LTC3613EWKH
Fast, High Efficiency Step-Down Regulator

DESCRIPTION

Demonstration circuit 1700A is a fast, high efficiency synchronous buck DC/DC converter with 4.5V to 24V input range. It can supply 15A maximum load current at 1.5V output. The demo board features the LTC®3613EWKH regulator. No external MOSFETs are required. The controlled on-time constant frequency valley current mode architecture allows for both fast transient response and constant frequency switching in steady-state operation. Differential output voltage sensing along with a precision internal reference combine to offer an accurate output regulation. The LTC3613 is ideal for applications such as distributed power systems, servers and point-of-load converters. The LTC3613EWKH is in a 7mm × 9mm 54-pin QFN package.

The light load operation mode of the converter is determined with the MODE/PLLIN pin. Use JP2 jumper to select discontinuous mode (DCM) or forced continuous mode (CCM) operation. Switching frequency is pre-set at about 350kHz. This frequency can be modified from 200kHz to 1MHz by changing the value of a resistor (R18). The converter can also be externally synchronized from 200kHz to 1MHz through the MODE/PLLIN pin (PLLIN terminal on the board). To shut down the converter, one simple way is to force the RUN pin below 1.1V (JP1: OFF). The power good output (PGOOD terminal) is low when the output voltage is outside of the ±7.5% regulation window.

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

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		4.5V to 24V
Output Voltage, V_{OUT}	V_{IN} = 4.5V to 24V, I_{OUT} = 0A to 15A	1.5V ±2%
Maximum Output Current, I_{OUT}	V_{IN} = 4.5V to 24V, V_{OUT} = 1.5V	15A
Typical Output Ripple	V_{IN} = 12V, I_{OUT} = 15A (20MHz BW)	40mV_{P-P}
Typical Efficiency	V_{IN} = 12V, V_{OUT} = 1.5V, I_{OUT} = 15A	87.5%
Typical Switching Frequency		350kHz

QUICK START PROCEDURE

Demonstration circuit 1700A is easy to set up to evaluate the performance of the LTC3613. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to V_{IN} (4.5V to 24V) and GND (input return).
2. Connect the 1.5V output load between V_{OUT} and GND (Initial load: no load).
3. Connect the DVMs to the input and outputs.
4. Turn on the input power supply and check for the proper output voltages. V_{OUT} should be 1.5V ±2%.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 2 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (–) terminals of an output capacitor. The probe's ground ring needs to touch the (–) lead and the probe tip needs to touch the (+) lead.

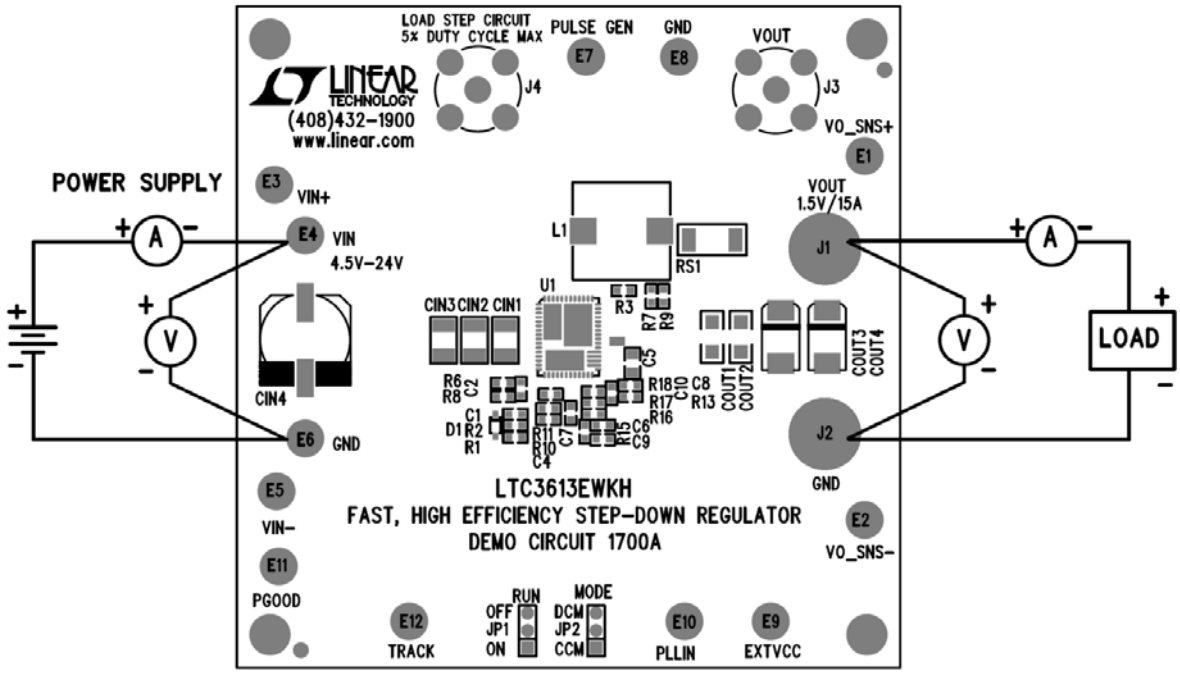


Figure 1. Proper Measurement Equipment Setup

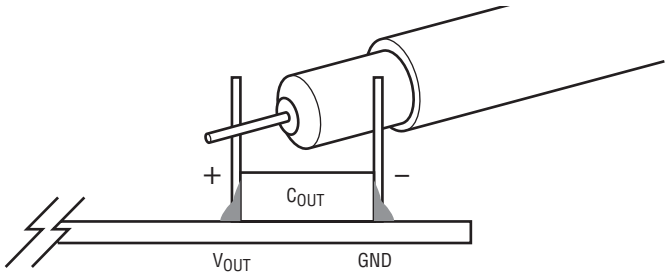


Figure 2. Measuring Output Voltage Ripple

QUICK START PROCEDURE

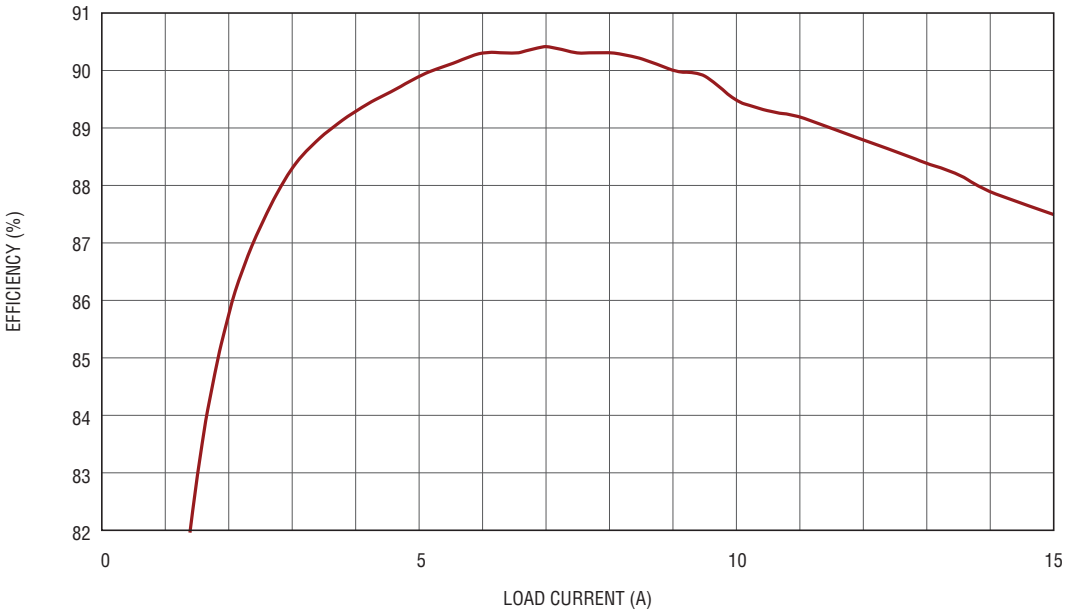
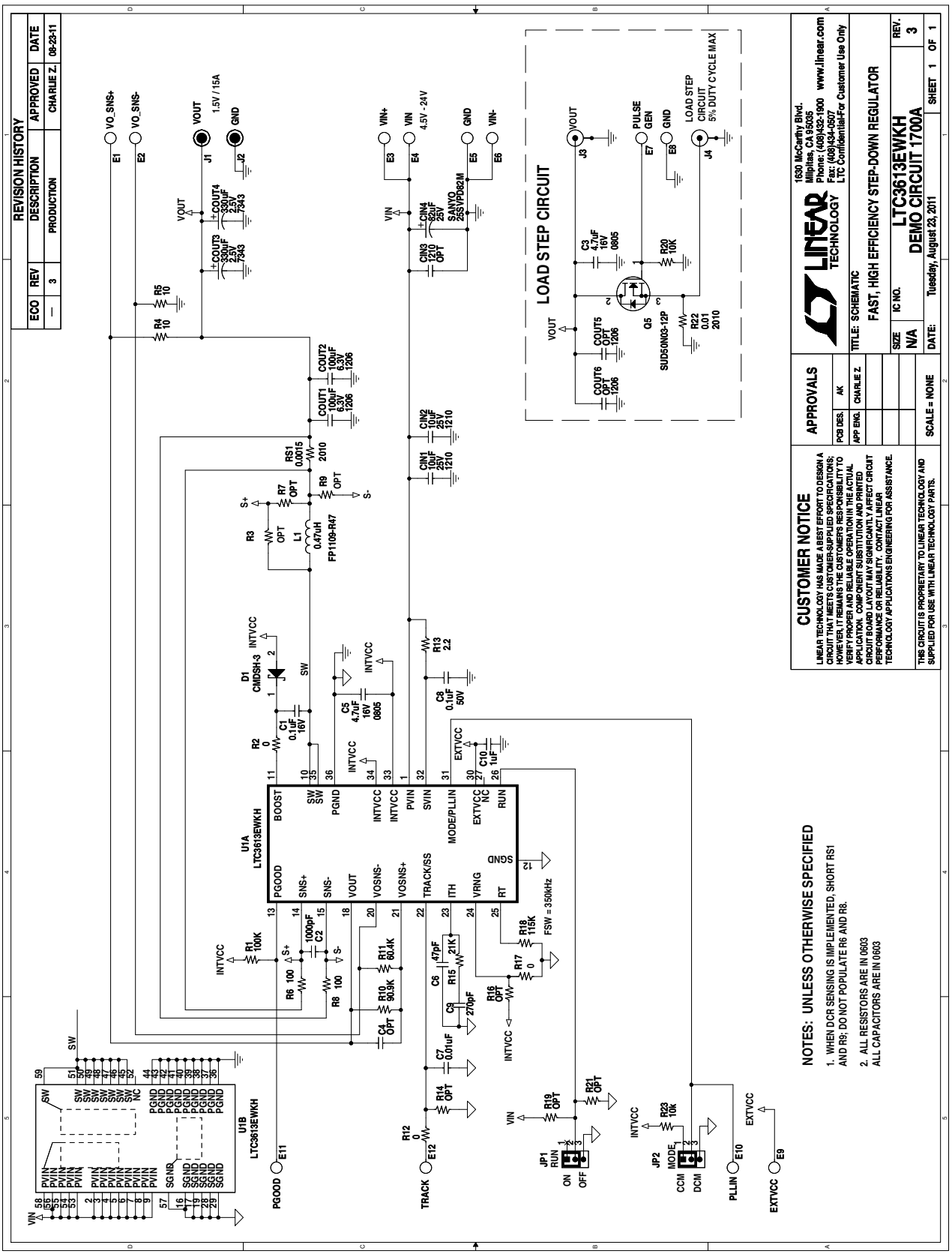


Figure 3. Efficiency vs Load Current (V_{IN} = 12V, V_O = 1.5V, CCM)

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	CIN1, CIN2	CAP, 1210 10µF 10% 16V X5R	AVX, 1210YD106KAT
2	1	CIN4	CAP, 82µF, 25V, Sanyo	SANYO, 25SVPD82M
3	2	COUT1, COUT2	CAP, 1206 100µF 20% 6.3V X5R	MURATA, GRM31CR60J107ME39L
4	2	COUT3, COUT4	CAP, 7343 330µF 20% 2.5V POSCAP	SANYO 2R5TPE330M9
5	2	C1, C8	CAP, 0603 0.1µF 10% 25V X7R	TDK C1608X7R1E104K
6	1	C2	CAP, 0603 1000pF 10% 50V X7R	AVX, 06035C102KAT
7	2	C3, C5	CAP, 0805 4.7µF 10% 16V X5R	TDK C2012X5R1C475K
8	1	C6	CAP, 0603 47pF 10% 25V NPO	AVX, 06033A470KAT2A
9	1	C7	CAP, 0603 0.01µF 10% 50V X7R	AVX, 06035C103KAT
10	1	C9	CAP, 0603 270pF 10% 25V NPO	AVX, 06033A271KAT2A
11	1	C10	CAP, 0603 1µF 10% 25V X5R	AVX, 06033D105KAT
12	1	D1	DIODE,CMDSH-3 SOD323	CENTRAL CMDSH-3
13	1	L1	IND., 0.47µH, FP1109 series	COILTRONICS, FP1109-R47-R
14	1	Q5	XSTR, MOSFET, DPAK-TO252AA	VISHAY SUD50N03-12P-E3
15	1	RS1	RES, 2010 0.0015Ω 1% 1/2W	VISHAY WSL20101L500FEA
16	1	R1	RES, 0603 100k 1% 1/10W	VISHAY CRCW0603100KFKEA
17	3	R2, R12, R17	RES, 0603 0Ω JUMPER	VISHAY CRCW06030000Z0EA
18	2	R4, R5	RES, 0603 10Ω 1% 1/10W	VISHAY CRCW060310R0FKEA
19	2	R6, R8	RES, 0603 100Ω 1% 1/10W	PANASONIC, ERJ-3EKF1000V
20	1	R10	RES, 0603 90.9k 1% 1/10W	PANASONIC, ERJ-3EKF9092V
21	1	R11	RES, 0603 60.4k 1% 1/10W	VISHAY, CRCW060360K4FKEA
22	1	R13	RES, 0603 2.2Ω 1% 1/10W	NIC, NRC06F2R20TRF
23	1	R15	RES, 0603 21k 1% 1/10W	VISHAY, CRCW060321K0FKEA
24	1	R18	RES, 0603 115k 1% 1/10W	VISHAY, CRCW0603115KFKEA
25	2	R20, R23	RES, 0603 10k 1% 1/10W	NIC, NRC06F1002TRF
25	1	R22	RES, 2010 0.01Ω 1% 1/2W	VISHAY WSL2010R0100FEA
27	1	U1	LTC3613EWKH	QFN-56-7X9
Additional Demo Board Circuit Components				
28	1	CIN3	OPT, 1210	
29	2	COUT5, COUT6	OPT	
30	3	C4, R9, R16	OPT	
31	1	R3	OPT	
32	4	R7, R14, R19, R21	OPT	
Demo Board Only				
33	12	E1, E2, E3, E4, E5, E6, E7, E8,	TURRET	MILL-MAX 2501-2-00-80-00-00-07-0
34		E9, E10, E11, E12		
35	2	JP1, JP2	HEADER, 3PIN, 2mm	SAMTEC TMM-103-02-L-S
36	2	XJP1, XJP2	SHUNT, 2mm	SAMTEC 2SN-BK-G
37	2	J1, J2	JACK, BANANA	KEYSTONE 575-4
38	2	J3, J4	CONN, BNC, 5 PINS	CONNEX 112404

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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