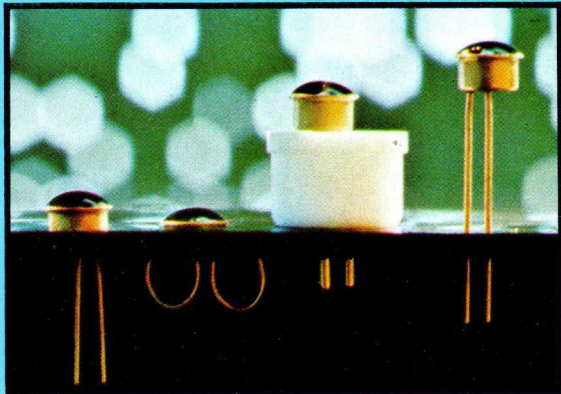


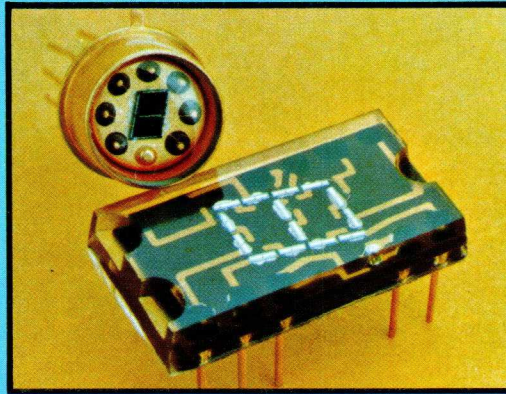
# Optoelectronics

## from Texas Instruments

Alphanumeric Displays



Avalanche Photodetectors



Beam-lead Phototransistor Arrays

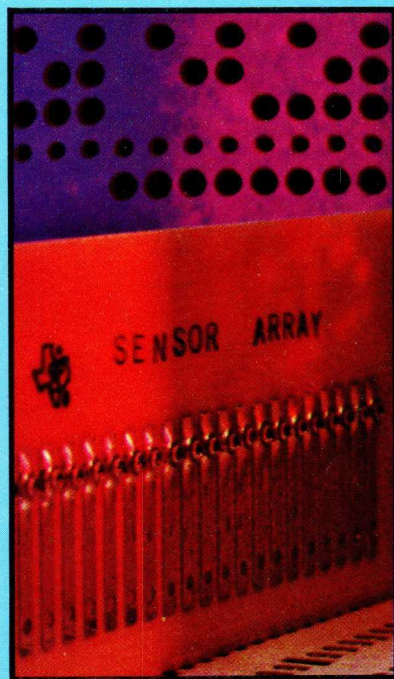


GaAs Laser Diodes

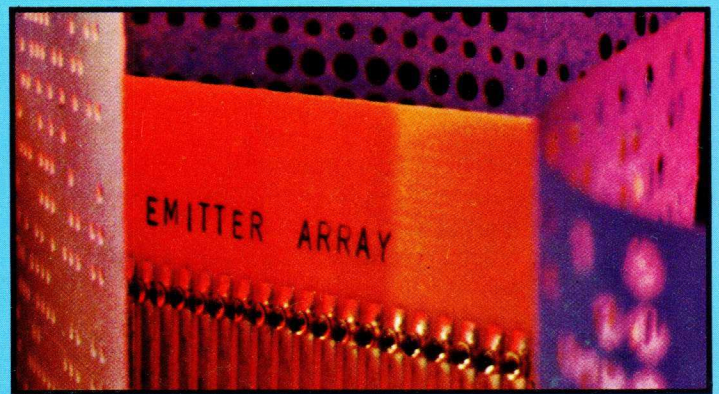
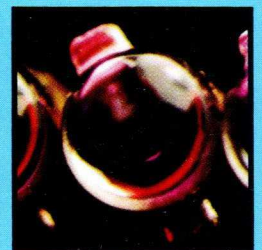
GaAs Light Sources

Infrared Detectors

Optically Coupled Isolators



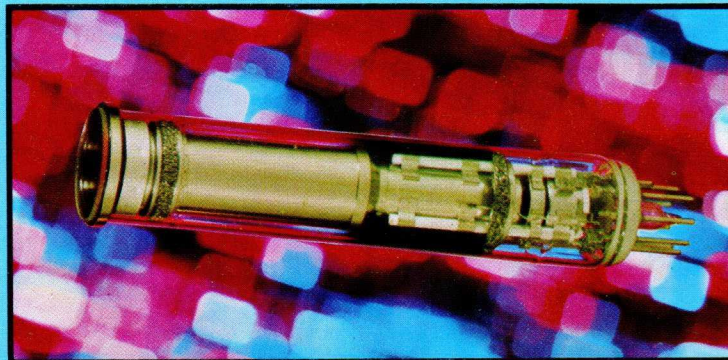
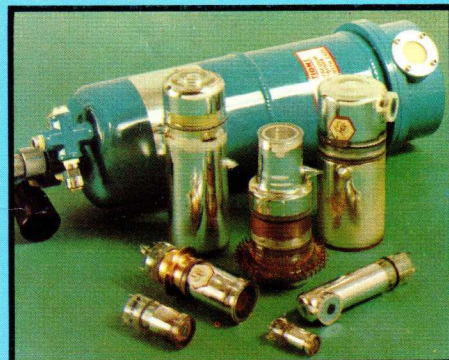
TIOPTO



Optically Coupled Pulse Amplifiers

Optoelectronic Materials

Silicon Photoamperic Detectors



Silicon Sensors

TIVICON™ Image Tubes

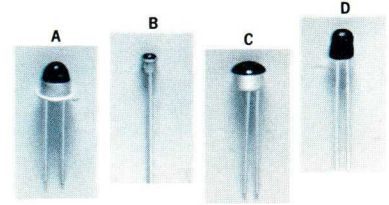
Visible Light Emitting Diodes



## Improve cost/performance ratios with optoelectronics from TI—your broadest choice of standard and state-of-the-art components

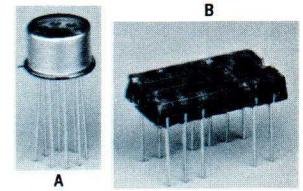
There's more for you in TI's growing optoelectronics line... more savings, more performance. TI has brought optoelectronics prices into line by standardizing to meet the specifications most designers need. And we've been designing-in system reliability and greater speed for more than a decade. TI devices are 20 times more reliable and 1000 times faster than the costly electro-mechanics they replace. Circuits get simpler, too, thanks to low voltage and current demands. Your choice is the industry's broadest. From high-density ready-made arrays to standard singles. Emitters. Sensors. Alpha-numeric displays. Isolators. Custom designs. Nearly everything "opto." So if you're planning to design something that's clever, efficient, reliable and profitable—take a good look at TI optoelectronics. Then call a TI sales engineer for more data. Or check with your TI distributor.

### Sources



#### Discrete Visible Emitters

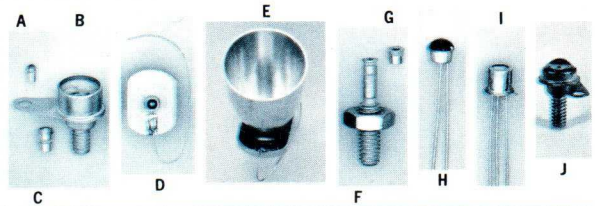
Type	Pkg	Luminance f-L Min	Typ	@ I <sub>F</sub> mA	V <sub>I</sub> Max	@ I <sub>F</sub> mA	Features
TIL203	A	375	750	20	2.0V	20	TO-18-clear lens
TIL204	A	375	750	20	2.0V	20	TO-18-red lens
TIL205	B	375	750	20	2.0V	20	Coaxial package-clear lens
TIL206	B	375	750	20	2.0V	20	Coaxial package-red lens
TIL207	C	375	750	20	2.0V	20	TIL63 header-clear lens
TIL208	C	375	750	20	2.0V	20	TIL63 header-red lens
TIL209	D	250	500	20	2.0V	20	All plastic-red



#### Visible Displays

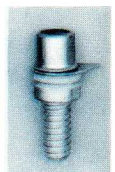
Type	Pkg	Typ Luminance Per Segment	@ I <sub>F</sub> mA	Typ V <sub>I</sub> /Segment	@ I <sub>F</sub> mA	Features
TIL301	A	250 f-L	5	1.7V	15	• Monolithic 7 segment numeric in 8 lead TO-5 can.
TIL302*	B	550 f-L	20	3.4V	20	• 7 segment numeric with decimal point, 14-lead dual-in-line package, character height: 0.25 in.

\* Decimal on right side available on request.



#### Infrared Emitters

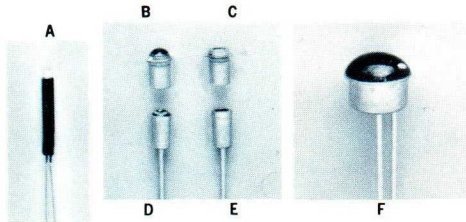
Type	Pkg	Pout Min	@ I <sub>F</sub> mA	½ Power Angle	V <sub>I</sub> Max	@ I <sub>F</sub> mA	λ Peak	Features
TIL23	A	0.40 mW	50	35°	1.5 V	50	0.93μ	• Pill package for double-sided printed circuit board mounting
TIL24	A	1.00 mW	50	35°	1.5 V	50	0.93μ	
TIXL06	B	0.6 mW	500	130°	2.3 V	500	0.91μ	0.0075 ins flat emitter
TIXL12	B	40.0 mW	300	130°	2.0 V	300	0.93μ	0.036 ins dome emitter
TIXL13	B	20.0 mW	300	130°	2.0 V	300	0.93μ	0.036 ins dome emitter
TIXL14	B	60.0 mW	1000	130°	2.0 V	1000	0.93μ	0.072 ins dome emitter
TIXL15	B	30.0 mW	1000	130°	2.0 V	1000	0.93μ	0.072 ins dome emitter
TIXL17	C	10.0 mW	200	20°	2.0 V	200	0.85μ	• Matched for use with photoemissive sensors such as S-1, S-20, S-25
TIXL18	C	5.0 mW	200	20°	2.0 V	200	0.82μ	
TIXL16	D	200.0 mW	2000	150°	2.0 V	2000	0.93μ	0.072 ins dome emitter
SL1183	E	200.0 mW	2000	20°	2.0 V	2000	0.93μ	175 mW into 20° cone
SL1191	D	350.0 mW	3000	150°	2.0 V	3000	0.93μ	Available with 20° reflector
TIXL19	F	10.0 mW	200	—	2.0 V	200	0.85μ	• Matched for use with photoemissive sensors
TIXL20	F	5.0 mW	200	—	2.0 V	200	0.82μ	
TIXL21	G	10.0 mW	200	—	2.0 V	200	0.85μ	• Matched for use with photoemissive sensors
TIXL22	G	5.0 mW	200	—	2.0 V	200	0.82μ	
TIXL26	H	0.50 mW	35	—	1.4 V	35	0.93μ	Industrial emitter
SL1143	I	0.25 mW	50	60°	1.4 V	50	0.93μ	TO-18 window can
TIXL27	J	15.0 mW	300	135°	2.2 V	300	0.94μ	Stud Header



#### Laser Diodes

Type	I <sub>T</sub> Typ	Pow+typ λ peak	Max Pulse Width	Max D.C.	Features
TIXL28	12 A	7W@3 I <sub>F</sub> 0.9μ	800 n sec	0.1%	Close Confinement—25°C
TIXL29	15 A	6W@2.5 I <sub>F</sub> 0.9μ	300 n sec	0.1%	Diffused Room Temp
TIXL30	2 A	7W@23 A 0.86μ	2.5 μ sec	3.5%	Diffused—80°C

# Sensors



## Phototransistors

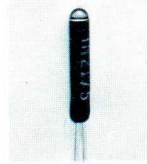
Type	Pkg	Min	Light Current Max @ V	Dark Current Max @ V	Power Diss	Features		
LS400*	A	1.0 mA	—	5	25 nA	30	50 mW	• Hermetic glass package
TIL58	A	1.0 mA	—	5	25 nA	30	50 mW	• Flat lens LS400.
LS600*	B	0.8 mA	—	5	25 nA	30	50 mW	• Pill package
TIL601	B	0.5 mA	3.0 mA	5	25 nA	30	50 mW	• Round lens
TIL602	B	2.0 mA	5.0 mA	5	25 nA	30	50 mW	• For mounting on double-sided printed circuit board
TIL603	B	4.0 mA	8.0 mA	5	25 nA	30	50 mW	
TIL604	B	7.0 mA	—	5	25 nA	30	50 mW	
TIL605	C	0.5 mA	3.0 mA	5	25 nA	30	50 mW	• Same as LS600 except with flat lens for wider field of view
TIL606	C	2.0 mA	5.0 mA	5	25 nA	30	50 mW	
TIL607	C	4.0 mA	8.0 mA	5	25 nA	30	50 mW	
TIL608	C	7.0 mA	—	5	25 nA	30	50 mW	
TIL609	D	0.5 mA	3.0 mA	5	25 nA	30	50 mW	• Coaxial package
TIL610	D	2.0 mA	5.0 mA	5	25 nA	30	50 mW	• Round lens
TIL611	D	4.0 mA	8.0 mA	5	25 nA	30	50 mW	• For mounting on single-sided printed circuit board
TIL612	D	7.0 mA	—	5	25 nA	30	50 mW	
TIL613	E	0.5 mA	3.0 mA	5	25 nA	30	50 mW	• Same as TIL609 except with flat lens for wider field of view
TIL614	E	2.0 mA	5.0 mA	5	25 nA	30	50 mW	
TIL615	E	4.0 mA	8.0 mA	5	25 nA	30	50 mW	
TIL616	E	7.0 mA	—	5	25 nA	30	50 mW	

### Industrial Types

TIL63	F	0.4 mA	—	5	25 nA	30	50 mW	• Low cost TO-18 header with epoxy lens.
TIL64	F	0.4 mA	1.6 mA	5	25 nA	30	50 mW	• Operating temperature range -40°C to +80°C.
TIL65	F	1.0 mA	4.0 mA	5	25 nA	30	50 mW	
TIL66	F	2.5 mA	10.0 mA	5	25 nA	30	50 mW	
TIL67	F	6.0 mA	—	5	25 nA	30	50 mW	

\*Special devices available upon request.

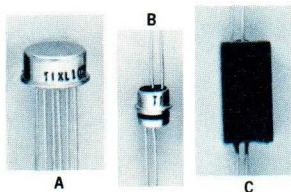
## Photo Diodes



Type	Min	Light Current Max	@ ± V	Dark Current Max	@ ± V	Power Diss	Features
1N2175	100 μA	—	±10	0.5 μA	±50	250 mW	• Hermetically sealed glass package.
H11	40 μA	—	±10	0.5 μA	±50	250 mW	• Can be used with ac bias.
H35	60 μA	—	±10	0.5 μA	±50	250 mW	
H38	100 μA	—	±10	10.0 μA	±50	250 mW	
H60	100 μA	200 μA	±10	0.5 μA	±50	250 mW	
H61	200 μA	300 μA	±10	0.5 μA	±50	250 mW	
H62	300 μA	400 μA	±10	0.5 μA	±50	250 mW	

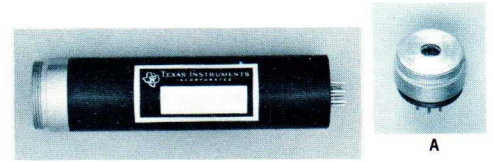
# Coupled Devices

## Optically Coupled Isolators



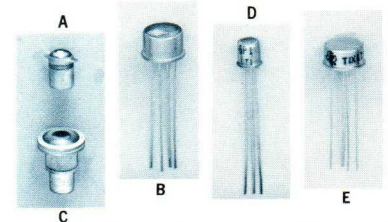
Type	Pkg	Input-to-Output Isolation	I <sub>c</sub> (ON) mA Min	I <sub>c</sub> (OFF) nA Max	V <sub>f</sub> V Max	V <sub>CE</sub> (sat) V Max	I <sub>f</sub> mA	Isolation Voltage	Features
TIL102	A	>10 <sup>12</sup> KΩ	2.5	100	1.3	0.3	10	±1kV	For the solid state replacement of reed relays and pulse transformers.
TIL103	A	>10 <sup>12</sup> KΩ	10.0	100	1.3	0.3	10	±1kV	
TIL107	B	>10 <sup>12</sup> KΩ	1.6	25	1.5	0.3	35	±1kV	
TIL108	B	>10 <sup>12</sup> KΩ	5.0	25	1.5	0.3	35	±1kV	
TIXL109	C	>10 <sup>12</sup> KΩ	.25	500	1.9	0.3	35	±5kV	

## Photodetector Modules\*



Type	Responsivity into 50Ω	N.E.P. 40 MHz; 1 Hz B.W.	Bandwidth	Features
TIXL74	2 x 10 <sup>13</sup> /W	5 x 10 <sup>-13</sup> W/√Hz @ 0.9 μ (max)	40 MHz min	Si Detector for 0.9 μ
TIXL75	2.8 x 10 <sup>14</sup> /W	1.5 x 10 <sup>-12</sup> W/√Hz @ 1.06 μ (max)	40 MHz	Ge Detector for 1.06 μ
TIXL76	6 x 10 <sup>13</sup> /W	6 x 10 <sup>-12</sup> W/√Hz @ 1.54 μ (max)	40 MHz	Ge Detector for 1.54 μ

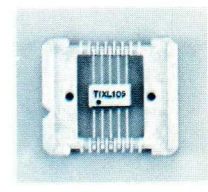
\*Consist of APD, preamplifier, temperature compensated bias circuit. 3e contains internal cooler. Detector heads (A) available separately.



## Signal Photodetectors

Type	Pkg	BV <sub>R</sub> @ 100μA	I <sub>L</sub> @ 30V	C <sub>J</sub> @ 10V	Features		
LSX900	A	125V min	6μA min	2.9pf typ	• GHz demodulator in pill pack.		
		BV <sub>R</sub> @ 100μA	I <sub>L</sub> @ 5V	I <sub>D</sub> @ 30V	C <sub>T</sub> @ 30V	D*	
TIXL51	B	75V min	90μA	70 nA	110pf	8 x 10 <sup>11</sup>	• Active area dia 0.100 ins TO-5 can
TIXL52	B	80V min	25μA	50 nA	40pf	1.3 x 10 <sup>11</sup>	• Active area dia 0.050 ins TO-5 can
TIXL53	B	100V min	10μA	30 nA	24pf	2.2 x 10 <sup>10</sup>	• Active area dia 0.030 ins TO-5 can
		BV <sub>R</sub> @ 100μA	Responsivity	Capacitance	Risetime		
HS1037	B	200V typ	0.45 A/W @ 0.9μ	7pf typ	80 n sec		• Active area dia 0.100 ins TO-5 can
		BV <sub>R</sub> @ 10μA	Avalanche Gain	typ C <sub>T</sub>	Typ η		
TIXL55	C	140V min 200V max	100 min 200 typ	1.2pf	20% @ 0.63μ		• Si APD, Active area 0.01 in diam., microwave package
TIXL56	D	140V min 200V max	100 min 200 typ	1.2pf	20% @ 0.63μ		• Si APD, Active area 0.01 in diam., TO-18 window can
TIXL57	D	30V min 60V max	20 min 50 typ	4.5pf	60% @ 1.06μ		• Ge APD, Active area 0.01 in diam., TO-18 window can
TIXL59	B	140V min 200V max	50 min 100 typ	12.0pf	30% @ 0.9μ		• Si APD, Active area 0.030 in diam., TO-5 window can
TIXL68	D	85V min 150V max	15 min 40 typ	3pf	25% @ 1.54μ		• Ge APD, Active area 0.01 in diam., TO-18 window can
TIXL69	B	140V min 200V max	50 min 100 typ	30pf	40% @ 0.9μ		• Si APD, Active area 0.06 in diam., TO-5 window can
		Equivalent Input Noise Current Typ	Input Impedance	Output Impedance	Fwd. Trans. Z Typ	Bandwidth	
TIXL151	E	Typ 4.5 pA/√Hz	100Ω typ	2Ω typ	4kΩ	50 MHz	• Amplifier designed for use with Photodiodes
TIXL152	E	Typ 3.0 pA/√Hz	300Ω typ	4Ω typ	12kΩ	18 MHz	

## Optically Coupled Pulse Amplifiers



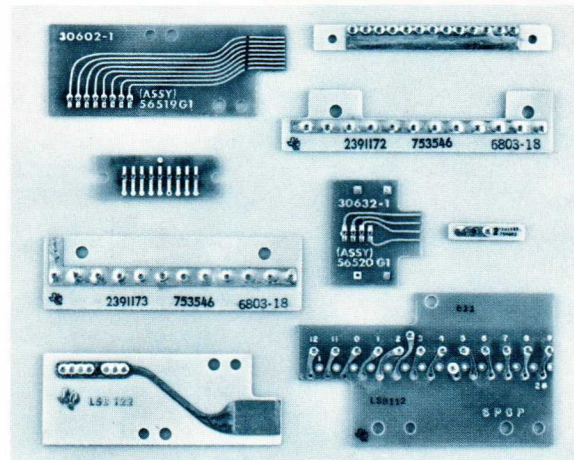
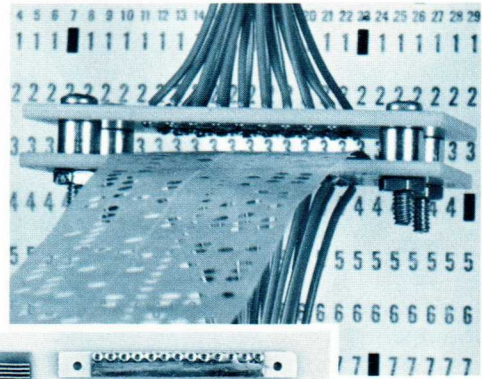
Type	Output Y	Output $\bar{Y}$	V <sub>f</sub> @ 10 mA Typ	Max Diss mW	tp Typ	Features		
	<sup>*</sup> V <sub>out(1)</sub> Min V	<sup>**</sup> V <sub>out(0)</sub> Max V	<sup>†</sup> V <sub>out(1)</sub> Min V	<sup>††</sup> V <sub>out(0)</sub> Max V				
TIXL104	5.0	0.5	2.5	0.5	1.2	75	700 ns	
TIXL105	5.0	0.5	2.5	0.5	1.2	75	700 ns	ac/dc interfacing, noise immune live receiver
TIXL106	5.0	0.5	2.5	0.5	1.2	75	700 ns	

\*I<sub>in</sub>=1.0 mA, N<sub>DC</sub>=7  
 \*\*I<sub>in</sub>=0.5 mA, N<sub>DC</sub>=7  
 †I<sub>in</sub>=0.5 mA, N<sub>DC</sub>=4  
 ††I<sub>in</sub>=10 mA, N<sub>DC</sub>=4

# Custom Sensor and Emitter Arrays

TI sensors and emitters are available mounted in printed circuit boards to your specifications for custom array or matrix applications. These complete units can be designed for tape readers, position indicators, pattern and character recognition, shaft encoders, and many other special applications.

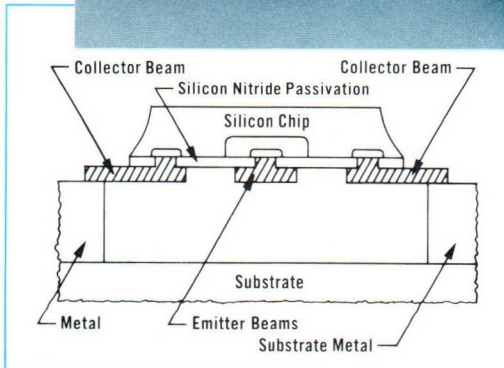
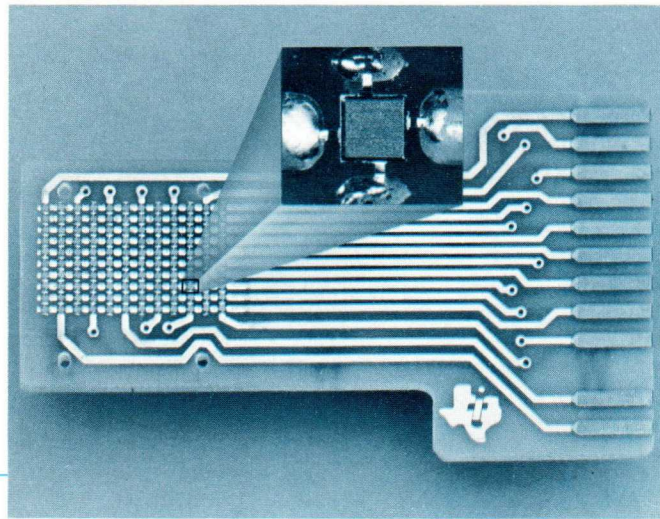
- TI can supply sensor arrays only – or emitter arrays only – or complete sensor/emitter array combinations.
- Components can be supplied matched for improved performance when required.
- Arrays are tested and ready for installation.
- Almost any configuration can be manufactured, providing maximum design flexibility.
- Components are firmly soldered for extra rugged units.



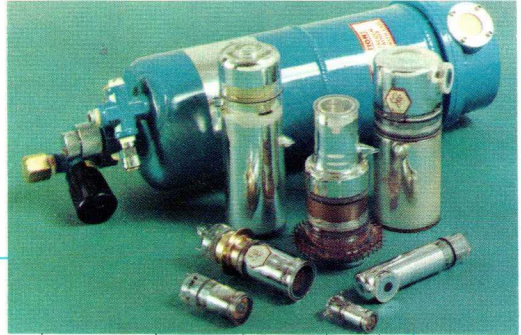
# Custom Beam-Lead Sensor Arrays

Beam-lead phototransistor arrays offer maximum design freedom and reliability for applications in which devices must be accurately spaced on centers too close for discrete packages and too far apart for an economical monolithic approach. "Beam leads" are cantilevered electrodes made as integral extensions of individual semiconductor chips (see cross section). Applications include static card readers, pattern-character recognition, credit card verifiers, holographic read only memories, garment tag readers, and computer input terminals.

- Available in X-Y and linear matrices mounted on ceramic substrate or printed circuit cards.
- Nitride passivated silicon chips provide increased reliability.
- Light current levels allow interface with standard logic families.



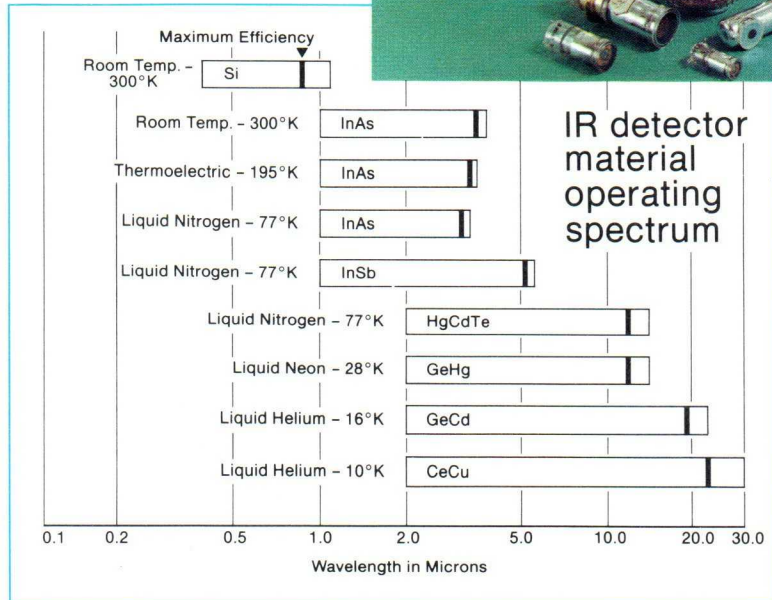
# Advanced Technology



## IR Detectors

TI produces solid-state infrared detectors for the electromagnetic spectrum from 1 to 30 microns. Monolithic arrays utilizing mercury cadmium telluride, indium antimonide and doped germanium are available as well as single element detectors and Dewars in a wide variety of configurations. TI offers a high-level capability in cold background detectors and amplifiers.

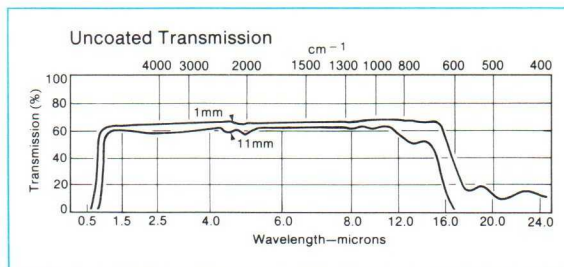
- High-density arrays.
- Background limited performance.
- Custom capability.
- Ruggedized construction.
- Low heat-load Dewars.



## IR Transmitting Glass (1173)

Type 1173 IR transmitting glass is available for your applications in a wide variety of sizes up to 12 x 24 inches.

- Useful in IR optical systems operating in the 0.9 to 14.0 micron region.
- Operation up to 200°C without transmission degradation.



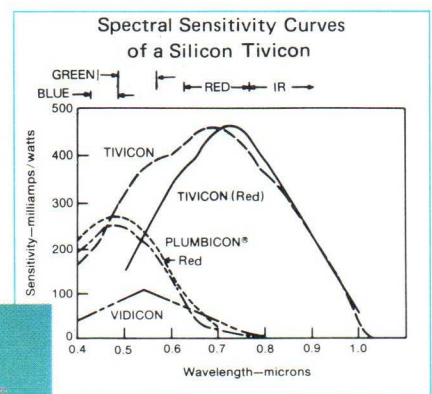
## TIVICON™ Television Image Tubes

TI has combined monolithic semiconductor technology and electron tube techniques to produce a television image tube with the highest quantum efficiencies ever obtained. Spectral response (0.35 to 1.2 microns) is the broadest ever provided by an image tube with both visible and infrared response. These unique properties have been achieved by combining a silicon wafer containing 2.4 million photodiodes (620,000/cm<sup>2</sup>) with a standard vidicon structure.

- 10<sup>-1</sup> to 10<sup>-3</sup> foot-candle faceplate sensitivity.
- No burn from high light level.

- Low blooming due to tube saturation.
- Spectral response from 0.35 to 1.2 microns.
- Easy vidicon replacement.

Type	Resolution in TV Lines	Sensitivity mA/W/cm <sup>2</sup>	Image Retention	Dark Current
VID1601	650	450	15%	10 na
VID1602	600	450	20%	20 na
VID1603	550	450	25%	30 na



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