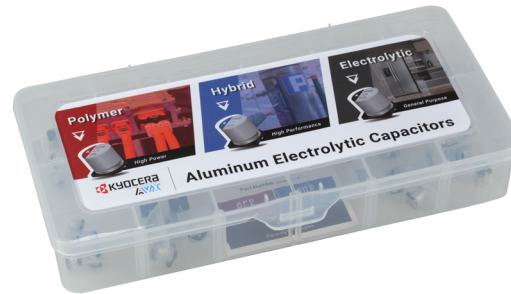


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Number of PN's: 12
Number of pieces per PN: 5-10

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- POLY ALU V-CHIP** (KITALPOLYVCHIP)
- HYBRID ALU V-CHIP** (KITALHYBVCHIP)
- MIX ALU V-CHIP** (KITALMIXVCHIP)
- MIX ALU RADIAL** (KITALMIXLEAD)





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A light gray world map is centered in the background of the lower half of the page. It shows the outlines of continents and major landmasses.

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