LT8582
Dual 3A Boost/Inverting/SEPIC DC/DC Converter

DESCRIPTION

Demonstration circuit 1734A features the dual channel LT®8582 in boost and inverting regulator configurations. The circuit is designed to convert a 5V to 10V input source to 12V at 900mA and –12V at 590mA as shown in Table 1.

Table 1. Maximum Guaranteed Output Currents

V_{IN} (V)	MAX I_{LOAD1} (mA)	MAX I_{LOAD2} (mA)
4.5	775	540
5.0	900	590
5.5	1000	625

To limit the temperature rise of the chip to 40°C, on the demo board with no air flow, the maximum combined output power is 15W. Additional input bulk capacitance may be needed, subject to source impedance.

DC1734A is designed to survive output short circuit events. On the positive channel an external disconnect MOSFET protects the boost converter. The negative channel is based on dual inductor inverting topology and does not need the external MOSFET as it is inherently output short protected. The circuit board includes an option to install the external disconnect MOSFET at the input side of the positive channel. To use it, remove Q1 and R1 from the top of the circuit board and install them on the back, in the location of Q2 and R2. Then, place a jumper from Q1's source to drain and cut the top copper as shown in Figure 6.

To change the topology of channel 1 from boost to inverting: Replace D1 with a capacitor similar to C12, replace C2 with a diode similar to D3, placing the diode so that its cathode is connected to ground, and replace R16 with an inductor similar to L3.

To change the topology of channel 2 from inverting to boost: Replace C12 with a diode similar to D1, placing the diode so that its anode is connected to L2, replace D3 with a capacitor similar to C2, and replace L3 with a jumper resistor similar to R16. However, this configuration will not be output short protected since it lacks the external disconnect MOSFET.

Each channel of the LT8582 includes a 42V master and slave power switch combination with 3A total current and can easily be configured as a boost, SEPIC, inverting or flyback converter. The LT8582 has a 2.5V to 22V operating input range, UVLO, soft-start, programmable switching frequency and many other features. The LT8582 data sheet gives a complete description of the part, its operation and application information. The data sheet must be read in conjunction with this quick start guide for working on or modifying the demo circuit 1734A.

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

PERFORMANCE SUMMARY (T_A = 25°C)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		5		10	V
V_{OUT1}	Channel 1 Output Voltage Accuracy	V_{IN} = 5V to 10V, I_{LOAD} = 900mA	11.6	12	12.4	V
	Channel 1 Output Voltage Ripple	V_{IN} = 5V, I_{LOAD} = 900mA		60		mV_{PP}
	Channel 1 Efficiency	V_{IN} = 5V, I_{LOAD} = 900mA		86		%
	Channel 1 Efficiency	V_{IN} = 10V, I_{LOAD} = 900mA		92		%
V_{OUT2}	Channel 2 Output Voltage Accuracy	V_{IN} = 5V to 10V, I_{LOAD} = 590mA	–11.5	–12	–12.3	V
	Channel 2 Output Voltage Ripple	V_{IN} = 5V, I_{LOAD} = 590mA		56		mV_{PP}
	Channel 2 Efficiency	V_{IN} = 5V, I_{LOAD} = 590mA		83		%
	Channel 2 Efficiency	V_{IN} = 10V, I_{LOAD} = 590mA		85		%
f_S	Switching Frequency			1		MHz

QUICK START PROCEDURE

Demonstration circuit DC1734A is easy to set up to evaluate the performance of the LT8582. Refer to Figure 1 for proper measurement equipment set-up and follow the procedure below.

To measure voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Remove the oscilloscope probe end cap and ground lead and set the bandwidth limit on the oscilloscope. Measure the input voltage ripple by touching the probe tip and ground directly across V_{IN} and GND terminals. See Figure 2 for proper input voltage ripple measurement technique. Measure the positive output voltage ripple by touching the probe tip directly across output capacitor C16 terminals, connecting the probe ground terminal to the board's GND plane. Measure the negative output voltage ripple by touching the probe tip directly across output capacitor C9, connecting the probe ground terminal to the board's GND plane. See Figure 3 for proper output voltage ripple measurement technique.

1. Place the on board jumpers in the following positions:

   To activate boost converter: **JP1** ON

   To activate inverting converter: **JP2** ON

2. With power off, connect the input power supply to V_{IN} and GND. Apply 7.5V to the input (source must have greater than 10A capability).

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 voltage is established, adjust the load and the input voltage within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters. The efficiency graphs of the two channels are provided in Figure 4 and Figure 5.

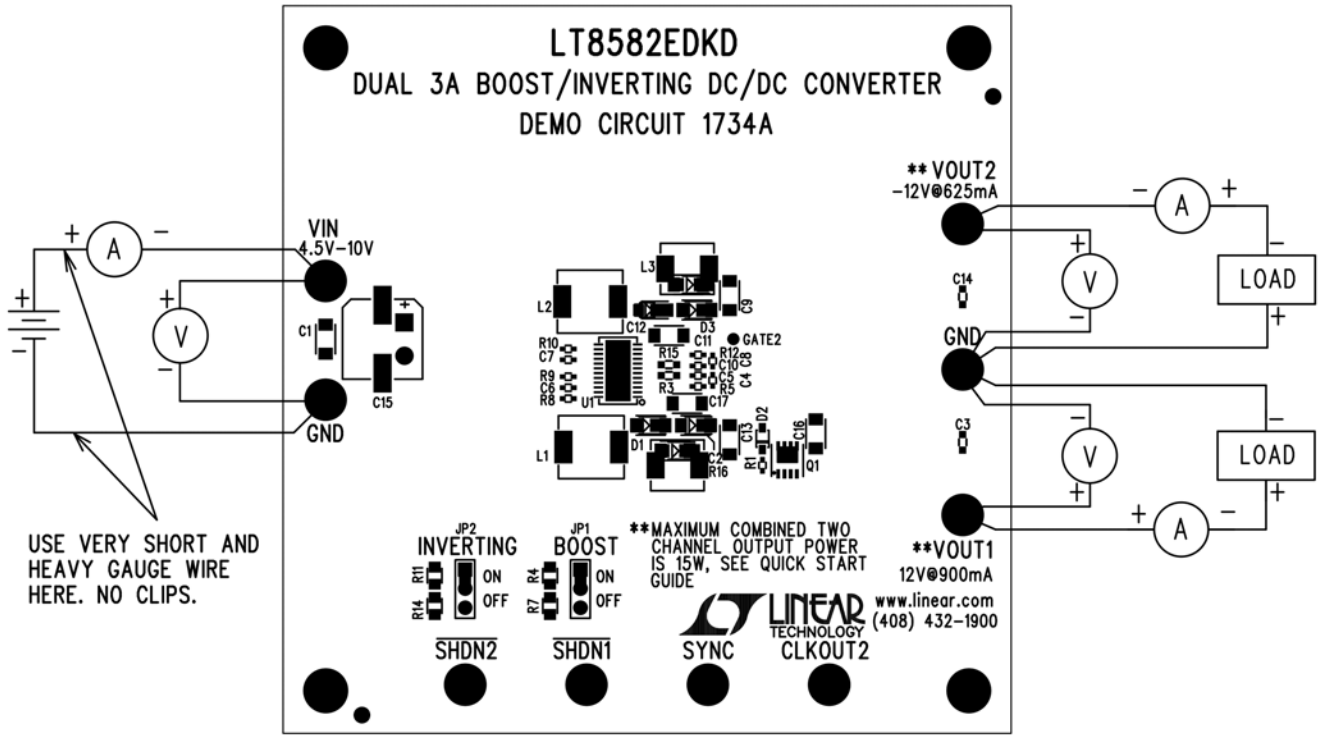


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

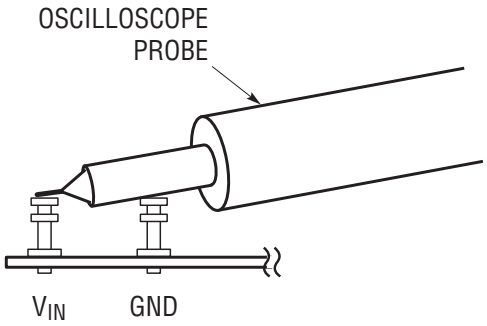


Figure 2. Proper Input Voltage Ripple Measurement Technique

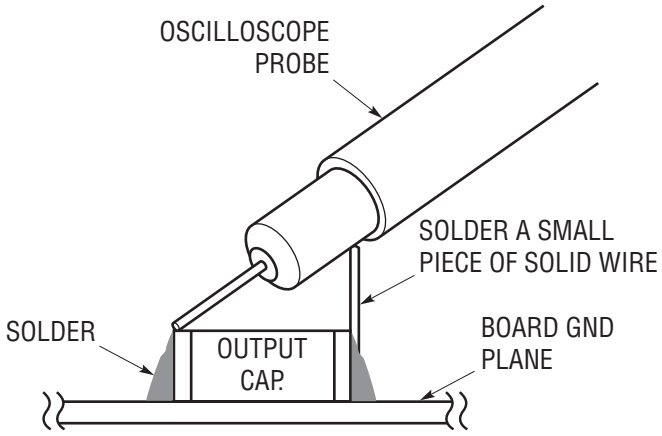


Figure 3. Proper Output Voltage Ripple Measurement Technique

QUICK START PROCEDURE

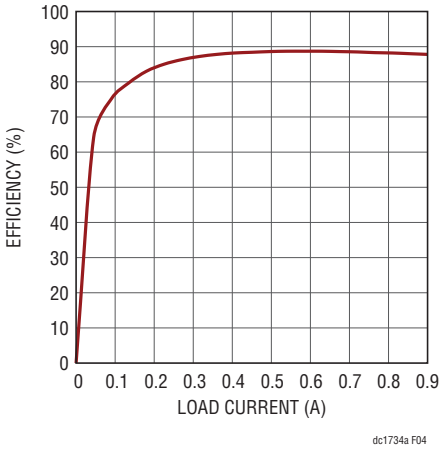


Figure 4. Channel 1 Boost Regulator Efficiency at V_{IN} = 5V

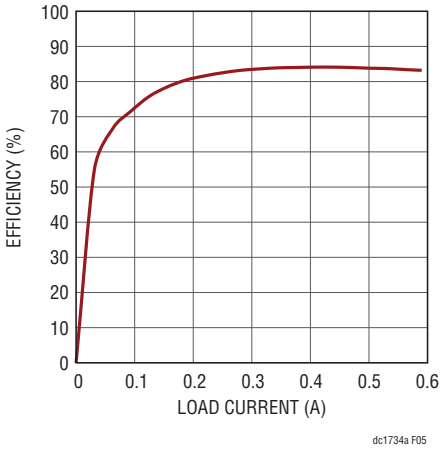


Figure 5. Channel 2 Inverting Regulator Efficiency at V_{IN} = 5V

BOARD MODIFICATIONS

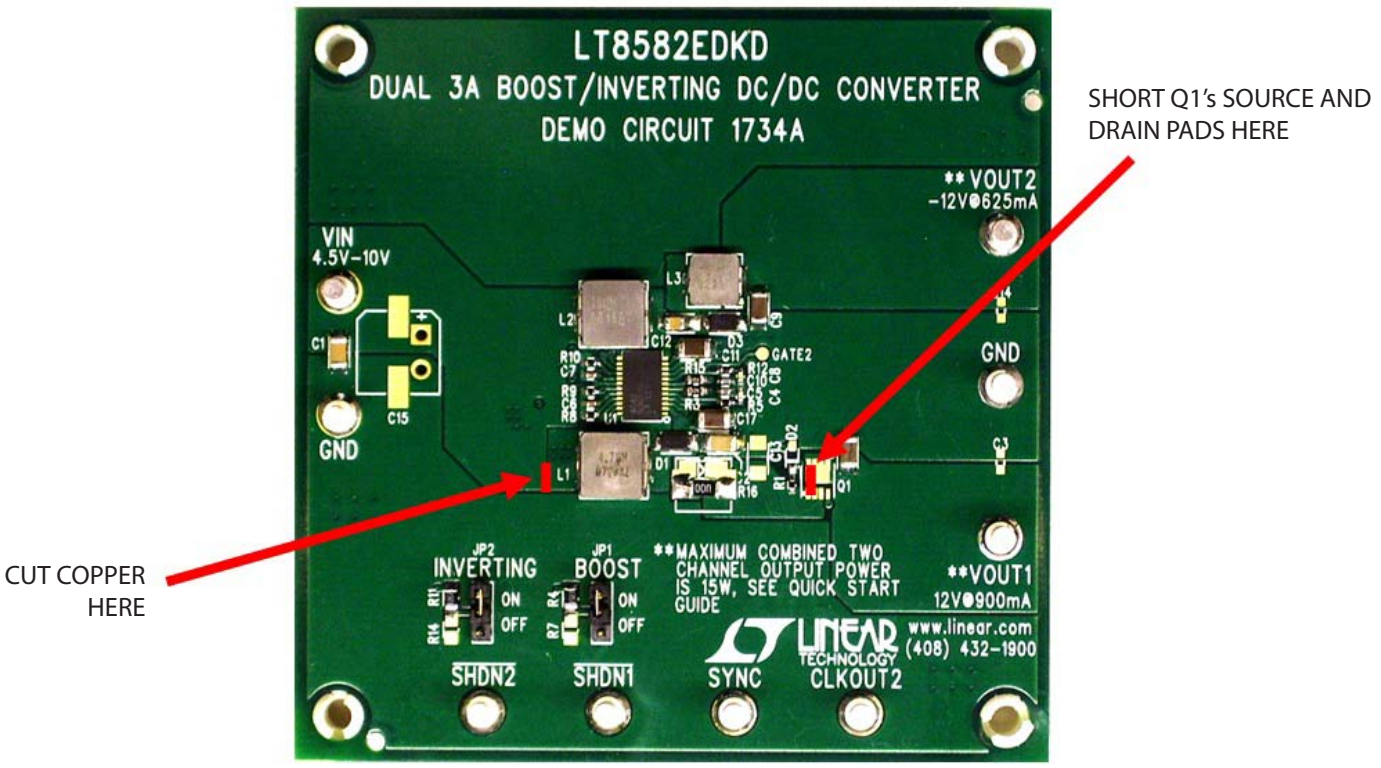
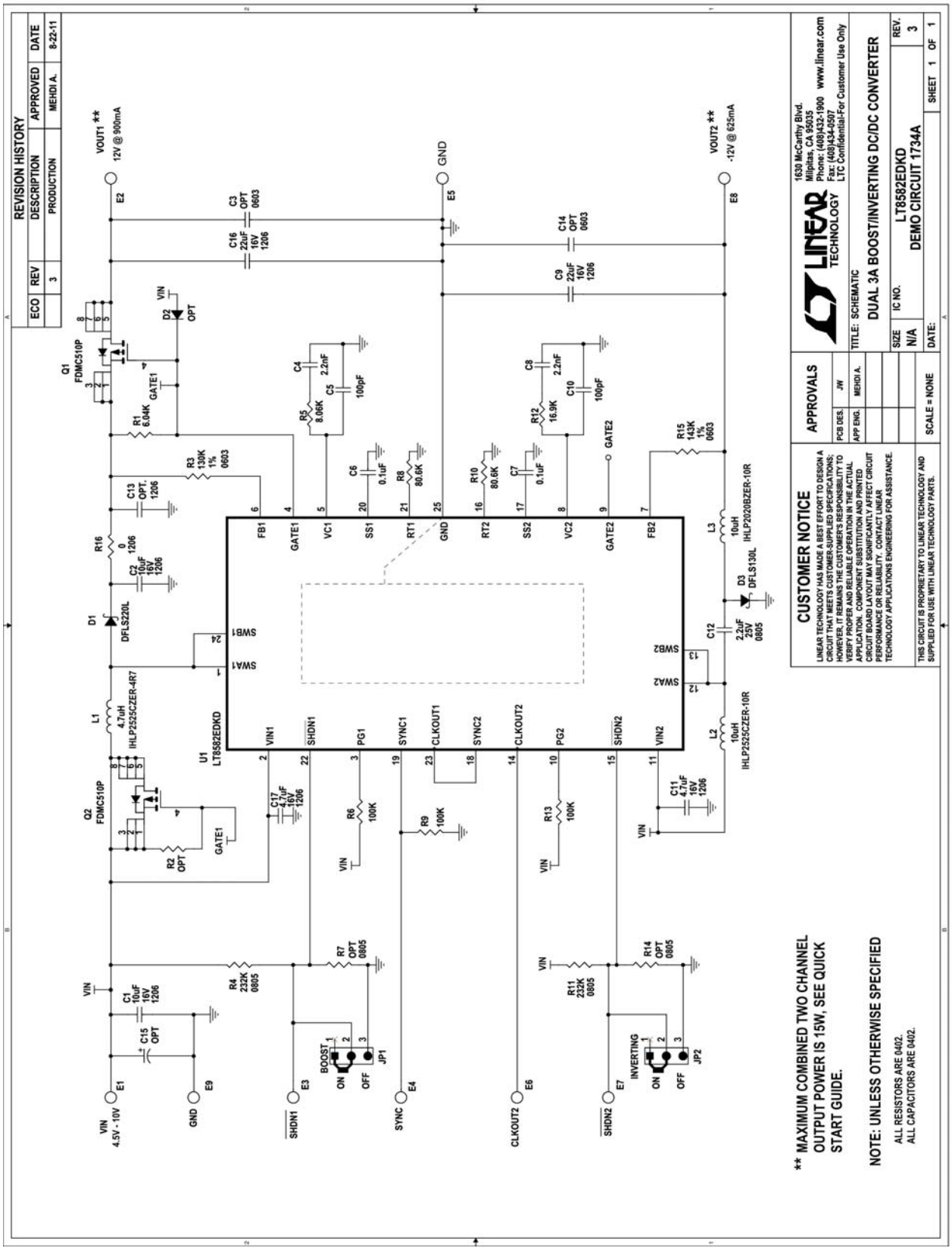


Figure 6. Using Channel 1 Input Disconnect Option (See Text)

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	3	C1, C2	CAP., X5R, 10µF, 16V, 20% 1206	AVX, 1206YD106MAT2A
2	1	C9, C16	CAP., X5R, 22µF, 16V, 20% 1206	TAIYO YUDEN, EMK316BJ226ML-T
3	2	C11, C17	CAP., X5R, 4.7µF, 16V, 20% 1206	TAIYO YUDEN, EMK316BJ475ML-T
4	2	C4, C8	CAP., X7R, 2.2nF, 50V, 10%, 0402	AVX, 04025C222KAT2A
5	2	C5, C10	CAP., NPO, 100pF, 16V, 10%, 0402	AVX, 0402YA101KAT2A
6	2	C6, C7	CAP., X7R, 0.1µF, 16V, 10% 0402	TDK, C1005X7R1C104K
7	1	C12	CAP., X7R, 2.2µF, 25V, 10%, 0805	MURATA, GRM21BR71E225KA73L
8	1	D1	RECTIFIER, DFLS220L, PowerDI-123	DIODES/ZETEX, DFLS220L-7
9	1	D3	RECTIFIER, DFLS130L, PowerDI-123	DIODES/ZETEX, DFLS130L-7
10	1	L1	INDUCTOR, 4.7µH	VISHAY, IHLP2525CZER4R7M11
11	1	L2	INDUCTOR, 10µH	VISHAY, IHLP2525CZER100M11
12	1	L3	INDUCTOR, 10µH	VISHAY, IHLP2020BZER100M11
13	1	Q1	P-CH MOSFET, FDMC510P, POWER-33	FAIRCHILD, FDMC510P
14	1	R1	RES., CHIP, 6.04k, 1/16W, 1% 0402	VISHAY, CRCW04026K04FKED
15	1	R3	RES., CHIP,130k, 1/10W, 1%, 0603	NIC, NRC06F1303TRF
16	2	R4, R11	RES., CHIP, 232k, 1/8W, 1%, 0805	VISHAY, CRCW0805232KFKEA
17	1	R5	RES., CHIP, 8.06k, 1/16W, 1% 0402	VISHAY, CRCW04028K06FKED
18	2	R8, R10	RES., CHIP, 80.6k, 1/16W, 1% 0402	VISHAY, CRCW040280K6FKED
19	3	R6, R9, R13	RES., CHIP, 100k, 1/16W, 5% 0402	NIC, NRC04J104TRF
20	1	R12	RES., CHIP, 16.9k, 1/16W, 1% 0402	VISHAY, CRCW040216K9FKED
21	1	R15	RES., CHIP,143k, 1/10W, 1%, 0603	NIC, NRC06F1433TRF
22	1	R16	RES., CHIP, 0Ω, 1/4W, 1206	NIC, NRC12ZOTR
23	1	U1	IC., LT8582EDKD, DFN-24(7MMX4MM)	LINEAR TECH., LT8582EDKD
Additional Demo Board Circuit Components				
1	0	C3, C14	CAP., 0603, OPTION	
2	0	C13	CAP., 1206, OPTION	
3	0	C15	CAP., SMD 8X10.5 & THRU HOLE 8X9.5, OPTION	
4	0	D2	DIODE, SOD-323, OPTION	
5	0	Q2	MOSFET, POWER-33, OPTION	
6	0	R2	RES., CHIP, 0402, OPTION	
7	0	R7, R14	RES., CHIP, 0805, OPTION	
Hardware for Demo Board Only				
1	9	E1-E9	TESTPOINT, TURRET, .094" pbf	MILL-MAX, 2501-2-00-80-00-00-07-0
2	2	JP1, JP2	3 PIN 0.079 SINGLE ROW HEADER	SAMTEC, TMM103-02-L-S
3	2	XJP1, XJP2	SHUNT, .079" CENTER	SAMTEC, 2SN-BK-G
4	4	(STAND-OFF)	STAND-OFF, NYLON 0.25"	KEYSTONE, 8831(SNAP ON)
5	1		FAB, PRINTED CIRCUIT BOARD	DEMO CIRCUIT 1734A

SCHEMATIC DIAGRAM



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