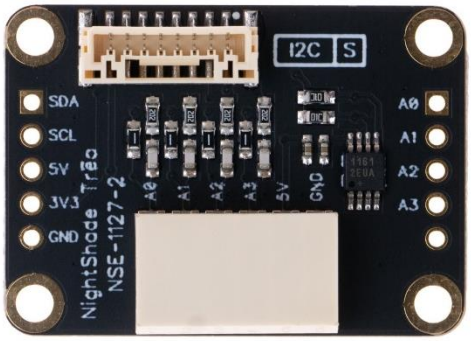
10x 4/2 Channel ADC - MAX11612 - Trēo™ Module

Module Features

- Maxim Integrated MAX11612
- RoHS Compliant
- Software Library
- NightShade Trēo™ Compatible
- Spring Terminals
- Breakout Headers



MAX11612 Features

(from Maxim Integrated)

- 0 - 40V Range
- 12-Bit Resolution
- 4 Single-Ended Channels or
  2 Fully Differential Channels
- Internal Voltage Reference
- 5MHz Bandwidth (-3dB)

Applications

- Industrial Signal Input
  - Pressure Sensors
  - Flow Meters
- Power Monitoring
  - Solar Energy
  - Alternative Energy
- Battery Management Systems

Description

The MAX11612 Trēo™ Module is an ADC module that features Maxim Integrated's MAX11612 ADC. The module provides 4 singled-ended ADC inputs or 2 full-differential inputs. Measurements are made with bandwidths up to 5MHz and 12-bit resolution. This module is a part of the NightShade Treo system, patent pending.

Trēo™ Compatibility

Electrical

Communication	I2C
Max Current, 3.3V	1mA
Max Current, 5V	1mA

Mechanical

- 35mm x 25mm Outline
- 30mm x 20mm Hole Pattern
- M2.5 Mounting Holes

Table of Contents

1 Summary

The MAX11612 ADC can make measurements on 4 channels with respect to ground (single-ended) or it can measure the voltage between channel 0 and 1, or 2 and 3; providing fully differential measurement. When using the MAX11612 for single-ended measurements, all four channels are measured simultaneously with the acquireAllChannels() function and measurements are stored in a local buffer. The measurements are retrieved with the readChannel() function. The differential measurements are made with the measureDiffChXChX() function corresponding to channels 0 and 1, or 2 and 3. The measurements can be made with respect to the internal reference (default) or to an external reference tied to the A3 pin.

2 What is Trēo™?

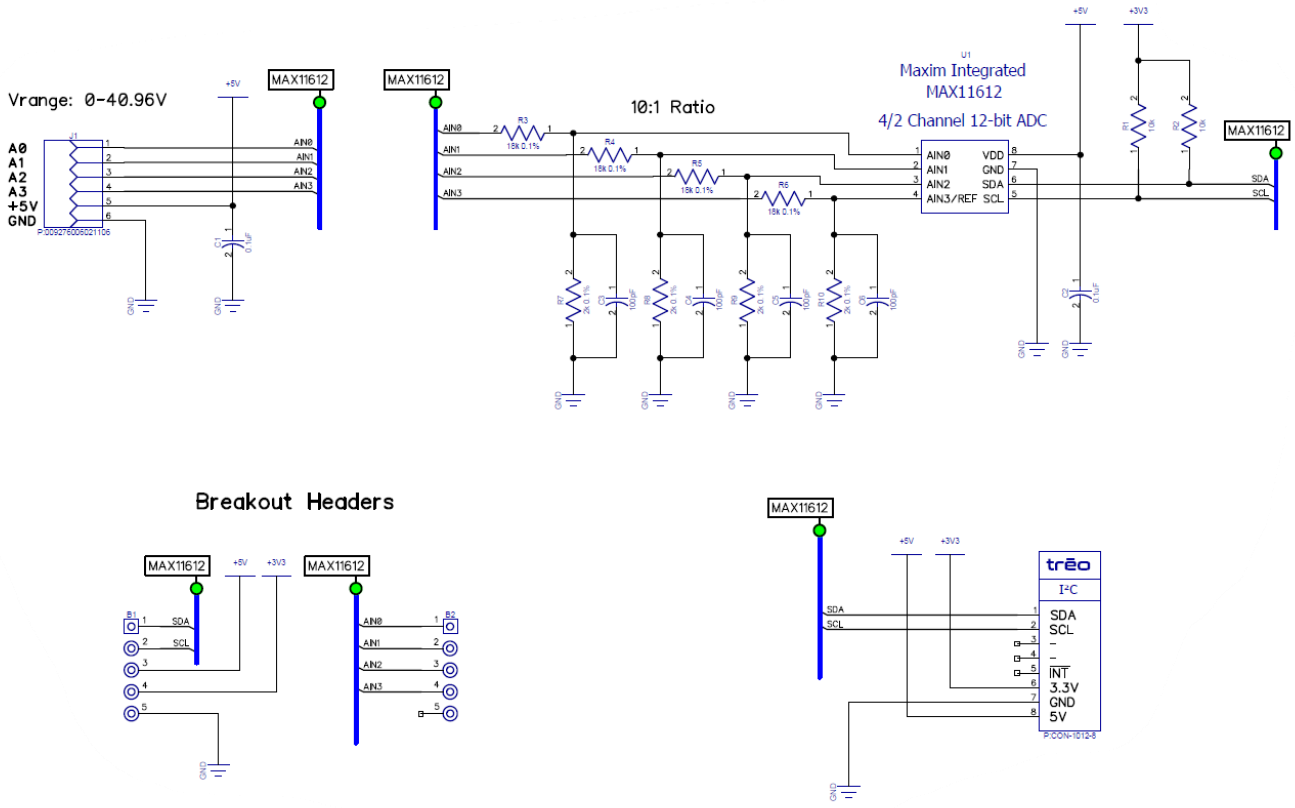
NightShade Trēo is a system of electronic modules that have standardized mechanical, electrical, and software interfaces. It provides you with a way to quickly develop electronic systems around microprocessor development boards. The grid attachment system, common connector/cabling, and extensive cross-platform software library allow you more time to focus on your application. Trēo is supported with detailed documentation and CAD models for each device.

Learn more about Trēo here.

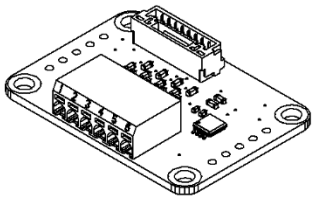
3 Electrical Characteristics

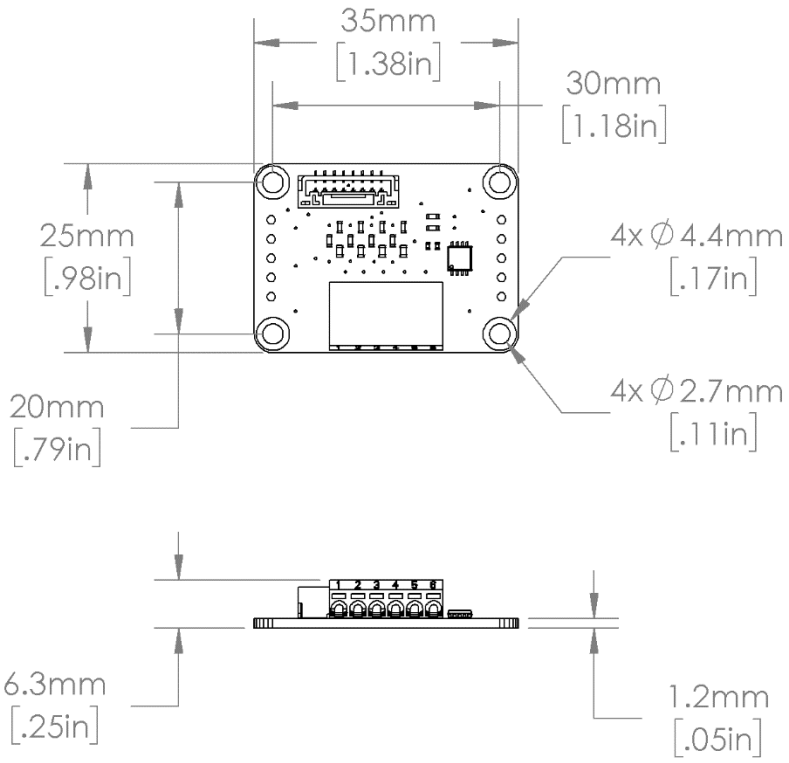
	Minimum	Nominal	Maximum
Voltages			
$V_{i/o}$ (SDA, SCL)	-0.3V	-	3.6V
$V_{3.3V}$	3.1V	3.3V	3.5V
V_{5V}	4.8V	5.0V	5.2V
V_{in} (A0, A1, A2, A3)	-0.3V	-	40V
V_{ExtRef}	0V	-	V_{5V}
Measurement			
Bandwidth (-3dB)	-	-	840kHz
Sample Rate (Int. Clock)	-	51ksps	-
Range	0V	$10*V_{ExtRef}$	40V
Precision	$10*V_{Ref}/4096$	10mV (V_{ref} = 4.096V)	12mV (V_{ref} = 5V)
Error (25°C)	-2.4%	-	+2.4%
I2C Slave Address		0x34	
Operating Temperature	-25°C	-	+85°C

4 Electrical Schematic



5 Mechanical Outline





6 Example Arduino Program

```
/*********************************************************
  MAX11612_ADC - NightShade_Treo by NightShade Electronics

  This sketch demonstrates the functionality of the
  NightShade Trēo MAX11612 ADC module. (NSE-1127-1/2) It
  prints the voltage present on channel 0 to Serial at
  115200 baudrate. 10x mode can be enabled for the
  NSE-1127-2.

  Created by Aaron D. Liebold
  on February 15, 2021

  Links:
  NightShade Trēo System: https://nightshade.net/treo
  Product Page: https://nightshade.net/product/treo-4-2-channel-12-bit-adc-max11612/

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  https://opensource.org/licenses/MIT
*********************************************************/

// Include NightShade Treo Library
#include <NightShade_Treo.h>

// Declare Objects
NightShade_Treo_MAX11612 adc(1);

// Set to 1 to enable the 10x input for NSE-1127-2
#define ENABLE_10X_INPUT 0

void setup() {
  adc.begin();
  Serial.begin(115200);
}

void loop() {
  adc.acquireAllChannels();

  if (ENABLE_10X_INPUT) {
    Serial.print((long) 10 * adc.readChannel(0));
  } else {
    Serial.print(adc.readChannel(0));
  }
  Serial.println("mV");

  delay(1000);
}
```

7 Library Overview (C++ & Python)

C++ Class

NightShade_Treo_MAX11612 <classObject>();

Python Module

<classObject> = NightShade_Treo_MAX11612()

7.1 Constructors

NightShade_Treo_MAX11612(int port, uint32_t clockSpeed)

Creates a ValveManifoldController object.

Arguments:

port	Integer of the I2C port used. (e.g. 0 = "/dev/i2c_0")
clockSpeed	The desired clock speed for the I2C bus.

Returns:

nothing

NightShade_Treo_MAX11612(int port)

Creates a ValveManifoldController object assuming the default slave address and clock speed.

Arguments:

port	Integer of the I2C port used. (e.g. 0 = "/dev/i2c_0")

Returns:

nothing

7.2 Methods

begin()

Initializes the MAX11612 to use the internal clock and internal voltage reference of 4.096V.

Arguments:

none

Returns:

error	0 = Success

acquireAllChannels()

Reads all channels (single ended) and stores the results in a local buffer. Data is read from the local buffer with the readChannel() function.

Arguments
none

Returns

error	0 = Success

readChannel(int channel)

Returns channel measurement value from the local buffer. The measurement is performed with the acquireAllChannels() function. When using the internal reference, the result is 10mV/LSB.

Arguments

channel	Number of the requested channel value (1-4)

Returns

value	The ADC value of the corresponding channel (int)

readDiffCh0Ch1()

Reads the voltage differential between channel 0 and channel 1.

Arguments
none

Returns

value	The ADC value of the voltage between the differential channels

readDiffCh1Ch0()

Reads the voltage differential between channel 1 and channel 0. When using the internal reference, the result is 10mV/LSB.

Arguments
none

Returns

value	The ADC value of the voltage between the differential channels

readDiffCh2Ch3()

Reads the voltage differential between channel 2 and channel 3. When using the internal reference, the result is 10mV/LSB.

Arguments
none

Returns

value	The ADC value of the voltage between the differential channels

readDiffCh3Ch2()

Reads the voltage differential between channel 3 and channel 2. When using the internal reference, the result is 10mV/LSB.

Arguments
none

Returns

value	The ADC value of the voltage between the differential channels

enableExternalReference(int enable)

Enables the use of the external voltage reference connected to A3.

Arguments

enable	0: Internal Voltage Reference 1: External Voltage Reference

Returns

error	0 = Success

enableReferenceOutput(int enable)

Connects internal voltage reference to the reference pin, A3.

Arguments

enable	0: Reference pin can be used as a reference input 1: Reference pin is connected to the internal voltage reference

Returns

error	0 = Success