Signal Chain Power
LT8362 Low I_Q Inverting Regulator

DESCRIPTION

Demonstration circuit SCP-LT8362-I-EVALZ features the LT8362 in a Cuk configuration. It operates with a switching frequency of 2MHz and is designed to convert a 4.5V to 42V source to –15V, with up to 1A output current (depending on input voltage).

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

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 LT8362. Please refer to the LT8362 datasheet for a complete description of the part.

Design files for this circuit board are available.

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Table 1. Performance Summary

SYMBOL	PARAMETER	NOTES	MIN	TYP	MAX	UNITS
$V_{IN(MAX)}$	Max Input Voltage				48	V
$V_{OUT(MAX)}$	Max Output Voltage				–48	V
$I_{SW(LIM)}$	Switch Current Limit				2	A

BOARD PHOTO

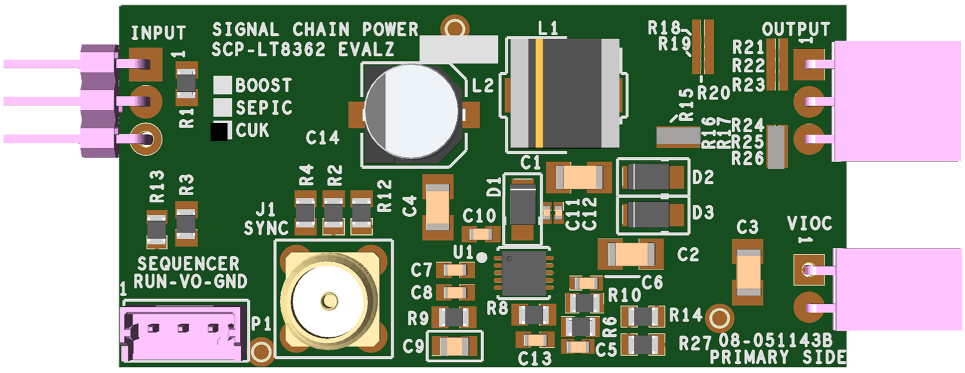


Figure 1. Photo of SCP-LT8362-I-EVALZ

QUICK START PROCEDURE

Demonstration circuit SCP-LT8362-I-EVALZ is easy to set up to evaluate the performance of any SCP hardware configuration.

1. The SCP-LT8362-I-EVALZ ships with a default output voltage of –12V. 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.
2. Connect the SCP-INPUT-EVALZ and SCP-OUTPUT-EVALZ boards to the SCP-LT8362-I-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-LT8362-I-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 (±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.

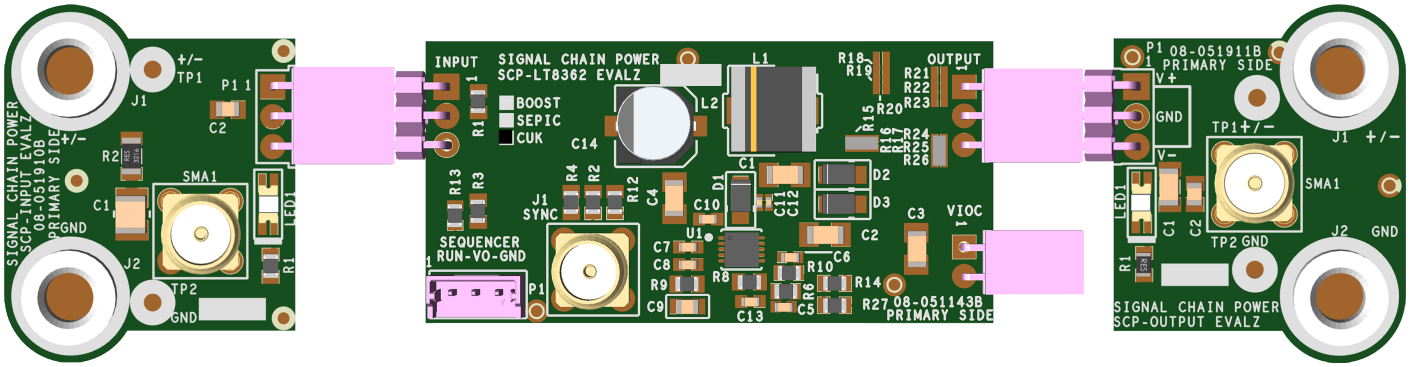


Figure 2. Proper Measurement Equipment Setup (Use SMA connectors for Measuring Input or Output Ripple)

CONFIGURATION SETTINGS

Demonstration circuit SCP-LT8362-I-EVALZ features the LT8362 in a Cuk configuration. It operates with a switching frequency of 2MHz and is designed to convert a 4.5V to 42V source to –15V, with up to 1A output current (depending on input voltage).

The output of the SCP-LT8362-I-EVALZ is resistor-programmable from –5V to –40V. The board can be also configured to drive VIOC-capable LDO regulators.

OUTPUT VOLTAGE PROGRAMMING

$$-0.80V_{FBX}\left(1+\frac{R6}{R8}\right)$$

Table 2. Resistor Selection Guide for Common Output Voltages

V_{OUT} (V)	R6 (Ω)	R8 (Ω)
–5.0	105K	20.0K
–6.0	71.5K	11.0K
–7.0	78.7K	10.2K
–8.0	102K	11.3K
–9.0	205K	20.0K
–10.0	115K	10.0K
–11.0	255K	20.0K
–12.0	140K	10.0K
–13.0	210K	13.7K
–14.0	165K	10.0K
–15.0	442K	24.9K
–16.0	215K	11.3K
–17.0	232K	11.5K
–18.0	215K	10.0K
–19.0	232K	10.2K
–20.0	255K	10.7K
–21.0	232K	10.2K
–22.0	255K	10.7K
–23.0	383K	13.7K
–24.0	309K	10.7K
–25.0	357K	11.8K
–30.0	365K	10.0K
–35.0	590K	13.7K
–40.0	487K	10.0K

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 1.00M for either pull-up or pull-down resistors R1 and R3, short R13 with 0Ω, and use the drive signal from connector P1.

If precision UVLO operation is desired, program enable divider R_5 and R_6 such that:

$$R6 = 10k – 100k, \text{ nominal}$$

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

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:

$$V_{HYST} = 80mV\frac{R5+R6}{R6}$$

VOLTAGE INPUT-TO-OUTPUT CONTROL (VIOC) IMPLEMENTATION

To implement the VIOC function for this regulator, set R27 to 0Ω. Refer to the “Configuration Settings” section in the Demo Manual for the LDO board and use the following configuration for this board.

Table 3. VIOC Cross-Reference Designators

VIOC SETTING REFERENCES	R_{BOT}	R_{TOP}	R_{MAX}
V_{OUT} Reference Designators	R8	R6	R14

$$V_{LDOIN} - V_{LDOOUT} = V_{VIOC} = -0.80V_{FB}\left(\frac{R_{BOT}+R_{TOP}}{R_{BOT}}\right)$$

$$V_{(MAX)LDOIN} = -0.80V_{FB}\left(\frac{R_{BOT}+R_{TOP}+R_{MAX}}{R_{BOT}}\right)+\left(\frac{V_{VIOC}}{40K}\right)R_{MAX}$$

The VIOC pin is designed to sink current only, and only sources via its internal 40k impedance to ground.

MODE PIN CONFIGURATION

The SCP-LT8362-I-EVALZ is configured by default for Burst Mode at light loads for efficiency. The MODE pin can also be configured to burst with spread spectrum, if desired. The table below shows the various configurations possible with the MODE pin.

Table 4. Settings for MODE Pin Configuration

MODE	R2	R4	R12
Burst Mode	0Ω	Open	Open
Burst/Spread Spectrum	100k	Open	Open
Pulse Skip	Open	Open	Open
Pulse Skip/Spread Spectrum	Open	Open	0Ω
Clock Sync/Pulse Skip	Open	0Ω	Open

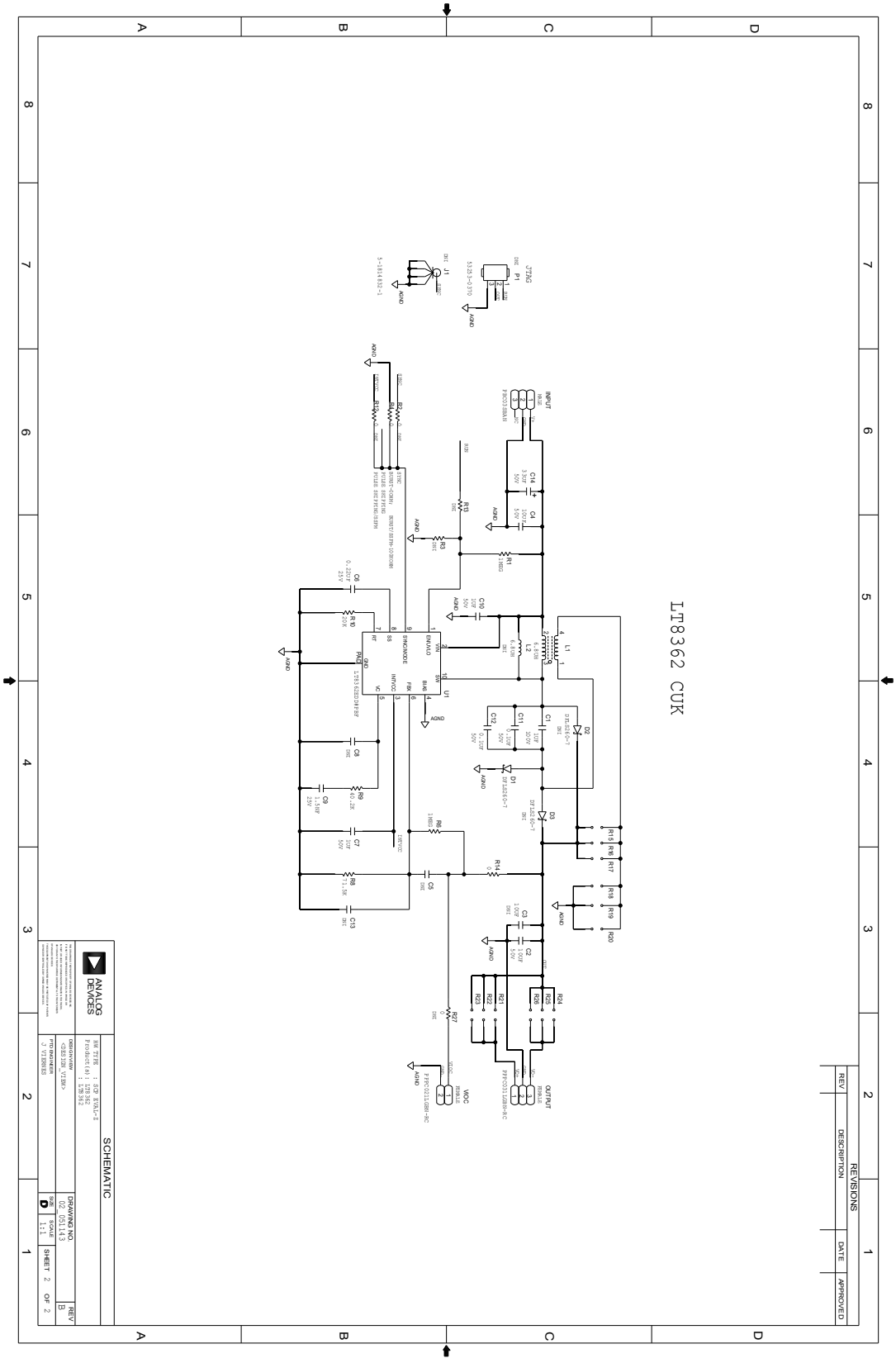
If the clock synchronization option is desired, the SCP-LT8362-I-EVALZ can be driven from an external source via the optional SMA connector J1.

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	PCB	PCB	ANALOG DEVICES 08_051143b
2	1	C1	CAP MULTILAYER CER, X7R	TAIYO YUDEN HMK316B7105KL-T
3	2	C11, C12	CAP CER 0.1UF 50V 10% X5R 0402	YAGEO CC0402KRX5R9BB104
4	1	C14	CAP ALUM 33UF 50V 20% 6.6X6.6MM	UNITED CHEMI CON EMVH500ADA330MF80G
5	2	C2, C4	CAP CER 10UF 50V X5R 1206	SAMSUNG CL31A106MBHNNNE
6	1	C3	CAP MLCC 1206 (Note 1)	N/A
7	3	C5, C8, C13	CAP MLCC 0603 (Note 1)	N/A
8	1	C6	CAP CER X7R	WURTH ELEKTRONIK885012206073
9	2	C7, C10	CAP CER 1UF 50V 10% X5R 0603	SAMSUNG CL10A105KB8NNNC
10	1	C9	CAP CER X7R, GENERAL PURPOSE	WURTH ELEKTRONIK885012207061
11	1	D1	DIO SCHOTTKY BARRIER RECTIFIER, 2A	DIODES INCORPORATED DFLS260-7
12	2	D2, D3	DIO SCHOTTKY (Note 1)	N/A
13	1	INPUT	CONN-PCB MALE HEADER 3POS 2.54MM PITCH R/A GOLD	SULLINS PBC03SBAN
14	1	J1	CONN-PCB STRAIGHT SMA PCB DIE CAST (Note 1)	TE CONNECTIVITY LTD 5-1814832-1
15	1	L1	IND POWER WIREWOUND 1.25A, 0.146OHM DCR	WURTH ELEKTRONIK74489430068
16	1	L2	IND POWER (Note 1)	N/A
17	1	OUTPUT	CONN FEMALE 3POS 2.54MM PITCH R/A GOLD	SULLINS PPPC031LGBN-RC
18	1	P1	CONN-PCB 3POS HEADER WIRE TO BRD WAFER ASSY STRAIGHT 2MM PITCH (Note 1)	MOLEX 53253-0370
19	1	R1	RES THICK FILM CHIP, GENERAL PURPOSE	YAGEO RC0805JR-071ML
20	1	R10	RES PRECISION THICK FILM CHIP	PANASONIC ERJ-6ENF2002V
21	3	R2, R12, R27	RES THICK FILM 0805 (Note 1)	N/A
22	2	R3, R13	RES THICK FILM 0805 (Note 1)	N/A
23	2	R4, R14	RES STANDARD THICK FILM CHIP JUMPER, FOR AUTOMOTIVE	VISHAY CRCW08050000Z0EA
24	1	R6	RES PRECISION THICK FILM CHIP	PANASONIC ERJ-6ENF1004V
25	1	R8	RES CHIP SMD 0805	YAGEO RC0805FR-0771K5L
26	1	R9	RES PRECISION THIN FILM CHIP	VISHAY PAT0805E4022BST1
27	1	U1	IC LOW IQ BOSS/SEPIC/INVERTING CONVERTER WITH 2A, 60V SW	LINEAR TECHNOLOGY LT8362EDD#PBF
28	1	VIOC	CONN FEMALE 2POS 2.54MM PITCH R/A GOLD	SULLINS PPPC021LGBN-RC

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

SCHEMATIC DIAGRAM



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