DEMO CIRCUIT 1419A
QUICK START GUIDE

LT3663EDCB
1.2A, 1.5MHz Step-Down Switching Regulator with Output Current Limit

DESCRIPTION

Demonstration Circuit 1419 is a 1.5MHz current mode step-down switching regulator with programmable output current limit. The current limit accurately controls the system power dissipation and reduces the size of the power path components.

The wide operating input voltage range of 7.5V to 36V (60V maximum) suits the LT3663 to a variety of input sources, including unregulated 12V wall adapters, 24V industrial supplies, and automotive power.

The LT3663 includes a low current shutdown mode, input overvoltage lockout and thermal shutdown.

The LT3663EDCB is available in an 8-lead (2mm × 3mm) DFN surface mount package with exposed pad.

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

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PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN		MAX	UNITS
VIN	Input Voltage Range		7.5	to	36.0	V
VOUT	Output Voltage Range	Iou1 0mA to ILIM	3.3	or	5.0	V
ILIM	Current Limit		0.6		1.2	A

OPERATING PRINCIPLE

Refer to the block diagram within the LT3663 data sheet for its operating principle.

The LT3663 is a constant frequency, current mode step down regulator. A switch cycle is initiated when the 1.5MHz oscillator enables the RS flip flop, turning on an internal power switch, Q1. An amplifier and comparator monitor the current flowing between the VIN and SW pins, turning the switch off when the current reaches a level determined by the voltage at node V_C. The error amplifier measures the output voltage through an external resistor divider tied to the FB pin and servos the V_C node. If the error amplifier's output increases, more current is delivered to the output; if it decreases, less current is delivered. An active clamp (not shown) on the V_C node provides current limit. The LT3663 is internally compensated with a pole zero combination on the output of the gm amplifier.

An external capacitor and internal diode are used to generate a voltage at the BOOST pin that is higher than the input supply. This allows the driver to fully saturate the internal bipolar NPN power switch for efficient operation. The switch driver operates from either VIN or BOOST to ensure startup.

An internal regulator provides power to the control circuitry. This regulator includes an input under-voltage and overvoltage protection which disable switching action when VIN is out of range. When switching is disabled, the LT3663 can safely sustain input voltages up to 60V.

Note that while switching is disabled the output will start to discharge.

Output current limiting is provided via the servo action of an amplifier. It compares the voltage across an inductor current sense resistor, RSENSE2, and compares it to a voltage programmed by external resistor R1 on the ILIM pin. A capacitor averages the inductor ripple current. If the averaged inductor current exceeds the programmed value then the V_C voltage is pulled low, reducing the current in the regulator. The output current limit circuit allows for a lower current rated inductor and diode and provides better control of system power dissipation.

QUICK START PROCEDURE

Using short twisted pair leads for any power connections, with all loads and power supplies off, refer to Figure 1 for the proper measurement and equipment setup.

Follow the procedure below:

1. Jumper, PS and LOAD 1ettings to start:
   JP1 = Run **JP4 =** 5.0V
   JP2 = 1 **PS1** = OFF
   JP3 = 1 **LOAD1** = OFF
2. Turn on PS1 and slowly increase voltage to 5.5V while monitoring the input current. If the current remains less than 50mA, increase PS1 until output turns on. Verify input voltage UVLO of 6.5V to 7.5V.
3. Increase PS1 to 12V and set LOAD1 to 120mA. Verify voltage on VOUT of 4.85V to 5.15V.
4. Set LOAD1 to 1.0A. Verify voltage on VOUT of 4.85V to 5.15V and ripple voltage of <50mV.
5. Increase LOAD1 current until VOUT drops below 4.9V. Verify LOAD1 current is between 1.1A and 1.4A. Reduce LOAD1 current to 120mA.
6. Set JP2 to 1 and JP3 to 0. Increase LOAD1 current until VOUT drops below 4.9V. Verify LOAD1 current is between 900mA and 1.1A. Reduce LOAD1 current to 120mA.
7. Set JP2 to 0 and JP3 to 1. Increase LOAD1 current until VOUT drops below 4.9V. Verify LOAD1 current is between 700mA and 900mA. Reduce LOAD1 current to 120mA.
8. Set JP2 to 0 and JP3 to 0. Increase LOAD1 current until VOUT drops below 4.9V. Verify LOAD1 current is between 500mA and 700mA. Reduce LOAD1 current to 120mA.
9. Set JP2 to 1, JP3 to 1 and JP4 to 3.3V. Verify voltage on VOUT of 3.2V to 3.4V
10. Set LOAD1 to 1.0A. Verify voltage on VOUT of 3.2V to 3.4V and ripple voltage of <50mV.
11. Increase PS1 to 36V and verify voltage on VOUT of 3.2V to 3.4V.
12. Increase PS1 to 40V and verify voltage on VOUT of 500mV.
13. Decrease PS1 to 30V and verify voltage on VOUT of 3.2V to 3.4V.
14. Turn off PS1 and Load 1.

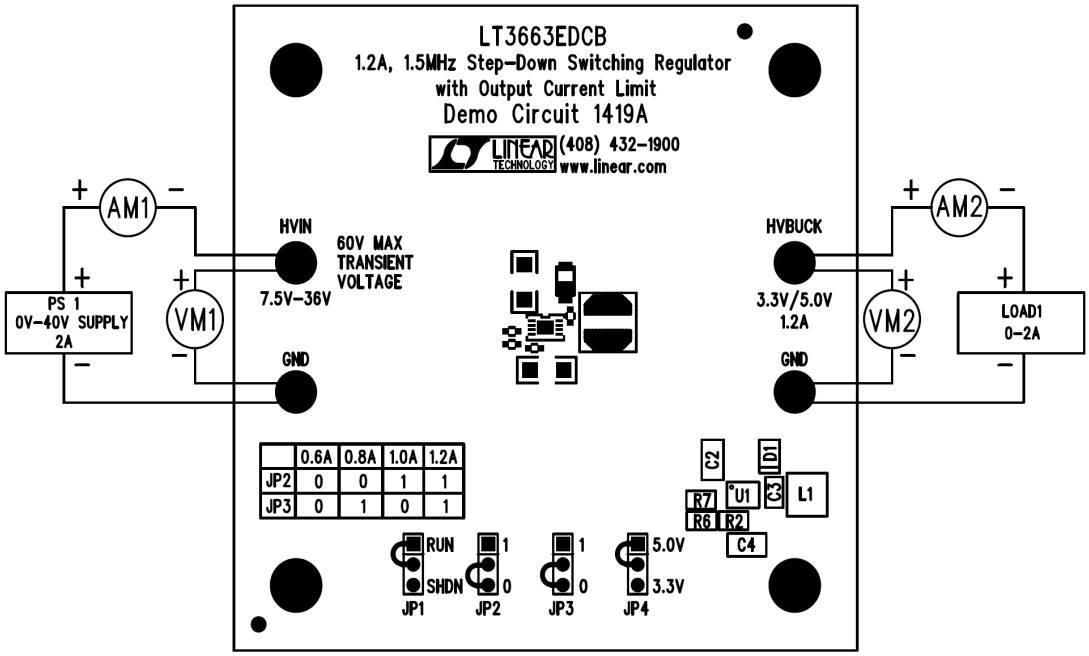

Figure 1. Proper Measurement Equipment Setup

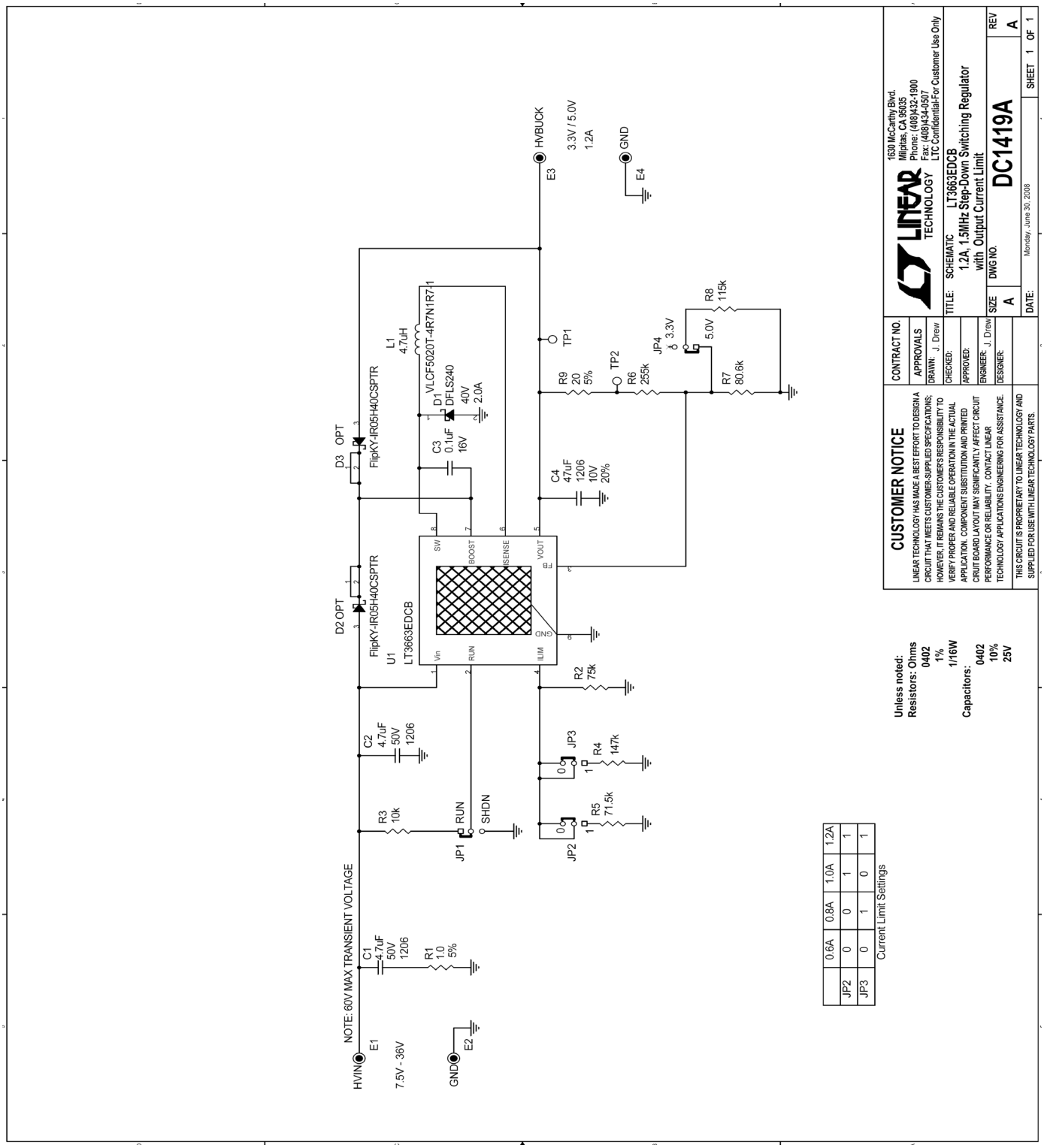

Figure 2: Schematic diagram

Linear Technology Corporation

LT3663EDCB

Bill Of Material
Demo Bd. #: DC1419A
9/10/2008

	Qty	Reference	Part Description	Manufacture / Part #	Kit Qty	In Stock	Qty On Order
				NUMBER OF BOARDS =	**10**		
		REQUIRED CIRCUIT COMPONENTS:					
1	1	C2	CAP, CHIP, X7R, 4.7µF, ±10%, 50V, 1206	MURATA, GRM31CR71H475KA12L	10		
2	1	C3	CAP, CHIP, X7R, 0.1µF, ±10%, 16V, 0402	MURATA, GRM155R71C104KA88	10		
3	1	C4	CAP, CHIP, X5R, 47µF, ±20%, 10V, 1206	TAIYO YUDEN, LMK316BJ476ML-T	10		
4	1	D1	DIODE, SCHOTTKY, 2A, 40V, SMB	DIODES INC, DFLS240L	10		
5	1	L1	IND, SMT, 4.7µH, 1.7A, ±30%, 102mΩ, 5mm x 5mm	TDK, VLCF5020T-4R7N1R7-1	10		
6	1	R2	RES, CHIP, 75kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW040275K0FKED	10		
7	1	R6	RES, CHIP, 255kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW0402255KFKED	10		
8	1	R7	RES, CHIP, 80.6kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW040280K6FKED	10		
9	1	U1	IC, SMT, 1.2A, 1.5MHz Step-Down Switching Regulator with Output Current Limit	LINEAR TECH, LT3663EDCB	10		
		ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:					
1	1	C1	CAP, CHIP, X5R, 4.7µF, ±10%, 50V, 1206	MURATA, GRM31CR71H475KA12L	10		
2	1	R1	RES, CHIP, 1.0Ω, 200ppm, 1/16W, 5%, 0402	VISHAY, CRCW04021R00JNED	10		
3	1	R3	RES, CHIP, 10.0kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW040210K0FKED	10		
4	1	R4	RES, CHIP, 147kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW0402147KFKED	10		
5	1	R5	RES, CHIP, 71.5kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW040271K5FKED	10		
6	1	R8	RES, CHIP, 115kΩ, 100ppm, 1/16W, 1%, 0402	VISHAY, CRCW0402115KFKED	10		
7	1	R9	RES, CHIP, 20Ω, 200ppm, 1/16W, 5%, 0402	VISHAY, CRCW040220R0JNED	10		
		OPTIONAL DEMO BOARD CIRCUIT COMPONENTS:					
1	0	D2,D3	DIODE, SCHOTTKY, 40V, 0.5A	VISHAY, IR05H40CSPTR	0		
		HARDWARE FOR DEMO BOARD ONLY:					
1	4	E1,E2,E3,E4	Turret, 0.09"	MIL-MAX, 2501-2	40		
2	4	JP1,JP2,JP3,JP4	3 Pin Jumper, 2mm	SAMTEC, TMM-103-02-L-S	40		
3	4	JP1,JP2,JP3,JP4	SHUNT, 2mm	SAMTEC, 2SN-BK-G	40		
4	4		STAND-OFF, NYLON 0.375" tall (SNAP ON)	KEYSTONE, 8832 (SNAP ON)	40		