LTM8073
60V, 3A Silent Switcher µModule Regulator

DESCRIPTION

Demonstration circuit 2389A is a 60V, 3A step-down µModule® regulator featuring the LTM®8073. The demo board is designed for 5V output from a 7V to 60V input. The wide input range allows a variety of input sources, such as automotive batteries and industrial supplies. The user adjustable features of the LTM8073 such as output voltage, switching frequency, soft-start and power good can be changed on DC2389A simply by modifying the appropriate resistors and/or capacitors. Two or more LTM8073s can be paralleled to share load current equally.

The LTM8073 can be programmed to different operation modes. The SYNC pin on the demo board is grounded by default for low ripple Burst Mode® operation. Moving JP1 to PULSE SKIPPING position can change the operation mode to pulse-skipping operation. To synchronize to an external clock, move JP1 to SYNC and apply the external clock to the SYNC turret. Once JP1 is on SPREAD SPECTRUM position, an external DC bias can be applied to the SYNC pin to enable low EMI spread spectrum operation. This DC bias can also be generated from V_{OUT} with appropriate voltage divider if V_{OUT} is 2.9V or higher. See Quick Start Procedure section for more details.

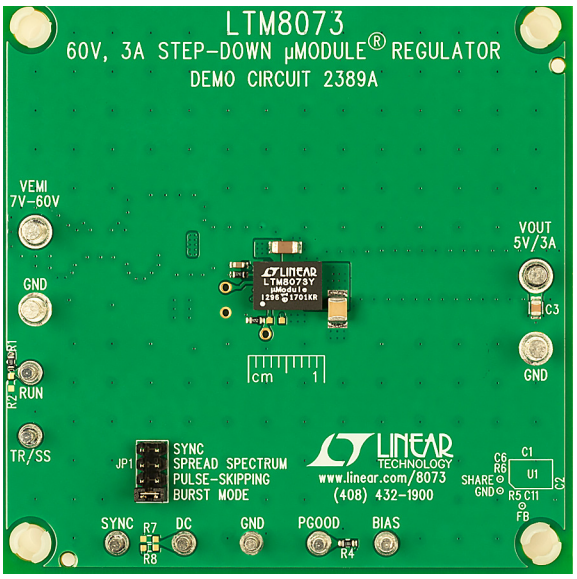
Figure 1 shows the efficiency of the circuit under different input voltages in Burst Mode operation. The rated maximum load current is 3A, while derating is necessary for certain input voltage and thermal conditions. Figure 2 shows the LTM8073 thermal performance on DC2389A demo board.

The demo board has an EMI filter installed. An inductor L1, which is shorted on the board by default, can be added in the EMI filter to further reduce the conducted emission.

The LTM8073 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this demo manual for demo circuit 2389A.

Design files for this circuit board are available at http://www.linear.com/demo/DC2389A

BOARD PHOTO



PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Voltage Range		7		60	V
V_{OUT}	Output Voltage		4.85	5	5.15	V
I_{OUT}	Maximum Output Current		3			A
f_{SW}	Switching Frequency			1.2		MHz
EFF	Efficiency at DC	V_{IN} = 12V, I_{OUT} = 1A		93.9		%

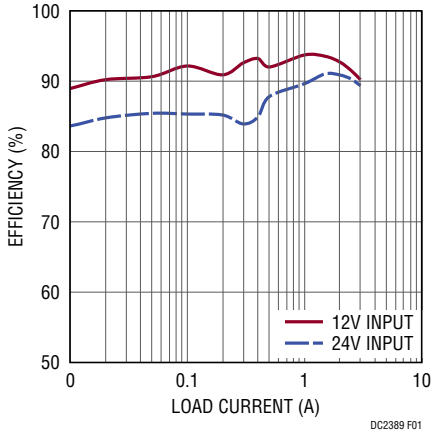


Figure 1. LTM8073 Demo Circuit DC2389A Efficiency vs Load Current

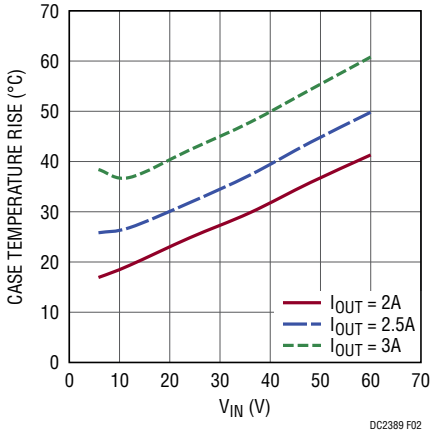


Figure 2. LTM8073 Demo Circuit DC2389A Case Temperature Rise vs Input Voltage

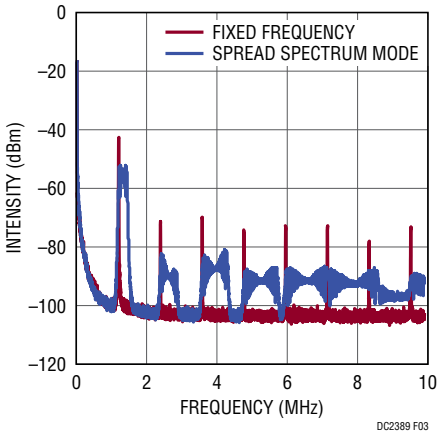


Figure 3. DC2389A Output Noise Spectrum, V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A

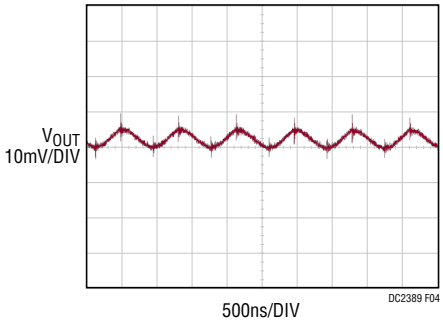


Figure 4. DC2389A Output Ripple, V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A

QUICK START PROCEDURE

Demonstration circuit 2389A is easy to set up to evaluate the performance of the LTM8073. Refer to Figure 5 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. See Figure 6 for the proper scope technique.

1. Set an input power supply that is capable of 60V/3A. Then turn off the supply.
2. With power off, connect the supply to the input terminals V_{EMI} and GND.
3. Turn on the power at the input.

NOTE: Make sure that the input voltage never exceeds 60V.

4. Check for the proper output voltage of 5V. Turn off the power at the input.
5. Once the proper output voltage is established, connect a variable load capable of sinking 3A at 5V to the output terminals V_{OUT} and GND. Set the current for 0A.
   a. If efficiency measurements are desired, an ammeter can be put in series with the output load in order to measure the DC2389A's output current.
   b. A voltmeter can be placed across the output terminals in order to get an accurate output voltage measurement.
6. Turn on the power at the input.

   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
7. Once the proper output voltage is established again, adjust the load and/or input within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other desired parameters.
8. An external clock can be added to the SYNC terminal when SYNC function is used (JP1 on the SYNC position). Please ensure that the chosen RT sets the LTM8073 switching frequency to equal or below the lowest SYNC frequency. An external 2.9V to 4.2V DC voltage can be applied to SYNC turret to enable low noise spread spectrum function (JP1 on the SPREAD SPECTRUM position). This DC voltage can be generated from V_{OUT} with a appropriate voltage divider. See the data sheet section, "Synchronization" for more information.

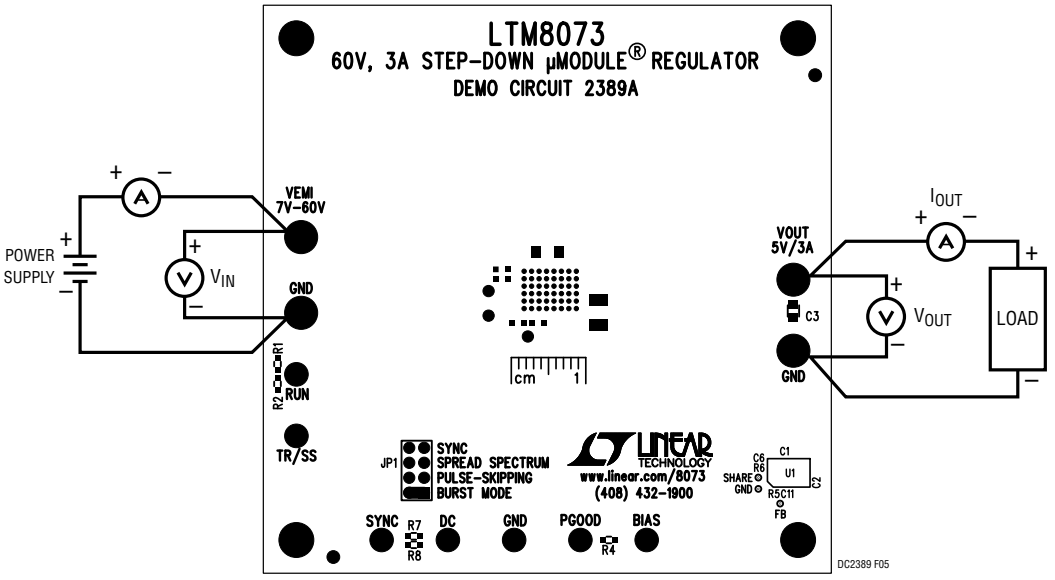


Figure 5. Proper Measurement Equipment Setup

QUICK START PROCEDURE

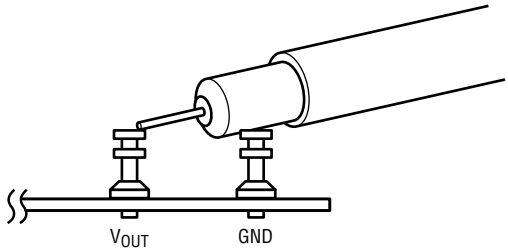
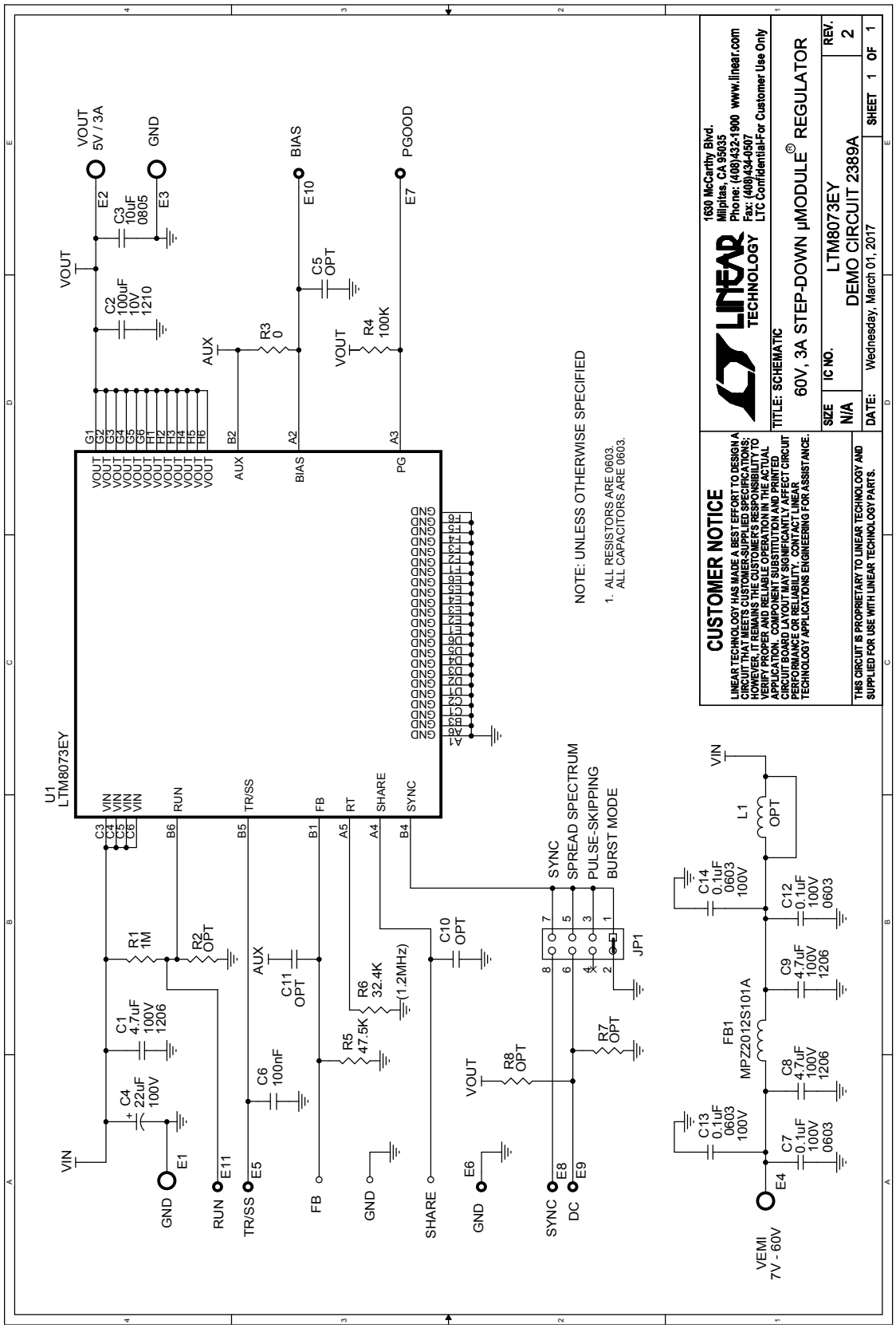


Figure 6. Measuring Output Ripple

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., 4.7µF, X7S, 100V, 10% 1206	AVX, 12061Z475KAT2A
2	1	C2	CAP., 100µF, X5R, 10V, 20% 1210	MURATA, GRM32ER61A107ME20L
3	1	C6	CAP., 100nF, X7R, 25V, 10% 0603	MURATA, GRM188R71E104KA01D
4	1	R1	RES., CHIP, 1M, 1/10W, 1%, 0603	VISHAY, CRCW06031M00FKEA
5	1	R3	RES., 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
6	1	R4	RES., 100k, 1/10W, 1% 0603	VISHAY, CRCW0603100KFKEA
7	1	R5	RES., 47.5k, 1/10W, 1% 0603	VISHAY, CRCW060347K5FKEA
8	1	R6	RES., 32.4k, 1/10W, 1% 0603	VISHAY, CRCW060332K4FKEA
9	1	U1	IC, REGULATOR, 48BGA	LINEAR TECH., LTM8073EY#PBF
Additional Demo Board Circuit Components				
1	1	C3	CAP., 10µF, X7R, 10V, 10% 0805	MURATA, GRM21BR71A106KE51L
2	1	C4	CAP., ALUM. 22µF, 100V	SUN ELECT., 100CE22BS
3	0	C5, C10, C11 (OPT)	CAP., OPTION, 0603	
4	4	C7, C12, C13, C14	CAP., 0.1µF, X7R, 100V, 10% 0603	MURATA, GRM188R72A104KA35D
5	2	C8, C9	CAP., 4.7µF, X7S, 100V, 10% 1206	AVX, 12061Z475KAT2A
6	1	FB1	FERRITE BEAD 0805	TDK, MPZ2012S101AT000
7	0	L1 (OPT.)	IND., OPTION	
8	0	R2, R7, R8 (OPT)	RES., 0603	
Hardware: For Demo Board Only				
1	4	E1-E4	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	7	E5-E11	TESTPOINT, TURRET, 0.064"	MILL-MAX, 2308-2-00-80-00-00-07-0
3	1	JP1	DOUBLE ROW HEADER 2 x 4 0.079"	WURTH ELEKTRONIK, 62000821121
4	1	XJP1	SHUNT, 0.079" CENTER	WURTH ELEKTRONIK, 60800213421
5	4	MH1-MH4	STAND-OFF, NYLON 0.5"	WURTH ELEKTRONIK, 702935000

SCHEMATIC DIAGRAM



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