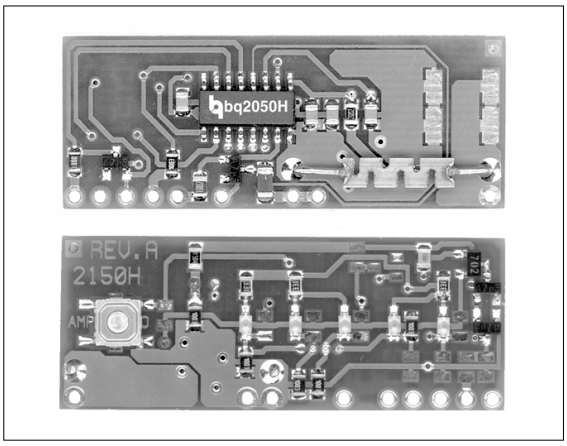
Benchmarq Products
from Texas Instruments

DM2050H

bq2050H Li-Ion Power Gauge™ Demonstration Module

Features

- Complete bq2050H Power Gauge solution for Li-Ion battery packs
- Battery information available over a single-wire (HDQ) bidirectional serial port
- Control signals to enhance pack protection
- Battery state-of-charge monitoring for 2-, 3-, and 4-cell series applications
- On-board regulator allows direct connection to the battery
- Includes push-button activated LEDs to display state-of-charge information
- Compact size for battery pack integration



General Description

The DM2050H Power Gauge Module is a complete and compact example solution for capacity monitoring of Li-Ion battery packs. The DM2050H incorporates a bq2050H Gas Gauge IC, a 0.03Ω current sense resistor, and all other components necessary to accurately monitor and display the capacity of 3 series cells.

The DM2050H includes five LEDs to display remaining capacity in 20% increments of the learned capacity. The LEDs are activated with the onboard push-button switch.

Contacts on the DM2050H provide direct connection to the battery stack (BAT+, BAT-) and the serial communications port (HDQ). The RBI input provides backup power to the bq2050H if the cells are removed or the battery is turned off. The DM2050H has a 1µF capacitor onboard connected to RBI to supply backup power for about an hour. In battery packs that use high-side FETs to control the charge/discharge of the Li-Ion cells, the RBI input can be wired to a single cell to provide prolonged data retention times. The SD input allows an external signal (active low) to turn the bq2050H IC off to minimize internal current consumption of the battery pack and maximize storage life of the pack in the system. When turned off, the DM2050H is non-functional, and the RBI power source maintains register information. Please refer to the bq2050H data sheet for the specifics on the operation of the gas gauge.

Pin Descriptions

P1	**HDQ/Serial Communications port**
P2	**PSTAT/Protector status input**
P3	**BAT+/Battery positive/pack positive**
P4	**SD/Shutdown**
P5	**RBI/Register backup input**
P6	**GND/Ground**
P7	**PACK-/Pack negative**
P8	**BAT-/Battery negative**
P9	**CFC/Charge FET control output**

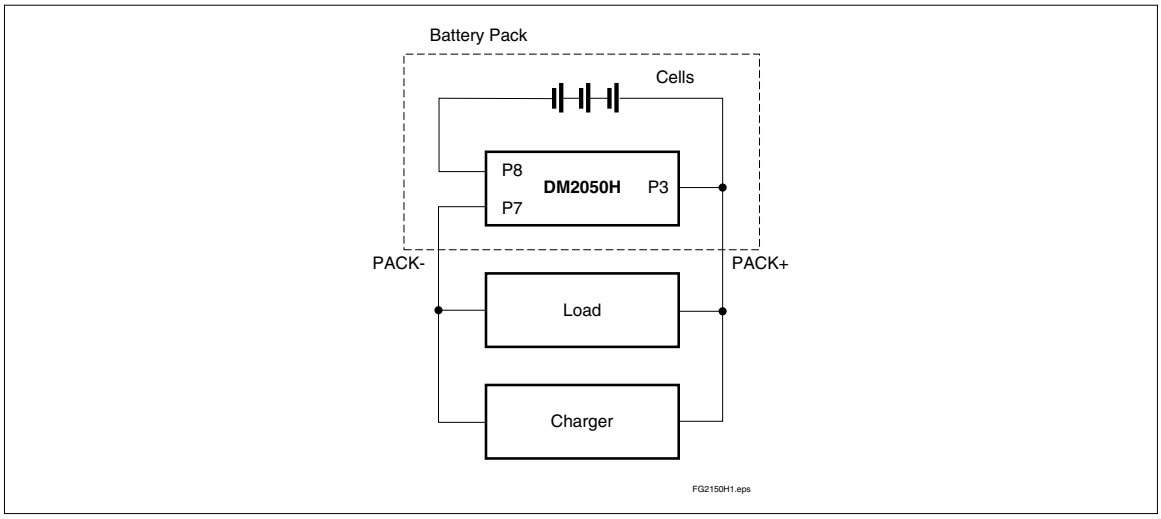


Figure 1. Module Connection Diagram

Re-Programming

The DM2050H circuit modules are pre-configured for battery pack voltage and pack capacity. The circuit modules can be re-programmed for capacity and other critical operating parameters via programming resistors.

The setting of pins 2, 3, 4, 5, and 6 of the bq2050H determine the PFC (Programmed Full Count) of the gas gauge via resistors R12–R15, R17–R20, and R23–R24. The bq2050H data sheet shows the complete explanation, calculations, and the Hi, Low or Float states.

PFC Input Settings				R_{SNS}	Capacity
SEG1 (pin 2)	SEG2 (pin 3)	SEG3 (pin 4)	SEG4 (pin 5)	(Ω)	(Ah)
H	L	L	L	0.03	4.5
L	H	L	L	0.03	3.0
L	H	H	H	0.03	1.5

Note: L = pull down via 100k to VSS, H = pull up via 100k to VCC, Z = not connected

SEG5 (pin 6) is configured in the Z state to enable the LEDs when charging and to configure the gas gauge for a Coke Anode pack.

The following procedure changes changes the configuration to one shown in the table above or to an alternative the following procedure should be followed:

(1) Ensure the DM2050H is disconnected from the battery and charger.

(2) Determine the required setup for pins 2, 3, 4, 5, and 6.

(3) Remove required 100k resistors where needed.

(4) Place required 100k resistors where needed.

(5) Reconnect the battery pack to the EV2200-50H evaluation system.

(6) Run the EV2200-50H software and move to the **Setup** tab to verify new PFC settings.

The DM2050H is shipped with a 0.03Ω sense resistor allowing the following current dynamic range.

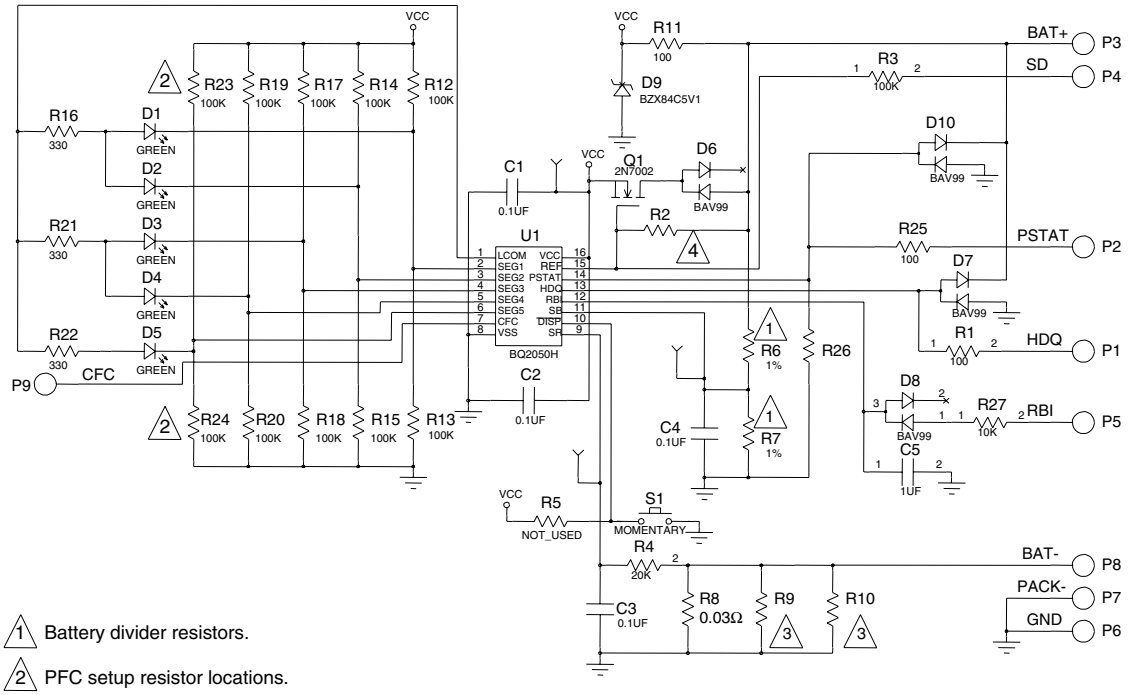
	Current Range		
R_{SNS} (Ω)	Minimum	Maximum Discharge	Maximum Charge
0.03	15mA	3A	3A

Note: Charge and discharge maximum limited by PCB design of DM2050H.

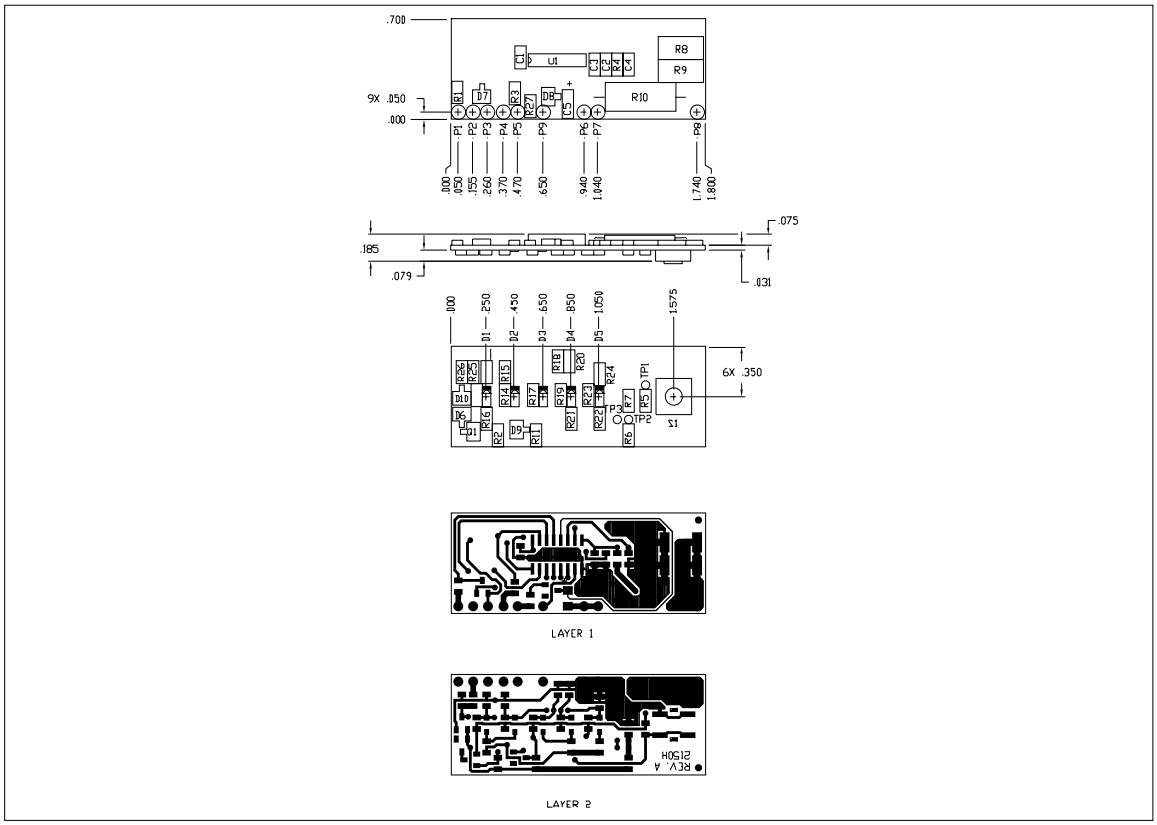
The bq2050H resistor divider is configured for a specific number of Li-Ion cells giving the following voltage limits:

			Voltage Range	
Pack Voltage	R6 (Ω)	R7(Ω)	EDV1	EDVF
10.8V 3 cells	1.1M	100k	9.12V	8.82V

DM2050H Schematic



DM2050H Board



Ordering Information

Module Part Number	EVM Part Number	Pack Voltage	Capacity
DM2050H-002	bq2050HEVM-002	10.8V	4.5Ah*

*Can be modified by adding or subtracting resistors on the DM2050H.