



# EV5030D-QH-00A

## USB Charging Port Controller with Current Limit Switch, Supporting CDP, DCP Modes

### DESCRIPTION

The EV5030D-QH-00A is an evaluation board for MP5030D, which integrates an USB current limit switch and charging port identification circuit. It achieves 3A continuous output current over a wide input supply range.

With MP5030D, it supports Dedicated Charging Port (DCP) and Charging Downstream Port (CDP) schemes for Battery Charging specification (BC1.2), the divider Mode, 1.2V/1.2V Mode without the need for external user interaction.

MP5030D provides linear line drop compensation, load current detection and status indication.

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

MP5030D requires a minimum number of readily standard external components to complete USB switch and charging mode auto detection solution. MP5030D is available in QFN-10(1.5mmx2mm) package.

### ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
System Input Voltage	$V_{IN}$	12	V
Default Output Voltage	$V_{OUT}$	5	V
Output Current	$I_{OUT}$	3	A

### FEATURES

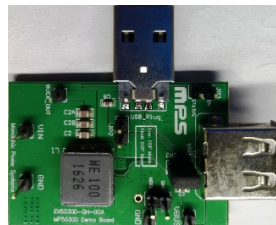
- Load Current Detection and Status Indication
- Up to 14V Operating Input Voltage Range
- Support DCP schemes for BC 1.2, Divider Mode and 1.2V/1.2V Mode
- Support CDP Mode for USB 2.0 Data
- Line Drop Compensation
- Programmable High Accuracy Current Limit
- 32m $\Omega$  Low- $R_{DS(ON)}$  Power MOSFET
- Input over Voltage Shutdown Protection
- Thermal Shutdown

### APPLICATIONS

- USB Charging Downstream Port (CDP)
- USB Dedicated Charging Ports (DCP)

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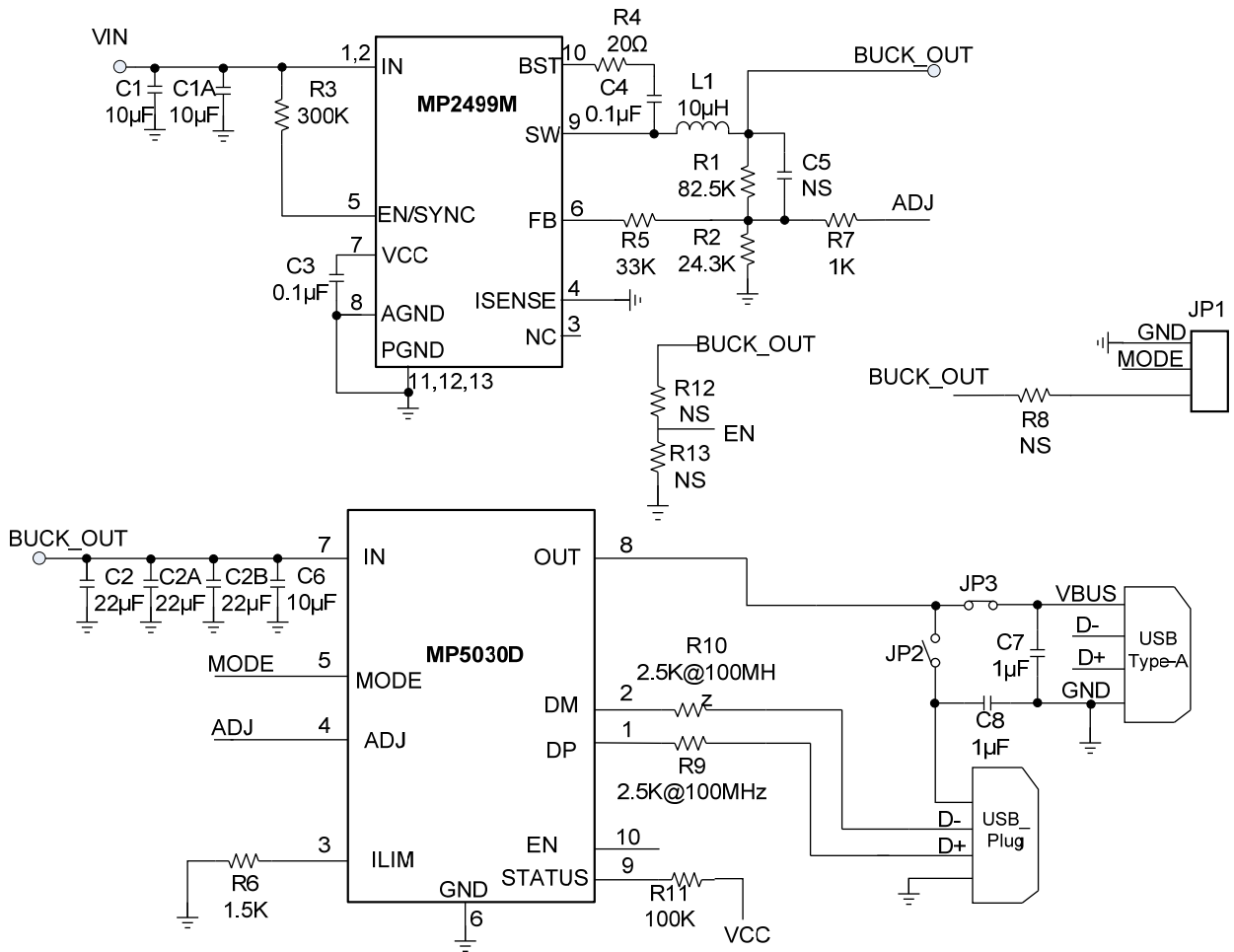
### EV5030D-QH-00AEVALUATION BOARD



(L×W)4.38cm× 2.89cm

Board Number	MPS IC Number
EV5030D-QH-00A	MP5030DGQH

## EVALUATION BOARD SCHEMATIC



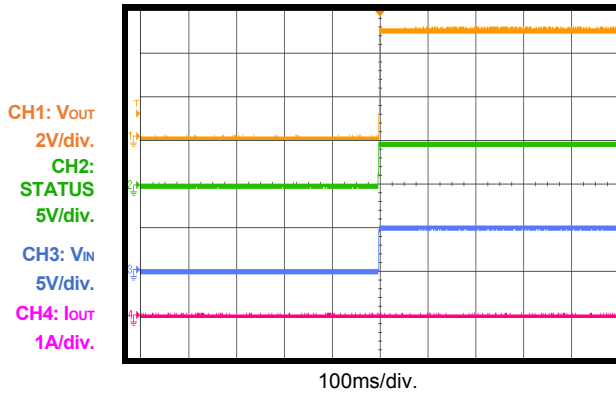
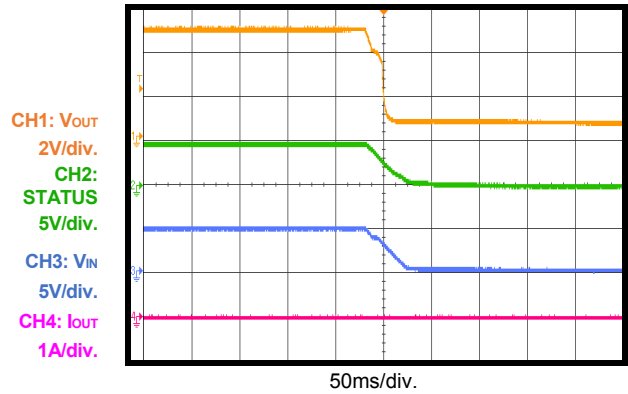
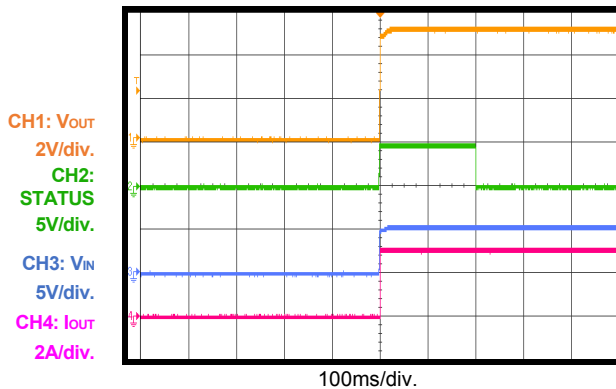
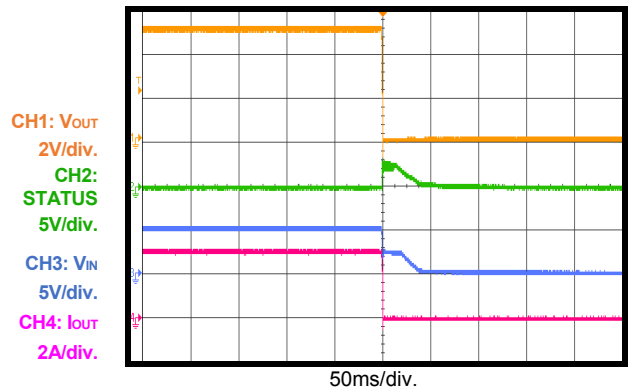
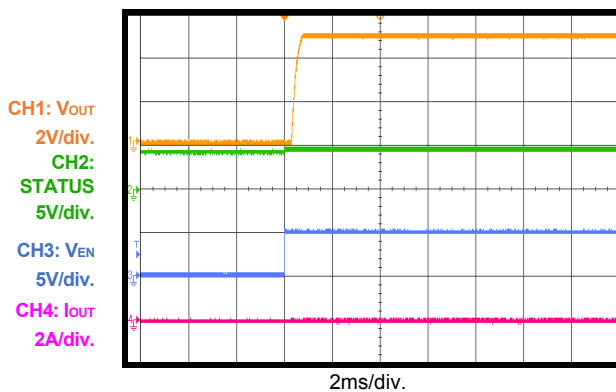
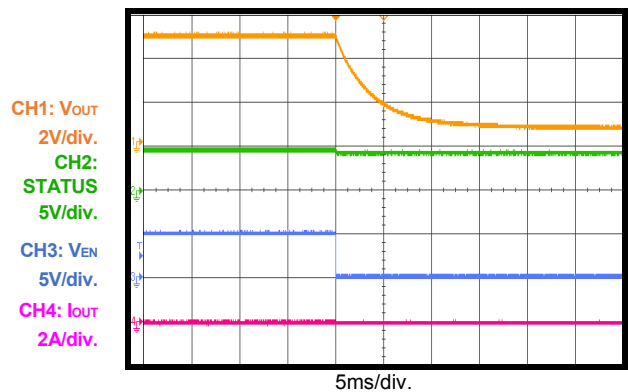
**NOTE:** In the default settings, MODE pin short to GND for CDP mode.

**EV5030D-QH-00A BILL OF MATERIALS**

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
2	C1, C1A	10 $\mu$ F	Ceramic Capacitor, 35V, X5R	0805	Murata	GRM21BR61E106KA43L
3	C2, C2A, C2B	22 $\mu$ F	Ceramic Capacitor, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
2	C3, C4	0.1 $\mu$ F	Ceramic Capacitor, 25V, X7R	0603	Murata	GRM188R71E104KA01D
0	C5, R8, R12, R13	NS				
1	C6	10 $\mu$ F	Ceramic Capacitor, 25V, X5R	0603	Murata	GRM21BR61E106MA73L
2	C7, C8	1 $\mu$ F	Ceramic Capacitor, 25V, X5R	0603	Murata	885012206076
1	R1	82.5k $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-0782K5L
1	R2	24.3k $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-0724K3L
1	R3	300k $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-07300KL
1	R4	20 $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-0720RL
1	R5	33k $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-0733KL
1	R6	1.5k $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-071K5L
1	R7	1k $\Omega$	Film Resistor, 1%	0603	YAGEO	RC0603FR-071KL
2	R11	100k	Film Resistor, 1%	0603	YAGEO	RC0603FR-07100KL
2	R9,R10	2.5k $\Omega$	Magnetic bead, 2.5k $\Omega$ @100MHz	0603	Würth	742792695
1	L1	10 $\mu$ H	Inductor, 12.5A Isat, DCR 30m $\Omega$	SMD	Würth	74437368100
1	USB	TYPE-A	TYPE-A USB Port	DIP	Würth	61400416021
1	USB_Plug	USB	Single USB Plug	SMD	Würth	629004113921
1	U1	MP2499M	Synchronous Step-Down Converter	QFN-13 (2.5mm $\times$ 3mm)	MPS	MP2499M
1	U2	MP5030D	Controller with USB Current Limit SW, supporting CDP, DCP.	QFN-10 (1.5mm $\times$ 2mm)	MPS	MP5030DGQH

**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

$V_{IN} = 5V$ ,  $V_{OUT} = 5V$ ,  $R_{ILIM} = 1.5k\Omega$ ,  $T_A = 25^\circ C$ , unless otherwise noted. Connect MP5030D Input to MP2499M Output, System\_VIN=12V is MP2499M Input Voltage.

**Start-Up through Input Voltage**
 $I_{OUT}=0A$ 

**Shutdown through Input Voltage**
 $I_{OUT}=0A$ 

**Start-Up through Input Voltage**
 $I_{OUT}=3A$ 

**Shutdown through Input Voltage**
 $I_{OUT}=3A$ 

**EN start-up**
 $I_{OUT}=0A$ 

**EN shutdown**
 $I_{OUT}=0A$ 


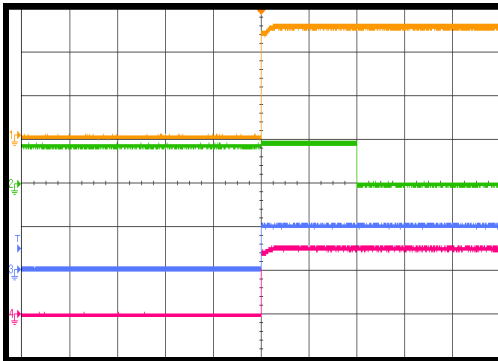
**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

$V_{IN} = 5V$ ,  $V_{OUT} = 5V$ ,  $R_{ILIM} = 1.5k\Omega$ ,  $T_A = 25^\circ C$ , unless otherwise noted. Connect MP5030D Input to MP2499M Output, System\_VIN=12V is MP2499M Input Voltage.

**EN start-up**

$I_{OUT}=3A$

CH1:  $V_{OUT}$   
2V/div.  
CH2: STATUS  
5V/div.  
CH3:  $V_{EN}$   
5V/div.  
CH4:  $I_{OUT}$   
2A/div.

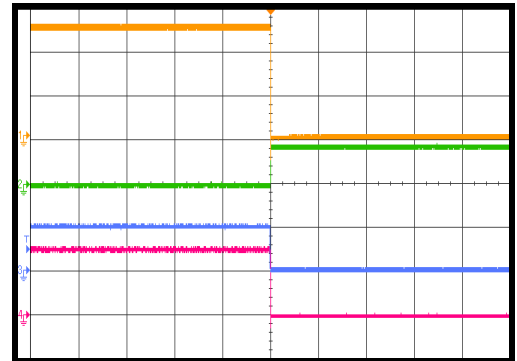


100ms/div.

**EN shutdown**

$I_{OUT}=3A$

CH1:  $V_{OUT}$   
2V/div.  
CH2: STATUS  
5V/div.  
CH3:  $V_{EN}$   
5V/div.  
CH4:  $I_{OUT}$   
2A/div.

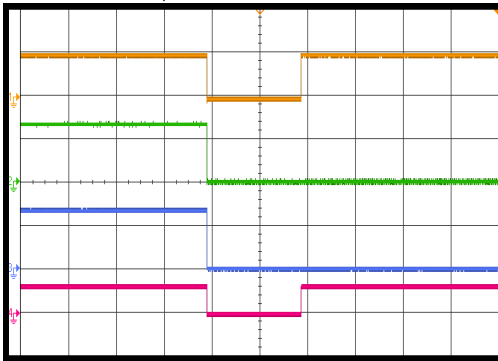


100ms/div.

**Mode Pin changes from Float to GND**

D+ and D- float,  $I_{OUT}=3A$

CH1:  $V_{OUT}$   
5V/div.  
CH2:  $V_{D+}$   
2V/div.  
CH3:  $V_{D-}$   
2V/div.  
CH4:  $I_{OUT}$   
5A/div.

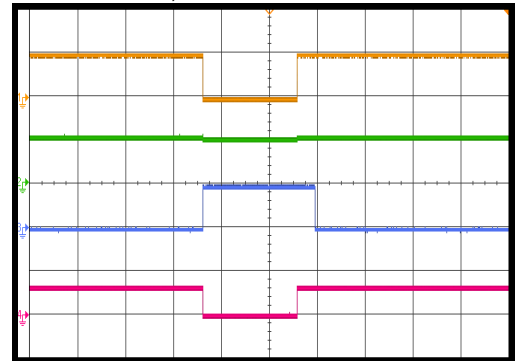


500ms/div.

**Mode Pin changes from Float to GND**

D+ and D- float,  $I_{OUT}=3A$

CH1:  $V_{OUT}$   
5V/div.  
CH2:  $V_{IN}$   
5V/div.  
CH3: STATUS  
5V/div.  
CH4:  $I_{OUT}$   
5A/div.

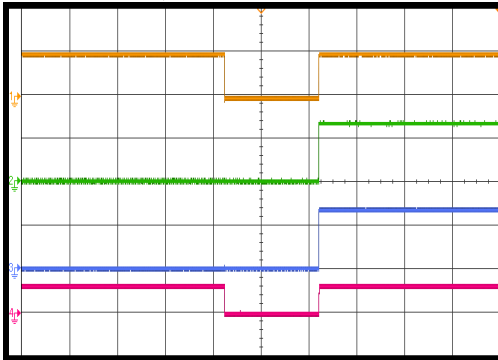


500ms/div.

**Mode Pin changes from GND to Float**

D+ and D- float,  $I_{OUT}=3A$

CH1:  $V_{OUT}$   
5V/div.  
CH2:  $V_{D+}$   
2V/div.  
CH3:  $V_{D-}$   
2V/div.  
CH4:  $I_{OUT}$   
5A/div.

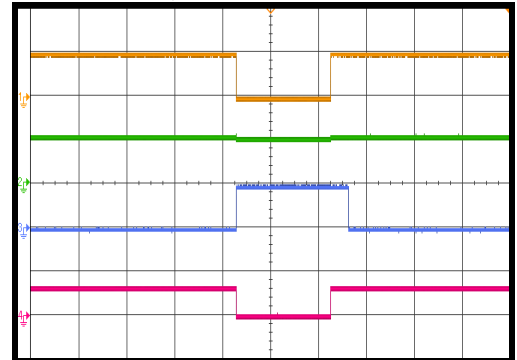


500ms/div.

**Mode Pin changes from GND to Float**

D+ and D- float,  $I_{OUT}=3A$

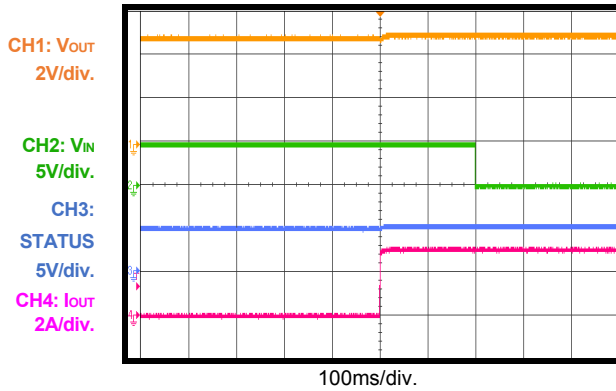
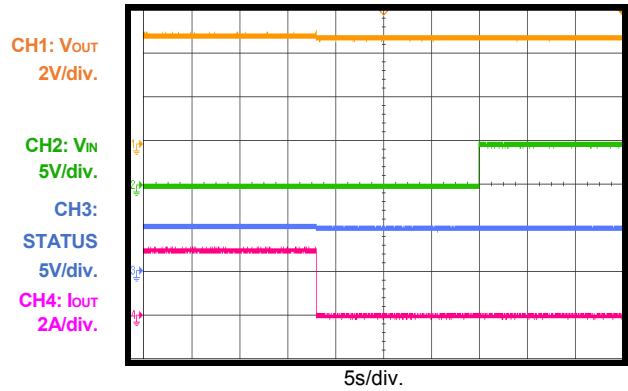
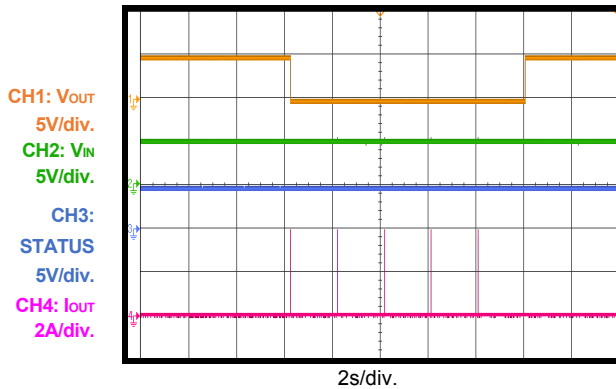
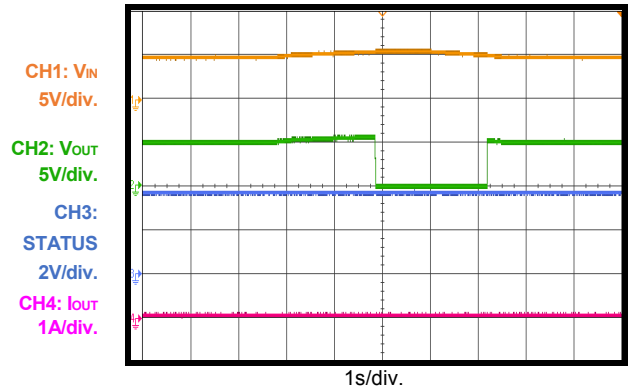
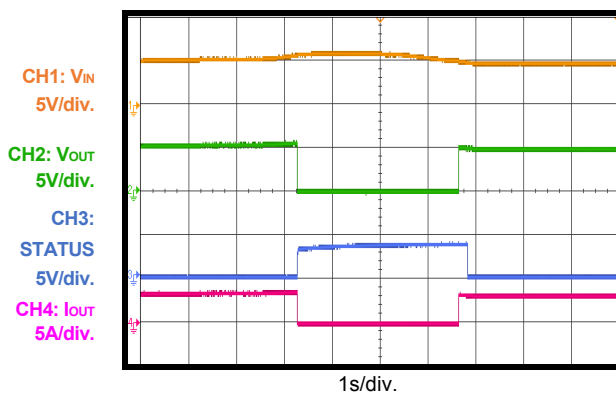
CH1:  $V_{OUT}$   
5V/div.  
CH2:  $V_{IN}$   
5V/div.  
CH3: STATUS  
5V/div.  
CH4:  $I_{OUT}$   
5A/div.



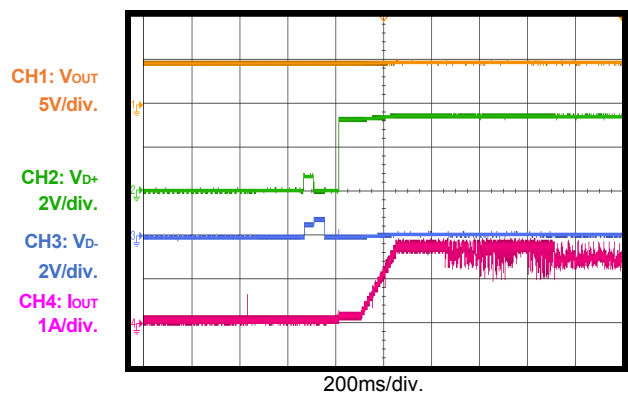
500ms/div.

**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

$V_{IN} = 5V$ ,  $V_{OUT} = 5V$ ,  $R_{ILIM} = 1.5k\Omega$ ,  $T_A = 25^\circ C$ , unless otherwise noted. Connect MP5030D Input to MP2499M Output, System\_VIN=12V is MP2499M Input Voltage.

**Status function**
 $I_{OUT}=0A$  to 3A

**Status function**
 $I_{OUT}=3A$  to 0A

**Short-Circuit Protection Entry and Recovery**

**Input Over-Voltage Protection**
 $I_{OUT}=0A$ 

**Input Over-Voltage Protection**
 $I_{OUT}=3A$ 

**CDP Mode Detection**

Mobile Phone Plug In

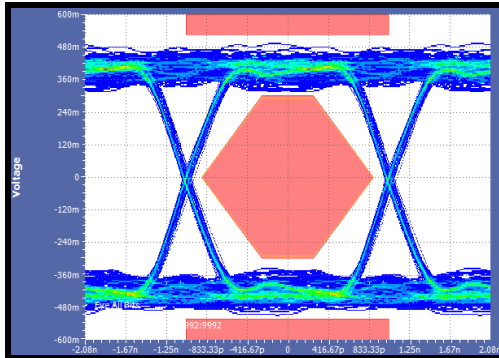


## TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

$V_{IN} = 5V$ ,  $V_{OUT} = 5V$ ,  $R_{ILIM} = 1.5k\Omega$ ,  $T_A = 25^\circ C$ , unless otherwise noted. Connect MP5030D Input to MP2499M Output, System\_VIN=12V is MP2499M Input Voltage.

### Eye Pattern Test

Recommended CDP Mode Setup



## PRINTED CIRCUIT BOARD LAYOUT

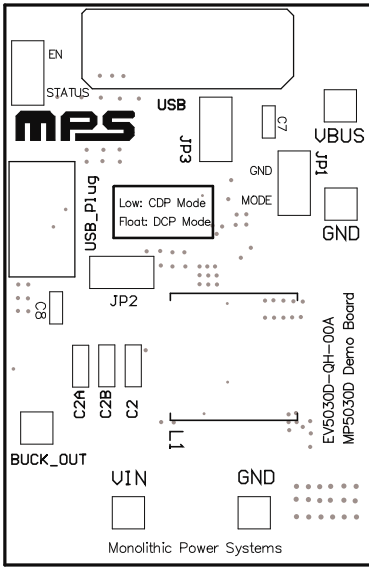


Figure 1: Top Silk Layer

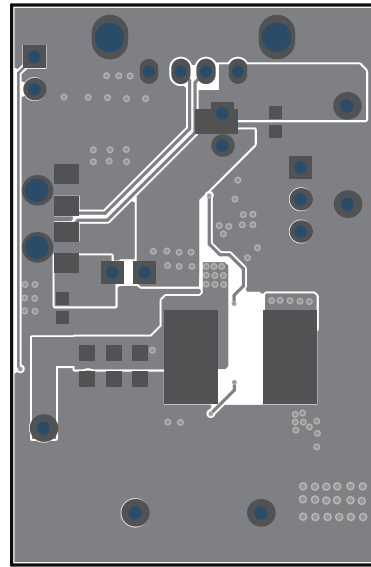


Figure 2: Top Layer

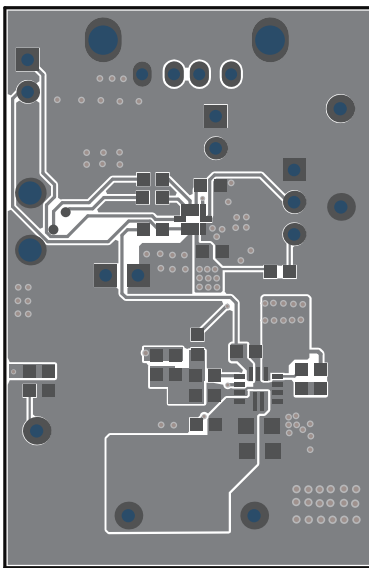


Figure 3: Bottom Layer

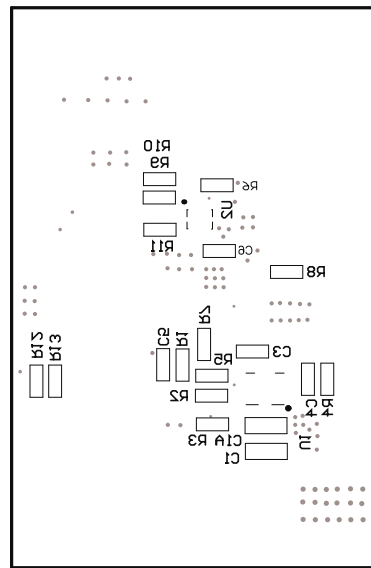


Figure 4: Bottom Silk Layer



## QUICK START GUIDE

1. Preset Power Supply to 12V.
2. Turn Power Supply off.
3. Connect Power Supply terminals to:
  - a. Positive (+): VIN
  - b. Negative (-): GND
4. EN pin for MP5030D: pull high or float enables the IC; pull low to disable the IC. EN is float in the demo board. STATUS pin for MP5030D is open drain output.
5. For default CDP mode, JP2 should open, MODE pin short to GND by JP1, USB\_plug connect to USB host. Turn power supply on after making connections, the board will automatically start up. Connect different mobile phones to Type-A USB port for CDP mode test.
6. For DCP mode, JP2 should open, MODE pin should be float, R9 and R10 should be replaced by 0Ω resistor. Do not use USB\_Plug port.

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