Enpirion® Power Evaluation Board

EN2342QI 12Vin 4A Buck PowerSoC

Evaluation Board User Guide

Description

This is the EN2342QI User Guide. The EN2342QI features an integrated inductor, power MOSFETS, controller, a bulk of the compensation network, and protection circuitry against system faults. This level of integration delivers a substantial reduction in footprint and parts count over competing solutions. The evaluation board is optimized for engineering ease of testing through programming options, clip leads, test points etc. Note that the EN2342QI shares the same PCB board design as the EN2340QI (since they are pin compatible). To be sure which evaluation board is being used, check the markings on top of the device package.

Evaluation Board Over View

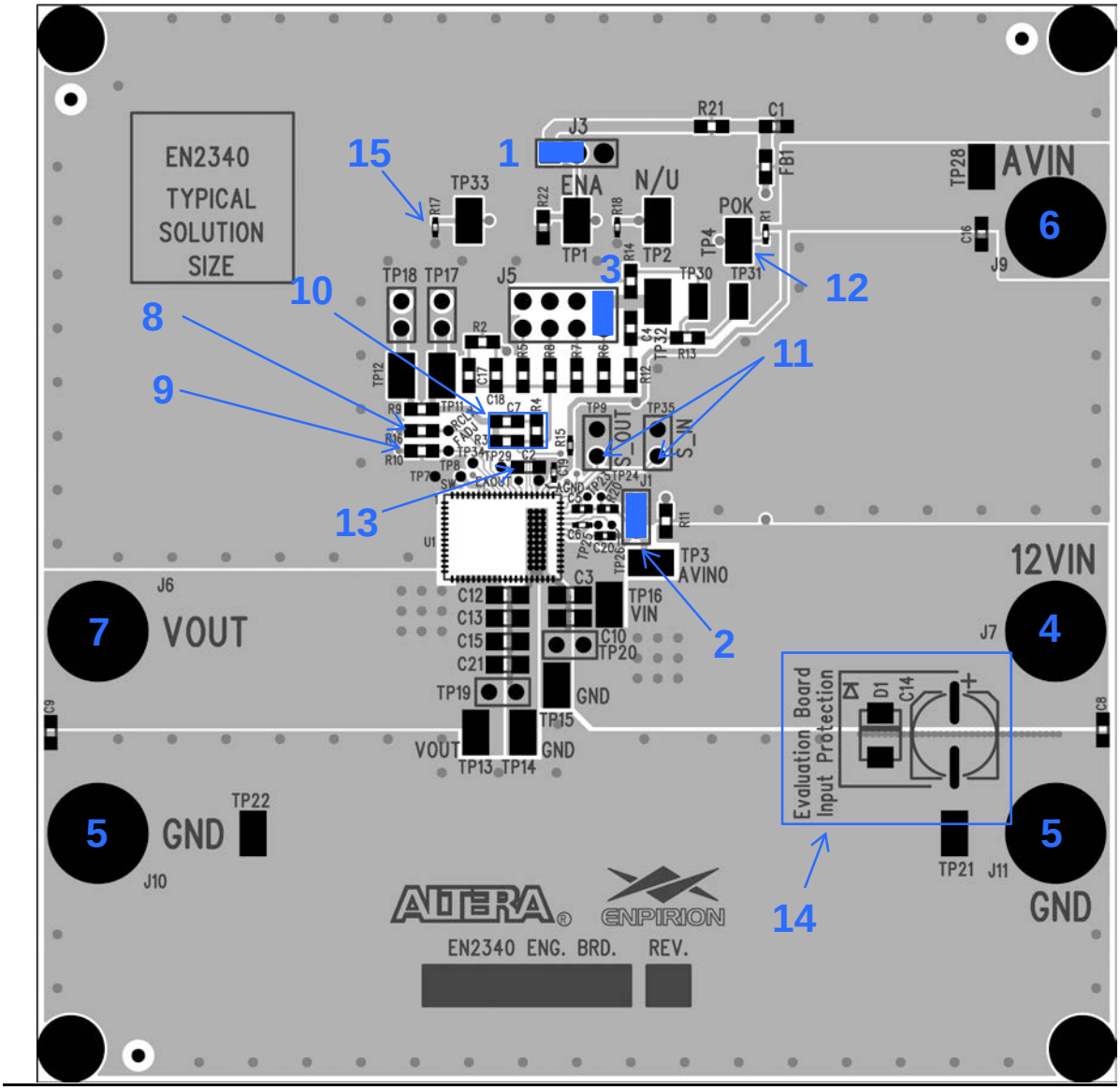


Figure 1. EN2342QI Evaluation Board Illustration (Follow instructions on page 2)

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 7.

1) **ENABLE** – The jumper on the left two pins of J3 enables the device through the resistor divider R21 and R22). Remove this jumper to disable the device. Leave J3 open and use an external signal to TP1 to toggle the enable on (>1.25V) and off (<0.95V).
2) **AVINO to AVIN Connection (J1)** - Connection from AVINO to AVIN pin. Add Jumper to J1 for Single Supply Mode. Remove Jumper for Dual Supply Mode.
3) **Output Voltage Settings (J5)** - As shown, output voltage is set to 1.2V. The jumper may be switched to change the output voltage. From left to right R5, R8, R7, R6 (3.3V, 2.5V, 1.2V, 1.0V).
4) **PVIN (J7)** - Connect 4.5V to 14V supply on J7. Do not turn on until everything is connected correctly.
5) **Ground (J10 and J11)** - Connect the input supply ground to J11 and the output ground to J10.
6) **AVIN (J9)** - This is the power for the internal controller. For Dual Supply Mode, connect the 3.3V to AVIN on J9. Be sure to remove J1. For Single Supply Mode, leave AVIN open and be sure J1 has a jumper.
7) **VOUT (J6)** - Connect the load to J6. If the instructions were followed up to this point, the device may be powered to turn on.
8) **RCLX Resistor (R16)** - Current limit resistor setting. Follow the table below for recommended values based on output voltage. See Datasheet for details.

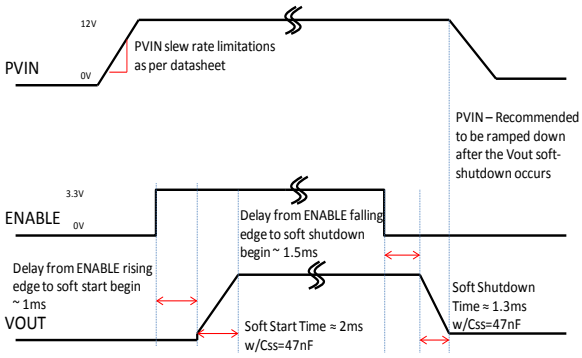
PVIN	V_{OUT}	R_{CLX}	R_{FS}
4.5V to 14V	5.0V	68.1k	30k
	3.3V	61.9k	22k
	2.5V	56.2k	10k
	1.8V	54.9k	4.87k
	1.5V	53.6k	3.01k
	1.2V	46.4k	3.01k
	≤1.0V	38.3k	3.01k

9) **RFS Resistor (R10)** - Frequency setting resistor. Follow the table below for recommended values based on output voltage. See Datasheet for details.

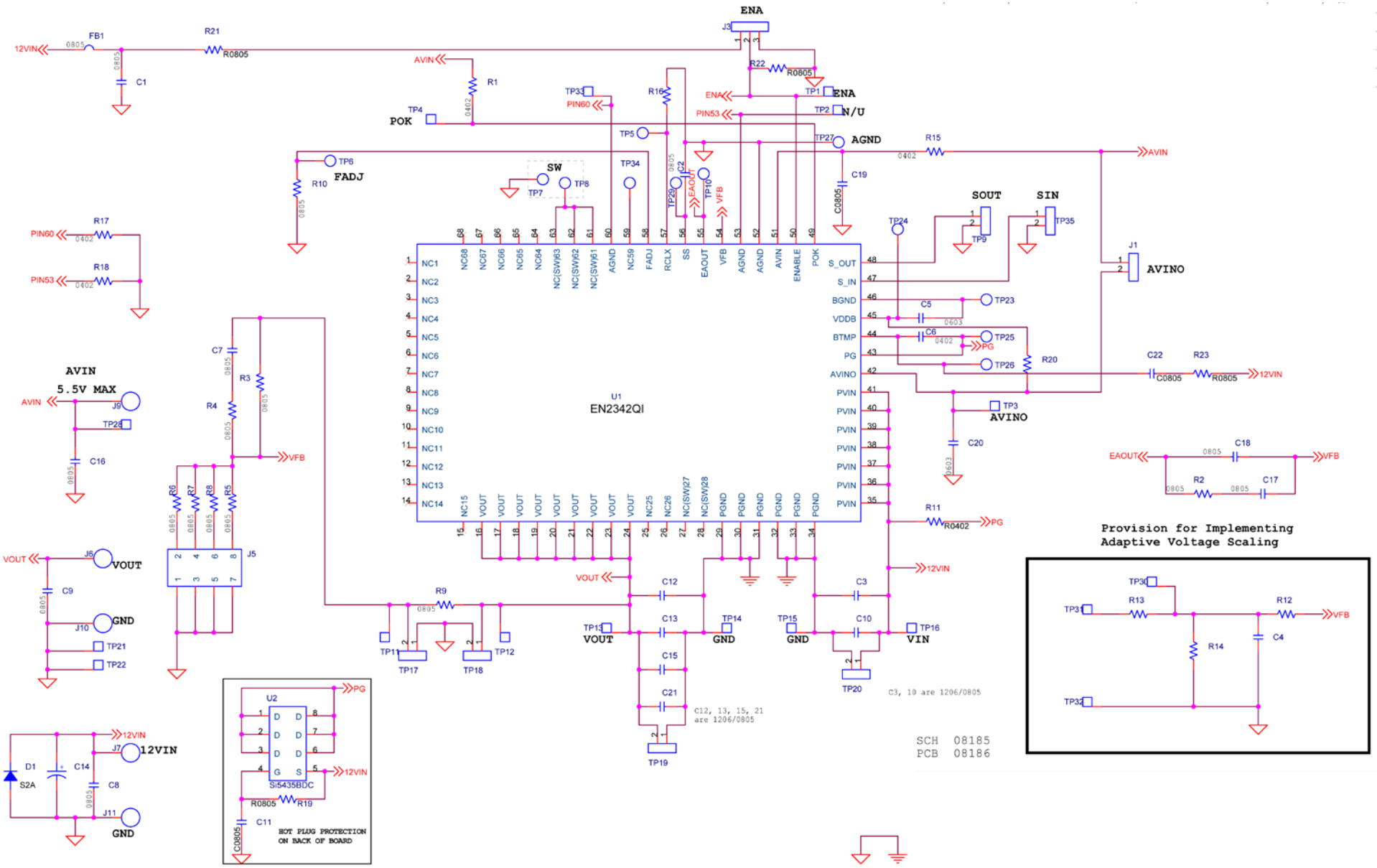
PVIN	VOUT	R_{FS}	Typical fsw
4.5V to 14V	5.0V	30k	1.48 MHz
	3.3V	22k	1.38 MHz
	2.5V	10k	1.3 MHz
	1.8V	4.87k	1.15 MHz
	1.5V	3.01k	1.0 MHz
	1.2V	3.01k	1.0 MHz
	<1.0V	3.01k	1.0 MHz

10) **External Compensation (R3 = Ra), C7 = Ca, R4 = Rca)** – The on board values are designed to work with a variety of input and output voltage ranges. For optimization, follow the Datasheet recommendations.
11) **S_IN and S_OUT** - Connect an external clock signal to S_IN to use an external clock as the switching frequency (0V ≤ S_IN ≤ 2.5V). Be sure the frequency is within 10% of the recommended typical switching frequency. The S_OUT pin can be used to "daisy chain" other EN2342 devices so they have the same operating frequency. See Datasheet for details on Frequency Synchronization.
12) **POK** - 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.
13) **Soft Start Capacitor (C2)** – The soft start capacitor is by defaulted 47nF and can be between 10nF to 68nF. See Datasheet for details.
14) **Input Protection** – The EN2342QI evaluation board comes with some input polarity protection and PVIN slew rate protection on the backside of the evaluation board. Be sure to follow input voltage specifications based on the Datasheet.

15) **Pre-Bias Protection** – Pre-Bias protection is disabled by default on the evaluation board. To enable pre-bias protection, remove R17 and connect TP33 to AVIN (a zero ohm connection may be used). A fast ENABLE signal greater than 3V/100µs must be used in order for the Pre-Bias protection to work properly. A signal generator is recommended to test this feature. Be sure to follow the sequence requirement where the 12V rail is in regulation before the device is enabled. Refer to the following timing diagram or the EN2342QI Datasheet for details on Pre-Bias Protection.



Evaluation Board Schematic



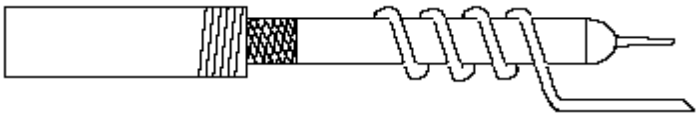
Bill of Materials

Designator	Qty	Description
C2	1	CAP 47000PF 50V CERAMIC X7R 0805
C7	1	CAP CER 68PF 50V 5% C0G 0805
C3	1	CAP CER 22UF 25V 10% X5R 1206
C12,C13	2	CAP CER 47UF 10V X5R 1206
C14	1	CAP ELECT 150UF 25V FK SMD
C6	1	CAP CER 22000PF 16V X7R 0402
C19	1	CAP CER 1.0UF 16V X5R 10% 0402
C20	1	CAPACITOR CERAMIC 1.0UF 10V 10% 0402 X5R SMT
C5	1	CAP CER 0.22UF 16V X5R 0402
D1	1	S2A DIODE
J3	1	CONN HEADER 3POS .100" SNGL TIN
J5	1	CONNECTOR HEADER 8 POS .100" STR TIN
J6,J7,J9,J10,J11	5	BANANA JACK
J1	1	CONN HEADER 2POS .1" T/H
R1	1	RES 100K OHM 1/16W 1% 0402 SMD
R3	1	RES 200K OHM 1/8W 0.1% 0805 SMD
R4	1	RES 10K OHM 1/8W 0.1% 0805 SMD
R5	1	RES 59.0K OHM 1/8W 1% 0805 SMD
R6	1	RES 604K OHM 1/8W 1% 0805 SMD
R7	1	RES 332K OHM 1/8W 1% 0805 SMD
R8	1	RES 86.6K OHM 1/8W 1% 0805 SM
R16	1	RES 46.4K OHM 1/8W 1% 0805 SM
R17,R18	2	RESISTOR ZERO OHM 1/10W 5% 0402 SMD
R20	1	RES 4.75K OHM 1/10W 1% 0402 SMD
R9	1	RES 49.9 OHM 1/8W 1% 0805 SMD
R10	1	RES 3.01K OHM 1/8W 1% 0805 SMD
R21	1	RES 10.0K OHM 1/8W 1% 0805 SMD
R22	1	RES 4.02KOHM 1/4W1% 0805 SMD
TP30,TP31	1	TEST POINT SURFACE MOUNT
TP1,TP2,TP4,TP13,TP14,TP15,TP16,TP21,TP22,TP28,TP32,TP33	12	TEST POINT SURFACE MOUNT
C1,C4,C8,C9,C10,C11,C15,C16,C17,C18,C21,C22,J4,R2,R11,R12,R13,R14,R15,R19,R23,U2	22	COMPONENT NOT USED ** DO NOT INSTALL **
U1	1	COPPER EN2342QI 4A 12V QFN

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 as 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. Use a low-loop-inductance scope probe tip similar to the one shown below to measure switching signals and input / output ripple to avoid noise coupling into the probe ground lead. Input ripple, output ripple, and load transient deviation are best measured near the respective input / output capacitors. For more accurate ripple measurement, please see Altera Enpirion App Note regarding this subject.



4. The board includes a pull-up resistor for the POK signal and ready to monitor the power OK status at clip lead marked POK.

Contact Information

Altera Corporation
101 Innovation Drive
San Jose, CA 95134
Phone: 408-544-7000
www.altera.com