EV5030-QH-00C

USB Charging Port Controller with Integrated Current Limit Switch, Supporting Type-C 5V and QC3.0 Modes Evaluation Board

DESCRIPTION

The MP5030 integrates a USB current limit switch and charging port identification circuit. It achieves 3A continuous output current over a wide input supply range.

The output of USB switch is current limit programmable. MP5030 supports DCP schemes for Battery Charging specification (BC1.2), the divider Mode, 1.2V/1.2V Mode and Quick Charge specification (QC 3.0) without the need for external user interaction. It also supports Type-C 5V@3A DFP mode.

MP5030 provides linear line drop compensation.

Fault protection includes hiccup current limiting, input OVP and thermal shutdown.

The MP5030 is available in QFN-10(1.5mmx2mm) package.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
System Input Voltage	V_{IN}	14	V
Default Output Voltage	V_{OUT}	5.15	V
Output Current	I_{OUT}	3	A

FEATURES

- 9V to 16V Operating Input Voltage Range
- 36V Absolutely Input Voltage
- Support QC 3.0 (3.6V-12Vout with 1% accuracy) and DCP schemes for BC 1.2, Divider Mode, 1.2V/1.2V Mode
- Line Drop Compensation for 5V Output
- Programmable High Accuracy Current Limit and Fairly Constant Power Limit
- 32mΩ Low-$R_{DS(ON)}$ Power MOSFET
- Input Discharge during high voltage to low voltage change
- Intelligent Input over Voltage Shutdown Protection
- Compatible with Buck, Boost, ACDC converters

APPLICATIONS

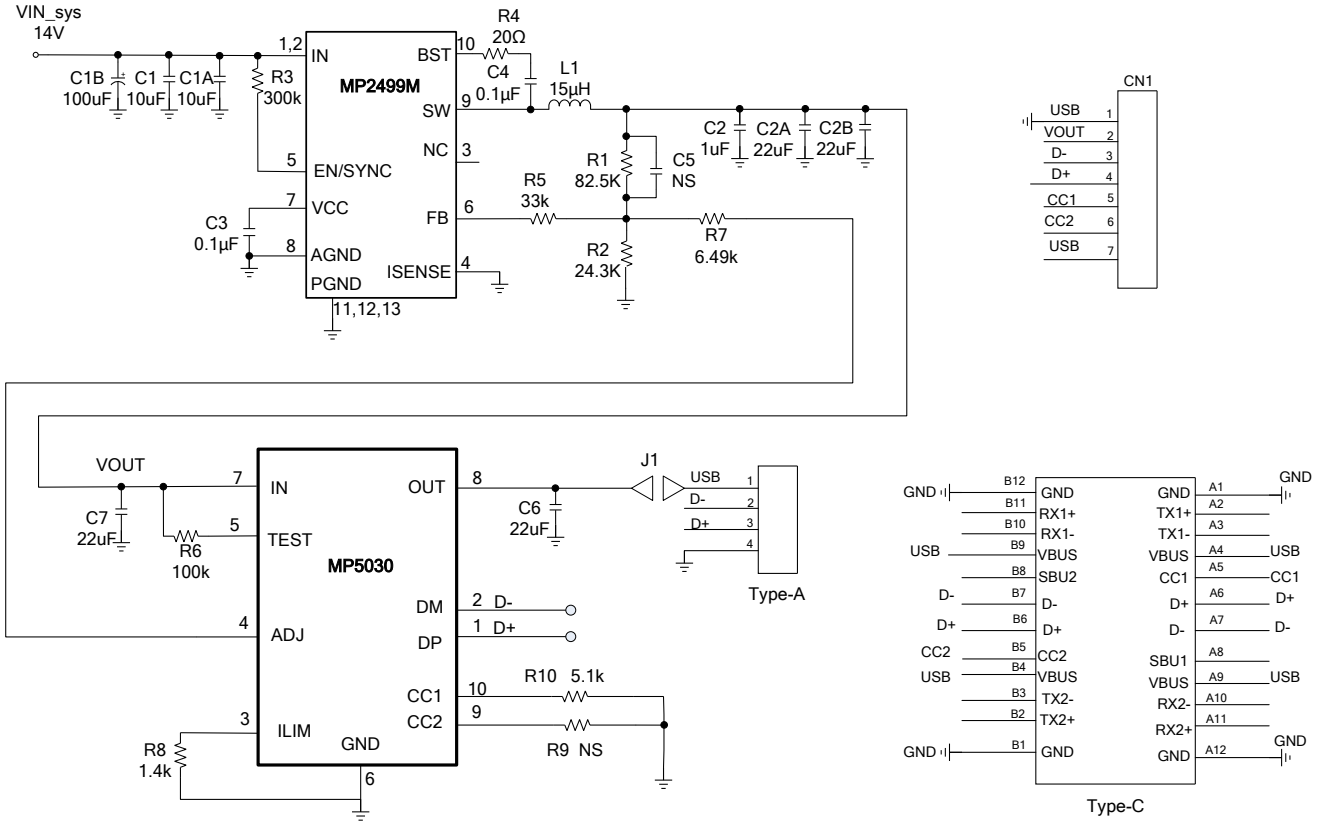
- USB Power Supplies
- AC/DC Wall Adapter with USB Ports
- Automotive Cigarette Lighter Adapters Power Bank

EV5030-QH-00C EVALUATION BOARD

(L×W)5.8cm×3.3cm

Board Number	MPS IC Number
EV5030-QH-00C	MP5030GQH

EVALUATION BOARD SCHEMATIC



EV5030-QH-00CBILL OF MATERIALS

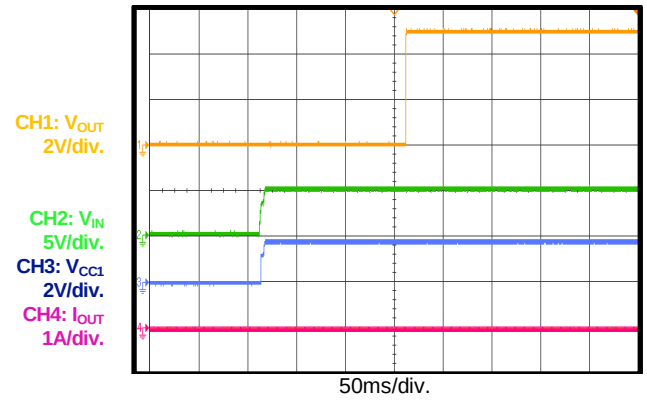
Qty	Ref	Value	Description	Package	Manufacturer	Part Number
2	C1,C1A	10μF	Ceramic Cap, 35V, X5R	0805	Murata	GRM21BR61E106KA43L
1	C1B	100μF	E- Cap., 50V	DIP	Wurth	860080674009
1	C2	1μF	Ceramic Cap, 16V, X5R	0603	Murata	GRM188R71C105KA12D
4	C2A, C2B, C6, C7	22uF	Ceramic Cap, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
2	C3,C4	0.1μF	Ceramic Cap, 25V, X7R	0603	Murata	GRM188R71E104KA01D
0	C5	NS				
1	R1	82.5k	Thick Film Res., 1%	0603	Yageo	RC0603FR-0782K5L
1	R2	24.3k	Thick Film Res., 1%	0603	Yageo	RC0603FR-0724K3L
1	R3	300k	Thick Film Res., 1%	0603	Yageo	RC0603FR-07300KL
1	R4	20Ω	Thick Film Res., 1%	0603	Yageo	RC0603JR-0720RL
1	R5	33k	Thick Film Res., 1%	0603	Yageo	RL0603FR-0733KL
1	R6	100k	Thick Film Res., 1%	0603	Yageo	RL0603FR-07100KL
1	R7	6.49k	Thick Film Res., 1%	0603	Yageo	RC0603FR-076K49L
1	R8	1.4k	Thick Film Res., 1%	0603	Yageo	RC0603FR-071K4L
0	R9	NS				
1	R10	5.1k	Thick Film Res., 1%	0603	Yageo	RC0603FR-075K1L
1	L1	15μH	Inductor, DCR=20mΩ max, Is=3A	COIL	UEC (威盛科)	WL-853
1	U1	MP2499M	Synchronous Step-Down Converter	QFN13 (2.5mm×3 mm)	MPS	MP2499M
1	U2	MP5030	QC3.0 Controller with USB Current Limit SW	QFN-10(1.5mmx 2mm)	MPS	MP5030
1	Type-A	Type-A	USB type-A port	Tray	Wurth	61400416021
1	Type-C	Type-C	USB type-C port	Tray	Wurth	632723300011

EVB TEST RESULTS

V_{IN}= 5V, V_{OUT} = 5V, R_{ILIM}=1.4kΩ, T_A = 25°C, CC1 pull-down by 5.1k resistor to ground, unless otherwise noted.

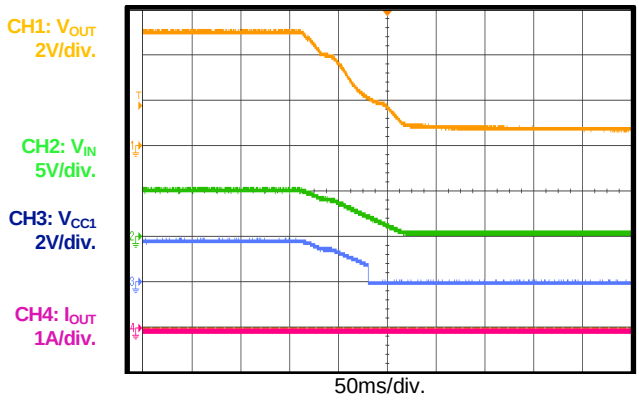
Start-Up through VIN

I_{OUT} = 0A



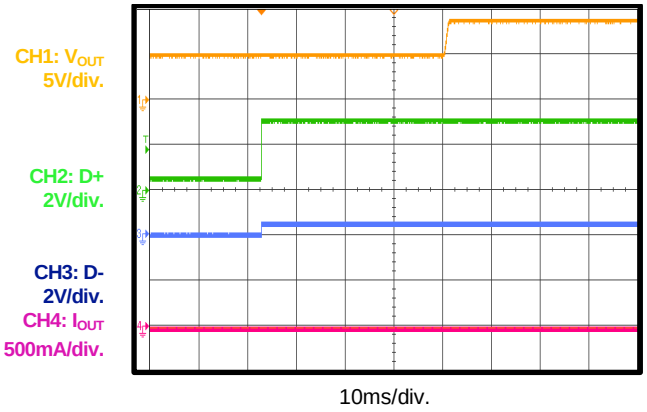
Shutdown through VIN

I_{OUT} = 0A



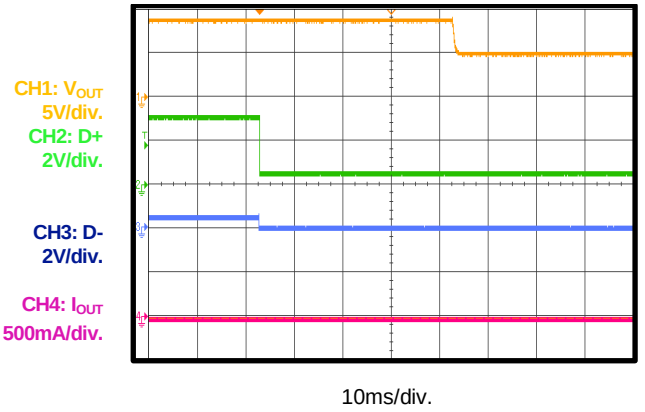
Mode Transition from 5V to 9V

I_{OUT} = 0A, from QC 2.0_5V to 9V



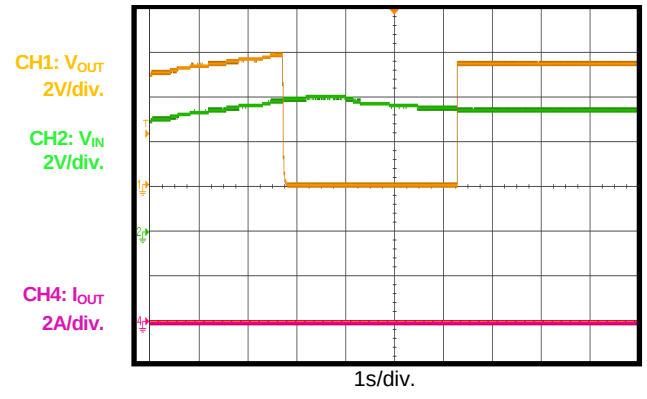
Mode Transition from 9V to 5V

I_{OUT} = 0A, from QC 2.0_9V to 5V



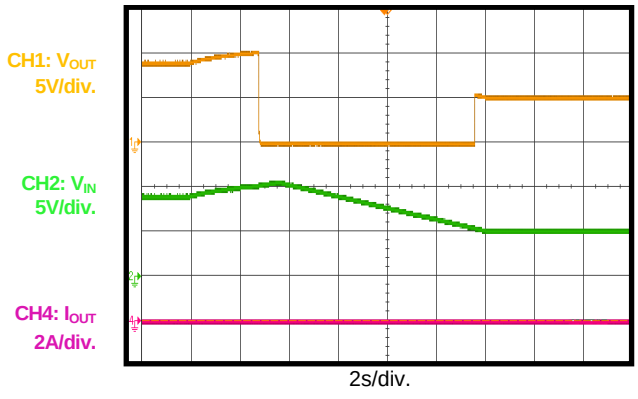
Input Over-Voltage Protection

QC 5V Mode, I_{OUT} = 0A



Input Over-Voltage Protection

QC 9V Mode, I_{OUT} = 0A

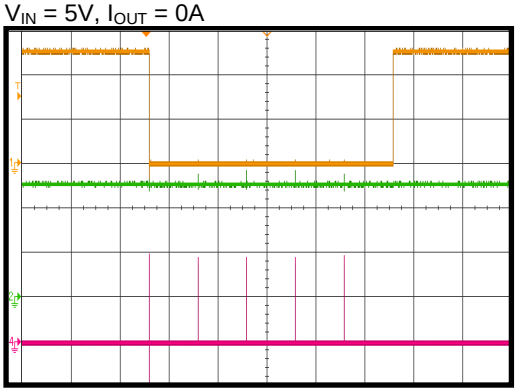


EVB TEST RESULTS *(continued)*

V_{IN} = 5V, V_{OUT} = 5V, R_{ILIM} = 1.4kΩ, T_A = 25°C, CC1 pull-down by 5.1k resistor to ground, unless otherwise noted.

Short-Circuit Protection Entry and Recovery

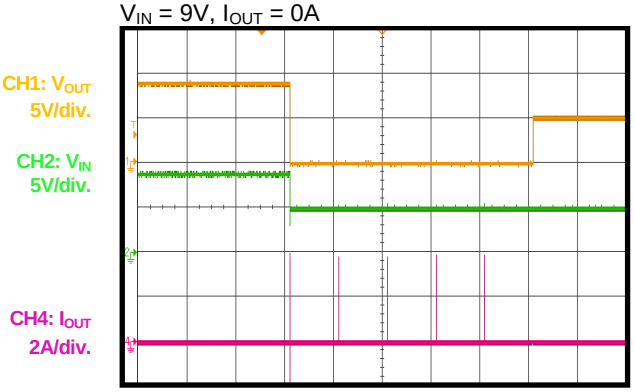
V_{IN} = 5V, I_{OUT} = 0A



2s/div.

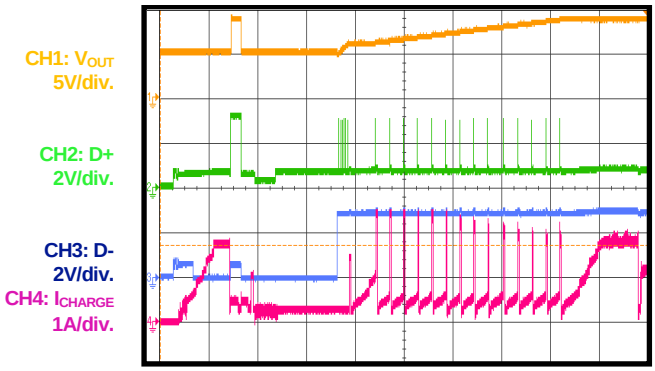
Short-Circuit Protection Entry and Recovery

V_{IN} = 9V, I_{OUT} = 0A



2s/div.

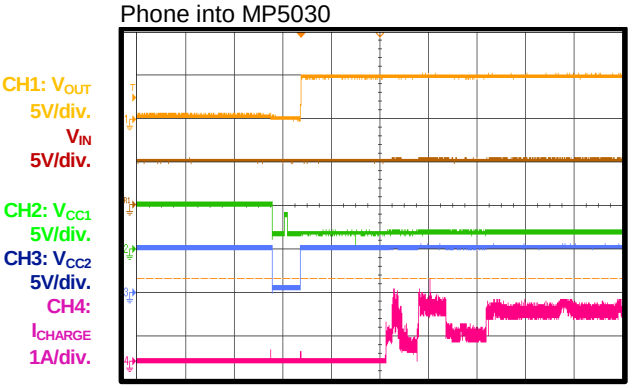
QC 3.0 Device Charging Test



2s/div.

Type-C Mode Test

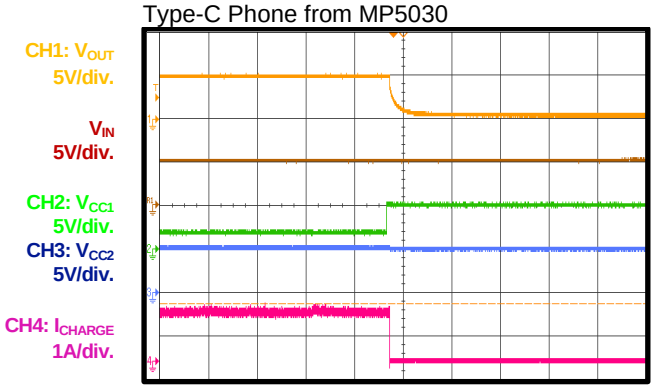
Remove CC1 pull-down resistor, plug Type-C Phone into MP5030



500ms/div.

Type-C Mode Test

Remove CC1 pull-down resistor, plug out Type-C Phone from MP5030



200ms/div.

PRINTED CIRCUIT BOARD LAYOUT

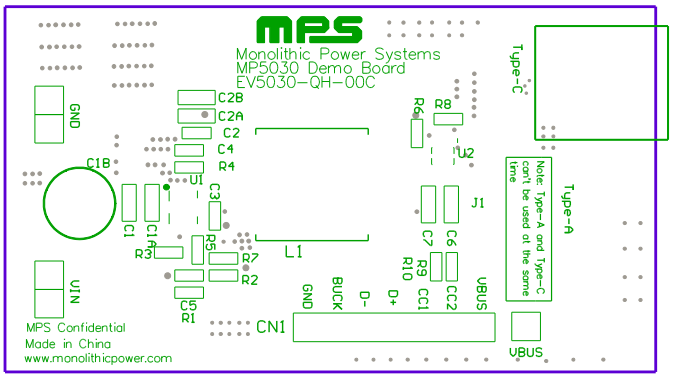


Figure 1: Top Silkscreen Layer

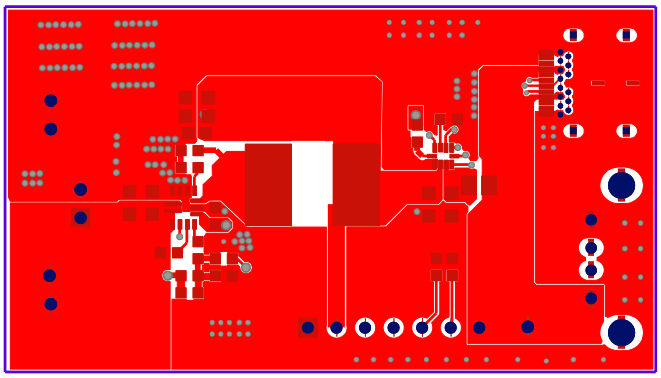


Figure 2: Top Layer

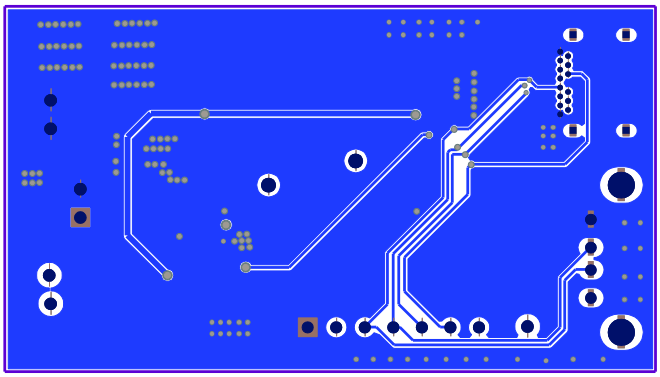


Figure 3: Bottom Layer

QUICK START GUIDE

1. Preset Power Supply to 14V.
2. Turn Power Supply off.
3. Connect Power Supply terminals to:
    a. Positive (+): VIN
    b. Negative (–): GND
4. Turn Power Supply on after making connections. The board will automatically start up.
5. Connect different mobile phones to Type-A or Type-C USB port for charging test. Note that Type-A and Type-C port can't be used at the same time. When Type-C phone is connected, remove R10 (5.1k) on board.