

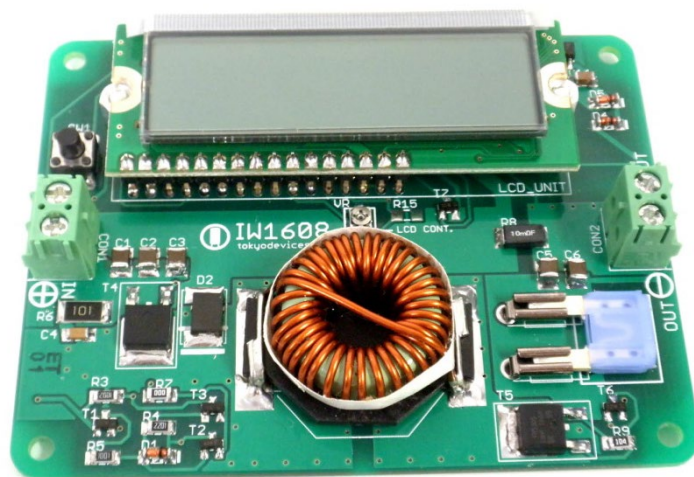


TOKYO DEVICES

IW1608-AL/IW1608-AX

High-Efficiency Solar Charging Board, Lead-Acid Battery, 5A, MPPT

Revision 1.0



The IW1608 is a charge controller designed to efficiently and safely charge lead-acid batteries using solar panel power. It employs the "Maximum Power Point Tracking (MPPT) algorithm" as its charging control method, ensuring that solar panels always maintain high power generation efficiency. Additionally, its precise power control minimizes self-consumption current, preventing power drain from the battery even during nighttime or cloudy days.

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1. Specifications

Item	Description
Supported Solar Panel	Open-circuit voltage: 16V to 28V, Output: up to 150W
Supported Battery	12V lead-acid battery; compatible with sealed, open-type, and AGM batteries
Charging Control Method	MPPT (Maximum Power Point Tracking)
Charging Voltage	Bulk/Absorb Charging: 14.3V, Floating Charging: 13.8V
Rated Output	70W / Maximum 82.5W
Efficiency	Up to 94.3%
Protection Features	Reverse output protection (10A fuse) Temperature shutdown Overcurrent and overvoltage protection
Self-Consumption Current	Approximately 700 μ A (min) (Auto-detect nighttime & sleep mode)
Board Dimensions	W90mm \times H70mm \times D30mm Mounting Screw Holes M3 x4 positions

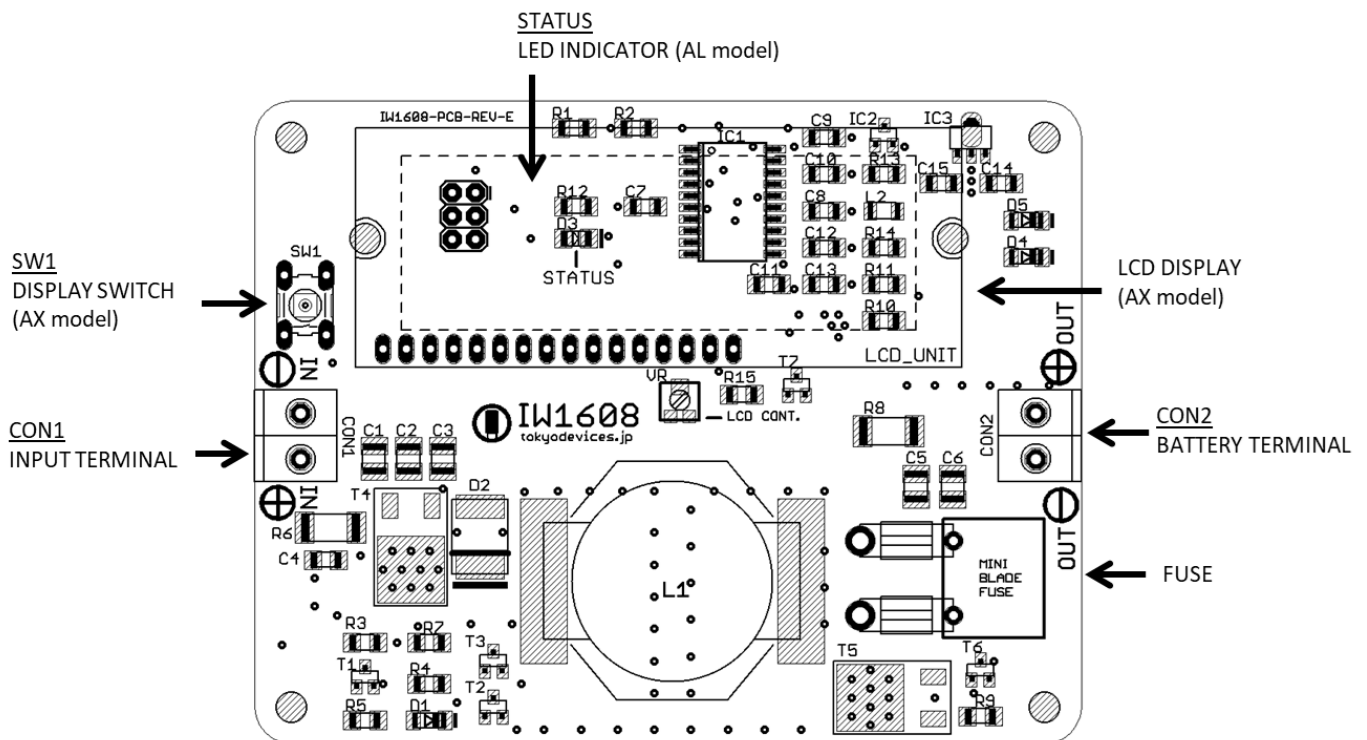


Figure 1 IW1608 Board Layout

1. Selection of Battery and Solar Panel

The IW1608 is designed exclusively for 12V lead-acid batteries. Select a solar panel with an open-circuit voltage of 16-28V. The solar panel size should be determined based on the battery's maximum charging current. For instance, for an automotive battery (approximately 40Ah), a solar panel of around 60W and 5A is suitable. For smaller batteries, a panel of about 20-30W is recommended. Larger panels, ranging from 100W to 150W, are also acceptable, but ensure that their

open-circuit voltage is below 28V.

- **Battery Connection:** A battery must always be connected. The device cannot function without it.
- **Panel Compatibility:** The IW1608 does not support panels exceeding 150W. Never connect anything other than solar panels to the input.

2. Connection and Charging Initiation

Figure 1 shows the schematic of the IW1608. Start by suppressing solar panel generation by covering it with a black cloth or similar method. Next, connect the solar panel cables to the terminals labeled **IN+** and **IN-** on the board. Ensure proper polarity.

Then, connect the battery to the terminals labeled **OUT+** and **OUT-**. If connected with reversed polarity, the fuse will blow, so please be cautious. The power will automatically turn on when the battery is connected. In the AX model, the display will show messages like **-TOKYO DEVICES-** and **IW1608**. In the AL model, the LED indicator will blink several times.

While the solar panel is covered, power generation is suppressed, and the IW1608 will immediately enter sleep mode. In the AX model, the screen will temporarily turn off. Next, remove the cover from the solar panel and start power generation. The IW1608 will automatically initiate charging in the optimal mode.

- **Reverse Polarity Protection:** If the battery is connected with reversed polarity, the fuse will blow for safety reasons. Replacement fuses are available from Tokyo Devices at <https://en.tokyodevices.com/>.
- **Cable Recommendation:** Use thicker cables, around 1.25 sq., to minimize loss.
- **Component Heating:** During high-power generation, electronic components and the board can become hot. Avoid touching them.
- **Proper Cable Disconnection:** To prevent malfunction, ensure that both cables are disconnected when removing the battery and panel cables. When rewiring, wait for about 30 seconds after disconnecting before reconnecting following the steps above.

3. Operating Modes

3.1. Sleep Mode

When the solar panel voltage is too low for charging, such as at night or on rainy days, the IW1608 enters sleep mode. In sleep mode, the module stops operating to avoid drawing power from the battery. On the AX model with an LCD screen, pressing the switch will display "SLEEP" on the screen, which will then turn off after a few seconds. For the AL model, the LED indicator remains off. As sunlight increases and the solar panel voltage rises to a suitable level for power generation, the module switches from sleep mode to MPPT charging mode.

3.2. MPPT Charging Mode

The MPPT charging mode consists of two sub-modes: absorb charging and floating charging.

Absorb Charging Mode

This mode is used when the battery is not fully charged and supplies high voltage and high current to the battery. As the battery approaches full charge, it automatically switches to floating charging mode. In the AX model, **ABSORB** is displayed on the screen, while in the AL model, the LED blinks.

Floating Charging Mode

In this mode, the battery is almost fully charged, so it is maintained at full charge using gentle current and safe voltage that do not stress the battery. If the battery voltage drops due to discharge, the module automatically switches back to absorb charging mode. The AX model displays **FLOAT** on the screen, while the LED remains steadily lit in the AL model.

4. LCD Screen Display (AX Model Only)

The LCD screen is operated using the screen-switching tact switch (SW1) mounted on the left side of the board. Each press of SW1 cycles through three screens in sequence:

Screen 1

- Top Left (Line 1): Displays the operating mode, showing either "SLEEP," "ABSORB," or "FLOAT." Refer to the previous section, "Operating Modes," for definitions.
- Top Right (Line 1): Real-time display of the generated power in watts (W).
- Bottom Right (Line 2): Real-time display of the charging current in amperes (A). If a "*" mark precedes the number, it indicates that the charging current is being limited due to excessive current flow.

ABSORB	69.5W
Current	*4.95A

Screen 2

- Top Left (Line 1): Displays the operating mode, showing either "SLEEP," "ABSORB," or "FLOAT." Refer to the previous section, "Operating Modes," for definitions.
- Top Right (Line 1): Real-time display of the generated power in watts (W).
- Bottom Right (Line 2): Real-time display of the charging current in amperes (A). If a "*" mark precedes the number, it indicates that the charging current is being limited due to excessive current flow.

PV	15.0V - 19.5V
BATTERY	*14.4V

Screen 3

- Top Left (Line 1): Displays the operating mode, showing either "SLEEP," "ABSORB," or "FLOAT." Refer to the previous section, "Operating Modes," for definitions.
- Top Right (Line 1): Real-time display of the generated power in watts (W).
- Bottom Right (Line 2): Real-time display of the charging current in amperes (A). If a "*" mark precedes the number, it indicates that the charging current is being limited due to excessive current flow.

PWM Duty	0x0332
Freq.	64KHz

Screen Auto-Off

The screen will automatically turn off after prolonged inactivity. Press SW1 to turn the display back on.

LCD Contrast Adjustment

If the LCD screen is too dim or faint, you can adjust the contrast using the variable resistor (VR) below the LCD screen (refer to Figure 1). Use a precision flathead screwdriver to adjust the contrast. Turning to the left will darken the display, while turning to the right will lighten it.

5. Product Customization Services

Tokyo Devices offers customization of circuit board exteriors, functionalities, and performance based on customer needs. For more details, please check the "Customization" on the Tokyo Devices website.

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