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XR79110
22V, 10A Synchronous Step Down COT Power Module

EVB User Manual

Document Revision History

Document No.	Release Date	Change Description
1A	12/12/14	Initial release of document.
013UMR00	7/9/19	Complete re-write. Updated to MaxLinear format.
013UMR01	12/18/19	Update RON, RFF, and CFF in schematic and BOM.

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Introduction

The XR79110 evaluation board provides a platform to evaluate the features and performance of the XR79110 Synchronous Step Down COT Power Module. The XR79110 provides a maximum load current rating of 10A with a 4.5V to 22V input voltage range and is packaged in a 10mm x 10mm x 4mm QFN.

Quick EVB Set Up and Start Up

Factory Settings

In addition to utilizing the 4.5V to 22V input voltage range and 10A maximum load current rating of the Synchronous Step Down COT Power Module, each Evaluation Board has been set up with the factory default configurations shown below for quick set up and operation. **Do not exceed the EVB maximum load current rating.**

- V_{IN} = 12V typical.
- V_{OUT} = 1.2V. For a different V_{OUT} selection, see V_{OUT} Selection.
- 500kHz Switching Frequency.
- Forced CCM mode. For DCM / CCM mode, see Jumper J1.
- Soft start time = 2.82ms.
- PGOOD is pulled up.

Quick Start Up

To quickly see the regulator in operation:

1. Use the factory settings and default configuration. If other settings or components are desired, apply them before the next steps and see Set-Up Options for more.
2. Connect a turned-off power supply that is within the V_{IN} specification (4.5V to 22V, 12V typical) to V_{IN}+ and V_{IN}- with short / thick leads. Use test pins T3 and T4 to monitor V_{IN}+ and V_{IN}- respectively. See locations in Figure 1 Note A.
3. Initially set to 0A, connect an electronic load that will be no more than the maximum I_{OUT} (10A) to V_{OUT}+ and V_{OUT}- with short / thick leads. Use test pins T1 and T2 to monitor V_{OUT}+ and V_{OUT}- respectively. See locations in Figure 1 Note B.
4. Turn on the power supply and check V_{OUT}. The EVB should power up and regulate the output at 1.2V (factory default).
5. Set or vary the load (do not exceed the maximum I_{OUT}) and check V_{OUT} and other desired performance levels such as regulation and efficiency. See I/O Test Points for more on monitoring.

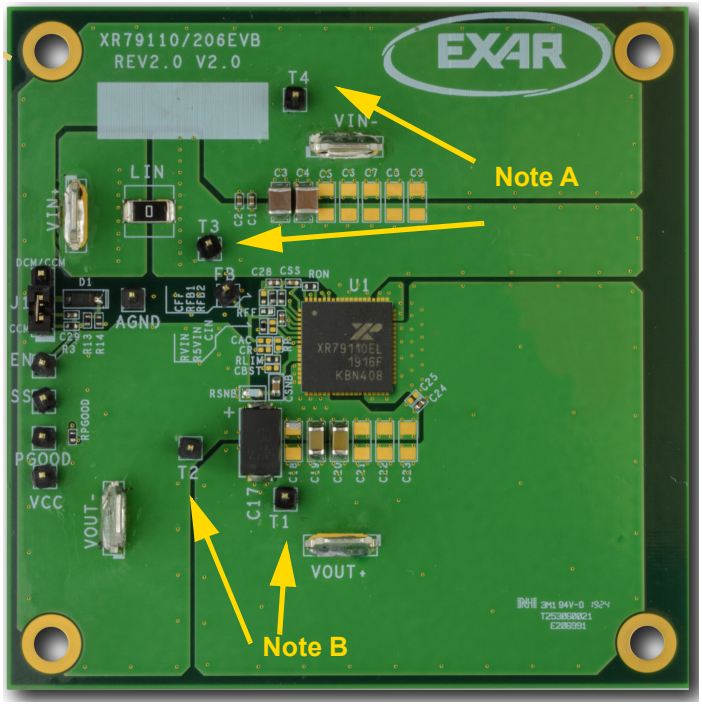


Figure 1: Monitoring V_{IN} and V_{OUT}

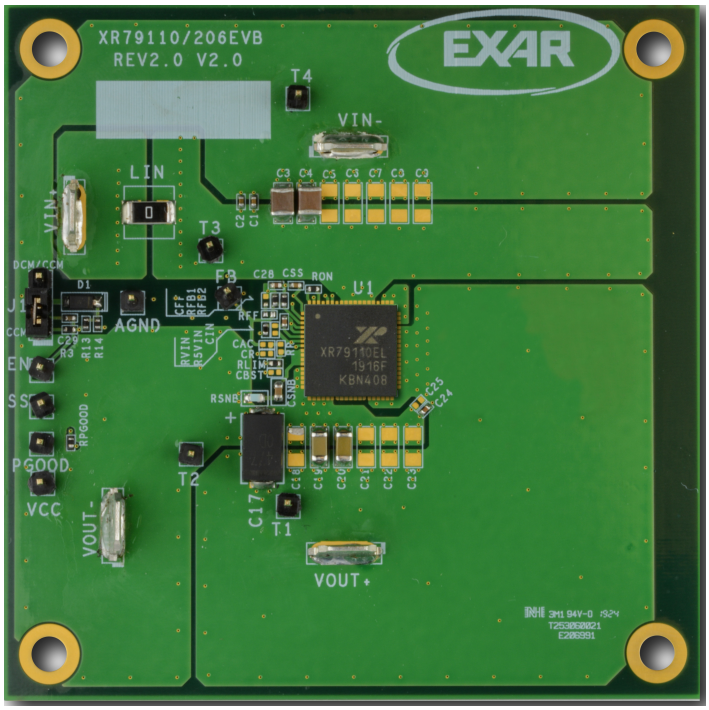


Figure 2: Top View of XR79110EVB, REV2.0

Reference Documentation

Please refer to the XR79110 Data Sheet for additional information, including a full list of IC features, pinout, pin descriptions, typical performance characteristics and external component calculations. This manual is meant to be used in conjunction with the datasheet. Refer to ANP-47 for EMI considerations.

This manual provides EVB schematics (XR79110EVB Schematic), PCB Layout (XR79110EVB PCB Layers) and bill of materials (XR79110EVB Bill of Materials) that can be utilized to assist in your design. The schematics are also available on the power module's product page.

Ordering Information

Table 1: Evaluation Board Ordering Part Number(1)

Power Module	Evaluation Board	IC Current Rating	Board Description
XR79110	XR79110EVB	10A	XR79110 Evaluation Board

1. Refer to www.maxlinear.com/XR79110 for most up-to-date Ordering Information.

Evaluation Board Overview

The block diagram shown in Figure 3 illustrates the connection points for the VIN and VOUT pins, location of the J1 DCM/CCM jumper and monitoring I/O test points for the XR79110EVB.

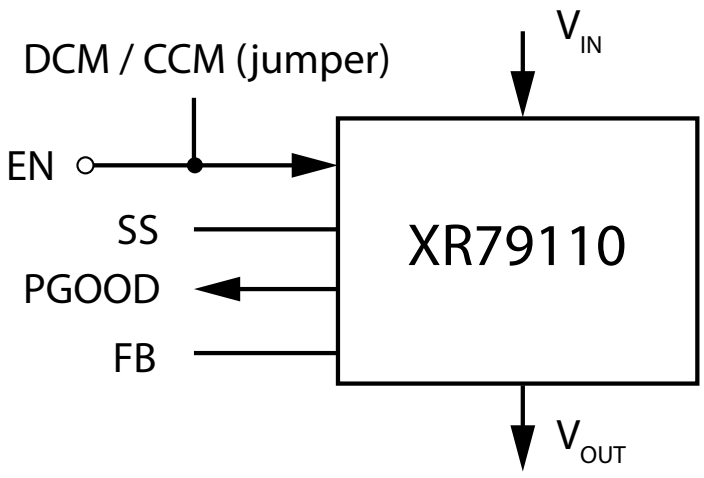


Figure 3: Block Diagram, XR79110EVB

I/O Test Points

EN input

The EN input can be used to monitor the voltage on the EN/MODE pin. On board circuitry provides voltage to the EN pin.

PGOOD output

The PGOOD output can be used to monitor the IC's PGOOD open drain output. It is tied to VCC through a 10kΩ resistor. VCC also has a test point that can be monitored. The PGOOD output can be used externally.

FB and SS monitoring

A test point is provided for the FB and SS signals of the IC. The test points are also called FB and SS, respectively. A 47nF capacitor is factory installed on each board for C_{SS}. Using this capacitor value and the datasheet equation, this calculates into a soft-start time of 2.82ms.

Set-Up Options

A jumper is factory installed per Table 2 to configure the EVB for operation. Jumper options are next described. Refer to the XR79110 product datasheet for additional information.

Table 2: Factory Settings

Jumper	Factory Setting	Description
J1	Jumper 1-2	Forced CCM

Jumper J1

Table 3: Jumper J1 Options

Jumper Options	Description	Position
Jumper 1-2	Forced CCM mode (factory setting).	Figure 4
Jumper 2-3	DCM / CCM mode. The regulator will operate in DCM at light load. Transition from DCM to CCM is at approximately 2.5A.	Figure 5

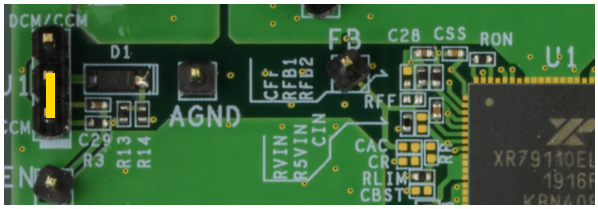


Figure 4: J1 Jumper in Forced CCM Mode

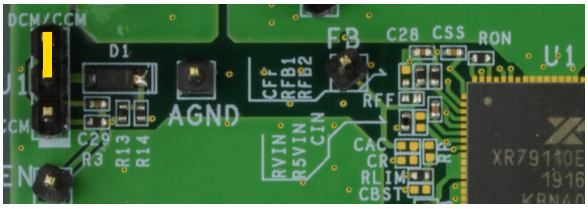


Figure 5: J1 Jumper in DCM / CCM Mode

V_{OUT} Selection

The factory installed configuration of V_{OUT} is 1.2V. The V_{OUT} can be modified by changing RFB1 according to:

$$RFB1 = RFB2 \times \left(\frac{V_{OUT}}{0.6} - 1\right)$$

Where RFB2 has a nominal value of 2kΩ.

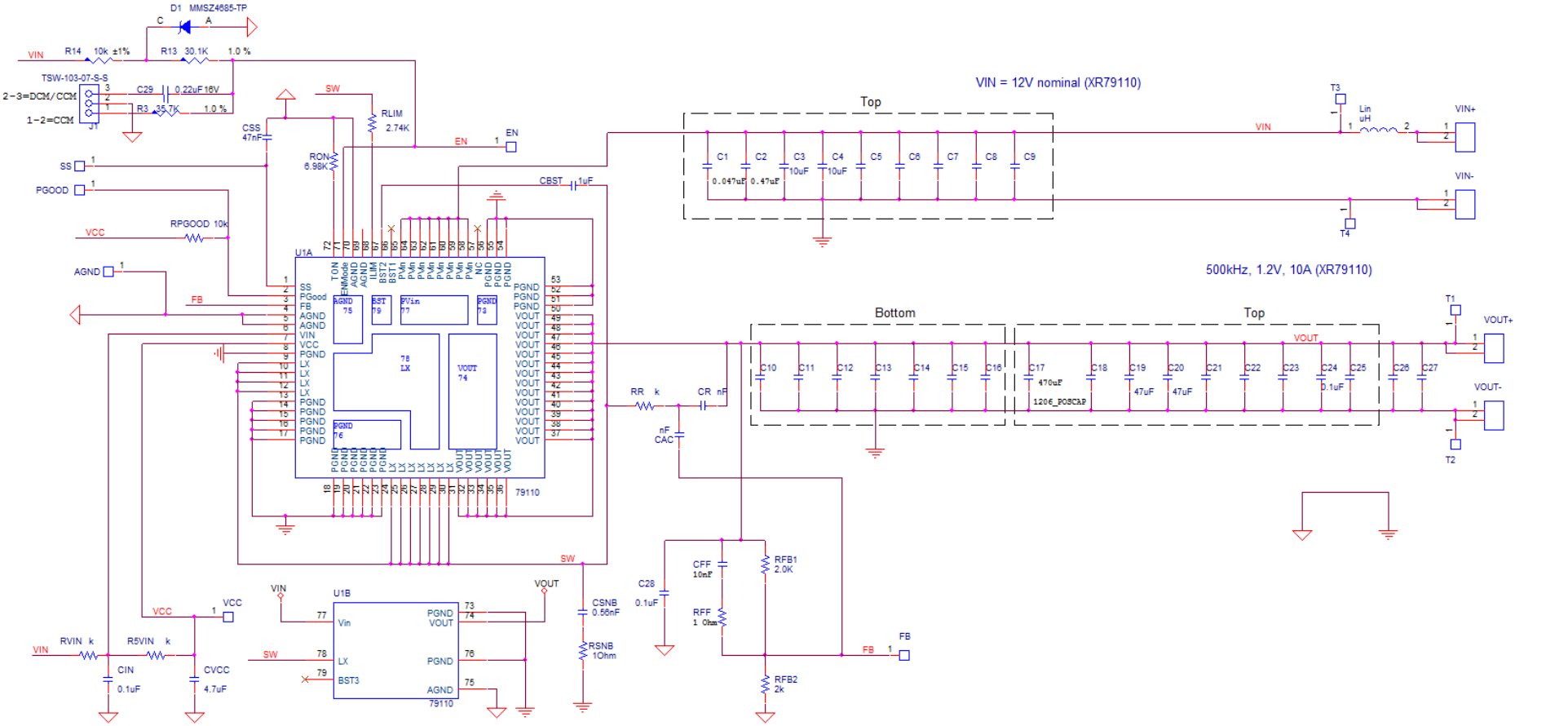
Important: Note that capacitor C17 has a voltage rating of 2.5V. Remove C17 when programming V_{OUT} > 2.5V.

Operation from a 5V Rail (V_{IN} = 4.5V to 5.5V)

For operation from a 5V rail, it is recommended to tie the output of the LDO to V_{IN} by populating R5VIN with a 0Ω resistor. This enhances driver operation at V_{IN} < 5V.

Important: R5VIN must be removed for operation at higher V_{IN}.

XR79110EVB Schematic



Notes:

1. All components are 0402 unless otherwise specified
2. C3-C25 are 1206
3. CSNB, RSNB, CVCC are 0603
4. Components values apply to XR79110 unless otherwise

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Figure 6: XR79110EVB Schematic

XR79110EVB PCB Layers

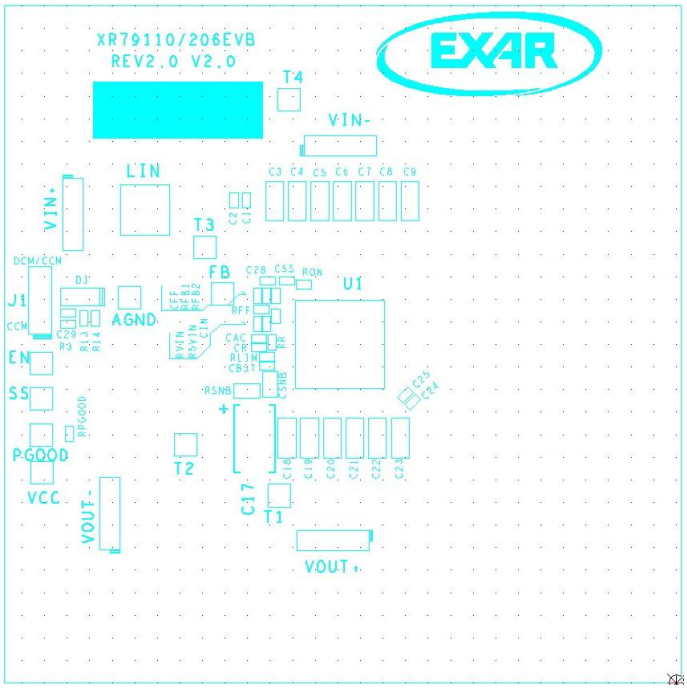

Figure 7: Assembly Top

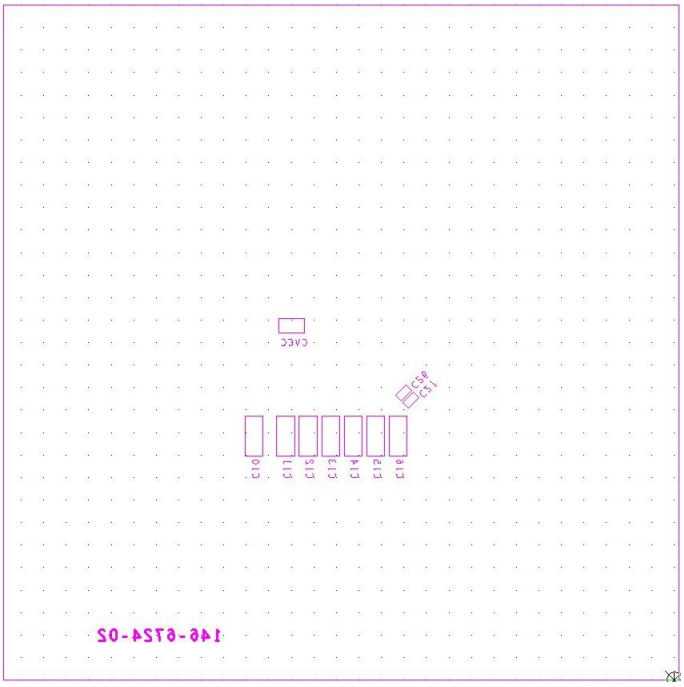

Figure 8: Assembly Bottom

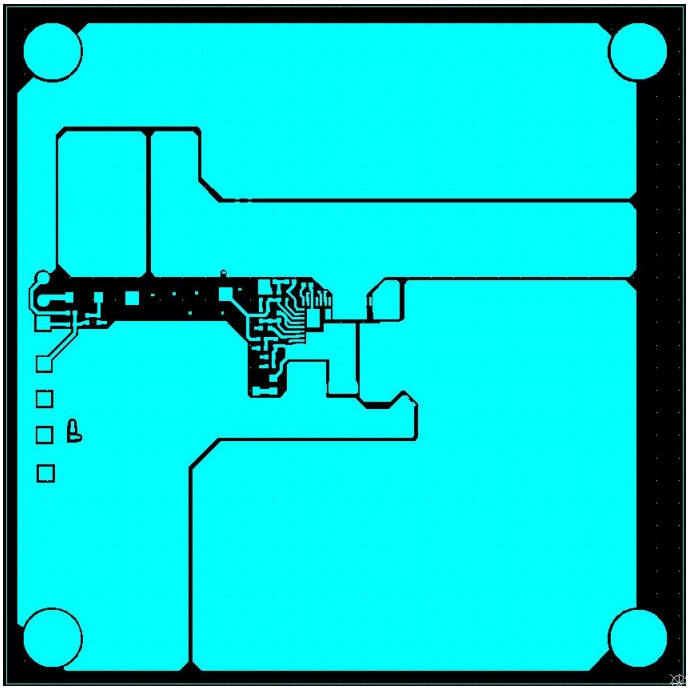

Figure 9: Top Layer

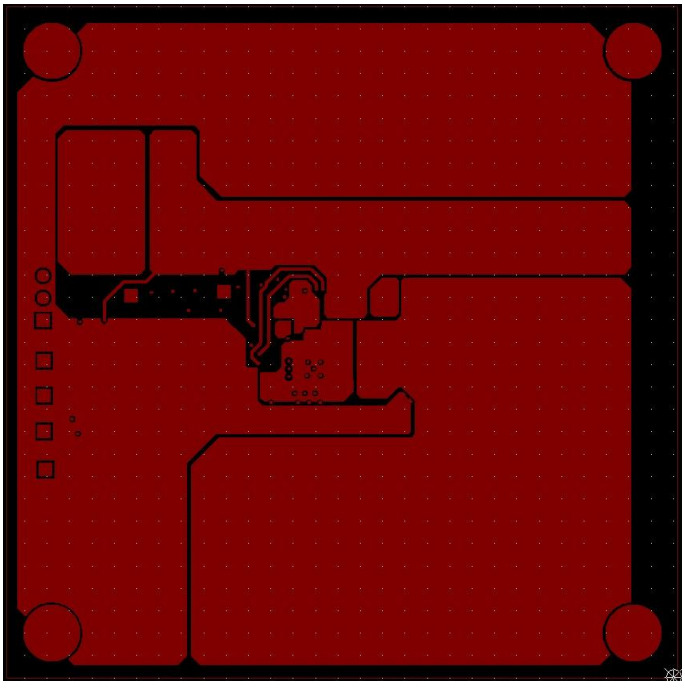

Figure 10: Bottom Layer

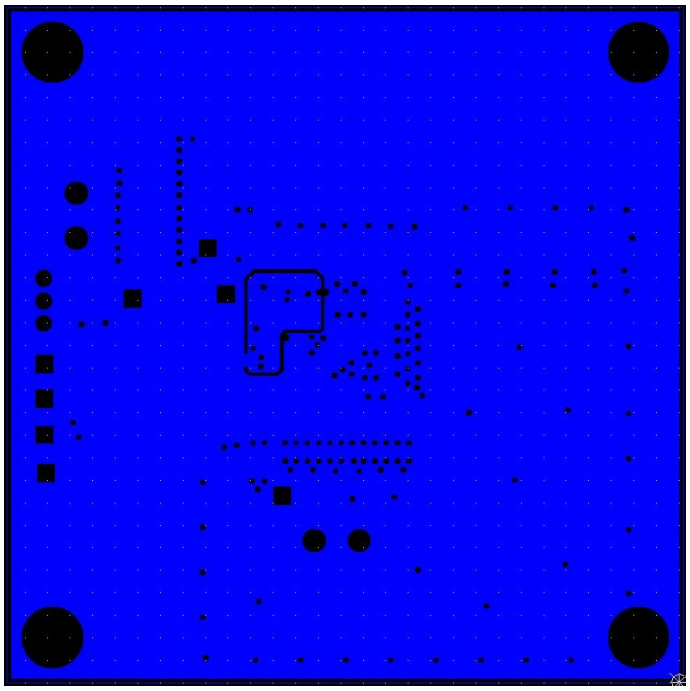

Figure 11: Layer 2

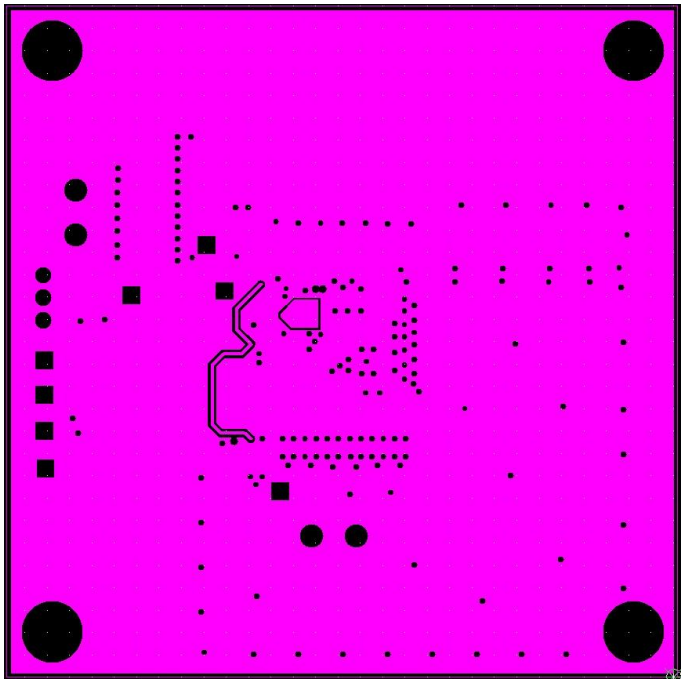

Figure 12: Layer 3

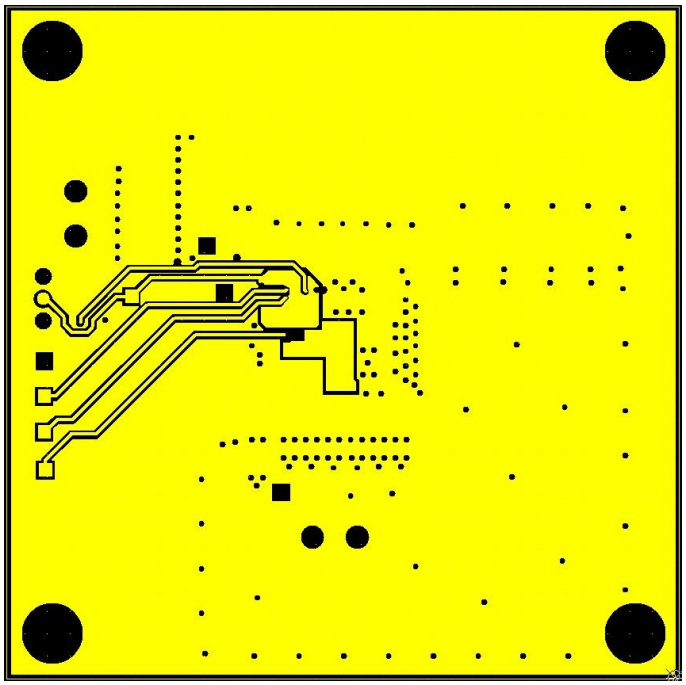

Figure 13: Layer 4

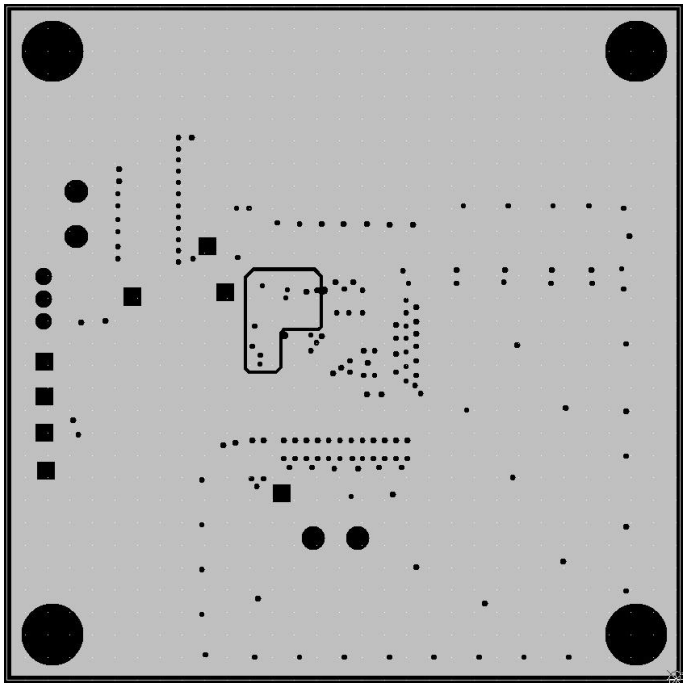

Figure 14: Layer 5

XR79110EVB Bill of Materials

Table 4: XR79110EVB Bill of Materials

Item	Qty	Reference Designator	Component	Manufacturer / Part Number	Package Size
1	1	PCB	XR79110 Evaluation Board	MaxLinear	
2	1	U1	XR79110	MaxLinear	10mm x 10mm
3	1	D1	Diode Zener 3.6V, 500mW, SOD123	ON Semi MMSZ4685T1G	SOD-123
4	1	C1	CERAMIC CER. 0.047µF, 25V, X7R, 10%	Murata GRM155R71E473KA88D	0402
5	1	C2	CERAMIC CER. 0.47µF, 25V, X5R, 10%	Murata GRM155R61E474KE01D	0402
6	2	C3, C4	CERAMIC CAP. 10µF, 50V, X5R, 10%	Murata GRM31CR61H106KA12L	1206
7	1	C17(1)	CAP, POSCAP, 470µF, 2.5V, 7mΩ, 20%	Panasonic 2R5TPE470M7	2917
8	2	C19, C20	CERAMIC CAP. 47µF, 10V, X5R, 10%	Murata GRM31CR61A476KE15L	1206
9	1	CSNB	CERAMIC CAP. 0.56nF, 50V, X7R, 10%	Murata GRM188R71H561KA01D	0603
10	3	CIN, C24, C28	CERAMIC CAP. 0.1µF, 50V, X7R, 10%	Murata GRM155R71H104KE14D	0402
11	1	CVCC	CERAMIC CER. 4.7µF, 10V, X5R, 10%	Murata GRM188R61A475KE15D	0603
12	1	C29	CERAMIC CAP. 0.22µF, 16V, X7R, 10%	Murata GRM155R71C224KA12D	0402
13	1	CSS	CERAMIC CAP. 47nF, 50V, X7R, 10%	Murata GRM155R71H473KE14D	0402
14	1	CFF	CERAMIC CAP. 10nF, 50V, X7R, 10%	Murata GRM155R71H103KA88J	0402
15	1	R3	Resistor 35.7kΩ, 1/10W, 1%, SMD	Panasonic ERJ-2RKF3572X	0402
16	1	RFB1	Resistor 2.0kΩ, 1/10W, 1%, SMD	Panasonic ERJ-2RKF2001X	0402
17	1	RFB2	Resistor 2.0kΩ, 1/10W, 1%, SMD	Panasonic ERJ-2RKF2001X	0402
18	1	RVIN	Resistor 0.0Ω, Jumper, 1/10W, SMD	Panasonic ERJ-2GE0R00X	0402
19	2	RPGOOD, R14	Resistor 10.0kΩ, 1/10W, 1%, SMD	Panasonic ERJ-2RKF1002X	0402
20	1	R13	Resistor 30.1kΩ, 1/10W, 1%, SMD	Panasonic ERJ-2RKF3012X	0402
21	1	RSNB	Resistor 1Ω, Jumper, 1/10W, SMD	Panasonic ERJ-6RQF1R0V	0603
22	1	RLIM	Resistor 2.74kΩ, 1/10W, 1%, SMD	Panasonic ERJ-3EKF2741V	0402
23	1	RFF	Resistor 0.0Ω, Jumper, 1/10W, SMD	Panasonic ERJ-2GE0R00X	0402
24	1	RON	Resistor 6.98kΩ, 1/10W, 1%, SMD	Panasonic ERJ-2RKF6981X	0402

Table 4: (Continued)XR79110EVB Bill of Materials

Item	Qty	Reference Designator	Component	Manufacturer / Part Number	Package Size
25	1	LIN	Resistor 0.0Ω, Jumper, 3/4W, SMD	Vishay / Dale CRCW12100000Z0EAHP	2010
26	10	T1, T2, T3, T4, VCC, PGOOD, SS, EN, AGND, FB	Header 1 pin	Wurth Elektronik 61300111121	2.54mm
27	1	J1	Header 3 pin	Wurth Elektronik 61300311121	2.54mm
28	4	VIN+, VOUT+, VIN-, VOUT-	Mounting Tab WA-MTAB	Wurth Elektronik 7471287	
29	1	J1 - Jumper	Header jumper	Wurth Elektronik 60900213421	2.54mm

1. Install POSCAP reverse to silkscreen polarity shown on board.

MaxLinear, Inc.
5966 La Place Court, Suite 100
Carlsbad, CA 92008
760.692.0711 p.
760.444.8598 f.

www.maxlinear.com