



Enpirion[®] Power Evaluation Board

ER3110DI 1A Wide VIN
Synchronous Buck Regulator
Evaluation Board User Guide

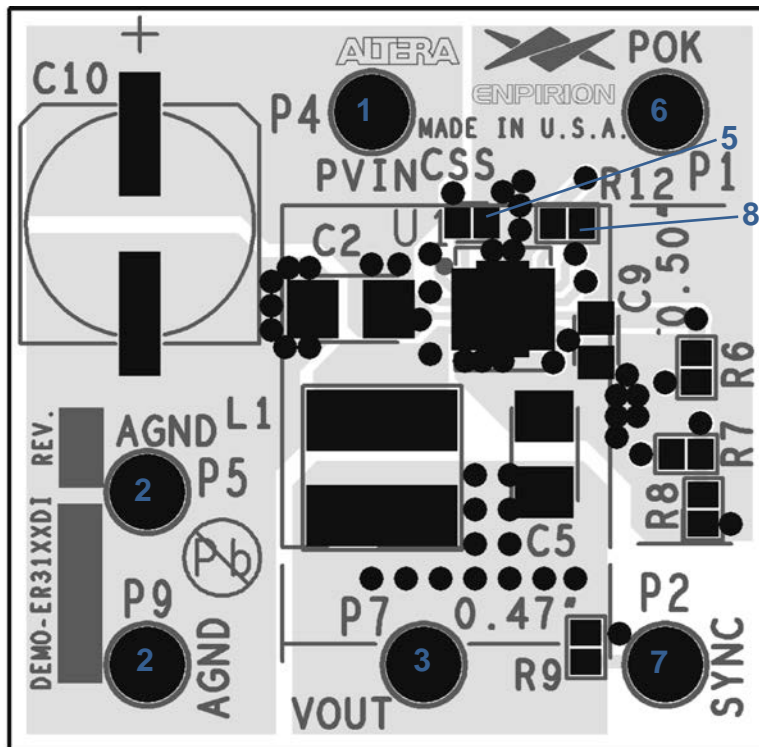
Description

This is the ER3110DI Evaluation Board User Guide. The ER3110DI features wide input voltage range (3V to 36V), integrated high-side and low-side NMOS devices, PFM mode for improved efficiency at light loads, and protection circuitry against system faults. This level of integration delivers a substantial reduction in footprint and part count over

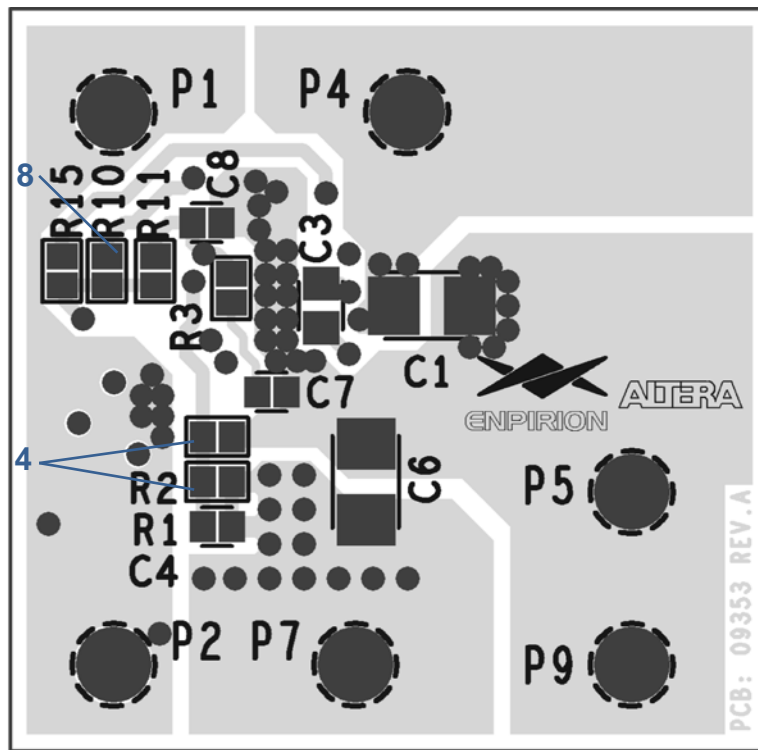
competing solutions. The evaluation board is optimized for engineering ease of testing through programming options, clip leads, test points, and supporting external components.

The ER3110DI and its sister part, the ER3105DI, share a common printed circuit board. The marking on the board below the “DEMO-ER31XXDI” identifies the version.

Evaluation Board Over View



(a) ER3110DI EVB Top Side



(b) ER3110DI EVB Bottom Side

Figure 1. ER3110DI Evaluation Board Illustration (Follow instructions on page 2)

Instructions

The numbers in the instructions below correspond to the numbers in Figure 1. By following the number sequence below, the device can be turned on by step 3.

- 1) **PVIN (P4)** - Connect a 3V to 36V power supply on P4. Do not turn the power supply on until everything is connected correctly.
- 2) **Ground (P5 and P9)** - Connect the input power supply ground to P5 and the output ground to P9.
- 3) **VOUT (P7)** - Connect the load to P7. If the instructions were followed up to this point, the power supply may be turned on. To disable the evaluation board, turn off the power supply connected in Step 1 and 2. The device may also be enabled or disabled by pulling the EN pin high or low, respectively.
- 4) **Output Voltage Setting** - The output voltage programming resistor R3, depends on the value chosen for the feedback resistor R2 and the desired output voltage

VOUT. Equation 1 describes the relationship between VOUT and the resistor values.

$$R_3 = \frac{R_2 * 0.6V}{V_{out} - 0.6V} \quad (1)$$

The feedback resistor R2 is chosen as 90.9kΩ. When changing the output voltage it may also be necessary to change certain other circuit elements for stability. See Table 1 for details.

Note 1: Connect Fsw to AVINO

- 5) **Soft Start Capacitor (C_{SS})** – If SS is pulled to AVINO, an internal 2ms timer is selected for soft-start. For other soft-start times, simply connect a capacitor from SS to GND. The soft-start time can be calculated by Equation 2:

$$Time (ms) = C_{SS}(nF) * 0.109 \quad (2)$$

- 6) **POK (P1)** - This is the open drain POK flag, which is pulled up to AVIN by R1. When VOUT is over 90% of regulation, POK will be pulled high to AVIN; otherwise POK is pulled low internally.

- 7) **SYNC (P2)** – SYNC is connected to AVINO through the R6 (200kΩ) resistor and sets the device to operate in PWM mode only. To set automatic PFM or PWM mode, remove R6 and install a 0Ω resistor on R9.
- 8) **FSW (R10, R12)** – The ER3110DI Evaluation Board operates at a default switching frequency of 500kHz, where FSW

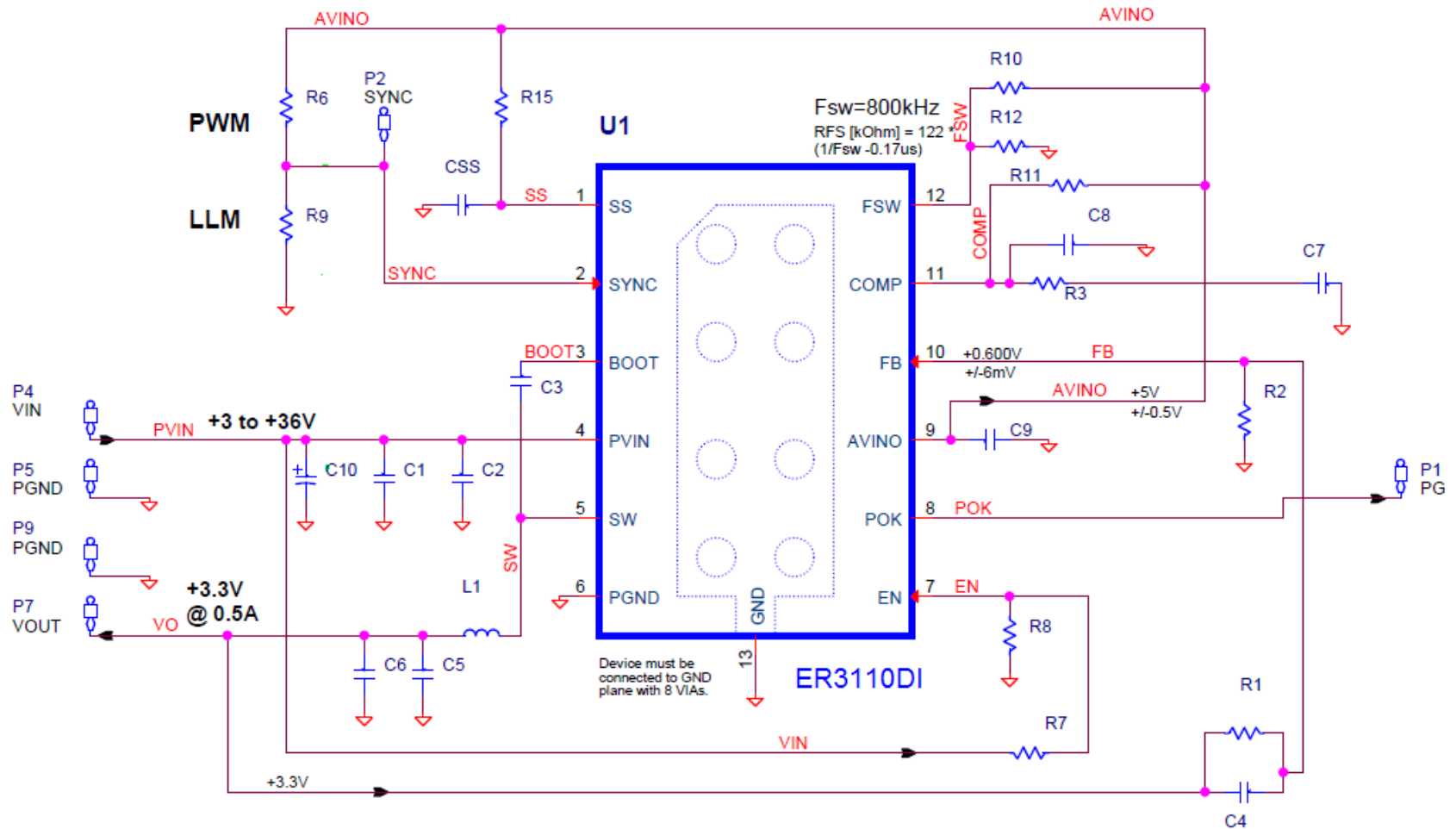
is tied to AVINO (R10= 0Ω). To adjust the switching frequency, remove R10 and install a resistor R_{FSW} (R12) from FSW to GND to program the switching frequency from 300kHz to 2MHz, as shown in Equation (3)

$$R_{f_{sw}} = 108.75 \cdot \left(\frac{1}{F_{sw}(MHz)} - 0.2 \right) (k\Omega) \quad (3)$$

Vout (V)	L1 (μH)	C2 (μF)	R1 (KΩ)	R2 (KΩ)	C4 (pF)	R12 (KΩ)	R3 (KΩ)
12	22	2x22	90.9	4.75	22	115	150
5	22	47 + 22	90.9	12.4	27	DNP (Note 1)	100
3.3	22	47 + 22	90.9	20	27	DNP (Note 1)	100
2.5	22	47 + 22	90.9	28.7	27	DNP (Note 1)	100
1.8	22	47 + 22	90.9	45.5	27	DNP (Note 1)	70

Table 1: External Components for Adjusting the Output Voltage

Evaluation Board Schematic



Bill of Materials

Designator	Qty	Description
C4	1	CAP,SMD,0402,27pF,50V,5%,C0G,ROHS
CSS	1	CAP,SMD,0402,33000pF,16V,10%,X7R,ROHS
C7	1	CAP,SMD,0402,470pF,50V,10%,X7R,ROHS
C3	1	CAP,SMD,0603,0.1uF,50V,10%,X7R,ROHS
C9	1	CAP,SMD,0603,1uF,16V,10%,X5R,ROHS
C1, C2	1	CAP,SMD,1206,10uF,50V,10%,X5R,ROHS
C5	1	CAP,SMD,1206,47uF,6.3V,10%,X5R,ROHS
C6	1	CAP,SMD,1206,22uF,6.3V,10%,X5R,ROHS
L1	1	INDUCTOR SHIELD PWR 22UH SMD
P4, P7	1	CONN-MINI TEST PT,VERTICAL,RED,ROHS
P5, P9	1	CONN-MINI TEST PT,VERTICAL,BLK,ROHS
P1, P2	1	CONN-MINI TEST POINT,VERTICAL,WHITE,ROHS
U1	1	ER3110DI Wide VIN 1A Synchronous Buck Regulator
R3	1	RES,SMD,0402,100K,1/16W,1%,TF,ROHS
R12	1	RES,SMD,0402,120K,1/16W,1%,TF,ROHS
R2	1	RES,SMD,0402,20K,1/16W,1%,TF,ROHS
R6, R7	2	RES,SMD,0402,200K,1/16W,1%,TF,ROHS
R1	1	RES,SMD,0402,90.9K,1/16W,1%,TF,ROHS
R10,R15	2	RES,SMD,0402,Zero OHM,1/10W,5%,TF,ROHS

Test Recommendations

To guarantee measurement accuracy, the following precautions should be observed:

1. Make all input and output voltage measurements at the board using the test points provided (P4 to P7). This will eliminate voltage drop across the line and load cables that can produce false readings.
2. Measure input and output current with series ammeters or accurate shunt resistors. This is especially important when measuring efficiency.
3. The board includes a pull-up resistor for the POK signal and ready to monitor the power OK status at clip lead marked POK.

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