

Advanced Li-Ion Charger Development System Control of On-Board Linear Regulator

Features

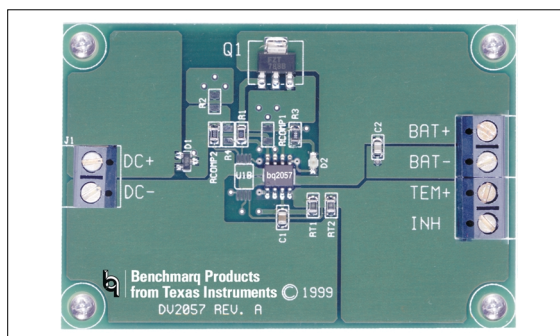
- bq2057 charge-control evaluation and development system for single- and dual-cell Li-Ion packs with coke or graphite anodes
- Optional temperature monitoring before and during charge
- Proprietary AutoComp™ charge-rate compensation
- Integrated trickle-charge for conditioning deeply discharged batteries
- Regulated charge current and voltage
- Charge status output for LED or host-processor interface to indicate charge-in-progress, full-capacity, and fault conditions
- Automatic battery-re-charge feature
- Charge termination by minimum current
- Direct battery connection
- 500mA charge rate
- High-side current sensing

General Description

The DV2057/C/T/W are complete development and evaluation environments for bq2057 series advanced Li-Ion linear charge management ICs. The DV2057 family supports both single- and dual-cell Li-Ion packs with coke or graphite anodes:

Part Number	Regulation Voltage
DV2057	4.1V
DV2057C	4.2V
DV2057T	8.2V
DV2057W	8.4V

Full charge is preceded by charge qualification based on battery temperature and voltage. The DV2057/C/T/W suspend charge if the battery temperature is outside the V_{TS1} to V_{TS2} thresholds and wait until the battery temperature is within the allowed range. The DV2057/C/T/W also check the battery voltage. If the battery voltage is below the low-voltage threshold, V_{MIN} , the DV2057/C/T/W use trickle charge to condition the battery. The conditioning charge rate, I_{COND} , is set at



approximately 10% of the regulation current. The conditioning current also minimizes heat dissipation in the external pass element during the initial stage of charge.

Once the battery voltage reaches the internal threshold, V_{MIN} , full charge begins. The DV2057/C/T/W complete the charge cycle in two phases. While the pack is below the regulation voltage, a constant-current phase replenishes approximately 70% of battery capacity. An accurate voltage-regulation phase completes the charge. The DV2057/C/T/W terminate charge when the current tapers off to the V_{TERM} threshold.

These boards feature the proprietary AutoComp technique to compensate safely for the internal impedance of the battery. The AutoComp resistors, R_{COMP1} , and R_{COMP2} , must be set according to the characteristics of the battery.

Before using these development boards, please review the bq2057 data sheet.

Connection Descriptions

J1	
DC+	Charger supply positive
DC-	Charger supply ground
J2	
BAT+	Positive battery terminal
BAT-	Negative battery terminal
J3	
TEM+	Thermistor connection
INH	Charge inhibit input

DV2057/C/T/W

Configuration

These boards have the following characteristics:

DV2057/C/T/W Regulation Voltages

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- Supply connector J1 accepts a maximum of 16VDC (See the limitation on power dissipation below.)
- Charge begins after application of both of the following:
 - the battery
 - supply voltage
- Temperature sensing: disabled
- AutoComp: disabled

The on-board regulator supplies a charging current of 500mA. This current is controlled by the value of the sense-resistor, R2 in the following equation:

$$I_{CHG} = \frac{0.100}{R_2}$$

As configured, charge can be inhibited by connecting the INH input to DC+ or DC-.

The value of R2 at shipment is 0.2Ω. This resistor can be changed to suit the application. However, the maximum power dissipation in Q1 should not exceed the PD rating. (See recommended DC Operating Conditions.)

Setup Procedure

1. Connect the battery pack to J1.
2. Connect the charging supply to J2.

See the bq2057 data sheet for information on configuring the temperature sensing circuit and the AutoComp feature.

As shipped the DV2057/C/T/W uses a bipolar transistor (Q1). Optionally, the user may replace Q1 with a P-channel MOSFET. Please refer to the schematic for details.

Recommended DC Operating Conditions

Symbol	Description	Minimum	Typical	Maximum	Unit	Notes
V _{DC}	Input DC voltage	V _{BAT} +0.5	-	15	V	See Note.
I _{CHG}	Battery charge current	-	-	500	mA	See Note.
V _{THERM}	Therm input voltage	0	-	V _{DC}	V	
V _{INH}	Inhibit input voltage	0	-	V _{DC}	V	
V _{BAT}	BAT input voltage	0	See Regulation Voltages Table.	V _{DC}	V	
P _D	Power dissipation			1.75	W	At 40°C ambient temperature

Note: Power dissipation must not exceed the maximum P_D rating.

$$P_D = I_{CHG} * (V_{DC} - V_{BAT})$$

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