# Battery Charger Design
# Application Note

80000nt10042a Rev.1 – 2010-10-04


Making machines talk.

# APPLICABILITY TABLE

| PRODUCT |
| --- |
| GC864-QUAD V2 |
| GC864-DUAL V2 |
| GE864-QUAD V2 |
| GE864-DUAL V2 |
| GE864-QUAD AUTOMOTIVE V2 |
| GE865-QUAD |
| GL865-DUAL |

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## Contents



 

# 1. Introduction

## 1.1. Scope

Scope of this document is to provide the guidelines to design a battery charger for the Telit modules that are not provided with. The battery charger is needed whenever a battery powered application requires an embedded battery charger.

## 1.2. Audience

This document is intended for Telit customers who need to implement a battery charger in their application.

## 1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/en/products/technical-support-center/contact.php

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

 

## 1.4. Document Organization

This document contains the following chapters (sample):

"Chapter 1: "Introduction" provides a scope for this document, target audience, contact and support information, and text conventions.

"Chapter 2: "Chapter two" gives guideline about how to design a battery charger.

## 1.5. Text Conventions


*Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.*

*Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.*

**Tip or Information – Provides advice and suggestions that may be useful when integrating the module.**

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

## 1.6. Related Documents

- Hardware User Guide of the relevant Telit module
- AT Command User Guide, 80000ST10025a
- Telit modules SW User Guide, 1vv0300784

## 1.7. Document History

| Revision | Date | Changes |
|---|---|---|
| 0 | 2010-08-27 | First issue |
| 1 | 2010-10-04 | Added GL865-DUAL to the applicability table |

 

# 2. Battery charger design

The products listed in the applicability table are not equipped with a battery charger. Aim of this application note therefore, is to help the customers to design a battery charger that goes along with a Telit module, suitable for applications that are battery powered with a Li-Ion (or Li-Polymer) cell.

## 2.1. Example of battery chargers

### 2.1.1. Battery Charger with 5V input

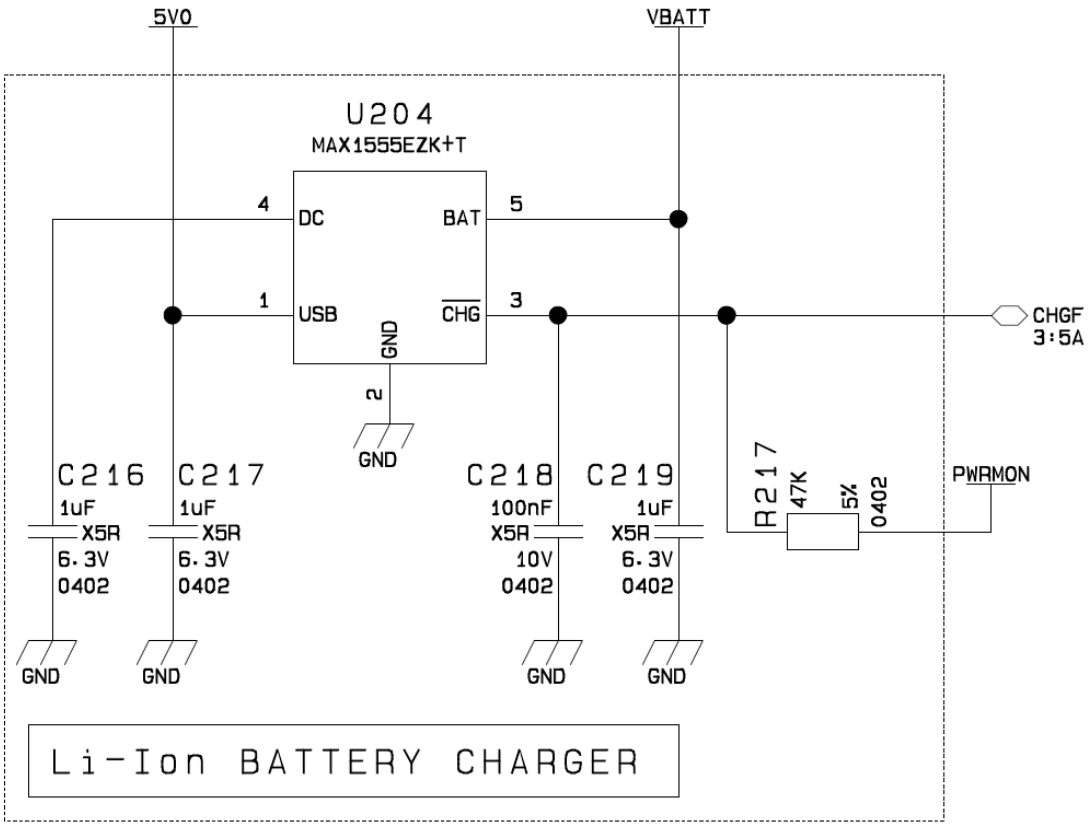


Fig 1: Battery Charger with 5V input power supply.

The MAX1555 charges the Li-Ion Cell by CCCV technique (Constant Current Constant Voltage).
If VBATT is less than 3 V, the device enters in pre-charge mode, where recharging current is limited to 40 mA. That low recharge current is suitable to "recover" an over-discharged cell.

With VBATT voltage between 3 V and 4.2 V, the recharge current is 90 mA Typ (Constant Current).
With 4.2 V VBATT, the recharge continues in Constant Voltage. In Constant Voltage mode, the recharge current is reduced with the recharge progress. When the recharge current falls to 50 mA Typ, the CHGF pin goes high to indicate the recharge of the battery has been completed. A GPI/O of the M2M can be used to monitor the state of recharge.

NOTE:

the CHGF pin is high also without power supply on the MAX 1555.

With power supply on USB input (5V0 in figure "Li-Ion BATTERY CHARGER"), the Constant Current recharge is 90 mA typ.
With power supply on DC input, the Constant Current recharge is 280 mA typ.

If it is necessary a higher Constant Current recharge, it is necessary to make use of the MAX 1811: Constant Current 450 mA typ.

The 450 mA recharge current is suitable for a cell capacity up to 2000 mAh.
The Li-Ion battery will be charged over the current range of 0.1 CmA to 1.5 CmA.
450 mA are 0.4 CmA for the 2000 mAh battery.
450 mA are 1.1 CmA for the 500 mAh battery.

For the Li-Ion BATTERY CHARGER, the BATT leakage current (without input power supply) is limited: 1 µA typ.

It is not provided a battery temperature gauging to manage the recharge current regarding temperature battery.

### 2.1.2. Battery Charger with up to 76V input

If it is necessary a wider power supply voltage, it is possible to make use of the MAX5033B to obtain a power supply voltage up to 76 V DC input voltage.

The MAX 5033B is a step down DC-DC converter with 5 V output voltage. The 500 mA output current is enough to power supply the MAX 1555 or MAX 1811.

The BJT is optional: if it is not necessary the ON /OFF function for the voltage regulator, the BJT can be left out.

 

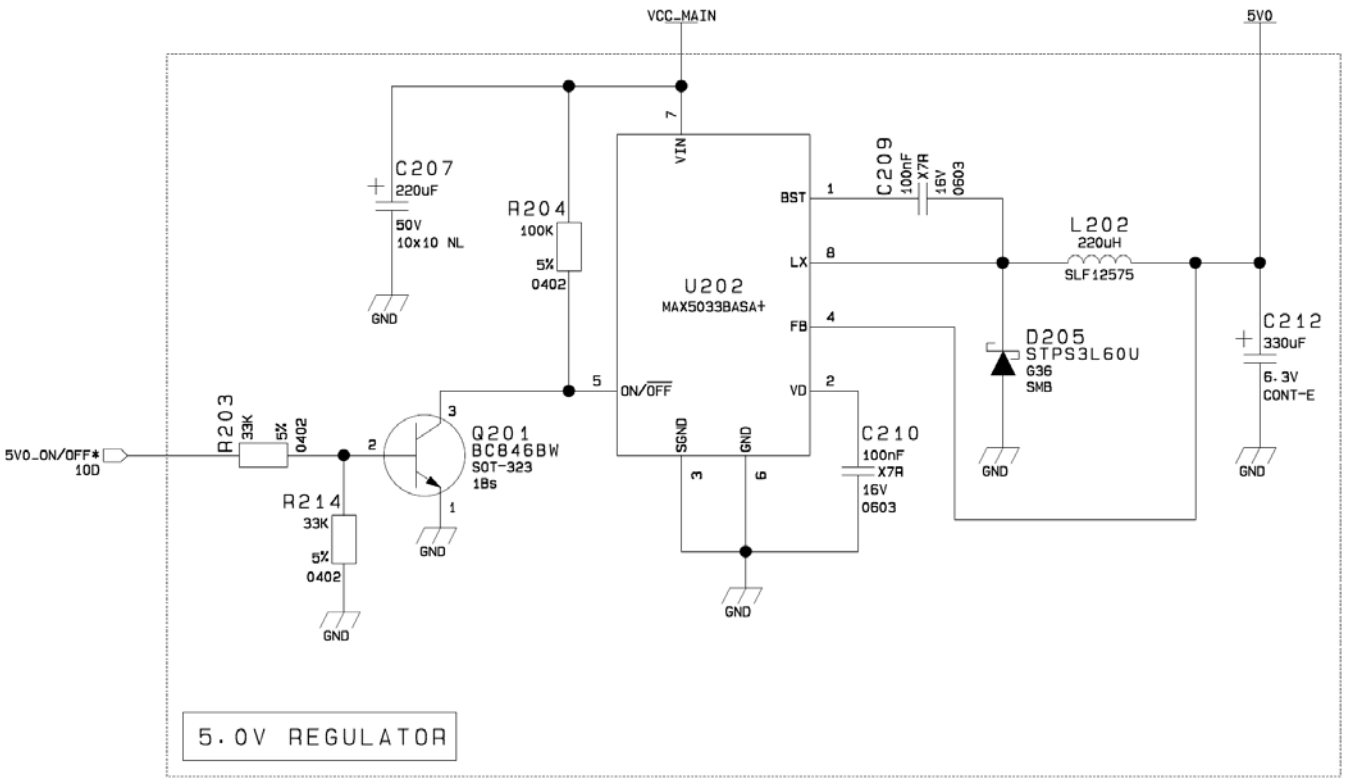


Fig.2: Wider input power supply voltage (up to 76 V DC input voltage).