LT3668
40V Step-Down Regulator with Dual Tracking LDOs

DESCRIPTION

Demonstration circuit 2243A is a triple power supply that includes one 400mA step-down regulator and two 200mA low dropout (LDO) linear tracking regulators featuring the LT®3668. The demo circuit is designed for one 6V and dual 5V outputs from a 7V to 40V input. Two LDO outputs are configured as post-regulators of the switching regulator output. The total current capability of three output channels is up to 400mA, while the two LDO regulators are capable of 200mA each.

The switching frequency of the step-down regulator can be programmed via an oscillator resistor (R8) over a 250kHz to 2.2 MHz range. The default setting is 600kHz.

The LT3668 internal boost diode and loop compensation reduce the components count and solution size. The current mode control scheme creates fast transient response and good loop stability. The switching regulator has cycle-by-cycle current limit and diode current sense, providing protection against shorted outputs.

JP1 can be used to set the whole LT3668 in shutdown mode. JP3 and JP4 enable and disable the outputs of the dual 5V tracking LDOs respectively.

The LT3668 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for demo circuit 2243A. Proper board layout is essential for both proper operation and maximum thermal performance. See the data sheet section “PCB Layout”.

Design files for this circuit board are available at http://www.linear.com/demo/DC2243A

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN1}	Input Supply Range of V_{IN1}		7		40	V
f_{SW}	Switching Frequency	V_{IN1} = 12V, V_{OUT1} = 6V/I_{OUT1} = 400mA V_{OUT2} = 5V/I_{OUT2} = 0 V_{OUT3} = 5V/I_{OUT3} = 0	510		690	kHz
V_{OUT1}	Output Voltage 1	V_{IN1} = 12V, V_{OUT1} = 6V/I_{OUT1} = 0 ~ 400mA V_{OUT2} = 5V/I_{OUT2} = 0 V_{OUT3} = 5V/I_{OUT3} = 0	5.88		6.12	V
V_{OUT2}	Output Voltage 2	V_{IN1} = 12V, V_{OUT1} = 6V/I_{OUT1} = 0 V_{OUT2} = 5V/I_{OUT2} = 0 ~ 190mA V_{OUT3} = 5V/I_{OUT3} = 0	4.9		5.1	V
V_{OUT3}	Output Voltage 3	V_{IN1} = 12V, V_{OUT1} = 6V/I_{OUT1} = 0 V_{OUT2} = 5V/I_{OUT2} = 0 V_{OUT3} = 5V/I_{OUT3} = 0 ~ 190mA	4.9		5.1	V
$I_{OUT1} + I_{OUT2} + I_{OUT3}$	Maximum Total Output Current		400			mA
I_{OUT2}, I_{OUT3}	Maximum LDO Output Current		190	200		mA

DESCRIPTION

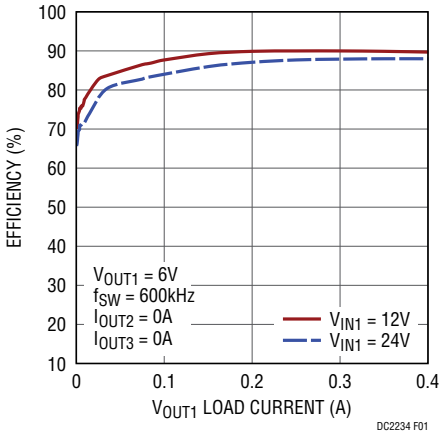

Figure 1. V_{OUT1} Typical Efficiency vs. Load Current

QUICK START PROCEDURE

Demonstration circuit 2243A is easy to set up to evaluate the performance of the LT3668. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

NOTE. When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the V_{IN} or V_{OUT} and GND terminals. See Figure 3 for the proper scope technique.

1. Place JP1, JP3 and JP4 on the EN position.
2. With power off, connect the input power supply to V_{IN1} and GND.
3. With power off, connect loads from V_{OUT1} to GND, from V_{OUT2} to GND, and from V_{OUT3} to GND.
4. Turn on the power at the input.

   NOTE: Make sure that the input voltage does not exceed 40V.
5. Check for the proper output voltages:
   V_{OUT1} = 6V, V_{OUT2} = 5V, V_{OUT3} = 5V

   NOTE: If there is no output, temporarily disconnect the load to make sure that the loads are not set too high or are shorted.
6. Once the proper output voltages are established, adjust the loads within the operating ranges and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

QUICK START PROCEDURE

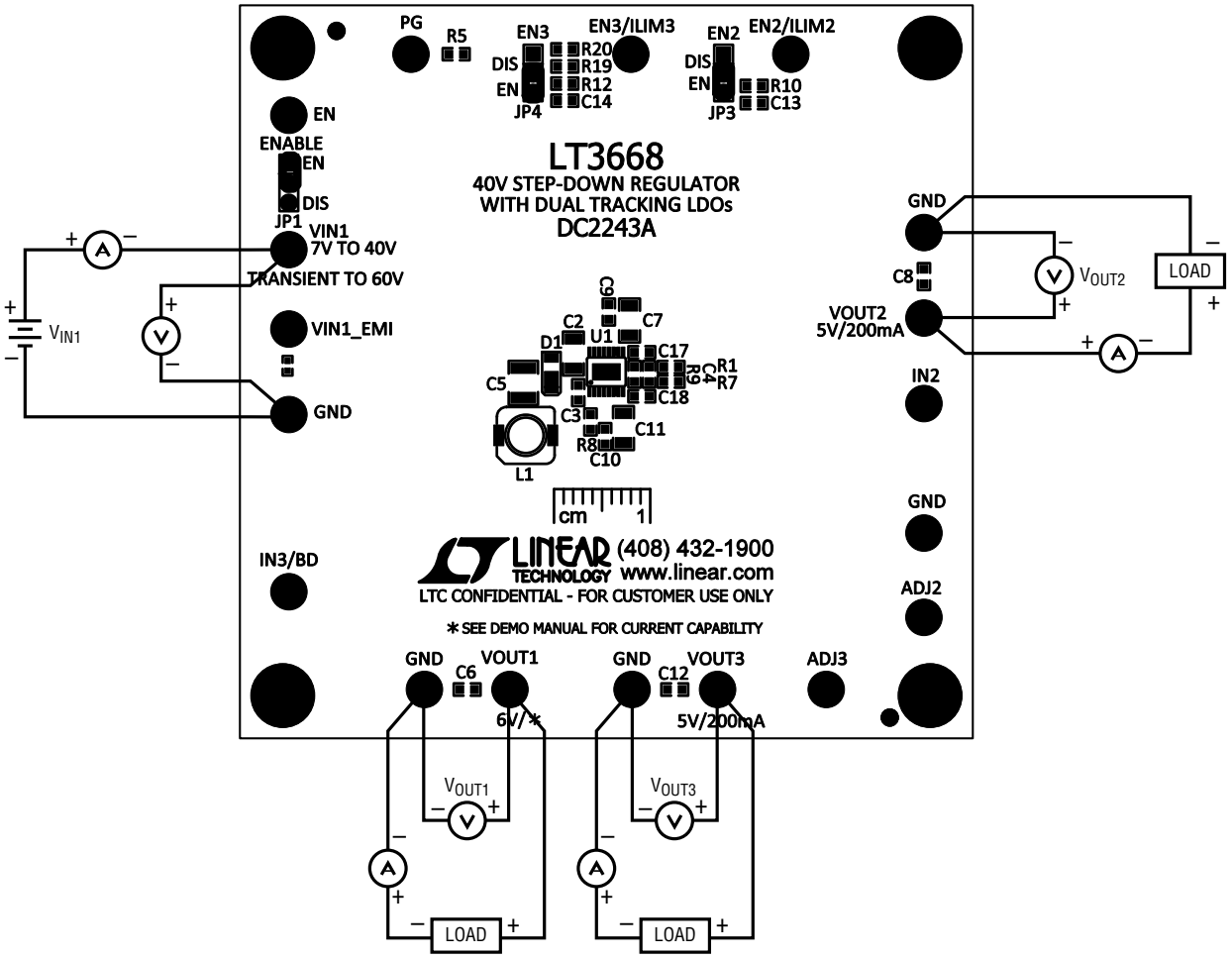

Figure 2. Proper Measurement Equipment Setup

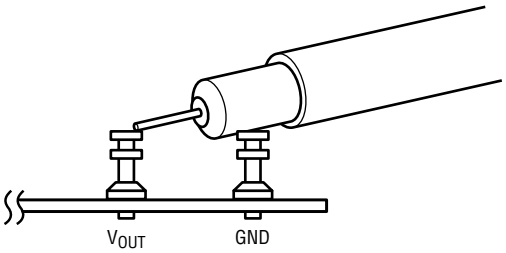

Figure 3. Measuring Input or Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C2	CAP., X7R 2.2µF 100V 10% 1206	AVX, 12061C225KAT2A
2	1	C3	CAP., X7R 0.22µF 25V 10% 0603	AVX, 06033C224KAT2A
3	1	C4	CAP., NPO 22pF 25V 5% 0603	AVX, 06033A220JAT2A
4	1	C5	CAP., X5R 22µF 25V 20% 1210	MURATA, GRM32ER61E226ME15L
5	2	C7, C11	CAP., X5R 10µF 10V 10% 1206	AVX, 1206ZD106KAT2A
6	2	C9, C10	CAP., X5R 1µF 25V 20% 0603	AVX, 06033D105MAT2A
7	1	D1	DIODE, SCHOTTKY 60V 1A POWERDI123	DIODES INC., DFLS160-7
8	1	L1	INDUCTOR, 27µH	SUMIDA, CDRH5D28RHPNP-270MC
9	1	R1	RES., CHIP 243k 0.10W 1% 0603	VISHAY, CRCW0603243KFKEA
10	1	R5	RES., CHIP 150k 0.10W 5% 0603	VISHAY, CRCW0603150KJNEA
11	1	R7	RES., CHIP 931k 0.10W 1% 0603	VISHAY, CRCW0603931KFKEA
12	1	R8	RES., CHIP 174k 0.10W 1% 0603	VISHAY, CRCW0603174KFKEA
13	1	R9	RES., CHIP 294k 0.10W 1% 0603	VISHAY, CRCW0603294KFKEA
14	1	U1	I.C., VOLTAGE REG. MSOP(16)-MSE16	LINEAR TECH., LT3668EMSE#PBF
Additional Demo Board Circuit Components				
1	1	C1	CAP., Alum 10µF 63V 20% OSCON-CE-6.3	SUN ELECTRONIC INDUSTRIES, 63CE10GA
2	1	C6	CAP., X7R 0.1µF 25V 10% 0603	MURATA, GRM188R71E104KA01D
3	0	C8, C12, C17, C18 (Opt)	CAP., 0603	
4	2	C13, C14	CAP., X7R 0.047µF 25V 20% 0603	AVX, 06033C473MAT2A
5	0	C15, C16 (OPT)	CAP., OSCON-CE-6.3	
6	0	C19, C20 (OPT)	CAP., 1206	
7	0	FB1 (OPT)	FERRITE BEAD, 600Ω/500mA 0603	TDK, MMZ1608S601AT
8	0	L2 (OPT)	INDUCTOR, 4.7µH	SUMIDA, CDRH2D18/LDNP-4R7NC
9	4	R6, R13, R17, R18	RES/JUMPER, CHIP 0Ω 0.25W 5A 0603	VISHAY, CRCW06030000Z0EA
10	2	R10, R12	RES., CHIP 1.50k 0.10W 1% 0603	VISHAY, CRCW06031K50FKEA
11	2	R19, R20	RES., CHIP 200k 0.10W 5% 0603	VISHAY, CRCW0603200KJNEA
Hardware: For Demo Board Only				
1	18	E1–E18	TURRET, TESTPOINT	MILL-MAX, 2501-2-00-80-00-00-07-0
2	3	JP1, JP3, JP4	HEADERS, 3 PINS 2mm CTRS.	SULLINS, NRPN031PAEN-RC
3	3	XJP1, XJP3, XJP4	SHUNT, 2mm CTRS.	SAMTEC, 2SN-BK-G
4	4	MH1–MH4	STANDOFF, NYLON 0.25''	KEYSTONE, 8831(SNAP ON)

SCHEMATIC DIAGRAM

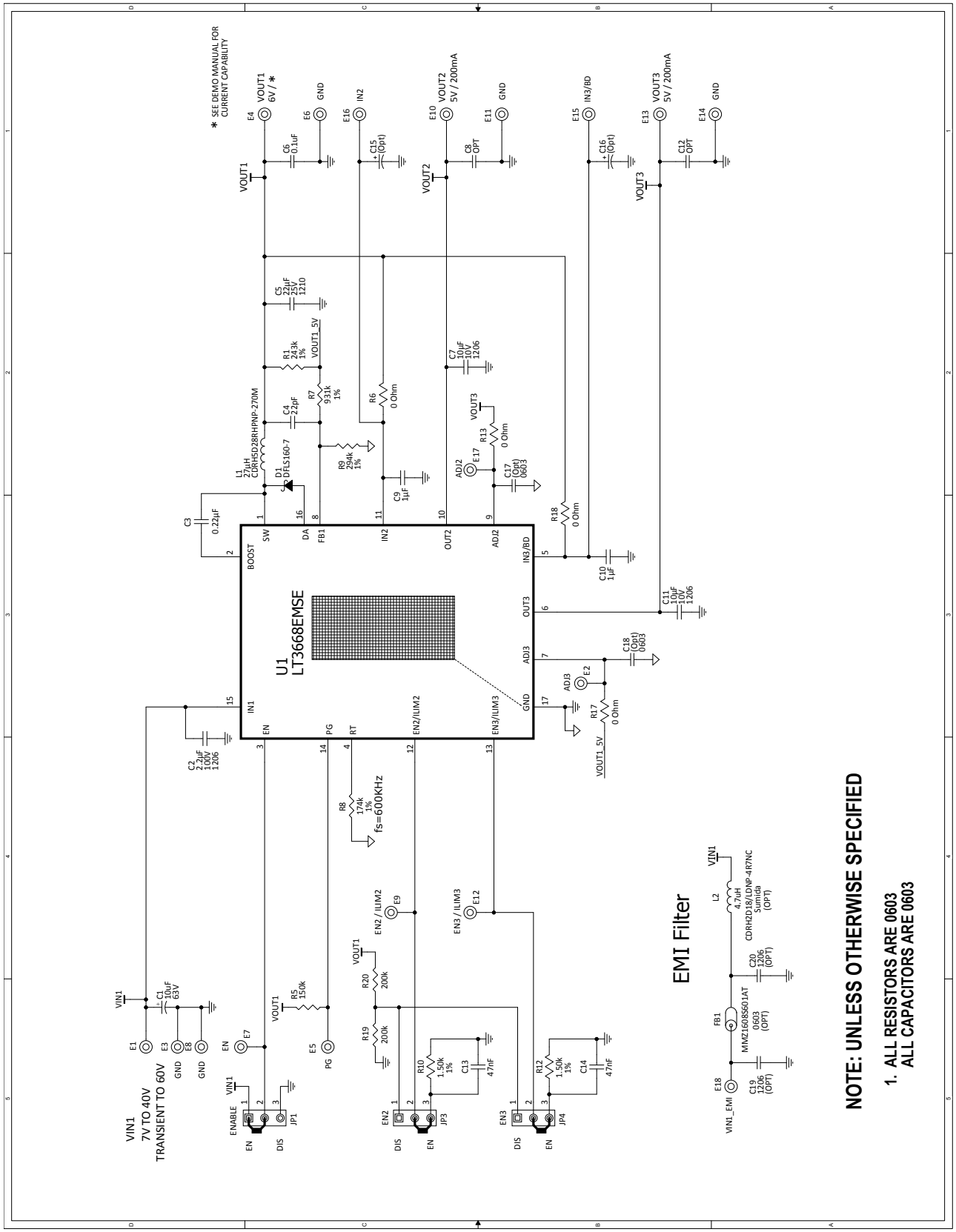

Figure 4. DC2243A Demo Circuit Schematic

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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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