

# LTC4079

## 60V, 250mA Linear Charger with Low Quiescent Current

### DESCRIPTION

Demonstration circuit 2133A features a simple battery charger circuit using the [LTC®4079](#) high-voltage monolithic linear charger. The DC2133 has an input voltage range from 2.7V to 60V and is capable of supplying up to 250mA charge current. The charge voltage is jumper-selectable to 4.2V or 8.4V. Charge current is adjustable via the PROG pin and initially programmed for 99mA. In shutdown or when unpowered, LTC4079 consumes only 10nA from the battery.

DC2133A is initially configured to enable charging from application of  $V_{IN}$  above the LTC4079 UVLO threshold.

The NTC input is connected to an on-board resistance to enable charging with only a 2-wire battery connection; however an external thermistor may be used with the NTC test point.

Termination is accomplished by timer method. Charging status is reflected by the CHRG LED.

**Design files for this circuit board are available at <http://www.linear.com/demo/DC2133A>**

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### PERFORMANCE SUMMARY Specifications are at $T_A = 25^\circ\text{C}$

| PARAMETER                | CONDITIONS                         | TYPICAL VALUE |
|--------------------------|------------------------------------|---------------|
| Input Voltage Range      |                                    | 2.7V to 60V   |
| Default Charging Voltage | $V_{BAT} = 4.2$                    | 4.2V          |
| Default Charging Current | $R_{PROG} = 3.01k$                 | 99mA          |
| PROG Pin Voltage         | $R_{PROG} = 3.01k, I_{CHG} = 99mA$ | 2.5V          |
| Input Regulation Voltage | EN = REG (JP1)                     | 10.3V         |
| Default Charge Timer     | $C_{TMR} = 0.068\mu F$             | 3h 45 min     |

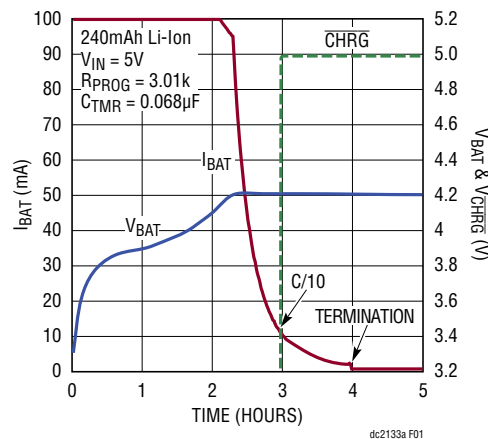


Figure 1. Typical Battery Charge Cycle

## QUICK START PROCEDURE

Demonstration circuit 2133 is easy to set up to evaluate the performance of LTC4079. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below.

1. The jumpers are initially set as below for a typical 4.2V charging application:

| JP1 | JP2 | JP3   | JP4  | JP5 |
|-----|-----|-------|------|-----|
| EN  | NTC | TIMER | VBAT | LED |
| ON  | INT | ON    | 4.2  | ON  |

2. With all power off, connect the input supply, battery, and meters as shown in Figure 2.

**Note:** Depending on the input cable and power supply impedance, hot plugging an input supply may cause overvoltage transients that can damage the board. R1 and C1 form an input transient damping network that mitigates this. See AN-88 for component selection.

3. Turn on the input power supply. Adjust the input voltage and current limit to the desired value.
4. Monitor the PROG pin voltage for a scaled representation of the output current according to the relationship:

$$I_{BAT} = \frac{250 \cdot V_{PROG}}{R_{PROG}}$$

**Note:** Minimize capacitance on the PROG pin to prevent charger instability.

5. Allow the battery to charge for a complete cycle.  $\overline{CHRG}$  will disable the LED when the charge current has dropped below 10mA, but the timer will continue to run and charge current will flow until the timer period ends.

### Optional

1. While powered off, change the setting of the EN jumper, JP1, to REG to evaluate the enable input regulation feature, or to OFF to disable charging.
2. Use an external thermistor connected to the NTC jumper, JP2, set to EXT.
3. To terminate charge on current, disable the TIMER input with JP3 set to OFF. LTC4079 will terminate on C/10 only.
4. The  $\overline{CHRG}$  LED can be disconnected to measure the true quiescent current of the LTC4079 in shutdown or for connection to external pull-up logic by setting the LED jumper, JP5 to OFF.
5. To change the battery charging voltage, set the  $V_{BAT}$  jumper, JP4. Alternatively, the feedback resistors may be adjusted for custom values, according to the battery voltage.

**Note:** DO NOT change the  $V_{BAT}$  with  $V_{IN}$  applied.

**QUICK START PROCEDURE**

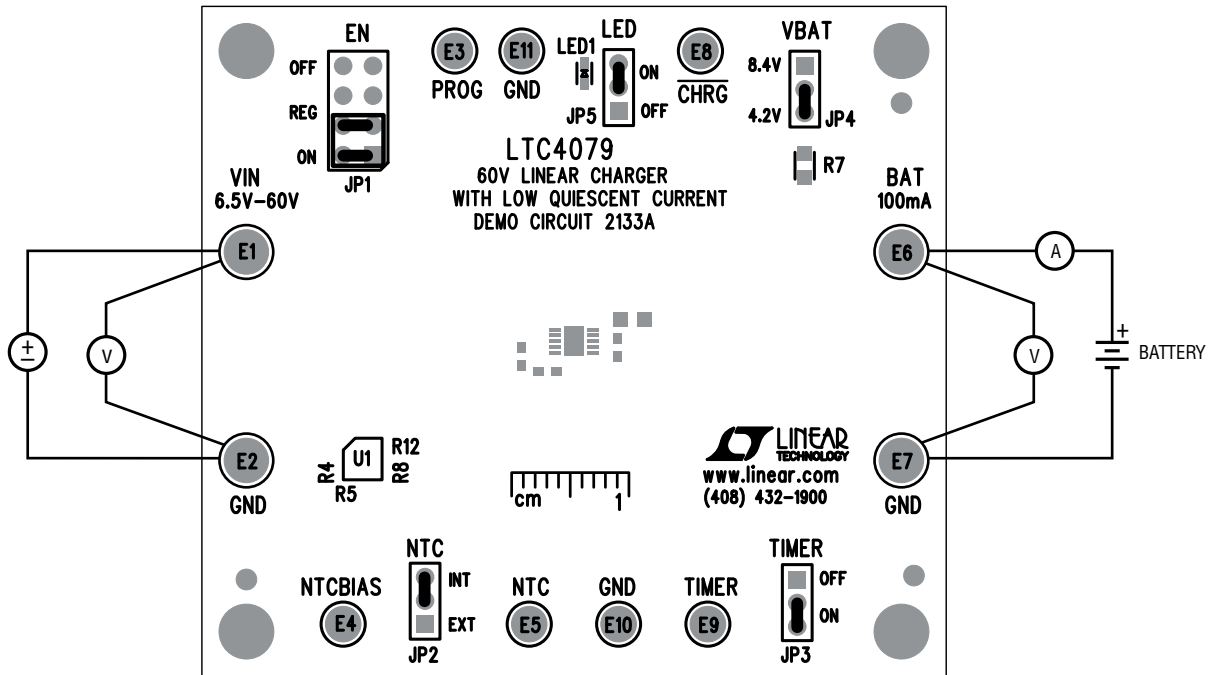


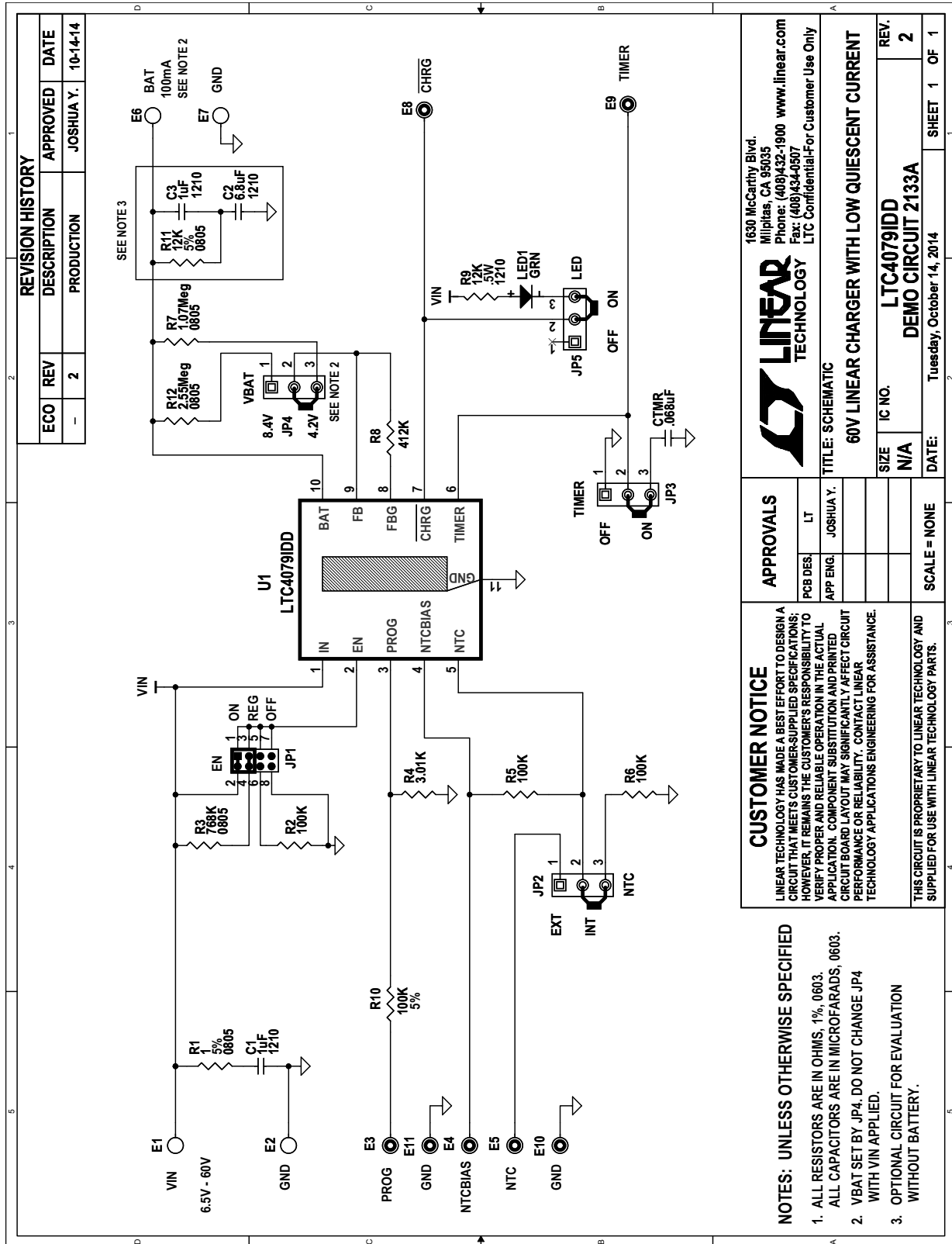
Figure 2. Proper Measurement Equipment Setup

# DEMO MANUAL DC2133A

## PARTS LIST

| ITEM  | QTY | REFERENCE                    | PART DESCRIPTION                              | MANUFACTURER/PART NUMBER          |
|---|-----|------------------------------|---|-----------------------------------|
| <b>Required Circuit Components</b>              |     |                              |   |                                   |
| 1   | 1   | C1, C3                       | CAP, CHIP, X7R, 1 $\mu$ F, 20%, 100V, 1210    | AVX, 12101C105MAT2A               |
| 2   | 1   | C2                           | CAP, CHIP, X5R, 6.8 $\mu$ F, 10%, 25V, 1210   | TDK, C3225X5R1E685K               |
| 3   | 1   | CTMR                         | CAP, CHIP, X7R, 0.068 $\mu$ F, 10%, 50V, 0603 | MURATA, GRM188R71H683KA93D        |
| 4   | 3   | R2, R5, R6                   | RES, CHIP, 100k $\Omega$ , 1%, 0603           | VISHAY, CRCW0603100KFKEA          |
| 5   | 1   | R3                           | RES, CHIP, 768k $\Omega$ , 1%, 0805           | VISHAY, CRCW0805768KFKEA          |
| 6   | 1   | R4                           | RES, CHIP, 3.01k $\Omega$ , 1%, 0603          | VISHAY, CRCW06033K01FKEA          |
| 7   | 1   | R7                           | RES, CHIP, 1.07M $\Omega$ , 1%, 0805          | VISHAY, CRCW08051M07FKEA          |
| 8   | 1   | R8                           | RES, CHIP, 412k $\Omega$ , 1%, 0603           | VISHAY, CRCW0603412KFKEA          |
| 9   | 1   | R12                          | RES, CHIP, 2.55M $\Omega$ , 1%, 0805          | VISHAY, CRCW08052M55FKEA          |
| 10  | 1   | U1                           | I.C., LTC4079IDD                              | LINEAR TECH., LTC4079IDD#PBF      |
| <b>Additional Demo Board Circuit Components</b> |     |                              |   |                                   |
| 1   | 1   | LED1                         | DIODE, LED, SMT, GREEN, 0603                  | LITE-ON, LTST-C190KGKT            |
| 2   | 1   | R1                           | RES, CHIP, 1 $\Omega$ , 5% 0805               | VISHAY, CRCW08051R00JNEA          |
| 3   | 1   | R9                           | RES, CHIP, 12k $\Omega$ , 3/4W, 5%, 1210      | VISHAY, CRCW121012K0JNEAHP        |
| 4   | 1   | R10                          | RES, CHIP, 100k $\Omega$ , 1%, 0603           | VISHAY, CRCW0603100KFKEA          |
| 5   | 1   | R11                          | RES, CHIP, 12k $\Omega$ , 5%, 0805            | VISHAY, CRCW080512K0JNEA          |
| <b>Hardware: For Demo Board Only</b>            |     |                              |   |                                   |
| 1   | 4   | E1, E2, E6, E7               | TEST POINT, TURRET, 0.094"                    | MILL-MAX, 2501-2-00-80-00-00-07-0 |
| 2   | 7   | E3, E4, E5, E8, E9, E10, E11 | TEST POINT, TURRET, 0.062"                    | MILL-MAX, 2308-2-00-80-00-00-07-0 |
| 3   | 1   | JP1                          | 2 x 4 PIN JUMPER, 0.1"                        | SAMTEC, TSW-104-07-L-D            |
| 4   | 4   | JP2, JP3, JP4, JP5           | 3 PIN JUMPER, 2mm                             | SULLINS, NRPNO31PAEN-RC           |
| 5   | 1   | XJP1                         | SHUNT, 2 x 2, 0.1"                            | SAMTEC, MNT-102-BK-G              |
| 6   | 4   | XJP2, XJP3, XJP4, XJP5       | SHUNT, 0.079"                                 | SAMTEC, 2SN-BK-G                  |
| 7   | 4   | STAND-OFF                    | STAND-OFF, NYLON 0.25"                        | KEYSTONE, 8831(SNAP ON)           |

**SCHEMATIC DIAGRAM**



# DEMO MANUAL DC2133A

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