UNIT ELECTRONICS

**Product Reference Manual (V1.0)**

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Description
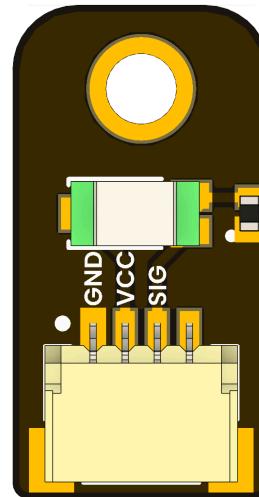
The **DevLab TEMT600 Ambient Light Sensor** module is designed to measure ambient illumination levels with high precision and minimal circuit complexity. It is based on the **Vishay TEMT600** phototransistor, a silicon NPN device specifically engineered to mimic the spectral sensitivity of the human eye, offering maximum response in the visible light range (440 nm – 800 nm) while minimizing sensitivity to infrared radiation.

When exposed to light, the phototransistor generates a photocurrent proportional to the incident of light intensity. This current is converted into a measurable analog voltage through a simple resistor network, allowing the module to provide a direct and linear signal output that can be read by an ADC, comparator, or microcontroller input. The resulting voltage increases smoothly with light intensity, enabling straightforward implementation of adaptive lighting systems.

DevLab format compatibility.

The DevLab TEMT600 Ambient Light Sensor follows the DevLab form factor for simplicity, compatibility, and quick development. The board's small and standardized size optimizes analog signal output and is electrically compatible with the DevLab sensor and interface modules.

The TEMT600 module features a 4 JST pin 1.00mm connector for smooth integration with other DevLab boards and microcontroller hosts, despite its analog voltage output. Mixed analog and digital systems maintain pinout uniformity and power routing with this method.

Key Features

- Spectral range: 440 – 800 nm
- Linear analog voltage output
- Fast response time
- Low power consumption
- Operating voltage: 3.3 V – 5 V
- Compact DevLab format
- 4-Pin JST 1.0 mm connector
- Wide dynamic light detection range

Hardware Features

- **Core Component:** Vishay TEMT600 phototransistor for visible light detection
- **Output Type:** Analog voltage proportional to light intensity
- **Bias Network:** Integrated 10 kΩ pull-down resistor for stable output reference
- **Connector:** 4-pin JST 1.0 mm interface (VCC, GND, SIGNAL, NC)
- **Supply Voltage:** 3.3 V – 5 V compatible
- **Output Range:** 0 V – VCC (linear with illuminance)
- **Board Ground Plane:** Shielded layout for signal stability and noise reduction
- **Mounting:** Single through-hole mechanical anchor (H1) for secure fixation

Software Support

- **Arduino IDE:**
  Fully compatible with the built-in analogRead() function for direct measurement of light intensity. The linear output voltage from the TEMT600 can be easily converted into relative brightness or illuminance values using simple analog-to-digital conversion.
- **PlatformIO / VS Code:**
  Supports development with automated builds, serial monitoring, and advanced debugging for projects using ADC-based light measurement. Ideal for structured firmware development across multiple microcontroller platforms.
- **MicroPython (Basic Support):**
  Allows direct reading of the analog output through the ADC pin using simple scripts. Suitable for quick experimentation, calibration, and educational use.
- **ESP-IDF (Optional):**
  Recommended for advanced developers who require low-level control of ADC resolution, sampling rate, and calibration curves for light intensity computation within the ESP32 ecosystem.

Applications

- Automatic display backlight adjustment
- Smart lighting and energy-saving systems
- Photographic exposure and brightness control
- Environmental and weather monitoring
- IoT ambient sensing nodes
- Optical proximity and light-level detection
- Consumer electronics illumination feedback
- Educational and experimental light measurement projects

CONTENTS

1 The Board

1.1 Accessories

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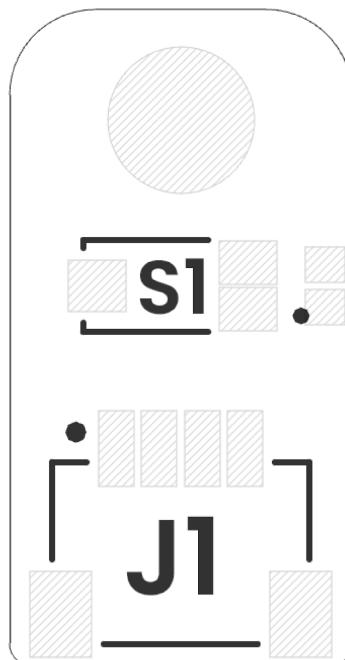
2 Ratings

2.1 Recommended Operating Conditions

Symbol	Description	Min	Typ	Max	Unit
VCC	Supply Voltage	3.0	3.3	5.0	V
IOUT	Output Current (signal)	0.5	—	20	mA
TA	Ambient Operating Temperature	–40	25	+85	°C
λ	Spectral Response Range	440	—	800	nm

3 Functional Overview

The **TEMT6000 Ambient Light Sensor** is an analog phototransistor designed to detect light intensity in a manner similar to the human eye. Its output voltage increases proportionally with the amount of incident light, making it ideal for applications that require automatic brightness control or light-level measurement. The sensor provides a simple analog signal that can be read directly by a microcontroller's ADC pin. Its compact design and linear response make it suitable for a wide range of environments, from indoor illumination monitoring to outdoor light detection systems.

3.2 Board Topology

Top View of Board Topology

Views of TEMT600 Sensor Topology

Table 3.2.1 - Components Overview
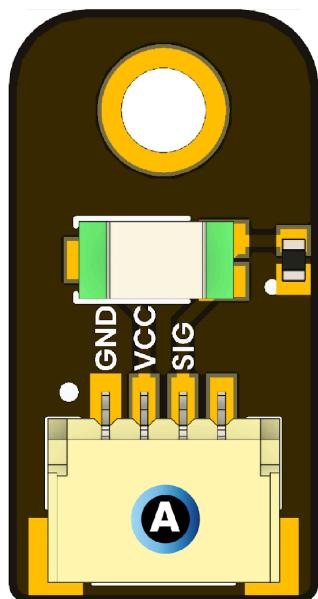
Ref.	Description
S1	TEMT6000 Ambient Light Sensor
J1	JST 1 mm pitch Connector for Power Supply and Signal

4 Connectors & Pinouts
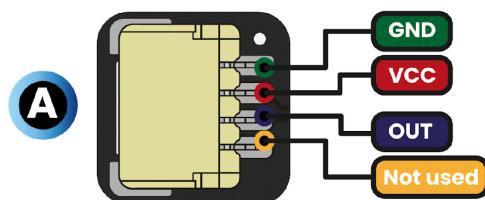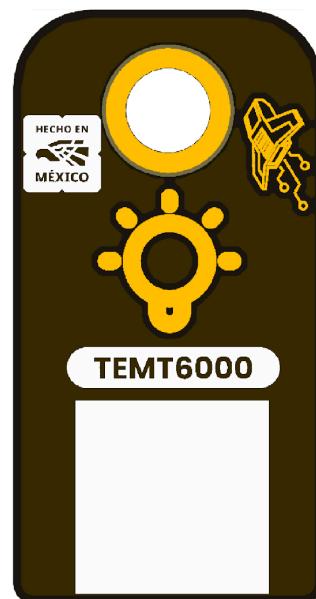
4.1 General Pinout

PINOUT

Top view

Bottom view

Description:

🟥 **Supply voltage**   🟩 **GND**   🟦 **Output**

DevLab TEMT600 Sensor Module *General Pinout*

4.2 Pinout General Description

Pin Label	Description
VCC	Power supply (3.3V or 5V)
GND	Ground
OUT	Analog Output
-	No data

5 Board Operation

5.1 Getting Started with Micropython
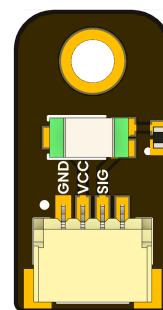
This section explains how to connect and use the **TEMT6000 Ambient Light Sensor** with a **MicroPython-compatible** board to measure ambient light intensity and visualize the data in real time via the Serial Monitor.

What You'll Need

- **DevLab TEMT600 Ambient Light Sensor**
- Microcontroller board (e.g., **ESP32** or **RP2040)**
- JST 4-Pin Pitch 1.00mm
- USB cable
- MicroPython firmware and **Thonny IDE**

JST 4-Pin Pitch 1.00mm   DevLab TEMT600 Ambient Light Sensor

Wiring Instructions

TEMT6000 Pin	Connect To	Description
VCC	5 V or 3.3 V	Match to your board's logic level
GND	GND	Common ground
SIG	GPIO12	Analog input (ADC)

💡 *Make sure the pin used for the signal (SIG) supports ADC functionality on your board.*

MicroPython Example

Use the following script to read the light level and display it in the Serial Monitor.

The official example is available in the DevLab repository:
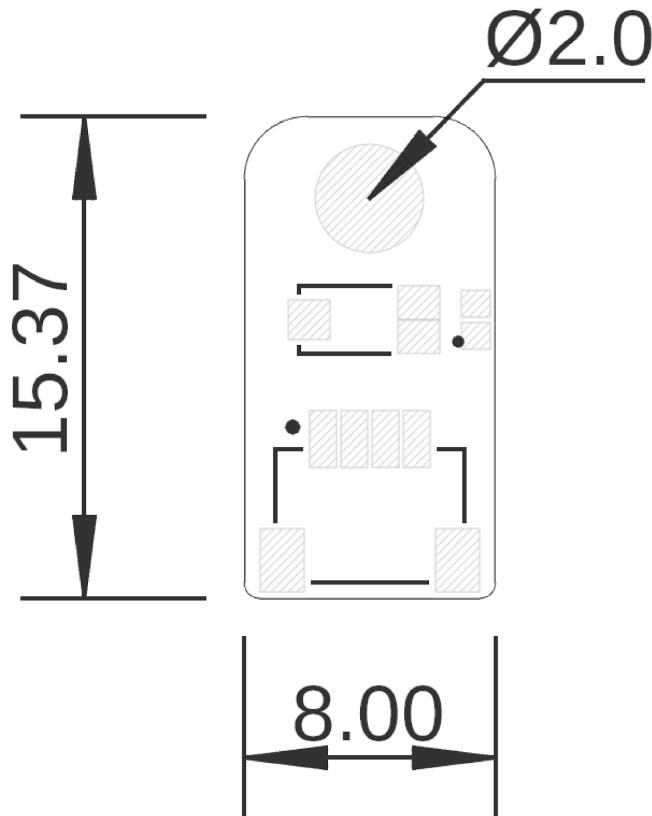
https://github.com/UNIT-Electronics-MX/unit_devlab_temt600_ambient_light_sensor/blob/main/software/examples/micropython/light_sensor_adc.py

This example continuously reads the analog signal from the **TEMT6000**, converts it into voltage, and displays the corresponding light level through the Serial Monitor in Thonny.

```python
from machine import Pin, ADC
import time

# Configure GPIO6 as ADC input (ESP32C6)
light_sensor = ADC(Pin(6))

# Depending on your board, you may need to set attenuation for higher voltage range
# For ESP32: attenuation can be 0db (0-1V), 2.5db (0-1.34V), 6db (0-2V), 11db (0-3.6V)
try:
    light_sensor.atten(ADC.ATTN_11DB)   # Full range ~3.6V
except:
    pass  # Some ports (like RP2040) don't need this

# Optionally set resolution (ESP32 defaults to 12 bits → values 0-4095)
try:
    light_sensor.width(ADC.WIDTH_12BIT)
except:
    pass

while True:
    value = light_sensor.read()  # Read raw ADC value
    voltage = value * 3.3 / 4095  # Convert to voltage (assuming 3.3V reference)

    print("Raw ADC:", value, "Voltage:", "{:.2f} V".format(voltage))
```

6 Mechanical Information

Mechanical dimensions in millimeters (mm)

Mechanical dimensions in millimeters

7 Company Information

Company name	UNIT Electronics
Company website	https://uelectronics.com/
Company Address	Salvador 19, Cuauhtémoc, 06000 Mexico City, CDMX

8 Reference Documentation

Ref	Link
Wiki	https://wiki.uelectronics.tem/wiki/devlab-temt6000-ambient-light-sensor

Github	https://github.com/UNIT-Electronics-MX/unit_devlab_temt6000_ambient_light_sensor
Thonny IDE	https://thonny.org/
Arduino IDE	https://www.arduino.cc/en/software
TEMT6000X01 - DataSheet	https://uelectronics.com/wp-content/uploads/2024/01/AR3960-TEMT6000-Sensor-de-Luz-Ambiental-datasheet.pdf

9 Appendix

9.1 Schematic (*https://github.com/UNIT-Electronics-MX/unit_devlab_temt600_ambient_light_sensor/blob/main/hardware/unit_sch_V_0_0_1_ue0098_TEMT6000.pdf*)

Title: UE0098-TEMT6000 v2		
SKU: UE0098	REV: 1	
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