



The I-ion battery charger stamp AS-910-03020-001 utilizes the MCP73831/2 devices with an advanced linear charge management control for use in space-limited, cost-sensitive applications. Along with their small physical size, the low number of external components required make the MCP73831/2 ideally suited for portable applications. For applications charging from a USB port, the MCP73831/2 adhere to all the specifications governing the USB power bus. The MCP73831/2 employ a desirable constant-current/constant voltage charge algorithm with selectable preconditioning and charge termination. The constant voltage regulation is fixed with 4.20V to accommodate the standard L-ion battery charging requirements. This stamp charger is selected for 4.20VDC. The constant current value is set with one external resistor, R1, for 400mA. The MCP73831/2 devices limit the charge current based on die temperature during high power or high ambient conditions. This thermal regulation optimizes the charge cycle time while maintaining device reliability. Several options are available for the preconditioning threshold, preconditioning current value, charge termination value and automatic recharge threshold. The preconditioning value and charge termination value are set as a ratio or percentage of the programmed constant current value. The MCP73831/2 devices are fully specified over the ambient temperature range of -40°C to +85°C.

Features:

- Linear Charge Management Controller:
 - Integrated Pass Transistor
 - Integrated Current Sense
 - Reverse Discharge Protection
- High Accuracy Preset Voltage Regulation: + 0.75%
- Voltage Regulation Option 4.20V
- Programmable Charge Current: 15 mA to 500 mA
- Selectable Preconditioning 10%
- Selectable End-of-Charge Control 7.5%
- Charge Status Output:
 - Tri-State Output - MCP73831 Charging/Charged, Open-Drain Output - MCP73832 Charging
- Automatic Power-Down
- Thermal Regulation
- Temperature Range: -40°C to +85°C
- Charge from a Regulated 5.0VDC to 6.0VDC Power Source
- Reverse Input Polarity Protection

Applications:

- Lithium-Ion/Lithium-Polymer Battery Charging
- Safe Charging for Hobby Projects
- Proto-Typing Integration
- Modifying Portable Equipment for L-ion Battery Use
- External Battery Power Sources
- USB Chargers

****CAUTION****

Read This Entire Document Before Use

For L-ion batteries smaller than 200mah, programming resistor R1 must be increased to an appropriate value to avoid over-charging and potential battery damage. Refer to the MCP73831 manufactures' literature/datasheet.

CHARGING STAMP OVERVIEW

MicroChip MCP73831/2 Battery Management IC

- Undervoltage Lockout (UVLO)

An internal UVLO circuit monitors the input voltage and keeps the charger in Shutdown mode until the input supply rises above the UVLO threshold. The UVLO circuitry has a built in hysteresis of 100 mV.

In the event a battery is present when the input power is applied, the input supply must rise to a level 150 mV above the battery voltage before the MCP73831/2 become operational.

The UVLO circuit places the device in Shutdown mode if the input supply falls to within +50 mV of the battery voltage. Again, the input supply must rise to a level 150 mV above the battery voltage before the MCP73831/2 become operational. The UVLO circuit is always active. Whenever the input supply is below the UVLO threshold or within +50 mV of the voltage at the VBAT pin, the MCP73831/2 are placed in Shutdown mode. During any UVLO condition, the battery reverse discharge current is less than 2 μ A.

- Battery Detection

A 6 μ A (typical) current is sourced by the VBAT pin to determine if a battery is present or not. If the voltage at +VBAT rises to VREG + 100 mV (typical), the device assumes that a battery is not present. If the voltage stays below VREG + 100 mV (typical), the device assumes that a battery is detected. In order to correctly detect a battery insertion, the impedance seen by the VBAT pin before the battery is connected must be greater than 2 M Ω .

- Charge Qualification

For a charge cycle to begin, all UVLO conditions must be met and a battery or output load must be present. A charge current programming resistor must be connected from PROG to Ground/Return. If the PROG pin is open or floating, the MCP73831/2 are disabled and the battery reverse discharge current is less than 2 μ A. In this manner, the PROG pin acts as a charge enable and can be used as a manual shutdown.

- Preconditioning

If the voltage at the +VBAT pin is less than the preconditioning threshold, the MCP73831/2 enter a preconditioning or Trickle Charge mode. The preconditioning threshold is factory set. Refer to In this mode, the MCP73831/2 supply a percentage of the charge current (established with the value of the resistor connected to the PROG pin) to the battery. The percentage or ratio of the current is factory set. When the voltage at the +VBAT pin rises above the preconditioning threshold, the MCP73831/2 enter the Constant-Current or Fast Charge mode.

- Fast Charge Constant-Current Mode

During the Constant-Current mode, the programmed charge current is supplied to the battery or load. The charge current is established using a single resistor R1 from PROG pin to Return/ground. Constant-Current mode is maintained until the voltage at the +VBAT pin reaches the regulation voltage, VREG.

- Constant-Voltage Mode

When the voltage at the +VBAT pin reaches the regulation voltage, VREG, constant voltage regulation begins. The regulation voltage is factory set to 4.2V with a tolerance of $\pm 0.75\%$.

- Charge Termination

The charge cycle is terminated when, during Constant-Voltage mode, the average charge current diminishes below a percentage of the programmed charge current (established with the value of the resistor connected to the PROG pin). A 1 ms filter time on the termination comparator ensures that transient load conditions do not result in premature charge cycle termination. The percentage or ratio of the current is factory set. The charge current is latched off and the MCP73831/2 enter a Charge Complete mode.

- Automatic Recharge

The MCP73831/2 continuously monitor the voltage at the +VBAT pin in the Charge Complete mode. If the voltage drops below the recharge threshold, another charge cycle begins and current is once again supplied to the battery or load. The recharge threshold is factory set.

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INSTRUCTIONS

The AS-910-03020 L-ion single cell battery charger stamp provides a safe method to charge L-ion batteries for hobby, product integration, or general use. The charging current is limited to 400ma to allow for a broader numbers of cell sizes that can be charged by this device.

There are four (4) exterior connections provided on the charger stamp.

- 6VDC+
- 6VDC-
- +VBAT
- -VBAT

The 6 Volt connections, (6VDC+ and 6VDC-), are for the battery charging power source. The charging source cannot provide power to a device connected to the battery. The 6VDC+ is for the charging power source positive(+) wire and the 6VDC- is for the charging power source negative(-) wire connections only. The Charger Stamp is reverse polarity protected if this connection is reversed/incorrectly applied.

For the L-ion battery charger stamp, the charging source, not included, needs to provide 5.0 to 6.0 volts DC at 500ma. Note: The charger stamp will go into over-voltage protection if the charging source exceeds 6.0 Volts DC. The charging source needs to be a regulated supply to prevent failure(s) in the control IC logic on the charger stamp.

The charger stamp is compatible with a USB connection being used as the power charging source. Refer to the wire connection standards for you particular USB port connection(s) and cable.

The +/- VBAT connections are for the L-ion cell's connection. Make sure to connect the battery positive(+) to the +VBAT connection and the battery negative(-) to the -VBAT connection. Reversing the polarity will damage the L-ion battery. Extra connection points are provided on the charger stamp to connect both the battery and the device using the batteries' charge.

With a proper power source applied to the charger stamp there are no LED indicators illuminated. When the L-ion battery is connected, the charger stamp will detect the battery and will light a "RED LED" for battery present and charging. The "GREEN LED" will light when the battery is present and fully charged.

CIRCUIT BOARD ASSEMBLY P/N AS-910-03020-001

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