LTC3638EMSE
High Efficiency, High V_{IN}, 250mA Step-Down Converter

DESCRIPTION

Demonstration circuit 2057A is a high input voltage, 250mA output DC/DC power supply featuring the LTC®3638. The IC operates with high efficiency Burst Mode® operation and includes an internal high side power MOSFET. The board will accept an input voltage between 4V and 140V, and provide jumper selected output voltages of 1.8V, 3.3V, 5V with an option for additional voltages. The IC includes internal soft-start and a provision for increasing soft-start time.

Included on the board is an ON/OFF jumper that can also be configured as a precision undervoltage lockout. Additional PC pads are included for programming current limit to optimize efficiency and for reducing output voltage ripple and reducing component size. A terminal (FBO) is included to allow multiple boards to be paralleled for higher output current.

Output voltages between 800mV and V_{IN} can be programmed using optional resistors (higher voltage rating output capacitors may be required).

The LTC3638 data sheet gives a complete description of the IC operation and application information. The data sheet must be read in conjunction with this quick start guide.

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

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PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITION	VALUE
Input Voltage Range		4V to 140V
1.8V Output Voltage	V_{IN} = 12V, I_{OUT} = 0A to 250mA	1.8V ±2%
3.3V Output Voltage	V_{IN} = 12V, I_{OUT} = 0A to 250mA	3.3V ±2%
5V Output Voltage	V_{IN} = 12V, I_{OUT} = 0A to 250mA	5V ±2%
Maximum Output Current, I_{OUT}	V_{IN} = 4V to 140V, V_{OUT} = 1.8V, 3.3V or 5V	250mA
Typical Efficiency	V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 250mA	83.7%
Typical Output Ripple	V_{IN} = 140V, V_{OUT} = 5V, I_{OUT} = 100mA (20MHz BW)	81mV_{P-P}

QUICK START PROCEDURE

Demonstration circuit 2057A is easy to set up to evaluate the performance of the LTC3638. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply (set for 0V) to VIN and GND (input return).
2. Select 5V output using jumper JP1 (B position) and JP2 (A position). Select ON position for JP3.
3. Connect the 5V output load between VOUT and GND (Initial load: no load).
4. Connect the DVMs to the input and outputs.
5. Turn on the input power supply and slowly increase to 12V. Check for the proper output voltages. (5V output should be within 5V ±2%.)
6. 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.
7. With power off, move jumpers JP1 and JP2 to the other fixed voltage settings (1.8V or 3.3V). Repeat steps 5 and 6. Check for the proper output 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.

Additional Notes:

1. **CAUTION: Be careful when testing with high voltage. High voltage can result in an electric shock if care is not taken.**
2. For 5V output, V_{IN} input voltage should be at least 5V or higher.

QUICK START PROCEDURE

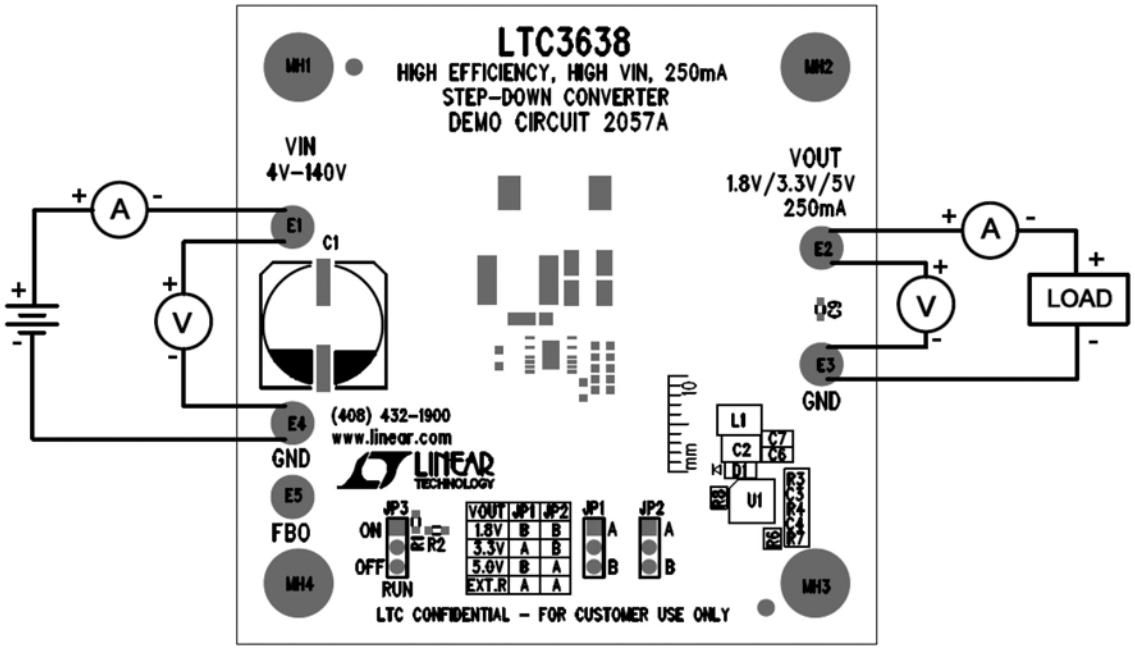


Figure 1. Proper Measurement Equipment Setup

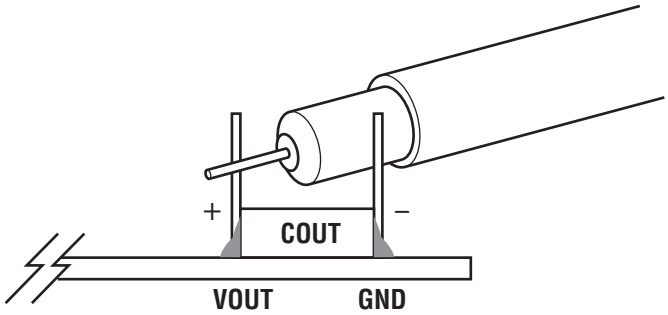
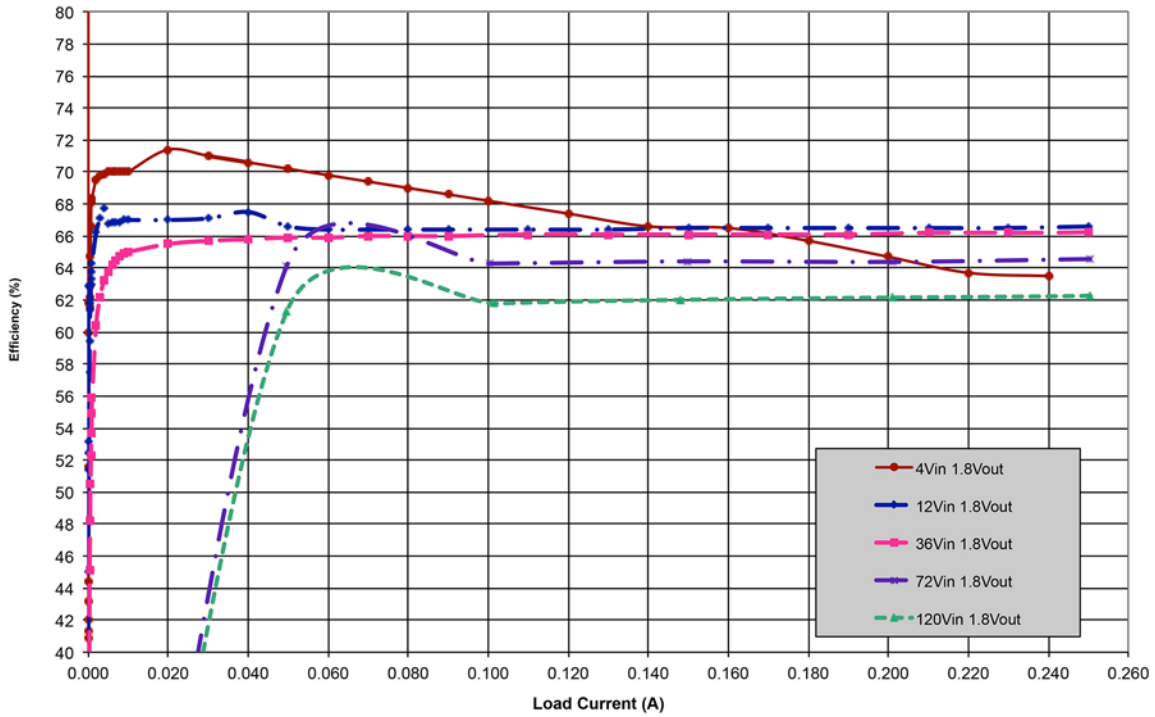


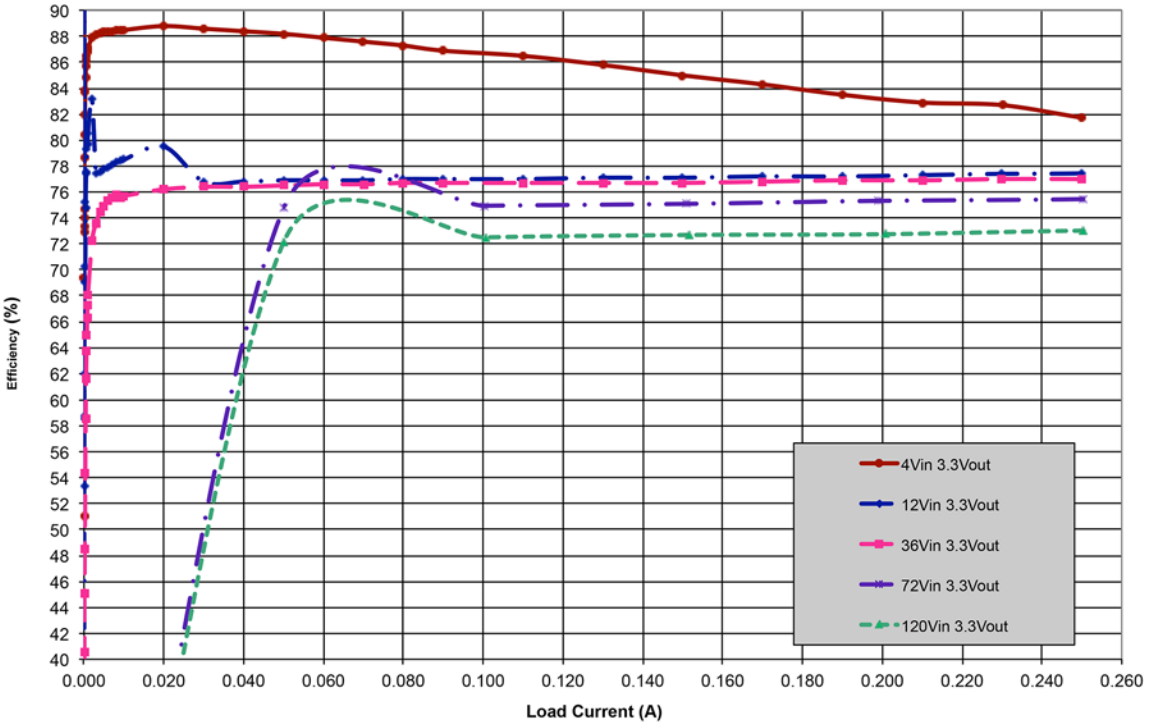
Figure 2. Measuring Output Voltage Ripple

QUICK START PROCEDURE

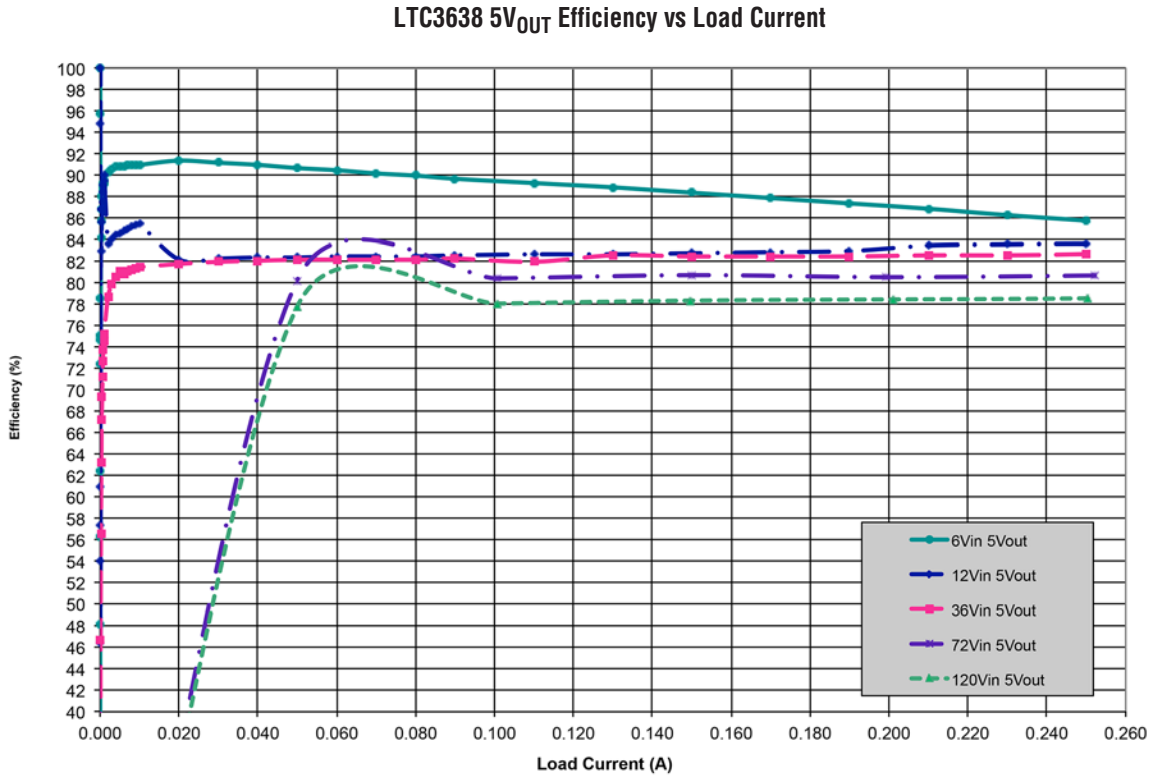
LTC3638 1.8V_{OUT} Efficiency vs Load Current



LTC3638 3.3V_{OUT} Efficiency vs Load Current



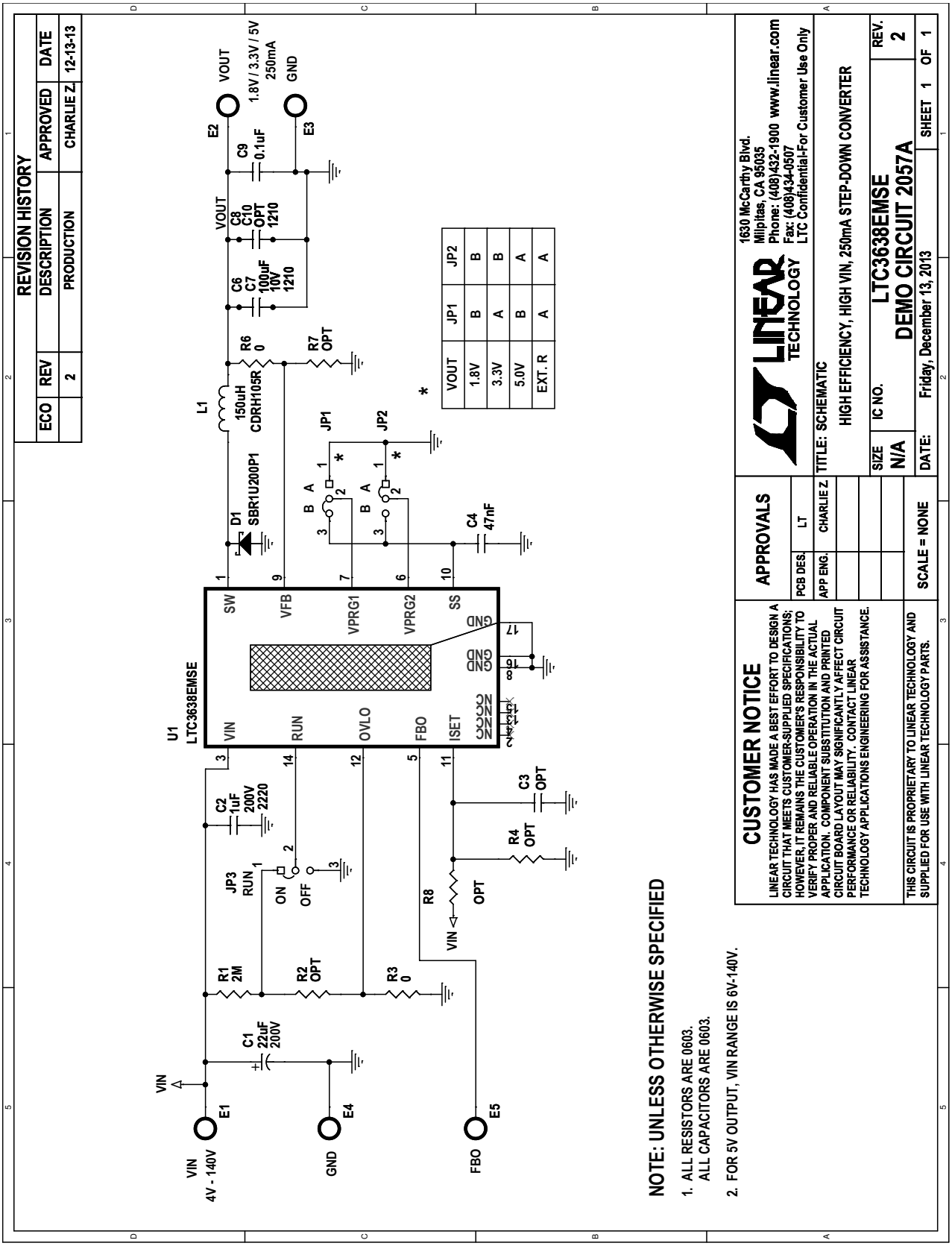
QUICK START PROCEDURE



PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	C1	CAP.SMD ALUM. ELECT., 22µF, 200V KE0-MVA	NIPPON CHEMI-CON, EMVE201ARA220MKG5S
2	1	C2	CAP., X7R, 1µF, 200V, 10% 2220	KEMET, C2220X105K2RACTU
3	1	C4	CAP., X7R, 47nF, 25V, 10% 0603	AVX, 06033C473KAT2A
4	2	C6, C7	CAP., X7R, 100µF, 10V, 20% 1210	TAIYO YUDEN, LMK325ABJ107MMH-T
5	1	C9	CAP., X7R, 0.1µF, 25V, 10% 0603	AVX, 06033C104KAT2A
6	1	D1	DIODE, SBR1U200P1	DIODES, SBR1U200P1-7
7	1	L1	INDUCTOR, 150µH	SUMIDA, CDRH105R-151
8	1	R1	RES., CHIP, 2M, 1/16W, 5% 0603	VISHAY, CRCW06032M00JNEA
9	1	U1	IC., LTC3638EMSE MSE16(12), 4X3MM	LINEAR TECH., LTC3638EMSE
Additional Demo Board Circuit Components				
10	0	C3 (OPT)	CAP., 0603	OPT
11	0	C8, C10 (OPT)	CAP., 1210	OPT
12	0	R2, R4, R7, R8 (OPT)	RES., 0603	OPT
13	2	R3, R6	RES., CHIP, 0Ω, 1/16W, 0603	VISHAY, CRCW06030000Z0EA
Hardware				
14	5	E1, E2, E3, E4, E5	TESTPOINT, TURRET 0.094"	MILLMAX 2501-2-00-80-00-00-07-0
15	3	JP1, JP2, JP3	JMP, 0.079 SINGLE ROW HEADER, 3-PIN	SULLINS, NRPN031PAEN-RC
16	3	XJP1, XJP2, XJP3	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G
17	4	STAND-OFFS	STAND-OFF, NYLON 0.5"	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



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Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged**.

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

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