

Linear Single Cell Li-Ion Battery Charger Evaluation Board

General Description

The evaluation board demonstrates the RT9525GQW to be designed for an integrated single cell Li-ion battery charger with Auto Power Path Management (APPM). No external MOSFETs are required making it suitable for portable applications. The RT9525GQW optimizes the charging tasks by using a control algorithm including pre-charge mode, fast-charge mode and constant-voltage mode. It terminates the charging task in constant voltage mode when the charging current reduces to the termination current of 20% I_{CHG_FAST}. The charge current is programmable with an external resistor. The RT9525GQW also provides undervoltage protection and overvoltage protection for the VIN supply. In addition, the internal thermal feedback circuitry regulates the die temperature to optimize the charge rate for all ambient temperatures.

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Performance Specifications

The performance specifications of the RT9525GQW are listed in Table 1. The test conditions are $V_{IN} = 5V$, $V_{BAT} = 4V$ and $T_A = 25^\circ C$, unless otherwise specified.

Table 1. Performance Specifications of RT9525GQW Evaluation Board

Item	Test Conditions	Min	Typ	Max	Unit
VIN Operating Range		4.2	--	6	V
VIN Undervoltage Lockout Threshold		3.1	3.3	3.5	V
VIN Undervoltage Lockout Hysteresis		--	240	--	mV
Battery Regulation Voltage	$0^\circ C$ to $85^\circ C$, $I_{LOAD} = 20mA$	4.16	4.2	4.23	V
System Regulation Voltage	$V_{IN} = 6V$	5.3	5.5	5.7	V
APPM Regulation Voltage	EN2 = L , EN1 = H	4.2	4.3	4.4	V
DPM Regulation Voltage	EN2 = L	4.35	4.5	4.63	V
Re-Charge Threshold	Battery Regulation - Recharge-Level	120	200	280	mV
VIN Charge Setting Range		100	--	1200	mA
VIN Current Limit	EN2 = H, EN1 = L (1.5A mode)	1.2	1.5	1.8	A
	EN2 = L, EN1 = H (500mA mode)	450	475	500	mA
	EN2 = L, EN1 = L (100mA mode)	80	90	100	mA
BAT Pre-Charge Threshold	BAT falling	2.75	2.85	2.95	V
BAT Pre-Charge Threshold Hysteresis		--	200	--	mV
Pre-Charge Current	$V_{BAT} = 2V$	5	10	15	%
Termination Current Ratio to Fast Charge		10	20	30	%
OVP SET Voltage	V_{IN} rising	6.25	6.5	6.75	V
OVP Hysteresis		--	100	--	mV
Output Short Circuit Detection Threshold	$V_{BAT} - V_{SYS}$	--	300	--	mV
Thermal Regulation		--	125	--	$^\circ C$
Thermal Shutdown Temperature		--	155	--	$^\circ C$
Thermal Shutdown Hysteresis		--	20	--	$^\circ C$
Pre-Charge Fault Time	$C_{TIMER} = 1\mu F$	1440	1800	2160	s
Fast-Charge Fault Time	$C_{TIMER} = 1\mu F$	11520	14400	17280	s

Power-up Procedure

Required Equipment

- RT9525GQW evaluation board
- DC power supply
- Electronic load
- Multimeter
- Oscilloscope

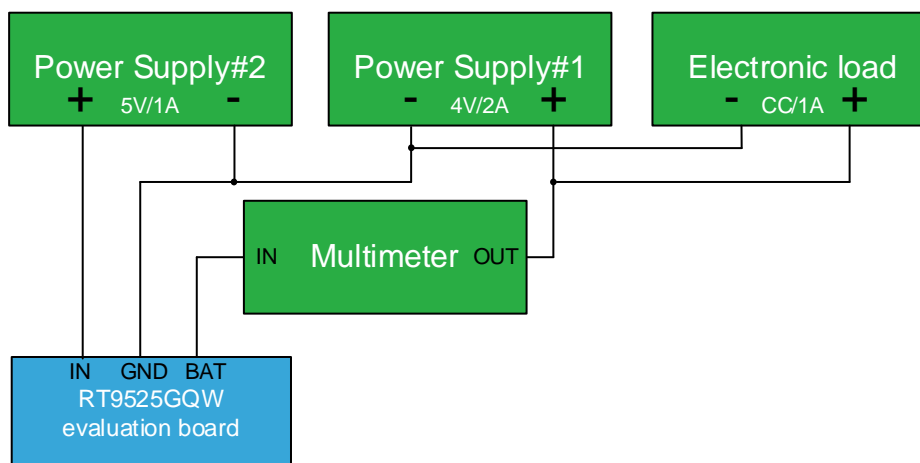
Quick Start Procedures

Inspect all the components on the EVB and make sure they are undamaged. Do not turn on power supplies until they are connected well on the EVB.

Equipment setup and the test procedures are stated below:

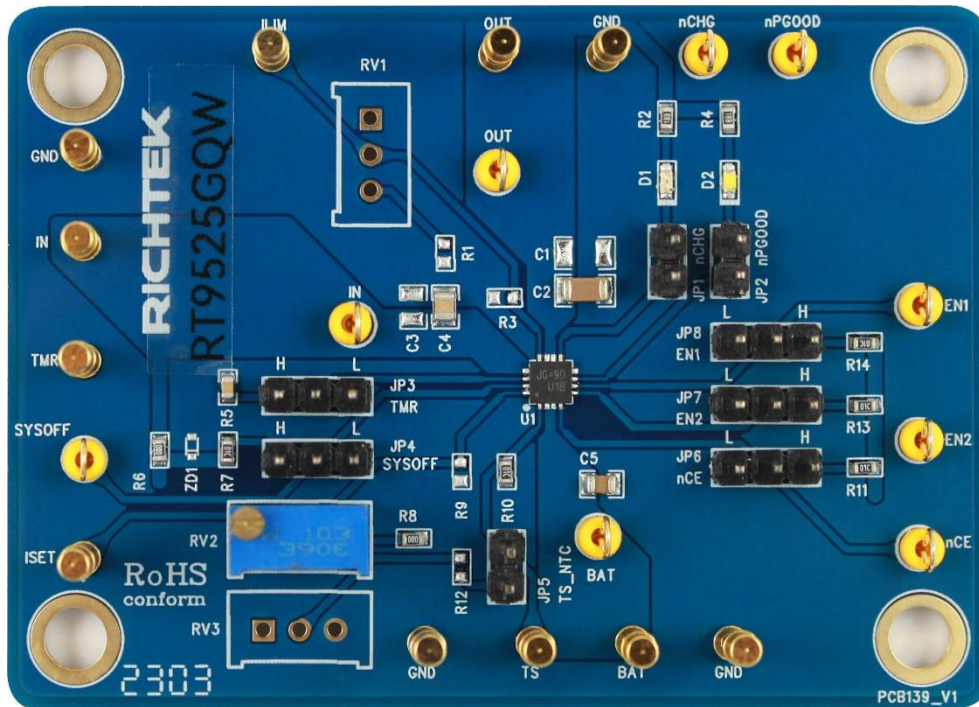
- 1) Put jumper connectors on JP1 and JP2.
- 2) Put jumper connectors on JP3, JP4, JP6 and JP8 at L side.
- 3) Put jumper connectors on JP7 at H side.
- 4) Adjust RV2 to 1k Ω .
- 5) Set power supply #1 voltage = 4V and current = 2A and connect it to BAT through multimeter and GND pins on the EVB.
- 6) Connect an e-load with power supply #1 in parallel and sink 1A in CC mode.
- 7) Set power supply #2 voltage = 5V and current = 1A and connect it to IN and GND pins on the EVB.
- 8) Turn on power supply #1 and the electronic load.
- 9) Turn on power supply #2.
- 10) Check whether D1 and D2 light or not.
- 11) Use a multimeter to check whether IBAT equals to $V_{ISET} / R_{ISET} \times 300$ or not.

Test Environment Diagram



Detailed Description of the Evaluation Board

Headers Description and Placement



Inspect carefully all the components used on the EVB according to the following bill of material and make sure all the components are undamaged and installed correctly. If there is any missing or damaged component, which may occur during transportation, please contact our distributors or e-mail us at evb_service@richtek.com.

Test Points

Test points are provided on the EVB and their pin names are listed in the table as shown below.

Test Point/ Pin Name	Pin Function
IN	Supply voltage input.
OUT	System connection pin.
BAT	Battery connection pin.
GND	Ground.
ISET	Charge current set input.
TMR	Safe charge timer setting.
TS	Thermistor monitor input.
EN1	Input current limit configuration setting.
EN2	
SYSOFF	System disconnection pin.
nCE	Charge enable.

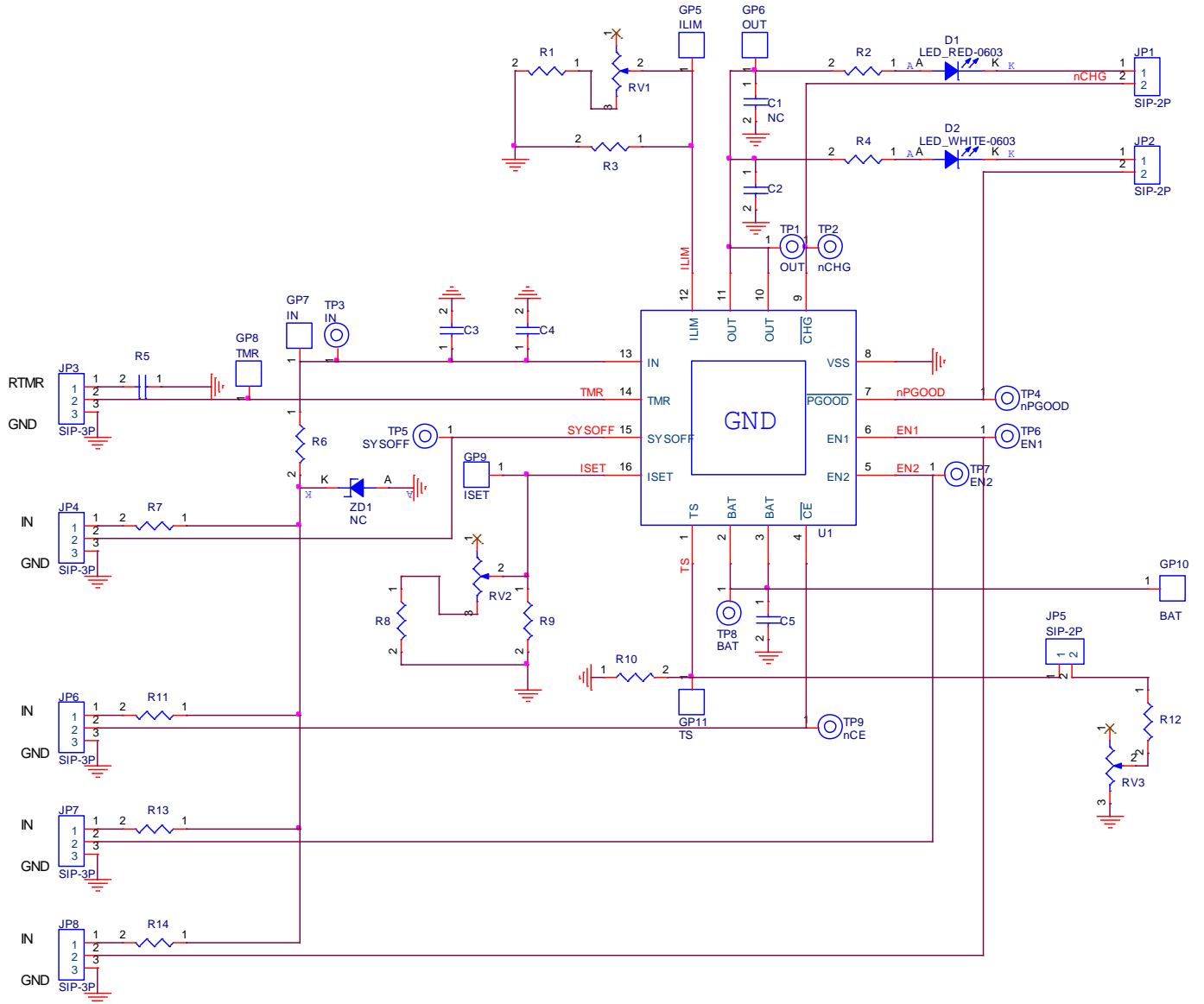
Test Point/ Pin Name	Pin Function
nCHG	Charger status output.
nPGOOD	Power good status output.

Bill of Material

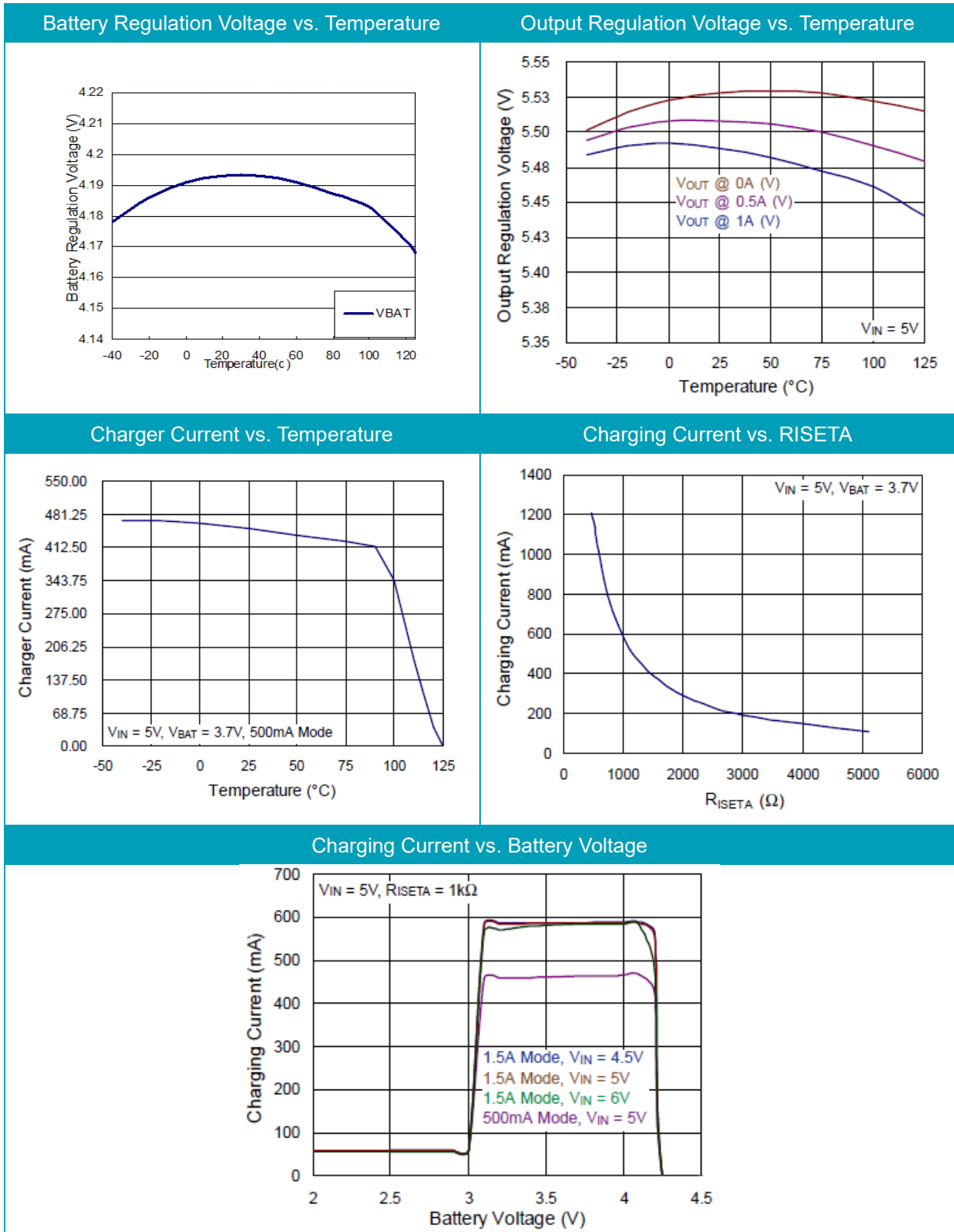
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U1	1	RT9525GQW	RT9525GQW	Single Cell Li-Ion Battery Charger	WQFN-16L 4x4	RICHTEK
C2	1	TMK316AB7106KL-T	10 μ F	Ceramic Capacitor, 25V/X7R	1206	TAIYO YUDEN
C4	1	0805X225K160CT	2.2 μ F	Ceramic Capacitor, 16V/X5R	0805	WALSIN
C5	1	0805B105K250CT	1 μ F	Ceramic Capacitor, 25V/X7R	0805	WALSIN
D1	1	LNL-191SUR	RED	LED	0603	LighTop
D2	1	LNL-190UW-4H	WHITE	LED	0603	LighTop
R2, R4	2	WR06X1501FTL	1.5k	Chip Resistor, 1/10W, 1%	0603	WALSIN
R5	1	0603X105K250CT	1 μ F	Ceramic Capacitor, 25V/X5R	0603	WALSIN
R6, R8	2	WR06X000 PTL	0	Chip Resistor, 1/10W, 1%	0603	WALSIN
R7, R10, R11, R13, R14	5	WR06X1002FTL	10k	Chip Resistor, 1/10W, 1%	0603	WALSIN
RV2	1	3296W103	10k	Varistor	3296	BOURNS

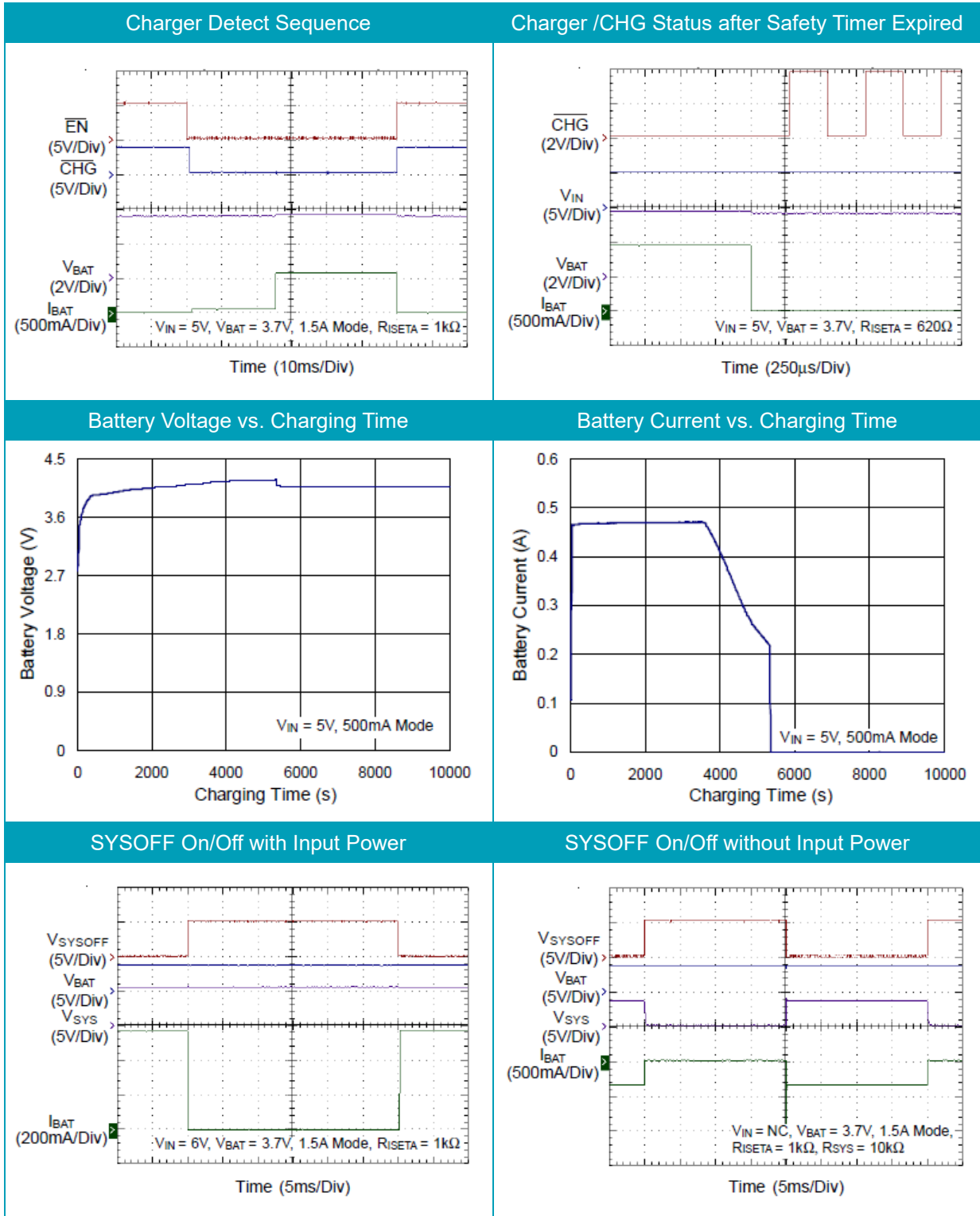
Typical Applications

EVB Schematic Diagram



Measurement Result





Layout of the Evaluation Board

The layout of RT9525GQW evaluation board is shown in Figure 1 and Figure 2. It is a two-layer PCB with 1 oz. Cu coated on both top and bottom sides and the PCB size is 70mm x 50mm.

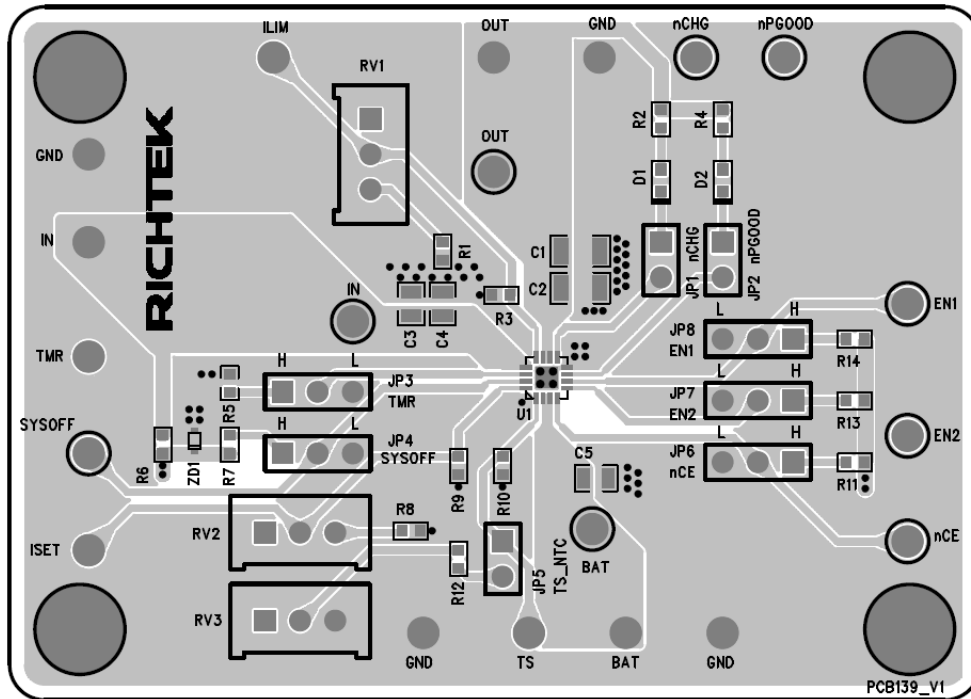


Figure 1. Top View (1st layer)

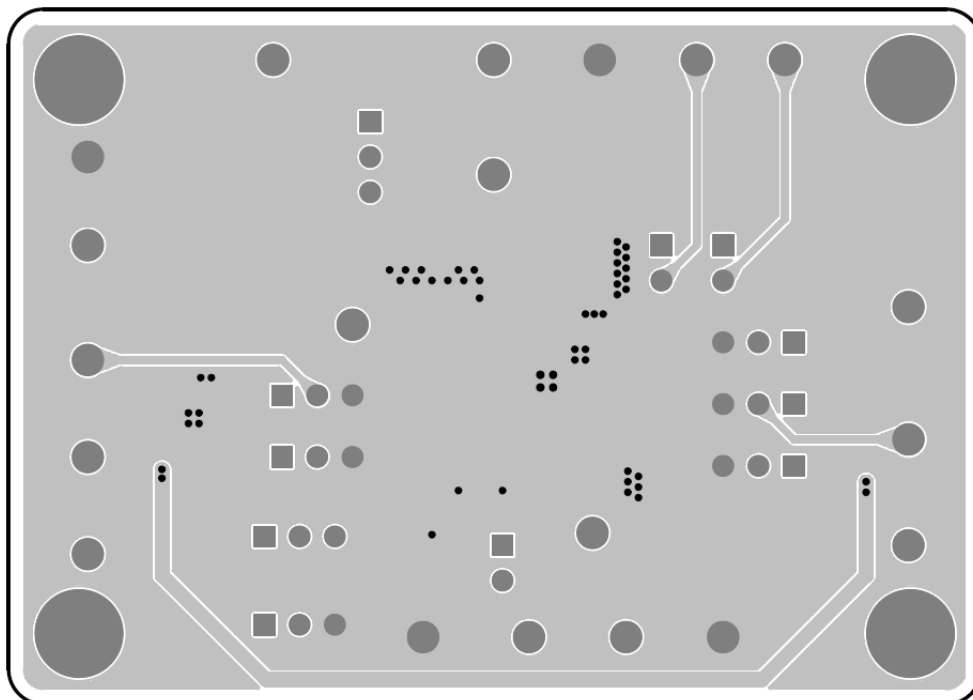


Figure 2. Bottom View (2nd layer)

More Information

For more information, please find the related datasheet or application notes from Richtek website

<http://www.richtek.com>.

Important Notice for Richtek Evaluation Board

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