



EVQ5075A-G-00A

5.5V, 5A, Programmable Current, Low- $R_{DS(ON)}$
Load Switch, AEC-Q100 Qualified
Evaluation Board

DESCRIPTION

The EVQ5075A-G-00A is an evaluation board for the MPQ5075A, a low- $R_{DS(ON)}$ load switch with current limit. The MPQ5075A provides 5A of load protection, covering a 1.2V to 5.5V voltage range. With very low $R_{DS(ON)}$ in a tiny package, the MPQ5075A provides a space-saving solution for automotive infotainment, clusters, and advanced driver assistance system (ADAS) applications.

The max load at the output (source) is current-

limited. This is accomplished by utilizing a sense FET topology. The magnitude of the current limit is controlled by an external resistor from the ILIM pin to ground.

The EVQ5075A-G-00A board can deliver a continuous 5A load current across a 1.2V to 5.5V operating input voltage (V_{IN}) range. The MPQ5075A is available in a compact QFN-13 (2.5mmx3mm) package, and is AEC-Q100 qualified.

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3V to 5.5V
Output voltage (V_{OUT})	$V_{IN} = 3\text{V to } 5.5\text{V}$, $I_{OUT} = 0\text{A to } 5\text{A}$	$V_{OUT} = 3\text{V to } 5.5\text{V}$
Maximum output current (I_{OUT})	$V_{IN} = 3\text{V to } 5.5\text{V}$	5A
Typical efficiency		
Peak efficiency		
Switching frequency (f_{sw})		

EVQ5075A-G-00A EVALUATION BOARD



LxWxH (6.4cmx6.4cmx1.3cm)

Board Number	MPS IC Number
EVQ5075A-G-00A	MPQ5075AGQB-AEC1

QUICK START GUIDE

1. Connect the load terminals to:
 - a. Positive (+): VOUT
 - b. Negative (-): GND
2. Preset the power supply output between 3V to 5.5V, then turn off the power supply.
3. Connect the power supply output terminals to:
 - a. Positive (+): VIN
 - b. Negative (-): GND
4. Turn the power supply on. The board should automatically start up.
5. To use the enable function, apply a digital input to the EN pin. Drive EN above 2.6V to turn the regulator on; drive it below 0.4V to turn the regulator off.
6. Use R1 to set the output current (I_{OUT}) limit. Use C4 to set the soft-start time (t_{SS}). ⁽²⁾
7. If the input voltage (V_{IN}) drops below 3V, then VCC requires a 3.6V power supply.
8. If using two input supplies, remove R2.

Note:

To select appropriate values for R1 and C4, refer to the Application Information section of the MPQ5075A datasheet.

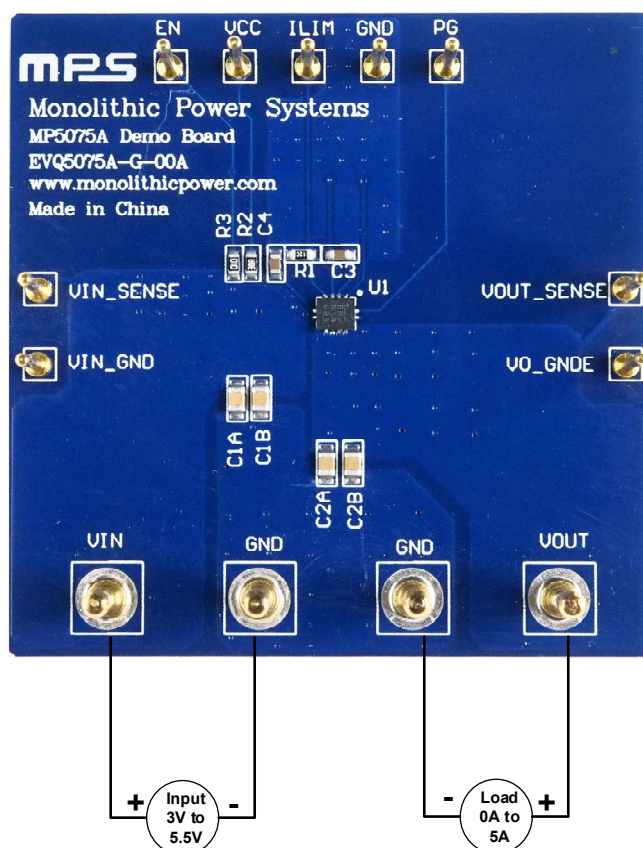


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

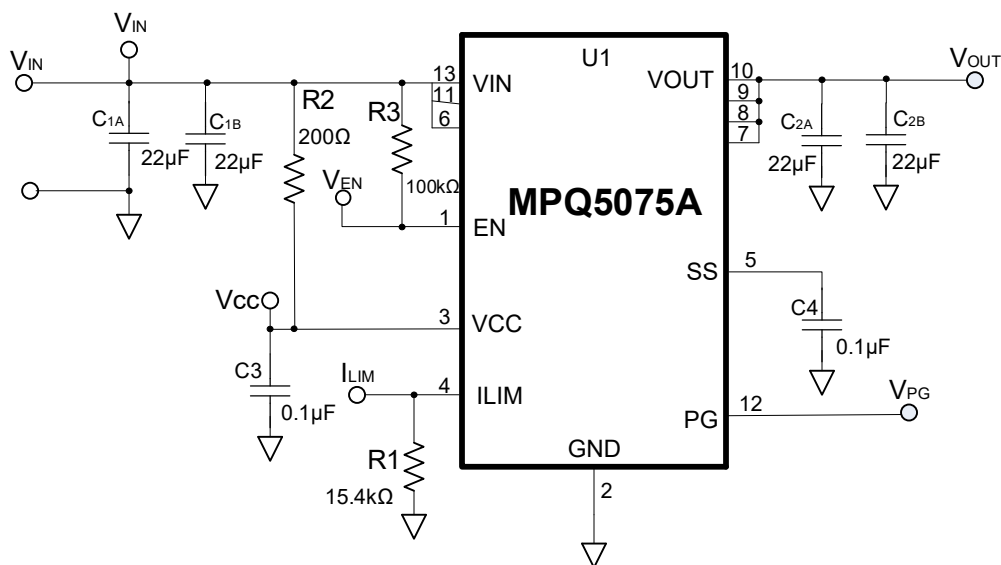


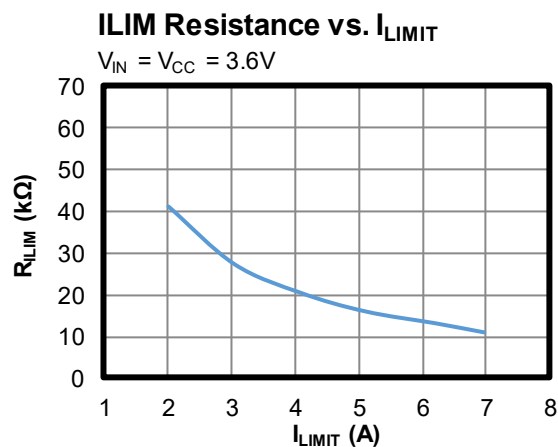
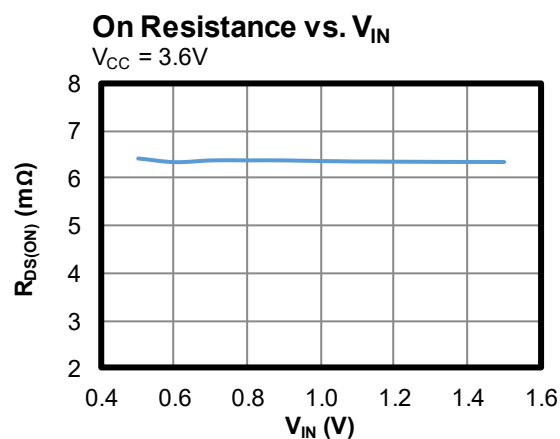
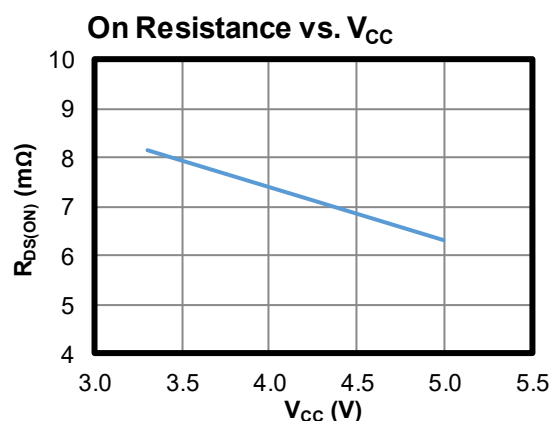
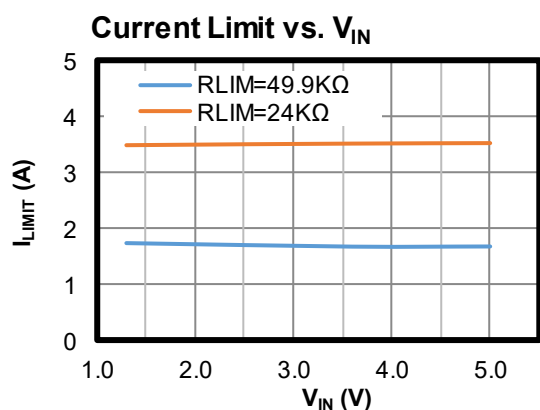
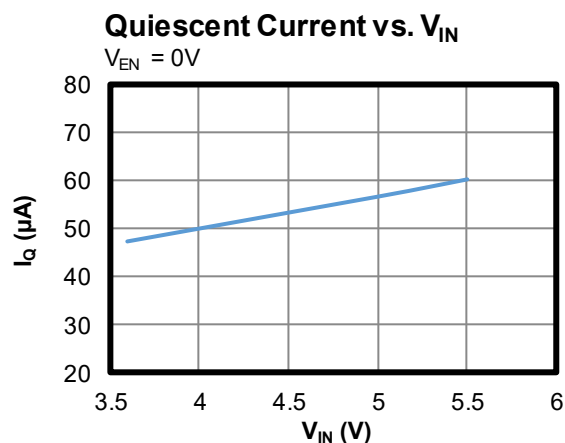
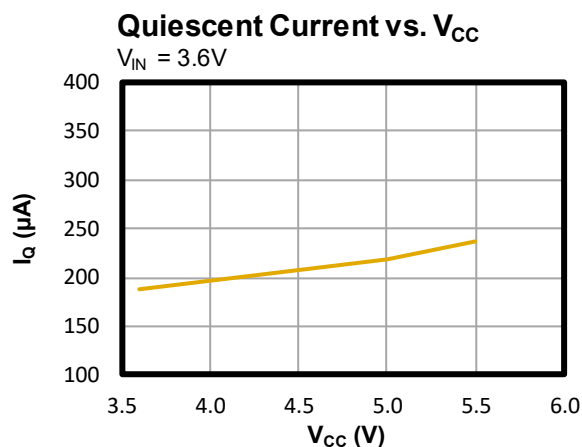
Figure 2: Evaluation Board Schematic

EVQ5075A-G-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
4	C1A, C1B, C2A, C2B	22 μ F	Ceramic capacitor, 10V, X5R	0805	Murata	GRM21BR61A226ME44L
2	C3, C4	100nF	Ceramic capacitor, 25V, X7R	0603	Murata	GRM188R71E104KA01D
2	R2	200 Ω	Resistor, 5%	0603	Yageo	AA0603JR-07200L
1	R1	15.4k Ω	Resistor, 1%	0603	Yageo	RC0603FR-0715K4L
1	R3	100k Ω	Resistor, 5%	0603		RC0603JR-07100KL
5	PG, EN, V _{CC} , I _{LIM} , GND	1mm	Test point	1mm	Any	
4	V _{IN} , GND, GND, V _{OUT}	NS	Test point			
1	U1	MPQ5075A	5a load switch	QFN (2.5mm x3mm)	MPS	MPQ5075AGQBE

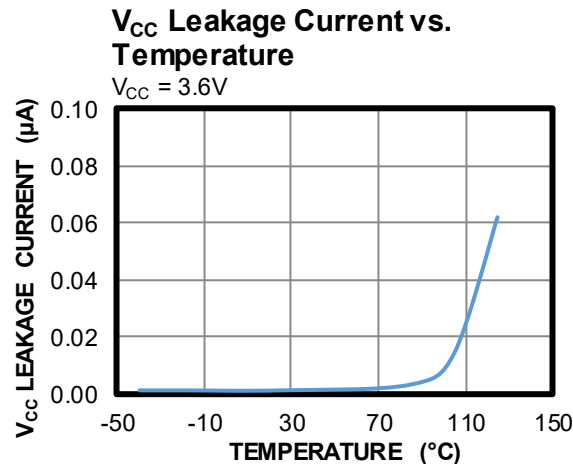
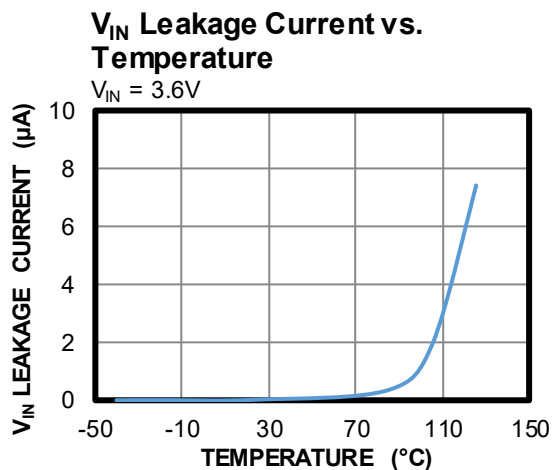
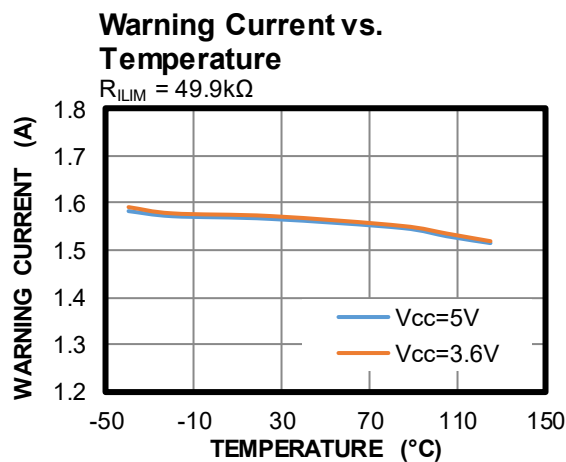
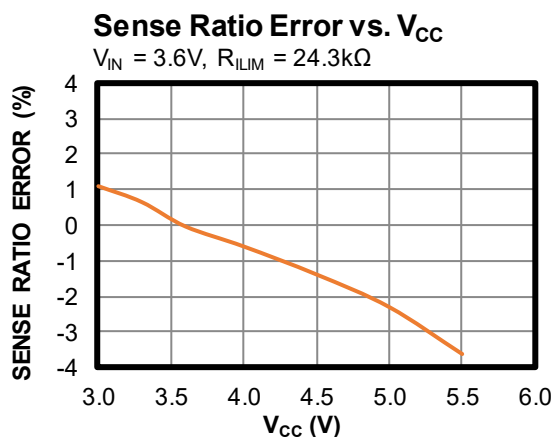
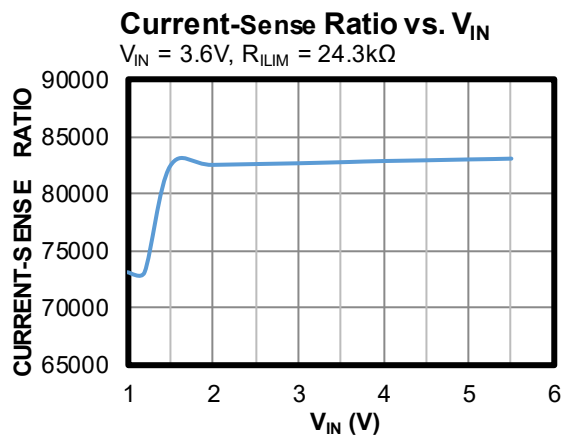
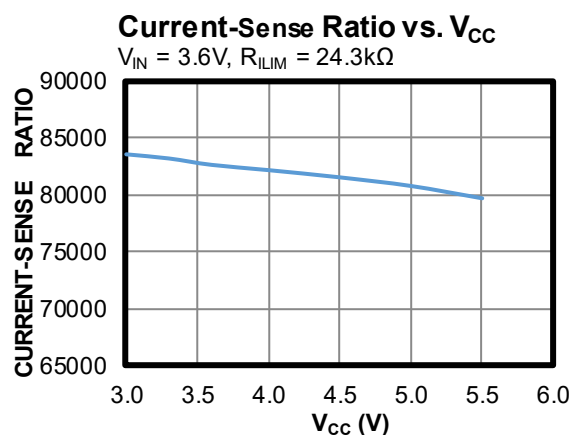
EVB TEST RESULTS

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.



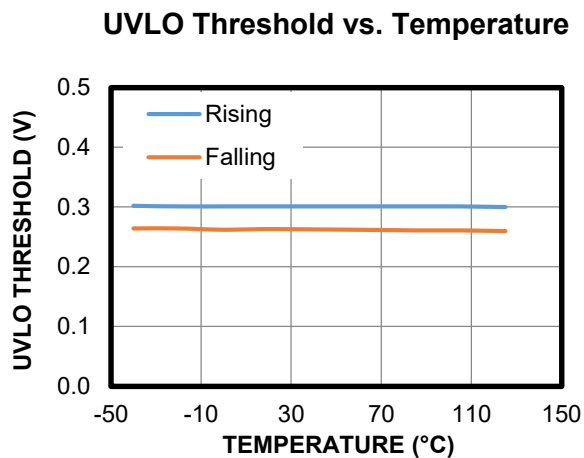
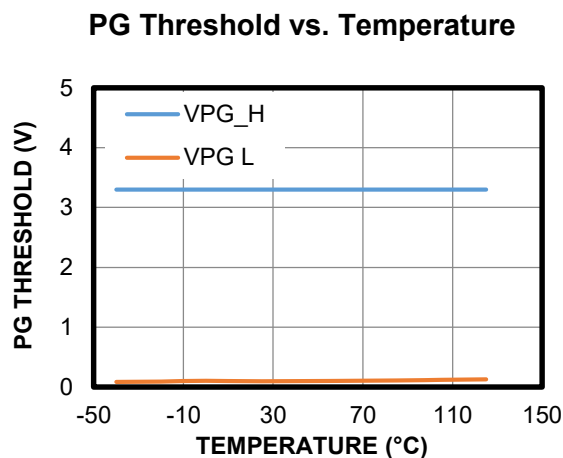
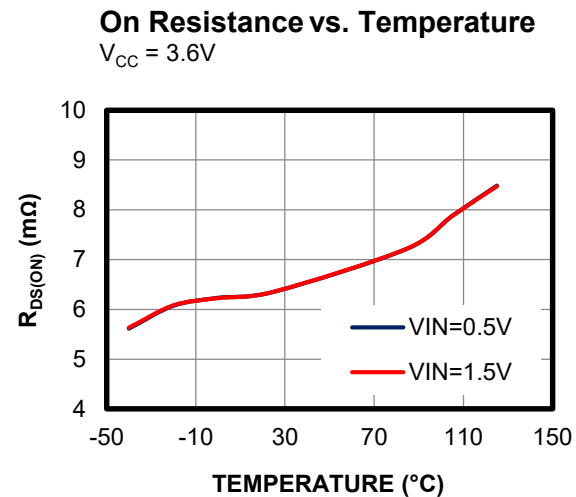
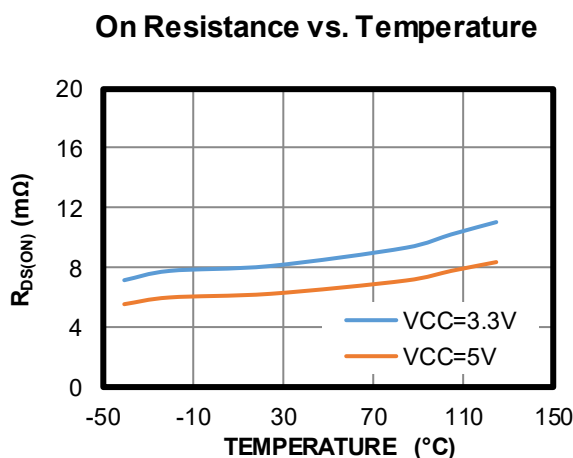
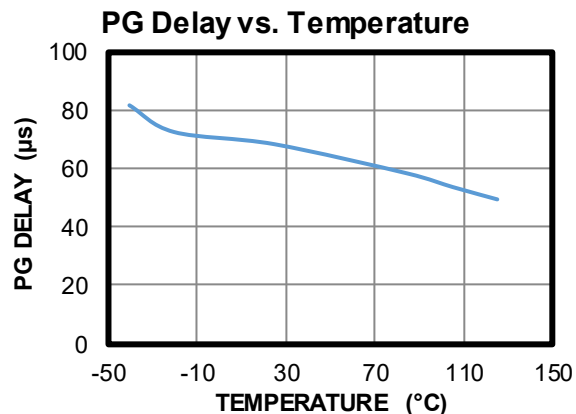
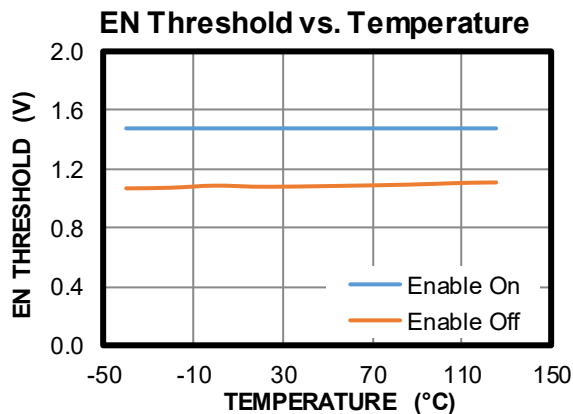
EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.



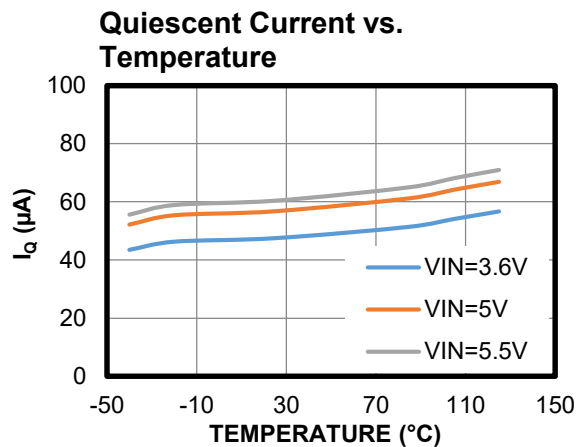
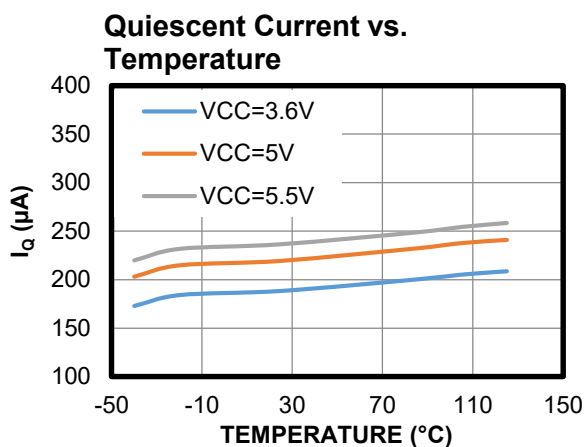
EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.



EVB TEST RESULTS *(continued)*

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.



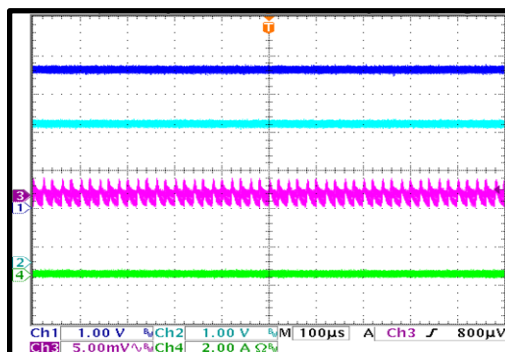
EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.

Steady State

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 0A$

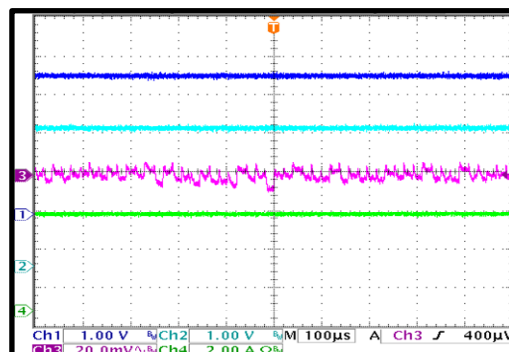
CH3: V_{OUT}
CH1: V_{IN}
CH2: V_{OUT}
CH4: I_{OUT}



Steady State

$V_{IN} = 3V$, $I_{OUT} = 4A$

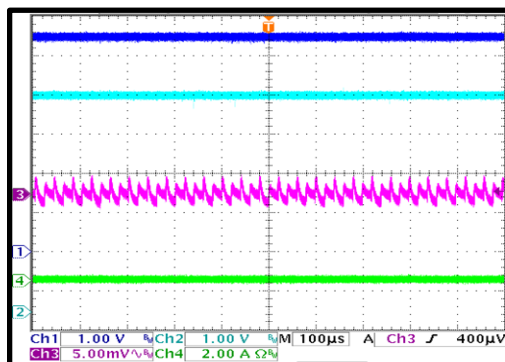
CH3: V_{OUT}
CH1: V_{IN}
CH2: V_{OUT}
CH4: I_{OUT}



Steady State

$V_{IN} = 5.5V$, $V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 0A$

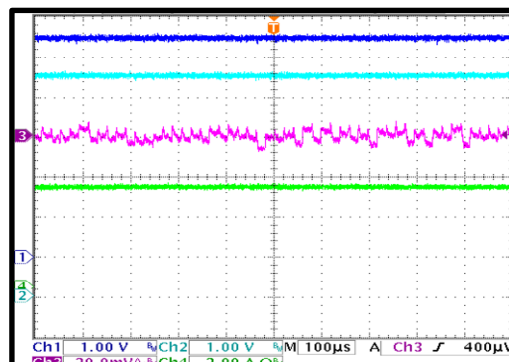
CH3: V_{OUT}
CH1: V_{IN}
CH4: I_{OUT}
CH2: V_{OUT}



Steady State

$V_{IN} = 5.5V$, $V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$

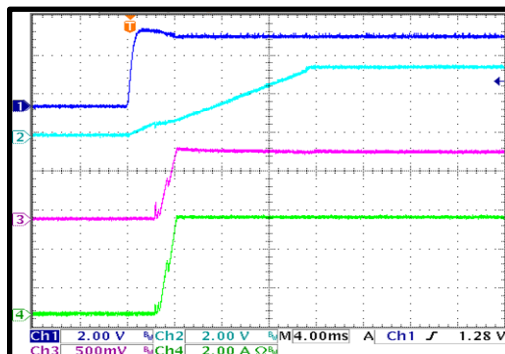
CH3: V_{OUT}
CH1: V_{IN}
CH4: I_{OUT}
CH2: V_{OUT}



Start-Up

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$

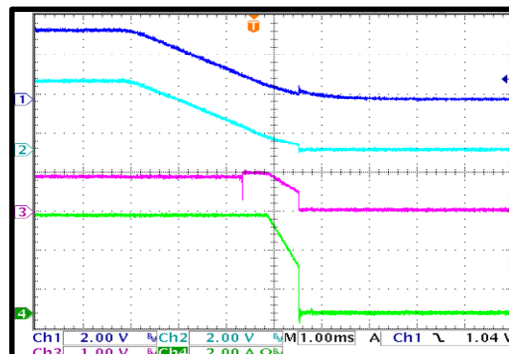
CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{ILIM}
CH4: I_{OUT}



Shutdown

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$

CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{ILIM}
CH4: I_{OUT}

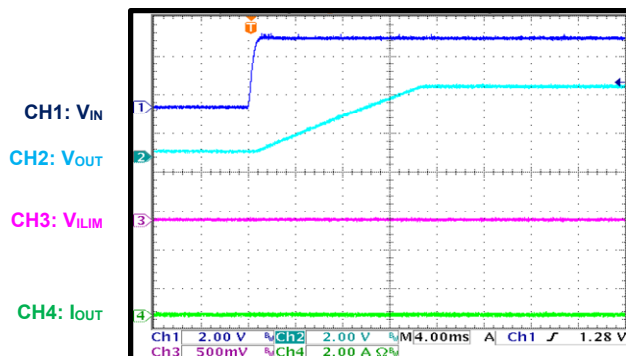


EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.

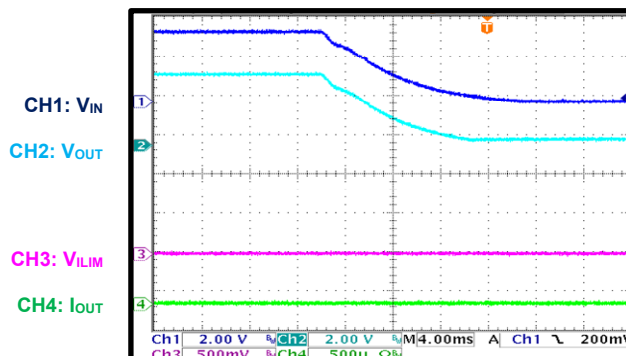
Start-Up

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 0A$



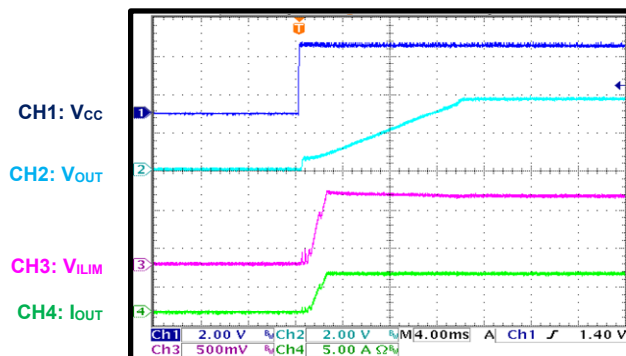
Shutdown

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 0A$



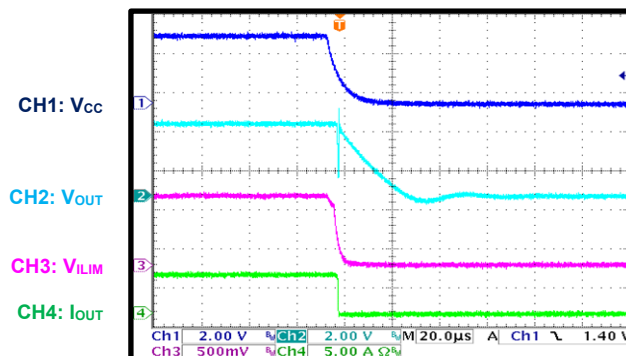
Start-Up through VCC

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$



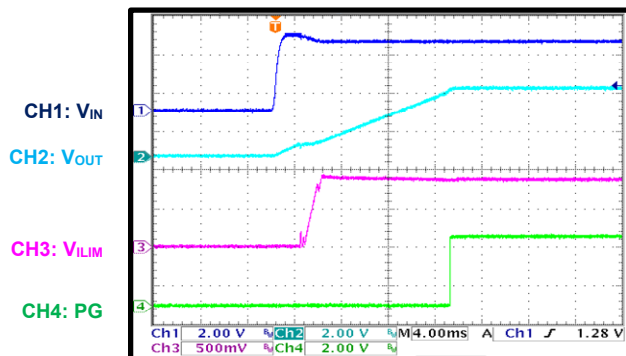
Shutdown through VCC

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$



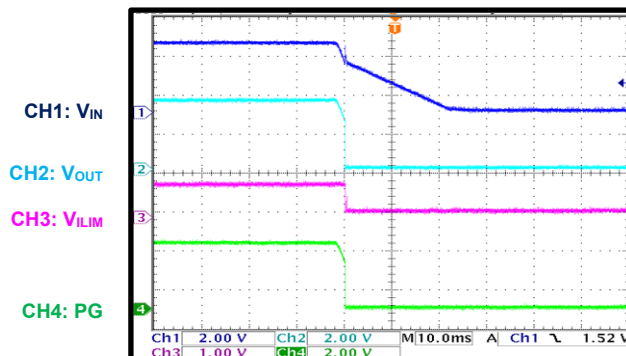
Start-Up with PG

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$



Shutdown with PG

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$

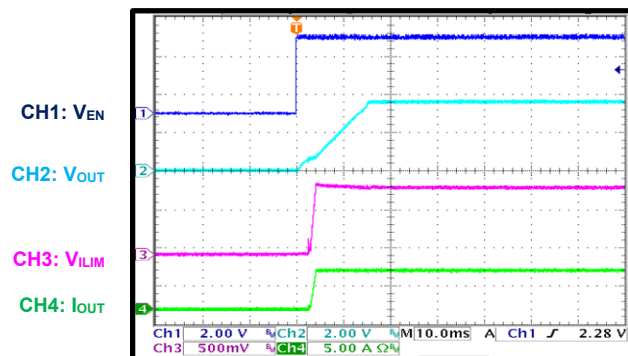


EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.

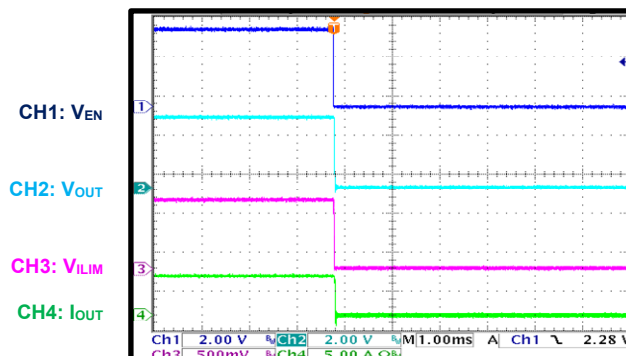
Start-Up through EN

$V_{IN} = V_{CC} = 3.6V$, $I_{OUT} = 5A$



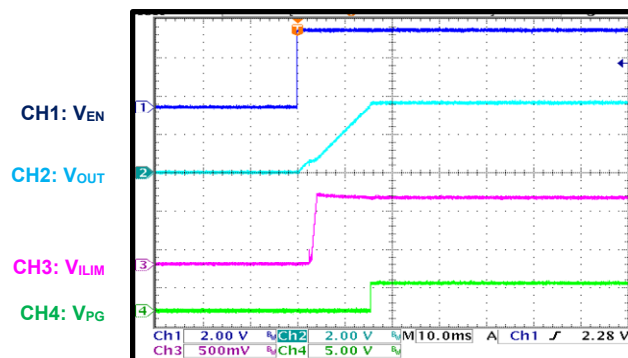
Shutdown through EN

$V_{IN} = V_{CC} = 3.6V$, $I_{OUT} = 5A$



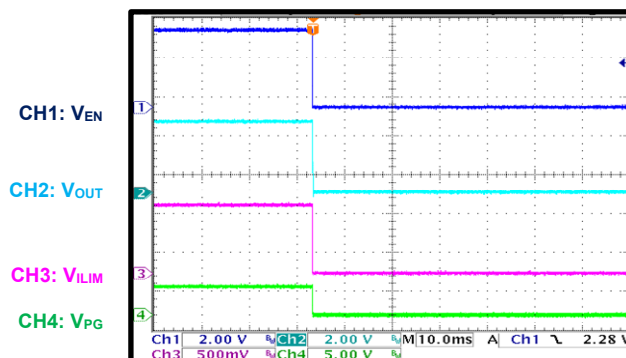
Start-Up through EN with PG

$V_{IN} = V_{CC} = 3.6V$, $I_{OUT} = 5A$



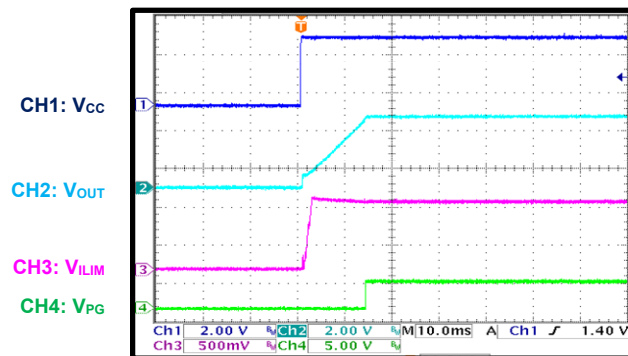
Shutdown through EN with PG

$V_{IN} = V_{CC} = 3.6V$, $I_{OUT} = 5A$



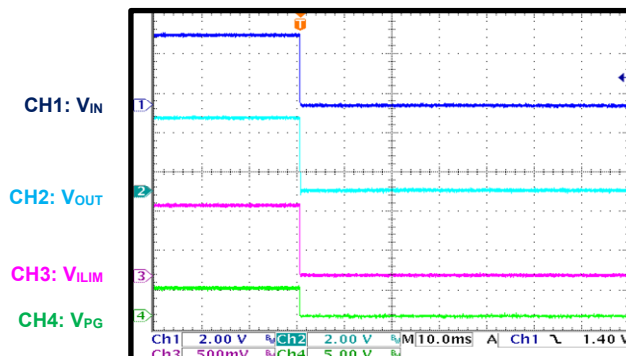
Start-Up through VCC with PG

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$



Shutdown through VCC with PG

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$



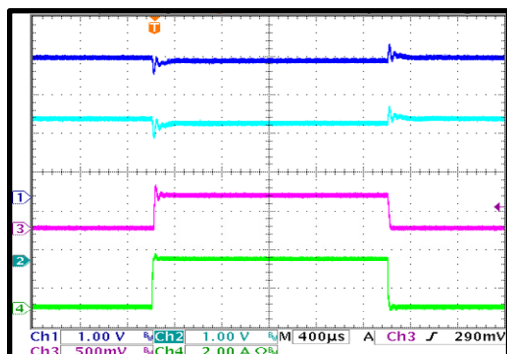
EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.

Load Transient

$V_{IN} = V_{CC} = 3.6V$, $I_{OUT} = 0A$ to $2.5A$

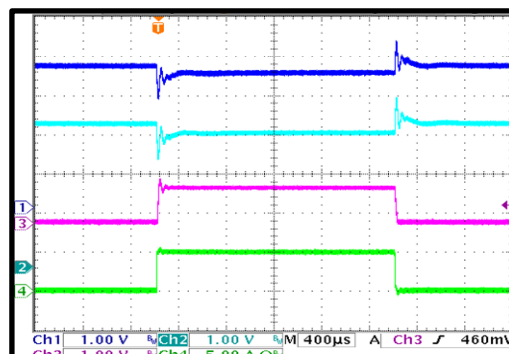
CH1: V_{IN}
CH3: V_{ILIM}
CH2: V_{OUT}
CH4: I_{OUT}



Load Transient

$V_{IN} = V_{CC} = 3.6V$, $I_{OUT} = 0A$ to $5A$

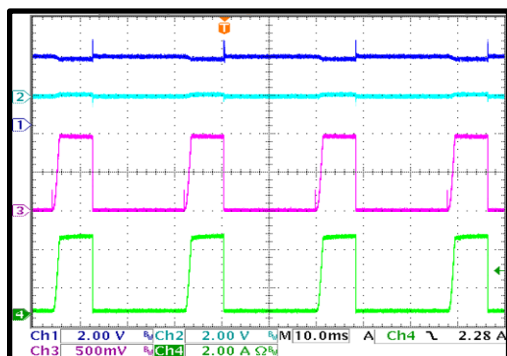
CH1: V_{IN}
CH3: V_{ILIM}
CH2: V_{OUT}
CH4: I_{OUT}



SCP

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$

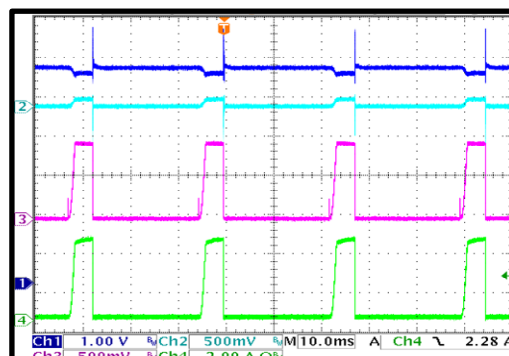
CH2: V_{OUT}
CH1: V_{EN}
CH3: V_{ILIM}
CH4: V_{PG}



SCP

$V_{IN} = 5.5V$, $V_{CC} = 3.6V$, $V_{EN} = 4V$

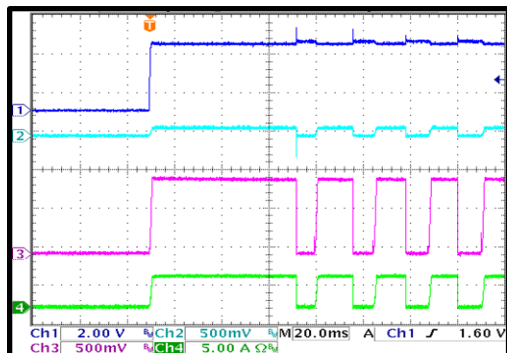
CH2: V_{OUT}
CH3: V_{ILIM}
CH1: V_{EN}
CH4: V_{PG}



SCP Start-Up

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$

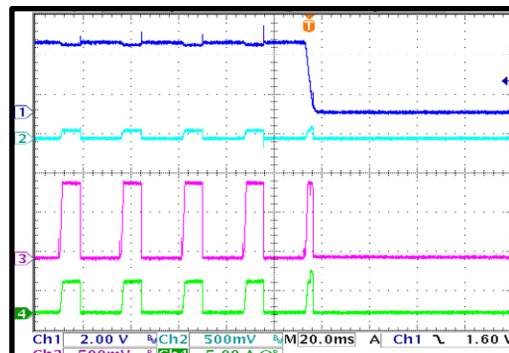
CH1: V_{CC}
CH2: V_{OUT}
CH3: V_{ILIM}
CH4: V_{PG}



SCP Shutdown

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$

CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{ILIM}
CH4: V_{PG}



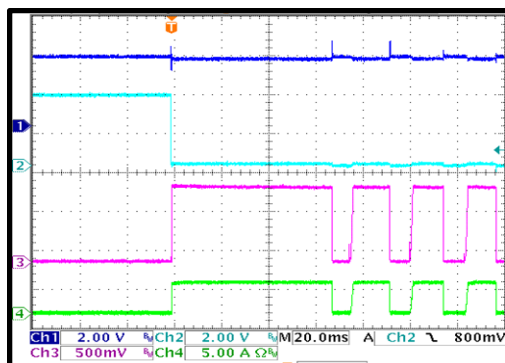
EVB TEST RESULTS (continued)

$V_{IN} = 3.6V$, $V_{CC} = 3.6V$, $V_{EN} = 2.5V$, $R_{LIMIT} = 15.4k\Omega$, $I_{OUT} = 5A$, $T_A = 25^\circ C$, unless otherwise noted.

SCP

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$

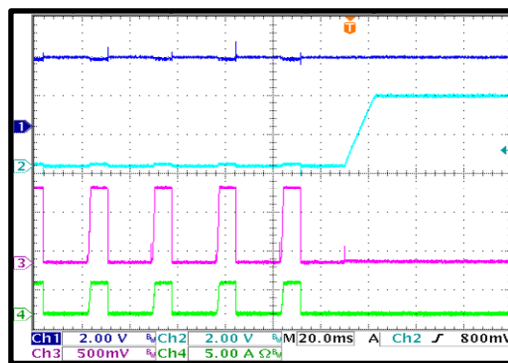
CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{ILIM}
CH4: I_{OUT}



SCP Recovery

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$

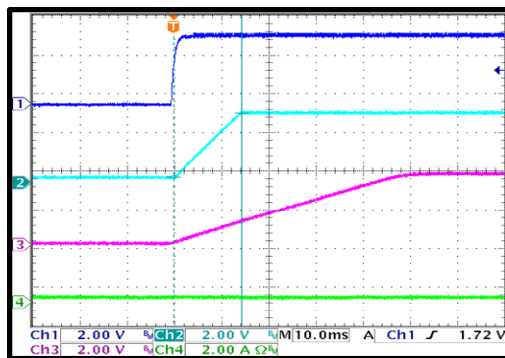
CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{ILIM}
CH4: I_{OUT}



Soft Start

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 0A$

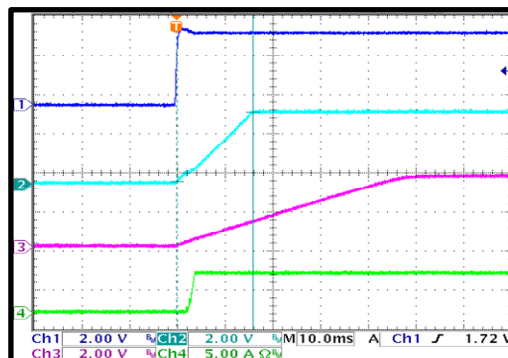
CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{SS}
CH4: I_{OUT}



Soft Start

$V_{IN} = V_{CC} = 3.6V$, $V_{EN} = 4V$, $I_{OUT} = 5A$

CH1: V_{IN}
CH2: V_{OUT}
CH3: V_{SS}
CH4: I_{OUT}



PCB LAYOUT

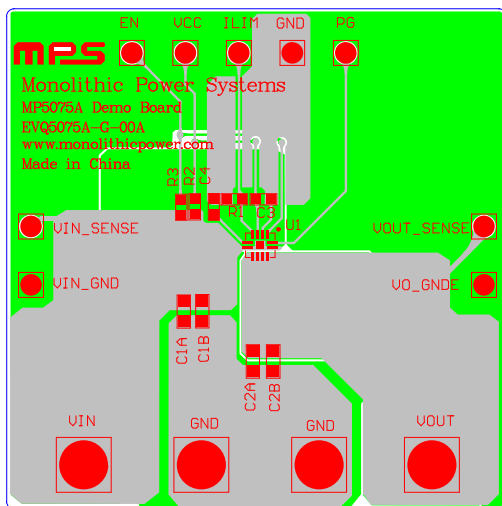


Figure 3: Top Silk

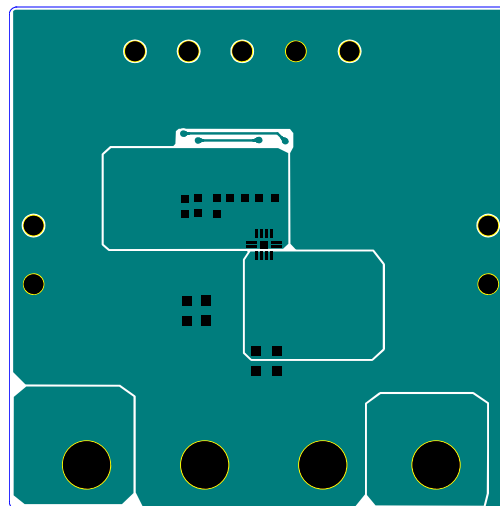


Figure 4: Bottom Layer



REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/7/2022	Initial Release	-

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