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MAX1879 Evaluation Kit

Evaluates: MAX1879

General Description

The MAX1879, in conjunction with a P-channel MOSFET and a current-limited wall-mount adapter with an output voltage between +4.7V to +20V, allows safe and quick charging of a single lithium-ion (Li+) cell.

The MAX1879 evaluation kit (EV kit) is a complete, fully assembled and tested Li+ battery charger. Jumpers on the EV kit allow easy adjustment to a +4.1V or +4.2V battery regulation voltage. A light-emitting diode (LED) indicates the cell's charging status. A 6VDC, current-limited wall-mount cube that supplies 400mA of constant current is included with the kit.

Features

♦ **Simple Stand-Alone Li+ Charger**

♦ **Low Power Dissipation**

♦ **Safely Precharges Over-Discharged Cells**

♦ **Top-Off Charging to Achieve Full Battery Capacity**

♦ **8-Pin µMAX Package**

♦ **Surface-Mount Construction**

♦ **Fully Assembled and Tested**

Component Suppliers

SUPPLIER	PHONE	FAX
Fairchild	408-822-2000	408-822-2102
Leader Electronics	770-729-9720	770-729-9726
Murata	814-237-1431	814-238-0490
Nihon	661-867-2555	661-867-2698
Taiyo Yuden	408-573-4150	408-573-4159
Toshiba	949-455-2000	949-859-3963

Note: _Please indicate that you are using the MAX1879 when contacting these manufacturers._

Ordering Information

PART	TEMP. RANGE	IC PACKAGE
MAX1879EVKIT	0°C to +70°C	8 µMAX

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C6	0	Not installed (0805)
C2, C3	2	0.1µF ±10%, 50V ceramic capacitors (0805) Taiyo Yuden UMK212BJ104KG
C4	0	Not installed (0603)
C5	1	2.2µF ±20%, 10V ceramic capacitor (0805) Taiyo Yuden LMK212BJ225MG
C7	1	1000pF ±10%, 50V ceramic capacitor (0603) Murata GRM188R71H102KA01
R1	1	412kΩ ±1% resistor (0805)
R2	1	10kΩ ±5% resistor (0805)
LED1	1	LED (T-1^3/4)
D1	1	1A Schottky diode (SOT123) Nihon EP10QY03 or Toshiba CRS02

DESIGNATION	QTY	DESCRIPTION
P1	1	20V, 4.5A, P-channel MOSFET (SuperSOT-6) Fairchild FDC638P
J1	1	PC-mount power jack, 2.1mm CUISTACK CP-202A
JU1	1	4-pin header
JU2, JU3	2	2-pin headers
U1	1	MAX1879EUA (8-pin µMAX)
None	1	AC adapter: input 90-264VAC, 47-63Hz, output 6VDC/400mA Leader Electronics Inc. MI-060100-30/MI3-UL or equivalent
None	3	Shunts (JU1, JU2, JU3)
None	1	MAX1879 PC board
None	1	MAX1879 data sheet
None	1	MAX1879 EV kit data sheet

**For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.**

Quick Start

The MAX1879 EV kit is a fully assembled and tested surface-mount board. Follow the steps below to verify board operation. Do not plug the wall cube in until indicated.

1) Install a shunt across pins 1 and 2 of jumper JU1 (TSEL) for a minimum 34ms on-time top-off pulse width.

2) Install a shunt across jumper JU2 (THERM) to disable the temperature-monitoring function.

3) Verify that a shunt is not across jumper JU3 (ADJ) if charging a +4.2V Li+ battery. Install a shunt across jumper JU3 if charging a +4.1V Li+ battery.

4) Connect the wall cube to the power jack (J1) connector on the EV kit.

5) Place a voltmeter across the EV kit's BATT+ and BATT- terminals.

6) Plug in the wall adapter.

7) **Observe correct Li+ cell polarity.** Connect a single-cell Li+ battery across the EV kit's BATT+ and BATT- terminals. The LED will turn on if the battery voltage is below the predetermined voltage (4.1V or 4.2V) and greater than +2.5V. Refer to Table 4 for additional LED status descriptions.

8) The LED will turn off once the Li+ cell has been charged to the predetermined voltage.

Detailed Description

The MAX1879 EV kit is a fully assembled and tested single Li+ battery charger. The EV kit contains an external P-channel MOSFET for current switching and can deliver up to 1A of current to an Li+ battery. The input source used on the EV kit is a +6V current-limited 400mA wall cube, but the kit is not restricted to this source. Alternate current-limited power sources can be used for higher currents.

The EV kit contains a jumper that sets the battery (BATT) regulation voltage to +4.1V or +4.2V. An external resistor can also adjust the regulation voltage from +4.0V to +4.2V. An LED indicates the charging status of the battery. The maximum charging time is 6.25 hours.

The MAX1879 employs thermistor feedback to prequalify the Li+ cell's temperature for fast charging. The EV kit contains a jumper that allows the user to bypass this feature or to connect an external thermistor to the EV kit board.

Input Source

The input source for the MAX1879 EV kit must be a current-limited supply capable of continuous short-circuit operation. The supply should have a current limit of ≤ 1A and an output voltage between +4.7V and +20V. The adapter provided with the EV kit is a +6V source

capable of supplying 400mA. Alternate current-limited power sources can be used for higher charge currents, but diode D1 and MOSFET P1 must be rated accordingly.

Jumper Selection

The MAX1879 EV kit features jumpers (JU1, JU2, and JU3) to configure the circuit for optimal charging performance and evaluation.

Jumper JU1 sets the minimum on-time pulse width. Refer to Table 1 for the JU1 shunt configuration to select the appropriate top-off pulse width. Refer to the *Selecting Minimum On-Time* section in the MAX1879 data sheet for information on selecting the minimum on-time pulse width in top-off mode.

Table 1. JU1 Shunt Positions

SHUNT POSITION	TSEL PIN	MINIMUM ON-TIME IN TOP-OFF (ms)
1-2	Connected to BATT	34
1-3	Connected to ADJ	69
1-4	Connected to GND	137

Jumper JU2 connects the MAX1879 thermistor input (THERM) to a 10kΩ resistor, thus disabling temperature qualification. To enable temperature qualification, remove the shunt from JU2 and connect a thermistor between the THERM and GND pads. The thermistor should be 10kΩ at +25°C and have a negative temperature coefficient. See Table 2 for the JU2 configuration. Refer to the *Thermistor* section in the MAX1879 data sheet for other thermistor details.

Table 2. Using a Thermistor

JUMPER	JUMPER STATE	FUNCTION
JU2	Open	Open before connecting a thermistor from THERM pad to GND
	Closed	Bypasses THERM with 10kΩ resistor

Jumper JU3 sets the battery regulation voltage. The EV kit comes with two voltage options, 4.2V (JU3 open) and 4.1V (JU3 closed). For other voltages (+4.0V to +4.2V), replace resistor R1. Refer to the *Adjusting the Battery Regulation Voltage* section in the MAX1879 data sheet to select resistor R1. See Table 3 for the JU3 configuration.

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Table 3. Fixed Voltage Regulation

JUMPER	JUMPER STATE	VOLTAGE REGULATION
JU3	Open	4.2V
	Closed	4.1V

Output Signal

The LED on the EV kit is driven by the $\overline{CHG}$ pin. Depending on the Li+ cell's charging status, the pin is low or high impedance, thus turning the LED on or off.

If a thermistor is installed, and the cell temperature is unacceptable for fast charging, or the charger is in the precharging state, the LED blinks at 2Hz. The EV kit stops charging the cell during a temperature fault. See Table 4 for LED and $\overline{CHG}$ states.

For driving logic circuits, remove the LED and install a 100kΩ pullup resistor from $\overline{CHG}$ to the logic supply of the $\overline{CHG}$ monitoring circuit. A logic low signal will appear at $\overline{CHG}$ when the charger is in fast-charge; otherwise, a logic high signal will be detected. During the precharging or temperature fault state, the output logic signal will alternate between low and high at a fixed frequency of 2Hz. See Table 4.

Table 4. LED States

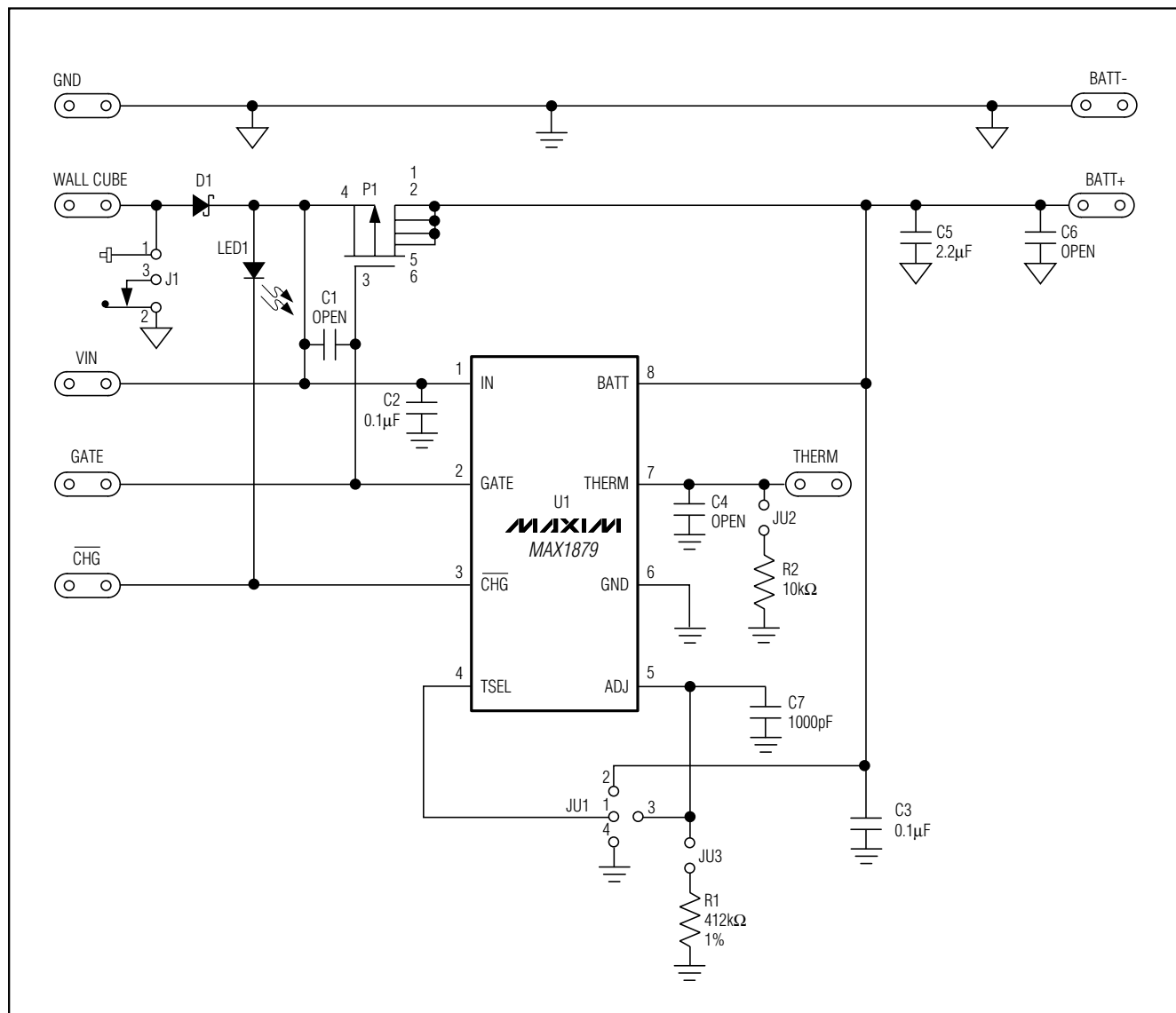| LED	CONDITION	$\overline{CHG}$ STATE
Off	No battery, no wall cube, cell voltage < 2.2V, top-off, or battery charged	High impedance
On	Fast-charge in progress	Low impedance
Blinking (2Hz)	Precharging near-dead cells (+2.2 to +2.5V) or temperature fault during fast-charge	High-low impedance (50% duty cycle)

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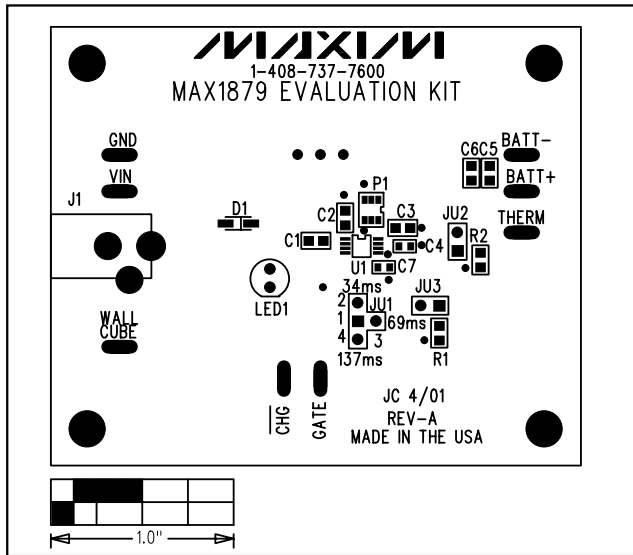
Figure 1. MAX1879 EV Kit Schematic

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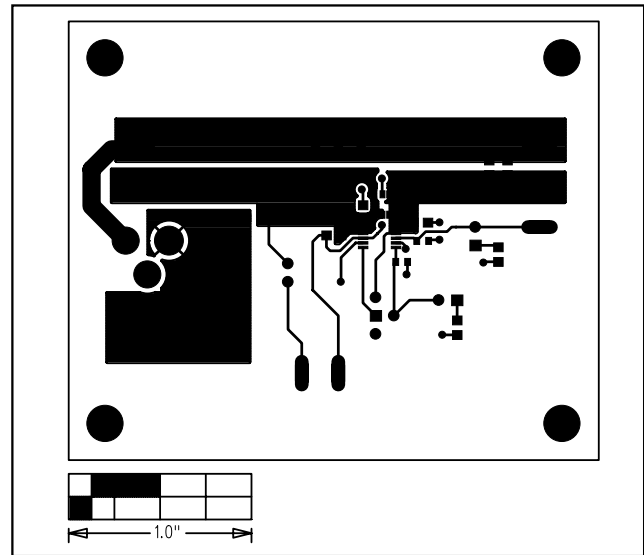Figure 2. MAX1879 EV Kit Component Placement Guide—Component Side

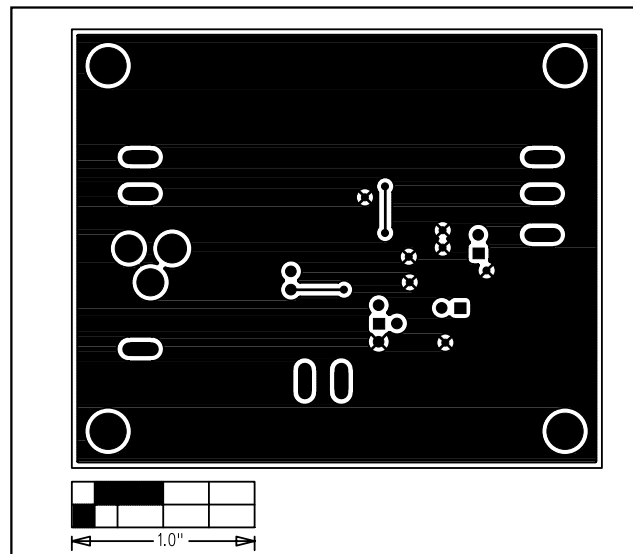

Figure 3. MAX1879 EV Kit PC Board Layout—Component Side

Figure 4. MAX1879 EV Kit PC Board Layout—Solder Side