EV2703-RP-00A

26V, 1A, Linear Charger with Configurable JEITA and Battery Diagnostic Evaluation Board

DESCRIPTION

The EV2703-RP-00A is an evaluation board designed to demonstrate the capabilities of the MP2703, a 26V, 1A, highly integrated linear charger for Li-ion or Li-polymer batteries with battery diagnostics.

The MP2703 has a dedicated ISET pin to set the charge current (I_{CC}) by connecting a resistor from this pin to ground. The MP2703 also has a minimum input voltage limit to reduce I_{CC} when the input power is overloaded.

The MP2703 integrates a battery diagnostic function. The BATTSNS pin provides an output proportional to the real battery voltage, which can be directly delivered to the external analog-to-digital converter (ADC) input to measure the battery voltage. In addition, an internal dummy load can be controlled to discharge the battery. An external microcontroller (MCU) can detect the battery impedance by measuring the battery voltage using the discharge function.

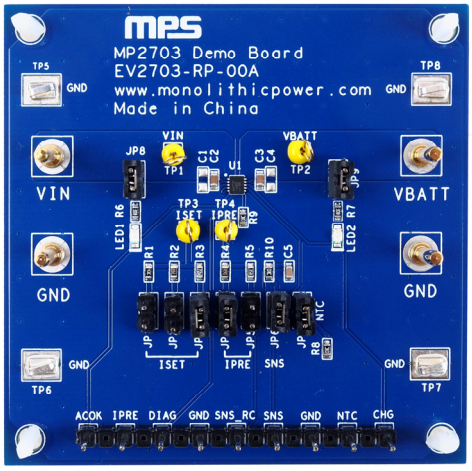
The MP2703 supports a fully customizable JEITA profile with configurable temperature windows and actions.

The EV2703-RP-00A supports an operating voltage up to 6V, and an absolute maximum input voltage (V_{IN}) up to 26V.

PERFORMANCE SUMMARY

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4V to 6V
Battery charge regulation voltage (V_{BATT_REG})	V_{IN} = 5V	4.2V
Charge current (I_{CC})	V_{BATT} = 4V	0.02A to 1A

EVALUATION BOARD



LxWxH (6.3cmx6.3cmx1.3cm)

Board Number	MPS IC Number
EV2703-RP-00A	MP2703GRP

QUICK START GUIDE

The EV2703-RP-00A evaluation board is designed for the MP2703 as a single-cell linear charger. Its layout accommodates most commonly used capacitors. The charge-full voltage is preset to 4.2V.

Table 1 lists the jumper set-ups for the EV2703-RP-00A.

Table 1: Jumper Installations

Jumper	Description	Factory Setting
JP1	ISET resistor selection 1: I_{CC} = 20mA	Off
JP2	ISET resistor selection 2: I_{CC} = 300mA	Off
JP3	ISET resistor selection 3: I_{CC} = 1A	On
JP4	IPRE resistor selection 1: I_{PRE} = 10% of I_{CC}	On
JP5	IPRE resistor selection 2: I_{PRE} = 20% of I_{CC}	Off
JP6	BATTSNS connected to RC filter	On
JP7	NTC setting: fixed 10kΩ pull-down	On
JP8	/ACOK pull-up	On
JP9	/CHG pull-up	On

Start-Up Procedure

To set up the EV2703-RP-00A, refer to Figure 1 on page 3 and follow the guidelines below:

1. Set the battery simulator output to be between 0V and 4.2V with a current limit set to 3A, then turn off the battery simulator.
2. Set the DC power source to be 5V with output current limit set to 2A, then turn off the DC power source.
3. Connect the battery simulator terminals to:
   a. Positive (+): VBATT
   b. Negative (-): GND
4. Connect the DC power source terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
5. Set the fast charge current using JP1, JP2, and JP3.
6. Set the pre-charge current using JP4 and JP5.
7. Turn on the battery simulator.
8. Turn on the DC power source. The IC should start up automatically.

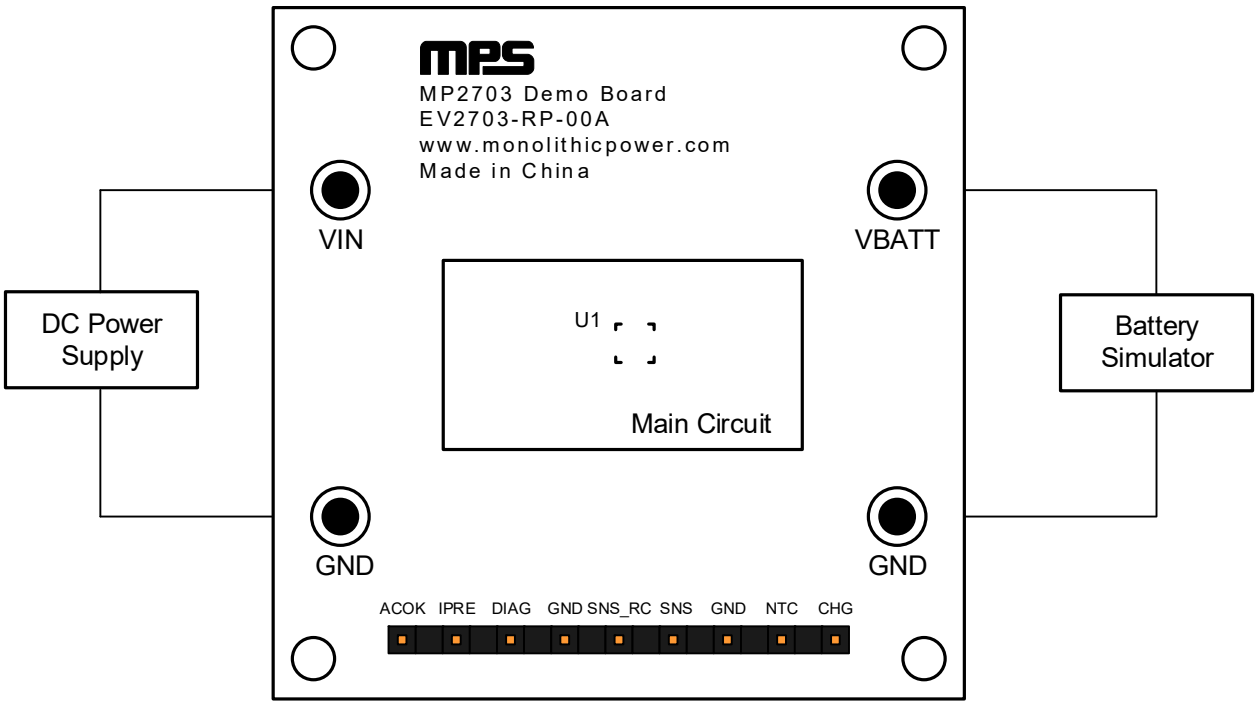


Figure 1: Test Set-Up for MP2703

EVALUATION BOARD SCHEMATIC

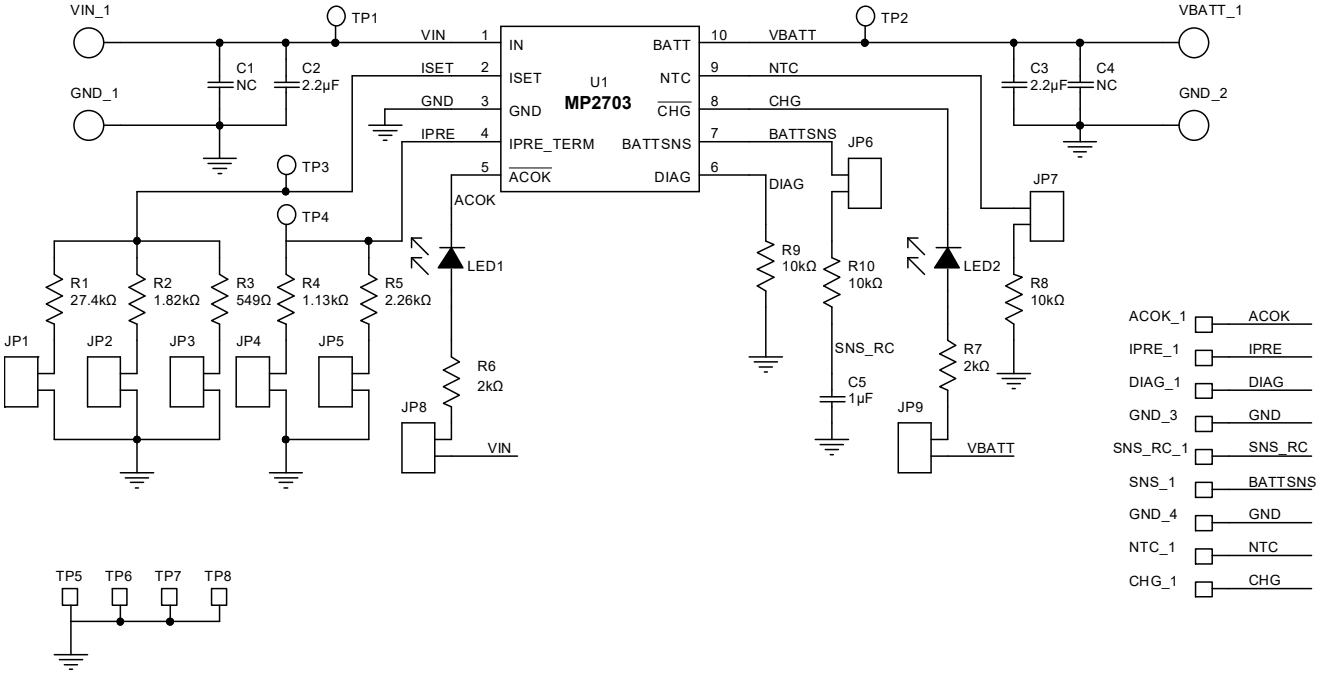


Figure 2: Evaluation Board Schematic

EV2703-RP-00A BILL OF MATERIALS

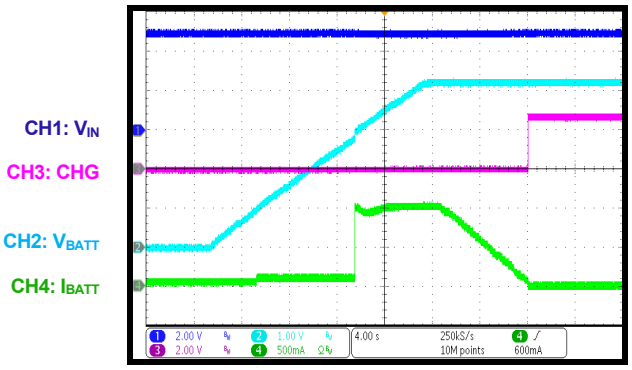
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
2	C1, C4	NC	Ceramic capacitor, 50V, X5R	0805		
2	C2, C3	2.2µF	Ceramic capacitor, 50V, X5R	0603	Murata	GRM188R61H225KE11D
1	C5	1µF	Ceramic capacitor, 25V, X7R	0603	Murata	GCM188R71E105KA64D
1	R1	27.4kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0727K4L
1	R2	1.82kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071K82L
1	R3	549Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07549RL
1	R4	1.13kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071K13L
1	R5	2.26kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-072K26L
2	R6, R7	2kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-072KL
3	R8, R9, R10	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	LED1	50mW	Red LED	0805	Baihong	BL-HUE35A-AV-TRB
1	LED2	50mW	Green LED	0805	Baihong	BL-HGE35A-AV-TRB
4	VIN_1, VBATT_1, GND_1, GND_2	2mm	Connector	DIP	Any	
9	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8, JP9	2.54mm	Row connector	DIP	Any	
6	JP3, JP4, JP6, JP7, JP8, JP9	2.54mm	Shunt connector	DIP	Any	
9	SNS_RC_1, NTC_1, IPRE_1, DIAG_1, CHG_1, SNS_1, ACOK_1, GND_3, GND_4	2.54mm	Row connector	DIP	Any	
4	TP1, TP2, TP3, TP4	1mm	Test point yellow	DIP	Any	
4	TP5, TP6, TP7, TP8	2.8mmx 3.8mm	Test point ground	SMD	Any	
1	U1	MP2703	26V, 1A, linear charger with battery diagnostic	QFN-10 (2.0mmx 2.5mm)	MPS	MP2703GRP

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 5V, V_{BATT} = 0V to 4.2V, I_{CC} = 1A, V_{IN_LIM} = 4.5V, T_A = 25°C, unless otherwise noted.

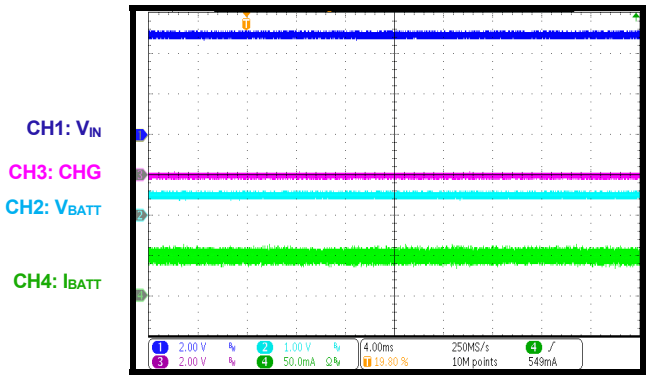
Battery Charge Profile

V_{IN} = 5V, I_{PRE} = 10% of I_{CC}, I_{CC} = 1A



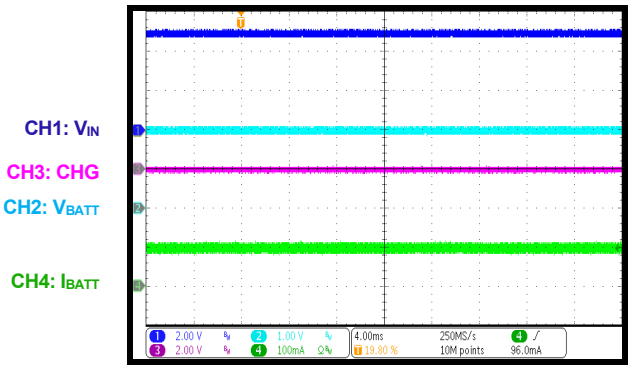
Trickle Charge

V_{IN} = 5V, V_{BATT} = 0.5V, I_{TC} = 50mA



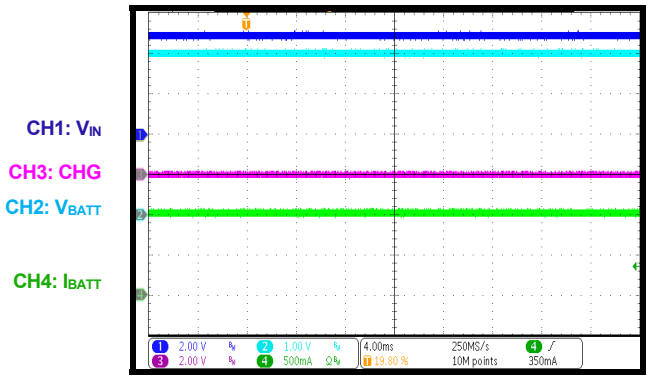
Pre-Charge

V_{IN} = 5V, V_{BATT} = 2V, I_{PRE} = 100mA



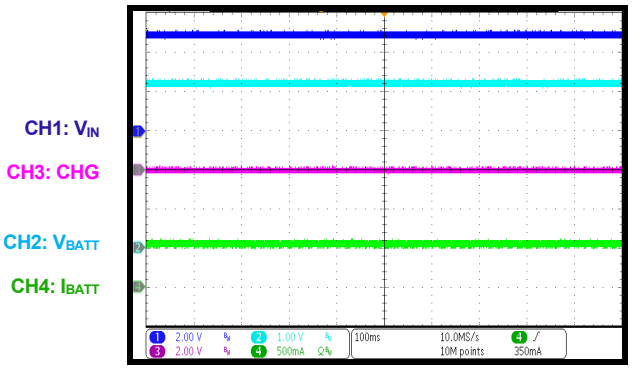
Constant Current Charge

V_{IN} = 5V, V_{BATT} = 4V, I_{CC} = 1A



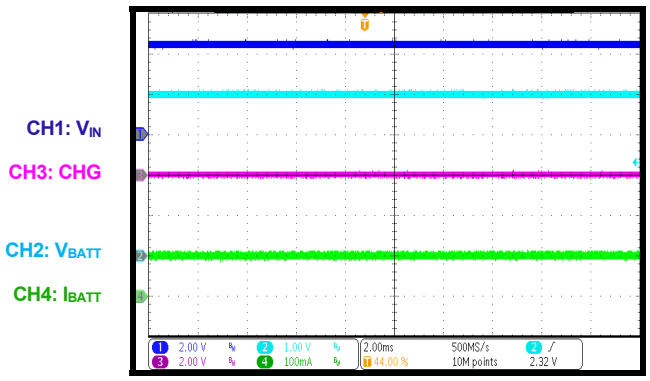
Constant Voltage Charge

V_{IN} = 5V, V_{BATT} = 4.185V, I_{CC} = 1A



Input Voltage Limit Steady State

V_{IN} = 5V(0.1A), V_{IN_LIM}=4.5V, V_{BATT} = 4V, I_{CC} = 1A

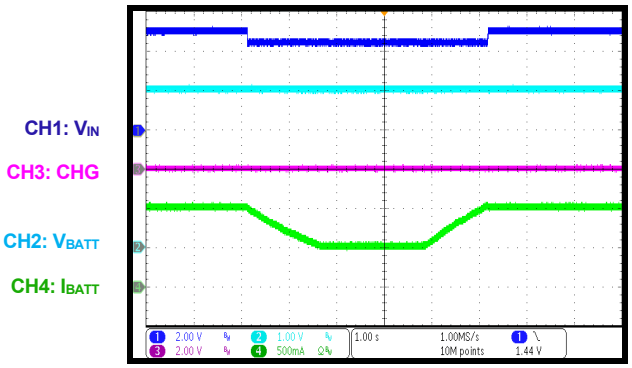


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 5V, V_{BATT} = 0V to 4.2V, I_{CC} = 1A, V_{IN_LIM} = 4.5V, T_A = 25°C, unless otherwise noted.

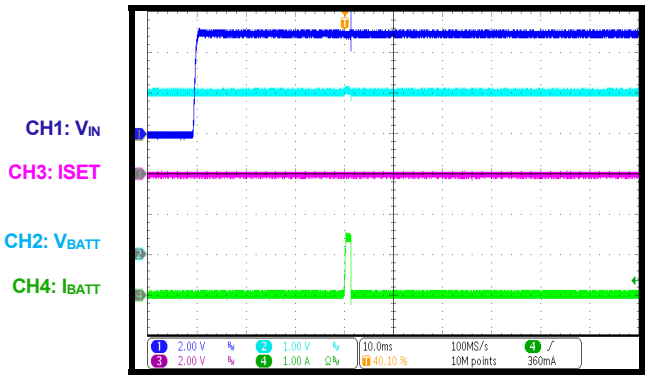
Input Voltage Limit

V_{IN} = 5V(1A to 0.5A to 1A), V_{IN_LIM} = 4.5V, V_{BATT} = 4V, I_{CC} = 1A



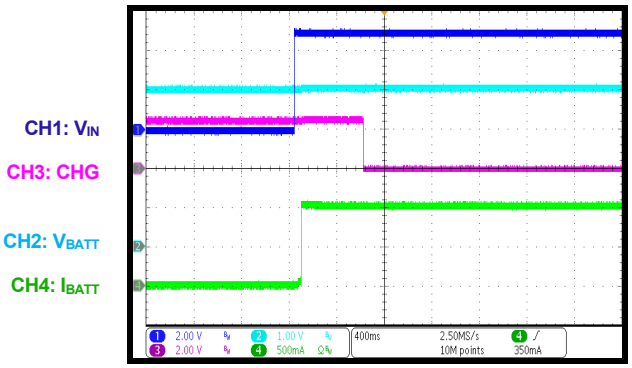
Start-Up with ISET Short

V_{IN} = 5V, V_{BATT} = 4V, ISET short



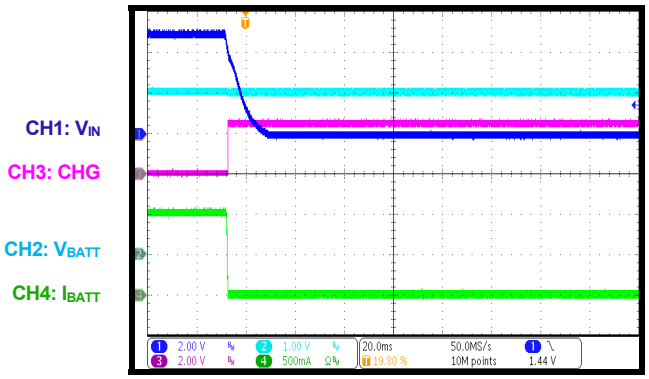
Start-Up

V_{IN} = 5V, V_{BATT} = 4V, I_{CC} = 1A



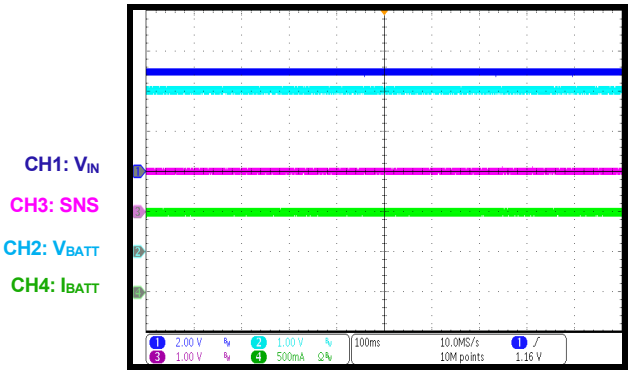
Shutdown

V_{IN} = 5V, V_{BATT} = 4V, I_{CC} = 1A



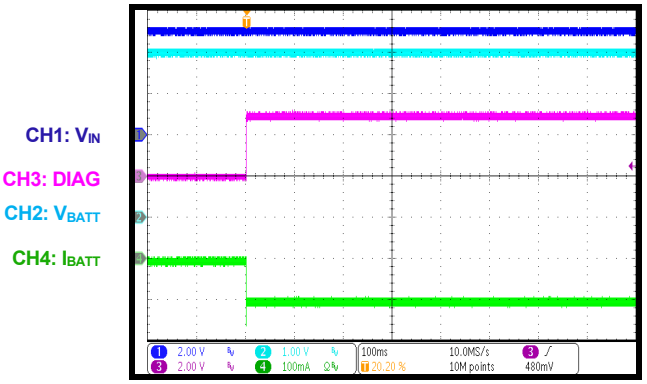
BATTSNS Output

V_{IN} = 5V, V_{BATT} = 4V, I_{CC} = 1A



Battery Dummy Load

V_{IN} = 5V, V_{BATT} = 4V, V_{NTC} = 0V



PCB LAYOUT

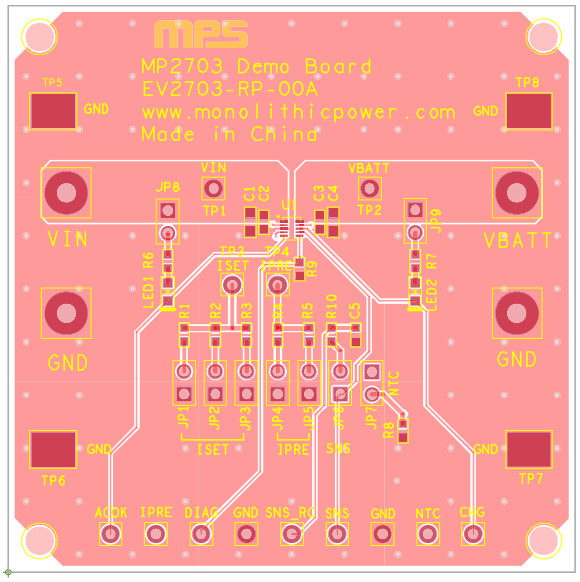


Figure 3: Top Layer

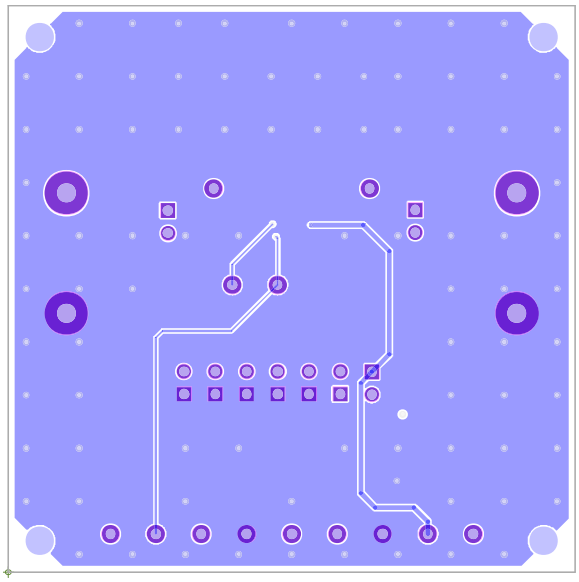


Figure 4: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	2/23/2023	Initial Release	-