LTM4626
20V_{IN}, 12A Step-Down µModule Regulator

DESCRIPTION

Demonstration circuit 2665A-A features the LTM®4626 µModule® regulator, a high performance, high efficiency step-down regulator. The LTM4626 is a complete DC/DC point-of-load regulator in a thermally enhanced 6.25mm × 6.25mm × 3.87mm BGA package. The LTM4626 has an operating input voltage range of 3.1V to 20V and provides an output current up to 12A. The output voltage is programmable from 0.6V to 5.5V and can be remotely sensed. The stacked inductor design improves thermal dissipation and significantly reduces the package area. Output voltage tracking is available through the TRACK/SS pin for supply rail sequencing. External clock synchronization is available through the SYNC/MODE pin. For high efficiency at low load currents, select DCM mode operation using the MODE jumper (JP7) in less noise sensitive applications. The LTM4626 data sheet must be read in conjunction with this demo manual for working on or modifying DC2665A-A.

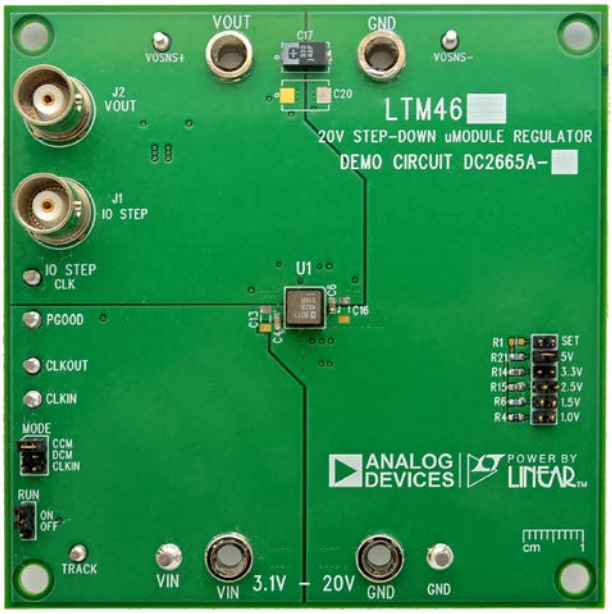
Design files for this circuit board are available.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS/NOTES	UNITS
Input Voltage Range		3.1V to 20V
Output Voltage V_{OUT}	Jumper Selectable	$1V_{DC}$, $1.5V_{DC}$, $2.5V_{DC}$, $3.3V_{DC}$, $5V_{DC}$
Maximum Continuous Output Current	Derating is Necessary for Certain Operating Conditions. See Data Sheet for Details	$12A_{DC}$
Default Operating Frequency		600kHz
Efficiency	V_{IN} = 12V, V_{OUT} = 1.5V, I_{OUT} = 15A	88.5%

BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit 2665A-A is an easy way to evaluate the performance of the LTM4626EY. Please refer to Figure 1 for test setup connections and follow the procedure below.

1. With power off, place the jumpers in the following positions:

JP8	JP7	JP1 TO JP6
RUN	MODE	V_{OUT} Select
ON	CCM	1.5V

2. Before connecting input supply, load and meters, preset the input voltage supply to be between 3.1V to 20V. Preset the load current to 0A.
3. With power off, connect the load, input voltage supply and meters as shown in Figure 1.
4. Turn on input power supply. The output voltage meters for each phase should display the programmed output voltage ±1.5%.
5. Once the proper output voltage is established, adjust the load current within the 0A to 12A range and observe the load regulation, efficiency, and other parameters. Output voltage ripple should be measured across the furthest output cap with a BNC cable and oscilloscope from J2.
6. To observe increased light load efficiency, place the MODE pin jumper (JP7) in the DCM position.
7. For optional load transient testing, an onboard transient circuit is provided to measure transient response. Place a positive pulse signal between the IO_STEP_CLK pin and GND pins. The pulse amplitude sets the load step current amplitude. The pulse width should be short (<1ms) and pulse duty cycle should be low (<15%) to limit the thermal stress on the load transient circuit. The load step can be monitored with a BNC connected to J1 (5mV/A).

QUICK START PROCEDURE

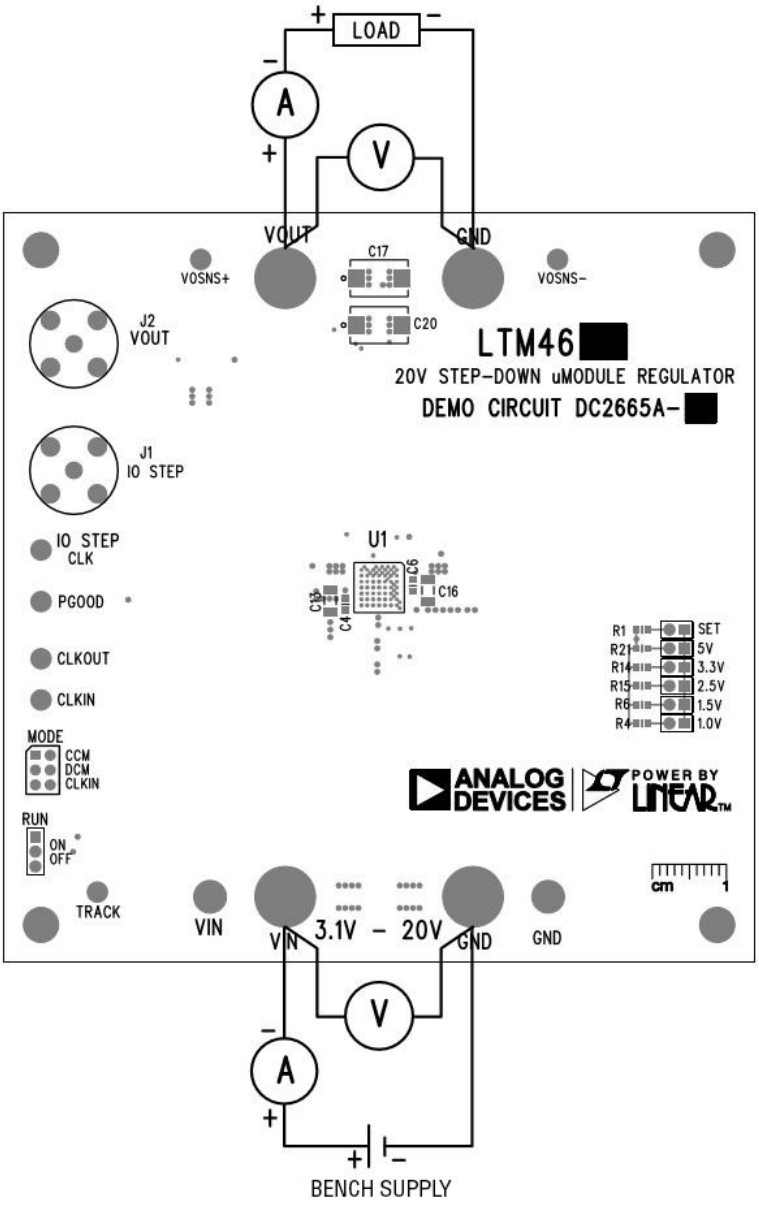
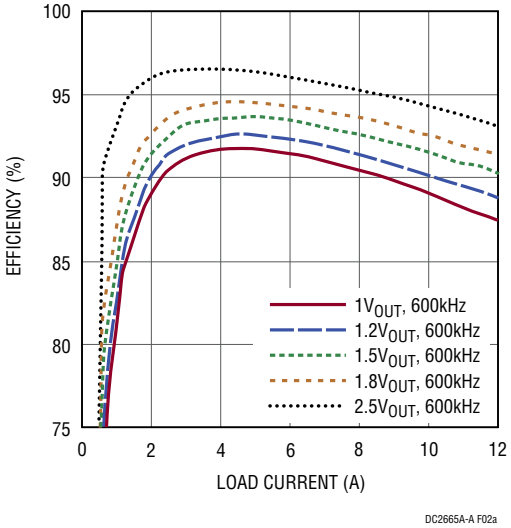
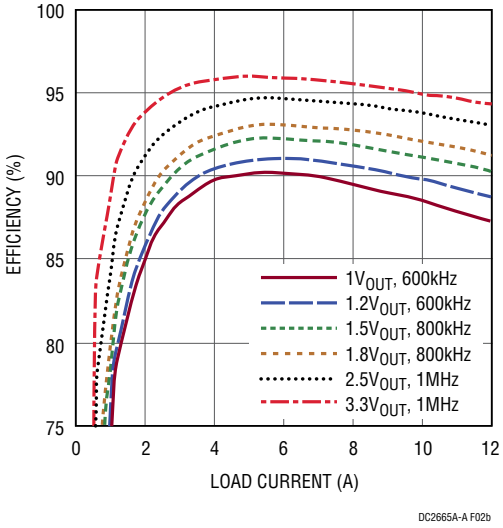


Figure 1. Test Setup of DC2665A-A

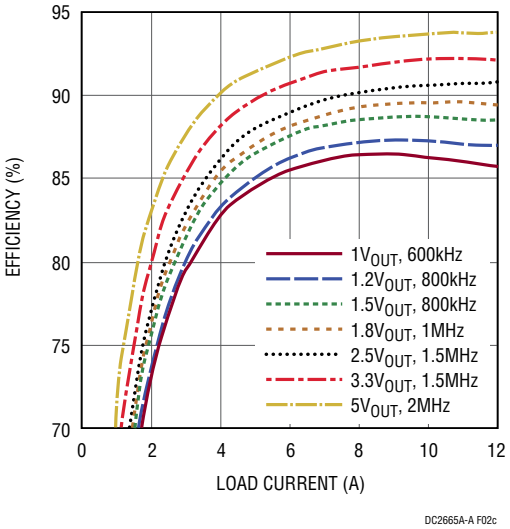
QUICK START PROCEDURE



a) 3.3V_{IN} CCM Efficiency vs Load Current



b) 5V_{IN} CCM Efficiency vs Load Current



c) 12V_{IN} CCM Efficiency vs Load Current

Figure 2. Measured Supply Efficiency at 3.3V_{IN}, 5V_{IN} and 12V_{IN}

QUICK START PROCEDURE

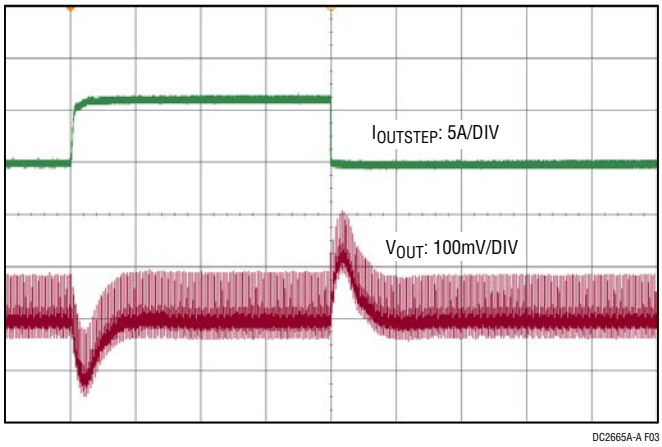


Figure 3. Load Transient (6A to 12A) Response Waveform at $12V_{IN}$ and $1.5V_{OUT}$, 50µs/DIV

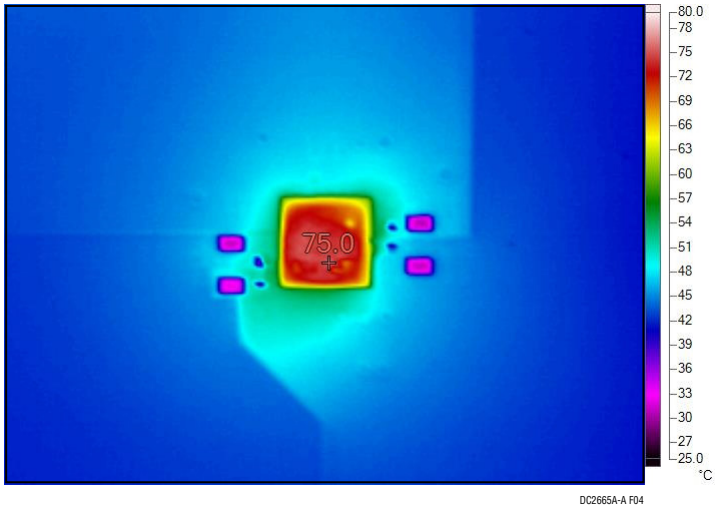
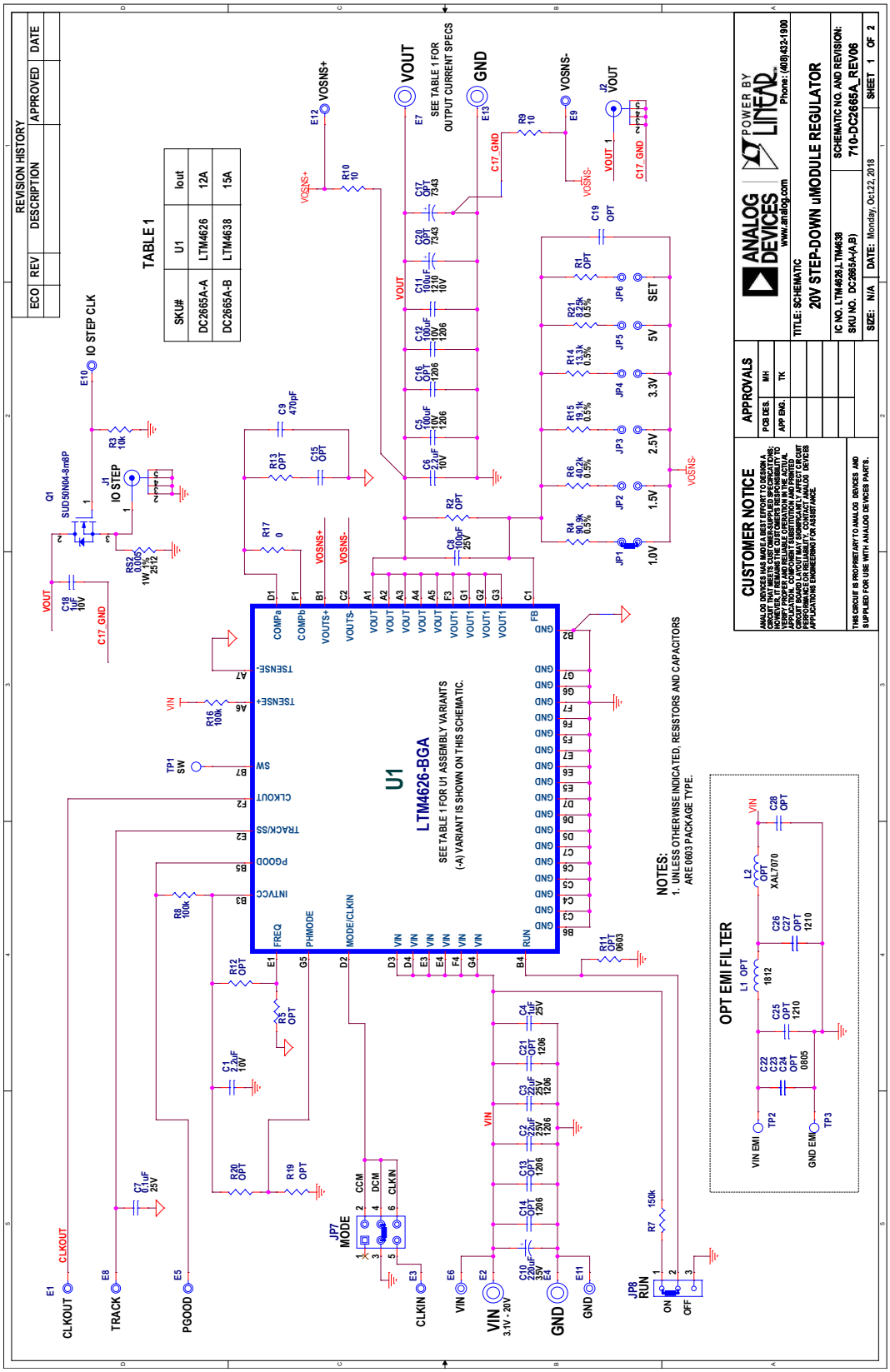


Figure 4. Measured Thermal Capture at $12V_{IN}$ and $1.5V_{OUT}$, $12A_{OUT}$ at 25°C Ambient with No Airflow

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C6	CAP, 2.2µF, X7R, 10V, 20%, 0603	TDK, C1608X7R1A225M080AC
2	2	C2, C3	CAP, 22µF, X5R, 25V, 10%, 1206	AVX, 12063D226KAT2A
3	1	C4	CAP, 1µF, X7R, 25V, 10%, 0603	MURATA, GRM188R71E105KA12D
4	2	C5, C12	CAP, 100µF, X5R, 10V, 20%, 1206	TDK, C3216X5R1A107M160AC
5	1	C7	CAP, 0.1µF, X7R, 25V, 10%, 0603	AVX, 06033C104KAT2A
6	1	C8	CAP, 100pF, X7R, 25V, 5%, 0603	AVX, 06033C101JAT2A
7	1	C9	CAP, 470pF, X7R, 50V, 10%, 0603	AVX, 06035C471KAT2A
8	1	C10	CAP, ALUM ELECT, 220µF, 35V	SUN ELEC, 35HVH220M
9	1	C11	CAP, 100µF, X5R, 10V, 20%, 1210	MURATA, GRM32ER61A107ME20L
10	1	C18	CAP, 1µF, X7R, 10V, 20%, 0603	AVX, 0603ZC105MAT2A
11	1	R3	RES, AEC-Q200, 10kΩ, 1%, 1/10W, 0603	VISHAY, CRCW060310K0FKEA
12	1	R4	RES, 90.9kΩ, 0.5%, 1/16W, 0603	SUSUMU, RR0816P-9092-D-93C
13	1	R6	RES, 40.2kΩ, 0.5%, 1/16W, 0603	SUSUMU, RR0816P-4022-D-59C
14	1	R7	RES, AEC-Q200, 150kΩ, 5%, 1/10W, 0603	PANASONIC, ERJ3GEYJ154V
15	2	R8, R16	RES, 100kΩ, 1%, 1/10W, 0603	STACKPOLE, RMCF0603FG100K
16	2	R9, R10	RES, 10Ω, 1%, 1/10W, 0603	VISHAY, CRCW060310R0FKEA
17	1	R14	RES, 13.3kΩ, 0.5%, 1/16W, 0603	SUSUMU, RR0816P-1332-D-13C
18	1	R15	RES, 19.1kΩ, 0.5%, 1/16W, 0603	SUSUMU, RR0816P-1912-D-28C
19	1	R17	RES, AEC-Q200, 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
20	1	R21	RES, 8.25kΩ, 0.5%, 1/16W, 0603	SUSUMU, RR0816P-8251-D-89H
21	1	RS2	RES, SENSE, 0.005Ω, 1%, 1W, 2512	VISHAY, WSL25125L000FEA
22	1	Q1	XSTR, MOSFET, N-CH, 40V, TO-252 (DPAK)	VISHAY, SUD50N04-8M8P-4GE3
23	1	U1	IC, 20V, 12A STEP-DOWN µMODULE REG.	ANALOG DEVICES, INC. LTM4626EY#PBF
Additional Demo Board Circuit Components				
24	0	C15, C19	CAP, OPTION, 0603	OPTION
25	0	C25, C26, C27, C28	CAP, OPTION, 1210	OPTION
26	0	C13, C14, C16, C21	CAP, OPTION, 1206	OPTION
27	0	C17, C20	CAP, OPTION, 7343	OPTION
28	0	C22, C23, C24	CAP, OPTION, 0805	OPTION
29	0	L1	IND, OPTION,1812	OPTION
30	0	L2	IND, OPTION	OPTION
31	0	R1, R2, R5, R11, R12, R13, R19, R20	RES, OPTION, 0603	OPTION
32	1	R17	RES, AEC-Q200, 0Ω, 1/10W, 0603	VISHAY, CRCW060310R0FKEA
Hardware: For Demo Board Only				
33	7	E1, E3, E5, E8, E9, E10, E12	TESTPOINT, TURRET 0.064"	MILL-MAX, 2308-2-00-80-00-00-07-0
34	4	E2, E4, E7, E13	JACK, BANANA	KEYSTONE, 575-4
35	2	E6, E11	TESTPOINT, TURRET 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
36	2	J1, J2	CONN, BNC, 5 PINS	AMPHENOL RF, 112404
37	6	JP1, JP2, JP3, JP4, JP5, JP6	HEADER, 1x2, 2mm	SULLINS, NRPN021PAEN-RC
38	1	JP7	HEADER, 2x3, 2mm	SULLINS, NRPN032PAEN-RC
39	1	JP8	HEADER, 1x3, 2mm	SAMTEC, TMM-103-02-L-S
40	4	MP1, MP2, MP3, MP4	STAND-OFF, NYLON 0.50" TALL	KEYSTONE, 8833(SNAP ON)
41	3	XJP1, XJP7, XJP8	SHUNT, 2mm	SAMTEC, 2SN-BK-G

SCHEMATIC DIAGRAM



ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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