Tiva™ C Series ARM® Microcontrollers

Texas Instruments

www.ti.com/tiva-c

2013

Tiva™ C Series Microcontrollers

Introduction

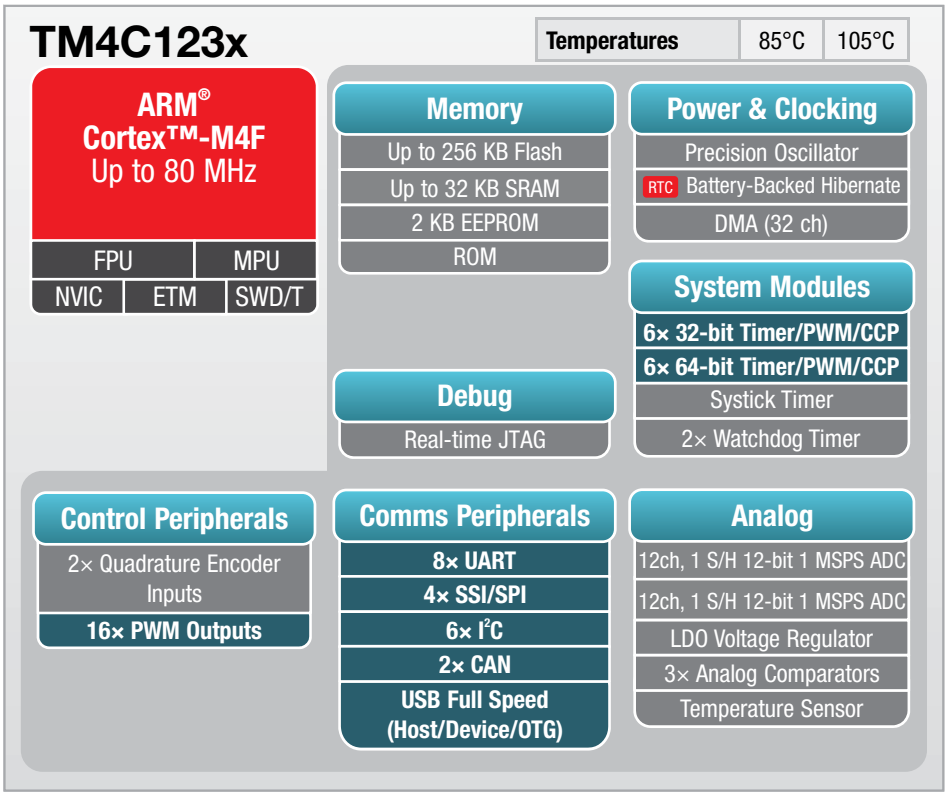
The **Tiva C Series ARM® MCUs** provide a broad portfolio of connected Cortex™-M4F microcontrollers. Designers who migrate to the Tiva C Series MCUs benefit from a balance between the floating-point performance needed to create highly responsive mixed-signal applications and the low-power architecture required to enable increasingly aggressive power budgets. Tiva C Series MCUs are supported by TivaWare™ for C Series software, designed specifically for those customers who want to get started easily, write production-ready code quickly, and minimize their overall cost of software ownership.

Key highlights

- ARM Cortex-M4F core
- CPU speed up to 80 MHz
- Up to 256-KB Flash
- Up to 32-KB single-cycle SRAM
- Two high-speed 12-bit ADCs up to 1 MSPS
- Up to two CAN 2.0 A/B controllers
- Optional full-speed USB 2.0 OTG/Host/Device
- Up to 40 PWM outputs
- Serial communication with up to:
  - 8 UARTs, 6 I²Cs, 4 SPI/SSI
- Intelligent low-power design power consumption as low as 1.6 µA

Benefits

- 12-bit ADC accuracy achievable at the full 1 MSPS rating without any hardware averaging, eliminating performance tradeoffs
- First ARM Cortex-M MCU in advanced 65-nm process technology provides the right balance between higher performance and low power consumption
- ARM Cortex-M4F with floating point accelerates math-intensive operations and simplifies digital signal processing implementations
- Range of pin-compatible memory and package configurations enables optimal selection of devices



Applications

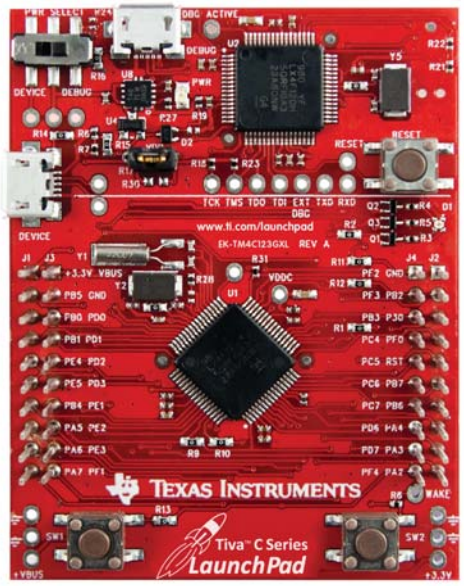
- Connectivity
- Sensor aggregation
- Security and access control
- Home and building automation
- Industrial automation
- Human machine interface
- Lighting control
- Energy
- Data acquisition
- System management

Tiva™ C Series Kits

Evaluation kit

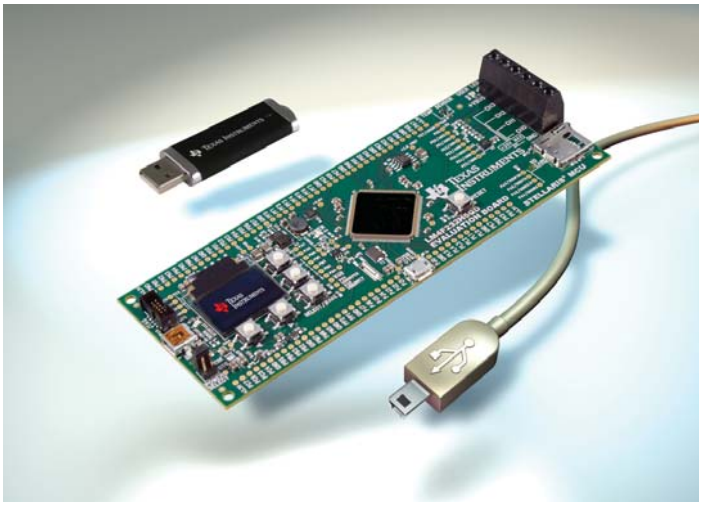
EK-TM4C123GXL LaunchPad Evaluation Kit is the perfect kit to get started with a Tiva C Series microcontroller at just U.S. $12.99.

www.ti.com/launchpad



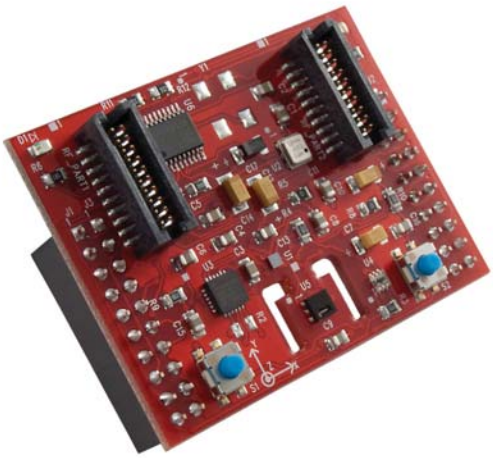
Development kit

EK-LM4F232 Development Kit is a compact and versatile tool for the Tiva C Series TM4C123G ARM® Cortex™-M4F based MCU. Key highlights include a color OLED display, USB OTG, a micro SD card, a coin cell battery for use with low-power hibernate, a temperature sensor, a three axis accelerometer for motion detection, and easy-access through-holes to all of the available device signals.



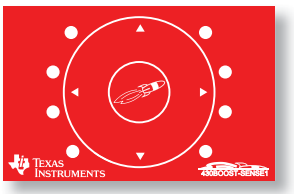
BoosterPacks

Now featuring the Tiva C Series Sensor Hub BoosterPack. Unlock a world of possibilities with TI's new Sensor Hub BoosterPack featuring 9-axis MEMS motion sensors, pressure sensor, ambient light sensor and IR temperature sensor.



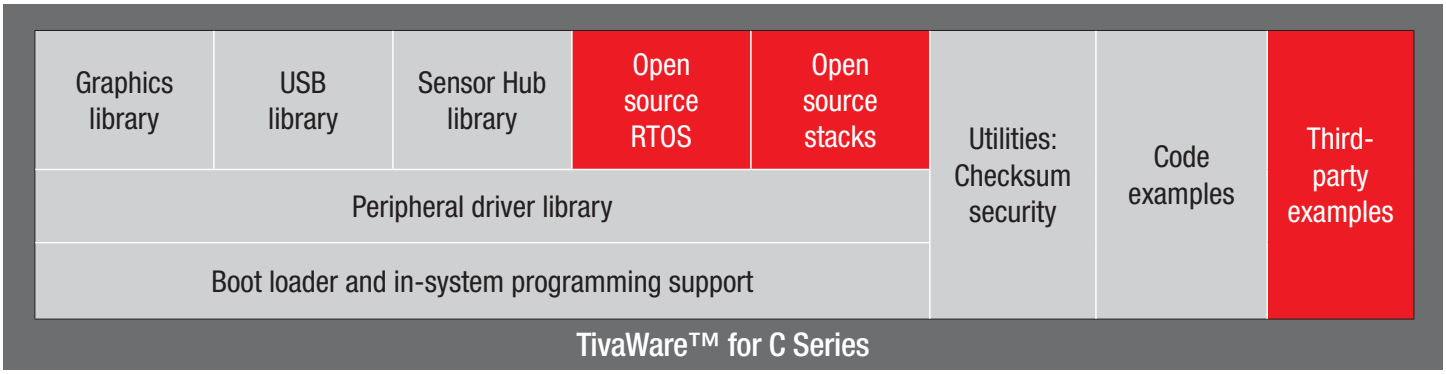
Plug-in BoosterPacks for the Tiva C Series TM4C123x LaunchPad make it simple and fun to explore various applications by expanding the functionality of the TM4C123G MCU.

www.ti.com/boosterpack



TivaWare™ for C Series Software

TivaWare for C Series provides free-license and royalty-free source code that customers can use to accelerate their time to market and reduce their total cost of software ownership.



Libraries and code examples

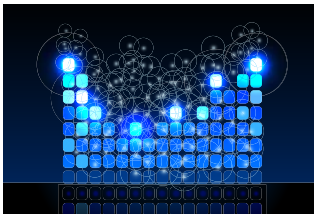
Use the TivaWare for C Series software libraries and start spending your time differentiating your solution!

Peripheral driver library

Set of BSD licensed functions for controlling Tiva™ C Series peripherals.

USB library

TivaWare royalty-free USB stack is provided to enable efficient USB host, device, and on-the-go operations.



Graphics library

Royalty-free set of graphics primitives and widgets to create GUIs.

Sensor Hub library

Tiva C Series Sensor Hub library offers an advanced sensor fusion algorithm and a broad range of sensor support.

CMSIS DSP library

Full support for ARM®'s Cortex™ Microcontroller Software Interface Standard (CMSIS) libraries.

Wireless library

Ready to run examples for wireless technologies like ZigBee®, *Bluetooth*®, and WiFi®.

Tiva™ C Series Software Ecosystem

Interactive Development Environment (IDE)

TivaWare™ for C Series is pre-built using five different compilers.

Code Composer Studio™ IDE

GNU

KEIL™ An ARM® Company

mentor embedded

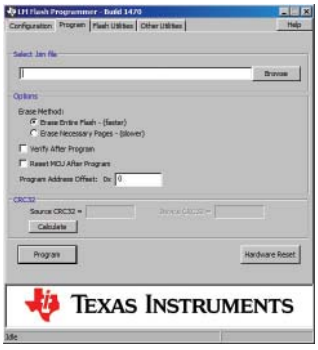
IAR SYSTEMS

Code Composer Studio™ (CCStudio) is an integrated development environment (IDE) for all of Texas Instruments embedded processor families.

Tiva C Series PinMux Utility

- Easy-to-use tool for configuring the GPIOs
- Generates source code in C
- Automatically checks and solves pin conflicts
- Intuitive user interface
- Provided free of charge

In-System Programming Support



- Boot loaders available in on-chip ROM
- Boot loader customized in Flash memory
- Serial Flash loader

Download: www.ti.com/tool/lmflashprogrammer

Real-Time Operating System (RTOS)

TI-RTOS

freeRTOS

mentor embedded

Micriμm

Tiva™ C Series Product Selector

TM4C123x Microcontrollers†

Part Number	Memory				Core			Timers								Serial Interfaces						Analog													
												Motion Control										ADC															
	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 Outputs	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	Pin/Package
TM4C1231C3PM	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1231D5PM	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1231E6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1231H6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1230C3PM	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1230D5PM	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1230E6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
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TM4C1231D5PZ	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1231E6PZ	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1231H6PZ	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1231H6PGE	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	–	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	144LQFP
TM4C1233C3PM	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1233D5PM	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1233E6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
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TM4C1232C3PM	32	12	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1232D5PM	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1232E6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1232H6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1233D5PZ	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1233E6PZ	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1233H6PZ	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1233H6PGE	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	D	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	144LQFP
TM4C1237D5PM	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1237E6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C1237H6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
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TM4C1236H6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C1237D5PZ	64	24	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C1237E6PZ	128	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
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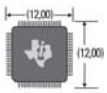
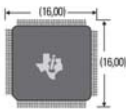
TM4C1237H6PGE	256	32	2K	✔	80	✔	✔	✔	12	✔	2	0	0	24	0	1	0	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	144LQFP
TM4C123BE6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	16	2	24	2	2	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C123BH6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	2	24	2	2	–	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C123AE6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	16	6	24	2	2	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C123AH6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	6	24	2	2	–	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C123BE6PZ	128	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C123BH6ZRB	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	–	8	6	4	0	2	12	24	1M	✔	✔	3/16	120	✔	✔	157BGA
TM4C123BH6PZ	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	–	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C123BH6PGE	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	–	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	144LQFP
TM4C123GE6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	16	2	24	2	2	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C123GH6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	2	24	2	2	0	8	4	4	0	2	12	12	1M	–	✔	2/16	43	✔	✔	64LQFP
TM4C123FE6PM	128	32	2K	✔	80	✔	✔	✔	12	✔	2	16	6	24	2	2	0	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C123FH6PM	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	6	24	2	2	0	8	6	4	0	2	12	12	1M	–	✔	2/16	49	–	✔	64LQFP
TM4C123GE6PZ	128	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	0	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C123GH6ZRB	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	0	8	6	4	0	2	12	24	1M	✔	✔	3/16	120	✔	✔	157BGA
TM4C123GH6PZ	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	0	8	6	4	0	2	12	22	1M	✔	✔	3/16	69	✔	✔	100LQFP
TM4C123GH6PGE	256	32	2K	✔	80	✔	✔	✔	12	✔	2	16	8	24	2	2	0	8	6	4	0	2	12	24	1M	✔	✔	3/16	105	✔	✔	144LQFP

†All devices are sampling

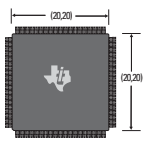
157-ball BGA



64-pin LQFP



100-pin LQFP



144-pin LQFP

Notes

Tiva™ C Series Product Selector

Tiva C Series TM4C123x Family Comparison

	TM4C123G TM4C123F	TM4C123B TM4C123A	TM4C1237 TM4C1236	TM4C1233 TM4C1232	TM4C1231 TM4C1230
Core	Cortex™-M4F	Cortex-M4F	Cortex-M4F	Cortex-M4F	Cortex-M4F
Max frequency	80 MHz	80 MHz	80 MHz	80 MHz	80 MHz
Flash	128–256 KB	128–256 KB	32–256 KB	32–256 KB	32–256 KB
SRAM	32 KB	32 KB	12–32 KB	12–32 KB	12–32 KB
USB	H/D/OTG	–	H/D/OTG	D	–
CAN	2	2	2	2	2
PWM outputs	16	16	–	–	–
QEI	2	2	–	–	–
Hibernate			Optional*		
Temperature	–40°C to 105°C –40°C to 85°C	–40°C to 105°C –40°C to 85°C	–40°C to 105°C –40°C to 85°C	–40°C to 105°C –40°C to 85°C	–40°C to 105°C –40°C to 85°C
Packaging	100 LQFP 144 LQFP 157 BGA 64 LQFP	100 LQFP 144 LQFP 157 BGA 64 LQFP	100 LQFP 144 LQFP 157 BGA 64 LQFP	100 LQFP 144 LQFP 157 BGA 64 LQFP	100 LQFP 144 LQFP 157 BGA 64 LQFP

**Hibernate options available in all packaging: Non-hibernate available only in 64-LQFP.*

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