EV8020-QV-00A

IEEE802.3af/at/bt PoE PD Interface Evaluation Board

DESCRIPTION

The EV8020-QV-00A evaluation board is designed to demonstrate the capabilities of the MP8020, an IEEE 802.3af/at/bt-compliant, Power over Ethernet (PoE) powered device (PD).

The MP8020 provides configurable inrush current limit during start-up and operation current limit during normal operation. A GATE1 driver supports an external MOSFET for higher efficiency under heavy loads. A high power good (PG) signal enables the downstream DC/DC converter.

An auxiliary power input detector (AUX) and GATE2 driver provide using a wall adapter with low power loss. The MP8020 also features a built-in detection resistor, thermal protection, and a wide input under-voltage lockout (UVLO) hysteresis.

The MP8020 is available in a QFN-18 (3mmx5mm) package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	37 to 57 (1)	V
Adapter voltage	$V_{ADAPTER}$	24 to 57 (2)	V
Output power	P_{OUT}	71.3	W

FEATURES

- Supports Power over Ethernet (PoE) Input and Auxiliary Adapter Input
- Compliant with IEEE 802.3af/at/bt Specifications
- GATE2 N-Channel MOSFET Driver for Adapter Supply
- Configurable Current Limit
- Automatic Maintain Power Signature
- 150°C Over-Temperature Protection (OTP)
- Available in a QFN-18 (3mmx5mm) Package

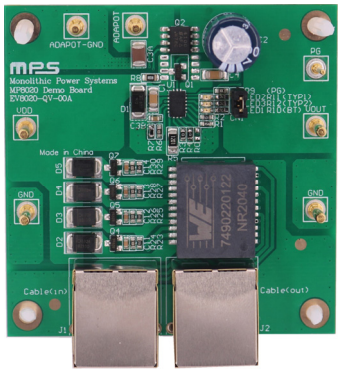
APPLICATIONS

- IEEE 802.3af/at/bt-Compliant Devices
- Security Cameras
- Video and VoIP Phones
- WLAN Access Points
- Internet of Things (IoT) Devices
- Pico Base Stations

Notes:

1) The start-up voltage exceeds 40V. After start-up, the board can operate with a 37V input voltage (V_{DD}).
2) It can also support a 12V adapter with different AUX resistor configurations.

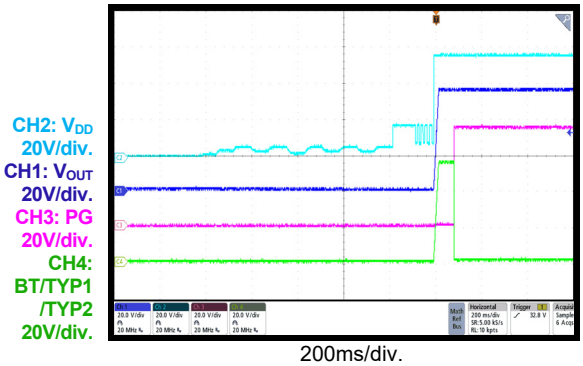
EV8020-QV-00A EVALUATION BOARD



LxWxH (6.3cmx6.3cmx1.5cm)

Board Number	MPS IC Number
EV8020-QV-00A	MP8020GQV

PSE Start-Up



200ms/div.

QUICK START GUIDE

The EV8020-QV-00A evaluation board layout accommodates most commonly used components. The EV8020-QV-00A has two start-up methods:

Method 1:

1. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
2. Connect the cable from the power sourcing equipment (PSE) to the Ethernet jack (J1). The board should start up automatically.

Method 2:

1. Preset the power supply to 40V ≤ V_{DD} ≤ 57V. After start-up, the board can operate with a 37V input voltage (V_{DD}).
2. Turn off the power supply.
3. Connect the power supply terminals to:
   a. Positive (+): VDD
   b. Negative (-): GND
4. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
5. After making the connections, turn on the power supply.
6. Once V_{DD} is applied, the MP8020 is enabled on the evaluation board.
7. To use the adapter supply function, connect the 24V or higher voltage adapter's positive terminal to ADAPOT and the negative terminal to ADAPOT-GND. The board then uses the adapter to supply power.
8. Remove the CN1 jumper to reduce losses.

EVALUATION BOARD SCHEMATIC

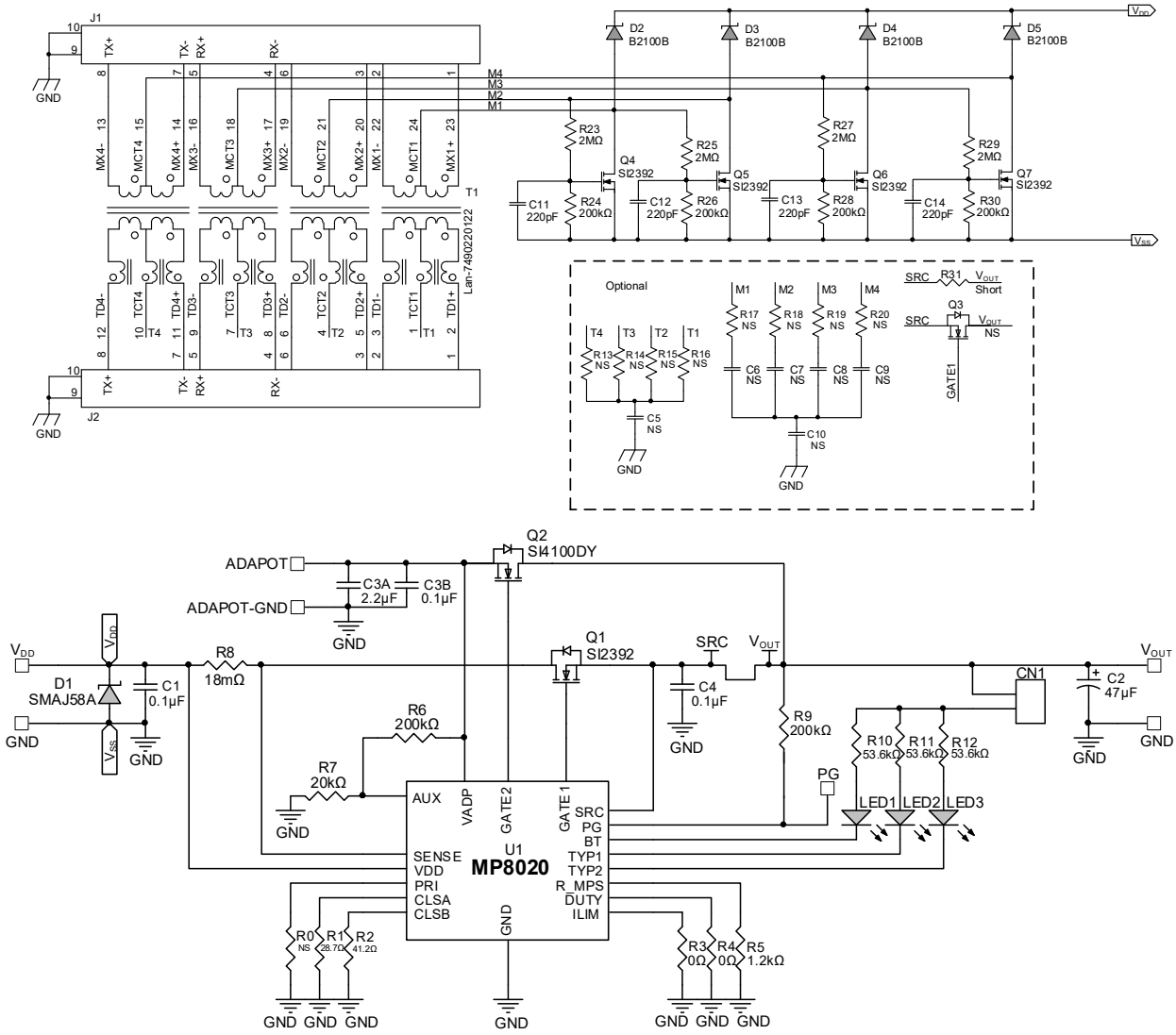


Figure 1: Evaluation Board Schematic

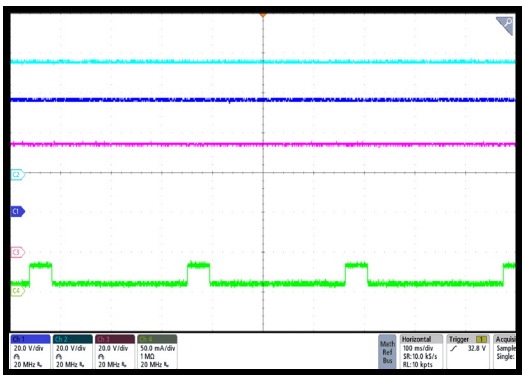
EV8020-QV-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
2	C1, C4	0.1µF	Ceramic capacitor, 100V, X7R	1206	Murata	GRM319R72A104KA01D
1	C2	47µF	Electrolytic capacitor, 100V	DIP	Jianghai	ECR2AXY470MLB100012
1	C3A	2.2µF	Ceramic capacitor, 100V, X7R	1210	Murata	GRM32ER72A225KA88L
1	C3B	0.1µF	Ceramic capacitor, 100V, X7R	0603	Murata	GRM188R72A104KA01D
4	C11, C12, C13, C14	220pF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H221KA01D
1	CN1	2.54mm	Connector header through-hole, 2-pin	DIP	Sullins	PCC02SAAN
1	CN1	2.54mm	Jumper	DIP	Sullins	STC02SYAN
1	D1	58V	TVS diode, 400W	SMA	Diodes Inc.	SMAJ58A
4	D2, D3, D4, D5	100V	Schottky diode, 2A	SMB	Diodes Inc.	B2100B
2	J1, J2	1.5A	Jack connector, RJ45	8P8C	Wurth	615008140121
3	LED1, LED2, LED3	20mA	Green LED, 2.2V	0603	Rohm	SML-D12M8WT86
5	Q1, Q4, Q5, Q6, Q7	126mΩ	N-channel MOSFET, 100V, 3.1A	SOT23	Vishay	SI2392DS-T1-GE3
1	Q2	63mΩ	N-channel MOSFET, 100V, 6.8A	8-SOIC	Vishay	SI4100DY-T1-GE3
16	C5, C6, C7, C8, C9, C10, R0, R13, R14, R15, R16, R17, R18, R19, R20, Q3	NS				
1	R1	28.7Ω	Film resistor, 1%	0603	Yageo	RL0603FR-0728R7T
1	R2	41.2Ω	Film resistor, 1%	0603	Yageo	RL0603FR-0741R2T
3	R3, R4, R31	0Ω	Film resistor, 1%	0603	Yageo	RL0603FR-070RT
1	R5	1.2kΩ	Film resistor, 1%	1206	Yageo	RL1206FR-071K2L
6	R6, R9, R24, R26, R28, R30	200kΩ	Film resistor, 1%	0603	Yageo	RL0603FR-07200KL
1	R7	20kΩ	Film resistor, 1%	0603	Yageo	RL0603FR-0720KL
1	R8	18mΩ	Film resistor, 1%	0805	Yageo	RL0805FR-070R018L
3	R10, R11, R12	53.6kΩ	Film resistor, 1%	0603	Yageo	RL0603FR-0753K6L
4	R23, R25, R27, R29	2MΩ	Film resistor, 1%	0603	Yageo	RL0603FR-072ML
1	T1	350µH	LAN transformer	SMD	Wurth	7490220122
1	U1	MP8020	IEEE 802.3 af/at/bt PoE PD interface	QFN-18 (3mmx5mm)	MPS	MP8020GQV

EVB TEST RESULTS

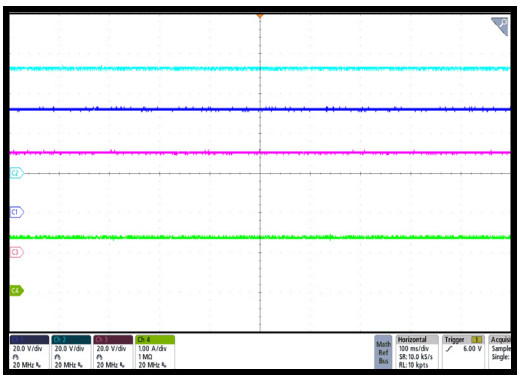
V_{DD} = 54V, V_{ADP} = 24V, T_A = 25°C, unless otherwise noted.

Steady State
I_{OUT} = 0A



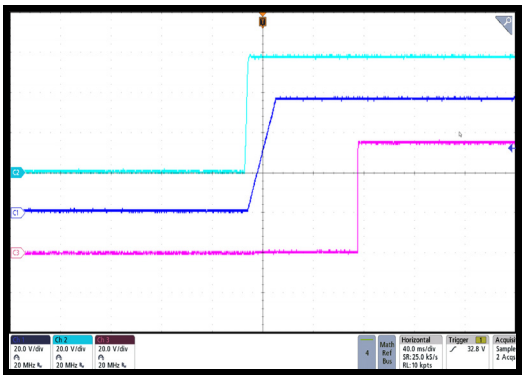
100ms/div.

Steady State
I_{OUT} = 1.35A



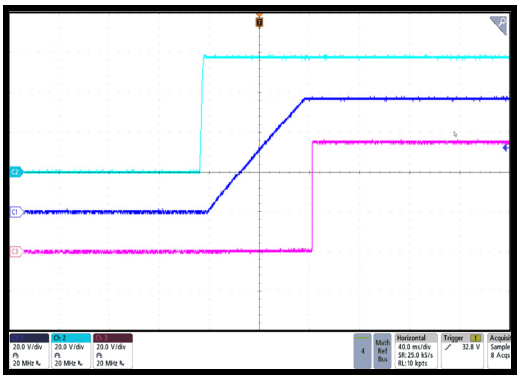
100ms/div.

Start-Up through VDD
I_{OUT} = 0A



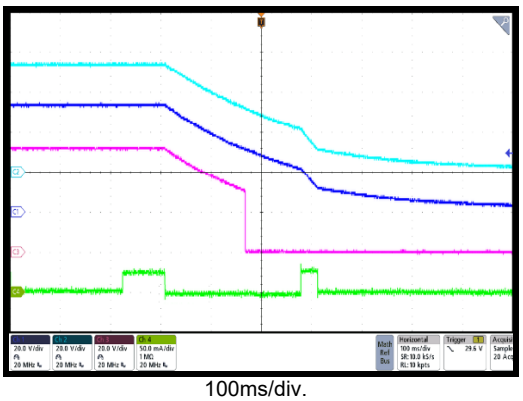
40ms/div.

Start-Up through VDD
I_{OUT} = 0.1A



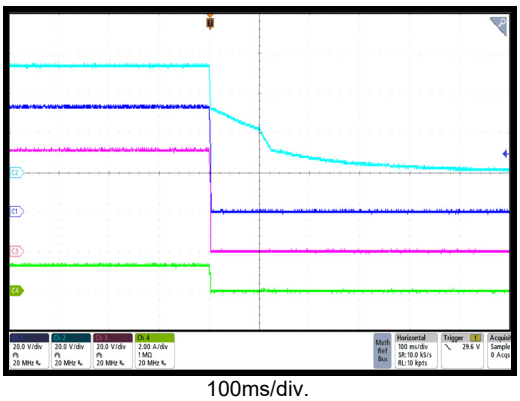
40ms/div.

Shutdown through VDD
I_{OUT} = 0A



100ms/div.

Shutdown through VDD
I_{OUT} = 1.35A



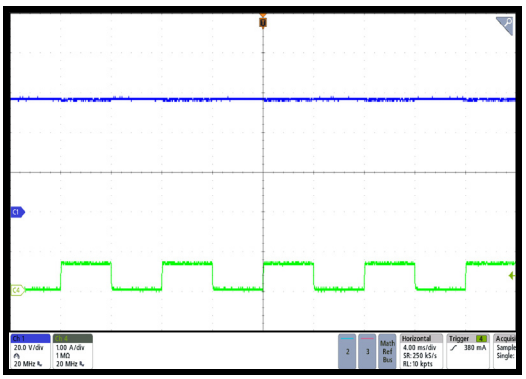
100ms/div.

EVB TEST RESULTS *(continued)*

V_{DD} = 54V, V_{ADP} = 24V, T_A = 25°C, unless otherwise noted.

Load Transient

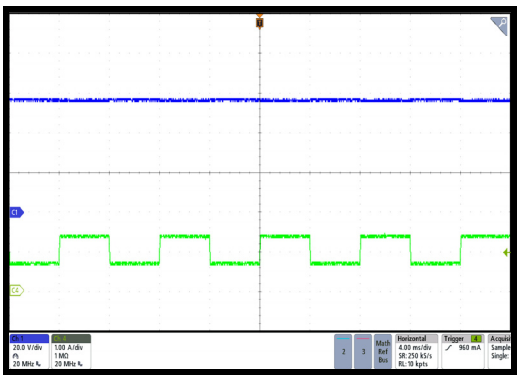
I_{OUT} = 0A to 0.675A, I_{RAMP} = 50mA/µs



4ms/div.

Load Transient

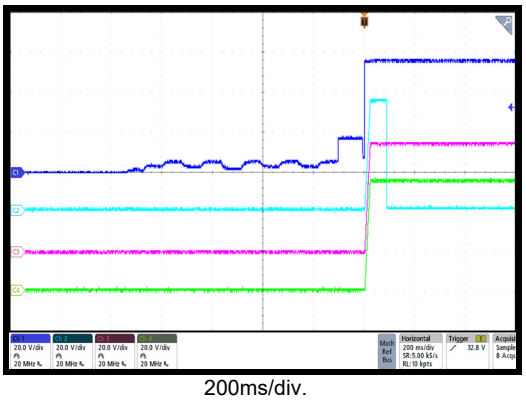
I_{OUT} = 0.675A to 1.35A, I_{RAMP} = 50mA/µs



4ms/div.

PSE Start-Up

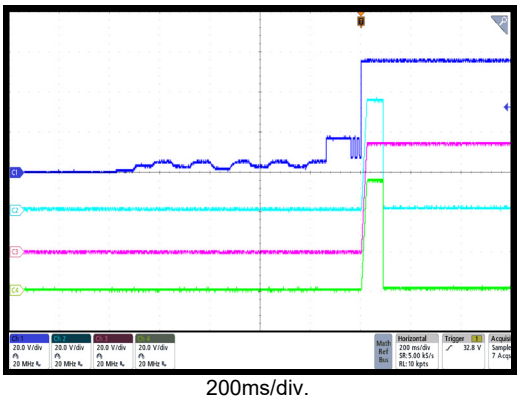
Class 1



200ms/div.

PSE Start-Up

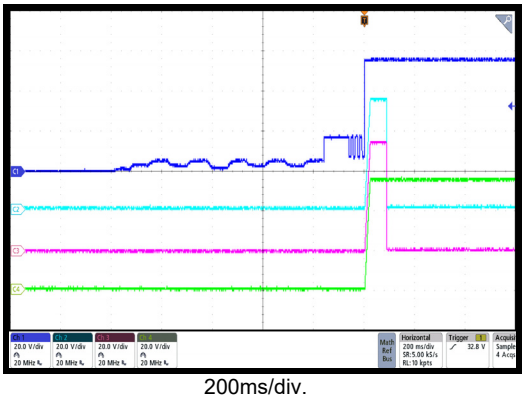
Class 4



200ms/div.

PSE Start-Up

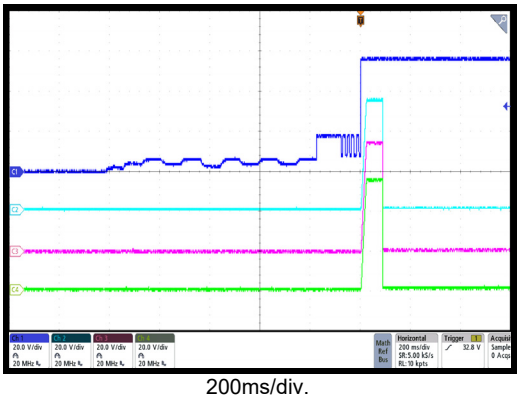
Class 6



200ms/div.

PSE Start-Up

Class 8



200ms/div.

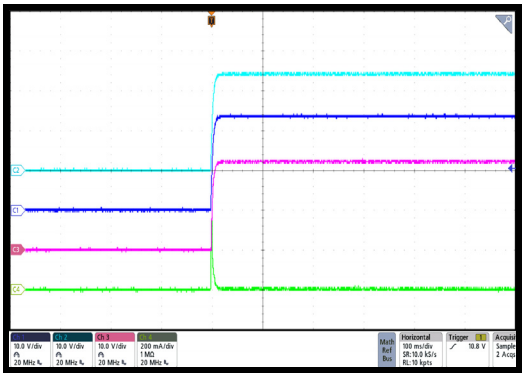
EVB TEST RESULTS *(continued)*

V_{DD} = 54V, V_{ADP} = 24V, T_A = 25°C, unless otherwise noted.

Adapter Start-Up

I_{OUT} = 0A

CH2: V_{ADP} 10V/div.
CH1: V_{OUT} 10V/div.
CH3: PG 10V/div.
CH4: I_{VADP} 200mA/div.

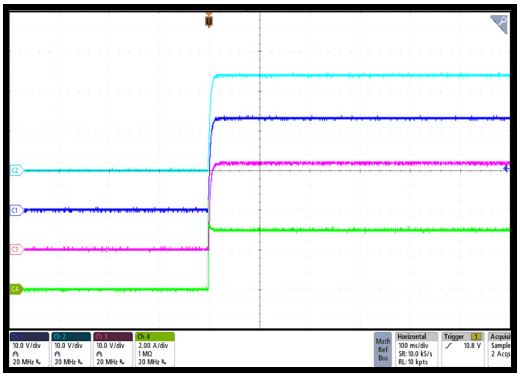


100ms/div.

Adapter Start-Up

I_{OUT} = 3A

CH2: V_{ADP} 10V/div.
CH1: V_{OUT} 10V/div.
CH3: PG 10V/div.
CH4: I_{VADP} 2A/div.

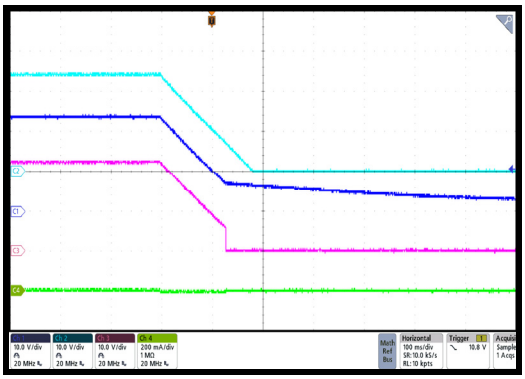


100ms/div.

Adapter Shutdown

I_{OUT} = 0A

CH2: V_{ADP} 10V/div.
CH1: V_{OUT} 10V/div.
CH3: PG 10V/div.
CH4: I_{VADP} 200mA/div.

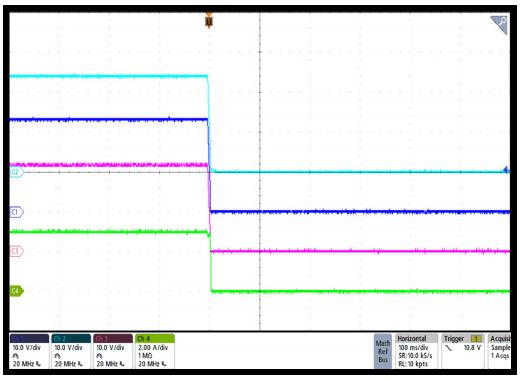


100ms/div.

Adapter Shutdown

I_{OUT} = 3A

CH2: V_{ADP} 10V/div.
CH1: V_{OUT} 10V/div.
CH3: PG 10V/div.
CH4: I_{VADP} 2A/div.

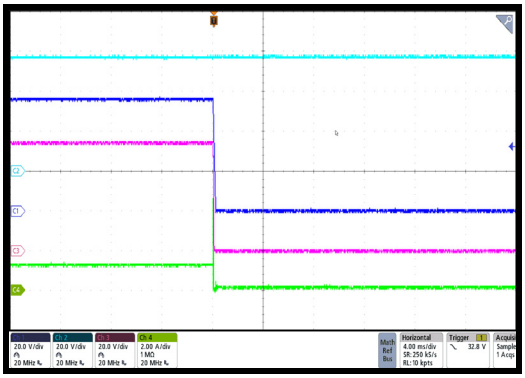


100ms/div.

SCP Entry

I_{OUT} = 1.35A to short

CH2: V_{DD} 20V/div.
CH1: V_{OUT} 20V/div.
CH3: PG 20V/div.
CH4: I_{VDD} 2A/div.

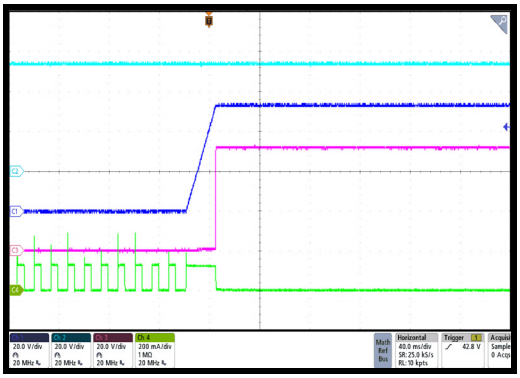


4ms/div.

SCP Recovery

I_{OUT} = 1.35A

CH2: V_{DD} 20V/div.
CH1: V_{OUT} 20V/div.
CH3: PG 20V/div.
CH4: I_{VDD} 200mA/div.



40ms/div.

PCB LAYOUT

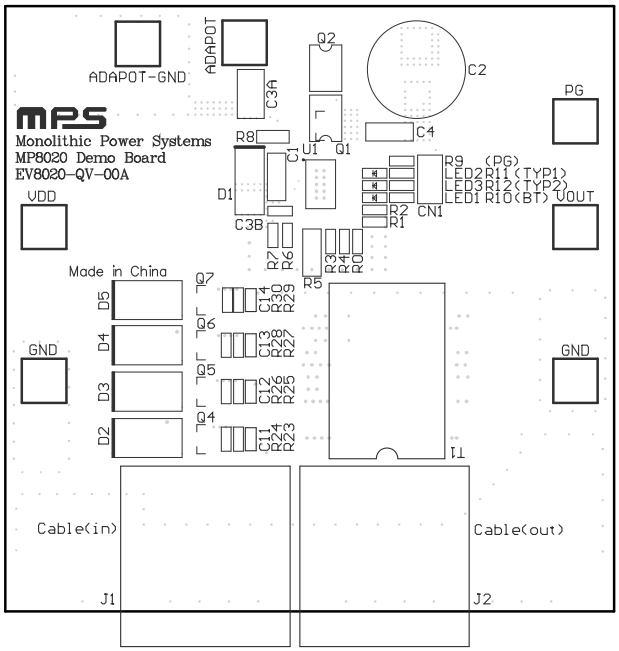


Figure 2: Top Silk

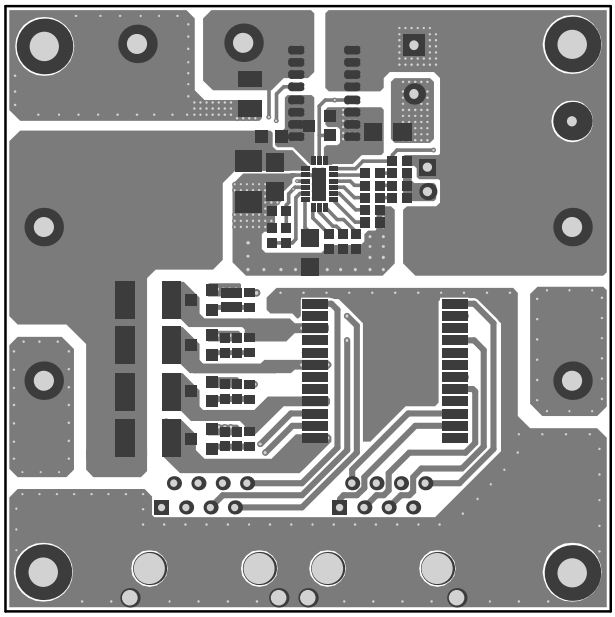


Figure 3: Top Layer

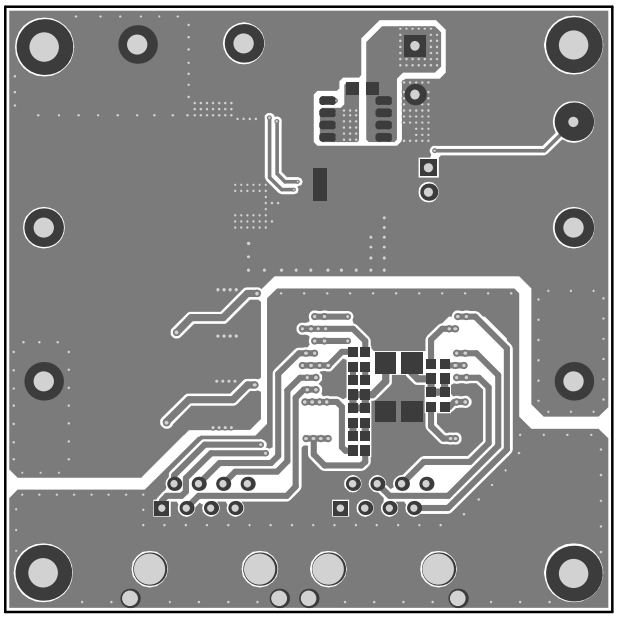


Figure 4: Bottom Layer

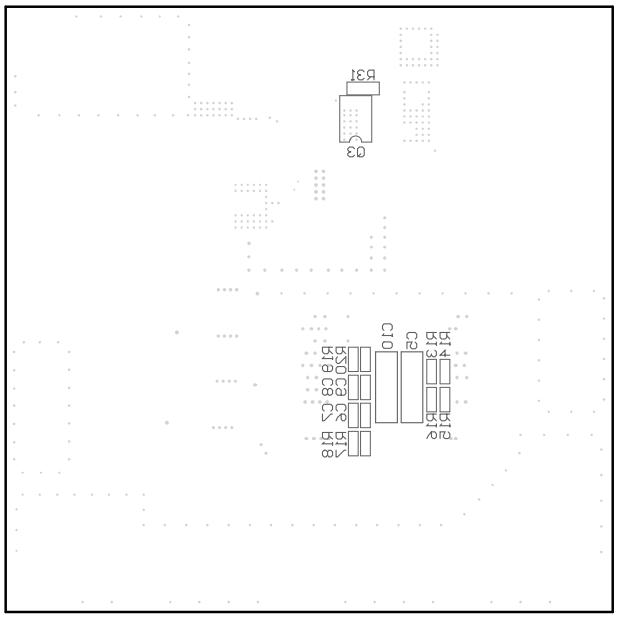


Figure 5: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	2/18/2022	Initial Release	-
1.01	9/20/2024	Correct units for R23, R25, R27, and R29 in Figure 3 and BOM	3–4