LTM4606
EN55022B Compliant 28V_{IN}, 6A Step-Down µModule Regulator

DESCRIPTION

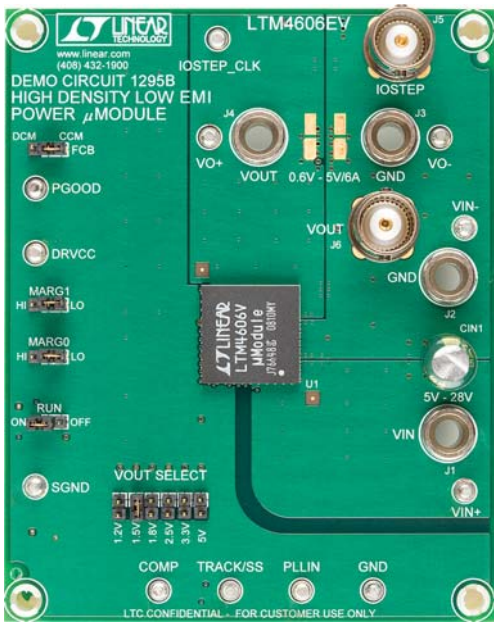
Demonstration circuit DC1295B features the LTM®4606EV, an EN55022 Class B certified, switch mode step-down power module. The input voltage range is from 4.5V to 28V with a jumper programmable output voltage from 0.6V to 5V. The rated load current is 6A, while derating is necessary for certain V_{IN}, V_{OUT}, and thermal conditions. The LTM4606 allows the user to program output ramp-up and ramp-down through the TRACK/SS pin. The output can be set to coincidentally or ratiometrically track to another voltage rail. Output voltage margining can also be realized through jumper position selections. The LTM4606 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC1295B.

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		5V to 28V
Output Voltage V_{OUT}	Jumper Selectable (Open for 0.6V)	1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5V; ±2%
Maximum Continuous Output Current	Derating Is Necessary for Certain V_{IN}, V_{OUT}, and Thermal Conditions	$6A_{DC}$
Default Operating Frequency		800kHz
Efficiency	V_{IN} = 12V, V_{OUT} = 3.3V, I_{OUT} = 6A	89.6%, See Figure 4

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit DC1295B is an easy way to evaluate the performance of the LTM4606EV. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical $1.5V_{OUT}$ application:

FCB	MARG1	MARG0	RUN	VOUT SELECT
CCM	LO	LO	ON	1.5V

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to be 12V.
3. Turn on the power at the input. The output voltage should be 1.5V ±2% (1.47V ~ 1.53V).
4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, efficiency and other parameters.
5. The very low ripple of the LTM4606 requires proper measurement technique. Input ripple can be measured with a typical scope probe, but you should not use the ground clip lead. See Figure 2 for an illustration of how to connect to the input capacitor. The output ripple should be measured with a 50Ω BNC cable connected to J6.
6. For the optional load transient test, apply an adjustable pulse signal between IOSTEP_CLK and GND pins. Pulse amplitude sets the current step. The pulse signal should have very small duty cycle (<5%) to limit the thermal stress on the transient load circuit. The output transient current can be monitored at BNC connector J5 (10mV/A), the output voltage can be monitored at BNC connector J6.

QUICK START PROCEDURE

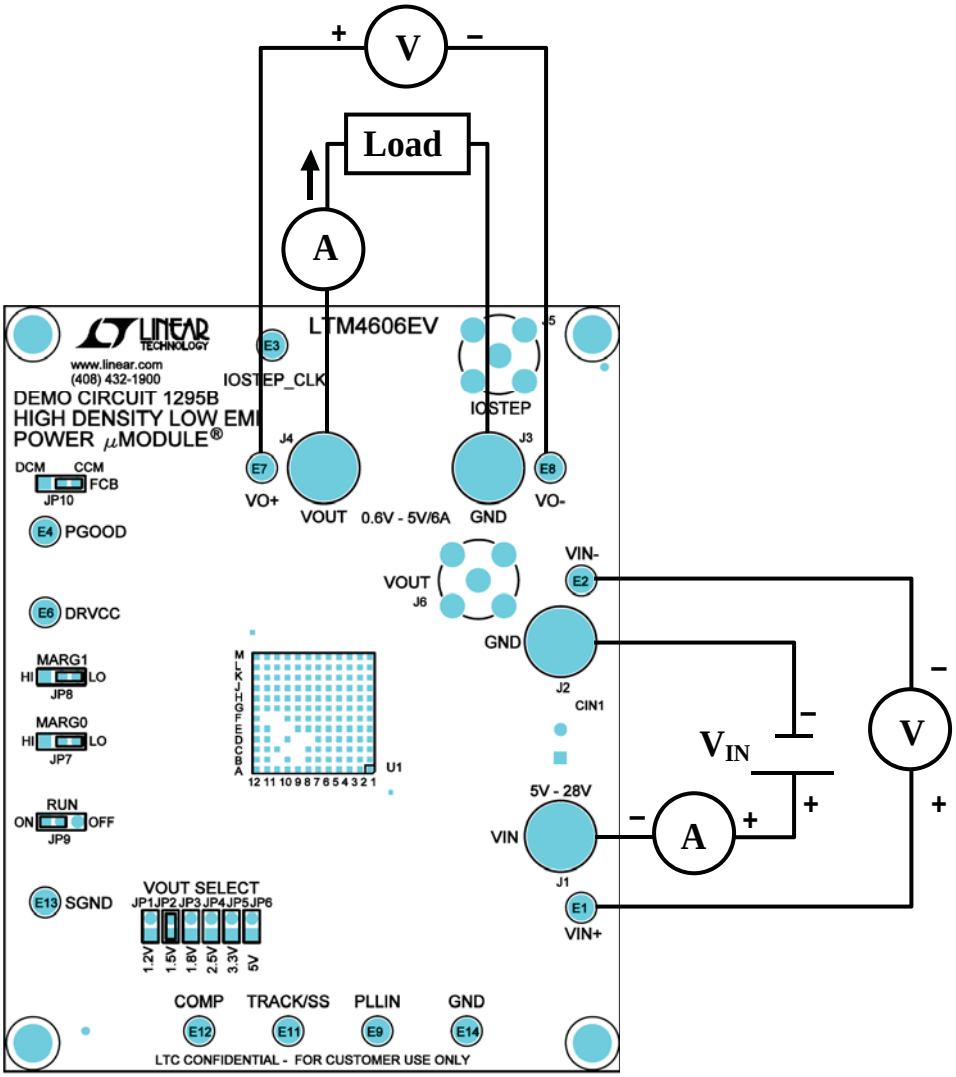


Figure 1. Test Setup of DC1295B

Input Capacitor

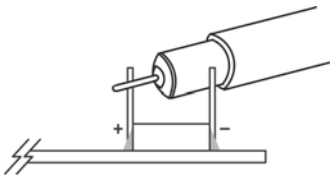
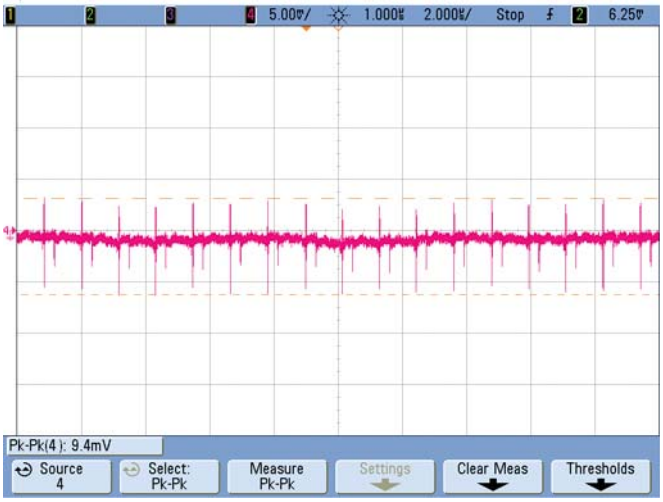
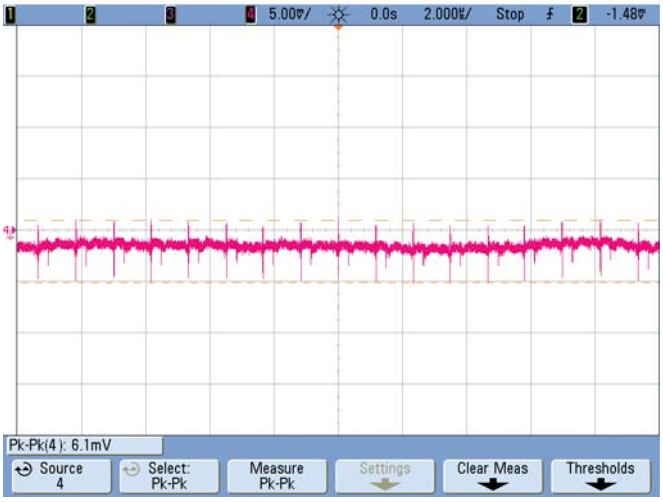


Figure 2. Scope Probe Placements for Measuring Input Ripple

QUICK START PROCEDURE



V_{IN} = 5V, V_{OUT} = 1.2V, I_{OUT} = 5A
OUTPUT CAPACITANCE: 100µF + 22µF CERAMIC CAPACITORS



V_{IN} = 5V, V_{OUT} = 1.2V, I_{OUT} = 5A
OUTPUT CAPACITANCE: 100µF + 22µF CERAMIC CAPACITORS
A 1µF CERAMIC CAPACITOR ADDED CLOSE TO C_{OUT1}

Figure 3. Output Ripple (300MHz BW)

QUICK START PROCEDURE

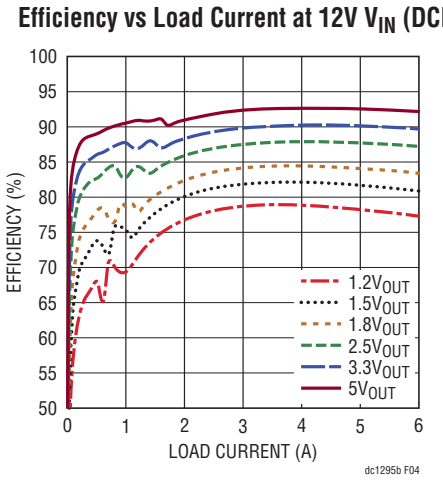
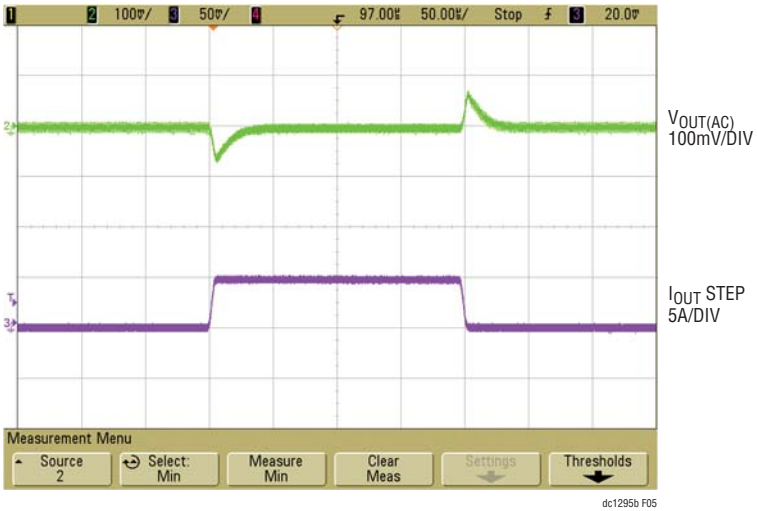


Figure 4. Measured Efficiency at 12V V_{IN} with Different V_{OUT}



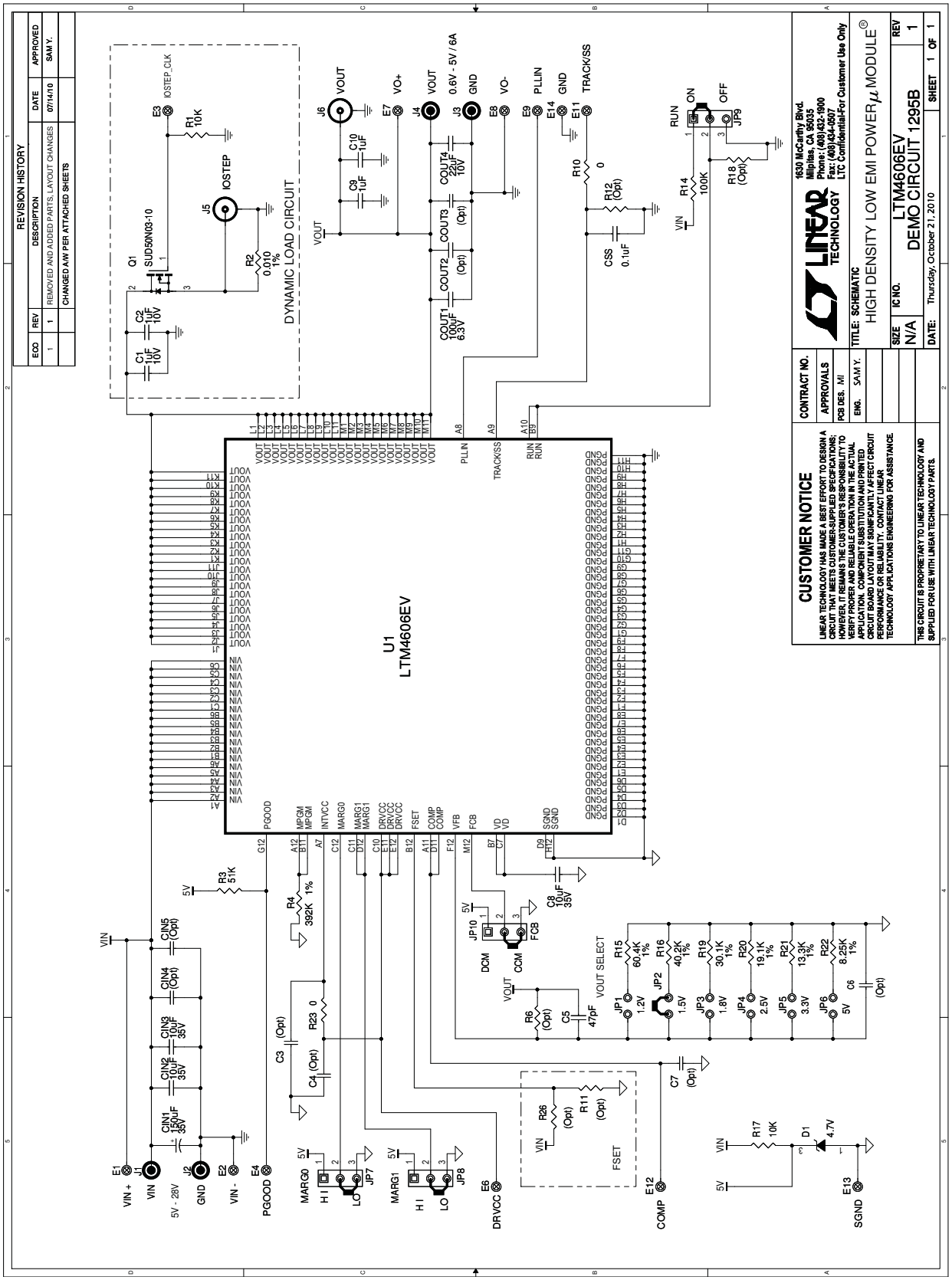
V_{IN} = 12V, V_{OUT} = 1.5V, 0A TO 5A LOAD STEP (CCM)
C_{OUT} = 100µF/6.3V/X5R + 22µF/10V/X5R CERAMIC CAPACITORS

Figure 5. Measured Load Transient Response

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CIN1	CAP, 150µF 20% 35V ALUM	SANYO 35ME150WXV (now SUNCON 35ME150WXV)
2	3	CIN2, CIN3, C8	CAP, 1206 10µF 20% 35V X5R	TAIYO YUDEN GMK316BJ106ML-T
3	1	COUT1	CAP, 1812 100µF 20% 6.3V X5R	TDK C4532X5R0J107M
4	1	COUT4	CAP, 1210 22µF 20% 10V X5R	TAIYO YUDEN JMK325BJ226MM-T
5	1	CSS	CAP, 0603 0.1µF 20% 16V X7R	AVX 0603YC104MAT2A
6	1	C5	CAP, 0603 47pF 10% 50V NPO	AVX 06035A470KAT2A
7	1	D1	DIODE, ZENER 4.7V	DIODES INC. BZX84C4V7
8	1	R17	RES, 0603 10k 5% 1/10W	VISHAY CRCE060310K0JNEA
9	1	R4	RES, 0603 392k 1% 1/10W	VISHAY CRCW0603392KFKEA
10	1	R14	RES. 0603 100k 5% 1/10W	VISHAY CRCW0603100KJNEA
11	1	R15	RES, 0603 60.4k 1% 1/10W	VISHAY CRCW060360K4FKEA
12	1	U1	IC, POWER µMODULE	LINEAR TECH. LTM4606EV
Additional Demo Board Circuit Components				
1	2	CIN4, CIN5	CAP, 1206 OPTION	OPTION
2	0	COUT2	CAP, 1812 OPTION	OPTION
3	0	COUT3	CAP, 1210 OPTION	OPTION
4	2	C1, C2	CAP, 0603 1µF 10% 10V X5R	TAIYO YUDEN LMK107BJ105KA
5	0	C3, C4, C6, C7	CAP, 0603 OPTION	OPTION
6	1	Q1	XSTR, SUD50N03-10CP MOSFET	SILICONIX SUD50N03-10CP
7	1	R1	RES, 0603 10k 5% 1/10W	VISHAY CRCE060310K0JNEA
8	1	R2	RES, 2512 0.010Ω 1% 1W	VISHAY WSL2512R0100FEA
9	1	R3	RES. 0603 51k 5% 1/10W	VISHAY CRCW060351K0JNEA
10	0	R6, R11, R12, R18, R26	RES, 0603 OPTION	OPTION
11	2	R23, R10	RES, 0603 0Ω JUMPER	VISHAY CRCW06030000Z0EA
12	1	R16	RES, 0603 40.2k 1% 1/10W	VISHAY CRCW060340K2FKEA
13	1	R19	RES, 0603 30.1k 1% 1/10W	VISHAY CRCW060330K1FKEA
14	1	R20	RES, 0603 19.1k 1% 1/10W	VISHAY CRCW060319K1FKEA
15	1	R21	RES, 0603 13.3k 1% 1/10W	VISHAY CRCW060313K3FKEA
16	1	R22	RES, 0603 8.25k 1% 1/10W	VISHAY CRCW06038K25FKEA
Hardware/Components (For Demo Board Only)				
1	12	E1-E4, E6-E9, E11-E14	TURRET	MILL MAX 2308-2-00-80-00-00-07-0
2	6	JP1, JP2, JP3, JP4, JP5, JP6	HEADER, 2-PIN, 2mm	SAMTEC TMM 102-02-L-S
3	4	JP7, JP8, JP9, JP10	HEADER, 3-PIN, 2mm	SAMTEC TMM-103-02-L-S
4	4	J1, J2, J3, J4	JACK, BANANA	KEYSTONE 575-4
5	2	J5, J6	CONN, BNC, 5 PINS	CONNEX 112404
6	5	JP2, JP7-JP10	SHUNT, 2mm	SAMTEC 2SN-BK-G
7	4		STANDOFF, NYLON	KEYSTONE 8834

SCHEMATIC DIAGRAM



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