Signal Chain Power Series LT8330 Boost Converter

DESCRIPTION

Demonstration circuit SCP-LT8330-EVALZ features the LT8330, a boost/SEPIC/inverting converter with a 1A, 60V switch. The demo circuit is specifically a boost converter with an operating input voltage range from 10V to 36V and an output voltage of 48V. With a 12V input, the maximum output current is 135mA.

Like all boards in the Signal Chain Power series, this board is designed to be easily plugged into other SCP boards to form a complete signal chain power system, enabling fast evaluation of low power signal chains. To evaluate this board, some universal SCP hardware is required, namely:

SCP-INPUT-EVALZ	SCP-1X2BKOUT-EVALZ
SCP-OUTPUT-EVALZ	SCP-1X5BKOUT-EVALZ
SCP-FILTER-EVALZ	SCP-5X1-EVALZ
SCP-THRUBRD-EVALZ	

Table 1. Performance Summary

SYMBOL	PARAMETER	NOTES	MIN	ТҮР	MAX	UNITS
VIN(MAX)	Max Input Voltage				40	V
V _{OUT(MAX)}	Max Output Voltage				59	V
ISW(LIM)	Switch Current Limit				1.0	A

BOARD IMAGE

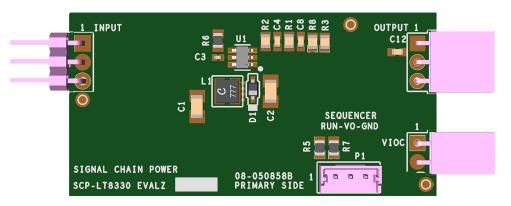


Figure 1. SCP-LT8330-EVALZ Evaluation Board

To properly evaluate SCP series demo boards, you will need the SCP Configurator companion software. SCP Configurator can help you choose the right board and topology for your design.

Note that this Demo Manual does not cover details important to the operation and configuration regarding the LT8330. Please refer to the LT8330 datasheet for a complete description of the part.

Design files for this circuit board are available.

All registered trademarks and trademarks are property of their respective owners.

QUICK START PROCEDURE

Demonstration circuit SCP-LT8330-EVALZ is easy to set up to evaluate the performance of any SCP hardware configuration.

- 1. The SCP-LT8330-EVALZ ships with a default output voltage of 48V. To change the output voltage, see "Configuration Settings" section, and modify the board accordingly. Be sure to check for open connections or solder shorts after making any modifications.
- Connect the SCP-INPUT-EVALZ and SCP-OUTPUT-EVALZ boards to the SCP-LT8330-EVALZ (refer to Figure 2) and connect the input board to a voltage source, V_{SOURCE}. Connect the output board to a voltmeter or dynamic load. Slowly raise the input voltage until the SCP-LT8330-EVALZ powers up into regulation and sweep V_{SOURCE} through the desired range of operation.

NOTE: Make sure that the input voltage is always within spec. If using a dynamic load to measure output voltage, make sure the load is initially set to zero.

- 3. Check for proper output voltage. The output should be regulated at the programmed value $(\pm 5\%)$.
- 4. Once the proper output voltage is established, power off V_{SOURCE} and similarly test other boards in the SCP system until all elements have been individually verified prior to assembling into the final circuit configuration.

NOTE: When measuring the input or output voltage ripple, use the optional SMA connector locations available on the input, output, 1×5 , 1×2 , and 5×1 breakout boards. Avoid using the test point connections with long scope leads.

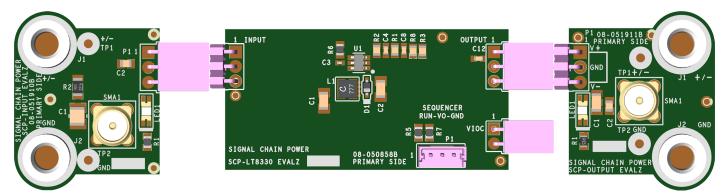


Figure 2. Proper Measurement Equipment Setup (Use SMA connectors for Measuring Input or Output Ripple)

CONFIGURATION SETTINGS

Demonstration circuit SCP-LT8330-EVALZ features the LT8330, a boost/SEPIC/inverting converter with a 1A, 60V switch. The demo circuit is specifically a boost converter with an operating input voltage range from 10V to 36V and an output voltage of 48V. With a 12V input, the maximum output current is 135mA.

The output of the SCP-LT8330-EVALZ is resistor-programmable from 5V to 59V. The board can be also configured to drive VIOC-capable linear regulators.

OUTPUT VOLTAGE PROGRAMMING

 $V_{OUT} = 1.6 V_{FBX} \left(1 + \frac{R1}{R2} \right)$

V _{OUT} (V)	R1 (Ω)	R2 (Ω)
5.0	24.3k	11.5k
6.0	31.6k	11.5k
7.0	115k	34.0k
8.0	102k	25.5k
9.0	118k	25.5k
10.0	105k	20.0k
11.0	107k	18.2k
12.0	71.5k	11.0k
13.0	97.6k	13.7k
14.0	78.7k	10.2k
15.0	115k	13.7k
16.0	102k	11.3k
17.0	162k	16.9k
18.0	205k	20.0k
19.0	150k	13.7k
20.0	115k	10.0k
21.0	243k	20.0k
22.0	255k	20.0k
23.0	226k	16.9k
24.0	140k	10.0k
25.0	215k	14.7k
30.0	442k	24.9k
35.0	287k	13.7k
40.0	255k	10.7k
45.0	374k	13.7k
50.0	357k	11.8k
55.0	357k	10.7k
59.0	412k	11.5k

EN/UVLO PIN CONFIGURATION

The EN/UVLO pin is tied to the optional SCP Run/Sequence header P1. To create a harness for this function, use Molex part 0510650300 with crimp pin 50212-8000.

To use an active run signal, use a $100k\Omega$ resistor for either pull-up or pull-down resistors R5 and R6, short R7 with 0Ω , and use the drive signal from connector P1.

If precision undervoltage lockout (UVLO) operation is desired, program enable divider R5 and R6 such that:

R6 is 10k to 100k, nominal

$$R5 = R6 \left(\frac{V_{IN} - 1.60V_{TH}}{1.60V_{TH}} \right)$$

The LT8330 has an accurate 1.60V threshold which places the part into under voltage lockout. The hysteresis threshold on the rising edge is typically 80mV and scales by the factor:

$$V_{HYST} = 130 mV \frac{R5 + R6}{R6}$$

VOLTAGE INPUT-TO-OUTPUT CONTROL (VIOC) IMPLEMENTATION

To implement the VIOC function for this regulator, set R_3 to $0\Omega.$ Refer to the "Configuration Settings" section in the Demo Manual for the LDO board and use the following configuration for this board.

VIOC SETTING REFERENCES	R _{BOT}	R _{TOP}	R _{MAX}	
V _{OUT} Reference Designators	R2	R1	R8	
$V_{LDOIN} - V_{LDOOUT} = V_{VIOC} = 1.6 V_{FB} \left(\frac{R_{BOT} + R_{TOP}}{R_{BOT}} \right)$				
$V_{(MAX)LDOIN} = 1.6V_{FB} \left(\frac{R_{BOT} + R_{TO}}{R_{BOT}}\right)$	P + R _{MAX})+I _{SINK} R _M	AX	

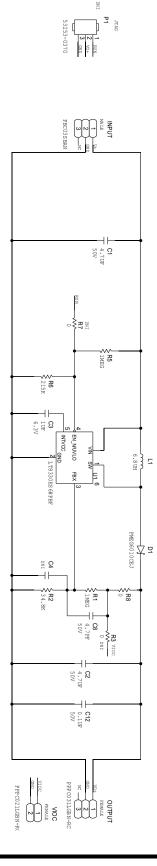
 I_{SINK} is the current through $R_{MAX},$ typically 15µA, so R_{BOT} should be sized such that the divider current runs a minimum of 100µA to minimize the I_{SINK} error term.

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	PCB	PCB	ANALOG DEVICES 08_050858b
2	2	C1, C2	CAP CER 4.7UF 50V 10% X7R 1206	SAMSUNG CL31B475KBHNNNE
3	1	C12	CAP CER 0.1UF 50V 10% X7R 0603	SAMSUNG CL10B104KB8NNNC
4	1	C3	CAP CER X7R, GENERAL PURPOSE	MURATA GRM155R70J105KA12D
5	1	C4	CAP MLCC 0603 (Note 1)	N/A
6	1	C8	CAP CER NPO	PHYCOMP (YAGEO) 2238 867 15478
7	1	D1	DIO SCHOTTKY BARRIER RECTIFIER, 1A	NEXPERIA PMEG6010CEJ
8	1	INPUT	CONN-PCB MALE HEADER 3POS 2.54MM PITCH R/A GOLD	SULLINS PBC03SBAN
9	1	L1	IC SHIELDED POWER, 0.2870HM DCR, 1.1A	WURTH ELEKTRONIK74438335068
10	1	OUTPUT	CONN FEMALE 3POS 2.54MM PITCH R/A GOLD	SULLINS PPPC031LGBN-RC
11	1	P1	CONN-PCB 3POS HEADER WIRE TO BRD WAFER ASSY STRAIGHT 2MM PITCH (Note 1)	MOLEX 53253-0370
12	1	R1	RES PRECISION THICK FILM CHIP	PANASONIC ERJ-6ENF1004V
13	1	R2	RES HIGH PRECISION SMD	TYCO ELECTRONICS RN73C2A34K8BTG
14	2	R3, R7	RES THICK FILM 0805 (Note 1)	N/A
15	1	R5	RES THICK FILM CHIP, GENERAL PURPOSE	YAGEO RC0805JR-071ML
16	1	R6	RES STANDARD THICK FILM CHIP, FOR AUTOMOTIVE	VISHAY CRCW0805215KFKEA
17	1	R8	RES STANDARD THICK FILM CHIP JUMPER, FOR AUTOMOTIVE	VISHAY CRCW08050000Z0EA
18	1	U1	IC-LIN LOW IQ BOOST/SEPIC/INVERTING CONVERTER WITH 1A, 60V SWITCH	LINEAR TECHNOLOGY LT8330ES6#PBF
19	1	VIOC	CONN FEMALE 2POS 2.54MM PITCH R/A GOLD	SULLINS PPPC021LGBN-RC

Note 1. These items are not stuffed (DNI).

SCHEMATIC DIAGRAM



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices.

Rev. 0



ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is a NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.

ANALOG



