

# Rapidly develop with low-cost MSPM0 microcontrollers

**MSP microcontrollers**

# MSPM0 MCUs | More options. Unlimited possibilities.

The most comprehensive portfolio of Arm® Cortex® M0+ microcontrollers that delivers the sensing and processing features you need



## Cost optimized

- Leveraging recent capacity and cost investments
- Industry's smallest packages enable the smallest PCB designs
- High performance integrated analog to reduce BOM cost



## Scalable

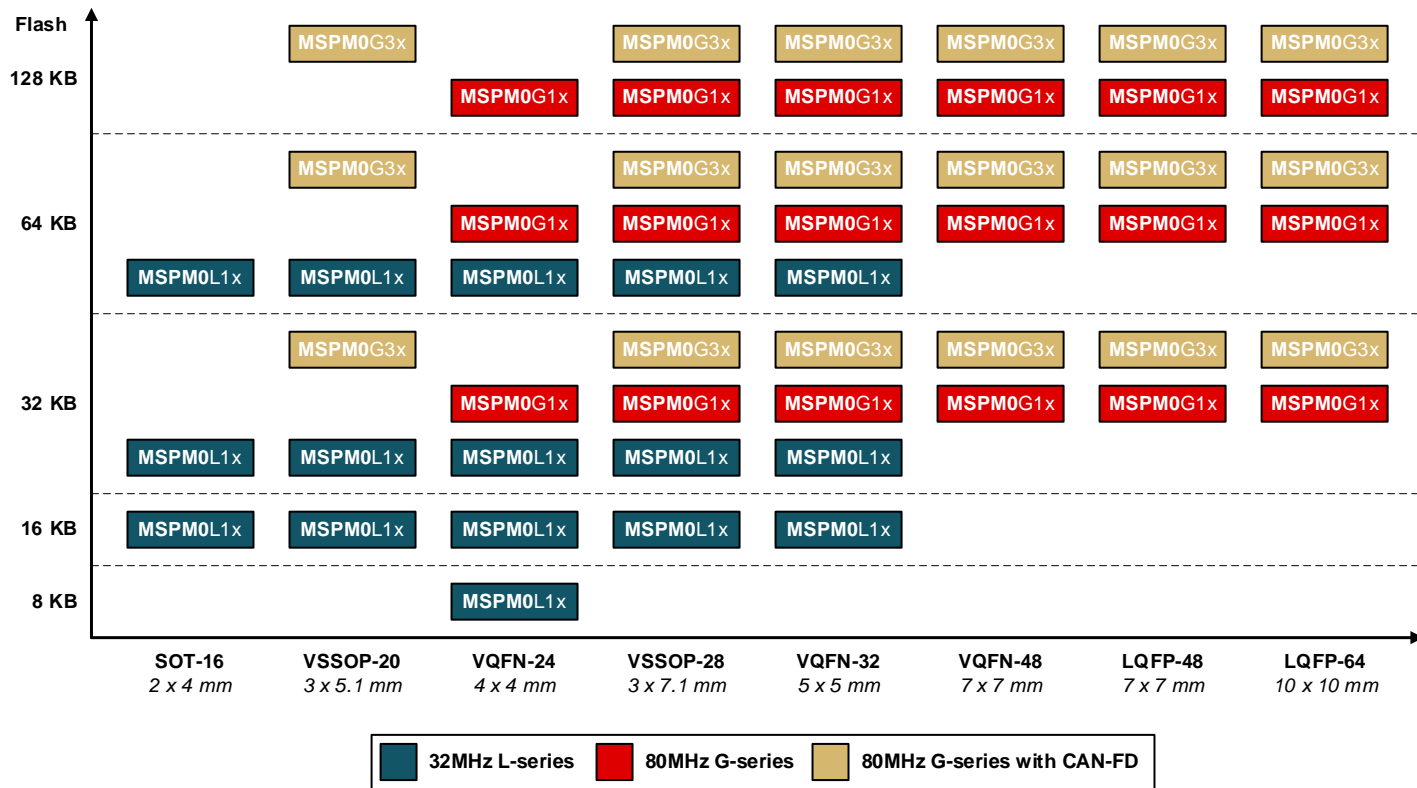
- 32/80MHz, 8-128 kB flash, 16-64 pins, and scalable analog
- Pin to pin compatible across wide range of memory & analog options
- 105C, 125C, and AEC- Q100 automotive options



## Simple to use

- Fast, fully graphical device configuration with code generation
- Code size optimized drivers (1/3rd the size of competitors)
- Plug-and-play subsystems, code examples, and reference designs

# MSPM0 MCUs | Broad Scalability



**32MHz**  
L-series MCUs

**80MHz**  
G-series MCUs

**Pin to pin**  
Hardware and software  
compatible

# MSPM0 L-Series Microcontrollers

| MSPM0L13xx/110x   |  | 1.62 - 3.6V<br>-40 to 125 C   |
|---|--|---|
| <b>CPU</b><br>Arm Cortex-M0+<br>32 MHz<br><br>NVIC / 3-ch DMA                 | <b>Power &amp; Clocking</b><br>POR / BOR / SVS<br>Internal LF 32kHz (3%)<br>Internal HF 4-32MHz (1%) | <b>Analog</b><br>12-bit ADC 1.45Msps (10-ch)<br>Comparator w/ 8-bit DAC<br>Zero-drift chopper op-amps (2)<br>General purpose amp<br>Internal ADC reference (1.5%)<br>Temperature sensor |
| <b>On-chip Memory</b><br>8, 16, 32 or 64 kB flash<br>2 or 4 kB SRAM           | <b>Communication</b><br>UART w/ LIN (1)<br>UART (1)<br>SPI (1)<br>I2C (2) w/ FastMode+               | <b>Timers</b><br>Low power 16-bit 2 CC (4)<br>Windowed watchdog   |
| <b>Data Integrity &amp; Security</b><br>CRC accelerator (16 and 32 bit)       | <b>IO</b><br>Up to 28 GPIO<br>Up to 2 low Ib OPA inputs  |   |
| <b>Programming &amp; Debug</b><br>ARM SWD interface<br>UART & I2C bootloader  |  |   |
| Leaded packages: SOT-16, VSSOP-20/28<br>No-lead packages: WQFN-16, VQFN-24/32 |  |   |

**< \$0.39**  
starting at 1 kU

**< 0.5  $\mu\text{V}/^\circ\text{C}$**   
Op-amp input offset  
drift

**46**  
8 kB- 64 kB memory,  
package, peripheral options

# MSPM0 G-Series Microcontrollers

| MSPM0G350x/310x/150x/110x   |                             |                                  | 1.62 - 3.6V<br>-40 to 125 C |
|---|-----------------------------|----------------------------------|-----------------------------|
| <b>CPU</b><br>Arm Cortex-M0+<br>80 MHz<br><br>NVIC / MPU / 7-ch DMA         | <b>Power &amp; Clocking</b> | <b>Precision Analog</b>          |                             |
|   | POR / BOR / SVS             | 12-bit ADC 4Msps (9-ch)          |                             |
|   | External LF 32kHz XTAL      | 12-bit ADC 4Msps (8-ch)          |                             |
|   | External HF 4-48MHz XTAL    | Comparators w/ 8-bit DACs (3)    |                             |
|   | Internal LF 32kHz (3%)      | 12-bit 1Msps buffered DAC (1)    |                             |
|   | Internal HF 4-32MHz (1%)    | Zero-drift chopper op-amps (2)   |                             |
|   | PLL (up to 80 MHz)          | Internal reference (1.5%)        |                             |
|   |                             | General purpose amp (1)          |                             |
|   |                             | Temperature sensor               |                             |
| <b>Accelerators</b>   | <b>Communication</b>        | <b>Timers</b>                    |                             |
| Math (DIV, SQRT, TRIG, MAC)   | UART w/ LIN (1)             | Advanced control 16-bit 4 CC (1) |                             |
| <b>On-chip Memory</b>   | UART (3)                    | Advanced control 16-bit 2 CC (1) |                             |
| 32, 64, or 128 kB flash [ECC]   | SPI (2)                     | General purpose 32-bit 2 CC (1)  |                             |
| 16 or 32 kB SRAM [ECC]  | I2C (2) w/ FastMode+        | General purpose 16-bit 2 CC (2)  |                             |
| <b>Data Integrity &amp; Security</b>  | CAN-FD (1)                  | Low power 16-bit 2 CC (2)        |                             |
| CRC accelerator (16 and 32 bit)   | <b>IO</b>                   | Windowed watchdog (2)            |                             |
| AES256 accelerator + TRNG   | Up to 60 GPIO               | Real-time clock (1)              |                             |
| <b>Programming &amp; Debug</b>  |                             |                                  |                             |
| ARM SWD interface   |                             |                                  |                             |
| UART & I2C bootloader   |                             |                                  |                             |
| Leaded packages: VSSOP-20/28, LQFP-48/64<br>No-lead packages: VQFN-24/32/48 |                             |                                  |                             |

## Dual 4 Msps

12- bit ADCs with 14 bit  
oversampling

## 3X lower latency

In field oriented motor control  
loops

## 87

32 kB- 64 kB memory,  
package, peripheral options

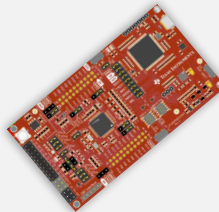
# MSPM0 software and tools ecosystem

*Rapidly develop with low-cost MSPM0 microcontrollers*



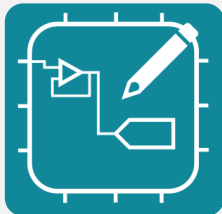
## MSPM0 SDK

*Software, tools, and documentation to accelerate product development*



## MSPM0 LaunchPad

*An unconstrained prototyping platform*



## SysConfig & Analog Configurator

*Intuitive graphical configuration and code generation*

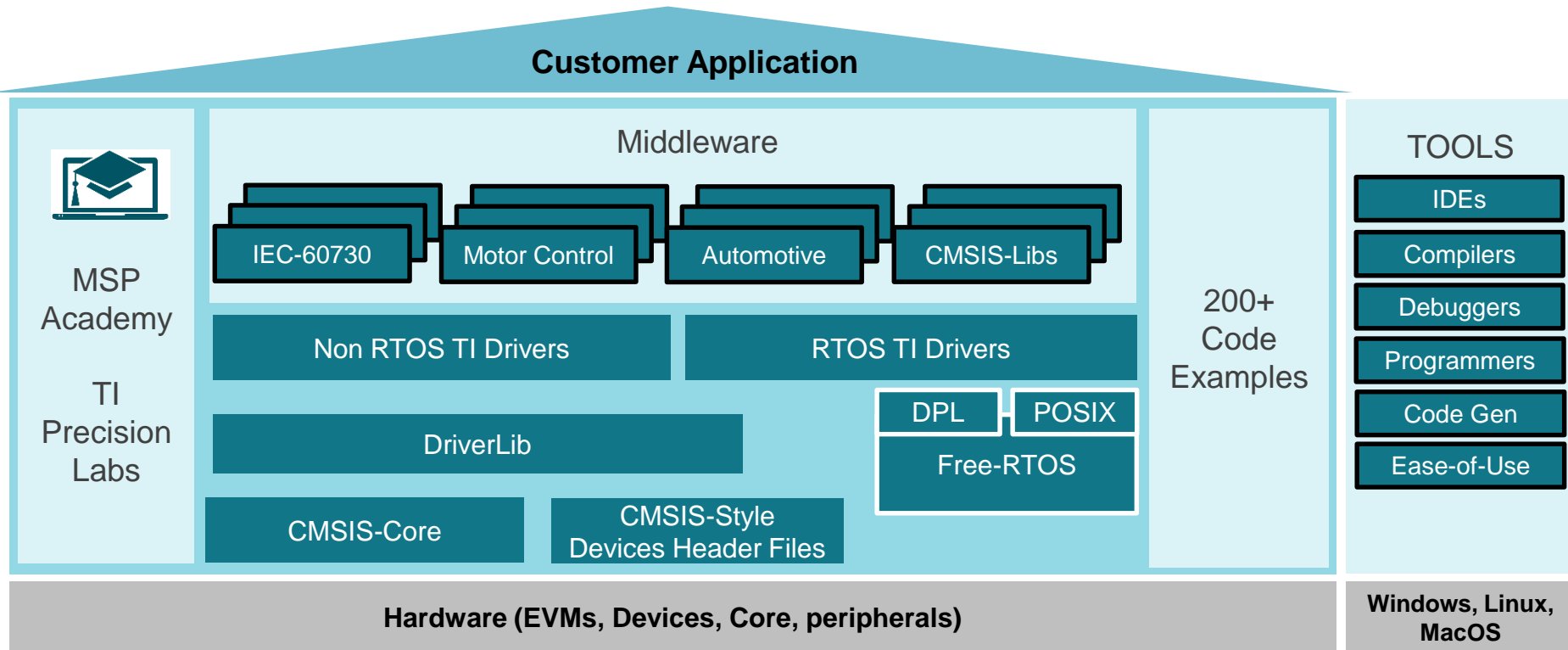


## CCS Theia

*A modern, high performance integrated development environment*

# MSPM0 software development kit

*Software, tools, and documentation to accelerate product development*



# MSPM0 LaunchPad ecosystem

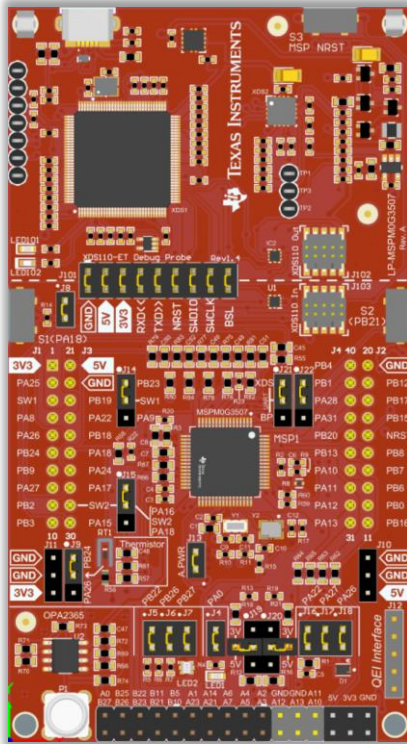
*An unconstrained prototyping platform*

## Integrated Debugger

- Built in XDS110 debugger supports breakpoints, watchpoints, and full access to memory map and CPU registers
- Back-channel UART sends data back to PC console

## BoosterPack header

- Access to device pins through 40pin BoosterPack header
- Plug in a BoosterPack EVM to quickly connect to sensors, LCDs, and other devices



LP-MSPM0G3507 pictured

## EnergyTrace

- Collect accurate power usage measurements
- Read EnergyTrace power state data from MSPM0 device

## Onboard analog

- Use onboard thermistor, light sensor and RGB LED to prototyping analog functionality directly on the LaunchPad

## Order today!

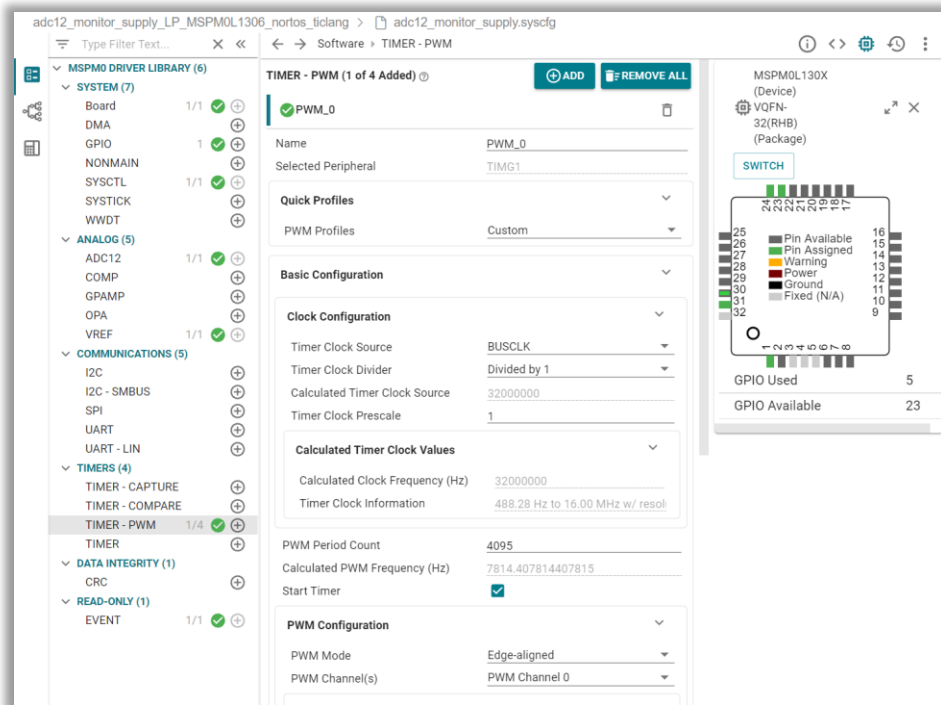
- Available on [ti.com](https://www.ti.com)



# SysConfig

*Intuitive graphical configuration and code generation*

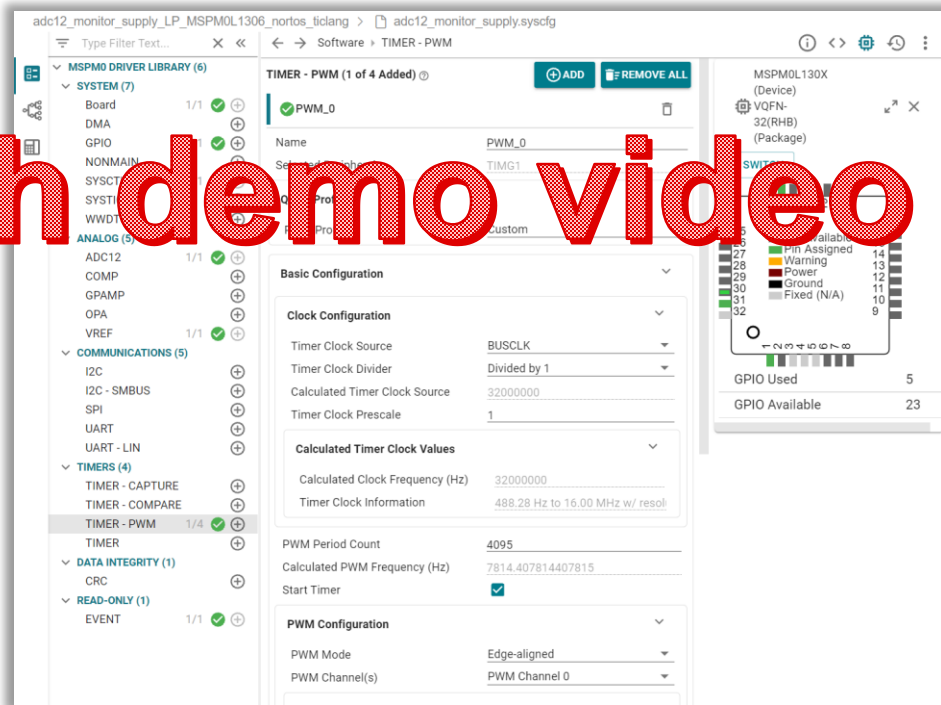
- Graphical utilities to configure pins, peripherals, subsystems, and other components
- Generates C code files for SDK examples or custom software
- Real-time conflict management ensures creating a valid configuration
- Real-time code preview



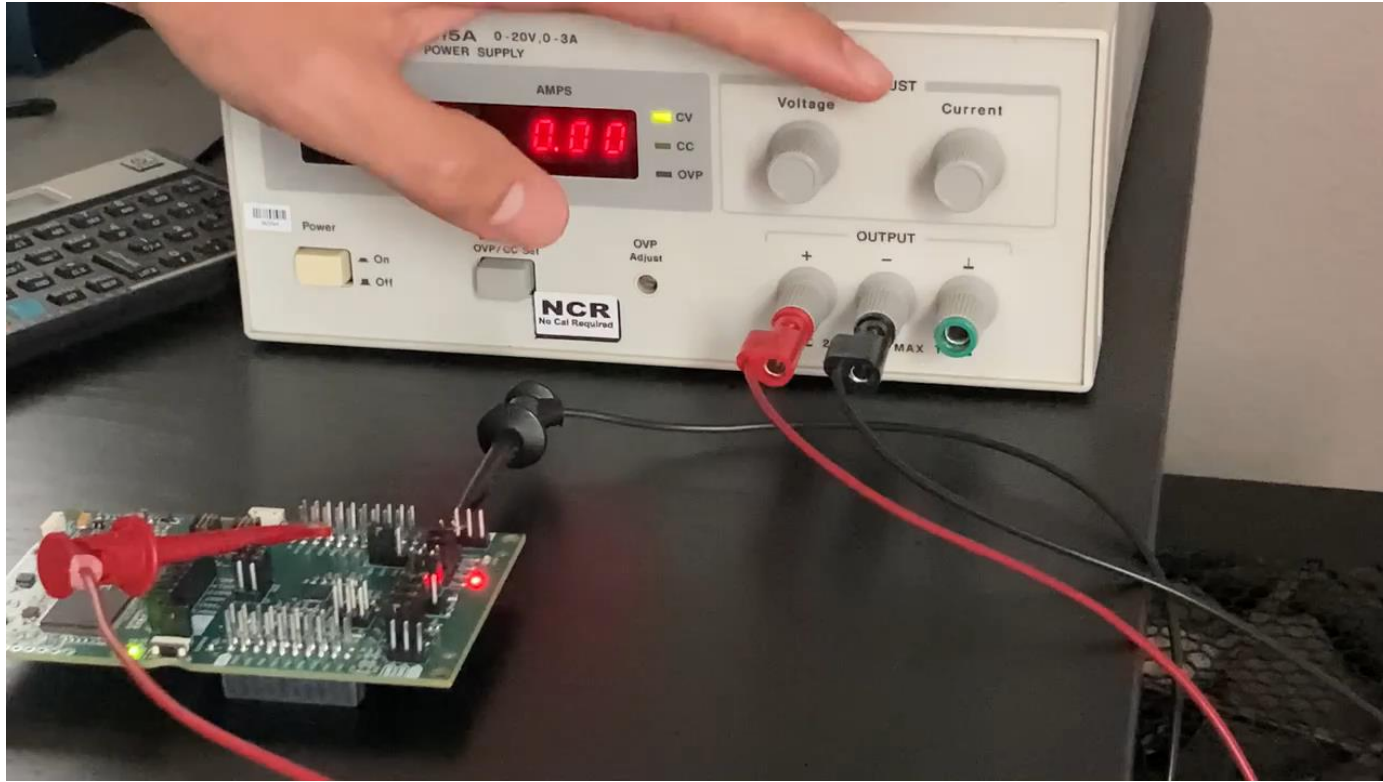
# SysConfig

*Intuitive graphical configuration and code generation*

- Graphical utilities to configure pins, peripherals, subsystems, and other components
- Generates C code files for SDK examples or custom software
- Real-time conflict management ensures creating a valid configuration
- Real-time code preview



# SysConfig – demo video



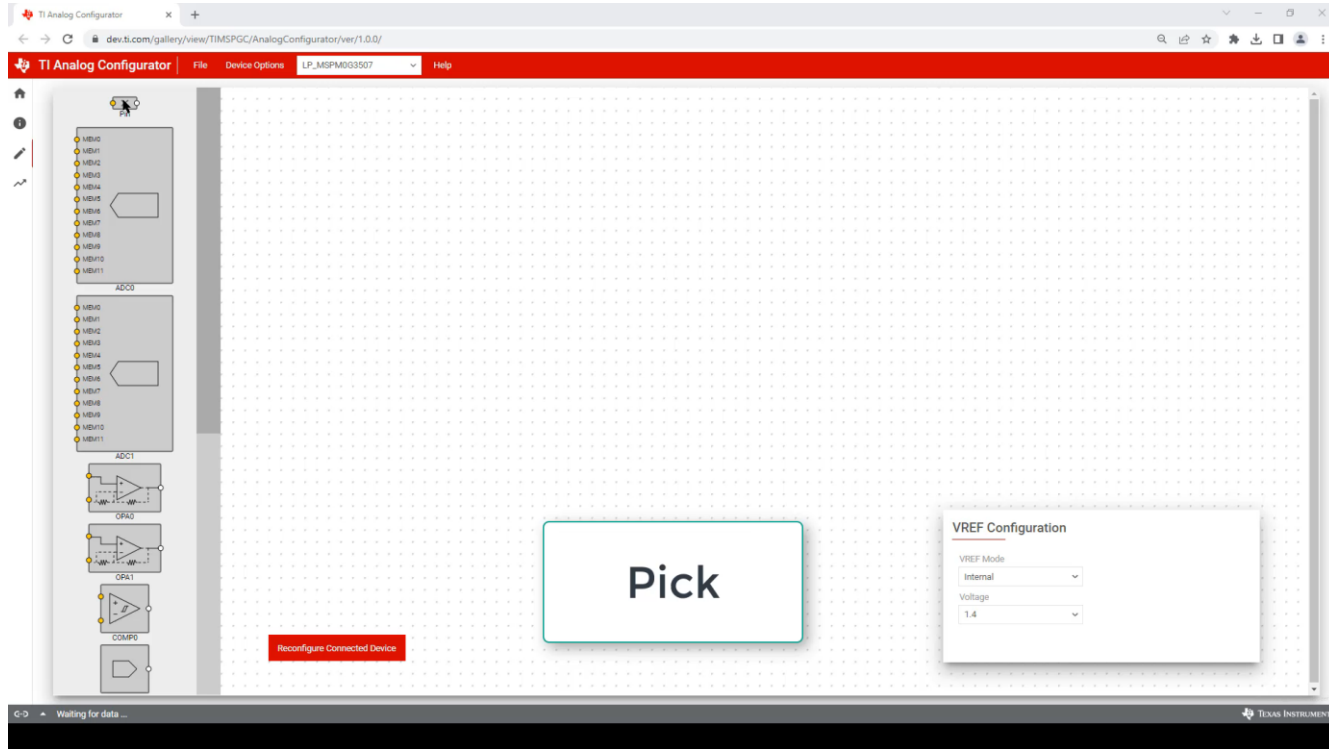
# Analog Configurator

*Analog configuration for analog engineers*

- Schematic style configuration of MSPM0 analog peripherals
- Create complex analog signal chains inside the device
- Flash the configuration directly to a LaunchPad for bench work
- Use built-in plotting features to observe signal acquisition
- Save configuration as a .syscfg file for use in your project



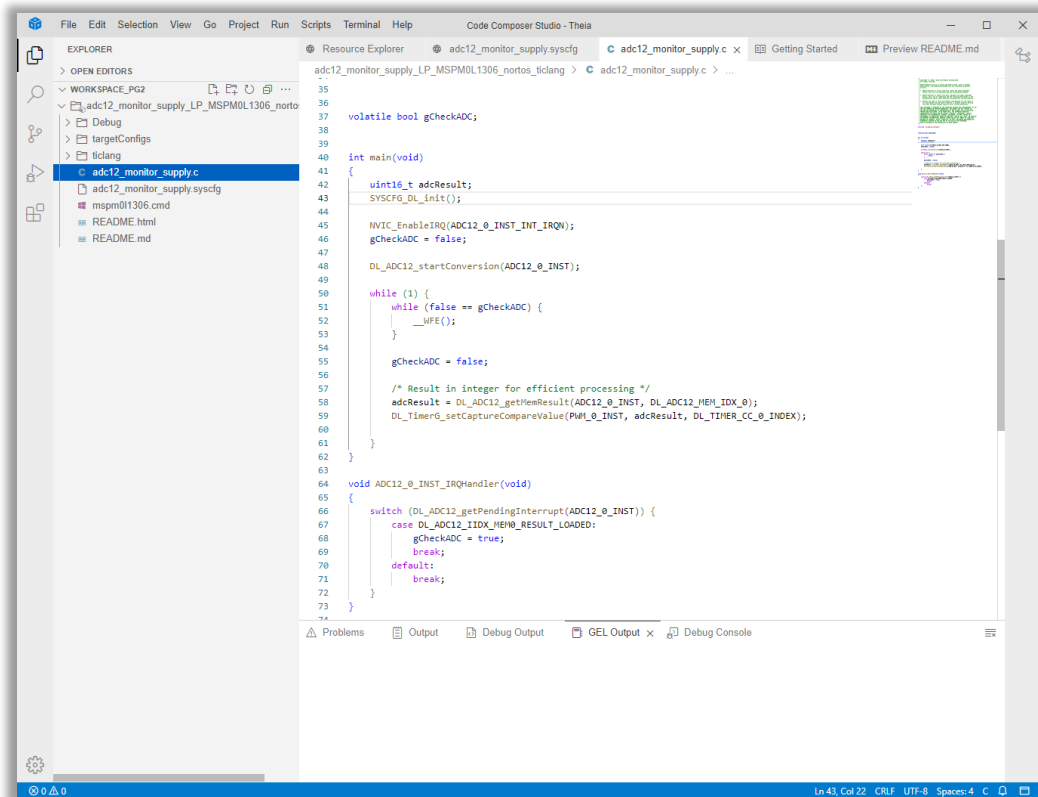
# Analog Configurator



# CCS Theia

*The future of code composer studio*

- CCS Theia embraces many of the design decisions of VSCode
- High performance, modern experience
- Available on ti.com and as a standalone desktop application
- Support for Open VSX extensions for full customization



# MSPM0 subsystems

*Building blocks for microcontroller systems*

- **Goal: Create content to solve common MCU design challenges**
- MSPM0 Subsystem = Specific functionality that MSPM0 can provide, such as:
  - ADC to SPI
  - FIR low pass filtering
  - Power sequencer
  - 1-wire emulation
  - + Many more...
- MSPM0 Subsystem  $\neq$  Full reference design
  - Subsystems are designed to be combined to create something akin to a full design

## MSPM0 Subsystem Format

Peripheral 1

Peripheral 2

Peripheral 3

Documentation



Source code



# Low cost ADC to SPI, I2C, UART

## Using low cost MSPM0

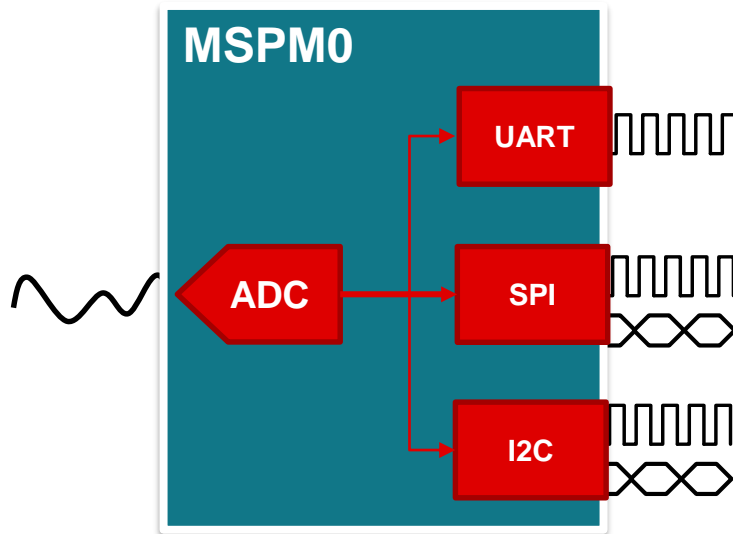
Available now!

### Functions

- Samples analog signals with ADC
- Sends ADC result through desired communication interface (SPI, I2C, UART)

### Advantages

- Reduce size of your PCB by using the MSPM0's internal ADC and send through SPI, I2C and/or UART.
- Can pre-process the ADC data before sending to another device.
- Can send through any included communication interface for flexibility





# Power sequencer and voltage supervisor

## Using low cost MSPM0

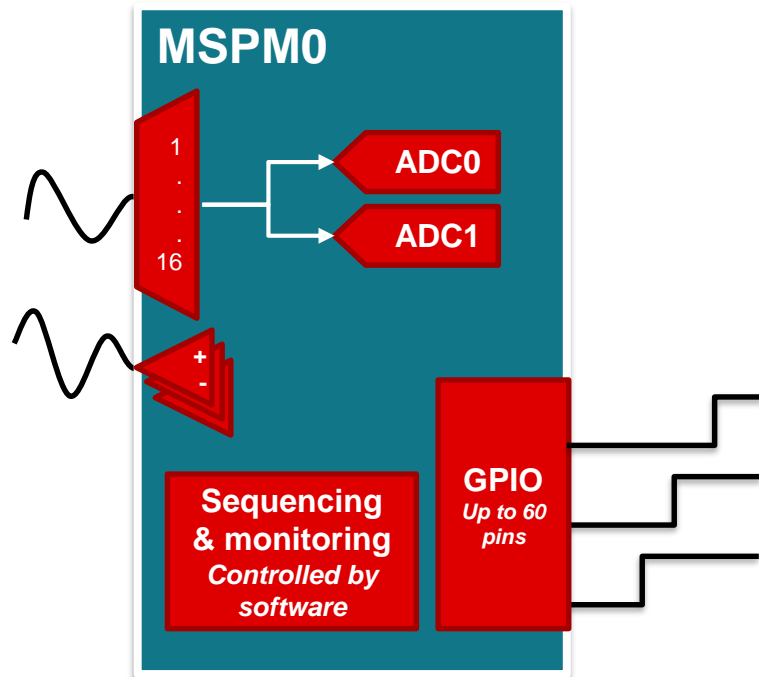
Coming soon

### Functions

- Sequences power enables to correctly start system from power down.
- Acts as voltage supervisor to ensure proper system operation

### Advantages

- 200us cold boot time gets system started quickly
- Precise, cycle-by-cycle control of GPIO timing
- Up to 16 ADC input channels for voltage monitoring
- 3x comparators for high speed fault detection and reaction



# Digital FIR Filter

## Using high performance MSPM0

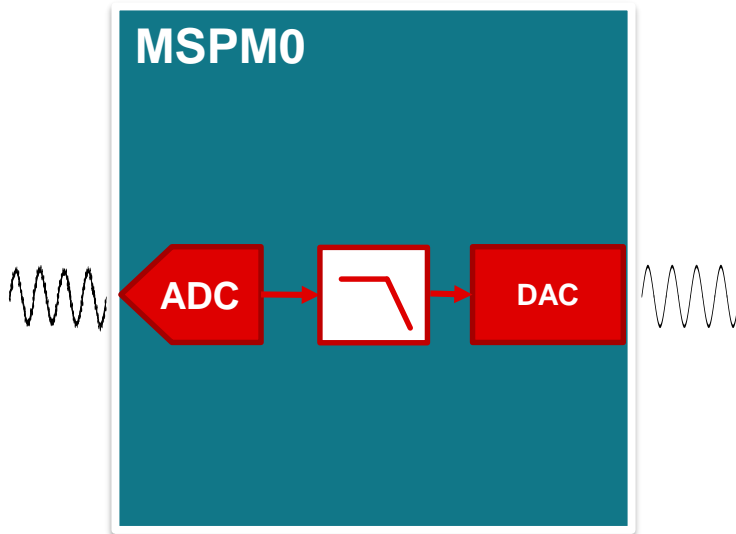
Coming soon

### Functions

- Samples analog signals with ADC
- Applies digital FIR Filter as signal is received.
- Filtered signal is output via DAC, or used internally.

### Advantages

- Use the MSPM0 internal Math Accelerator to improve performance of required multiply and accumulate tasks.
- Improve SNR without any additional external components
- Adjust filter parameters such as cutoff frequency and filter order on the fly.



# 1-wire target emulation

## With MSPM0

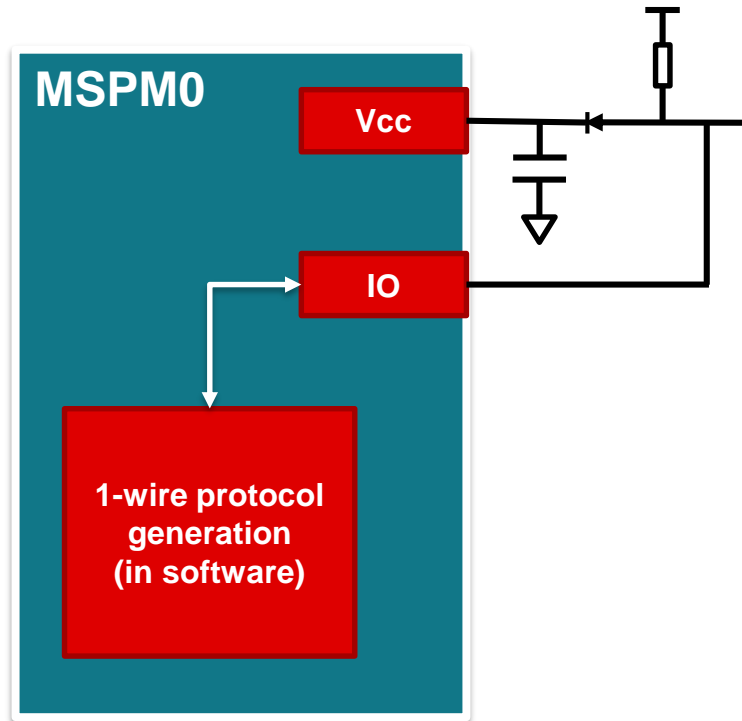
Coming soon

### Functions

- Emulate 1-wire interface

### Advantages

- Open drain IO enables communication at voltages up to 5V
- Low power MSPM0 can be parasitically powered via 1-wire bus
- Software flexibility can emulate many different discrete 1-wire devices
- Support for 1-wire overdrive speeds
- Easily emulate legacy 1-wire EEPROM devices with MSPM0 EEPROM SW library



# MSPM0 MCUs | More options. Unlimited possibilities.

The most comprehensive portfolio of Arm® Cortex® M0+ microcontrollers that delivers the sensing and processing features you need



## Cost optimized

- Leveraging recent capacity and cost investments
- Industry's smallest packages enable the smallest PCB designs
- High performance integrated analog to reduce BOM cost



## Scalable

- 32/80MHz, 8-128 kB flash, 16-64 pins, and scalable analog
- Pin to pin compatible across wide range of memory & analog options
- 105C, 125C, and AEC- Q100 automotive options



## Simple to use

- Fast, fully graphical device configuration with code generation
- Code size optimized drivers (1/3rd the size of competitors)
- Plug-and-play subsystems, code examples, and reference designs

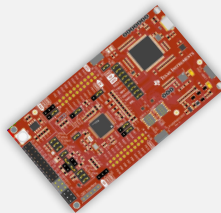
# MSPM0 software and tools ecosystem

*Rapidly develop with low-cost MSPM0 microcontrollers*



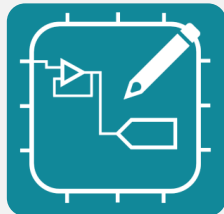
## MSPM0 SDK

*Software, tools, and documentation to accelerate product development*



## MSPM0 LaunchPad

*An unconstrained prototyping platform*



## SysConfig & Analog Configurator

*Intuitive graphical configuration and code generation*



## CCS Theia

*A modern, high performance integrated development environment*



© Copyright 2023 Texas Instruments Incorporated. All rights reserved.

This material is provided strictly “as-is,” for informational purposes only, and without any warranty.  
Use of this material is subject to TI’s **Terms of Use**, viewable at [TI.com](https://www.ti.com)

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2023, Texas Instruments Incorporated