QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1083A-B
6A HIGH VOLTAGE HIGH DENSITY POWER MODULE

LTM4603HVEV

DESCRIPTION

Demonstration circuit DC1083A-B features the LTM®4603EV, the high efficiency, high density switch mode step-down power module. The input voltage range is from 4.5V to 28V. The output voltage is programmable from 0.6V to 5V, refer to step down ratio curve in the LTM4603 datasheet. The rated load current is 6A, while de-rating is necessary for certain 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 externally. An internal phase-lock loop allows the Module to be synchronized to an external clock. The LTM4603 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. Margining function is provided for the user who wants to stress their system by varying supply voltages during testing.

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

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

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		4.5V
Maximum Input Voltage		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	De-rating is necessary for certain V_{IN}, V_{OUT}, and thermal conditions	$6A_{DC}$
Default Operating Frequency		1 M Hz
External Sync. Clock Freq. Range	Please refer to datasheet for minimum Ton and Toff requirement.	700kHz to 1.3MegHz
Efficiency	V_{IN}=12V, V_{OUT} =1.5V, I_{OUT} =6A	82%, See Figure 3
Load Transient	V_{IN}=12V, V_{OUT} =1.5V	See Figure 4 and Table 1 for details

QUICK START PROCEDURE

Demonstration circuit 1083A-B is easy to set up to evaluate the performance of the LTM4603HVEV. 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:

Vout Select	RUN	MARG0	MARG1
1.5V	ON	LO	LO

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and Vin supply to be less than 28V.
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

5. To measure input and output ripple, please refer to Figure 2 for proper setup.
6. For optional load transient test, apply 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 J3 (10mV/A), the output voltage can be monitor at BNC connector J4.
7. For Margining function test, place jumper MARG0 and MARG1 in the configurations shown in the following table, measure the output voltage at J4.

MARG1	MARG0	ΔVout
LO	LO	0
LO	HI	+5%
HI	LO	-5%
HI	HI	0

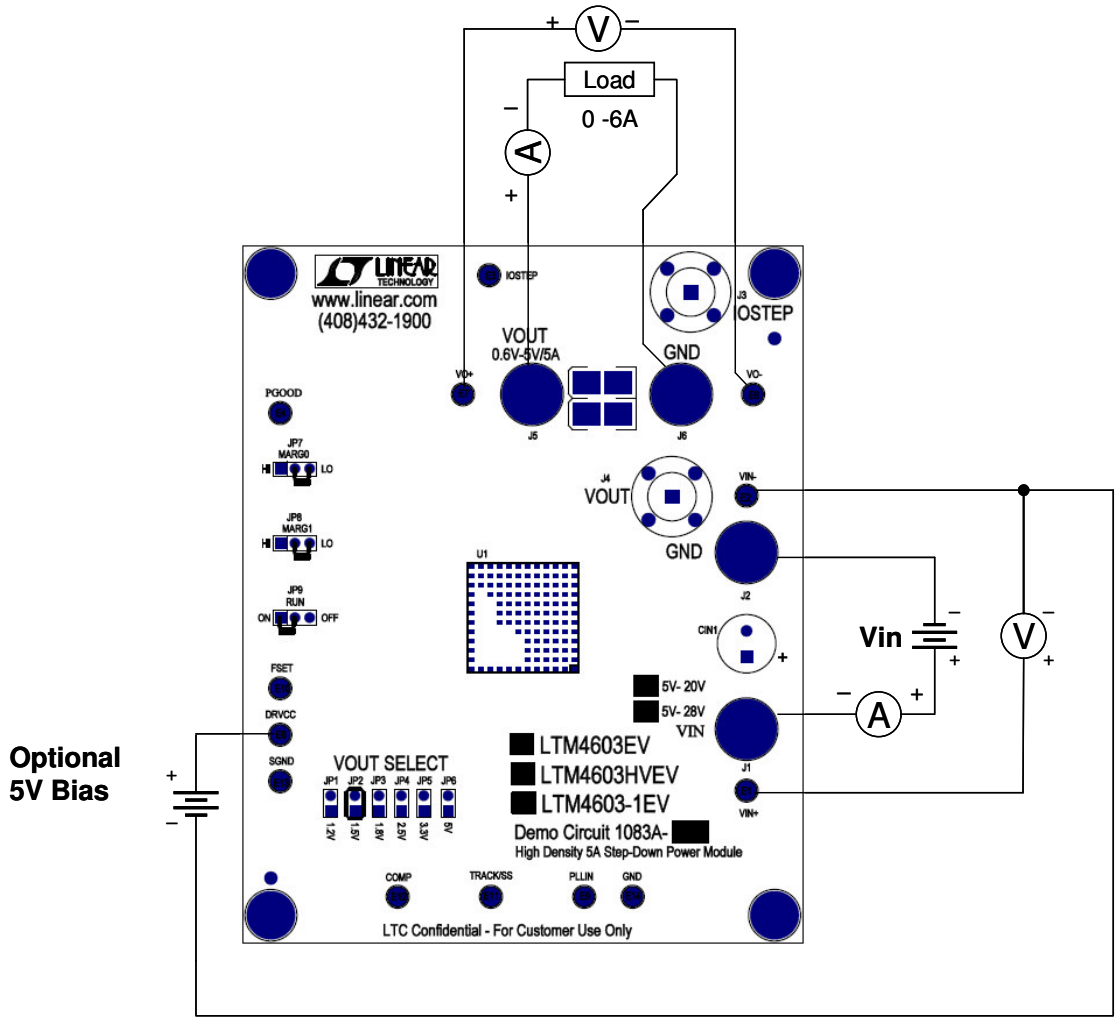


Figure 1. Test Setup of DC1083A-B (DRVCC Bias Supply is Optional)

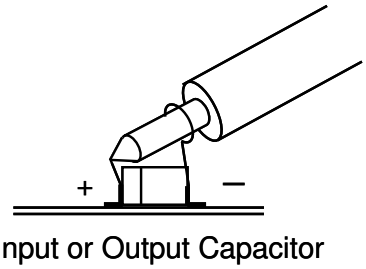


Figure 2. Scope Probe Placements for Measuring Input or Output Ripple.

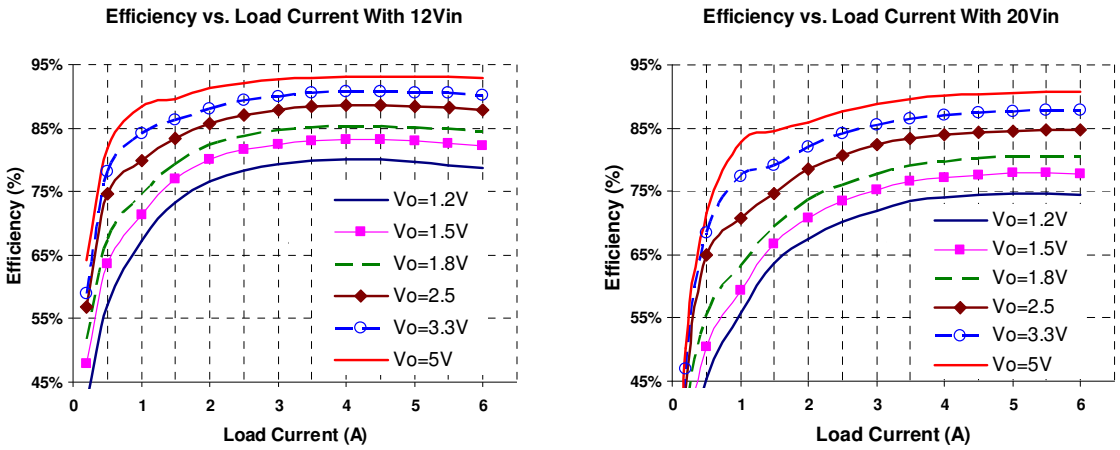
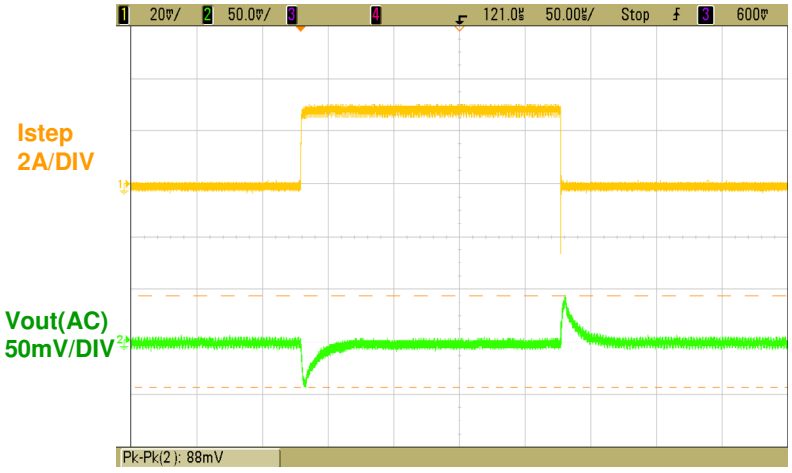


Figure 3. Measured Supply Efficiency with Different V_{IN} and V_{OUT}



Vin = 12V

Vout =1.5V

1.5A to 4.5A LOAD STEP

Cout = 1 X 10uF, X5R, 1206 ceramic, 1X100uF, X5R, 1812, ceramic

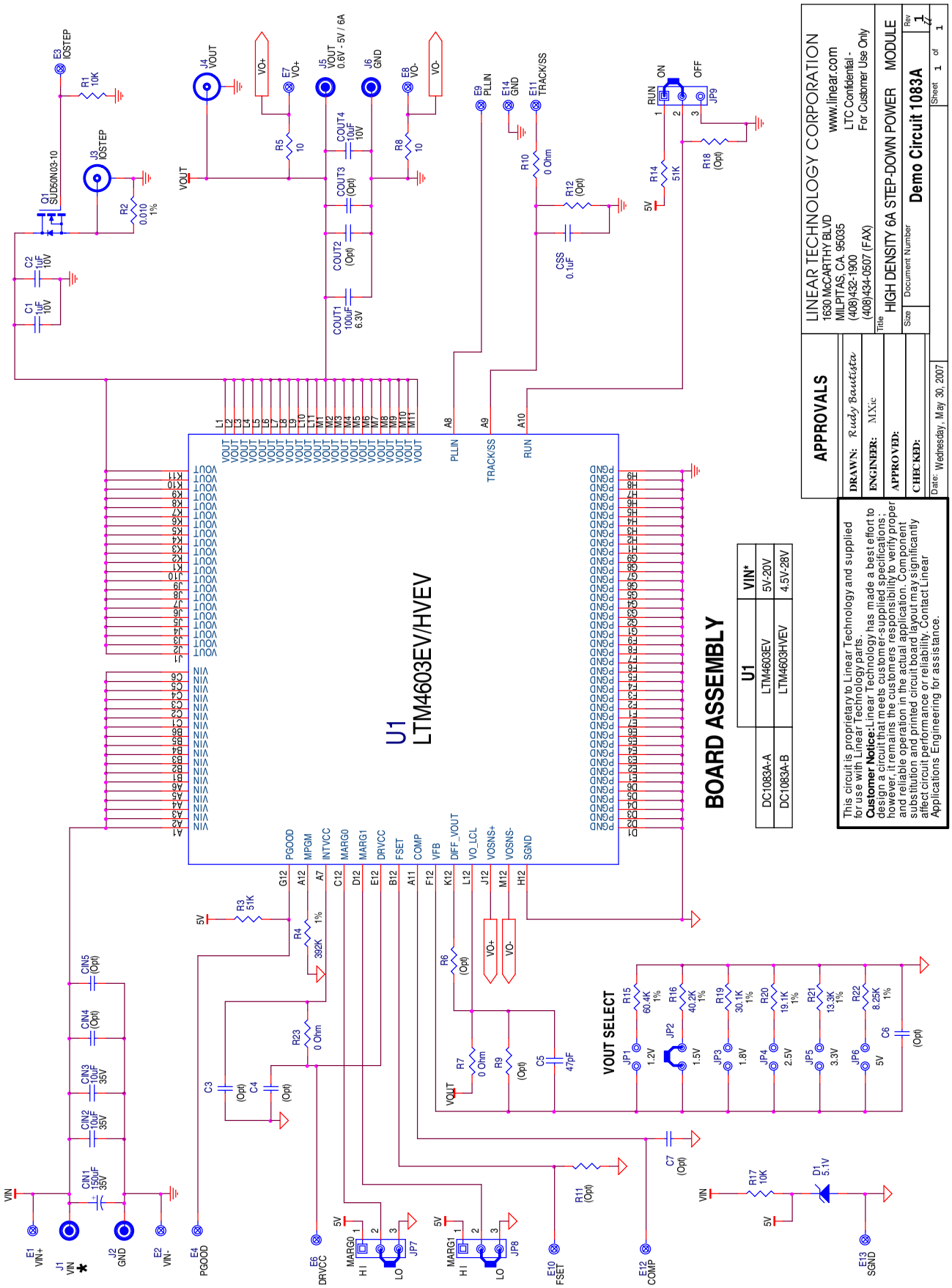
Figure 4. Measured Load Transient Response (3A Step)

Table1. Output Capacitor vs, Load Transient (0-3A Step)

TYPICAL MEASURED VALUES			
COUT1 VENDORS	**PART NUMBER**	**COUT2 VENDORS**	**PART NUMBER**
TAIYO YUDEN	JMK316BJ226ML-T501 (22uF, 6.3V)	SANYO POS CAP	6TPE220MIL (220uF, 6.3V)
TAIYO YUDEN	JMK325BJ476MM-T (47uF, 6.3V)	SANYO POS CAP	2R5TPE330M9 (330uF, 2.5V)
TDK	C3225X5R0J476M (47uF, 6.3V)	SANYO POS CAP	4TPE330MCL (330uF, 4V)

Vout (V)	CIN (CERAMIC)	CIN (BULK)	COUT1 (CERAMIC)	COUT2 (BULK)	VIN (V)	DROOP (mV)	PEAK TO PEAK (mV)	RECOVERY TIME (uS)	LOAD STEP (A/uS)	RSET (KOHM)
1.2	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	5	34	68	30	3	60.4
1.2	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 2.5V	5	22	40	26	3	60.4
1.2	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	5	20	40	24	3	60.4
1.2	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	5	32	60	18	3	60.4
1.2	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	12	34	68	30	3	60.4
1.2	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 2.5V	12	22	40	26	3	60.4
1.2	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	12	20	39	24	3	60.4
1.2	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	12	29.5	55	18	3	60.4
1.5	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	5	35	70	30	3	40.2
1.5	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 2.5V	5	25	48	30	3	40.2
1.5	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	5	24	47.5	26	3	40.2
1.5	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	5	36	68	26	3	40.2
1.5	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	12	35	70	30	3	40.2
1.5	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 2.5V	12	25	48	30	3	40.2
1.5	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	12	24	45	26	3	40.2
1.5	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	12	32.6	61.9	26	3	40.2
1.8	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	5	38	76	37	3	30.1
1.8	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 2.5V	5	29.5	57.5	30	3	30.1
1.8	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	5	28	55	26	3	30.1
1.8	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	5	43	80	26	3	30.1
1.8	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	12	38	76	37	3	30.1
1.8	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 2.5V	12	28	55	30	3	30.1
1.8	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	12	27	52	26	3	30.1
1.8	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	12	36.4	70	26	3	30.1
2.5	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	5	38	78	40	3	19.1
2.5	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 4V	5	37.6	74	34	3	19.1
2.5	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	5	39.5	78.1	28	3	19.1
2.5	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	5	66	119	12	3	19.1
2.5	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	12	38	78	40	3	19.1
2.5	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 4V	12	34.5	66.3	34	3	19.1
2.5	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	12	35.8	68.8	28	3	19.1
2.5	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	12	50	98	18	3	19.1
3.3	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	7	42	86	40	3	13.3
3.3	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 4V	7	47	89	32	3	13.3
3.3	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	7	50	94	28	3	13.3
3.3	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	7	75	141	14	3	13.3
3.3	2 X 10uF 25V	150uF 35V	1 X 22uF 6.3V	330uF 4V	12	42	86	40	3	13.3
3.3	2 X 10uF 25V	150uF 35V	1 X 47uF 6.3V	330uF 4V	12	47	88	32	3	13.3
3.3	2 X 10uF 25V	150uF 35V	2 X 47uF 6.3V	220uF 6.3V	12	50	94	28	3	13.3
3.3	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	12	69	131	22	3	13.3
5	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	15	110	215	20	3	8.25
5	2 X 10uF 25V	150uF 35V	4 X 47uF 6.3V	NONE	20	110	217	20	3	8.25

* LTM4603 module has similar load transient response at 12Vin and 20Vin


U1
LTM4603EV/HVEV
BOARD ASSEMBLY
U1 | VIN*
LTM4603EV | 5V-20V
LTM4603HVEV | 4.5V-28V
DC1083A-A
DC1083A-B
VOUT SELECT
APPROVALS
DRAWN: Rudy Bautista
ENGINEER: MXic
APPROVED:
CHECKED:
LINEAR TECHNOLOGY CORPORATION
1630 McCARTHY BLVD
MILPITAS, CA 95035
(408)432-1900
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HIGH DENSITY 6A STEP-DOWN POWER MODULE
Demo Circuit 1083A
Date: Wednesday, May 30, 2007
This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.
Customer Notice: Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customers responsibility to verify proper and reliable operation in the actual application. Component substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.

DC1083A-B BOM

Item	*Qty*	*Reference*	*Part Description*	*Manufacturer / Part #*
		REQUIRED CIRCUIT COMPONENTS:		
1	1	CIN1	Cap., Alum 150uF 35V 10%	SANYO 35ME150WXV+TS
2	2	CIN2,CIN3	Cap., X7R 10uF 35V 20%	Taiyo Yuden GMK316BJ106ML-T
3	1	COUT1	Cap., X5R 100uF 6.3V 20%	Taiyo Yuden JMK432BJ107MU-T
4	1	COUT4	Cap., X5R 10uF 10V 10%	Taiyo Yuden LMK316BJ106KL-T
5	1	C5	Cap., NPO 47pF 50V 10%	AVX 06035A470KAT1A
6	1	R14	Res., Chip 51K 0.1W 5%	AAC CR16-513JM
7	1	R4	Res., Chip 392K 0.1W 1%	AAC CR16-3923FM
8	2	R7,R23	Res., Chip 0 Ohm 1/16W 1 AMP	AAC CJ06-000M
9	1	R16	Res., Chip 40.2K 0.1W 1%	AAC CR16-4022FM
10	1	U1	I.C., Volt. Reg.	Linear Technology Corp. LTM4603HVEV
		ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:		
1	2	CIN4,CIN5	Cap., 1206 TBD	
2	1	COUT2	Cap., X5R 100uF 6.3V 20%	Taiyo Yuden JMK432BJ107MU-T
3	1	COUT3	Cap., 1210 TBD	
4	1	CSS	Cap., X7R 0.1uF 16V 20%	AVX 0603YC104MAT2A
5	2	C1,C2	Cap., X5R 1uF 10V 10%	Taiyo Yuden LMK107BJ105KA
6	4	C3,C4,C6,C7	Cap., 0603 TBD	
7	1	D1	Zener Diode, 5.1V	On Semi. MMBZ5231B
8	1	Q1	Mosfet, N-Channel 30V	Siliconix SUD50N03-10
9	2	R17,R1	Res., Chip 10K 0.1W 5%	AAC CR16-103JM
10	1	R2	Res., LRC 0.010 0.25W 1%	IRC LRF1206-01-R010-F
11	1	R3	Res., Chip 51K 0.1W 5%	AAC CR16-513JM
12	2	R8,R5	Res., Chip 10 0.1W 5%	AAC CR16-100JM
13	5	R6,R9,R11,R12,R18	Res., 0603 TBD	
14	1	R10	Res., Chip 0 Ohm 1/16W 1 AMP	AAC CJ06-000M
15	1	R15	Res., Chip 60.4K 0.1W 1%	AAC CR16-6042FM
16	1	R19	Res., Chip 30.1K 0.06W 1%	AAC CR16-3012FM
17	1	R20	Res., Chip 19.1K 0.1W 1%	AAC CR16-1912FM
18	1	R21	Res., Chip 13.3K 0.1W 1%	AAC CR16-1332FM
19	1	R22	Res., Chip 8.25K 0.1W 1%	AAC CR16-8251FM
		HARDWARE-FOR DEMO BOARD ONLY:		
1	13	E1-E4,E6-E14,	Turret, Testpoint	Mill Max 2308-2
2	6	JP1-JP6	Jumper, 2 Pins 2mm Ctrs.	Samtec TMM-102-02-L-S
3	3	JP7,JP8,JP9	Headers, 3 Pins 2mm Ctrs.	Samtec TMM-103-02-L-S
4	4	J1,J2,J5,J6	Connector, Banana Jack	Keystone 575-4
5	2	J3,J4	BNC Connector	Connex 112404
6	4	XJP2,XJP7,XJP8,XJP9	Shunt, 2mm Ctrs.	Samtec 2SN-BK-G
7	4		STAND-OFF, NYLON, 0.50" Tall	KEYSTONE, 8833 (SNAP ON)