

User's Guide

BQ25175EVM Evaluation Module



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ABSTRACT

This user's guide describes the characteristics, operation, and use of the BQ25175EVM evaluation module (EVM). This EVM is designed to help the user evaluate and test the various operating modes of the BQ25175. This user's guide includes setup instructions for the hardware and software, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module.

Throughout this user's guide, the abbreviations *EVM*, *BQ25175EVM*, *BMS036*, and the term *evaluation module* are synonymous with the BMS036 evaluation module, unless otherwise noted.

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WARNING

Hot surface! Contact may cause burns. Do not touch!

Some components may reach high temperatures $>55^{\circ}\text{C}$ when the board is powered on. The user must not touch the board at any point during operation or immediately after operating, as high temperatures may be present.

1 Introduction

The Texas Instruments BQ25175EVM is a Li-Ion and Li-Poly chemistry battery charger IC for 4.35-V single cell. Charging current can be set from 60 mA to 600 mA with external resistor on ISET.

1.1 Printed Circuit Board Assembly

The BQ25175EVM PCB contains the BQ25175 IC and support circuits. This board contains several jumpers and connectors. R5 can be used to change ISET value, fast charge current. R6 can be used to adjust TS, battery temp sensor to simulate hot and cold fault.

1.2 I/O Descriptions

[Table 1-1](#) lists the input and output connections available on this EVM and their respective descriptions.

Table 1-1. EVM I/O Connections

I/O Connector	Description
J1 – VOUT / GND / GND / TS	Battery connection, TS should be 10k NTC but not needed.
J2 – VIN / GND	Input voltage from external power supply, recommended 5 V. Max operating input voltage is 6.6 V, OVP trip point. Max input voltage is 30 V while in OVP.
JP1 – VOUT / R1	STAT LED
JP2 – POT / TS / 10k	NTC temp sensor. R6 range from 0 to 50 k Ω . R2 = 10 k Ω
JP3 – TS / GND	Disable charge by pulling TS to GND
JP4 – ISET / R3	Sets Fast Charge Current. Adjust through R5, range 60 mA to 600 mA

2 Test Summary

This section describes the jumpers and connectors on the EVM as well as how to properly connect, setup, and use the BQ25175EVM. Note that the default jumper setting of headers are marked with white bars to indicate the shorting jumper position.

2.1 Equipment

This section includes a list of supplies required to perform tests on this EVM.

1. Battery simulator such as Keithley 2400 or equivalent. Or a single-cell battery.
2. Power supply, 5-V 1-A input. Note that unit can operate up to 6.6-V input.
3. Voltage meter and current meter.

2.2 Cautions

To prevent possible damage to battery under test verify that charging conditions of the cell are not exceeded. Check max charge voltage and current.

Power dissipation of the device can be exceeded with too high an input to output voltage drop and current. Thermal regulation begins reducing current at 125 °C, at 150 °C device will shut off.

Device can get hot during high input-to-output voltage drop and high current conditions. Use caution when handling the board.

2.3 Test Instructions

In order for this EVM to operate properly, the following components must be connected and properly configured.

1. Set input power supply to 5 V and Battery Simulator to 3.6 V with compliance to support 600 mA. Turn off Supply and Battery Simulator.
2. Adjust R5 to lowest value so $R_{ISET} = 500 \Omega$ (600 mA fast charge)
3. Connect input voltages to J2 and Battery Simulator to J1 on the EVM.
4. Configure all EVM jumpers to factory setting, refer to table below.
5. Turn on all supplies and loads
 - a. 5-V Input supply current limit should be greater than 600 mA
 - b. Out voltage should be 3.6 V and charge current 600 mA
 - c. LED D1 will be ON
6. Simulate battery completing charge by increasing Battery Simulator voltage to 4.35 V
 - a. Current will decrease to 0 mA
 - b. LED D1 will switch to OFF.

Table 2-1. Jumper Factory Setting

I/O Connector	Factory Setting
JP1	Shorting jumper installed
JP2	Shorting jumper installed with TS to 10k
JP3	Open
JP4	Shorting jumper installed

3 Board Layout, Schematic, and Bill of Materials

3.1 Board Layout

The board layout is shown in [Figure 3-1](#) to [Figure 3-6](#).

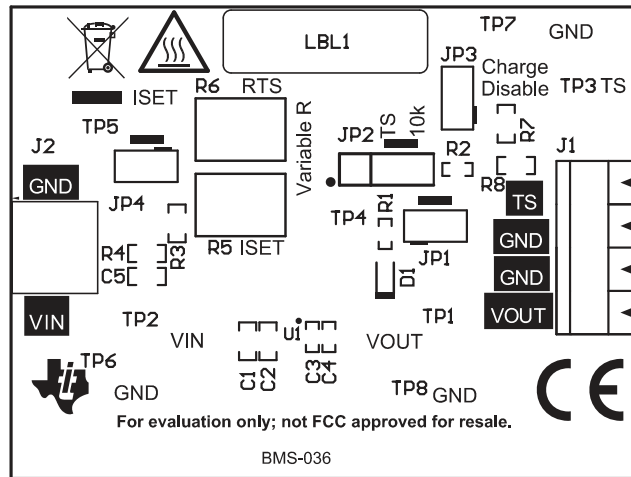


Figure 3-1. Top Overlay

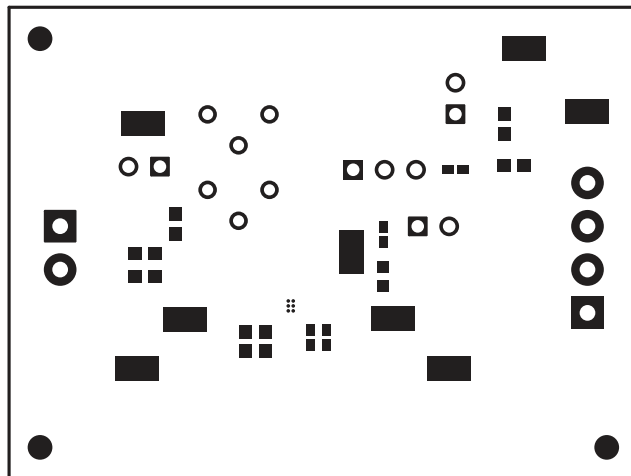


Figure 3-2. Top Solder

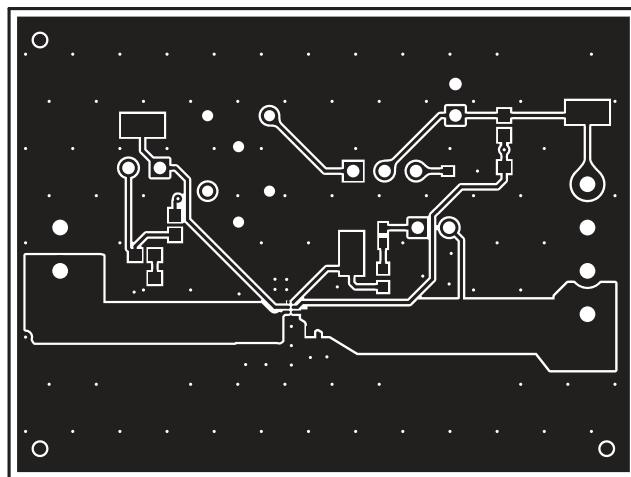


Figure 3-3. Top Layer

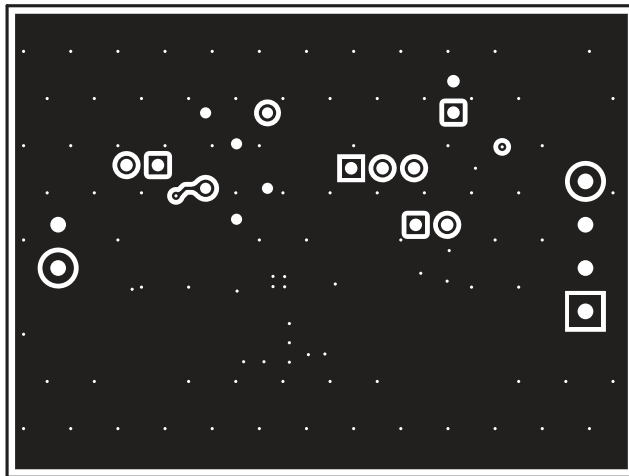


Figure 3-4. Bottom Layer

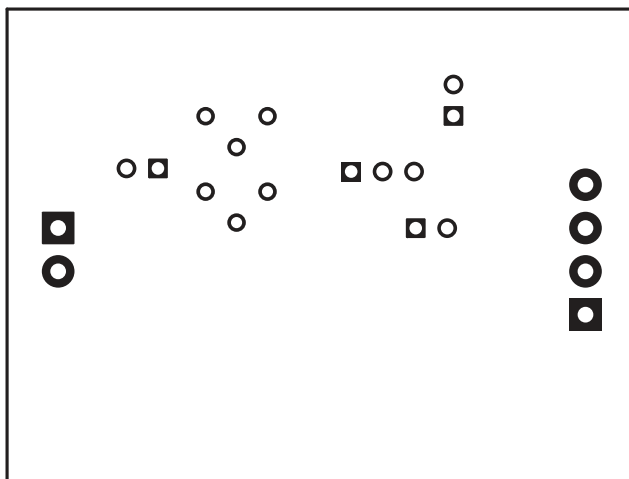


Figure 3-5. Bottom Solder

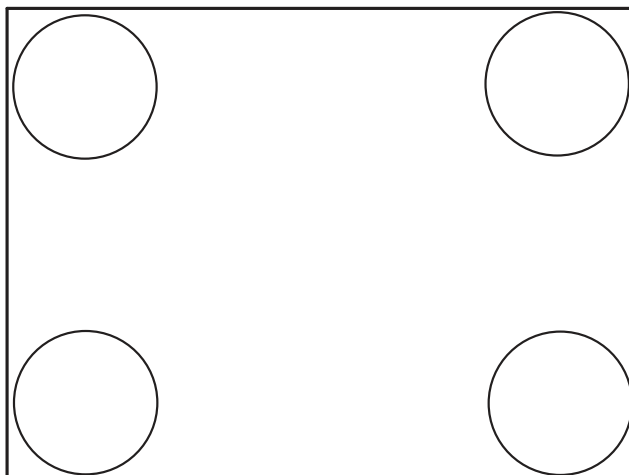


Figure 3-6. Bottom Overlay

3.2 Schematic

The BQ25175EVM schematic is shown in Figure 3-7.

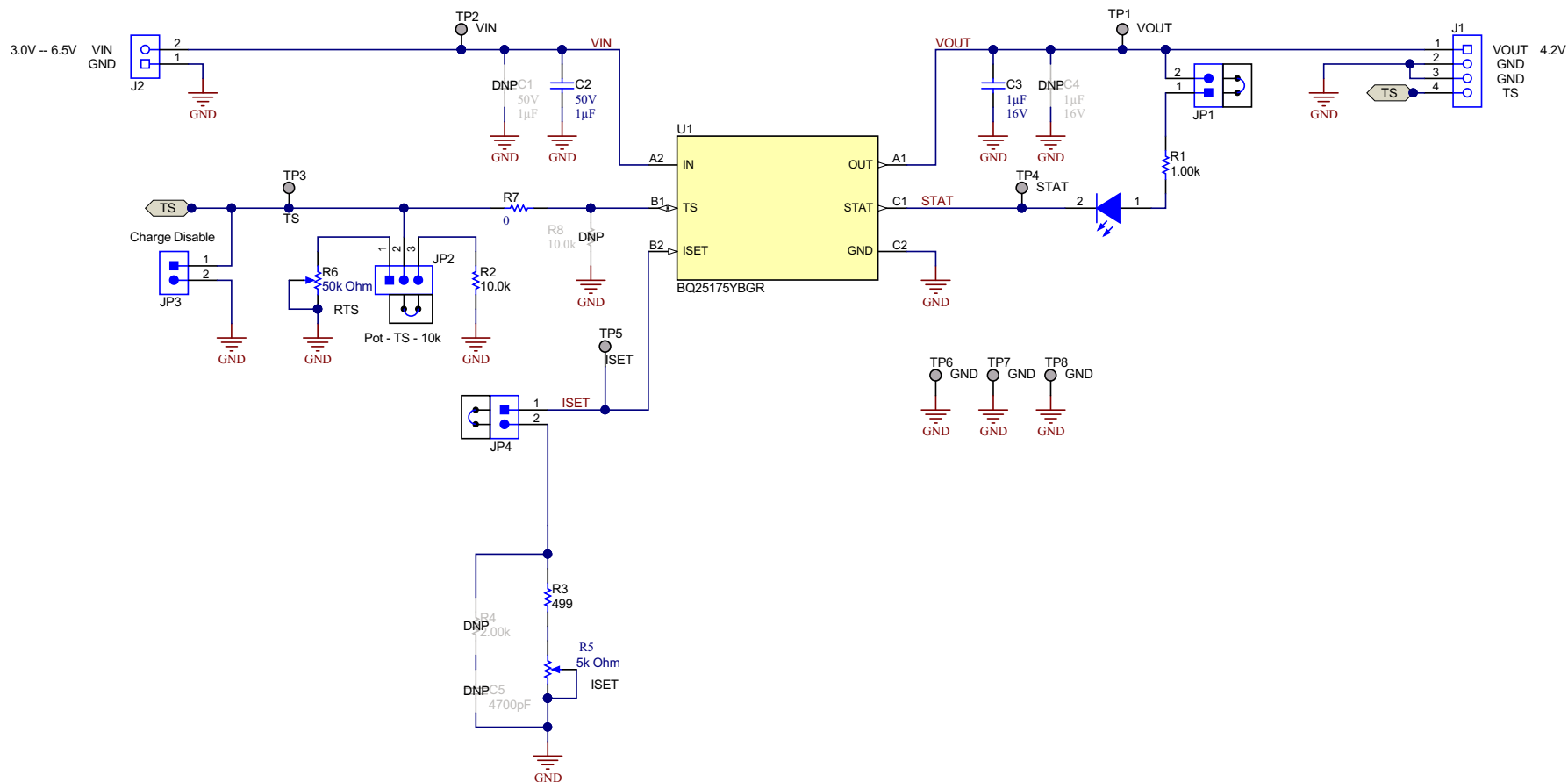


Figure 3-7. BQ25175EVM Schematic

3.3 Bill of Materials

The bill of materials is shown in the following table.

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
!PCB1	1		Printed Circuit Board		BMS-036	Any		
C2	1	1uF	CAP, CERM, 1 μ F, 50 V,+/- 20%, X5R, AEC-Q200 Grade 3, 0603	0603	GRT188R61H105M E13D	MuRata		
C3	1	1uF	CAP, CERM, 1 μ F, 16 V,+/- 20%, X5R, 0402	0402	GRM155R61C105 MA12D	MuRata		
D1	1	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On		
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
J1	1		Terminal Block, 3.5mm Pitch, 4x1, TH	14x8.2x6.5mm	ED555/4DS	On-Shore Technology		
J2	1		Terminal Block, 3.5mm Pitch, 2x1, TH	7.0x8.2x6.5mm	ED555/2DS	On-Shore Technology		
JP1, JP3, JP4	3		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions		
JP2	1		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	Sullins Connector Solutions		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady		
R1	1	1.00k	RES, 1.00 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04021K00F KED	Vishay-Dale		

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
R2	1	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0F KED	Vishay-Dale		
R3	1	499	RES, 499, 1%, 0.1 W, 0603	0603	CRCW0603499RF KEAC	Vishay-Dale		
R5	1	5k Ohm	Trimmer Potentiometer, Lead Sealed Type Multiturn PV37 Series, TH	6.71x4.5mm	PV37W502C01B00	Bourns		
R6	1	50k Ohm	Trimmer Potentiometer, Lead Sealed Type Multiturn PV37 Series, TH	6.71x4.5mm	PV37W503C01B00	Bourns		
R7	1	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo		
SH-JP1, SH-JP2, SH-JP4	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8		Test Lead clips and hooks, SMT	Test Point, Body 3.25x1.65mm	S1751-46	Harwin		
U1	1		BQ25175YBGR, YBG0006AJAP (DSBGA-6)	YBG0006AJAP	BQ25175YBGR	Texas Instruments		Texas Instruments
C1	0	1uF	CAP, CERM, 1 μ F, 50 V,+/- 20%, X5R, AEC-Q200 Grade 3, 0603	0603	GRT188R61H105M E13D	MuRata		
C4	0	1uF	CAP, CERM, 1 μ F, 16 V,+/- 20%, X5R, 0402	0402	GRM155R61C105 MA12D	MuRata		

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
C5	0	4700pF	CAP, CERM, 4700 pF, 50 V, +/- 10%, X5R, 0603	0603	GRM188R61H472 KA01D	MuRata		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
R4	0	2.00k	RES, 2.00 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06032K00F KEA	Vishay-Dale		
R8	0	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0710KL	Yageo		

Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

4 Revision History

DATE	REVISION	NOTES
May 2021	*	Initial Release

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