LTC3852EUDD
Low V_{IN}, High Efficiency Step-Down DC/DC Converter

DESCRIPTION

Demonstration circuit 1270A is a low input voltage, high efficiency synchronous buck DC/DC converter with 2.7V to 5.5V input range. It can supply 15A maximum load current at 1.5V output. The demo board features the LTC®3852EUDD controller. The integrated charge pump provides 5V to the LTC3852's control logic and gate drives, supporting a wide selection of logic-level N-channel power MOSFETs with high efficiency. The constant frequency current mode architecture allows a phase-lockable frequency of up to 750kHz. The LTC3852 is ideal for general purpose 3.3V systems, lithium-ion powered devices and distributed DC power systems. The LTC3852EUDD is in a 3mm × 5mm 24-Lead QFN package.

The light load operation mode of the converter is determined with the FCB pin. Use JP2 jumper to select burst mode, discontinuous mode or forced continuous mode operation. Switching frequency is preset at about 400KHz. This frequency can be easily modified from 250kHz to 750kHz by changing the value of a resistor (R5). The converter can also be externally synchronized from 250kHz to 750kHz through 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 exceeds the ±10% regulation window.

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

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Input Voltage Range		2.7V to 5.5V
Output Voltage, V_{OUT}	V_{IN} = 2.7V to 5.5V, I_{OUT} = 0A to 15A	1.5V ±2%
Maximum Output Current, I_{OUT}	V_{IN} = 2.7V to 5.5V, V_{OUT} = 1.5V	15A
Typical Output Ripple	V_{IN} = 3.3V, I_{OUT} = 15A (20MHz BW)	11mV_{P-P}
Typical Efficiency	V_{IN} = 3.3V, V_{OUT} = 1.5V, I_{OUT} = 15A	90.4%
Typical Switching Frequency		400kHz

QUICK START PROCEDURE

Demonstration circuit 1270A is easy to set up to evaluate the performance of the LTC3852EUDD. 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}(2.7V to 5.5V) 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.

OPTIONAL HIGH INPUT VOLTAGE (4V to 38V) OPERATION

The LTC3852 can also be used for high input voltage applications (4V to 38V input), with the integrated charge pump bypassed:

1. Remove the 0Ω resistor from R3 and put the resistor at R26 position (disconnect V_{IN1} from V_{IN}, and connect V_{IN2} from V_{IN}). Remove R22 and R23. The C1 flying cap can also be removed.
2. The related power components, such as input/output capacitors, MOSFETs, and inductor, need to be changed to fit the new application specification.

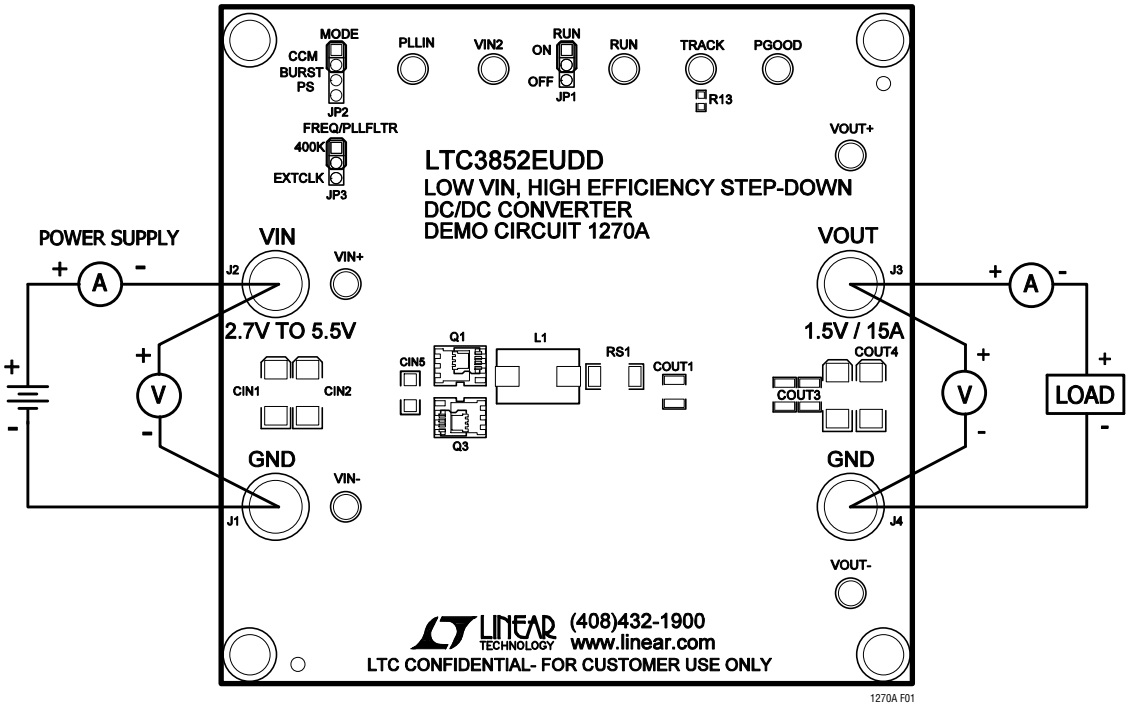


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

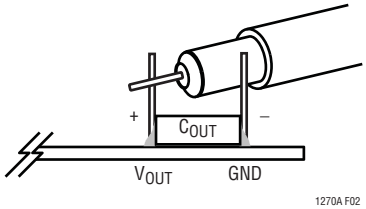


Figure 2. Measuring Output Voltage Ripple

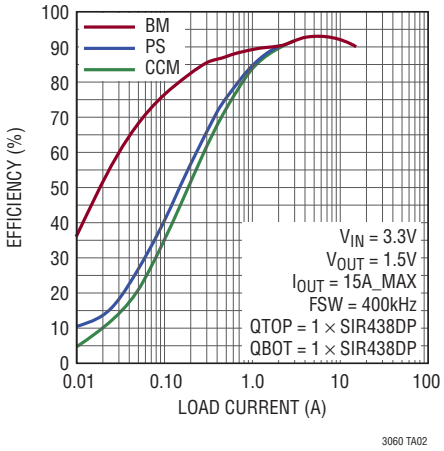


Figure 3. Efficiency vs Load Current

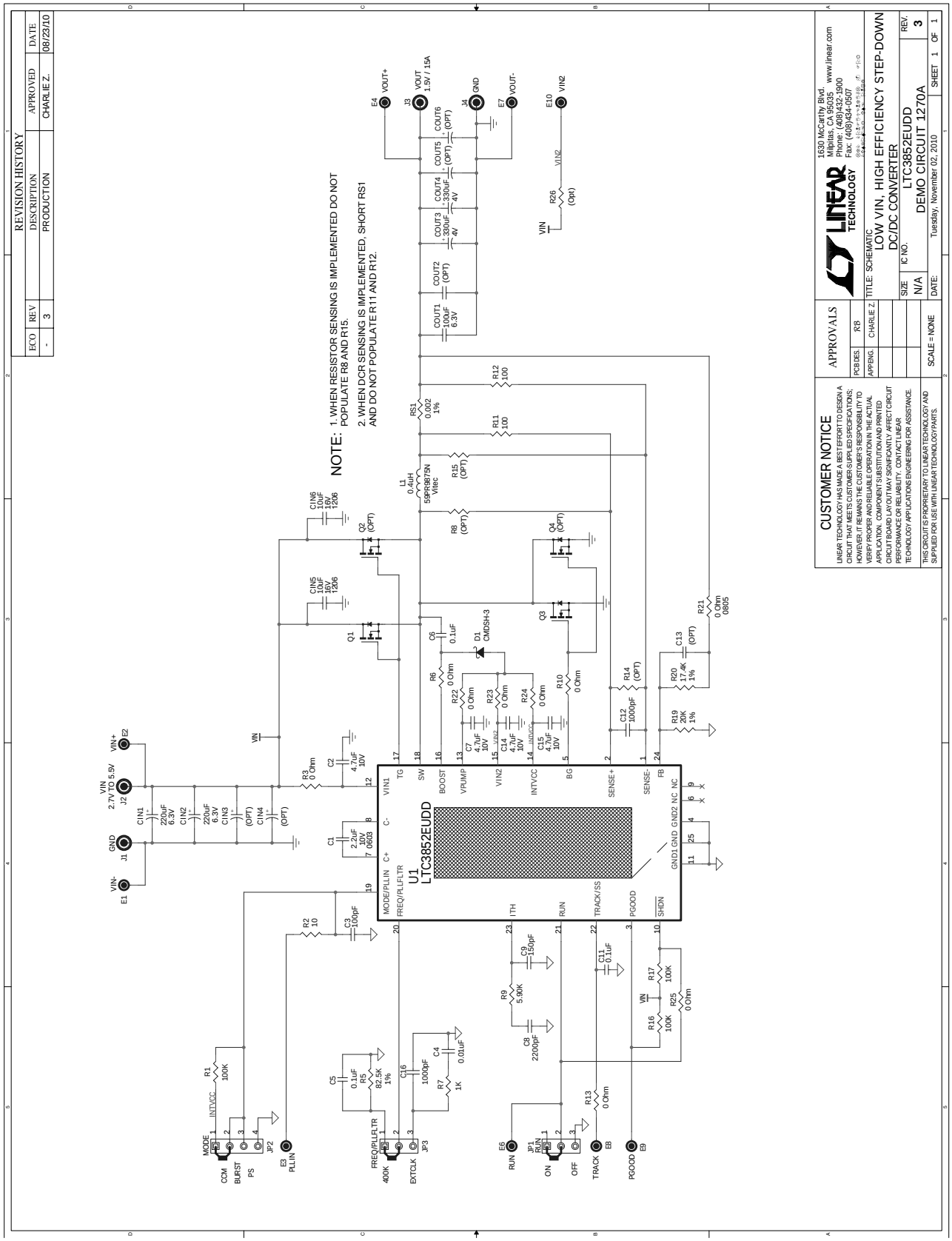
PARTS LIST

ITEM	QUANTITY	REFERENCE-DESCRIPTION	DESCRIPTION	MANUFACTURERS PART NUMBER
Required Circuit Components				
1	2	C_{IN2}, C_{IN1}	Cap., POSCAP 220µF 6.3V 20% 7343	SANYO 6TPE220MI
2	2	C_{IN6}, C_{IN5}	Cap., X5R 10µF 16V 20% 1206	Taiyo Yuden EMK316BJ106ML
3	1	C_{OUT1}	Cap., X5R 100µF 6.3V 20% 1210	AVX 12106D107MAT2A
4	2	C_{OUT3}, C_{OUT4}	Cap., POSCAP 330µF 4V 20%	SANYO 4TPE330MI
5	1	C1	Cap., X5R 2.2µF 10V 10% 0603	Taiyo Yuden LMK107BJ225MA
6	4	C2, C7, C14, C15	Cap., X5R 4.7µF 10V 10% 0603	Taiyo Yuden LMK107BJ475KA
7	1	C3	Cap., X7R 100pF 25V 10% 0603	AVX 06033C101KAT2A
8	1	C4	Cap., X7R 0.01µF 100V 10% 0603	AVX 06031C103KAT2A
9	3	C5, C6, C11	Cap., X7R 0.1µF 25V 10% 0603	AVX 06033C104KAT2A
10	1	C8	Cap., X7R 2200pF 25V 20% 0603	AVX 06033C222MAT2A
11	1	C9	Cap., X7R 150pF 25V 10% 0603	AVX 06033C151KAT1A
12	2	C12, C16	Cap., NPO 1000pF 25V 10% 0603	AVX 06033A102KAT1A
13	1	D1	Schottky Diode, 30V	Central Semi. CMDSH-3
14	1	L1	Inductor, 0.4uH	Vitec 59PR9875N

PARTS LIST

ITEM	QUANTITY	REFERENCE-DESCRIPTION	DESCRIPTION	MANUFACTURERS PART NUMBER
15	2	Q1,mQ3	Mosfet-N Channel, 30V/45A LFPAK	Renesas RJK0330DPB-00-J0
		Q1,mQ3 (Alternate)	Mosfet-N Channel, Reduced Qg, 25V SO-8	Vishay SiliconixSiR438DP
16	1	RS1	Res., 0.002 1/2W 1% 2010	Vishay WSL-2010-2L000-F-EA
17	3	R1, R16, R17	Res., Chip 100k 0.06W 5% 0603	Vishay CRCW0603104JNEA
18	1	R2	Res., Chip 10 0.06W 5% 0603	Vishay CRCW0603100JNEA
19	8	R3, R6, R10, R13, R22-R25	Res/Jumper, Chip 0Ω 1/16W 1 AMP 0603	Vishay CRCW0603000ZOEA
20	1	R5	Res., Chip 82.5k 0.06W 1% 0603	Vishay CRCW060382K5FKEA
21	1	R7	Res., Chip 1k 0.06W 5% 0603	Vishay CRCW06031K00JNEA
22	1	R9	Res., Chip 5.90k 0.06W 1% 0603	Vishay CRCW06035K90FKEA
23	2	R12, R11	Res., Chip 100 0.06W 5% 0603	Vishay CRCW0603100RJNEA
24	1	R19	Res., Chip 20k 0.06W 1% 0603	Vishay CRCW06032002FKEA
25	1	R20	Res., Chip 17.4k 0.06W 1% 0603	Vishay CRCW06031742FKEA
26	1	R21	Res/Jumper, Chip 0Ω 1/8W 1 AMP 0805	Vishay CRCW08050000ZOEA
27	1	U1	I.C., Volt. Reg. QFN(24)(UDD) 3mm × 5mm	Linear Tech. Corp. LTC3852EUDD
Additional Circuit Components				
1	0	C_{IN3}, C_{IN4}	Cap., POSCAP 220µF 6.3V 20% 7343	Sanyo 6TPE220MI
2	0	C_{OUT2}	Cap., X5R 100µF 6.3V 20% 1210	AVX 12106D107MAT2A
3	0	C_{OUT5}, C_{OUT6}	Cap., POSCAP 330µF 4V 20%	Sanyo 4TPE330MI
4	0	C13	Cap., 0603	
5	0	Q4, Q2	N-Chan. Single, SO8-PWRPAK-SGL	
6	0	R8, R14, R15, R26	Res., 0603	
Hardware For Demo Board Only				
1	9	E1-E4, E6 to E10	Turret, Testpoint	Mill Max 2501-2-00-80-00-00-07-0
2	2	JP3, JP1	Headers, 3 Pins 2mm Ctrs.	Samtec TMM-103-02-L-S
3	1	JP2	Headers, 4 Pins 2mm Ctrs.	Samtec TMM-104-02-L-S
4	4	J1-J4	Connector, Banana Jack	Keystone 575-4
5	3	XJP1 to XJP3	Shunt, 2mm Ctrs.	Samtec 2SN-BK-G
6	4		Stand-Off, Nylon 0.5" Tall	Keystone, 8833(Snap On)
7	1		FAB, Rev3 Printed Circuit Board	Demo Circuit 1270A
8	2		Stencil	Stencil #1270A

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.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035