

LTM4702EY 16V, 8A Step-Down μ Module Regulator with Low Noise Reference

DESCRIPTION

Evaluation board EVAL-LTM4702-AZ is a step-down DC/DC switching converter featuring the [LTM[®]4702](#) μ Module[®] regulator. The evaluation board is designed to deliver 8A maximum output current from a 4V to 16V input. The LTM4702 employs Silent Switcher[®] architecture with internal hot loop bypass capacitors to achieve both low EMI and high efficiency. The LTM4702 contains a current mode regulator IC, power inductor, and a modest amount of input and output capacitance. A single resistor (R3) sets the output voltage, providing unity gain operation over the output range, resulting in virtually constant output noise independent of output voltage.

The EVAL-LTM4702-AZ evaluation board default switching frequency is 800kHz. An external resistor is placed from RT pin to GND (R7) to set the switching frequency.

SYNC pin programs three different operating modes (JP1 jumper): select PULSE for pulse-skipping mode

with improved efficiency at light loads; select FCM for forced continuous mode operation where fixed frequency operation is more critical than low current efficiency and where the lowest output ripple is desired; select SYNC to synchronize to an external clock signal.

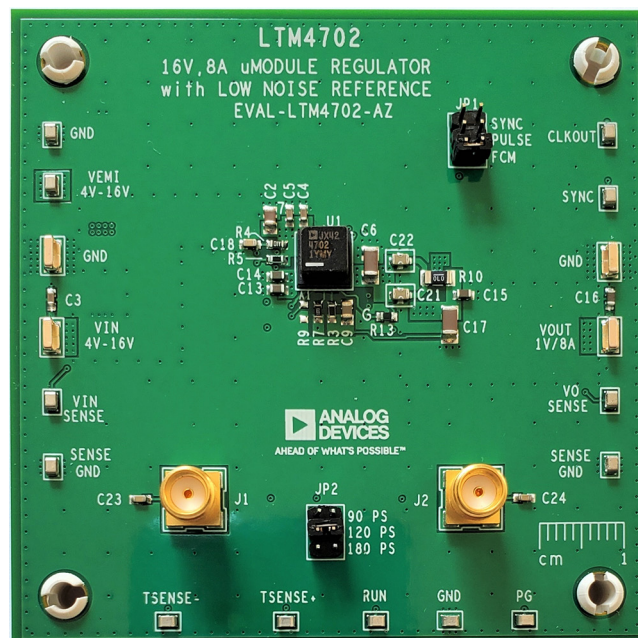
The RUN terminal can be used to set the LTM4702 in shutdown mode. The power good output (PG) will be low when the output voltage is outside of the $\pm 7.5\%$ regulation window. When the power good feature is used, set the PGSET resistor (R1) value according to the regulator output voltage.

The LTM4702 data sheet gives a complete description of the operation and application information. The data sheet must be read in conjunction with this evaluation board.

Design files for this circuit board are available.

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BOARD PHOTO Part marking is either ink mark or laser mark



PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	MIN	TYP	MAX	VALUE
Input Voltage Range		4		16	V
Output Voltage	$V_{IN} = 4\text{V to } 16\text{V}$, $I_{OUT} = 0\text{A to } 8\text{A}$		$1 \pm 2\%$		V
Maximum Output Current	$V_{IN} = 4\text{V to } 16\text{V}$		8		A
Typical Switching Frequency			800		kHz
Typical Efficiency	$V_{IN} = 12\text{V}$, $I_{OUT} = 8\text{A}$		80.5		%

QUICK START PROCEDURE

Evaluation board EVAL-LTM4702-AZ is easy to set up to evaluate the performance of the LTM4702. See 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} (4V to 16V) and GND (input return).
2. Connect the 1V output load between V_{OUT} and GND (Initial load: no load).
3. Connect the DVMs to the input and output. Set default jumper position:

JP1: FCM ON

JP2: 120 PS ON

4. Turn on the input power supply and check for the proper output voltage. V_{OUT} should be $1\text{V} \pm 2\%$.
5. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, efficiency, 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 may 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.

TYPICAL PERFORMANCE CHARACTERISTICS

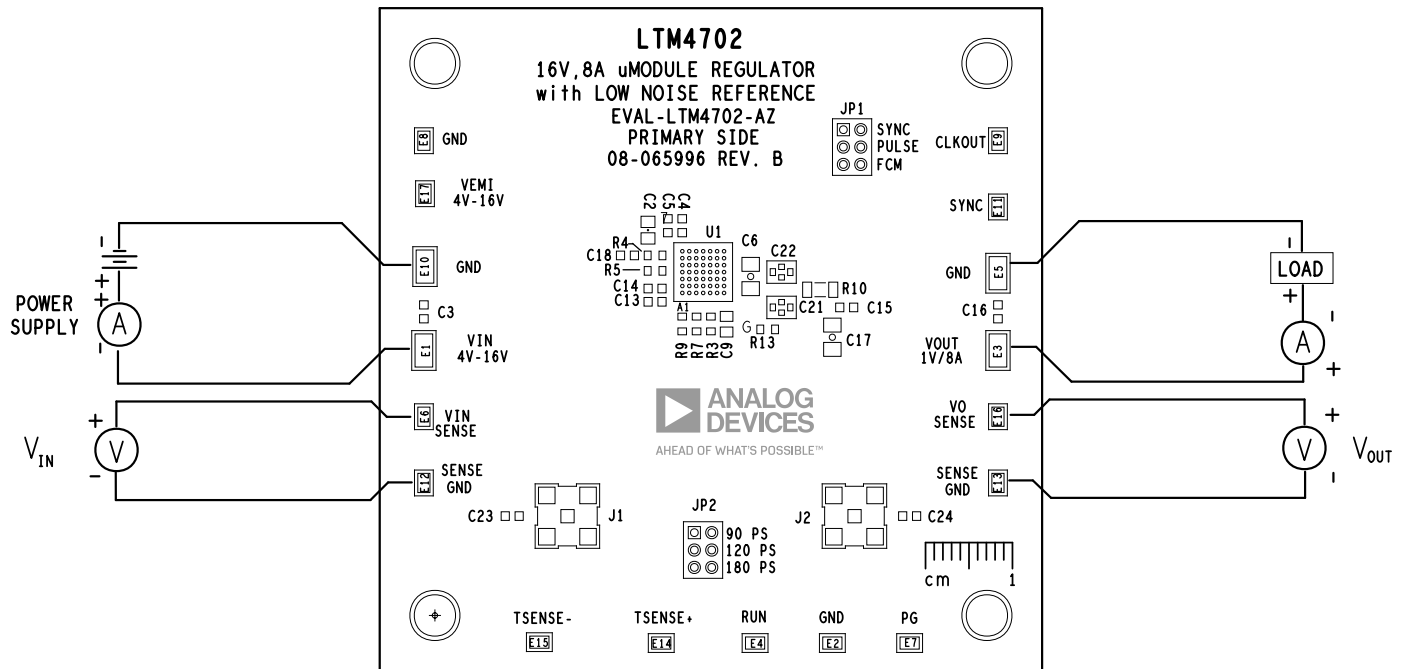


Figure 1. Proper Measurement Equipment Setup

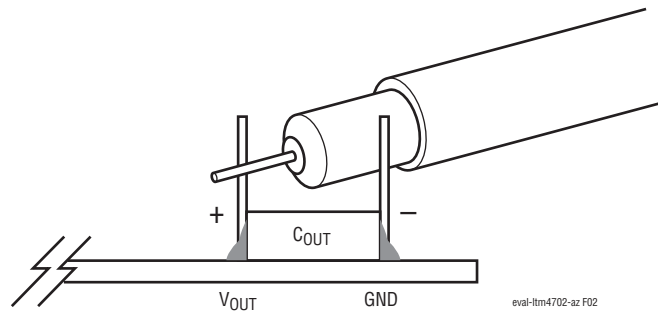


Figure 2. Measuring Output Ripple Voltage

TEST RESULTS

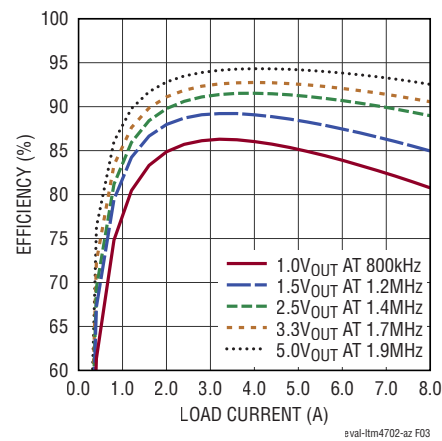


Figure 3. Efficiency vs Load Current, $V_{IN} = 12V$

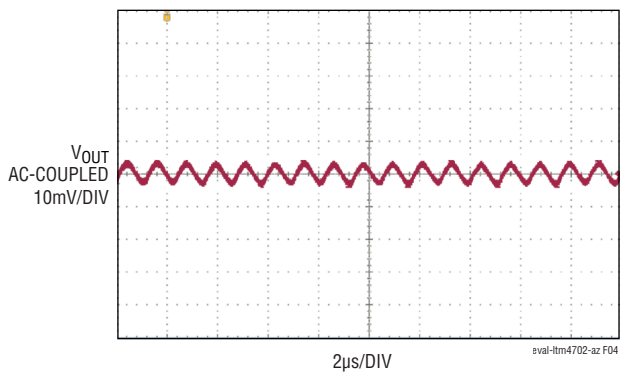


Figure 4. Output Voltage Ripple ($12V_{IN}$, 1V, 8A Output)

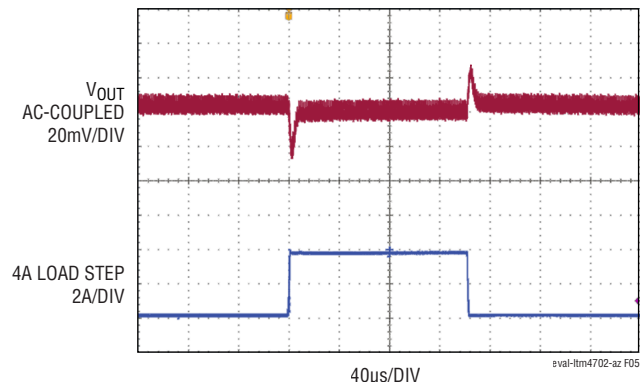


Figure 5. Load Step Transient Test ($V_{IN} = 12V$, $V_{OUT} = 1V$)

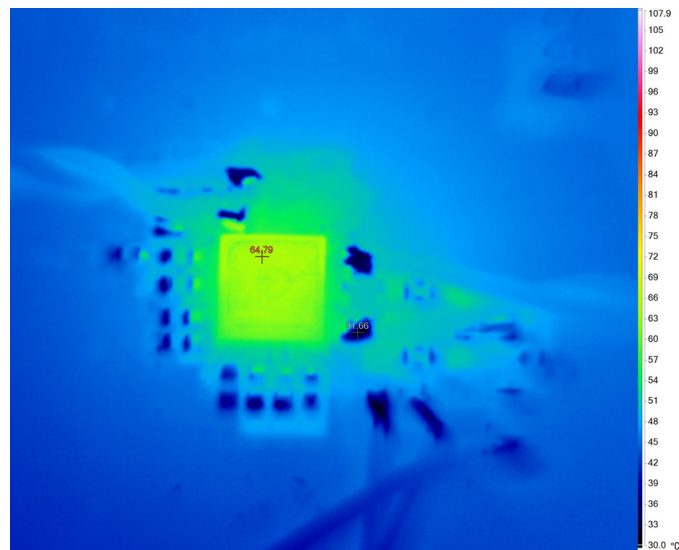


Figure 6. Thermal Image, $V_{IN} = 12V$, 1V, 8A Output (No Heat Sink, No Forced Airflow)

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, ALUM POLY HYBRID, 100μF, 25V, 20%, 6.3mm × 7.7mm, AEC-Q200	PANASONIC, EEH2C1E101XP
2	1	C10	CAP CER, 1μF, 25V, 10%, X7R, 0603, AEC-Q200	TDK, CGA3E1X7R1E105K080AC
3	2	C11, C12	CAP CER, 22μF, 25V, 10%, X7R, 1210	MURATA, GRM32ER71E226KE15L
4	4	C13, C14, C15, C16	CAP CER, 10μF, 6.3V, 20%, X7S, 0603	TDK, C1608X7S0J106M080AC
5	2	C6, C17	CAP CER, 100μF, 10V, 20%, X5R, 1206, LOW ESR	TDK, C3216X5R1A107M160AC
6	3	C18, C23, C24	CAP CER, 0.1μF, 25V, 10%, X7R, 0603	SAMSUNG, CL10B104KA8NNNC
7	1	C19	CAP CER, 2200pF, 16V, 10%, X7R, 0603	VISHAY, VJ0603Y222KXJCW1BC
8	1	C2	CAP CER, 22μF, 25V, 20%, X5R, 0805, AEC-Q200	MURATA, GRT21BR61E226ME13L
9	2	C21, C22	CAP FEEDTHRU, 4.7μF, 10V, 20%, 0805, 3-TERMINAL	MURATA, NFM21PC475B1A3D
10	3	C3, C4, C5	CAP CER, 2.2μF, 25V, 10%, X5R, 0603	MURATAGRM188R61E225KA12D
11	1	C9	CAP CER, 1μF, 10V, 10%, X7R, 0805	AVX, 0805ZC105KAT2A
12	1	FB1	IND., CHIP FERRITE BEAD, 0.015Ω, DCR, 5.1A	WURTH ELEKTRONIK, 74279228600
13	1	L1	IND., POWER SHIELDED WIREWOUND, 0.0073Ω, DCR, 9.5A	WURTH ELEKTRONIK, 744373240022
14	1	R1	RES., SMD, 49.9k, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ-3EKF4992V
15	1	R10	RES., SMD, 0Ω, 1%, 1/4W, 1206	VISHAYWSL, 120600000ZEA9
16	1	R12	RES., 1.2k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW06031K20FKEA
17	1	R13	RES., SMD, 0Ω, JUMPER, 1/10W, 0603, AEC-Q200, PRECISION POWER	VISHAY, CRCW060300000Z0EA
18	2	R2, R5	RES., SMD, 100k, 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ-3EKF1003V
19	1	R3	RES., SMD, 10k 1%, 1/10W, 0603, AEC-Q200	PANASONIC, ERJ-3EKF1002V
20	1	R4	RES., SMD, 1Ω, 1%, 1/10W, 0603	YAGEO, RC0603FR-071RL
21	1	R7	RES., 137k, 1%, 1/10W, 0603, AEC-Q200	VISHAY, CRCW0603137KFKEA
22	1	U1	IC-ADI, 18VIN, 8A, Silent Switcher, μModule REGULATOR	ANALOG DEVICES, LTM4702EY#PBF
Additional Demo Board Circuit Components				
18	0	C7, C8, C20, C25	OPTIONAL CAPACITOR	
19	0	R6, R8, R9, R11	OPTIONAL RESISTOR	
20	0	L2	OPTIONAL INDUCTOR	
Hardware: For Demo Board Only				
24	2	J1, J2	CONN., PCB, SMA, FEMALE JACK, RCP, 50Ω	MOLEX, 732511350
26	2	JP1, JP2	CONN., HDR, MALE, 2 × 3, 2mm, VERT, ST, THT	WURTH ELEKTRONIK, 62000621121
27	4		STANDOFF, BRD, SPT, SNAP-FIT, 9.53mm LENGTH, EVAL BOARD MTG	KEYSTONE, 8832
28	2		CONN., SHUNT, FEMALE, 2-POS, 2mm	KEYSTONE, 8831
29	1	PCBs	FAB PRINTED CIRCUIT BOARD	WURTH ELEKTRONIK, 702931000

SCHEMATIC DIAGRAM



REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER
0	04/23	Initial Release	—

DEMO MANUAL

EVAL-LTM4702-AZ



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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