**MAX31856 Notes**

Table : Version History

|  |  |
| --- | --- |
| **Date** | **Notes** |
| 11/29/24 | Created |

# General Notes

* Make sure thermocouple leads are not touching or wrapped as a single unit (there should be two separate leads, a positive and a negative). The polarity matters and may need to be reversed if there are unexpected measurements/results (<https://electronics.stackexchange.com/questions/621482/will-reversing-the-polarity-of-a-k-thermocouple-damage-it> )

# Acronyms

|  |  |  |
| --- | --- | --- |
| **Acronym** | **Definition** | **Comment** |
| CPOL | Clock Polarity |  |
|  |  |  |
|  |  |  |

# Adafruit Max31856 Library

* Installed via Arduino IDE on 11/29/24.

|  |  |  |
| --- | --- | --- |
| **Example/Config** | **Date** | **Results/Comment** |
| max31856\_oneshot.ino w/ hardware SPI | 11/29/24 | Not working, perhaps we need to hook up DRDY pin? |
| max31856\_manual.ino w/ hardware SPI | 11/29/24 | Success (only shows TC temp, no CJ temp) |
| max31856\_oneshot.ino w/ software SPI | 11/29/24 | Success (occasionally gave nan values but this might have been due to a loose TC connection) |
| max31856\_oneshot.ino w/ hardware SPI | 11/29/24 | Success. Both CJ and TC temps |
|  |  |  |

# SPI

## Read Cold Junction Via SPI

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

/\*!

@brief Return cold-junction (internal chip) temperature

@returns Floating point temperature in Celsius

\*/

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

float Adafruit\_MAX31856::readCJTemperature(void) {

return readRegister16(MAX31856\_CJTH\_REG) / 256.0;

}

# Troubleshooting

## Thermocouple reads nan

* Wiggle TC.
* MAX31856 could be experiencing an over/under voltage fault which will suspend conversions and the ability of the MAX31856 to detect other faults.

## Over/Under Voltage

* 12/01/24: Encountered an over/under voltage fault. Rebooted Arduino several times and this didn’t seem to help. It is possible that this is due to the thermocouple not being shielded or electrically interfering or having a grounding issue (see <https://forum.arduino.cc/t/thermocouple-interference-overvoltage-fault-max31856/1035662/6> ). Move TC so it isn’t touching other items.
* One of the TC leads could also have pulled out of the terminal block.

# Research Notes

## 11/29/24

* Successfully read temperatures of both CJ and TC using Adafruit supplied libraries/code.

A screenshot of a computer

Description automatically generated

## 12/01/24

* Successfully read temperatures of both CJ and TC using \LumArduinoSDK\Examples\MAX31856\SPI\_OneShot\SPI\_OneShot.ino

A screenshot of a computer program

Description automatically generated

## 12/11/24

* Updating code

A screenshot of a computer program

Description automatically generated

## 12/18/24

* Moved triggerOneShot function to main part of loop. Works

A screenshot of a computer program

Description automatically generated

* Successfully used MATLAB

A screenshot of a computer program

Description automatically generated

## 01/05/25

* Simulink version appears to work.
* execution order seems to have the CR0 being set to 1 shot at end of loop which results in it reporting 16 instead of 80.
* A diagram of a computer code

  Description automatically generated with medium confidence

|  |  |
| --- | --- |
| **deltaT\_s** | **status** |
| 1/1 | Works |
| 1/10 | Works |
| 1/20 | Works |
| 1/30 | Can’t compile |
| 1/40 | Works but unit doesn’t respond this fast |

A graph with a line going up

Description automatically generated with medium confidence

Figure : Data at deltaT\_s = 1/40