

DESCRIPTION

Demonstration circuit DC848 is a complete power controller for a USB powered device. It is based on the LTC4066 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 LTC4066 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 77mm² of PCB area with all the components on one side.

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		4.5-5.5V
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

Demo DC848 is based on the LTC4066. 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 800mA.

QUICK START PROCEDURE

Demonstration circuit DC848 is easy to set up to evaluate the performance of the LTC4066. 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 Master ON/OFF jumper in the ON position.
3. Place the USB ON/OFF jumper in the ON position. Place the USB current jumper 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 D3 will illuminate. The battery will be in trickle charge mode. Increase the battery voltage to 3.6V from about 2.9V the battery charge current will increase to 475mA. Note that the input current from the USB does not exceed the USB spec of 500mA.

4. Now increase the load on the SYSTEM LOAD OUTPUT. Note that as the output load is increased the charging current is decreased and the USB current remains within the 500mA limit.
5. 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 LTC4066
6. Place the USB ON/OFF jumper in the OFF position and note that the USB current falls to under 300uA to comply with the USB suspend mode current.

Adapter Charging

7. Ramp up the wall adapter voltage. When the wall adapter exceeds 4.3 volts the LTC4066 will cease drawing current from the USB and switch over to the wall adapter.
8. Note that the charge current to the battery has increased to 700mA.
9. 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.

Battery Powered Operation

10. 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 LTC4066. D4 comes on. Note that the battery is now being discharged.

Other

11. Frequency at charge timer cap C2 changes with charging current, indicating the adaptive feature to ensure the full charge of battery.
12. Pins are provided to all control functions in order to simplify wiring of the demo circuit into a system board.
13. 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 DC848

USB POWER SOLUTION IN QFN 4X4

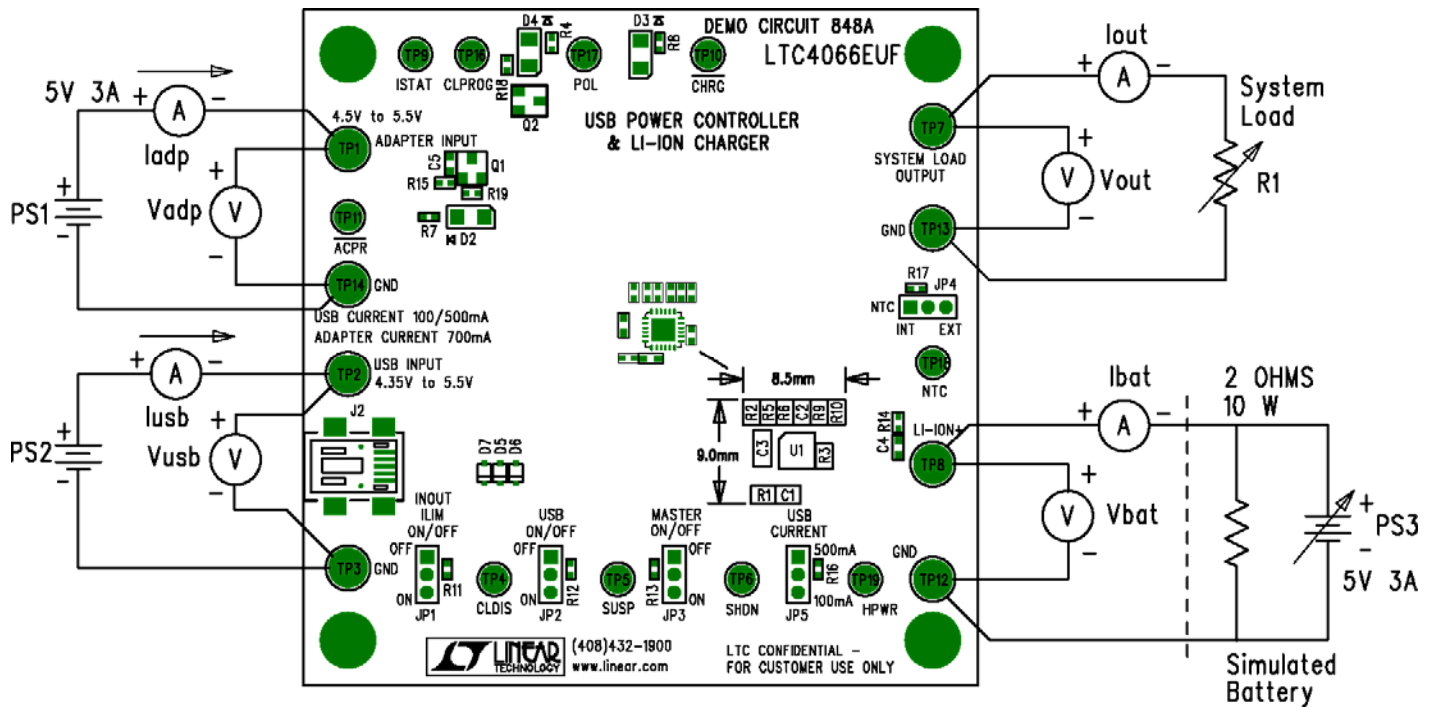
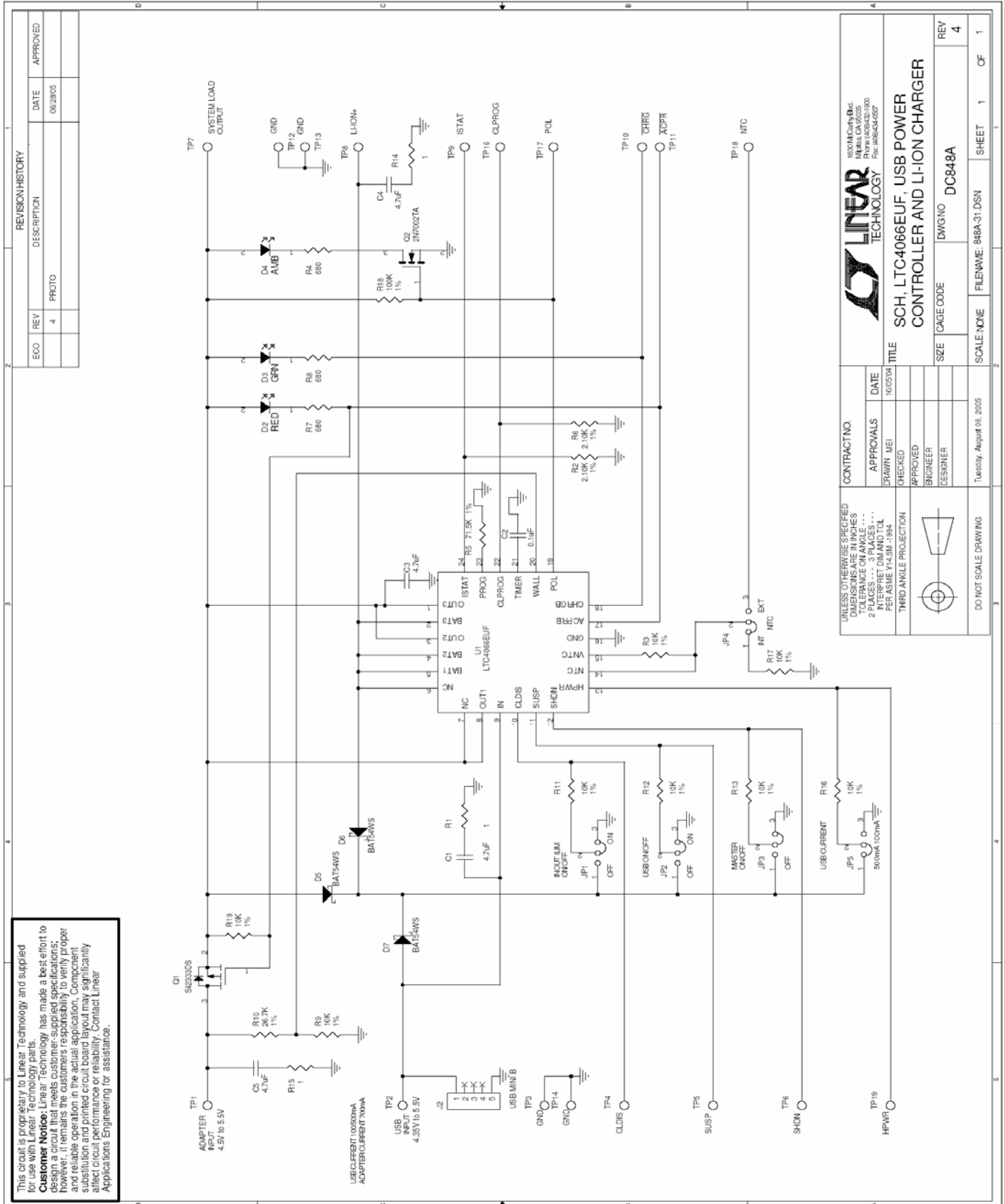


Figure 1. Proper Measurement Equipment Setup

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USB POWER SOLUTION IN QFN 4X4



This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.

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 tolerances, component quality, and component age may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.

REVISION HISTORY		
ECO	REV	DESCRIPTION
	4	PROTO
		DATE
		APPROVED

		9500 MCDEVEN BLVD MILPITAS, CA 95035 (415) 964-7000 FAX: (415) 964-8848 WWW.LINEARTECH.COM
TITLE SCH, LTC4066EU-F, USB POWER CONTROLLER AND LI-ION CHARGER		
DATE 10/05/04		
APPROVALS DRAWN: MEI CHECKED: [Signature] APPROVED: [Signature] ENGINEER: [Signature] DESIGNER: [Signature]		
CONTRACT NO. [Blank]		
SCALE NONE		
FILE NAME 918A-31.DSN		
SHEET 1 OF 1		
SIZE A		
DWG NO DC848A		
REV 4		