

HL7022

2A Li-ion Battery Switching Charger with Integrated OTG Boost

Overview

The HL7022 is a compact, flexible, high-efficiency, USB compliant switch-mode charge management device for single cell Li-ion and Li-polymer battery used in a wide range of portable applications. The charge parameters can be programmed through I²C interface. The HL7022 integrates a synchronous PWM controller, power MOSFET, input current sensing, high-accuracy current and voltage regulation, and charge termination function into a tiny CSP package.

The HL7022 provides a complete automatic three-phase battery charging control: trickle charge, constant-current charge (CC), and constant voltage charge (CV) until the battery reaches the charge termination voltage. The input current is automatically limited to the value set by the host. Charging is terminated based on the battery voltage and a user selectable minimum current level. A safety timer with reset control provides a safety backup for I²C interface. During normal operation, the IC automatically restarts the charge cycle if battery voltage falls below an internal threshold and automatically enters a sleep mode or a high impedance mode when input supply is not correctly connected. The charge status can be reported to the host through the I²C interface.

During the charging process, the IC monitors its junction temperature (T_J) and reduces the charge current once T_J increases to about 120°C. To support USB OTG device, the HL7022 can provide VBUS (5.0V) by boosting the battery voltage.

The HL7022 is available in a 14-pin DFN package.

Features

- Fully automatic and efficient charge management for a large capacity lithium battery
 - Automatic conditioning, CC/CV charge control, termination, and recharge
 - Support 2A charge current using 33mΩ sensing resistor
 - 3MHz Synchronous PWM, 1μH low profile inductor
 - Input current regulation accuracy: ±5% (100mA and 500mA)
 - Charge voltage regulation accuracy: -0.25%-0.41% (25°C), ±1% (0°C to 85°C), ±2% (0°C to 125°C)
 - 20V Input voltage tolerance, 6.3V max operating voltage
 - Input voltage based dynamic power management (VIN DPM)
 - Optional 32s/30 minutes safety timer with reset control
 - Power up without battery
- Automatic adapter fault detection
- High impedance mode with low power consumption
- Comprehensive protections
 - Reverse battery leakage protection
 - Thermal regulation and shutdown
 - Input & output over-voltage protection
- Built-in input current and input voltage limit
- Automatic charge and USB compliant start sequence
- Full range programmable charge parameter through I²C compatible interface
 - Input current limit threshold
 - Input voltage DPM threshold
 - Charge termination current
 - Charge termination voltage
 - Charge termination enable
 - Support 3.4MHz I²C HS mode
- USB OTG boost
 - Input voltage range from battery: 2.5-4.5V
 - 5.0V/400mA (V_{BAT} ≥ 3.0V)
- 3mm x 3mm DFN package

Applications

- Smartphones
- MP3 Players
- Tablet PCs

Simplified Application Diagrams

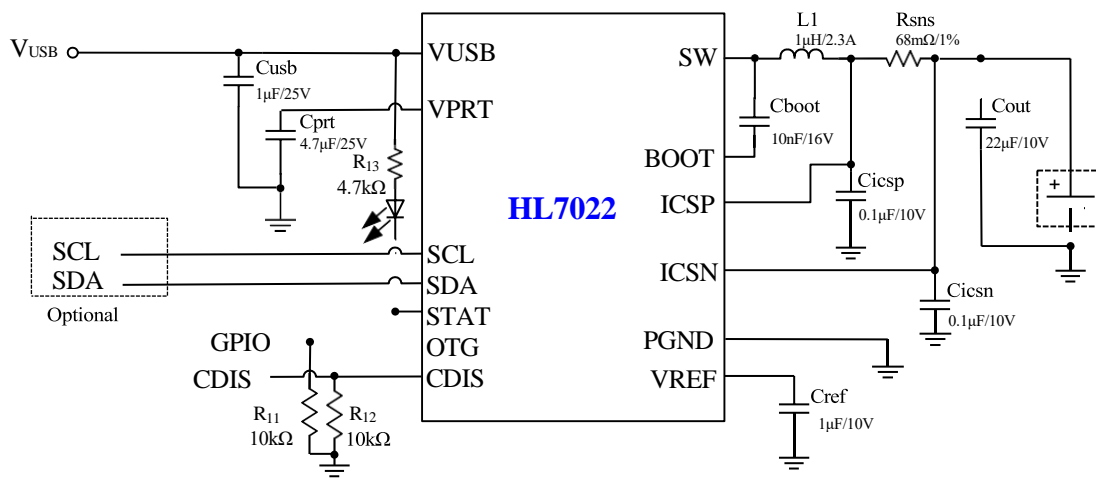


Figure 1. HL7022FN01 Simplified Application Diagram

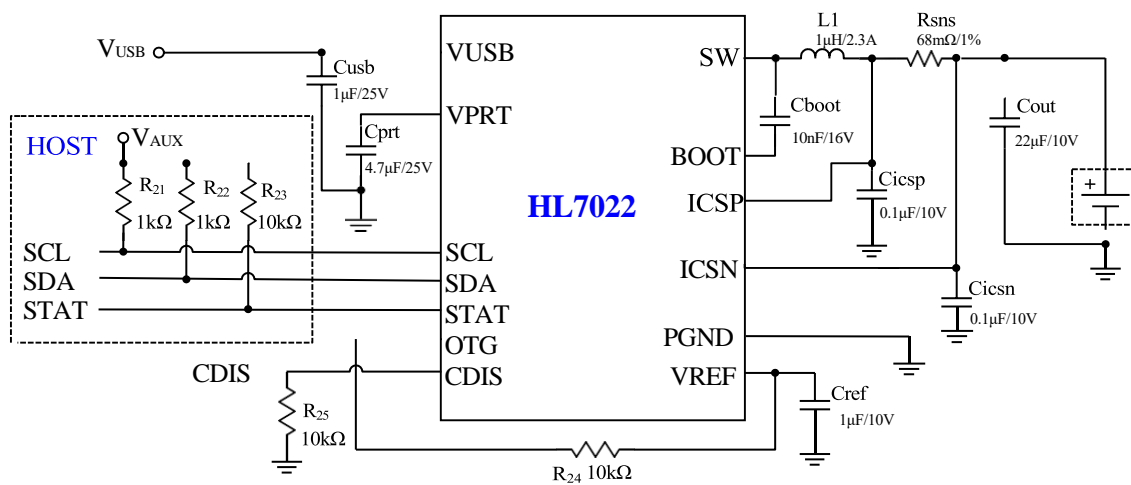


Figure 2. HL7022FN02 Simplified Application Diagram

Ordering Information

Part Number	HL7022	
Default Charge Termination Voltage	4.20V	
OTG Mode Maximum Output Current	400mA	
I ² C Address	6AH	
Pre-charge Current	325mA	
CC Current (Default)	1050mA (Rsns=68mΩ)	325mA (Rsns=68mΩ)
30min. Safety Timer and 32s Watch-Dog Timer	No	Yes
Package	DFN	
Packing Method	Tape and Reel	
Marking Information	HL7022FN01	HL7022FN02

Notice

Careful board level surge protection using TVS diode and OVP device on VIN pin, and TVS diode on VBAT pin, is essential to withstand high voltage spikes that may appear in PCB manufacturing process or end user applications. Without such protection, the IC is prone to electrical over-stress damage.

Component	Part Number	Value	Size	Vendor
L1	LQM2HPN1R0MGH	1μH/2.3A	2016	Murata
Cicsp, Cicsn	C1005X5R1A104K	0.1μF/10V	0402	TDK
Cboot	C2012X5R1E103K	10μF/16V	0805	TDK
Cusb	C2012X5R1E105K	1μF/25V	0805	TDK
Cprt	C2012X5R1E475K	4.7μF/25V	0805	TDK
Cref	GRM185R61A105K	1μF/10V	0603	Murata
Cout	GRM319R61A226ME15D	22μF/10V	1206	Murata
Rsns	ERJ8BWFR068V	68mΩ/1%	1206	PANASONIC
	RL0805FR-070R056L	56mΩ/1%	0805	Yageo
R21, R22	-	1kΩ	-	-
R11, R12, R23/24/25	-	10kΩ	-	-
R13	-	4.7kΩ	-	-

Table 1. Recommended Component list

Important Notice

Halo Microelectronics reserves the right to modify, improve, and terminate its products, services, documentations, etc. without advance notice. Customers are encouraged to contact Halo Microelectronics sales representatives to get the latest product information.

Without proper legal authorization, Halo products shall not be used for medical or military applications. Halo Microelectronics does not assume any liability of personal or property damages of any kind due to such applications.

All text, images, trademarks of this document, and any intellectual property contained in the product and in this document belong to Halo Microelectronics Co. Ltd. No part of this document may be used, copied, modified, distributed, or published without legal authorization from Halo Microelectronics.

© 2022 Halo Microelectronics. All rights reserved. www.halomicro.com