

# New Product Update

Discover TI's new MSPM0 MCUs designed to be low power, low cost for all automotive applications

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# Agenda

- Portfolio introduction and features
- L-series and G-series M0+ MCUs
- Getting started with development

Please feel free to use the “Q&A” function for any questions you have throughout this presentation.

# MSPM0 MCUs | More options. Unlimited possibilities.

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

 <b>Cost optimized</b>	<ul style="list-style-type: none"><li>• Leveraging TI's recent capacity and cost investments</li><li>• Industry's smallest packages enable the smallest PCB designs</li><li>• High performance integrated analog to reduce BOM cost</li></ul>
 <b>Scalable</b>	<ul style="list-style-type: none"><li>• 32/80 MHz, 16-128 kB flash, 16-64 pins, and scalable analog</li><li>• Plug-and-play subsystems, code examples, and reference designs</li><li>• Pin to pin compatible across wide range of memory &amp; analog options</li><li>• 105° C, 125° C, and AEC-Q100 automotive options</li></ul>
 <b>Automotive ready</b>	<ul style="list-style-type: none"><li>• CAN and LIN Libraries, optimized drivers with CAN Middleware</li><li>• TI-Clang compiler qualified for ISO-26262</li><li>• Bootcode for ASPICE Level 3</li><li>• Support for IAR, KEIL and 3<sup>rd</sup> party stacks</li><li>• Grounds up automotive Q100. Evita Lite Compatible.</li></ul>



# MSPM0 MCUs | Portfolio features

## MSPM0 Mixed-Signal MCUs

**Arm Cortex-M0+ CPU**  
**32 or 80 MHz** at less than 96  $\mu\text{A}/\text{MHz}$   
Up to **174** CoreMark / **76** MIPS  
Optional hardware **DIV/SQRT/TRIG/MAC**

**Compute**



**Sense**



**Up to 4-Msps, 12-bit SAR ADCs**  
Zero-drift **chopper** op-amps with **PGA**  
High-speed / ultra-low power comparators

**16- to 128-kB** flash memory (optional **ECC**)  
**4- to 32-kB** SRAM

**Memory**



**Control**



Advanced **control** timers  
General purpose & **low power** timers  
**12-bit 1-Msps** buffered DAC, 8-bit ref DAC

**SOT, VSSOP, QFN, QFP**  
**16 to 64 pins** with **pin-to-pin** compatibility

**Package**



**Connect**



**UART (LIN), I2C (FM+), SPI, and CAN-FD,**  
**AES (128/256), TRNG, CRC 16/32**

1.62-3.6 V  
<200- $\mu\text{s}$  cold boot  
time

1- $\mu\text{A}$  standby  
with retention

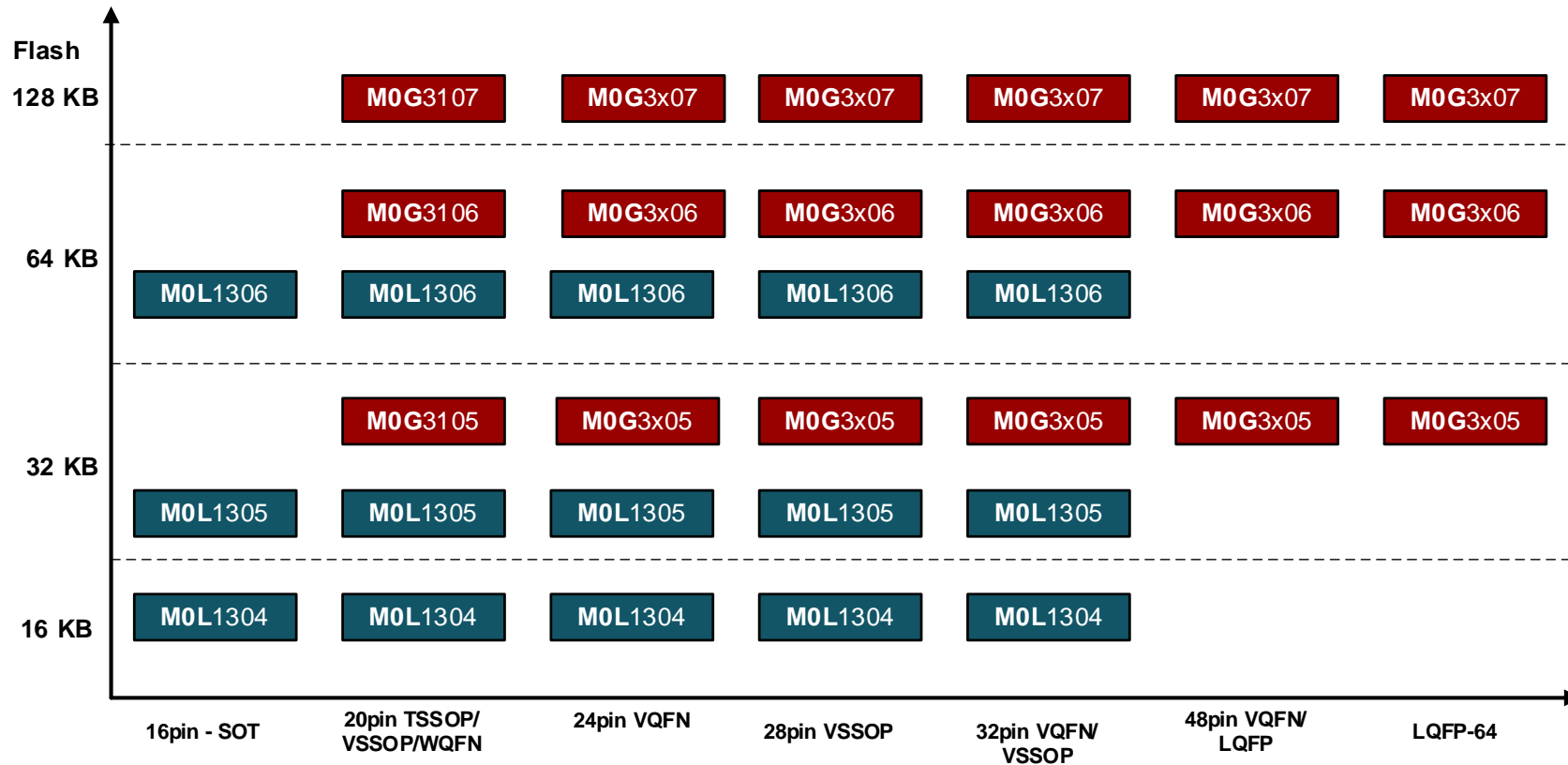
$\pm 1\%$  on-chip HF  
oscillator

-40 to 125C  
temperature range

AEC-Q100 grade 1  
automotive

Easy-to-use platform with a common software development kit and pin-to-pin compatibility in common packages

# MSPM0 automotive MCUs | Broad scalability



**Pin-to-pin**  
Hardware and software  
compatible

**80 MHz**

**G-series MCUs**

**M0G310x**

Dual 12-bit ADCs  
CAN-FD, LIN  
AES + TRNG

**M0G350x**

Dual 12-bit ADCs  
3x comparators  
2x op-amps  
12-bit DAC  
CAN-FD, LIN  
AES + TRNG  
Math accelerator

**32 MHz**

**L-series MCUs**

**M0L130x**

12-bit ADC  
Comparator  
2x op-amps  
LIN

See more at [ti.com/mspm0](https://ti.com/mspm0)

# MSPM0 | Reducing your system cost

AEC-Q100 Grade 1  
FS-QM

## TI's advanced technology with Flash

### M0L1304QDYRQ1

→ Sense and communicate temperature information

- LIN support
- 1.68MSPS 11.2-ENOB ADC for efficient and accurate temperature sampling
- Low cost and good supply



Power Tailgate

### M0G3507QPMRQ1

→ Control motor to open or close the tailgate

- CAN-FD support, low power advantage with 1.5µA standby current
- Hardware math accelerator for easier motor control
- Good long-term price strategy and self-controlled supply chain



OBC

### M0L1304QDYRQ1

→ detect signals from charging gun and wake up host MCU accordingly

- Low cost
- Low power: 1µA standby current
- High flexibility: MCU solution suitable for different wake-up requests

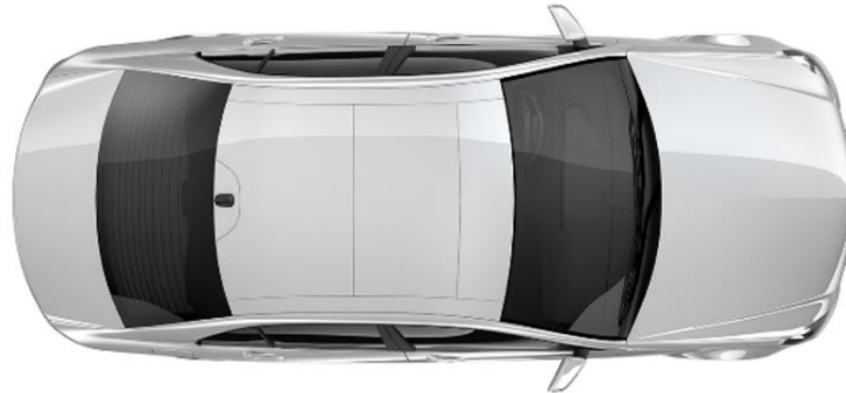
## Smaller packages



Seat Heater



Rotatable Display



Sunroof / Smart Glass

## Advanced analog integration

### M0G3507QPMRQ1

→ Control motor to rotate the display screen

- Great specs for sensor-less FOC motor control: 80MHz high frequency, hardware math accelerator and advanced timers with dead band
- Low cost

#### Debug security

Password auth debug

Password auth BSL

Full SWD disable

TI FA flow disable option

Lockable config data

#### Standards

EVITA-Light

#### Crypto acceleration

TRNG

Basic AES accelerator

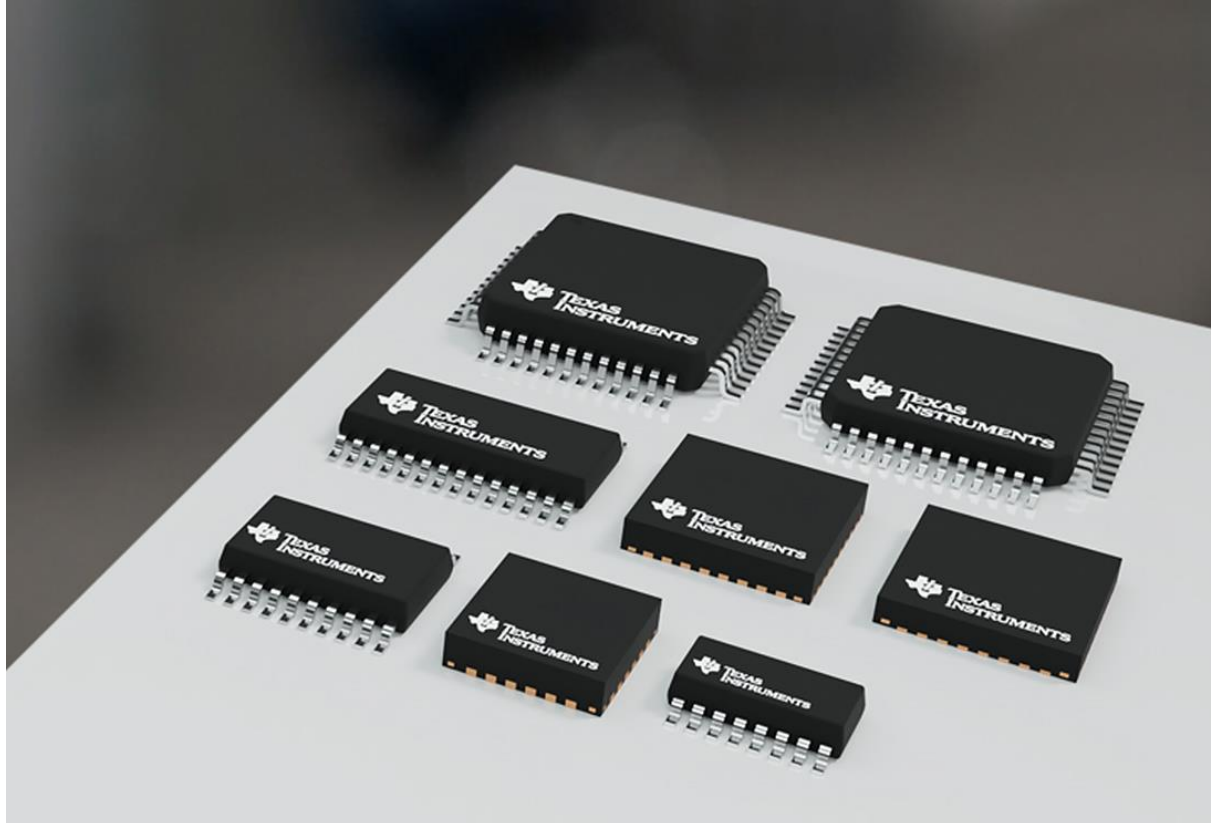
#### Secure boot

### M0G3x0xQ

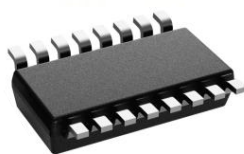
→ Control motor to open or close the sunroof / Control transparency smartly

- 80MHz high frequency & CAN-FD support
- Dual 4MSPS 11.2-ENOB ADCs: sample different analog signals in parallel with high efficiency
- Various low-cost package options: From 20 pins to 64 pins, leaded & no-lead

# MSPM0 MCUs | Scalable small packages



Competing MCUs  
SOIC (8-pin)  
29.4mm<sup>2</sup>



TI MSPM0 MCUs  
SOT (16-pin)  
13.4mm<sup>2</sup>

# 7

Pin to pin compatible  
packages

**2x pins, 1/2 space**  
16-pins SOT vs. 8-pins SOIC

## Low cost

SOT, VSSOP, VQFN, LQFP packaging  
technologies

# MSPM0 L-Series microcontrollers

## MSPM0L13x3/4/5/6

1.62 - 3.6V  
-40 to 125 C

**CPU**  
**ARM Cortex-M0+**  
**32 MHz**

NVIC / 3-ch DMA

### On-chip Memory

8, 16, 32 or 64 kB flash

2 or 4 kB SRAM

### Data Integrity & Security

CRC accelerator (16 and 32 bit)

### Programming & Debug

ARM SWD interface

UART & I2C bootloader

### Power & Clocking

POR / BOR / SVS

Internal LF 32kHz (3%)

Internal HF 4-32MHz (1%)

### Communication

UART w/ LIN (1)

UART (1)

SPI (1)

I2C (2) w/ FastMode+

### IO

Up to 28 GPIO

Up to 2 low Ib OPA inputs

### Precision Analog

12-bit SAR ADC 1.68-Msps (10-ch)

Comparator w/ 8-bit DAC

Zero-drift chopper op-amps (2)

General purpose amp

Internal ADC reference (1.5%)

Temperature sensor

### Timers

Low power 16-bit 2 CC (4)

Windowed watchdog

Leaded packages: SOT-16, VSSOP-20/28  
No-lead packages: WQFN-16, VQFN-24/32

**< \$0.460**  
starting at 1 kU

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

**1  $\mu\text{A}$**   
Typical standby current



# MSPM0 MCUs | Get more accuracy out of your sensors

**7x**

Reduction in input  
offset voltage error

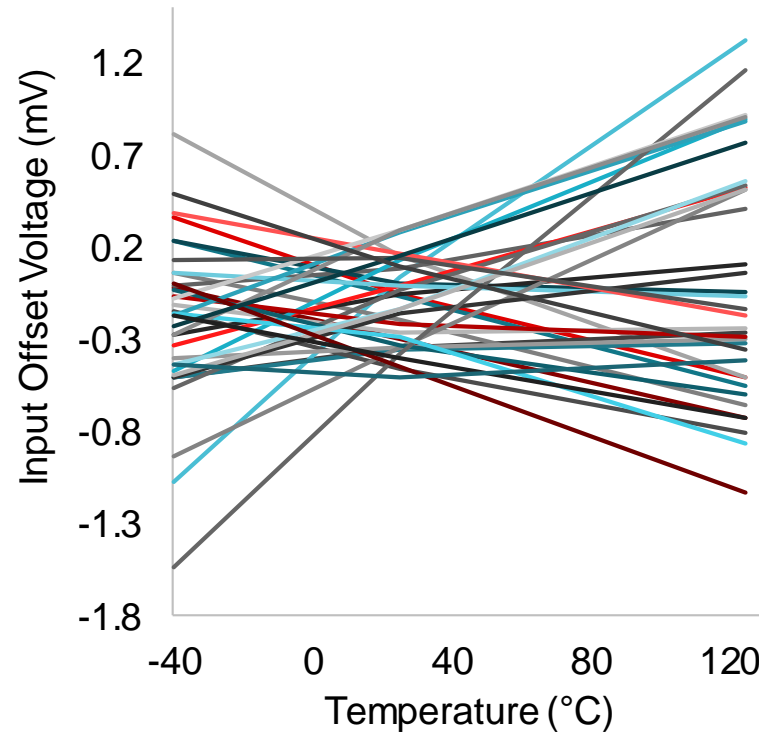
**Zero**

Crossover distortion

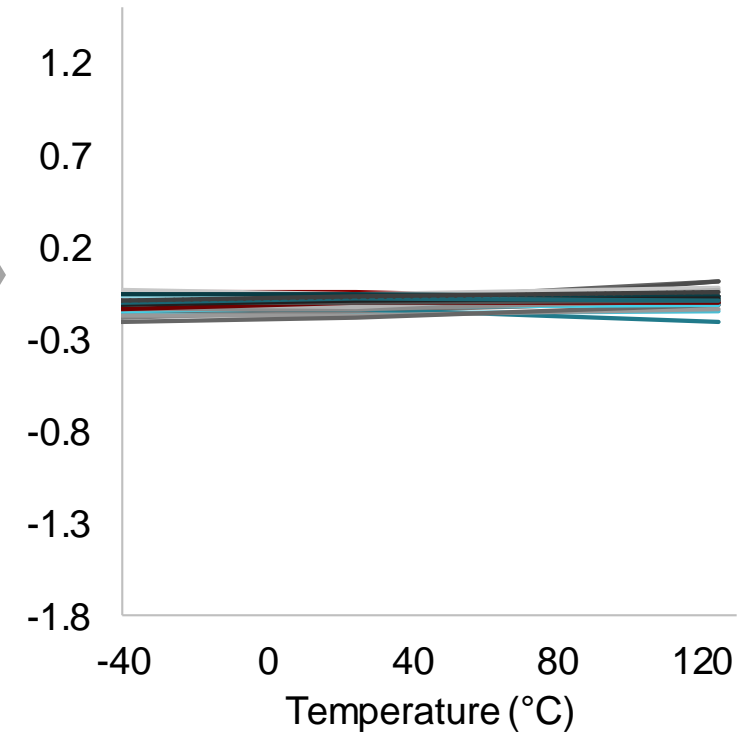
**<150 pA**

Available ultra-low input  
bias current

Input Offset vs. Temperature  
No Chopping  
( $\pm 2\text{mV}$  max)



Input Offset vs. Temperature  
With Chopping  
( $\pm 300\mu\text{V}$  max)



# MSPM0 G-Series microcontrollers

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

## Dual 4 Msps

12- bit ADCs with 14 bit oversampling

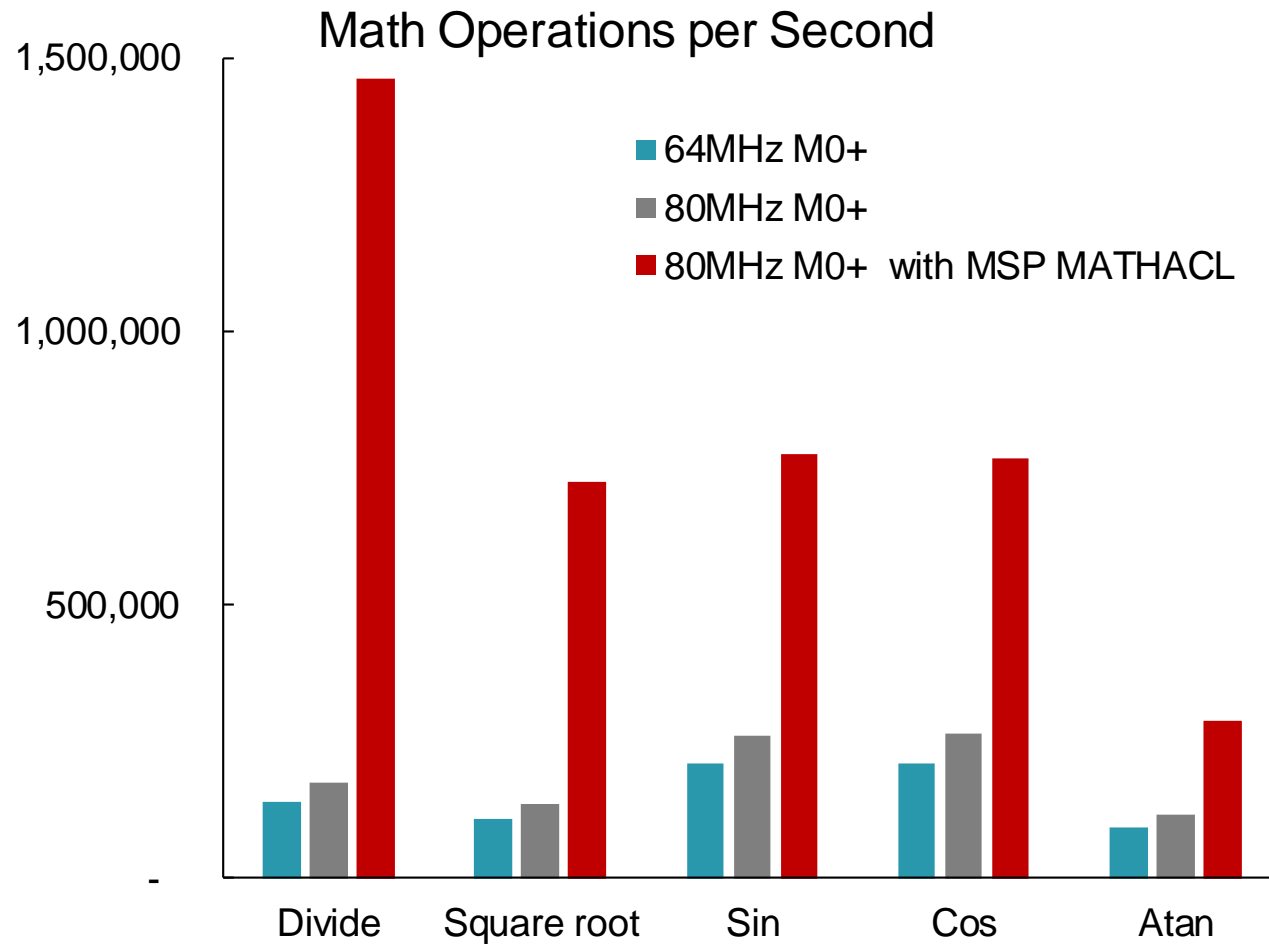
## 3X lower latency

In field oriented motor control loops

## 5Mbit/s

CAN2.0A, CAN2.0B, or CAN-FD in  
20pin

# MSPM0 MCUs | Reduce your real-time loop latency



**3x**

Lower loop latency in  
field-oriented motor control

**6x**

More square root operations per  
second

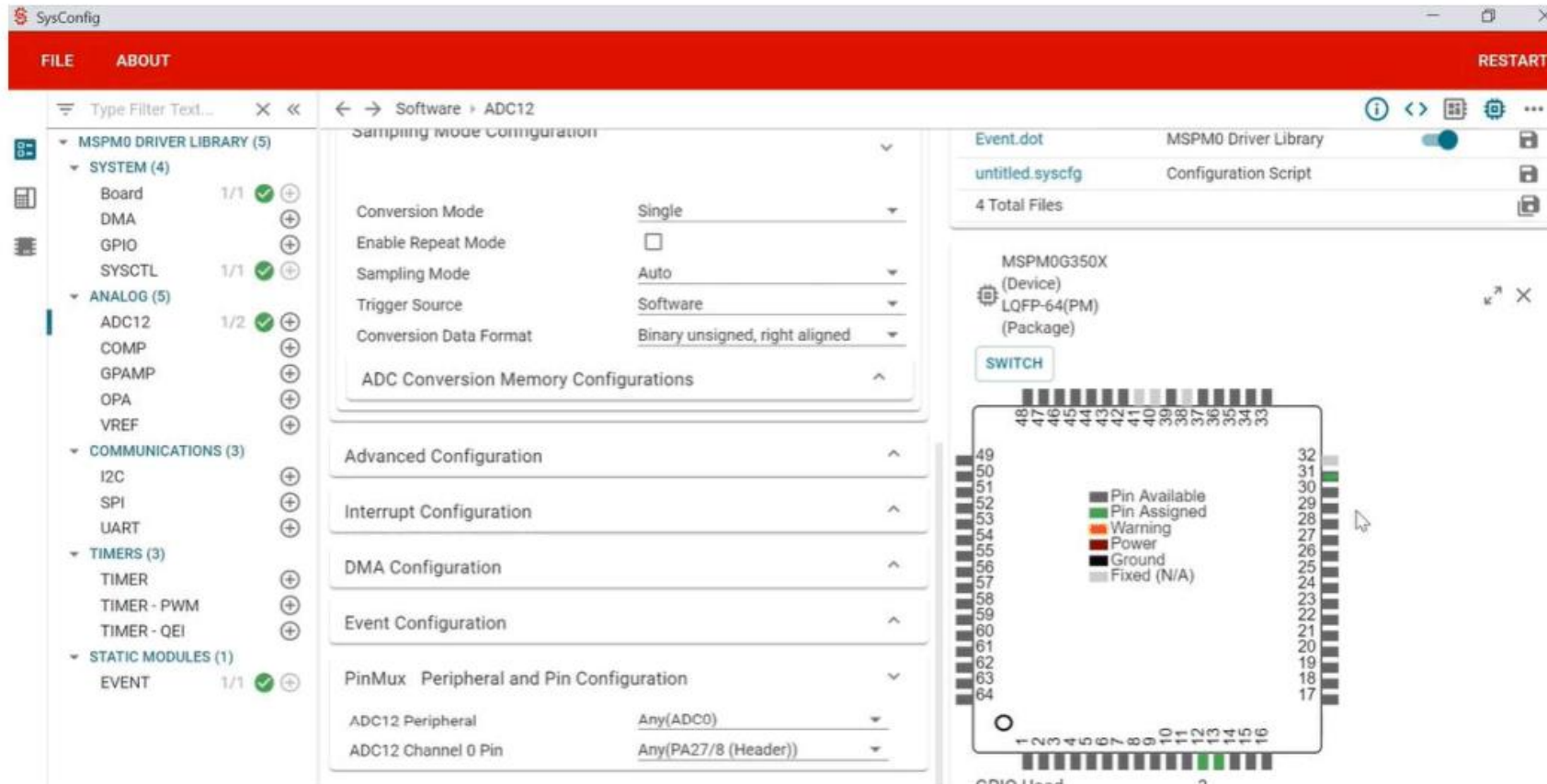
**10x**

More divide operations per  
second

# MSPM0 MCUs | Simple, fast development

## Graphical Configuration Tool – SysConfig

Rapidly prototype with  
a live demo today!

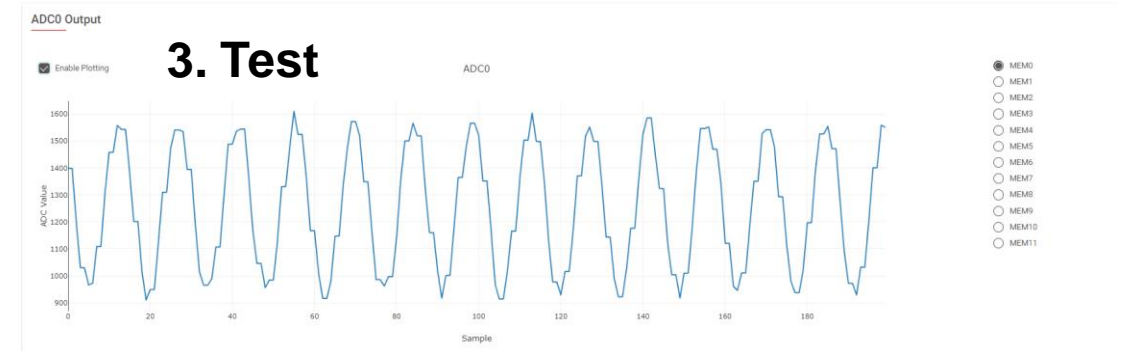
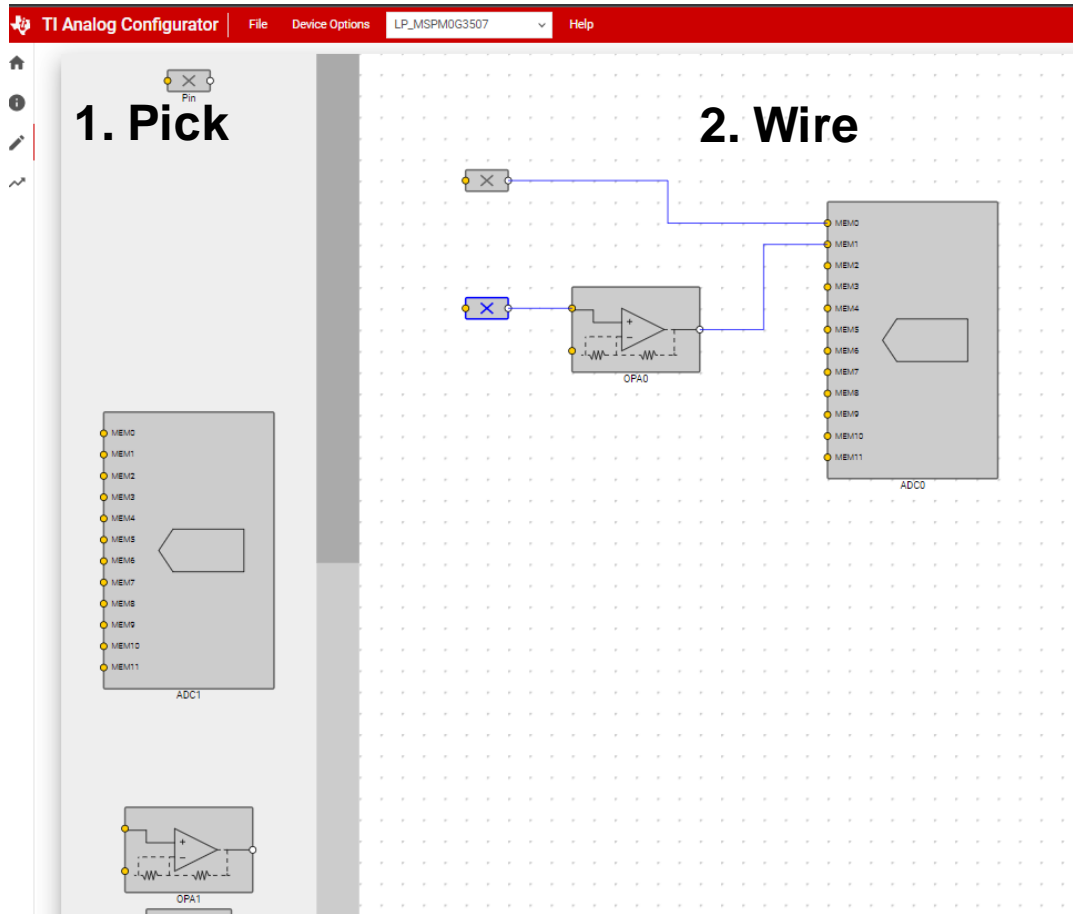


Peripheral initialization  
Automatic pin mux resolution  
Clock tree configuration  
Power estimation

# MSPM0 MCUs | Simple, fast development

Rapidly prototype with  
a live demo today!

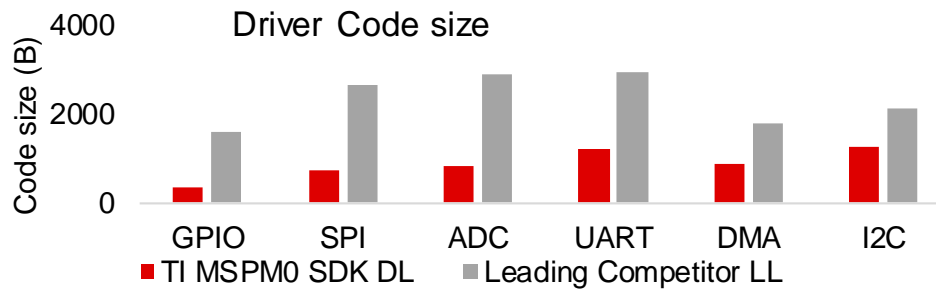
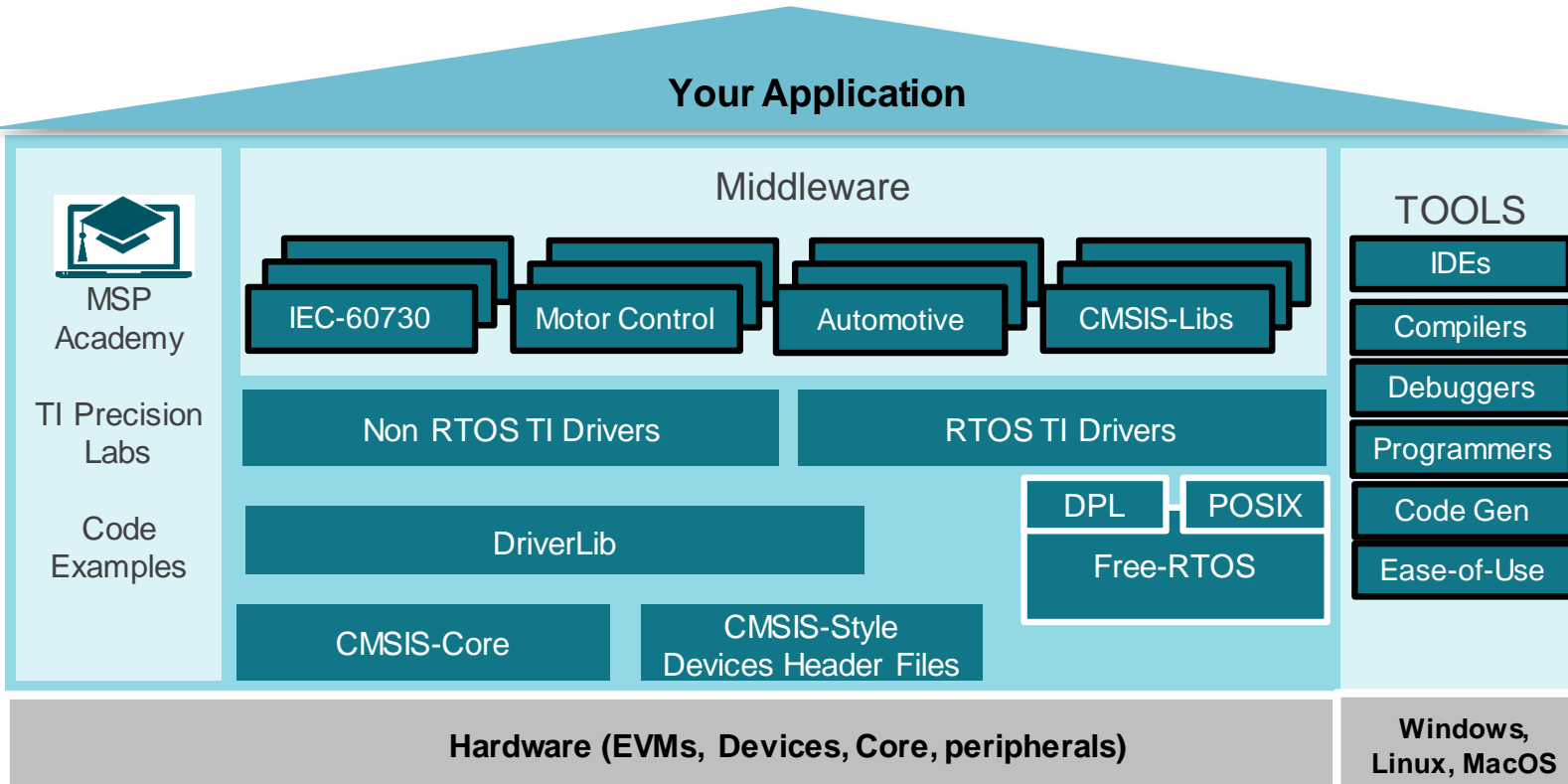
## Analog Configurator



With just a few clicks, users can visualize  
their signal chain, make modifications to it,  
and view real-time data for evaluation.



# MSPM0 MCUs | Optimized software



## Rapid prototyping tools



Launchpads  
Available  
Today!



3P Tools

# Getting started

You can start evaluating this device leveraging the following:

Content type	Content title	Link to content or more details
Portfolio overview	Overview page for MSPM0 MCUs	<a href="#">MSPM0 overview page</a>
Software	MSPM0 software development kit (SDK)	<a href="#">MSPM0-SDK</a>
Technical blog content or white paper	How Arm Cortex-M0+ MCUs optimize general-purpose processing, sensing and control	<a href="#">Technical article</a>
Selection and design tools and models	MSPM0 MCU product selection tool	<a href="#">Product selection tool</a>
Application Brief/Blog	Optimize Automotive Body Electronics Designs With AEC-Q100 MSPM0 MCUs	<a href="#">MSPM0 in Body Electronic and Lighting systems</a>
Customer training series or webinar session	MSPM0 Academy Training	<a href="#">MSPM0 Academy</a>

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