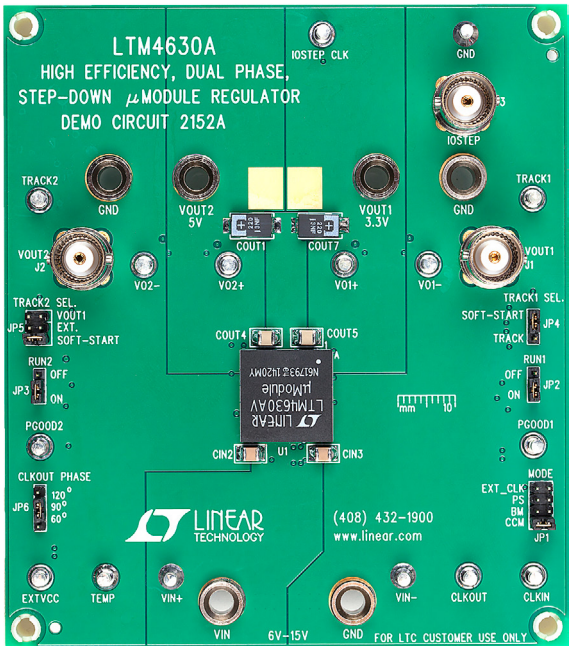
LTM4630A
Dual 18A or Single 36A µModule Regulator

DESCRIPTION

Demonstration circuit 2152A features the LTM®4630AEV, the high efficiency, high density, dual 18A, switch mode step-down power module regulator. The input voltage is from 6V to 15V. The output voltage is programmable from 0.6V to 5.3V. DC2152A can deliver up to 18A maximum in each channel. ±3% transient accuracy can be achieved with 25% load step. As explained in the data sheet, output current derating is necessary for certain V_{IN}, V_{OUT}, and thermal conditions. The board operates in continuous conduction mode in heavy load conditions. For high efficiency at low load currents, the MODE jumper (JP1) selects pulse-skipping mode for noise sensitive applications or Burst-Mode® in less noise sensitive applications. Two outputs can be connected in parallel for a single 36A output solution with optional jumper resistors. The board allows the user to program how its output ramps up and down through the TRACK/SS pin. The output can be set up to either coincidentally or ratio-metrically track with another supply's output. Remote output voltage sensing is available for improved output voltage regulation at the load point. These features and the availability of the LTM4630AEV in a compact 16mm × 16mm × 4.41mm LGA package make it ideal for use in many high-density point-of-load regulation applications. The LTM4630A data sheet must be read in conjunction with this demo manual for working on or modifying the demo circuit DC2152A.

Design files for this circuit board are available at http://www.linear.com/demo/DC2152A

BOARD PHOTO



PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

PARAMETER	CONDITIONS/NOTES	VALUE
Input Voltage Range		6V ~ 15V
Output Voltage V_{OUT1}	V_{IN} = 6~15V, I_{OUT1} = 0~18A, JP1: CCM	3.3V ± 1.5% (3.2505V ~ 3.3495V)
Output Voltage V_{OUT2}	V_{IN} = 6~15V, I_{OUT2} = 0~18A, JP1: CCM	5.0V ± 1.5% (4.925V ~ 5.075V)
Per-Channel Maximum Continuous Output Current	Derating is Necessary for Certain V_{IN}, V_{OUT} and Thermal Conditions, See Data Sheet for Detail	18A
Default Operating Frequency		600kHz
Resistor programmable Frequency Range		250kHz – 780kHz
External Clock Sync. Frequency Range		400kHz – 780kHz
Efficiency of Channel 1	V_{IN} = 12V, V_{OUT1} = 3.3V, I_{OUT1} = 18A, f_{SW} = 600kHz	93.4% See Figure 2
Efficiency of Channel 2	V_{IN} = 12V, V_{OUT2} = 5.0V, I_{OUT2} = 18A, f_{SW} = 600kHz	95.4% See Figure 3
Load Transient of Channel 1	V_{IN} = 12V, V_{OUT1} = 3.3V, I_{STEP} = 9~13.5A	See Figure 4
Load Transient of Channel 2	V_{IN} = 12V, V_{OUT2} = 5.0V, I_{STEP} = 9~13.5A	See Figure 5

QUICK START PROCEDURE

Demonstration circuit DC2152A is easy to set up to evaluate the performance of the LTM4630AEV. Please refer to Figure 1 for proper measurement setup and follow the procedure below:

1. Place jumpers in the following positions for a typical application:

JP1	JP2	JP3	JP4	JP5	JP6
MODE	RUN1	RUN2	TRACK1 SEL.	TRACK2 SEL.	CLKOUT PHASE
CCM	ON	ON	SOFT-START	SOFT-START	90°

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 in channel 1 should be 3.3 V ± 1.5% (3.2505V ~ 3.3495V) and the output voltage in channel 2 should be 5.0V ± 1.5% (4.925V ~ 5.075V).
4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, output voltage ripple, efficiency and other parameters. Output ripple should be measured at J1 and J2 with BNC cables. 50Ω termination should be set on the oscilloscope or BNC cables.
5. (Optional) For optional load transient test, apply an adjustable pulse signal between “IOSTEP CLK” and “GND” test point. Pulse amplitude (3V~3.5V) sets the load step current amplitude. The output transient current can be monitored at the BNC connector J3 (15mV/A). The pulse signal should have very small duty cycle (< 10%) to limit the thermal stress on the transient load circuit. Switch the jumper resistors R34 or R35 (on the backside of boards) to apply load transient on channel 1 or channel 2 correspondingly.
6. (Optional) LTM4630A can be synchronized to an external clock signal. Place the JP1 jumper on EXT_CLK and apply a clock signal (0~5V, square wave) on the “CLKIN” test point.
7. (Optional) The outputs of LTM4630A can track another supply. The jumpers JP4 and JP5 allow choosing soft-start or output tracking. If tracking external voltage is selected, the corresponding test points, “TRACK1” and “TRACK2”, need to be connected to a valid voltage signal.
8. (Optional) LTM4630A can be configured for a 2-phase single output at up to 36A on DC2152A. Install 0Ω resistors on R14,R17,R28,R39 and remove R7,R19. Output voltage is set by R25 based on equation V_{OUT} = 0.6V(1+60.4k/R25).

QUICK START PROCEDURE

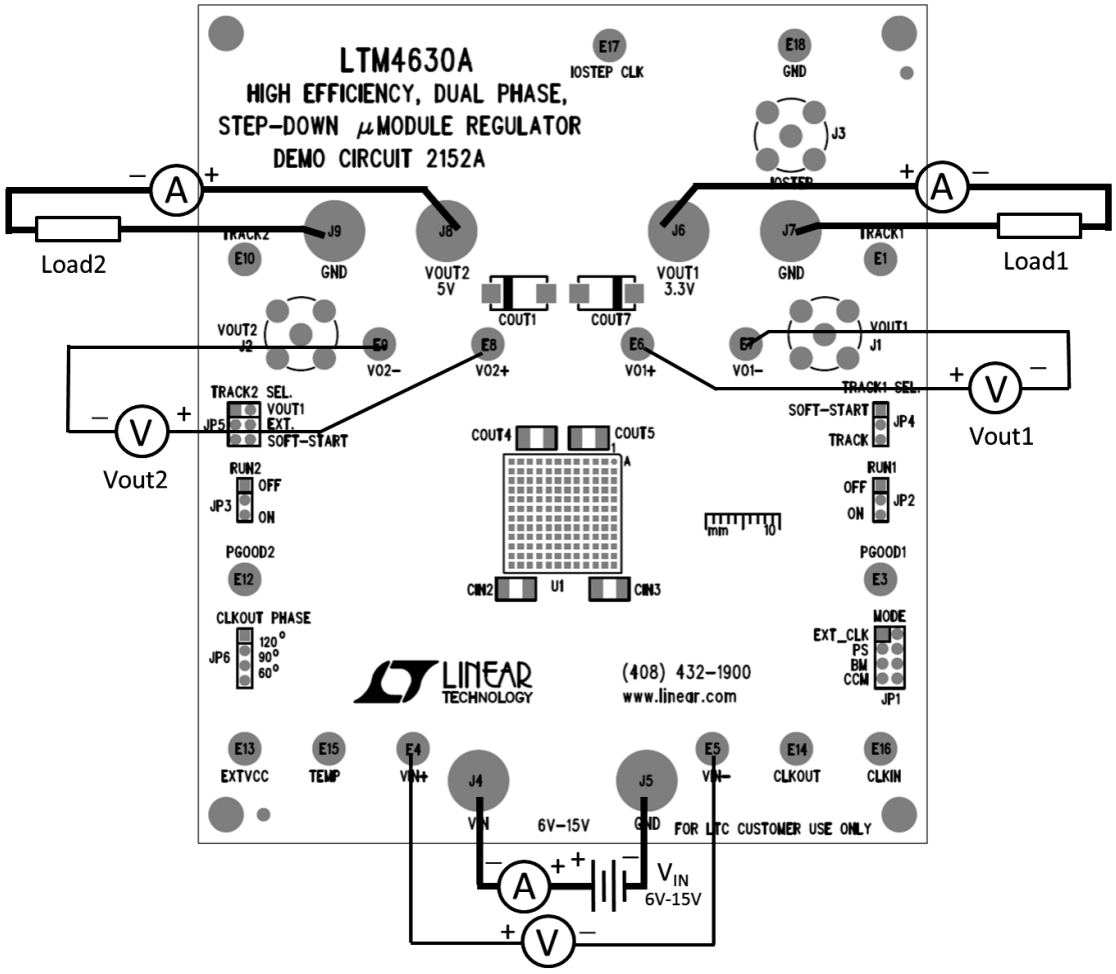


Figure 1. Test Setup of DC2152A

QUICK START PROCEDURE

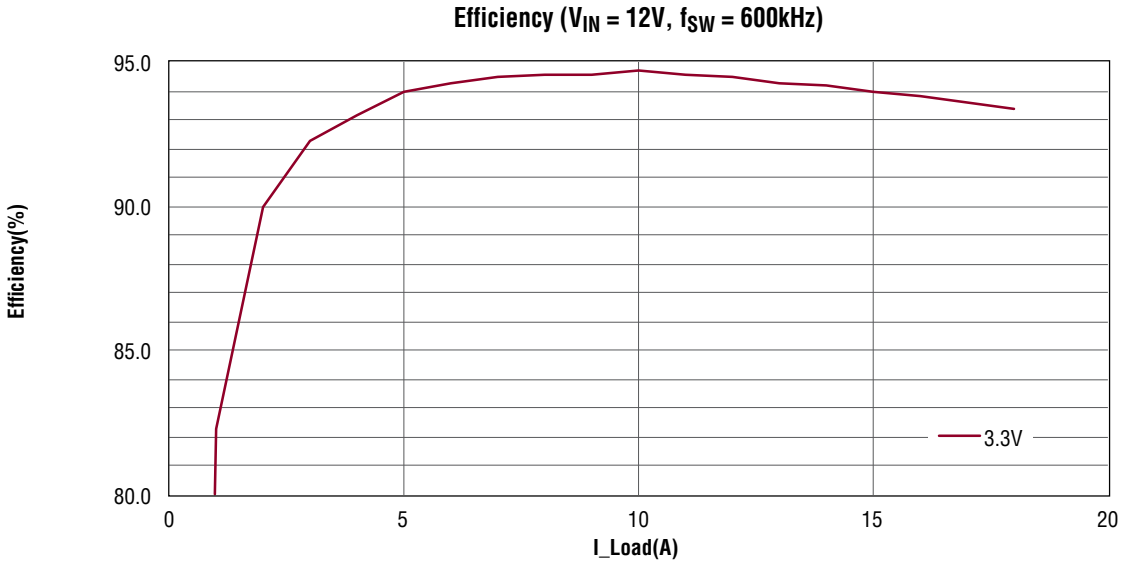


Figure 2. Measured Efficiency on Channel 1 (V_{OUT1} = 3.3V, f_{SW} = 600kHz, Channel 2 Disabled)

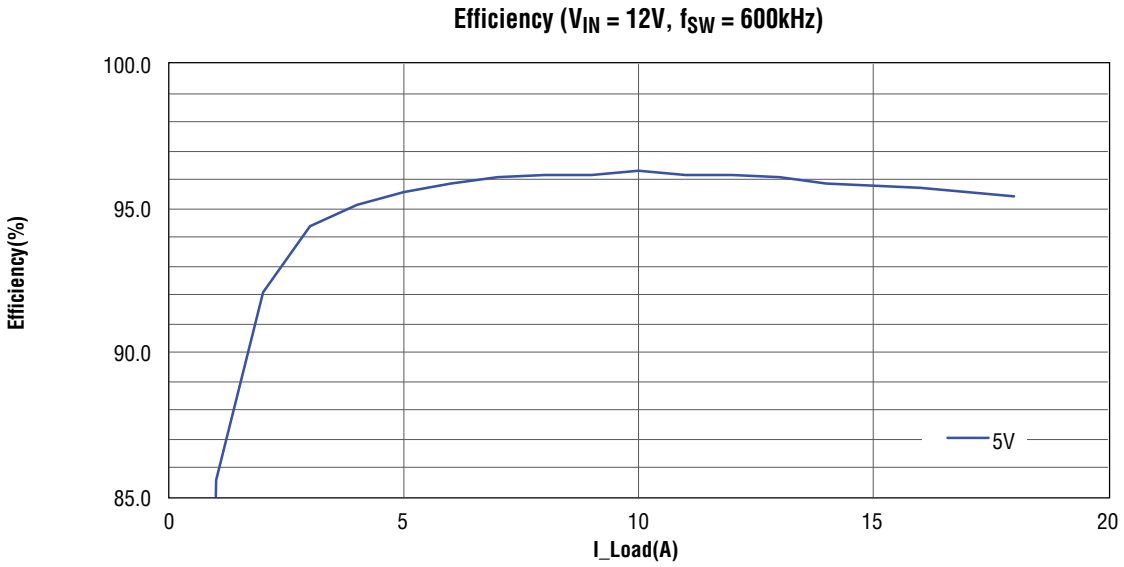


Figure 3. Measured Efficiency on Channel 2 (V_{OUT2} = 5.0V, f_{SW} = 600kHz, Channel 1 Disabled)

QUICK START PROCEDURE

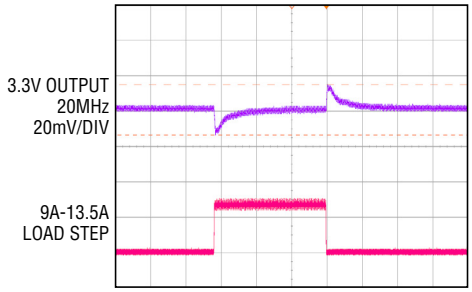


Figure 4. Measured Channel 1, 9A-13.5A Load Transient (V_{IN} = 12V, V_{OUT1} = 3.3V)

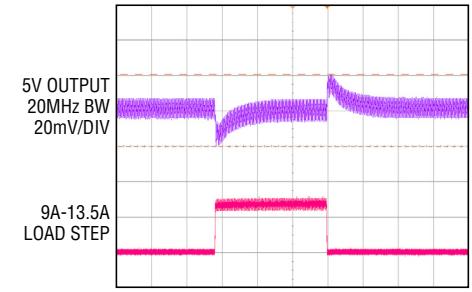


Figure 5. Measured Channel 2, 9A-13.5A Load Transient (V_{IN} = 12V, V_{OUT2} = 5.0V)

QUICK START PROCEDURE

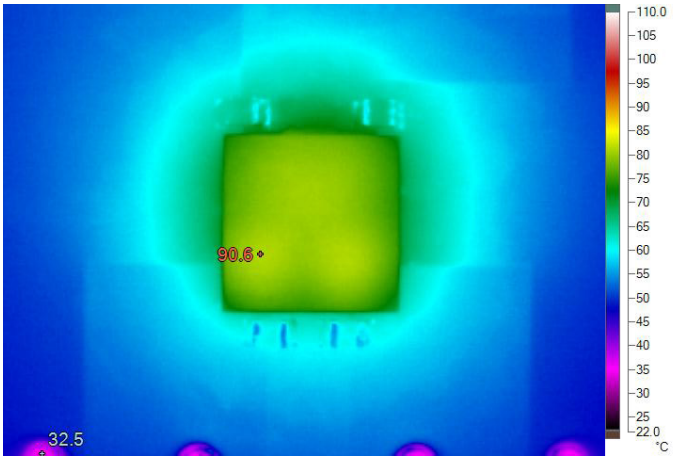


Figure 6. Thermal Capture at $12V_{IN}$, $3.3V_{OUT1}$ at 14A and $5V_{OUT2}$ at 14A (T_A = 25°C, No Forced Airflow and No Heat Sink)

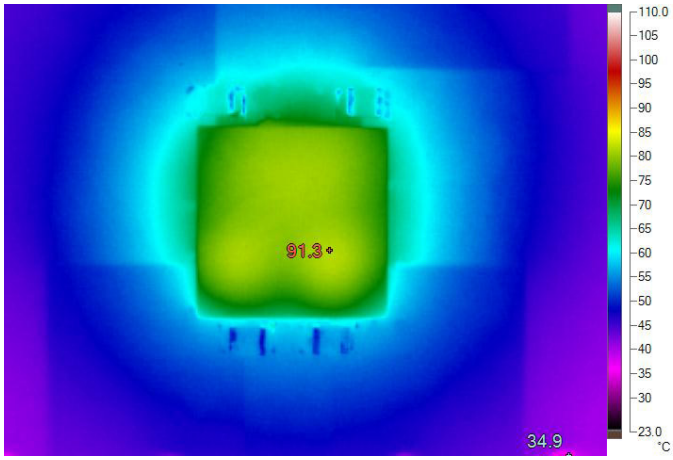


Figure 7. Thermal Capture at $12V_{IN}$, $3.3V_{OUT1}$ at 17A and $5V_{OUT2}$ at 17A (T_A = 25°C, 200LFM Airflow and No Heat Sink)

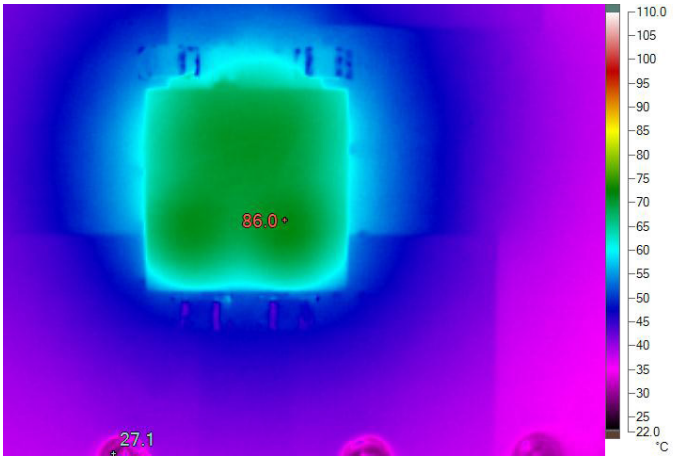
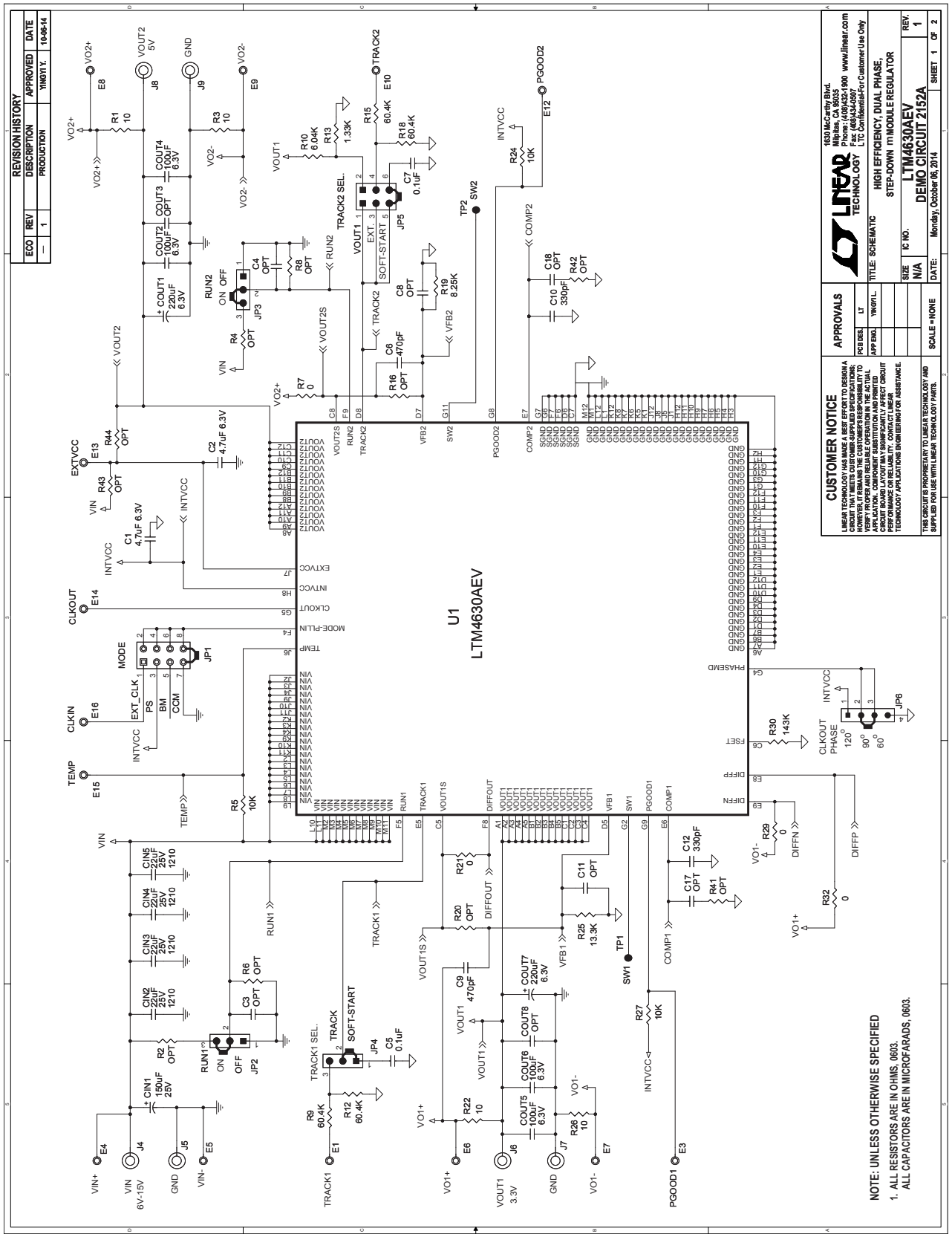


Figure 8. Thermal Capture at $12V_{IN}$, $3.3V_{OUT1}$ at 18A and $5V_{OUT2}$ at 18A (T_A = 25°C, 400LFM Airflow and No Heat Sink)

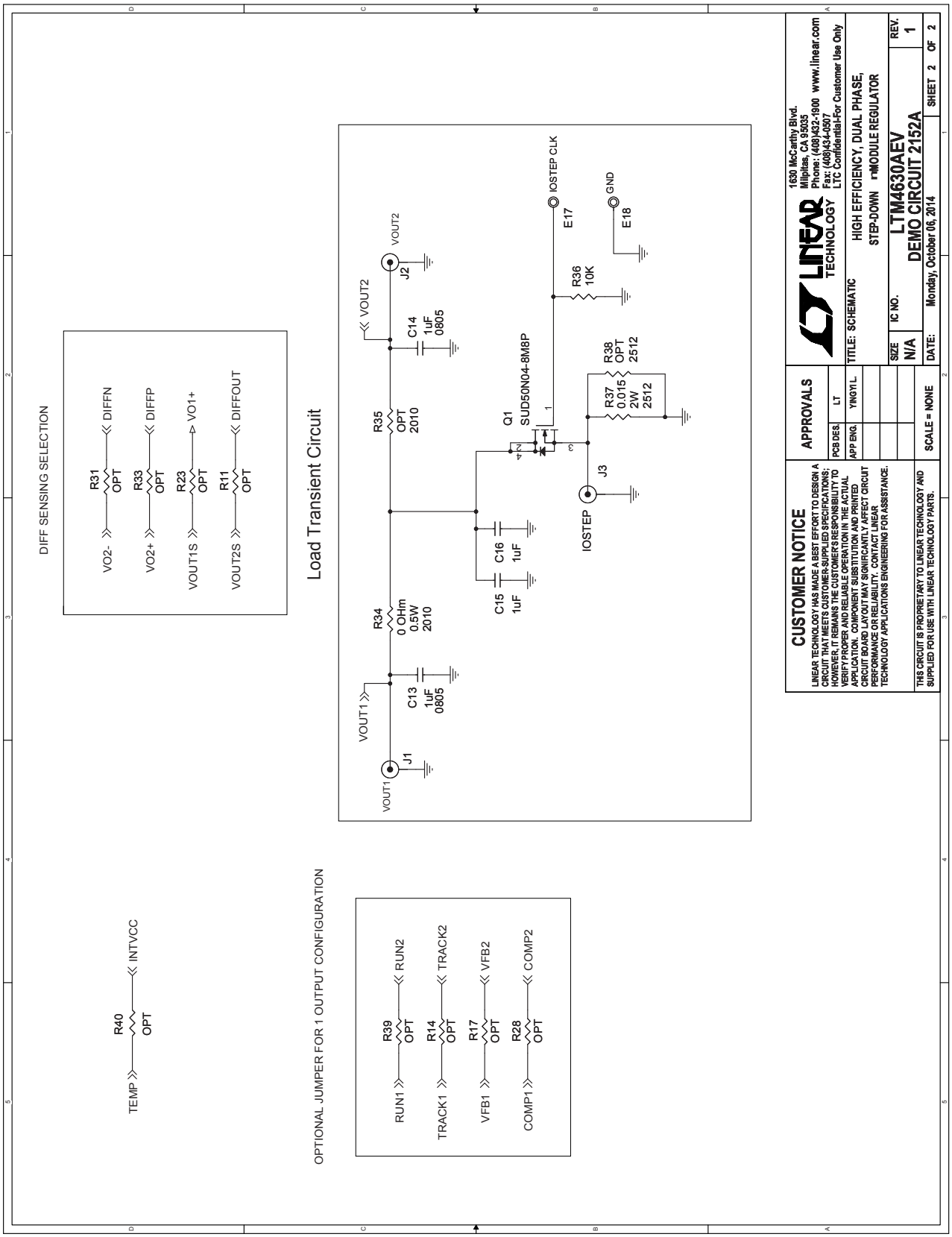
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	CIN1	Cap., 150µF, 25V, Aluminum Electr.,	SUN ELECT., 25CE150AX
2	4	CIN2, CIN3, CIN4, CIN5	Cap., X5R, 22µF, 25V, 10%, 1210	MURATA, GRM32ER61E226KE15L
3	2	COUT1, COUT7	Cap., 220µF, 6.3V, POSCAP 7343	PANASONIC, 6TPF220M5L
4	4	COUT2, COUT4, COUT5, COUT6	Cap., X5R, 100µF, 6.3V, 20%, 1210	AVX, 12106D107MAT2A
5	2	C1, C2	Cap., X5R, 4.7µF, 6.3V, 10%, 0603	AVX, 06036D475KAT2A
6	2	C5, C7	Cap., X5R, 0.1µF, 25V, 10%, 0603	AVX, 06033D104KAT
7	2	C6, C9	Cap., X7R, 470pF, 100V, 10%, 0603	AVX, 06031C471KAT2A
8	2	C10, C12	Cap., X7R, 330pF, 100V, 10%, 0603	AVX, 06031C331KAT2A
9	2	C13, C14	Cap., X7R, 1µF, 10V, 10%, 0805	AVX, 0805ZC105KAT2A
10	2	C15, C16	Cap., X7R, 1µF, 10V, 10%, 0603	AVX, 0603ZC105KAT2A
11	1	Q1	XSTR,SUD50N04-8M8P-4GE3 MOSFET	VISHAY SUD50N04-8M8P-4GE3
12	4	R1, R3, R22, R26	Res., Chip, 10, 1%, 0603	VISHAY, CRCW060310R0FKEA
13	4	R5, R24, R27, R36	Res., Chip, 10k, 1%, 0603	VISHAY, CRCW060310K0FKEA
14	4	R9, R12, R15, R18	Res., Chip, 60.4k, 1%, 0603	VISHAY, CRCW060360K4FKEA
15	1	R10	Res., Chip, 6.04k, 1%, 0603	VISHAY, CRCW06036K04FKEA
16	1	R13	Res., Chip, 1.33k, 1%, 0603	VISHAY, CRCW06031K33FKEA
17	1	R19	Res., Chip, 8.25k, 1%, 0603	VISHAY, CRCW06038K25FKEA
18	1	R25	Res., Chip, 13.3k, 1%, 0603	VISHAY, CRCW060313K3FKEA
19	1	R30	Res., Chip, 143k, 1%, 0603	VISHAY, CRCW06031431KFKEA
20	1	R37	Res., Chip, 0.015Ω, 2W, 2512	VISHAY, WSL2512R0150FEA
21	1	U1	LTM4630AEV 15 × 15 × 4.41-LGA	LINEAR TECH., LTM4630AEV#PBF
Additional Demo Board Circuit Components				
1	0	COUT3, COUT8,	OPT, 1210	OPT
2	0	C3, C4, C8, C11, C17, C18	OPT, 0603	OPT
3	0	R2, R4, R6, R8, R11, R14, R16, R17, R20, R23, R28, R31, R33, R39, R40, R41, R42, R43, R44	OPT, 0603	OPT
4	4	R7, R21, R29, R32	Res., Chip, 0, 1%, 0603	VISHAY, CRCW06030000Z0EA
5	1	R34	Res., Chip, 0Ω, 0.5W, 2010	VISHAY, CRCW20100000Z0EF
6	0	R35	OPT, 2010	OPT
7	0	R38	OPT, 2512	OPT
Hardware: For Demo Board Only				
1	16	E1, E3-E10, E12-E18	TESTPOINT, TURRET, .094" pbf	MILL-MAX, 2501-2-00-80-00-00-07-0
2	3	J1, J2, J3	CONN, BNC, 5 PINS	CONNEX, 112404
3	6	J4-J9	JACK BANANA	KEYSTONE, 575-4
4	1	JP1	HEADER, 2 × 4 0.079 DOUBLE ROW	SULLINS, NRPN042PAEN-RC
5	3	JP2, JP3, JP4	HEADER, 1 × 3 0.079 SINGLE ROW	SULLINS, NRPN031PAEN-RC
6	1	JP5	HEADER, 2 × 3 0.079 DOUBLE ROW	SULLINS, NRPN032PAEN-RC
7	1	JP6	HEADER, 1 × 4 0.079 SINGLE ROW	SULLINS, NRPN041PAEN-RC
8	6	XJP1-XJP6	SHUNT, .079" CENTER	SAMTEC, 2SN-BK-G
9	4	(STAND-OFF)	STAND-OFF, NYLON 0.50"	KEYSTONE, 8833(SNAP ON)

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



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