



EV2759-Q-00A

36V SW Charger with Power Path Management For 1-6 Cell Batteries EV Board

DESCRIPTION

The EV2759-Q-00A is an evaluation board for the MP2759, a highly integrated switching charger designed for portable devices with 1-6 cell series Li-ion or Li-polymer batteries pack. It is able to achieve up to 3A charge current and support variety of battery chemistry types with different battery full voltage.

The MP2759 can operate under maximum 36V DC input voltage. When input power supply is present, the MP2759 charges the battery with four phases: trickle-charge, pre-charge, constant-current charge and constant-voltage charge.

To guarantee safe operation, the MP2759 has robust protection functions including: battery over-voltage protection, battery temperature sensing and protection, thermal shutdown, and charging safety timer.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V _{IN}	10 - 36	V
Input Current	I _{IN}	Up to 3	A
Battery Charge Regulation Voltage	V _{BATT_REG}	3.6 - 4.4 Selectable	V
Fast Charge Current	I _{CC}	Up to 3	A

FEATURES

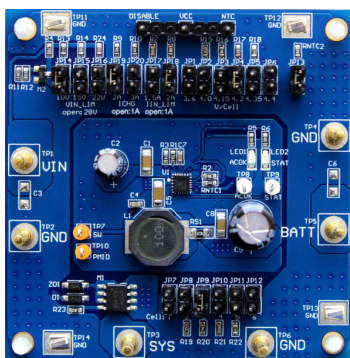
- Up to 36V Operation Input Voltage
- Up to 3A Charge Current
- 1 to 6 Cell Series with 3.6V/4.0V/4.1V/4.15V/4.2V/4.35V/4.4V Battery Regulation Voltage for Each Cell
- Input Current Limit Regulation
- Input Minimum Voltage Regulation
- Support OR Selection Power Path Management
- 0.5% Battery Regulation Voltage Accuracy
- Charge Operation Indicator
- Input Status Indicator
- Battery Over Voltage Protection
- Charging Safety Timer
- Battery Thermal Monitor and Protection with JEITA Profile

APPLICATIONS

- Industrial Medical Equipment
- Power Tools
- Robot and Portable Vacuum Cleaners
- Wireless Speakers

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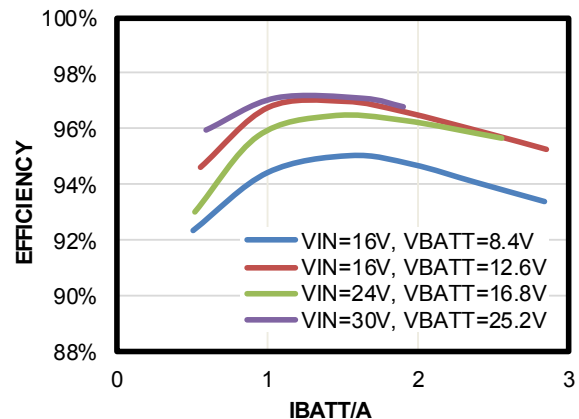
EV2759-Q-00A EVALUATION BOARD



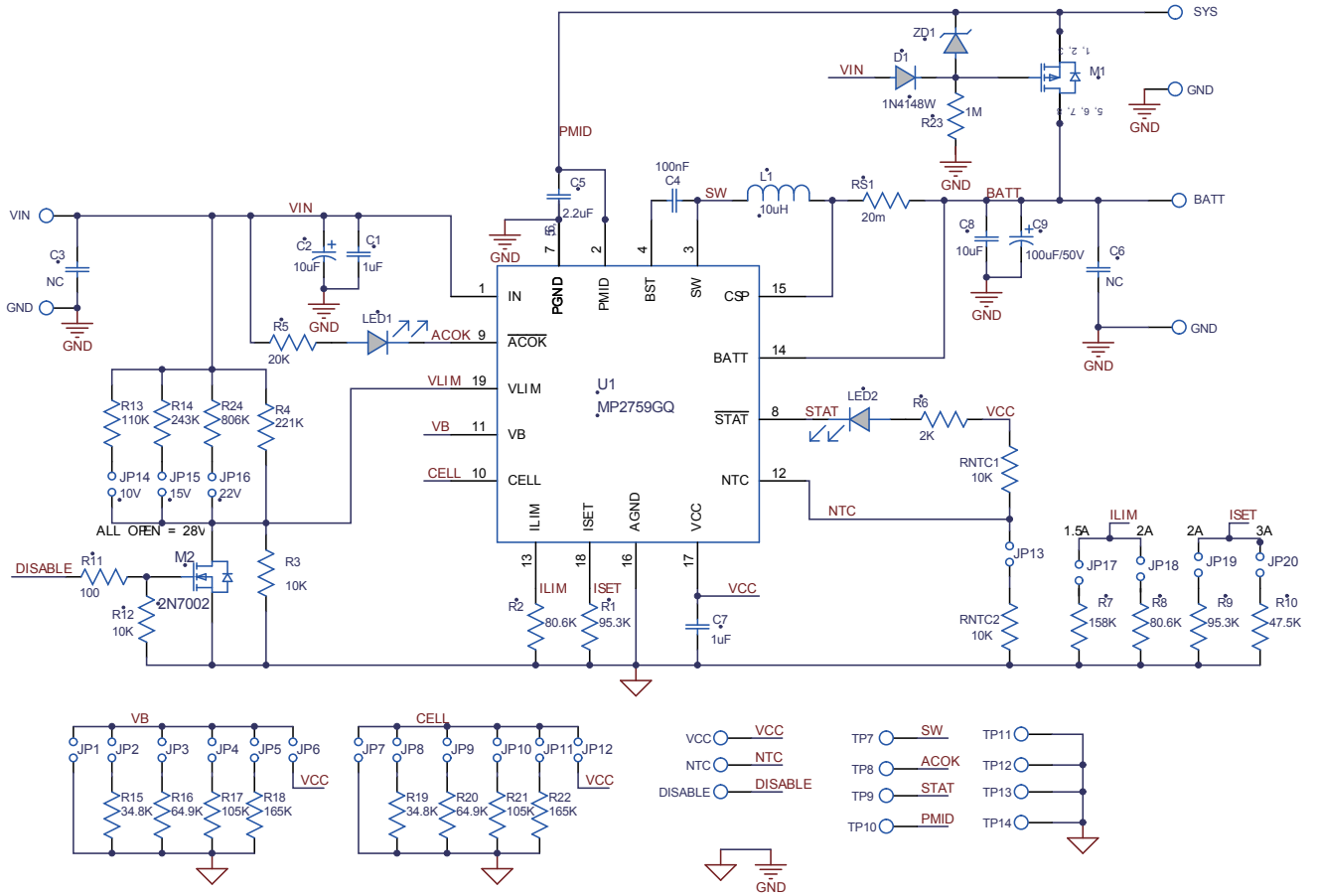
(L × W × H) 6.35cm x 6.35cm x 1.3cm

Board Number	MPS IC Number
EV2759-Q-00A	MP2759GQ-0000

Efficiency vs. Charge Current



EVALUATION BOARD SCHEMATIC



EV2759-Q-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	1 μ F	Ceramic Capacitor;50V;X7R	1206	muRata	GRM31MR71H105KA88L
1	C2	10 μ F	Electrolytic Capacitor;50V;Electrolytic	DIP	Jianghai	CD287-50V10
1	C4	100nF	Ceramic Capacitor;50V;X7R;0603;	0603	muRata	GRM188R71H104KA93D
1	C5	2.2 μ F	Ceramic Capacitor;50V;X7R;1206;	1206	muRata	GRM31CR71H225KA88L
1	C7	1 μ F	Ceramic Capacitor;25V;X7R;0603	0603	muRata	GRM188R71E105KA12D
1	C8	10 μ F	Ceramic Capacitor;50V;X5R	1206	muRata	GRM31CR61H106KA12L
1	C9	100 μ F	Electrolytic Capacitor;50V;100uF	DIP	Rubycon	50YXF100MEFC
1	L1	10 μ H	Inductor;10uH;35m;4A	SMD	Würth	744066100
1	RS1	20m Ω	Film Resistor;1%;	0805	Yageo	RL0805FR-070R02L
2	R1, R9	95.3k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-0795K3L
2	R2, R8	80.6k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-0780K6L
3	R3,RNTC1, RNTC2	10k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-0710KL
1	R4	221k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-07221KL
1	R5	20k Ω	Film Resistor;5%;	0603	Yageo	CR03T03705NJ20K
1	R6	2k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-072KL
1	R7	158k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-07158KL
1	R10	47.5k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-0747K5L
1	R11	100 Ω	Film Resistor;1%	0603	Yageo	RC0603FR-07100RL
1	R12	10k Ω	Film Resistor;5%;	0603	Yageo	RC0603JR-0710K
1	R13	110k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-07110KL
1	R14	243k Ω	Film Resistor;1%;	0603	Yageo	RC0603FR-07243KL
2	R15, R19	34.8k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-0734K8L
2	R16, R20	64.9k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-0764K9L
2	R17, R21	105k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-07105KL
2	R18, R22	165k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-07165KL
1	R23	1Meg Ω	Film Resistor;5%;	0603	Yageo	RC0603JR-071ML
1	R24	806k Ω	Film Resistor;1%	0603	Yageo	RC0603FR-07806KL
1	LED1	Red	LED Red	0805	BRIGHT LED	F3D02R-4A
1	LED2	Green	LED Green	0805	BRIGHT LED	F3D02HG-1A
1	U1		MP2759GQ-0000	QFN-3mm*3mm	MPS	MP2759GQ-0000
1	M1		P-Chnannel Mosfet, 60V, 23m Ω	SO-8	Analog Power	AM4417P
1	M2		N-Channel Mosfet, 60V	SOT-23	Fairchild	2N7002MTF



EV2759-Q-00A BILL OF MATERIALS(continued)

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	D1		Diode;75V;0.15A	SOD-123	Diodes	1N4148W
1	ZD1	11V	Zener Diode;11V;5mA/500mW;	SOD-123	Diodes	BZT52C11
6	VIN, GND, BATT, GND, SYS, GND		2.0mm Connector	DIP		
4	TP7, TP8, TP9, TP10		test point	DIP		
4	TP11, TP12, TP13, TP14		ground test point	SMD		
23	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9, JP10, JP11, JP12, JP13, JP14, JP15, JP16, JP17, JP18, JP19, JP20, VCC, NTC, DISABLE		2.54mm Connector	DIP		

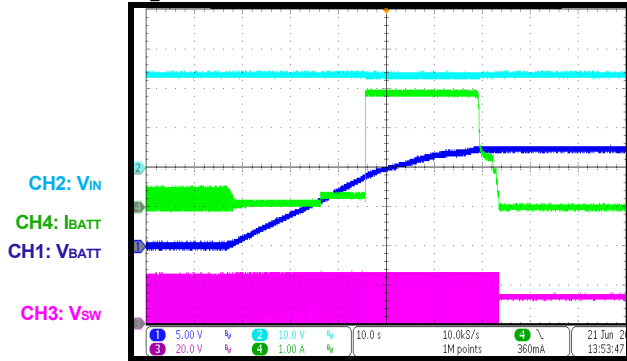
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board.

$L = 10\mu\text{H}/35\text{m}\Omega$, $C_{\text{BATT}}=10\mu\text{F}$, $R_{\text{SNS}} = 20\text{m}\Omega$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

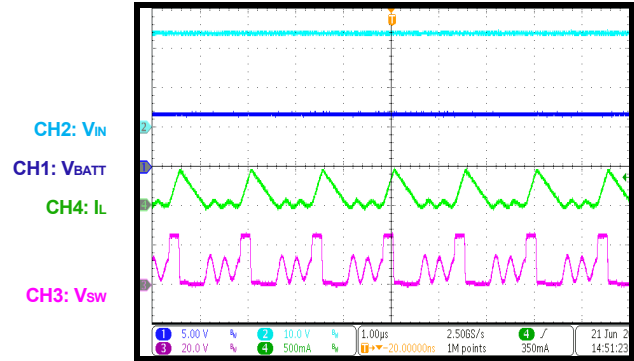
Battery Charge Curve

$V_{\text{IN}}=24\text{V}$, 3 Cell, $V_{\text{BATT_REG}}=4.2\text{V}$, $I_{\text{CC}}=3\text{A}$,
 $I_{\text{IN_LIM}}=2\text{A}$



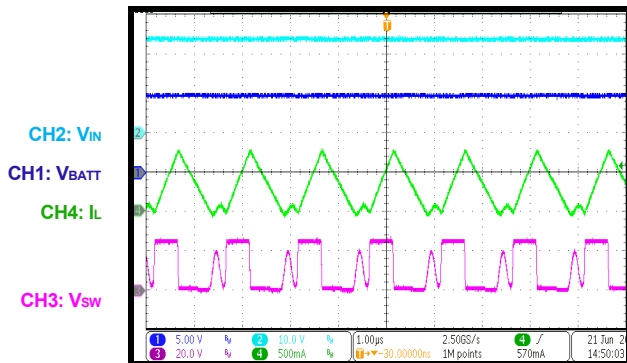
Trickle-Charge Steady State

$V_{\text{IN}}=24\text{V}$, 4 Cell, $V_{\text{BATT}}=7\text{V}$, $I_{\text{CC}}=3\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$



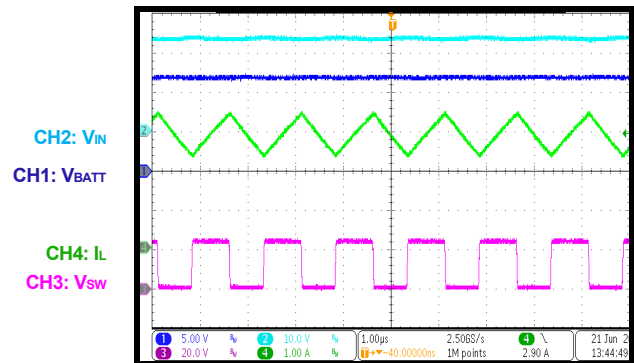
Pre-Charge Steady State

$V_{\text{IN}}=24\text{V}$, 4 Cell, $V_{\text{BATT}}=10\text{V}$, $I_{\text{CC}}=3\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$



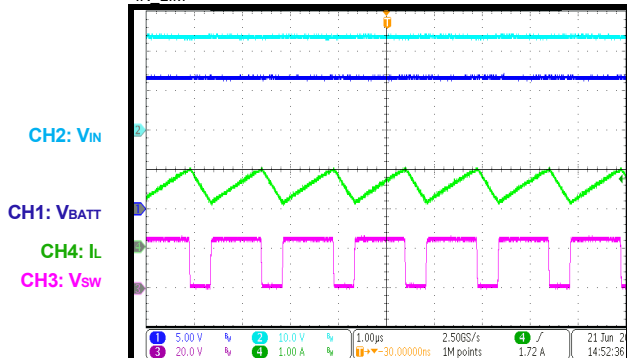
CC-Charge Steady State

$V_{\text{IN}}=24\text{V}$, 4 Cell, $V_{\text{BATT}}=12\text{V}$, $I_{\text{CC}}=3\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$



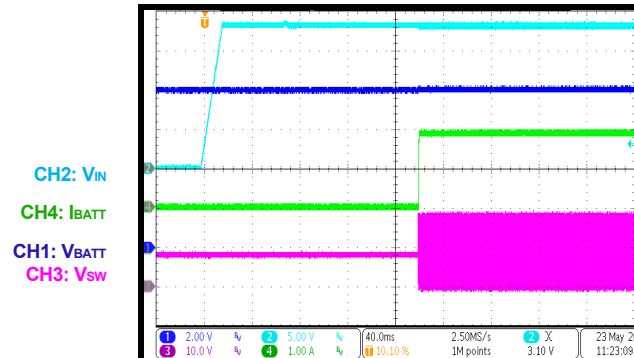
CV-Charge Steady State

$V_{\text{IN}}=24\text{V}$, 4 Cell, $V_{\text{BATT}}=16.8\text{V}$, $I_{\text{CC}}=3\text{A}$,
 $I_{\text{IN_LIM}}=2\text{A}$



Power On, CC-Charge Mode

$V_{\text{IN}}=18\text{V}$, 2 Cell, $V_{\text{BATT}}=8\text{V}$, $I_{\text{CC}}=2\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$



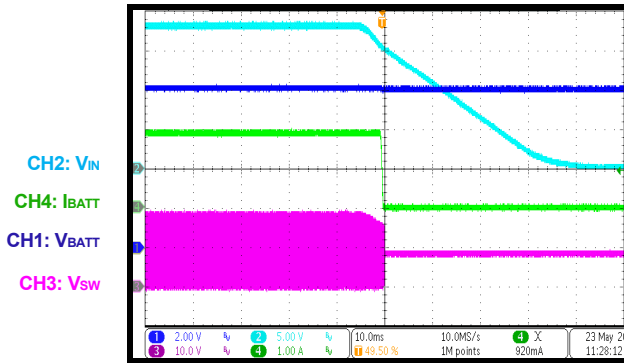
EVB TEST RESULTS (continued)

Performance curves and waveforms are tested on the evaluation board.

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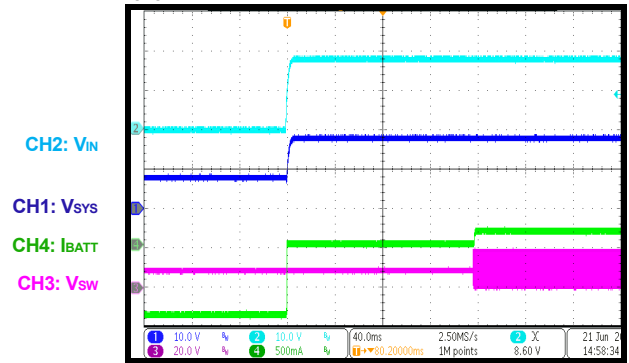
Power Off, CC-Charge Mode

$V_{\text{IN}}=18\text{V}$, 2 Cell, $V_{\text{BATT}}=8\text{V}$, $I_{\text{CC}}=2\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$



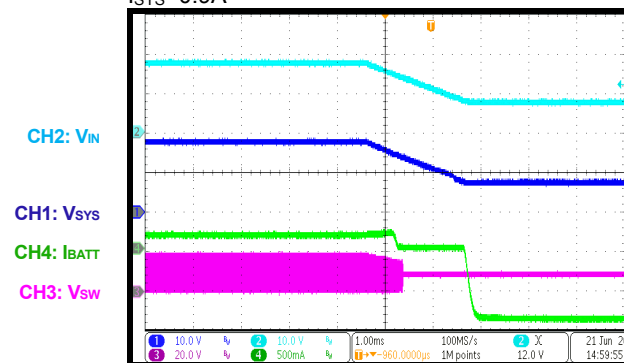
Power On, Power Path Operation

$V_{\text{IN}}=18\text{V}$, 2 Cell, $V_{\text{BATT}}=8\text{V}$, $I_{\text{CC}}=2\text{A}$, $I_{\text{IN_LIM}}=1\text{A}$, $I_{\text{SYS}}=0.9\text{A}$



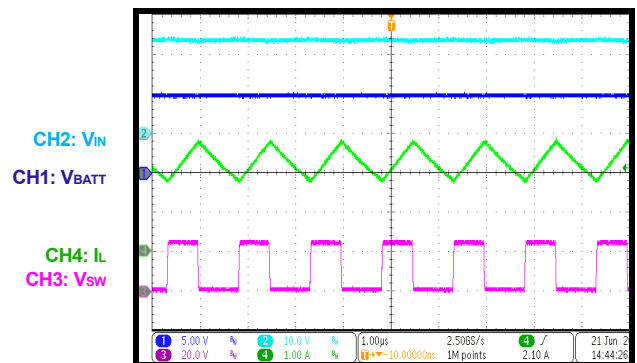
Power Off, Power Path Operation

$V_{\text{IN}}=18\text{V}$, 2 Cell, $V_{\text{BATT}}=8\text{V}$, $I_{\text{CC}}=2\text{A}$, $I_{\text{IN_LIM}}=1\text{A}$, $I_{\text{SYS}}=0.9\text{A}$



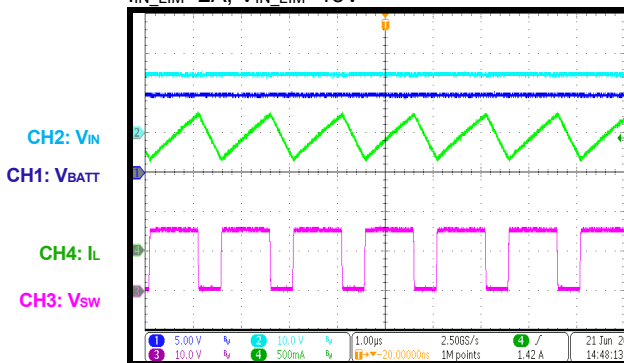
I_{IN_LIM} Loop Control

$V_{\text{IN}}=24\text{V}$, 3 Cell, $V_{\text{BATT}}=10\text{V}$, $I_{\text{CC}}=3\text{A}$, $I_{\text{IN_LIM}}=1\text{A}$



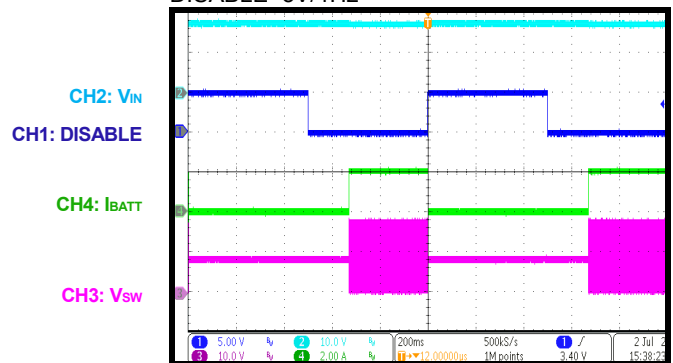
V_{IN_LIM} Loop Control

$V_{\text{IN}}=24\text{V}/1\text{A}$, 3 Cell, $V_{\text{BATT}}=10\text{V}$, $I_{\text{CC}}=3\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$, $V_{\text{IN_LIM}}=15\text{V}$



VLIM On/Off

$V_{\text{IN}}=18\text{V}$, 2 Cell, $V_{\text{BATT}}=8\text{V}$, $I_{\text{CC}}=2\text{A}$, $I_{\text{IN_LIM}}=2\text{A}$, $\text{DISABLE}=5\text{V}/1\text{Hz}$



PRINTED CIRCUIT BOARD LAYOUT

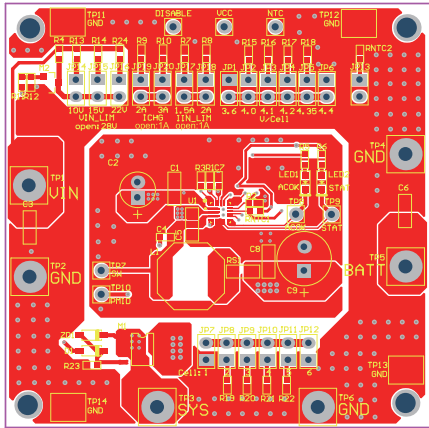


Figure 1: Top Layer

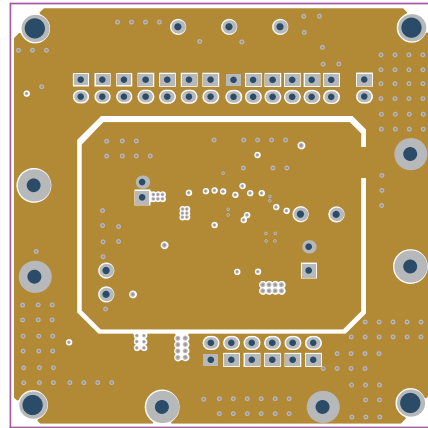


Figure 2: Middle Layer 1

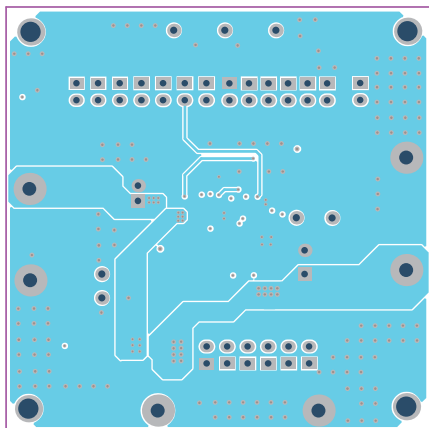


Figure 3: Middle Layer 2

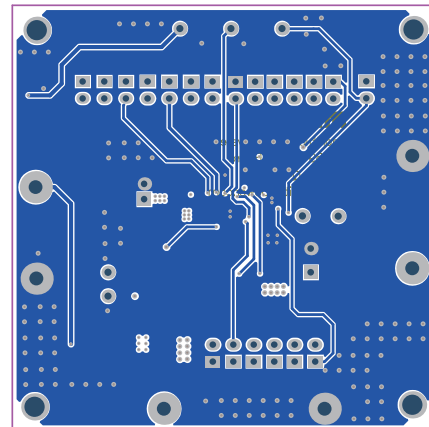


Figure 4: Bottom Layer

QUICK START GUIDE

Table 1: Connectors

Connectors	Description
TP1/VIN	Connect to input source positive terminal
TP2/GND	Connect to input source negative terminal
TP5/BATT	Connect to battery pack positive terminal
TP4/GND	Connect to battery pack negative terminal
TP3/SYS	Connect to system load positive terminal
TP6/GND	Connect to system load negative terminal
TP7/SW	Test point of switching node
TP10/PMID	Test point of PMID
DISABLE, VCC, NTC, TP8/ACOK, TP9/STAT	Test connection for related signals
TP11, TP12, TP13, TP14 / GND	Test point of ground

Table 2: Jumpers

Jumpers	Description	Alternative	Default
JP1,JP2,JP3,JP4,JP5,JP6	Select battery regulation voltage for each cell	3.6V/4.0V/4.15V/4.2V/4.35V/4.4V	4.2V
JP7,JP8,JP9,JP10,JP11,JP12	Select battery cell numbers	1cell/2cell/3cell/4cell/5cell/6cell	3cell
JP13	NTC divider	On board NTC divider or pull-up only	NTC divider
JP14,JP15,JP16	Select input voltage minimum limit	10V/15V/22V/28V	10V
JP17,JP18	Select input current limit	1A/1.5A/2A	2A
JP19,JP20	Select CC-charge current	1A/2A/3A	2A

This board is designed for MP2759 which is a highly integrated switching charger for 1-6 cell Li-ion/Li-Polymer batteries in series. And layout accommodates most commonly used capacitors.

- 1, Connect the battery pack to BATT and GND connectors, take care that the battery positive/negative terminal must not be reversely connected.
- 2, If using a battery emulator, preset the battery emulator to proper voltage and turn off the emulator, connect to BATT and GND, then turn on the emulator output.
- 3, Preset an input power source to proper voltage and turn off the power source, connect the power source to VIN and GND, then turn on the power source. The EVB would start charging.
- 4, Please confirm that the NTC jumper has been connected, otherwise it would not charge because of NTC fault.
- 5, To modify the charging parameters, the EVB offers multiple options to be configured by the jumpers.
 - The charge current can be selected among 1A/2A/3A
 - The input current limit can be selected among 1A/1.5A/2A
 - The cell numbers can be selected among 1s/2s/3s/4s/5s/6s
 - The battery regulation voltage of each cell can be selected among 3.6V/4.0V/4.15V/4.2V/4.35V/4.4V

- The input voltage minimum limit can be selected among 10V/15V/22V/28V.

6, Connect the system load to SYS and GND connectors if you need, take care that the positive/negative terminal must not be reversely connected.

7, Please take care that the max system load current should not exceed the input source capacity, if the system load has the possibility of exceeding the input source output current limit, a schottky diode is required to bypass Q1 body diode.

Notes

For the other detailed description on the operation of this part, please contact local FAE to apply the latest datasheet.

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