Programmable Switch-mode, USB/AC Input Li+ Battery Charger with TurboCharge™ Mode and USB "On- the-Go" Power

FEATURES & APPLICATIONS

- **USB or AC input with programmable input current limiting**
- **Up to 1.25A continuous charging current from AC adapter**
- **Up to 750mA charging current from 500mA USB port using automatic TurboCharge™ mode**
- **+4.35 to +6.2V input voltage range (+16V tolerant)**
- **Two product options:**
  - SMB138A: charger off until I²C command initiation, enable/disable control via I²C
  - SMB138C: charger powers up in charging mode, enable/disable control via I²C
- **USB "On-the-Go" Power support for USB OTG enabled devices (+5V reverse output @ 200mA)**
- **Reverse current blocking (<5uA)**
- **High-efficiency 3MHz voltage-mode step-down regulator**
- **Integrated frequency compensation**
- **Internal power MOSFETs and precision current sensing**
- **High-accuracy float voltage regulation: 1%**
- **Thermal regulation (current foldback)**
- **Trickle charging**
- **Pre-charge and complete-charge (36/240min) safety timers**
- **Digital programming of all major parameters via I²C interface**
  - Fast charge voltage threshold, float voltage
  - Pre-charge, fast charge, termination current
- **Status register monitors and flags charger operation**
  - Charge in-progress/termination
  - Charge timer fault
  - OC/UV/OV detection/shutdown
- **uCSP-19 lead-free package (0.4mm ball pitch)**

Applications

- **2.5/3/3G+ GSM/CDMA/WCDMA Phones**
- **Smartphones/PDAs**
- **Portable Media Players**
- **Portable GPS Terminals**

INTRODUCTION

The SMB138 is a programmable single-cell lithium-ion/lithium-polymer battery charger designed for a variety of portable applications. The device provides a simple and efficient way to charge high-capacity Li-Ion batteries via a USB or AC adapter input. Unlike conventional devices, the SMB138's high-efficiency, switch-mode operation eliminates the thermal problems of conventional linear solutions. Also the buck converter architecture effectively multiplies the input current to increase charge rate for the Li+ cell and uses current limited supplies like USB more efficiently. The SMB138 also supports USB On-the-Go devices by providing the required USB-OTG +5V power supply using the Li-Ion battery as a source.
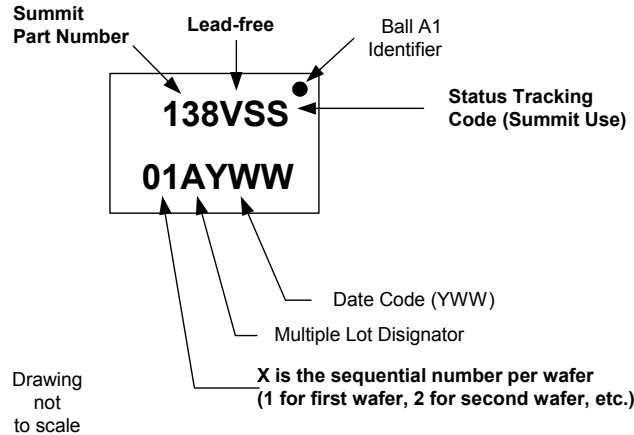
The SMB138 can switch between USB mode and AC Adapter mode and works seamlessly in conjunction with a USB controller. Charge control includes qualification, trickle-charge, pre-charge, constant current/constant voltage, float voltage and termination/safety settings that are fully programmable via a serial I²C/SMBus and stored in non-volatile memory making the device truly a flexible solution. Fast charge current level can be set via I²C (limited in USB mode to ensure 100mA or 500mA input). Built-in is reverse-current blocking to prevent inadvertent cell discharge. High frequency operation and integrated power FETs contribute to reduced external component count and size.

The SMB138A device requires a user I²C command for charging initiation, whereas the SMB138C device powers up in the charging mode. The SMB138C offers the option to automatically charge the battery only when the battery voltage is below a selectable "dead-battery" threshold.
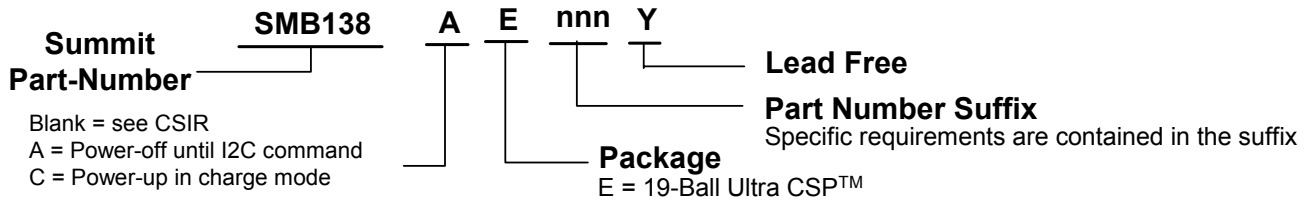
The SMB138 also offers several features that protect the battery pack as well as the charger and input circuitry: over-current, under/over-voltage and thermal protection. Ultra-accurate, 1% battery float voltage control improves battery capacity utilization. The STAT output is an interrupt to flag various status/flag events (programmable selection) and the status register can be read via the serial port. The SMB138 is available in an ultra-compact lead-free uCSP-19 package and is rated over the –30C to +85C temperature range.

SYSTEM APPLICATION
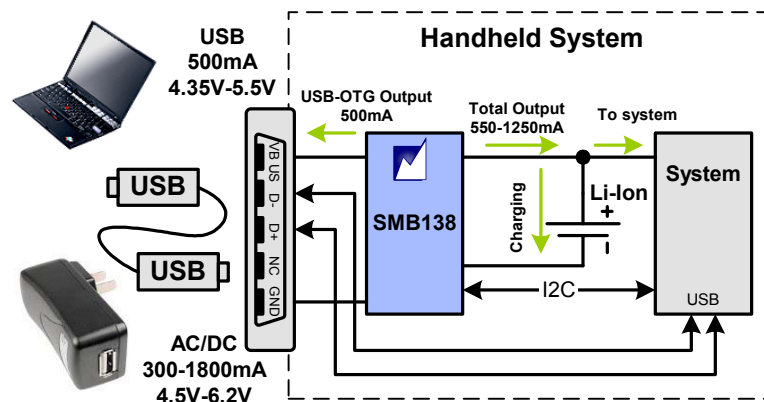
Figure 1 – Using the SMB138 to charge a single cell Li+ battery from USB or AC Adapter power sources

PART MARKING

Summit Part Number → **138VSS** ← Status Tracking Code (Summit Use)

Lead-free ↓

Ball A1 Identifier ●

01AYWW

Date Code (YWW)

Multiple Lot Disignator

X is the sequential number per wafer
(1 for first wafer, 2 for second wafer, etc.)

Drawing not to scale

ORDERING INFORMATION

SMB138 A E nnn Y

Summit Part-Number

Blank = see CSIR
A = Power-off until I2C command
C = Power-up in charge mode

Lead Free

Part Number Suffix
Specific requirements are contained in the suffix

Package
E = 19-Ball Ultra CSP™

NOTICE