

“LoCosto ULC” single-chip family: TI’s third-generation GSM-based solutions for Ultra Low-Cost handsets

TCS2305 GSM and TCS2315 GPRS solutions



TCS2305 GSM key features:

- Enables Ultra Low-Cost (ULC) handsets targeted at emerging, fast-growing regions as well as established, cost-sensitive markets
- Leverages 65-nm process with advanced DSP and ARM® technologies
- TI’s proven DRP™ single-chip technology featuring integrated digital RF, now shipping in volume on previous “LoCosto” solutions
- Delivers a compelling next-generation user experience in ultra low-cost (ULC) handsets
 - Lowest cost color handset because no additional external SRAM memory is needed to support up to 128 x 160, 65-k 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 mitigates voice chopping and double talk
 - Improved loudness (up to twice as loud) for noisy environments and hands-free operation
 - FM connectivity with integrated stereo support
 - Ability to record FM for on-the-fly ringers
- Optimized system design reduces component count and PCB board size compared to previous generations:
 - Up to 25 percent reduction in eBOM
 - Lower overall component count by 40 percent
 - Smaller modem block footprint by as much as 35 percent reduces PCB board size and enables innovative handset form factors and larger batteries
- Lower power consumption for 30 percent longer talk time and 60 percent longer standby time
- USB charging for universal and easy charger access
- Flexibility for cost-sensitive and enhanced ULC handsets
- Hardware-based M-Shield™ technology for robust SIMLock, IMEI, and software/data security to protect users, operators and device manufacturers
- Scalable across regions, market segments, languages and subscriber types

TCS2315 GPRS key features:

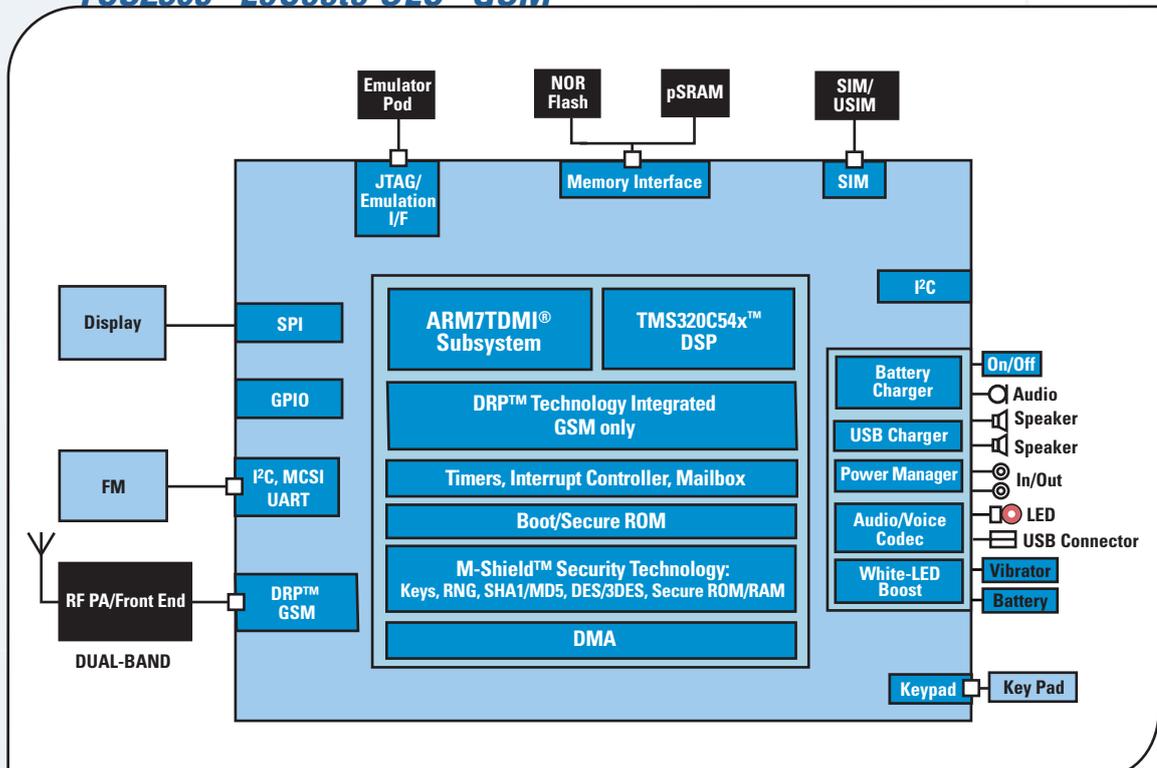
- All the features of TCS2305, plus:
- GPRS capability
- Built-in VGA camera support with JPEG encode/decode and advanced imaging functions such as rotation, zoom, etc.
- CD-quality (44.1 kHz) MP3 stereo playback capability
- USB connectivity for data transfer between PC and phone
- Mass storage capability (SD/MMC)
- *Bluetooth*® connectivity with multiple profiles including stereo headset

By combining its advanced 65-nanometer (nm) process technology with its leading DRP™ digital RF and DSP technologies, as well as an ARM® core, TI's "LoCosto ULC" single chip for ULC handsets set a new standard for features and a compelling user experience in the ULC handset segment. The performance, high-quality functionality and innovative form factors enabled by the TCS2305 and TCS2315 solutions are unmatched in the ULC segment.

The TCS2305 (GSM) and TCS2315 (GPRS) "LoCosto ULC" solutions have a sustainable low cost structure that makes it especially well suited for emerging cost-sensitive markets like China, India, Brazil, Russia and others, where the next billion subscribers will come from. At the same time, these solutions have several advanced features enabling a new generation of compelling user capabilities in enhanced ULC handsets for more established markets and regions.

The "LoCosto ULC" solutions extend the scalability and flexibility of TI's successful "LoCosto" family of single-chip wireless handset solutions. The software portability from one generation of "LoCosto" solution, such as the TCS2300 and TCS2310 solutions, to the next generation, TCS2305 and TCS2315 solutions, gives manufacturers and operators the ability to rapidly and

TCS2305 "LoCosto ULC" GSM

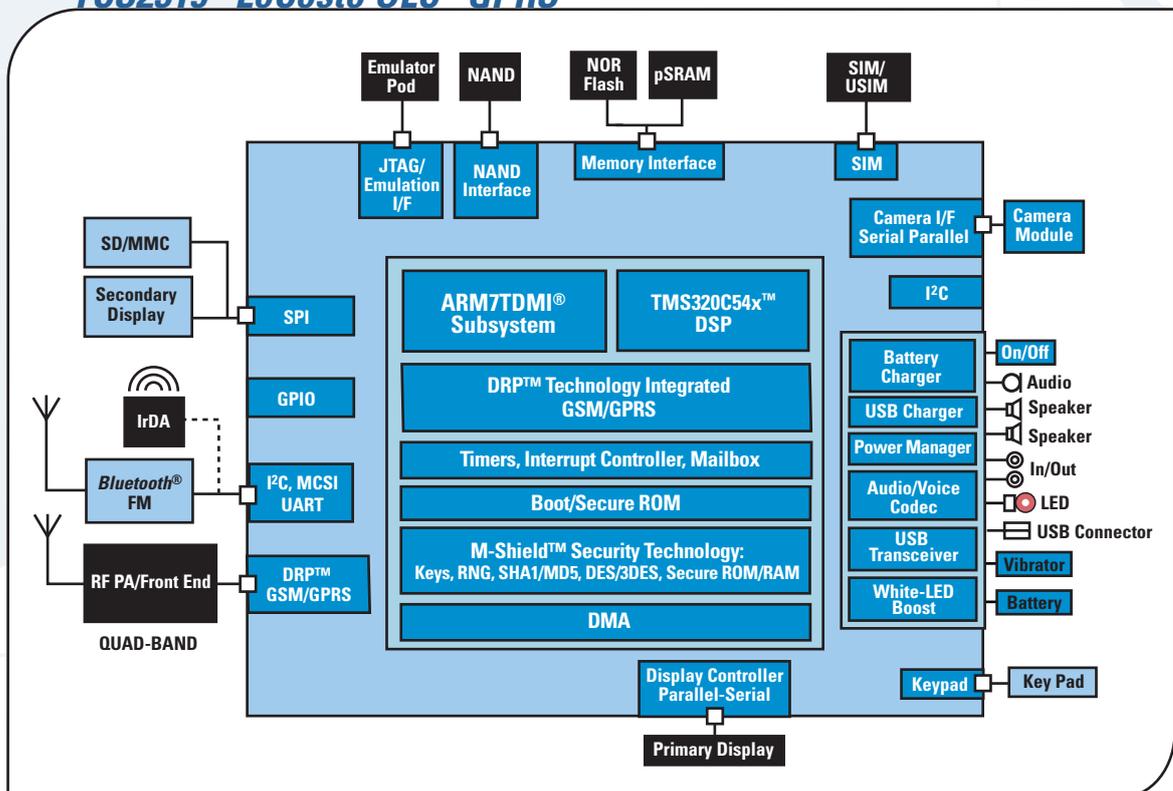


cost-effectively differentiate products and service offerings for both emerging and mature markets, crossing over every language, region and subscriber type.

Feature-rich ULC platform

Combining TI's TMS320C54x™ DSP core with an ARM7™ RISC processor on a single chip, and integrating TI's DRP™ technology, gives the "LoCosto ULC" solutions, TCS2305 (GSM) and TCS2315 (GPRS), the powerful processing capabilities that are needed for a ULC feature-set far richer than previously possible. A truly compelling user experience featuring a color display without requiring additional external SRAM memory, high-end full duplex voice quality, MP3 and polyphonic ringers, longer talk time and standby time, stereo FM radio connectivity, built-in VGA camera support, CD-quality MP3 playback, USB connectivity and charging, mass storage (SD/MMC) support, handsfree speakerphone operation, vibration ringer, headset support, *Bluetooth* connectivity for data transfer and stereo headset and other functionality is within reach of even the lowest cost handsets. Conversely, its scalability make the "LoCosto ULC" a cost-effective solution for a broad range of differentiated handsets customized by manufacturers for service offerings that cross regional borders, language barriers and subscriber requirements in both emerging and mature marketplaces.

TCS2315 "LoCosto ULC" GPRS



Innovative user form factors such as ultra-slim, clamshell and candybar handsets are possible because of the reduced component count and PCB board space requirements brought about by the smaller 65-nm process node, increased integration, and advanced packaging technologies for a single-chip solution. In addition, a smaller PCB area requirement allows a handset to support larger batteries for a longer battery life enabling extended standby and talk times. The superb full-duplex quality of voice service of the “LoCosto ULC” solutions are comparable to more expensive handsets. In fact, the voice loudness on both ends of a call can be improved by 7 dB or practically twice as loud. Moreover, voice chopping and double talk are reduced dramatically, making handsets based on the TCS2305 and TCS2315 solutions very effective in handsfree applications and noisy environments, characteristic of densely populated emerging markets. The TCS2305 and TCS2315 also offer SMS text messaging, a Universal Subscriber Identity Module (USIM) interface for SIM cards and support for a standard keypad and joy stick.

Low power for longer talk and standby times

Lowering the power dissipation in the advanced “LoCosto ULC” solutions extend the battery life of a handset, lengthening the standby and talk times for users. “LoCosto ULC” single-chip platform integrates power management functions for best-in-class power consumption levels and supports USB charging for universal and easy charger access. This eliminates the need to supply a charger with the phone (saving costs) and minimizes electronic waste from incompatible or obsolete chargers.

Hardware-based security protects users, operators and manufacturers

Concerns over the security of wireless handsets are completely mitigated by TI’s scalable and hardware-based M-Shield™ technology. The “LoCosto ULC” solutions take advantage of M-Shield technology to safeguard not just the handset owner’s sensitive personal information, but it also defeats malicious attempts to unlock the handset’s SIMlock code. Cracking the SIMlock code can increase subscriber churn because users are able to switch a handset that had been locked to one network to another provider’s network. To reduce phone theft and protect the service provider’s investment in subsidized handsets, TI’s M-Shield technology secures the contents of flash memory, including boot code, and provides robust SIMLock and handset’s International Mobile Equipment Identity (IMEI) protection. This level of protection is simply not possible with software-based security systems.

TI’s M-Shield security technology includes secure read-only memory (ROM), unique hardware-based public keys, and other protection measures to safeguard valuable information, data and software stored on a handset, including sensitive personal information of handset owners as well as the

device's boot code and other critical firmware modules provided by the handset manufacturer. The investment handset manufacturers have made in developing software and other intellectual property (IP) is protected against piracy and the handset itself is safeguarded against malicious attackers attempting to install viruses, worms and other unwanted software on the device.

Sustainable low costs

Fabricating the "LoCosto ULC" solutions with 65-nm process technology as well as several other chip- and system-level cost optimization techniques all contribute to the device's sustainable ULC characteristics. For example, the electronic bill of materials (eBOM) for an entry-level ULC handset is reduced by up to 25 percent with the "LoCosto ULC" solutions compared with the previous generation. Additionally, fabricating the chip at a smaller process node means that the chip itself is substantially smaller. This, along with component reduction, reduces the size of a handset's PCB, lowering the manufacturing cost of the cell phone. Integration of the power management with the digital baseband into a single chip also yields reduction in the modem PCB area.

Other system-level cost reduction features include the ability of TCS2305 and TCS2315 solutions to support a full 128 x 160, 65-k color display with no additional external SRAM memory. Circuitry for power management for phone peripherals like headsets and battery charging is also integrated on-chip to further reduce costs by lowering chip count.

Integrated DRP technology lowers costs

Integrating TI's innovative DRP RF architecture into the TCS2305 and TCS2315 solutions add another dimension to lowering the cost of a mobile phone. DRP technology applies digital techniques to simplify radio frequency processing and dramatically cuts the cost and power consumption of transmitting and receiving information wirelessly. Processing radio signals with digital logic can significantly simplify the implementation and enhance the scalability of wireless communications capabilities.

By integrating DRP technology into the "LoCosto" family of wireless solutions, functions that were previously implemented in discrete devices have now been combined in a single-chip solution. With the RF section included in one device, space requirements and component counts are reduced. At the same time, interconnects are minimized, greatly improving the handset's reliability. By digitizing analog functionality, testability and manufacturing cycle time are improved with built-in calibration, drift effects are reduced and auto-compensation for process and temperature variances is enabled. All of these advantages add to the cost savings by reducing the size of the underlying platform and enabling handsets in sleeker, more compact form factors.

For more information

Visit www.ti.com/tcs2305 or www.ti.com/tcs2315

Features and Specifications for TCS2305 (GSM)

- 65-nm process technology, single-chip solution
- GSM voice:
 - Dual band: 850/1900 or 900/1800 or 850/1800 or 900/1900
 - Codecs: HR, FR, EFR, AMR
 - Acoustic algorithms for high-quality full-duplex voice: AEC, ANR, IIR, FIR, AGC, DRC, WMC
- SAIC and TTY Support
- ARM7TDMI and TMS320C54x DSP, both at 104 MHz
- DRP technology
- Black and white (96 x 96 pixels) and Color LCD support (up to 65 k, 128 x 160); no external SRAM memory needed; enhanced color use case support
- Improved acoustic performance (Full duplex voice call support and up to 2X louder)
- Ringers:
 - MIDI ringtone and playback - 16 polyphonics
 - CD-quality (44.1 kHz) MP3 ringers
- Integrated support for broadcast stereo FM radio reception and playback
- Ability to record FM for on-the-fly ringers
- Headset, handsfree, vibrator
- Lower power consumption for up to 60 percent longer standby and 30-percent talk time
- USB charging for universal and easy charger access
- Hardware security (Flash content protection, ME personalization, IMEI protection) OMTP1.0 compliant
- WLED support
- USIM interface to either 1.8-V or 3-V SIM cards
- Standard 5 x 5 keyboard and joy stick

Features and Specifications for TCS2315 (GPRS)

- All the features of TCS2305, plus:
- GPRS capability
- MIDI ringer player support, 32 polyphonics
- Built-in VGA camera support
- MP3 stereo playback
- USB connectivity
- Mass storage capability (SD/MMC)

ULC Market Characteristics	User/OEM Careabouts	New TCS2305 and TCS2315 "LoCosto ULC" Platform Resources	TCS2305 and TCS2315 "LoCosto ULC" End-User Benefits	TCS2305 and TCS2315 "LoCosto ULC" Operator Benefits
Low Incomes	Affordability Ultra Low-Cost	65-nm process node Single chip with integrated DRP technology Up to 25% lower eBoM	Affordable handsets especially in emerging markets, removes barriers to purchase	Increased subscriber base especially in emerging markets. Lower handset subsidies
Status Aspirations	Appealing Form Factor	40% fewer components and 35% smaller modem/PCB area Single-chip solution	Attractive small and slim form factors, larger batteries	Increase subscriber base with attractive features
	Color Display	Color displays (Up to 128 x 160, 65 K color) with enhanced MMI and animation capability. No additional external SRAM, enabling lower EBOM	Color ULC handset for enhanced user experience and social status	Increase subscriber base with attractive features
	Camera and Imaging	Up to VGA camera support	Ability to take spontaneous pictures	Increase average revenue per user via data (MMS) traffic
First Phone Experience	MMI Simplicity	Fast ARM7 @ 104 MHz and higher on-chip SRAM allows personalization (additional graphics etc.) and smoother MMI processing	Compelling experience and personalization	Build subscriber loyalty with improved user experience
Noisy Environments	Voice Clarity and Loudness	Full Duplex Voice Call Support with twice the loudness important for handsfree operation in noisy environments	Voice clarity and loudness well suited to handsfree operation with noisy conditions	Build subscriber loyalty with improved user experience
Limited Power Access	Long Battery Life	60% longer stand-by time 30% longer talk time USB Charging for universal and easy battery access	Longer interval between battery charges, especially important in rural environments without reliable power sources	Build subscriber loyalty with improved user experience
Personalization	Ringtones and Customization	Integrated MIDI32, CD-quality (44.1 kHz) MP3, ability to record FM, GPRS capability	Improved user experience and personalization (ringers on-the-fly)	Increase average revenue per user (ARPU)
Desire for Infotainment	Music and News	FM Connectivity with integrated stereo, CD-quality MP3 stereo playback; USB Connectivity and Mass storage (SD/MMC)	Music and news anytime, anywhere. Especially attractive for emerging markets	Build subscriber loyalty with improved user experience and increase ARPU
Handset Fraud Concerns	Robust Handset Security	Robust hardware-based security for SIMLock, IMEI, phone software and personal data protection	Strong personal data protection	Increased ROI with handset theft/fraud prevention; Reduced subscriber churn; High-value content protection
Retail Market	Fast time to market for handset manufacturers	Full software re-use from previous LoCosto generation, easy development, faster time to market	Familiar software environment facilitates ease-of-experience and includes easy upgrades	Familiar software environment facilitates easy upgrades and simplifies continuing support

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