



1.5A Li-ion Battery Switching Charger with Integrated OTG Boost

Features

- ◆ Full Automatic and Efficient Charge Management for Large Capacity Lithium Battery
 - Automatic Conditioning, CC/ CV Charge Control, Termination and Recharge
 - 550-1450mA Programmable Charge Current
 - 3MHz Synchronous PWM, 1 μ H Low Profile Inductor
 - Input Current Regulation Accuracy: $\pm 5\%$ (100mA and 500mA)
 - Charge Voltage Regulation Accuracy: $\pm 1\%$
 - 20V Input Voltage Tolerance, 5.9V 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 Adaptor Fault Detection
- ◆ High Impedance Mode with Low Power Consumption
- ◆ Comprehensive Protection
 - Reverse Battery Leakage Protection
 - Thermal Regulation and Shut-down
 - Input & Output Over-Voltage Protection
- ◆ Built-in Input Current and Input Voltage Limit
- ◆ Integrated Power MOSFET with Max 1.5A Charge Current
- ◆ 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 V~4.5 V
 - 5.0 V/ 650 mA (Vbat \geq 3.0V)
- ◆ 2mm x 2mm WLCSP Package

Applications

- Smart phone
- MP3 player
- Tablet PC



Order Information

Part Number	HL7005
Default Charge Termination Voltage	4.2V
Maximum Charge Current	1450mA
OTG Mode Maximum Output Current	650mA
I ² C Address	6AH
30min Safety Timer and 32s Watch-Dog Timer	Yes
Package	20-Bump WLCSP

Typical Application Diagram

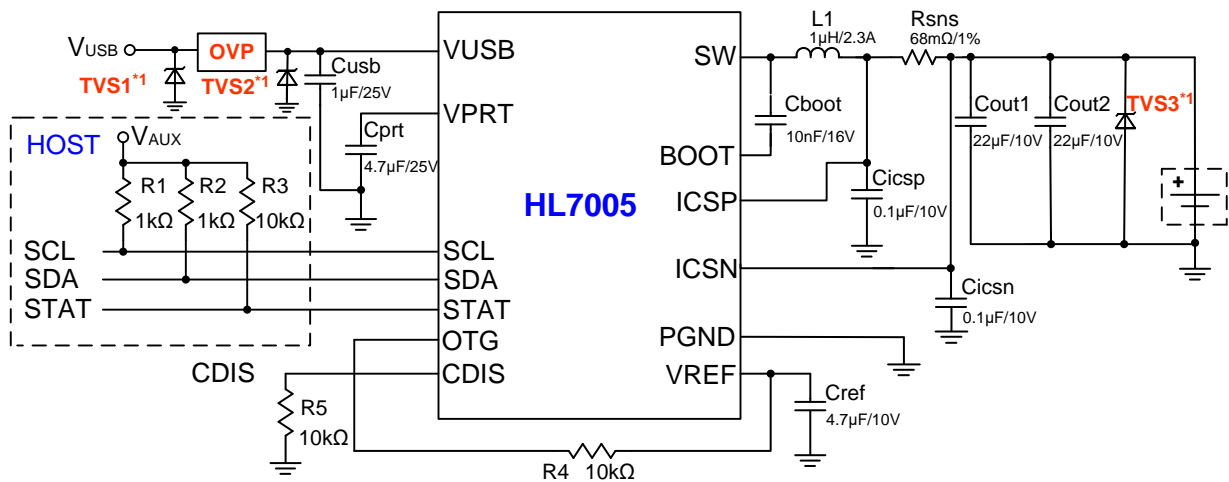


Figure 1. HL7005 Typical Application Diagram

Notice

*1. 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	10nF/16V	0805	TDK
Cusb	C2012X5R1E105K	1μF/25V	0805	TDK
Cprt	C2012X5R1E475K	4.7μF/25V	0805	TDK
Cref	GRM185R61A475KE11D	4.7μF/10V	0603	Murata
Cout1, Cout2	GRM319R61A226ME15D	22μF/10V	1206	Murata
Rsns	ERJ8BWFR068V	68mΩ/1%	1206	PANASONIC
	RL0805FR-070R056L	56mΩ/1%	0805	Yageo



R1,R2	-	1kΩ	-	-
R3,R4,R5	-	10kΩ	-	-
TVS1/TVS2/TVS3	See Table2	-	-	Will SEMI
OVP	See Table3	-	-	Will SEMI

Table 1 Recommended Component list

Component	Package	P _{PK} (W) tp=8/20 μs	Part Number	V _{RWM} (V)	V _F (V) I _F =20Ma		IR(μA)	V _{BR} (V)		
				Max	Min	Max	Max	Min	Typ	Max
TVS1	DFN2x2-3L	4000	ESD5641D12	12.0	0.45	1.25	0.1	13.0	15.0	17.0
TVS2	DFN2x2-3L	4000	ESD5641D07	7.5	0.45	1.25	1.0	8.0	9.0	10.0
TVS3	DFN2x2-3L	3500	ESD56161D04	4.5	0.50	1.10	8.0	5.1	5.7	6.3

Table 2 Recommended TVS

Component	Part umber	VIN(MAX)	RON	Package	Component Dimensions(mm)		
					L	W	H
OVP	WS3210C68	30V	45mΩ	WLCSP-9B	1.400	1.400	0.586

Table 3 Recommended OVP



Description

HL7005 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. HL7005 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.

HL7005 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 the battery voltage falls below an internal threshold and automatically enters sleep mode or high impedance mode when the 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, HL7005 can provide VBUS (5.0V) by boosting the battery voltage.

HL7005 is available in a 20-pin WLCSP package.



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