

LTM4645 25A DC/DC Step-Down µModule Regulator

DESCRIPTION

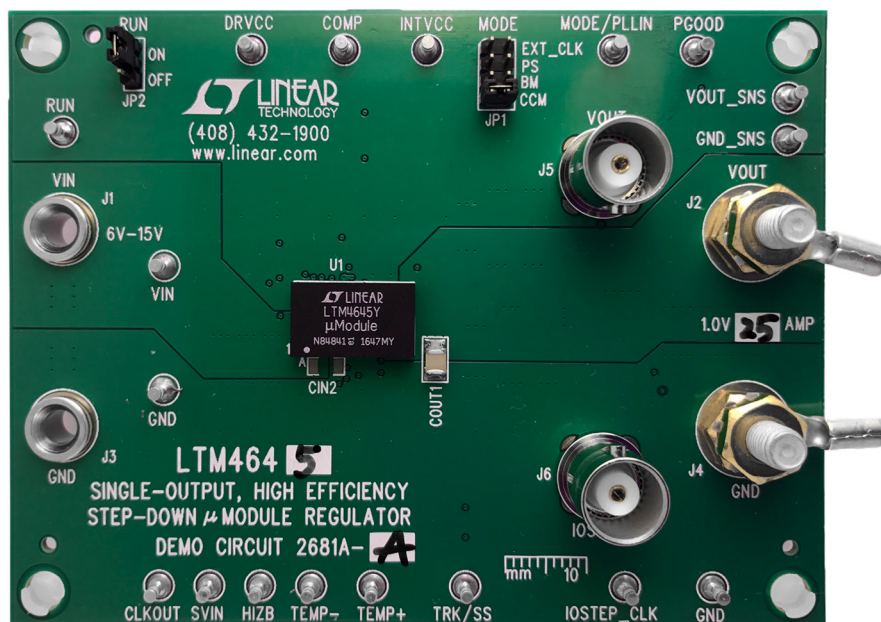
Demonstration circuit DC2681A-A features the LTM[®]4645EY, a 25A high efficiency, switch mode step-down power µModule[®] regulator. The input voltage range is from 6V to 15V. To use DC2681A-A for input voltage range from 4.7V to 6V, connect INTV_{CC} to SV_{IN} (change R22 from OPT to 0Ω), DRV_{CC} to V_{IN} (change R21 from 0Ω to OPT, R28 from OPT to 0Ω). The output voltage range is 0.6V to 1.8V. Derating is necessary for certain V_{IN}, V_{OUT}, frequency and thermal conditions. The DC2681A-A offers the TRK/SS pin allowing the user to program output tracking or soft-start period. The board operates in continuous conduction mode in heavy load conditions. For high efficiency at low load currents, the MODE_PLLIN jumper selects pulse-skipping mode for noise sensitive applications or burst mode operation in

less noise sensitive applications. The MODE_PLLIN pin also allows the LTM4645 to synchronize to an external clock signal (between 400kHz and 800kHz). DC2681A-A has the option of choosing both internal and external compensation circuit for LTM4645. Tying the PHASMD pin to different voltage generates certain phase difference between MODE_PLLIN and CLKOUT. The LTM4645 data sheet must be read in conjunction with this demo manual prior to working on or modifying demo circuit DC2681A-A.

Design files for this circuit board are available at <http://www.linear.com/demo/DC2681A-A>

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BOARD PHOTO



PERFORMANCE SUMMARY

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		6V to 15V
Output Voltages		1.0V \pm 1.0%
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details	25ADC
Operating Frequency		600kHz
Efficiency	$V_{IN} = 12V, V_{OUT} = 1.0V, I_{OUT} = 25A$	84.6% Figure 2
Load Transient $V_{OUT(P-P)}$	$V_{IN} = 12V, V_{OUT} = 1.0V, I_{STEP} = 0A \text{ to } 12.5A$	128mV Figure 3

QUICK START PROCEDURE

Demonstration circuit DC2681A-A is an easy way to evaluate the performance of the LTM4645EY. 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 application:

MODE	RUN
CCM	ON

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 12V.
3. Turn on the power supply at the input. The output voltage should be 1.0V \pm 1.0% (0.99V to 1.01V).

4. Vary the input voltage from 6V to 15V and adjust the load current from 0A-25A. Observe the output voltage regulation, ripple voltage, efficiency, and other parameters.
5. (Optional) For optional load transient test, apply an adjustable pulse signal between IOSTEP_CLK and GND test points. The pulse amplitude sets the load step current amplitude. Keep the pulse width short (<1ms) and pulse duty cycle low (<5%) to limit the thermal stress on the load transient circuit.
6. (Optional) LTM4645 can be synchronized to an external clock signal. Place the JP1 jumper on EXT_CLK and apply a clock signal (0V to 5V, square wave) on the MODE_PLLIN test point.

QUICK START PROCEDURE

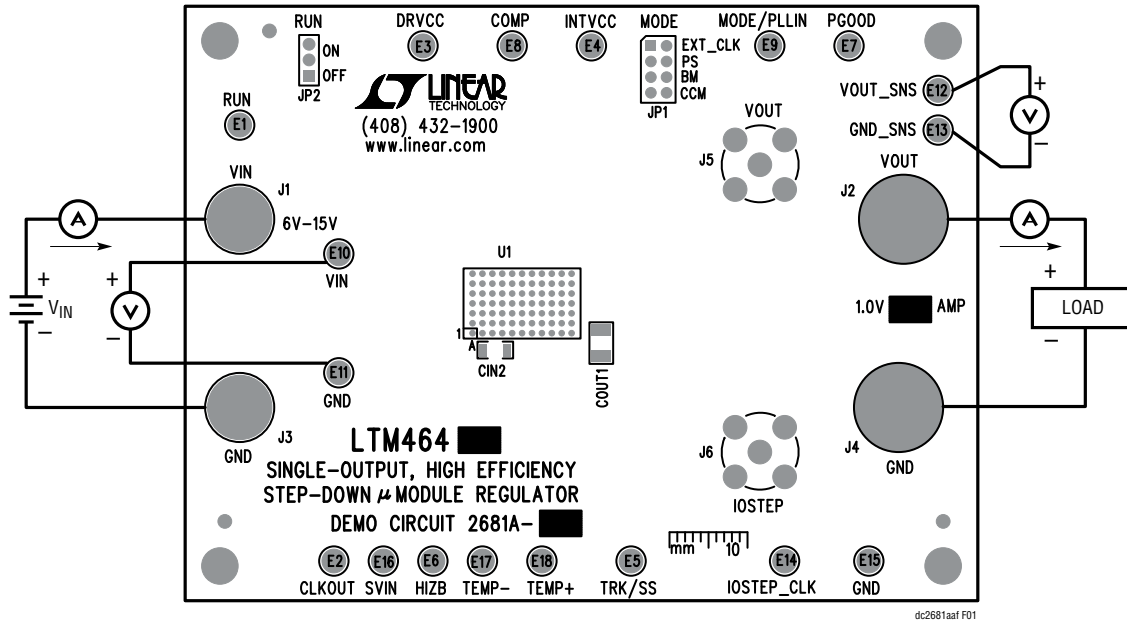


Figure 1. Measurement Setup of DC2681A-A

QUICK START PROCEDURE

12V_{IN}, 600kHz Efficiency Sweeps

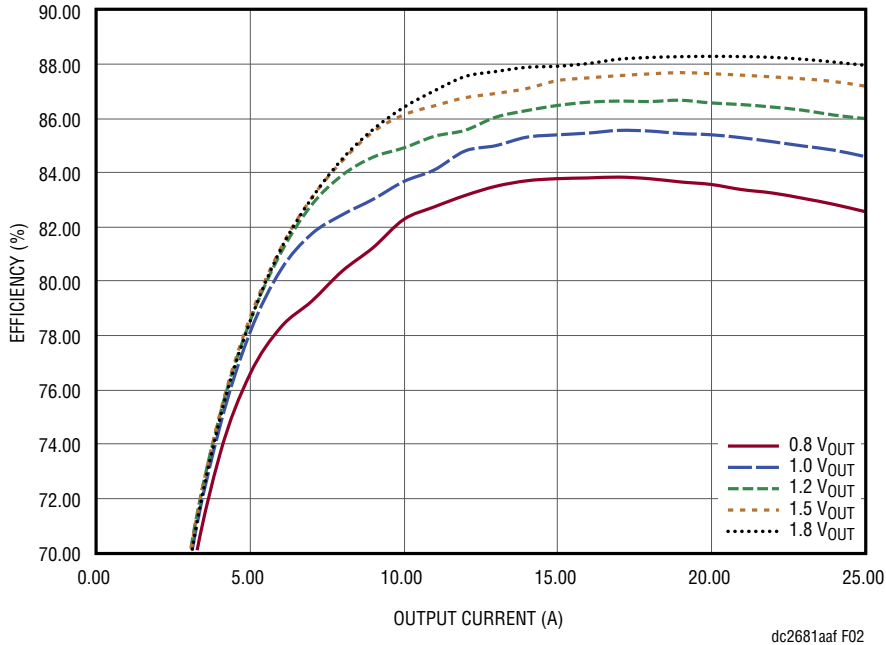


Figure 2. Measured Efficiency at V_{IN} = 12.0V, f_{SW} = 600kHz, CCM

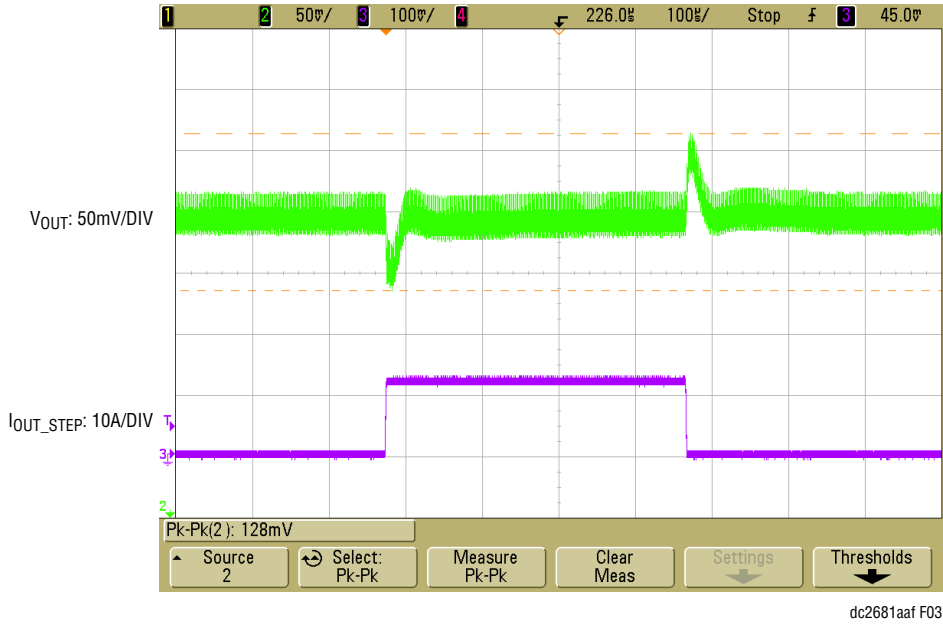


Figure 3. Measured Load Transient

QUICK START PROCEDURE

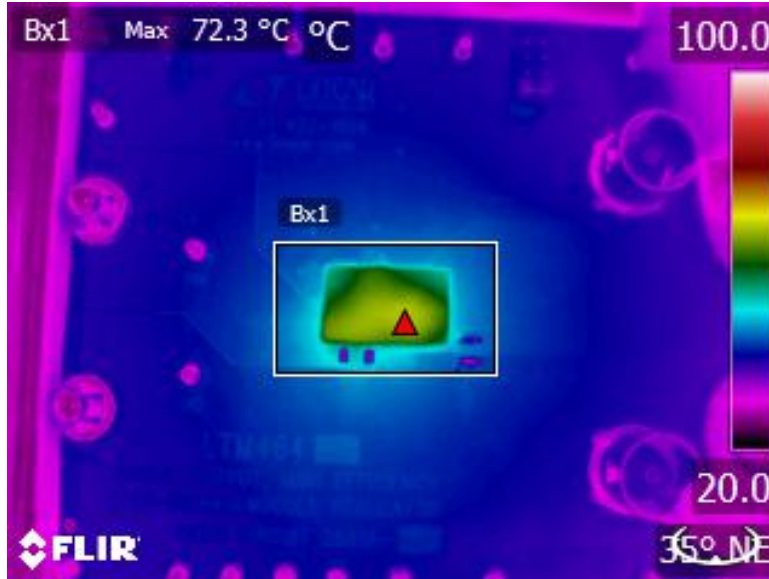


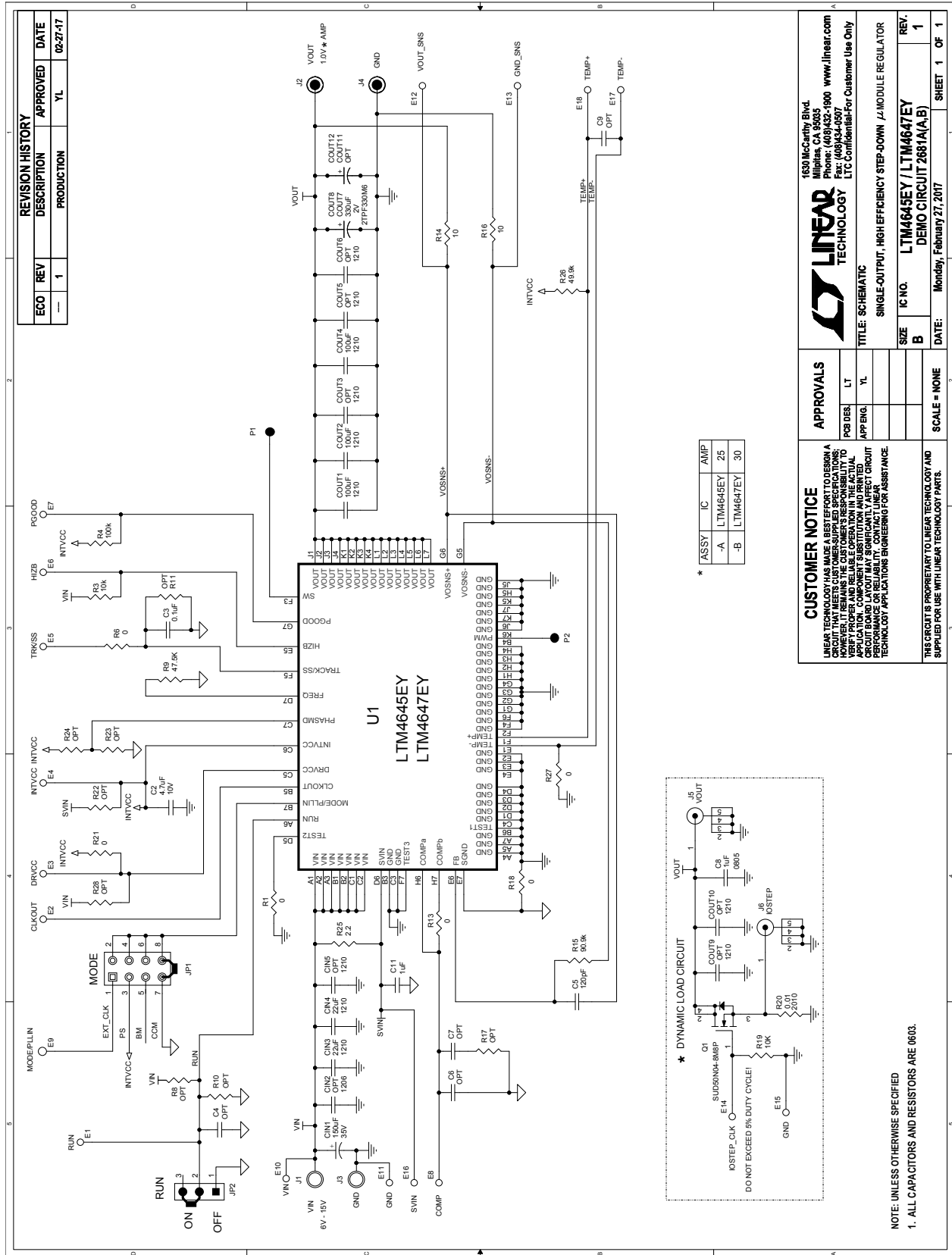
Figure 4. Thermal Image of LTM4645
 $V_{IN} = 12V$, $V_{OUT} = 1.0V$, $I_{LOAD} = 25A$
Ambient Temperature = 25.0°C, No Forced Air Flow

DEMO MANUAL DC2681A-A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CIN1	CAP., ALUM., 150µF, 35V, 20%, HVH	SUN ELECTRONIC INDUSTRIES CORP, 35HVH150MT
2	3	CIN3, CIN4	CAP., 22µF, X5R, 25V, 20%, 1210	MURATA, GRM32ER61E226ME15L
3	3	COUT1, COUT2, COUT4	CAP., 100µF, X5R, 6.3V, 20%, 1210	MURATA, GRM32ER60J107ME20L
4	2	COUT7, COUT8	CAP., POSCAP, 330µF, 2V, D2E	PANASONIC, 2TPF330M6
5	1	C2	CAP., 4.7µF, X5R, 10V, 10%, 0603	AVX, 0603ZD475KAT2A
6	1	C3	CAP., 0.1µF, X7R, 16V, 10%, 0603	AVX, 0603YC104KAT2A
7	1	C5	CAP., 120pF, X7R, 50V, 10%, 0603	YAGEO, CC0603KRX7R9BB121
8	1	C8	CAP., 1µF, X7R, 50V, 10%, 0805	MURATA, GRM21BR71H105KA12L
9	1	C11	CAP., 1µF, X7R, 50V, 10%, 0603	TAIYO YUDEN, UMK107AB7105KA-T
10	1	Q1	XSTR., MOSFET, N-CH, 40V, TO-252	VISHAY, SUD50N04-8M8P-4GE3
11	2	R3, R19	RES., 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
12	1	R4	RES., 100k, 1/10W, 1%, 0603	VISHAY, CRCW0603100KFKEA
13	1	R9	RES., 47.5k, 1/10W, 1%, 0603	VISHAY, CRCW060347K5FKEA
14	2	R14, R16	RES., 10Ω, 1/10W, 5%, 0603	VISHAY, CRCW060310R0JNEA
15	1	R15	RES., 90.9k, 1/10W, 1%, 0603	VISHAY, CRCW060390K9FKEA
16	1	R20	RES., SENSE, 0.01Ω, 1/2W, 1%, 2010	VISHAY, WSL2010R0100FEA
17	1	R25	RES., 2.2Ω, 1/10W, 5%, 0603	VISHAY, CRCW06032R2JNEA
18	1	R26	RES., 50k, 1/10W, 1%, 0603	VISHAY, CRCW060350K0FKEA
19	1	U1	IC, LTM4645EY#PBF BGA77-15x9-5.01	LINEAR TECH., LTM4645EY#PBF
Additional Demo Board Circuit Components				
1	0	CIN2	CAP., OPTION, 1206	MURATA, GRM31CR6YA106KA12L
2	0	CIN5, COUT3, COUT5, COUT6, COUT9, COUT10	CAP., OPTION, 1210	OPT
3	0	COUT11, COUT12	CAP., OPTION, D3L	OPT
4	0	C4, C6, C7, C9	CAP., OPTION, 0603	OPT
5	6	R1, R6, R13, R18, R21, R27	RES., 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
6	0	R8, R10, R11, R17, R22, R23, R24, R28	RES., OPTION, 0603	OPT
Hardware: For Demo Board Only				
1	18	E1-E18	TESTPOINT, TURRET, .062"	MILL-MAX, 2308-2-00-80-00-00-07-0
2	1	JP1	CONN., HEADER, 2x4, 2mm	SULLINS, NRPNO42PAEN-RC
3	1	JP2	CONN., HEADER, 1x3, 2mm	SULLINS, NRPNO31PAEN-RC
4	2	J1, J3	CONN., BANANA JACK	KEYSTONE, 575-4
5	2	J2, J4	STUD, TESTPIN	PEM, KFH-032-10
6	4	J2, J4 (x2)	NUT, BRASS 10-32	ANY, #10-32M/S BR PL
7	2	J2, J4	RING, LUG #10	KEYSTONE, 8205
8	2	J2, J4	WASHER, TIN PLATED BRASS	ANY, #10 EXT BZ TN
9	2	J5, J6	CONN, BNC, 5 PINS	CONNEX, 112404
10	2	XJP1, XJP2	SHUNT, 2mm	SAMTEC, 2SN-BK-G
11	4	MTGS. at 4 CORNERS	STAND-OFF, NYLON, SNAP-ON, 0.50" TALL	KEYSTONE, 8833 (SNAP ON)

SCHEMATIC DIAGRAM



DEMO MANUAL DC2681A-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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