

LTM4605

20V, 5A High Efficiency Buck-Boost μ Module Regulator

DESCRIPTION

Demonstration circuit DC1198B-A features the [LTM[®]4605EV](#), the high efficiency, high density switch mode buck-boost μ Module[®] regulator. The LTM4605EV can regulate its output voltage from an input voltage above, below, or equal to the output. The input voltage range of DC1198B-A is from 4.5V to 20V with a preset output voltage of 12V. The rated load current is 5A, although derating is necessary for certain V_{IN} , V_{OUT} , and thermal conditions. The switching frequency may be synchronized to an external clock from 200kHz to 400kHz. This PLL

can be used not only to reduce undesirable frequency harmonics but also to parallel LTM4605 to provide high output current. The LTM4605 data sheet must be read in conjunction with this demo manual prior to working on or modifying DC1198B-A.

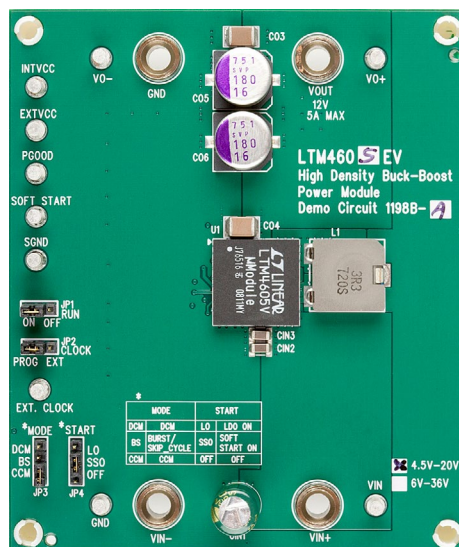
Design files for this circuit board are available at <http://www.linear.com/demo>

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PERFORMANCE SUMMARY ($T_A = 25^\circ\text{C}$)

PARAMETER	CONDITIONS	VALUE
Input Voltage Range V_{IN}		4.5V to 20V
Output Voltage V_{OUT}	$V_{IN} = 12\text{V}$, $I_{OUT} = 5\text{A}$.	$12\text{V} \pm 2\%$
Maximum Continuous Output Current	Derating Is Necessary for Certain V_{IN} , V_{OUT} , and Thermal Conditions	$5A_{DC}$ at $5V_{IN}$ $12A_{DC}$ at $V_{IN} > V_{OUT}$
Default Operating Frequency		300kHz
Efficiency	$V_{IN} = 12\text{V}$, $V_{OUT} = 12\text{V}$, $I_{OUT} = 5\text{A}$	97.6%, See Figure 3 for More Information
Load Transient	$V_{IN} = 5\text{V}$, $V_{OUT} = 12\text{V}$	See Figure 4 for Details

BOARD PHOTO



dc1198bafa

DEMO MANUAL DC1198B-A

QUICK START PROCEDURE

Demonstration circuit DC1198B-A is an easy way to evaluate the performance of the LTM4605EV. Please refer to Figure 1 for proper measurement equipment set-up and follow the procedure below:

1. Place jumpers in the following positions for a typical $12V_{OUT}$ application:

RUN	CLOCK	MODE	START
ON	PROG	CCM	SSO

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 less than 20V.
3. Turn on the power at the input. The output voltage should be $12V \pm 2\%$.

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. Cooling fan and lower current sensing resistor are necessary for $V_{IN} < 5V$ and $I_{OUT} = 5A$.
5. To measure input and output ripple, please refer to Figure 2 for proper setup.
6. The voltage of pin PLLFLTR determines the switching frequency. Modify R6 and R7 to adjust the switching frequency. Turn off the power supply before attempting to remove and replace R6 and R7. Do not allow voltage at pin PLLFLTR exceed 2.4V.
7. The Inductor, RS1 and RS2 should be modified to accommodate certain input and output condition. Please refer to the LTM4605 data sheet for recommended component values.

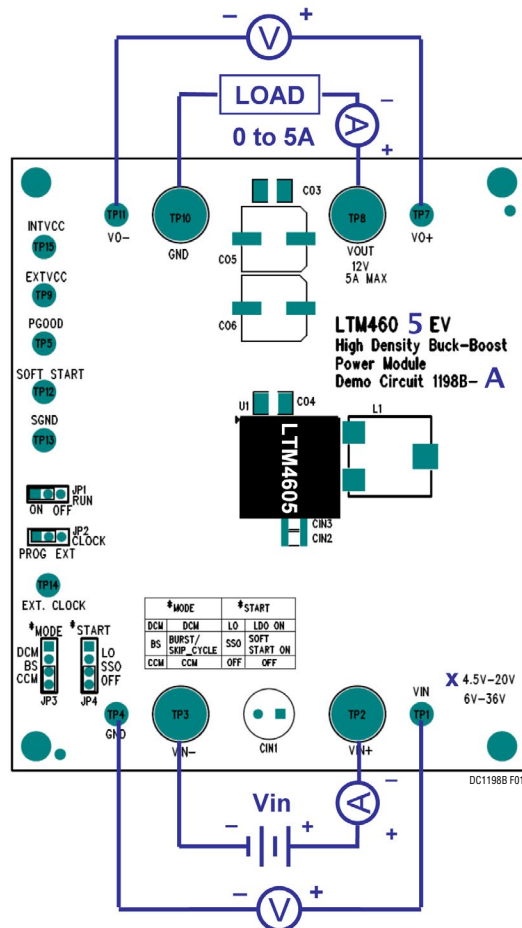
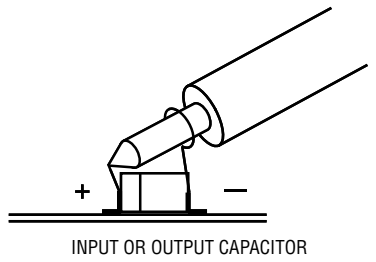


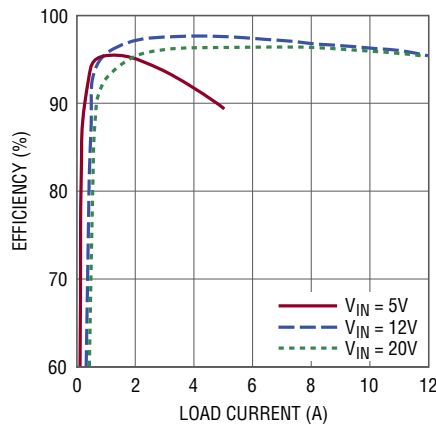
Figure 1. Test Setup of DC1198B-A

QUICK START PROCEDURE



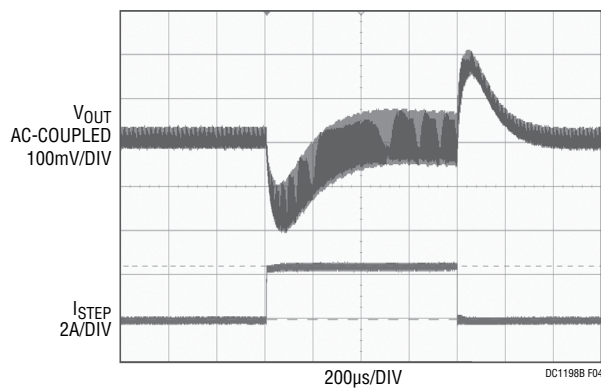
DC1198B F02

Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple



DC1198B F03

Figure 3. Measured Supply Efficiency with Different V_{IN}. (V_{OUT} = 12V)



DC1198B F04

V_{IN} = 5V, V_{OUT} = 12V
 CONTINUOUS CURRENT MODE (CCM)
 1.25A TO 3.75A LOAD STEP
 C_{OUT} = 2x22µF CERAMIC (1812, X7R), 2x180µF OSCON (16V)
 PEAK-TO-PEAK OUTPUT VOLTAGE DEVIATION = 413mV

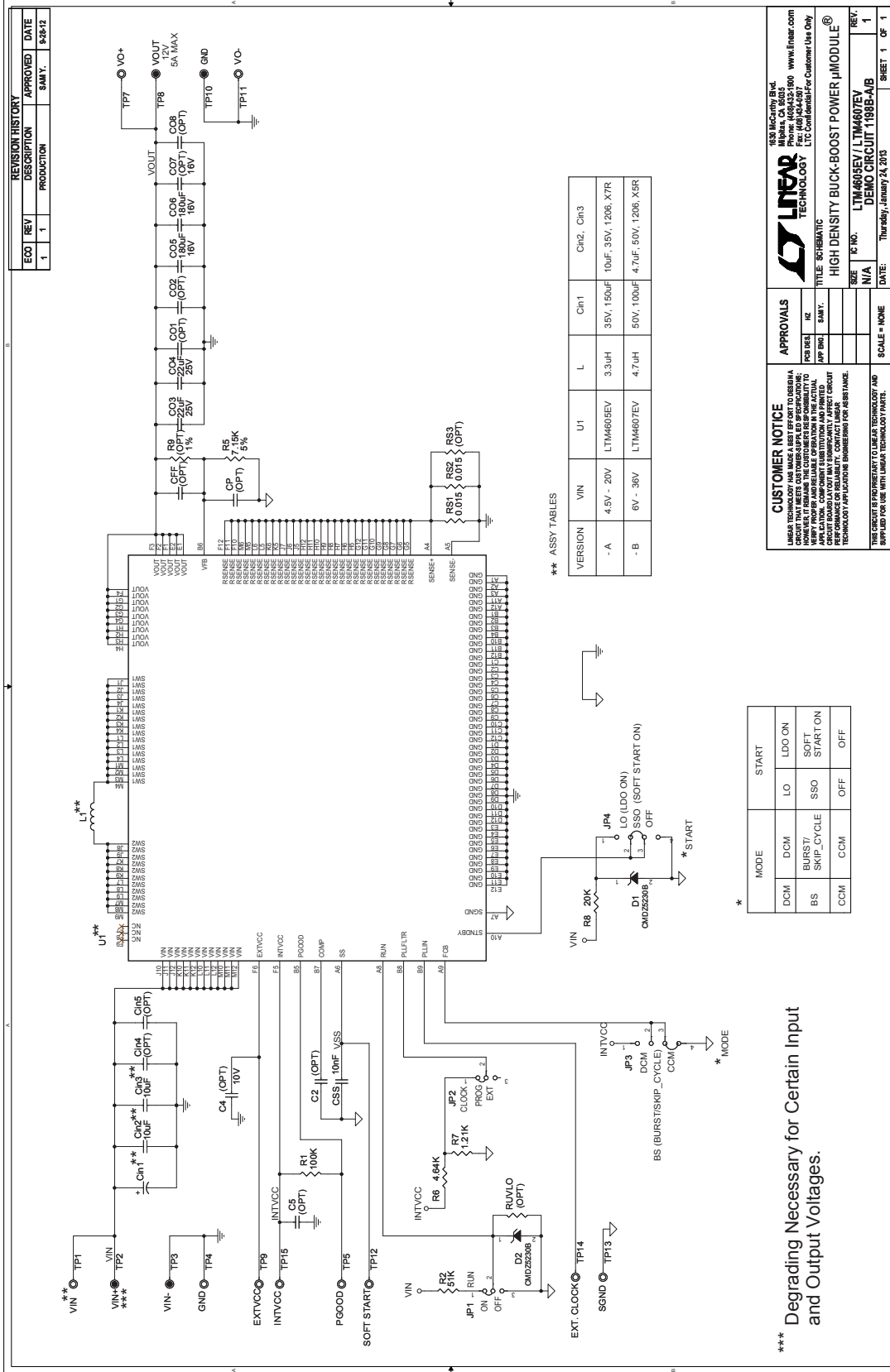
Figure 4. Measured Load Transient Response (2.5A Step, 25% to 75%)

DEMO MANUAL DC1198B-A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CIN1	CAP, ALUM, 150µF, 20%, 35V	SANYO, 35ME150WXV+TS (NOW SUNCON 35ME150WXV)
2	2	CIN2, CIN3	CAP, X7R, 10µF, 20%, 35V, 1206	TAIYO YUDEN, GMK316BJ106ML-T
3	1	CSS	CAP, X7R, 0.01µF, 25V, 10%, 0603	AVX 06033C103KAT4A
4	2	CO3, CO4	CAP, X7R, 22µF, 16V, 20%, 1812	TDK C4532X7R1C226M
5	2	CO5, CO6	CAP, OS-CON, 180µF, 16V	SANYO 16SVP180MX
6	1	L1	IND IRON POWER SMT FIXED, 3.3µH	TOKO FD1254-3R3M=P3
7	1	R5	RES, CHIP, 7.15k, 1/16W, 1%, 0603	VISHAY CRCW06037K15FKEA
8	1	R6	RES, CHIP, 4.64k, 1/16W, 1%, 0603	VISHAY CRCW06034K64FKEA
9	1	R7	RES, CHIP, 1.21k, 1/16W, 1%, 0603	VISHAY CRCW06031K21FKEA
10	2	RS1, RS2	RES, CHIP, 0.015 1/2W, 1%, 1206	VISHAY WSL1206R0150FEA
11	1	U1	I.C., LTM4605EV#PBF	LINEAR TECHNOLOGY CORPORATION LTM4605EV#PBF
Additional Demo Board Circuit Components				
1	0	CIN4, CIN5 (OPT)	CAP, 1206	
2	0	C2, C4, C5, CP, CFF (OPT)	CAP, 0603	
3	0	CO1, CO2 (OPT)	CAP, SVP, 100µF, D3L	
4	0	CO7 (OPT)	CAP, 1206, 16V	
5	0	CO8 (OPT)	POSCAP, D3L	
6	2	D1, D2	ZENER DIODE, 4.7V	CENTRAL SEMICONDUCTOR CMDZ5230B-7-F
7	1	R1	RES, CHIP, 100k, 1/16W, 5%, 0603	VISHAY CRCW0603100KJNEA
8	1	R2	RES, CHIP, 51k, 1/16W, 5%, 0603	VISHAY CRCW060351K0JNEA
9	1	R8	RES, CHIP, 20k, 1/16W, 1%, 0603	VISHAY CRCW060320K0FKEA
10	1	RS3 (OPT)	RES, 1206	
11	1	R9, RUVLO (OPT)	RES, 0603	
Hardware/Components (For Demo Board Only)				
1	2	JP1, JP2	2mm SINGLE ROW HEADER, 3 PIN	SAMTEC TMM-103-02-L-S
2	2	JP3, JP4	2mm SINGLE ROW HEADER, 4 PIN	SAMTEC TMM-104-02-L-S
3	4	JP1, JP2, JP3, JP4	SHUNT	SAMTEC 2SN-BK-G
4	10	TP1, TP4, TP5, TP7, TP9, TP11 TO TP15	TESTPOINT, TURRET, 0.095"	MILL-MAX 2501-2-00-80-00-00-07-0
5	4	TP2, TP3, TP8, TP10	BANANA JACK	KEYSTONE 575-4
6	4	STAND OFF	STAND OFF, NYLON 0.50" TALL	KEYSTONE 8833 (SNAP ON)

SCHEMATIC DIAGRAM



DEMO MANUAL DC1198B-A

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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