Selection Guide:
TI embedded processors based on ARM® technology

Texas Instruments

The right processor for your design

Workshops

Hands-on workshops and events
are available throughout the year:

- **TI ARM training (www.ti.com/
  training):** Experience hands-on
  multi-day and single-day work-
  shops to gain a working under-
  standing of how to optimally use
  TI's ARM-based solutions and
  accelerate product development.
- **TI Tech Days (www.ti.com/
  techdays):** Participate in forums
  for design engineers where
  practical high-performance
  solutions, tools and workshops
  are presented for analog and
  digital technologies. Opportunity
  to meet with a number of Texas
  Instruments' experts to help
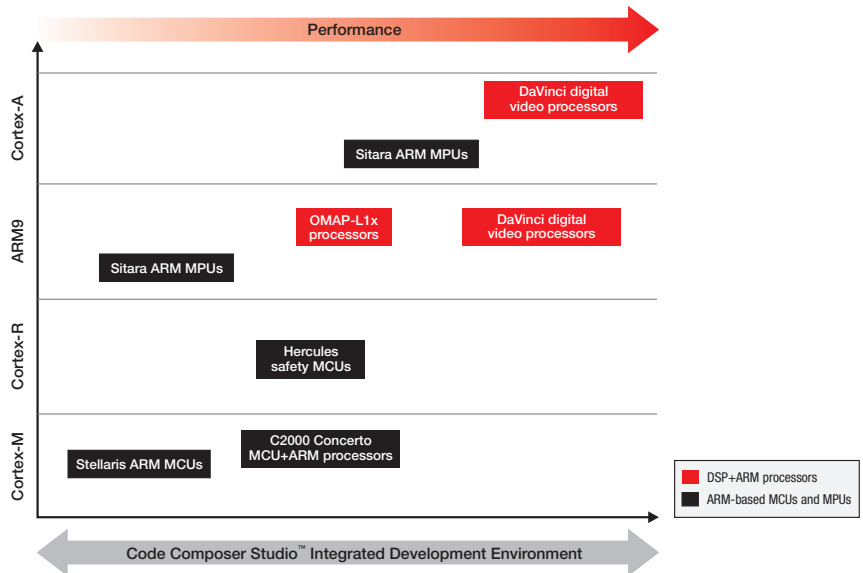 solve your technical challenges!

Meeting design needs: TI's ARM-based solutions enable differentiated embedded design, make development easy and accelerate time to market.

For designers looking to create ARM-based products in markets such as industrial, consumer, human machine inter-
face (HMI), video analytics, video communications, medical and avionics Texas Instruments (TI) offers a broad
portfolio of ARM processors spanning very low-end microcontrollers to very high-performance processors. This port-
folio scales from $1 up to 1.5 GHz. These ARM solutions are optimized for embedded applications, integrating critical
peripherals and come complete with a range of development options including low-cost tools and robust software
suites. Designed to support scalability and software reuse, the ARM architecture enables developers to take a sus-
tainable software approach to design that accelerates the development of next-generation products.

TI has 18 years experience creating widely adopted ARM products and today offers several choices for designers to
create different solutions. Offering developers many options for differentiating their designs, TI offers ARM-based
products with a range of performance, integrated peripherals, and software. TI has an optimal solution to meet
almost any microprocessor or microcontroller design need whether you need:

- A high level operating system (i.e., Linux™, Windows® CE or Android™)
- Support for high-throughput networking interfaces (i.e., greater than 1Gbps)
- Ability to display graphics with high resolution up to 1080p or support a large (more than 5-inch) display?

▲ *The right ARM microprocessor for your application*

Simplify ARM development utilizing TI resources

TI is committed to providing a variety of resources to aid in product development – everything from online techni-
cal support to hands-on training – with the goal of making ARM development easy.

Online support is available through a number of different avenues:

- **E2E™ Community (e2e.ti.com):** Engage with an open network of more than 50,000 engineers and TI experts
  who collaborate by asking and answering technical questions, sharing knowledge, exploring new ideas and
  solving problems.
- **DesignSomething (www.designsomething.org):** Innovate with open-source platforms accessing online
  support that includes wikis, tech docs, white papers.
- **ARM Wikis (processors.wiki.ti.com):** Access information to start development on hardware and software sur-
  rounding TI's embedded portfolio.
- **ARM online training (www.ti.com/training):** Access a multitude of online training opportunities for microcon-
  trollers and microprocessors. Trainings are available at a variety of levels, providing information that is critical to
  start development.
- **ARM videos (www.ti.com/videos):** View overviews and demos of TI's ARM solutions.
- **Design Network (www.ti.com/tidesignnetwork):** Connect with local support to quickly resolve design chal-
  lenges through a professional network of experts.

TI recognizes that software is a core component of developing with ARM® processors and provides a total system solution with production-ready software tools that are skillfully architected to be modular and reusable across multiple processors, designs and development environments. Software ranks as one of the leading development costs of embedded systems and the instruction-set compatibility of the ARM architecture, in conjunction with TI's extensive ARM portfolio, enables developers to maximize code reuse to reduce system cost and speed time to market while enabling you to more effectively differentiate your products.

TI ARM® microprocessor software simplifying your designs

If your end equipment needs a brain, TI's ARM microprocessors (MPUs), DaVinci™ digital video processors and DSP+ARM embedded processors offer a solution. By utilizing ARM cores, specifically the ARM9™ and Cortex™-A8 cores, and common peripheral sets, TI's processors offer highly reusable software code bases that allow you to easily scale within the product family and across TI's embedded processing portfolio. The combination of high performance and a memory management unit (MMU) on these MPUs enable support for high-level operating systems (HLOSs) including Android™, Linux™ and Windows® Embedded CE. If you require real-time operating systems (RTOSs), a variety of TI RTOS partners have ported their own RTOSs and frameworks to TI's AM1x ARM9- and AM3x Cortex-A8-based MPUs. The list includes – but is not limited to – Green Hills (Integrity®), Mentor Graphics (Nucleus®), QNX (Neutrino®), and Wind River (VxWorks®). To further accelerate development time in the embedded design process, TI provides its StarterWare software packages, offering user-friendly, production-ready software that does not require the use of an operating system and gives you a good starting point if you need to develop your own operating system.

Further simplifying the development process, TI allows you to go from demo to development in minutes, with the availability of Linux EZ software development kits (EZ SDK) and Android Development Kits (Dev Kits). These SDKs, available across all TI MPUs, include royalty-free board support packages (BSPs), graphics SDKs, documentation, performance benchmarks and example applications that can save time and money.

You can take full advantage of the processor, graphics and display subsystems and develop in your preferred environment with the Eclipse-based Code Composer Studio™ IDE, a variety of OS-specific tools and extended debugging capability with TI/commercial JTAG emulators.

For more information visit **www.ti.com/embeddedsw**

TI ARM microcontroller software simplifies and speeds development

StellarisWare® software for ARM Cortex-M3 and M4F MCUs

With Stellaris® microcontrollers, all your programming can be in C/C++, even interrupt service routines and startup code. Our StellarisWare software (**www.ti.com/stellarisware**) is an extensive suite of software designed to simplify and speed development of Stellaris-based microcontroller applications, containing:
• Stellaris Peripheral Driver Library for Stellaris peripheral initialization and control functions
• Stellaris USB Library for USB device, USB host or USB On-the-Go (OTG) applications
• Stellaris Graphics Library for graphical display support

Features and benefits:
• Free license and royalty-free use (for use with Stellaris MCUs).
• Simplify and speed the development of applications – can be used for application development or as a programming example.

• Allow the creation of full-function, easy-to-maintain code.
• Written entirely in C except where absolutely not possible. Even written in C, the software is reasonably efficient in terms of memory and processor usage due to the compact nature of the Cortex-M Thumb®-2 instruction set.
• Take full advantage of the stellar interrupt performance of the Cortex-M core, without requiring any special pragmas or custom assembly code prologue/epilogue functions.
• Can be compiled with error-checking code (for development use) or without (for final production use in an MCU with a smaller memory configuration).
• Available as both object library and source code, so that the library can be used as-is or adapted as desired.

Hercules™ software and tools

TI and our partners offer a variety of Hercules development kits, tools and software components designed to accelerate and simplify the development process.

Each Hercules development kit comes with Code Composer Studio™ (CCStudio) Integrated Development Environment (IDE), TI utilities, documentation, hardware schematics, and code examples. TI utilities include a Hardware Abstraction Layer Code Generation (HALCoGen) tool which provides a graphical user interface that allows the user to configure peripherals, interrupts, clocks, and other microcontroller parameters.

Once the device is configured, the user can generate peripheral initialization and driver code, which can then be easily imported into CCStudio IDE, IAR Workbench, or Keil µVision. Hercules Safety MCUs are also supported by multiple RTOS which are being used in safety and mission critical applications today such as SAFERTOS from High Integrity Systems, µC/OS-II™ from Micrium, and ThreadX from Express Logic.

For other RTOS, TI utilities, and software components available please visit our website at **www.ti.com/hercules**.

Sitara™ ARM® Cortex™-A8 and ARM9™ microprocessors

Why TI's Sitara ARM microprocessors?

TI's Sitara ARM microprocessors (MPUs) are designed to optimize perfor-
mance and peripheral support for customers in a variety of markets. With
more than 120 products, the Sitara ARM MPU family features AM3x ARM
Cortex™-A8 and AM1x ARM9™-based solutions with performance
ranging from 275 MHz to 1.5 GHz that feature unique combinations of
peripherals and accelerators to drive down system cost and expand
connectivity options.
(**www.ti.com/sitara**)

- Robust offerings that include multiple operating frequencies for optimiz-
  ing power versus performance, 3D graphics acceleration, multiple pack-
  aging options and temperature ranges
- Integrated high-bandwidth connectivity peripherals including: CAN, DDR2/
  DDR3 interfaces, Gigabit Ethernet, PCI Express, SATA 2.0 and USB 2.0
- Features highly reusable software code bases that allow designers to
  easily scale amongst Sitara ARM MPU products and other product families
- Demo in 10 minutes and develop in less than an hour with robust
  Linux™ software development kits
- Accelerate both software and hardware development with low-cost
  development tools and free software base ports for Android™ and
  Windows® Embedded Compact
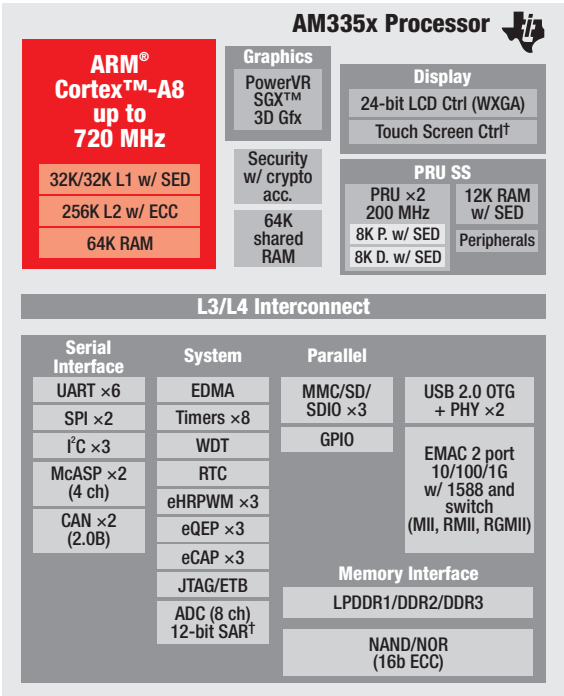- Extensive Real-time Operating System (RTOS) support*

*This list is not exhaustive, but includes features available on select
devices.*

† Use of TSC will limit available ADC channels
SED: Single error detection/parity.

▲ *AM335x ARM MPU block diagram*

Key features
- AM3x ARM Cortex-A8 and AM1x ARM9 processors
- Optional high-performance 3D graphics accelerator
- Programmable real-time unit (PRU) for flexible interfaces
- Robust display options
- Optimized for low-power applications
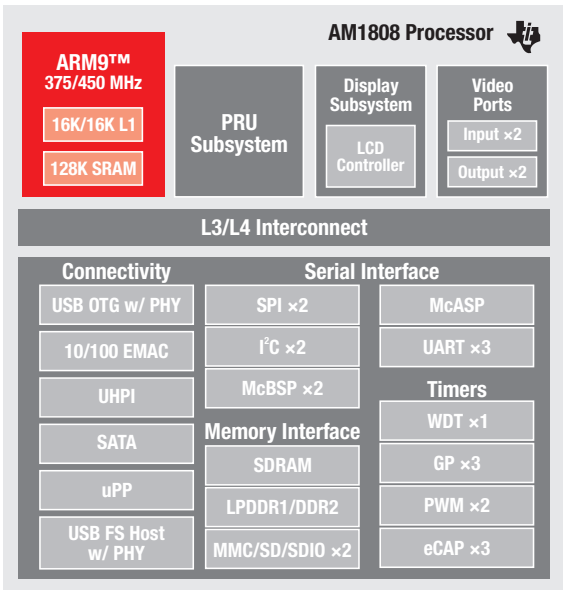- Free Linux, Android and Windows Embedded Compact base ports

Key peripherals
- USB 2.0 connectivity
- 10/100/1000 Ethernet MAC with options for switching
- Display subsystem LCD controller
- Support for composite, S-video and digital video outputs
- Video I/O for camera and other video input options
- CAN
- EtherCAT®
- PROFIBUS®
- SATA 2.0
- PCI Express
- MMC/SD card interface
- SDRAM, LPDDR1, DDR2, and DDR3 support

▲ *AM1808 ARM microprocessor block diagram*

*The above block diagrams represent several examples of the 120+ Sitara
ARM MPU product line.*

Key applications

- Automation and control
- Human machine interface
- Medical
- Portable data terminals
- Point-of-sale
- Portable navigation
- Industrial automation
- Connected displays
- Gaming equipment
- Consumer goods

Software tools to simplify development

TI invests in software tools to help simplify development. Within the Sitara ARM MPU family software development kits (SDKs) and board support packages (BSPs) are available for Linux™, Android™ and Windows® Embedded Compact to have you demoing in 10 minutes and developing within an hour. All of TI's software offerings include peripheral drivers and boot loaders. In addition, TI enables third parties to port their own operating system and develop their own BSPs on TI platforms.

Further simplifying the development process, TI has invested in developing a single SDK on the Linux operating system that works not only within the Sitara ARM MPU family, but scales across TI's embedded microprocessor portfolio. TI is taking things a step further with the availability of the StarterWare software packages. These offerings significantly reduce learning curves and accelerate development time in the embedded design process by offering user-friendly, production-ready software for Sitara 32-bit ARM microprocessor (MPU), C6000™ digital signal processor (DSP) and DSP+ARM developers. StarterWare provides application developers with a flexible starting point that does not require the use of an operating system. Customers use application programming interfaces (APIs) to configure and interface with peripherals and lightweight software stacks to enable USB, network and graphics functionality. Example code and application notes included with StarterWare reduce development time up to 10×. StarterWare, as with TI's other software offerings, allows for easy migration to other TI embedded devices.

Get started today with TI ARM development tools

Development tools such as evaluation modules (EVMs) come complete with hardware, software and documentation and are available directly from Texas Instruments. Additional low-cost community-based boards can be obtained from numerous partners and distributors.

Sitara ARM MPU development tools

Name	Tool/Software part number	Tool/ Software type	Product group
Reference design kit			
EPOS Reference Design for retail applications	VPOS353	Reference design	AM37x ARM MPU

Sitara ARM MPU development tools (continued)

Name	Tool/Software part number	Tool/ Software type	Product group
Evaluation modules			
AM17x Evaluation Module (EVM)	TMDXEVM1707	Development Boards/EVMs	AM1x ARM9™
AM1810 PROFIBUS® Evaluation Module	TMDXEVM1810	Development Boards/EVMs	AM1x ARM9
AM18x evaluation module with Wi-Fi	TMDXEVMWIFI1808L	Development Boards/EVMs	AM1x ARM9
AM18x eXperimenter's Kit	TMDSEXP1808L	Development Boards/EVMs	AM1x ARM9
AM3517 Evaluation Module (EVM)	TMDSEVM3517	Development Boards/EVMs	AM35x Cortex-A8
AM/DM37x Evaluation Module (EVM)	TMDSEVM3730	Development Boards/EVMs	AM37x Cortex-A8
DM814x/AM387x Evaluation Module	TMDXEVM8148	Development Boards/EVMs	AM387x Cortex-A8
DM816x/AM389x Evaluation Module (EVM)	TMDXEVM8168	Development Boards/EVMs	AM389x Cortex-A8
AM335x Evaluation Module	TMDXEVM3358	Development Boards/EVM	AM335x Cortex-A8
AM3359 Industrial Development Kit	TMDXIDK3359	Development Boards/EVM	AM3359 Cortex-A8
Industrial Communications Engine	TMDXICE3359	Development Boards/EVM	AM335x Cortex-A8
Software development kits			
Android Development Kit for Sitara ARM MPUs	ANDROIDSDK-SITARA	Software Development Kit	AM3x Cortex-A8
Linux EZ Software Development Kit (EZSDK) for Sitara ARM MPUs	LINUXEZSDK-SITARA	Software Development Kit	AM3x Cortex-A8
Real-Time Linux Software Development Kit (SDK) for AM1810 MPUs	LINUXEZSDK-AM1810	Software Development Kit	AM1x ARM9
Windows Embedded CE Software Development Kit (SDK) for ARM AM1x / OMAP-L1x	WINCESDK-AM1XOMAPL1X	Software Development Kit	AM1x ARM9
Windows Embedded CE Software Development Kit (SDK) for AM3x Cortex-A8-based processors	WINCESDK-A8	Software Development Kit	AM3x Cortex-A8
StarterWare for ARM9 and Cortex-A8-based processors	STARTERWARE-ARMMPU	Software Development Kit	AM1x ARM9 and AM3x Cortex-A8
Other tools			
FlashTool for AM35x, AM37x, DM37x and OMAP35x devices	FLASHTOOL	Other tools	AM3x Cortex-A8
Linux cryptography for Sitara ARM-based MPUs	ARMCRYPTO	Other tools	AM3x Cortex-A8 AM1x ARM9
OpenLink open source Wi-Fi and Bluetooth® daughter card for AM18x EVMs	TMDXWL1271DC18XL1X	Other tools	AM1x ARM9
Pin MUX Utility for Sitara ARM MPUs (AM389x, AM387x, AM335x, AM35x, AM/DM37x, DM816x, OMAP35x)	PINMUXTOOL	Other tools	AM3x Cortex-A8
Power Estimation Tool (PET)	POWEREST	Other tools	AM3x Cortex-A8
PROFIBUS on AM1810 ARM MPUs	PROFIBUS	Other tools	AM1x ARM9

Hercules™ ARM® safety microcontrollers
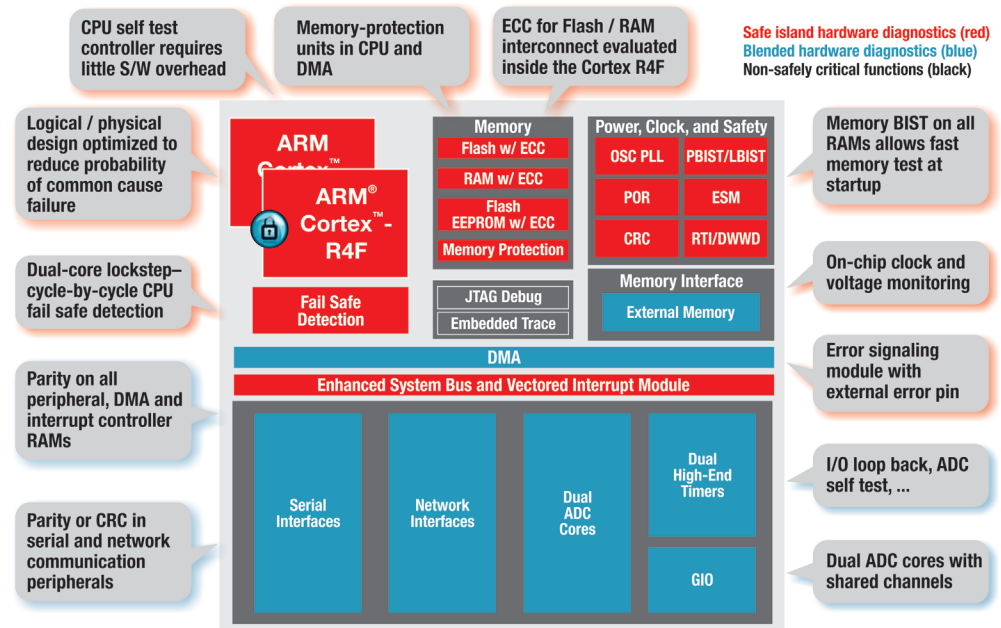
Why Hercules microcontrollers?

Hercules safety microcontrollers are based on TI's 20+ years of safety-critical system expertise, industry collaboration and proven hardware for the automotive market. The platform consists of three ARM Cortex™-based microcontroller families (RM48x, TMS570 and TMS470M) that deliver scalable performance, connectivity, memory and safety features. Unlike many microcontrollers that rely heavily on software for safety capabilities, Hercules microcontrollers implement safety in hardware to maximize performance and reduce software overhead.

The Hercules RM4x family provides the highest level of performance for broad safety applications, including medical and industrial, and are developed to the IEC 61508 SIL-3 safety standard.

▲ *Hercules dual-CPU lockstep MCU block diagram*

The Hercules TMS570 family provides high performance for transportation applications and is very well suited for applications that need to meet IEC 61508 SIL-3 or ISO 26262 requirements. The Hercules TMS470M family cost efficiently meets the needs of applications that require less performance and lower safety levels.

The RM48x and TMS570 dual-CPU lockstep architectures simplify development while eliminating redundant system requirements to reduce cost. CPU hardware built-in self test (BIST) detects latent defects without complex safety software and code-size overhead. Hardware comparison of CPU outputs provides nearly instant safety response time without any additional performance impact. ECC logic is integrated in the CPU to protect both memories and busses. All RAM memories can be tested using hardware BIST for high diagnostic coverage and an integrated Memory Protection Unit (MPU) helps protect against deterministic errors in application software. (www.ti.com/hercules)

Key features

RM48x Safety MCUs
- ARM Cortex-R4F core with floating-point support
- Up to 220 MHz
- Lockstep safety features built-in simplify SIL-3 applications
- Up to 3-MB Flash/256-KB RAM with ECC
- Memory protection units in CPU and DMA
- Ethernet, USB, CAN
- External memory interface

TMS570LS Safety MCUs
- ARM Cortex-R4F core floating-point support
- Up to 180 MHz
- Lockstep safety features built-in simplify SIL-3/ASIL D applications
- Up to 3-MB Flash/256-KB RAM with ECC
- Memory protection units in CPU and DMA
- Flexible timer module with up to 44 channels
- Ethernet, FlexRay™, CAN, LIN, SPI
- External memory interface

TMS470M Safety MCUs
- 80-MHz ARM Cortex-M3 CPU
- Up to 640-KB Flash / 64-KB RAM with ECC protection and EEPROM emulation
- Single 3.3-V supply (Vreg on-chip)
- Flexible timer module (16 ch)
- 2 CAN, 2 MibSPIs, 2 LIN/UART
- Safety features (ECC, BISTs, CRC)
- Pin- and software-compatible family
- Embedded debug module

Key peripherals

RM48x Safety MCUs
- Flexible timer module with up to 44 channels for PWM generation or input capture
- 12-bit analog/digital converter

TMS570LS Safety MCUs
- 12-bit analog/digital converter

TMS470M Safety MCUs
- 10-bit analog/digital converter (16 ch)

Key applications

RM48x Safety MCUs
- Industrial automation and control
- Safety Programmable Logic Controllers (PLCs)
- Power generation and distribution
- Turbines and windmills
- Ventilators and defibrillators
- Infusion and insulin pumps

TMS570LS Safety MCUs
- Braking systems (ABS and ESC)
- Electric power steering (EPS)
- HEV/EV inverter systems
- Aerospace
- Railway control, communications and signaling
- Off-road vehicles

TMS470M Safety MCUs
- Electric Power Steering (EPS)
- Braking systems (ABS, ESC)
- Safety-related automotive
- Automotive infrastructure
- Commercial vehicles
- Off-road vehicles
- Airbags, electric park brake, safe communication, parking assist

Hercules evaluation and development tools

Name	Tool part number	Tool type	Price
RM48 USB stick kit	TMDXRM48USB	Evaluation kit	$79
TMS570 USB stick kit	TMDX570LS31USB	Evaluation kit	$79
TMS470M USB stick kit	TMDX470MF066USB	Evaluation kit	$79
RM48 development kit	TMDXRM48HDK	Development kit	$199
TMS570 development kit	TMDX570LS31HDK	Development kit	$199
TMS470M development kit	TMDX470MF066HDK	Development kit	$175

Software included in each kit
- Code Composer Studio™ (CCStudio) v4.x Integrated Development Environment (IDE): C/C++ compiler/linker/debugger
- HALCoGen peripheral driver generation tool
- CCStudio and nowFlash flash programming tools
- HET IDE/simulator/assembler
- GUI demo with project/code examples

Integrated development environment (IDE)
Program/compile/debug code using these IDEs:
- CCStudio IDE
- IAR Workbench
- KEIL μVision

Real-time operating systems
- SAFERTOS: High-integrity systems
- μC/OS: Micrium
- ThreadX: Express Logic
- AUTOSAR: Vector Microsar and EB tresos

GUI-based code-generation tools and other software tools

Safety MCU demos
- Safety feature highlight
- Ambient light demo
- Temperature demo
- LED light show
- Maze game (RM48 and TMS570)
- Source code viewable via CCStudio IDE

PLL calculators
- Easily configure the FMzPLL and FPLLs in the Hercules platform Phase Lock Loop modules

HET IDE
- Graphical programming environment
- Includes WaveFormer Pro SynaptiCAD
- Generates CCStudio IDE-ready software
- Includes functional examples

HALCoGen
- User input on high-abstraction level
- Graphical-based code generation
- Easy configuration
- Quick start for new projects
- Supports CCStudio, IAR and KEIL IDEs nowECC Generation Tool
- Command line program for generating error correction code for Hercules devices. Can be used in conjunction with CCStudio IDE.

nowFlash Programming Tool
- GUI and command line programmer for loading code into Hercules devices without an IDE

www.ti.com/hercules

Why Stellaris microcontrollers?

Designed for serious microcontroller applications, the award-winning Stellaris 32-bit ARM Cortex-M microcontrollers (MCUs) combine sophisti-cated, flexible mixed-signal system-on-chip integration with unparalleled real-time multi-tasking capabilities. With more than 270 devices, the Stellaris family provides entry into the industry's strongest ecosystem, with code compatibility ranging from $1 to more than 1 GHz. (www.ti.com/stellaris)

- Development is easy with the royalty-free StellarisWare® software
- Superior analog integration saves in system cost
- Advanced communication capabilities, including 10/100 Ethernet MAC/PHY
- USB and USB-OTG, CAN controllers, and extended peripheral interfaces
- Optimized for performance with fast internal busses and fast flash
- Real MCU GPIOs—all can generate interrupts, are 5-V tolerant, and have programmable drive strength and slew rate control

Key features
- Fixed- and floating-point options
- Low power – standby modes as low as 1.6 μA
- Optimized for single-cycle flash usage
- Deterministic, fast interrupt processing: always 12 cycles, or just 6 cycles with tail-chaining
- Three sleep modes with clock gating for low power
- Single-cycle multiply instruction and hardware divide
- Atomic operations
- ARM Thumb®-2 mixed 16-/32-bit instruction set
- 1.25 DMIPS/MHz – better than ARM7
- Extra debug support including data watchpoints and flash patching
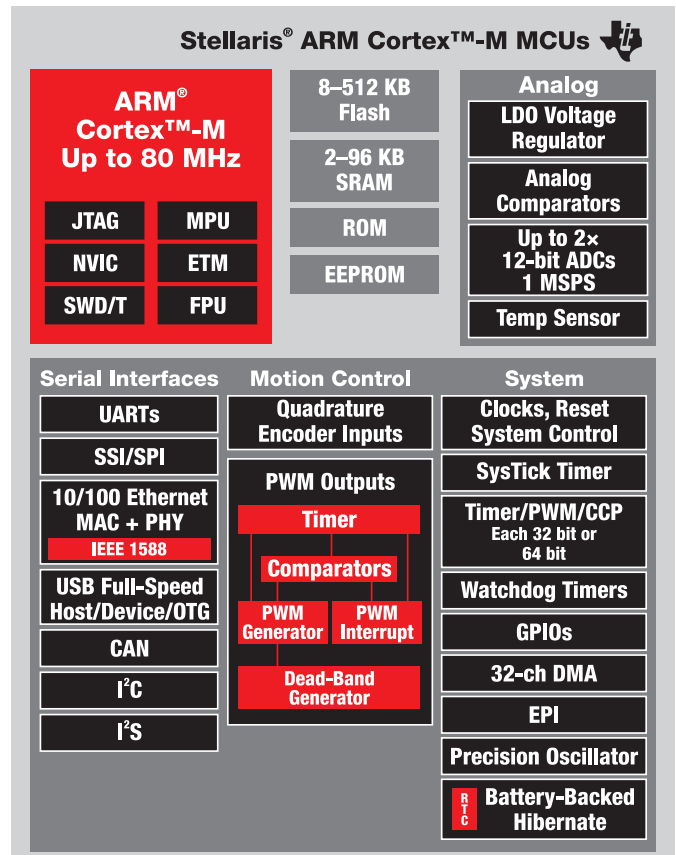
Key peripherals
- ARM Cortex-M4F MCUs
  - For LM4F110 series: CAN, 12-bit ADCs, 2-KB EEPROM
  - For LM4F120, 130, 230 series: CAN, 12-bit ADCs, 2-KB EEPROM, USB OTG
- ARM Cortex-M3 MCUs
  - For 6000, 8000, 9000 series: 10/100 Ethernet MAC + PHY, CAN, USB OTG, external memory interface, 12-bit ADCs
  - For 3000, 5000 series: USB OTG, CAN, external memory inter-face, 12-bit 1MSPS ADCs
  - For 1000, 2000 series: CAN, external memory interface, 12-bit 1MSPS ADCs

Key applications
The Stellaris family is perfect for cost-conscious applications requiring significant control processing and connectivity capabilities, including:
- Smart energy
- Motion control
- Monitoring (remote, fire/security, etc.)
- HVAC and building controls
- Power and energy monitoring and conversion
- Network appliances and switches
- Factory automation
- Electronic point-of-sale machines
- Test and measurement equipment
- Medical instrumentation
- Gaming equipment

Stellaris ARM Cortex-M3 and M4F MCUs

Stellaris® ARM Cortex™-M MCUs

ARM® Cortex™-M Up to 80 MHz	8–512 KB Flash	Analog
	2–96 KB SRAM	LDO Voltage Regulator
JTAG / MPU	ROM	Analog Comparators
NVIC / ETM	EEPROM	Up to 2× 12-bit ADCs 1 MSPS
SWD/T / FPU		Temp Sensor

Serial Interfaces	Motion Control	System
UARTs	Quadrature Encoder Inputs	Clocks, Reset System Control
SSI/SPI	PWM Outputs	SysTick Timer
10/100 Ethernet MAC + PHY (IEEE 1588)	Timer	Timer/PWM/CCP Each 32 bit or 64 bit
USB Full-Speed Host/Device/OTG	Comparators	Watchdog Timers
CAN	PWM Generator / PWM Interrupt	GPIOs
I²C	Dead-Band Generator	32-ch DMA
I²S		EPI
		Precision Oscillator
		RTC Battery-Backed Hibernate

▲ *Stellaris family block diagram*

ARM POWERED®

Cortex™
Intelligent Processors by ARM®

Pb lead-free   RoHS 2002/95/EC ✓

The Stellaris family offers the industry's first and broadest implementation of Cortex-M3 and the Thumb®-2 instruction set. With blazingly-fast responsiveness, Thumb-2 technology combines both 16-bit and 32-bit instructions to deliver the best balance of code density and performance. Thumb-2 uses 26 percent less memory than pure 32-bit code to reduce system cost while delivering 25 percent better performance.

Stellaris® ARM® Cortex™-M3 Microcontroller family

Stellaris family	Program Flash (KB)	Packages	Key features
LM3Sx00	8 to 64	48-LQFP	
LM3S1000	16 to 512	64-, 100-LQFP, 108-BGA	
LM3S2000	64 to 512	64-, 100-LQFP, 108-BGA	
LM3S3000	16 to 256	64-, 100-LQFP	
LM3S5000	16 to 512	64-, 100-LQFP, 108-BGA	
LM3S6000	64 to 512	100-LQFP, 108-BGA	
LM3S8000	96 to 512	100-LQFP, 108-BGA	
LM3S9000	128 to 512	100-LQFP, 108-BGA	

Mixed Signal · Motor Control · CAN · I²S · USB · 10/100 Ethernet MAC + PHY

The Stellaris ARM Cortex-M4 microcontrollers, called the Stellaris LM4F series, provides floating point and a wide range of capabilities and peripherals. The series encompasses categories of applications that include general MCU, USB, and advanced motion control with up to 16 PWM outputs, with a generous number of serial communication peripherals, including up to eight UARTs, six I²C, four SSI/SPI, and two CAN controllers.

Stellaris® ARM® Cortex™-M4F Microcontroller family

Stellaris series	Program Flash (KB)	Packages	Key features
LM4F110	32 to 256	64-LQFP	
LM4F130	32 to 256	64-LQFP	
LM4F230	32 to 256	100-LQFP, 144-LQFP	
LM4F112	64 to 256	100-LQFP, 144-LQFP	
LM4F132	64 to 256	100-LQFP, 144-LQFP	
LM4F232	128 to 256	100-LQFP, 144-LQFP	

Mixed Signal 2 × 12-bit ADCs, 1 MSPS · Floating-Point Unit 80 MHz · Low Power Standby < 1.6 µA · USB Device, Host, OTG · Serial Connectivity UART, SPI I²C, 2× CAN · Motion Control 16 × PWM / 2 × QEI

Getting started (software kits)

The Stellaris family extends the benefits of the ARM Cortex-M3 architecture with the integration of advanced motion control and connectivity features, with more than 270 microcontroller combinations to fit the specific needs and price point in any market segment. To start your development, Stellaris makes it easy with software support and a variety of evaluation kits, development kits, reference design kits and module.

StellarisWare® software

With Stellaris microcontrollers, all your programming can be in C/C++, even interrupt service routines and startup code. Our StellarisWare software (**www.ti.com/stellarisware**) is an extensive suite of software designed to simplify and speed development of Stellaris-based microcontroller applications, containing:

• Stellaris Peripheral Driver Library for Stellaris peripheral initialization and control functions
• Stellaris USB Library for USB device, USB host or USB On-the-Go (OTG) applications
• Stellaris Graphics Library for graphical display support

Please see page 3 for how StellarisWare can help you develop your design easily.

Stellaris quick start evaluation and full-featured development kits

Evaluation and development with Stellaris is eased through inexpensive, 10-minute out-of-the-box evaluation kits and full-featured development kits, packaged with a choice of evaluative tools from today's leading ARM software tool providers (**www.ti.com/stellariskits**).

Stellaris quick start evaluation and full-featured development kits

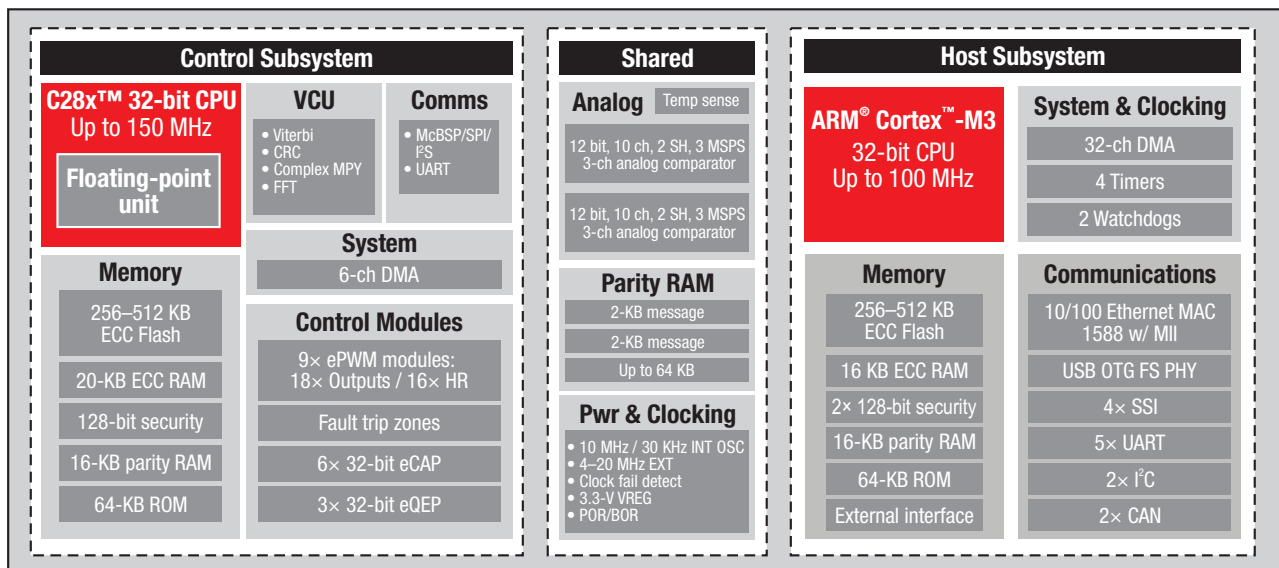| Stellaris kit	Use for these devices
EK-LM4F232 USB+CAN Evaluation Kit	LM4F MCUs
DK-LM3S9B96 Ethernet+USB-OTG+CAN+I²S+EPI Development Kit	All Stellaris MCUs
EK-LM3S9B92 Ethernet+USB-OTG Evaluation Kits	9000 Series
EK-LM3S9B90 Ethernet+USB-OTG Evaluation Kits	9000 Series
EK-LM3S8962 Ethernet+CAN Evaluation Kits	8000 Series
EK-LM3S6965 Ethernet Evaluation Kits	6000 Series
EK-LM3S3748 USB H/D Evaluation Kits	3000 and 5000 Series
EK-LM3S2965 CAN Evaluation Kits	2000 Series
EK-LM3S1968 Evaluation Kits	1000 Series
EK-LM3S811 Evaluation Kits	800 Series, 600 Series, 300 Series, 100 Series

C2000™ Concerto™ microcontrollers

Why Concerto microcontrollers?

Engineering is full of compromises. It's a balance between numerous aspects – cost, power consumption, reliability, feature set, flexibility and the list goes on. With every generation, engineers push the envelope of efficiency and functionality in their designs. Digital control is bringing new possibilities in driving smarter and more efficient systems. Connectivity is becoming pervasive in applications that previously didn't require communication. Today, in many real-time control applications, such as automation or energy conversion, one of the biggest compromises is finding a balance between robust loop control and adding communications or host functionality. But what if you could eliminate some of those compromises?

With the C2000 Concerto family of microcontrollers, the need to compromise is eliminated. By combining an industry-leading host core along with an industry-leading control core, Concerto MCUs provide the best of both

worlds in one device, simplifying both hardware and software aspects, all while reducing cost. (**www.ti.com/concerto**)

- No need to compromise between communication and control
- Enable safety certifications
- Lower system cost with integration
- Scalable performance, selectable math and control enhancements
- Single IDE built-in functionality with dual-subsystem debugging and programming
- Multi OS support
- controlSUITE™ application software libraries and device drivers to reduce development time. Simple, quick and secure communication between subsystems.

Control Subsystem				Shared		Host Subsystem		

Control Subsystem

C28x™ 32-bit CPU Up to 150 MHz

Floating-point unit

VCU
- Viterbi
- CRC
- Complex MPY
- FFT

Comms
- McBSP/SPI/I²S
- UART

System
6-ch DMA

Memory
- 256–512 KB ECC Flash
- 20-KB ECC RAM
- 128-bit security
- 16-KB parity RAM
- 64-KB ROM

Control Modules
- 9× ePWM modules: 18× Outputs / 16× HR
- Fault trip zones
- 6× 32-bit eCAP
- 3× 32-bit eQEP

Shared

Analog Temp sense
- 12 bit, 10 ch, 2 SH, 3 MSPS 3-ch analog comparator
- 12 bit, 10 ch, 2 SH, 3 MSPS 3-ch analog comparator

Parity RAM
- 2-KB message
- 2-KB message
- Up to 64 KB

Pwr & Clocking
- 10 MHz / 30 KHz INT OSC
- 4–20 MHz EXT
- Clock fail detect
- 3.3-V VREG
- POR/BOR

Host Subsystem

ARM® Cortex™-M3 32-bit CPU Up to 100 MHz

System & Clocking
- 32-ch DMA
- 4 Timers
- 2 Watchdogs

Memory
- 256–512 KB ECC Flash
- 16 KB ECC RAM
- 2× 128-bit security
- 16-KB parity RAM
- 64-KB ROM
- External interface

Communications
- 10/100 Ethernet MAC 1588 w/ MII
- USB OTG FS PHY
- 4× SSI
- 5× UART
- 2× I²C
- 2× CAN

Key features

- C28x (up to 150 MHz) optimized for:
  - Real-time control (DSP heritage)
  - Sensing and DSP filtering and processing
  - Firmware programmable PLM solutions (VCU)
  - Digital power independent multi-loop control
  - Motor control and power monitoring
  - Industry-leading control peripherals
- ARM Cortex-M3 (up to 100 MHz) optimized for:
  - Host communications: Ethernet, USB, CAN, UART, SPI, I²C
  - Scheduling
  - O/S

Key peripherals

- Flexible high-resolution PWMs to support complex waveforms and timings
- High-speed precision analog including dual 2.9 MSPS 12-bit ADCs, analog comparators
- Ethernet with on-chip MAC
- USB On-the-Go with on-chip MAC and PHY
- Dual CAN

Key applications

- Industrial automation
- Solar inverters/Micro-inverters
- Server and telecom power
- Power monitoring
- Automotive
- Integrated power line communication

Getting started – kits and software

Concerto tools will continue the C2000 controlCARD tools methodology. By detaching the C2000 processor and all necessary support circuitry and putting them on controlCARDs, a designer can test multiple processors on one application board. These controlCARDs require only one 5-V supply and plug into a simple motherboard connector that gives access to every pin on the device. All C2000 application kits are also based on controlCARDs. Start exploring what Concerto MCUs have to offer, right out of the box!

C2000 Concerto development tools

Name	Tool part number	Tool type	Price
Concerto H52C1 Experimenter Kit	TMDXDOCKH52C1	Experimenter Kit	$139
Concerto controlCARD	TMDXCNCDH52C1	controlCARD	$99

Why DaVinci digital video processors?

Optimized for digital video systems, DaVinci digital video processor solutions are tailored for digital audio, video, imaging, and vision applications. The DaVinci platform includes a general-purpose processor, video accelerators, an optional DSP, and related peripherals. With over 200+ devices, offerings include a wide range of performance, power and price points. Optimized for video encode and decode applications, the scalable DaVinci platform of solutions also includes free multimedia codecs and easy-to-use development tools and software. TI's integrated DSP+ARM® system-on-chip (SoC) architecture is suited for products requiring intensive signal processing, comprehensive system control, a responsive graphical user interface and the ability to run applications under advanced operating systems. (**www.ti.com/davinci**)

- Robust offerings that include multiple operating frequencies, 3D graphics acceleration, multiple packaging options and temperature ranges
- Integrated high-bandwidth connectivity peripherals including: HD video coprocessor, 3D graphics core, CAN, DDR2/DDR3 interfaces, Gigabit Ethernet, PCI Express, SATA 2.0 and USB 2.0
- Demo in 10 minutes and develop in less than an hour with robust Linux™ and Android™ software development kits
- Accelerate both software and hardware development with low-cost development tools and free software base ports

Key features
- ARM Cortex-A8 and ARM9 processors
- Fixed-/floating-point DSP
- Key peripheral integration
- HD video capture and display
- HD video accelerators (up to 1080p60)
- Reference designs available for IPNC and DVT applications

Key peripherals
- USB 2.0 connectivity
- 10/100/1000 Ethernet MAC
- Display subsystem LCD controller
- Video input and sensor interface for camera and other video input options
- CAN
- SATA 2.0
- HDMI
- PCI Express
- MMC/SD card interface
- SGX 3D graphics engine
- Support for multiple HD displays

Key applications
- DVR and DVS
- Digital signage
- Endoscope
- STB/DVR/Streaming media
- Video analytics server
- Video communications system
- IP network cameras

Software/hardware tools to simplify development

TI provides customers with standard software methods to accelerate applications on the DSP and hardware coprocessors. DSP/BIOS™ Link provides the foundation for the ARM to load, start and communicate with the DSP, saving precious ARM MIPS. The Codec Engine algorithm framework provides the ARM developer an additional level of abstraction, which automates the instantiation and invocation of eXpressDSP™-compliant codecs and algorithms. Software Development Kits (SDKs), provided with each EVM, are available for download for free and provide key software components and documentation. Hardware development kits including EVMs, starter kits and experimenter boards are available for purchase.
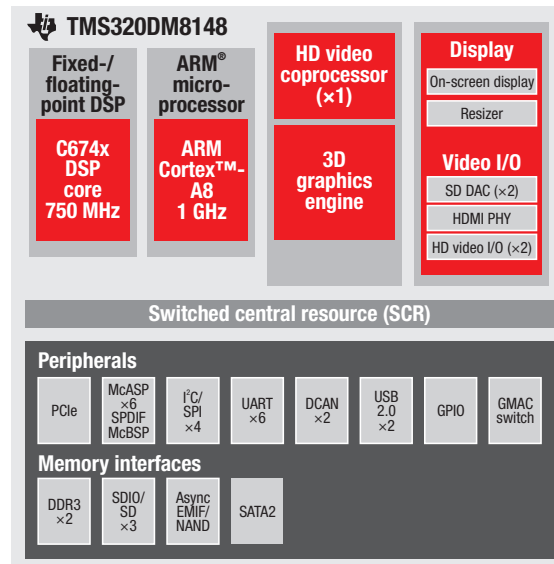
▲ *DM8148 processor block diagram*
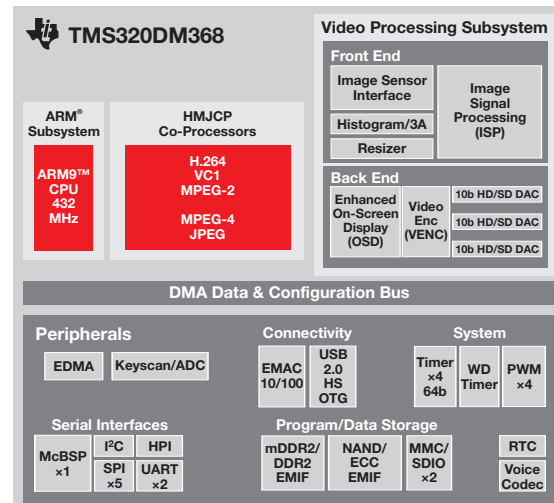
▲ *DM368 processor block diagram*

Everything you need to get to market faster

TI has launched free software development tools to enable developers to easily leverage the real-time, intensive signal processing power of the C6x DSP for DaVinci's digital video processors.

- **GStreamer DMAI Plug-In** – Pipeline-based multimedia framework that allows you to create a variety of media-handling software components, including simple audio playback, audio and video playback, recording, streaming, and editing
- **C6EZAccel** – Bundles TI's extensive set of C6x DSP kernels and source libraries for many common processing functions
- **C6EZRun** – User uses ARM APIs to access the DSP and partitions code between ARM and DSP for user without writing any DSP code

For more information about TI's GStreamer DMAI Plug-In for OMAP™ and DaVinci processors, please visit: **www.ti.com/tool/gstreamer**

For more information about TI's free C6EZ Tools, please visit: **www.ti.com/c6eztoolswiki**

OMAP-L1x processors

Why OMAP-L1x processors?

The OMAP-L1x processors include ARM9™ + DSP architectures which offer a variety of peripherals for networking, secure boot and multi-level encryption, and run Linux™ and the DSP/BIOS™ real-time kernel for operating system flexibility. The product line is also pin-for-pin compatible with various devices in the TMS320C674x DSP product line. Power consumption ranges from 8 mW in standby to 400 mW total power. (**www.ti.com/dsparm**)

- TI's OMAP-L1x processor system-on-chip (SoC) architecture is suited for products requiring intensive signal processing, comprehensive system control, a responsive graphical user interface and the ability to run applications under advanced operating systems
- Robust offerings that include multiple operating frequencies, multiple packaging options and temperature ranges
- Integrated connectivity peripherals including: CAN, DDR2 interfaces, Ethernet, USB 2.0, and SATA
- Accelerate both software and hardware development with low-cost development tools and free software base ports
- Secure boot and multi-level encryption options available
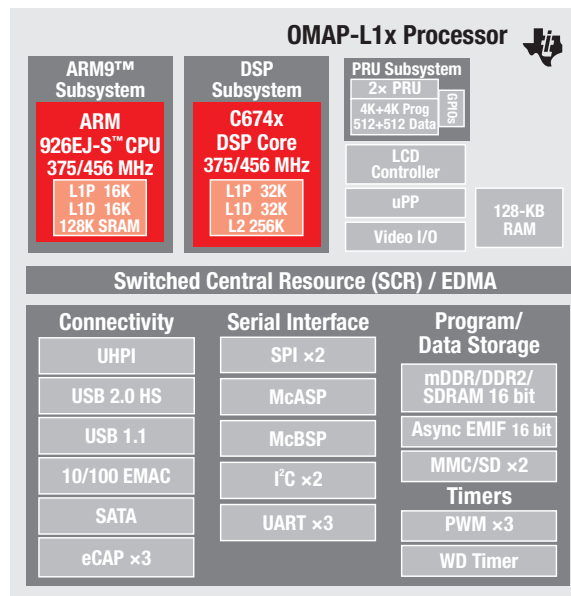
Note: Not all features in all products.

▲ OMAP-L1x processor block diagram

Key features
- ARM9 processors
- Floating-/fixed-point DSP
- Key peripheral integration
- Programmable real-time unit (PRU) for flexible interfaces
- Robust display options
- Free Linux and Windows® Embedded Compact base ports

Key peripherals
- USB 2.0 connectivity
- 10/100 Ethernet MAC
- Display subsystem LCD controller
- Video I/O for camera and other video input options
- CAN
- MMC/SD card interface

Key applications
- Automation and control
- Software-defined radios
- Smart grid
- Test and measurement
- Machine vision
- Currency counter
- Medical

Software/hardware tools to simplify development

TI provides customers with standard software methods to accelerate applications on the DSP and hardware coprocessors. DSP/BIOS™ Link provides the foundation for the ARM to load, start and communicate with the DSP. The Codec Engine algorithm framework provides the ARM developer an additional level of abstraction, which automates the instantiation and invocation of eXpressDSP™-compliant codecs and algorithms. Software Development Kits (SDK) are available for download for free and provide key software components and documentation. Hardware development kits including Evaluation Modules (EVM), starter kits and experimenter boards are available for purchase. SDKs are provided with each EVM.

Everything you need to get to market faster

TI has launched three free software development tools to enable developers to easily leverage the real-time, intensive signal processing power of the C6x DSP for TI's OMAP-L1x processors:

- **C6EZAccel** – Bundles TI's extensive set of C6x DSP kernels and source libraries for many common processing functions
- **C6EZRun** – User uses ARM APIs to access the DSP and partitions code between ARM and DSP for user without writing any DSP code
- **C6EZFlo** – An alternative to traditional programming; a graphical user interface with C code compile and debug functionality

For more information about TI's free C6EZ Tools, please visit: **www.ti.com/c6eztoolswiki**

OMAP-L1x processors development tools

| Name	Tool/Software part number	Tool/Software type	Product group
Evaluation modules			
OMAP-L137 / TMS320C6747 Floating-Point Starter Kit	TMDSOSKL137	Starter kit	OMAP-L137
OMAP-L138 Evaluation Module	TMDSEVML138	Development boards/EVMs	OMAP-L138
OMAP-L138 Experimenter Kit	TMDSEXPL138	Development boards/EVMs	OMAP-L138
Software development kits			
Linux SDK for OMAP-L137 processors	LINUXSDK-OMAPL137	Software Development Kit (SDK)	OMAP-L137
Linux SDK for OMAP-L138 processors	LINUXSDK-OMAPL138	Software Development Kit (SDK)	OMAP-L138
Windows® Embedded CE Software Development Kit (SDK) for ARM AM1x /OMAP-L1x	WINCESDK- AM1XOMAPL1X	Software Development Kit (SDK)	OMAP-L138
StarterWare for ARM9 and Cortex-A8-based processors	STARTERWARE-OMAPL138	Software Development Kit (SDK)	AM1x ARM9 and AM3x Cortex-A8
Other tools			
C6EZRUN Software Development Tool	C6RUN-DSPARMTOOL	Utilities/Plug-ins	All
C6EZACCEL Software Development Tool	C6ACCEL-DSPLIBS	Application software	All
SYS/BIOS™ Real-Time Operating System (RTOS)	SYSBIOS	Operating systems (OS/RTOS)	All
DSP/BIOS™ Real-Time Operating System	DSPBIOS	Operating systems (OS/RTOS)	All
PROFIBUS® on OMAP-L138 Application Processors	PROFIBUS	Other tools	OMAP-L138
PRU Software Development Package	SPRC940	Other tools	OMAP-L13x

Power for TI ARM® processors

Power management units (PMUs)/Power management ICs (PMICs) and discrete devices

Texas Instruments power management units (PMICs) integrate multiple DC/DC converters in one package, simplifying power design by reducing component count, while maintaining high power efficiency and performance. TI's PMU/PMIC solutions include those that integrate several

inductive step-down converters with linear regulators, charge pumps or other analog circuits, such as battery chargers, and an I²C interface to save space.

TPS65910 `NEW`
Highly flexible PMU integrating several DC/DC and LDO to power processors like OMAP™ and Sitara ARM MPUs and other popular processors. Available in 6-mm × 6-mm QFN package.
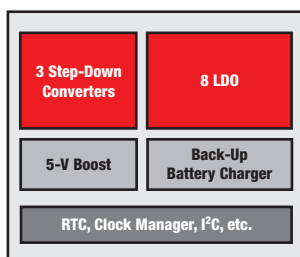
TPS6507x
General-purpose PMU integrating several DC/DC, LDO, battery charger, and WLED backlighting. Reference design available for different processors. Available in 6-mm × 6-mm QFN package.
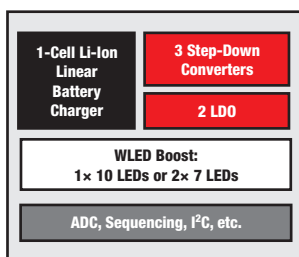
TPS65250/1 `NEW`
General-purpose PMU integrating 3× buck converters with integrated FETs (2A, 2A, 3A) and wide VIN from 4.5V to 18V. In case of power shut-down, the "Dying Gasp" function (x250 only) allows to save critical data before shutting down. Available in 6-mm × 6-mm QFN package.

3 Step-Down Converters	**8 LDO**	
5-V Boost	**Back-Up Battery Charger**	
RTC, Clock Manager, I²C, etc.		

TPS65910/1

1-Cell Li-Ion Linear Battery Charger	**3 Step-Down Converters**
	2 LDO
WLED Boost: 1× 10 LEDs or 2× 7 LEDs	
ADC, Sequencing, I²C, etc.	

TPS6507x

Step-Down Converter (3A)
Step-Down Converter (2A)
Step-Down Converter (2A)
"Dying Gasp" Circuitry
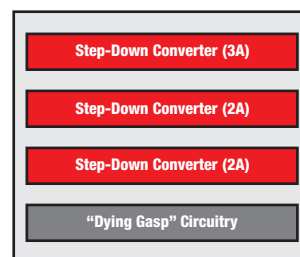
TPS65250/1

TI's Stellaris® is the industry's leading family of robust, real-time microcontrollers (MCUs) based on the revolutionary Cortex™-M technology from ARM. Depending on system constraints such as battery operation, cost sensitivity or need for highest efficiency, TI offers optimized products to power Stellaris MCU-based systems.

Simple Solution	Wide-Input Voltage Range	High Efficiency
TPS78233 150-mA LDO Fixed 3.3 Vout	**TPS63001** 800-mA Buck-Boost DC/DC Converter	**TPS62237** 500-mA DC/DC Converter Fixed 3.3 Vout
• Stable with 1-µF ceramic cap • Low Iq = 1 µA • Low dropout: 17.5 mV @ 85°C	• Input voltage range: 1.8 V–5.5 V • Up to 96% efficiency • Power-save mode for light-load currents	• 12-mm² solution size • High PSRR (up to 90dB) • Power-save mode for light-load currents
TPS78233	**TPS63001**	**TPS62237**

Power solutions			
Processor family	Part number	Without charger	With charger
DaVinci™	DM335, DM355, DM365, DM368	TPS65053	TPS65070
DaVinci	DM646x, DM644x, DM643x	TPS65023, TPS659105	–
Sitara™ Cortex-A8	AM17x, AM18x	TPS65910, TPS650061	TPS65070
Sitara Cortex-A8	AM3505/17	TMS65910, TPS65023	TPS650732
Sitara Cortex-A8	AM3703/15 800 MHz	TPS65930/2x/10, TPS65023	TPS65950, TPS650731
Sitara Cortex-A8	AM3703/15 1 GHz	TPS65951/x2181/x10, TPS65023	TPS65950A3, TPS650731
Sitara Cortex-A8	AM3892/4	TPS659112	–
OMAP-L1x	OMAP-L137/8	TPS65910, TPS65023	TPS65070
Stellaris	LM3Sxxxx	TPS78233, TPS62237, TPS61201, TPS65000x, TPS63001, TPS54231, LMZ10501	

The vast ARM® ecosystem is made up of companies that provide development tools, training and support, design tools and services, operating systems and production support. Because of the strength of the ARM architecture in the broader market, the ARM ecosystem is one of the strongest and most vibrant third-party infrastructures in the world.

In support of this, TI collaborates with some of the industry's leading third parties to extend resources and simplify ARM-based product development for customers. Whether creating a new microcontroller product or innovating on the microprocessor platform, there is an established company who has the right resources to accelerate development efforts and reduce your time to market.

Below is a list of third-party providers that TI works closest to support a range of ARM-based offerings. A complete partner listings and product offerings can be found at **ti.com/tidesignnetwork**.

TI Design Network

Product	Third Party	Description	Cortex™-A Sitara™ ARM MPU	ARM9™ OMAP-L1x	Cortex-A DaVinci™	Cortex-R Hercules™	Cortex-M Stellaris®
Complier/ Debugger	Code Red	Red Suite (GNU C/C++ compiler, code_probe/Eclipse debugger/IDE)					✔
	Sourcery™ CodeBench	Sourcery CodeBench (C/C++ compiler), GDB/Eclipse debugger/IDE	✔	✔	✔		✔
	IAR	IAR C/C++ compiler, C-SPY/Embedded workbench debugger/IDE	✔	✔	✔	✔	✔
	Keil	RealView C/C++ compiler, µVision debugger/IDE	✔	✔	✔	✔	✔
	Rowley	CrossWorks for ARM (C/C++ compiler, CrossStudio debugger/IDE)					✔
Development Tools	ARM RealView	Software development supporting all ARM processors and ARM CoreSight™ debug technology	✔	✔	✔	✔	
	Blackhawk	Leading provider of advanced emulation products	✔	✔	✔	✔	
	Lauterbach	Expertise in emulators for debugging, trace and logic analyzing	✔	✔	✔	✔	
	Spectrum Digital	Scan-path emulators, evaluation modules and application-specific hardware	✔	✔	✔	✔	
Modules and Reference Designs	Embest	Global provider of embedded hardware and software	✔	✔	✔		
	Logic	Full-service product development focusing on electrical, software and mechanical engineering	✔	✔	✔		
	Phytec	Full-solution provider with complete custom hardware design services, Windows® CE and Linux™ services, off-the-shelf system-on-modules (SOMs) and development kits, and in-house production facilities	✔	✔	✔		
	Z3 Technologies	Deliver OEM-ready hardware modules and application-specific software	✔	✔	✔		
RTOS and Technology Partners	Adaptive Digital	Deliver highly optimized algorithms as linkable object libraries with "C" callable functions	✔	✔	✔		
	Calsoft Labs	Port, customize and certify Flash player in addition to multimedia-specific software services	✔	✔	✔		
	CMX	CMX-RTX™ RTOS offering small footprint, fast context switch times					✔
	Express Logic	ThreadX advanced RTOS designed specifically for deeply embedded applications				✔	✔
	FreeRTOS.org	FreeRTOS.org open-source mini real-time kernel				✔	✔
	Green Hills	RTOS and software development tools for 32- and 64-bit embedded systems	✔	✔	✔		✔
	IAR	PowerPac fully featured RTOS combined with a high-performance file system					✔
	Intelligraphics	Provides professional device driver, firmware, and board support package development services	✔	✔	✔		
	Keil	RTX flexible royalty-free RTOS with source code					✔
	Mentor Graphics	Efficient RTOS with database management, USB, networking, multimedia and advanced graphical user interface capabilities	✔	✔	✔	✔	✔
	Micrium	Portable, scalable, preemptive real-time multitasking kernel (RTOS)				✔	✔
	Micro Digital	SMX no-royalty, modular, multitasking RTOS for embedded systems				✔	✔
	QNX	Component-based architectures of the QNX Neutrino RTOS and QNX Momentics development suite	✔	✔	✔		
	Quadros	RTXC for embedded applications					✔
	RoweBots	Unison ultra-tiny embedded Linux and POSIX-compatible RTOS					✔
	Sciopta	SCIOPTA real-time operating system for safety-critical applications				✔	✔
	Segger	embOS RTOS for embedded applications					✔
	Wind River	Provides device development portfolio including VxWorks operating system, WRLinux operating system and development	✔	✔	✔		
	Wittenstein	SAFERTOS RTOS kernel for certified and critical applications				✔	✔
Services	Adeneo	Provides design, system integration, support and training expertise on Windows Embedded CE and Linux embedded operating systems	✔	✔	✔		
	DSW	Designs, develops, markets and supports high-complexity embedded software products for commercial and consumer IP-based media applications					✔
	Mistral	Provides embedded hardware and software design services	✔	✔	✔		✔
	MPC Data	Expertise in Linux, Windows CE and RTOS porting and applications	✔	✔	✔		

Applications

Applications leveraging power of ARM® cores

TI is committed to delivering not only the right levels of performance, but the right levels of peripheral integration to meet the needs of a variety of markets. Using the ARM core as a foundation, device manufacturers have a common foundation on which to create their products while having the ability to scale, expanding their product portfolio.

TI ARM solutions: Meeting market needs

	DaVinci™ Digital Video Processors	OMAP-L1x Processors	Sitara™ ARM Microprocessors	Concerto™ Microcontrollers	Stellaris® ARM Cortex™-M-Based Microcontrollers	Hercules™ Safety Microcontrollers
ARM core	ARM9™, ARM Cortex-A8	ARM9	AM1x ARM9, AM3x Cortex-A8	ARM Cortex-M3	ARM Cortex-M3, M4F	ARM Cortex-R4, M3
Audio	✔	✔	✔	✔	✔	
Automotive	✔	✔		✔		✔
Communications	✔	✔	✔	✔	✔	✔
Imaging	✔	✔				
Industrial	✔	✔	✔	✔	✔	✔
Medical	✔	✔	✔	✔	✔	✔
Security	✔	✔	✔		✔	
Wireless	✔		✔	✔	✔	
Key feature	Completely tailored high performance	High performance and low power	Low power and high performance with extensive peripheral integration	Dual subsystem architecture for optimized real-time control and communications	Open architecture software, rich communication options	Safety

TI's software-compatible and scalable platforms from $1 to 1.5 GHz make application-specific peripherals, packages and temperature ranges possible. This also includes the complete signal chain of analog, power and mixed signal.

Point of sale

Electronic point-of-service (EPOS) terminals and devices, such as bar-code scanners, portable data terminals and point-of-sale terminals are rapidly changing the way both financial and non-financial electronic transactions are conducted. Providing continuity and consistency across a range of products will not only enable rapid product development but also future-proof the extension of product lines. This is particularly critical as new technological capabilities emerge and require integration into point-of-service product platforms. Sharing the same basic architectures from 32-bit microntrollers and microprocessors to digital signal processors (DSPs) through integrated microprocessor + DSP multi-core devices and ancillary processing devices such as video processors gives the manufacturer the flexibility needed to develop differentiated product offerings across many applications.

Customer requirements

- Security: Pre-evaluated for PCI security certification
- Portability: Allows transactions to move closer to the consumer whenever possible
- Wireless connectivity: Maximizes the portability of the terminal; validates financial transactions immediately
- Peripheral capabilities: Supports features including barcode readers, various types of touch screens, magnetic stripe readers, short-range wireless NFC connectivity, sensors, cameras, video processing and printers
- Operating system: Supports multiple operating systems (OS) such as Linux™, Android™, Windows® Compact Embedded or Windows Mobile as well as a host of RTOS

TI solutions

- **Stellaris® ARM® Cortex-M3 and M4F MCUs:** Supports base-level designs with ability to manage a pin pad, magnetic stripe reader while providing a secure communications link
- **Sitara™ ARM microprocessor:** Designed to support a high-resolution large screen, advanced operating system and touch-screen capabilities
- **DaVinci™ digital video processor:** Supports higher-resolution screen and real-time streaming video for advertising

End equipments

- Bar-code scanners
- Portable data terminals
- Card readers

Industrial and home automation

The design environment for industrial automation is evolving with ARM®-based solutions becoming critical to market success. In addition to its proven, reliable architecture, there is a robust ARM software development ecosystem to support the migration to 32-bit ARM architectures. TI offers designers a wide range of differentiated products including embedded processors in the Stellaris® MCUs, based on the ARM Cortex™-M3 and M4F cores, the C2000™ Concerto™ MCUs, Hercules™ Safety MCUs based on the Cortex-R cores and the Sitara™ ARM microprocessors (MPUs), based on the ARM9™ and Cortex-A8 cores, to meet the needs of this market. Each of these products feature capabilities making them strong contenders for integration into embedded processors targeted at the industrial automation.

TI has invested to deliver software-compatible devices along with industrial hardware development tools, software and analog complements to provide a total industrial system solution. One of the first examples of leveraging solutions from across TI's ARM portfolio is the AM3359 Industrial Development Kit (IDK). Designed with the industrial automation market in mind, the IDK is an extensive development platform enabling customers to evaluate all popular industrial communications and motor control applications. IDK has many different evaluation features such as 512 MB of DDR2 memory, dual motor drivers, digital I/O, a C2000™ Piccolo™ MCU with integrated analog-to-digital converters, a Stellaris ARM Cortex-M3 MCU, USB, Ethernet, SPI, I^{2}C and much more.

Customer requirements
- Higher performance: Robustness and accuracy; Industrial grade products
- Lower power: Enables fan-less designs
- Advanced packaging: Drives to smaller size; Tough enclosures for shock protection

TI solutions
- **Stellaris ARM Cortex-M3 and M4F MCUs:** Provides hardware support for deterministic behavior.
- **Sitara ARM microprocessor:** Leverage programmable real-time unit (PRU) and the universal parallel port (uPP) to execute a variety of control, monitoring or other functions not available on chip. Supports multiple, on-chip, production-ready industrial Ethernet and Fieldbus communication protocols with master and slave functionality.
- **OMAP-L1x processor:** Integrated, single-chip processors optimized for recognizing objects, tracking motion and mapping positions.
- **Concerto C28x™ MCU+ARM:** Leverage Concerto's dual subsystem architecture to simplify designs by separating communications/monitoring and real-time control or power line communication functions.
- **Hercules Safety MCU:** Developed to the IEC 61508 SIL-3 safety standard, Hercules MCUs provide a high level of performance for safety critical industrial control.
- **DaVinci™ digital video processors:** Leverage imaging/vision capabilities to execute functions based on the capture and processing of images.

End equipments
- Industrial automation
- Industrial control
- Remote monitoring
- Machine vision
- PLC
- Drives and I/O-level devices

Human machine interface (HMI)

As devices become more intuitive, human machine interfaces are becoming more prominent across markets. An HMI allows an operator to interact with a machine in a graphical, visual way. Basic user interfaces characterized by touch-screen-actuated buttons, slide bars and basic graphics can be handled by an MCU, such as one based on ARM's Cortex™-M core. Beyond that, a high-level operating system is required and the processor type shifts from an MCU to an MPU.

Customer requirements
- Robustness and reliability
- Graphics capability: Support for 2D and 3D graphics
- Connectivity: Ethernet, CAN, USB, UART, SPI, MMS/SD
- Low power, packaging and board space
- Over-temperature performance

TI solutions
- **Stellaris ARM Cortex-M3 and M4F MCUs:** Advanced communications and connectivity capabilities and production-ready graphics library in StellarisWare®
- **Sitara ARM microprocessor:** Powerful process for quick response time and high-quality graphics support

End equipments
- Operator panels
- Single-board computers
- Supervisory control and data acquisition panels (SCADA)
- Remote terminal units
- White goods
- Networked printers

Product selection table

TI's ARM-based devices*

TI processor	CPU	MHz	Operating system	Key peripherals
AM1705/7	AM1x ARM9™	450	Linux™, Windows® CE, RTOS	I^2C, SPI, UART, USB, MMC/SDIO, Ethernet MAC (EMAC)
AM1802	AM1x ARM9	300	Linux, Windows CE, RTOS	I^2C, SPI, UART, USB, MMC/SDIO, EMAC
AM1806	AM1x ARM9	375/456	Linux, Windows CE, RTOS	I^2C, SPI, UART, USB, MMC/SDIO
AM1808	AM1x ARM9	375/456	Linux, Windows CE, RTOS	I^2C, SPI, UART, USB, MMC/SDIO, EMAC, SATA
AM1810	AM1x ARM9	375/456	Linux, Windows CE, RTOS	I^2C, SPI, UART, USB, MMC/SDIO, EMAC, SATA, PROFIBUS®
AM3352	AM3x Cortex™-A8	500/600/720	Linux, Windows CE, RTOS, Android	Crypto, Gigabit EMAC, CAN, LPDDR1/DDR2/DDR3, ADC
AM3354	AM3x Cortex-A8	500/600/720	Linux, Windows CE, RTOS, Android	Graphics, Crypto, Gigabit EMAC, CAN, LPDDR1/DDR2/DDR3, ADC
AM3356	AM3x Cortex-A8	275/500/600/720	Linux, Windows CE, RTOS, Android	PRU, Crypto, CAN, LPDDR1/DDR2/DDR3, ADC, master & slave support, Gigabit EMAC
AM3357	AM3x Cortex-A8	275/600/720	Linux, Windows CE, RTOS, Android	PRU, Crypto, CAN, LPDDR1/DDR2/DDR3, ADC, master & slave support (PROFIBUS and others), EtherCAT® slave, Gigabit EMAC
AM3358	AM3x Cortex-A8	500/600/720	Linux, Windows CE, RTOS, Android	Graphics, PRU, Crypto, CAN, LPDDR1/DDR2/DDR3, ADC, Gigabit EMAC
AM3359	AM3x Cortex-A8	600/720	Linux, Windows CE, RTOS, Android	Graphics, PRU, Crypto, CAN, LPDDR1/DDR2/DDR3, ADC, master & slave support (PROFIBUS and others), EtherCAT slave, Gigabit EMAC
AM3505/17	AM3x Cortex-A8	600	Linux, Windows CE, RTOS, Android	I^2C, SPI, UART, USB, MMC/SDIO, EMAC, CAN
AM3703/15	AM3x Cortex-A8	800/1000	Linux, Windows CE, RTOS, Android	I^2C, SPI, UART, USB, MMC/SDIO
AM3871/2/4	AM3x Cortex-A8	800/1000	Linux, Windows CE, RTOS, Android	PCIe, SATA, CAN, Gigabit EMAC, UART, USB
AM3892/4	AM3x Cortex-A8	1200/1500	Linux, Windows CE, RTOS	PCIe, SATA, Gigabit EMAC, UART, USB
OMAP-L137	ARM9 + C674x DSP	450	Linux, Windows CE, RTOS	SDRAM/NAND, MMC/SDIO, EMAC, UART, USB 2.0 HS OTG, USB 1.1
OMAP-L138	ARM9 + C674x DSP	375/456	Linux, Windows CE, RTOS	mDDR/DDR2, SDRAM/NAND, MMC/SDIO, SATA, uPP, EMAC, USB 2.0 HS OTG, USB 1.1
OMAP-L132	ARM9 + C674x DSP	200	Linux, Windows CE, RTOS	mDDR/DDR2, SDRAM/NAND, MMC/SDIO, EMAC, USB 2.0 HS OTG
TMS320DM355	ARM9 + video	135/216/270	Linux	mDDR/DDR2, USB 2.0 H/OTG
TMS320DM335	ARM9	135/216	Linux	mDDR/DDR2, USB 2.0 H/OTG
TMS320DM365	ARM9 + video	216/270/300	Linux	EMAC, mDDR/DDR2, HPI, voice codec, USB 2.0 H/OTG
TMS320DM368	ARM9	432	Linux	EMAC, mDDR/DDR2, HPI, voice codec, USB 2.0 H/OTG
DM3730	Cortex-A8 + C64x DSP	660/800	Linux, Windows CE, RTOS, Android	I^2C, SPI, UART, USB, MMC/SDIO, SDMA, graphics accelerator
DM3725	Cortex-A8 + C64x DSP	660/800	Linux, Windows CE, RTOS, Android	I^2C, SPI, UART, USB, MMC/SDIO, SDMA, graphics accelerator
TMS320DM6467	ARM9 + C64x DSP	594/729, 297/365	Linux, Windows CE	EMAC, DDR2, USB 2.0, HPI, PCI, ATA
TMS320DM6446	ARM9 + C64x DSP	300/600	Linux, Windows CE	EMAC, DDR2, USB 2.0, HPI, ATA, Flash card I/F
TMS320DM6443	ARM9 + C64x DSP	300/600	Linux, Windows CE	EMAC, DDR2, USB 2.0, HPI, ATA, Flash card I/F
TMS320DM6441	ARM9 + C64x DSP	256/512	Linux, Windows CE	EMAC, DDR2, USB 2.0, HPI, ATA, Flash card I/F
TMS320DM8168	Cortex-A8 + C674x DSP	1000/1000	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB, SGX530 graphics
TMS320DM8167	Cortex-A8 + C674x DSP	1000/1000	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB
TMS320DM8166	Cortex-A8 + C674x DSP	667/720	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB, SGX530 graphics
TMS320DM8165	Cortex-A8 + C674x DSP	667/720	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB
TMS320DM8148	Cortex-A8 + C674x DSP	1000/750	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB, SGX530 graphics
TMS320DM8147	Cortex-A8 + C674x DSP	1000/750	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB
TMS320DM8146	Cortex-A8	720	Linux, Windows CE, RTOS	DDR2, DDR3, HDMI, PCIe, SATA, Gigabit EMAC, UART, USB, SGX530 graphics
TMS570LS20x/10x	ARM Cortex-R4F in Lockstep	160	AUTOSAR, various embedded RTOS	FlexRay™, CAN, buffered ADC, buffered SPI, SCI/LIN/UART, PWM/timer coprocessor, self test and ECC for safety-critical applications
TMS570LS31x/21x	ARM Cortex-R4F in Lockstep	180	AUTOSAR, various embedded RTOS	FlexRay, ENET, CAN, buffered ADC, buffered SPI, SCI/LIN/UART, PWM/timer coprocessor, self test and ECC for safety-critical applications
RM48x	ARM Cortex-R4F in Lockstep	220	Various embedded RTOS	USB, ENET, CAN, buffered ADC, buffered SPI, SCI/UART, PWM/timer coprocessor, self test and ECC for safety-critical applications
TMS470Mx	ARM Cortex-M3	80	Various embedded RTOS	CAN, buffered ADC, buffered SPI, SCI/LIN/UART, PWM/timer coprocessor, self test and ECC for safety-critical applications
Concerto F28M35Hx	ARM Cortex-M3 + C28x w/ FPU	100/100 or 75/150	Various embedded RTOS	EMAC, USB MAC+PHY, I^2C, UART/SCI, SSI/SPI, up to 1MB Flash and 136KB RAM, floating-pt. C28x core, dual 12-bit ADC, enh. PWM for dig. pwr, motor ctrl
Concerto F28M35Mx	ARM Cortex-M3 + C28x w/ FPU	75/75	Various embedded RTOS	EMAC, USB MAC+PHY, I^2C, UART/SCI, SSI/SPI, up to 1MB Flash and 136KB RAM, floating-point C28x core, dual 12-bit ADC, enh. PWM for digital power, motor ctrl
Concerto F28M35Ex	ARM Cortex-M3 + C28x w/ FPU	60/60	Various embedded RTOS	EMAC, USB MAC+PHY, I^2C, UART/SCI, SSI/SPI, up to 1MB Flash and 136KB RAM, floating-point C28x core, dual 12-bit ADC, enh. PWM for digital power, motor ctrl
Stellaris® LM3Sx00s	ARM Cortex-M3	20 – 50	Various embedded RTOS	(MCU) ADC, SSI/SPI, UART, I^2C, motion control
Stellaris LM3S1000s	ARM Cortex-M3	25 – 80	Various embedded RTOS	(MCU) ADC, SSI/SPI, UART, I^2C, motion control, Hibernate
Stellaris LM3S2000s	ARM Cortex-M3	25 – 80	Various embedded RTOS	(MCU) CAN, ADC, SSI/SPI, UART, I^2C, motion control, Hibernate
Stellaris LM3S3000s	ARM Cortex-M3	50	Various embedded RTOS	(MCU) USB 2.0 FS D/H/OTG, ADC, SSI/SPI, UART, I^2C, motion control, Hibernate, StellarisWare® in ROM
Stellaris LM3S5000s	ARM Cortex-M3	50 – 80	Various embedded RTOS	(MCU) USB 2.0 FS D/H/OTG, CAN, ADC, SSI/SPI, UART, I^2C, motion control, Hibernate, StellarisWare in ROM
Stellaris LM3S6000s	ARM Cortex-M3	25 – 50	Various embedded RTOS	(MCU) 10/100 EMAC+PHY, ADC, SSI/SPI, UART, I^2C, motion control, Hibernate
Stellaris LM3S8000s	ARM Cortex-M3	50	Various embedded RTOS	(MCU) 10/100 EMAC+PHY, CAN, ADC, SSI/SPI, UART, I^2C, motion control, Hibernate
Stellaris LM3S9000s	ARM Cortex-M3	80	Various embedded RTOS	(MCU) 10/100 EMAC+PHY, USB 2.0 FS D/H/OTG, CAN, ADC, SSI/SPI, UART, I^2C, motion control, Hibernate, StellarisWare in ROM
Stellaris LM4F110	ARM Cortex-M4F	80	Various embedded RTOS	(MCU) UARTs, I^2C, SSI/SPI, CAN, 32–256 KB Flash, 12–32 KB SRAM, EEPROM
Stellaris LM4F120	ARM Cortex-M4F	80	Various embedded RTOS	(MCU) USB device; UARTs, I^2C, SSI/SPI, CAN; 32–256 KB Flash, 12–32 KB SRAM, EEPROM
Stellaris LM4F130	ARM Cortex-M4F	80	Various embedded RTOS	(MCU) USB D/H/OTG; UARTs, I^2C, SSI/SPI, CAN; 64–256 KB Flash, 24–32 KB SRAM, EEPROM
Stellaris LM4F230	ARM Cortex-M4F	80	Various embedded RTOS	(MCU) advanced motion control block USB; USB D/H/OTG, UARTs, I^2C, SSI/SPI, CAN; 128–256 KB Flash, 32 KB SRAM, EEPROM

Additional devices available at www.ti.com/arm

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Discrete power solutions

Device	V_{IN} (V)	I_{OUT} (mA)	Description	Package
TPS78233	2.2 – 5.5	150	1-µA quiescent current LDO	SOT23-5
TPS23753	36 – 60	1000	PoE interface with integrated isolated converter	TSSOP-14
TPS62237	2.05 – 6.0	500	Up to 94% efficiency, 3-MHz buck converter	1×1.5×0.6 SON-6
TPS61201	0.3 – 5.5	600	0.3-V input, 3.3-V output boost converter	3×3 SON-10
TPS65000x	2.3 – 6.0	600 / 200 / 200	Triple output PMU, 2.25-MHz converter with dual LDOs	3×3 QFN
TPS62150 / 140	3.0 – 17	1000	Up to 95% efficiency, 3-MHz step-down converter	3×3 16-QFN
TPS63001	1.8 – 5.5	1500	Up to 95% efficiency, buck boost converter	3×3 SON-10
TPS54231	3.5 – 28	2000	Extended temperature range step-down converter with ECO-mode™	SOIC-8

PMU power solutions

Device	V_{IN} (V)	No. of outputs	Charger	Audio codec	USB 2.0 OTG PHY	WLED boost	DCDC setp-down converter	DCDC setp-down controller	LDO	I²C	Description	Package	Automotive	Price*
TPS6500x	1.8 to 6.0	3	—	—	—	—	1	—	2	—	General purpose. TPS65001 with supervisor	QFN-16		1.40
TPS65250/1	4.5 to 18	3	—	—	—	—	3	—	—	—	Flexible PMU with 3 buck and wide V_{IN} range	QFN-40		3.05
TPS65053/8	2.5 to 6.0	5	—	—	—	—	2	—	3	—	Low-cost 5-channel PMU	QFN-24		1.85
TPS65070/2/3	2.8 to 6.3	5	Linear	—	—	yes	3		2	I²C	AM3x Cortex™-A8 PMU with charger and touch screen	QFN-48		3.60
TPS65023x	2.5 to 6.0	6	—	—	—	—	3	—	3	I²C	Flexible 6× channel PMU. Also WCSP package	QFN-40	yes	3.30
TPS650240/1/2/3/4/5	2.5 to 6.0	6	—	—	—	—	3	—	3	Logic H/L	PMU with logic high-/low-voltage scaling	QFN-32	yes	2.95
TPS650250	2.5 to 6.0	6	—	—	—	—	3	—	3	—	Flexible PMU with all V_{OUT} externally adjustable	QFN-32	yes	2.95
TPS65050/1/2/4/6	2.5 to 6.0	6	—	—	—	—	2	—	4	Logic H/L	Low-cost 6-channel PMU	QFN-32		1.85
TPS65921	2.7 to 4.5	7	—	—	yes	—	3	—	4	2× I²C	Optimized for OMAP35x processors	BGA-139		3.60
TPS65930	2.7 to 4.5	7	—	yes	yes	—	3	—	4	2× I²C	Optimized for OMAP35x processors	BGA-139		3.95
TPS65951	2.7 to 4.5	12	—	yes	yes	—	3	—	9	2× I²C	Optimized for OMAP35x processors, 0.8-mm pitch	BGA-169		4.50
TPS65910	2.7 to 5.5	13	—	—	—	—	3	—	9	2× I²C	AM3x Cortex-A8 PMU, with 5V boost.	QFN-48		3.45
TPS659105	2.7 to 5.5	13	—	—	—	—	3	—	9	2× I²C	DM64x PMU, with 5V boost.	QFN-48		3.45
TPS65950	2.7 to 4.5	13	Linear	yes	yes	—	3	—	10	2× I²C	Optimized for OMAP35x processors	BGA-209		4.50

*Suggested resale price in U.S. dollars in quantities of 1,000.
New devices are listed in **bold red**.
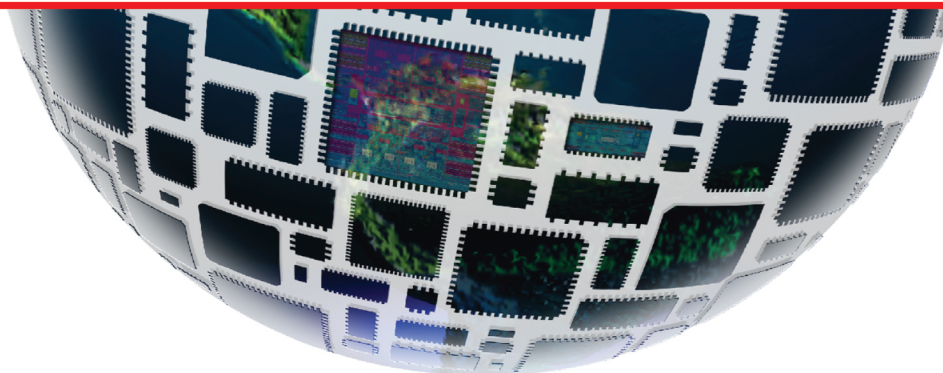
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Korea	080-551-2804
Malaysia	1-800-80-3973
New Zealand	0800-446-934
Philippines	1-800-765-7404
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