

LTM8002 40V_{IN}, 2.5A Step-Down μ Module Regulator

DESCRIPTION

Demonstration circuit 2501A features the [LTM[®]8002](#), a 40V, 2.5A step-down μ Module[®] regulator. This demo circuit is configured to deliver a 5.0V output from an input voltage between 6.0V to 40V at a switching frequency of 1MHz. The wide input range of the LTM8002 allows a variety of input sources such as automotive batteries and industrial supplies. Under light load conditions, the available Burst Mode[®] operation supports high efficiency with low output ripple.

The demo board has an EMI filter installed. The EMI performance of the board is shown in Figure 6 and Figure 7.

The LTM8002 data sheet gives complete description of the device, operation and application information. The data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit 2501A.

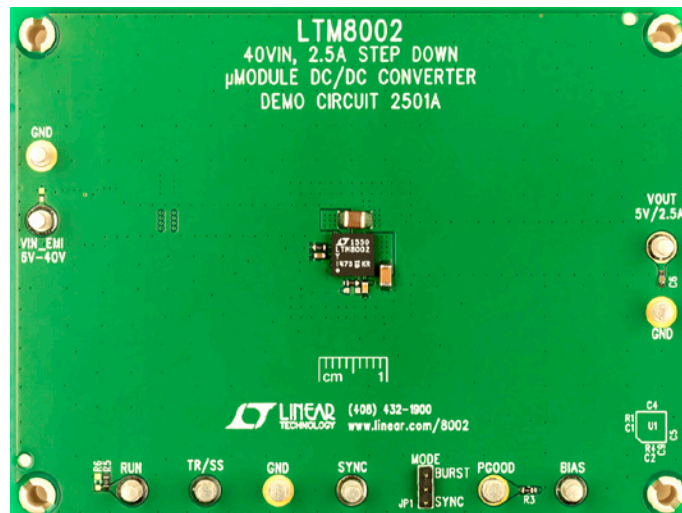
Design files for this circuit board are available at <http://www.linear.com/demo/DC2501A>

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PERFORMANCE SUMMARY Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{IN}	Input Supply Range		6		40	V
V _{OUT}	Output Voltage		4.75	5	5.25	V
I _{OUT}	Output Current	V _{IN} = 12V	2.5			A
f _{SW}	Switching Frequency	V _{IN} = 12V, I _{OUT} = 2.5A		1		MHz
V _{OUT} (AC)	Output Ripple (BW)	V _{IN} = 12V, I _{OUT} = 2.5A		30		mV
η	Efficiency	V _{IN} = 12V, I _{OUT} = 2.5A		90.7		%

BOARD PHOTO



QUICK START PROCEDURE

Demo circuit 2501A is an easy way to evaluate the performance of the LTM8002. Refer to Figure 1 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_{INEMI} or V_{OUT} and GND terminals. See Figure 2 for proper scope probe technique.

1. Place JP1 in Burst position.
2. With power off, connect the input power supply to V_{IN_EMI} and GND.
3. Turn on the power at the input.

Note. Make sure that the input voltage does not exceed 40V.

4. Check for the proper output voltage between V_{OUT} and GND ($V_{OUT} = 5V$).

Note. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

5. Once the proper output voltage is established, adjust the load within the operating range and measure the output voltage regulation, ripple voltage, efficiency and other parameters.
6. An external clock can be added to the SYNC terminal when SYNC function is used (JP1 on the SYNC position). Make sure that R1 be chosen to set the switching frequency equal to or below the lowest SYNC frequency. JP1 can also set the regulator in pulse-skipping mode (Floating JP1) or spread spectrum mode (JP1 on SYNC, and set it high between 3.2V and 4.2V).

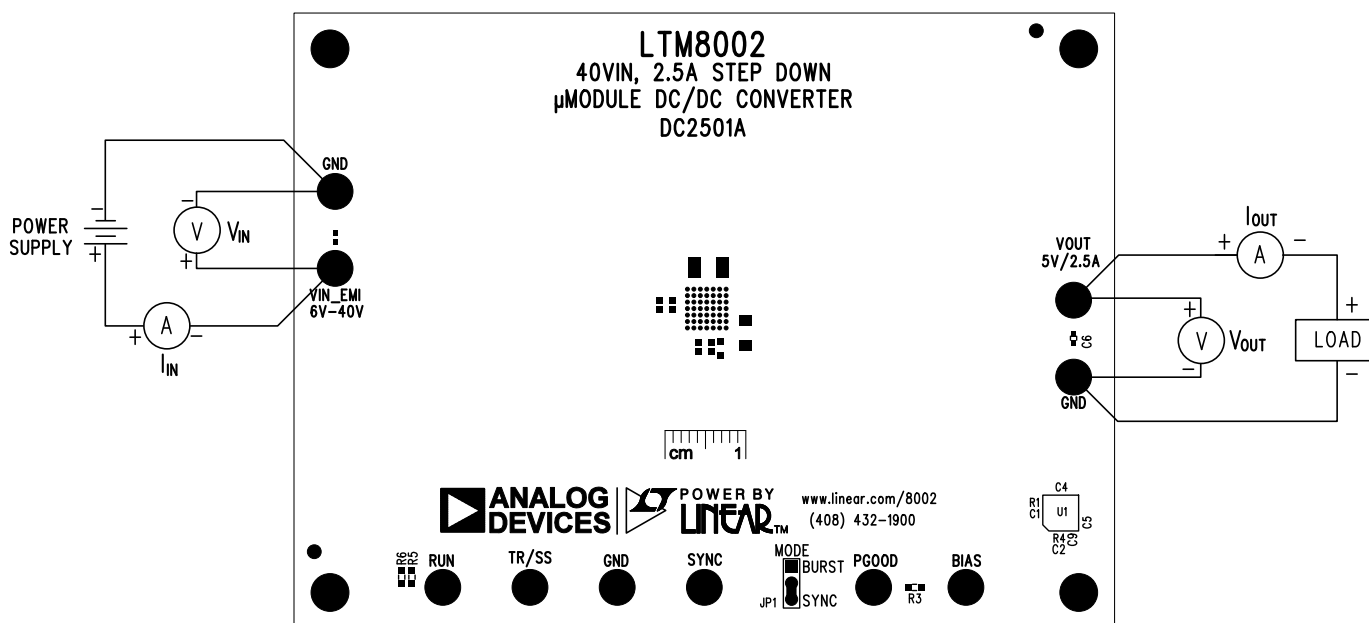


Figure 1. DC2501A Proper Equipment Setup

QUICK START PROCEDURE

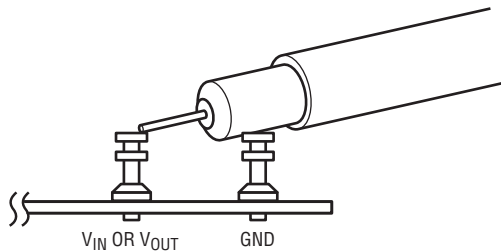


Figure 2. Measuring Input or Output Ripple

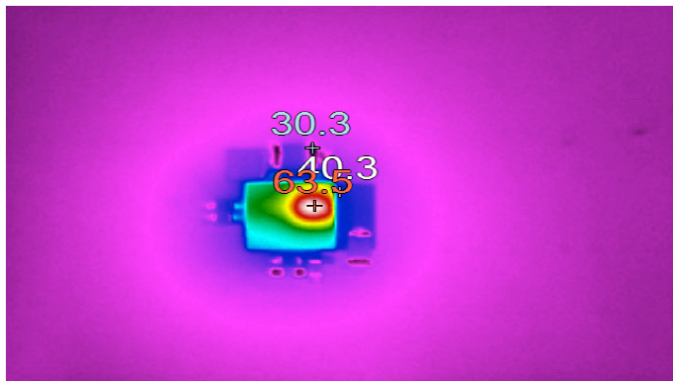


Figure 3. DC2501A Thermal Performance (12V_{IN}, I_{OUT} = 2.5A, T_A = 25°C)

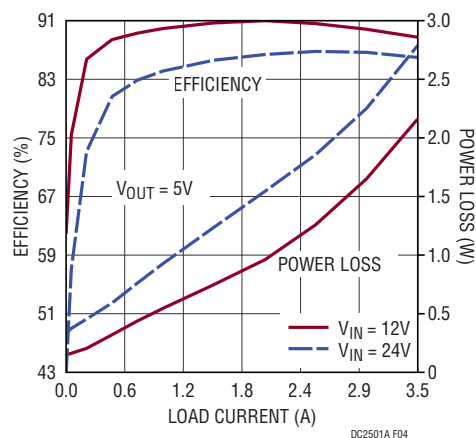


Figure 4. DC2501A Efficiency vs Load Current (T_A = 25°C)

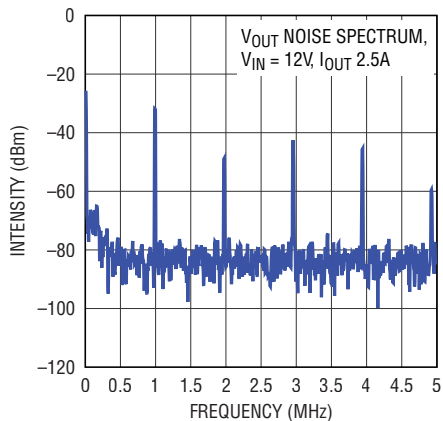
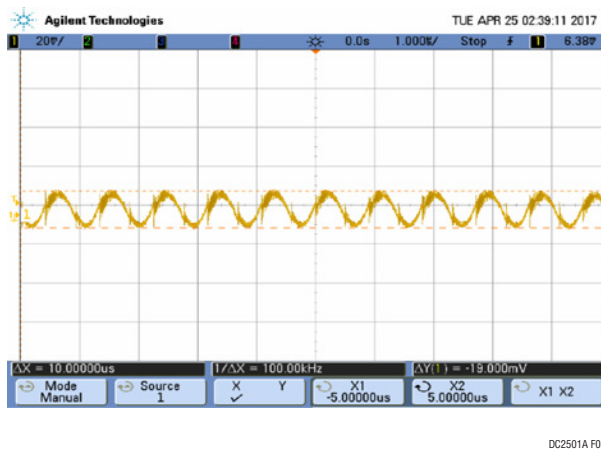


Figure 5. Output Noise with Load Current 2.5A, V_{IN} = 12V



DC2501A F05

QUICK START PROCEDURE

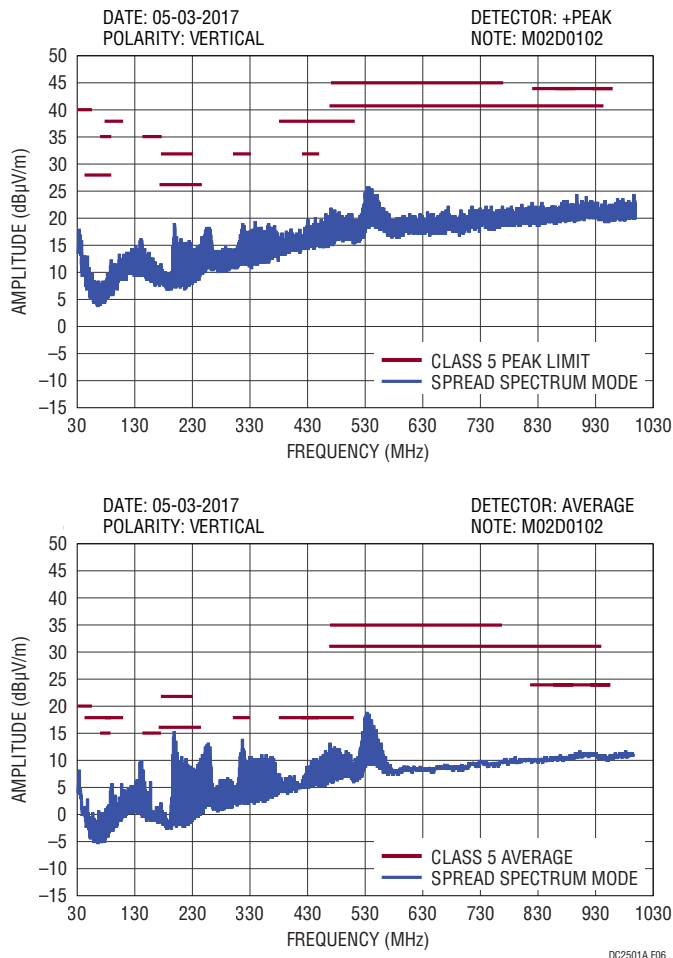


Figure 6. Radiated Peak and Average EMI – 30MHz to 1GHz. Condition: $I_{OUT} = 2.5A$, $V_{IN} = 14V$, $f_{SW} = 1MHz$

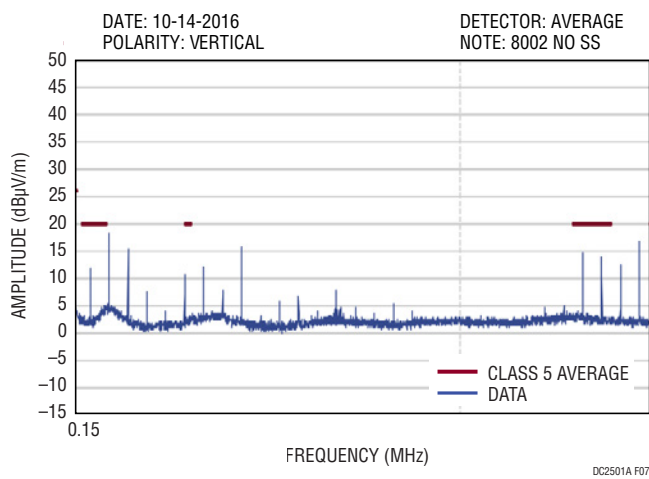


Figure 7. Radiated Average EMI Below 30MHz. Condition: $I_{OUT} = 2.5A$, $V_{IN} = 14V$, $f_{SW} = 1MHz$

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., X7R, 0.1 μ F, 25V, 10% 0603	MURATA, GRM188R71E104KA01D
2	1	C3	CAP., ALUM., 15 μ F, 50V	SUNCON ELEC., 50HVT15MT
3	2	C4, C8	CAP., X7R, 10 μ F, 50V, 10% 1210	MURATA, GRM32ER71H106KA12L
4	1	C5	CAP., X7S, 22 μ F, 6.3V, 20% 1206	MURATA, GRM31CR70J226KE19L
5	1	C6	CAP., X5R, 10 μ F, 6.3V, 20% 0402	MURATA, GRM155R60J106ME44D
6	1	C7	CAP., X7R, 4.7 μ F, 50V, 10% 1206	MURATA, GRM31CR71H475KA12L
7	1	C9	CAP., X7R, 1 μ F, 25V, 10% 0603	MURATA, GRM188R71E105KA12D
8	2	C10	CAP., X7R, 0.1 μ F, 50V, 10% 0402	MURATA, GRM155R71H104KE14D
9	1	FB1	FERRITE CHIP 30 Ω 6A 0805	TDK, MPZ2012S300AT000
10	1	R1	RES., CHIP, 41.2k, 1/10W, 1% 0603	VISHAY, CRCW060341K2FKEA
11	2	R3, R5	RES., CHIP, 100k, 1/10W, 1% 0603	VISHAY, CRCW0603100KFKEA
12	1	R4	RES., CHIP, 24.3k, 1/10W, 1% 0603	VISHAY, CRCW060324K3FKEA
13	1	R7	FIXED IND 470NH 2.25A 87 M Ω , 0805	WURTH ELEKTRONIK, 744383220047
14	1	U1	I.C., BGA, LTM8002, 49-PIN	ANALOG DEVICES, INC., LTM8002HY#PBF
Additional Demo Board Circuit Components				
1	0	C2, C11, C12 (OPT)	CAP., 0603	
2	0	R6 (OPT)	RES., 0603	
Hardware for Demo Board Only				
1	10	E1-E11	TESTPOINT, TURRET, 0.094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	HEADER 3-PIN 0.079 SINGLE ROW	WURTH ELEKTRONIK, 62000311121
3	1	XJP1	SHUNT, 0.079" CENTER	WURTH ELEKTRONIK, 60800213421
4	4	MH1-MH4	STAND-OFF, NYLON 0.50"	WURTH ELEKTRONIK, 702935000



ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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