EV8128-Q-00A

1A, DiSEqC 1.x and 2.x Compatible, LNB Voltage Regulator with I²C Interface Evaluation Board

DESCRIPTION

The EV8128-Q-00A is an evaluation board designed to demonstrate the capabilities of the MP8128, a highly integrated, DiSEqC 1.x and DiSEqC 2.x compatible, low-noise block (LNB) voltage regulator. It provides efficient, low-noise power and interface signals to a satellite receiver's LNB antenna ports.

The device integrates a boost regulator and a tracking linear voltage regulator. The boost regulator provides a power source 1.1V above the LNB output voltage. The tracking linear voltage regulator provides clean power and protects the output from overloads and shorts. The MP8128 features voltage selection, over-current protection (OCP), an I²C interface, and a selectable 22kHz tone signal.

The MP8128 offers a simple solution with a low component count, and is available in a QFN-20 (3mmx3mm) package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	8 to 14	V
LNB output voltage (1)	LNB_OUT	10.33 to 20	V
LNB output current	I_{OUT}	0 to 1	A

Note:

1) Use the I²C interface to set the LNB output voltage.

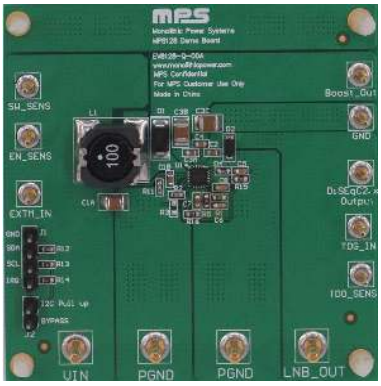
FEATURES

- 8V to 14V Input Voltage (V_{IN}) Range
- Up to 1A Configurable Current
- DiSEqC 1.x and DiSEqC 2.x Compatible
- Integrated I²C Bus
- Low-Noise LDO Output
- 440kHz Switching Frequency (f_{SW})
- Selectable 22kHz Internal or External Signal Source
- Selectable LNB Output Voltage
- Over-Current Protection (OCP), Short-Circuit Protection (SCP), and Overt-Voltage Protection (OVP)
- Thermal Shutdown
- Available in a QFN-20 (3mmx3mm) Package

APPLICATIONS

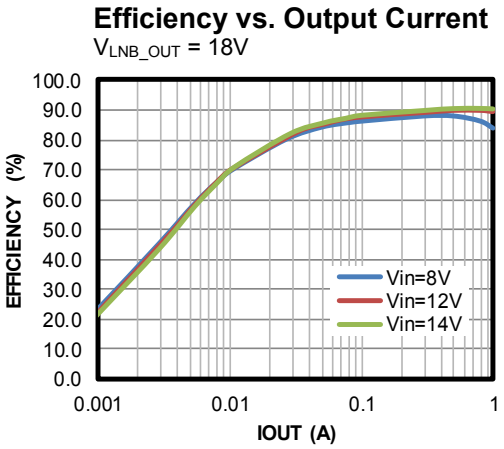
- LNB Power Supplies and Controls for Satellite Set-Top Boxes
- TV Satellite Receivers
- Personal Computer (PC) Satellite Card Receivers

EV8128-Q-00A EVALUATION BOARD



LxW (63.5mmx63.5mm)

Board Number	MPS IC Number
EV8128-Q-00A	MP8128GQ



QUICK START GUIDE

1. Connect the load (≤1A) terminals to:
   a. Positive (+): LNB_OUT
   b. Negative (-): GND
2. Preset the power supply between 8V and 14V.
3. Turn off the power supply.
4. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
5. Install the MP8128 GUI software.(2)
6. Connect the computer to the board via the USB cable.(3)
7. Turn on the power supply.
8. Open the GUI, then click the “Part Numbers” drop-down menu. Select “MP8128” in the drop-down menu.
9. Set the MP8128 registers via the I²C. (4) To set the registers, follow steps 10 through 12:
10. Read UVLO status register 02h, bit[3].
11. To set the LNB voltage (V_{LNB_OUT}), write VSEL register 00h, bits[4:3]. For example, to set V_{LNB_OUT} to 18V, write 11 to bits[4:3].
12. To set the LNB line drop voltage compensation, write the VLINE register 00h, bits[2:0]. To set the voltage compensation to 0V, write 000 to bits[2:0]. Once VLINE is changed from 111 to any other value, the board should start up automatically.

Notes:

2) The MPS GUI software can be downloaded from the MPS website.
3) The EVKT-MP8128 includes a USB to I²C communication interface for GUI control.
4) The MP8128 address is set to 0x08h by default.

EVALUATION BOARD SCHEMATIC

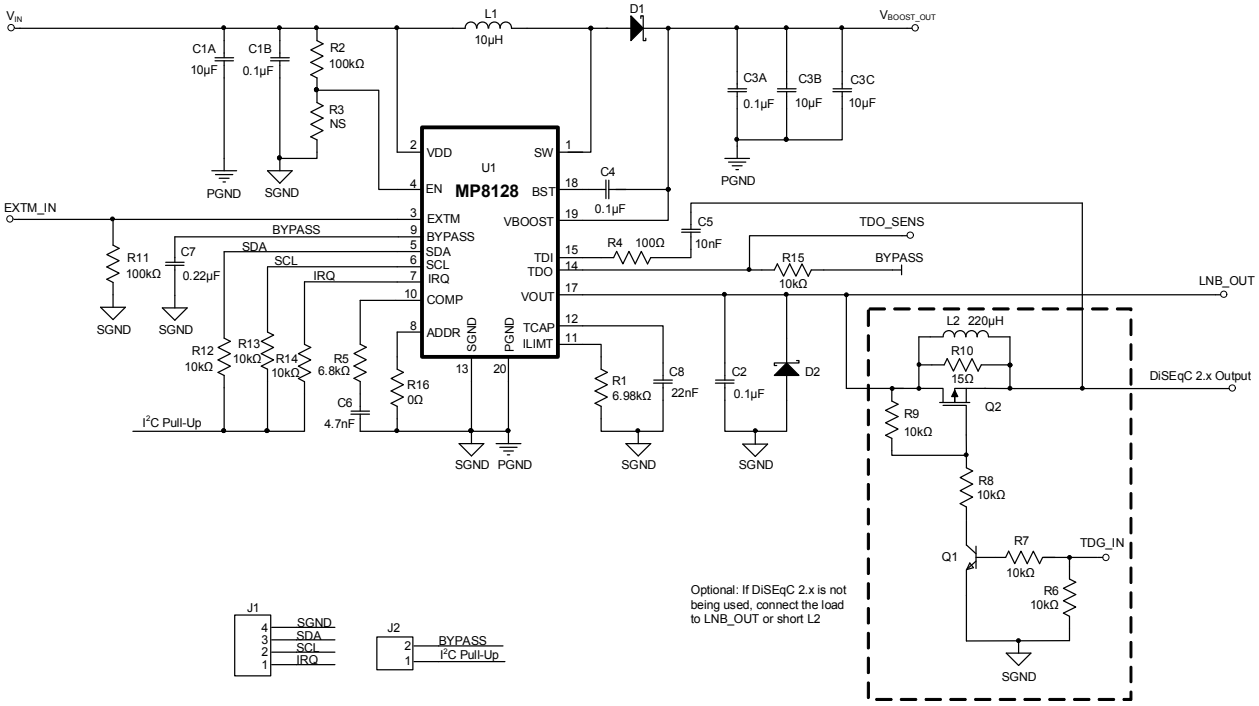


Figure 1: Evaluation Board Schematic (5)

Note:

5) The MP8128 address is set to 0x08h by default.

EV8128-Q-00A BILL OF MATERIALS

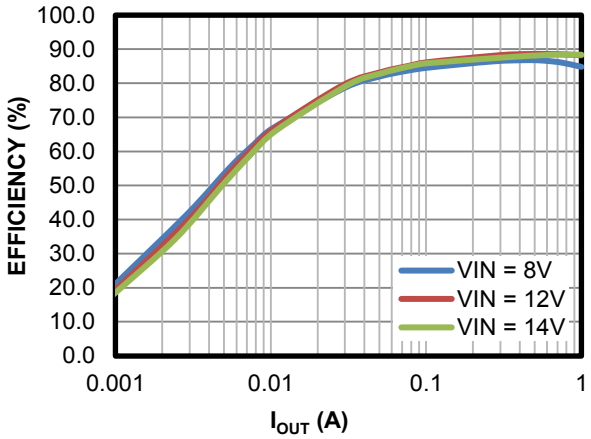
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
3	C1A, C3B, C3C	10µF	Ceramic capacitor, 25V, X7R	1210	Murata	GRM32DR71E106KA12L
4	C1B, C2, C3A, C4	0.1µF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H104KA93D
1	C5	10nF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM188R71H103KA01D
1	C6	4.7nF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H472KA01D
1	C7	0.22µF	Ceramic capacitor, 25V, X7R	0603	Murata	GRM188R71E224KA88D
1	C8	22nF	Ceramic capacitor, 25V, X7R	0603	Murata	GRM188R71E223KA01D
1	R1	6.98kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-076K98L
2	R2, R11	100kΩ	Film resolution, 1%	0603	Royal Ohm	RL0603FR-07100KL
0	R3	NS				
1	R4	100Ω	Film resolution, 1%	0603	Royal Ohm	RL0603FR-07100RL
1	R5	6.8kΩ	Film resolution, 1%	0603	Royal Ohm	RL0603FR-076K8L
8	R6, R7, R8, R9, R12, R13, R14, R15	10kΩ	Film resolution, 1%	0603	Royal Ohm	RL0603FR-0710KL
1	R10	15Ω	Film resolution, 1%	0805	Yageo	RC0805FR-0715RL
1	R16	0Ω	Film resolution, 1%	0603	Yageo	RC0603FR-070RL
1	L1	10µH	Inductor, DCR = 16.3mΩ, I_{RATED} = 7.2A, I_{SAT} = 8.5A	SMD	Wurth	7443251000
1	L2	220µH	Inductor, DCR = 434mΩ, I_{SAT} = 1.47A	SMD	TDK	VLF10045T-221MR90
1	D1	40V	Schottky diode, 3A	SMA	Diodes, Inc.	B340
1	D2	40V	Schottky diode, 1A	SOD-123	Diodes, Inc.	1N5819HW
1	Q1	25V	NPN, BJT transistor, 625mW, 1.5A	SOT-23	Any	
1	Q2	340mΩ	P-channel MOSFET, 60V, 1.25A	SOT-23	Vishay	SI2309DS-T1-E3
1	U1	MP8128	LNB power regulator with I²C interface, 1A	QFN-20 (3mmx 3mm)	MPS	MP8128GQ

EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

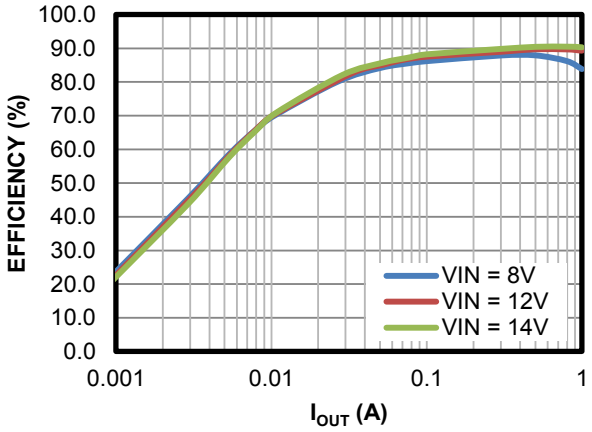
Efficiency vs. I_{OUT}

V_{LNB_OUT} = 13V



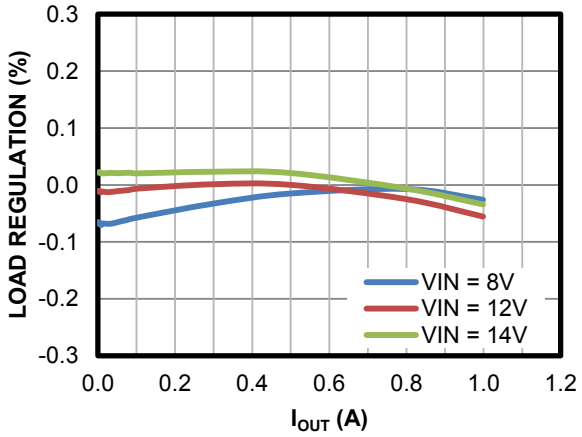
Efficiency vs. I_{OUT}

V_{LNB_OUT} = 18V



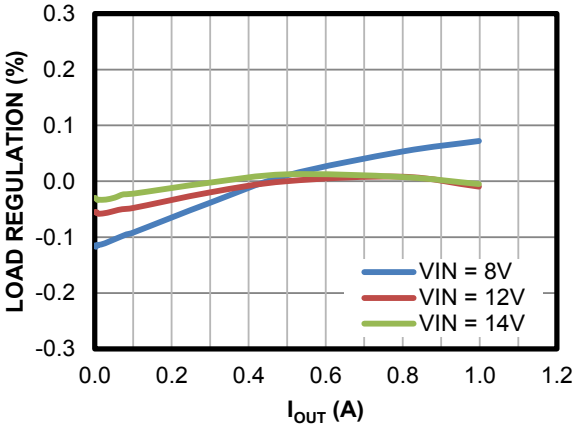
Load Regulation

V_{LNB_OUT} = 13V



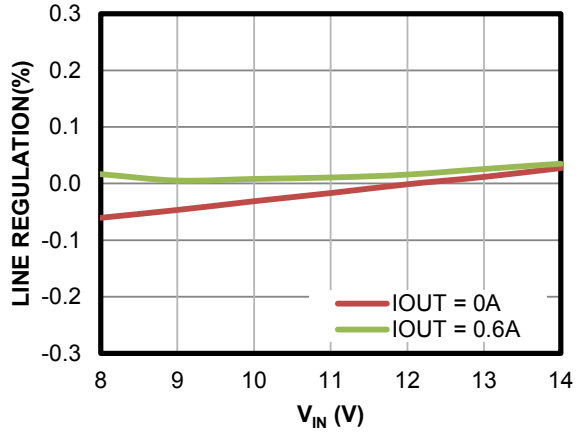
Load Regulation

V_{LNB_OUT} = 18V



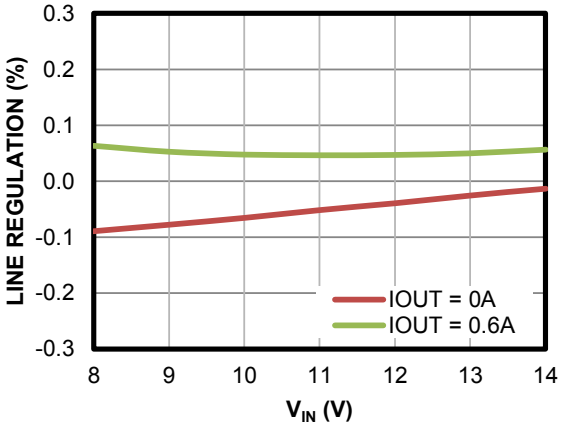
Line Regulation

V_{LNB_OUT} = 13V



Line Regulation

V_{LNB_OUT} = 18V

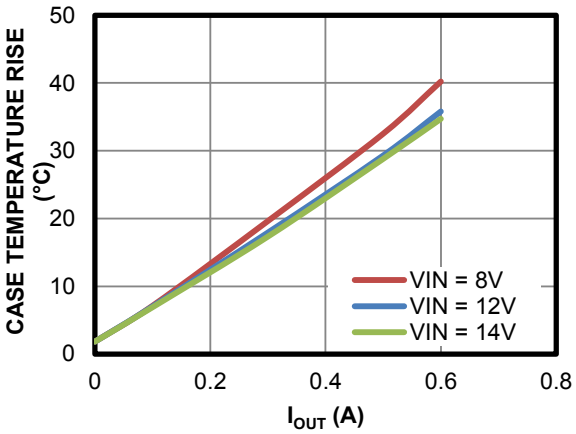


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

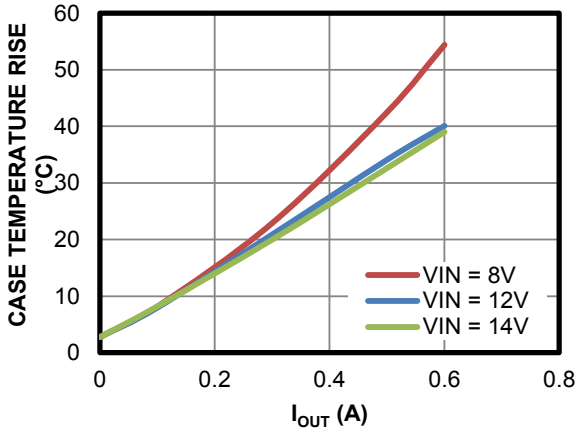
Case Temperature Rise vs. I_{OUT}

V_{LNB_OUT} = 13V



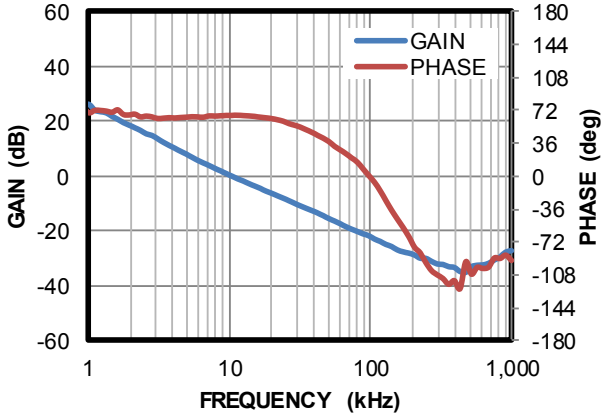
Case Temperature Rise vs. I_{OUT}

V_{LNB_OUT} = 18V



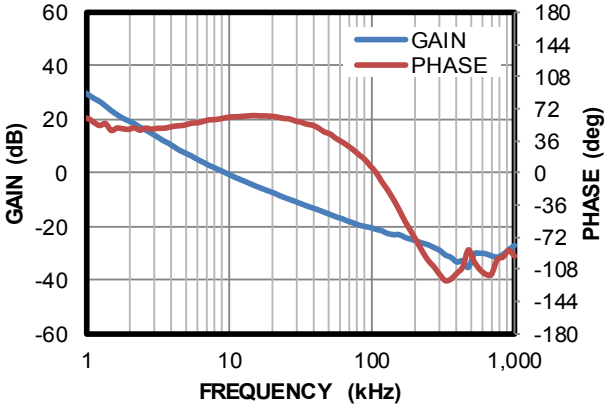
Boost Bode Plot

V_{LNB_OUT} = 13V, boost load = 0.6A



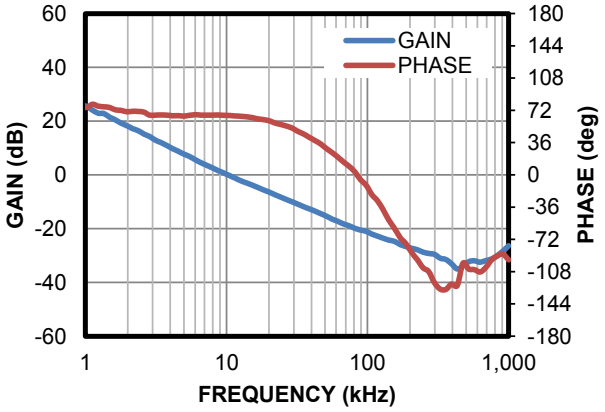
Boost Bode Plot

V_{LNB_OUT} = 18V, boost load = 0.6A



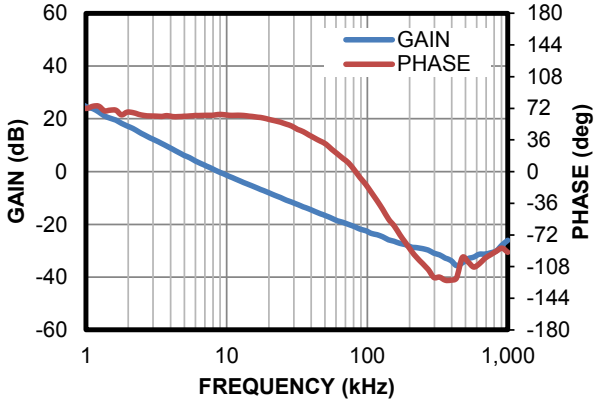
Boost Bode Plot

V_{LNB_OUT} = 13V, boost load = 1A



Boost Bode Plot

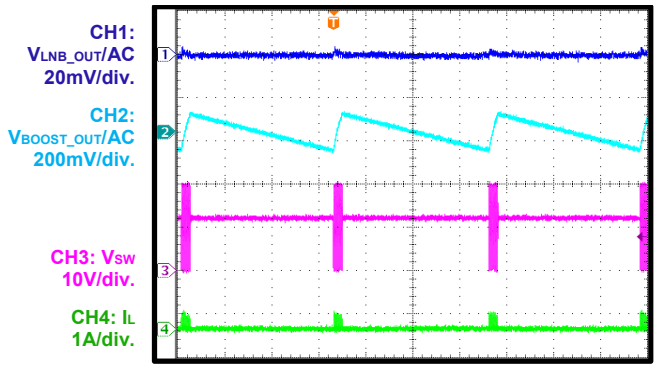
V_{LNB_OUT} = 18V, boost load = 1A



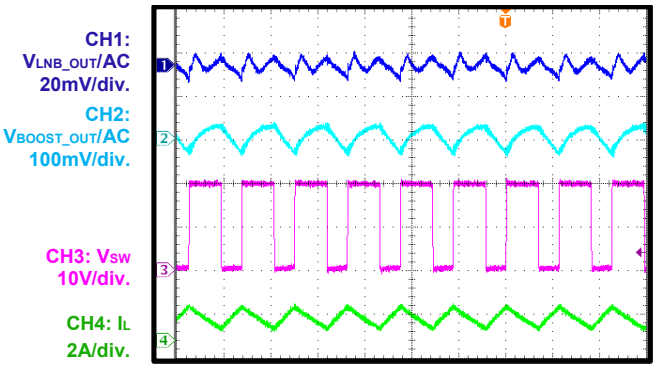
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

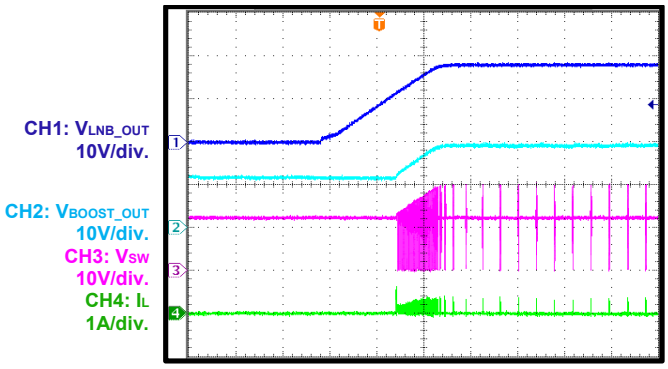
Steady State
I_{OUT} = 0A



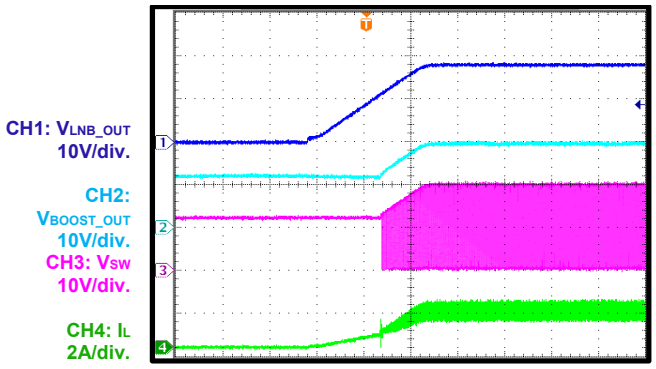
Steady State
I_{OUT} = 0.6A



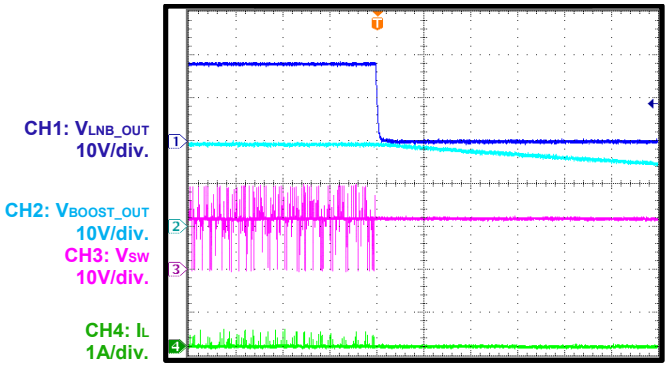
Start-Up through the I²C
I_{OUT} = 0A, VLINE bits set to 000



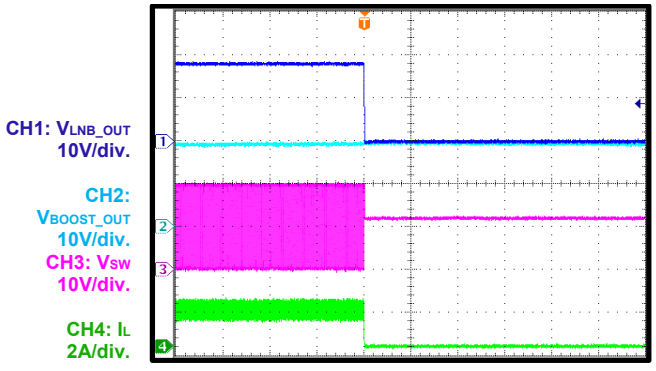
Start-Up through the I²C
I_{OUT} = 1A, VLINE bits set to 000



Shutdown through the I²C
I_{OUT} = 0A, VLINE bits set to 111



Shutdown through the I²C
I_{OUT} = 1A, VLINE bits set to 111

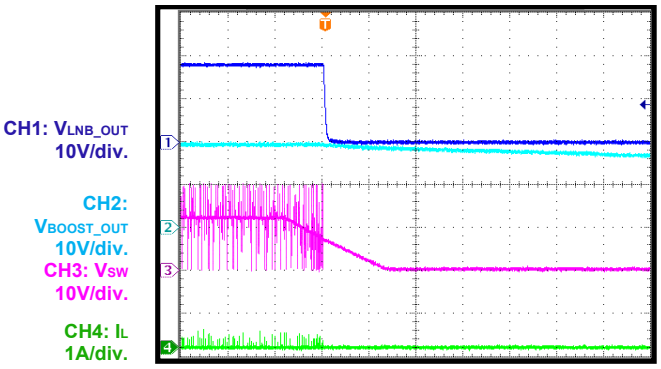


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

Shutdown through VIN

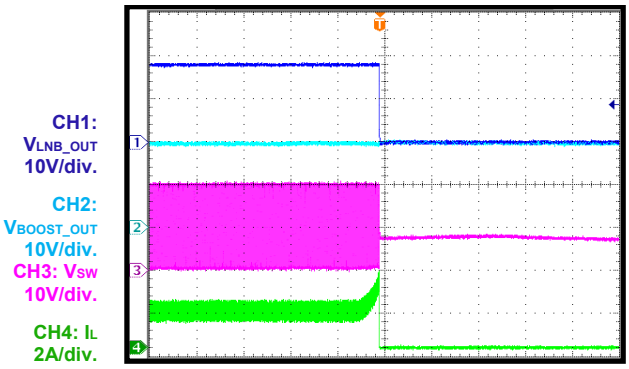
I_{OUT} = 0A



40ms/div.

Shutdown through VIN

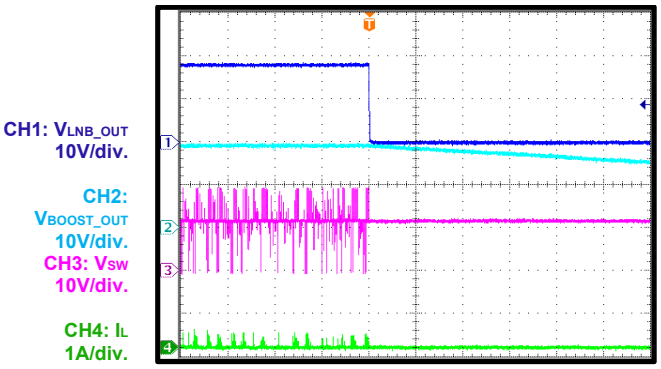
I_{OUT} = 1A



2ms/div.

Shutdown through EN

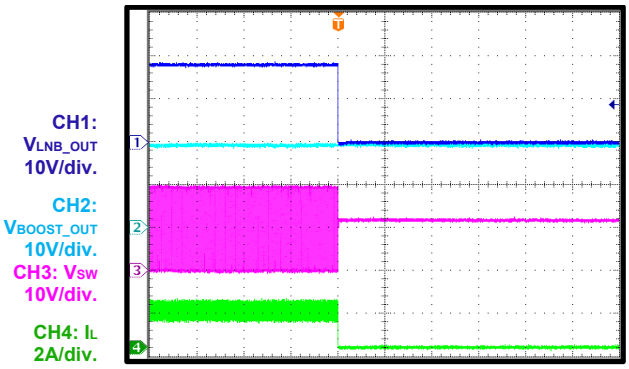
I_{OUT} = 0A



40ms/div.

Shutdown through EN

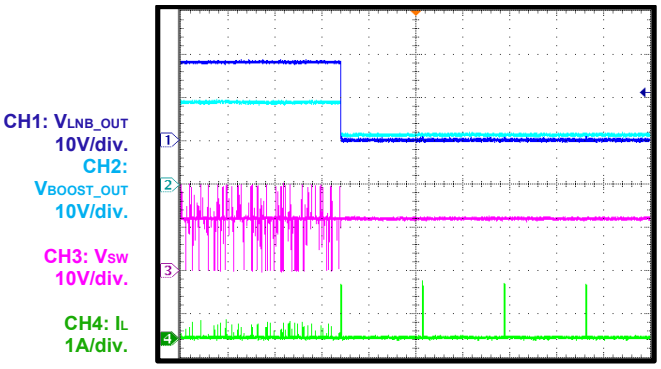
I_{OUT} = 1A



2ms/div.

SCP Entry

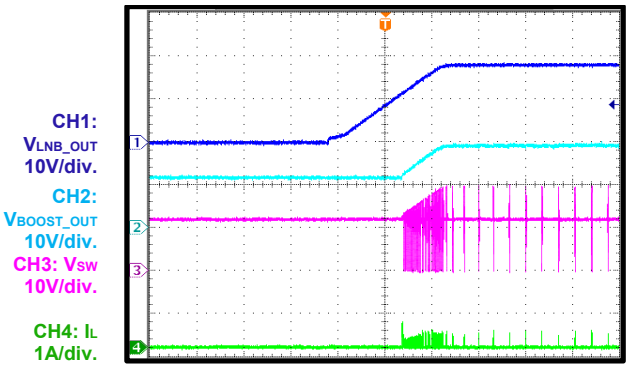
I_{OUT} = 0A, OCR = 0, DCL = 1



1s/div.

SCP Recovery

I_{OUT} = 0A, OCR = 0, DCL = 1



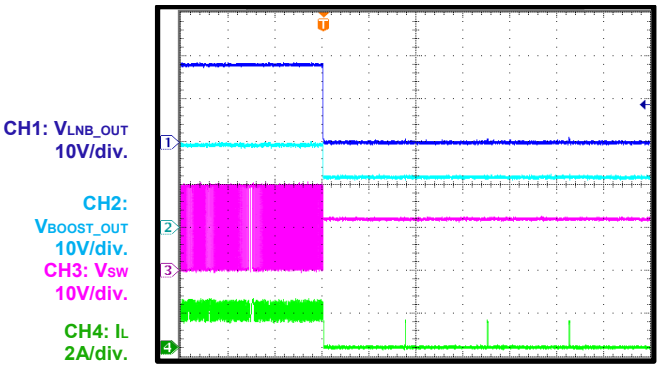
2ms/div.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

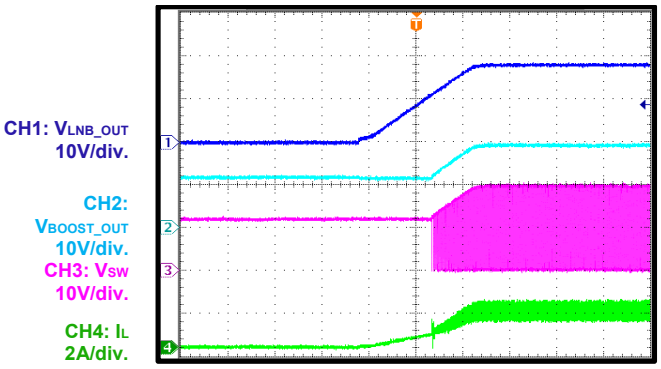
SCP Entry

I_{OUT} = 1A, OCR = 0, DCL = 1



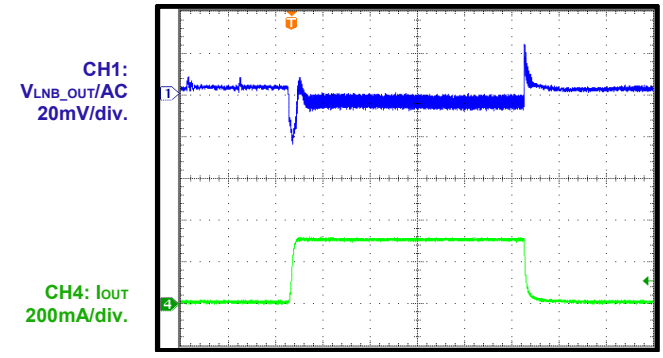
SCP Recovery

I_{OUT} = 1A, OCR = 0, DCL = 1



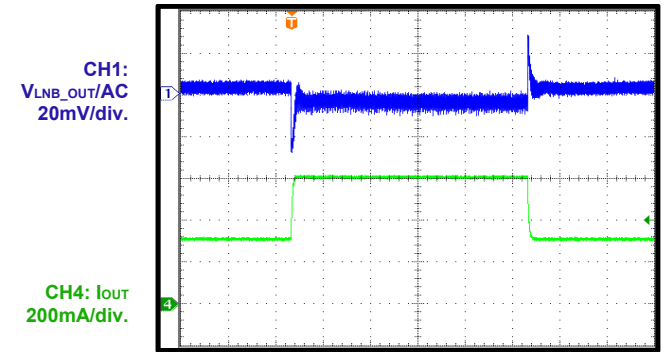
Load Transient

I_{OUT} = 0A to 0.3A



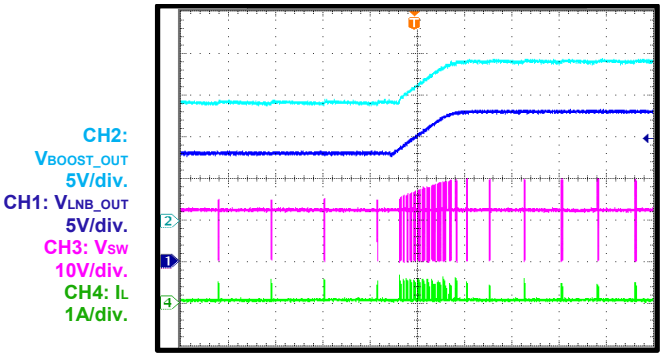
Load Transient

I_{OUT} = 0.3A to 0.6A



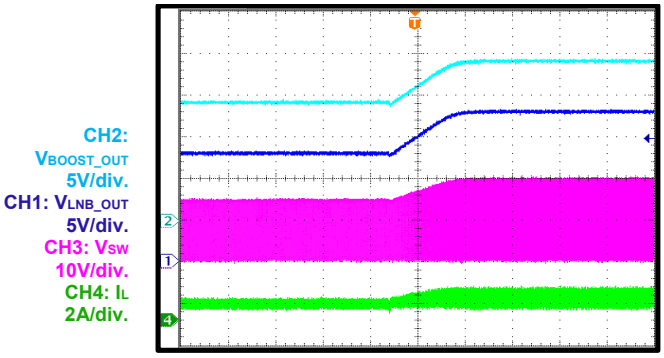
Switching from 13V to 18V

I_{OUT} = 0A



Switching from 13V to 18V

I_{OUT} = 0.6A

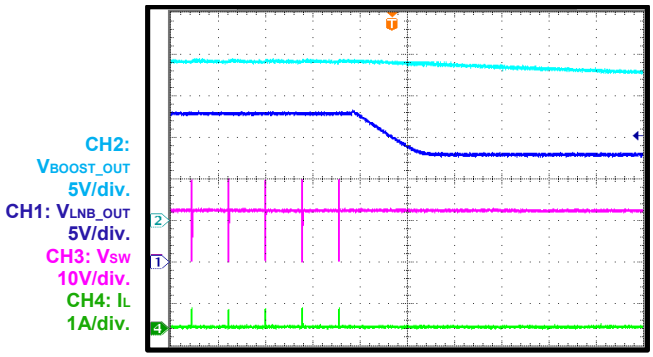


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

Switching from 18V to 13V

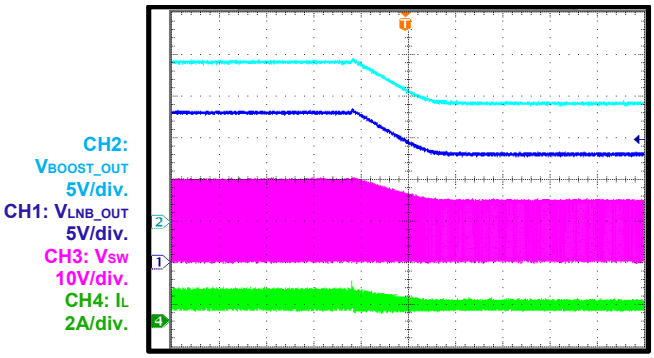
I_{OUT} = 0A



1ms/div.

Switching from 18V to 13V

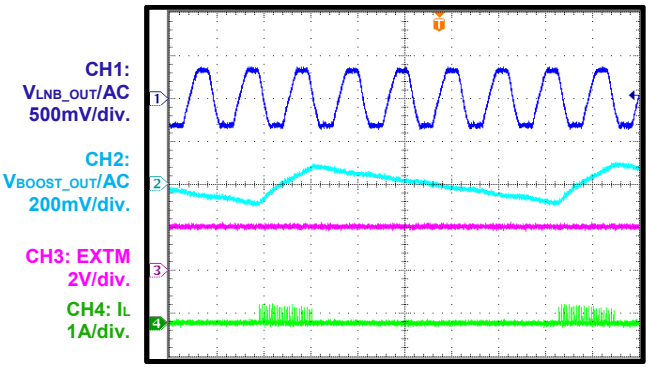
I_{OUT} = 0.6A



1ms/div.

Tone Signal Steady State

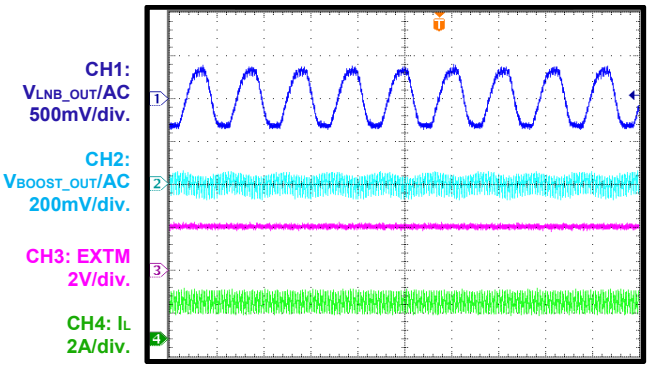
EXTM = 2V, TCTRL = 0, I_{OUT} = 0A



40µs/div.

Tone Signal Steady State

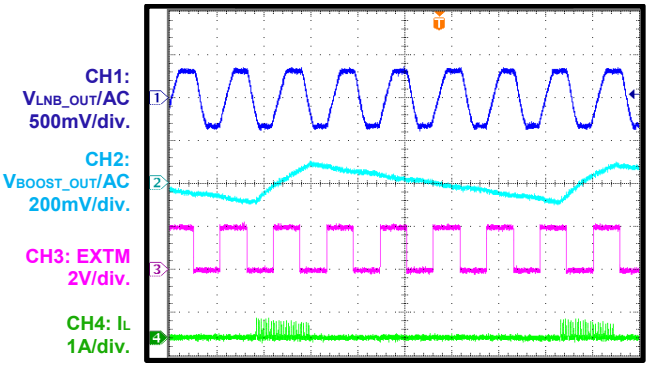
EXTM = 2V, TCTRL = 0, I_{OUT} = 1A



40µs/div.

Tone Signal Steady State

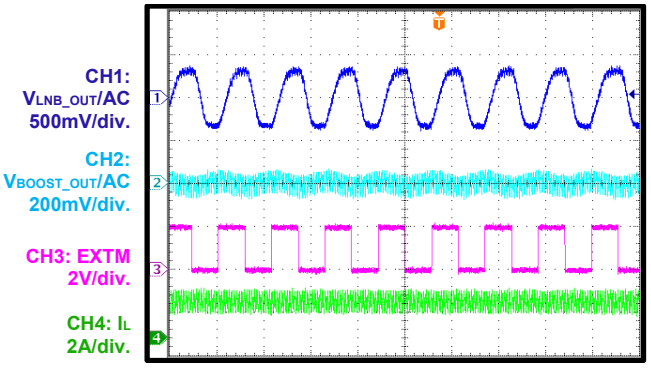
EXTM = 22kHz square wave, TCTRL = 1,
I_{OUT} = 0A



40µs/div.

Tone Signal Steady State

EXTM = 22kHz square wave, TCTRL = 1,
I_{OUT} = 1A



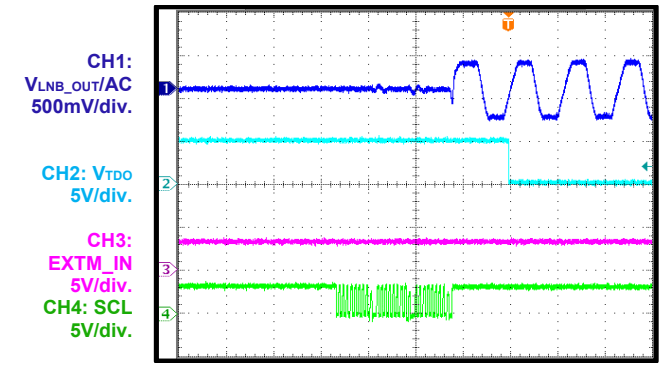
40µs/div.

EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, V_{LNB_OUT} = 18V, L = 10µH, T_A = 25°C, unless otherwise noted.

Tone Entry

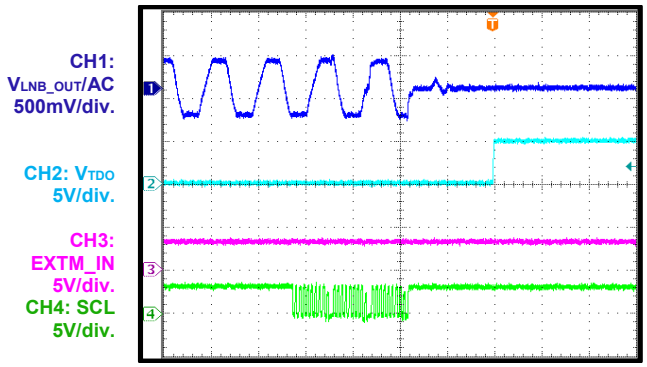
EXTM = 3.3V, TCTRL = 0, I_{OUT} = 0A,
TEN = 0 to 1



40µs/div.

Tone Exit

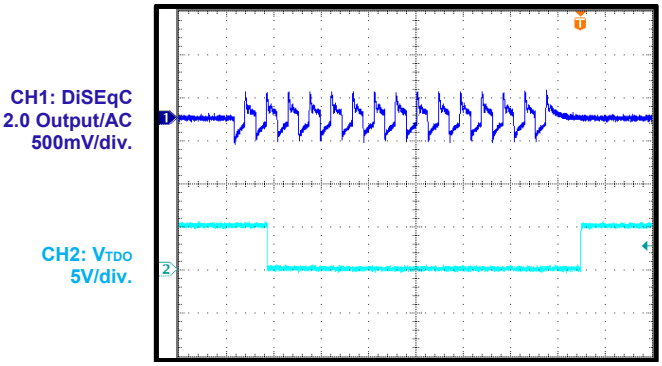
EXTM = 3.3V, TCTRL = 0, I_{OUT} = 0A,
TEN = 1 to 0



40µs/div.

Tone Signal Detected from Load

DiSEqC 2.0 output load = 0mA to 40mA,
load transient frequency = 22kHz,
50% duty cycle



100µs/div.

PCB LAYOUT

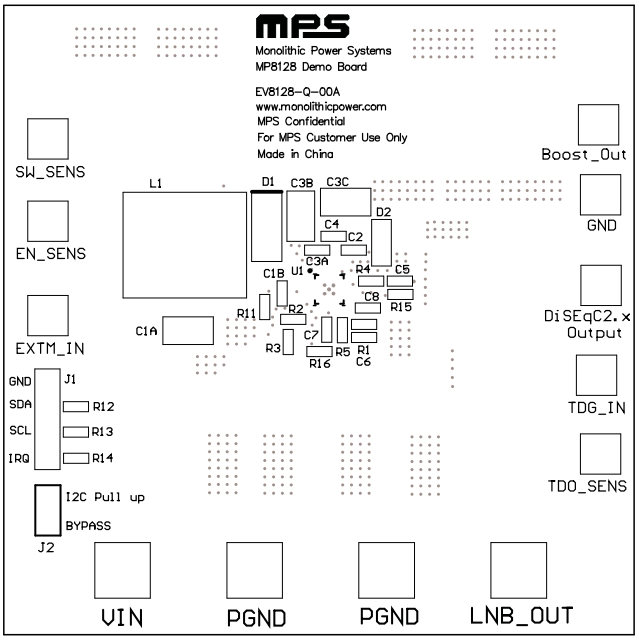


Figure 2: Top Silk

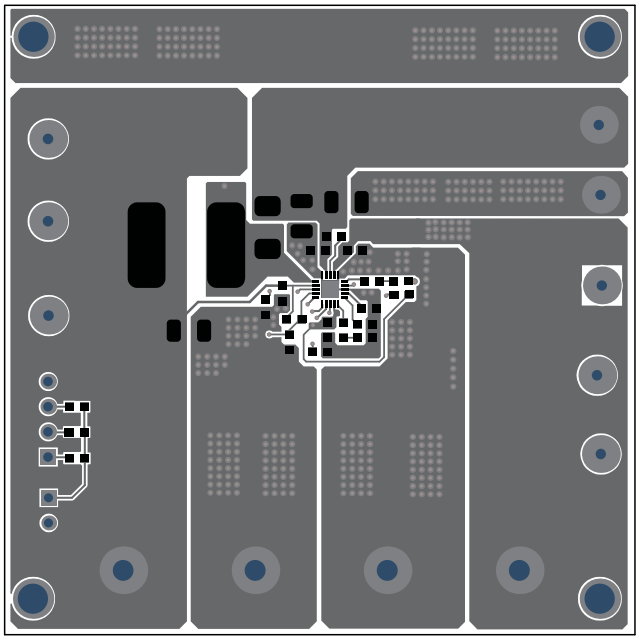


Figure 3: Top Layer

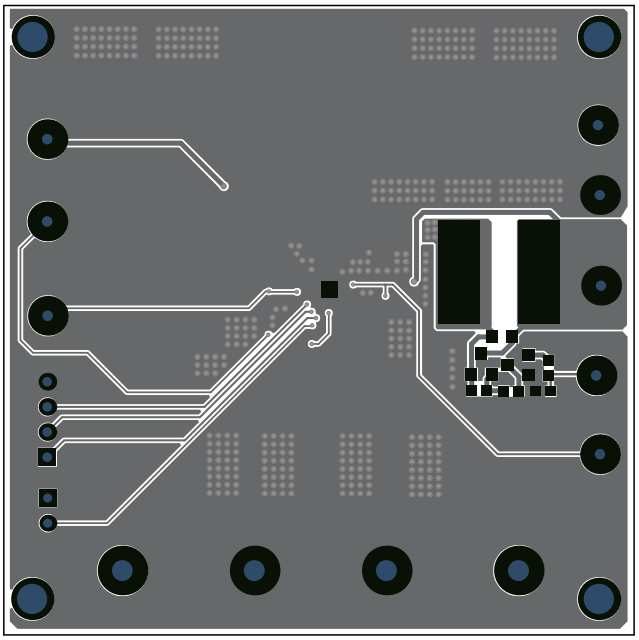


Figure 4: Bottom Layer

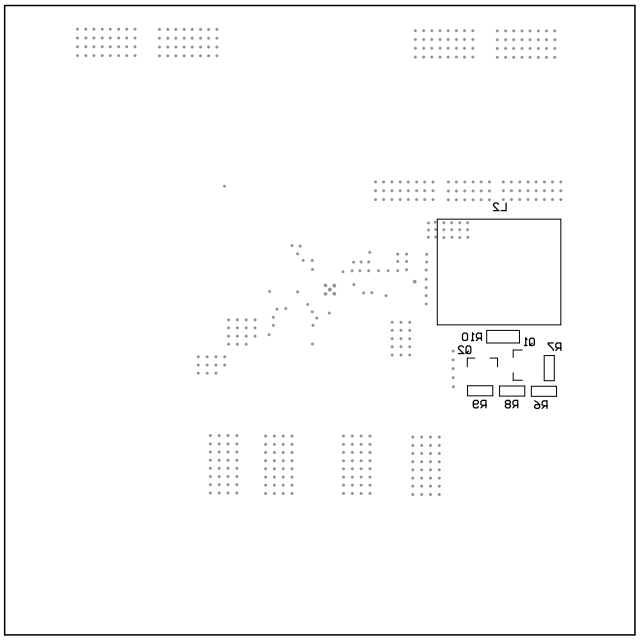


Figure 5: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	12/18/2017	Initial Release	-
1.1	9/23/2021	Grammar and formatting updates, including headers and footers	All