LT3741
High Power Constant Current, Constant Voltage Synchronous Buck Controller

DESCRIPTION

Demonstration circuit 1602 is a High Power Constant Current, Constant Voltage Synchronous Buck Controller featuring the LT3741. The demo board is optimized for 20A output from a 12V input. Being an LED driver, the output current is being regulated until the output voltage reaches a programmed voltage limit. The voltage limit on this demo board is set to around 6V by R11 and R14. The 6V is chosen because of the 10V voltage rating of the output capacitors. Higher output voltage can be easily achieved with higher voltage rated output capacitors. The ideal load to be used with this demo board is a single LED, such as PT120 from Luminus Devices. Smaller LEDs may not be able to handle the high current, even for a short period of time. At 20A, the demo circuit can operate continuously. However, it is necessary to mount the LED load on a proper heat sink and possibly with a fan to avoid exceed its maximum temperate rating.

The input voltage range of the LT3741 itself is 6V to 36V. However, the demo board utilizes 30V MOSFETs to demonstrate best efficiency so the maximum recommended input voltage is 24V for the demo board. The typical efficiency of the demo board is 94% from a 12V input to 5V, 20A load. The lower the input voltage, the higher the efficiency tends to be with a given load. At output power level of 100W, a couple of percent of efficiency im-

provement is a huge advantage in minimizing temperature rise. If an efficiency measurement is needed in an application, the output voltage must be measured at the output capacitors instead of at the LED load. This prevents cable loss from being counted as a loss of the board. Output current can be adjusted by varying the CTRL1 voltage.

R16 can be used to slow down the gate drive. Slower gate drive helps to reduce ringing on the SW node without noticeable effect on the efficiency. A 10Ω is usually more than enough to completely damp any ringing.

R10, R13 and C14 help filtering out voltage spikes seen on the SENSE+ or SENSE- pin. It is critical to have those components on a board.

The LT3741 datasheet gives a complete description of the part, operation and application information. The datasheet must be read in conjunction with this quick start guide for demo circuit 1602A.

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

PERFORMANCE SUMMARY Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
PV_{IN}*	Input Supply Range. $PV_{IN}=V_{IN}$	L1 is Optimized for 12V.		12	24	V
V_{OUT}*	Output Voltage	With ONE PT120 LED. 6V is the over voltage limit.		4.5	6	V
I_{OUT}	Output Current	In Current Mode	18.8	20	21.2	A
V_{OUT}	Output Voltage	In Voltage Mode	5.88	6	6.12	V
F_{SW}	Switching Frequency	R3=100k	380	420	460	kHz
EFE	Efficiency at DC	V_{IN} = 12V, V_{OUT}=5V, I_{OUT}=20A		94		%

*: PV$_{IN}$ and V$_{IN}$ of the demo circuit are limited to 24V typical by the selection of MOSFETs. The LT3741 input range is 6V to 36V. VOUT maximum of the demo circuit is limited to 6V due to the selection of the output capacitors.

QUICK START PROCEDURE

Demonstration circuit 1602A is easy to set up to evaluate the performance of the LT3741. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to PV$_{IN}$ and GND. The input power supply should have a current limit of 10A or more.

2. With power off, connect a LED between VOUT and GND.

3. Turn on the power at the input. Be careful not to look at a powered LED directly.

4. Carefully evaluate other design parameters as needed.

5. Adjust CTRL1 to change output current.

6. To modify the demo board for other applications, please contact Linear Applications Group for help.
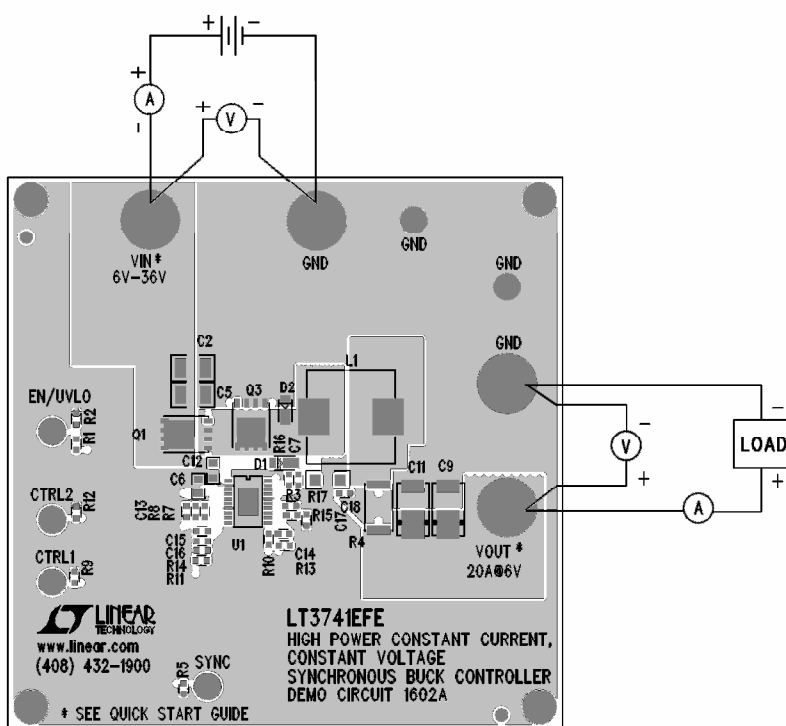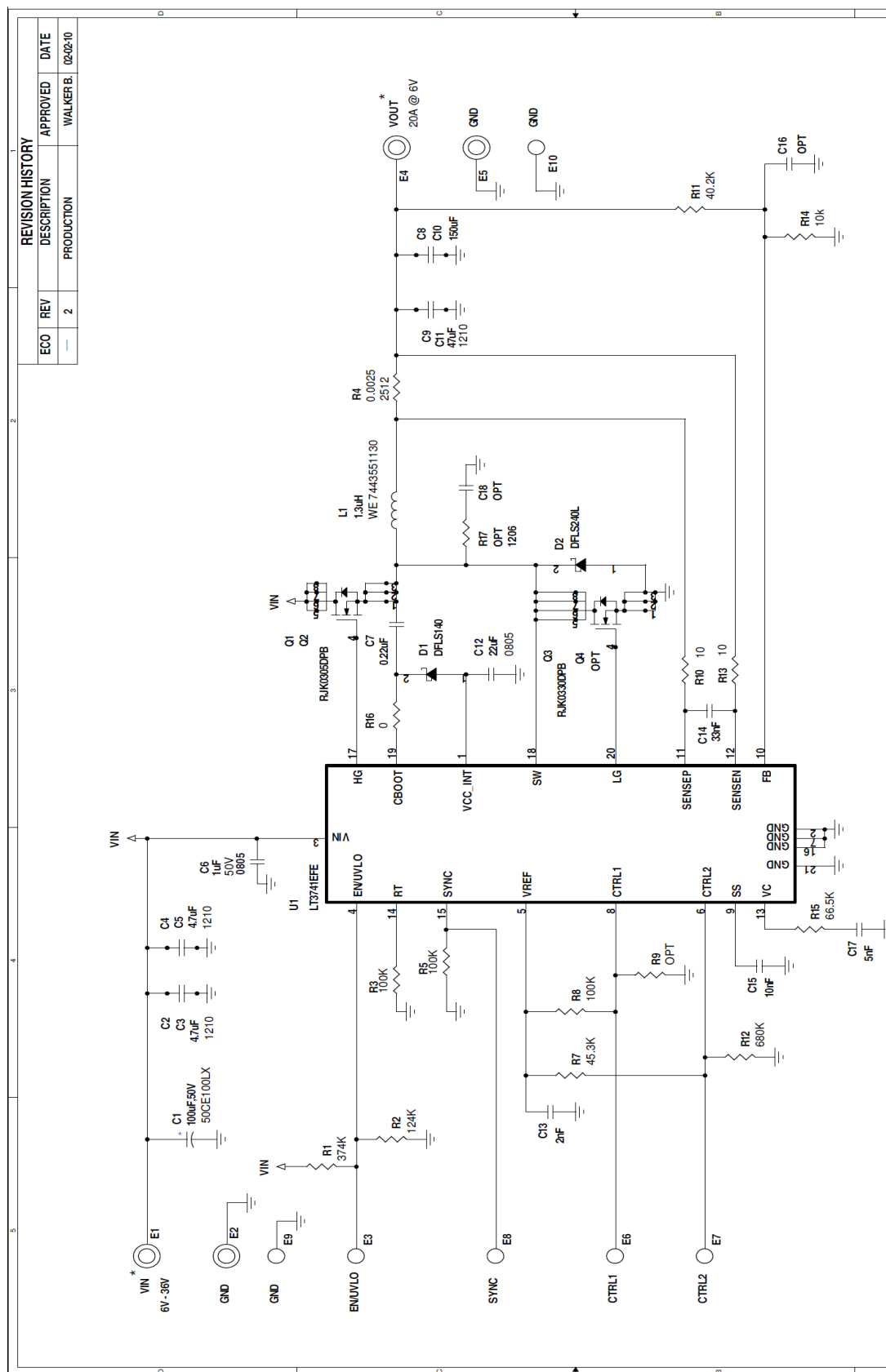

Figure 1. Proper Measurement Equipment Setup

Schematic — LT3741EFE Demo Circuit 1602A, High Power Constant Current, Constant Voltage Synchronous Buck Controller

REVISION HISTORY

ECO	REV	DESCRIPTION	APPROVED	DATE
—	2	PRODUCTION	WALKER B.	0242-10

CUSTOMER NOTICE

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

NOTE: UNLESS OTHERWISE SPECIFIED

* - SEE QUICK START GUIDE

1. ALL RESISTORS ARE IN OHMS, 0603.
   ALL CAPACITORS ARE IN MICROFARADS, 0603.