

MSPM0 clock module introduction

— MSPM0 peripheral training series

Presented by Eason Zhou

MCU level overview

—MSPM0Lxx series

MSPM0L13x3/4/5/6

1.62 - 3.6V
-40 to 125 C

| | | | |
|---|--|---|---|
| CPU ARM Cortex-M0+ 32 MHz NVIC / 3-ch DMA | Power & Clocking POR / BOR / SVS Internal LF 32kHz (5%) Internal HF 4-32MHz (1%) | Precision Analog 12-bit SAR ADC 1Msps (1) ULP/HS Comparator (1) 8-bit reference DAC (1) Zero-drift chopper op-amps (2) General purpose amp (1) Internal ADC reference (2.5%) Temperature sensor | Clock Module Internal LF 32kHz (5%) Internal HF 4-32MHz (1%) |
| On-chip Memory 8, 16, 32 or 64 kB flash 2 or 4 kB SRAM | Communication UART w/ LIN (1) UART (1) SPI (1) I2C (2) w/ FastMode+ | Timers General purpose 16-bit 2 CC (4) Windowed watchdog | |
| Data Integrity & Security CRC accelerator (16 and 32 bit) | IO Up to 28 GPIO Up to 2 low Ib OPA inputs | | |
| Programming & Debug ARM SWD interface ROM UART & I2C BSL | | | |

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

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

MSPM0L13xx clock module introduction

Key Features

Internal Oscillators:

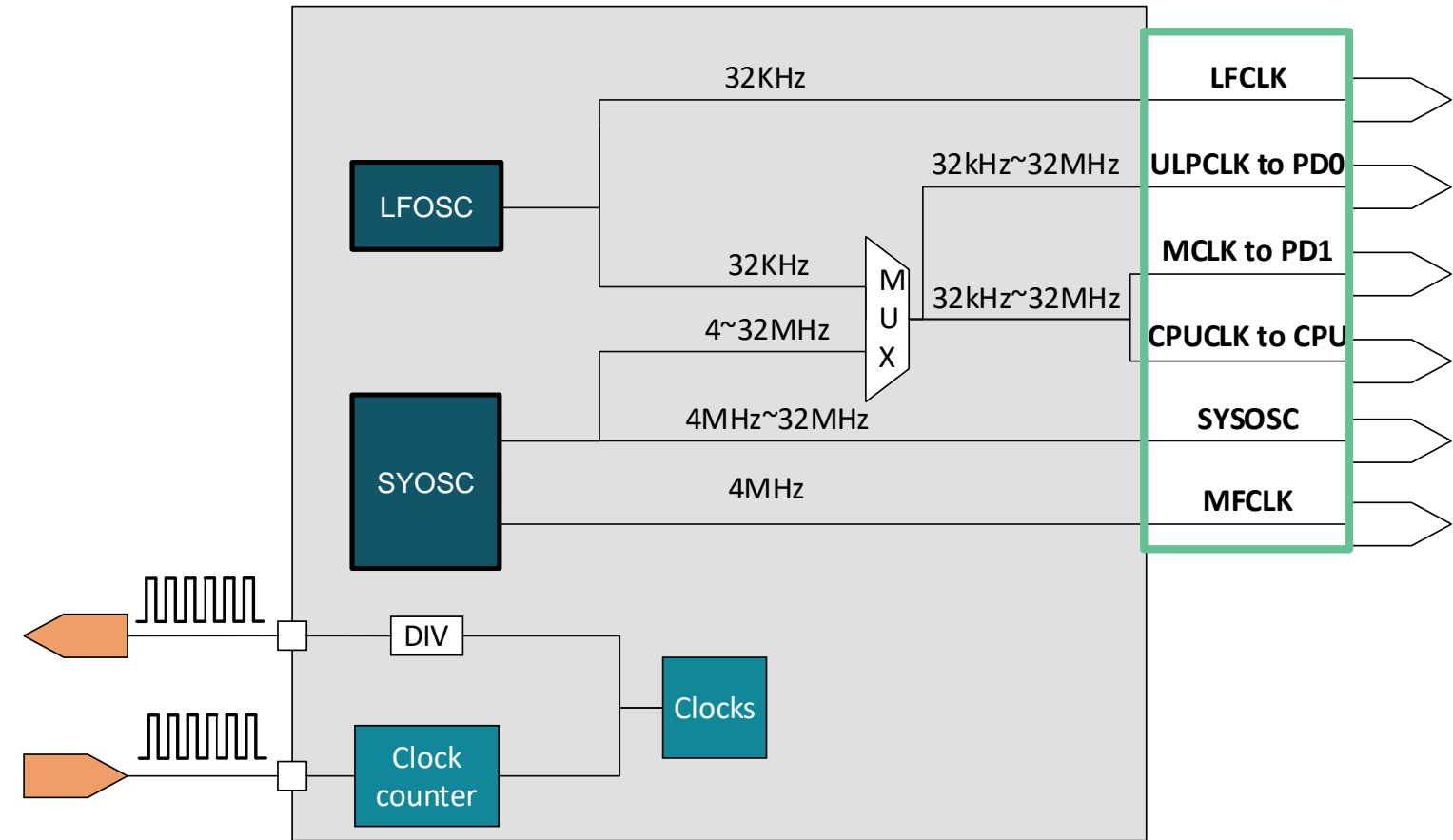
- LFOSC (32kHz)
- SYSOSC (4-32MHz)
 - $\pm 2.5\%$ no correction; $\pm 1\%$ with resistor correction

Clocks:

| Clock Name | Frequency | Source | Direction |
|------------|-------------|---------------|-----------|
| CPUCLK | 32kHz~32MHz | LFCLK, SYSOSC | CPU |
| MCLK | | | PD1 |
| ULPCLK | | | PD0 |
| SYSOSC | 4~32MHz | SYSOSC | PD1/PD0 |
| MFCLK | 4MHz | SYSOSC | PD1/PD0 |
| LFCLK | 32kHz | LFCLK | PD1/PD0 |

Others:

- CLK_OUT
- Clock monitor
- Frequency clock counter



MCU level overview

—MSPM0Gxx series

| MSPM0G350x/310x/150x/110x | | |
|--|--|---|
| 1.62 - 3.6V -40 to 125 C | | |
| CPU Arm Cortex-M0+ 80 MHz NVIC / MPU / 7-ch DMA | Power & Clocking 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) | Precision Analog 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 |
| Accelerators Math (DIV, SQRT, TRIG, MAC) | Communication UART w/ LIN (1) UART (3) SPI (2) I2C (2) w/ FastMode+ CAN-FD (1) | Timers 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) |
| On-chip Memory 32, 64, or 128 kB flash [ECC] 16 or 32 kB SRAM [ECC] | IO Up to 60 GPIO | |
| Data Integrity & Security CRC accelerator (16 and 32 bit) AES256 accelerator + TRNG | | |
| Programming & Debug ARM SWD interface UART & I2C bootloader | | |

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

| Clock Module |
|--------------------------|
| External LF 32kHz XTAL |
| External HF 4-48MHz XTAL |
| Internal LF 32kHz (5%) |
| Internal HF 4-32MHz (1%) |
| PLL (Up to 80MHz) |

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

MSPM0G350x clock module introduction

Key Features

Internal Oscillators:

- LFOSC (32kHz): low frequency oscillator
- SYSOSC (4-32MHz): system oscillator
 - $\pm 2.5\%$ no correction; $\pm 1\%$ with resistor correction
- SYSPLL: System phase locked loop

External Oscillators:

- LFXT(32kHz): low frequency, low power crystal oscillator
- HFXT (4-48MHz): high frequency crystal oscillator

Clocks:

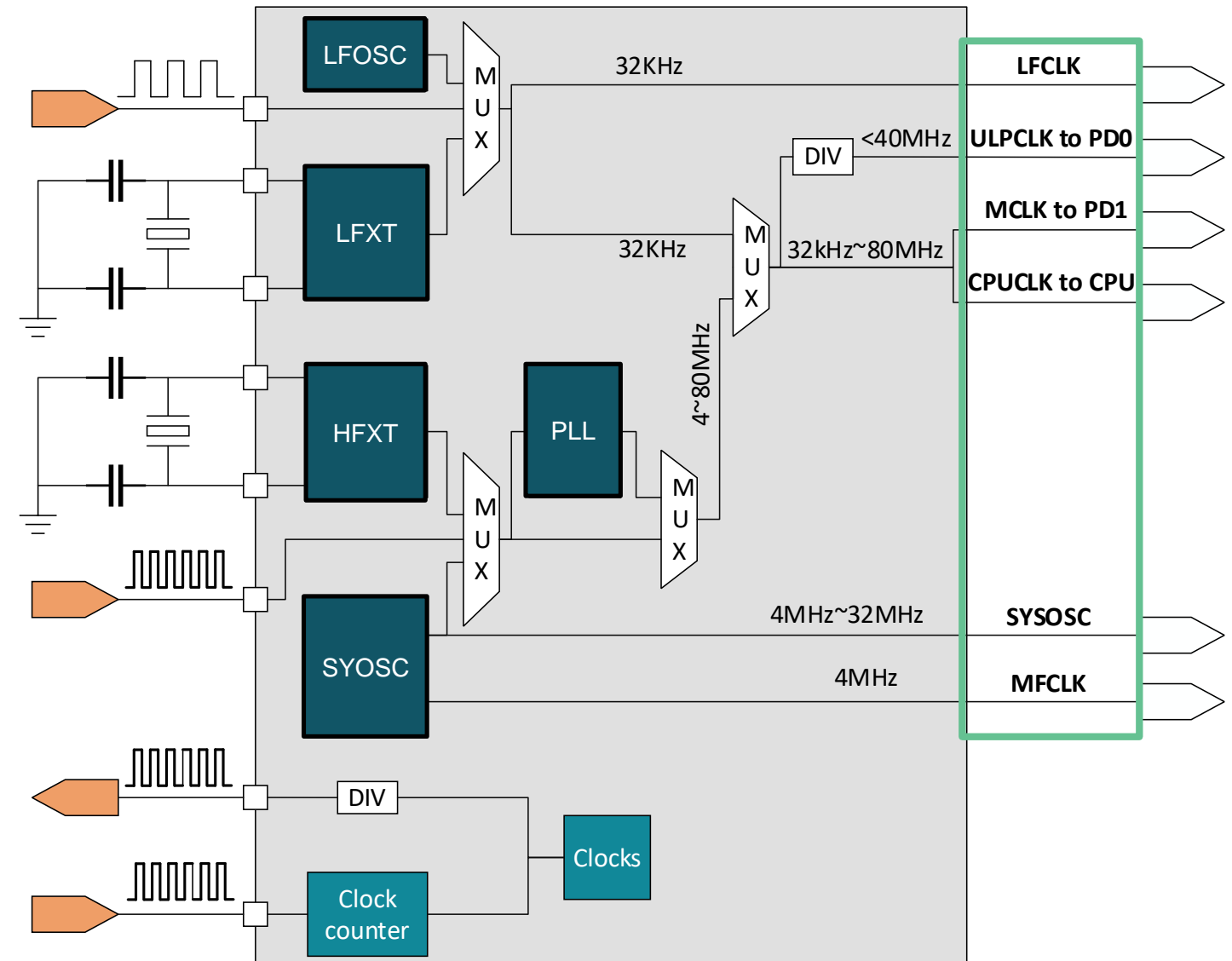
| Clock Name | Frequency | Source | Direction |
|------------|-------------|--------------------------|-----------|
| CPUCLK | 32kHz~80MHz | LFCLK, SYSOSC, HFXT, PLL | CPU |
| MCLK | | | PD1 |
| ULPCLK | | | PD0 |
| SYSOSC | 4~32MHz | SYSOSC | PD1/PD0 |
| MFCLK | 4MHz | SYSOSC | PD1/PD0 |
| LFCLK | 32kHz | LFCLK | PD1/PD0 |

Others:

- CLK_OUT: External clock output with divider
- Clock monitor: Indicate LFCLK, MCLK and oscillators are alive
- Frequency clock counter: Used to calibrate oscillators

Differences Between G and L MCUs

- MSPM0G350x support external crystal



Clock module quick start

Academy

[Clock introduction lab](#)

Driverlib Examples

MSPM0G350x:

- sysctl_frequency_clock_counter
- sysctl_hfxt_run
- sysctl_lfxt_standby
- sysctl_mclk_syspll

MSPM0L13xx:

NA

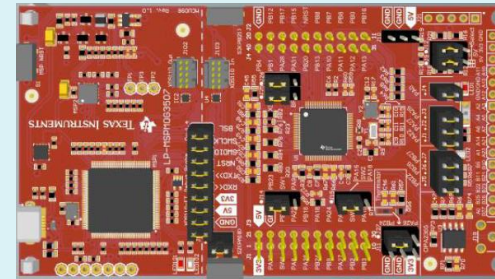
Related Links

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

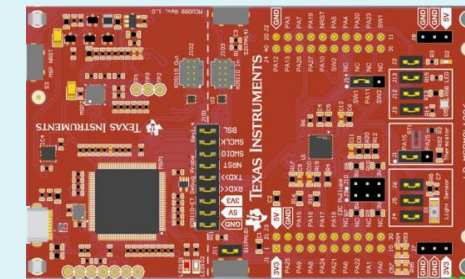
- [MSPM0G350x datasheet](#)
- [MSPM0L13xx datasheet](#)
- [MSPM0Gxx technical reference manual](#)
- [MSPM0Lxx technical reference manual](#)

Launchpad

LP-MSPM0G3507



LP-MSPM0L1306



Sysconfig Entrance for Clock Setting

The screenshot shows the Sysconfig application interface. On the left, a list of modules is displayed with checkboxes and expand/collapse icons. 'SYSCTL' is selected and highlighted with a red box, with the text 'Step 1:' next to it. On the right, the 'SYSCTL' configuration page is shown, with 'Clock Configuration' selected and highlighted with a red box, with the text 'Step 2:' next to it.

| Type | Filter Text... | Count | Status | Action |
|---------------|----------------|-------|--------|--------|
| DMA | | 2/7 | ✓ | + |
| GPIO | | | | + |
| RTC | | | | + |
| SYSCTL | | 1/1 | ✓ | + |
| SYSTICK | | | | + |
| ANALOG (5) | | | | + |
| ADC12 | | | | + |
| COMP | | | | + |
| DAC12 | | | | + |
| OPA | | | | + |

Software > SYSCTL

SYSCTL

Power & Systems Configuration

Clock Configuration

PinMux Peripheral and Pin Configuration

Other Dependencies

To find more MSPM0 training series, please visit:

- [Ti.com.cn](http://ti.com.cn)
- [WeChat \(德州仪器公众号\)](#)
- [Bilibili](#)
- [21IC](#)