BH1750 GY-302 Digital Light Sensor Module

5-pad I2C breakout · BH1750FVI ambient light sensor with 16-bit output in lux · Onboard 3.3 V regulator, 3 V to 5 V supply · Address 0x23 or 0x5C

3 V TO 5 V | 1 TO 65535 LX | 16-BIT | I2C 0x23 / 0x5C | PEAK 560 NM | HEADER INCLUDED

1 DEVICE IDENTIFICATION

ITEM	VALUE
Order code	**MOD-BH1750-GY302**
Contents	**1 x module, 1 x 5-pin 2.54 mm male header, not soldered**
Board markings	**BH1750 and V322 on the front; GY-302, V322 and the pad names on the back**
Sensor chip	**BH1750FVI ambient light sensor, 6-lead WSOF6 package**
Regulator	**3.3 V regulator marked 662K feeds the sensor chip**
Interface	**I2C, 7-bit address 0x23 (ADDR low) or 0x5C (ADDR high)**

The output is already in light units: divide the 16-bit reading by 1.2 for lux at the default setting. No calibration is needed for ordinary use.

2 PIN FUNCTIONS

PAD	NAME	FUNCTION
1	**VCC**	Supply, 3 V to 5 V. Feeds the onboard 3.3 V regulator that powers the sensor chip.
2	**GND**	Ground, common with the host.
3	**SCL**	I2C clock.
4	**SDA**	I2C data.
5	**ADDR**	Address select. Unconnected or GND gives 0x23. Connect to 3.3 V for 0x5C.

Names as printed on the back. Pads are one row at 2.54 mm pitch, numbered here from VCC to ADDR (Figure 1).

Take ADDR high from 3.3 V, not 5 V. The sensor chip runs at 3.3 V from the regulator, and its inputs must stay below its own supply. On a 5 V Arduino use the 3.3V pin to select 0x5C, or leave ADDR unconnected for 0x23.

3 SPECIFICATIONS

3.1 RECOMMENDED OPERATING CONDITIONS (BOARD)

PARAMETER	CONDITIONS	MIN	MAX	UNIT
Supply, VCC	VCC pad to GND	**3.0**	**5.0**	V
I2C clock	Standard or fast mode		**400**	kHz
Operating temperature	Sensor chip rating	**-40**	**+85**	°C

The regulator lets the board run from 5 V Arduino boards and 3.3 V boards such as the ESP32 and Raspberry Pi. Power VCC from the same voltage as the host's I/O.

3.2 SENSOR CHIP ABSOLUTE MAXIMUM RATINGS

PARAMETER	MIN	MAX	UNIT
Chip supply (after the regulator)		**4.5**	V
Operating temperature	**-40**	**+85**	°C
Storage temperature	**-40**	**+100**	°C
SDA sink current		**7**	mA
Power dissipation		**260**	mW

Stress limits of the sensor chip only, not ratings for the VCC pad. The chip's own operating supply is 2.4 V to 3.6 V, provided by the regulator. Operation at these limits is not implied.

3.3 OPTICAL AND ELECTRICAL CHARACTERISTICS (SENSOR CHIP)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Measurement range	Default sensitivity	**1**		**65535**	lx
Extended range	Sensitivity adjusted (5.3)	**0.11**		**100000**	lx
Peak wavelength	Close to the human eye		**560**		nm
Measurement accuracy	Sensor out / actual, 1000 lx	**0.96**	**1.2**	**1.44**	times
Dark output	0 lx, high resolution	**0**	**0**	**3**	count
Resolution	High resolution mode		**1**		lx
Resolution	High resolution mode 2		**0.5**		lx
Resolution	Low resolution mode		**4**		lx
Measurement time	High resolution modes		**120**	**180**	ms
Measurement time	Low resolution mode		**16**	**24**	ms
Incandescent / fluorescent ratio	1000 lx		**1**		times
Supply current, measuring	100 lx		**120**	**190**	µA
Supply current, power down	No light		**0.01**	**1.0**	µA

Chip figures at 3.0 V and 25 °C with a white LED source. The 1.2 accuracy figure is why raw counts are divided by 1.2 to give lux. Sensor chip current only; the regulator adds its own small current.

The 120 ms high resolution measurement averages out 50 Hz and 60 Hz mains flicker from lighting.

4 I2C INTERFACE

4.1 INTERFACE SUMMARY

PARAMETER	VALUE
Address, ADDR low	**0x23 (7-bit). Write byte 0x46, read byte 0x47**
Address, ADDR high	**0x5C (7-bit). Write byte 0xB8, read byte 0xB9**
ADDR thresholds	**High at 0.7 x chip supply or more, low at 0.3 x or less**
Bus speed	**Up to 400 kHz (fast mode)**
Write format	**One instruction byte per transaction, each followed by STOP**
Read format	**Two bytes: high byte, then low byte**
Result in lux	**(high << 8 | low) / 1.2 at default sensitivity, high resolution mode**
State after power-up	**Power down; send Power On, then a measurement instruction**

4.2 I2C TIMING (SENSOR CHIP)

PARAMETER	SYMBOL	MIN	MAX	UNIT
SCL clock frequency	f_{SCL}		**400**	kHz
Bus free time	t_{BUF}	**1.3**		µs
Hold time, (repeated) START	$t_{HD;STA}$	**0.6**		µs
Set-up, repeated START	$t_{SU;STA}$	**0.6**		µs
Set-up, STOP	$t_{SU;STO}$	**0.6**		µs
Data hold time	$t_{HD;DAT}$	**0**	**0.9**	µs
Data set-up time	$t_{SU;DAT}$	**100**		ns
SCL low period	t_{LOW}	**1.3**		µs
SCL high period	t_{HIGH}	**0.6**		µs
SDA output low, 3 mA sink	V_{OL}	**0**	**0.4**	V

5 INSTRUCTIONS AND MEASUREMENT MODES

5.1 INSTRUCTION SET

INSTRUCTION	BYTE	EFFECT
Power Down	**0x00**	No measurement
Power On	**0x01**	Ready for a measurement
Reset	**0x07**	Clears the result; needs Power On first
Continuous, high resolution	**0x10**	1 lx steps, 120 ms
Continuous, high resolution 2	**0x11**	0.5 lx steps, 120 ms
Continuous, low resolution	**0x13**	4 lx steps, 16 ms
One time, high resolution	**0x20**	One reading, then power down
One time, high resolution 2	**0x21**	One reading, then power down
One time, low resolution	**0x23**	One reading, then power down
Sensitivity, high bits	**0x40 | MT[7:5]**	Sets the top 3 bits of MTreg
Sensitivity, low bits	**0x60 | MT[4:0]**	Sets the low 5 bits of MTreg

Do not send any other byte. High resolution mode is the best general choice and suits dim light below 10 lx. In high resolution mode 2 the reading has one extra fractional bit, so divide by 2.4 instead of 1.2.

5.2 MEASUREMENT SEQUENCE

1. Send `0x01` (Power On).
2. Send `0x10` (continuous, high resolution).
3. Wait 180 ms for the first result.
4. Read two bytes and divide the 16-bit value by 1.2 for lux.
5. Read again at any time; continuous mode updates every 120 ms.

5.3 SENSITIVITY ADJUSTMENT (MTREG)

MTREG	SENSITIVITY	LX PER COUNT, HIGH RES	LX PER COUNT, HIGH RES 2
31	0.45 x	**1.85**	**0.93**
69 (default)	1 x	**0.83**	**0.42**
254	3.68 x	**0.23**	**0.11**

Measurement time scales with MTreg. A higher value reads dimmer light and corrects for a tinted cover: if a cover passes half the light, double MTreg. A lower value extends the top of the range for bright sunlight. Lux = counts / 1.2 x 69 / MTreg in high resolution mode.

6 MECHANICAL DATA

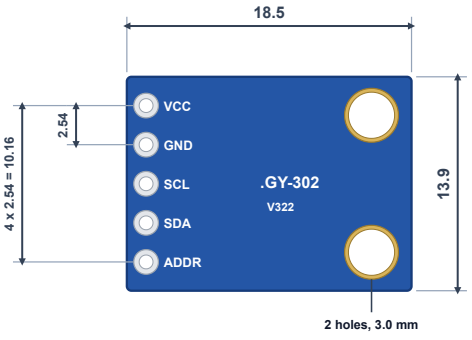


Figure 1. Back of the board, where the pad names are printed. Simplified drawing, not to scale. Dimensions in mm.

Board size	**18.5 x 13.9 mm**
Connections	**5 pads, one row along the 13.9 mm edge**
Pad pitch	**2.54 mm**
Mounting holes	**2, 3.0 mm diameter, at the far end from the pads**
Header	**5-pin male, 2.54 mm, supplied loose**
Light window	**Top face of the sensor chip, centre of the front**

- The sensor reads light falling on the front of the board.
- Mount it with small screws and spacers through the two holes, keeping screw heads clear of the components.

7 APPLICATION AND IMPLEMENTATION

7.1 HOST CONNECTIONS

MODULE	UNO / NANO	MEGA 2560	ESP32	RASPBERRY PI
VCC	5V	5V	3V3	3V3 (pin 1)
GND	GND	GND	GND	GND (pin 6)
SCL	A5	21 (SCL)	GPIO22	GPIO3 (pin 5)
SDA	A4	20 (SDA)	GPIO21	GPIO2 (pin 3)
ADDR	Unconnected for 0x23, or 3.3 V for 0x5C			

ESP32 pins are the ESP32 Dev Module defaults for `Wire.begin()`. On a Raspberry Pi, enable I2C; `i2cdetect -y 1` should show 23. Two boards can share one bus when one has ADDR high.

7.2 PLACEMENT AND COVERS

- Face the front of the board towards the light you want to measure, with nothing shading the chip.
- Outdoors, fit a clear or diffusing weatherproof cover; the board itself is not sealed. Compensate for the cover with MTreg (5.3).
- Direct sun can pass 65535 lx. Set MTreg to 31 to read up to about 100000 lx.
- Keep LEDs on the same project away from the sensor's view.

8 EXAMPLE CODE (ARDUINO IDE)

8.1 FIRST TEST, NO LIBRARY NEEDED

```
// BH1750 GY-302 first test. No library needed.
// VCC to 5V (Uno) or 3V3 (ESP32), GND to GND.
// SCL to A5 or GPIO22, SDA to A4 or GPIO21.
// ADDR open or GND = 0x23, ADDR to 3.3V = 0x5C.
#include <Wire.h>

const uint8_t ADDR = 0x23;  // 0x5C if ADDR is high

void command(uint8_t op) {
  Wire.beginTransmission(ADDR);
  Wire.write(op);
  Wire.endTransmission();
}

void setup() {
  Serial.begin(115200);
  Wire.begin();
  Wire.beginTransmission(ADDR);
  if (Wire.endTransmission() != 0) {
    Serial.println("No BH1750 found, check wiring");
    while (true) delay(1000);
  }
  Serial.println("BH1750 found");
  command(0x01);  // power on
  command(0x10);  // continuous, 1 lx steps
  delay(180);     // first reading takes 120-180 ms
}

void loop() {
  Wire.requestFrom(ADDR, (uint8_t)2);
  if (Wire.available() == 2) {
    uint16_t raw = Wire.read() << 8;
    raw |= Wire.read();
    Serial.print(raw / 1.2, 1);
    Serial.println(" lx");
  }
  delay(1000);
}
```

8.2 RUNNING THE TEST

1. Solder the header and wire the module as in 7.1.
2. Upload the sketch and open the Serial Monitor at **115200** baud.
3. It prints **BH1750 found**, then a reading in lux every second. Cover the chip with a finger and the value falls towards 0; shine a torch on it and it rises.
4. If ADDR is connected to 3.3 V, change `0x23` to `0x5C` in the sketch.

The sketch uses only the built-in Wire library. For a ready-made driver, install **BH1750** by Christopher Laws from **Tools > Manage Libraries** and call `Wire.begin()` before `lightMeter.begin()`.

9 TROUBLESHOOTING

SYMPTOM	CAUSE AND FIX
"No BH1750 found, check wiring"	Check VCC and GND, swap SCL and SDA, and check every header joint. An I2C scanner should report 0x23, or 0x5C with ADDR high.
Found at 0x5C, but the sketch uses 0x23	ADDR is high. Leave it unconnected for 0x23, or change the address in the sketch.
Reading stays at 0 lx	No measurement instruction was sent after Power On, or the chip is covered. Send 0x01 then 0x10 and wait 180 ms.
Reading sticks at about 54612 lx	The sensor is at full scale in bright sun. Lower MTreg to 31 (5.3).
Reading lower than expected behind a cover	The cover absorbs light. Raise MTreg by the cover's loss, for example double it for a cover that passes half.

10 REVISION HISTORY

REV	DATE	CHANGE
1	2026-10-14	Initial release.