Stellaris® ARM® Cortex™-M Microcontrollers

Texas Instruments

ARM Cortex-M MCUs delivering **connectivity**, high-performance **analog** integration, and **ease of use**.

Getting Started with Stellaris® Microcontrollers

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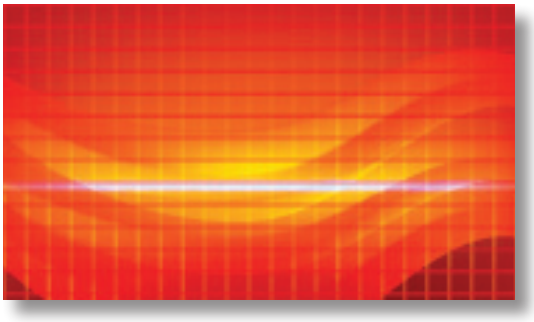
Stellaris MCU Advantage

The Stellaris ARM® Cortex™-M4F microcontrollers (MCUs), called the Stellaris LM4F series, deliver leading analog integration, floating-point performance, and best-in-class power consumption. The LM4F MCUs are the first Cortex-M MCUs to be manufactured in a 65-nanometer process technology, so you can easily find the right balance between high-performance precision and low-power consumption at an affordable price. With various RoHS-compliant package options, 64-LQPF, 100-LQFP, 144-LQFP, and the 157-BGA, you have a selection that allows you choose the right number of I/Os and size for your application.

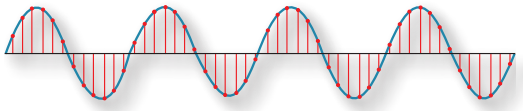
The Stellaris ARM Cortex-M4F MCUs feature advanced motion-control capability with two integrated Quadrature Encoder Inputs (QEI), 16 motion-control Pulse Width Modulators (PWM) modules, and two high-speed 12-bit ADC modules. In keeping with TI's philosophy of making motor control more accessible and easier to use, the Stellaris devices can be paired with TI's popular InstaSPIN™-BLDC software to effortlessly spin motors. The Stellaris ARM Cortex-M4F MCUs also feature a comprehensive set of connectivity peripherals with up to 8 UARTs, 4 SSI/SPI, USB OTG, 2 CAN, and 6 I^2C. The large number of serial interfaces and highly flexible pin muxing gives you a microcontroller that is connected and scalable for a broad range of motor control applications.

TI recognizes that software drives your time to market so all of the LM4F MCUs are supported by free license, royalty-free StellarisWare® software. StellarisWare is a suite of Stellaris-specific and third-party APIs that were designed to minimize the cost of software ownership and reduce time to market. One of the components of StellarisWare is the Stellaris Graphics Library which is a set of graphics primitives and widgets used to create graphical user interfaces on Stellaris microcontroller-based boards that have a graphical display. One of the new features is the support for over 130 different predefined fonts and includes support for both Western European, Cyrillic and Asian character sets. Most of the driver and bootloader APIs are integrated into ROM, with all the StellarisWare software provided in standard C so you can seamlessly develop applications in your tool of choice.



Connectivity

The Stellaris ARM Cortex-M4F microcontrollers feature an extensive set of serial connectivity to allow your embedded system to communicate to a large range of external devices. Each serial peripheral has its own transmit/receive buffers that can be paired with the Direct Memory Access (DMA) engine to maximize connectivity without sacrificing performance.



Integrated Analog

A primary focus in designing the Stellaris ARM Cortex-M4F microcontrollers is the high-quality, high-resolution analog-to-digital converters (ADCs). The two integrated 12-bit ADCs can sample as fast as 1 MSPS each, with the ability to interleave the samples to obtain an effective sample rate of 2 MSPS.

Motor Control

The Stellaris ARM Cortex-M4F microcontrollers feature deterministic performance and IP especially designed for simultaneous advanced motion control and real-time connectivity. The LM4F series supports up to 40 simultaneous Pulse Width Modulator (PWM) outputs that are designed to work in conjunction with the two integrated quadrature encoder inputs (QEI) and the IEEE Standard for Floating-Point Arithmetic (IEEE 754).

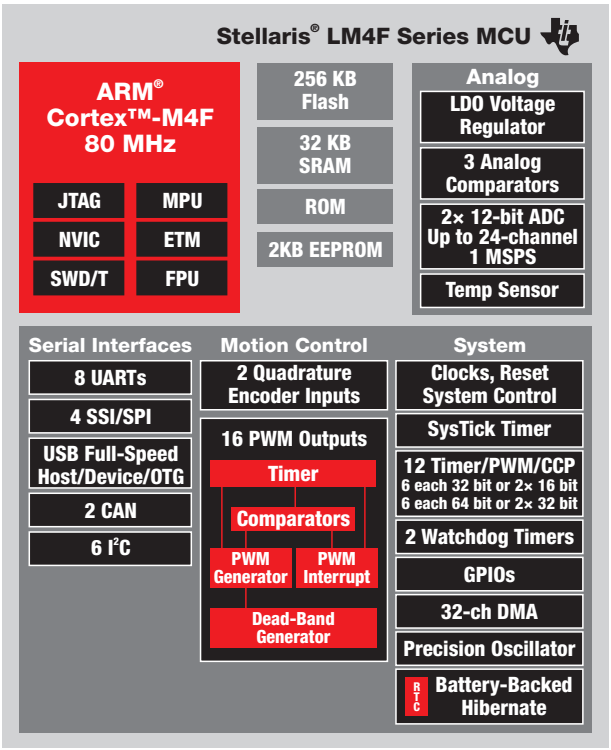
Tools and Software

StellarisWare software is an extensive software suite designed to simplify and speed development of Stellaris-based microcontroller applications. StellarisWare software operates with all LM3S and LM4F series Stellaris MCUs and is ready to work on a variety of development tools including TI's Code Composer Studio™ IDE, Keil™ RealView® MDK-ARM, IAR Systems Embedded Workbench®, Sourcery CodeBench™, and generic GNU.

Stellaris® ARM® Cortex-M4F MCUs

Features

- All LM4F variants include the ARM Cortex-M4F core with single-precision floating point at 80 MHz
- Up to 256 KB single-cycle Flash memory and 32 KB single-cycle SRAM
- Up to two 12-bit ADC modules and 24 channels of inputs
- Up to two CAN 2.0 A/B controllers
- Optional full-speed USB 2.0 OTG/Host/Device
- Advanced motion control capability, with up to 16 PWM outputs and two quadrature encoder inputs
- Generous serial communication, with up to
  - 8 UARTs
  - 6 I^2C modules
  - 4 SPI/SSI modules
- Low power modes including power-saving Hibernate mode
- 64-LQFP, 100-LQFP, and 144-LQFP packages



Benefits

- 12-bit ADC accuracy is achievable at the full 1 MSPS rating without any hardware averaging, eliminating performance tradeoffs
- ARM Cortex-M4F with floating point accelerates math-intensive operations and simplifies digital signal processing implementations
- First ARM Cortex-M MCU in advanced 65-nm process technology provides the right balance between higher performance and low power consumption
- Range of pin-compatible memory and package configurations enables optimal selection of devices
- Extensive on-chip peripherals enable a variety of applications, including 1-D scanners, microprinters, digital power, motion control, home appliances, LED signage/control, portable fitness, and industrial automation

Stellaris ARM Cortex-M4F MCUs scale to higher performance and lower power for a variety of applications

Stellaris LM4F MCUs offer a broad range of applications, such as industrial automation, motion control, health and fitness, and more. Learn more about the applications and end equipment below and the corresponding LM4F series MCU.

Applications/End equipment	Benefits of using Stellaris Cortex-M4F	Part numbers
 Scanners	Variety of light sensors can be interfaced to the high-accuracy 12-bit ADC; 80-MHz performance and floating-point support guarantee quick analysis of sensor data; USB and serial support for connection to host computers; *Bluetooth*® serial profile support for wireless connectivity	LM4F120 series LM4F130 series
 Microprinters • Portable printer/scanners • Thermal microprinters)	Simplify motor control implementation using the Stellaris motion-control block; low-power performance supports mobile micro printers; USB and serial support for connection to host computers; *Bluetooth* serial profile support for wireless connectivity	LM4F230 series
 Home appliances/Home automation • AC units • Air purifiers • Humidifiers • Coffee makers • HMI for white goods • Wired and wireless connectivity modules	Starting at $1.65 (at 1KU), Stellaris LM4F devices deliver connectivity at a price point for consumer applications; simplify motor control implementation using the Stellaris motion control block; USB and wireless connectivity support connected appliances	LM4F110 series LM4F120 series LM4F130 series LM4F230 series
 Uninterruptible power supplies	High-speed, high-accuracy 12-bit ADC modules can accurately identify power problems; performance to support by standby and line-interactive UPS systems	LM4F230 series
 AC inverter drives • Ventilation systems • Pumps • Elevators • Conveyor and machine tool drives	Simplify the PWM programming needed to drive the inverter switch array using timers or motion control; high-speed 12-bit ADCs enable sensorless drive implementations; StellarisWare® Graphics Library delivers the fastest time to market for a design requiring operator interface	LM4F230 series
 Building automation • Elevator controllers • Building security zones nodes • Wired and wireless connectivity modules	Starting at $1.65 (at 1KU), Stellaris LM4F devices deliver connectivity at a price point for building applications; StellarisWare® in ROM simplifies development of connected applications; USB and wireless connectivity support connected appliances	LM4F110 series LM4F120 series LM4F130 series

Stellaris® ARM® Cortex™-M4F MCU Product Selection

LM4F Microcontrollers†

	Memory				Core			Timers								Serial Interfaces						Analog											
												Motion Control										ADC											
Part Number	Flash (KB)	SRAM (KB)	EEPROM (Bytes)	DMA	Max Speed (MHz)	Internal Precision Oscillator	MPU	SysTick (24-Bit)	General-Purpose (Total)	Real-Time Clock (RTC)	Watchdog	PWM Units	PWM Fault	CCP (Total)	QEI Channels	CAN MAC	USB D, H, or O	UART	I²C	SSI/SPI	I²S	Units	Resolution (bits)	Channels	Speed (samples/sec)	External Voltage Reference	Internal Temp Sensor	Analog/Digital Comparators	GPIO Pins	Battery-Backed Hibernation	LDO Voltage Regulator	Operating Temperature	Pin/Package
LM4F110B2QR	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F110C4QR	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F110E5QR	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F110H5QR	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F111B2QR	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	I	64LQFP
LM4F111C4QR	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	I	64LQFP
LM4F111E5QR	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	I	64LQFP
LM4F111H5QR	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	I	64LQFP
LM4F112C4QC	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
LM4F112E5QC	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
LM4F112H5QC	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
LM4F112H5QD	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	I	144LQFP
LM4F120B2QR	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F120C4QR	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F120E5QR	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
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LM4F122C4QC	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
LM4F122E5QC	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
LM4F122H5QC	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
LM4F122H5QD	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	I	144LQFP
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LM4F130E5QR	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
LM4F130H5QR	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	I	64LQFP
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LM4F132H5QC	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
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LM4F231E5QR	128	32	2K	✔	80	✔	✔	✔	12	✔	2	2	6	24	2	2	0	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	I	64LQFP
LM4F231H5QR	256	32	2K	✔	80	✔	✔	✔	12	✔	2	2	6	24	2	2	0	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	I	64LQFP
LM4F232E5QC	128	32	2K	✔	80	✔	✔	✔	12	✔	2	2	8	24	2	2	0	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	I	100LQFP
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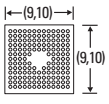
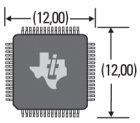
LM4F232H5QD	256	32	2K	✔	80	✔	✔	✔	12	✔	2	2	8	24	2	2	0	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	I	144LQFP

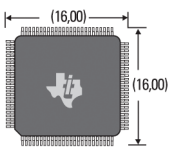
†All devices are sampling



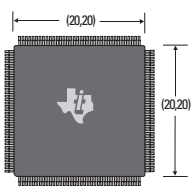
157-ball BGA



64-pin LQFP



100-pin LQFP



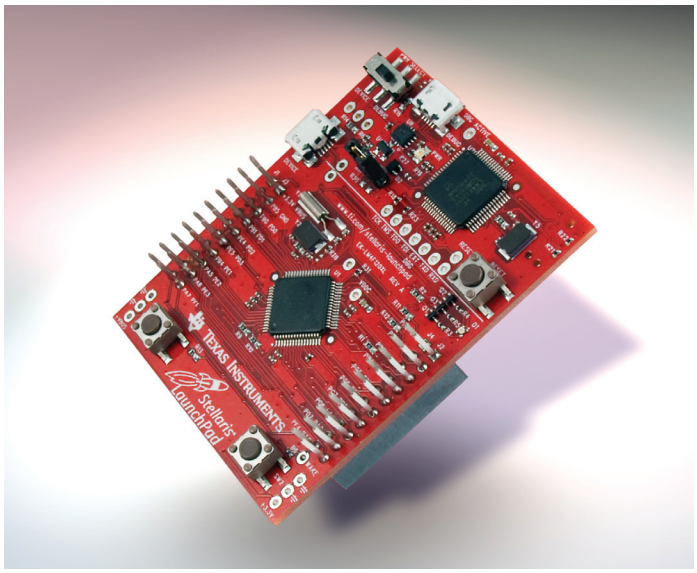
144-pin LQFP

Select package options

Stellaris® ARM® Cortex™-M4F Kits

Stellaris LM4F120 LaunchPad Evaluation Kit

The Stellaris LM4F120 LaunchPad Evaluation Kit (EK-LM4F120XL) is a low-cost evaluation platform for ARM® Cortex™-M4F-based microcontrollers. The Stellaris LaunchPad's design highlights the LM4F120H5QR microcontroller's USB 2.0 Device interface, Hibernation module, and overall cost effectiveness. The Stellaris LaunchPad also features programmable user buttons and an RGB LED for custom applications. The stackable headers of the Stellaris LM4F120 LaunchPad BoosterPack XL interface demonstrate how easy it is to expand the functionality of the Stellaris LaunchPad when interfacing to other peripherals with Stellaris BoosterPacks and MSP430™ MCU BoosterPacks.



EK-LM4F120XL

Features

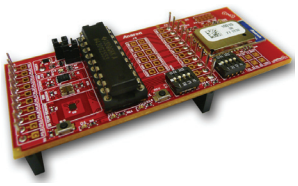
- Stellaris LM4F120H5QR microcontroller
- USB Micro-B connector for device
- RGB user LED
- Two user switches (application/wake)
- Available I/O brought out to headers on a 0.1" grid
- On-board Stellaris In-Circuit Debug Interface (ICDI)
- Switch-selectable power sources
  - ICDI
  - USB device
- Reset switch
- Preloaded RGB quickstart application
- Supported by StellarisWare® software including the USB library and the peripheral driver library
- Stellaris LM4F120 LaunchPad BoosterPack XL interface which features stackable headers to expand the capabilities of the 40-pin Stellaris LaunchPad evaluation platform

Ordering information

Part number	Description
EK-LM4F120XL	Stellaris LM4F120 LaunchPad Evaluation Kit

Plug-in BoosterPacks for Stellaris LaunchPad

The Stellaris LaunchPad has a 40-pin XL interface that supports various plug-in modules called BoosterPacks (sold separately). BoosterPacks are designed and built by TI, third-party companies, and the LaunchPad community, and allow you to expand the available peripherals and potential applications of the Stellaris LaunchPad. Here are several of the Stellaris BoosterPacks that are available today. For more information, go to our Stellaris LaunchPad web page (www.ti.com/stellaris-launchpad) or the TI MCU BoosterPack page (www.ti.com/boosterpack).



RF BoosterPack
(A2530E24A-LPZ)

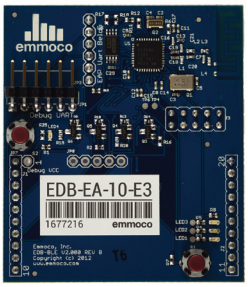
Anaren A2530 Radio Module with Z-Stack ZNP for ZigBee® protocol

LCD BoosterPack
(EB-LM4F120-L35)

Kentec 3.5" QVGA TFT graphic LCD module with resistive touch screen

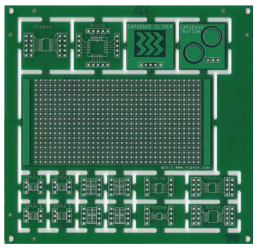
2.7" OLED Display BoosterPack
(EB-LM4F120-OEL)

By Kentech



Bluetooth® BoosterPack
(EDB-BLE)

Emmoco's easy-to-use *Bluetooth* Smart Board enables mobile control of embedded systems via iPhone, iPad, and Android™



Perf Board BoosterPack
(PCBPOP1)

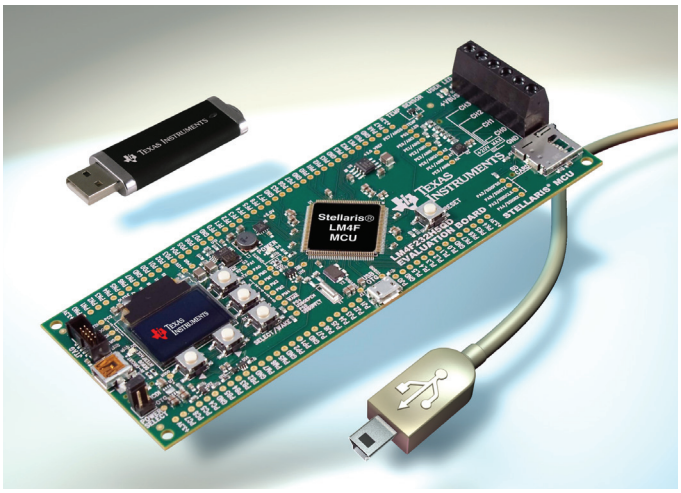
EMI 2×4" perfboard with PCB, 2×10 headers and components needed to complete kit and prototypes

www.ti.com/boosterpack

Stellaris® ARM® Cortex™-M4F Kits

LM4F Evaluation Kit

The Stellaris LM4F232 USB+CAN Evaluation Kit is a compact and versatile evaluation platform for the Stellaris LM4F232 ARM Cortex-M4F-based microcontroller. The evaluation kit design highlights the LM4F232 microcontroller's integrated USB 2.0 On-the-Go/Host/Device interface, CAN, analog, and low-power capabilities.



EK-LM4F232

Features

- Uses Stellaris LM4F232H5QD with 256 KB internal Flash memory and 144-pin LQFP with excellent prototyping capability
- 96×64 color OLED display provides useful output and interface options
- USB Micro-AB for prototyping USB application
- microSD card slot for data storage
- 5-mm screw terminals for attaching external sensors and other analog inputs
- Precision 3.0-V reference for accurate analog-to-digital conversion
- Temperature sensor for temperature monitoring
- 3-axis accelerometer for position sensing
- All I/O brought out to headers for easy prototyping
- Five user/navigation buttons (including select/wake) for user input
- One-user LED
- 10-pin JTAG header providing standard debug interface

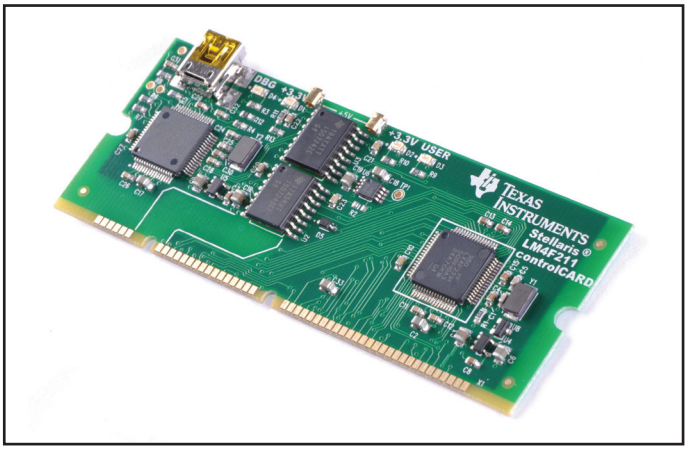
Ordering information

Part number	Description
EKK-LM4F232	Stellaris LM4F232 Evaluation Kit for Keil™ RealView® MDK-ARM (32 KB code-size limited)
EKI-LM4F232	Stellaris LM4F232 Evaluation Kit for IAR Systems Embedded Workbench® (32 KB code-size limited)
EKC-LM4F232	Stellaris LM4F232 Evaluation Kit for Sourcery CodeBench™ (30-day limited)
EKS-LM4F232	Stellaris LM4F232 Evaluation Kit for Code Composer Studio™ IDE (board-locked)

LM4F controlCARD

The MDL-LM4F211CNCD is a motor controlCARD module designed to operate with TI's DRV83xx baseboards. It can be purchased with a DRV8312 baseboard as part of the DK-LM4F-DRV8312 development kit to spin 3-phase brushless DC (BLDC) motors using TI's InstaSPIN™-BLDC motor control solution included on this kit's CD.

The Stellaris LM4F211 microcontroller (MCU) on the MDL-LM4F211CNCD controlCARD is pre-programmed with the necessary firmware in its Flash memory to run a simple application for verification of operation and can also be reprogrammed by the customer to operate with other compatible baseboards to control other motors or end-customer applications.



LM4F controlCARD

Features

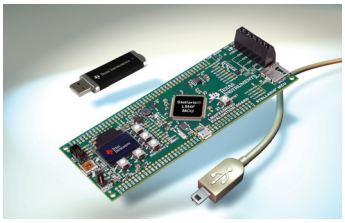
- Stellaris 32-bit ARM Cortex-M4F LM4F211 microcontroller
- Pluggable 64-pin DIMM form factor
- Hardware-compatible with other TI DRV baseboards
- Auto-isolation enabling upon debug connection

Ordering information

Part number	Description
MDL-LM4F211CNCD	Stellaris LM4F211 controlCARD module in single-unit packaging

Stellaris® Technology Kits

Human Machine interface



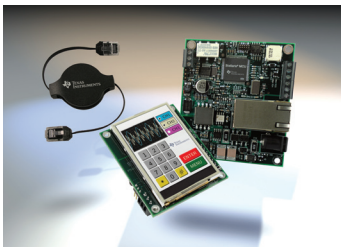
HMI on LM4F MCUs

The EK-LM4F232 kit includes a 96 × 64 color OLED. The out-of-the-box example demonstrates just how easy it is to use GraphicsLib to display and manipulate the data from an on-board 3-axis accelerometer. Data is written to the display using an SPI bus.

www.ti.com/tool/ek-lm4f232

Ordering information

Part number	Description
EKK-LM4F232	Evaluation Kit for Keil™ RealView® MDK-ARM (32 KB code-size limited)
EKI-LM4F232	Evaluation Kit for IAR Systems Embedded Workbench® (32 KB code-size limited)
EKC-LM4F232	Evaluation Kit for Sourcery CodeBench™ (30-day limited)
EKS-LM4F232	Evaluation Kit for Code Composer Studio™ IDE (board-locked)



HMI Reference Design

At the heart of the Stellaris Intelligent Display Module Reference Design is a highly integrated LM3S6918 ARM Cortex-M Stellaris microcontroller featuring 10/100 Ethernet MAC and PHY integrated on chip.

www.ti.com/tool/rdk-idm

Ordering information

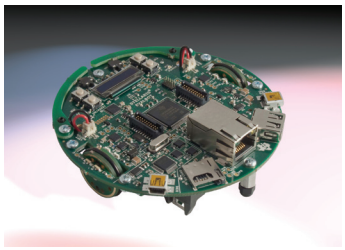
Part number	Description
RDK-IDM	3.5” Landscape Display Reference Design Kit (RDK)

Internet Connectivity

Wi-Fi® on Stellaris

It is easy to pair TI’s Wi-Fi solutions with Stellaris microcontrollers. The SimpleLink™ Wi-Fi CC3000 Evaluation Module connects with the EK-LM4F232 as the perfect platform for demonstrating a web server, a web client, or even just a simple Wi-Fi connection. For more information and example code:

www.ti.com/stellaris-cc3000



Ethernet for Stellaris

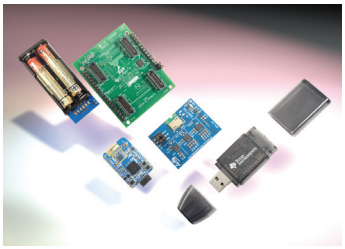
Have fun developing your Ethernet application with the first ever robotic development kit. The EVALBOT demonstrates all the differentiating features of the LM3S9000 series devices, including the only integrated 10/100 ENET MAC + PHY in the market.

www.ti.com/evalbot

Ordering information

Part number	Description
EKS-EVALBOT	Evaluation Kit with Code Composer Studio™ IDE
EKK-EVALBOT	Evaluation Kit with Keil Tools
EKI-EVALBOT	Evaluation Kit with IAR Tools
EKC-EVALBOT	Evaluation Kit with Sourcery CodeBench™ Tools
EKT-EVALBOT	Evaluation Kit with Code Red Technologies Tools

Wireless Connectivity



CC2560 *Bluetooth*® Wireless Kit

Provides the tools needed to develop and prototype *Bluetooth* SPP, A2DP, and AVRCP solutions.

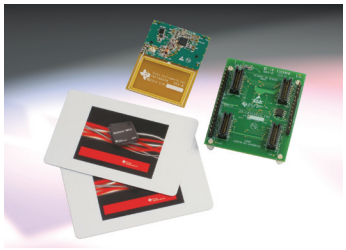
www.ti.com/tool/dk-em2-2560b

2.4-GHz SimpliciTI™ Wireless Kit

Provides the tools needed to develop and prototype 2.4-GHz applications, featuring TI’s proprietary SimpliciTI protocol for establishing small P2P or star networks.

www.ti.com/tool/dk-em2-2500s

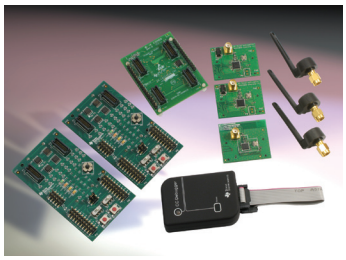
www.ti.com/stellariswirelesskits



13.56-MHz RFID Wireless Kit

Provides the tools needed to develop and prototype 13.56-MHz RFID applications.

www.ti.com/tool/dk-em2-7960r



ZigBee® Wireless Kit

Provides the tools needed to develop and prototype ZigBee applications.

www.ti.com/tool/dk-em2-2520z

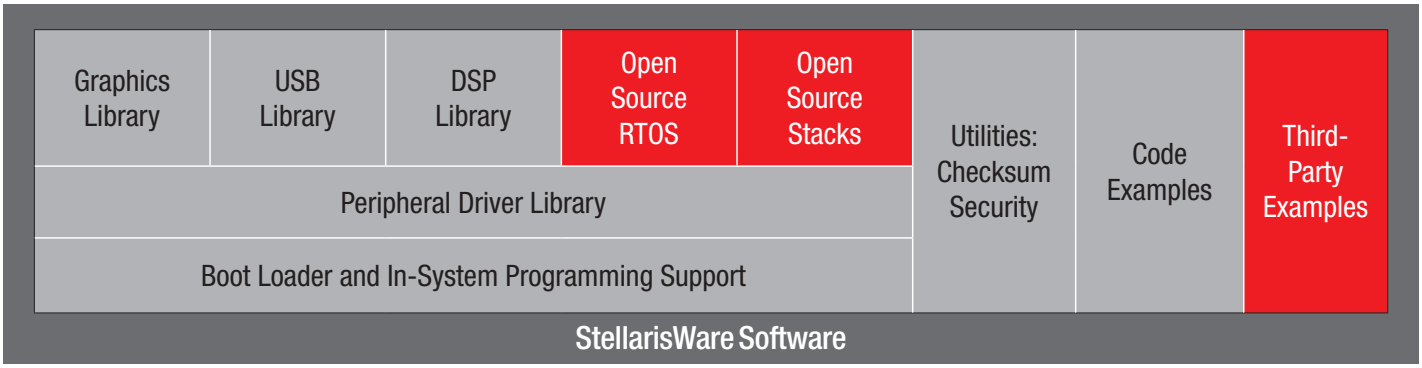
StellarisWare® Software

Software made easy with StellarisWare software

With Stellaris® microcontrollers, all your programming can be in C/C++, even interrupt service routines and startup code. We make it even easier by providing StellarisWare software support that includes code and royalty-free libraries for applications support.

Our StellarisWare software 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 now including international font support
- Stellaris Boot Loader for in-field programmability
- Stellaris utilities provide optimized commonly used functions such as CRC error checking and AES cryptography tables
- Stellaris In-System Programming for manufacturing support
- Stellaris DSP Library provides support for IEC 60730 Class B safety requirements
- Stellaris IQMath Library is a math library for fixed-point processors that speeds computation of floating-point values
- Stellaris Wireless Libraries for integration with TI's wireless solutions
- Stellaris Open Source Support provides open source Ethernet and RTOS options
- Stellaris Code Examples provides an extensive array of source code samples



For the latest capabilities provided in StellarisWare software, go to **www.ti.com/stellarisware**.

On many Stellaris MCUs, StellarisWare software is provided in ROM (read-only memory) which makes it easier to use the libraries to quickly develop efficient and functional applications in an environment where the entire Flash memory is available for use in the application. The ROM-based StellarisWare software also supports user Flash-memory-based overrides of standard StellarisWare functions, for complete flexibility in functionality.

StellarisWare software packages have the following 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 series 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 needed.
- Compiles on ARM®/Keil, IAR, Code Composer Studio™ IDE, CodeSourcery, and generic GNU development tools.

The latest StellarisWare software release can always be found at **www.ti.com/stellarisware**

StellarisWare® Software

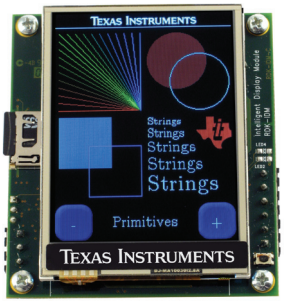
Stellaris® Peripheral Driver Library

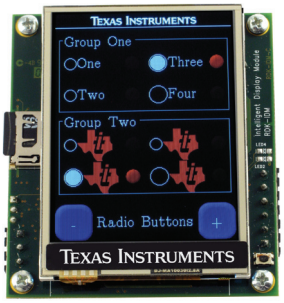
The Stellaris Peripheral Driver Library is a royalty-free set of functions for controlling the peripherals found on the Stellaris family of ARM Cortex-M series microcontrollers. Vastly superior to a GUI peripheral configuration tool, the Stellaris Peripheral Driver Library performs both peripheral initialization and peripheral control functions with a choice of polled or interrupt-driven peripheral support.

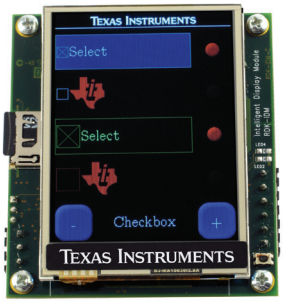
The Stellaris Peripheral Driver Library provides support for two programming models: the direct register access model and the software driver model. Each programming model can be used independently or combined, based on the needs of the application or the programming environment desired by the developer. The direct register access model includes header files for each specific Stellaris MCU and generally results in smaller and more efficient code in a software development environment familiar to most deeply embedded firmware engineers and to engineers used to working with 8- and 16-bit MCUs. The software driver model insulates the software engineer from hardware details including the operation of each register, bit field, their interactions, and sequencing required for the proper operation of the peripheral, generally requiring less time to develop applications.

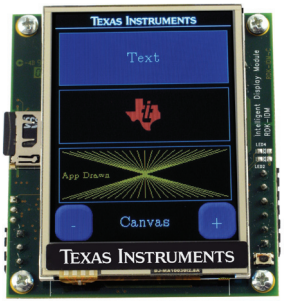
Stellaris Graphics Library

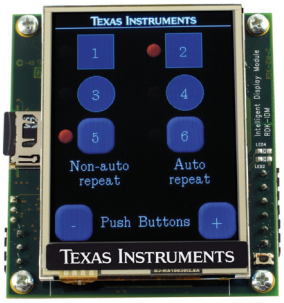
The Stellaris Graphics Library is a royalty-free set of graphics primitives and a widget set for creating graphical user interfaces on Stellaris microcontroller-based boards that have a graphical display. The graphical library consists of three building layers of functionality: the display driver layer, specific to the display in use; the graphics primitives layer, which draws points, lines, rectangles, circles, fonts, bitmap images, and text, either in the active display buffer or in an off-screen buffer for flicker-free operation; and the widget layer, which provides check boxes, push buttons, radio buttons, sliders, list boxes, and a generic encapsulation of one or more graphics primitives to draw a user interface element on the display, along with the ability to provide application-defined responses to user interaction with the widget element. The Stellaris Graphics Library also includes API support for implementing memory-efficient international fonts so customers can develop their HMI applications in their language of choice while conserving valuable Flash memory for their application. To learn how to quickly and easily construct a visually appealing display and control center leveraging a Stellaris ARM® Cortex™-M-based microcontroller to run the system, some well-defined graphics primitives and applications widgets from the Graphics Library, check out this whitepaper: ***The Stellaris Graphics Library Makes Short Order of Assembling a Dynamic HMI***.

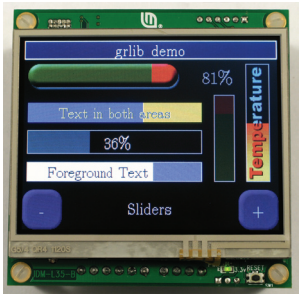


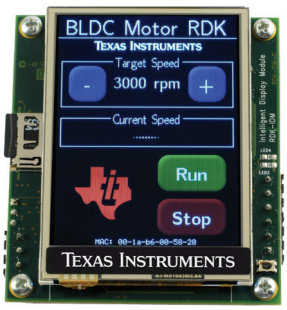












Stellaris USB Library

All Stellaris microcontrollers with USB functionality have passed USB Device and USB Embedded Host compliance testing. The Stellaris USB Library is a royalty-free set of data types and functions for creating USB Device, Host, or On-the-Go (OTG) applications for Stellaris microcontroller-based systems. Several programming interfaces are provided, ranging from the thinnest layer, which merely abstracts the underlying USB controller hardware, to high-level interfaces offering simple APIs supporting specific devices.

USB Device Examples	USB Host Examples	USB-OTG Examples
HID Keyboard HID Mouse CDC Serial Mass Storage Generic Bulk Audio Device Firmware Upgrade Oscilloscope	Mass Storage HID Keyboard HID Mouse Isochronous Audio Input	SRP (Session Request Protocol) HNP (Host Negotiation Protocol)
Windows®-based INF for the supported USB classes (in a precompiled DLL that saves development time)		

StellarisWare® Software

Stellaris® Support for CMSIS DSP Lib

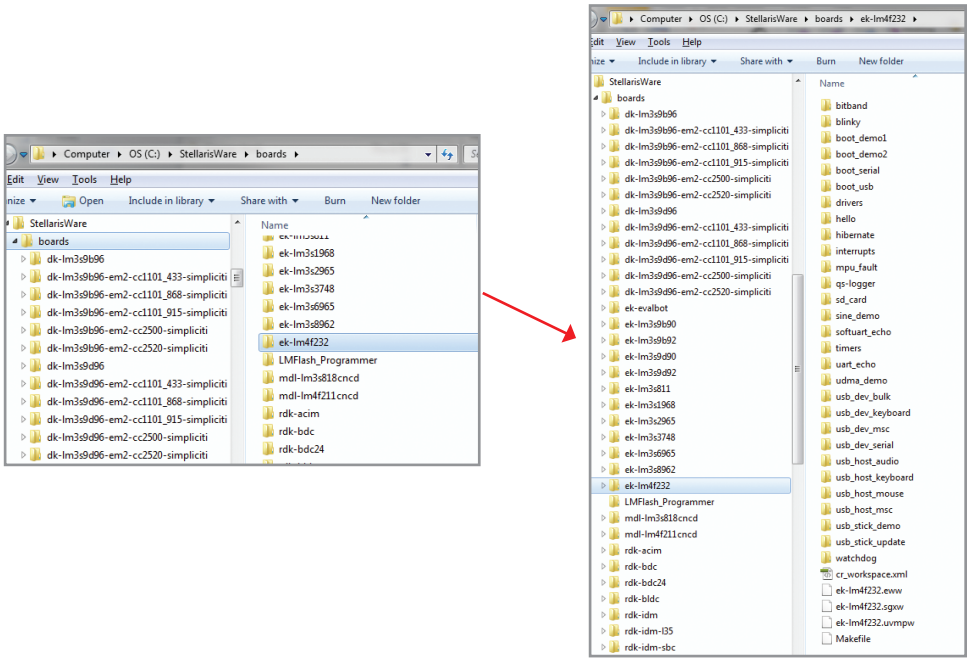
In addition to the rich functionality available with StellarisWare software, TI also provides Stellaris support for ARM®'s Cortex™ Microcontroller Software Interface Standard (CMSIS) DSP Lib. The support for the CMSIS DSP Lib includes source code and example applications, which saves time for complex math operations by leveraging the floating-point core to execute common DSP algorithms such as complex arithmetic, vector operations, filter, and control functions.

Stellaris Wireless Libraries

Texas Instruments´ Stellaris ARM Cortex-M microcontrollers are an ideal fit for a variety of wireless solutions with their high degree of performance and integrated connectivity. Stellaris and TI's RF solutions drive intelligence and advancing functionality in applications such as metering, home automation, and security. StellarisWare software makes it easier to bring wireless applications to market with its integrated software for TI RFID, Low-Power RF, ZigBee®, and *Bluetooth*® solutions.

Stellaris Code Examples

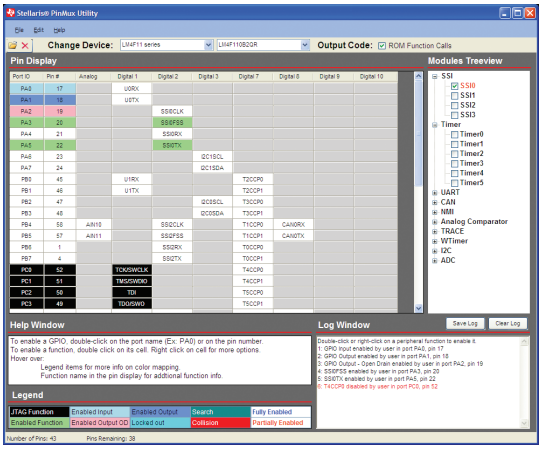
All Stellaris development and evaluation kits ship with a rich set of applications that provide examples of how to use Stellaris microcontrollers and the StellarisWare software. Every kit ships with a quickstart application that is tailored to use the features provided on the evaluation board. Because the quickstart application uses many of the peripherals on the board simultaneously, the kits also ship with a set of simpler applications. These simpler applications provide stand-alone coding examples for all peripherals that are supported in the kit. To support user development with the kit, source code and project files are provided for the quickstart application and the simpler example applications. Documentation is provided for all example projects that explains the functionality of each example application.



Download: ***www.ti.com/tool/sw-lm3s***

Stellaris PinMux Utility

TI's Stellaris PinMux Utility provides a quick and easy-to-use tool for configuring the GPIOs on Stellaris LM4F microcontrollers. Whether you are an experienced firmware engineer, hobbyist, or student, the combination of graphical configuration and code generation tools ensures that you can quickly and correctly initialize the alternate GPIO functions every time. So, put away those long pin tables in the data sheet, save yourself hours of work, and download the Stellaris PinMux utility today.



Download: ***www.ti.com/tool/lm4f_pinmux***

Stellaris® In-System Programming Support

Stellaris microcontrollers provide a number of different mechanisms for in-system programming support.

All Stellaris MCUs ship with either a Boot Loader in ROM or a Serial Flash Loader programmed into Flash memory, providing maximum flexibility for production programming options. For customization, we also provide a royalty-free Stellaris Boot Loader that facilitates in-field updates for end applications, with flexible interface options and program signaling.

Stellaris Boot Loader in ROM

Most Stellaris microcontrollers provide the Stellaris Boot Loader in read-only memory (ROM) integrated on the device. These microcontrollers provide flexible interface options for Flash memory programming (both manufacturing and in-field updates) directly through the on-chip ROM. With flexible interface options including UART, I^2C, and SSI, and selectable methods for signaling an in-field update, the Stellaris Boot Loader provides users with maximum flexibility in boot loading requirements. Stellaris ARM Cortex-M4F devices also include the USB Device Firmware Update (DFU) class directly in ROM.

Stellaris Boot Loader Customized in Flash Memory

For applications that need in-field programmability but require special controls, we also provide royalty-free Stellaris Boot Loader source code that can be added to your application at the beginning of the Flash memory. With flexible interface options including UART, I^2C, SSI, USB host, USB device, or Ethernet, and selectable methods for signaling an in-field update, the Stellaris Boot Loader provides users with maximum flexibility in boot-loading requirements. The Stellaris Peripheral Driver Library includes source code and documentation about the Stellaris Boot Loader, including example applications that utilize the Boot Loader for in-field updates.

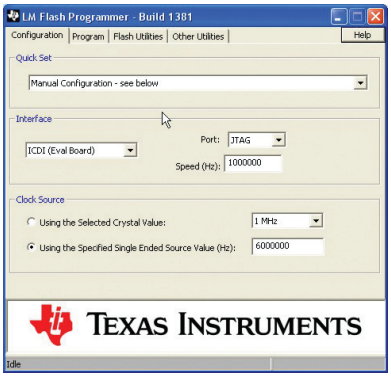
- Free license and royalty-free use (for use with Stellaris MCUs)
- Small piece of code that can be programmed as an application loader at the beginning of the MCU's internal Flash memory
- Also used as an update mechanism for an application running on a Stellaris microcontroller
- Interface options include UART (default), I^2C, SSI, USB host (mass storage), USB device (DFU), or Ethernet (BOOTP protocol)

Stellaris Serial Flash Loader

Smaller Stellaris microcontrollers ship with a royalty-free, one-time-use Serial Flash Loader application pre-programmed into Flash memory. For these microcontrollers, the Serial Flash Loader can be used in conjunction with the LM Flash Programmer application, a standard JTAG debugger, or a production programmer to load the end application into Flash memory during manufacturing.

The Serial Flash Loader is a small application that allows programming of the Flash without the need for a debugger interface or production programmer. We provide a free Flash programming utility for PCs called LM Flash Programmer that supports either command line or GUI usage and makes full use of all the commands supported by the Serial Flash Loader application. For users who want to build their own Flash programmers, we also supply a sample UART download utility that makes full use of all the commands supported by the Serial Flash Loader application. Application note AN01242 provides source code and information about the Serial Flash Loader and the sample UART download utility sflash.exe.

- Pre-loaded in Flash memory on all shipped Stellaris MCUs that do not have the ROM-based Stellaris Boot Loader
- Small piece of code that allows programming of the Flash memory without the need for a debugger interface
- Interface options include UART or SSI
- Free LM Flash Programmer utility makes full use of all commands supported by the Serial Flash Loader



*Download: **www.ti.com/tool/lmflashprogrammer***

TI Worldwide Technical Support

Internet

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