Signal Chain Power
LT3470A Buck Converter

DESCRIPTION

Demonstration circuit SCP-LT3470A-BEVALZ is a 40V micropower DFN buck regulator featuring the LT3470A. The board is optimized for 3.3V output at up to 250mA load current for a steady state input voltage range of 4V to 36V.

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 LT3470A. Please refer to the LT3470A datasheet for a complete description of the part.

Design files for this circuit board are available.

Table 1. Performance Summary

SYMBOL	PARAMETER	NOTES	MIN	TYP	MAX	UNITS
$V_{IN(MAX)}$	Max Input Voltage				40	V
$V_{OUT(MAX)}$	Max Output Voltage				16	V
$I_{OUT(MAX)}$	Max Output Current				250	mA

BOARD IMAGE

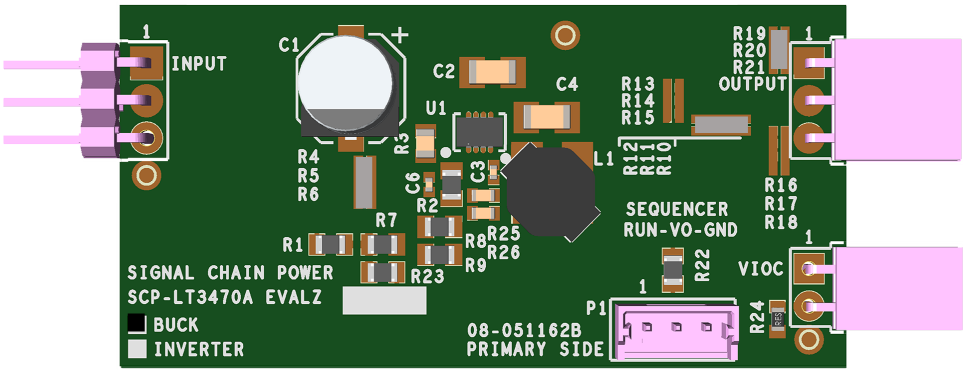


Figure 1. SCP-LT3470A-BEVALZ Board

QUICK START PROCEDURE

Demonstration circuit SCP-LT3470A-BEVALZ is easy to set up to evaluate the performance of any SCP hardware configuration.

1. The SCP-LT3470A-BEVALZ ships with a default output voltage of 5V. 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-LT3470A-BEVALZ (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-LT3470A-BEVALZ 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.

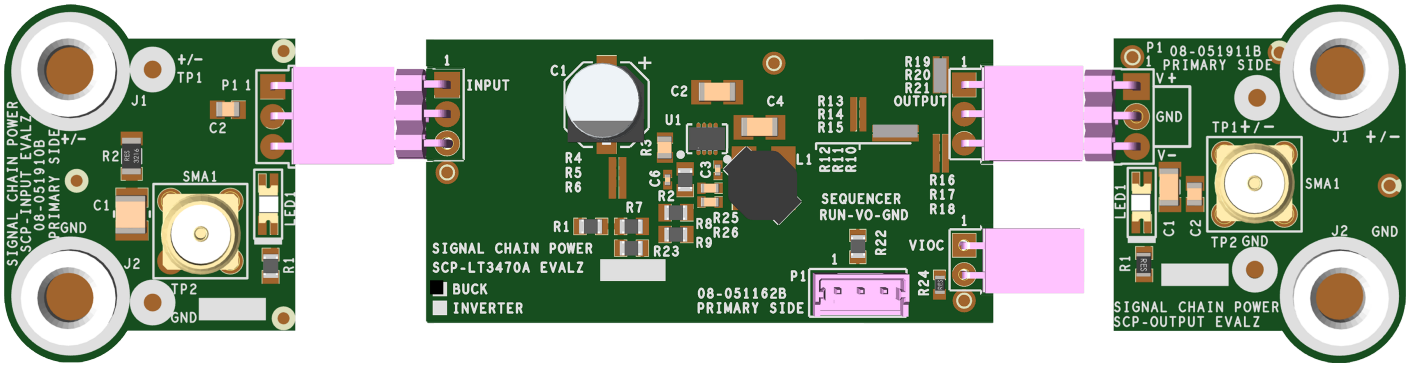


Figure 2. Proper Measurement Equipment Setup (Use SMA connectors for Measuring Input or Output Ripple)

CONFIGURATION SETTINGS

Demonstration circuit SCP-LT3470A-BEVALZ is a 40V micropower DFN buck regulator featuring the LT3470A. The board is optimized for 3.3V output at up to 250mA load current for a steady state input voltage range of 4V to 36V.

The output of the SCP-LT3470A-BEVALZ is resistor-programmable from 3V to 16V. The board can be also configured to drive VIOC-capable LDO regulators.

OUTPUT VOLTAGE PROGRAMMING

$$V_{OUT} = 1.25V_{FB}\left(1+\frac{R2}{R3}\right)$$

Table 2. Resistor Selection Guide for Common Output Voltages

V_{OUT} (V)	R2 (Ω)	R3 (Ω)
3.0	140k	100k
3.3	115k	69.8k
3.5	107k	59.0k
4.0	165k	75.0k
4.5	294k	113k
5.0	102k	34.0k
5.5	340k	100k
6.0	523k	137k
6.5	150k	35.7k
7.0	107k	23.2k
7.5	590k	118k
8.0	576k	107k
8.5	162k	28.0k
9.0	806k	130k
9.5	107k	16.2k
10.0	931k	133k
11.0	107k	13.7k
12.0	118k	13.7k
13.0	187k	20.0k
14.0	102k	10.0k
15.0	110k	10.0k
16.0	118k	10.0k

$\overline{SHDN}$ PIN CONFIGURATION

The $\overline{SHDN}$ 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 R7, short R23 with 0Ω, and use the drive signal from connector P1.

VOLTAGE INPUT-TO-OUTPUT CONTROL (VIOC) IMPLEMENTATION

To implement the VIOC function for this regulator, set R_9 to 0Ω. Refer to the "Configuration Settings" section in the Demo Manual for the low-dropout (LDO) linear regulator 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	R3	R2	R8

$$V_{LDOIN} - V_{LDOOUT} = V_{VIOC} = 1.25V_{FB}\left(\frac{R_{BOT}+R_{TOP}}{R_{BOT}}\right)$$

$$V_{(MAX)LDOIN} = 1.25V_{FB}\left(\frac{R_{BOT}+R_{TOP}+R_{MAX}}{R_{BOT}}\right)+I_{SINK}R_{MAX}$$

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.

CONFIGURATION FOR V_{OUT} < 3.0V

For V_{OUT} between 1.25V and 3.0V, contact the SCP team via email at SCP@analog.com.

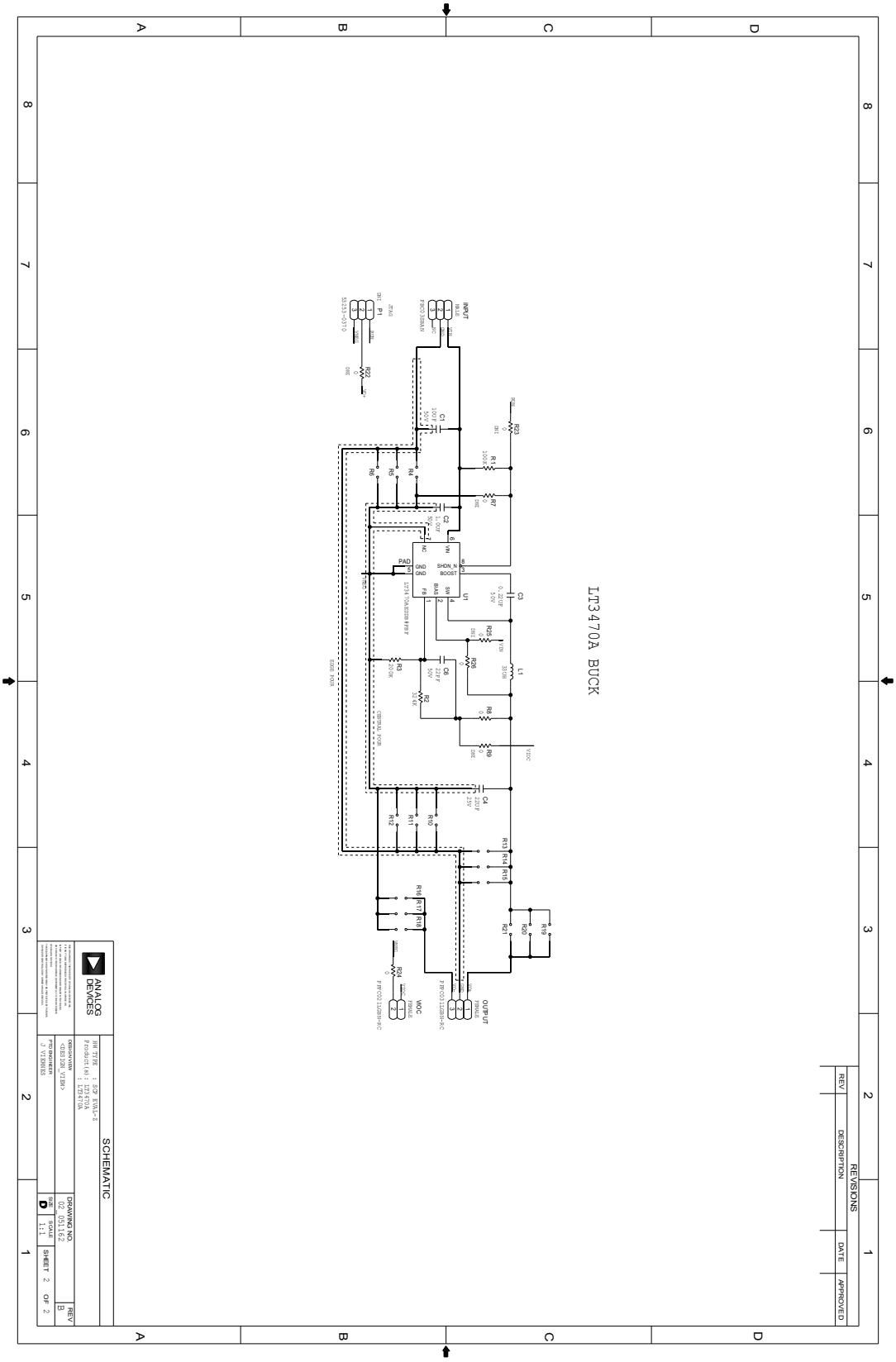
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	PCB	PCB	ANALOG DEVICES 08_051162c
2	1	C1	CAP ALUM 10UF 50V 20% RAD SMD	PANASONIC 50SVPF10M
3	1	C2	CAP CER X7R, GENERAL PURPOSE	YAGEO CC1206KKX7R9BB105
4	1	C3	CAP CER 0.22UF 50V 10% X5R 0402	TAIYO YUDEN UMK105BJ224KV-F
5	1	C4	CAP CER 22UF 10% 25V X5R 1206	SAMSUNG CL31A226KAHNNNE
6	1	C6	CAP CER NP0	YAGEO CC0402JRNP09BN220
7	1	INPUT	CONN-PCB MALE HEADER 3POS 2.54MM PITCH R/A GOLD	SULLINS PBC03SBAN
8	1	L1	IND SHIELDED POWER, 0.5OHM DCR, 0.75A	WURTH ELEKTRONIK 74408942330
9	1	OUTPUT	CONN FEMALE 3POS 2.54MM PITCH R/A GOLD	SULLINS PPPC031LGBN-RC
10	1	P1	CONN-PCB 3POS HEADER WIRE TO BRD WAFER ASSY STRAIGHT 2MM PITCH (Note 1)	MOLEX 53253-0370
11	1	R1	RES PRECISION THICK FILM CHIP 100k 1% 1/8W 0805	PANASONIC ERJ-6ENF1003V
12	1	R2	RES THICK FILM 324k 1% 1/8W 0805	VISHAY CRCW0805324KFKEA
13	2	R24, R25	RES FILM SMD 0603 (Note 1)	N/A
14	1	R26	RES FILM SMD 0-Ohm 5% 0.1W 0603	PANASONIC ERJ-3GEY0R00V
15	1	R3	RES THICK FILM 0805 200k 1% 1/8W	PANASONIC ERJ-6ENF2003V
16	4	R7, R9, R22, R23	RES STANDARD THICK FILM CHIP JUMPER 0805 (Note 1)	N/A
17	1	R8	RES STANDARD THICK FILM CHIP JUMPER, FOR AUTOMOTIVE	VISHAY CRCW08050000Z0EA
18	1	U1	IC MICROPWR BUCK REGULATOR	LINEAR TECHNOLOGY LT3470AEDDB#PBF
19	1	VIOC	CONN FEMALE 2POS 2.54MM PITCH R/A GOLD	SULLINS PPPC021LGBN-RC

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

Note 2. Locations R4–R6, R10–R12, R19–R21 are shorted with 0Ω resistors for the Positive Buck option; R13–R15, R16–R18 are DNI.

SCHEMATIC DIAGRAM



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.