lamaPLC: MPPT solar charging Controller Modules

An **MPPT** (*Maximum Power Point Tracking*) Solar Charge Controller is an intelligent DC-to-DC converter that optimizes the energy harvested from solar panels. Unlike basic controllers, it decouples the solar panel's voltage from the battery's, ensuring the panel always operates at peak efficiency.

Core Function & Working Principle

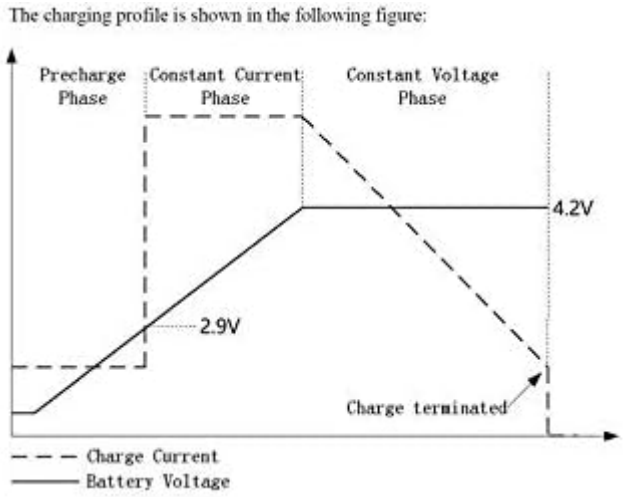
- **Maximum Power Point Tracking:** Solar panels have a fluctuating *"sweet spot"* (*Maximum Power Point* or **MPP**) where the combination of voltage (V) and current (I) produces the most watts. The MPPT module uses a perturb-and-observe algorithm to *"sweep"* the panel's input, finding the optimal point in real time as sunlight and temperature change.
- **Voltage Down-Conversion:** If a panel produces 18V but the battery only needs 12V, an MPPT controller converts that *"excess"* 6V into additional amperage rather than wasting it as heat.
- **Efficiency:** Modern MPPT modules typically offer 98% to 99% tracking efficiency, harvesting up to 30% more energy than standard PWM Controllers.

SD05CRMA

The **SD05CRMA** is a compact *Solar Charge Controller module* based on the CN3163 integrated circuit. It is designed specifically to charge single-cell **3.7V** *Lithium-Ion* (Li-Ion) or *Lithium-Polymer* (LiPo) batteries using solar energy.

Core Specifications

- **Input Voltage:** DC 4.4V to 6.5V (optimized for 5V solar panels).
- **Output Voltage:** DC 4.2V (standard charging voltage for Li-Ion/LiPo).
- **Maximum Charge Current:** 1.0A by default.
- **Operating Temperature:** -40°C to +85°C.
- **Dimensions:** Approximately 18mm x 10.16mm x 2.7mm



Key Features

- **Adaptive Charging:** The module features an *"on-chip adaptive cell"* that automatically adjusts the charging current based on the solar panel's output capability, preventing the input voltage from collapsing.
- **MPPT-like Performance:** Although linear, its adaptive nature makes it ideal for solar systems with fluctuating power availability.
- **Adjustable Current:** You can adjust the charging current by replacing R1 with a resistor (e.g., 1.18kω for 1A, 1.47kω for 0.8A).
- **Status Indicators:** It typically includes two LEDs: "**CR**" (Charging) and "**OK**" (Fully Charged or Constant Voltage mode).
- **Protection:** Includes overcharge protection, thermal regulation to prevent overheating, and automatic sleep mode when the input source is removed.

Note: If your solar panel outputs more than 6.5V (e.g., 12V or 18V), you must use a DC-DC step-down module.

Energy harvesting topics on lamaPLC

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• LamaPLC: LTC3108-1 Ultra Low Voltage Boost Converter Power Manager Breakout Development Board	2026/04/23 21:52	ltc3108-1, voltage, boost, converter, power manager, step-up, dc dc converter, thermoelectric generator, solar cell, energy harvesting, eh

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