C2000 F280013x Real-Time Microcontrollers



Key Features and Benefits

Real-Time Processing

- 120-MHz C28x × 32-bit DSP CPU
- Equivalent to 240-MHz Arm®
 Cortex®-M7* based device on real-time signal chain performance*
- Floating Point Unit (FPU) for more precise mathematical calculations
- Trigonometric Math Unit (TMU) speeds up algorithms key to real-time control systems

Memory

- Up to 256KB (128KW) of flash memory (ECC) and 36KB of SRAM (ECC, Parity)
- New enhanced flash technology averages 92% efficiency for effective 110 MHz

Actuation

 Up to 14-PWM channels with 2-channel highresolution PWMs enable accurate actuation and improved flexibility

Sensing

- Two 12-bit ADCs, 4 MSPS, up to 21-channels
- Four windowed comparators with reference DACs

Connectivity

- CAN, 3 × UART, SPI, 2 × I2C

· Clock and System

- Crystal oscillator or external clock
- 10-MHz INTOSC, ±1% with precision resistor

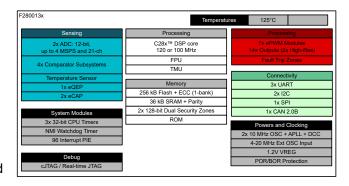
Integrated Security and Safety

 AES tables, secure boot, JTAG lock, dualcode security module, unique ID, missing clock detection, dual-clock comparator

Packaging T_A = 125°C

- 48 (9 × 9) or 64 (12 × 12) LQFP
- 32 (5 × 5) or 48 (7 × 7) QFN

The TMS320F280013x series is part of the Entry-Performance line of C2000 real-time microcontroller (MCU) family built for efficient control of power electronics. With an industry leading ultra-low latency (sensing-compute-control) and optimized price the devices offer a no-compromise answer for real-time control of industrial applications.



Key Applications

- Industrial 3-phase motor and digital power control
 - Appliances
 - Motor drives
 - Industrial power
 - Solar

Resources

TMS320F2800137 Product Folder

TMS320F2800137 LaunchPad Evaluation Module

TMS320F2800137 controlCARD Evaluation Module

HVAC Reference Design

C2000WARE Software Development Kit

C2000WARE-MOTORCONTROL-SDK

C2000WARE-DIGITALPOWER-SDK

* Performance Benchmark Application Note

C2000 Academy Training Workshops

SysConfig Graphical Device Configuration

Code Composer Studio Free IDE

Addition to the Generation 3 MCU Portfolio

The TMS320F280013x real-time microcontrollers are an extension of the Generation 3 C2000 MCU portfolio. All Generation 3 devices are compatible with C2000WARE software and pin-to-pin compatibility exists between many devices. Figure 1 illustrates the F280013x series in the portfolio and includes a new focus on application tailored series in the Entry-Performance line.

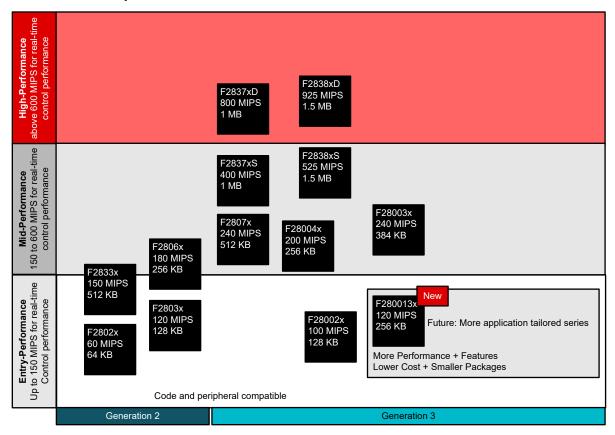


Figure 1. C2000 MCU Portfolio With New F280013x Entry-Performance Line

Pin and Packaging Options

Table 1 details the TMS320F280013x MCU series offers a broad set of memory and package options with industrial temperature range support.

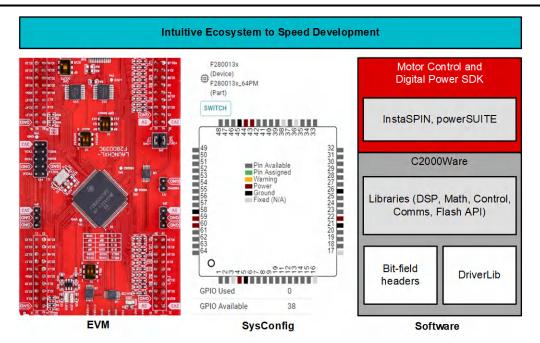
6 PWM, no CAN

Industrial -40°C to 125°C Flash (KB) 48-pin QFN 7 × 7 48-pin QFP 9 × 9 64-pin QFP 12 × 12 Variants MHz Differences 32-pin QFN 5 × 5 F2800137 256 120 14 PWM, CAN F2800135 14 PWM, CAN **** <∕ 128 120 **1 1** F2800133 120 64 14 PWM, CAN **1 \ 1 1**

Table 1. F280013x Packaging Options and Key Variant Differences

100

F2800132



The C2000 MCU SysConfig offers:

- Full peripheral configuration and application-specific calculators
- Integrated tool support: PinMux, Security (DCSM)
- · Dependency detection across modules
- NEW One-click setup and initialization of C2000 MCU libraries
- **NEW** Memory configuration support
- NEW Board component support for easier migration, faster development
- **NEW** ePWM support
- NEW FreeRTOS configuration

New C2000 Developer Experience

C2000 MCU Academy offers all your training needs in one place including getting started resources, interactive classes, advanced workshops, and videos.

- NEW restructured navigation and new lab content
- NEW videos: 5-minute Ecosystem overview, migrating in < 10 m, CCS Getting Started, EPWM overview, and ADC





Comparison of Device Features

The F280013x series enables real-time control capability for industrial applications. Compared to the F28002x series, the F280013x series offers increased performance, flash and RAM memories, additional security features, and new small QFN package options at substantially lower prices. Pin-to-pin compatibility is offered in the QFP packages. Table 2 provides an overview of feature differences between the two.

Table 2. Comparison Between F280013x and F28002x Series

Feature	F280013x	F28002x
MIPS	120 MHz maximum	100 MHz maximum
Flash	256KB (1 bank)	128KB (1 bank)
RAM	36KB	24KB
ADC	2 × 12b	2 × 12b
CMPSS	3 × CMPSS_LITE, 1 × 12b DAC	4 × 12b DAC
CLB	0	2
HWBIST	No	Yes
PWM	14 × ePWM (2 HRPWM)	14 × ePWM (8 HRPWM)
QEP, CAP	1 eQEP, 2 eCAP	2 eQEP, 3 eCAP, 1 HRCAP
Comms	3 UART, 1 SPI, 2 I2C, 1 CAN	3 UART, 2 SPI, 1 I2C, 1 CAN 1 FSI, 1 PMBus
Safety level	Functional Safety Quality Managed	Functional Safety Quality Managed
ERAD	No	Yes
Security	DCSM, Secure Boot, JTAG Lock, AES Tables	DCSM
Packages	32 48 QFN; 48 64 QFP 125°C	48 64 80 QFP 125°C Q100
Starting Price (1 ku)	\$0.79	\$1.43

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