

# MSPM0 ADC module introduction

— MSPM0 peripheral training series

Prepared by Yuhao Zhao

# MCU level overview

## —MSPM0Lxx series

### MSPM0L13x3/4/5/6

<b>CPU</b> <b>ARM Cortex-M0+</b> <b>32 MHz</b>	<b>Power &amp; Clocking</b>	<b>Precision Analog</b>
NVIC / 3-ch DMA	POR / BOR / SVS	12-bit SAR ADC 1.68-Msps (10-ch)
<b>On-chip Memory</b>	Internal LF 32kHz (3%)	Comparator w/ 8-bit DAC
8, 16, 32 or 64 kB flash	Internal HF 4-32MHz (1%)	Zero-drift chopper op-amps (2)
2 or 4 kB SRAM	<b>Communication</b>	General purpose amp
<b>Data Integrity &amp; Security</b>	UART w/ LIN (1)	Internal ADC reference (1.5%)
CRC accelerator (16 and 32 bit)	UART (1)	Temperature sensor
<b>Programming &amp; Debug</b>	SPI (1)	<b>Timers</b>
ARM SWD interface	I2C (2) w/ FastMode+	Low power 16-bit 2 CC (4)
UART & I2C bootloader	<b>IO</b>	Windowed watchdog
	Up to 28 GPIO	
	Up to 2 low Ib OPA inputs	

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

1.62 - 3.6V  
-40 to 125 C

*32 MHz MCU with up to 64kB flash, 32 pins, 12-bit ADC, dual zero-drift OPA/PGA, COMP*

## —MSPM0Gxx series

### MSPM0G350x/310x/150x/110x

<b>CPU</b> <b>Arm Cortex-M0+</b> <b>80 MHz</b>	<b>Power &amp; Clocking</b>	<b>Precision Analog</b>
NVIC / MPU / 7-ch DMA	POR / BOR / SVS	12-bit ADC 4Msps (9-ch)
<b>Accelerators</b>	External LF 32kHz XTAL	12-bit ADC 4Msps (8-ch)
Math (DIV, SQRT, TRIG, MAC)	External HF 4-48MHz XTAL	Comparators w/ 8-bit DACs (3)
<b>On-chip Memory</b>	Internal LF 32kHz (3%)	12-bit 1Msps buffered DAC (1)
32, 64, or 128 kB flash [ECC]	Internal HF 4-32MHz (1%)	Zero-drift chopper op-amps (2)
16 or 32 kB SRAM [ECC]	PLL (up to 80 MHz)	Internal reference (1.5%)
<b>Data Integrity &amp; Security</b>	<b>Communication</b>	General purpose amp (1)
CRC accelerator (16 and 32 bit)	UART w/ LIN (1)	Temperature sensor
AES256 accelerator + TRNG	UART (3)	<b>Timers</b>
<b>Programming &amp; Debug</b>	SPI (2)	Advanced control 16-bit 4 CC (1)
ARM SWD interface	I2C (2) w/ FastMode+	Advanced control 16-bit 2 CC (1)
UART & I2C bootloader	CAN-FD (1)	General purpose 32-bit 2 CC (1)
	<b>IO</b>	General purpose 16-bit 2 CC (2)
	Up to 60 GPIO	Low power 16-bit 2 CC (2)
		Windowed watchdog (2)
		Real-time clock (1)

Leaded packages: VSSOP-20/28, LQFP-48/64  
No-lead packages: VQFN-24/32/48, nFBGA-64, WCSP-28

1.62 - 3.6V  
-40 to 125 C

*80 MHz MCU with up to 128kB flash, 64 pins, advanced analog, AES/TRNG, CAN-FD*

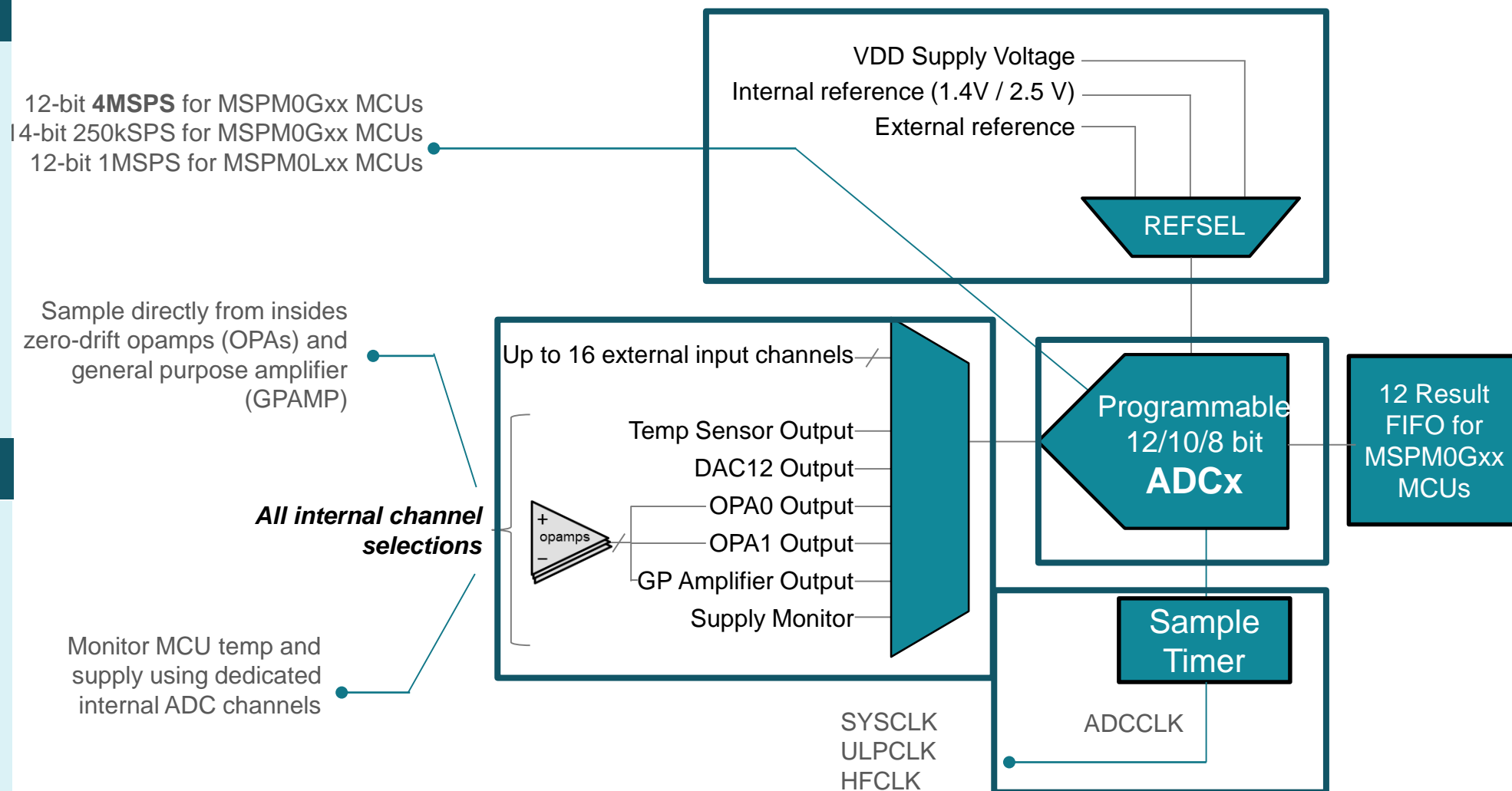
# MSPM0 ADC module introduction

## Key Features

- **12-bit** resolution ADC
- 14-bit 250ksps with **H/W oversampling**
- **DMA support** with interrupt
- Operates in RUN, SLEEP and STOP **low-power modes**
- Full scale operating range: **1.62V – 3.6V**
- **11.2-bit** ENOB

## Key Differences between G and L MCUs

- MSPM0G350x MCUs have **2 simultaneous ADC modules** and MSPM0L130x MCUs have one ADC module
- The max ADC sampling clock on MSPM0G350x is **48 MHz** ; The MSPM0L130x's ADC CLK has a max sampling speed of **32 MHz**.
- 12-bit **4MSPS** conversion rate on MSPM0G350x MCUs
- **4 ADC FIFOS** on the MSPM0L130x and 12 on the MSPM0G350x



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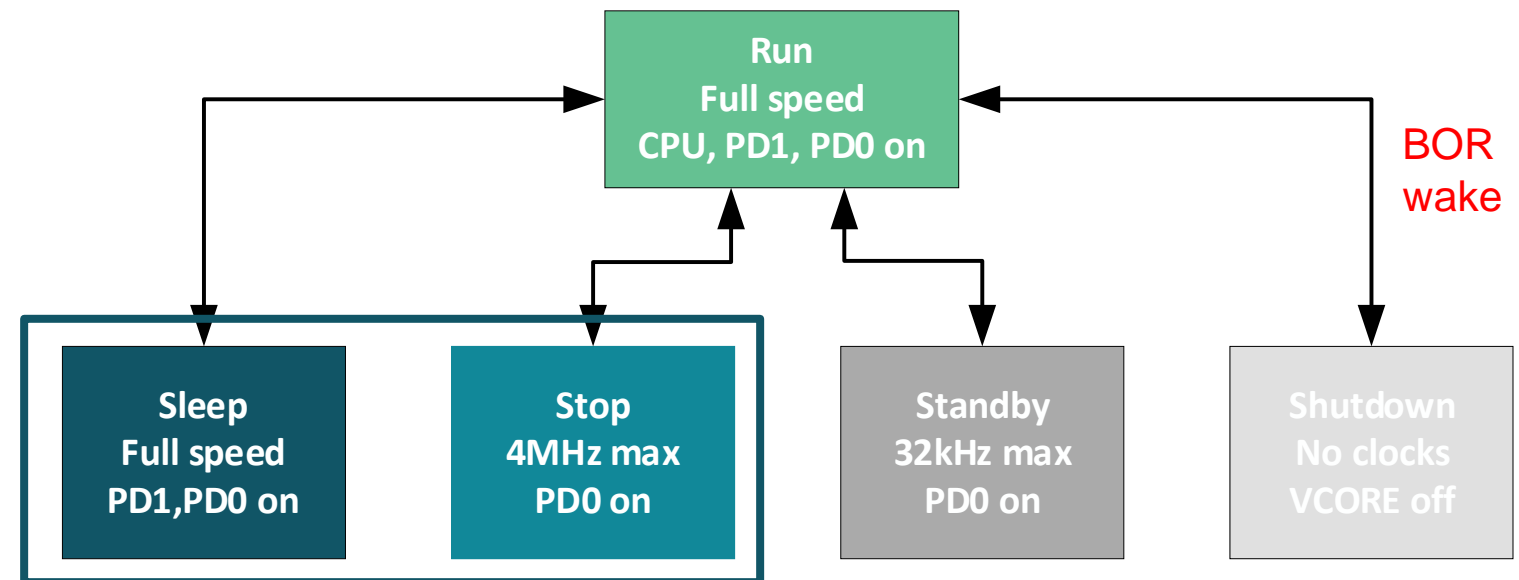
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Operating Mode	RUN			SLEEP			STOP			STANDBY			SHUTDOWN
	RUN0	RUN1	RUN2	SLEEP0	SLEEP1	SLEEP2	STOP0	STOP1	STOP2	STANDBY0	STANDBY1	STANDBY2	
ADC	OPT									NS			OFF
DAC12	OPT									NS			OFF

OPT: The function is optional in the specified mode, and remains enabled if configured to be enabled.

NS: The function is not actively clocked during the specific mode but can be triggered.



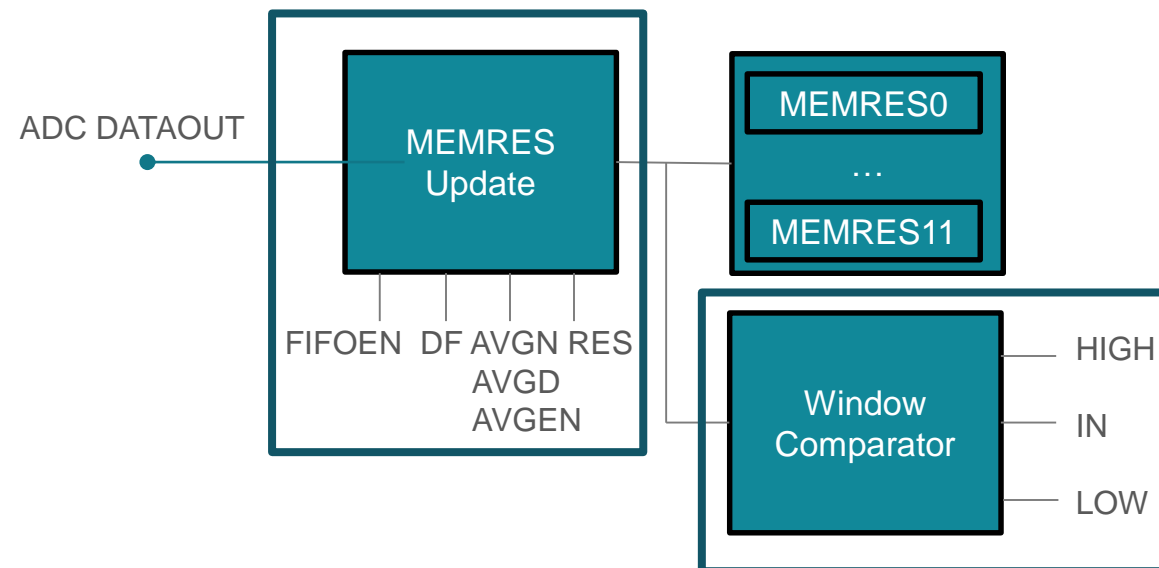
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Bit Field Value	AVGN Settings (number of samples accumulated)	AVGD Settings (number of bits to right shift)
0x0	0	0
0x1	2	1
0x2	4	2
0x3	8	3
0x4	16	4
0x5	32	5
0x6	64	6
0x7	128	7



# ADC module quick start

## Academy

[ADC introduction lab](#)

## Driverlib Examples

### MSPM0G350x:

- adc12\_14bit\_resolution\_250ksps
- adc12\_max\_freq\_dma
- adc12\_max\_freq\_dma\_8bit
- adc12\_monitor\_supply
- adc12\_simultaneous\_trigger\_event
- adc12\_simultaneous\_trigger\_event\_stop
- adc12\_single\_conversion
- adc12\_single\_conversion\_vref\_external
- adc12\_single\_conversion\_vref\_internal
- adc12\_triggered\_by\_timer\_event
- adc12\_triggered\_by\_timer\_event\_stop
- adc12\_window\_comparator

### MSPM0L13xx:

- adc12\_max\_freq\_dma
- adc12\_max\_freq\_dma\_8bit
- adc12\_monitor\_supply
- adc12\_single\_conversion
- adc12\_single\_conversion\_vref\_external
- adc12\_single\_conversion\_vref\_internal
- adc12\_triggered\_by\_timer\_event
- adc12\_triggered\_by\_timer\_event\_stop
- adc12\_window\_comparator

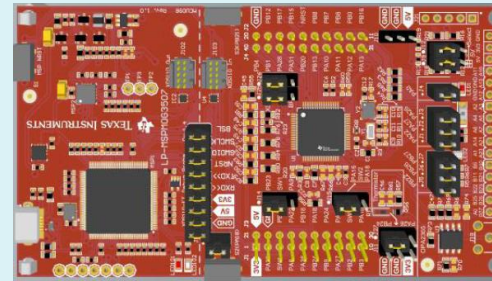
## Related Links

- [MSPM0 online resource](#)
- [MSPM0 quick start guide](#)
- [MSPM0 Sysconfig user's guide](#)

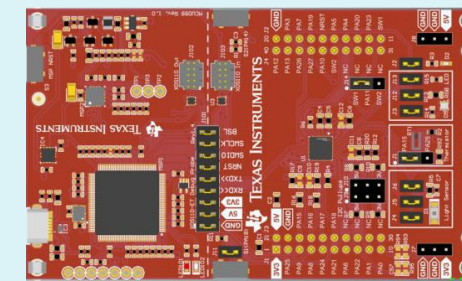
- [MSPM0G350x datasheet](#)
- [MSPM0L13xx datasheet](#)
- [MSPM0Gxx technical reference manual](#)
- [MSPM0Lxx technical reference manual](#)

## Launchpad

[LP-MSPM0G3507](#)



[LP-MSPM0L1306](#)



## Sysconfig Entrance for ADC Setting

The screenshot shows the Sysconfig GUI for configuring the ADC12 module. The left pane shows the 'ANALOG (5)' section with 'ADC12' selected. The right pane shows the 'ADC12 (1 of 2 Added)' list with 'ADC12\_0' checked. Below the list, the 'Quick Profiles' section shows 'Basic Configuration' selected.

# To find more MSPM0 training series, please visit:

- [MSPM0 MCUs](#)
- [MSPM0 SDK](#)
- [MSPM0 Academies](#)