Signal Chain Power
LT3463 Dual Output Converter

DESCRIPTION

Demonstration circuit SCP-LT3463-EVALZ is a dual output DC-DC converter designed to create a dual polarity regulated voltage for powering several signal chains. The positive regulator is a boost converter (with 20V output) while the other is an inverting charge pump (with –20V output).

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 LT3463. Please refer to the LT3463 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				15	V
$V_{OUT(MAX)}$	Max Output Voltage	Positive V_{OUT}			+40	V
		Negative V_{OUT}			–40	V
$I_{SW(LIM)}$	Switch Current Limit		180	250	320	mA

BOARD IMAGE

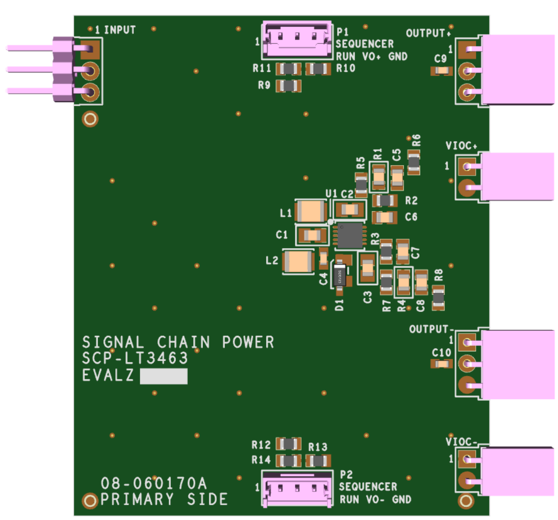


Figure 1. SCP-LT3463-EVALZ Board

QUICK START PROCEDURE

Demonstration circuit SCP-LT3463-EVALZ is easy to set up to evaluate the performance of any SCP hardware configuration.

1. The SCP-LT3463-EVALZ ships with default output voltages of 20V and –20V, respectively. 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-LT3463-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-LT3463-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 voltages. 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.

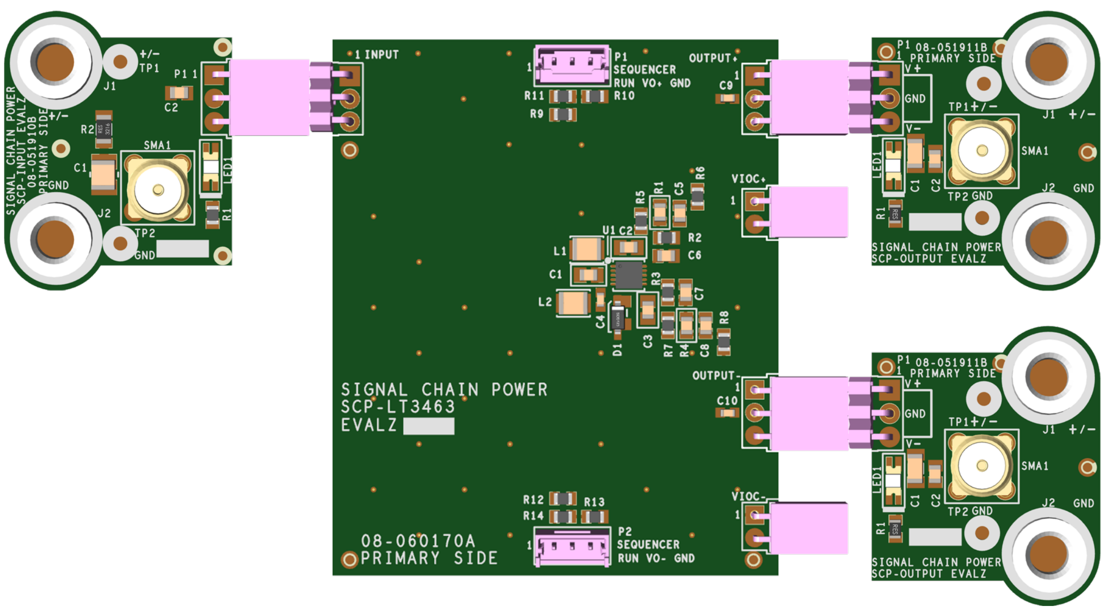


Figure 2. Proper Measurement Equipment Setup (Use SMA connectors for Measuring Input or Output Ripple)

CONFIGURATION SETTINGS

Demonstration circuit SCP-LT3463-EVALZ is a dual output DC-DC converter designed to create a dual polarity regulated voltage for powering several signal chains. The positive regulator is a boost converter (with 20V output) while the other is an inverting charge pump (with –20V output).

Each output of the SCP-LT3463-EVALZ is resistor-programmable from |5V| to |40V|. The board can be also configured to drive VIOC-capable linear regulators.

OUTPUT VOLTAGE PROGRAMMING

$$+V_{OUT} = 1.25V\left(1+\frac{R_1}{R_2}\right)$$

$$-V_{OUT} = 1.25V\left(\frac{R_4}{R_3}\right)$$

Table 2. Resistor Selection Guide for Common Output Voltages

$\lvert V_{OUT}\rvert$ (V)	R1 (Ω)	R2 (Ω)	R3 (Ω)	R4 (Ω)
5.0	200k	66.5k	49.9k	200k
5.5	340k	100k	76.8k	340k
6.0	523k	137k	110k	523k
6.5	261k	61.9k	49.9k	261k
7.0	1.07M	232k	191k	1.07M
7.5	590k	118k	97.6k	590k
8.0	1.0M	187k	154k	1.0M
8.5	340k	59k	49.9k	340k
9.0	806k	130k	113k	806k
9.5	1.07M	162k	140k	1.07M
10.0	931k	133k	115k	931k
11.0	1.07M	137k	121k	1.07M
12.0	1.18M	137k	124k	1.18M
13.0	1.87M	200k	178k	1.87M
14.0	1.02M	100k	90.9k	1.02M
15.0	1.0M	90.9k	82.5k	1.0M
16.0	1.18M	100k	93.1k	1.18M
17.0	1.15M	90.9k	84.5k	1.15M
18.0	2.21M	165k	154k	2.21M
19.0	1.02M	71.5k	66.5k	1.02M
20.0	1.0M	66.5k	61.9k	1.0M
24.0	1.82M	100k	95.3k	1.82M
30.0	1.21M	52.3k	49.9k	1.21M
36.0	1.43M	51.1k	49.9k	1.43M
40.0	1.69M	54.9k	49.9k	1.62M

$\overline{\text{SHDN}}$ PIN CONFIGURATION

The $\overline{\text{SHDN}}$ pins ($\overline{\text{SHDN1}}$ and $\overline{\text{SHDN2}}$) are tied to the optional SCP Run/Sequence headers P1 and P2. To create a harness for this function, use Molex part 0510650300 with crimp pin 50212-8000.

To use an active run signal, use a 100kΩ resistor for either pull-up or pull-down resistors R9, R10, R12 and R13, short R11 and R14 with 0Ω, respectively, and use the drive signal from connectors P1 and P2.

VOLTAGE INPUT-TO-OUTPUT CONTROL (VIOC) IMPLEMENTATION

To implement the VIOC function for both regulators, set R6 and R8 to 0Ω, respectively. 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 for V_{OUT1}	R2	R1	R5
V_{OUT} Reference Designators for V_{OUT2}	R3	R4	R7

Positive VIOC Equations

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

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

I_{SINK} is the current through R_{MAX} which is typically 15µA. Since the divider current is fixed due to the internal low side gain setting feedback resistor and is less than the recommended divider current of 100µA, the effect of the sink current on the maximum linear regulator input voltage cannot not be mitigated and should be taken into consideration.

Negative VIOC Equations

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

$$V_{(MAX)LDOIN} = -1.25\left(\frac{R_{TOP} + R_{MAX}}{R_{BOT}}\right) + V_{VIOC}\left(\frac{R_{MAX}}{40k}\right)$$

Because the V_{LDOIN} term is simply the sum of the final output voltage after the LDO and the difference the LT3463 is adding on top, it can be helpful to take the desired final output voltage, add 1.0V, and then look up that voltage-resistor combination from Table 2.

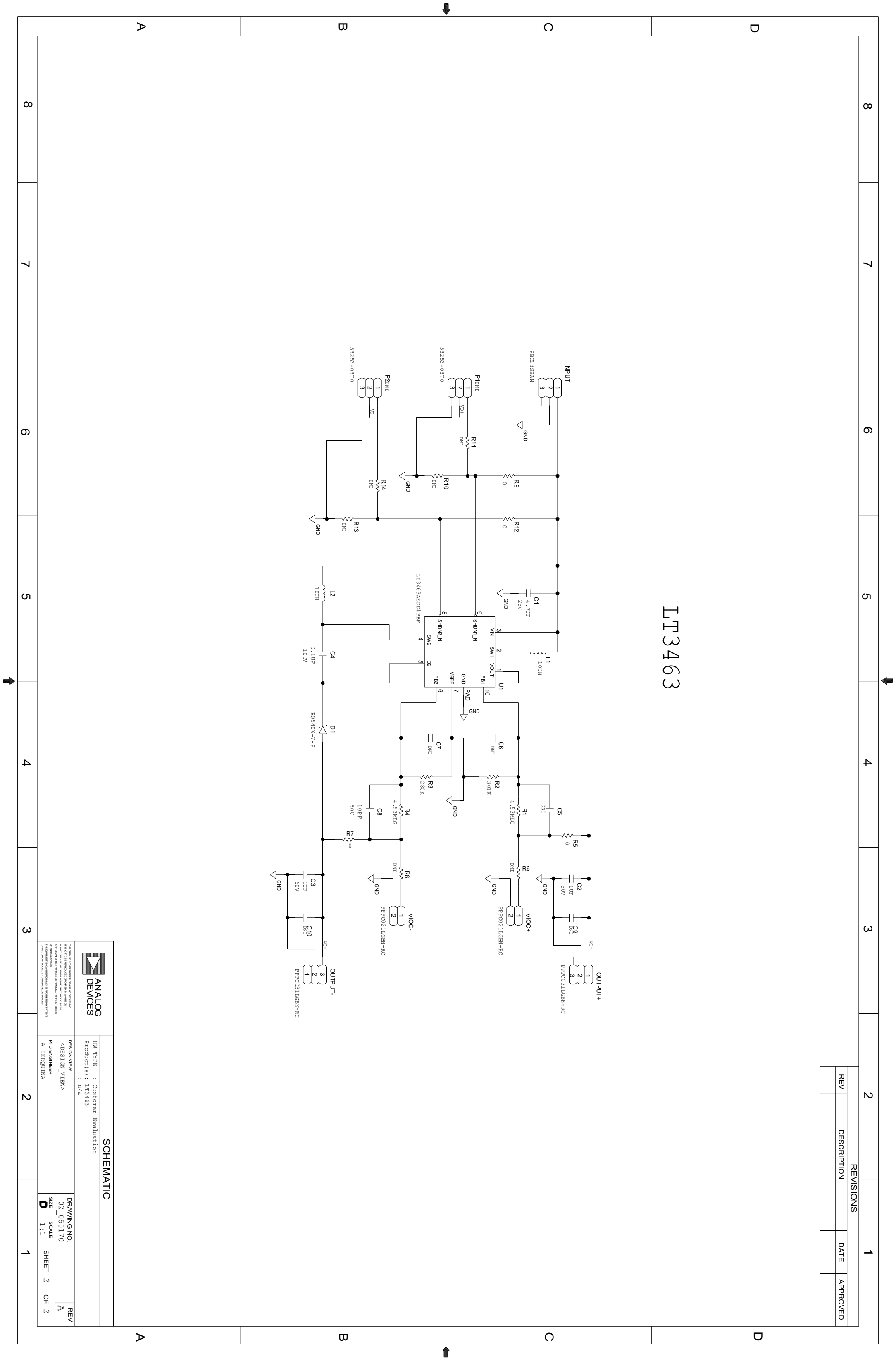
R_{MAX} can then be obtained by figuring out the difference between the maximum and nominal output voltage of the LT3463, divided by the current through the internal R_{BOT} resistor, which is $1.25/R_{BOT}$.

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	PCB	PRINTED CIRCUIT BOARD	ANALOG DEVICES 08_060170a
2	1	C1	CAP 4.7uF 25V CER X5R 0805	SAMSUNG CL21A475KAQNNNG
3	2	C9, C10	CAP MLCC 0603 (Note 1)	N/A
4	2	C2, C3	CAP 1uF 50V CER X7R 0805	SAMSUNG CL21B105KBFNNNE
5	1	C4	CAP 0.1uF 100V CER X7R 0603	SAMSUNG CL10B104KC8NNNC
6	3	C5, C6, C7	CAP MLCC 0805 (Note 1)	N/A
7	1	C8	CAP 10pF 50V CER NP0 0805	AVX 08055A100JAT2A
8	1	D1	DIODE SCHOTTKY BARRIER RECTIFIER	DIODES INC B0540W-7-F
9	1	INPUT	CONN MALE 3POS 2.54MM PITCH R/A	SULLINS PBC03SBAN
10	2	L1, L2	IND 10uH 0.45A 0.39-OHM	MURATA LQH32CN100K53L
11	2	OUTPUT+, OUTPUT-	CONN FEMALE 3POS 2.54MM PITCH R/A	SULLINS PPPC031LGBN-RC
12	2	P1, P2	CONN-PCB 3POS HEADER WIRE TO BRD WAFER ASSY STRAIGHT 2MM PITCH	MOLEX 53253-0370
13	2	R1, R4	RES 4.53M 1% THICK FILM 0805	VISHAY CRCW08054M53FKEA
14	6	R6, R8, R10, R11, R13, R14	RES THICK FILM 0805 (Note 1)	N/A
15	4	R5, R7, R9, R12	RES 0-OHM 1% THICK FILM 0805	VISHAY CRCW08050000Z0EA
16	1	R2	RES 301K 1% THICK FILM 0805	PANASONIC ERA-6AEB3013V
17	1	R3	RES 280K 1% THICK FILM 0805	PANASONIC ERA-6AEB2803V
18	1	U1	IC DUAL MICROPOWER DC/DC CONVERTER WITH SCHOTTKY DIODES	ANALOG DEVICES LT3463AEDD#PBF
19	2	VIOC+, VIOC-	CONN FEMALE 2POS 2.54MM PITCH R/A	SULLINS PPPC021LGBN-RC

Note 1. These items are not stuffed (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.

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