DESCRIPTION

Demonstration circuit 891 is a High Current Capacitive Charging Circuit featuring the LT3750EMS. It is a DC/DC flyback converter used to charge large capacitors to high voltages. The circuit implemented on the board is a simple example of how to charge a 400uF capacitor to 300V in approximately one second, depending upon the line and load conditions. An output capacitor discharge circuit is included on the board for the convenience of the user. This discharge circuit can be disabled by the user or permanently enabled at the expense of a minor degradation in the charging profile.

The LT3750 is a current-mode flyback controller optimized for charging large value capacitors to a predetermined target voltage. This target voltage is set by the turns ratio of the flyback transformer and just two resistors in a simple, low voltage network, so there is no need to connect components to the high voltage output. The charging current is set by an external sense resistor and is monitored on a cycle-by-cycle basis. The LT3750 is available in a space saving MSOP-10 package.

WARNING! LETHAL VOLTAGES ARE PRESENT ON THE DC891 CIRCUIT BOARD. DO NOT OPERATE THE ASSEMBLY UNLESS YOU ARE TRAINED TO HANDLE HIGH VOLTAGE CIRCUITS.

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

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Input Voltage Range	Vout = 0 to 320V	6-20VDC
Output Target Voltage	Vin = 6 to 20VDC	300 ± 5%VDC
Average Input Charging Current	Vin = 0 to 20V, Cload = 400uF	2.2A

QUICK START PROCEDURE

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Demonstration circuit 891 is easy to set up to evaluate the performance of the LT3750. For proper equipment setup, follow the procedure below, referring to Figure 1.

1. With the power source turned off, connect the input power supply to the board through the VIN (E1) and GND (E2) terminals.
2. Connect the load to the VOUT (E3) and GND (E5) terminals.
3. Set the CHARGE jumper at JP1 to the STOP position. Alternatively, the user may connect a 0-24V signal source to the three pin JP1 header. Refer to the data sheet and schematic for proper signal levels.

4. Position the OUTPUT BLEEDER jumper at JP2 to the NORMAL OPERATION position for initial testing. The user can also leave the jumper set to DISCHARGE, but there will be a minor degradation to the operation of the charge time.
5. Turn on the input power source to at least 6V, but below 20V.
6. Change the CHARGE jumper at JP2 to the GO position. If a signal source is used, apply an active transition.
7. The output should start charging towards 300V.

OPERATION

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Demonstration circuit 891, featuring the LT3750, is a DC/DC Flyback converter used to charge large valued capacitors to a predetermined voltage. The charging current is set by the current sense resistor R10, while the target voltage is determined by the turns ratio of the transformer T1. For a complete description of the operation of the LT3750 integrated circuit, please refer to the data sheet.

The DC891 demo board is equipped with two physical interfaces to control the charge cycle. One is a simple solder terminal at location E6. The other is 2mm header at location JP1. For the convenience of the user, a high impedance 100K pull up resistor is connected between the CHARGE pin and the VIN power input. A jumper has been installed between CHARGE and GND. The data sheet defines a signal profile that must be used to properly activate the CHARGE input, so it is recommended that the user employ a suitable signal source to control the charge cycle.

The DONE bit is pulled up to VIN through a high impedance 100K resistor. This may not be compatible with all electrical systems.

DC891 is equipped with a safety circuit that drains the output capacitor of charge when the controller is not delivering energy to the load. When JP2 is set to NORMAL OPERATION, this safety circuit is disabled and the output capacitor will bleed down from its own leakage current. If JP2 is set to DISCHARGE, the output capacitor will be discharge through the combined parallel resistance of R2, R3 and R4.

Due to the high charging currents made possible by the LT3750, it is possible to simply engage the safety circuit all the time by leaving JP2 in the DISCHARGE position. This will result in only a minor degradation in the charging profile.

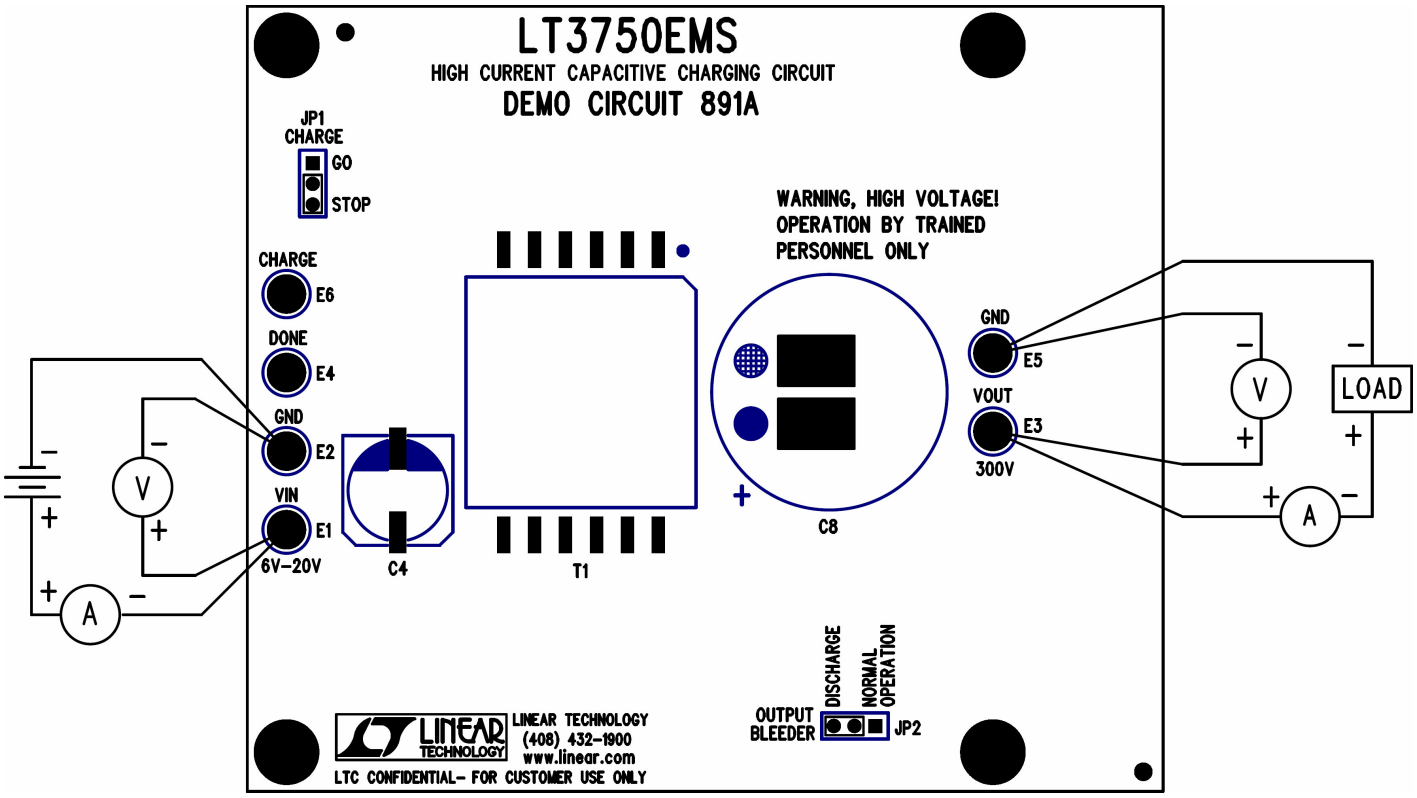
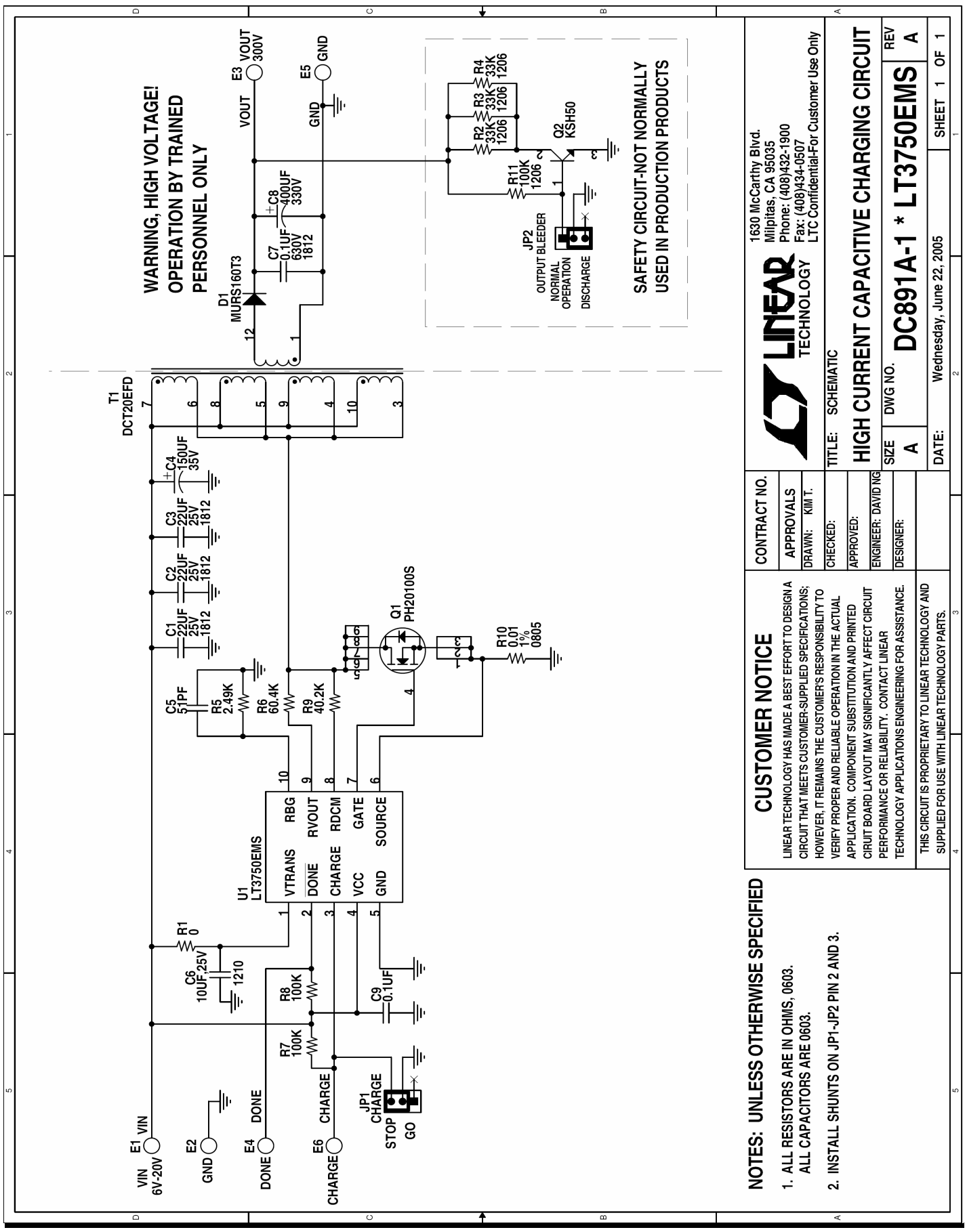


Figure 1. Proper Measurement Equipment Setup



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0603.
   ALL CAPACITORS ARE 0603.
2. INSTALL SHUNTS ON JP1-JP2 PIN 2 AND 3.

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 CIRUIT 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.

CONTRACT NO.

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TITLE: SCHEMATIC

HIGH CURRENT CAPACITIVE CHARGING CIRCUIT

SIZE	DWG NO.	REV
A	**DC891A-1 * LT3750EMS**	A

DATE: Wednesday, June 22, 2005 SHEET 1 OF 1