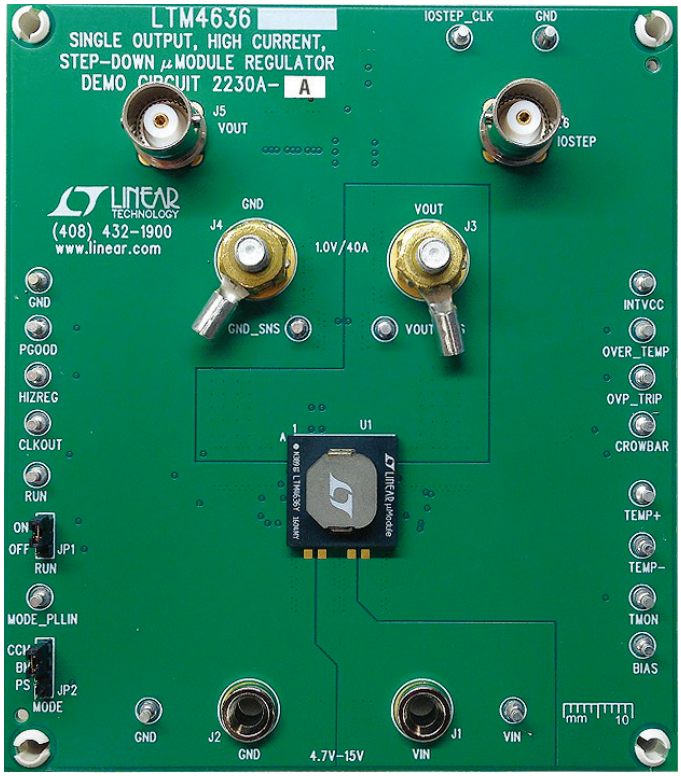
LTM4636
40A DC/DC µModule Regulator

DESCRIPTION

Demonstration circuit 2230A-A features the LTM®4636EY, a 40A high efficiency, switch mode step-down power µModule® regulator. The input voltage range is from 4.7V to 15V. For input voltage range from 4.7V to 5.5V, short PV_{CC} pin to V_{IN} pin with R8 = R21 = 0Ω and remove R17. The output voltage range is 0.6V to 3.3V. Derating is necessary for certain V_{IN}, V_{OUT}, frequency and thermal conditions. The board operates in continuous conduction mode in heavy load conditions. For high efficiency at low load currents, the MODE_PLLIN jumper selects pulse-skipping mode for noise sensitive applications or Burst Mode® operation in less noise sensitive applications. The MODE_PLLIN pin also allows the LTM4636 to synchronize to an external clock signal. DC2230A-A has the option of choosing both internal and external compensation circuit for LTM4636. Tying the PHASMD pin to different voltage generates certain phase difference between MODE_PLLIN and CLKOUT. The LTM4636 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC2230A-A.

Design files for this circuit board are available at http://www.linear.com/demo/DC2230A-A

BOARD PHOTO



PERFORMANCE SUMMARY

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		4.7V to 15V
Output Voltages		1.0V ± 1.3%
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details.	40ADC
Operating Frequency		350kHz
Efficiency	V_{IN} = 12V, V_{OUT} = 1.0V, I_{OUT} = 40A	87.7% (see Figure 2)
Load Transient	V_{IN} = 12V, V_{OUT} = 1.0V, I_{STEP} = 0A to 10A	81mV (see Figure 3)

QUICK START PROCEDURE

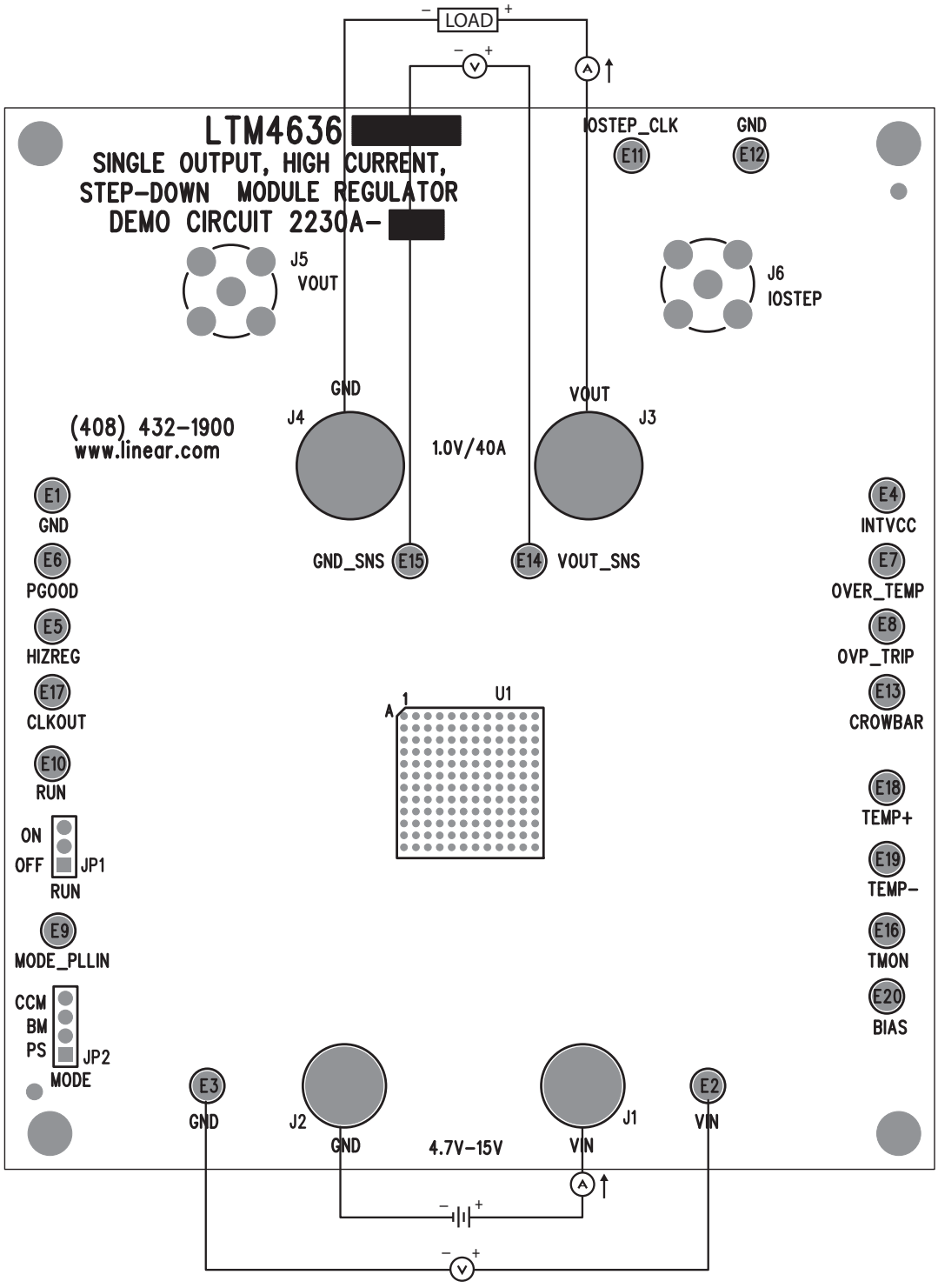
Demonstration circuit 2230A-A is an easy way to evaluate the performance of the LTM4636EY. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below.

1. Place jumpers in the following positions for a typical application:

MODE	RUN
CCM	ON

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to 12V.
3. Turn on the power supply at the input. The output voltage should be 1.0V ± 1.3% (0.987V to 1.013V).
4. Vary the input voltage from 6V to 15V and adjust the load current from 0A – 40A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.
5. (Optional) For optional load transient test, apply an adjustable pulse signal between IOSTEP_CLK and GND test points. The pulse amplitude sets the load step current amplitude. Keep the pulse width short (<1ms) and pulse duty cycle low (<5%) to limit the thermal stress on the load transient circuit.
6. (Optional) LTM4636 can be synchronized to an external clock signal. Place the JP1 jumper on EXT_CLK and apply a clock signal (0V to 5V, square wave) on the MODE_PLLIN test point.

QUICK START PROCEDURE



QUICK START PROCEDURE

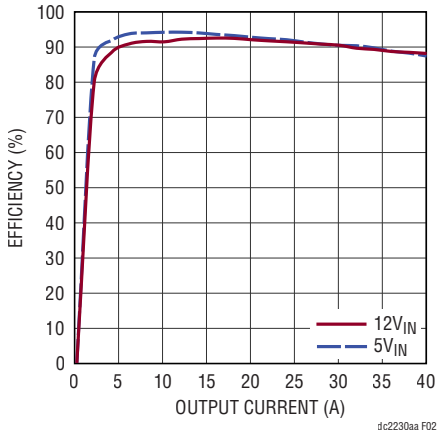


Figure 2. Measured Efficiency at V_{IN} = 5V/12V, V_{OUT} = 1V, f_{SW} = 350kHz, CCM

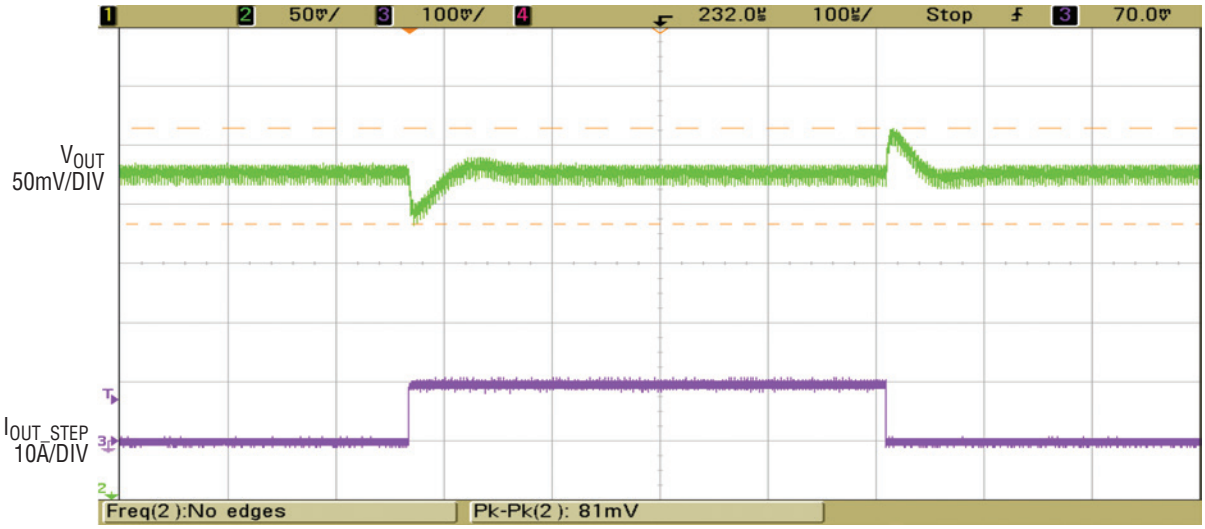


Figure 3. Measured Load Transient, V_{IN} = 12V, V_{OUT} = 1.0V, I_{STEP} = 0A to 10A

QUICK START PROCEDURE

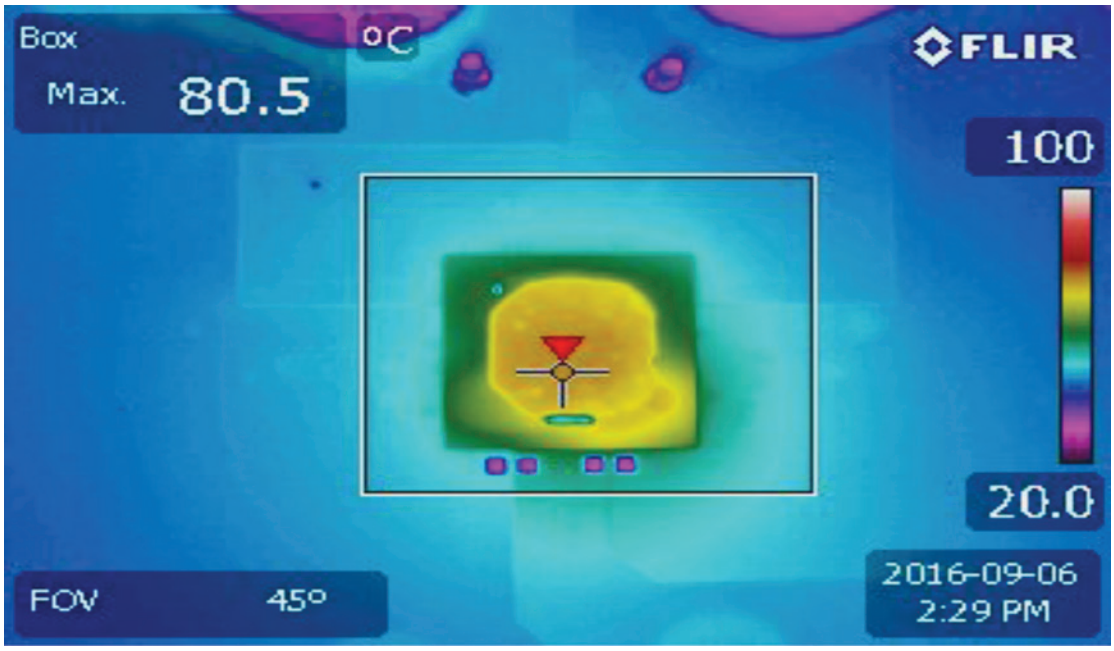
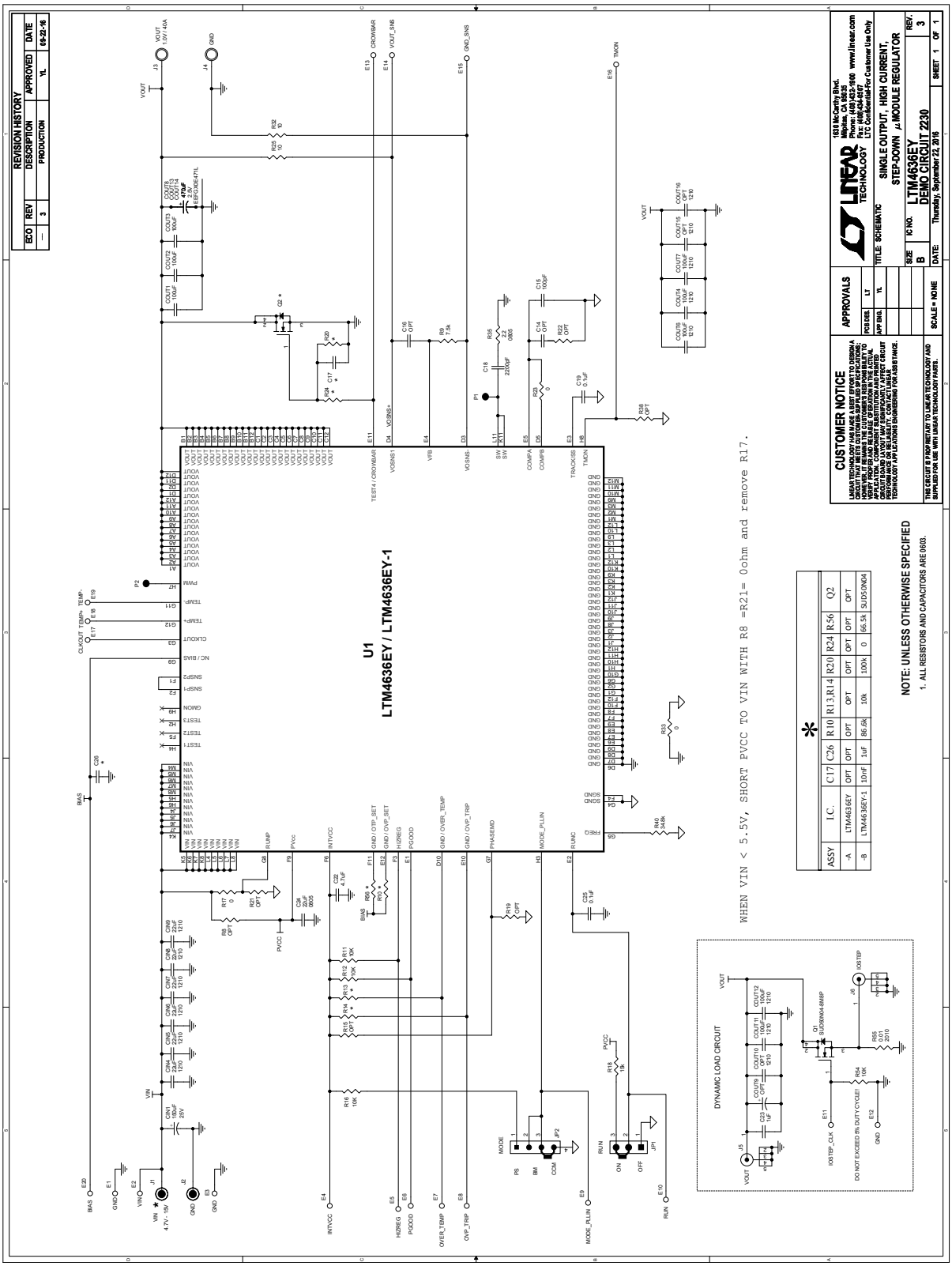


Figure 4. Thermal Image of LTM4636, V_{IN} = 12V, V_{OUT} = 1.0V, I_{LOAD} = 40A, Ambient Temperature = 23.0°C, No Forced Airflow

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART #
Required Circuit Components				
1	1	CIN1	CAP., ALUM. ELECT., 150µF, 25V, CE SERIES	SUN ELECT., 25CE150AX
2	6	CIN4, CIN5, CIN6, CIN7, CIN8, CIN9	CAP., 22µF, X5R, 16V, 20%,1210	MURATA, GRM32ER61C226ME20
3	8	COUT1, COUT2, COUT3, COUT4, COUT6, COUT7, COUT11, COUT12	CAP., 100µF, X5R, 6.3V, 20%,1210	MURATA, GRM32ER60J107ME20L
4	3	COUT8, COUT13, COUT14	CAP., POSCAP, 470µF, 2.5V, 20%, D3L	PANASONIC, 2R5TPE470M9
5	1	C15	CAP.,100pF, NP0, 50V, 5%, 0603	MURATA, GRM1885C1H101JA01D
6	1	C18	CAP., 2200pF, X7R, 25V, 10%, 0603	MURATA, GRM188R71E222KA01D
7	2	C19, C25	CAP., 0.1µF, X5R, 16V, 10%, 0603	MURATA, GRM188R61C104KA01D
8	1	C22	CAP., 4.7µF, X5R, 10V, 10%, 0603	TDK, C1608X5R1A475K080AC
9	1	C23	CAP., 1µF, X5R, 25V, 10%, 0603	MURATA, GRM188R61E105KA12D
10	1	C24	CAP., 22µF, X5R, 6.3V, 20%, 0805	KEMET, C0805C226M9PACTU
11	1	Q1	XSTR., MOSFET, N-CH, 40V, 50A, TO-252	VISHAY, SUD50N04-8M8P-4GE3
12	1	R9	RES., 7.5k, 0.5%, 0603	VISHAY, CRCW06037K5FKEA
13	4	R11, R12, R16, R54	RES., 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
14	1	R18	RES., 15k, 1/10W, 1%, 0603	VISHAY, CRCW060315K0FKEA
15	2	R25, R32	RES., 10Ω, 1/10W, 1%, 0603	VISHAY, CRCW060310R0FKEA
16	1	R35	RES., 2.2Ω, 1/8W, 5%, 0805	VISHAY, CRCW08052R20JNEA
17	1	R40	RES., 34.8k, 1/10W, 1%, 0603	VISHAY, CRCW060334K8FKEA
18	1	R55	RES., SENSE, 0.01Ω, 1/2W, 1%, 2010	VISHAY, WSL2010R0100FEA
19	1	U1	LTM4636EY#PBF, 16mm × 16mm × 5.01mm BGA	LINEAR TECH., LTM4636EY#PBF
Additional Demo Board Circuit Components				
1	0	COUT9 (OPT)	CAP., OPTION, D3L	OPT
2	0	COUT10, COUT15, COUT16 (OPT)	CAP., OPTION, 1210	OPT
3	0	C14, C16, C17, C26(OPT)	CAP., OPTION, 0603	OPT
4	0	R8, R10, R13, R14, R15, R19, R20, R21, R22, R38 (OPT), R22, R24, R38, R56 (OPT)	RES., OPTION, 0603	OPT
5	3	R17, R23, R33	RES., 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
6	0	Q2	XSTR., OPT, TO-252	OPT
Hardware				
1	20	E1-E20	TEST POINT, TURRET, 0.064 MTG. HOLE	MILL-MAX, 2308-2-00-80-00-00-07-0
2	1	JP1	CONN., HEADER, 1 × 3, 2mm	SULLINS, NRPN031PAEN-RC
3	1	JP2	CONN., HEADER, 1 × 4, 2mm	SULLINS, NRPN041PAEN-RC
4	2	J1, J2	CONN., JACK, BANANA, NON-INSULATED, 0.218	KEYSTONE, 575-4
5	2	J3, J4	STUD, TEST PIN	PEM, KFH-032-10
6	4	J3, J4 × 2	NUT, BRASS 10-32	ANY, #10-32M/S BR PL
7	2	J3, J4	RING, LUG #10	KEYSTONE, 8205
8	2	J3, J4	WASHER, TIN PLATED BRASS	ANY, #10 EXT BZ TN
9	2	J5, J6	CONN., BNC, 5 PINS	CONNEX, 112404
10	2	XJP1, XJP2	SHUNT, 2mm	SAMTEC 2SN-BK-G
11	4	(STANDOFF)	STANDOFF, NYLON, SNAP-ON, 0.500	KEYSTONE, 8833 (SNAP-ON)

SCHEMATIC DIAGRAM



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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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