LTM4600EV

DESCRIPTION

Demonstration circuit DC823B-A features the LTM®4600EV, the high efficiency, high density switch mode step-down power module. The input voltage is from 4.5V to 20V. The output voltage is programmable from 0.6V to 5V, refer to step down ratio curve in the LTM4600 data sheet. The rated load current is 10A, while de-rating is necessary for different V_{IN}, V_{OUT}, and thermal conditions. Integrated input and output filters enable a simple PCB layout. Only bulk input and output capacitors are needed.

Design files for this circuit board are available. Call the LTC factory.

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	TEST CONDITION	VALUE
Minimum Input Voltage		4.5V
Maximum Input Voltage		20V
Output Voltage V_{OUT}	Selectable with jumpers (open for 0.6Vo)	1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5V
Maximum Continuous Output Current	5-20V_{IN}, 1.5V_{OUT}	10 A_{DC}
Efficiency	V_{IN} = 12V, V_{OUT}=1.5V, I_{OUT} = 10A	82%, See Figure 1
Load Transient	V_{IN} = 12V, V_{OUT}=1.5V	See Figure 2 and Table 1 for details

QUICK START PROCEDURE

Demonstration circuit DC823B-A is easy to set up to evaluate the performance of the LTM4600EV. Refer to Figure 3 for proper measurement equipment setup and follow the procedure below:

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

V_{OUT} Select	FCB	RUN
1.5V	CCM	ON

2. With power off, connect the input power supply, load, optional 5V bias supply and meters as shown in Figure 3. Preset the load to 0A and Vin supply to be less than 20V. The optional 5V bias supply must be off while the main Vin is turned off.
3. Turn on the power at the input. The output voltage should be 1.5V ± 2%.
4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters. Output voltage ripple should be measured at J6 with a BNC cable.
5. For 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 (<15%) to limit the thermal stress of the transient load circuit. The output transient current can be monitored at BNC connector J5 (10mV/A).

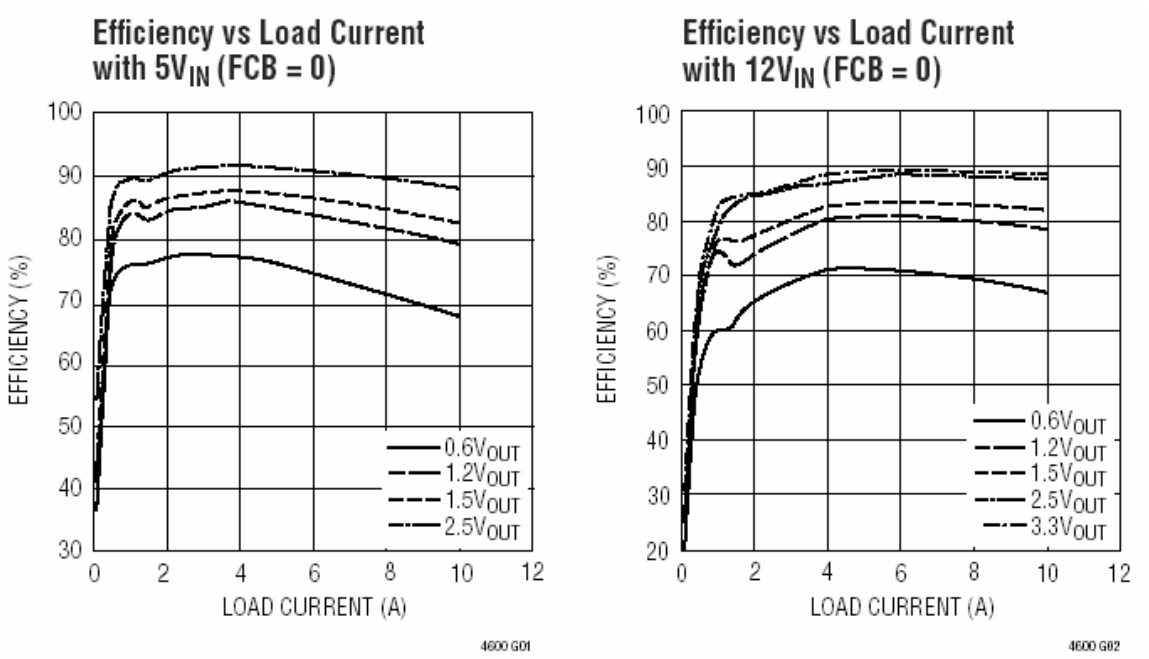
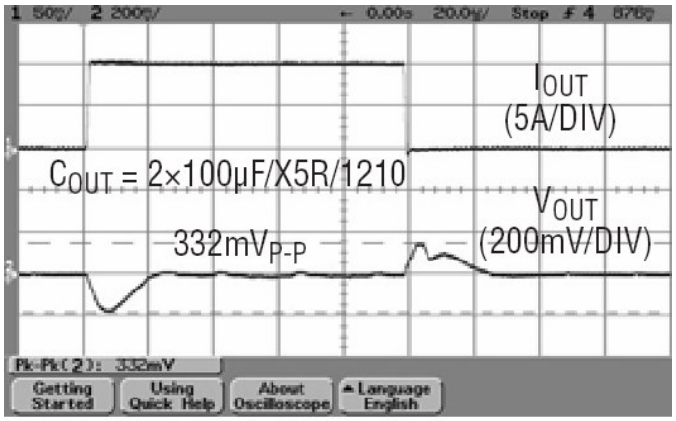


Figure 1. Measured Supply Efficiencies with Different V_{IN} and V_{OUT}



V_{IN} = 12V
V_{OUT} = 1.5V
FCB = 0
0A TO 10A LOAD STEP

Figure 2. Measured Load Transient Response (0-10A Step)

Table 1. Output capacitors vs. load transient (0A-5A step)

TYPICAL MEASURED VALUES			
C_{OUT1} VENDORS	PART NUMBER	C_{OUT2} VENDORS	PART NUMBER
TDK	C4532X5R0J107MZ (100UF,6.3V)	SANYO POS CAP	6TPE330MIL (330µF, 6.3V)
TAIYO YUDEN	JMK432BJ107MU-T (100µF, 6.3V)	SANYO POS CAP	2R5TPE470M9 (470µF, 2.5V)
TAIYO YUDEN	JMK316BJ226ML-T501 (22µF, 6.3V)	SANYO POS CAP	4TPE470MCL (470µF, 4V)

V_{OUT} (V)	C_{IN} (CERAMIC)	C_{IN} (BULK)	C_{OUT1} (CERAMIC)	C_{OUT2} (BULK)	C_{COMP}	C3	V_{IN} (V)	DROOP (mV)	PEAK TO PEAK (mV)	RECOVERY TIME (µs)	LOAD STEP (A/µs)
1.2	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	12	35	68	25	5
1.2	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	5	35	68	25	5
1.5	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	12	36	75	25	5
1.5	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	5	36	75	25	5
1.8	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	12	40	81	30	5
1.8	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	5	40	81	30	5
2.5	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	12	51	102	30	5
2.5	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	5	57	116	30	5
3.3	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	12	64	129	35	5
3.3	2 × 10µF 25V	150µF 35V	3 × 22µF 6.3V	470µF 4V	NONE	100pF	7	82	166	35	5
1.2	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 2.5V	NONE	100pF	12	35	70	20	5
1.2	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 2.5V	NONE	100pF	5	35	70	20	5
1.5	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 2.5V	NONE	100pF	12	37	79	20	5
1.5	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 2.5V	NONE	100pF	5	37	79	20	5
1.8	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 2.5V	NONE	100pF	12	44	85	20	5
1.8	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 2.5V	NONE	100pF	5	44	88	20	5
2.5	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 4V	NONE	100pF	12	48	103	30	5
2.5	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 4V	NONE	100pF	5	48	103	30	5
3.3	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 4V	NONE	100pF	12	52	106	30	5
3.3	2 × 10µF 25V	150µF 35V	1 × 100µF 6.3V	470µF 4V	NONE	100pF	7	66	132	30	5
1.2	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	12	40	80	20	5
1.2	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	5	40	80	20	5
1.5	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	12	44	89	20	5
1.5	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	5	44	84	20	5
1.8	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	12	44	91	20	5
1.8	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	5	46	91	20	5
2.5	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	12	56	113	30	5
2.5	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	5	56	113	30	5
3.3	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	12	64	126	30	5
3.3	2 × 10µF 25V	150µF 35V	2 × 100µF 6.3V	330µF 6.3V	NONE	100pF	7	64	126	30	5
1.2	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	12	49	98	20	5
1.2	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	5	49	98	20	5
1.5	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	12	54	108	20	5
1.5	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	5	61	118	20	5
1.8	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	12	62	125	20	5
1.8	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	5	62	128	20	5
2.5	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	12	70	159	25	5
2.5	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	5	60	115	25	5
3.3	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	12	76	144	25	5
3.3	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	7	100	200	25	5
5	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	15	188	375	25	5
5	2 × 10µF 25V	150µF 35V	4 × 100µF 6.3V	NONE	NONE	100pF	20	159	320	25	5

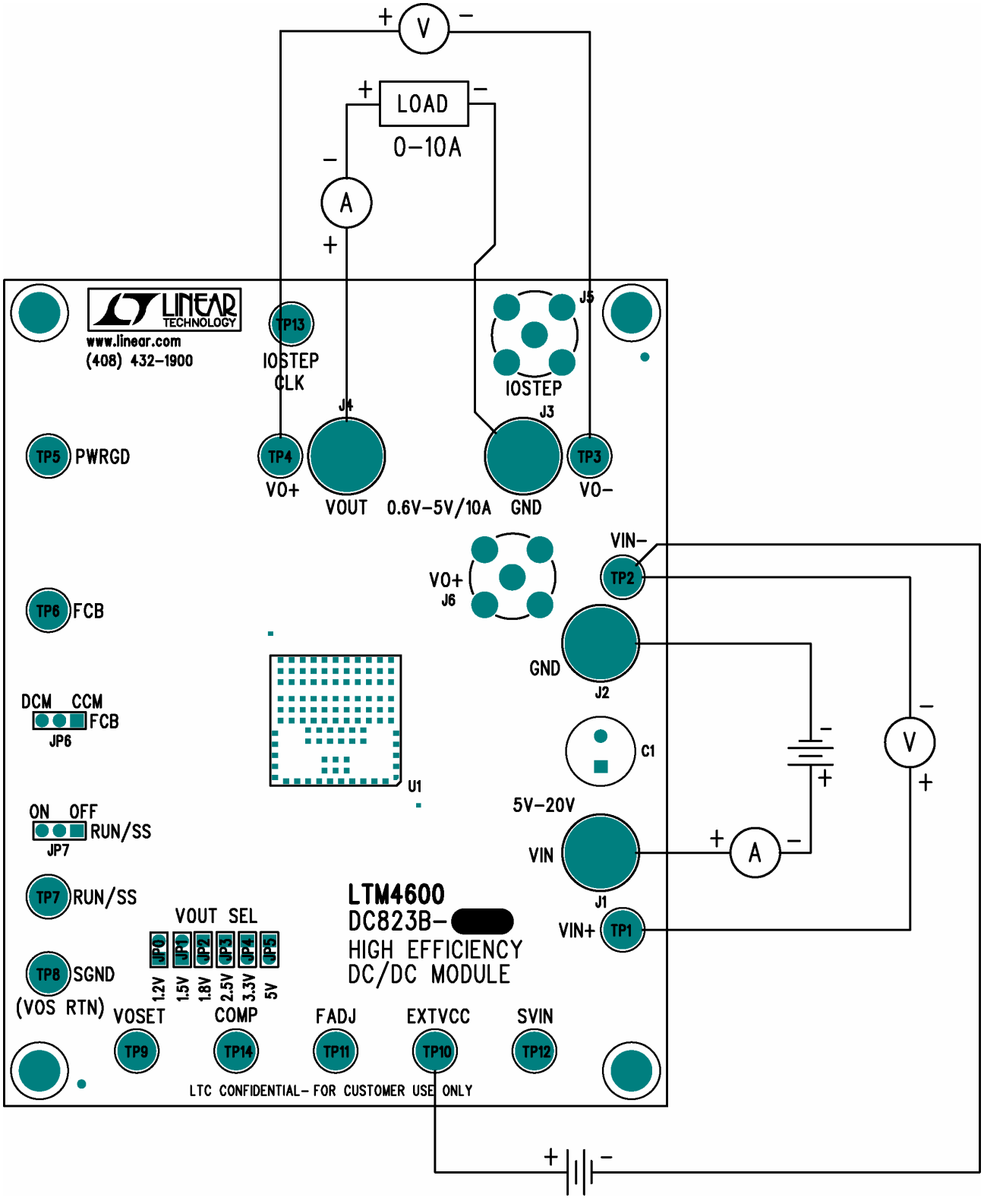
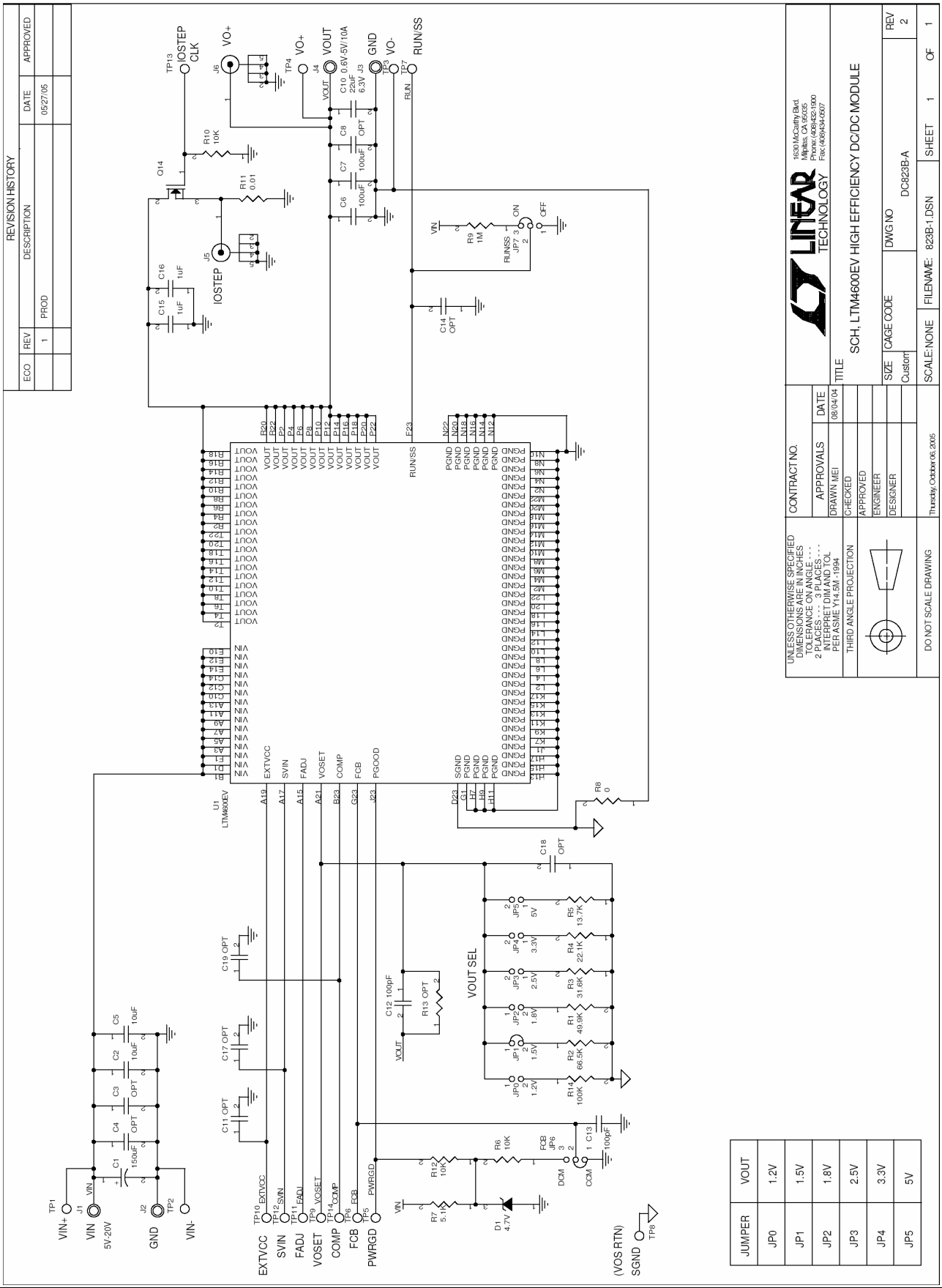


Figure 3. Test Setup of DC823B-A (EXTVCC Vbias Supply is Optional)



DC823B-A BOM:

Item	Qty	Reference	Part Description	Manufacture / Part #
REQUIRED CIRCUIT COMPONENTS:				
1	1	C1	CAP, ALUM150uF 35V 20%	SANYO 35MV150WXVTS
2	2	C5,C2	CAP, X5R 10uF 25V 20% 1206	TDK C3216X5R1E106MT
3	2	C7,C6	CAP, X5R 100uF 6.3V 20% 1812	TDK C4532X5R0J107MZ
4	1	C10	CAP, X5R, 22uF 6.3V 20% 1206	TAIYO YUDEN JMK316BJ226ML-T501
5	1	C12	CAP, NPO 47pF 50V 5% 0603	AVX 06035A470JAT2A
6	1	R1	RES, 66.5K OHMS 1% 1/10W 0603	AAC CR16-6652FM
7	1	R8	RES, 0 OHM JUMPER 0603	ACC CJ06-000M
8	1	U1	IC, LTM4600EV	LINEAR TECH. LTM4600EV
ADDITIONAL CIRCUITS:				
1	0	C4,C3	CAP, 1206 OPTION	TAIYO YUDEN EMK316BJ475ML-T
2	0	C8	CAP, 1812 OPTION	TAIYO YUDEN JMK432BJ107MU-T
3	0	C11,C14,C18	CAP, 0603 OPTION	OPTION
4	1	C13	CAP, NPO 100pF 50V 10% 0603	AVX 06035A101KAT
5	2	C15,C16	CAP, X5R 1uF 10V 20% 0603	TAIYO YUDEN LMK107BJ105MA-T
6	0	C17	CAP, 0805 OPTION	OPTION
7	1	D1	DIODE, ZENER 4.7V	DIODES INC. BZX84C4V7-7
8	1	Q14	XSTR,SUD50N03-10CP MOSFET	SILICONIX SUD50N03-10CP
9	1	R2	RES, 100K OHMS 1% 1/10W 0603	AAC CR16-1003FM
10	1	R3	RES, 31.6K OHMS 1% 1/10W 0603	AAC CR16-3162FM
11	1	R4	RES, 22.1K OHMS 1% 1/10W 0603	AAC CR16-2212FM
12	1	R5	RES, 13.7K OHMS 1% 1/10W 0603	AAC CR16-1372FM
13	3	R6,R10,R12	RES, 10K OHMS 5% 1/10W 0603	AAC CR16-103JM
14	1	R7	RES, 5.1K OHMS 5% 1/10W 0603	AAC CR16-512JM
15	1	R9	RES, 1M OHMS 5% 1/10W 0603	AAC CR16-105JM
16	1	R11	RES, 0.01 OHM 5% 1W 2512	IRC LRF2512-01-R010-J
HARDWARE - FOR DEMO BOARD ONLY:				
1	6	JP1-JP5,JP0	HEADER,2PIN, 2mm	COMM CON 2802S-02G2
2	2	JP6,JP7	HEADER,3PIN, 2mm	COMM CON 2802S-03G2
3	3	JP0,JP6,JP7	SHUNT	COMM CON CCIJ2MM-138GW
4	4	J1,J2,J3,J4	JACK, BANANA	KEYSTONE 575-4
5	2	J5,J6	CONN,BNC,5 PINS	CONNEX 112404