

# Wireless Handsets Solutions Guide



**→ Table of Contents**

<b>Technologies</b>	
Overview of Technologies	4
DRP™ Technology	5
M-Shield™ Technology	6
SmartReflex™ Power and Performance Management Technology	7
<b>TCS Chipset Solutions</b>	
Overview	8
TCS2010 (GSM)	10
TCS2110 (GPRS)	12
TCS2200 (GPRS)	14
TCS2300 LoCosto™ Solution (GSM)	16
TCS2310 LoCosto™ Solution (GPRS)	17
TCS2305 LoCosto™ Solution (GSM)	18
TCS2315 LoCosto™ Solution (GPRS)	19
TCS2600 (GPRS)	20
TCS2700 (GPRS)	22
OMAP850 (EDGE)	24
OMAPV1030 (EDGE)	26
OMAPV1035 (EDGE)	27
Chipset Reference Designs	28
<b>OMAP™ Platform</b>	
Overview	30
<b>Integrated Modem and Applications Processors</b>	
OMAP730	31
OMAP750	32
OMAP850	33
<b>OMAP-Vox™ Solutions</b>	
OMAPV1030	35
OMAPV1035	36
<b>OMAP-DM Coprocessors</b>	
OMAP-DM510	38
<b>Multimedia Processors</b>	
OMAP331	39
<b>High-Performance Multimedia-Rich Applications Processors</b>	
OMAP1610	40
OMAP1621	41
OMAP1710	42
OMAP2420	43
OMAP2430/OMAP2431	44
OMAP™ 3 Platform	45
OMAP3440	46
OMAP3430	47
OMAP3420	48
OMAP3410	49
<b>OMAP™ Platform Resources</b>	
OMAP™ Platform Software	50
Wireless Application Center	51
Application Suite	52
OMAP™ Gaming Development Platform	53
OMAP™ Developer Network	54
OMAP™ Technology Centers	55
Software Development Tools	56
<b>Mobile Connectivity Solutions</b>	
Overview	57
BlueLink™ 7.0 Bluetooth® and FM Solution	58
BlueLink™ 6.0 Bluetooth® and FM Solution	59
BlueLink™ 5.0 Bluetooth® Solution	60
BRF6150 Bluetooth Solution	61
WiLink™ 6.0 WLAN, Bluetooth® and FM Solution	62
WiLink™ 5.0 WLAN Platform	63
WiLink™ 4.0 WLAN Platform	64
WLAN and Bluetooth® Coexistence	65
NaviLink™ 6.0 GPS Solution	66
NaviLink™ 5.0 GPS Solution	67
NaviLink™ 4.0 GPS Solution	68
Hollywood™ Mobile DTV Solution	69
<b>High-Performance Analog</b>	
Overview	70

**Engaging the Wireless User**

From the entry-level mobile phone to the most intelligent smartphone, today's wireless devices must contain a full range of multimedia capabilities. A user experience that engages consumers will be part instant gratification, part perpetual connectivity and part business necessity. TI provides system-level solutions and a keen understanding of the wireless industry, while fulfilling its customers' requirements. For instance, the flexible OMAP™ platform can scale its multimedia and application processing capabilities. TI's system expertise and track record as a reliable, on-time supplier demonstrates its commitment to provide flexible and open solutions to its customers and partners.

From entry-level users to high-end technophiles, mobile device consumers across the globe are seeking an unparalleled user experience. At a time when mobile entertainment on handsets has become critical, TI technology can meet the requirements of the most demanding applications, such as GPS, 2D and 3D video gaming, stereo FM radio, multi-megapixel digital photography, CD-quality music and others. TI's proven portfolio is comprised of a comprehensive selection of wireless chipsets, low-power baseband, modem and applications processors, digital RF technology, power management, security, high-performance analog, mobile connectivity functions such as single-chip *Bluetooth*<sup>®</sup>, Wireless LAN (WLAN) and GPS. TI wireless solutions have always started with the broadest set of technology building blocks, such as the OMAP<sup>™</sup> platform with its numerous multimedia capabilities. TI's commitment to developing partner relationships with its customers has led to shipments of billions of digital basebands and other wireless solutions.

When it was introduced, the OMAP platform defined wireless applications processing offering manufacturers a high-performance engine to drive differentiation in multimedia for every market segment and region. LoCosto<sup>™</sup> solutions for entry-level mobile devices, OMAP and OMAP-Vox<sup>™</sup> solutions for the mid-tier to high-end devices attest to the scalability of the technology and TI's understanding of the distinct needs of the industry. The OMAP platform supports all high-level operating systems, providing flexible and open solutions to manufacturers and third-party developers. The applications, software and tools available through the extensive OMAP Developer Network help reduce development time and resources for handset manufacturers.

TI's DRP<sup>™</sup> single-chip technology fulfills user demands for less expensive, more power efficient, sleeker mobile devices. By aggressively integrating handset electronics, DRP technology significantly reduces board space in TI's modem technology and mobile connectivity solutions.

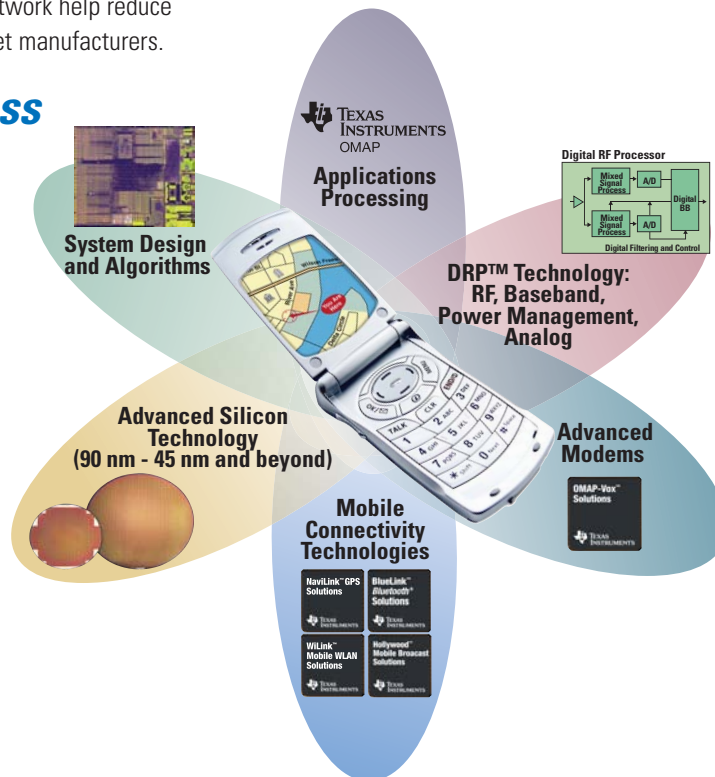
TI's system-level expertise as well as its scalable platforms facilitate software re-use across product lines, maximizing manufacturers' research and development.

TI provides high-performance analog products, applications knowledge and local technical support to help you get to market faster with a winning design. TI offers reliable, scalable and power-efficient power management, audio, touch-screen and logic solutions for mobile handsets.

TI's commitment to fulfilling customer requirements has been driven by continuous innovations in product and process technologies, as well as a business model that includes supplying custom and chipset solutions. TI's process innovations include advancements to the 45-nanometer (nm) process node and new packaging techniques, both of which effectively meet our customers' requirements for smaller form factors and longer battery life. TI's scalable manufacturing capabilities effectively manage supply-chain demands.

Texas Instruments' wireless portfolio is a direct result of its commitment to the growth of the wireless industry and, more importantly, to the success of its customers.

## Ingredients for Success





## Overview

### To Know More

#### TI's foundational innovations featured in this issue:

DRP™ Single-Chip Technology	5
M-Shield™ Security Technology	6
SmartReflex™ Power and Performance Management Technology	7

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 breadth 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 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 handsets.

### DRP™ Single-Chip 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 platforms, LoCosto™, OMAP-Vox™, BlueLink™ Bluetooth® solutions, NaviLink™ GPS single-chip solution, single-chip WiLink™ wireless LAN (WLAN) devices and Hollywood™ mobile digital television (DTV) solution.

### M-Shield™ Mobile Security Technology

M-Shield technology is one of the industry's most robust security solutions for 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, and secure chip-to-chip interconnects, among other features. M-Shield technology enables a system-level security architecture with standard application programming interfaces (APIs) that ensure faster development of security applications and streamlines deployment across OMAP™ platforms.

M-Shield capabilities such as a public-key infrastructure strengthens the security of the mobile device itself and the protection of the sensitive personal information or high-value creative content transmitted or stored on the device. M-Shield offers a hardware-strengthened secure environment for the safe execution of sensitive applications and the secure storage of important data. Secure on-chip keys (e-fuse) give 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 the complete line of OMAP processors.

### SmartReflex™ Power and Performance Management Technology

Now in its second generation, SmartReflex technology optimizes wireless handset performance and power consumption through advanced process techniques. Reducing power consumption and optimizing performance involves intelligent and adaptive silicon IP, advanced system-on-a-chip architectural techniques and innovative software. The recently introduced SmartReflex 2 technology adds to these techniques and automates their application within the design process. These features address power consumption challenges that include optimizing leakage versus power 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. TI has shipped more than 1 billion devices that incorporate SmartReflex technology 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.



## DRP™ Single-Chip 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 mobile devices. Achieving these two seemingly opposed objectives is only possible by aggressively integrating handset electronics. DRP technology does just that by targeting the analog content of devices, which often accounts for as much as 30 to 40 percent of total board real estate.

TI's digital radio frequency (RF) processor architecture applies digital techniques to simplify RF processing and dramatically cut the cost and power consumption of transmitting and receiving information wirelessly. The processing of radio signals with digital logic can significantly shift the paradigm for embedding wireless communications by making it easier to implement and to scale. For handset manufacturers, DRP technology delivers many benefits including:

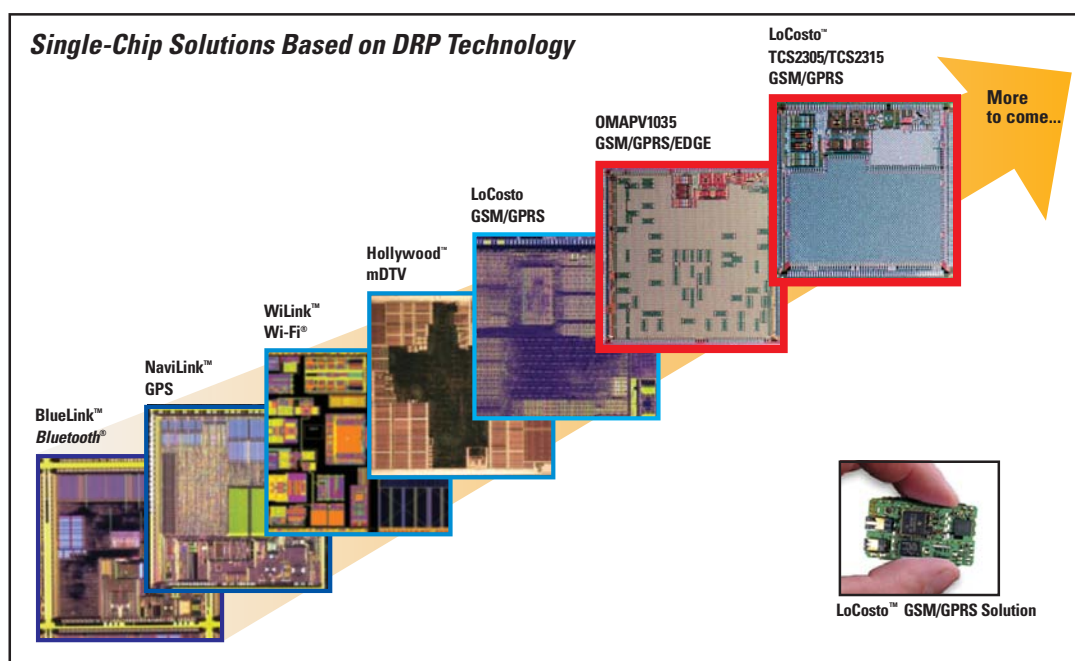
- Lower solution cost and bill of materials (BOM)
- Increased system performance
- Longer battery life – better active and stand-by times
- Smaller form factor to enable small, sleek mobile devices
- Flexibility to integrate multiple radios if the market conditions warrant
- Easier design and test for wireless designers due to turn-key, ready-to-manufacture solutions

### Key Benefits

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

DRP technology oversamples analog signals and processes them in the digital domain, capturing all of the benefits of digital CMOS fabrication and the advancements to smaller submicron process geometries.

TI's DRP architecture has been successfully integrated onto a single chip such as LoCosto™ and OMAP-Vox™ platforms as well as the WiLink™ WLAN platform, BlueLink™ Bluetooth® products, Navilink™ GPS solutions and the Hollywood™ mobile TV solution.





## M-Shield™ Security Technology

### M-Shield™ Mobile Security Technology

M-Shield™ mobile security technology is a system-level solution that consists of intimately interleaved hardware and software mechanisms to provide a high level of terminal and services security in the wireless industry. Moreover, M-Shield technology sets the benchmark for the security considered necessary for wireless content protection, access control, and financial transactions. This security technology is the keystone for TI's OMAP™ wireless platform and its wireless chipsets.

M-Shield technology provides an infrastructure that supports platform-level security for the mobile device itself, and protects high-value content transmitted or stored on the device. A hardware-enforced secure environment is responsible 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.

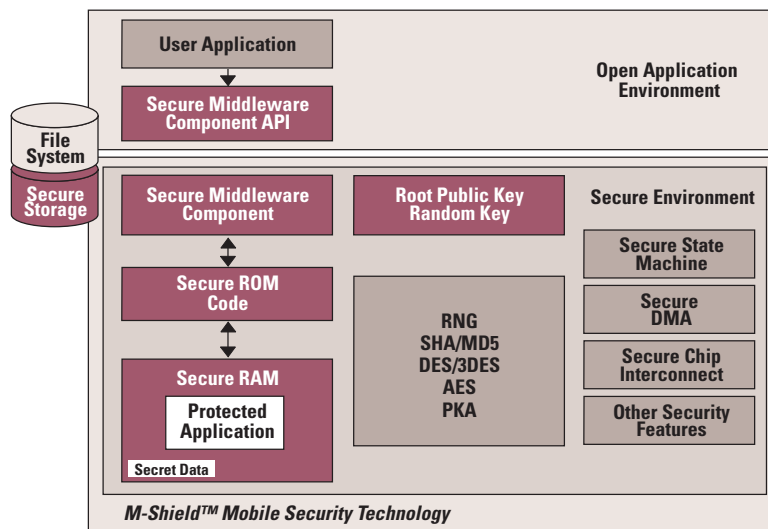
Central to M-Shield technology is the industry's first hardware-based secure execution environment. A secure state machine (SSM) applies and guarantees the system's security policy rules while entering, executing and exiting from the secure environment. Eliminating the vulnerability of chip-interconnects is also critical to the overall protection of M-Shield technology. Access to certain peripherals and partitions of the system, such as keyboards, displays, fingerprint sensors, smartcard physical interfaces 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

- Highly robust security solution includes a complete security infrastructure with on-chip cryptographic keys, secure execution environment, secure storage, secure chip-interconnects and other features
- TrustZone™ standard-based APIs that enable interoperability and a faster development and streamlining of security-based applications
- Flexible security framework includes a Secure Middleware Component to support third-party software and applications
- Tampering detection triggers effective protective actions
- Compelling user experience through high-performance hardware-based cryptographic accelerators that reduce latencies and deliver rapid system-level response
- Low power consumption maintains extended battery life

Complementing M-Shield technology's hardware-based system-level solution is a secure environment that includes a security framework and TrustZone™ Standard-based APIs that enable interoperability and a faster development and streamlining of security-based applications.

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 OMA DRM, OMA BCast, WM-DRM, CPRM, 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

Now in its second generation, SmartReflex™ technology is a holistic approach to reducing power without sacrificing 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 mobile devices and offers a pathway to future solutions.

SmartReflex technology has three facets: silicon intellectual property (IP); techniques that can be applied at the system-on-a-chip (SoC) architectural design level; and system software that manages many of the hardware-enabled SmartReflex technologies while seamlessly interfacing to other power management techniques based in operating systems (OS) or third-party software subsystems. The recently introduced SmartReflex 2 technology enhances these features while automating their use within designs. SmartReflex technologies are 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, 65 and 45 nanometers (nm). Several SmartReflex technologies can be applied to significantly limit leakage from a device, and these techniques have already been implemented in many of TI's wireless components.

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 2 technology adds retention 'til access (RTA) and adaptive body biasing (ABB). RTA puts unused memory banks in lower voltage states, so that power is optimized in memory as well as logic, while ABB can dynamically adjust transistors in operation in order to optimize performance and power consumption.

#### SmartReflex SoC Architectural and Design Technologies

Beyond established power reduction techniques such as low power modes and clock gating, SmartReflex technology includes innovative techniques at the architectural level of SoC design that reduce both

#### 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 2 technology automates application of SmartReflex techniques within design process

dynamic and static power consumption. For example, adaptive voltage scaling (AVS), dynamic voltage and frequency scaling (DVFS), dynamic power switching (DPS) and static leakage management (SLM) are innovative technologies in the SmartReflex portfolio.

#### SmartReflex System Software

The SmartReflex technology 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, developing a collaborative and cooperative environment with regards to power and performance.

With its SmartReflex PriMer tool, SmartReflex 2 technology goes a step beyond system software to automate the application of power management within the design process. SmartReflex PriMer integrates SmartReflex techniques with the RTL design description, providing a bug-free implementation that optimizes power consumption and performance while saving time to market for designers.

#### SmartReflex Technology's Pathway to the Future

Today, more than 1 billion components with SmartReflex technology have been shipped by TI. The roadmap for SmartReflex technology stretches far into the future, penetrating deeper into mobile devices and leveraging the application of SmartReflex technology into other high-performance, power-sensitive industry segments.



## Overview

### → To Know More

#### TCS chipset and OMAP-Vox solutions featured in this issue

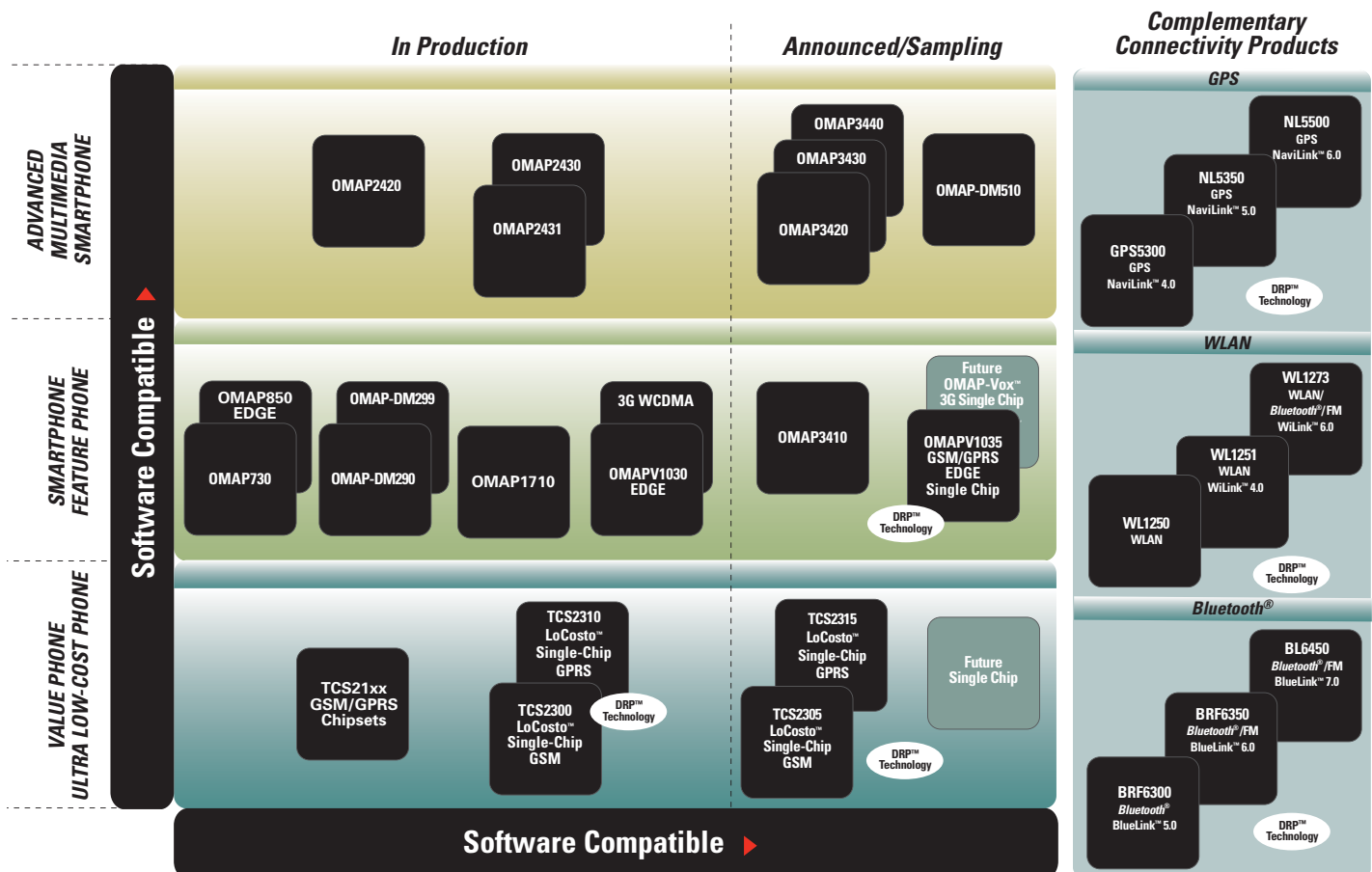
TCS2010 (GSM)	10
TCS2110 (GPRS)	12
TCS2200 (GPRS)	14
TCS2300 LoCosto™ (GSM)	16
TCS2310 LoCosto™ (GPRS)	17
TCS2305 LoCosto™ (GSM)	18
TCS2315 LoCosto™ (GPRS)	19
TCS2600 (GPRS)	20
TCS2700 (GPRS)	22
OMAP850 (EDGE)	24
OMAPV1030 (EDGE)	26
OMAPV1035 (EDGE)	27
Chipset Reference Designs	28

TI's TCS and OMAP-Vox™ solutions give mobile device manufacturers complete, scalable platforms that meet the requirements of all leading market segments and standards, including GSM, GPRS, EDGE and WCDMA. TI's solutions help our customers 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 entry-level handsets to high-end multimedia-rich smartphones, TCS chipsets support leading mobile operating systems (OSs). Standards-compliant protocol stacks, high-level programming







languages, easy-to-use APIs and development tools are 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 premium 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 BOM and continuing TI's industry-leading track record of low power consumption and long 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 OMAP Technology Centers (OTCs) serve as additional resources for quickly deploying compelling 2G, 2.5G and 3G devices.

### TI's Family of Single-Chip Handset Solutions

TI's integration capabilities are shown in its unique LoCosto™ and OMAP-Vox™ platforms, the industry's first architectures to provide single-chip solutions for entry to mid-range wireless handsets. Using TI's advanced DRP™ technology, LoCosto and OMAP-Vox solutions combine radio and 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 and OMAP-Vox 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. 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 reducing overall development costs. TI's OMAP-Vox modem technology is optimized to efficiently run a dynamic mixture of applications and baseband communications on the same hardware. The scalable OMAP-Vox 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.

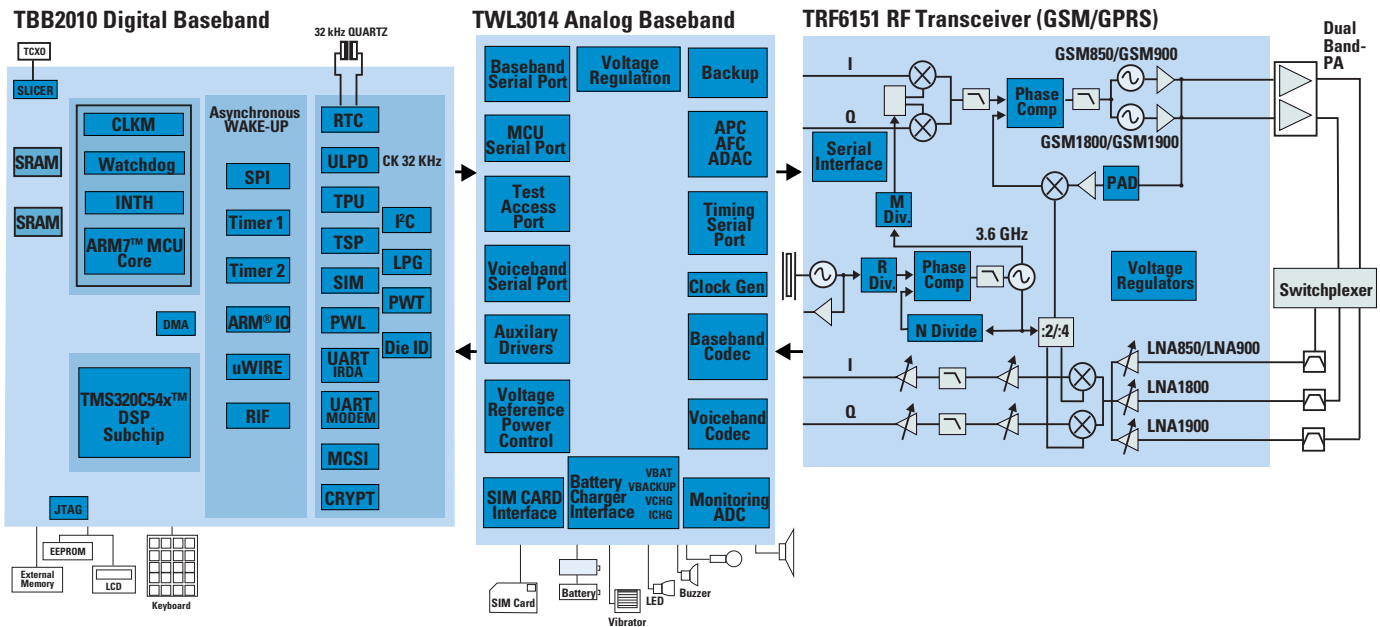
#### TCS2010 components include:

- 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 TCS2110 GSM/GPRS chipsets
- Class 12 GPRS support
- 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

---

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

---

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

---

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 Class 12/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.

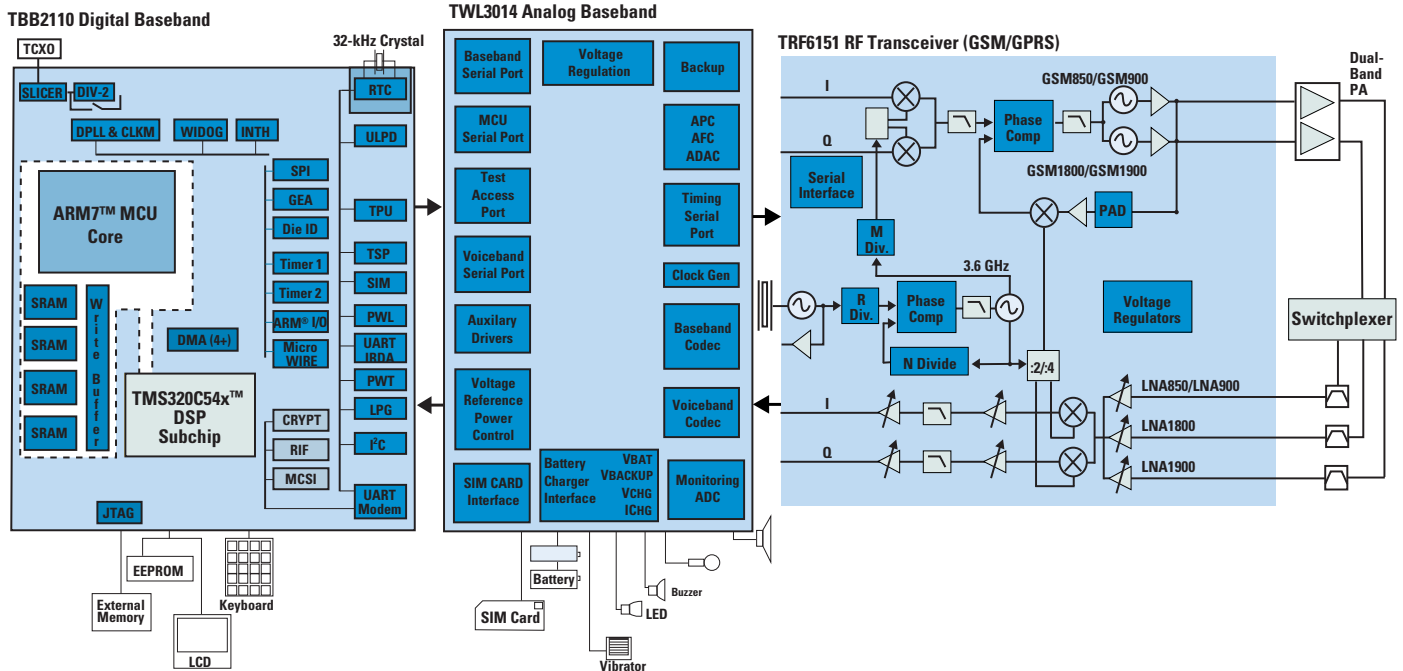
## TCS2110 components include:

- 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

---

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
- 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

---

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

---

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 Class 12/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.

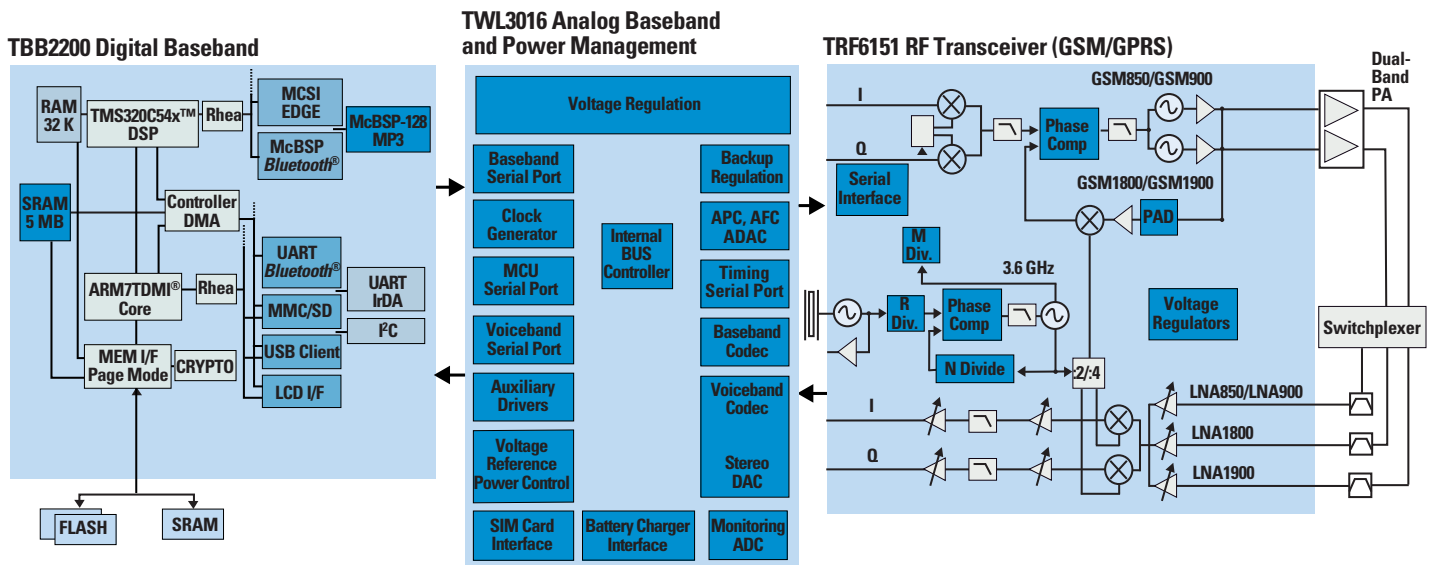
## TCS2200 components include:

- 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

---

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

---

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

---

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 Class 12/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



## GSM

## TCS2300 LoCosto™ Single-Chip Handset Solution

TI's unique TCS2300 LoCosto™ solution is the industry's first architecture to provide single-chip solutions for ultra low-cost to entry-level wireless handsets. Using TI's advanced DRP™ technology and 90-nm process technology, the TCS2300 solution combines radio and all baseband processing into one highly integrated solution, reducing component count, board space, power consumption and system cost. With the TCS2300 solution, wireless handsets can be made as compact as match boxes and affordable for emerging economies.

The TCS2300 solution 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.

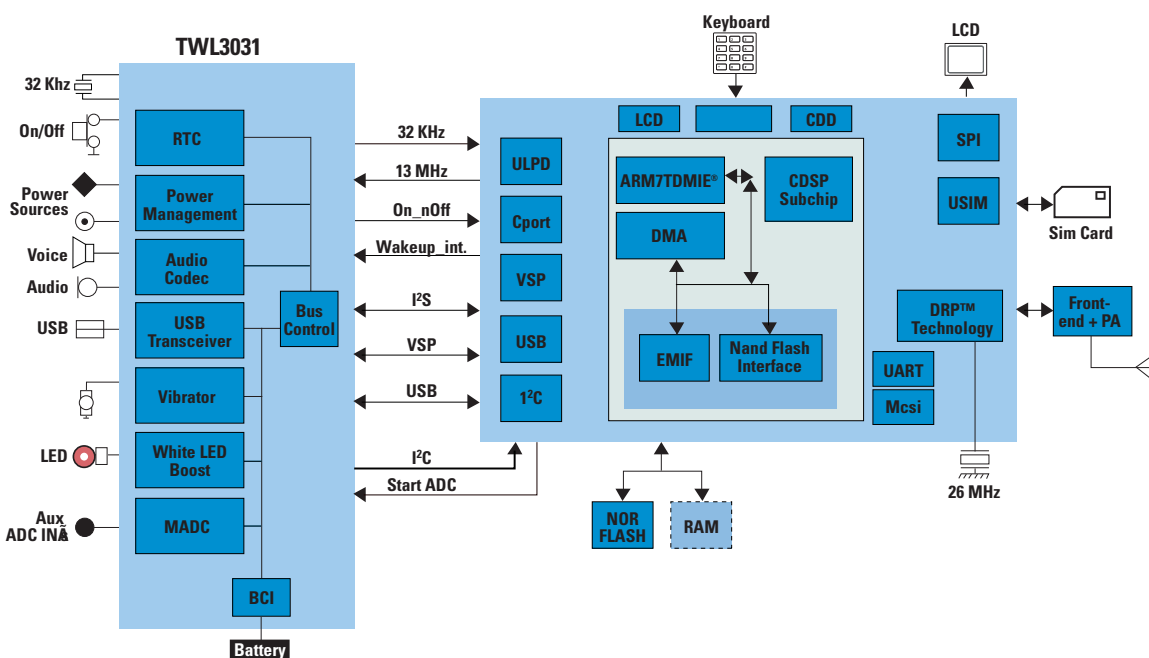
The TCS2300 solution supports standard voice codecs in dual-band phones. Support for both color and monochrome displays, MIDI 16 polyphonic ringtones, system security and highly optimized memory footprint offering provides the normal complement of features demanded in basic phones.

## Key Benefits

- GSM only
- Voice codecs F/R, H/R, EF/R, AMR
- Dual band: 850/1900, 900/1800, 850/1800 or 900/1900
- Black and white LCD (96 x 96 pixels) and color LCD support (up to 65,000, 128 x 128 pixels)
- SAIC and TTY support
- MIDI ringtone and playback - 16 polyphonics
- Headset, handsfree, vibrator
- FM connectivity
- Hardware security (Flash content protection, ME personalization, IMEI protection) OMTP1.0 compliant
- No external SRAM needed and 2-MB NOR flash (B&W) or 4-MB NOR flash (color 128 x 128, 65,000 colors)
- Up to 64 MB external flash and up to 6 MB external SRAM

The TCS2300 solution offers a scalable platform enabling cost-effective development of handsets ranging from ultra low-cost GSM handsets with a black-and-white display to a slightly more expensive device including a color display and FM radio. These sub-\$30 handsets lower the threshold for mass market adoption – especially in emerging markets.

## TCS2300 LoCosto™ Solution





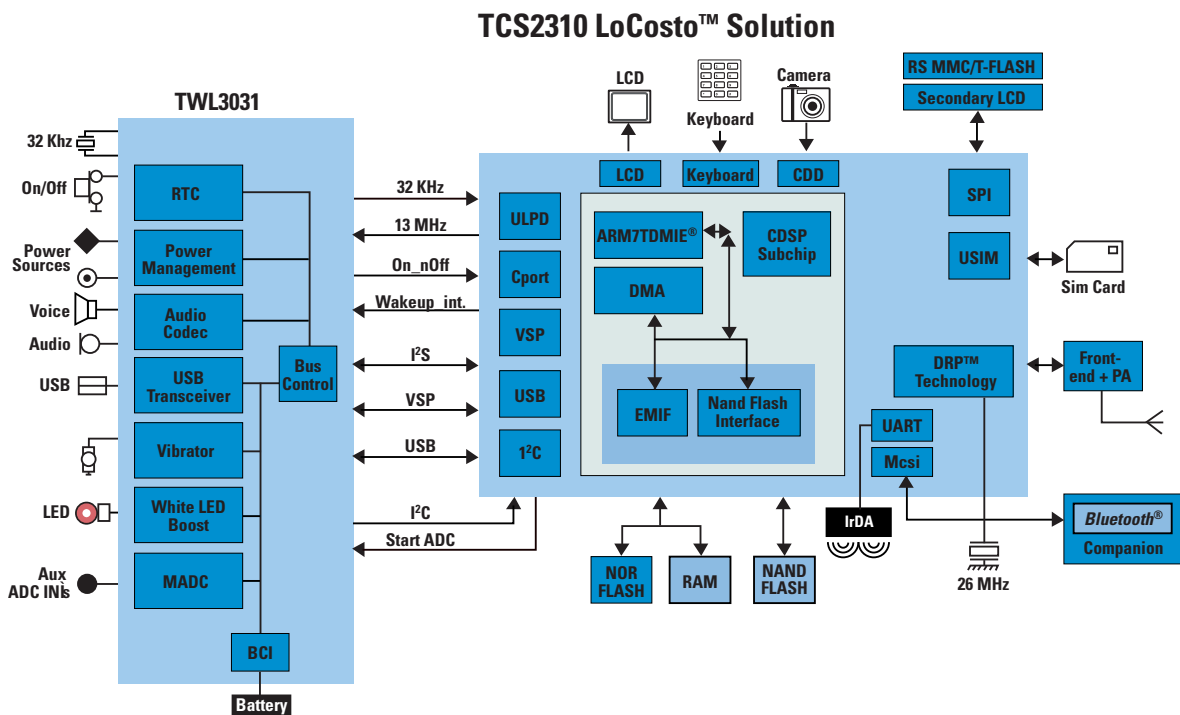
### TCS2310 LoCosto™ Single-Chip Handset Solution

Integrating TI's groundbreaking DRP™ technology and 90-nm process technology, the TCS2310 LoCosto™ solution 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 cost savings and the potential to create phones in new sleeker form factors.

The TCS2310 solution adds support for MP3/AAC ringers and players, camera and video, MIDI 32 polyphonic ringtones, *Bluetooth*®, non-removable and removable mass storage media, additional external program and data memory, peripheral interfaces and a complete set of functionality required for entry-level handsets.

The scalable TCS2310 solution enables cost-effective development of differentiated handsets addressing multiple market segments, from low-cost GPRS handsets with a black-and-white screen to entry-level GPRS devices featuring a basic VGA camera and MP3 player, to high-end GPRS devices with features including 1-megapixel camera, video, and advanced connectivity such as *Bluetooth*, WLAN or GPS.

Key Benefits
• GPRS Class 10
• SAIC and TTY support
• WAP/SMS/EMS/MMS
• Dual-color displays
• MP3/AAC player and ringers
• MIDI 32 polyphonics player and ringer
• Integrated camera support up to 1.3 megapixel
• Video MPEG-4/H.263 support up to QCIF15 frames per second (fps)
• TI <i>Bluetooth</i> ® protocol stack and profiles include stereo headset and A2DP
• Advanced connectivity support including WLAN and GPS
• Hardware security (Flash content protection, ME personalization, IMEI protection) OMTP1.0 compliant
• Non-removable and removable mass storage interface





## GSM

### TCS2305 GSM LoCosto™ Single-Chip for ULC market

The TCS2305 (GSM) is a member of TI's next-generation LoCosto™ family single-chip solutions which have set a new standard for features and a compelling user experience in the ultra low-cost (ULC) handset segment. By combining advanced 65-nm process technology, a TMS320C54x™ DSP with a powerful ARM7™ core, and integrating TI's market-leading DRP™ technology, the TCS2305-based handsets with high performance, robust functionality and innovative form factors are possible in the most price-sensitive handsets.

The TCS2305 LoCosto solution is optimized for emerging regions such as India, China, Brazil and Russia. In addition to enabling lowest cost color phones, these highly flexible and scalable solutions also address value-conscious segments in more mature markets.

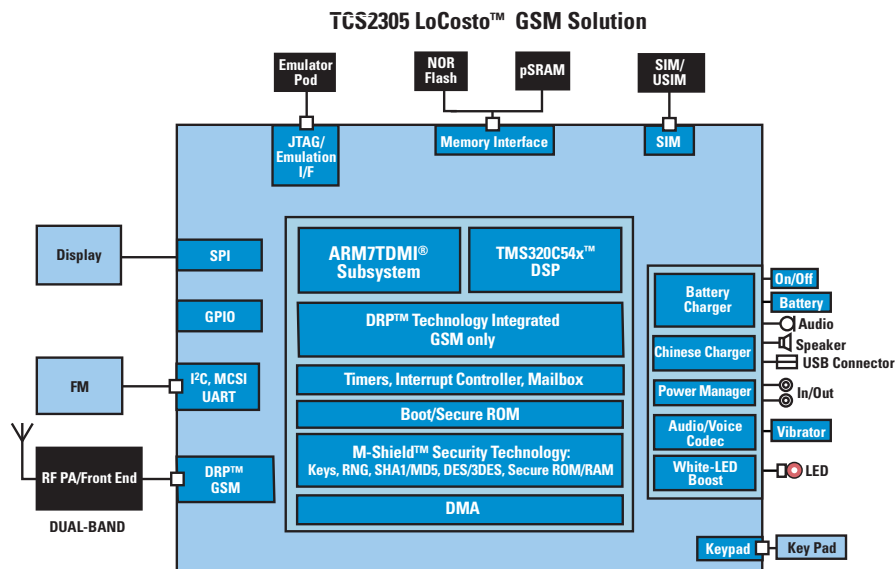
#### Sustainable Low Cost Structure

Several chip- and system-level factors contribute to the sustainable low cost structure of the next generation of LoCosto solutions. Starting with 65-nm process technology, additional cost-optimization techniques include an approximate 25 percent reduction in a handset's electronic eBOM, reduced PCB area caused by smaller chips and greater silicon integration, and a cost-optimized PCB technology. Integration of power management with the digital baseband into a single chip also yields reduction in the modem PCB area. With the RF section included in one device, space requirements and component counts are reduced. Reduced chip count, smaller PCBs, increased integration and advanced packaging enable handsets in innovative and fashionable form factors. A smaller PCB means that the size of the handset's battery can be increased, giving the device a longer battery life with extended standby and talk times.

#### Key Benefits

##### TCS2305 GSM Solution:

- Leverages 65-nm process with advanced DSP and ARM® technologies
- Integrated DRP™ technology, single-chip solution
- Delivers a compelling next-generation user experience in ULC handsets
  - Lowest cost color handset with no additional external SRAM memory (128 x 160 and 65,000 color displays)
  - Fast CPU processing for smooth user interface processing
  - CD-quality (44.1 kHz) MP3 ringers and polyphonic ringers
  - High-end full-duplex voice quality
  - FM connectivity with integrated stereo support
  - Record FM for on-the-fly ringers
- Optimized system design reduces component count and PCB board size relative to previous generation
  - Over 25 percent reduction in eBOM
  - Lower overall component count by approximately 40 percent
  - Smaller modem by as much as 35 percent reduces PCB board size
- Easy charger access and compliant to USB Chinese charger interface
- Lower power consumption for longer talk (30 percent) and standby (60 percent) times
- Innovative handset form factors and larger batteries enabled by smaller PCB requirements



### TCS2315 LoCosto™ Single-Chip for Richest Feature Set GPRS Handsets

The TCS2315 solution has the powerful processing capabilities required for an affordable feature set far richer than previously possible.

Enhanced capabilities now possible in affordable feature phones include a high-resolution QVGA 256,000 colors display, high-end full-duplex voice quality, near CD-quality MP3 and polyphonic ringers, longer talk time and standby time, stereo FM radio connectivity, up to 2-megapixel camera support, MP3/AAC playback and mass storage (SD/MMC, micro memory stick, Micro-SD) support, USB connectivity and charging, handsfree speakerphone operation, vibration ringer, headset support, *Bluetooth*®, as well as WLAN and GPS connectivity and other functionality.

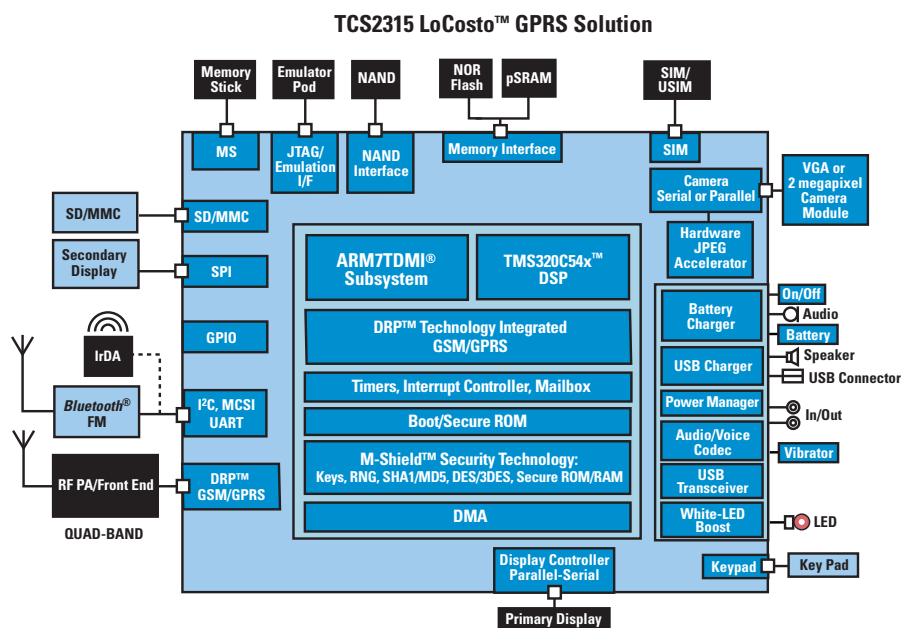
The TCS2315 LoCosto solutions extend the established performance of TI's successful first generation of TCS2310 LoCosto single-chip wireless handset solutions. The software portability from one generation of LoCosto solution to the next gives manufacturers and operators the ability to rapidly and cost-effectively differentiate products and service offerings for both emerging and mature markets, crossing over every language, region and subscriber type.

**Key Benefits**

**TCS2315 GPRS Solution:**

- All of the benefits of the TCS2305 GSM solution plus the following:
  - GPRS Class 10
  - Built-in 2-megapixel camera support, with JPEG encode/decode and advanced imaging functions such as rotation, zoom, etc.
  - Support for video MPEG4/H263, QCIF 15 fps
  - CD-quality MP3/AAC stereo playback capability for rich music
  - USB connectivity for data transfer between PC and phone
  - Mass storage capability (SD/MMC, micro memory stick, Micro-SD) to store MP3 music and ringers, pictures, data, and contacts
  - *Bluetooth*® connectivity (with multiple profiles includes stereo headset)
  - MP3/AAC/stereo playback
  - Video MPEG-4/H263 support, QCIF 15 fps

Feature rich but low-cost handsets are also afforded the protection of TI's scalable and hardware-based M-Shield™ security technology. The M-Shield capabilities of the LoCosto solutions safeguard the handset owner's sensitive personal information and defeat attempts to unlock the handset's SIM lock code.





## GPRS

### TCS2600 Chipsets

The TCS2600 is a complete hardware/software reference design 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.

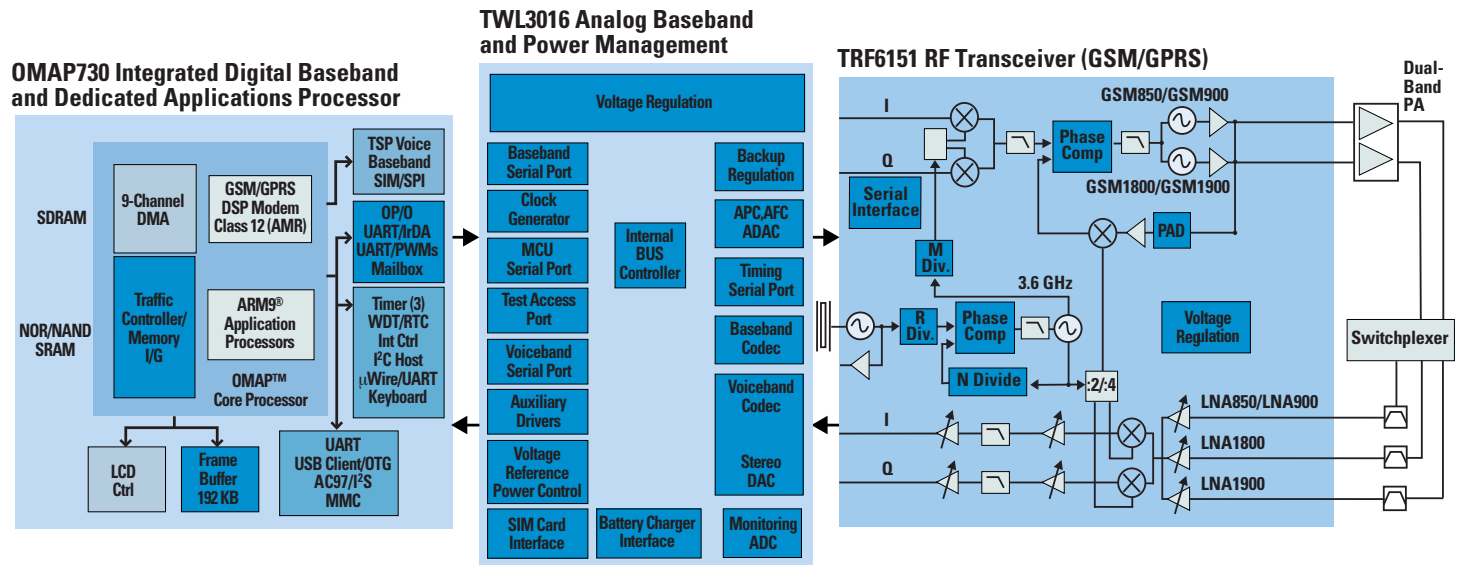
Designed for security, the TCS2600 includes 48-kB secure ROM and 16-kB secure RAM with dedicated NOR/NAND flash memory and write production. A true random number generator (TRNG) aids in encryption and authentication standards. The numerous software modules and hardware features of the chipsets ensure 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

#### 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 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, dedicated 802.11 a/b/g high-speed interface, Fast IrDA and more



See OMAP™ Processor information on page 31

### 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 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 clock input reduction of 50 percent

### TRF6151 RF Transceiver

Specifically designed for GSM/GPRS reception as part of the TCS2600 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, 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 includes three components as part of the chipset, providing battery savings, reduced board space and lower cost.

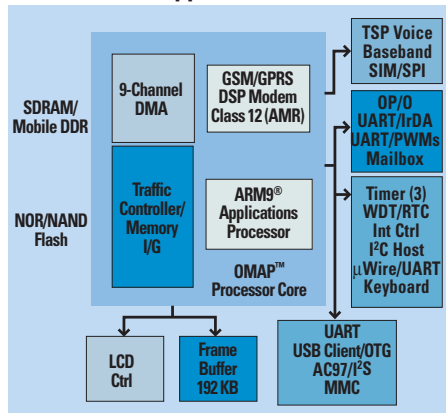
#### TCS2700 components include:

- 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

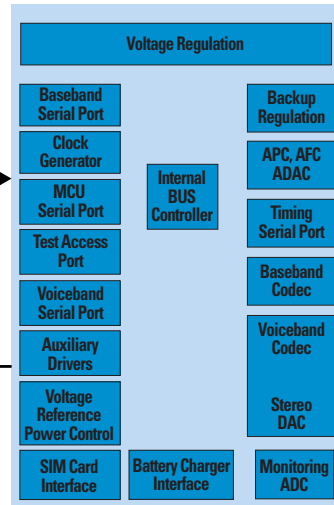
#### Key Benefits

- 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 enables longer MP3 music playback and better hands-free speaker phone operation
- Extended standby time and battery savings through integrated analog baseband and power management devices
- Compatibility across all OMAP™ applications processors
- OMAP Developer Network and OMAP Technology Centers support
- Complete reference design and set of peripherals
- Mobile OS support

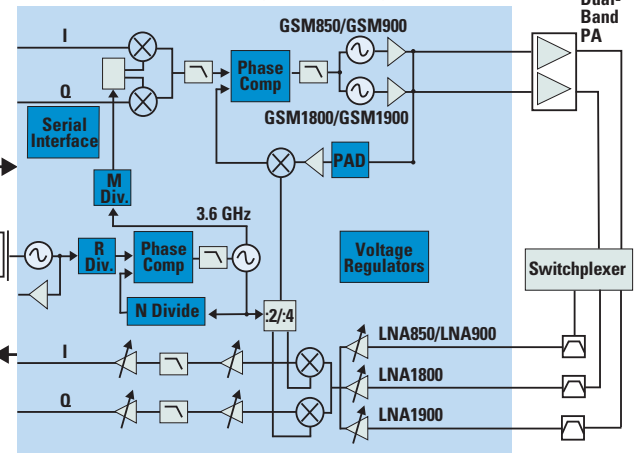
#### OMAP750 Integrated Digital Baseband and Dedicated Applications Processor



#### TWL3016 Analog Baseband and Power Management



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



See OMAP™ Processor information on page 32



### OMAP750 Integrated Communication and Dedicated Applications Processor

---

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 supports 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 Open Core Protocol (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

---

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



## EDGE

## OMAP850 Chipset

The OMAP850 EDGE chipset and complete reference design are targeted at wireless smartphones and PDAs. It serves as the ideal migration path to EDGE for manufacturers using the TCS2600 GSM/GPRS chipset.

### OMAP850 chipset components include:

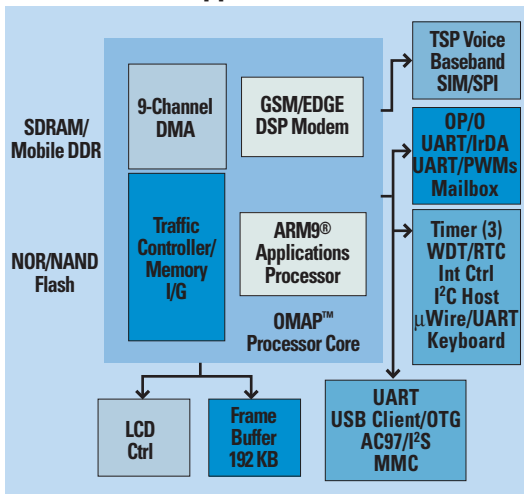
- OMAP850 applications processor with quad-band EDGE modem
- TWL3027 integrated analog baseband with full power management and audio codec
- BRF6150 *Bluetooth*® single chip featuring TI's patented DRP™ technology
- Fully optimized third-party RF

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, GPS and WLAN capabilities to bring added, optional capabilities.

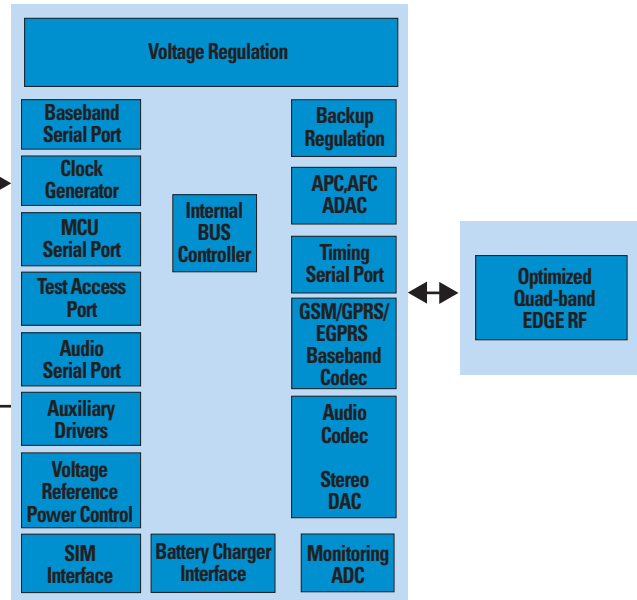
### Key Benefits

- 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-megapixel camera, etc.
- Software compatible with TCS2600 GSM/GPRS chipset
- Modules available for camera, GPS and WLAN
- TI's highly integrated BRF6150 *Bluetooth*® wireless technology based on TI's patented DRP™ technology
- High-level mobile OS support, including Symbian OS™, S60, Microsoft® Windows Mobile® and Linux®
- OMAP™ Developer Network and OMAP Technology Centers support

### OMAP850 Integrated Digital Baseband and Dedicated Applications Processor



### TWL3027 Analog Baseband and Power Management



See OMAP™ Processor information on page 33



## 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-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, an analog baseband device combined with a digital baseband device, is part of a TI DSP solution intended for mobile applications including GSM900, DCS1800 and PCS1900 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 handsets where performance and space are critical. The device leverages TI's 130-nm digital CMOS process while incorporating 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
- 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.



## EDGE

### OMAPV1030 Integrated GSM/GPRS/EDGE Solution

The OMAPV1030 solution is one of the industry's most highly integrated and optimized EDGE solutions (UMA-ready), 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 WCDMA.

The OMAPV1030 solution is specifically designed to bring multimedia functionality to mass market mobile phones and delivers advanced capabilities to mid-range wireless handsets. The OMAPV1030 solution includes best-in-class, advanced multimedia performance including:

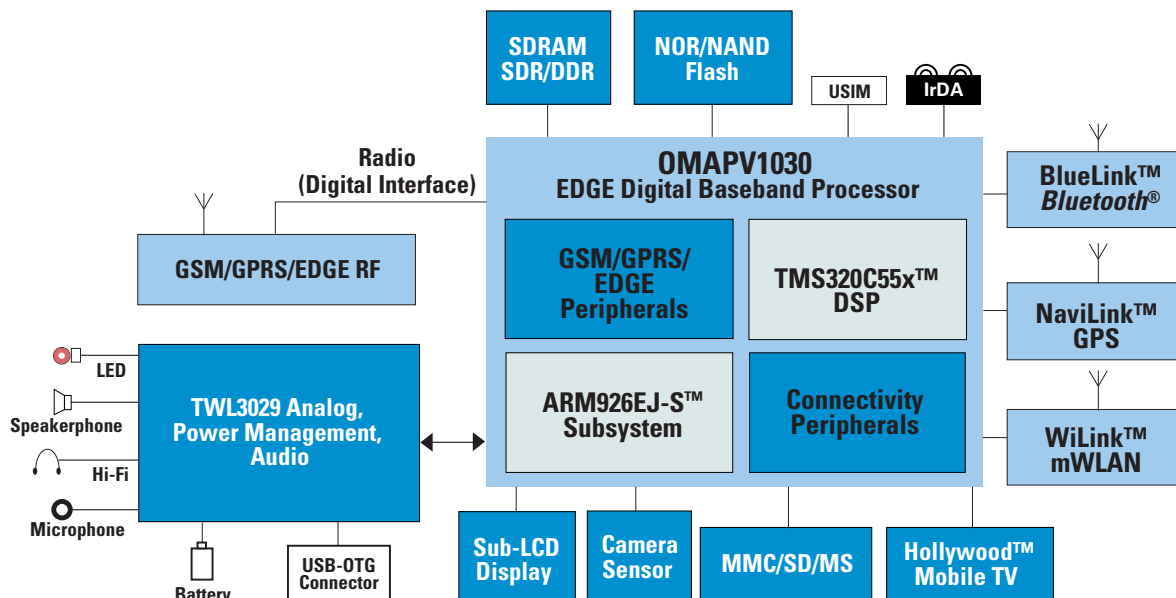
- Comprehensive audio/video codecs and imaging algorithms
- Ringtones: 64-polyphonic MIDI
- Audio: MP3, stereo, AAC, AAC+, enhanced AAC+, WMA
- Still image: Camera up to 2 megapixel with 1.3 second shot-to-shot imaging: JPEG, GIF, EXIF, PNG, BMP
- Dual LCD support (main LCD up to QVGA 256,000 color)

#### Key Benefits

- Integrated modem and applications processing on a single core
- EDGE Class 10 support, Class 12 capable, UMA ready
- High-performance Java™ (including Java acceleration)
- Ability to support HLOSs and Nucleus™ applications suites
- Support for external memory cards including MMC/SD
- Connectivity includes Wi-Fi®, Bluetooth® 2.0/EDR, IrDA and USB OTG
- Embedded security via hardware accelerators supporting terminal security, transactions security, and content security
- Re-usable APIs for maximum re-use across OMAP-Vox family improving time-to-market
- Complete TI system solution offering

- Video:
  - Capture, playback and streaming MPEG-4/H.263 (QVGA) up to 25-fps QVGA display
  - H.264 (QVGA) playback at 15-fps QVGA display
- 2D and 3D gaming 100,000 polygons per second, 2-megapixel rasterization, 15 fps

The OMAPV1030 solution supports all form factor requirements, including PDAs, clamshells, bar-types and other mechanical designs. TI's open-platform architecture provides manufacturers the flexibility and choice needed to differentiate their products to emerging markets worldwide.



### OMAPV1035 Single-Chip Handset Solution

The OMAPV1035 solution is the first to integrate GSM/GPRS/EDGE modem, digital RF and applications processor functionality onto the same silicon, leveraging the LoCosto™ single-chip cell phone solution and the multimedia capabilities of the OMAP-Vox™ platform.

Sharing the same platform with the OMAP-Vox family ensures software re-use for faster and more cost-effective feature phone development. Integrating the innovative RF capabilities of TI's DRP™ technology with the powerful processing of the OMAP-Vox architecture yields significant cost savings. As a result, mobile device manufacturers can bring compelling multimedia applications to entry and mid-range wireless devices worldwide.

The OMAPV1035 is the first 65-nm single-chip solution to support EDGE, as well as to integrate modem, applications processor and RF into a single offering. A powerful multimedia platform, the OMAPV1035 leverages the capabilities of advanced ARM® and DSP technologies to deliver the following:

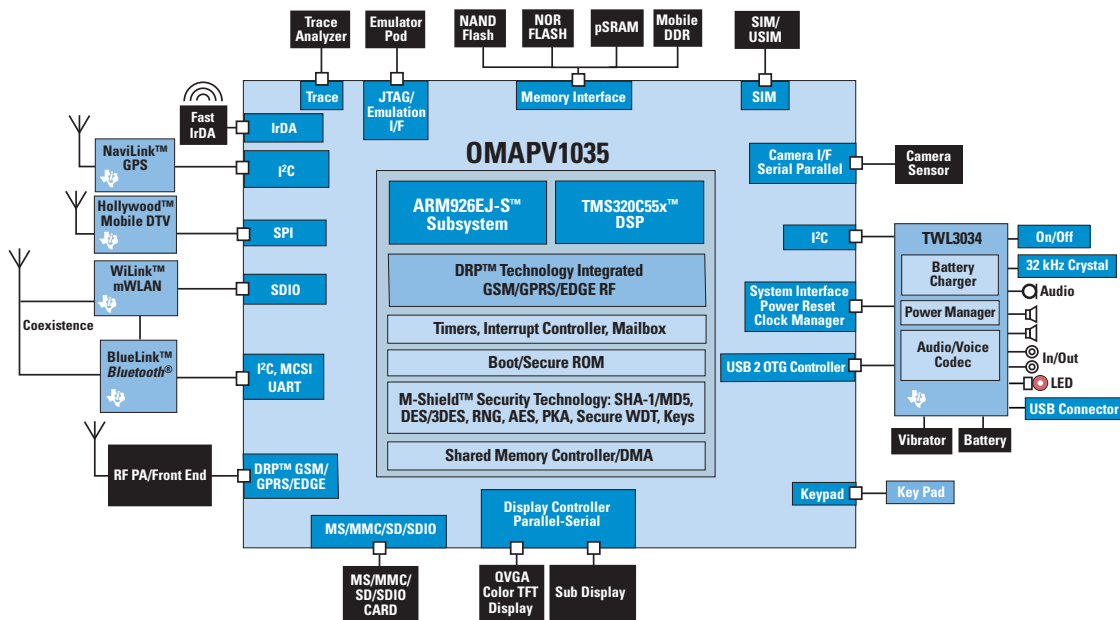
- 30-fps video playback and record with QVGA display
- A full 256,000 palette of colors
- 3-megapixel resolution camera support with sub-second delay
- User responsiveness as fast as 0.3 seconds shot-to-shot
- "See What I See" at 15 fps, 2D/3D gaming, audio/video codecs and imaging algorithms (MP3, AAC+, eAAC+, WMA/WMV, Real)
- 3D graphic processing up to 200,000 polygons per second

The OMAPV1035 is scalable and adaptable to customer needs with a wide range of configuration and connectivity capabilities. The common software foundation used across TI solutions allows for

#### Key Benefits

- Single chip with integrated RF, digital baseband and application processor for affordable EDGE multimedia devices
- EDGE Class 12 release 4/5 compliant, DTM Class 11
- 65-nm process for smallest footprint and circuit board costs
- Leverages TI's innovative DRP™ technology
- Extensive connectivity options: BlueLink™ Bluetooth®, WiLink™ WLAN, NaviLink™ GPS and Hollywood™ DTV
- USB high-speed and USB OTG support for high-speed connectivity
- TV-out support
- SD/MMC/MS-Pro/Micro-SD support for external storage
- Embedded TI's M-Shield™ technology for strong HW-assisted security and SmartReflex™ technologies for advanced power reduction
- Complete TI system software offering with seamless migration from the OMAPV1030 solution
- Lower power consumption compared to previous generation OMAPV1030 solution

maximum software re-use, improving time to market and easing the processing of porting application suites. TI's open-platform architecture provides manufacturers the flexibility and choice needed to differentiate their products to markets worldwide.





## Chipset Reference Designs

### Chipset Reference Designs

TI's chipset family and supporting reference designs speed manufacturers' 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 applications suite for the wireless chipsets.

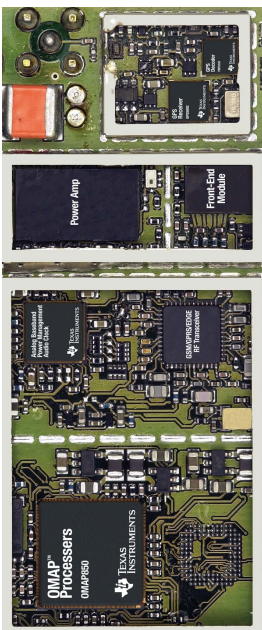
TI's best-in-class customer support guides manufacturers from design start through full-scale production. Worldwide locations are based in Europe, USA, China, Taiwan and Japan.

### Key Benefits

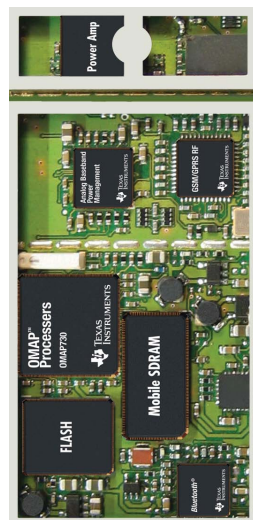
- Manufacturing quality, with competitive BOM costs and full component list
- Designs tailored to all market segments
- Low power consumption
- Board design and layout
- Complete and fully-validated wireless software suite includes communication protocol stacks and leading OS support
- Customizable-ready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

### TI Chipset Reference Designs

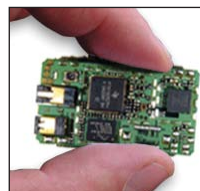
- TCS2010 GSM/GPRS
- TCS2110 GSM
- TCS2200 GSM/GPRS
- TCS2300 GSM LoCosto™ Solution
- TCS2310 GPRS LoCosto™ Solution
- TCS2305 GSM LoCosto™ Solution
- TCS2315 GPRS LoCosto™ Solution
- TCS2600 GSM/GPRS
- TCS2700 GSM/GPRS
- OMAP850 EDGE
- OMAPV1030 OMAP-Vox™ Solution GSM/GPRS/EDGE
- OMAPV1035 OMAP-Vox™ Solution GSM/GPRS/EDGE
- BRF6100 Bluetooth®
- And more



OMAP850  
Reference Design



TCS2600 GSM/GPRS Chipset  
Reference Design




LoCosto™ GSM/GPRS  
Reference Design



BlueLink™ 6.0  
Bluetooth® Solution



 <b>To Know More</b>	
<b>OMAP™ processors featured in this issue:</b>	
Integrated Modem and Applications Processors	31-33
OMAP-Vox™ Solutions	34-36
OMAP-DM Coprocessors	37-38
Multimedia Processors	39
High-Performance Multimedia-Rich Applications Processors	40-49
OMAP Platform Resources	50-56





## Overview

For designers looking to deliver the most differentiated, 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 advanced applications, including streaming media, security, interactive gaming, multi-megapixel imaging, location-based services and more.

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

Optimized software, including the operating system port, is an essential element of the OMAP platform. TI delivers differentiated software solutions on the OMAP platform addressing all high-level operating systems with key driver support and hardware-accelerated multimedia codecs. An extensive selection of integrated peripherals and manufacturing-ready reference designs reduces a system's bill-of-materials (BOM) cost and 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 (Symbian, Linux and Microsoft), 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 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.

### OMAP™ 3 Platform

TI's OMAP 3 platform builds on the robust multimedia performance of TI's OMAP 2 processors and adds a new realm of support for even higher-performance entertainment and 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 and beyond handsets. The OMAP 3 platform is a complete system solution for advanced graphics standards including OpenGL® ES 2.0 and OpenVG™. Support for these open graphic standards gives developers the tools to create effects that deliver a level of cinematic realism rivaling that of Hollywood movies. Rich effects such as facial features and textured backgrounds that previously were only possible with PCs and gaming consoles will be brought to the mobile environment.





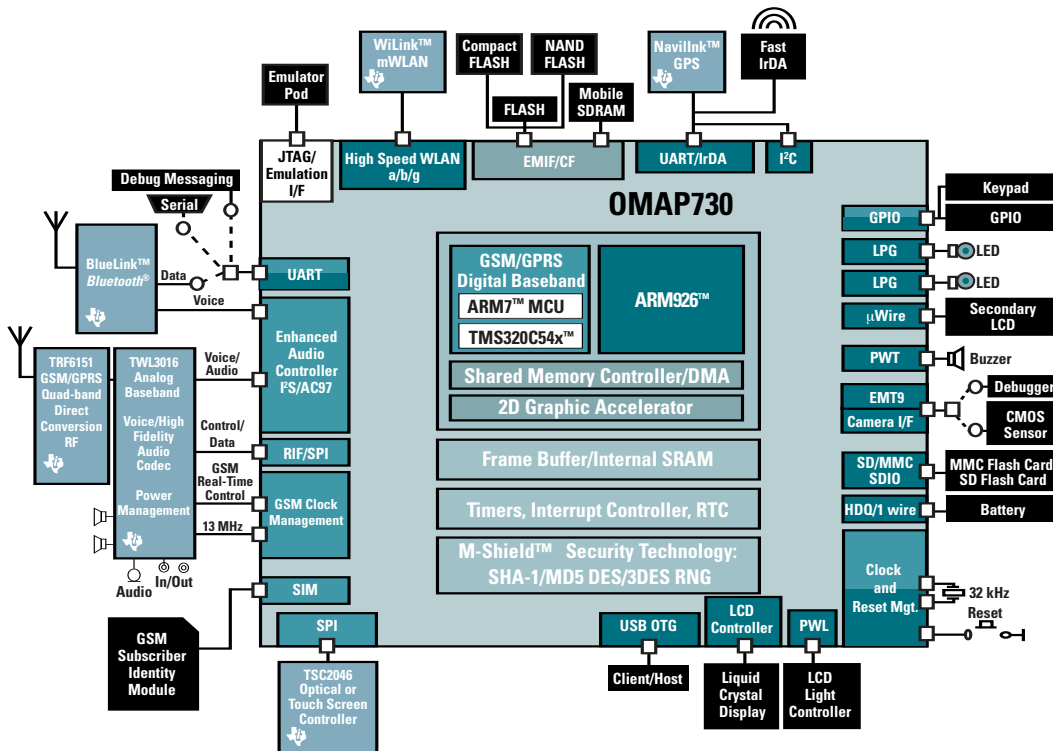
**OMAP730 Processor**

The OMAP730 builds on the proven foundation of previous processors 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 integration 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™ communications interface
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch





## Integrated Modem and Applications Processors

### OMAP750 Processor

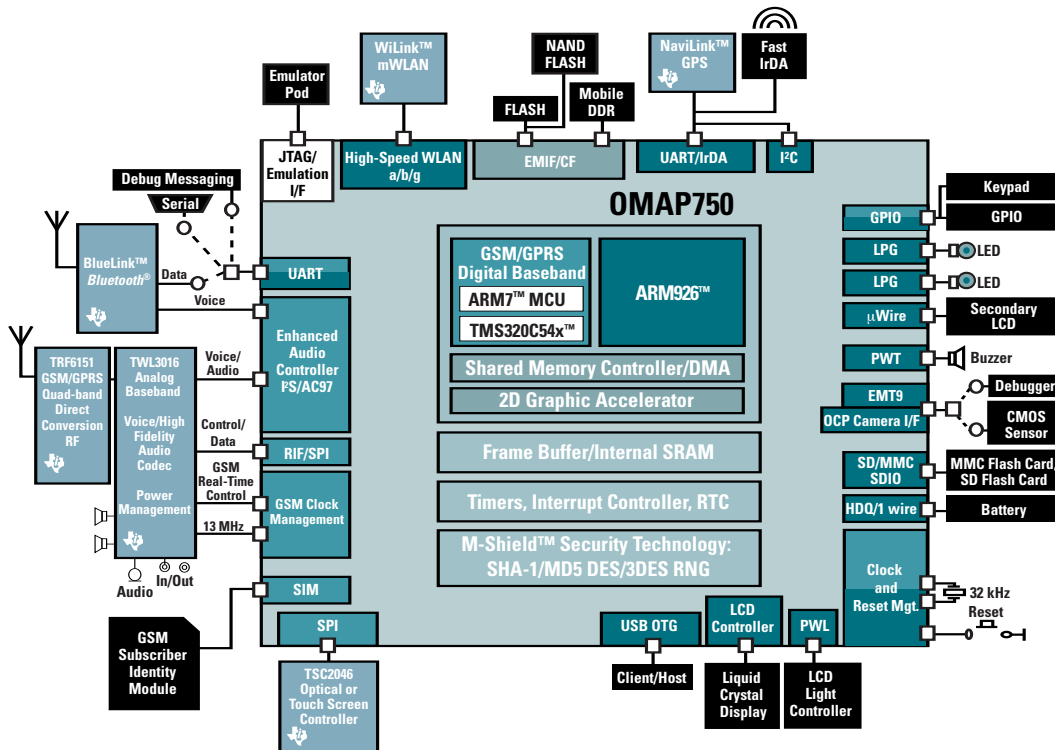
Targeted at wireless handsets, smartphones, PDAs and Internet access devices, the OMAP750 extends capabilities of the OMAP73x device while including a range of features that improve multimedia application performance. The OMAP750 integrates an ARM926™ core dedicated to applications processing. The processor is a complete Class12 GSM/GPRS modem baseband subsystem which 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 supports 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-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

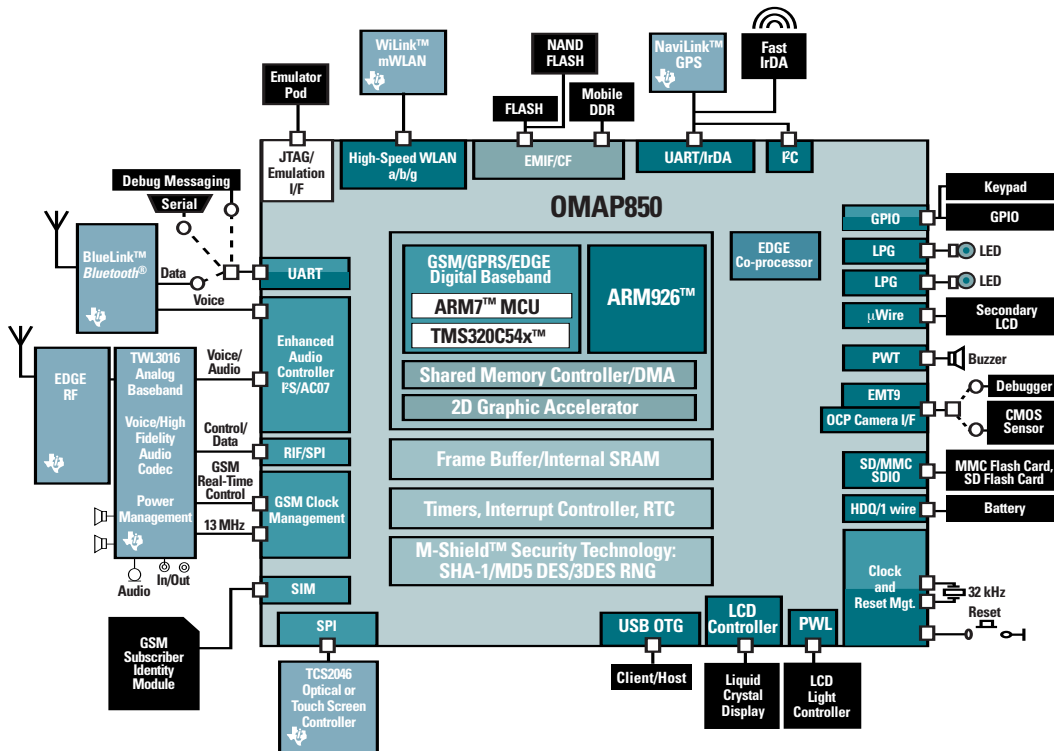
The OMAP850 integrated modem and applications processor offers the high performance and low power required for GSM/GPRS and EDGE applications including multimedia, gaming and camera functionality. Software compatible with other OMAP™ applications processors, it serves as an ideal choice for upgrading 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. The OMAP850 supports MPEG-4 video, Windows Media® Video, MP3, up to 2.0 megapixel still image capture and more.

TI includes a security hardware platform as part of the OMAP850 that includes secure mode, secure boot and hardware encryption accelerators. It supports high-level mobile OSs, such as Symbian OS™, Microsoft® Windows Mobile®, 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-megapixel camera and others
- HLOSs 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****OMAP-Vox™ Solutions**

One important aspect of 2.5G and 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. Leveraging software compatibility across the platform, customers can easily scale across multiple market segments from GSM/GPRS/EDGE to WCDMA. 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 re-used for evolving market segment requirements.

Designed to scale from feature phones to advanced multimedia smartphones, the OMAP-Vox platform continues TI's legacy of software compatibility and re-use, saving years of software design effort. This software serves as the foundation for applications, multimedia and communications development on all OMAP-Vox solutions, saving manufacturers time and money.

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, high-performance multimedia codecs and functions, applications software suite via ecosystem partners, a competitive handset reference design and a complete development toolkit.

The OMAP-Vox family includes the OMAPV1030 (GSM/GPRS/EDGE) and OMAPV1035 GSM/GPRS/EDGE integrated solutions. Optimized to enable mid-range multimedia devices, the OMAPV1030 supports applications such as high-quality video capture and playback, video streaming and downloads, megapixel digital still cameras and interactive 2D/3D gaming.

A powerful multimedia solution, the OMAPV1035 was the first 65-nm single-chip solution to support EDGE, and to integrate modem, applications processor and RF into a single offering.

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

### OMAPV1030 Integrated GSM/GPRS/EDGE Solution

The OMAPV1030 solution is one of the industry's most highly integrated and optimized EDGE solutions (UMA-ready), 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 high-volume, 90-nm digital CMOS process technology.

The OMAPV1030 processor is based on the OMAP™ platform 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 WCDMA.

The OMAPV1030 solution is specifically designed to bring multimedia functionality to mass market mobile phones and delivers advanced capabilities to mid-range wireless handsets. The OMAPV1030 solution includes best-in-class, advanced multimedia performance including:

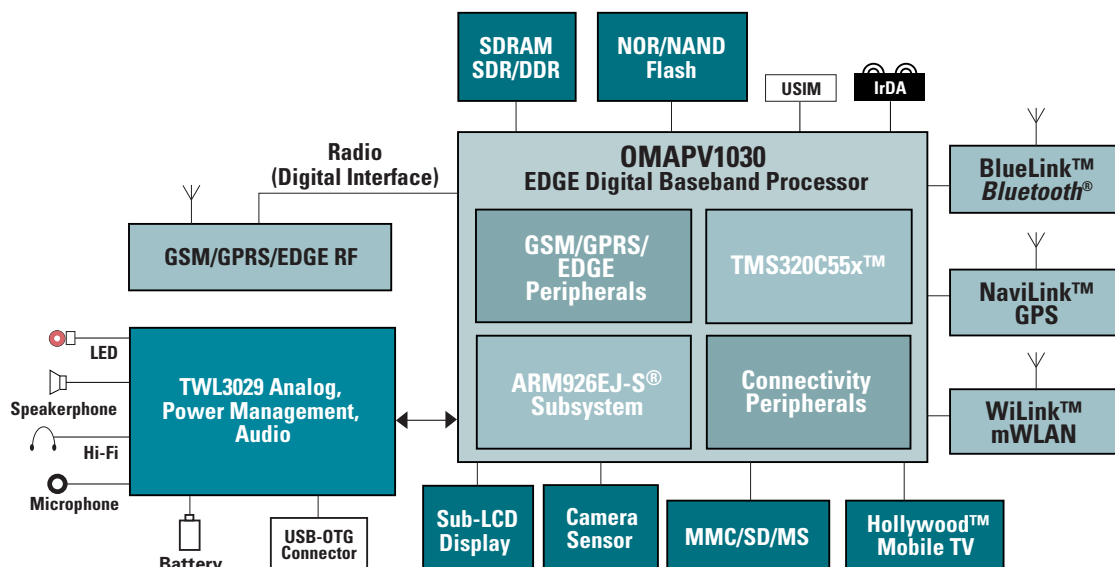
- Comprehensive audio/video codecs and imaging algorithms
- Ringtones: 64-polyphonic MIDI
- Audio: MP3, AAC, AAC+, enhanced AAC+, WMA, stereo sound
- Still image: Camera up to 2 megapixel with 1.3 second shot-to-shot imaging: JPEG, GIF, EXIF, PNG, BMP
- Dual LCD support (main LCD up to QVGA 256,000 palette of color)

#### Key Benefits

- Integrated modem and applications processing on a single core
- EDGE Class 10 support, Class 12 capable, UMA ready
- High-performance Java™ (including Java acceleration)
- Ability to support HLOSs and Nucleus™ applications suites
- Support for external memory cards including MMC/SD
- Connectivity includes Wi-Fi®, Bluetooth® 2.0/EDR, IrDA and USB OTG
- Embedded security via hardware accelerators supporting terminal security, transactions security and content security
- Re-usable APIs for maximum re-use across OMAP-Vox family, improving time to market
- Complete TI system solution offering

- Video:
  - Capture, playback and streaming MPEG-4/H.263 (QVGA) up to 25-fps QVGA display
  - H.264 (QVGA) playback at 15-fps QVGA display
  - 2D and 3D gaming 100,000 polygons per second, 2-megapixel rasterization, 15 fps

The OMAPV1030 solution supports all form factor requirements, including PDAs, clamshells, bar-types and other mechanical designs. TI's open-platform architecture provides manufacturers the flexibility and choice needed to differentiate their products to emerging markets worldwide.





## OMAP-Vox™ Solutions

### OMAPV1035 Single-Chip Handset Solution

The OMAPV1035 solution is the first to integrate GSM/GPRS/EDGE modem, digital RF and applications processor functionality onto the same silicon. The device builds on the LoCosto™ single-chip cell phone solution and the multimedia capabilities of the OMAP-Vox™ platform.

Sharing the same platform with the OMAP-Vox family ensures software re-use for faster and more cost-effective feature phone development. Integrating the innovative RF capabilities of TI's DRP™ technology with the powerful processing of the OMAP-Vox architecture yields significant cost savings. As a result, mobile device manufacturers can bring differentiated multimedia applications to entry- and mid-range wireless devices worldwide.

The OMAPV1035 was the first 65-nm single-chip solution to support EDGE, as well as to integrate modem, applications processor and RF into a single offering. A powerful multimedia platform, the OMAPV1035 leverages the capabilities of advanced ARM® and DSP technologies to deliver the following:

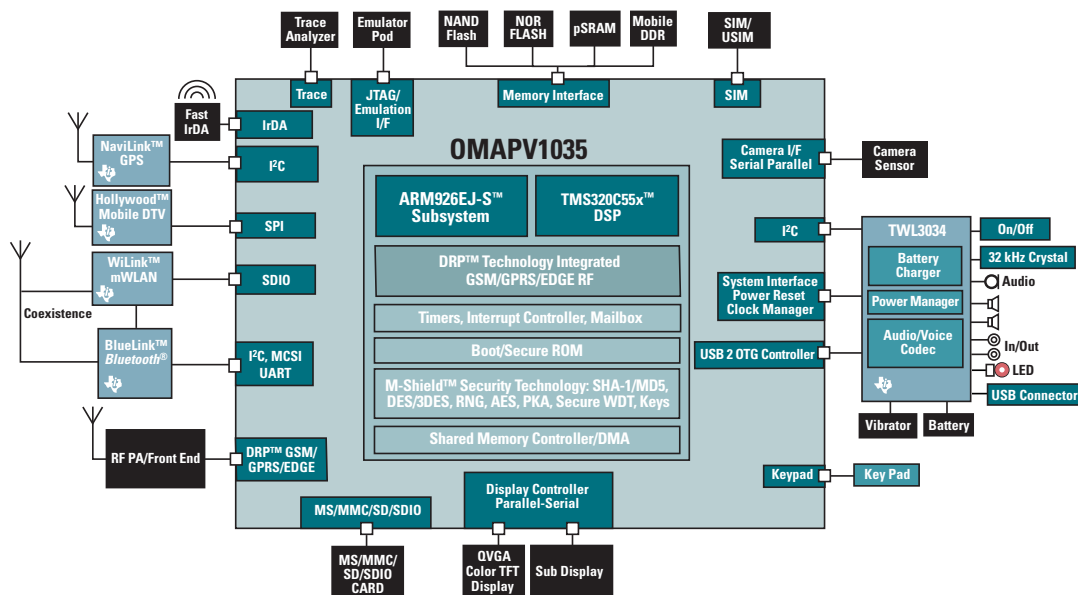
- 30-fps video playback and record with QVGA display
- A full 256,000 palette of colors
- 3-megapixel resolution camera support with sub-second delay
- User responsiveness as fast as 0.3 seconds shot-to-shot
- "See What I See" at 15 fps, 2D/3D gaming, audio/video codecs and imaging algorithms (MP3, AAC+, eAAC+, WMA/WMV, Real)
- 3D graphic processing up to 200,000 polygons per seconds

The OMAPV1035 is scalable and adaptable to customer needs with a wide range of configuration and connectivity capabilities. The common software foundation used across TI solutions allows for

### Key Benefits

- Single chip with integrated RF, digital baseband and application processor for affordable EDGE multimedia devices
- EDGE Class 12 release 4/5 compliant, DTM Class 11
- 65-nm process for smallest footprint and circuit board costs
- Leverages TI's innovative DRP™ technology
- Extensive connectivity options: BlueLink™ Bluetooth®, WiLink™ WLAN, NaviLink™ GPS and Hollywood™ DTV
- USB High-Speed and USB OTG support for high-speed connectivity
- TV-out support
- SD/MMC/MS-Pro/Micro-SD support for external storage
- Embedded TI's M-Shield™ technology for strong HW-assisted security and SmartReflex™ technologies for advanced power reduction
- Complete TI system software offering with seamless migration from the OMAPV1030
- Lower power consumption compared to previous generation, OMAPV1030

maximum software re-use, improving time to market and easing the processing of porting application suites. TI's open-platform architecture provides manufacturers the flexibility and choice needed to differentiate their products to emerging markets worldwide.





## OMAP-DM Coprocessors

As wireless services drive forward into advanced 3G and 4G technologies, handsets themselves continue to grow in capabilities such as higher-resolution cameras and displays. Today, camera phones are moving to 5- and 8-megapixel image sensors and beyond, with displays that show a corresponding increase in resolution. As a result, baseband and application processors that were designed for lower resolutions are beginning to strain to keep up with the demand for increased multimedia performance. Handset manufacturers need solutions that can help them upgrade their existing designs quickly and with minimal development investment in order to provide users the latest advanced features in imaging and video.

OMAP-DM coprocessors address the need for increased multimedia performance in the cellular handset market. Integrating a high-performance ARM microprocessor with a dedicated image signal processor (ISP) and a video processor, the OMAP-DM devices allow system developers to quickly adapt their current architectures to meet market requirements and differentiate their products. The coprocessors are streamlined to provide all the necessary interfaces to camera sensors and hosts, operating side by side with OMAP™ application processors or directly with baseband modem processors to provide media-centric handsets. By complementing the standalone OMAP processor or other host, the OMAP-DM coprocessors support higher camera resolutions while speeding multimedia operation to enhance the user's experience of video and still images in a variety of applications.

High performance, flexibility and ease of use are key to the design of OMAP-DM products. Devices support a number of widely used imaging and video standards up to D1 (720 x 480) resolutions. A variety of interfaces make system hardware connections straightforward, and stacked memory options and small form factor packages keep space to a minimum.

Software is ready to use and operation is transparent to the developer: the phone operating system, media applications and graphical user interface remain on the host processor while the OMAP-DM device accelerates handset imaging and video. The framework and codecs that form the

### Key Benefits

- Simplifies design of new and existing mobile systems with high-resolution imaging and video capabilities
- Seamlessly supports OMAP™ application processors, with a variety of host interfaces for added flexibility
- Full support of multiple image sensors utilizing various interfaces to maximize compatibility
- Advanced image signal processor (ISP) for fast JPEG compression
- Supports multiple video algorithms for encode and decode at high mobile display resolutions
- Ready to use without coprocessor programming, minimizing risk and saving development time
- Includes TI baseline imaging and video processing software, with many additional advanced still imaging and video features available from third parties
- Low power consumption, small form factor aid long battery operation and mobility
- Leverages TI expertise in both digital still cameras and wireless technologies

baseline software are included by TI along with the product. In addition, advanced still imaging and video features and applications are available from third parties. The OMAP-DM family provides memory and feature sets for a wide range of handsets, and future introductions will address market trends toward cameras and displays with even higher resolutions.

For nearly a decade, TI has been applying its leadership in digital signal processor technology to provide highly integrated solutions for digital still cameras (DSCs). Not long after releasing its first DSC products, TI redefined wireless multimedia technology with the introduction of the OMAP platform. OMAP-DM coprocessors combine TI's expertise in imaging and wireless technologies, helping extend the capabilities of media-centric handsets with higher resolutions and more features than ever.

## → OMAP-DM Coprocessors

### OMAP-DM510

The highly integrated OMAP-DM510 multimedia coprocessor combines low-power hardware and programmable image processing capability to provide high still image and video quality in camera phones. As 3G phones add cameras with ever higher resolutions, application processors that are already in use need the boost of a coprocessor to speed multimedia performance. The OMAP-DM510 permits manufacturers to integrate increased performance from a coprocessor with little redesign into systems with existing platforms in order to improve camera and video quality.

The OMAP-DM510 device features an ARM processor and TI's most advanced Image Signal Processor (ISP) technology. With its best-in-class imaging and video, the device supports camera image sensors up to 5 and 8 megapixels, content output to TV displays, JPEG compression, and D1 (720 x 480 pixels) video encode and decode for multiple codec standards. Internal processing improves picture quality with features such as defect pixel correction, lens shading compensation, color filter array interpolation, white balancing, Gamma correction, color space conversion and image scaling.

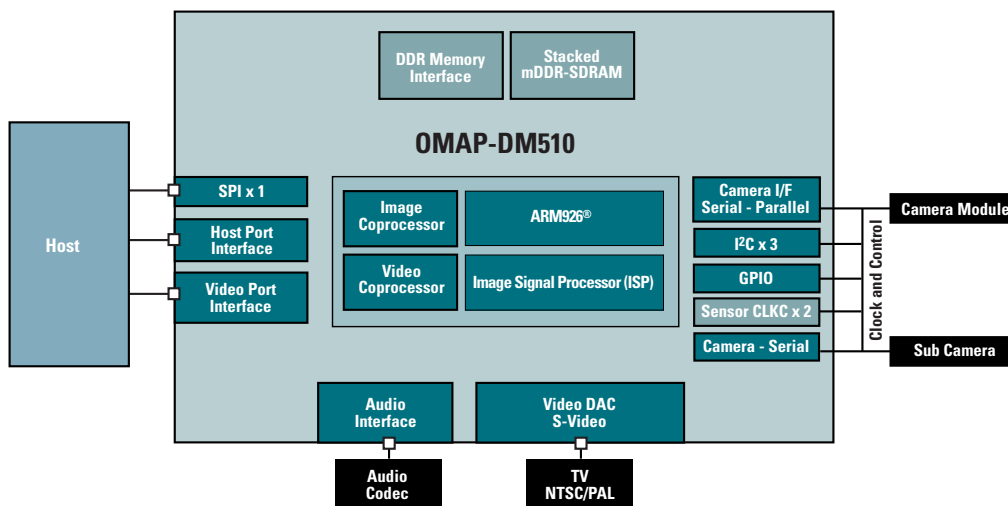
Flexible interfaces support various types of CMOS sensor interfaces, signal conditioning circuits, power management, mobile DDR-SDRAM, and auto-focus motor controls. The coprocessor also offers a seamless interface to application and baseband processors. Low power consumption, optimized by TI's unique SmartReflex™ power-saving technologies, helps prolong time between battery charges in media-centric handsets.

The OMAP-DM510 device comes ready-to-use with software, enabling coprocessor enhancement to new and existing systems with minimal

#### Key Benefits

- TI's latest image signal processor (ISP) technology
- Supports up to 30-fps encode and decode at D1 resolution
- Full support of multiple image sensors utilizing various interfaces to maximize compatibility
- High-quality video capture supported with high-resolution advanced video codecs
- Integrate output to TV with digital overlay
- Seamless interface to OMAP™ application processors and other baseband and application processors
- Ready to use without coprocessor programming, minimizing risk and saving development time
- Includes TI baseline imaging and video processing software, with additional advanced still imaging and video features available from third parties
- Low power consumption, small form factor aid long battery operation and mobility
- Leverages TI expertise in both digital still cameras and wireless technologies

investment in development. Software management for the OMAP-DM510 device's programmable and dedicated image processing functions and peripherals is performed through the high-level operating system on the host processor. As part of the product, TI provides the framework and codecs that make up the baseline software. In addition, advanced still imaging and video features and applications are available from third parties.





### OMAP331 Processor

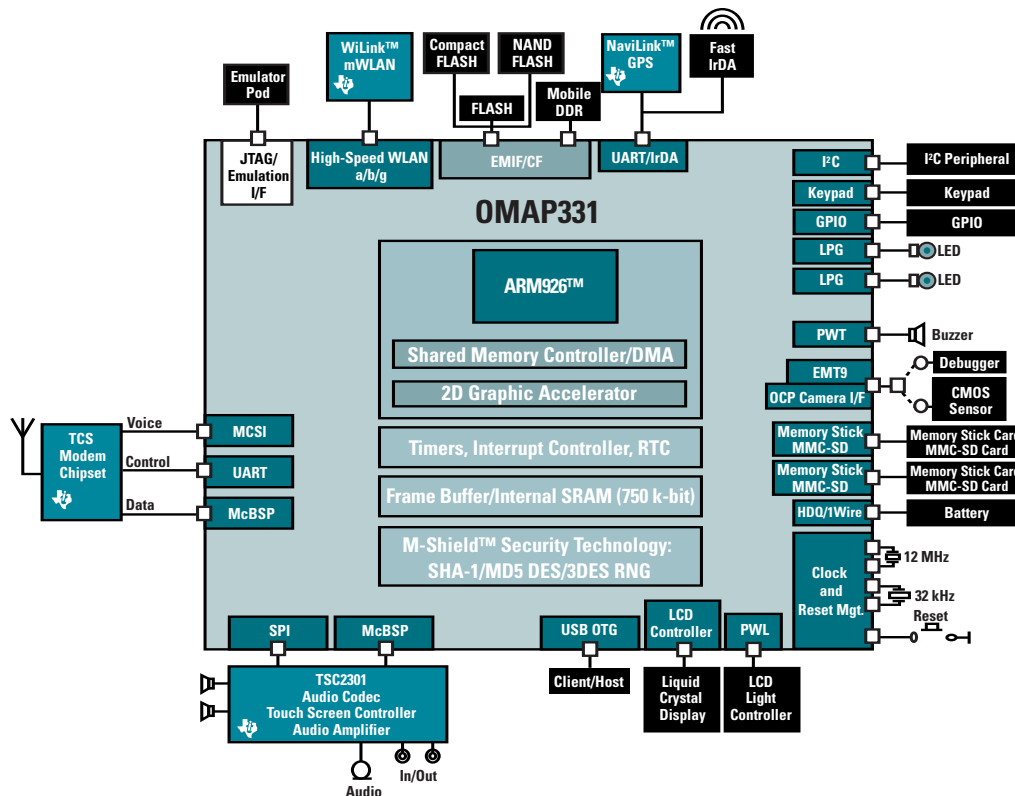
The OMAP331 processor provides a feature-rich platform for price-sensitive 2.5G and 3G handsets, PDAs and other mobile devices. Based on an ARM926™ processing core, the OMAP331 processor delivers multimedia functionality while maintaining power efficiency. Software re-use and compatibility with higher end OMAP™ devices provide manufacturers a migration path to higher performing smart-phones, Internet and multimedia devices.

Features found in the OMAP331 processor include robust multimedia performance, fast processing speeds, a 2D-graphics accelerator engine, a high-throughput direct memory access interface and much more. An on-chip frame buffer improves performance of multimedia applications like streaming video and graphics. Enhanced, high-resolution imaging is possible through a parallel Open Core Protocol (OCP) camera port.

The OMAP331 processor includes a hardware-based security engine and random number generator (RNG) 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 previous generation
- Low power consumption
- Software re-use 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



## → High-Performance Multimedia-Rich Applications Processors

### OMAP1610 Processor

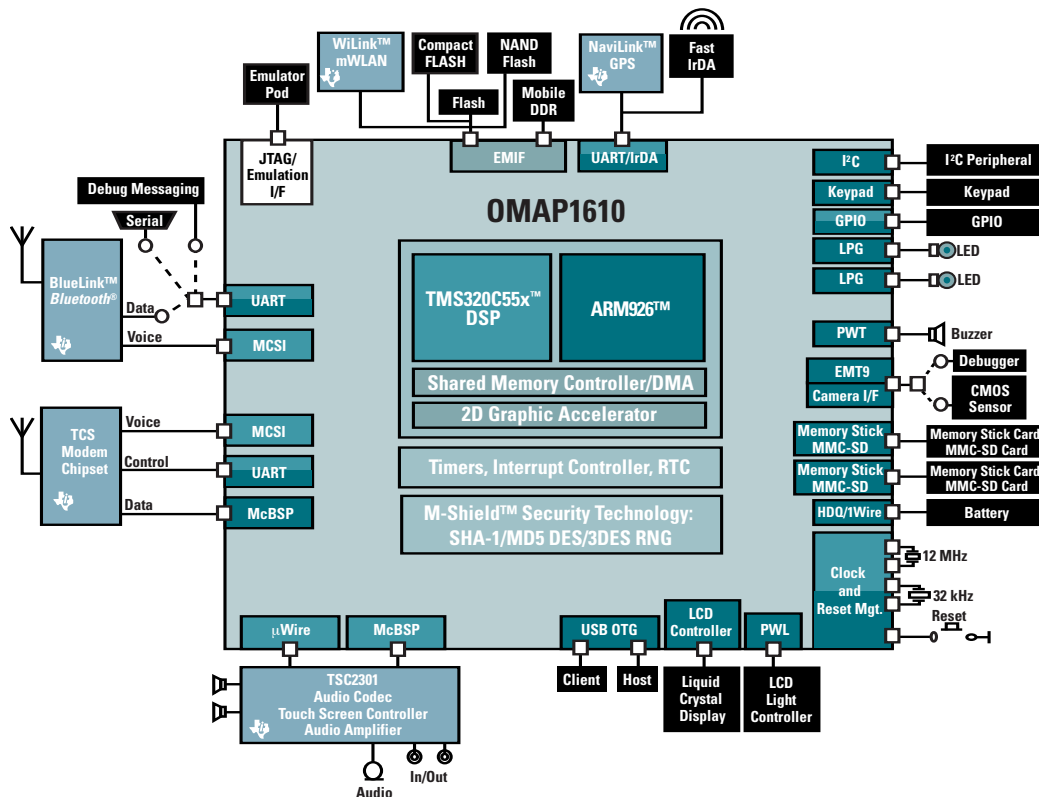
The OMAP1610 applications processor features a dual-core architecture based on TI's TMS320C55x™ DSP and TI-enhanced ARM926™ cores. Each core has processing capabilities of up to 200 MHz, resulting in enhanced performance for processing multimedia applications, including videoconferencing, interactive gaming, speech processing, location-based services, video streaming and others. Manufacturers benefit from 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 processor, with a hardware-based security system which provides protection of creative content or software, guarding confidential information and securing information transmission.

The OMAP1610 applications processor maintains standby power consumption levels of less than 10  $\mu$ A, which is among the lowest in the industry. It supports all cellular standards and complements any modem technology.

### Key Benefits

- Multimedia applications including videoconferencing, interactive gaming, speech processing, m-commerce, location-based services and others
- Supports all cellular standards
- Migration path to high-end market segments through scalability of the OMAP™ platform
- Reduced power consumption through hardware-based accelerators
- Secure mode of operation with wireless security hardware
- Dedicated on-chip 2D-graphics engine
- TI-enhanced ARM926™ core
- 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

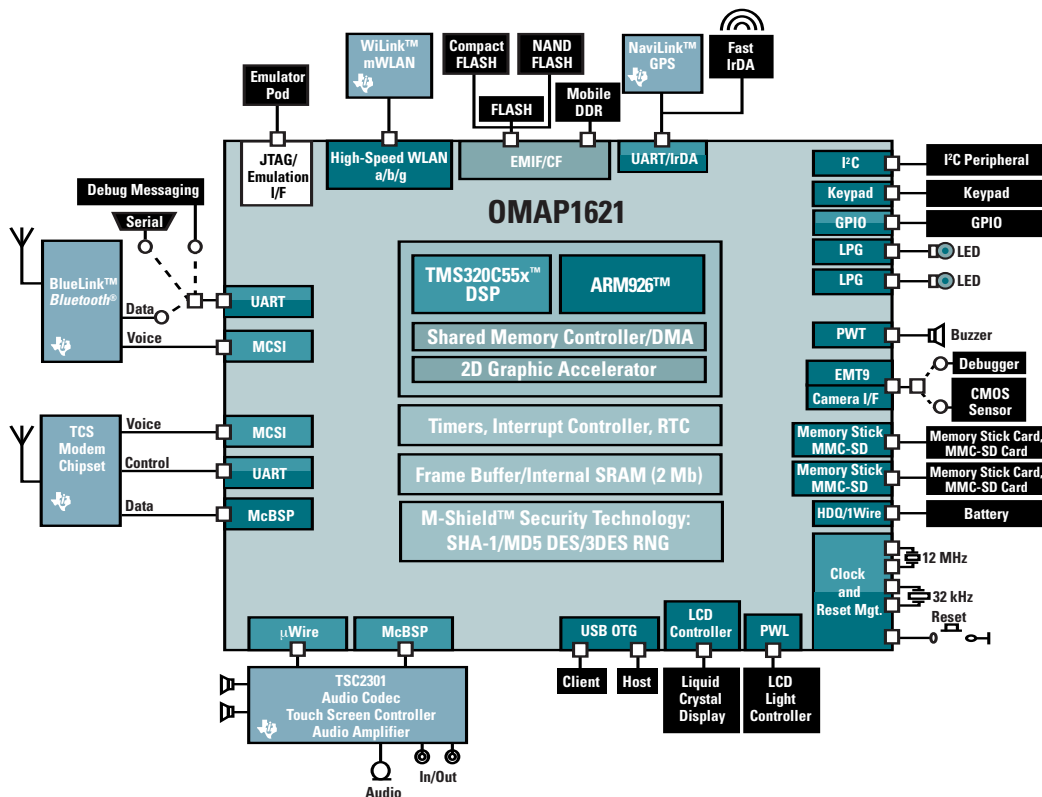
The OMAP1621 applications processor is a software-compatible upgrade to the OMAP1610 processor. The OMAP1621 processor boasts improved ARM® and DSP performance versus previous devices to meet the increasing performance demands of multimedia-enabled handsets. Additionally, the OMAP1621 processor adds 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 processor includes an enhanced camera port interface bus that results in higher throughput.

The OMAP1621 processor 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 with a hardware-based security system, enabling 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 µA 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 processor 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 data throughput with integrated VLYNQ™ communications interface
- Scalable solution provides path to high-end market segments
- Reduced power consumption through hardware-based accelerators
- Secure mode of operation through wireless security hardware
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch



## → High-Performance Multimedia-Rich Applications Processors

### OMAP1710 Processor

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

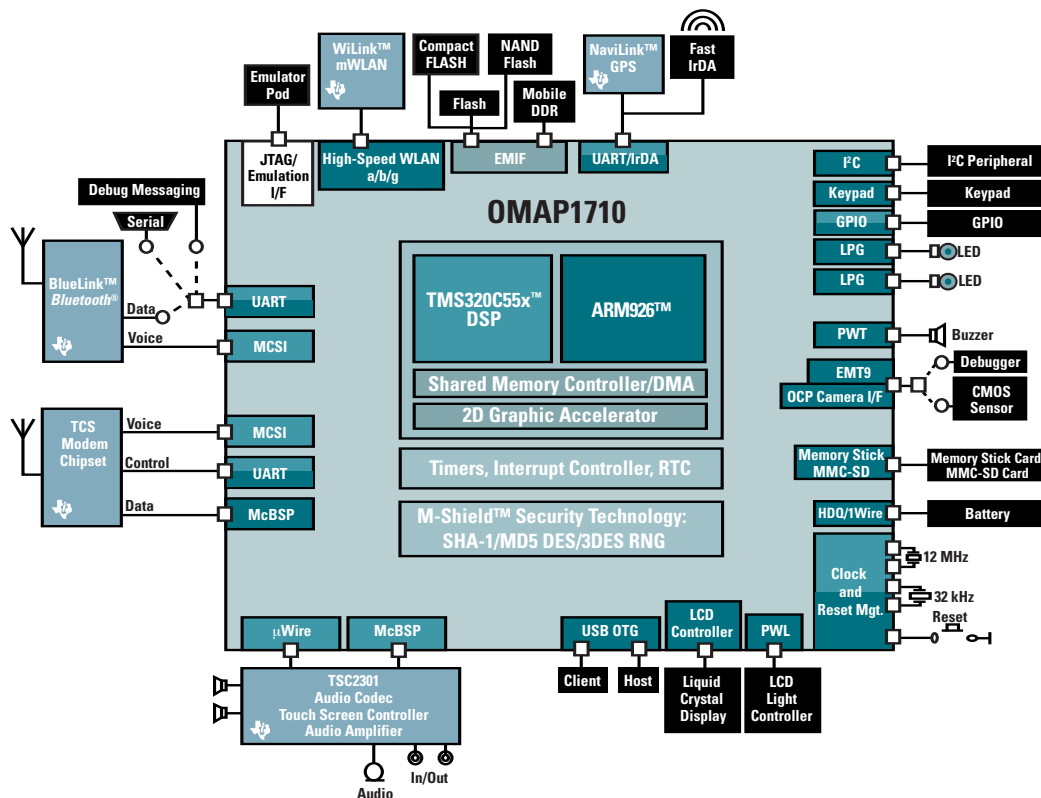
A range of software and hardware accelerators are included as part of the OMAP1710 processor, including video encode and decode, still picture compression, Java™ and security. TI's advanced security hardware provides a secure execution environment and an ideal platform to address a range of security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

The OMAP1710 processor 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 processor offers an easy migration path due to software compatibility with previous generations of OMAP™ applications processors.

### Key Benefits

- 90-nm CMOS process technology
- 40 percent performance improvement in a variety of mobile applications compared to previous generations
- TMS320C55x™ DSP and ARM926 at 220 MHz
- Software re-use 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 megapixels
- 802.11 capable up to 54-Mbps data throughput with integrated VLYNQ™ communications interface
- Integrated hardware and software security
- Improved multimedia and graphics
- Optimized for TI's TCS wireless chipsets
- High-level 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

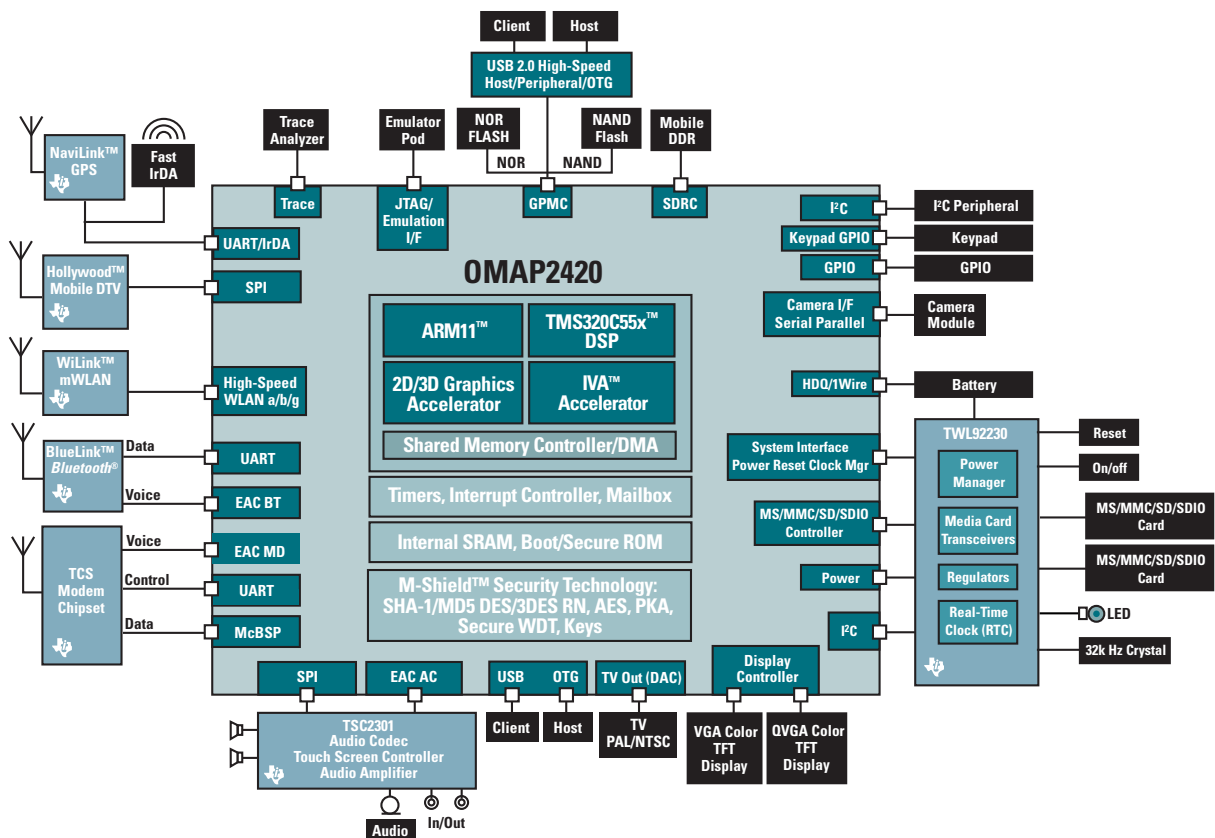
The OMAP2420 processor, software compatible with previous OMAP™ processors, adds features for further enhancing the “All-in-One Entertainment” features that the OMAP 2 architecture brings to smartphones and wireless PDAs.

The OMAP2420 processor 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 compromising quality of service. The OMAP2420 processor includes an integrated ARM1136™ processor (330 MHz), a TI TMS320C55x™ DSP (220 MHz), 2D/3D graphics accelerator, IVA™ imaging accelerator, high-performance system interconnects and industry-standard peripherals.

Multimedia enhancements made in the OMAP2420 processor include an 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 fps. An added TV video output supports connections to television displays for displaying images and video captured from the handset. Streaming media performance is boosted by 5-MB internal SRAM.

**Key Benefits**

- Dedicated 2D/3D graphics accelerator at 2-million polygons per second
- IVA™ accelerator 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



## → High-Performance Multimedia-Rich Applications Processors

### OMAP2430 and OMAP2431 Processors

The OMAP2430 and OMAP2431 high-performance applications processors deliver best-in-class performance to multimedia-enabled handsets and 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 and OMAP2431 processors balance multimedia performance, flexibility, power and cost. IVA™ 2 technology, TI's latest-generation imaging, video and audio accelerator (OMAP2430 only), boosts mobile video playback performance to DVD quality. The processors also integrate an ARM1136® RISC processor core (up to 450 MHz), dedicated 2D/3D graphics hardware acceleration, high-speed system interconnect, numerous peripherals, and camera, display and memory subsystems.

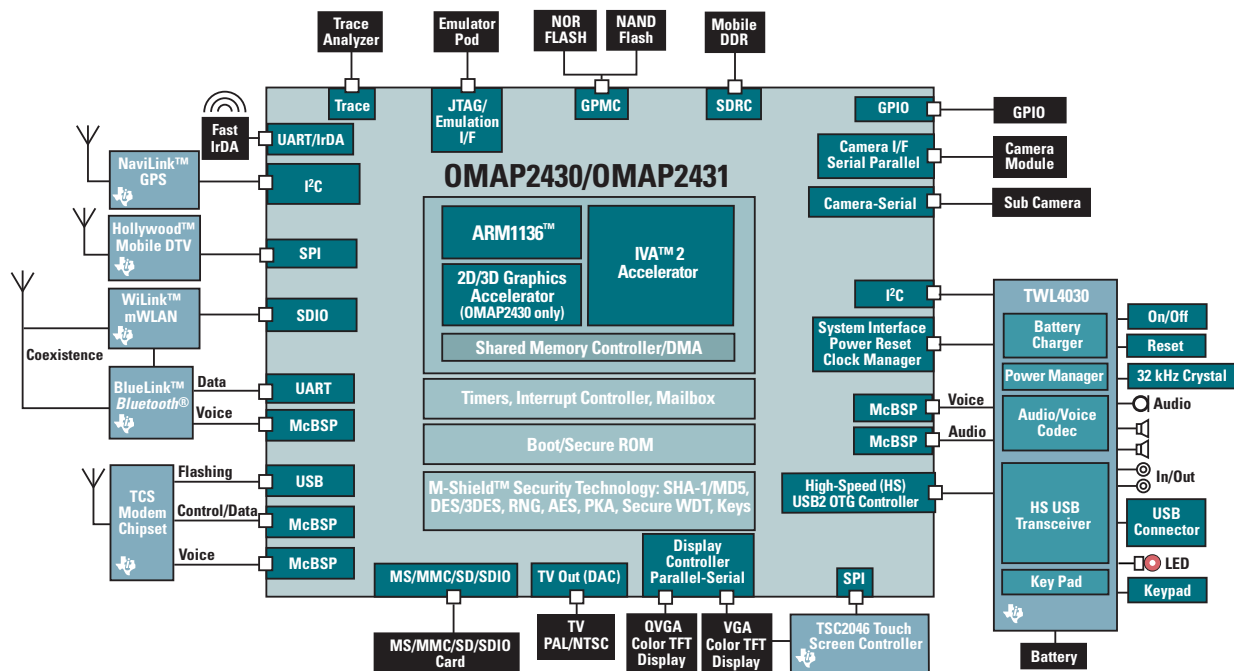
Multimedia features supported include:

- Downloadable media playback and digital TV decode: MPEG-4, H.264, Windows Media® Video (VC-1), RealVideo® version 10 decode up to D1 (720 x 480) 30 fps
- Still image capture: > 5 megapixel with 1 second shot-to-shot delay
- Motion video capture: MPEG-4, 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 (OMAP2430 processor only)

### Key Benefits

- Advanced IVA™ 2 accelerator 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
- Embedded M-Shield™ mobile security technology enables value-added services and terminal security
- Support for all major HLOSs aids applications development
- Optimized power management companion chip: TWL4030
- 14 mm x 14 mm, MicroStar BGA™, memory stackable package

The OMAP2430 and OMAP2431 processors support HLOSs, including Linux®, Microsoft® Windows Mobile® and Symbian™. The processors' high performance allows for the use of more highly compressed codecs that bring spectral efficiency and cost savings. Embedded M-Shield™ security technology enables value-added services for content protection, transaction security and secure network access, as well as terminal security functions such as secure flashing and booting, terminal identity protection and network lock protection.



## High-Performance Multimedia-Rich Applications Processors



### OMAP™ 3 Applications Processors

The OMAP™ 3 family of multimedia applications processors introduces a new level of performance that enables laptop-like productivity and advanced entertainment in multimedia-enabled handsets. For manufacturers designing multimedia-enabled handsets, the OMAP 3 family offers a range of high-level performance and productivity capabilities. TI's OMAP 3 family of applications processors integrates the ARM® Cortex™-A8 superscalar microprocessor core, delivering up to 3X gain in performance over ARM11-based processors. These new processors leverage industry-leading technologies to extend mobile phone battery life together with the performance needed for laptop-comparable productivity software and an audio/video experience equivalent to that of consumer electronics devices.

The OMAP 3 applications processors are the industry's first to be designed in a 65-nm CMOS process technology, reflecting TI's commitment to providing advanced silicon technology that drives a revolution in mobile communications. The device can operate at a higher frequency than previous generation OMAP processors, increasing its clock speed over the OMAP 2 platform, while lowering the core voltage and adding power reduction features to help prolong battery life. Multimedia applications benefit from faster, higher-quality image capture and processing for cameras, exceptional audio/video performance, enhanced support for external displays and high-speed connectivity interfaces. Compatible with a wide range of modems, the OMAP 3 family helps manufacturers develop compelling new mobile applications that will revolutionize handheld communications in both work and play.

The OMAP 3 family of applications processors integrates the most advanced and effective power management techniques in the market. The chips make extensive use of TI's SmartReflex™ technologies,

#### Key Features and Benefits

- Proven OMAP™ 3 architecture combines mobile entertainment with high performance productivity applications to meet the needs of all multimedia-enabled handsets
- Advanced superscalar ARM® Cortex™-A8 RISC core
- 65-nm CMOS process technology adds processing performance while reducing power consumption
- Seamless connectivity to Hard Disk Drive (HDD) devices for mass storage
- Leverages SmartReflex™ technologies for advanced power reduction and performance enhancement
- M-Shield™ mobile security enhanced with ARM TrustZone™ support
- Software-compatible with OMAP 2 and OMAP 3 processors
- HLOS support for customizable interface
- Optimized power management companion chip: TWL5030

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 OMAP 3 processors support HLOSs 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, OMAP 3 security is based on open APIs, providing an environment for secure applications that deliver robust performance and interoperability.

## → High-Performance Multimedia-Rich Applications Processors

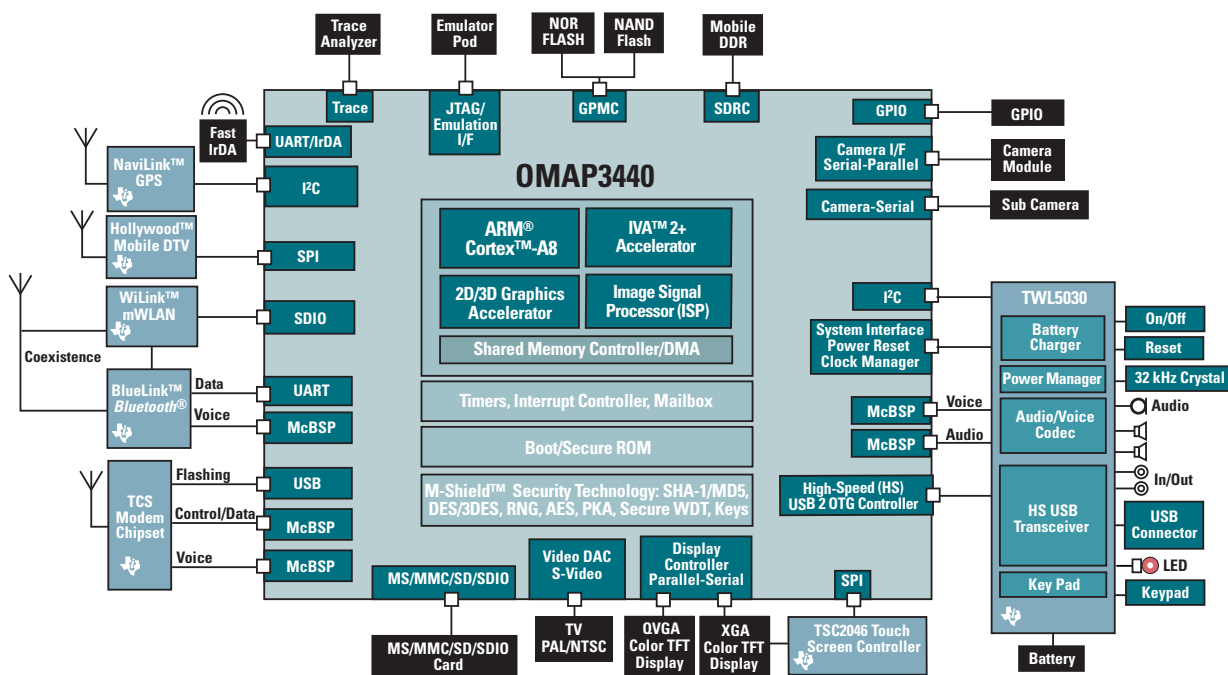
### OMAP3440 Processor

Pushing mobile multimedia boundaries, TI introduces the OMAP3440 processor, the newest addition to the OMAP™ 3 platform. The OMAP3440 processor offers increased performance and advanced multimedia benefits targeting applications that require high performance, such as the mobile Internet device (MID) market. TI's new OMAP3440 processor is the industry's first applications processor to bring full HD camcorder functionality to mobile devices, giving users the ability to record high-definition (HD) video, as well as enjoy new applications enabled by the large displays in the latest Smartphones and Mobile Internet Devices (MIDs). The OMAP3440 processor leverages TI's high performance IVA™ 2+ multimedia accelerator to support 720p HD video record and playback, unleashing user creativity behind the lens. Additionally, at the heart of the OMAP3440 processor is a PowerVR SGX 2D/3D graphics hardware accelerator that supports OpenGL® ES and OpenVG® and provides outstanding graphic and gaming capabilities.

**Productivity.** Like the rest of the OMAP 3 product family, the OMAP3440 processor integrates the ARM Cortex-A8 superscalar microprocessor core, which provides 800 MHz of performance to enhance applications that take advantage of the larger displays used in MIDs. Combined with TI's technology in the OMAP3440 processor, the ARM Cortex-A8 enables faster user interfaces, faster data access and boosts productivity and entertainment applications on the mobile phone, while maintaining power efficiencies expected in a handset.

### Key Features and Benefits

- 65-nm CMOS process technology adds processing performance
- IVA™ 2+ (Image Video Audio) accelerator enables multi-standard encode/decode at D1 30 fps
- Integrated image signal processor (ISP) for faster, higher-quality image capture and lower system cost
- Flexible system support
  - Composite and S-video TV output
  - XGA, 16 M-color 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



## High-Performance Multimedia-Rich Applications Processors



### OMAP3430 Processor

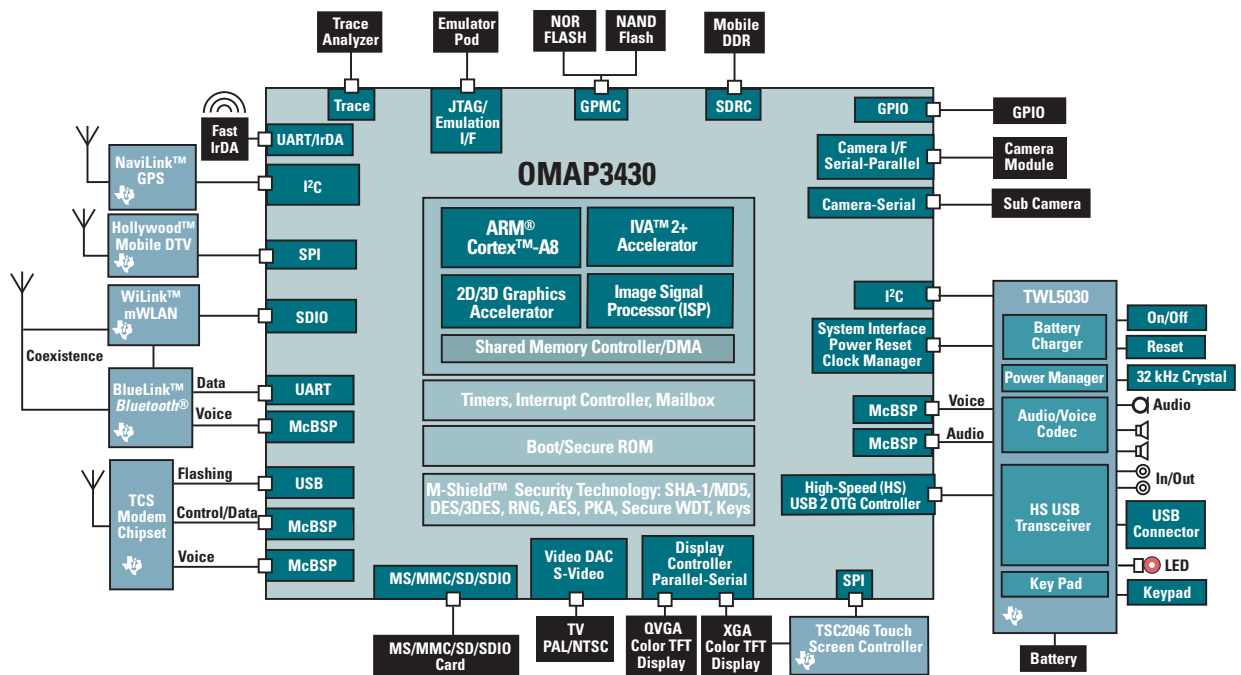
The OMAP3430 applications processor with the ARM® Cortex™-A8 core delivers up to 3X the performance of ARM11-based processors, enabling laptop-like productivity and advanced entertainment in 3G handsets. The industry's first applications processor to be designed in a 65-nm CMOS process, the OMAP3430 combines the optimal mix of advanced technology and innovation to provide the most advanced applications processor in the market. 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+ accelerator, 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 IVA 2+ accelerator enables multi-standard (MPEG-4, H.264, Windows® Media Video®, RealVideo®, etc.) encode and decode at DVD resolutions and 720p capability for video decode. With the advanced multimedia 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 processors dedicated PowerVR SGX 2D/3D graphics hardware accelerator, supporting OpenGL® ES and OpenVG®, provides outstanding graphic and 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 OTG support and much more.

### Key Features and Benefits

- 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+ accelerator enables multi-standard (MPEG-4, WMV9, RealVideo®, H.263, H.264) encode/decode at D1 (720 x 480 pixels) 30 fps and MPEG-4 decode at 720p (1280 x 720 pixels) 30 fps
- Integrated image signal processor (ISP) for faster, higher-quality image capture and lower system cost
- 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 OTG support
- Seamless connectivity to HDD devices for mass storage
- SmartReflex™ technologies for advanced power reduction
- M-Shield™ mobile security enhanced with ARM TrustZone™ support
- Software-compatible with OMAP™ 2 and OMAP 3 processors
- HLOS support for customizable interface
- Optimized power management companion chip: TWL5030



## → High-Performance Multimedia-Rich Applications Processors

### OMAP3420 Processor

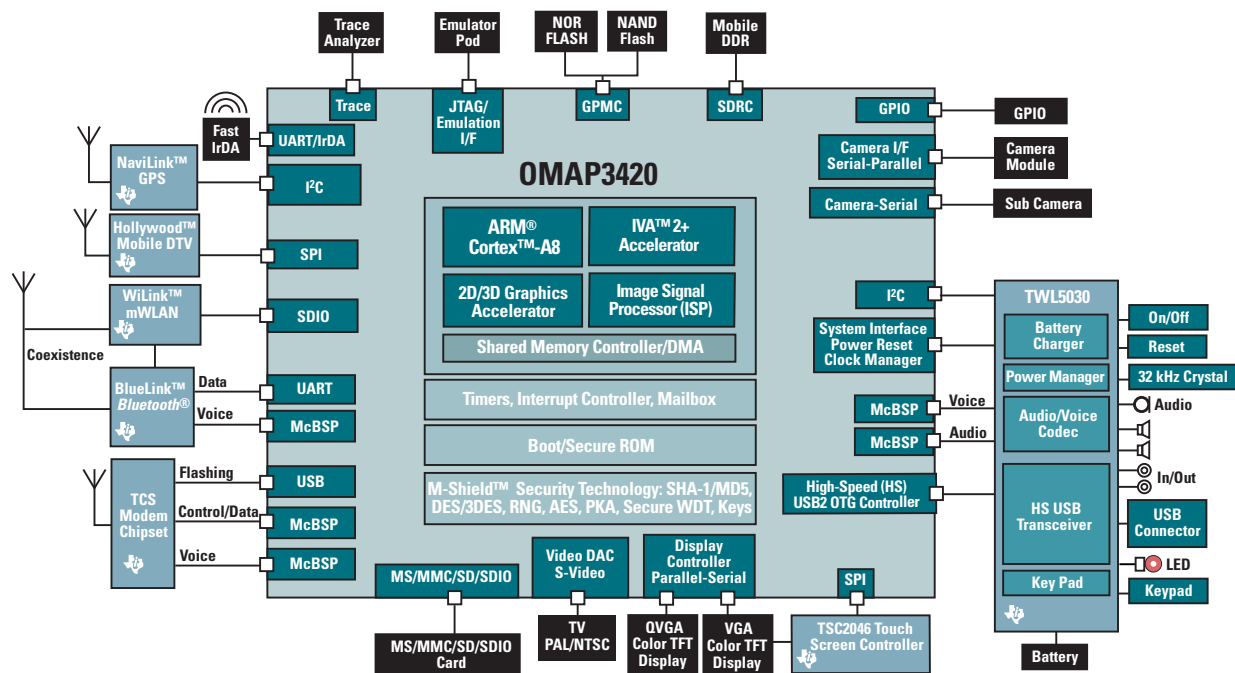
The OMAP3420 processor is designed to provide the right mix of performance and cost to meet the needs of the mid-tier multimedia enabled handsets market. The OMAP3420 processor is designed in a 65-nm CMOS process to allow a higher operating frequency while lowering core voltage and power consumption. The ARM® Cortex™-A8 superscalar microprocessor core provides exceptional performance to deliver laptop-like productivity and entertainment at a price point for the advanced multimedia-enabled handsets market.

The IVA™ 2 imaging, video and audio accelerator in the OMAP3420 processor enables VGA quality video camcorder and playback for multiple standards, including MPEG-4, H.264, Windows Media Video processor and RealVideo®. The OMAP3420 device includes a PowerVR SGX 2D/3D graphics hardware accelerator to provide high quality, OpenGL® ES and OpenVG® graphic and gaming capabilities.

Additional system features include an image signal processor which allows up to 5-megapixel still image capture, as well as support for parallel and serial displays and cameras, composite and S-Video TV output, high-speed USB 2.0 OTG support and seamless hard disk drive (HDD) interfaces. In addition, the OMAP3420 processor is software compatible with all OMAP 2 and OMAP 3 processors, allowing a fully software scalable solution.

### Key Features and Benefits

- Advanced superscalar ARM® Cortex™-A8 RISC core
- 65-nm CMOS process technology adds processing performance while reducing power consumption
- IVA™ 2 accelerator enables VGA resolution video playback for multiple video standards
- Integrated image signal processor (ISP) for faster, higher-quality image capture and lower system cost
- Flexible system support
  - Composite and S-video TV output
  - VGA (640 x 480 pixels), 16-M color (24-bit definition) display support
  - Flatlink™ 3G-compliant serial display and parallel display support
  - High-speed USB 2.0 OTG support
- Seamless connectivity to HDD devices for mass storage
- SmartReflex™ technologies for advanced power reduction and performance enhancement
- M-Shield™ mobile security enhanced with ARM TrustZone™ support
- Software-compatible with OMAP™ 2 and OMAP 3 processors
- HLOS support for customizable interface
- Optimized power management companion chip: TWL5030





High-Performance Multimedia-Rich Applications Processors

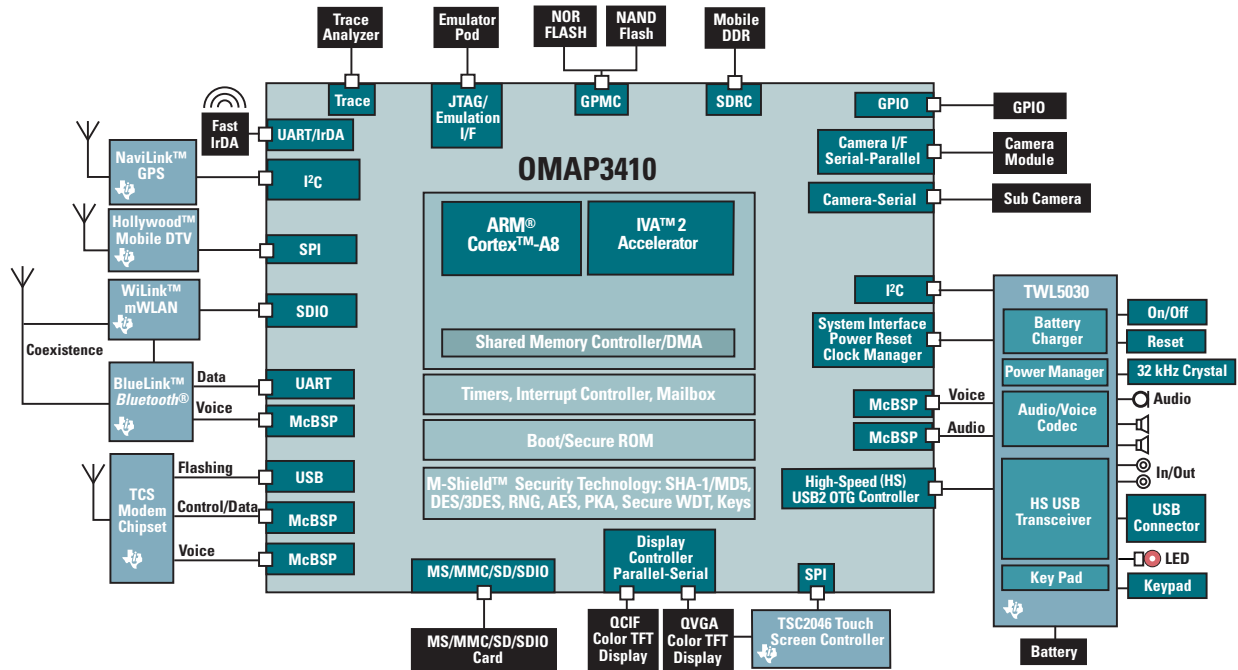


OMAP3410 Processor

The OMAP3410 processor is designed to meet the needs of the basic multimedia enabled handsets market, which includes CIF quality video capture and playback for multiple standards (MPEG-4, Windows® Media Video® 9, RealVideo®, H.264), up to 3-megapixel still image capture, music playback and 3D gaming. The lowest cost member of the OMAP™ 3 family, the OMAP3410 processor shares many of the technologies that are present in the OMAP3430 and OMAP3420 devices, including a 65-nm CMOS process, the ARM® Cortex™-A8 superscalar microprocessor core as well as IVA™ 2 imaging, video and audio accelerator, for a rich multimedia experience and targeted general purpose processing. In addition, the OMAP3410 processor is software compatible with all OMAP 2 and OMAP 3 processors, allowing a fully software scalable solution.

Key Features and Benefits

- Advanced superscalar ARM Cortex-A8 RISC core
- 65-nm CMOS process technology adds processing performance while reducing power consumption
- IVA™ 2 accelerator enables CIF resolution video playback for multiple video standards
- Seamless connectivity to HDD devices for mass storage
- SmartReflex™ technologies for advanced power reduction and performance enhancements
- M-Shield™ mobile security enhanced with ARM TrustZone™ support
- Software-compatible with OMAP™ 2 and other OMAP 3 processors
- HLOS support for customizable interface
- Optimized power management companion chip: TWL5030





## OMAP Platform Resources

### 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 and OMAP 3 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 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 giving 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 for networks supporting 2.5G, 3G and beyond.

### 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 BSP includes GNU Linux OS, source-level debugging tools, Linux trace tools, language tools including C, C++ and Java™. Commercial support is available from MontaVista, for both their MontaVista CEE 3.x and Mobilinux 4.x products, Wind River also is offering commercial grade Linux on the OMAP platform. These offerings include the Linux kernel, software updates, utilities, development tools and technical support. Additionally, there are partners including Trolltech and Access that offer complete user interface (UI) and application platforms on the OMAP platform with Linux.

### 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 and TAO Group combine enhanced Java applications and services with TI's TCS wireless chipsets, OMAP-Vox™ chipsets and 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.

symbian  
OS



JAVA COMMUNITY  
PROCESS  
EC MEMBER

## Wireless Applications Center

The Wireless Applications Center helps handset makers to see a variety of 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. Current locations include Dallas, Bangalore, Taipei and Nice.

Within each center are targeted areas to meet customer needs, including a wireless demo area to see actual solutions in use. The OMAP Developer Network Support Lab provides extensive support tools and programs to assist design from the beginning of development

through to customer demonstrations and volume manufacturing. Additionally, several advanced test systems facilitate thorough and rapid testing of new systems and subsystems.

Other offerings of the center include an application benchmarking program to compare OMAP technology performance numbers with those of competitive platforms; a device loan and support program that gives customers access to tools and devices for development and demonstrations at tradeshows and customer meetings; and a website database where demos are accessible online.



**OMAP Platform Resources****Application Suite Ecosystem**

Broadening its commitment to accelerate wireless development in high-growth markets worldwide, TI is working with leading application software providers to offer a scalable, integrated application suite for affordable feature phones. Partner application suites are integrated onto TI's LoCosto™ single-chip mobile phone solution and OMAP-Vox™ product family for a highly customizable application solution that greatly reduces the overall handset development cycle. Working with market-leading solutions including Motorola AJAR, OpenPlug's ELIPS and SKY MobileMedia's SKY-MAP™, TI gives its customers the flexibility to select an application suite that can be easily adapted to the unique needs of handsets and specific operator and consumer requirements.

Porting, validating and integrating software requires significant monetary and time investment. Working with an ecosystem of application software providers, TI handset customers have the flexibility to choose a pre-integrated solution, simplifying the development process. With the technical integration work complete, handset manufacturers reduce time to market by approximately six months, opening doors to quickly deliver new phone models, particularly for high-growth markets. A common TI software foundation built with open industry standard application programming interfaces (APIs) allows for software re-use and easy consistent migration across TI's roadmap of LoCosto solutions and OMAP-Vox platforms.

TI is committed to delivering solutions for emerging markets as they require increasingly advanced technologies. TI and its applications suite partners make efficient use of system resources and promote seamless interaction between applications. These integrated offerings reduce time to market, allowing mobile device manufacturers to introduce new differentiated models faster and reduce costs.

**Key Benefits**

- All partner application suites available on TI's LoCosto and OMAPV1030 platforms
- Accelerated porting on OMAPV1035 solution
- Committed and aligned roadmap with all partners for future TI products
- Ongoing commercial products development with several application suites for second and third quarter 2008 shipments

**MOTOROLA**



## OMAP™ Gaming Development Platform

The OMAP™ Gaming Development Platform allows developers and publishers to create a portfolio of mobile games with significantly reduced time and monetary investments. With this gaming platform based on Ideaworks3D's Airplay™ and TI's OMAP platform, developers will be able to create games targeting a broad range of mobile handsets. Developers will be able to create the majority of a game before new handsets are available on the market, enabling prompt availability of games on new mobile phones as they enter the market.

The combined solution from TI and Ideaworks3D changes the current mobile gaming development process by allowing developers to create one game which runs on leading open operating systems (OSs), including Symbian OS™, Linux® and Microsoft® Windows Mobile®. As part of this effort, Ideaworks3D will optimize and integrate its industry leading Airplay game software development kit (SDK) for TI's OMAP2430 and OMAP-Vox™ processors, which benefits TI's extensive OMAP ecosystem of leading game publishers and developers, serving handset manufacturers and mobile operators worldwide.

TI's OMAP platform integrates advanced 3D graphics hardware acceleration enabling mobile game developers to extract new levels of performance and enhance the game-play experience. The new OMAP Gaming Platform with Ideaworks3D allows developers to take full advantage of the powerful 3D graphics capabilities of the OMAP architectures for popular mobile operating systems.

### Key Features

- Complete hardware and software package to enable developers to optimize performance-, timing- and memory-related design factors early in the game development process
- Based on the OMAP2430 processor and OMAP-Vox™ platform with Ideaworks3D Airplay™ software
- Increases the target market for a game by increasing the footprint
- Reduces mobile gaming fragmentation and developers costs
- Offers a complete single-game developer package enabling 3D development across multiple operating systems

TI's OMAP processor-based mobile gaming platform is a complete hardware and software package that will enable developers to optimize performance-, timing- and memory-related design factors early in the game development process.

TI's mobile gaming website provides additional resources for developers, handset manufacturers and operators. The site contains information on all of TI's mobile gaming developments and includes downloadable SDK and tools, and market and standards information. Visit [www.ti.com/omappgaming](http://www.ti.com/omappgaming) to learn more about how TI is changing the mobile gaming market.



# Mobile Gaming



**OMAP Platform Resources****OMAP Developer Network**

Since 2000, TI's OMAP™ Developer Network has provided innovative applications, services and multimedia modules for TI's OMAP processors, OMAP-Vox™ cellular modem solutions and non-cellular wireless technologies including WLAN, *Bluetooth*® and GPS. Consisting of an extensive range of third party software developers and hardware manufacturers, the optimized OMAP software and algorithms deliver the latest, most compelling applications for handsets in 2.5G and 3G and beyond.

TI Ecosystem seeks to engage key applications, service areas and key players in the market to bring the richness of the solution onto our platforms.

OMAP Developer Network members are continuously building new multimedia-rich applications and services on the entire TI wireless portfolio 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, HD multimedia, speech recognition, 3D console quality gaming, Java™ virtual machines, high-end audio, image and video stabilization, videoconferencing, location-based services and security. TI works with the industry's most innovative developers, including Access, Aricent, Beatnik, Discretix, Droplet, HI Corp, Ideaworks3D, Ingenient, Motorola TTPCom, Movial, NXP Software, Nexstreaming, Open-Plug, PacketVideo, SRS Labs, Sasken, SKY MobileMedia, TAT, Trolltech, Trusted Logic, and hundreds more.

**Training**

Various online and live workshop training opportunities are available for software development, DSP algorithm development, development tools and other subjects. TI also periodically holds targeted training and interaction sessions on key topics such as graphics, multimedia and security. As an OMAP Developer Network member, you will have access to dedicated support resources within TI to assist you in developing your applications and services successfully and ensuring that they are optimized to the underlying TI platform.

**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.

**Member Benefits/Product Exposure**

As a member of the OMAP Developer Network, once your application, service or reference design is available within TI Wireless Application Centers (WACs), TI has the opportunity to expose your product to a range of leading wireless OEMs and ODMs in the market. Prospective customers will be exposed to developer product information through a variety of marketing opportunities including:

- OMAP Developer Network online catalog
- TI OMAP Developer Network collateral used by TI Business Development and Marketing
- Wireless ACCESS e-newsletter
- Website promotions
- Online demos (internal)
- Customer showcase events

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 may be included in OEM/ODM proposals and requests for quotation to complement TI's products.

**For more information visit [www.ti.com/omapdevnet](http://www.ti.com/omapdevnet)**



**TEXAS  
INSTRUMENTS**  
**OMAP  
Developer Network**



**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 must consider communications protocols, baseband processors and other wireless design technologies, in addition to other requirements like security, HLOSs, 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 OMAP Technology Centers (OTCs). Manufacturers may use OTCs to leverage leading expertise in hardware design, embedded software development, HLOS 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, EDGE, WCDMA protocols
- WLAN 802.11x, *Bluetooth*® wireless technology
- Multimedia codec development
- ARM® and DSP algorithm development



OTCs are valued members of TI's wireless offering 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 Intrinsic MPC Data Limited Sasken SysOpen Digia TapRoot Systems Teleca Wipro
Linux®
Elektrobit Intrinsic Sasken SysOpen Digia TapRoot System Teleca Wipro
Microsoft® Windows Mobile®
BSQUARE Fujitsu Broad Solution & Consulting Intrinsic MPC Data Limited Sasken Teleca TapRoot System Wipro
Nucleus™
Elektrobit Intrinsic MPC Data Limited Sasken SysOpen Digia Wipro



## OMAP 2 and OMAP 3 Platform Resources

### OMAP™ Software 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.

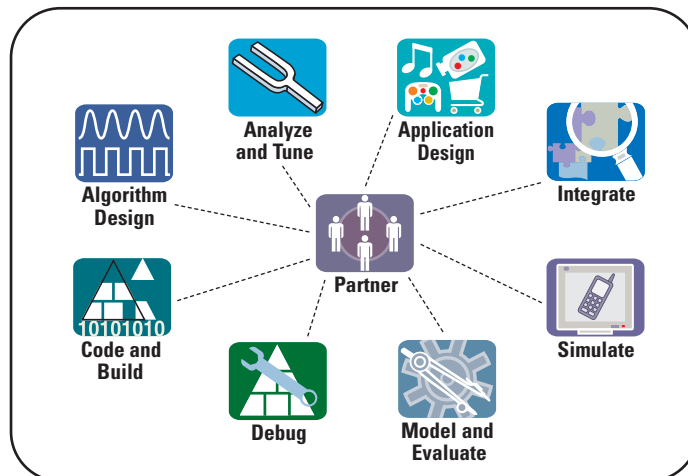
The comprehensive toolset for OMAP developers gives TI customers significant options to help system integrators solve the functional requirements, performance goals and power constraints they face when developing wireless handsets.



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

### OMAP2430 and OMAP3430 Software Development Platforms (SDP)

The OMAP2430 and OMAP3430 SDPs offer 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 and OMAP™ 3 architectures. The SDPs provide a full range of software, services and support, including board support packages for access to HLOSs 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 SDPs save time to market by providing all the hardware and software needed for cost-effective development of OMAP 2 and OMAP 3 processor-based systems.



### To Know More

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

BlueLink™ 7.0 <i>Bluetooth</i> ® and FM Solution	58
BlueLink 6.0 <i>Bluetooth</i> and FM Solution	59
BlueLink 5.0 <i>Bluetooth</i> Solution	60
BRF6150 <i>Bluetooth</i> Solution	61
WiLink™ 6.0 WLAN, <i>Bluetooth</i> and FM Platforms	62
WiLink 5.0 WLAN Platform	63
WiLink 4.0 WLAN Platform	64
WLAN and <i>Bluetooth</i> Coexistence	65
NaviLink™ 6.0 GPS Solution	66
NaviLink 5.0 GPS Solution	67
NaviLink 4.0 GPS Solution	68
Hollywood™ Mobile DTV Solution	69

### Multi-Radio Connectivity Devices

TI offers leading multi-radio single-chip solutions for *Bluetooth*® technology, mobile WLAN, GPS, FM radio and mobile digital TV using TI's DRP™ technology and 65-nm process technology. TI combines *Bluetooth*®, FM (receive and transmit) and WLAN on the same chip by coupling its proven connectivity technologies with high-level integration expertise. TI's mobile connectivity solutions are tightly integrated with TI's cellular modem solutions, OMAP™ processors and OMAP-Vox™ solutions so manufacturers can get products to market quickly.

**GPS** – TI addresses GPS with a highly integrated single-chip solution that interfaces with TI's wireless chipsets and delivers precision location capabilities to markets ranging from voice-centric handsets to high-end multimedia smartphones. TI's NaviLink™ 4.0 and NaviLink™ 5.0 single-chip solutions are optimized for mobile phones. Through DRP technology, TI is able to provide the smallest size and lowest cost GPS discrete solution with low power and high performance to mobile phone manufacturers.

***Bluetooth*® Wireless Technology** – Leveraging its innovative DRP technology, TI's single-chip *Bluetooth* wireless solutions integrate an RF and *Bluetooth* processor that is optimized to mix with cellular technology. 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 mobile devices. TI integrates into one chip, the industry's best performing *Bluetooth* with high-fidelity FM stereo receive and transmit, with power optimization and ultra low power (ULP) enabled.

**802.11/WLAN** – Innovative performance levels in hardware, firmware and driver, TI brings to the industry low power and small size solution with interoperability across mobile standards. TI also offers support for Voice over WLAN (VoWLAN) and brings embedded and battery powered applications a new level of functionality and extended battery life.

TI has created a coexistence package for WLAN and *Bluetooth* wireless technologies in co-located environments. This package enables data and voice to be transmitted without interference while optimizing system throughput, range, and responsiveness. Additionally with no antennae isolation requirements, even providing for shared antenna designs, it is ideal for mobile handsets.

**Mobile Digital TV** – Mobile digital TV (DTV) combines the two best-selling consumer products in history – TVs and mobile phones. TI technology is driving mobile digital TV with OMAP™ processors and Hollywood™ mobile broadcast solution, 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.

### Emerging Technologies

**ULP** (Ultra Low Power) *Bluetooth*® technology is a radio technology for small devices that integrates easily with *Bluetooth* technology and consumes a fraction of the power of classic *Bluetooth* enabled products. ULP connects small devices within power and battery lifetime constraints to mobile phones and personal computers. TI's 65-nm connectivity portfolio is designed to support ULP.

**NFC** (Near Field Communications) is an evolution of low data rate contactless and short range RFID technologies. TI is part of the NFC Forum and other organizations which are working to define a standard approach to implementing NFC in a mobile phone. NFC enables contactless purchasing, "tap on" advertising and peer-to-peer information exchange.

**High-Speed *Bluetooth*** (Seattle) is the next step in extending the data rate for *Bluetooth* solutions. Both UWB (Ultra Wide Band) and 802.11 WLAN technologies are being examined for use in applications where large amounts of data need to be transmitted in a PAN or LAN scenario. Both technologies will leverage *Bluetooth* for easy service discovery and the wideband capabilities of UWB and WLAN for data transfer between mobile phones and other CE devices or access points. TI is actively involved with the *Bluetooth* SIG in developing the requirements for high speed *Bluetooth* solutions.



## BlueLink™ 7.0 Bluetooth® and FM Solution

### BL6450 BlueLink™ 7.0 WPAN Solution: Bluetooth® and FM RX/TX Single Chip

The BL6450 BlueLink™ 7.0 single chip is the industry's first *Bluetooth*® solution manufactured in 65-nm CMOS and provides a complete hardware and software solution for *Bluetooth* and FM receive and transmit, enabling ease of design and expediting time to market for mobile device manufacturers.

The solution's *Bluetooth* function is based on TI's fifth-generation *Bluetooth* core, and its FM function presents state-of-the-art performance in all critical FM parameters, such as current consumption, stereo signal-to-noise ratio (SNR) and sensitivity.

Since both the *Bluetooth* and FM functions are integrated on the same silicon, the solution ensures optimal RF coexistence. Consequently, the two functions can work simultaneously so that the FM function receives/scans/sends radio data system (RDS) information to a host, while the *Bluetooth* function is in any operational mode.

Additionally, the BlueLink 7.0 solution adds support for FM transmit, including a programmable gain power amplifier with levels compliant to FCC and ETSI specifications and higher power levels. It also includes FM analog and digital (I<sup>2</sup>S) data interfaces supporting voice quality sample rate and MP3 audio quality sample rates.

TI's power management hardware and software algorithms provide significant power savings in the most commonly used *Bluetooth* modes of operation, such as page and inquiry scan.

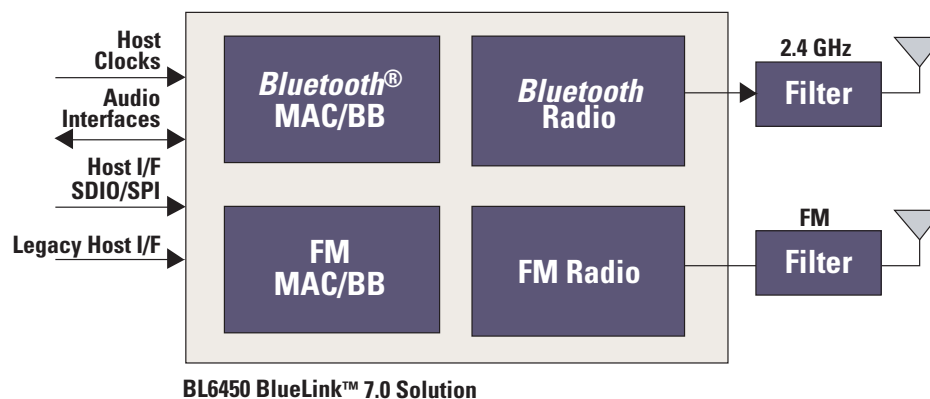
Leveraging TI's DRP™ technology and 65-nm process technology, the BL6450 is the industry's smallest *Bluetooth* and FM single-chip solution. These advancements allow customers to realize significant cost and size savings due to:

- Significantly lower number of external components compared to discrete *Bluetooth* and FM solutions
- Significantly smaller number of interfaces (for the FM function) compared to discrete *Bluetooth* and FM solutions

#### Key Benefits

- Supports *Bluetooth*® Specification 2.1+ enhanced data rate (EDR)
- Fully embedded FM and radio data system (RDS) receiver and transceiver, supporting U.S./European and Japanese FM band and high-fidelity FM stereo and mono on a single chip
- Best-in-class *Bluetooth* (RF) performance (TX power, RX sensitivity, blocking)
- Best-in-class FM receiver sensitivity level and audio quality
- Industry's smallest *Bluetooth* and FM single-chip solution based on TI's 65-nm CMOS process and DRP™ technology
- Highly optimized for mobile phone systems with lowest BOM, small solution size and direct connection to battery
- Advanced power management for extended battery life and ease of design
- Supports multiple *Bluetooth* profile use-cases (complex scenarios) working concurrently with FM
- Improved AFH algorithm with minimal adoption time
- Supports Class 1.5 - higher than Class 2 transmit power without external PA, improving *Bluetooth* link robustness
- Easy integration into various host system topologies with shared and separated interfaces for *Bluetooth* and FM functions
- Pre-integrated with TI OMAP™ application processors, GSM/GPRS/EDGE/UMTS, GPS and WLAN solutions
- High throughput coexistence mechanism with TI's WLAN devices operating on 2.4-GHz band

The BL6450 BlueLink 7.0 single chip also incorporates TI's *Bluetooth*/WLAN coexistence hardware and software solution, providing a collaborative interface with TI's WiLink™ mobile WLAN solutions for optimal bandwidth. TI's coexistence solution enables advanced usage scenarios such as VoIP over WLAN with *Bluetooth* voice using a shared antenna.





**BRF6350 BlueLink™ 6.0 Bluetooth® and FM Solution**

The BlueLink™ 6.0 platform provides a complete hardware and software solution, enabling ease of design and faster time to market. The BRF6350 BlueLink 6.0 single chip is the only 90-nm solution available in the WPAN marketplace. The solution's *Bluetooth*® function is based on TI's fourth generation *Bluetooth* core that has been shipped in millions of units worldwide, while its FM function delivers state of the art performance in all critical FM parameters, such as current consumption, stereo SNR and sensitivity.

Since both *Bluetooth* and FM functions are integrated on the same silicon, the solution ensures optimal RF coexistence. Consequently, the two functions can work simultaneously in such a way that the FM function receives/scans/sends RDS information to a host, while the *Bluetooth* function is in any operational mode.

BlueLink 6.0 platform software offers designers the flexibility to work with various operating systems, including Linux®, Microsoft® Windows Mobile®, Symbian™ and Nucleus. The BlueLink 6.0 software includes TI's Bluetooth Protocol Stack (BTIPS) running on Nucleus. BTIPS is optimized to work with TI's OMAP™ and OMAP-Vox™ platforms and TCS wireless chipsets. In addition to BTIPS, the BlueLink 6.0 software package includes an FM protocol stack.

Leveraging TI's DRP™ technology and 90-nm process, the BRF6350 BlueLink 6.0 single chip is an integrated *Bluetooth* and FM solution in a small form factor. These advancements allow manufacturers to realize significant cost, size and power savings due to:

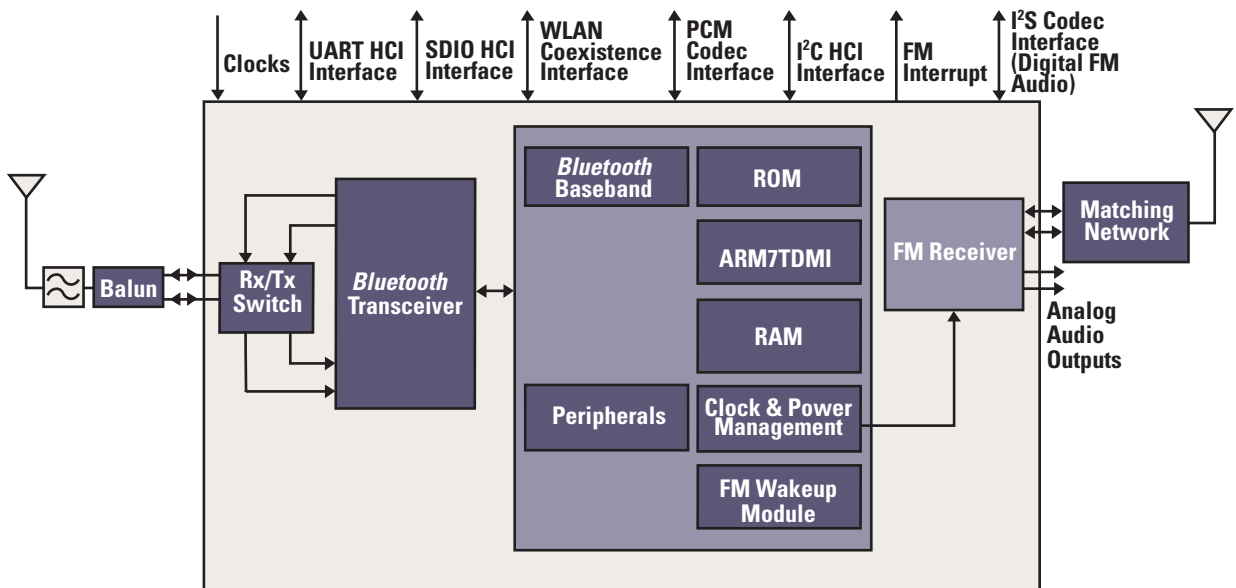
- 25 percent smaller device size compared to discrete *Bluetooth* and FM solutions

**Key Benefits**

- Supports *Bluetooth*® Specification 2.1, EDR and high-fidelity FM stereo and mono receiver on a single chip
- Integration of *Bluetooth* and FM in the same silicon provides 25 percent solution size savings compared to discrete solutions
- Proven FM-*Bluetooth* RF coexistence
- Complete software stack support for *Bluetooth* and FM, enabling ease of design and quick time to market
- On-chip power management adapted to cellular applications
- Incorporates TI's *Bluetooth* and WLAN coexistence hardware and software solution, providing a collaborative interface with TI's mobile WLAN solutions
- TI's DRP™ single-chip technology delivers smallest and lowest cost solution

- Lower number of external components compared to discrete *Bluetooth* and FM solutions
- Lower number of balls (for the FM function) compared to discrete *Bluetooth* and FM solutions
- Power savings in the most commonly used *Bluetooth* modes of operation, such as page and inquiry scan, through hardware and software algorithms

The BlueLink 6.0 single chip also incorporates TI's *Bluetooth* /WLAN coexistence hardware and software solution, providing a collaborative interface with TI's WiLink™ mobile WLAN solution for optimal bandwidth. TI's coexistence solution enables advanced usage scenarios such as VoIP over WLAN with *Bluetooth* voice using a shared antenna.



**BRF6350 BlueLink™ 6.0 Functional Block Diagram**



## BlueLink™ 5.0 Bluetooth® Solution

### BRF6300 BlueLink™ 5.0 Bluetooth® Single-Chip Solution

Optimized for mobile handsets, 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 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.

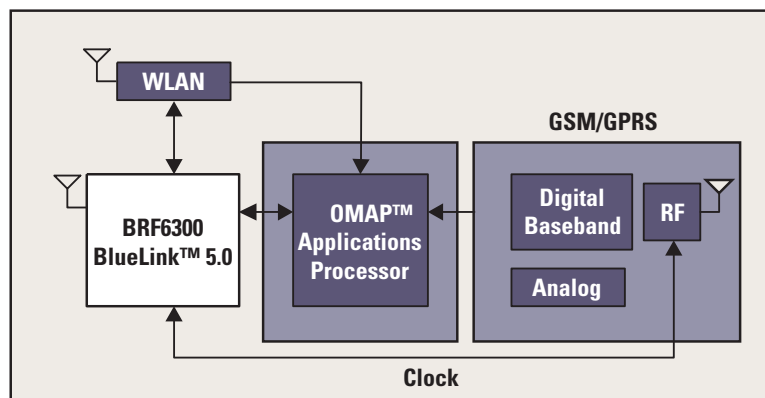
The single-chip solution is optimized for mobile handsets delivering the RF performance and ease of integration required by manufacturers. TI's advanced process and novel design enable the BRF6300 BlueLink 5.0 solution to connect directly to the battery (up to 5.4 V). This design saves the cost and space 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

### Key Benefits

- Supports Specification v2.0 and EDR
- Industry best power management including lowest power consumption, direct connection to battery (up to 5.4 V) and shut-down (6  $\mu$ A) 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
- TI's 90-nm CMOS and DRP™ single-chip technology

OMAP™ processors. The single-chip solution includes TI's proven collaborative coexistence mechanism between WLAN and *Bluetooth* networks. This feature, combined with *Bluetooth* Specification v2.0 adaptive frequency 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 Single-Chip Bluetooth® Wireless Technology

Optimized for mobile handsets, 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.

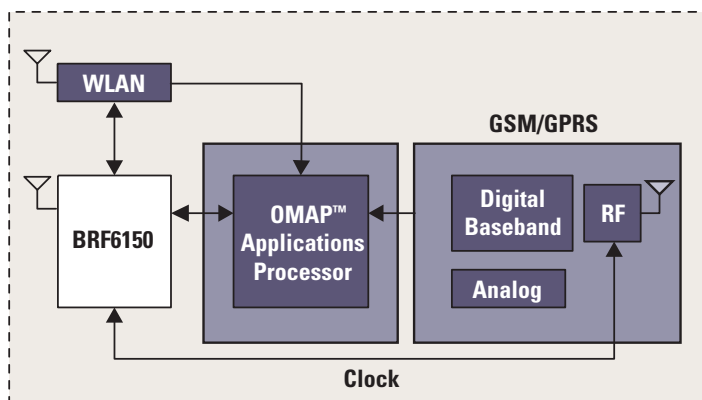
The BRF6150 offers improved RF performance, and power management capabilities, delivering higher integration and reduced package size, resulting in a 50 mm<sup>2</sup> PCB layout Bluetooth wireless technology solution for mobile phones. The BRF6150 is tailored to suit mobile applications requirements, 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 adaptive frequency hopping (AFH), offers an upgrade to the current coexistence solution. When manufacturers combine the v1.2 compliant BRF6150 with TI's Bluetooth/WLAN coexistence hardware and software package and a TI WLAN solution, improved coexistence performance is achieved. This combination results in better utilization of the 2.4 GHz frequency band and solves the most demanding coexistence scenarios for simultaneous

#### Key Benefits

- 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

Bluetooth wireless technology voice/data and high speed Wi-Fi data. It also enhances WLAN data throughput to maximum performance when co-located into mobile devices such as smartphones and wireless PDAs. The BRF6150 includes complete reference designs with TI's GSM/GPRS chipsets and OMAP™ platform.



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



## WiLink™ 6.0 WLAN Bluetooth® and FM Solution

### WiLink™ 6.0 Single-Chip WLAN, Bluetooth® and FM Solutions

TI's WiLink™ 6.0 mobile platform is a complete hardware and software offering comprised of proven carrier-quality mobile WLAN, Bluetooth and FM cores integrated onto a single chip.

There are two solutions in the WiLink 6.0 product offering. The WL1271 supports 802.11b/g/n (2.4 GHz), while the WL1273 supports 802.11a/b/g/n (Both 2.4 and 5 GHz). Both single-chip solutions support Bluetooth Lisbon Release and FM transmit and receive.

The WiLink 6.0 single-chip solutions are manufactured in 65-nm CMOS process and use TI's DRP™ technology to deliver low power, a small form factor and low cost requirements of handset manufacturers worldwide.

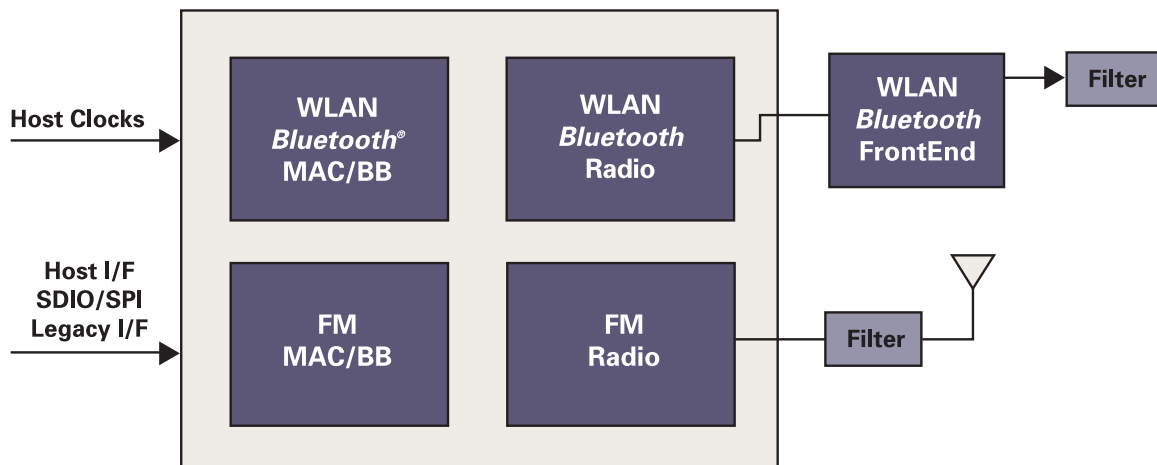
TI's WiLink 6.0 single-chip solution is designed to work with OMAP™ 2 and OMAP™ 3 processors and the OMAP-Vox™ platform to provide an optimized modem, applications processor and mWLAN/Bluetooth/FM solution for high-end smartphones, as well as entry- to mid-tier handsets.

The WiLink 6.0 solution includes TI's proven, robust coexistence platform, which addresses system-wide interference issues, encompassing radio design, and hardware and software solutions. Coexistence expertise is becoming increasingly important as more radios are being added to the handset. TI leads the market in coexistence solutions for Bluetooth and mWLAN with more than 30 handsets using its coexistence platform.

#### Key Benefits

- Single-chip mobile WLAN, Bluetooth® and FM solution implemented in 65-nm CMOS process using TI's DRP™ technology enables:
  - Reduced power consumption for extended talk and standby times
  - Bill of material reduction
  - Small form factor
- Highly integrated to enhance the user experience with range-extended mobile WLAN (802.11 b/g), Bluetooth Specification v2.1 and FM functional cores
- Sophisticated ELP™ low-power technology and VoWLAN support with on-chip UMA and IMS acceleration for extended talk time and battery life
- Coexistence features enable simultaneous operation of each integrated function

The WiLink Software Development Kit (SDK) 6.x included with the WiLink 6.0 platform is optimized for mobile phone applications. This SDK includes support for Linux®, Windows® WinCE™, Symbian™ and real time 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.



WiLink™ 6.0 Single-Chip WLAN, Bluetooth® and FM Solutions



### WiLink™ 5.0 Mobile WLAN Solution

The WiLink™ 5.0 platform integrates mobile WLAN (mWLAN), *Bluetooth*® and FM stereo audio all in a space-saving platform for mobile phones. The WiLink™ 5.0 solution provides fast time to market for handset manufacturers and caters to evolving consumer tastes for rapid data access, mobile entertainment and seamless connectivity between the WLAN and cellular networks.

TI brings seamless cellular and Wi-Fi® connectivity to consumers with VoWLAN functionality, optimized on TI's OMAP-Vox™ and WiLink solutions, enabling UMA on the handset across multiple operating systems such as Symbian™, Microsoft® Windows Mobile®, Linux® and low level operating systems. UMA provides consumers on-the-go voice access over WLAN or the cellular network using their mobile phones, and will transition to IMS as the fixed mobile convergence market matures.

The WiLink 5.0 platform integrates TI's WiLink 4.0 mWLAN single chip with its BlueLink™ 6.0 solution, which combines *Bluetooth* with high-fidelity FM stereo and mono performance on a single chip. The combination of mWLAN, *Bluetooth* and FM functionality allows users to perform a variety of simultaneous tasks, such as listening to the radio music on a *Bluetooth* headset while checking email via Wi-Fi.

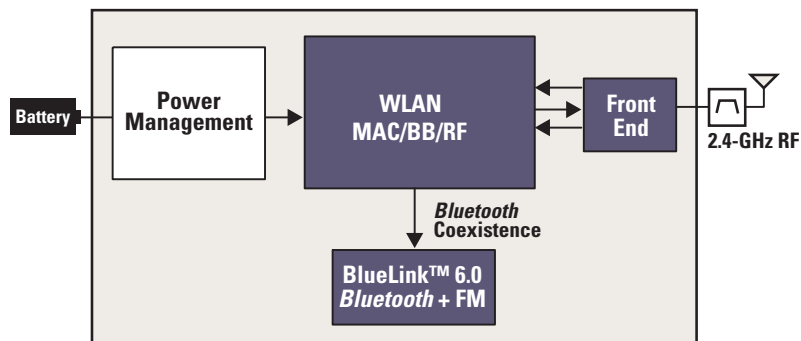
Both devices in the WiLink 5.0 module are manufactured at the 90-nm node, which cuts both solution size and power consumption by up to 20 percent over competitive solutions, in critical modes of operation.

With three co-located radios, efficient management of RF is required for simultaneous operation of WLAN, *Bluetooth* and FM applications. The WiLink 5.0 platform takes advantage of TI's expertise from the

### Key Benefits

- Integrates TI's BlueLink™ 6.0 solution, which combines *Bluetooth*® with high-fidelity FM stereo and mono performance on a single chip
- VoWLAN functionality, optimized on TI's OMAP-Vox™ and WiLink solutions, enabling UMA on the handset
- 20 percent reduction in solution size and power consumption through use of TI's innovative DRP™ technology at 90-nm
- Advanced *Bluetooth* and WLAN coexistence through use of TI's second generation of *Bluetooth*/WLAN hardware and software co-existence package, enabling re-use of existing systems, quick time to market, and antenna sharing, reducing the BOM for manufacturers
- Support for multiple operating systems: Symbian™, Microsoft® Windows Mobile®, Linux® and low level OSs

company's previous generations of mobile WLAN solutions, which are being shipped in more than 30 mobile handset devices and cellular convergence products today. The platform uses the second generation of TI's *Bluetooth*/WLAN hardware and software coexistence package, enabling re-use of existing systems, quick time to market and antenna sharing, reducing the BOM for manufacturers.



WiLink™ 5.0 Platform: WLAN, *Bluetooth*® + FM



## WiLink™ 4.0 WLAN Platform

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

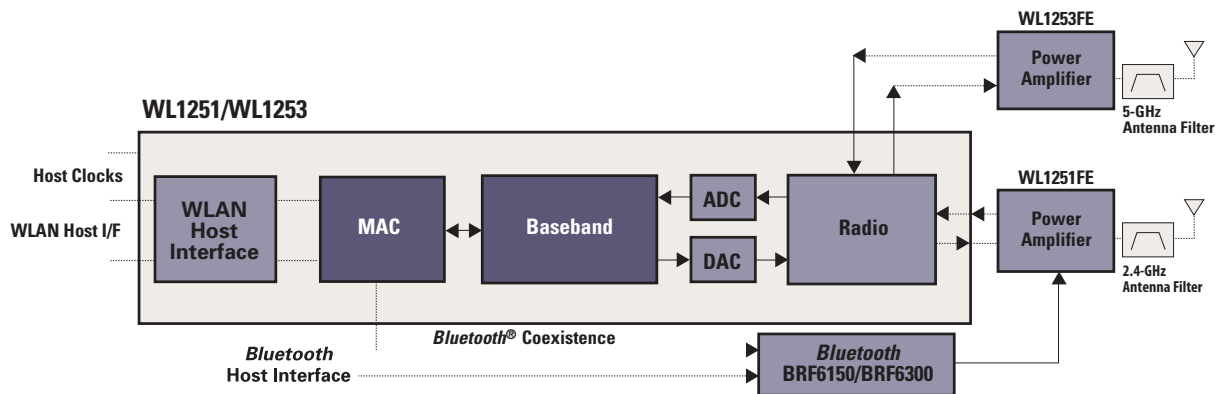
TI's WiLink™ 4.0 mobile WLAN platform is a complete hardware and software offering optimized for mobile phones. TI's WiLink 4.0 platform offers two different hardware single-chip implementations to provide flexibility for OEMs to offer 802.11b/g or 802.11a/b/g operation. The WL1251 802.11b/g solution and the WL1253 802.11a/b/g solution are system-on-a-chip architectures (SOCs) which integrate the media access controller (MAC), baseband processor and RF transceiver.

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 SDK compatibility enables just-in-time manufacturing options that are responsive to marketplace demand and design re-use 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 SDK includes support for Linux®, Windows® WinCE™, Symbian™ and real-time 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 802.11b/g, a/b/g applications
- Single-chip 802.11 Media Access Controller/Baseband/RF transceiver WLAN solutions (WL1251 and WL1253) reduce BOM, save PCB space and extend standby and talk times
- Voice over WLAN (VoWLAN)-ready: Sophisticated power-saving sleep modes match traffic characteristics of VoWLAN applications
- First WLAN solutions using 90-nm manufacturing process to enable market leading physical size and low power consumption, through use of TI's innovative DRP™ technology
- 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 for voice and data use involving WLAN and *Bluetooth* operations
- Robust solution shipping in volume in more than 30 handset models with over 9 OEMs



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

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





### WLAN and Bluetooth® Coexistence

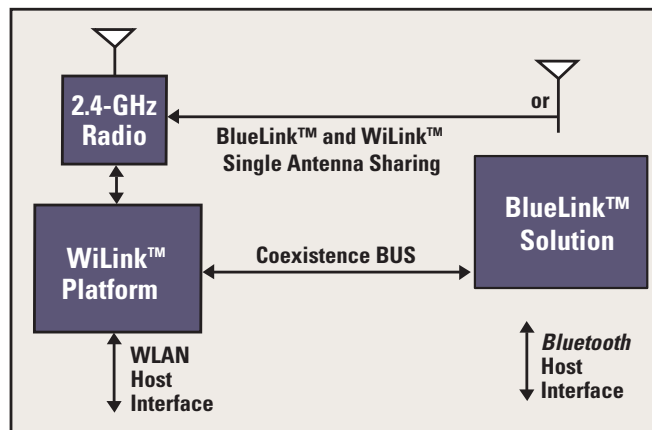
TI has developed a coexistence solution for simultaneous operation of 802.11b/g WLAN and Bluetooth® personal area networking in mobile devices. Because 802.11b/g and Bluetooth occupy the same 2.4-GHz ISM range of wireless communications spectrum, their RF signals can cause interference for each other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

TI's coexistence solution 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 operation 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™ 6.0 GPS Solution

### NL5500 NaviLink™ 6.0 Single-Chip A-GPS/Bluetooth®/FM Solution

As the popularity of global positioning satellite (GPS) systems continues to grow, mobile handset users are demanding similar functionality on their mobile phones. In addition, the vast majority of mobile handsets include *Bluetooth*® functionality to provide wireless connectivity between devices. A growing segment of the mobile handset market are incorporating FM radio receiver/transmitter (Rx/Tx) to allow users to enjoy FM radio when not making phone calls. Built on TI's leadership positions in GPS and *Bluetooth* technologies, the NL5500 NaviLink™ 6.0 solution incorporates all of these functions into a single chip: GPS and assisted GPS (A-GPS), *Bluetooth* and FM Rx/Tx. With the integration of these three functions into a single-chip, the NL5500 can deliver applications such as mobile navigation, 3D maps, location-based services, safety services and FM radio while allowing the consumer to wirelessly connect their mobile devices to other *Bluetooth* enabled devices.

The NL5500 NaviLink 6.0 A-GPS/*Bluetooth*/FM single-chip solution is manufactured in 65-nm process technology and uses TI's DRP™ technology to provide the smallest size and highest value while still delivering a low power and high performance discrete A-GPS/*Bluetooth*/FM solution to mobile phone manufacturers. With integrated Position Optimizer software to support inertial navigation sensors, superior performance can be obtained in weak satellite signal areas, such as downtown areas, enhancing the consumer's GPS experience.

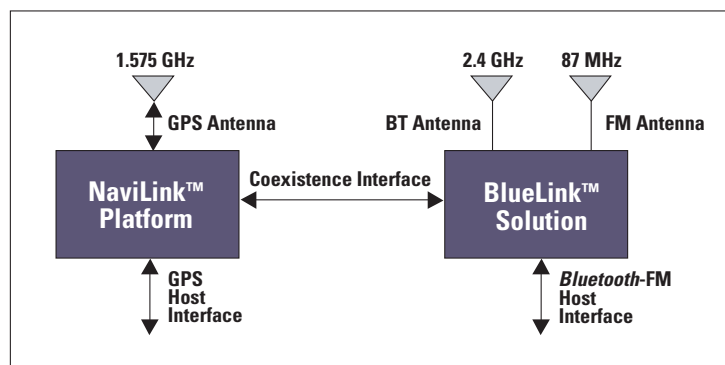
- **Smallest Size:** The NL5500 NaviLink 6.0 solution integrates a complete A-GPS system as well as *Bluetooth* and FM Rx/Tx into one chip, significantly reducing the board layout area required for three discrete solutions. The single chip enables a significant solution size savings of up to 40% over the previous discrete *Bluetooth*/FM and A-GPS solutions from TI.
- **High Value:** As a single chip, the NL5500 significantly reduces the number of external passives required, providing BOM savings over competitor's products.

#### Key Benefits

- Single-chip solution integrating A-GPS, *Bluetooth*® and FM radio Rx/Tx
- Offers significant solution size savings as a result of TI's DRP™ technology and 65-nm manufacturing process delivering solution area savings of up to 40%
- Low power with integrated power-saving module that cuts power requirements in half
- High A-GPS performance with weaker satellite signals exceeding 3GPP and 3GPP2 requirements
- Optimized to interface with TI's 3G and OMAP™ solutions to deliver a complete solution for handset OEMs

- **Low Power:** With integrated power management on-chip, the NL5500 NaviLink 6.0 solution simplifies design, further reduces the BOM and provides industry leading low power consumption. The single chip also allows direct connect to battery for easy incorporation into mobile phone designs.
- **High Performance:** The NL5500 NaviLink 6.0 solution enables a rapid time to first fix (TTFF) from weak satellite signals, exceeding the GPS requirements for 3GPP and 3GPP2 operation. TI's Position Optimizer software allows support for Inertial Navigation Sensors, delivering even better GPS performance in weak signal areas, such as downtown and heavily wooded areas.

With tens of millions of GPS units for handsets already deployed, the NL5500 is a proven third generation solution that will save OEMs power and size while increasing the performance of their product. Further development and design support can be found through TI's Developer Network. The NL5500 is expected to be in products on the market by the end of 2009.



NaviLink 6.0



### NL5350 NaviLink™ 5.0 Single-Chip GPS Solution

Consumers are becoming accustomed to using global positioning system (GPS) services on handheld devices and are demanding similar functionality on their mobile phone. TI's NL5350 NaviLink™ 5.0 single-chip solution for GPS and assisted GPS (A-GPS) applications is optimized for mobile phones to deliver applications such as mobile navigation, 3D maps, location-based services and safety services.

The NaviLink 5.0 GPS single-chip solution is manufactured in 90-nm process technology and uses TI's DRP™ technology. Through DRP technology, TI is able to provide the smallest size, lowest cost, low power, and high performance discrete GPS solution to mobile phone manufacturers.

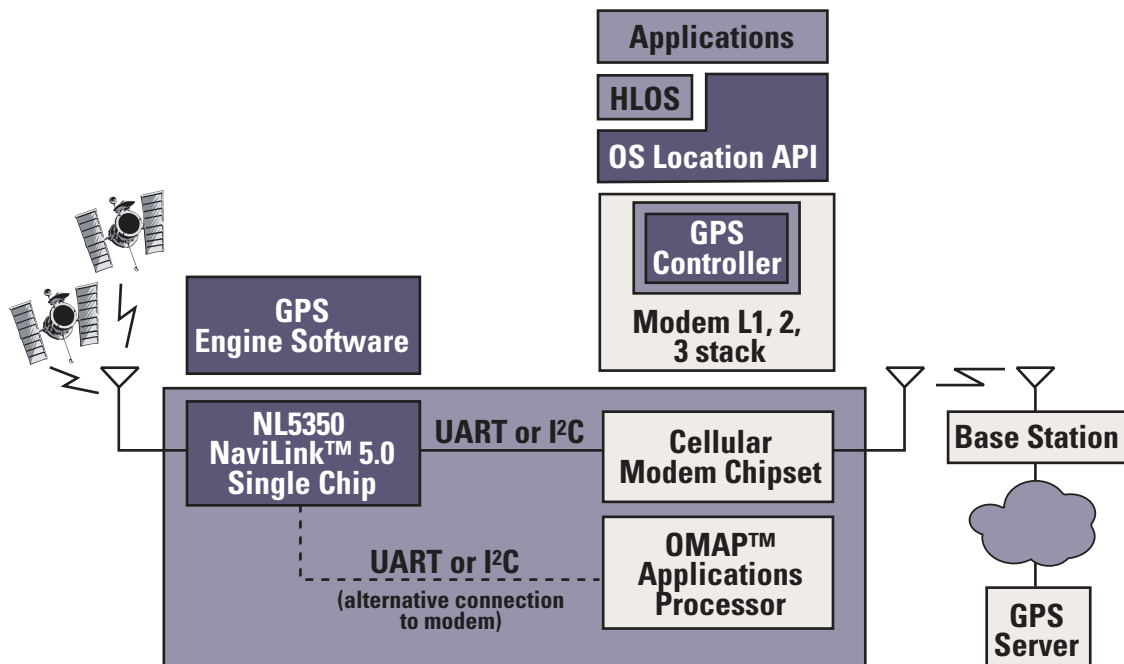
- **Smallest Size:** The NL5350 NaviLink 5.0 solution integrates a complete GPS system into one chip, significantly reducing the board layout area for a discrete GPS engine. The single chip enables a board area for the complete system of around 25 mm<sup>2</sup>.
- **Lowest Cost:** As a single chip, the NL5350 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 BOM that is almost 50 percent less than competition today.
- **Low Power:** The NL5350 NaviLink 5.0 solution has power management integrated on-chip, which simplifies design and further reduces the BOM. 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 GPS solution with a board area around 25 mm<sup>2</sup>
- Lowest total BOM for a complete GPS system with only 11 external passives required
- Low power with integrated power management
- High GPS performance with weaker satellite signals, exceeding 3GPP and 3GPP2 requirements
- Optimized to interface with TI's 3G and OMAP™ solutions to deliver a complete solution for handset OEMs

- **High Performance:** The NL5350 NaviLink 5.0 solution enables a rapid time to first fix (TTFF) from weak satellite signals exceeding the GPS requirements for 3GPP and 3GPP2 operation.

The NL5350 NaviLink 5.0 single-chip solution is expected to sample in 2Q 2008. Additionally, TI is collaborating with Murata to deliver a small module to handset OEMs to speed time to market of NaviLink solution-based GPS mobile phones.



NL5350 NaviLink™ 5.0 Single-Chip GPS Solution



## NaviLink™ 4.0 GPS Solution

### GPS5300 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 manufactured in 90-nm process technology and uses TI's DRP™ technology. Through DRP technology, TI is able to provide a small size, low cost, low power and high performance discrete A-GPS solution to mobile phone manufacturers.

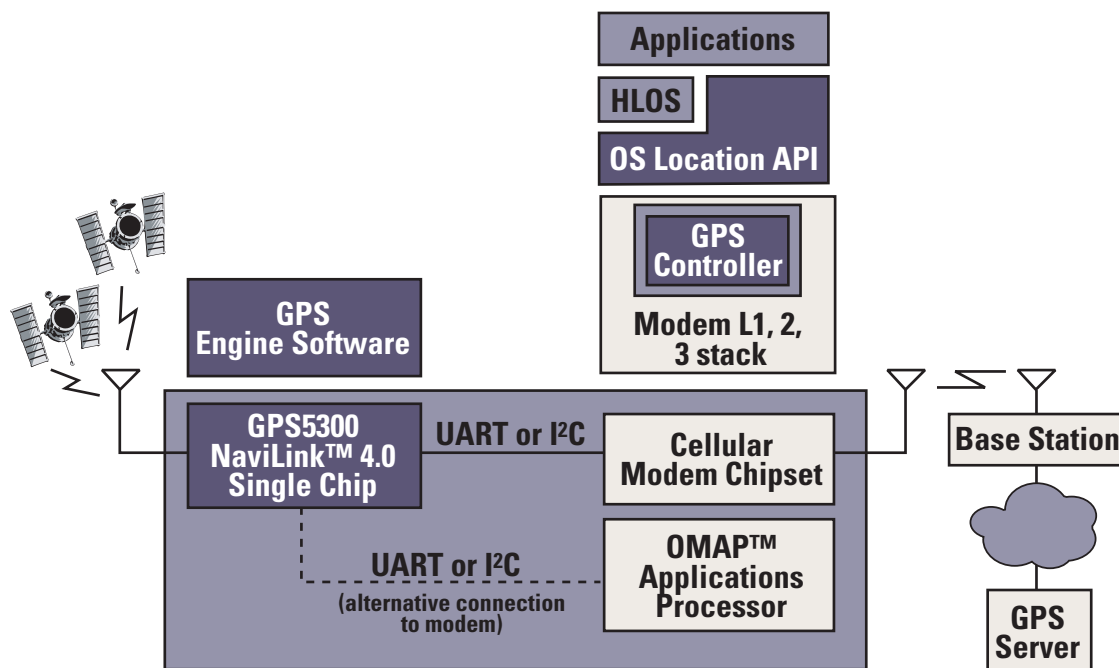
- **Small Size:** The GPS5300 NaviLink 4.0 solution integrates a complete GPS system into one chip, significantly reducing the board layout area for a discrete A-GPS engine. The single chip enables a board area for the complete system of less than 50 mm<sup>2</sup>.
- **Lowest Cost:** As a single chip, the GPS5300 only requires 11 external passives, a significant reduction over existing solutions which require up to 30 external passives.
- **Low Power:** The GPS5300 NaviLink 4.0 solution has power management integrated on-chip, which simplifies design and further reduces the BOM. 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
- Small A-GPS solution with a board area less than 50 mm<sup>2</sup>
- Lowest total BOM 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™ solutions 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.

To further speed time to market, manufacturers can work with members of TI's worldwide wireless ecosystem to assist in integrating the NaviLink 4.0 solution into new GPS-enabled handsets. 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.



GPS5300 NaviLink™ 4.0 Single-Chip Solution

Hollywood™ Mobile DTV Single-Chip Solution



Hollywood™ Mobile DTV Single-Chip Solution

TI's Hollywood™ mobile DTV single chip is the first in the industry to integrate the mobile TV tuner and demodulator into one piece of silicon using standard 90-nm digital process. By using TI's DRP™ technology, the Hollywood solution delivers low cost and long battery life in the smallest board area.

The DTV1000 Hollywood mobile DTV solution supports DVB-H (digital video broadcast - handheld) operating at 470-750 MHz (UHF) and 1.6 GHz (L-band) frequency ranges.

The DTV1000 chip interfaces with TI's family of OMAP™ applications processors and OMAP-Vox™ integrated processor and cellular modem solutions 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.

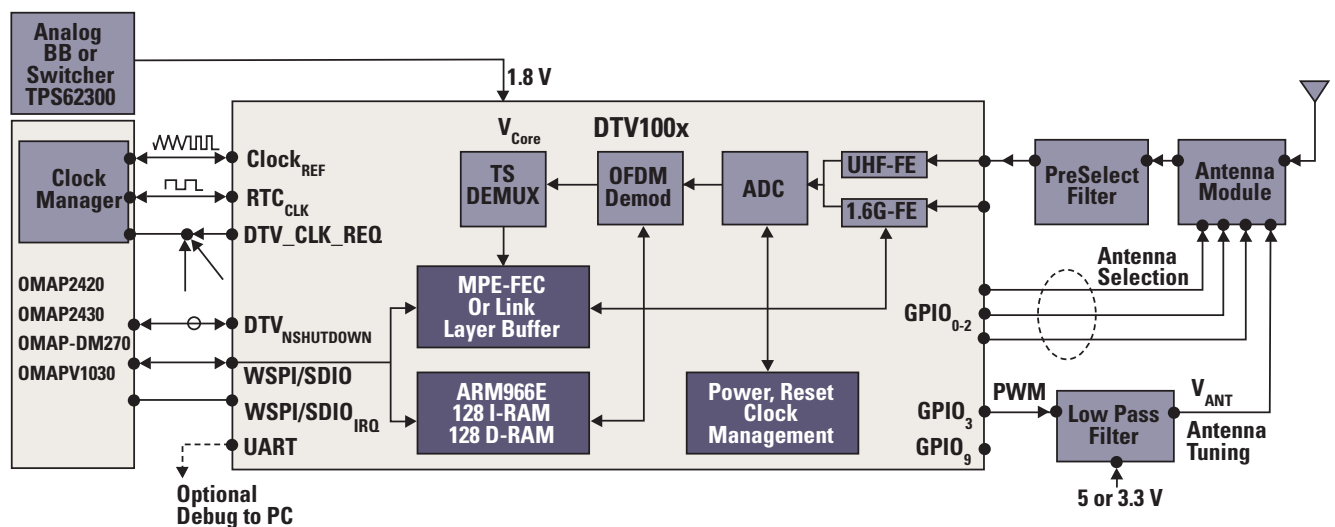
Through TI's innovative DRP technology, the DTV1000 device combines a two-chip or system in package (SIP) solution into a single piece of silicon in standard 90-nm digital process to deliver:

- **Smallest Board Area:** High degree of integration and low ball count has led 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 Lower Bill of Materials:** High integration has led to a small number of low cost external components, driving the estimated BOM in volume under \$10.

Key Benefits

- First mobile DTV single chip solution—integrates RF, demodulator, 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
- Fast time to market: development platform, operating system agnostic driver and API integration package

- **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 technique 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 DTV1000 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.



Hollywood™ Mobile DTV Single-Chip Solution



## Solutions for Handsets

Texas Instruments provides a broad portfolio of high-performance analog and logic products, plus application knowledge, local technical support and easy-to-use design tools to help you differentiate your handset design and get to market faster. TI's high-performance analog offers the greatest amount of performance and efficiency from the smallest solution size. 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, Amplifiers, Data Converters, Interface, Power Management and RF.

### Audio Power Amplifier - Speaker

Device	Description
TPA2006D1	1.45-W Mono, Fully Differential, Filter-Free Class-D Audio Amplifier
TPA2010D1	2.5-W Mono, Fully Differential, Filter-Free Class-D Audio Amplifier in WCSP
TPA2012D2	2.1-W Stereo Class-D Audio Amplifier in WCSP
TPA2013D1	2.7-W Mono Audio Class-D Amplifier with Integrated Boost Converter
TPA6204A1	1.7-W Mono Fully Differential, Class-AB Audio Amplifier
TPA6205A1	1.25-W Mono, Fully Differential, Class-AB Audio Amplifier

### Audio Codec and DAC

Device	Description
TLV320AIC31/2/3	Low-Power Stereo Codec with HP/Speaker Amps and 3D Effects
TLV320AIC3104/5/6	Low-Power Stereo Codec with HP Amp and Enhanced Digital Effects
TLV320AIC34	Low-Power 4-Channel Audio Codec with Dual Audio Buses
PCM3793A/4A	Very Low-Power Stereo Codec with HP/Class-D Speaker Amplifier, Notch Filters, ALC and 3D Effects
TLV320DAC32	Low-Power Stereo DAC with 4 Outputs, HP/Speaker Amps and 3D Effects

### Audio Power Amplifier - Headphone

Device	Description
TPA4411	80-mW DirectPath™ Stereo Headphone Driver
TPA6130A2	138-mW DirectPath™ Stereo Headphone Amplifier with I <sup>2</sup> C Volume Control
TPA6100A2	50-mW Ultra-Low Voltage Stereo Headphone Audio Amplifier
TPA6110A2	Stereo Headphone Audio Amplifier

### Video and Interface

Device	Description
OPA360/1	3-V Video Amplifier with 6dB Gain and Filter
SN65LVDS301/302	subLVDS 24-Bit RGB Serdes for LCD Modules

### Touch Screen Controller

Device	Description
TSC2003	4-Wire Touch Screen Controller with I <sup>2</sup> C Interface
TSC2004	4-Wire Touch Screen Controller with Programmable Pre-Processing, I <sup>2</sup> C Interface, 1.2V to 3.6V in CSP
TSC2005	4-Wire Touch Screen Controller with Programmable Pre-Processing, SPI Interface, 1.6V to 3.6V in CSP
TSC2007	4-Wire Touch Screen Controller with Pre-Processing, I <sup>2</sup> C Interface, 1.2V to 3.6V in CSP with Integrated Audio Converters
TSC2100	Programmable 4-Wire Touch Screen Controller with Stereo Audio Codec and Headphone/Speaker Amplifier
TSC2101	Programmable 4-Wire Touch Screen Controller with 6 Audio Inputs, Stereo Audio Codec and Headphone/Speaker Amplifier





### OLED and TFT Display Supply

Device	Description
TPS61045	28-V, 0.4-A Switch Boost Converter for OLED
TPS61140	Dual-Output, Single Inductor Boost Converter for OLED Sub- and WLED Main Display
TPS61081	27-V, 1.2-A Switch Boost Converter with Integrated Power Diode
TPS65120	4-Channel Small Form Factor TFT Display Power Supply
TPS65130	Dual $\pm$ Output Driver for Active-Matrix OLED Displays

### White LED and Xenon Camera Flash

Device	Description
TPS61050	1.2-A High Power White LED Flashlight Driver with I <sup>2</sup> C
TPS65560	Integrated Photo Flash Charger and IGBT Driver for Xenon Lamps
TCA6507	7-Bit, I <sup>2</sup> C and SMBus LED Driver with Intensity Control and Shutdown

### White LED Backlight Driver

Device	Description
TPS60250	Charge Pump for 7 WLEDs with 2 or 3 Banks and I <sup>2</sup> C Interface
TPS61161	Inductive Boost Converter for 6-10 White LEDs with Digital or PWM Dimming
TPS61150	Dual-Output, Single Inductor Boost Converter for up to 12 WLEDs
TPS75103	LDO-Based 2 x 2 Bank LED Driver with PWM Brightness Control

### Multi-Channel Power Management

Device	Description
TPS65020	6-Channel Power Mgmt IC with I <sup>2</sup> C for Li-Ion Powered Systems
TPS65053	5-Channel Power Mgmt IC with GPIO control for Li-Ion Powered Systems
TPS65820	9-Channel Fully Integrated Power Mgmt IC with Li-Ion Charger for Li-Ion powered systems
	<b>Partner Products</b>
TPS65030	Power Management IC for USB-OTG in CSP
TUSB6010	USB 2.0 High-Speed On-the-Go Local Bus Interface Bridge Controller

### DC/DC Converter and LDO

Device	Description
TPS62270	400-mA, 2.25-MHz Step-Down Converter with Selectable V <sub>OUT</sub> (2-Level) for DVS
TPS62400	400-mA and 600-mA Dual Output Step-Down Converter with GPIO Interface for DVS
TPS62290	1000-mA Step-Down Converter in 2mm x 2mm SON Package
TPS62356	1000-mA, 3-MHz Step-Down Converter with I <sup>2</sup> C for Dynamic Voltage Scaling (DVS)
TPS63000	96% Efficient, 1.2-A Buck-Boost Converter in 3 x 3 QFN
TPS71701	150-mA, High-Bandwidth PSRR LDO in 1.5mm x 1.5mm SON
TPS71918-12	2 x 200-mA Dual Output, High PSRR LDO in 2mm x 2mm SON
TPS728185315	200-mA LDO with Dual Switchable Voltage Level for DVS
TPS3808	Low Quiescent Current, Programmable-Delay Supervisory Circuit (SVS)

### Battery Management and Authentication

Device	Description
bq24020	1-Cell Li-Ion Fully Integrated Charger for AC/DC Adapter and USB
bq24070	Single-Chip Charge and System Power-Path Management IC
bq26150	CRC-Based Battery Authentication IC
bq27500	System-Side, Impedance Track™ Fuel Gauge for Li-Ion Powered Systems
bq24300	Charger Front End Protection IC with 30-V Max VIN and 5.5-V LDO Output in 2 x 2 QFN
TLV3012	Low Battery Detector with 6 $\mu$ s Comparator and 1.242-V 1% Reference

### Linear and Logic

Device	Description
TXB0102/4	2/4 - Bit Bidirectional Voltage-Level Translator with Auto Direction Sensing and $\pm$ 15-kV ESD Protection
TS3A24157	0.65 $\Omega$ Dual SPDT Analog Switch Dual-Channel 2:1 Multiplexer/Demultiplexer
TS3USB30	High-Speed USB 2.0 (480-Mbps) 1:2 Multiplexer/Demultiplexer Switch
TCA6408	Low-Voltage 8-Bit I <sup>2</sup> C and SMBus I/O Expander
SN74AUP1Gxx	Advanced Ultra-Low Power CMOS Single-Gate Logic

**Important Notice:** The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

The platform bar, OMAP, OMAP-Vox, LoCosto, TMS320C55x, TMS320C54x, MicroStar BGA, Auto-Band, DRP, M-Shield, SmartReflex, BlueLink, WiLink, NaviLink, FlatLink, ELP, Hollywood, IVA and VLYNQ are trademarks of Texas Instruments. The Bluetooth word mark and logos are owned by the Bluetooth SIG, Inc., and any use of such marks by Texas Instruments is under license. All other trademarks are property of their respective owners.