**FAQ0034**
Frequently Asked Questions

# How to set I2C clock?

**Questions:**

How to set I2C clock?

**Answer:**

Taking AT32F403A as an example, I2C module is linked to APB1 bus, so the CLKFREQ bit of the I2C_CTRL2 register should be configured according to the APB1 clock frequency. For example, if $f_{APB1} = 36MHz$, the CLKFREQ bit should be 36.

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|---|---|---|---|---|
| Bit 7: 0 | CLKFREQ | 0x00 | rw | I²C input clock frequency<br>Correct input clock frequency must be set to generate correct timings. The range allowed is between 2 MHz and 120 MHz.<br>2: 2MHz<br>3: 3MHz<br>……<br>120: 120MHz |

After configuration, I2C clock is set through the SPEED bit of the I2C_CLKCTRL register

| | | | | |
|---|---|---|---|---|
| Bit 11: 0 | SPEED | 0x000 | rw | I²C bus speed config<br>In standard mode:<br>High level= SPEED x $T_{I2C\_CLK}$<br>Low level= SPEED x $T_{I2C\_CLK}$<br>In fast mode:<br>DUTYMODE = 0:<br>High level= SPEED x $T_{I2C\_CLK}$ x 1<br>Low level= SPEED x $T_{I2C\_CLK}$ x 2<br>DUTYMODE = 1:<br>High level= SPEED x $T_{I2C\_CLK}$ x 9<br>Low level= SPEED x $T_{I2C\_CLK}$ x 16<br>The minimum value allowed in standard mode is 4. In fast mode, the minimum value allowed is 1.<br>The CLKCTRL register can be configured only when the I2C is disabled (I2CEN=0). |

For example, $f_{APB1} = 8MHz$, then $T_{I2C\_CLK} = 1/8ns = 125ns$, in standard mode, if the I2C clock is to set as 100K, then SPEED bit should be configured to be 0x28 (40), the calculation formula is $T_{I2C\_CLK} \times SPEED = 125ns \times 40 \times 2 = 10us$, that is 100K, in which, x2 represents the sum of high level time and low level time.

**Type:** MCU applications
**Applicable products:** All AT32 MCUs
**Main function:** I2C
**Minor function:** None

**Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 2022.2.16 | 2.0.0 | Initial release |

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