MSPM0 accelerator module introduction

—an MSPM0 peripheral training series

Presented by Johnson He
80 MHz MCU with up to 128kB flash, 64 pins, advanced analog, AES/TRNG, CAN-FD
MSPM0G350x accelerator module introduction

### Key Features

#### Divider:
- 32bit hardware divider for fixed point and IQ format numbers
  - Divide operation in 8 cycles

#### MAC
- Multiply-Accumulate operation in 2 cycles

#### Square:
- Square root operation in 21 cycles

#### Trigonometric:
- 24bit trigonometric calculations (sin, cos, atan)
  - 24bit accuracy operation in 29 cycles
  - Configurable resolution for lower computation cycles

### Application

- Significantly reduce the calculation time of division, square root and trigonometric calculations.
- Increase the computational power for math intensive and real time critical tasks.
- Speed up the control loop in application like motor control FOC and digital power control system.
- Lower the power consumption for math calculation with accelerator executed in parallel to CPU operation.

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**Diagram Description:**
- **Math Accelerator** includes:
  - 32-bit Divider
  - Square root
  - Trigonometric
  - MAC
- **Clock**
- **Interrupt**
- **Interface Bus**
- **CPU-ONLY PD1 Peripheral Bus(MCLK)**
- **Cortex-M0+ 80MHz**
- **NVIC Event**

**Parallel processing to reduce CPU loading**
Accelerator module quick start

**Academy**
- MSPM0 introduction lab

**Driverlib Examples**
- **MSPM0G350x:**
  - mathacl_mpy_div_op
  - mathacl_trig_op
- **MSPM0L130x:**
  - No accelerator module

**Launchpad**
- LP-MSPM0G3507
- LP-MSPM0L1306

**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

**Easy to Use with IQMath**

New version IQMath will call accelerator module automatically

Step 1: Add IQmathLib.h & iqmath.a file into your project:

Step 2: Define IQ format variable using _iqxx:

Step 3: Run IQMath function:

```
_iQ24div(Var1_iq24, Var2_iq24);
```
To find more MSPM0 training series, please visit:

- Ti.com.cn
- WeChat (德州仪器公众号)
- Bilibili
- 21IC