

DESCRIPTION

Demonstration circuit DC937A is a complete power controller for a USB powered device. It is based on the LTC4085 and provides the following functions: 700mA CC/CV timer terminated temperature qualified charger suitable for Li-Ion cells, a USB power manager that insures compliance with the USB power specification and power path management for the battery. The LTC4085 uses the intermediate bus voltage topology that results

in faster charging and lower power loss than the charger fed topology. All this functionality consumes less than 56mm² of PCB area.

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

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Table 1. Performance Summary

PARAMETER	CONDITION	VALUE
Input Voltage		4.5V - 5.5V
Battery Charger		
I _{out}	V _{IN} = 5V, V _{bat} =3.6V	700mA +/- 7%
Float Voltage	V _{in} = 5V, battery disconnected from BATT pin	4.20V +/- 35mV
Trickle Charge Threshold	V _{IN} = 5V	2.9V +/- 0.1V
Recharge Threshold	V _{IN} = 5V	(V _{float} - 130mV) to (V _{float} -60mV)
USB Current		
Input Current 500mA Mode	V _{IN} = 5V, USB Active 500mA Mode	475mA typical, 500mA max
Input Current 100mA Mode	V _{IN} = 5V, USB Active 100mA Mode	93mA typical, 100mA max
Input Current Suspend Mode	V _{IN} =5V, USB Suspend	300uA max

OPERATING PRINCIPLES

DC937A is the demo board for LTC4085. This chip manages the power supplies that would be typical for a USB powered device. Power is input from either the USB cable or an adapter to an intermediate voltage bus. The intermediate voltage bus is preferentially powered

from the adapter, then USB and finally if required from the battery via an ideal diode. The battery charger is a CC/CV timer terminated type capable of charge currents of up to 1500mA.

QUICK START PROCEDURE

Demonstration circuit DC937A is easy to set up to evaluate the performance of the LTC4085. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Connect input power supply, meters and output load as shown in Figure 1.

USB Charging

2. Place the USB ON/OFF jumper (JP1) in the ON position. Place the USB current jumper (JP2) in the 500mA position. Set the battery simulator voltage to zero, slowly raise the USB input voltage. When the supply voltage exceeds 3.8V the charger should activate and the charge LED D2 will illuminate. The battery will be in trickle charge mode, I_{BAT} is around 70mA. Increase the battery voltage to about 2.9V. The

battery charge current (I_{BAT}) will increase to 475mA. Note that the input current from the USB (I_{USB}) does not exceed the USB spec of 500mA.

3. Now increase the load on the SYSTEM LOAD OUTPUT (I_{OUT}). Note that as the output load is increased the charging current is decreased and the USB current remains within the 500mA limit.
4. Place the USB current jumper in the 100mA position and note that USB input current falls to maintain compliance with the USB input current spec. Also note that as the external load is increased the battery will start to discharge into the SYSTEM LOAD OUTPUT, illustrating the ideal diode function of the LTC4085
5. Place the USB ON/OFF jumper (JP1) in the OFF position and note that the USB current falls to under 300uA to comply with the USB suspend mode current.

Adapter Charging

6. Ramp up the wall adapter voltage. When the wall adapter exceeds 4.3 volts the LTC4085 will cease drawing current from the USB and switch over to the wall adapter. Both the AC-present LED (D1, red) and charge LED (D2, green) are on.
7. Note that the charge current to the battery has increased to 700mA.
8. Increase the battery voltage to 4.2V and note that the charge current falls to 0. This illustrates the constant voltage portion of the charging characteristic. In the mean time, the charge LED (D2) turns off.

Battery Powered Operation

9. Set Both USB input voltage and the adapter input voltage to zero. The battery will now power the load on the System Load Output, illustrating the ideal diode function of the LTC4085. Note that the battery is now being discharged.

Other

Frequency at charge timer cap C3 changes with charging current, indicating the adaptive feature to ensure the full charge of battery.

10. Pins are provided to all control functions in order to simplify wiring of the demo circuit into a system board.
11. NTC function; provision has been made for connection of an external 10k NTC, for temperature qualified charging. To use this feature set the NTC jumper in the external position and connect the external NTC to the NTC terminal and ground.

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC937A

USB POWER SOLUTION IN DFN 3X4

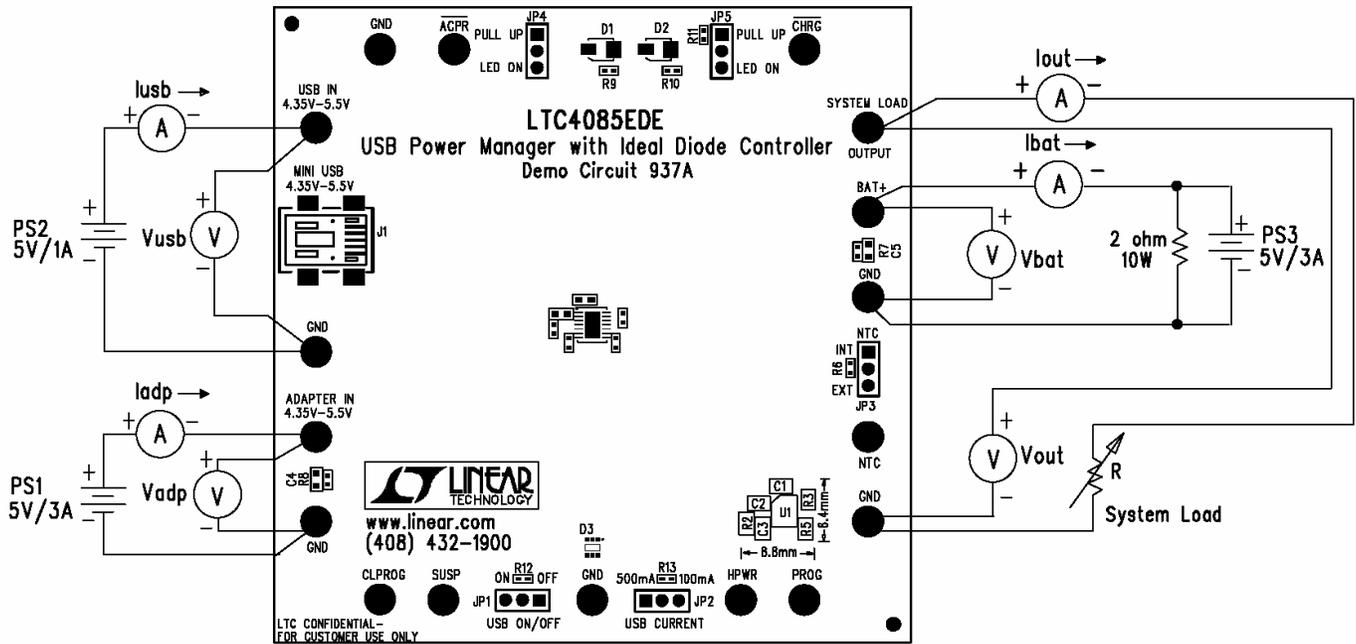
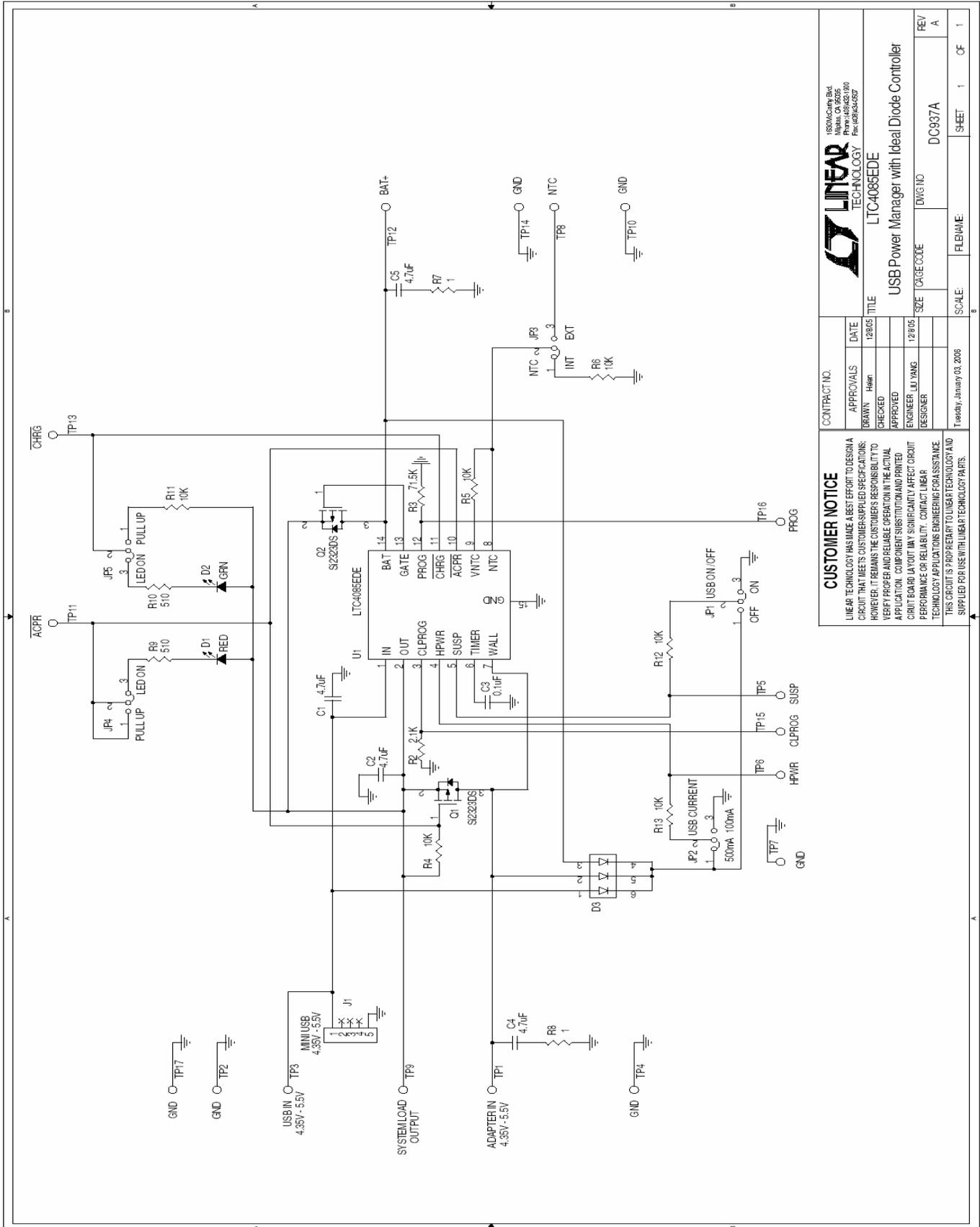


Figure 1. Proper Measurement Equipment Setup

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC937A

USB POWER SOLUTION IN DFN 3X4



CUSTOMER NOTICE		CONTRACT NO.	
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS THE 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.		LTC4088EDE	
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.		USB Power Manager with Ideal Diode Controller	
		DATE	12/05
		DESIGNED BY	JU YANG
		CHECKED BY	
		APPROVED BY	
		DESIGNER	
		SIZE	DWG NO
		SCALE	DC937A
		SHEET	1 OF 1