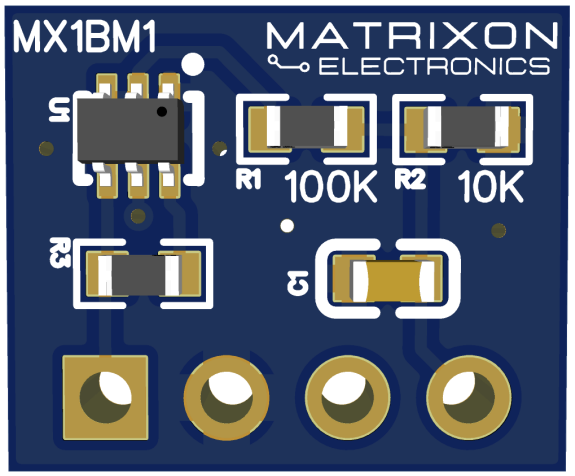
MATRIXON ELECTRONICS

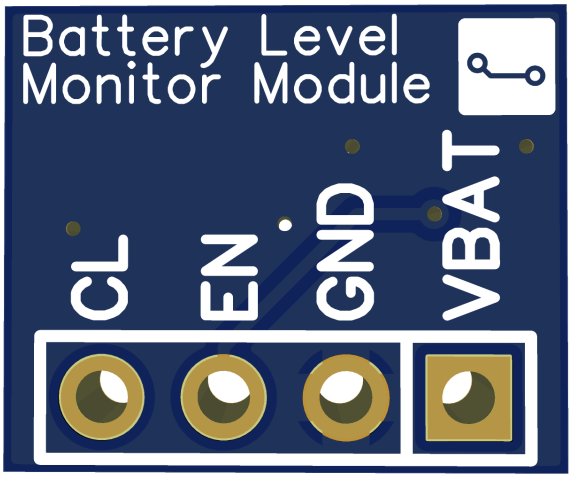
Battery Level Monitor Module

MX1BM1

Product Datasheet

A compact 4-pin module for monitoring battery voltage (3–5.2V) using an ADC, Features enable function. Ideal for 1S LiPo, 1S Lithium Ion battery and USB-powered projects.





Version: Rev 1.0
Author: Madhesh Ram Kishore Kumar

Overview

The MX1BM1 - Battery Level Monitor Module is a compact, low-power board designed to measure battery voltage. It safely scales battery voltages (3.0V to 5.2V) for ADC input on MCUs like ESP32, STM32, Arduino, etc. It features an enable-controlled voltage divider with MOSFET gating for low standby current, ideal for deep-sleep applications.

Key Features

- Input voltage: 3.0V to 5.2V (VBAT)
- Output: Scaled analog voltage for 3.3V ADCs
- Enable-controlled voltage divider (low-power)
- 10µF smoothing capacitor for clean ADC readings
- Standard 2.54mm 4-pin header for easy integration
- Breadboard-friendly and compact

Applications

- Battery-powered IoT devices
- Remote sensor nodes
- Device battery level reporting
- Low-voltage cut-off / battery protection systems
- USB power diagnostics
- Smart wearables and embedded systems

Purchase Link

Download the Gerber files here: MX1BM1 - Battery Level Monitor Module
Example Arduino sketch: Example Code.ino

Pinout Description

Pin	Label	Function
1	VBAT	Connect to battery or input voltage (max 5.2V)
2	GND	Ground connection
3	EN	Enable control (active HIGH, 3.3V logic)
4	CL	Scaled analog voltage output to MCU ADC

Enable Logic

- Logic HIGH (≥2.5V): Enables the voltage divider and outputs the scaled voltage
- Logic LOW (0V): Turns off the divider to reduce standby current
- Compatible with 3.3V microcontrollers (ESP32, STM32, etc.)

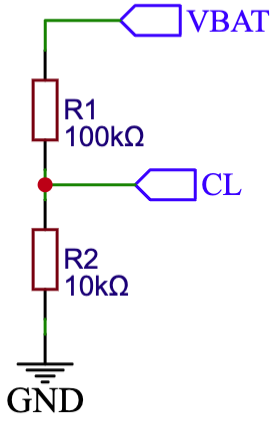
Voltage Divider Configuration

This is a classic resistive voltage divider. The formula for output voltage:

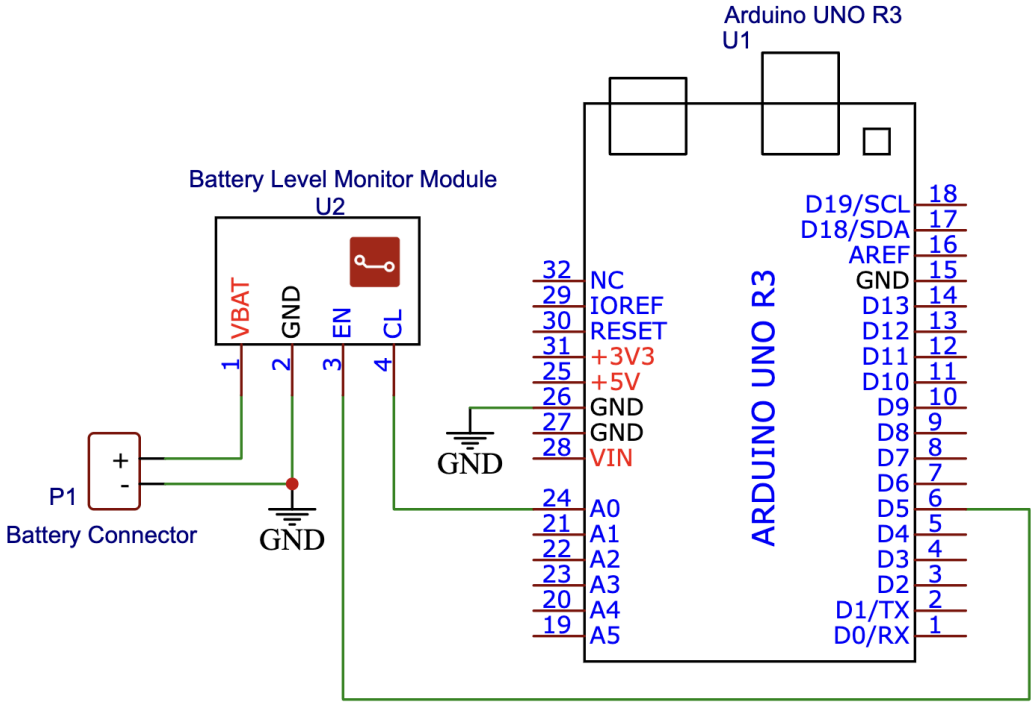
$$Vcl = VBAT \times \frac{R2}{R1 + R2}$$

$$Vcl = VBAT \times \frac{10k}{100k + 10k}$$

Battery Voltage (VBAT)	Output Voltage (CL)
3.0 V	0.272 V
3.7 V	0.336 V
4.2 V (LiPo max)	0.381 V
5.0 V (USB)	0.454 V
5.2 V (VBAT max)	0.472 V



Example Application



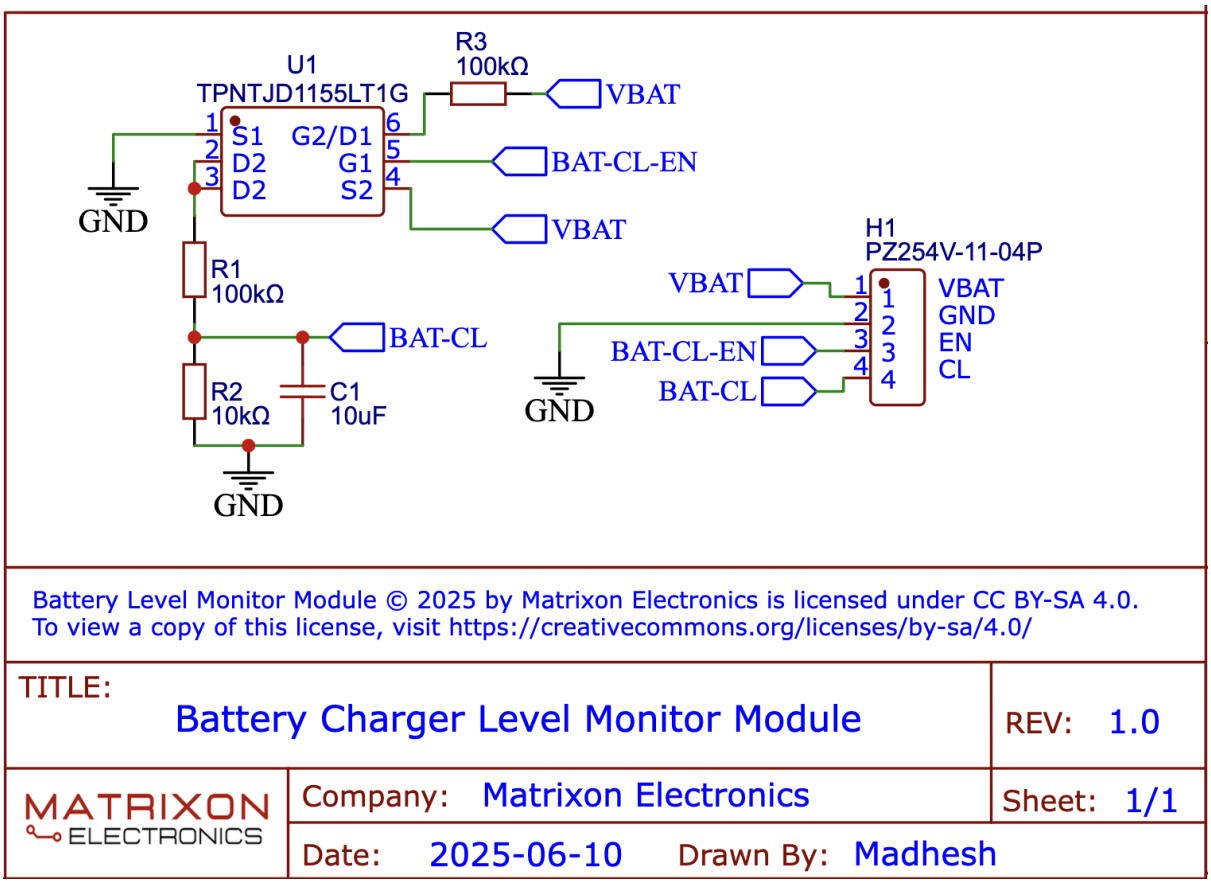
Example Arduino Code

```
#define EN_PIN 5
#define CL_PIN A0
void setup() {
 pinMode(EN_PIN, OUTPUT);
 digitalWrite(EN_PIN, LOW);
 Serial.begin(9600);}

void loop() {
 digitalWrite(EN_PIN, HIGH);   // Enable module
 delay(5);                     // Wait for stable output
 int raw = analogRead(CL_PIN); // Read ADC value
 digitalWrite(EN_PIN, LOW);    // Disable module
  // Voltage divider: R1 = 100k, R2 = 10k
  // Divider ratio: CL = VBAT * (10 / 110) = VBAT * 0.0909
  // So, VBAT = CL / 0.0909
 float v_adc = raw * (3.3 / 4095.0);     // ADC (assuming 12-bit ADC and 3.3V ref)
 float battery_voltage = v_adc / 0.0909; // Reconstruct battery voltage
 Serial.print("Battery Voltage: ");
 Serial.print(battery_voltage, 2);       // 2 decimal places
 Serial.println(" V");
 delay(1000);}
```

This code enables the Battery Level Monitor Module by setting the EN pin HIGH, allowing the voltage divider to output the scaled battery voltage to the CL pin. The microcontroller then reads this voltage using its ADC and calculates the actual battery voltage using the known divider ratio (R1 = 100k, R2 = 10k). After reading, the module is disabled to save power. The measured battery voltage is printed to the Serial Monitor once every second.

Schematic Diagram



TITLE: Battery Charger Level Monitor Module		REV: 1.0
MATRIXON ELECTRONICS	Company: Matrixon Electronics	Sheet: 1/1
	Date: 2025-06-10 Drawn By: Madhesh	

PCB Layout & Dimensions

Parameter	Value
Board Size	12mm x 10mm
Layers	2
Components Placement	Top layer (Single side)
Pin Pitch	2.54mm
Pin Header	1×4 Male

Revision History

Date	Version	Modify Content
20/08/2025	Rev 1.0	New