

# LT3507

## Triple Monolithic Step-Down Regulator with LDO

### DESCRIPTION

Demo circuit 1161B is a triple monolithic step-down regulator with LDO featuring LT<sup>®</sup>3507. The demo circuit is designed for 1.8V, 3.3V, 5.0V and 2.5V outputs from a 7V to 36V input. The current capability of each channel is 2.4A, 1.3A, 1.4A and 0.2A respectively. Independent input voltage, feedback, soft-start and power good pins for each channel simplify complex power supply tracking/sequencing requirements.

All three converters are either synchronized to a common external clock input or single-resistor programmable from 250kHz to 2.5MHz using internal oscillator. At all frequencies, a 180° phase shift between  $V_{OUT1}$  and the other two outputs is maintained, reducing input voltage ripple and component size. Programmable frequency allows for optimization between efficiency and external component size.

Each output can be independently disabled using its own soft-start pin, or by using the SHDN pin the entire part can be placed in a low quiescent current shutdown mode.

The LT3507 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for demo circuit 1161B.

**Design files for this circuit board are available at <http://www.linear.com/demo>**

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### PERFORMANCE SUMMARY (T<sub>A</sub> = 25°C)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		7V
Maximum Input Voltage		36V
Output Voltage $V_{OUT1}$	$V_{IN} = 7V \sim 36V$	1.80V $\pm 3\%$
Output Voltage $V_{OUT2}$	$V_{IN} = 7V \sim 36V$	3.33V $\pm 3\%$
Output Voltage $V_{OUT3}$	$V_{IN} = 7V \sim 36V$	5.0V $\pm 3\%$
Output Voltage $V_{OUT4}$	$V_{IN} = 7V \sim 36V$	2.52V $\pm 3\%$
Switching Frequency		450kHz $\pm 10\%$
Maximum Output Current $I_{OUT1}$	$V_{IN} = 7V \sim 36V$	2.4A
Maximum Output Current $I_{OUT2}$	$V_{IN} = 7V \sim 36V$	1.3A
Maximum Output Current $I_{OUT3}$	$V_{IN} = 7V \sim 36V$	1.4A
Maximum Output Current $I_{OUT4}$	$V_{IN} = 7V \sim 36V$	0.2A
Voltage Ripple $V_{OUT1}$	$V_{IN} = 12V, I_{OUT1} = 2.4A$	<20mV
Voltage Ripple $V_{OUT2}$	$V_{IN} = 12V, I_{OUT2} = 1.3A$	<20mV
Voltage Ripple $V_{OUT3}$	$V_{IN} = 12V, I_{OUT3} = 1.4A$	<20mV
Voltage Ripple $V_{OUT4}$	$V_{IN} = 12V, I_{OUT4} = 0.2A$	<10mV

## QUICK START PROCEDURE

Demo circuit 1161B is easy to set up to evaluate the performance of the LT3507. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

Note: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the VIN or VOUT and GND terminals. See Figure 2 for proper scope probe technique.

1. With power off, connect the input power supply to VIN and GND.

2. Turn on the power at the input.

Note: Make sure that the input voltage does not exceed 36V.

3. Check for the proper output voltages.

Note: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

4. Once the proper output voltages are established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

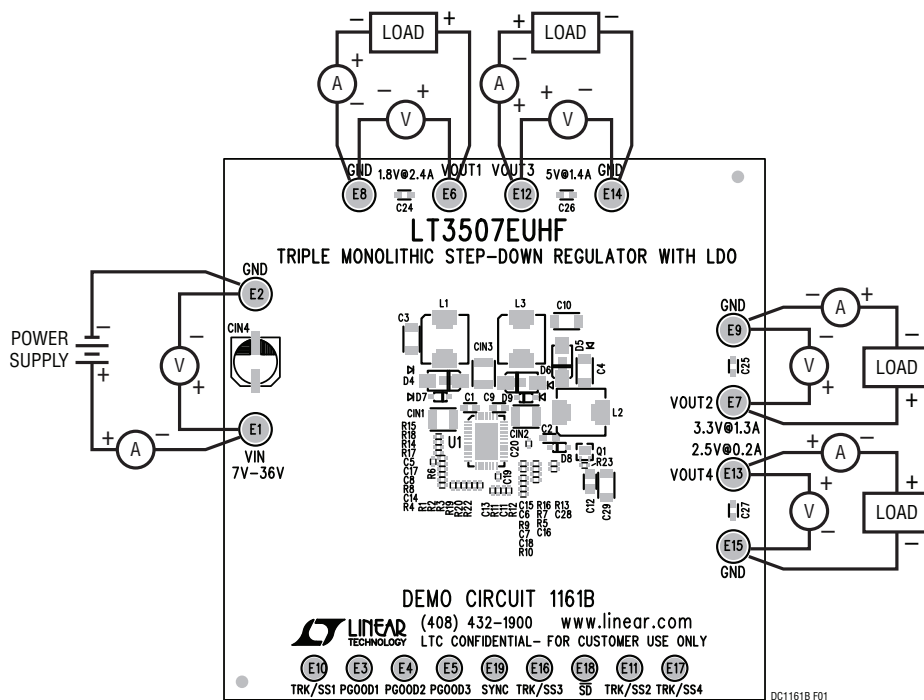


Figure 1. DC1161B Proper Equipment Setup

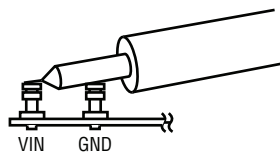


Figure 2. Measuring Input or Output Ripple

## SYNC FUNCTION

Install a 10k R20 resistor if the board is synchronized from an external signal generator.

## EMI FILTER

Install EMI filters on the backside of the DC1161, however, a trace cut is required for the insertion of the option circuit. See Figure 3 for the cut line.

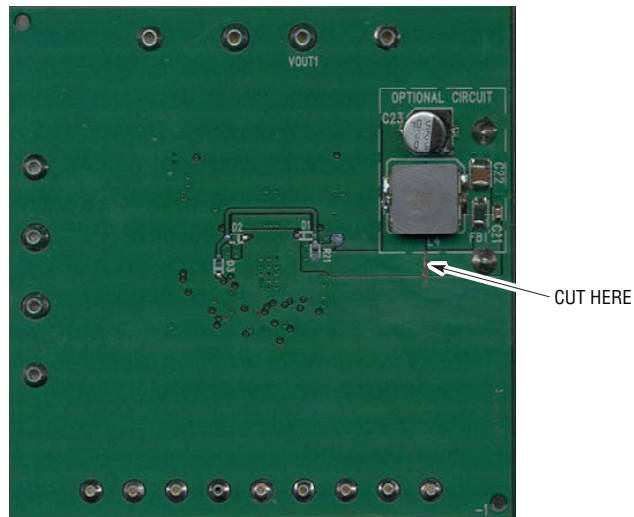


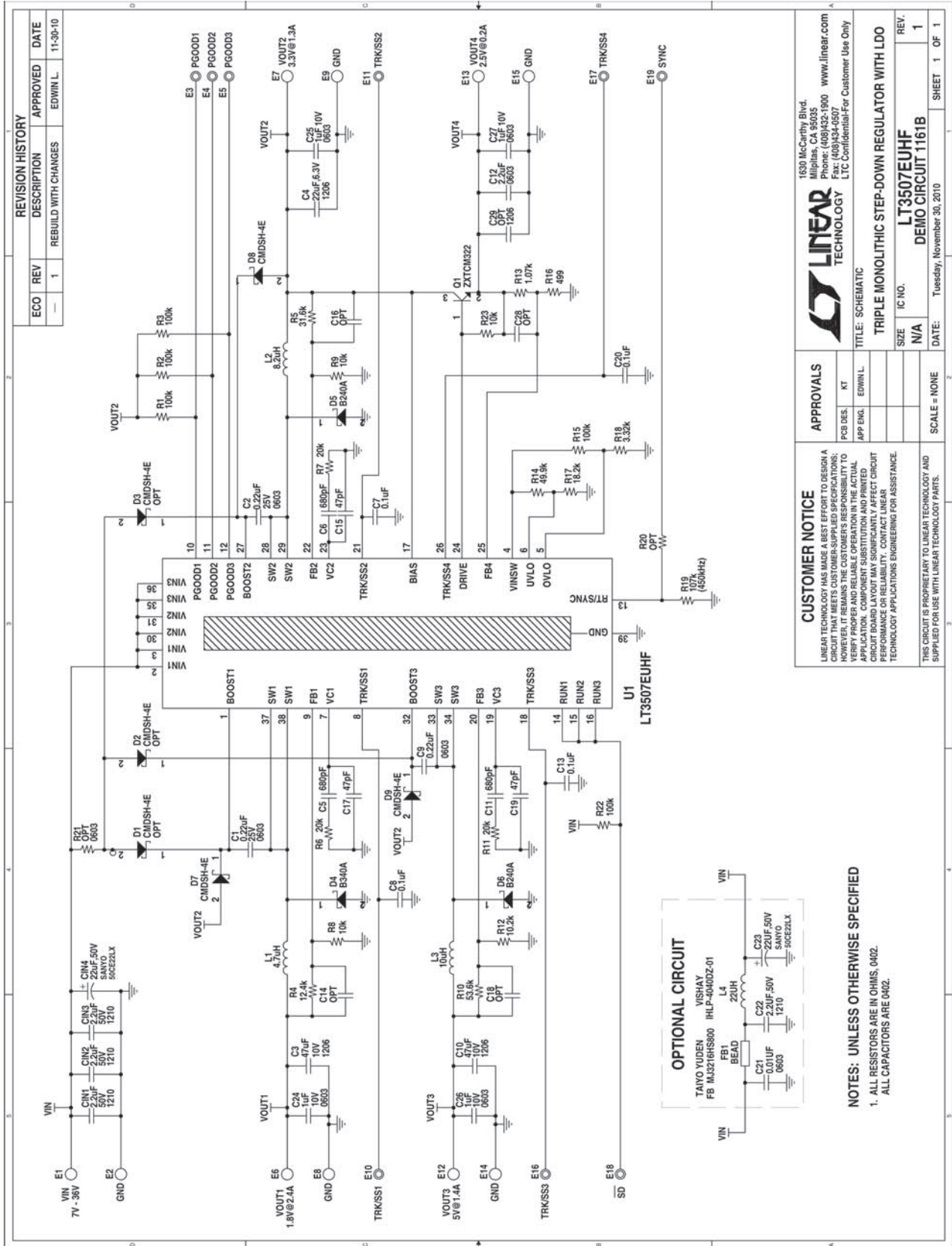
Figure 3. Cut Line for the EMI Filter Installation

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## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER / PART #
<b>Required Circuit Components</b>				
1	3	CIN1, CIN2, CIN3	CAP., X7R, 2.2 $\mu$ F, 50V, 10%, 1210	TDK, C3225X7R1H225K
2	3	C1, C2, C9	CAP., X7R, 0.22 $\mu$ F, 25V, 10%, 0603	TDK, C1608X7R1E224K
3	2	C3, C10	CAP., X5R, 47 $\mu$ F, 10V, 20%, 1206	TAIYO YUDEN, LMK316BJ476ML-T
4	1	C4	CAP., X5R, 22 $\mu$ F, 6.3V, 20%, 1206	TAIYO YUDEN, JMK316BJ226ML
5	3	C5, C6, C11	CAP., X7R, 680pF, 50V, 10%, 0402	AVX, 04025C681KAT
6	4	C7, C8, C13, C20	CAP., X5R, 0.1 $\mu$ F, 10V, 10%, 0402	AVX, 0402ZD104KAT
7	1	C12	CAP., X5R, 2.2 $\mu$ F, 6.3V, 20%, 0603	TAIYO YUDEN, JMK107BJ225MA
8	3	C15, C17, C19	CAP., NPO, 47pF, 50V, 5%, 0402	AVX, 04025A470JAT
9	1	D4	DIODE, SCHOTTKY, B340A, SMA-DIODE	DIODES INC., B340A
10	2	D6, D5	DIODE, SCHOTTKY, B240A, SMA-DIODE	DIODES INC., B240A
11	3	D7, D8, D9	DIODE, SCHOTTKY, CMDSH-4E, SOD323	CENTRAL SEMI., CMDSH-4E
12	1	L1	IND., 4.7 $\mu$ H	NIC, NPIM74C4R7MTRF
13	1	L2	IND., 8.2 $\mu$ H	NIC, NPIM74C8R2MTRF
14	1	L3	IND., 10 $\mu$ H	NIC, NPIM74C100MTRF
15	1	Q1	XTOR, NPN, 50V LOW SATURATION, MLP322	ZETEX, ZXTCM322TA
16	5	R1, R2, R3, R15, R22	RES., CHIP, 100k, 1/16W, 1%, 0402	YAGEO, RC0402FR-07100KL
17	1	R4	RES., CHIP, 12.4k, 1/16W, 1%, 0402	VISHAY, CRCW040212K4FKEA
18	1	R5	RES., CHIP, 31.6k, 1/16W, 1% 0402	VISHAY, CRCW040231K6FKEA
19	3	R6, R7, R11	RES., CHIP, 20k, 1/16W, 1% 0402	VISHAY, CRCW040220K0FKEA
20	3	R8, R9, R23	RES., CHIP, 10k, 1/16W, 1% 0402	YAGEO, RC0402FR-0710KL
21	1	R10	RES., CHIP, 53.6k, 1/16W, 1% 0402	VISHAY, CRCW040253K6FKEA
22	1	R12	RES., CHIP, 10.2k, 1/16W, 1% 0402	NIC, NRC04F1022TRF
23	1	R13	RES., CHIP, 1.07k, 1/16W, 1% 0402	YAGEO, RC0402FR-071K07L
24	1	R14	RES., CHIP, 49.9k, 1/16W, 1% 0402	VISHAY, CRCW040249K9FKEA
25	1	R16	RES., CHIP, 499 $\Omega$ , 1/16W, 1% 0402	AAC, CR05-4990FM
26	1	R17	RES., CHIP, 18.2k, 1/16W, 1% 0402	VISHAY, CRCW040218K2FKEA
27	1	R18	RES., CHIP, 3.32k, 1/16W, 1% 0402	VISHAY, CRCW04023K32FKEA
28	1	R19	RES., CHIP, 107k, 1/16W, 1% 0402	AAC, CR05-1073FM
29	1	U1	I.C., LT3507EUF, QFN38UHF	LINEAR TECH., LT3507EUFH
<b>Additional Demo Board Circuit Components</b>				
1	1	CIN4	CAP., ELECTROLYTIC, 22 $\mu$ F, 50V	SANYO, 50CE22LX
2	0	C14, C16, C18	CAP., 0402	OPT
3	0	C21	CAP., X7R, 0.01 $\mu$ F, 50V, 10%, 0603	OPT
4	0	C22	CAP., X7R, 2.2 $\mu$ F, 50V, 10%, 1210	OPT
5	0	C23	CAP., ELECTROLYTIC, 22 $\mu$ F, 50V	OPT
6	4	C24-C27	CAP., X5R, 1 $\mu$ F, 10V, 10%, 0603	MURATA, GRM188R61A105K
7	0	C28	CAP., 0402	OPT
8	0	C29	CAP., 1206	OPT
9	0	D1, D2, D3	DIODE, SCHOTTKY, CMDSH-4E, SOD323	OPT
10	0	FB1	BEAD, 1206 OPT	TAIYO YUDEN, FB MJ3216HS800
11	0	L4	IND., 22 $\mu$ H, OPT	VISHAY, IHLP4040DZER220-M01
12	0	R20	RES., CHIP, 0402	OPT
13	0	R21	RES., CHIP, 0603	OPT
<b>Hardware-For Demo Board Only</b>				
1	10	E1, E2, E6-E9, E12-E15	TP, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	9	E3, E4, E5, E10, E11, E16-E19	TP, TURRET, 0.064"	MILL-MAX, 2308-2-00-44

SCHEMATIC DIAGRAM



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Mailing Address:

Linear Technology  
1630 McCarthy Blvd.  
Milpitas, CA 95035

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