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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# EN5319QI 1.5A Synchronous DC/DC Converter Evaluation Board User Guide

## Introduction

Thank you for choosing Altera Enpirion power products!

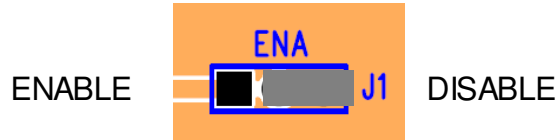
This evaluation board user guide applies to the EN5319 devices mounted on PCB's with the part number 08251 rev A on the backside. This user guide should be used together with the latest device datasheet. The datasheet can be found at [www.altera.com/enpirion](http://www.altera.com/enpirion).

Following are the features of this evaluation board.

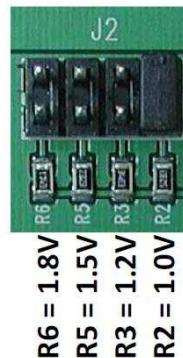
- Populated with one EN5319QI 1.5A PowerSoC with integrated inductor.
- Pre-tinned pads are available for a wide range of input and output capacitor configurations.
- There are four positions available for the output capacitors. The first position, closest to the IC, can accommodate a 1206, 0805, or 0603 case size while the other three positions can accommodate either 0805 or 0603 capacitor case sizes.
- The base output capacitor configuration is 2 x 22uF 0603 MLCC. Refer to the product datasheet for output capacitor requirements.
- There are two positions for the input capacitors. The first position, closest to the IC, can accommodate an 0805 or 0603 case size while the other position can accommodate an 0805 case size. The base input capacitor configuration is a single 10uF 0805 MLCC. Refer to the product datasheet for input capacitor requirements.
- Output voltage programming is accomplished via a simple resistor divider. Jumpers are provided for 4 pre-configured output settings. These settings are as follows:
  - 1.0V, 1.2V, 1.5V, 1.8V
- Easy jumpers are provided for the following signals:
  - Enable
- Numerous test points are provided as well as clip leads for input and output connections
- The board comes with input decoupling and reverse polarity protection.

Figure 1 shows a photograph of the evaluation board. Please refer to this figure while configuring the board for evaluation.

STEP 1: Set the “ENABLE” jumper to the Disable Position.



STEP 2: Select the desired VOUT voltage setting by placing the jumper J2 on the correct jumper pin. Figure below shows the VOUT jumper options and their nominal voltages. Note that depending on the tolerance of the resistors populated on the board, each output voltage setting may have a larger tolerance than just the VFB pin as specified in the datasheet. Please see Figure 3 and the Bill of Materials section. Multiple jumpers can be populated to get other output voltages not listed below. With the resistors shown below, if all 4 jumper positions are populated, the output voltage will be approximately 3.7V. Note that for any VOUT higher than 3.3V, the output capacitors need to be changed to 2 x 22uF/0805.



**CAUTION:** the VOUT jumper settings can only be changed when the device is off. Failure to follow this guideline may result in damage to the part.

**Please note: The loop compensation circuit for this evaluation board has been chosen for a wide range of VIN and VOUT values. In order to optimize the loop for any specific VIN/VOUT operating point, please see the compensation table in the datasheet. See Figures 1 and 3.**

STEP 3: Connect a Power Supply to the input power connectors, VIN (J4) and GND (J5). DO NOT turn the power supply on yet.

**CAUTION:** Be mindful of the input voltage magnitude and polarity. Even though the evaluation board comes with reverse polarity protection diodes, it may not protect the device under all conditions.

STEP 4: Connect an electronic load, or load board to the load to the output connectors VOUT (J6) and GND (J7).

STEP 5: Turn on the input supply, and move the ENABLE jumper to the enabled position. The EN5319QI is now powered up.

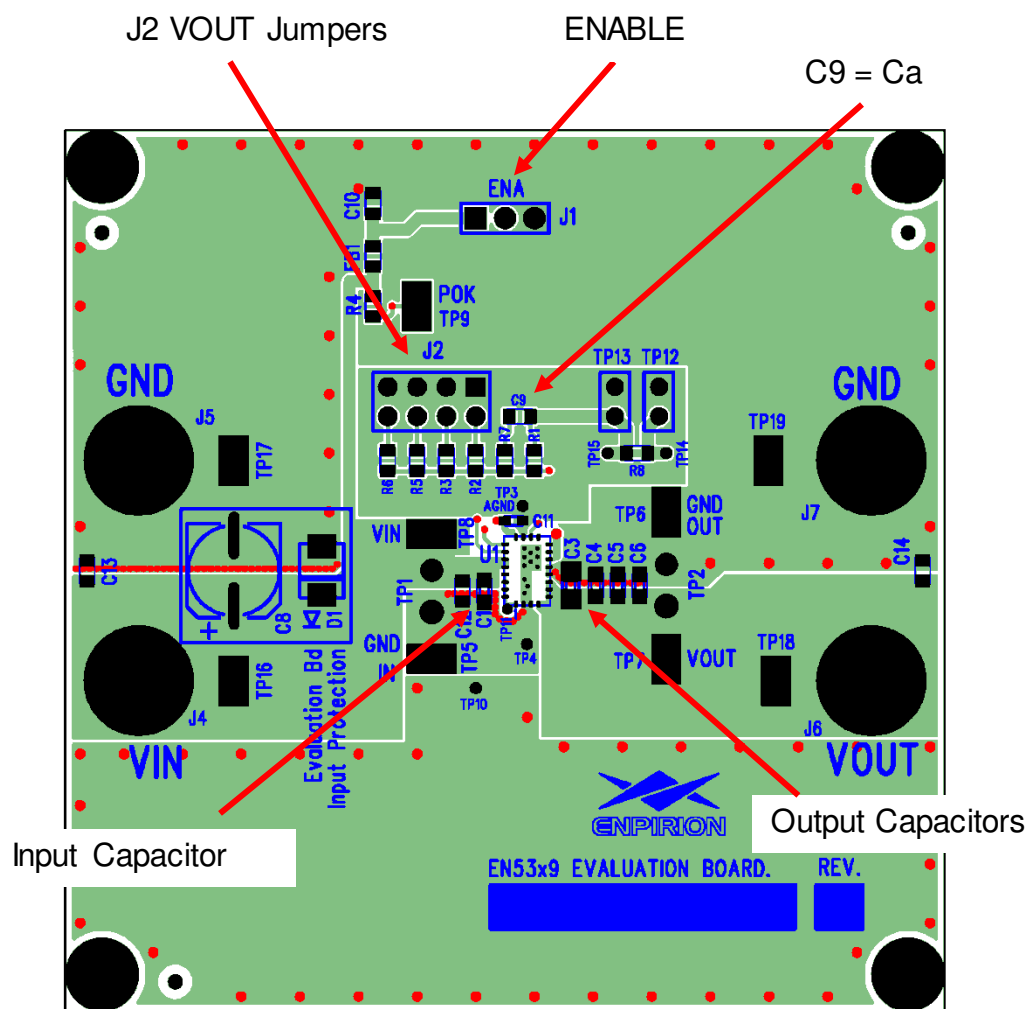


Figure 1. Evaluation Board top view.

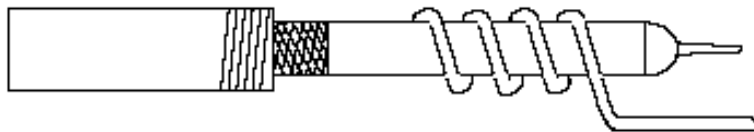
## Test Recommendations

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

Make all input and output voltage measurements at the board using the test points provided (TP5 to TP8). This will eliminate voltage drop across the line and load cables that can produce false readings.

Measure input and output current with series ammeters or accurate shunt resistors. This is especially important when measuring efficiency.

Use a low-loop-inductance scope probe tip similar to the one shown in Figure 2 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 Enpirion App Note regarding this subject ([www.altera.com/enpirion](http://www.altera.com/enpirion)).



**Figure 2.** Recommended probe configuration.

If you need to measure radiated EMI, place a 10uF/0805, X7R capacitor at the input and output edges of the PCB (C13 and C14 positions), and connect the PVIN power and the load to the board at or near these capacitors. The added capacitor at the input edge is for high-frequency decoupling of the input cables. The one added at the output edge is meant to represent a typical load decoupling capacitor.

Evaluation Board Schematic

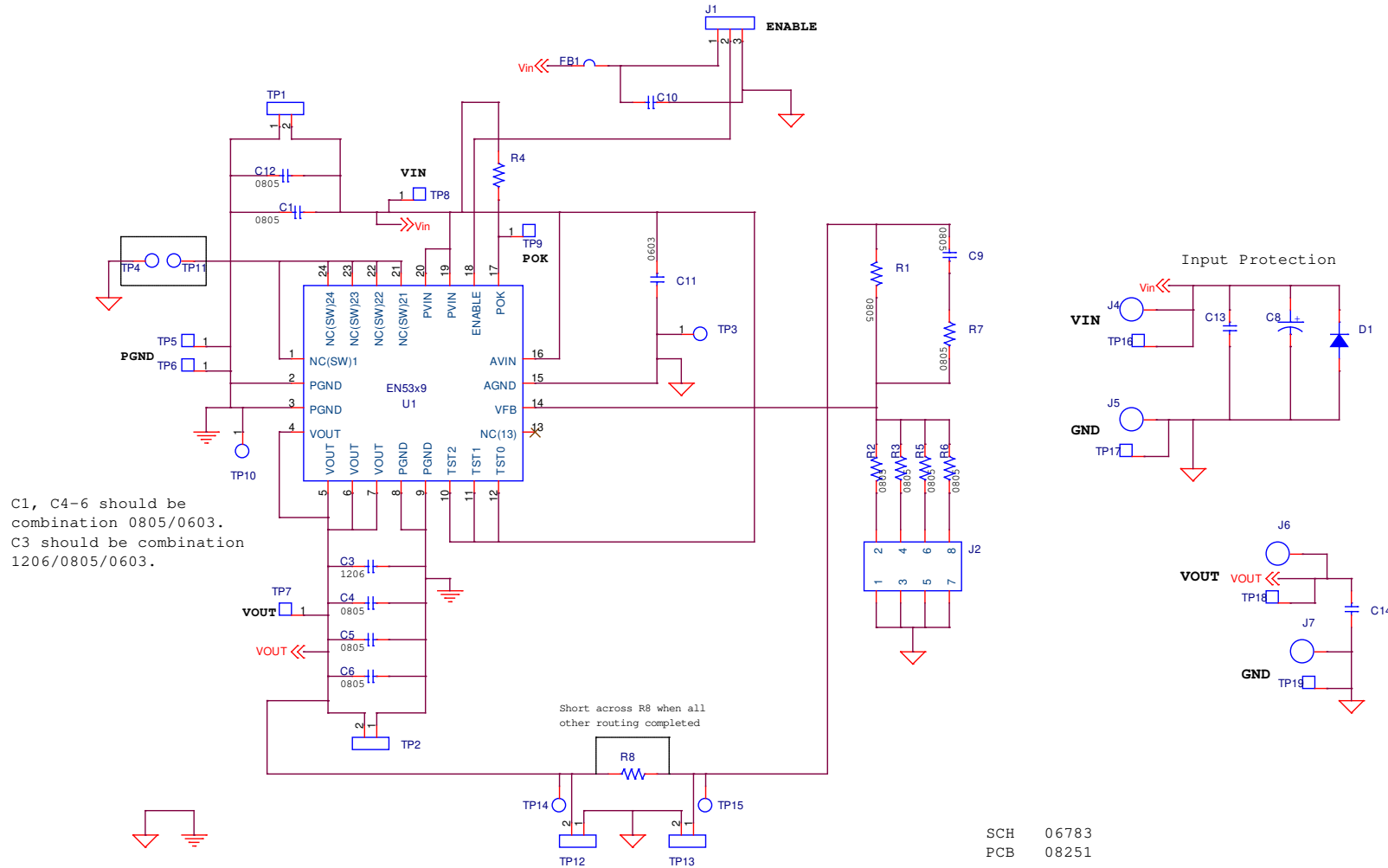


Figure 3. Engineering Evaluation board schematic.

## Bill of Materials

Designator	Qty	Description
C1, C10	2	CAP CER 10UF 10V 10% X7R 0805
C3, C4	2	CAP CER 22UF 6.3V X5R 0603
C8	1	CAPACITOR, SMT ELECTROLYTIC, 150UF, 20%, 10V
C9	1	CAP CERM 6.8PF 50V NP0 0805
C11	1	CAPACITOR CER 1UF 10V X5R 0603
C5, C6, C12-C14, R8	6	NOT USED
D1	1	TVS UNIDIRECT 600W 6.5V SMBJ6.5A
FB1	1	SMT FERRITE BEAD 4A 0805, Wurth Electronik 742792012
J1	1	CONNECTOR HEADER, 3 POSITION, Samtec ASP-121920-02
J2	1	CONNECTOR HEADER, 8 POSITION Dual, Samtec TSW-104-24-T-D
J4-J7	4	BANANA JACK, KEYSTONE 575-4
R1, R3	2	RES 348K OHM 1/8W 1% 0805
R2	1	RES 523K OHM 1/8W 1% 0805 SMD
R4	1	RES 100K OHM 1/8W 1% 0805 SMD
R5	1	RES 232K OHM 1/8W 1% 0805 SMD
R6	1	RES 174K OHM 1/8W 1% 0805 SMD
R7	1	RES ZERO OHM 1/8W 5% 0805 SMD
TP5-TP9, TP16-TP19	9	TEST POINT SURFACE MOUNT, KEYSTONE 5016
U1	1	EN5319QI QFN 1.5A

## Contact Information

Altera Corporation  
101 Innovation Drive  
San Jose, CA 95134  
Phone: 408-544-7000  
[www.altera.com](http://www.altera.com)

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