


# *Wireless Terminals Solutions Guide*

2006



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## Broad Wireless Technology Portfolio

In the 2.5G and 3G era of wireless communications, mobile users want access to a range of services in a handset. Texas Instruments (TI) wireless technology portfolio offers handset manufacturers the flexibility to create handsets from voice-only to capability-rich. TI's focus is on real-time communications, and its proven wireless technology is delivering the high performance and low power consumption needed for a range of applications such as multimedia, DVD-quality video, MP3 audio, high-end imaging, speech recognition, security, location-based services and e-commerce.

TI's experience in providing semiconductor solutions to the wireless market spans over 15 years. As the established leader for 2.5G and 3G, TI provides the technology of choice to leading wireless handset and handheld manufacturers including Nokia, NEC, Fujitsu, Sendo, Legend and many more. The company supports wireless standards including GSM, GPRS, EDGE, WCDMA, UMTS, TDMA and PDC. Operating system vendors such as Symbian™, Microsoft®, Palm®, Sun Microsystems and SavaJe have also ported their software platforms on TI's processors, and a broad range of software developers are creating innovative applications to run on OMAP™ processor-based mobile devices.

## Overview



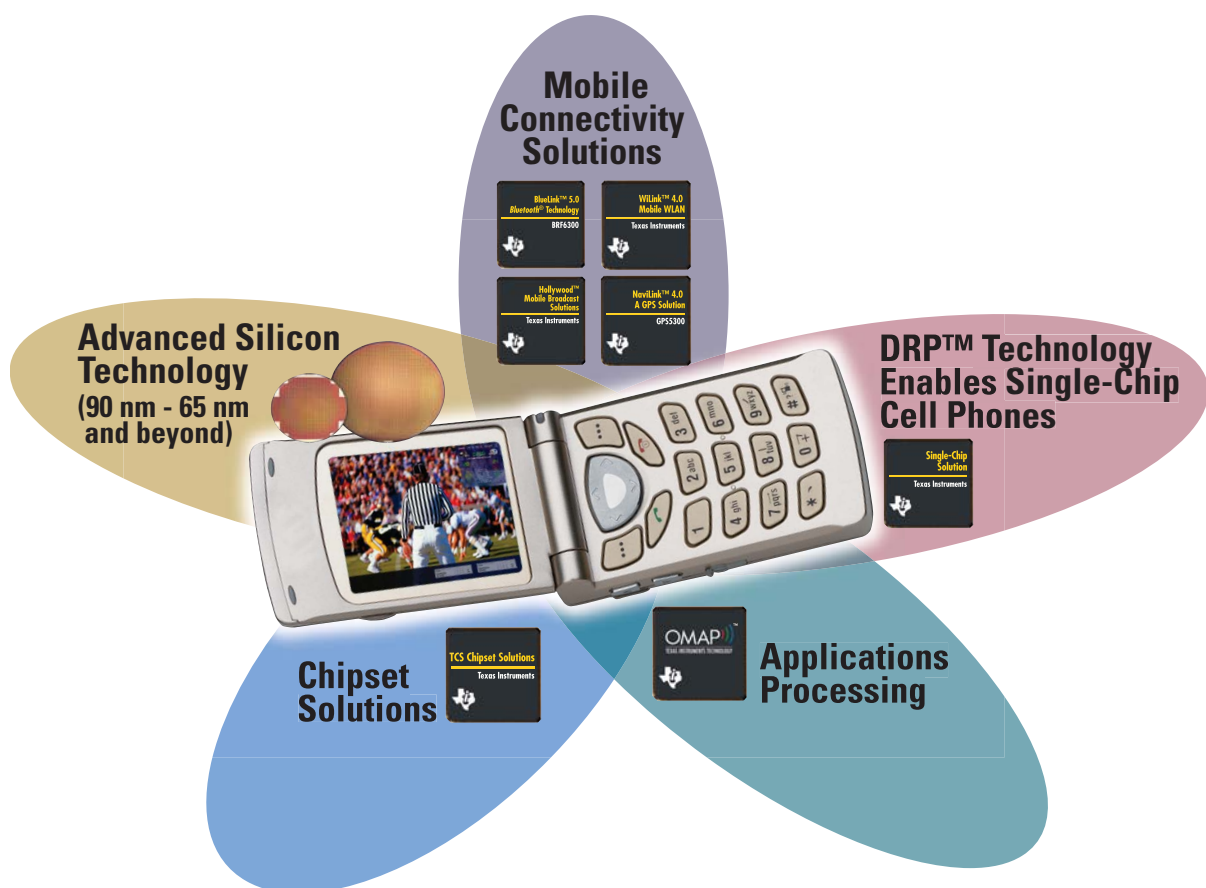
Through its TCS family of chipsets, TI provides complete “antenna-to-applications” solutions that include digital baseband modems, integrated analog and power management, RF processing and powerful applications processors. To enhance system flexibility, TI also offers a complete range of peripherals such as USB, *Bluetooth*® wireless technology, removable flash cards, camera controllers, stereo codecs, drivers and more. In addition, complete hardware and software wireless reference designs give manufacturers the tools they need to develop and deliver products to market fast.

Software reuse and programmability are key features of TI's wireless technology, giving manufacturers the ability to leverage engineering from previous generations for developing multiple product lines. TI's wireless chipset solutions and OMAP™ applications processors are backward and forward compatible, providing customers with platform investment protection as standards and capabilities evolve.

For differentiated voice and multimedia applications, TI offers the widely adopted OMAP platform that combines high-performance, power-efficient processors with comprehensive, easy-to-use software and unprecedented technical support. OMAP processors support all standards and major high-level operating systems. TI's OMAP Developer Network delivers the compelling, easy-to-implement applications for 2.5G and 3G wireless smartphones, PDAs and other Internet access devices.

TI has the architecture, systems expertise, partnerships and manufacturing strength to continue to offer customers differentiated technology solutions into the next generation of wireless communications. Please read on to find out more about TI's solutions for a full range of mobile devices and applications.

## Positioned for Continued Success





## Overview



### To Know More

#### TI's Foundational Innovations featured in this issue:

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TI long ago demonstrated that true breakthrough innovations often cross over the neat lines imposed by conventional solutions. Innovation knows no boundaries between product categories or end equipment market segments. Because of the far-reaching breath of its expertise and core competencies in many divergent technologies, TI has been able to develop innovations that are foundational to a broad range of technologies. These innovations stretch across product lines and defy the demarcations between markets. In the end, these innovations render a diverse spectrum of technologies and products that are more efficient and more effective. Innovations like DRP™ technology, SmartReflex™ power and performance optimization techniques and M-Shield™ security capabilities are being applied across many wireless technologies in a wide variety of different types of handsets.

### DRP™ Technology

TI's DRP technology has emerged from the demands placed on wireless handset manufacturers for higher levels of integration. Manufacturers are faced with providing greater, more compelling functionality while at the same time lowering costs, improving power-efficiency and enabling smaller, lighter mobile devices.

TI has applied its digital expertise to migrate much of the RF analog content, which often accounts for as much as 30 to 40 percent of a handset, to the digital domain. By doing so, DRP technology frees up board space for added functionality. Digital technology can be much more power-efficient than many analog devices, so standby and talk times can be extended. With DRP technology, handsets are able to take advantage of the efficiencies and cost-reductions inherent in each new submicron digital process node.

DRP technology has been deployed in several wireless technologies, such as TI's single-chip cell phone solution, "LoCosto", three single-chip *Bluetooth*® subsystems, the Hollywood™ family of integrated mobile digital television broadcast solutions, the NaviLink™ GPS single-chip solution and the single-chip WiLink™ wireless LAN (WLAN) devices.

### SmartReflex™ Power and Performance Management Technology

The objective of SmartReflex technology is to optimize wireless handset performance and functionality at the lowest possible level of power consumption. Achieving this goal involves intelligent and adaptive silicon IP, advanced system-on-a-chip architectural techniques and innovative software. All of these aspects of SmartReflex technology address power consumption challenges such as leakage at submicron process geometries and many others.

In the wireless industry, SmartReflex technology is having far-reaching effects on lowering power consumption without sacrificing system functionality. Millions of mobile wireless devices have already deployed one aspect of SmartReflex technology or another. TI has produced more than 120 million devices which incorporate SmartReflex innovations. Moving forward, SmartReflex technology will leverage the momentum it has gained from its application in wireless handsets into other high-performance, power-sensitive segments.

### M-Shield™ Mobile Security Technology

M-Shield technology is one of the industry's most robust security solutions for wireless mobile devices. Its hardware and software features include a complete security infrastructure with on-chip cryptographic keys, as well as a secure execution environment, protected storage mechanisms, secure chip-to-chip interconnects and other features. M-Shield technology enables a transparent security architecture with standard application programming interfaces (APIs) that ensure a streamlined deployment as well as faster development and provisioning of security applications.

The M-Shield capabilities ensure end-to-end security for the mobile wireless device itself and any sensitive personal information or high-value creative content stored on the device. For example, a public-key infrastructure that ensures end-to-end security for the mobile wireless device itself as well as any high-value content transmitted and stored on the device. This infrastructure offers a hardware-enforced secure environment for the safe execution of sensitive applications and the secure storage of important data. For example, a public-key infrastructure with secure on-chip keys (e-fuse) gives manufacturers one-time programmable keys that are accessible only in secure mode for authentication and encryption.

M-Shield technology is the keystone security technology for all of TI's TCS wireless chipsets and the complete line of OMAP™ processors.





## DRP™ Technology

TI's DRP™ technology is a direct response to the dilemma wireless handset manufacturers confront: attract new users by delivering compelling functionality to all segments of the marketplace while at the same time fulfilling user demand for less expensive, more power-efficient, smaller and lighter wireless mobile devices. Achieving these two seemingly opposed objectives is only possible by aggressively integrating handset electronics. DRP technology does just that by attacking the analog content of wireless devices, which often accounts for as much as 30 to 40 percent of total board real estate.

By applying its digital expertise to the RF analog content of handsets, TI has developed sampled-data processing techniques, samplers, switched-capacitor filters, oversampling converters and digital signal processors that can assume the functions previously performed by analog amplifiers, filters and mixers. DRP technology is far from a simple and inefficient transference of analog blocks into digital technology. Rather, it oversamples analog signals and processes them in the digital domain, capturing all of the benefits of digital CMOS fabrication and the astounding advancements to smaller and smaller submicron process geometries.

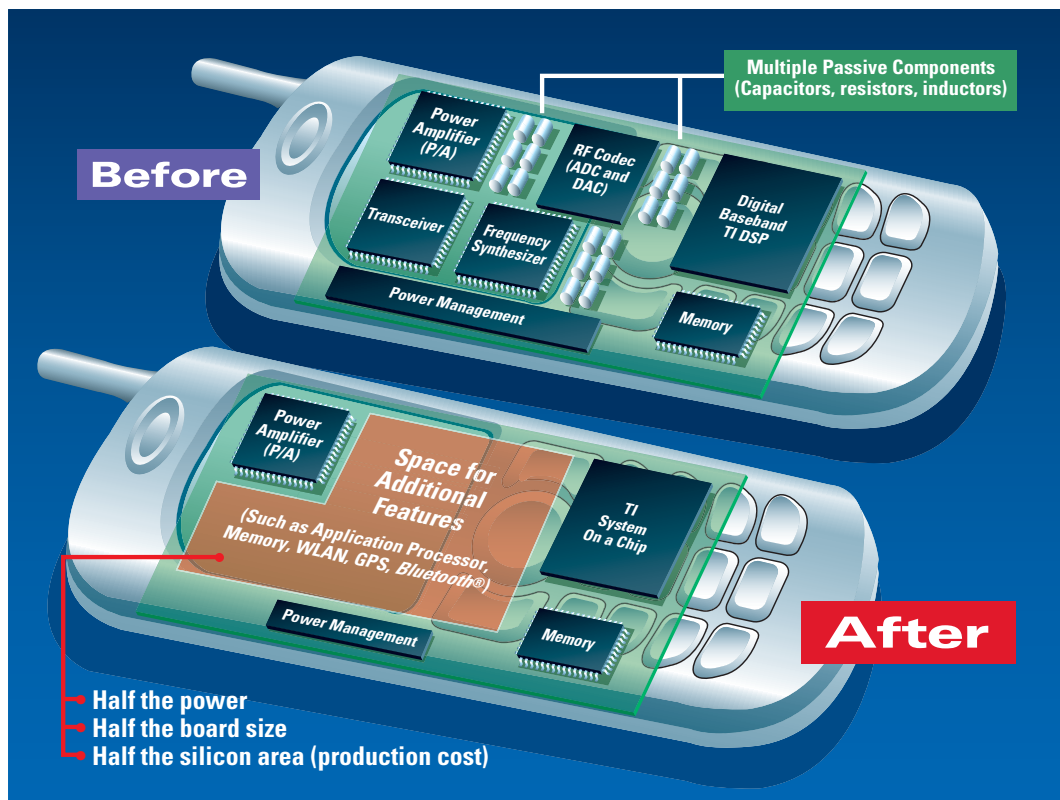
At each successively smaller process node, digital components achieve faster process switching speeds. With DRP technology, handset

### Key Benefits

- Migrating RF processing from the analog to the digital domain makes possible higher levels of integration in wireless handsets
- Highly integrated single-die RF and baseband processors reduce design complexity, size, power consumption and cost while enabling greater functionality
- DRP technology takes advantage of the ongoing advances in digital CMOS fabrication to smaller submicron process nodes
- The increased digital content of handsets enabled by DRP technology simplifies testing procedures and increases manufacturing yields

designers can take advantage of these faster switching speeds to decrease even further the analog content of their designs. With higher process switching speeds the oversampling rate of analog input signals can be increased and this, in turn, reduces noise aliasing problems so that the design of input networks may be relaxed.

CMOS process technology also offers radio performance characteristics that are attractive to radio integration. Device frequency capabilities, noise levels and the availability of passive elements enable the integration of high-performance radio functions in CMOS.





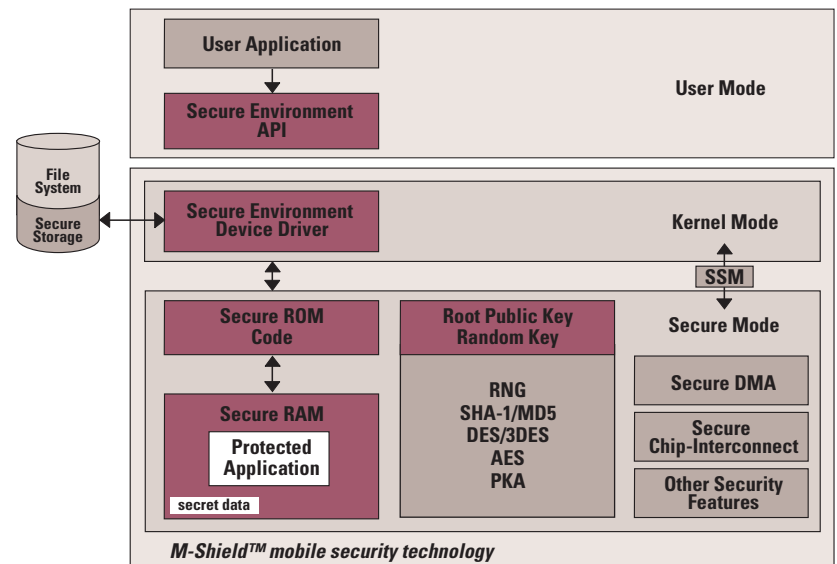
## M-Shield™ Technology

### M-Shield™ Mobile Security Technology

M-Shield™ mobile security technology is a system-level solution that involves both hardware and software mechanisms for the highest level of terminal and content security in the wireless industry. Moreover, M-Shield technology sets the benchmark for the impenetrable security that is needed for wireless financial applications and transactions. M-Shield technology is the keystone security technology for TI's OMAP™ wireless platform and its wireless chipsets.

M-Shield technology provides an infrastructure that ensures end-to-end security for the mobile wireless device itself as well as any high-value content transmitted and stored on the device. This infrastructure offers a hardware-enforced secure environment for the safe execution of sensitive applications and the secure storage of important data. For example, a public-key infrastructure with secure on-chip keys (e-fuse) gives manufacturers one-time programmable keys that are accessible only in secure mode for authentication and encryption.

Central to M-Shield technology is the industry's first hardware-based secure execution environment. A one-of-a-kind secure state machine (SSM) applies and guarantees the system's security policy rules while entering, executing and exiting from the secure environment. Eliminating the vulnerability of chip-interconnects is also critical to the overall protection of M-Shield technology. Certain peripherals and partitions of the system, such as keyboards, displays, fingerprint sensors, smartcard physical interfaces and cryptoprocessors, can be disabled to ensure that sensitive information cannot be accessed and stolen. Secure memory storage and memory access further safeguard the device and its content.



### Key Benefits

- Transparent security architecture with standard APIs ensures a streamlined deployment as well as faster development and provisioning of security-based applications
- Industry's most robust security solution includes a complete security infrastructure with on-chip cryptographic keys, secure execution environment, secure storage, secure chip-interconnects and other features
- Compelling user experience ensured because of high-performance hardware-based cryptographic accelerators that eliminate latencies and deliver rapid system-level response
- Tampering detection triggers effective protective actions
- Low power consumption maintains extended battery life
- Flexible security software solution includes device drivers, security software libraries and APIs to support third-party middleware software and applications

Complementing M-Shield technology's hardware-based capabilities is a software framework that includes device drivers, security software libraries and application programming interfaces (APIs) that support a wide range of cryptographic functions. In addition, this software framework interfaces the cryptography engine to higher levels of the system, such as the operating system (OS), industry-standard security protocols and security interfaces like SSL, TLS, IPSec and Public Key Cryptography Standards. Third-party security applications are available from a wide range of TI partners.

## SmartReflex™ Power and Performance Management Technology



### SmartReflex™ Power and Performance Management Technology

SmartReflex™ technology is a holistic approach to power reduction without sacrificing high performance. More so than the piecemeal power reduction techniques of the past, the rich, product-proven portfolio of SmartReflex technologies takes a comprehensive system-wide perspective on the interrelated issues of power and performance in wireless mobile devices and offers a pathway to future solutions.

SmartReflex technology has three facets: first, silicon intellectual property (IP); second, techniques that can be applied at the system-on-a-chip (SoC) architectural design level; and last, system software that manages many of the hardware-enabled SmartReflex technologies and which interfaces seamlessly to other power management techniques based in operating systems (OS) or third-party software subsystems. SmartReflex technologies are being leveraged by TI for industry-leading power and performance management in custom and standard devices.

### SmartReflex Silicon IP

TI has developed a significant number of sophisticated power reduction solutions at the chip-level, many of which have transitioned into SmartReflex technology. One emerging power challenge relevant to wireless handsets is static leakage power. Leakage becomes a significantly greater part of a device's total power consumption at the smaller submicron fabrication process nodes, such as 90 nanometers (nm) and 65 nm. Several SmartReflex technologies can be applied to drastically limit leakage from a device. Many of TI's 90 nm wireless components already implement SmartReflex technology to reduce leakage power.

SmartReflex technology also includes a library of power management cells to facilitate a granular approach to partitioning a device's power domains. These cells can be used to architect multiple power domains so the device's functional blocks can be independently powered down or put into a standby power mode, significantly reducing power.

### SmartReflex SoC Architectural and Design Technologies

Beyond established power reduction techniques such as low power modes and clock gating, SmartReflex technology includes new innovative techniques at the architectural level of SoC design that reduce both dynamic and static power consumption. For example, adaptive voltage scaling (AVS), dynamic voltage and frequency scaling (DVFS), dynamic power switching (DPS) and standby leakage management (SLM) are innovative new technologies in the SmartReflex portfolio.

#### Key Benefits

- Optimized performance with lowest possible power consumption
- Lower power with high performance enables smaller, sleeker mobile devices with less heat dissipation
- Lengthens standby time, talk time and battery life without sacrificing performance
- Drastically limits chip-level power leakage that is exacerbated as process geometries shrink

### SmartReflex System Software

The SmartReflex portfolio includes intelligent software that controls lower-level hardware technologies to optimize power consumption and performance. For example, workload predictor, resource manager and device driver power management software are a few of the system-level capabilities of SmartReflex technology. Additionally, SmartReflex technology features DSP/BIOS™ power management software for DSP resources.

SmartReflex technology crosses over traditional boundary lines to support power reduction across multiple cores, hardware accelerators, functional blocks, peripherals and other system components. And system-level SmartReflex technology is open to OS-based and third-party power management software so that a collaborative and cooperative environment with regards to power and performance can be developed.

### SmartReflex Technology's Pathway to the Future

To date more than 120 million components with SmartReflex technology have been shipped by TI.

The roadmap for SmartReflex technology stretches far into the future, penetrating deeper into wireless mobile devices and leveraging the application of SmartReflex technology into other high-performance, power-sensitive industry segments.

## Overview

### To Know More

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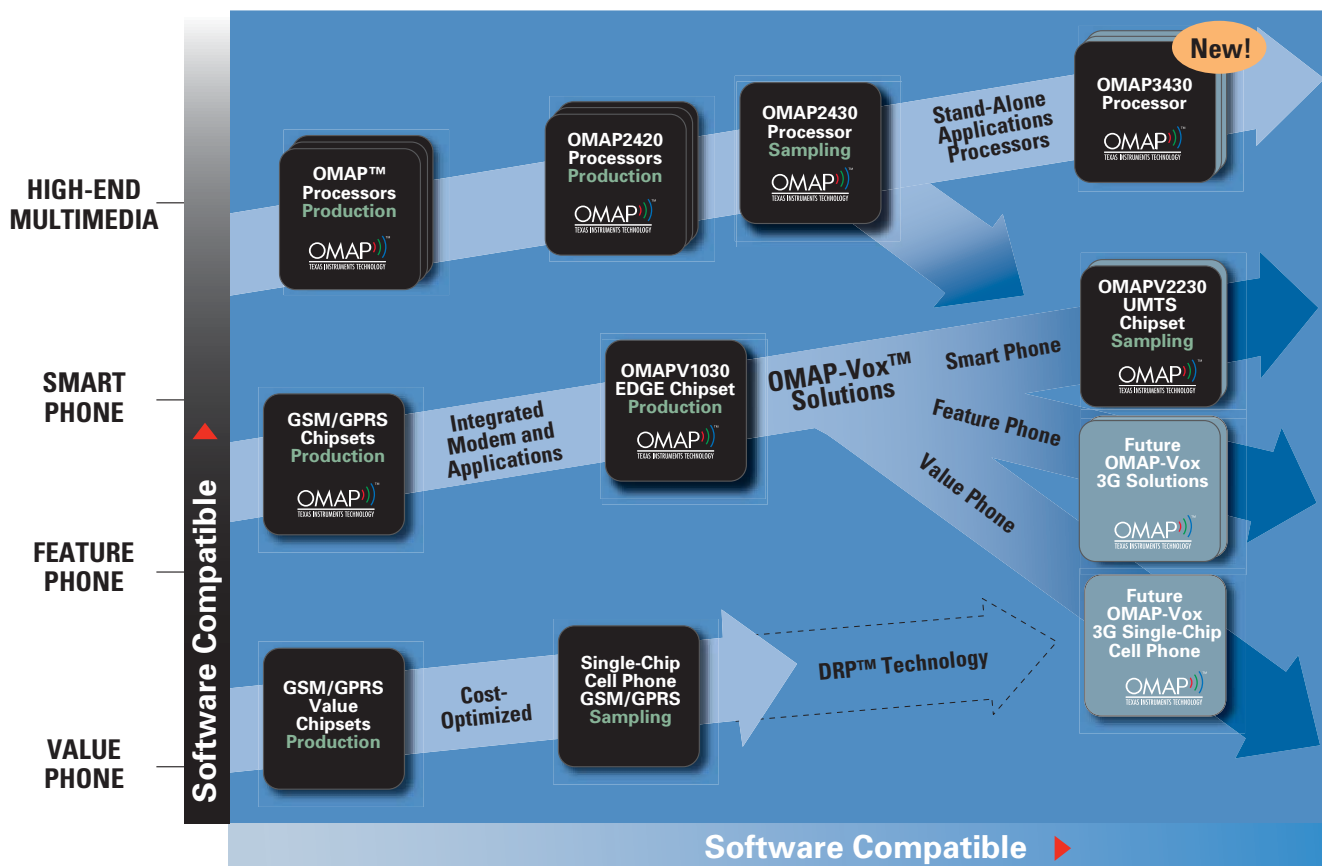
TI's family of TCS Chipsets give mobile device manufacturers complete, scalable platforms that meet the requirements of all leading market segments and standards, including GSM, GPRS, WCDMA, UMTS and EDGE. TI's solutions provide the necessary elements to bring differentiated mobile devices to market fast, including a broad range of hardware, software, reference designs, development tools and support. Digital and analog baseband processors, applications processors capable of real-time multimedia processing, power management ICs, RF transceivers and more are also part of TI's broad range of TCS Chipset offerings.

#### Highly integrated TCS Chipsets give manufacturers:

- Real-time multimedia processing
- High-performance processing
- Low power consumption
- Small form factors

From traditional, cost-sensitive voice-centric handsets to high-end multimedia-rich smartphones, TCS Chipsets support all leading mobile operating systems. Standards-compliant protocol stacks, high-level programming languages, easy-to-use APIs and development tools are

### Solutions for All Market Segments



TI Provides Easy Migration Across Standards and Market Segments





part of the fully validated and tested reference designs. Incorporating OMAP™ applications processors within many TCS Chipset solutions allows TI to deliver the most highly integrated modems, baseband and dedicated smartphone solutions available.

TI's TCS Chipsets offer advanced real-time and general purpose processing for the most advanced applications, including streaming media, graphics, high-end stereo, polyphonic audio, interactive 3D gaming and entertainment, speech processing, location-based services and more. The advanced integration of TI's TCS Chipsets reduces part count and size, delivering a low bill of materials (BOM) and continuing TI's industry-leading track record of the lowest power consumption and longest battery life.

More recent generations of TCS Chipsets address the growing importance of security, providing a comprehensive set of hardware-based security features, software libraries and services that allow manufacturers to add enhanced protection. TI's built-in M-Shield™ security technology enables phone manufacturers and mobile operators to support value-added services including:

- Content protection
- Transaction security
- Secure network access
- Terminal security functions
- Flashing and booting
- Terminal identity protection
- Network lock protection

Value-added software and services are available as part of TCS Chipsets and reference designs. The application software suite enables an easy-to-use PC-based software development environment, optimized JAVA™ Sun KVM, MIDI, MP3, WAP2.0 stack and browser, EMS and MMS KVM messaging clients, *Bluetooth*® wireless

technology and more. TI's OMAP Developer Network and Independent OMAP Technology Centers (OTC) serve as additional resources for quickly deploying compelling 2.5G and 3G devices.

### **“LoCosto”: TI's new single-chip handset solution**

TI's integration capabilities are shown in its unique new “LoCosto” platform, the industry's first architecture to provide single-chip solutions for low- to mid-range wireless handsets. Using TI's advanced DRP™ technology, “LoCosto” combines the radio and all the baseband processing into one highly integrated device. The result is a lower BOM and savings in board space, power consumption and system cost. Utilizing “LoCosto” technology, wireless handsets can be designed in sleeker form factors and at costs affordable to new markets.

### **OMAP-Vox™ Solutions: Offering Scalable and Flexible Roadmaps**

OMAP-Vox™ integrated solutions merge both modem and applications functionality onto the existing OMAP architecture and share a common software platform. Additionally, these solutions share a common software platform that can be re-used for a variety of growing market requirements, thus saving manufacturers years of software design effort and bringing overall development costs down. TI's OMAP-Vox modem technology is optimized to efficiently run a dynamic mixture of applications and baseband communications on the same hardware. The OMAP-Vox scalable hardware architecture has enough performance to run modem and applications on the same processing core sharing hardware resources and is designed to easily extend from 2.5G to 3G and beyond. And to meet the stringent security requirements set by mobile operators, manufacturers, content providers and financial services, TI's OMAP-Vox solutions include embedded security technology, a set of hardware accelerators including terminal security, financial transaction security and content security, without the latencies and risks associated with software-only solutions.



## GSM

## TCS2010 Chipset

Designed for low power, TI's TCS2010 chipset offers a full Class 12 GSM/GPRS platform with applications processing abilities. The solution combines a dual-core digital baseband processor based on TI's low power TMS320C54x™ DSP and ARM® general-purpose processing cores, along with an analog baseband that uses power-down sleep modes to reduce power consumption and increase standby time of mobile devices.

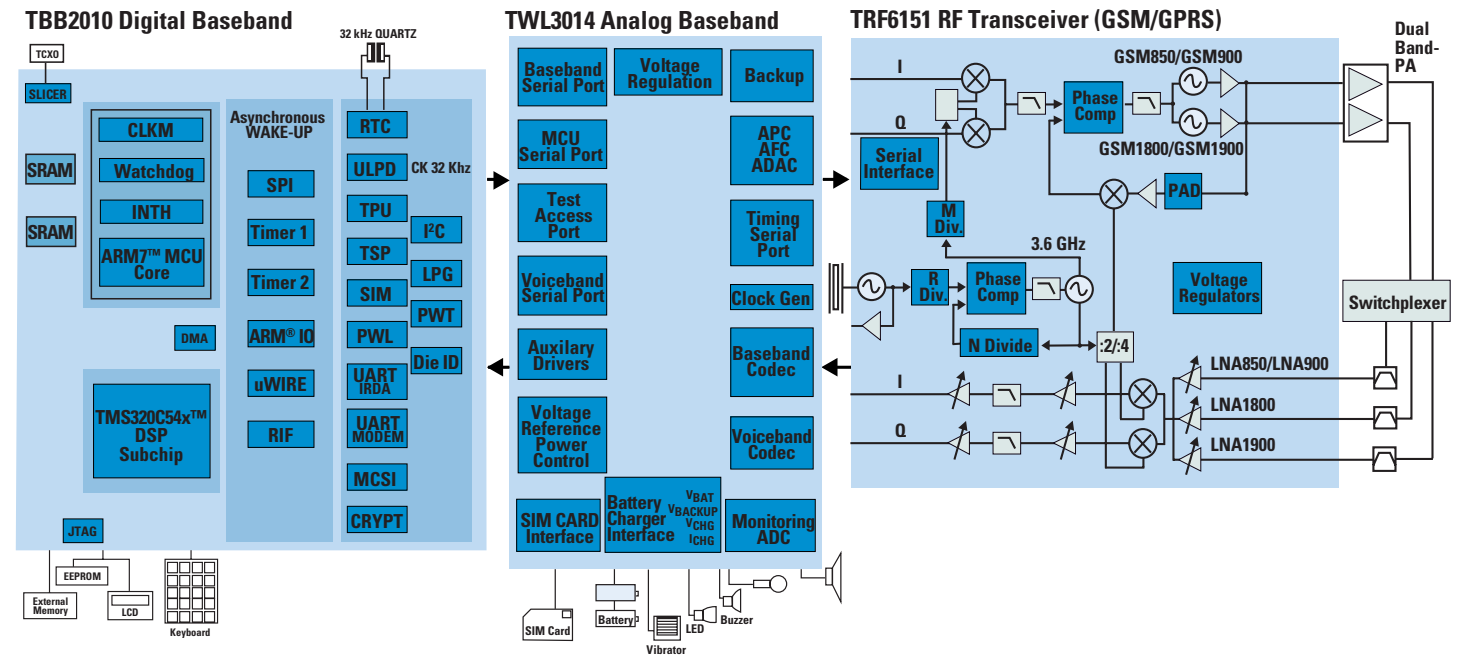
## TCS2010 components include:

- TBB2010 dual core digital baseband processor
- TWL3014 analog baseband with sleep modes for reduced power consumption
- TRF6151 direct conversion, quad-band RF transceiver

When additional application processing is required, the TCS2010 is optimized to interface with TI OMAP™ applications processors. The combination of the TCS2010 and an OMAP processor delivers the processing performance needed for advanced multimedia applications.

## Key Benefits

- Complete GSM/GPRS handset reference design
- Dual-core digital baseband with TI proven GSM/GPRS modem architecture
- Reduced BOM costs for high-volume low-cost handsets
- Low power consumption with twice the standby time of previous generation
- Pin compatibility with TBB2100 GSM/GPRS modem
- Integrated quad-band, direct conversion, single-chip RF transceiver
- Software compatible with TCS2200 and TCS2100 GSM/GPRS chipsets
- Class 12 GPRS ready
- Adaptive MultiRate Narrow Band (AMR-NB) vocoders
- Integrated EOTD location determination
- Optimized interface to OMAP™ applications processors
- Full range of software applications through TCS Wireless Software Suite





### TBB2010 Digital Baseband

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Based on TI's leading TMS320C54x™ DSP for wireless-centric applications, the TBB2010 is extremely efficient. The baseband's on-chip memory and fast, four-channel DMA controller allow for quick data transfers. Page mode with external memory access also facilitates data movement.

#### Key Features

- Dual-core architecture combining TI's C54x™ DSP and an ARM7TDMI® core
- On-chip memory
- Four-channel DMA controller
- Page mode for external memory access

### TWL3014 Analog Baseband

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The TWL3014 analog baseband integrates all the power management and analog functions on a single chip, reducing board space requirements, chip count and development costs. The device includes voiceband and baseband codecs and features programmable low-dropout voltage regulators.

#### Key Features

- Single-chip solution integrates power management functions
- Voice band codecs
- Single/Multi-slot baseband codecs
- I/Q RF interface and GMSK modulator in UL path
- LDO voltage regulators with programmable voltage
- Battery charger interface; control of either 1-cell Li-ion or 3-series Ni-MH/Ni-CD cell batteries
- 1.8-V or 3-V automatic frequency control/power Control SIM interface
- 1.8-V or 3.3-V external memory
- Headset audio interface, LED drivers
- 10 mm x 10 mm MicroStar BGA™ package

### TRF6151 RF Transceiver

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The TRF6151 is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

#### Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm QFP package



## GPRS

## TCS2110 Chipset

The TCS2110 chipset and complete reference design support Class 12 GPRS and offer software compatibility with TI's TCS2010 and TCS2200 GSM/GPRS chipset solutions. It provides MIPS processing headroom for manufacturers to add features and applications, and also incorporates a power-split technique for delivering low power consumption.

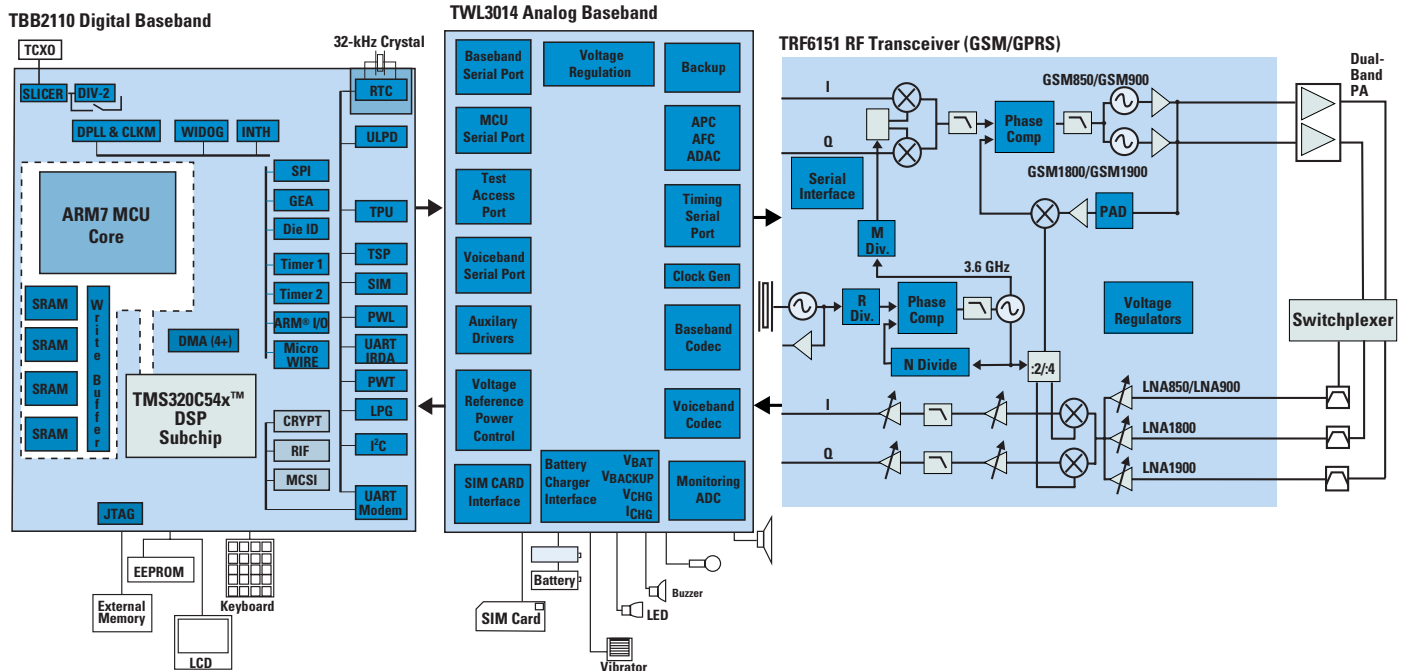
## TCS2110 components include:

- TBB2110 digital baseband combines TMS320C54x™ DSP with ARM7TDMI® processor
- TWL3014 analog baseband with power-split technique for low power consumption
- TRF6151 single-chip, quad-band RF transceiver with dual-conversion architecture

A complete set of communication software is provided as part of the TCS2110 solution, along with a comprehensive TCS Wireless Software Suite that provides a range of embedded applications including WAP2.0 stack and browser, EMS and MMS messaging clients, *Bluetooth*® protocol stack and profiles.

## Key Benefits

- Complete hardware and software solution for GPRS handset
- Class 12 GPRS with headroom for additional applications and features
- Reduced BOM cost through high integration levels
- Software compatible with TCS2200 and TCS2010 GSM/GPRS chipsets
- Integrated EOTD location determination
- Optimized interface to OMAP™ applications processors for multimedia applications
- Easy-to-use software development environment for embedded applications





## TBB2110 Digital Baseband

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The TBB2110 is a dual-core, high-performance digital baseband that includes a powerful shared-memory architecture. It combines TI's low-power TMS320C54x™ DSP with an ARM7TDMI® RISC processor to support multi-slot GPRS Class 12 with the corresponding data throughput and extra processing headroom for manufacturers to deliver their own value through added applications and features.

### Key Features

- TMS320C54x DSP with Data/Program memory on-chip
- ARM7TDMI™ running internal SRAM
- 130-nm CMOS technology
- 3.3-V I/Os, 1.8-V cores
- Memory protection unit
- DMA controller
- Real Time Clock (RTC)
- GSM ultra-low-power device (ULPD)
- HW accelerator for GPRS encryption
- Die-ID cell
- Two UARTS, one supporting IRDA control
- SIM interface (3.3-V and 1.8-V compliant)
- 12 mm x 12 mm MicroStar BGA™ package

## TWL3014 Analog Baseband

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The TWL3014 analog baseband integrates all the power management and analog functions on a single chip, reducing board space requirements, chip count and development costs. The device includes voiceband and baseband codecs and features programmable low-dropout voltage regulators.

### Key Features

- Single-chip solution integrates power management functions
- Voice band codecs
- Single/Multi-slot baseband codecs
- I/Q RF interface and GMSK modulator in UL path
- LDO voltage regulators with programmable voltage
- Battery charger interface; control of either single-cell Li-Ion or 3-series Ni-MH/Ni-CD cell batteries
- 1.8-V or 3-V automatic frequency control/power Control SIM interface
- 1.8-V or 3.3-V external memory
- Headset audio interface, LED drivers
- 10 mm x 10 mm MicroStar BGA™ package

## TRF6151 RF Transceiver

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The TRF6151 delivers GSM/GPRS reception as part of the TCS2110 chipset. It is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device brings together several external components to reduce complexity, part count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

### Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm QFP package





## GPRS

## TCS2200 Chipset

Targeted at multimedia Java™ handsets, TI's TCS2200 chipset solution and reference design deliver the enhanced performance and low power consumption required for processing-intensive multimedia applications.

## TCS2200 components include:

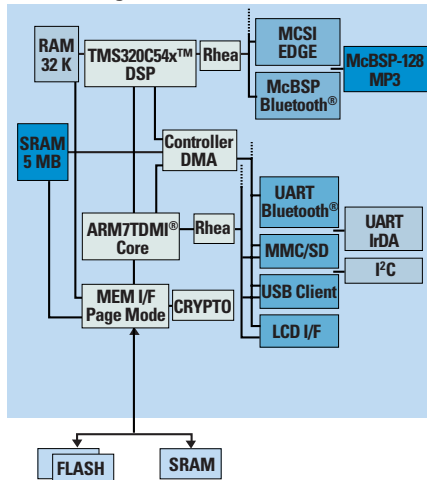
- TBB2200 digital baseband with integrated TI DSP and ARM® cores
- TWL3016 analog baseband with integrated power management
- TRF6151 quad-band RF transceiver

Storage and fast data movement facilities are gained through the TCS2200's extended memory resources and fast direct memory access (DMA) controller. The solution is software compatible with the TCS2110 and TCS2010, includes a L1/L2/L3 GSM/GPRS protocol stack and a full peripheral set with USB, MMC, Memory Stick®, Bluetooth® wireless technology and others. The fully type-approved TCS2200 reference design includes a full BOM, detailed board design with schematics and layout. A complete set of development tools allows manufacturers to easily differentiate capabilities.

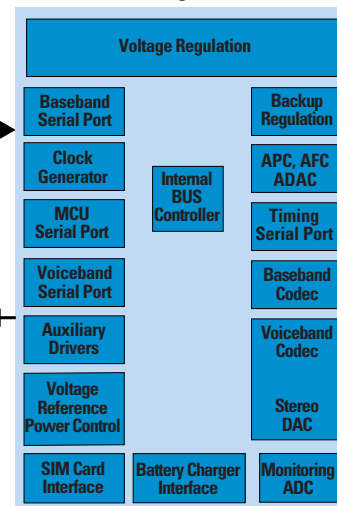
## Key Benefits

- Integrated applications processor and digital baseband leverage proven dual-core modem architecture
- Enhanced application processing with color display, music and security
- Low system power consumption through split power-down techniques
- Security protection through hardware features and third party security library
- Fast data movement and extended memory resourced with DMA
- Page-mode interface for external memory
- Location determination through integrated EOTD
- Full peripheral set including USB, MMC, Memory Stick®, Bluetooth® wireless technology and others

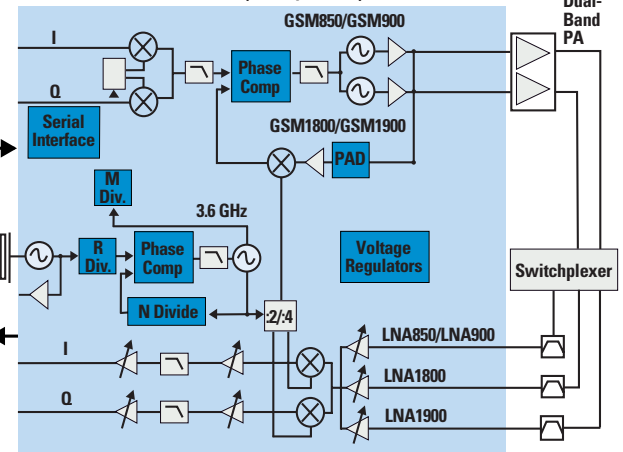
## TBB2200 Digital Baseband



## TWL3016 Analog Baseband and Power Management



## TRF6151 RF Transceiver (GSM/GPRS)





### TBB2200 Digital Baseband

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The TBB2200 provides the connectivity and capabilities required for the latest multimedia applications. It features TI's proven digital baseband architecture, integrating TI's leading, low power TMS320C54x™ DSP and the ARM7TDMI® core. The TBB2200 runs a complete Class 12 modem and includes a TCS Wireless Software Suite.

#### Key Features

- Dual core architecture including C54x™ DSP and ARM7TDMI core
- ARM® processor with DMA and page-mode access
- Complete Class 12 modem
- Full suite of Java™ and embedded multimedia applications
- USB client port
- Parallel port for color LCDs
- Interfaces for Smart Card, *Bluetooth*® wireless technology
- External NAND flash
- 12 mm x 12 mm MicroStar BGA™ package
- 130-nm CMOS technology

### TWL3016 Analog Baseband

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The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 extends system standby time significantly, contributing to the overall battery savings the TCS2200 provides. The device also includes a D/A converter for applications like MP3 music, and an 8-Ω amplifier for hands-free speaker phone operation.

#### Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall clock input reduction of 50 percent
- 10 mm x 10 mm MicroStar BGA™ package

### TRF6151 RF Transceiver

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Specifically designed for GSM/GPRS reception as part of the TCS2200 chipset, the TRF6151 transceiver is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part count and cost of the RF subsystem. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

#### Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm QFP package



## GPRS

## TCS2600/TCS2630 Chipsets

The TCS2600 and TCS2630 are complete hardware/software reference designs for high-performance multimedia smartphones, delivering twice the performance of TI's previous generation while extending battery life. Its reduced part count and integrated set of peripherals on-chip lower BOM costs and free up space for additional functionality.

Designed for security, the TCS2600 and TCS2630 include 48-kB secure ROM and 16-kB secure RAM with dedicated NOR/NAND flash memory and write production. A true random number generator (TRNG) aids in encryption and authentication standards. The numerous software modules and hardware features of the chipsets ensure a secure mode of operation where information stored on the device is safeguarded and ownership rights of content and programs are protected.

## TCS2600 components include:

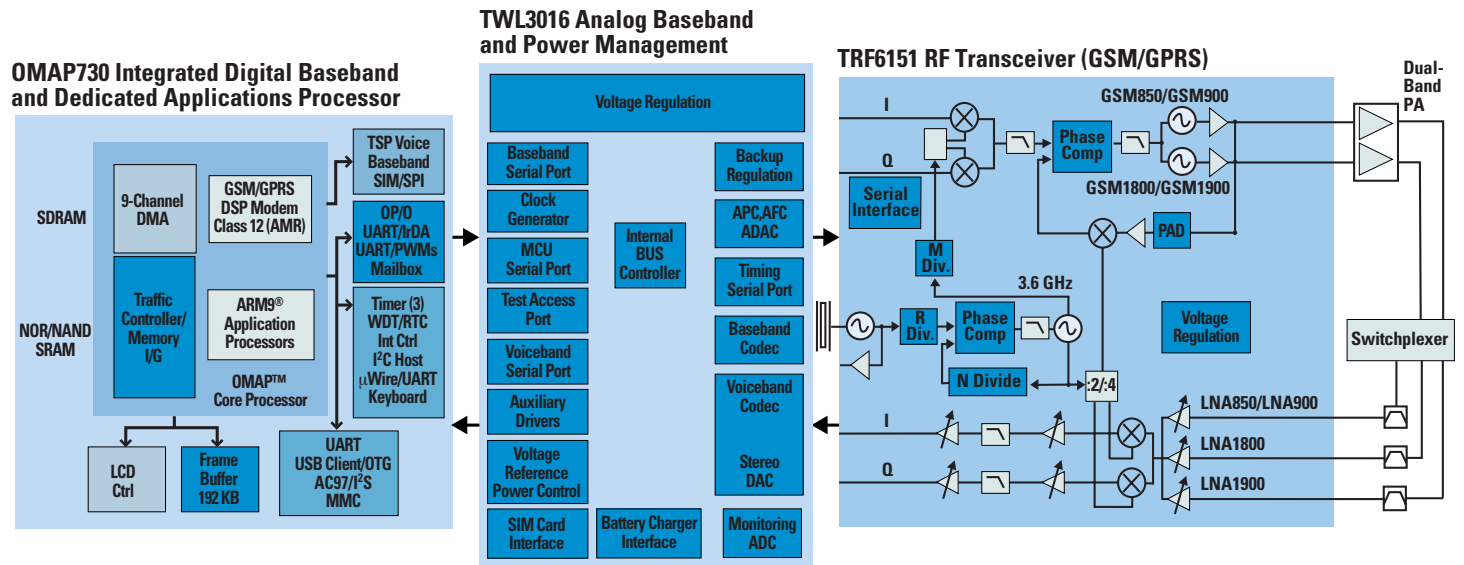
- OMAP730 with integrated Class 12 GSM/GPRS digital baseband and dedicated ARM926™ applications processor
- TWL3016 analog baseband with complete power management
- TRF6151 quad-band RF transceiver

## TCS2630 components include:

- OMAP733 (OMAP730 with 256 Mb stacked SDRAM)
- TWL3016 analog baseband with complete power management
- TRF6151 quad-band RF transceiver

## Key Benefits

- Proven GSM/GPRS modem technology and EDGE upgradeable
- Complete reference design includes S60 Platform and Microsoft® Windows Mobile®
- Twice the performance over previous generation, including 70 percent audio performance improvement and 8X Java™ processing increase
- High-level mobile OS support
- Software compatible with OMAP™ processors and applications
- OMAP Developer Network and Independent OMAP Technology Centers support
- Highly integrated with reduced smartphone BOM and chip count
- Memory protection on FLASH and SDRAM interface
- Hardware acceleration for Java
- Complete peripherals set: USB On-the-Go, SD/MMC/SDIO, Bluetooth® wireless technology, dedicated 802.11 a/b/g high-speed link, Fast IrDA and more



See OMAP™ Processor information on page 44



## OMAP730 and OMAP733 Integrated Digital Baseband and Dedicated Applications Processors

TI's OMAP730 combines an ARM926EJ-S™ applications processing core with TI's GSM/GPRS digital baseband modem, delivering twice the application performance of its predecessor (OMAP710), and doubling standby time for handsets and smartphones.

The OMAP733 includes the same features as the OMAP730 and adds support for 256-Mb stacked SDRAM. The result is less power consumption versus traditional external memory configurations, making the OMAP733 an ideal engine for space-constrained systems or small, light mobile devices.

Over 40 on-chip integrated peripherals reduce board space by half, as compared with the previous generation, saving cost and providing space for added functionality. An SRAM frame buffer delivers faster streaming media and application performance. The OMAP73x includes a standard interface to 54-Mbps WLAN technology, along with accelerated Java™ processing, web browsing, personal information management (PIM) applications, location-based services and more. A comprehensive hardware-based security system features bootloaders, secure RAM and ROM, a secure mode of operation, and hardware accelerators to address security standards.

### Key Features

- Low-voltage 130 nm technology
- 1.1-V to 1.5-V core, 1.8-V to 2.75 V I/O
- Extremely low power consumption: less than 10  $\mu$ A in standby mode
- Split power supplies for application processing, digital baseband and real-time clock enable precise control over power consumption
- Optimized clocking and power management: only two clocks required at 13 MHz and 32 kHz

## TWL3016 Analog Baseband

The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 is able to extend system standby time significantly, contributing to the overall battery savings the TCS2600/TCS2630 provides. The device also includes a D/A converter for applications like MP3 music and an 8- $\Omega$  amplifier for hands-free speakerphone operation.

### Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall TCS2600/TCS2630 clock input reduction of 50 percent

## TRF6151 RF Transceiver

Specifically designed for GSM/GPRS reception as part of the TCS2600/TCS2630 chipsets, the TRF6151 transceiver is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part-count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

### Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm, 48-pin QFP package



## GPRS

### TCS2700 Chipset

The TCS2700 chipset solution and reference design includes a range of features that deliver improved multimedia applications performance to wireless handsets, smartphones and other Internet access devices. Based on the OMAP750 applications processor, the TCS2700 chipset's improved throughput and faster memory options enhance the processing speed of applications including streaming video and high-end imaging.

The TCS2700 is designed for Class 12 GSM/GPRS and integrates three components as part of the chipset, providing battery savings, reduced board space and lower cost.

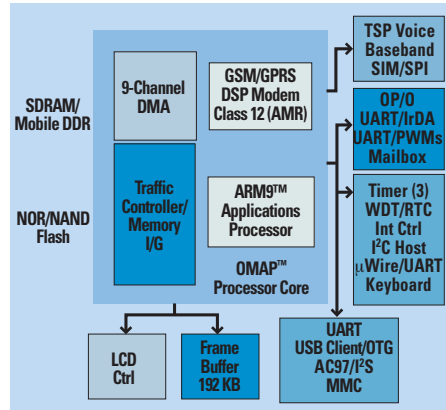
#### TCS2700 components include:

- OMAP750 integrates a GPRS modem baseband and ARM926™ core for applications processing
- TWL3016 analog baseband with integrated power management
- TRF6151 RF transceiver based on direct conversion (DC) architecture

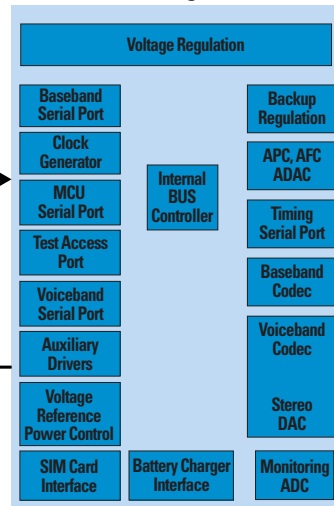
#### Key Benefits

- Ideal for Class 12 GSM/GPRS wireless handsets, smartphones and Internet access devices
- Leverages OMAP750 processor for enhanced performance of streaming video and high-end imaging applications
- D/A converter in analog baseband provides MP3 music and hands-free speaker phone operation
- Extended standby time and battery savings through integrated analog and power management with power-down sleep modes
- Compatibility across all OMAP™ applications processors
- OMAP Developer Network and Independent OMAP Technology Centers support
- Complete reference design and set of peripherals
- GPS, WLAN and *Bluetooth*® wireless technology
- Mobile OS support

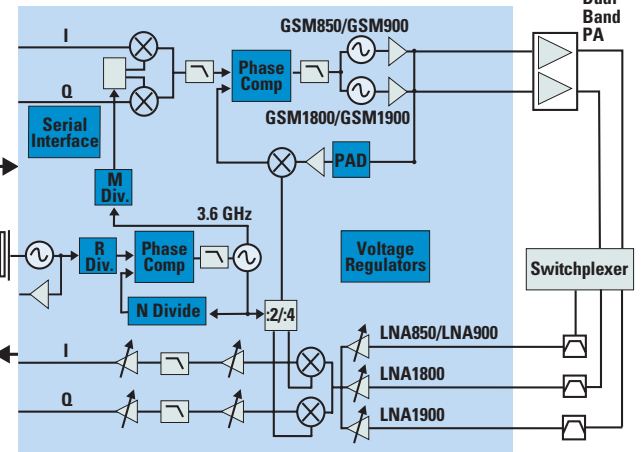
#### OMAP750 Integrated Digital Baseband and Dedicated Applications Processor



#### TWL3016 Analog Baseband and Power Management



#### TRF6151 RF Transceiver (GSM/GPRS)



See OMAP™ Processor information on page 45





## OMAP750 Integrated Communication and Dedicated Applications Processor

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The OMAP750 extends capabilities of the OMAP73x devices while including a range of features that improve multimedia application performance. The single-chip OMAP750 integrates an ARM926™ core dedicated to applications processing with a complete Class12 GSM/GPRS modem baseband subsystem that consists of an ARM7™ core with TI's low-power TMS320C54x™ DSP core.

The OMAP750 incorporates faster memory options, including support of double data rate (DDR) memory that increases processing speed over the OMAP730, which only supported SDRAM. Improved throughput from an internal frame buffer also enhances processing of multimedia applications, including streaming video and high-end imaging functions.

### Key Features

- Improved multimedia and application performance
- Class 12 GSM/GPRS modem baseband and ARM926 core for applications processing
- Increased processing speeds through DDR memory option and internal frame buffer
- Security protection through hardware-based security platform
- Extended list of peripherals, including parallel OCP camera interface for high-resolution imaging
- GPS, WLAN and *Bluetooth*® wireless technology
- 2.0-megapixel camera
- Pin-to-pin compatible with OMAP730

## TWL3016 Analog Baseband

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The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 is able to extend system standby time significantly, contributing to the overall battery savings the TCS2700 provides. The device also includes a D/A converter for applications like MP3 music and an 8-Ω amplifier for hands-free speakerphone operation.

### Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall TCS2700 clock input reduction of 50 percent

## TRF6151 RF Transceiver

---

The TRF6151 delivers GSM/GPRS reception as part of the TCS2700 chipset. It is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device brings together several external components to reduce complexity, part-count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

### Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm, 48-pin QFP package



## GSM/GPRS

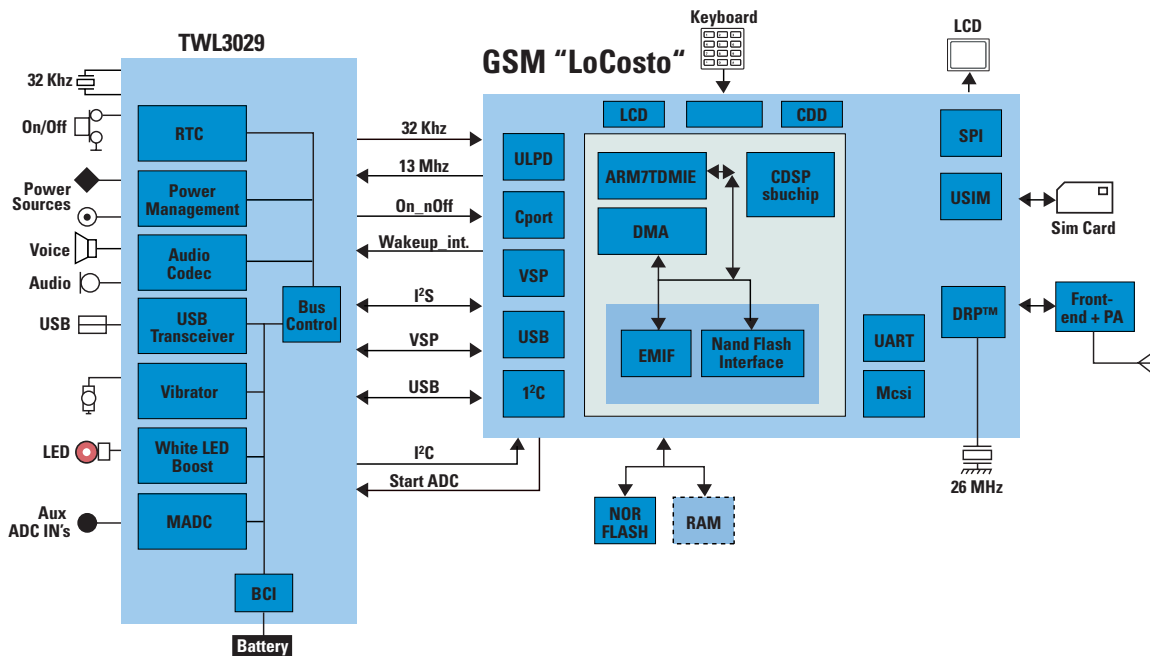
### “LoCosto” Single-Chip Handset Solutions

TI's unique new “LoCosto” platform is the industry's first architecture to provide single-chip solutions from ultra-low to entry-range wireless handsets. Using TI's advanced DRP™ technology, “LoCosto” combines the radio and all the baseband processing into one highly integrated solution, reducing component count, board space, power consumption and system cost. For the first time, wireless handsets can be made as compact as match boxes and inexpensively enough to open up entire new markets around the world.

The “LoCosto” platform combines an ARM7™ general-purpose RISC processor core with a TMS320C54x™ DSP core, both operating at 104 MHz, for high performance with low power consumption. An improved memory interface with DMA supports a variety of external memory types efficiently. Reference designs are available for the solutions and come with extensive software support for codecs, testing and other standards to help simplify design.

#### GSM “LoCosto” Key Benefits

- GSM only
- Voice codecs F/R, H/R, EF/R, AMR
- Dual band 850/1900 or 900/1800 or 850/1800 or 900/1900
- Black and white LCD (96 x 96 pixels) (up to color with additional memory)
- MIDI ringtone and playback - 16 polyphonies
- Vibrator
- Hardware Security (Flash content protection, ME personalization, IMEI protection) OMTP1.0 compliant
- No external SRAM
- 2.0 MB Flash





### “LoCosto” Product Family

Integrating TI’s groundbreaking DRP™ technology, “LoCosto” successfully incorporates functions that previously have not been combined in a single device. With the RF section included in the device, designs save space and components while requiring less interconnect for greater reliability. The digitization of what was formerly analog functionality improves testability, enables built-in calibration, reduces drift effects and allows for auto-compensation for process and temperature variances. All of these advantages add to the savings in cost from a smaller platform and the potential to create phones in new sleeker form factors.

The scalable “LoCosto” platform enables cost-effective development of handsets addressing multiple market segments, from ultra-low-cost, GSM-only handsets with a black-and-white screen to mid-range GPRS-based devices featuring a camera and MP3 player. One solution, GSM “LoCosto”, supports inexpensive designs, while another solution, GPRS “LoCosto”, targets designs that are more highly featured.

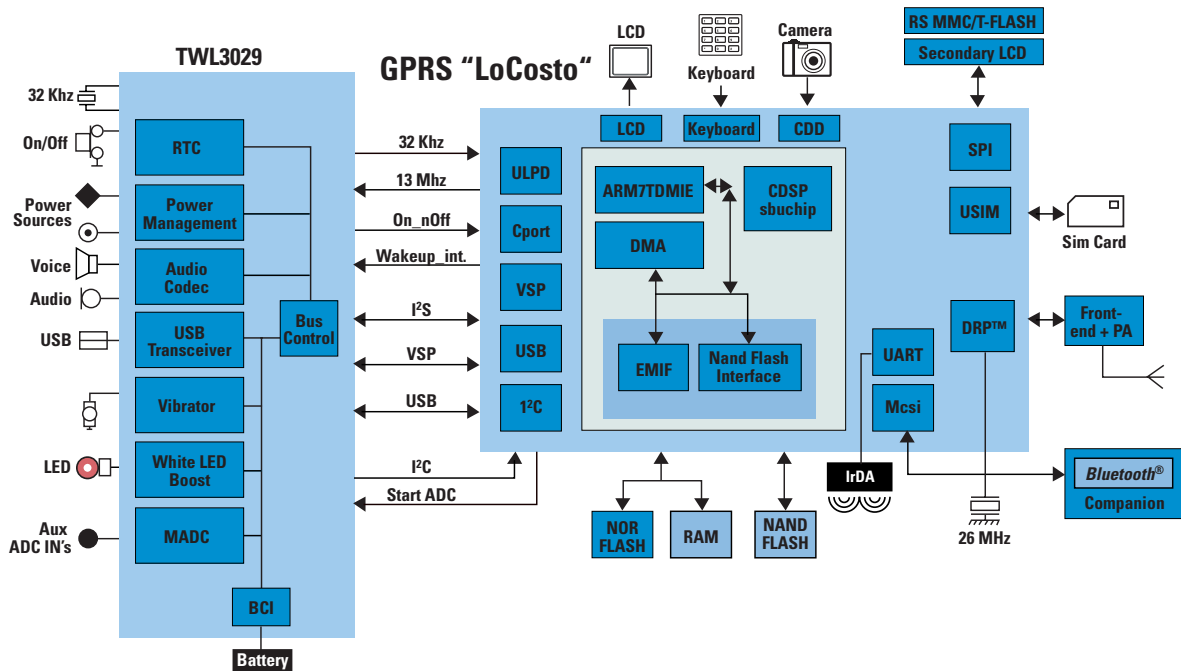
The GSM-only “LoCosto” solution supports standard voice codecs in dual-band phones. Support for both color and monochrome displays, MIDI 16 polyphonies ringtones, system security and highly optimized memory footprint offering provides the normal complement of features demanded in basic phones.

The GPRS-based “LoCosto” solution adds support for MP3/AAC ringers and players, camera with second display, MIDI 32 polyphonies ringtones, *Bluetooth*®, non-removable and removable mass storage media, additional external program and data memory, peripheral interfaces and complete set of functionality required for entry-level handsets.

TI’s first “LoCosto” solution is expected to go into volume production in the first half of 2006.

#### GPRS “LoCosto” Key Benefits

- GPRS Class 10
- WAP/SMS/EMS/MMS
- Dual color LCDs
- MP3/AAC player and ringers
- MIDI 32 polyphonies player and ringer
- Integrated VGA camera support
- TI *Bluetooth* protocol stack and profiles
- Non-removable and removable mass storage interface





## EDGE

## OMAP850 Chipset

The OMAP850 chipset is TI's first EDGE chipset and complete reference design targeted at wireless smart phones and PDAs. It serves as the ideal migration path to EDGE for manufacturers using the TCS2600 GSM/GPRS chipset.

### OMAP850 chipset components include:

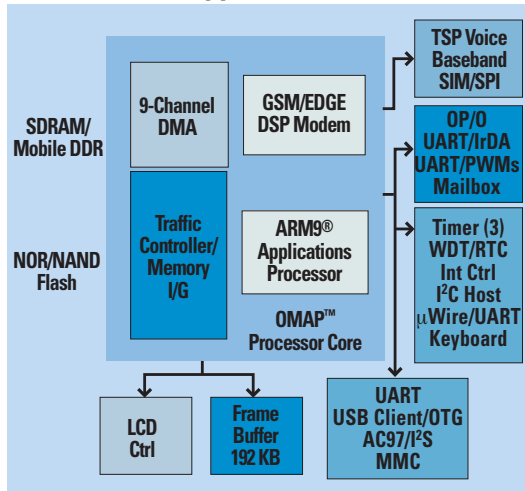
- OMAP850 applications processor with quad-band EDGE modem
- TWL3027 integrated analog baseband with full power management and audio codec
- BRF6150 *Bluetooth*® single chip featuring TI's patented DRP™ technology
- Fully optimized third-party RF

The OMAP850 chipset is a flexible, scalable solution with the performance and low power required for systems addressing EDGE applications, including multimedia, gaming and camera functionality. In addition to the solution's components, modules are also available for incorporating camera, A-GPS and WLAN capabilities to bring added, optional capabilities.

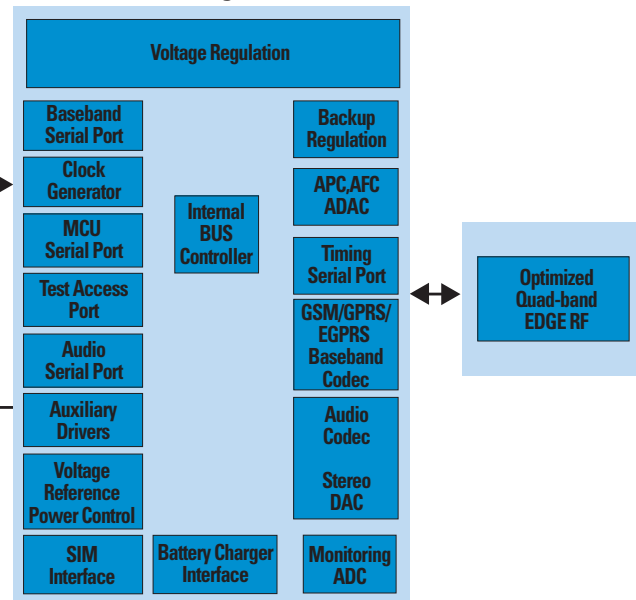
### Key Benefits

- Complete pre-FTA certified, smartphone EDGE Class 12 reference design
- Data rates of 3X the throughput of GSM/GPRS devices
- Applications including MPEG-4 video and Windows Media® video, MP3, 2.0 megapixel camera, etc.
- Software compatible with TCS2600 GSM/GPRS chipset
- Modules available for camera, A-GPS through TI's Navilink™ chip and high-speed WLAN through TI's TNETW1230
- TI's highly integrated BRF6150 *Bluetooth*® wireless technology based on TI's patented DRP architecture
- High-level mobile OS support, including Symbian OS™, S60, Microsoft® Windows Mobile®, SavaJe OS and Linux®
- OMAP™ Developer Network and Independent OMAP Technology Centers support

### OMAP850 Integrated Digital Baseband and Dedicated Applications Processor



### TWL3027 Analog Baseband and Power Management



See OMAP™ Processor information on page 46



## OMAP850 Integrated Digital Baseband and Dedicated Applications Processor

The OMAP850 high-performance applications processor is integrated with a digital baseband and EDGE co-processor. It is based on the OMAP750 applications processor for GSM/GPRS with added EDGE capabilities. It enables applications including MPEG-4 video and Microsoft® Windows Media® video, MP3, 2.0 megapixel camera and more.

### Key Features

- Based on previous generation OMAP750 applications processor
- EDGE Class 12
- Quad vocoders for AMR, EFR, RF and HR
- Camera sensors and support for up to 2.0 megapixels
- Enhanced frame-buffer interface data rate
- DDR support addition
- Secure boot, secure mode and hardware encryption accelerators
- Complete peripheral set
- Complete reference design, hardware and software

## TWL3027 Analog Baseband

The TWL3027 is an analog baseband device which, together with a digital baseband device is part of a TI DSP solution intended for digital cellular telephone applications including GSM 900, DCS 1800 and PCS 1900 standards (dual-band capability).

The TWL3027 includes a complete set of baseband functions to perform the interface and processing of voice signals, interface and processing of baseband in-phase (I) and quadrature (Q) signals which support single-slot and multi-slot mode for both GMSK and 8-PSK modulations. The TWL3027 also includes associated auxiliary RF control features, supply voltage regulation, battery charging controls, and switch ON/OFF system analysis.

### Key Features

- Applications include EGPRS, GSM900 and PCS1900 DCS1800 Cellular Telephones
- Baseband codec single and multi-slot
- GMSK/8PSK with I/Q RF interface
- Auxiliary RF converters
- SIM card interface
- Five Channel Analog to Digital Converter
- Audio DAC based on I<sup>2</sup>S format
- Voice codec
- Six low-dropout low-noise linear voltage regulators
- Dedicated low quiescent current mode on regulators
- High voltage (20 V), Li-Ion or NiMH battery charging control
- Voltage detectors (with power-off delay)
- Dedicated very low quiescent current supply domain
- 143-ball MicroStar Junior BGA™ package

## BRF6150 Bluetooth® Solution

TI's BRF6150 is a highly integrated *Bluetooth* v1.2 single-chip solution that integrates TI's baseband with *Bluetooth*® wireless technology, RF, ARM7TDMI® and power management into a single device for enhanced performance, reduced cost and reduced board space. The BRF6150 is optimized for mobile terminals where performance and space are critical. The device leverages TI's advanced 130 nm digital CMOS process while incorporating advantages of DRP technology in a board layout of 50 mm<sup>2</sup>.

### Key Features

- Full *Bluetooth*® wireless technology specification v1.2, including eSCO, AFH and faster connection
- Based on previous generation, BRF6100, with improved performance and features
- Direct connection to battery at 2.7 V to 5.5 V; 1.65 V to 3.6 V via LDO
- RF TX: 25 µA; RF RX: 27 µA; Deep-sleep 30 µA
- Improved RF performance with sensitivity of -85 dBm, TX Power + 7 dBm and Class 1 ready
- Blocking -0 dBm at GSM bands
- Direct connection to battery with 8 external passives and a PCB layout area of 50 mm<sup>2</sup>
- Collaborative interface with WLAN and *Bluetooth* wireless technology v1.2 AFH
- Complete reference designs with TI's TCS Chipsets and OMAP™ platform
- Manufactured in TI's 130-nm CMOS process
- Packaging: 4.5 x 4.5 x 0.8 ROM; or 4.5 x 4.5 stacked flash prototypes

## Third-Party-RF Transceiver

A third-party RF transceiver has been fully optimized to work with the other above components in the OMAP850 chipset smartphone solution.





## OMAPV1030 Integrated EDGE Chipset

The OMAPV1030 is one of the industry's most highly integrated and optimized EDGE solutions, combining applications and modem on a single device to enable handset manufacturers to reduce costs and speed time to market. The baseband processor design expands on TI's proven GSM/GPRS technology and leverages TI's advanced high-volume 90 nm digital CMOS process technology.

The OMAPV1030 processor is based on the OMAP™ architecture and runs both GSM/GPRS/EDGE modem and applications processing on a single OMAP™ core, ensuring a high-quality multimedia mobile experience. The combination of the ARM926EJ-S™ and TI DSP is used to improve performance while reducing costs and power consumption, resulting in longer battery life and usage times for consumers. Because all OMAP-Vox™ solutions share a common software platform, this solution maximizes software re-use to bring overall development costs down and provides a natural and affordable roadmap from GSM/GPRS/EDGE to UMTS.

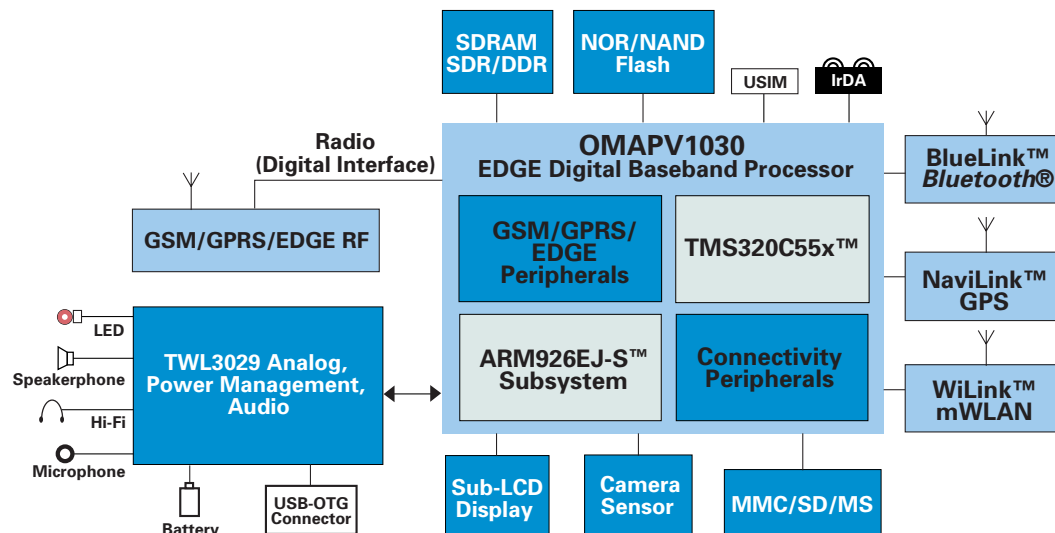
The OMAPV1030 solution is specifically designed to bring multimedia functionality to mass market mobile phones and delivers advanced capabilities to mid-range wireless handsets. These capabilities include:

- Digital camera with 2-megapixel still images
- Video capture, playback, and streaming at 30 fps (rendering up to QVGA)
- Digital audio such as MP3, AAC+, enhanced AAC+ and other audio formats

### Key Benefits

- Integrated modem and applications processing on a single core
- Reduced bill-of-materials
- Support for Nucleus™ based applications suites (as well as Java™ acceleration support)
- Ability to support high-level operating systems such as Windows Mobile™ software, Symbian OS™ software and embedded Linux®
- Improved performance while reducing costs and power consumption
- Feature-rich multimedia with high-end performances
- Embedded security via hardware accelerators supporting terminal security, transactions security, and content security—without the latencies and risks associated with software-only solutions
- Access to the OMAP™ platform ecosystem, including software developers, system integrators, and development tool providers

- Two-color LCD screens with main screen up to QVGA in size
- 2D and 3D gaming
- High-performance Java™
- 64 polyphonic MIDI ringtones
- Hardware-based security
- Connectivity with USB, Bluetooth®, IrDA, WLAN, external memory cards



### OMAPV2230 Integrated UMTS Solution

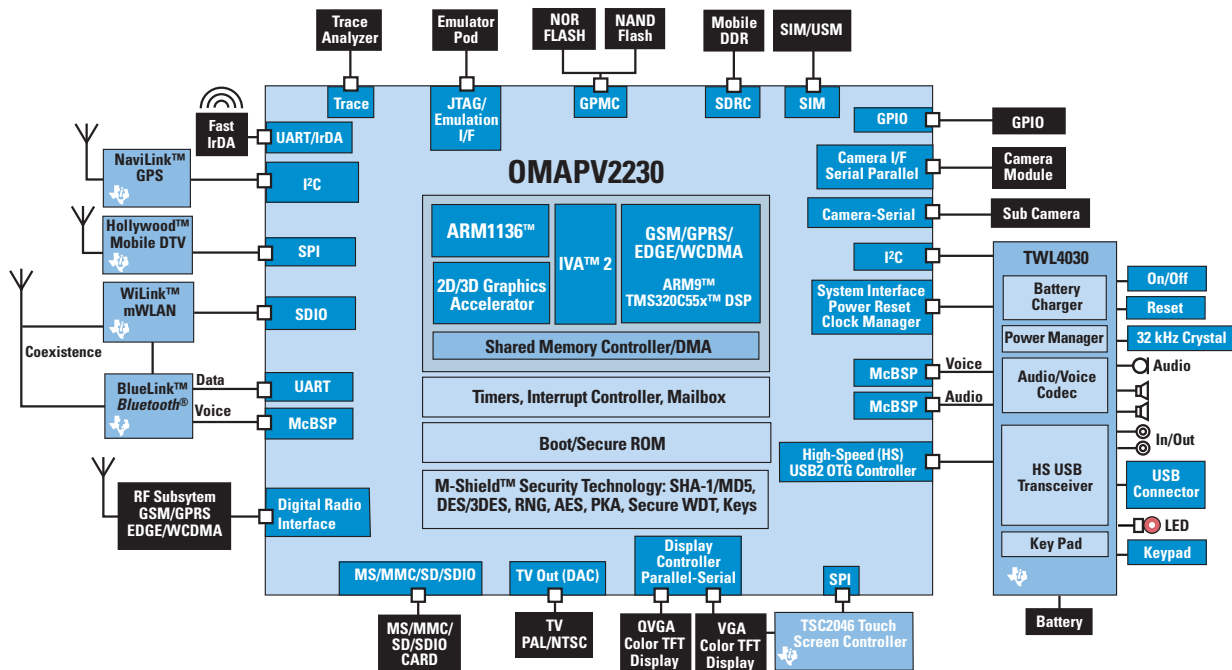
The OMAPV2230 UMTS solution for 3G handsets provides size, performance and power consumption benefits by integrating both modem and applications on a single device. The digital baseband is based on proven WCDMA/GSM/GPRS/EDGE technology, and the applications processor is based on TI's OMAP™ 2 architecture. Manufactured using TI's 90-nm advanced CMOS process technology, the OMAPV2230 enables worldwide roaming and supports a variety of multimedia applications with consumer electronics quality. The architecture makes it easy to migrate existing OMAP software, and the open platform and flexible connectivity options enable product differentiation with value-added features.

The integrated applications processor enables a variety of mobile entertainment applications at streaming speeds up to 384 Kbps. The platform is capable of supporting video codecs such as H.263, MPEG4, H.264, WMV and RealVideo®, plus high-quality audio codecs such as MP3, WMA, RealAudio® and AAC/AAC+. An advanced IVA™ 2 accelerator and a 3D graphics accelerator core enable:

- Video streaming and playback with high-quality audio up to 30 fps VGA
- Camcorder with high-quality audio up to 30 fps VGA
- Two-way video teleconferencing up to 30 fps CIF
- >5 megapixel digital still camera with < 1 second shot-to-shot delay
- Interactive 3D gaming rendering up to 1M triangles/second
- Fast audio and video download
- Mobile digital TV decode and display

#### Key Benefits

- Advanced applications and modem integrated in one device enable a low-power, high-performance system solution
- Enables worldwide operation for WCDMA/GSM/GPRS/EDGE modem standards
- Advanced Imaging, Video and Audio Accelerator (IVA™ 2) boosts video performance in mobile phones up to 4X and imaging performance up to 1.5X
- Delivers a multimedia experience with consumer electronics quality to the handset
- Multi-engine parallel processing architecture supports complex usage scenarios
- Built-in M-Shield™ mobile security technology enables value-added services and terminal security
- Support for all major High Level Operating Systems (HLOS) aids applications development
- Optimized power management companion chip: TWL4030





## **Chipset Reference Designs**

TI's Chipset family and supporting reference designs speed a manufacturer's new product development and time-to-market, and address market segments ranging from voice-centric phones to application-rich smartphones. In some cases, manufacturers can leverage a reference design to deliver a new product to market in less than six months.

Because they are fully tested and type-approved, TI's wireless reference designs allow manufacturers to focus on product differentiation and product development. They come with a complete BOM and component list, along with board design and layout. A complete and fully validated wireless software suite includes communication protocol stacks for 2G, 2.5G and 3G, along with support for major mobile OS and the wireless application suite for the wireless chipsets.

TI's best-in-class customer support guides manufacturers from design start through full-scale production. Worldwide locations are based in Europe, USA, China, Taiwan and Japan.

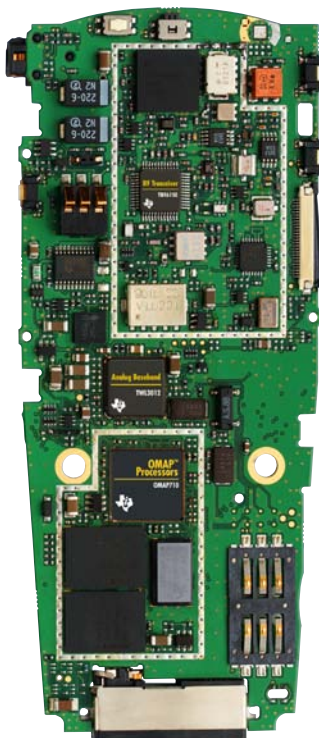
### **Key Benefits**

- Manufacturing quality, with competitive BOM costs and full component list
- Designs tailored to all market segments
- Low power consumption
- Board design and layout
- Complete and fully-validated Wireless Software Suite includes communication protocol stacks and leading OS support
- Customizable-ready user interface
- Multimedia and PIM applications
- Worldwide support structure

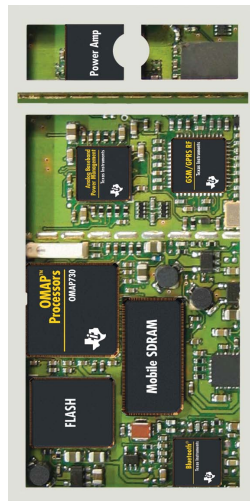


**TI Chipset Reference Designs**

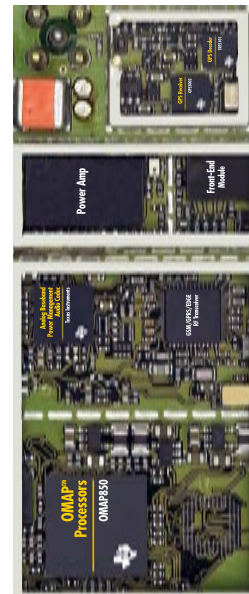
- TCS2010 GSM/GPRS
- TCS2110 GSM
- TCS2200 GSM/GPRS
- TCS2500 GSM
- TCS2600 GSM/GPRS
- TCS2700 GSM/GPRS
- TCS2630 GSM/GPRS/UMTS
- OMAP850 EDGE
- OMAPV1030 GSM/GPRS/EDGE
- "LoCosto" GSM/GPRS
- BRF6100 *Bluetooth*<sup>®</sup>



**TCS2500 GSM Chipset Reference Design**



**TCS2600 GSM/GPRS Chipset Reference Design**



**OMAP850 Reference Design**



**BlueLink™ 5.0 Bluetooth® Solution**



## → To Know More

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OMAP-Vox™ Solutions	47-49







For designers looking to deliver the most compelling, multimedia-rich applications that will attract users to next-generation devices and services, TI's OMAP™ platform is the answer. Its comprehensive mix of processors, software and support deliver the real-time processing and low power consumption necessary for 2.5G and 3G applications, including streaming media, security, interactive gaming, mobile commerce, location-based services and more.

The OMAP family includes applications processors and integrated baseband and applications processors suited for a wide range of mobile devices from general-purpose handsets to high-end power-efficient multimedia smartphones and other Internet access devices. TI has maximized software reuse and has incorporated a high level of compatibility, making the OMAP platform an effective choice for implementing a complete multi-line product family for all market segments.

Optimized software, including the operating system port, is an essential element of the OMAP platform. TI delivers optimized OMAP reference software for all leading operating systems with key driver support and DSP-accelerated applications. An extensive selection of integrated peripherals and manufacturing-ready reference designs reduces a system's bill-of-materials (BOM) cost, reduces board space and accelerates time-to market.

A comprehensive, open-software infrastructure makes the OMAP platform an ideal complement to TCS Wireless Chipset solutions. TI provides support for the most prevalent OSs, high-level programming languages, third-party applications, multimedia components, basic building block algorithms and a host of software development

tools. In addition, TI's OMAP Developer Network of third party application developers includes an extensive selection of innovative applications and media components that manufacturers can easily integrate into products for differentiation.

TI also offers support with its full complement of reference designs. Wireless design centers in the Americas, Europe and Asia provide quick access to TI expertise. Additionally, the worldwide Independent OMAP Technology Centers are staffed by development experts who provide system integration, development and other critical support for OMAP processor-based product development. Finally, TI offers training, technical documentation, an online knowledge base and interactive discussion groups—all designed to speed the development process and work with manufacturers to quickly get to market.

### New OMAP™ 3 Platform

TI's new OMAP 3 platform takes the robust multimedia performance of TI's OMAP 2 processors and adds a new realm of support for even higher-performance productivity applications. As the industry's first architecture to be based on the ARM® Cortex™-A8 processor, the OMAP 3 platform can triple the ARM performance of ARM11™-based processors. In addition, the DSP-based IVA™ 2+ accelerator provides up to 4x the performance of previous OMAP multimedia processing. Software-compatible with previous generations of OMAP technology, the OMAP 3 platform introduces a new level of performance that enables laptop-like productivity and advanced entertainment in 3G handsets.



**OMAP Platform Software****Operating Systems Optimized for the OMAP™ Platform**

Through close collaboration with OS providers and key third parties, TI provides robust development packages for the OMAP™ platform that support all wireless communications standards and the most widely used high-level programming languages. Complete reference designs, board support packages (BSP) and reference software packages provide everything needed to get started with the OMAP platform, including integrated development environments, driver support, accelerated DSP software, JTAG emulators, and more depending on the selected OS. TI's OMAP 2 platforms include innovative power management and hardware acceleration for multimedia codecs and graphics which provide a richer multimedia experience with leading enterprise and entertainment applications. These platform capabilities and tools, in addition to applications and support available through the OMAP Developer Network and Independent OMAP Technology Centers (OTCs), enable developers to create and optimize real-time execution of applications that leverage the processing power and low power consumption of the OMAP platform.

**Symbian OS™**

Developing with the Symbian OS and the OMAP platform gives developers an open, easy-to-develop software environment with access to DSP-based hardware acceleration through a high-level API. TI is a Symbian Platinum Partner and offers full support for Symbian OS v8 and v9 ports. TI is also qualified to support S60 Software Platform and has access to S60 APIs. This gives TI's hardware platform a higher level of integration with S60 Software Platform. Software libraries from TI and the OMAP Developer Network provide manufacturers with innovative software applications to further

differentiate devices. Also supported is UIQ, a user interface platform for Symbian OS, especially designed for media rich mobile phones. These user interface platforms are designed to offer easy access to the wide variety of data services in 2.5G and 3G networks.

**Microsoft® Windows Mobile®**

Collaboration with Microsoft has enabled TI to design optimized solutions that get manufacturers to market fast. Windows Mobile software is certified for OMAP processors, and TI will continue to support further OS versions. TI offers DSP hardware accelerated Windows Media in certain OMAP platforms. Platform reference designs with software packages and BSPs for Microsoft Windows Mobile-based devices on Pocket PC, Pocket PC Phone Edition, and Microsoft Smartphone are included. A full range of easy-to-use software development tools is also available through the OMAP Developer Network and Microsoft's mobile2market programs.

**Linux®**

A full board support package for Linux helps software developers get started quickly with the performance and power efficiency of the OMAP platform. The open source BSP includes the basics plus a set of advanced and fully tested tools to accelerate development. This includes GNU Linux OS, source-level debugging tools, Linux trace tools, language tools including C, C++ and Java™. Also available are the MontaVista Linux products, MontaVista CEE 3.x and Mobilinux 4.x. These products include the MontaVista Linux kernel, software updates, utilities, development tools and technical support, along with expanded technology add-on products.





### Palm®

TI works closely with PalmSource to enable OMAP developers with the Palm OS capabilities they need to quickly develop compelling multimedia-rich applications for handheld mobile devices like smart phones, PDAs and wireless PDAs.

### Java™

TI, Sun Microsystems and other Java™ leaders have created a complete Java solution and development environment for TI's wireless chipsets and the OMAP platform. Through Java virtual machines (VMs) companies like Aplix, Esmertec, Tao Group and SavaJe combine enhanced Java applications and services with TI's TCS wireless chipsets and the OMAP processors. Enhanced Java features include MIDP and CDLC, which provide a complete J2ME™ (Java 2 Micro Edition) application runtime environment. TI's OMAP platform supports Mobile Media APIs (JSR-135), MPEG-4, MP3, MIDI and other MIME types.

### SavaJe

Based on Sun Microsystems' Java technology, SavaJe OS offers OEMs, ODMs and operators a standardized platform with a high level of security. TI's OMAP platform enables the SavaJe OS to provide HTML Web browsing, SMS and MMS messaging, games, PIM, full-motion video, MP3 support and Over-the-Air (OTA) application provisioning and device management, including OS patching and upgrades. At the foundation of the SavaJe OS lies an advanced multi-threaded, multi-tasking operating system supporting the industry standards essential to the wireless market—Sun-certified Java.

### Wireless Applications Center

With locations worldwide, TI opened its first Wireless Applications Center for customers and members of the OMAP Developer Network in Dallas in 2002. Current locations include Dallas, Bangalore, Taipei and Nice. The applications center provides a venue for handset makers to see all of TI's wireless technologies in action, including the OMAP platform as well as solutions for cellular, Wireless LAN and *Bluetooth*® wireless technology. Manufacturers use the applications center to gain firsthand experience with new wireless software programs and services on the market and under development from TI's OMAP Developer Network.



**OMAP Developer Network**

TI's OMAP Developer Network provides innovative applications, services and multimedia modules for OMAP processors/2.5G/3G and PAN, WLAN Connectivity solutions. Consisting of an extensive range of third party software developers, the ready-to-implement OMAP software and algorithms deliver the latest, most compelling applications of a user's 2.5G or 3G experience.

OMAP Developer Network members are continuously building new multimedia-rich applications and capabilities for the entire TI wireless range to enable product differentiation, quick time-to-market and fast return on investment. Just a few of the applications available through the OMAP Developer Network include streaming media, voice recognition, 3D gaming, Java virtual machines, high-end audio, speech recognition, text-to-speech, video conferencing, location-based services and security. TI works with the industry's most innovative developers, including Access, BitFlash, Certicom, Faith, Flextronics Systems Software (Emuzed), Ingenient, McubeWorks, Ideaworks3D, InterVideo, HI Corporation, McAfee, Microsoft Media, Nuance, PacketVideo, Philips Software, RealNetworks, SafeNet, Sasken, Trolltech, Trusted Logic, TTPCom, and many more.

**Training**

Various online and live workshop training opportunities are available for software development, DSP algorithm development, development tools and other subjects.

**Developer Catalog**

TI's online OMAP Developer Network catalog serves as an important place to assist TI customers in identifying solutions offered by developer network members. Application descriptions and services are provided for additional information to aid in selecting an application mix or to seek engineering assistance in a particular application area.

**Invitation to Join Network**

If you are developing software applications for 2.5G and 3G handsets and PDAs, apply for membership to the OMAP Developer Network.

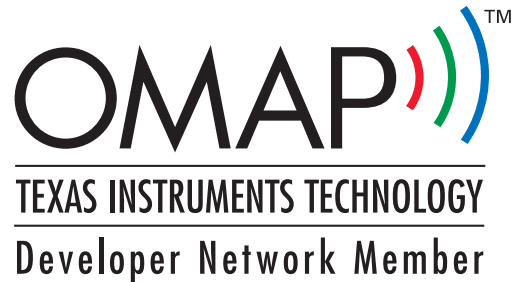
[www.ti.com/omapdevnet](http://www.ti.com/omapdevnet)

**Member Benefits/Product Exposure**

Prospective customers will be exposed to developer product information through a variety of marketing opportunities including:

- OMAP Developer Network online catalog
- TI collateral
- Wireless Access e-newsletter
- Website promotions
- Online demos

Network members may have their application demos selected for use in one or more of TI's regional Wireless Applications Centers for direct exposure to TI customers. Members may also be invited to participate at select tradeshow using TI booth properties and exhibit space. Members can also be included in OEM/ODM proposals and Requests for Quotation to complement the TI base solution.



**Independent OMAP Technology Centers** 

Wireless manufacturers are seeking expert support for emerging technologies and specialized techniques that are continually evolving. While TI is the world leader in wireless expertise, the skills and time-to-market requirements of manufacturers in the wireless industry today are tremendously divergent. Manufacturers still must think long and hard about communications protocols, baseband processors and other wireless design technologies, but now they also must contend with new issues like security, high-level operating systems, multimedia coders/decoders (codecs), consumer applications and services, interactive gaming, location-based services, WLAN (802.11), and *Bluetooth*® wireless technology.

To further streamline the development process, TI offers support and service through its worldwide Independent OMAP Technology Centers (OTCs). Manufacturers can use OTCs to leverage leading expertise in hardware design, embedded software development, operating system support and system integration. It's possible to assemble a team of world class experts locally for your project using OTCs.

TI's global network of OTCs provides the diverse expertise that wireless manufacturers need locally:

- Systems integration
- Full turnkey design (hardware and software)
- Wireless systems architecture
- Embedded software development
  - Device drivers
  - OS Baseport development
  - OS optimization
  - Middleware
  - Applications
- Hardware design
- RF and antenna design
- Communication protocols and telephony
- GSM/GPRS, UMTS, WCDMA Protocols
- WLAN 802.11x, *Bluetooth*® wireless technology
- Multimedia codec development
- ARM® and DSP algorithm development

OTCs are valued members of TI's Wireless package with proven track records. As wireless designs become more integrated and complex, TI and its OTCs are working to ensure that manufacturers receive the

support and solutions they need to capitalize on the rapidly changing wireless market in the locale they want it. When you plan your next product development, consider the benefits of partnering with TI and an OTC for support.

[www.ti.com/otc](http://www.ti.com/otc)

Symbian™ OS
Elektrobit Fujitsu Broad Solution & consulting Hampex Intrinsyc MPC Data Limited Sasken SysOpen Digia TapRoot Systems Teleca Wipro
Linux®
Elektrobit Intrinsyc MPC Data Limited Sasken SysOpen Digia Wipro
Microsoft® Windows Mobile®
BSQUARE Fujitsu Broad Solution & consulting Intrinsyc MPC Data Limited Sasken Teleca Wipro
Nucleus™
Elektrobit Intrinsyc MPC Data Limited Sasken SysOpen Digia Wipro
Palm® OS
HandEra Teleca Wipro







## Software Development Tools

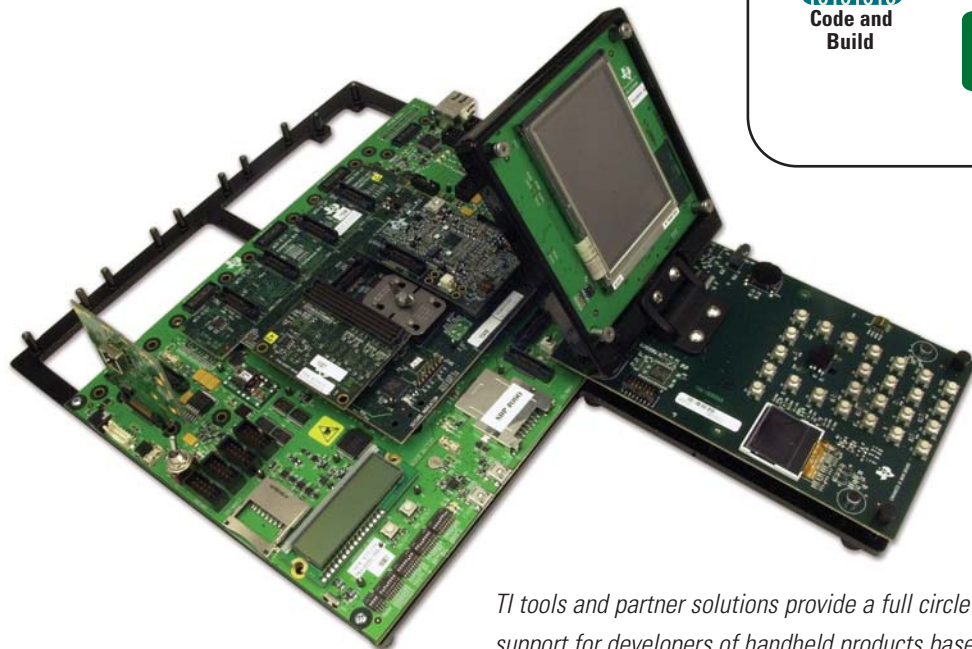
### OMAP™ Development Tools

From early development to final optimization, TI and partners provide a complete line of products that enable effective, efficient development for architectures based on the OMAP™ platform. Even before silicon is available, models allow you to simulate the device. Then, when silicon is ready, development platforms aid you in coding and debugging performance-critical applications.

TI's highly optimized Code Composer Studio™ integrated development environment (IDE) provides best-in-class support for development of DSP-based codecs and multimedia functions. TI also includes ARM® compilers with industry-standard ABI support that deliver fast, compact executable files. For debugging, TI's XDS-560 emulator allows you to take advantage of the emulation capabilities designed into OMAP processors. Finally, our innovative visualization and optimization tools help you to achieve the greatest performance possible with your design.

Complementary tool solutions are also available from TI's many partners. Close support from the Emulation Developer Community helps third parties to develop their products early and effectively. For example, companies such as Lauterbach and Sophia Systems provide powerful products for OMAP devices.

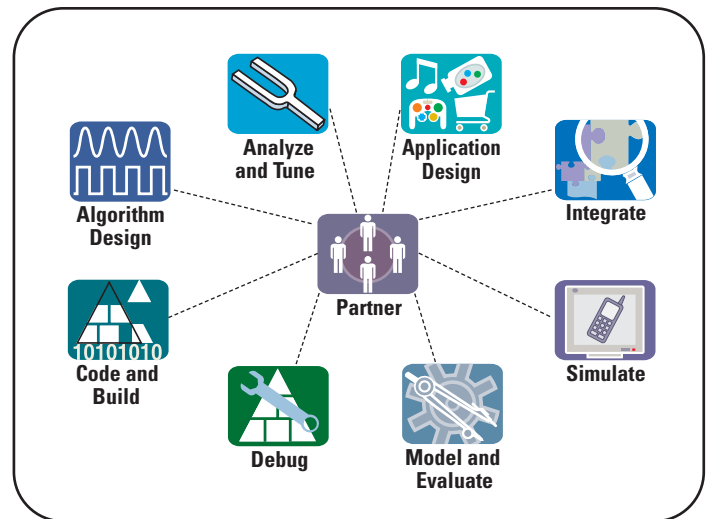
The comprehensive toolset for OMAP developers gives TI customers significant options to better help system integrators solve the functional requirements, performance goals and power constraints they face when developing wireless handsets.



*TI tools and partner solutions provide a full circle of support for developers of handheld products based on OMAP processors.*

### OMAP2430 Software Development Platform (SDP)

The OMAP2430 SDP offers an easy, cost-effective way to develop, evaluate and test software for next-generation advanced smartphones and converged portable multimedia devices based on the OMAP™ 2 architecture. The SDP provides a full range of software, services and support, including board support packages for access to high-level operating systems such as Symbian™, Linux® and Microsoft® Windows Mobile®. Throughout development, designers have flexible tools for developing all aspects of the system, including peripheral drivers. Visibility into each software component streamlines the debug process considerably. Tools for debugging mobile connectivity capabilities such as Bluetooth® or wireless LAN are also included.



*TI's OMAP2430 SDP saves time-to-market by providing all the hardware and software needed for cost-effective development of OMAP 2 processor-based systems.*



## High-Performance Multimedia-Rich Applications Processors



### OMAP1610 Processor

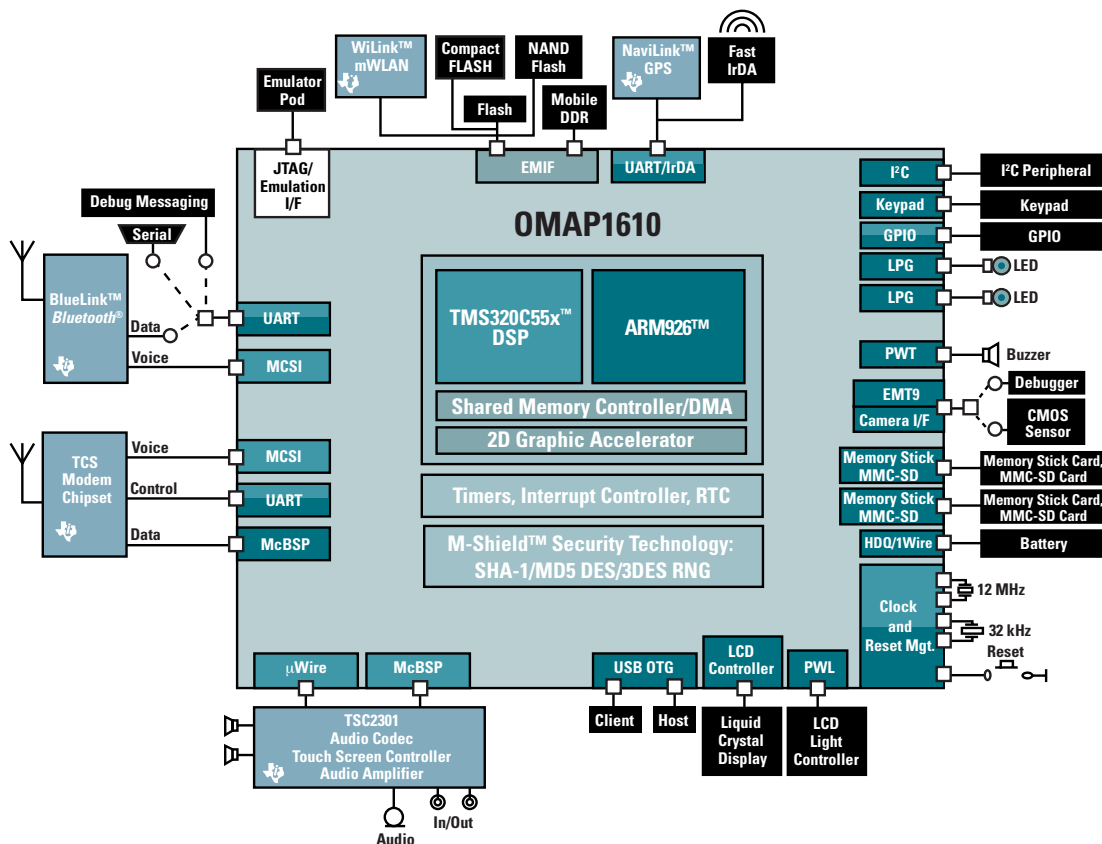
The OMAP1610 and OMAP16x devices are single-chip applications processors that feature the same dual-core architecture of the OMAP1510 based on TI's TMS320C55x™ DSP and TI-enhanced ARM926™ cores. Each core has processing capabilities of up to 200 MHz, resulting in enhanced performance for processing 2.5G and 3G multimedia applications such as video conferencing, interactive gaming, speech processing, location-based services, video streaming and others. Because the OMAP1610 shares the same architecture of the OMAP1510, manufacturers benefit with scalability across the OMAP™ processor family and gain a path to higher-end market segments.

The high-speed DSP and ARM® engines include hardware-based application accelerators such as a dedicated on-chip 2D graphics engine that eliminates the need for discrete graphic chips and multimedia acceleration. Java™ program accelerators are also incorporated into the OMAP1610, and a hardware-based security system provides protection of creative content or software, guarding confidential information and securing information transmission.

In addition to performance improvements, the OMAP1610 applications processor maintains standby power consumption levels of less than 10 µA and is among the lowest in the industry. It supports all cellular standards, and complements any modem, chipset and air interface.

#### Key Benefits

- Multimedia applications including video conferencing, interactive gaming, speech processing, m-commerce, location-based services and others
- Supports all cellular standards
- Migration path to high-end market segments through scalability
- Reduced power consumption through inclusion of hardware-based accelerators
- Secure mode-of-operation with wireless security hardware
- Dedicated on-chip 2D graphics engine
- TI-enhanced ARM926™
- Leverages TI's TMS320C55x™ DSP and TI-enhanced 200-MHz processing capabilities
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch



## High-Performance Multimedia-Rich Applications Processors

### OMAP1621 Processor

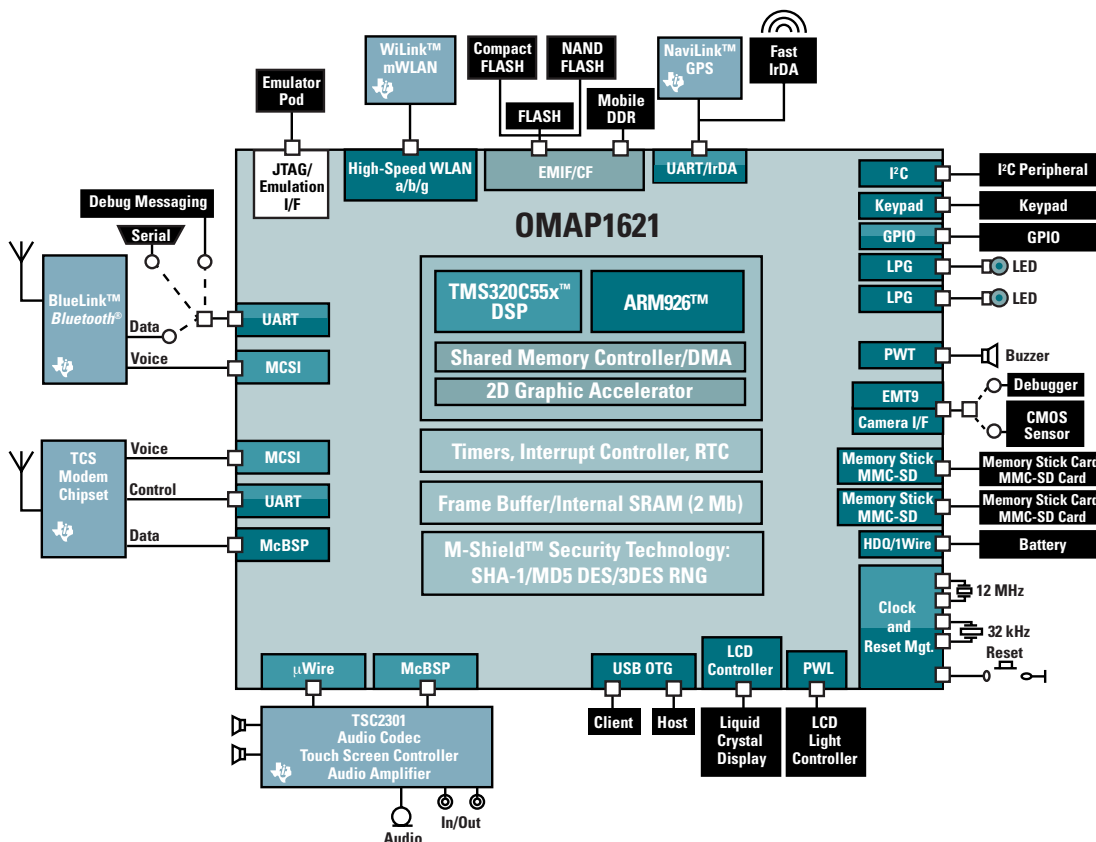
The OMAP1621 single chip applications processor is software compatible upgrade to the OMAP1610 processor. The OMAP1621 boasts improved ARM® and DSP performance versus previous devices to meet the increasing performance demands of multimedia enabled handsets. Additionally, the OMAP1621 processor adds 2 MB of internal SRAM optimized to act as a frame buffer enabling higher graphics and streaming media performance. To support higher resolution cameras, the OMAP1621 includes an enhanced camera port interface bus that results in higher throughput.

The OMAP1621 includes several hardware-based application accelerators that eliminate the need for discrete graphic chips and multimedia accelerators. Java acceleration is also included in the ARM and a hardware-based security system enables secure e-commerce applications and the replay of copyright protected digital media content.

The OMAP1621 and other OMAP16xx applications processors maintain standby power consumption levels of less than 10  $\mu$ A and are among the lowest in the industry. The processors support all cellular standards and complement any modem technology.

### Key Benefits

- The OMAP1621 processor enjoys all the same features, functionality and benefits of the OMAP1610 and more
- Increased DSP and ARM® performance
- Improved graphics and streaming media performance
- Improved support for higher resolution camera via an enhanced camera port interface bus
- Support of all cellular standards
- WLAN-capable to speeds up to 54 Mbps
- Scalable solution provides path to high-end market segments
- Reduced power consumption through inclusion of hardware-based accelerators
- Secure mode-of-operation through wireless security hardware
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch
- Mobile DDR memory stacked option (OMAP1623-512 Mb)



## High-Performance Multimedia-Rich Applications Processors



### OMAP1710 Processor

The dual-core OMAP1710 applications processor combines an ARM926™ processor with a TMS320C55x™ DSP core operating at 220 MHz. The first OMAP™ applications processor manufactured on TI's advanced 90-nm CMOS process technology, the OMAP1710 provides up to 40 percent more performance for a variety of applications, while consuming half the power of current TI applications processors in active mode.

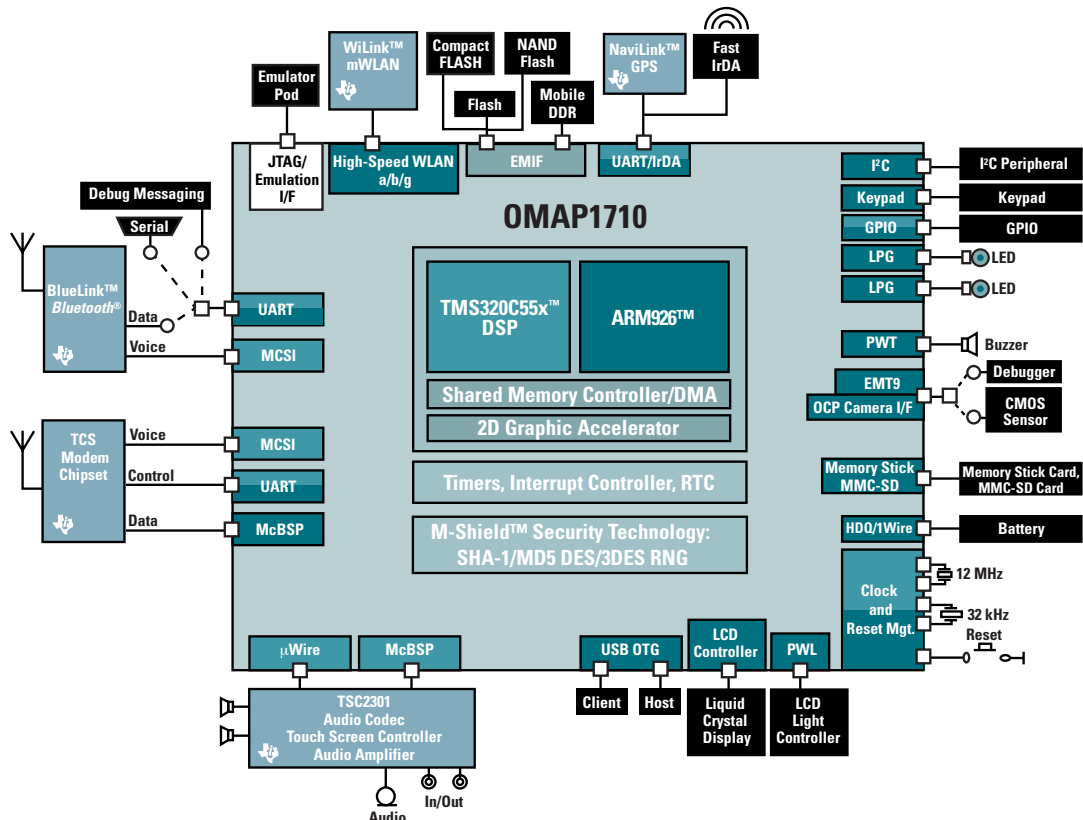
A range of software and hardware accelerators are included as part of the OMAP1710, including video encode and decode, still picture compression, Java™ and security. TI's advanced security hardware provides a secure execution environment and an ideal platform to address a range of security threats. Features including a secure bootloader, secure mode of operation, secure RAM and ROM and various accelerators are all aspects of TI's security-based capabilities.

The OMAP1710 is designed to handle a variety of applications in parallel for concurrent features and service. This unique approach ensures that applications are not interrupted or degraded when additional operations are launched or run simultaneously.

For manufacturers looking to increase performance and multimedia capabilities of their product line, the OMAP1710 offers an easy migration path due to software compatibility with previous generations of OMAP applications processors.

### Key Benefits

- First OMAP™ processor manufactured on TI's advanced 90-nm CMOS process technology
- 40 percent performance improvement in a variety of mobile applications
- TMS320C55x™ DSP and ARM926 at 220 MHz
- Software reuse due to compatibility and flexibility across other OMAP devices
- Multiple engines enable concurrent features and service without quality degradation
- High-performance camera interface supports up to 2.0 megapixels
- 802.11 capable up to 54 Mbps of data throughput with integrated VLYNQ™ interface
- Integrated hardware and software security
- Improved multimedia and graphics
- Optimized for TI's TCS wireless chipsets
- Advanced mobile OS support
- Broad range of applications through OMAP Developer Network
- Development support and access to open programming interfaces and development tools
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch



## High-Performance Multimedia-Rich Applications Processors

### OMAP2420 Processor

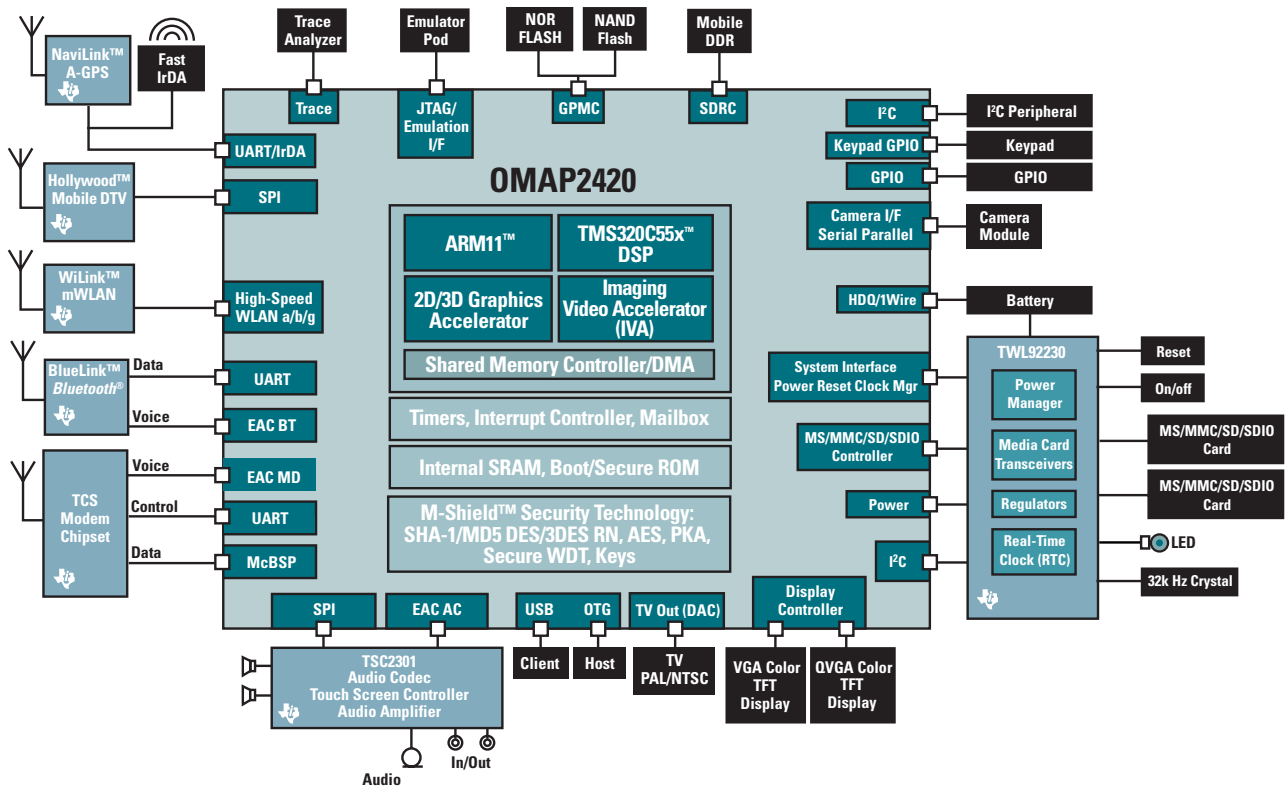
The OMAP2420, software compatible with previous OMAP processors, adds capabilities for further enhancing the “All-in-One Entertainment” capabilities that the OMAP 2 architecture brings to smartphones and wireless PDAs.

The OMAP2420 includes the benefits of the OMAP 2 architecture’s parallel processing, giving users the ability to instantly run applications and operate multiple functions simultaneously without quality of service compromises. The OMAP2420 includes an integrated ARM1136™ processor (330 MHz), a TI TMS320C55x™ DSP (220 MHz), 2D/3D graphics accelerator, imaging and video accelerator, high-performance system interconnects and industry-standard peripherals.

Multimedia enhancements made in the OMAP2420 include an added imaging and video accelerator for higher-resolution still capture applications, multi-megapixel cameras and full-motion video encode and decode with VGA resolution up to 30 frames per second. An added TV video output supports connections to television displays for displaying images and video captured from the handset. 5-Mb internal SRAM also boost streaming media performance.

### Key Benefits

- Dedicated 2D/3D graphics accelerator at 2 million polygons per second
- Imaging and video accelerator (IVA™) enables high-resolution still image capture, larger screen sizes and higher video frame rates
- Supports high-end features including 4+ megapixel cameras, VGA-quality video, high-end interactive gaming functionality and analog/digital TV video output
- 5-Mb internal SRAM boosts streaming media performance
- Software compatibility with previous OMAP™ processors
- Parallel processing ensures no interruptions or degradation of service with simultaneously running applications
- Optimized power management companion chip: TWL92230
- 14 mm x 14 mm, MicroStar BGA™, memory stackable package
- 12 mm x 12 mm MicroStar BGA package
- Mobile DDR memory stacking options (OMAP2422-512 Mb; OMAP2423-768 Mb)



## High-Performance Multimedia-Rich Applications Processors



### OMAP2430 Processor

The OMAP2430 high-performance applications processor delivers best-in-class multimedia performance to 2.5G and 3G wireless handsets and multimedia-enabled wireless PDAs. Based on TI's enhanced OMAP™ 2 multi-engine parallel processing architecture and high-performance, low-leakage 90-nm CMOS process technology, the OMAP2430 balances multimedia performance, flexibility, power and cost. Featuring TI's latest-generation imaging video and audio accelerator, the IVA™ 2, the OMAP2430 boosts mobile video playback performance to DVD quality. The processor also integrates a 330-MHz ARM1136® RISC processor core, dedicated 2D/3D graphics hardware acceleration, high-speed system interconnect, numerous peripherals, and camera, display and memory subsystems.

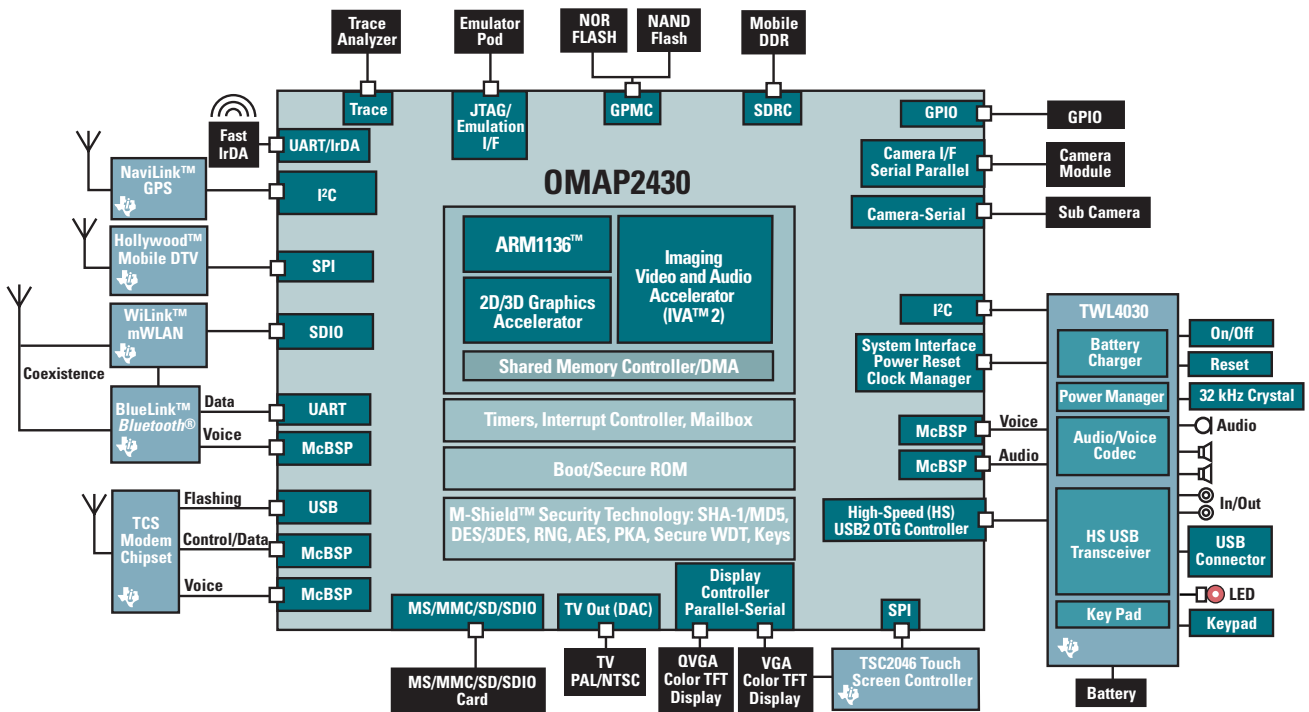
Multimedia features supported include:

- Downloadable media playback and digital TV decode: MPEG4, H.264, Windows Media® video (VC-1), RealVideo® version 10 decode up to D1 (720 x 480) 30 fps
- Still image capture: > 5 Mpixel with 1 second shot-to-shot delay
- Motion video capture: MPEG4, H.264 encoding up to VGA 30 fps
- Video teleconferencing: H.263, H.264 videoconferencing with simultaneous recording of VTC session up to CIF 30 fps
- 2D/3D gaming: rasterization up to 1 million polygons per second

### Key Benefits

- Advanced IVA™ 2 boosts video performance in mobile phones by up to 4X and imaging performance by up to 1.5X
- Delivering a multimedia experience with consumer electronics quality to the handset
- Multi-engine parallel processing architecture for supporting complex usage scenarios
- Built-in M-Shield™ mobile security technology enables value-added services and terminal security
- Support for all major High Level Operating Systems (HLOS) aids applications development
- Optimized power management companion chip: TWL4030
- 14 mm x 14 mm, MicroStar BGA™, memory stackable package

The OMAP2430 supports high-level operating systems (HLOS) including Linux®, Microsoft® Windows Mobile™ and Symbian™. The processor's high performance enables the use of more highly compressed codecs that bring spectral efficiency and cost savings. Built-in M-Shield™ security technology enables value-added services for content protection, transaction security and secure network access, plus terminal security functions such as secure flashing and booting, terminal identity protection and network lock protection.





## → High-Performance Multimedia-Rich Applications Processors

**NEW**

### OMAP3430 Processor

The OMAP3430 applications processor with the ARM® Cortex™-A8 core delivers up to 3X the performance of ARM11-based processors, enabling laptop-like productivity and advanced entertainment in 3G handsets. The industry's first applications processor to be designed in a 65-nm CMOS process, the OMAP3430 combines the optimal mix of advanced technology and innovation to provide the most advanced applications processor in the market.

The first device in TI's OMAP™ 3 architecture is the OMAP3430 multimedia applications processor. Designed in a 65-nm CMOS process, the OMAP3430 operates at a higher frequency than previous generation OMAP processors, while lowering the core voltage and adding power reduction features.

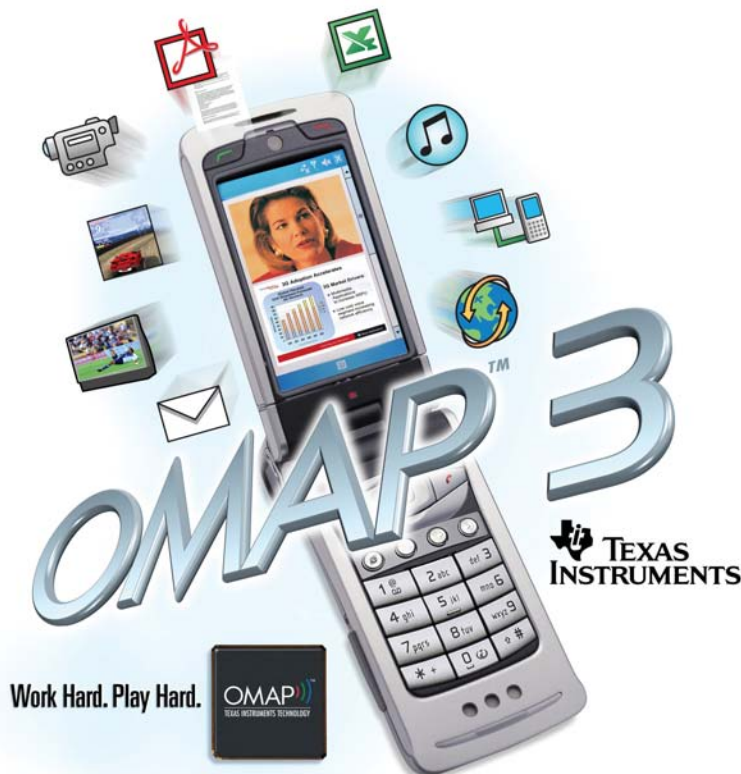
IVA™ 2+ a second-generation, power-optimized version of TI's imaging, video and audio accelerator used in TI's DaVinci™ technology provides up to 4X performance improvement in multimedia processing versus previous OMAP processors. The increased capabilities of the IVA2+ enables multi-standard (MPEG4, H.264, Windows® Media Video®, RealVideo® etc.,) encode and decode at DVD resolutions. With the advanced multi-media capabilities a multi-standard DVD-quality camcorder can be added to a phone for the first time. In addition, the ARM's vector floating-point acceleration, coupled with the OMAP3430's

dedicated 2D/3D graphics hardware accelerator, provides outstanding gaming capabilities.

System features include an integrated image signal processor, support for parallel and serial displays and cameras, Composite and S-video TV output, high speed USB 2.0 On-the-Go (OTG) support and much more.

The OMAP3430 boasts the most advanced and effective power management techniques in the market. The chip makes exhaustive use of TI's SmartReflex™ technologies which include a broad range of intelligent and adaptive hardware and software techniques that dynamically control voltage, frequency and power based on device activity, modes of operation and temperature.

The OMAP3430 supports high-level operating systems (HLOS) including Linux®, Microsoft Windows Mobile and Symbian™. Built-in M-Shield™ security technology enables value-added services for content protection, transaction security and secure network access, plus terminal security functions such as secure flashing and booting, terminal identity protection and network lock protection. Enhanced with ARM TrustZone™ support, OMAP3430 security is based on open APIs, providing an environment for secure applications that deliver robust performance and interoperability.





High-Performance Multimedia-Rich Applications Processors



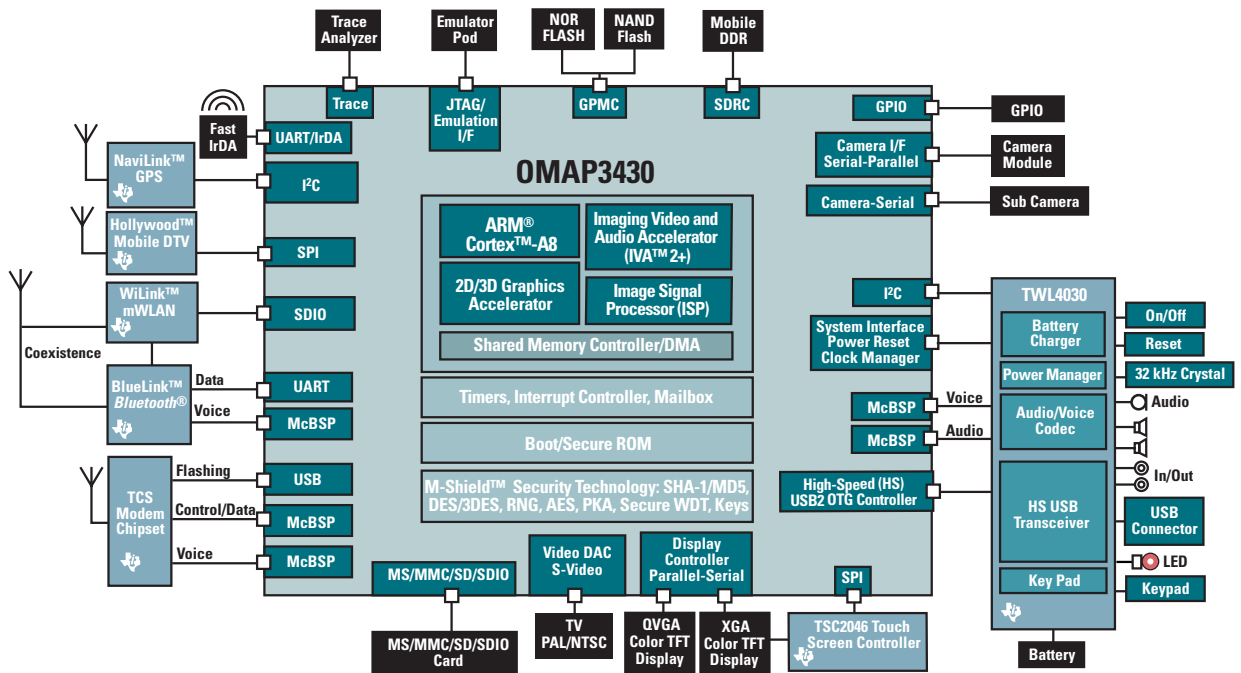
OMAP3430 Processor

Key Features

- Combines mobile entertainment with high performance productivity applications
- Industry's first processor with advanced superscalar ARM® Cortex™-A8 RISC core enabling 3X gain in performance
- Industry's first processor designed in 65-nm CMOS process technology adds processing performance
- IVA™ 2+ (Image Video Audio) accelerator enables multi-standard (MPEG4, WMV9, RealVideo®, H.263, H.264) encode/decode at D1 (720 x 480 pixels) 30 fps
- Integrated image signal processor (ISP) for faster, higher-quality image capture and lower system cost

Key Benefits

- Flexible system support
  - Composite and S-video TV output
  - XGA (1024 x 768 pixels), 16 M-color (24-bit definition) display support
  - Flatlink™ 3G-compliant serial display and parallel display support
  - High-speed USB 2.0 On-The-Go support
- Seamless connectivity to Hard Disk Drive (HDD) devices for mass storage
- Leverages SmartReflex™ technologies for advanced power reduction
- M-shield™ mobile security enhanced with ARM TrustZone™ support
- Software-compatible with OMAP™ 2 processors
- HLOS support for customizable interface
- Optimized power management companion chip: TWL4030



## → Basic Multimedia Applications Processors

### OMAP331 Processor

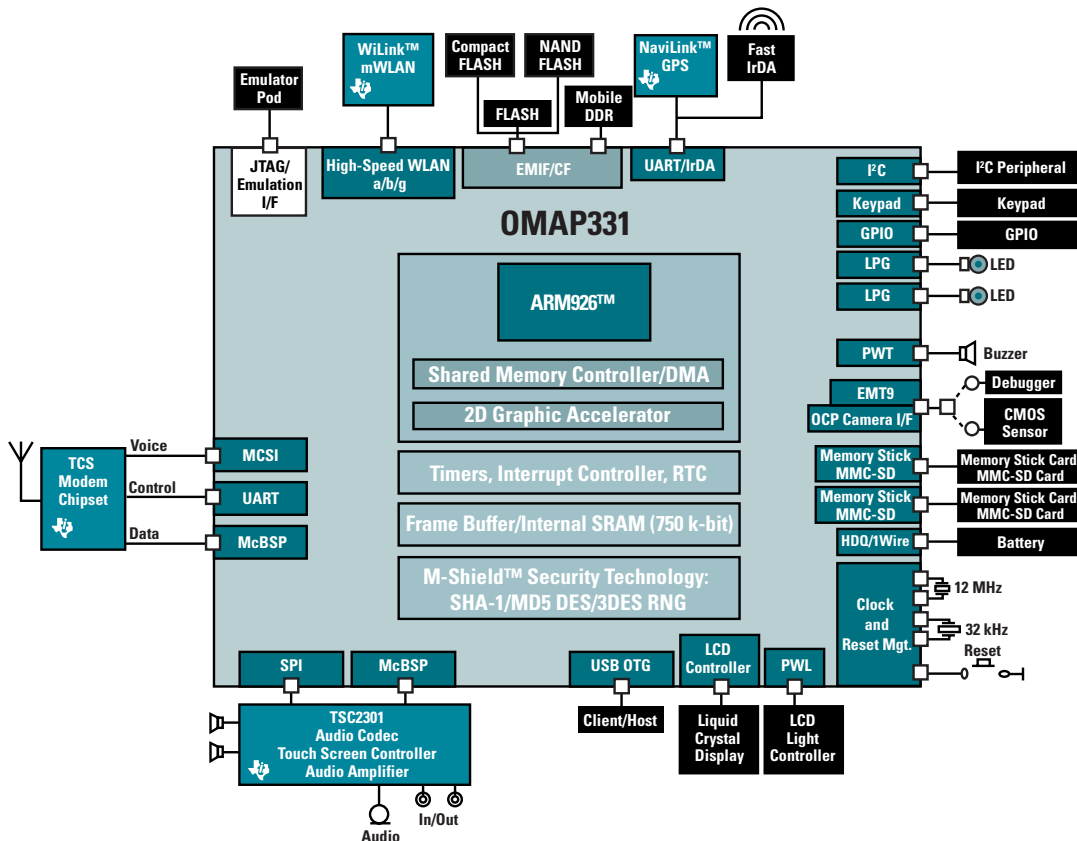
The OMAP331 applications processor provides a feature-rich platform for price-sensitive 2.5G and 3G handsets, PDAs and other mobile devices. Based on an ARM926™ processing core, the OMAP331 includes the features of the OMAP310 with extended capabilities for 17 percent faster performance over the OMAP310, and lower power consumption. Software reuse and compatibility with higher end OMAP™ devices provide manufacturers a migration path to higher performing smartphones, Internet appliances and multimedia devices.

Added features found in the OMAP331 include increased multimedia performance, faster processing speeds, a 2D graphics accelerator engine, improved frame buffer performance, a high-throughput direct memory access interface and several other enhancements. An on-chip frame buffer improves performance of multimedia applications like streaming video and graphics. Enhanced, high-resolution imaging is possible through a new parallel OCP camera port.

The OMAP331 includes a hardware-based security engine and random number generator for transparent security algorithm processing. Hardware accelerators are also included to address industry security standards such as MD5/SHA1 and DES/3DES.

### Key Benefits

- 17 percent faster performance and enhanced features over the OMAP310
- Low power consumption
- Software reuse and compatibility with other OMAP™ devices
- On-chip frame buffer and 2D graphics accelerator speeds multimedia performance
- High-resolution imaging through OCP camera port
- Hardware-based security platform
- 802.11 capable up to 54 Mbps
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch





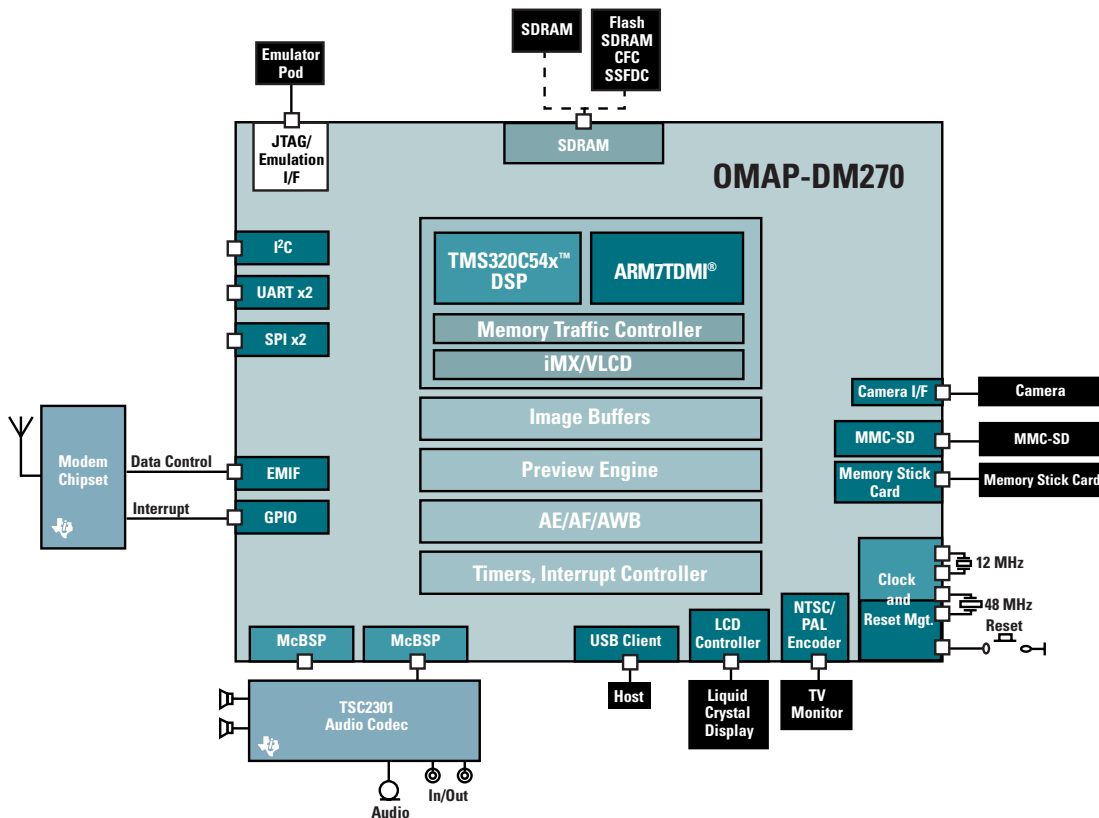
### OMAP-DM270

The OMAP-DM270 combines image-processing capabilities with a highly integrated imaging peripheral set in a programmable platform. Consisting of ARM7TDMI® and TMS320C54x™ DSP cores with on-chip program and data memory, the OMAP-DM270 offers enhanced performance and flexibility for camera-enabled mobile handsets and PDAs and fulfills customer demands for image quality, feature richness and low cost.

Platform programmability is achieved through a DSP-based imaging coprocessor that gives manufacturers the ability to implement proprietary image processing algorithms in software and differentiate their products. In addition, the OMAP-DM270 architecture supports various types of CCD and CMOS sensors, signal conditioning circuits, power management, SDRAM, shutter, iris and auto-focus motor controls.

The OMAP-DM270 supports all the popular audio, video, imaging and voice standards, including MPEG-4 video up to 30 fps (VGA). A full set of peripherals includes on-screen display and an interface for color LCD. Seamless interface to CompactFlash™, SmartMedia™, Secure Digital™ and Memory Stick™ cards are also provided as part of the OMAP-DM270 multimedia processor.

Key Benefits
• Integrated programmable platform lets manufacturers add image-processing algorithms
• Performance delivers high image quality and rich features in cost-effective solution
• Broad range of encoding support, including support of all major audio, video, imaging and voice standards
• MPEG-4 video support of up to 30 fps (VGA)
• Live view and digital zoom through preview engine
• Real-time auto-focus, auto-white balance and auto-balance statistics
• Highly integrated peripheral set
• Leverages 130 nm process technology for low power and increased performance



## → Integrated Modem and Applications Processors

### OMAP730 Processor

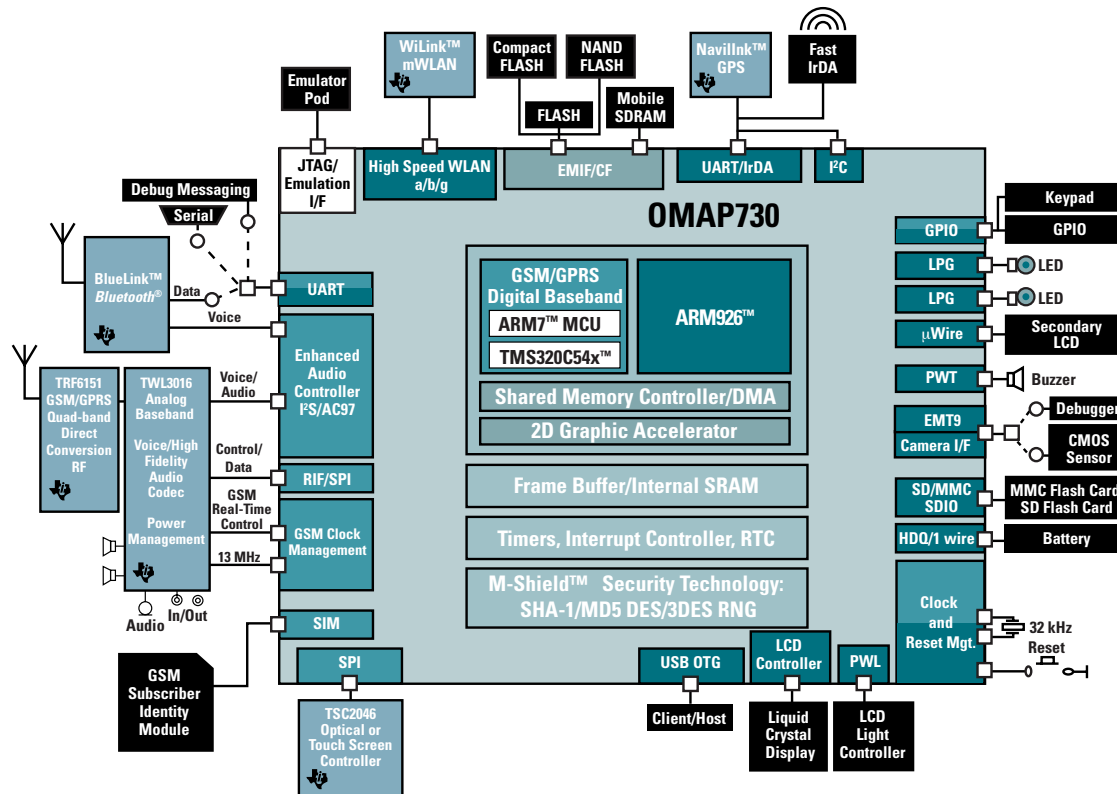
The single chip OMAP730 builds on the proven foundation of the OMAP710 processor, and offers twice the application performance and double the standby time for handsets, smartphones and PDAs. It includes a dedicated TI-enhanced ARM926™ processor for applications processing, and TI's Class 12 GSM/GPRS digital baseband that incorporates an ARM7TDMI® and TMS320C54x™ DSP core. The ARM926 applications processor enables applications like high-quality streaming audio, hardware-based security, accelerated Java™ processing, web browsing, personal information management (PIM) applications, location-based services and more. The OMAP730's integrated SRAM frame buffer boosts streaming media performance and lowers IDLE-mode power.

Forty integrated on-chip peripherals included as part of the OMAP730 reduce board space by half over the previous generation and overall system cost by one-third. This provides additional space for functionality such as WLAN, GPS or *Bluetooth*® wireless technology. A comprehensive hardware security subsystem is also included and consists of a secure bootloader, secure execution environment with secure RAM and ROM, and hardware accelerators for encryption and authentication.

The OMAP730 processor is available as part of the TCS2600 chipset and reference design.

### Key Benefits

- Twice the application performance over the previous generation
- Double the standby time for handsets, smartphones and PDAs
- Half the board space over the previous generation and reduced system cost
- Enables applications including accelerated Java™ processing, web browsing, personal information management, location-based services and more
- Increased space for adding functionality including WLAN, GPS or *Bluetooth*® wireless technology
- Security protection through hardware security subsystem
- Integrated peripherals including USB On-the-Go and VLYNQ™
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch
- Mobile SDR memory stacked option (OMAP733-256 Mb)





### OMAP750 Processor

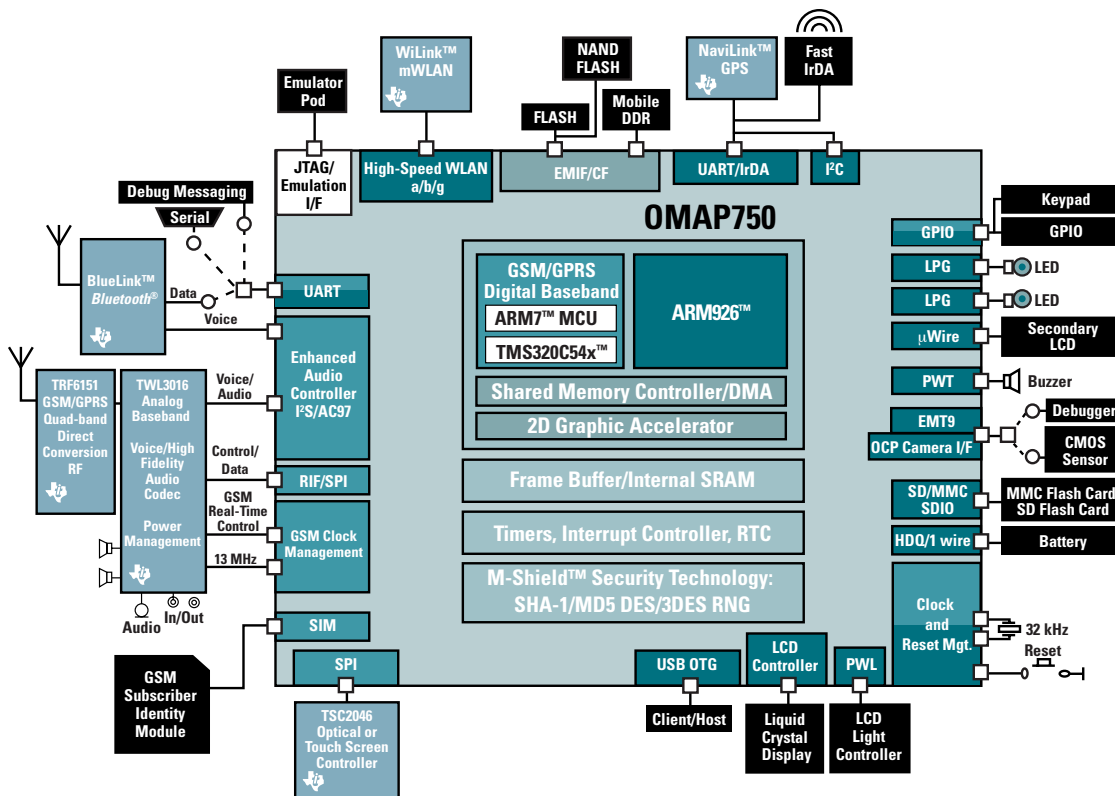
Targeted at wireless handsets, smartphones, PDAs and Internet access devices, the OMAP750 extends capabilities of the OMAP73x device while including a range of features that improve multimedia application performance. The single-chip OMAP750 integrates an ARM926™ core dedicated to applications processing with a complete Class12 GSM/GPRS modem baseband subsystem that consists of an ARM7™ core with TI's low power TMS320C54x™ core.

The OMAP750 incorporates faster memory options, including support of double data rate (DDR) memory that increases processing speed over the OMAP730, which only supported SDRAM. Improved throughput from an internal frame buffer also enhances processing of multimedia applications, including streaming video and high-end imaging functions.

The OMAP750 provides strong security safeguards, as its hardware-based measures offer a higher degree of protection over software-only features. A secure bootloader, secure memory (ROM and RAM), and random number generators are included. Security hardware accelerators also address popular security standards like MD5/SHA1 and DES/3DES.

#### Key Benefits

- Improved multimedia and application performance
- Class 12 GSM/GPRS modem baseband and ARM926 core for applications processing
- Increased processing speeds through DDR memory option and internal frame buffer
- Protection through hardware-based security platform
- Extended list of peripherals, including parallel OCP camera interface for high resolution imaging
- GPS, WLAN and Bluetooth® wireless technology capable
- 2.0 megapixel camera
- Pin-to pin compatible with OMAP730
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch



## → Integrated Modem and Applications Processors

### OMAP850 Processor

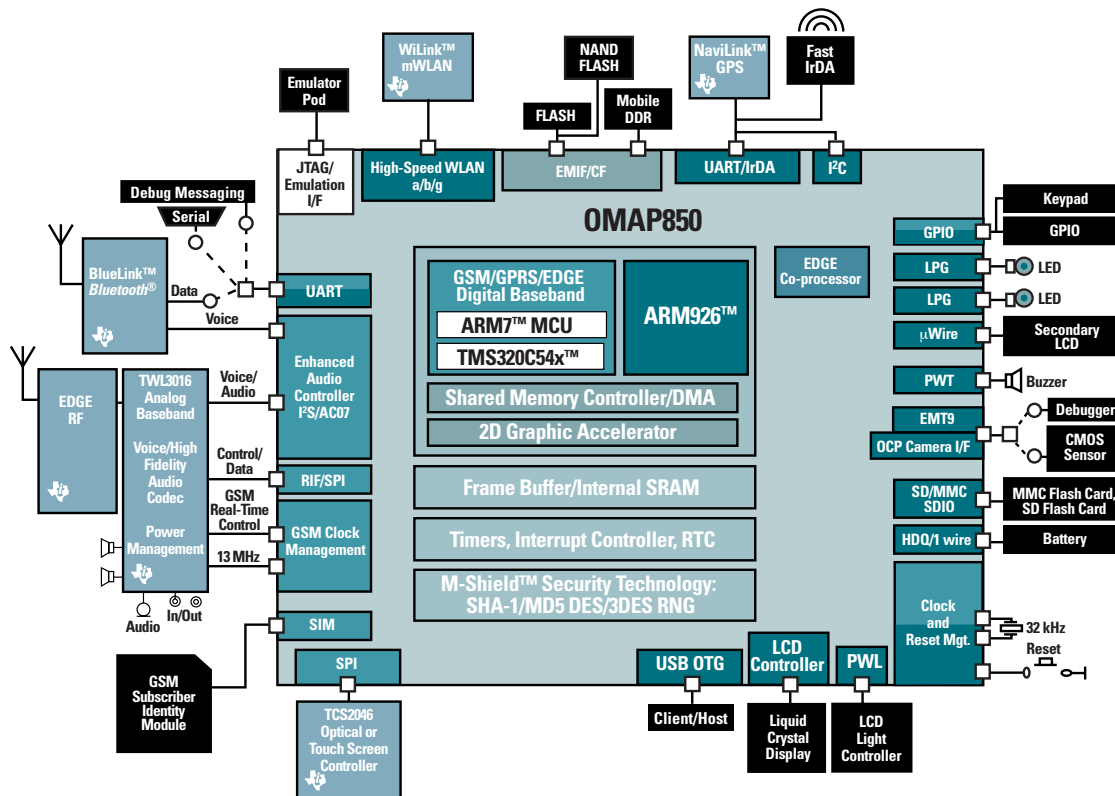
Designed to work as part of the TCS3500 chipset, the OMAP850 integrated modem and applications processor offers the high performance and low power required for GSM/GPRS and EDGE applications including multimedia, gaming and camera functionality. Because it is software compatible with other OMAP™ applications processors, it serves as an ideal choice for upgrading wireless smartphones and PDAs to meet the EDGE standard requirements.

The OMAP850 processor integrates into a single package an ARM9-based applications processor and a GSM/GPRS/EDGE digital baseband. It is based on the OMAP750 and supports MPEG-4 video, Windows Media® video, MP3, 2.0 megapixel camera and more.

TI includes a security hardware platform as part of the OMAP850 that includes secure boot, secure mode and hardware encryption accelerators. It supports high-level mobile OSs, such as Symbian OS™, Microsoft® Windows Media®, S60 and Linux®.

### Key Benefits

- Enables multimedia, gaming and camera functions in high-performance smartphones and PDAs
- Based on previous generation OMAP730 applications processor
- GSM/GPRS/EDGE capable
- Software compatible with family of OMAP™ applications processors
- Support for various software standards including MPEG-4 video, Microsoft Windows Media video, MP3, 2.0 megapixel camera and others
- High-level mobile OS support
- Broad range of applications through OMAP Developer Network
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch







## OMAP-Vox™ Solutions

One important aspect of 3G success is the ability to bring advanced services to the broadest possible population of mobile users. TI's OMAP-Vox™ platform is the answer. With OMAP-Vox solutions, TI adds modem functionality to its successful OMAP™ architecture, and with software compatibility across the platform, customers can easily scale across multiple market segments from GSM/GPRS/EDGE to UMTS. OMAP-Vox solutions are optimized to efficiently run a dynamic mix of application and communication functions on the same hardware. They integrate proven modem, multimedia and applications processing onto a single chip with a compatible software foundation that can be reused for evolving market segment requirements.

Targeted from cost-effective phones to high-end mobile entertainment phones enabled by TI's OMAP architecture, the new OMAP-Vox platform continues TI's legacy of software compatibility and reuse, therefore saving years of software design effort. This software will serve as the foundation for applications, multimedia and communications development on all OMAP-Vox solutions, saving manufacturers time and money. This allows customers to design a variety of handsets to meet the high-volume 2.5G marketplace today with a quick migration to 3G.

From antenna-to-applications, the OMAP-Vox platform offers complete system solutions encompassing an integrated modem and applications processor, RF, analog and power management functions, complete field-tested protocol stack software, highly performing multimedia codecs and functions, applications software suite, a competitive form-factor handset reference design and a complete development toolkit.

The OMAP-Vox family includes the OMAPV1030 GSM/GPRS/EDGE, and OMAPV2230 UMTS integrated solutions. Optimized to enable mid-range multimedia devices, the OMAPV1030 supports applications such as high-quality video capture and playback, video streaming downloads, megapixel digital still cameras and interactive 2D/3D gaming. The OMAPV2230, designed for high-end mobile communications, enables worldwide roaming and supports an even wider variety of multimedia applications with consumer electronics quality. Both solutions are built on TI's leading modem and OMAP technology and leverage TI's advanced high-volume 90 nm digital process technology.

Customers using TI's wireless chipsets will also be able to reuse the GSM/GPRS protocol stack software when migrating to the OMAP-Vox platform. These complete, scalable solutions deliver the necessary elements to bring differentiated mobile devices to market fast, including a broad range of hardware, software, reference designs, development tools and support.



## OMAP-Vox™ Solutions

### OMAPV1030 Integrated GSM/GPRS/EDGE Solution

The OMAPV1030 is one of the industry's most highly integrated and optimized EDGE solutions, combining applications and modem on a single device to enable handset manufacturers to reduce costs and speed time to market. The baseband processor design expands on TI's proven GSM/GPRS technology and leverages TI's advanced high-volume 90 nm digital CMOS process technology.

The OMAPV1030 processor is based on the OMAP™ architecture and runs both GSM/GPRS/EDGE modem and applications processing on a single OMAP core, ensuring a high-quality multimedia mobile experience. The combination of the ARM926EJ-S™ and TI DSP is used to improve performance while reducing costs and power consumption, resulting in longer battery life and usage times for consumers. Because all OMAP-Vox solutions share a common software platform, this solution maximizes software re-use to bring overall development costs down and provides a natural and affordable roadmap from GSM/GPRS/EDGE to UMTS.

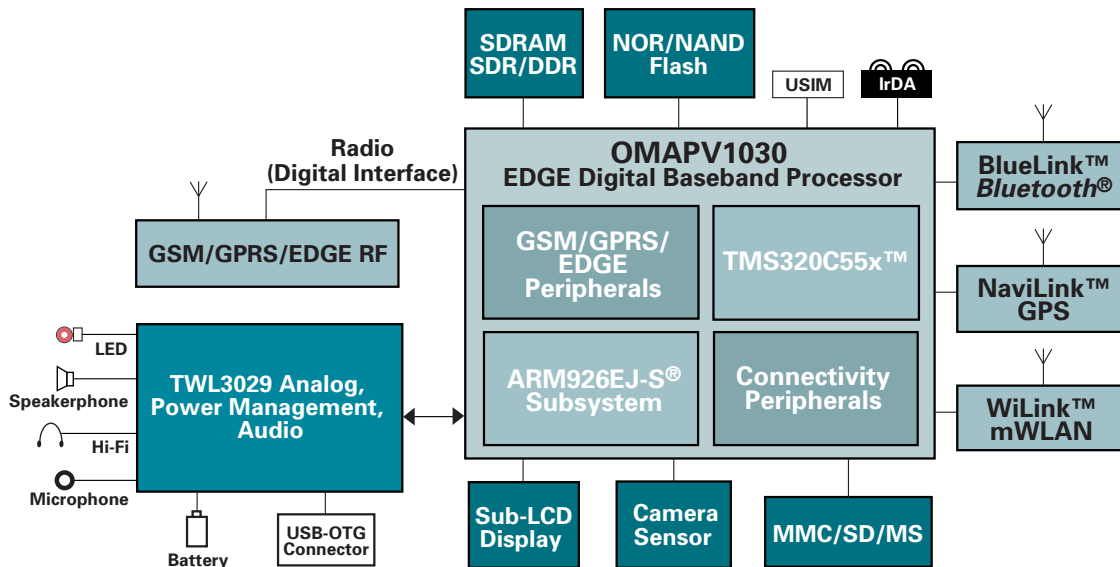
The OMAPV1030 solution is specifically designed to bring multimedia functionality to mass market mobile phones, and delivers advanced capabilities to mid-range wireless handsets. These capabilities include:

- Digital camera with 2-megapixel still images
- Video capture, playback, and streaming at 30 fps (rendering up to QVGA)
- Digital audio such as MP3, AAC+, enhanced AAC+ and other audio formats

### Key Benefits

- Integrated modem and applications processing on a single core
- Reduced bill of materials
- Support for Nucleus™ based applications suites (as well as Java™ acceleration support)
- Ability to support high-level operating systems such as Microsoft® Windows Mobile® software, Symbian OS™ software and embedded Linux®
- Improved performance while reducing costs and power consumption
- Feature-rich multimedia with high-end performances
- Embedded security via hardware accelerators supporting terminal security, transactions security, and content security—without the latencies and risks associated with software-only solutions
- Access to the OMAP platform ecosystem, including software developers, system integrators, and development tool providers

- Two-color LCD screens with main screen up to QVGA in size
- 2D and 3D gaming
- High-performance Java™
- 64 polyphonic MIDI ringtones
- Hardware-based security
- Connectivity with USB, Bluetooth®, IrDA, WLAN, external memory cards



### OMAPV2230 Integrated UMTS Solution

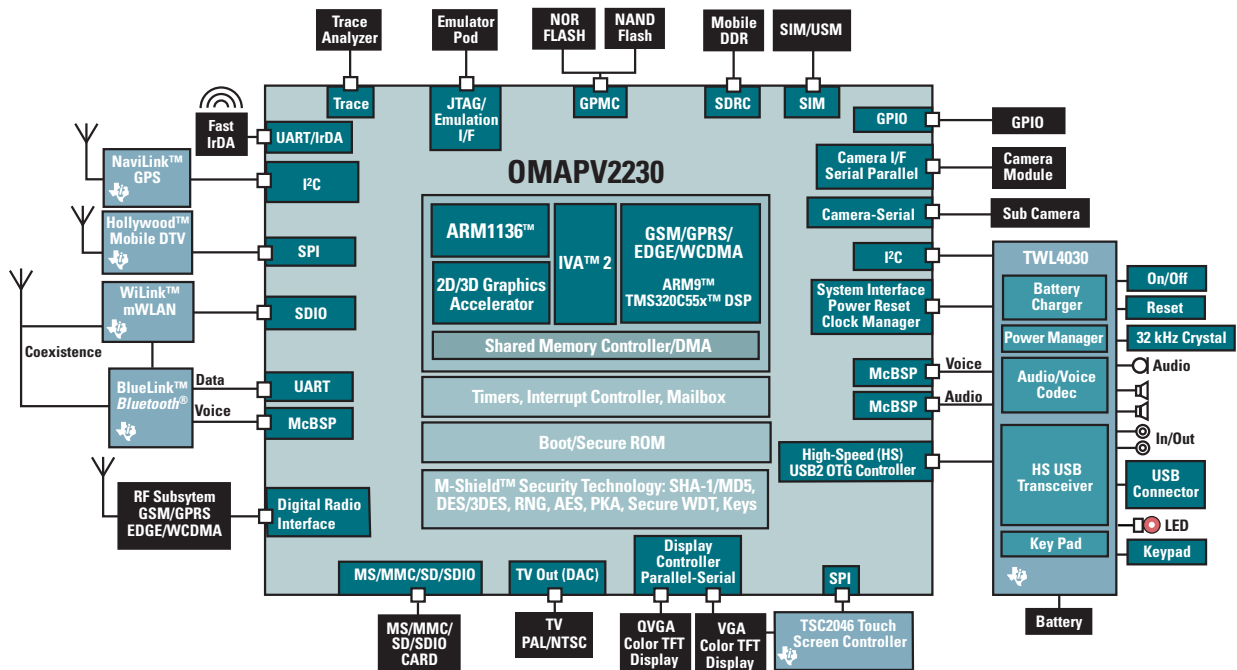
The OMAPV2230 UMTS solution for 3G handsets provides size, performance and power consumption benefits by integrating both modem and applications on a single device. The digital baseband is based on proven WCDMA/GSM/GPRS/EDGE technology, and the applications processor is based on TI's OMAP™ 2 architecture. Manufactured using TI's 90 nm advanced CMOS process technology, the OMAPV2230 enables worldwide roaming and supports a variety of multimedia applications with consumer electronics quality. The architecture makes it easy to migrate existing OMAP software, and the open platform and flexible connectivity options enable product differentiation with value-added features.

The integrated applications enables a variety of mobile entertainment applications at streaming speeds up to 384 Kbps. The platform is capable of supporting video codecs such as H.263, MPEG4, H.264, WMV and RealVideo, plus high-quality audio codecs such as MP3, WMA, RealAudio and AAC/AAC+. An advanced IVA™ 2 accelerator and a 3D graphics accelerator core enable:

- Video streaming and playback with high-quality audio up to 30 fps VGA
- Camcorder with high-quality audio up to 30 fps VGA
- Two-way video teleconferencing up to 30 fps CIF
- >5 megapixel digital still camera with < 1 second shot-to-shot delay
- Interactive 3D gaming rendering up to 1M triangles/second
- Fast audio and video download
- Mobile digital TV decode and display

#### Key Benefits

- Advanced applications and modem integrated in one device enable a low-power, high-performance system solution
- Enables worldwide operation for WCDMA/GSM/GPRS/EDGE modem standards
- Advanced Imaging, Video and Audio Accelerator (IVA™ 2) boosts video performance in mobile phones up to 4X and imaging performance up to 1.5X
- Delivers a multimedia experience with consumer electronics quality to the handset
- Multi-engine parallel processing architecture supports complex usage scenarios
- Built-in M-Shield™ mobile security technology enables value-added services and terminal security
- Support for all major High Level Operating Systems (HLOS) aids applications development
- Optimized power management companion chip: TWL4030





## Overview



### To Know More

#### Mobile Connectivity Solutions featured in this issue:

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To deliver mobile connectivity on multiple networks in today's complex mobile devices, TI's integrated, proven wireless connectivity solutions ensure multi-mode operation and access to a variety of network connections for service anytime, anywhere. TI offers single-chip solutions for *Bluetooth*® technology, mobile WLAN, GPS and mobile digital TV using TI's DRP™ technology and 90 nanometer process technology. TI's mobile connectivity solutions are TI's tightly integrated with TI's cellular modem solutions, OMAP™ processors and OMAP-Vox™ solutions so manufacturers can get products to market efficiently and fast. TI is also looking to the future by driving development of future mobile technologies such as Ultra Wideband, FM radio and others.

### *Bluetooth*® Wireless Technology

TI focuses on delivering *Bluetooth* technology for mobile devices. By leveraging its innovative DRP technology, TI's single-chip *Bluetooth* wireless solutions integrate a RF and *Bluetooth* processor that is optimized to mix with the various 2.5G and 3G communication standards. TI's single-chip *Bluetooth* solutions deliver high performance with low power and lower system cost, enabling manufacturers to provide optimized *Bluetooth* wireless personal area networking (WPAN) connectivity to their mobile devices.

### 802.11/WLAN

Optimized at the hardware, firmware and driver level, TI solutions deliver the power efficiency, small size, data/access security and spectrum sharing required for mobile WLAN handsets. Innovative performance levels, the industry's lowest power and smallest size and interoperability across mobile standards bring embedded and battery-powered applications a new level of functionality and extended battery life. TI also offers support for Voice over WLAN (VoWLAN) technologies to deliver seamless voice and data connectivity between WLAN and cellular networks.

TI's experience also has resulted in a coexistence package for WLAN and *Bluetooth* wireless technologies in co-located environments. TI's coexistence platform enables data and voice to be transmitted without interference while optimizing system throughput, range, and responsiveness. And with no antennae isolation requirements, even providing for shared antenna designs, it is ideal for mobile phone designs.

### Mobile Digital TV

Mobile digital broadcast TV (DTV) combines the two best-selling consumer products in history—TVs and mobile phones. TV will be an ingredient that drives demand for the next generation of wireless mobile phones because consumers want both communications and entertainment—all in one place and in one device. TI technology is driving mobile digital TV with Hollywood™ mobile broadcast solutions, the wireless industry's first digital TV on a single piece of silicon, which captures broadcast signals and allows consumers to watch live TV programming on their handset. Together, a Hollywood single chip and an OMAP™ processor will bring you the same TV you watch at home—but on your cell phone.

### GPS

TI addresses assisted GPS (A-GPS) and stand-alone GPS with a highly integrated single-chip solution interfaces with TI's wireless chipsets and delivers precision location capabilities to markets ranging from voice-centric handsets to high-end multimedia smart phones. TI's GPS5300 NaviLink™ 4.0 single-chip solution for A-GPS applications is optimized for 3G mobile phones. Through DRP technology, TI is able to provide the smallest size and lowest cost A-GPS discrete solution with low power and high performance to mobile phone manufacturers.

### Ultra Wideband

Ultra Wideband (UWB) is a wireless technology for transmitting digital data at very high rates over a wide spectrum of frequency bands using very low power, targeted for wireless personal area networks (PANs). UWB is ideally suited for wireless communications, particularly short-range and high-speed data transmissions. TI is actively involved with the WiMedia™ Alliance to promote and enable the rapid adoption and standardization of UWB worldwide for high-speed wireless, multimedia-capable personal-area connectivity in the PC, CE and mobile market segments.



**BlueLink™ 5.0 Bluetooth® Single-Chip Solution**

Optimized for mobile terminals, the BlueLink™ 5.0 platform from TI is a highly integrated, digital CMOS, single-chip solution supporting Bluetooth® Specification v2.0 and all software needed for Bluetooth operation. The BRF6300 BlueLink 5.0 single-chip solution is based on TI's prior generation BRF6150, leveraging and exceeding its capabilities to provide maximum Enhanced Data Rate (EDR) support, lowest power consumption in most Bluetooth scenarios and lowest cost and bill of materials (BOM).

TI's BRF6300 BlueLink 5.0 solution integrates the Bluetooth baseband, RF transceiver, ARM7TDMI®, memory (ROM and RAM) and power management on one chip. The single chip utilizes TI's DRP™ technology, a revolution in RF technology offering major advantages over the existing solutions based on analog RF. All-digital single-chip benefits include increased scalability, lower power consumption, reduced size and ultimately lower system cost.

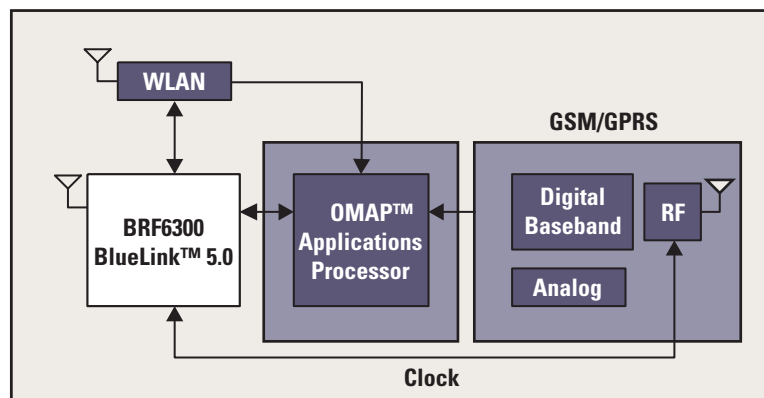
The single chip is optimized for mobile terminals delivering the RF performance and ease of integration required by manufacturers. TI's advanced process and novel design enables the BRF6300 BlueLink 5.0 solution to connect directly to the battery (up to 5.4 V). This saves the cost and space of an external regulator and simplifies the interface and integration with the host by separating their power management entities.

For ease of design, the BlueLink 5.0 platform is pre-integrated in complete reference designs with TI's cellular modem chipsets and OMAP™ processors. The single chip includes TI's proven collaborative coexistence mechanism between WLAN and Bluetooth networks. This feature combined with Bluetooth Specification v2.0 adaptive frequency

**Key Benefits**

- Best cost and performance Bluetooth® wireless technology solution
- Supports specifications v2.0 and Enhanced Data Rate (EDR) single-chip solutions for mobile terminals
- Industry best power management including lowest power consumption, direct connection to battery (up to 5.4 V) and shut-down (6 µA) to enable market's longest talk, standby times
- Complete solution for faster time-to-market and integration
- Cost savings
  - Complete set of reference designs with TI's OMAP™ processors and TCS chipsets
  - WLAN coexistence solution
- Based on TI's cutting-edge 90-nm CMOS and DRP™ technology

hopping (AFH) and extended Synchronous Connection Oriented (eSCO) allows TI to deliver a high-quality Bluetooth voice and enhanced data throughput when co-located in small mobile products such as smartphones and wireless PDAs.



**Smartphone application: BRF6300 BlueLink 5.0 solution interconnects with the OMAP™ applications processor, GSM/GPRS chipset and WLAN.**



## BRF6150 Solution (WPAN)

### BRF6150 Single-Chip *Bluetooth*® Wireless Technology

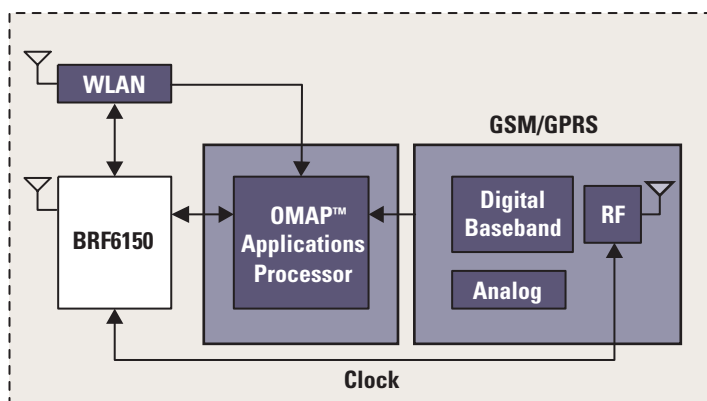
Optimized for mobile terminals, TI's BRF6150 is a highly integrated *Bluetooth*® wireless technology Specification v1.2 solution that combines TI's *Bluetooth* wireless technology baseband, RF, ARM7TDMI® and power management into a single chip. Its extreme levels of integration enhance performance and lower power consumption while reducing cost and minimizing board space.

The BRF6150 is based on TI's BRF6100 device. Improved RF performance and power management capabilities deliver higher integration and reduced package size, resulting in a 50 mm<sup>2</sup> PCB layout *Bluetooth* wireless technology solution for cellular phones. The BRF6150 is tailored to suit cellular applications requirements, including RF performance, power consumption, solution size, ease of integration and cost. It connects directly to the battery, saving cost and space of external regulators and simplifying the interface with the host by separating power management entities.

The BRF6150, which utilizes AFH, offers an upgrade to the current coexistence solution. When manufacturers combine the v1.2 compliant BRF6150 with TI's WiFi/*Bluetooth* wireless technology coexistence software package for either the TNETW1100B chipset for 802.11b or TNETW1230 solution for 802.11a/b/g, improved coexistence performance is achieved. This results in better utilization of the 2.4 GHz frequency band and solves the most demanding coexistence scenarios for simultaneous *Bluetooth* wireless technology voice/data and high speed Wi-Fi data. It also enhances WLAN data throughput to maximum performance when co-located into small mobile products such as smartphones and wireless PDAs. The BRF6150 includes complete reference designs with TI's GSM/GPRS chipsets and OMAP™ platform.

### Key Benefits

- Industry's longest talk, standby and shut-down times
- Direct connection to battery provides improved power management (2.7 V to 5.5 V)
- Full *Bluetooth*® Specification v1.2, including AFH and faster connection
- Low cost and part count due to high integration and improved interfaces
- Reduced development time through availability of pin-to-pin compatible stacked-flash prototypes (4.5 mm x 4.5 mm)
- Complete reference designs with TI's OMAP™ Platform and GSM/GPRS chipsets provide fast time-to-market
- WLAN collaborative coexistence solution
- Manufactured in 130 nm process to meet mass-production needs



**Smartphone application: BRF6150 interconnects with the OMAP™ applications processor, GSM/GPRS chipset and WLAN.**





**WiLink™ 4.0 Mobile WLAN Single-Chip Solutions**

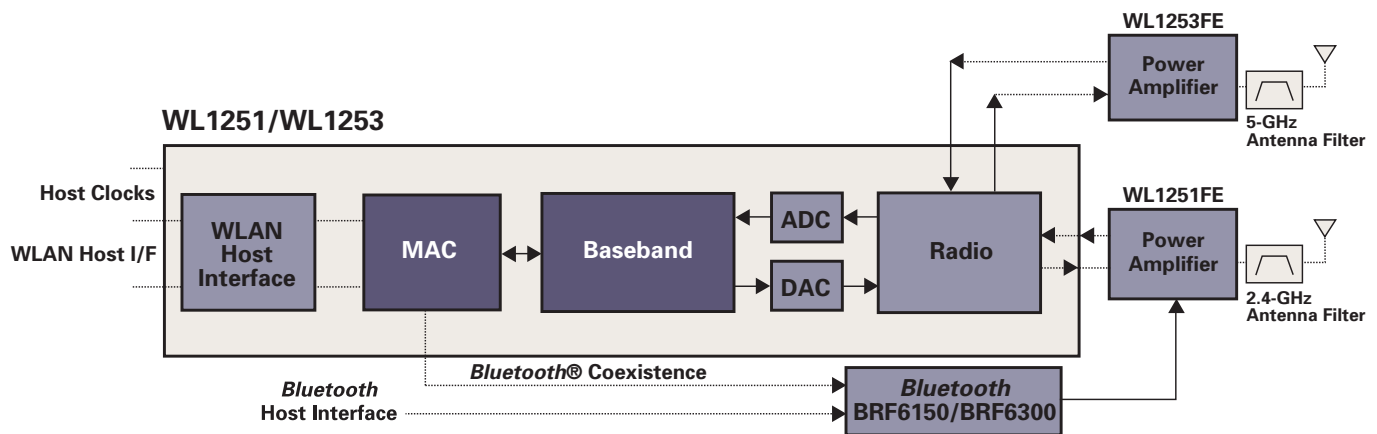
TI's WiLink™ 4.0 mobile WLAN platform is a complete hardware and software offering optimized for mobile phones. TI's WiLink 4.0 platform offers two different hardware single-chip implementations to provide flexibility for OEMs to offer IEEE 802.11b/g or IEEE 802.11a/b/g operation. The WL1251 802.11b/g solution and the WL1253 802.11a/b/g solution are single chips which integrate the media access controller (MAC), baseband processor and RF transceiver. Additionally, both single chips support IEEE 802.11e/i/d/k and the WL1253 802.11a/b/g solution also supports IEEE 802.11h/j.

The WL1251 and WL1253 WiLink 4.0 single-chip solutions are manufactured in 90 nm process technology and extend TI's leadership in single-chip integrated solutions using TI's DRP™ technology. Both single-chip solutions are pin-for-pin compatible to simplify manufacturers' product line strategies for 802.11b/g and 802.11a/b/g products. This compatibility enables just-in-time manufacturing options that are responsive to marketplace demand and design reuse to speed time-to-market of new products.

The WiLink Software Development Kit (SDK) 4.X included with the WiLink 4.0 platform is optimized for embedded applications. This includes support for Linux®, Windows® WinCE™, Symbian™ operating systems, as well as lab testing and manufacturing software. It is also partitioned to minimize host CPU loading and power consumption in mobile applications.

**Key Benefits**

- Complete WLAN hardware and software solutions optimized for mobile IEEE 802.11b/g, IEEE 802.11a/b/g applications
- Single-chip 802.11 Media Access Controller/Baseband/RF transceiver WLAN solutions (WL1251 and WL1253) reduce BOM costs, saves PCB space and extend standby and talk times
- Voice over WLAN (VoWLAN)-ready: Sophisticated power-saving sleep modes match the packet and traffic characteristics of VoWLAN applications
- First WLAN solutions using 90 nm manufacturing process and uses TI's DRP™ technology to enable market leading physical size (6 mm x 6 mm BGA) and low power consumption
- Industry's lowest power consumption with TI's ELP™ technology extends battery life of handsets, wireless PDAs and other mobile devices
- Bluetooth® coexistence technology ensures high quality of service during simultaneous voice and data WLAN and Bluetooth operations



*\*Optional: The WL1253FE is only used in conjunction with the WL1253 for 802.11a operation*



## WLAN and Bluetooth® Coexistence

### Bluetooth® and WLAN Coexistence

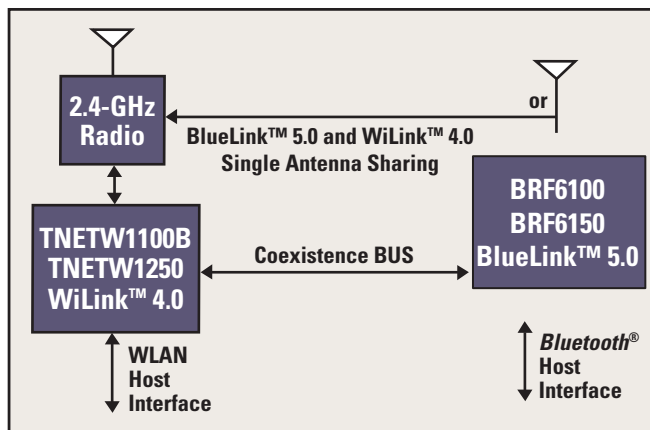
TI has developed a coexistence solution for simultaneous functionality of 802.11b/g WLAN and *Bluetooth*® personal area networking in mobile devices. Because 802.11b/g and *Bluetooth* occupy the same 2.4-GHz ISM range of wireless communications spectrum, their RF signals can cause interference for each other unless a coexistence solution is deployed.

TI's coexistence package provides intelligent and seamless coordination between TI's WLAN and *Bluetooth* technologies at the media access control (MAC) layer. With this level of time domain coordination, no RF isolation is needed between the 802.11 and *Bluetooth* antennas, simplifying designs and ensuring effective operations in small form factors.

Designed for interoperability and coexistence, TI's WLAN and *Bluetooth* single-chip solutions are capable of cost-efficient collaboration and effective coexistence with each other. For instance, WLAN and *Bluetooth* technologies are able to share the same antenna and antenna filter, reducing bill of materials (BOM) costs and circuit board space. In addition, TI's WLAN/*Bluetooth* coexistence technology ensures effective simultaneous operations of voice and data.

### Key Benefits

- Simultaneous 802.11 and *Bluetooth* functionality for data and voice applications
- Hardware and software solution
- Flexibility: supported by TI's WLAN and *Bluetooth* single-chip solutions
- Low power consumption for mobile battery-operated platforms
- No RF isolation requirements reduces board space
- Shared antenna design
- Intelligent MAC-layer coordination eliminates performance penalties caused by allocating dedicated bandwidth
- Small footprint ideal for compact handheld devices



**Coexistence Solution Architecture**



### NaviLink™ 4.0 GPS Single-Chip Solution

Global positioning system (GPS) applications are increasing in popularity in mobile phones worldwide for mobile navigation, mapping and safety services. TI's GPS5300 NaviLink™ 4.0 single-chip solution for assisted global positioning system (A-GPS) and stand-alone GPS applications is optimized for 3G mobile phones.

The NaviLink single-chip solution is the industry's first A-GPS solution manufactured in 90 nm process technology and extends TI's leadership in single-chip integrated solutions using TI's DRP™ technology. Through DRP technology, TI is able to provide the smallest size, lowest cost, low power and high performance discrete A-GPS solution to mobile phone manufacturers.

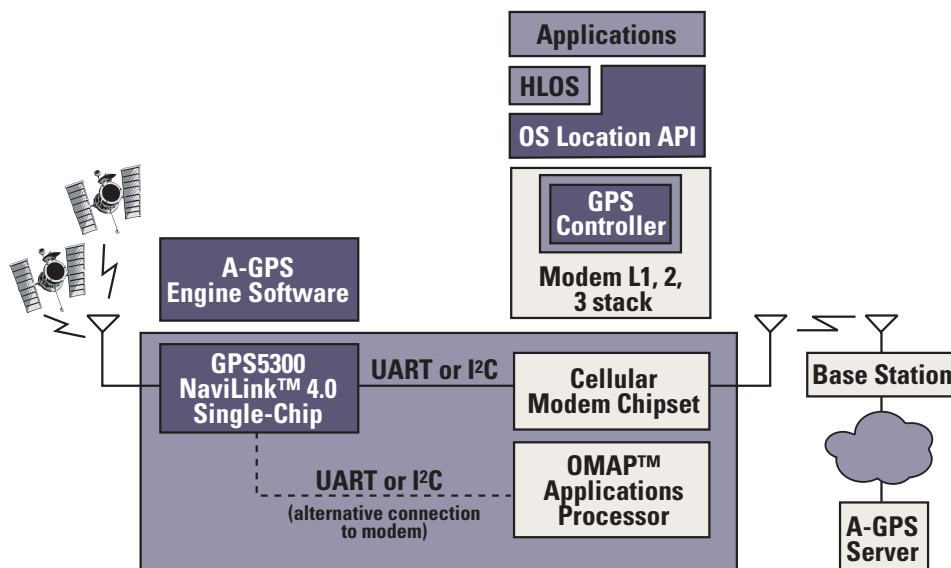
- **Smallest Size:** The GPS5300 NaviLink 4.0 solution integrates a complete GPS system into one chip, significantly reducing the board layout area for a discrete A-GPS engine. The single-chip enables a board area for the complete system of less than 50 mm<sup>2</sup>.
- **Lowest Cost:** As a single chip the GPS5300 only requires 11 external passives, a significant reduction over existing solutions which require up to 30 external passives. This level of integration delivers a total bill of materials that is almost 50 percent less than competition today.
- **Low Power:** The GPS5300 NaviLink 4.0 solution has power management integrated on-chip, which simplifies design and further reduces the bill-of-materials. The single chip also allows direct connect to battery for easy incorporation into mobile phone designs.

#### Key Benefits

- Single chip using TI's DRP™ technology and 90 nm manufacturing process
- The smallest A-GPS solution with a board area less than 50 mm<sup>2</sup>
- Lowest total bill-of-materials for a complete A-GPS system with only 11 external passives required
- Low power with integrated power management
- High A-GPS performance with weaker satellite signals, exceeding 3GPP and 3GPP2 requirements
- Optimized to interface with TI's 3G chipsets and OMAP™ processors to deliver a complete solution for handset OEMs
- Small module speeds time-to-market for A-GPS enabled phones

- **High Performance:** The GPS5300 NaviLink 4.0 solution enables a rapid time to first fix (TTFF) from weak satellite signals exceeding the A-GPS requirements for 3GPP and 3GPP2 operation.

The GPS5300 NaviLink 4.0 single-chip solution is sampling now and is expected to be in production in 2Q 2006. Additionally, TI is collaborating with Murata to deliver a small module to handset OEMs to speed time to market of NaviLink chip-based A-GPS mobile phones.





## Hollywood™ Solutions

### Hollywood™ Mobile Broadcast Single-Chip Solutions

TI's Hollywood™ mobile broadcast single chips are the first in the industry to integrate the mobile TV tuner and demodulator into one piece of silicon using standard 90 nanometer digital process. By using TI's DRP™ technology, the Hollywood solutions deliver low cost and long battery life in the smallest board area.

The first two products in the Hollywood mobile DTV family are the DTV1000 supporting DVB-H (digital video broadcast - handheld) operating at 470-750 MHz (UHF) and 1.670-1.675 GHz (L-band) frequency ranges; and the DTV1001 supporting ISDB-T (integrated services digital broadcast - terrestrial) one-segment for the Japan market.

Both the DTV1000 and the DTV1001 chips interface with TI's family of OMAP™ applications processors to deliver crisp, clear video and stereo audio, offering consumers the quality of a living room TV-viewing experience in the palm of their hand.

Through TI's innovative DRP technology, the Hollywood devices combine a two-chip or system in package (SIP) solution into a single piece of silicon in standard 90 nanometer digital process to deliver:

- **Smallest Board Area:** High degree of integration and low ball count has lead to a footprint of less than 1cm<sup>2</sup> for the entire solution including all passive and power switch components which is significantly smaller than current solutions that require a separate tuner, demodulator and external memory.
- **Low Part Count and Smaller Bill-of-Materials:** High integration has lead to a small number of low cost external components driving the estimated bill of materials in volume under \$10.
- **Very Low Power:** Low 1-V RF CMOS process and low power design techniques have resulted in only 30 mW of power consumption for a typical category B DVB-H terminal. Combined with TI's low power OMAP application processors this can deliver four to seven hours of view time depending on display size and battery rating.
- **Fast Time-to-Market:** Significant value-added processing in the DTV100X results in a simple software driver and API package accelerating integration with host processors, such as OMAP applications processors, and reducing time to market.
- **High Performance:** Multiple concurrent television channels (elementary streams) can be supported and fast channel switching times under 1.5 seconds are possible.



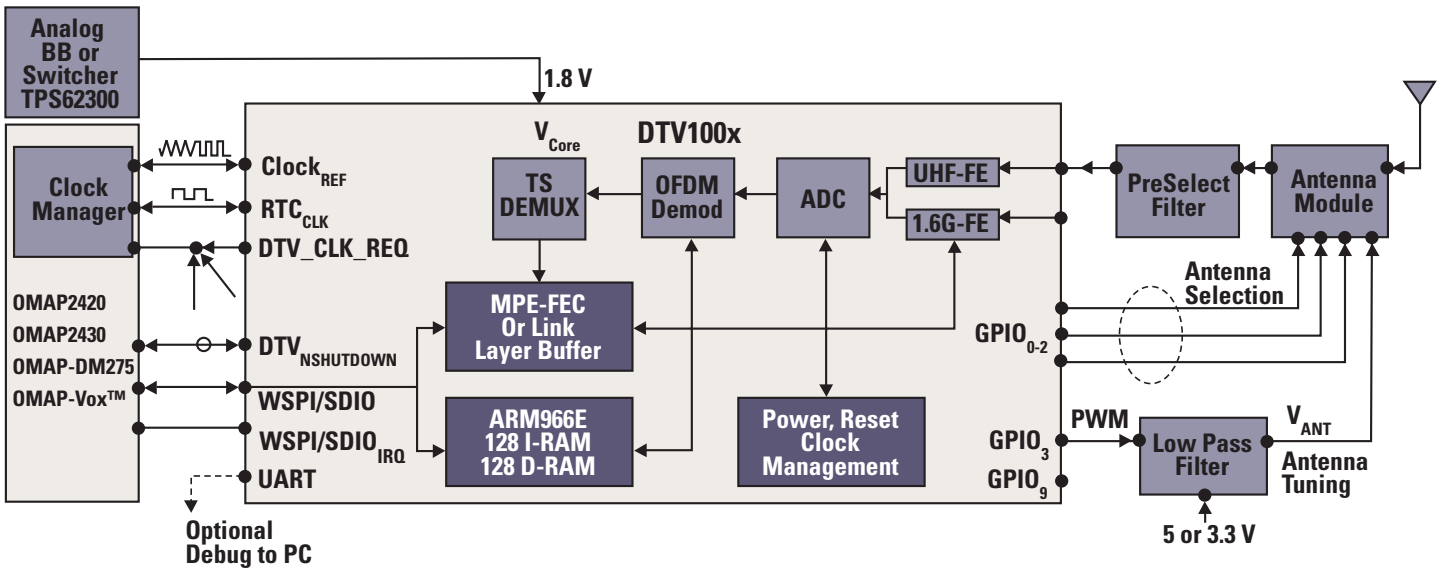
In order to conduct evaluation and decrease time-to-market for software development TI is providing a RDP (Reference Development Platform) for its DTV100X Hollywood family of mobile DTV products. Schematics and form-factor PCB layouts are included with the RDP kit, as is a complete software package. The kit is provided to help developers with evaluation and rapid design of a mobile DTV product. The RDP board provides the key test points needed for performance testing and connections to an external host processor like the TI's OMAP2420, OMAP2430, DM275 or OMAPV1030 products.

The Hollywood reference development platform features:

- Small form factor evaluation and development board of 3" x 2.85"
- Complete software package
- PC diagnostic tools package
- RF connector inputs and RF filters integrated
- External host processor connections
- Complete I/O and test pin access via 18 pin header
- Functional visual indication
- Integrated power supplies

**Key Benefits**

- First mobile DTV single chip solution—integrates RF, demod, decoder and memory
- World's smallest footprint package—less than 30 mm<sup>2</sup> resulting in low-cost BOM
- Low-Power Design—90 nm RF CMOS design, low 1-V core design
- Both DVB-H (DTV1000) and ISDB-T (DTV1001) products available
- Fast time-to-market: Development platform, operating system agnostic driver and API integration package





## Overview

Texas Instruments provides the highly efficient, small form factor, high-performance analog solutions needed for today's portable applications, including power management, touch screen controllers, audio power amplifiers, video amplifiers and audio codecs. Visit [www.ti.com/analogportable](http://www.ti.com/analogportable) for data sheets, samples and evaluation modules. Visit [www.ti.com/analoglit](http://www.ti.com/analoglit) for a complete listing of TI literature including guides for Audio, Video, Lighting and Display, Amplifiers, Data Converters, Interface and Power Management.

### 1 Speaker Audio Power Amplifiers

Device	Description
TPA6203A1	1.25-W Mono Fully-Differential Class-AB
TPA6204A1	1.7-W Mono Fully-Differential Class-AB
TPA2005D1	1.4-W Mono Fully-Differential Filter-Free Class-D
TPA2010D1	2.5-W Mono Fully-Differential Filter-Free Class-D
TPA2012D2	2.1-W Stereo Fully-Differential Filter-Free Class-D

### 2 Headphone Audio Power Amplifiers

Device	Description
TPA4411	80-mW Stereo Cap-Free Headphone Amplifier
TPA611xA2	150-mW Stereo Headphone Amplifier Family
TPA610xA2	Ultra-Low-Voltage Stereo Headphone Amplifier Family

### 3 Touch Screen Controllers

Device	Description
TSC2101	"Smart" 4-Wire TSC with Stereo Audio Codec with Integrated Audio Amps
TSC2301	"Smart" 4-Wire TSC with Stereo Audio Codec with Integrated HP Amp, Keypad Interface and GPIOs
TSC2046	4-Wire Touch Screen Controller with Low-Voltage Digital I/O
TSC2003	4-Wire Touch Screen Controller with I <sup>2</sup> C Interface
TSC2005	Low-Voltage (1.6 V), Low-Power, 4-Wire Resistor Touch Screen Controller, with Preprocessing, SPI Interface in 2.5X3CSP

### 4 Video Amplifier

Device	Description
OPA360/1	Internal Gain = 2, Filter, DC-Coupled Output, Ultra-Low Shutdown Power: 5µA Max; SC-70

### 5 Mobile SerDes Chipset

Device	Description
LVDS301/ LVDS302	24+3-bit SerDes with Programmable Bandwidth, Sub LVDS, Low-Power/Standby, Bus Swap, Parity Check

### 6 Audio Converters

Device	Description
TLV320AIC26	Low-Power Stereo Audio DAC/Mono ADC with Integrated HP/Speaker Amp
TLV320AIC29	Low-Power Stereo Audio DAC/Mono ADC with Integrated HP + Speaker Amps and Diff Input
TLV320AIC3x	Low-Power Stereo Audio CODEC Family with Mixing/Muxing I/Os and Integrated HP/Speaker Amps
PCM1775	Low-Power Stereo Audio DAC with 500 mW Class-D Mono Speaker Amp and Headphone Amp, Mixing
PCM1776	Low-Power Stereo Audio DAC with 500 mW Class-D Stereo Speaker Amp and Headphone Amp, Mixing
PCM3793	Low-Power Stereo Audio Codec with 500 mW Class-D Stereo Speaker Amp and Headphone Amp
PCM3794	Low-Power Stereo Audio Codec with Headphone Amp





7 Integrated Power Management	
Device	Description
TPS65020/1	Power Mgmt IC for OMAP™ Processors: 3 DC/DCs, 3 LDOs, I <sup>2</sup> C

8 OLED and TFT Display Supply	
Device	Description
TPS65110	3-Channel Charge Pump for TFD Displays
TPS65120	4-Channel Small Form-Factor TFT Display Power Supply
TPS65130	Dual ± Output Driver for Active-Matrix OLED™ Displays
TPS61045	Digitally Adjustable 375-mA Switch Boost Converter, Up to 28V

9 White LED Backlight Drivers	
Device	Description
TPS60230/1	5/3 WLED Charge Pump, Current-Regulated, 125 mA
TPS61040/1/2/3	Simple, Current-Regulated WLED Driver
TPS61060/1/2	Synchronous WLED Driver with Digital Brightness Control, CSP Package

10 White LED and Xenon Camera Flash	
Device	Description
TPS61058/9	500/800-mA WLED Flash Driver in 3 x 3 QFN
TPS65552A	Photo Flash Charger for Xenon Lamps

11 DC/DC Converter and LDO Supplies	
Device	Description
TPS62350	800-mA, 3-MHz, Step-Down DC/DC Converter with 1µH Inductor and I <sup>2</sup> C Interface
TPS62400	Dual Step-Down Converter
TPS711xx	Dual 250-mA Output, Ultra-Low-Noise, High PSRR LDO in CSP Package
TPS799xx	Ultra-Low-Noise, High PSRR LDO in CSP Package

12 Battery Management and Authentication	
Device	Description
bq24032	1-Cell Li-Ion Charger for AC/DC Adapter and USB with Dynamic Power Path Management
bq27200	1-Cell Li-Ion Fully Integrated Battery Fuel Gauge with I <sup>2</sup> C
bq26150	CRC-Based Battery Authentication IC



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