

HL7090SOC

900mA Li-Ion Battery Switching Charger, Dual Channel Input, Integrated Boost SOC

Overview

The HL7090 is a compact, flexible, high-efficiency, USB compliant switch-mode charge management device for single cell Li-ion and Li-polymer battery used in the applications of ear pods and e-cigarettes. The charge parameters can be programmed through I²C interface (HL7090FN03 version). The HL7090 integrates a synchronous PWM controller, power MOSFET, input current sensing, high-accuracy current and voltage regulation, and charge termination function into a tiny QFN package.

The HL7090 provides a complete automatic three-phase battery charging control including 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 battery voltage and a minimum current level selected by user. 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 a sleep mode or a 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 supply power for system load, the HL7090 can boost the battery voltage to a programmed voltage at PMID.

The HL7090 is available in a 20-pin QFN package.

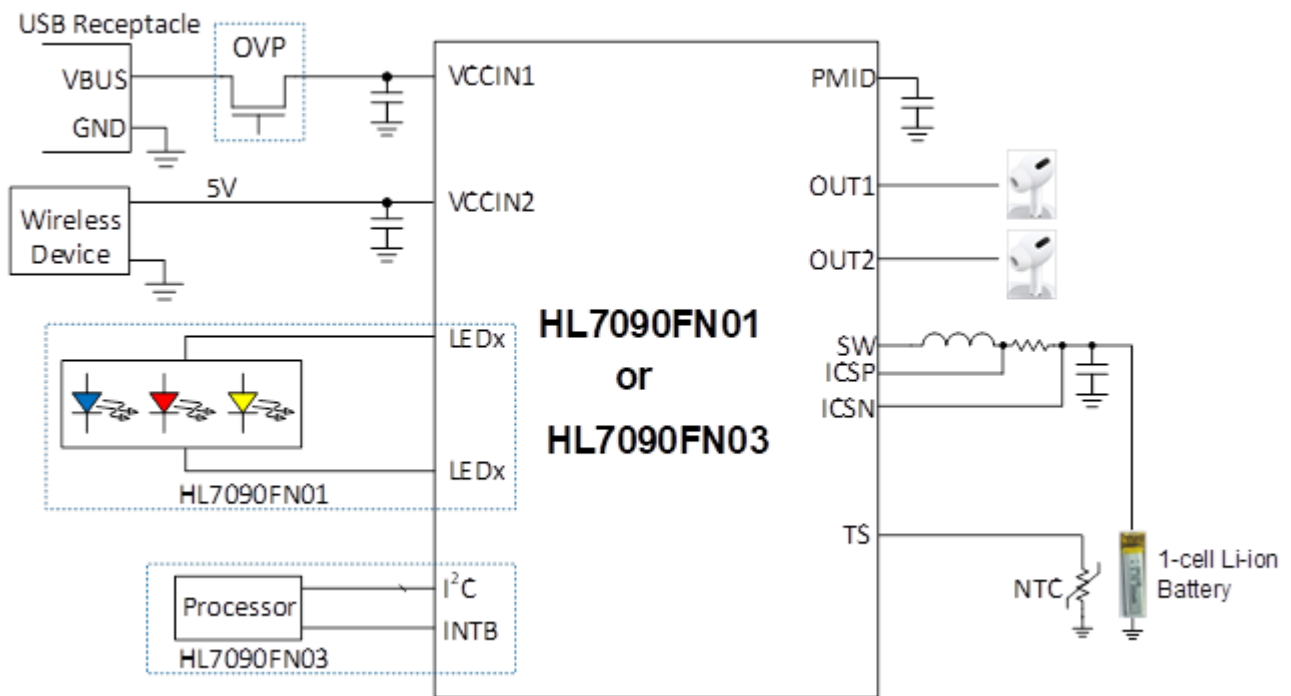
Features

- Fully automatic and efficient charge management for lithium battery
 - Automatic conditioning, CC/CV charge control, termination, and recharge
 - Programmable charge current using an external resistor and 68mΩ sensing resistor
 - 1.5MHz Synchronous PWM, 4.7μH low profile inductor
 - Charge current regulation accuracy: ±5%
 - Charge voltage regulation accuracy:
 - ±0.3% (T_J=25°C),
 - ±1% (T_J=0°C to 85°C),
 - ±2% (T_J=0°C to 125°C)
 - 10V Input voltage AMR, 6V max operating voltage
 - Input voltage based dynamic power management (VIN DPM)
 - Power up without battery
- Automatic adapter fault detection
- High impedance mode (low power mode) with low power consumption
- Integrated power MOSFET with max 900mA charge current
- Automatic charge and USB compliant start sequence
- Comprehensive protections
 - Reverse battery leakage protection
 - Thermal regulation and shutdown
 - Input & output over-voltage protection
 - PMID short protection
- Integrated boost
 - Input voltage range from battery 2.5-4.5V
 - 5.0V/ 500mA (V_{ICSN} ≥ 3.0V) for HL7090FN01
 - 4.7-5.4V/500mA for HL7090FN03
 - 2A Output current limit
 - OTP selectable VOUT target for HL7090FN01
- Two load switches with max 250mA current limit and auto load detection
- Battery temperature sensing in charging and boost
- Full range programmable charge parameter through I²C compatible interface (HL7090FN03)
- Autonomous battery charging with or without host management
 - Battery charge enable/disable
 - Battery charge preconditioning
 - Charge termination and recharge
- 3mm x 3mm QFN-20 package

Applications

- Ear Pods
- E-Cigarettes
- True Wireless Stereo Earbuds

Simplified Application Diagram



Ordering Information

Part Number		HL7090FN01	HL7090FN03
Default charge termination voltage ($V_{\text{TERM}=0}$)		4.192V	4.192V I ² C programmable
Default charge termination voltage ($V_{\text{TERM}=1}$)		4.352V	4.352V, I ² C programmable
Maximum charge current		900mA	900mA
Regulation voltage in boost		5V (4.7V, 5.2V or 5.4V by OTP option)	4.7V - 5.4V, I ² C programmable
Maximum output current on each OUT1 and OUT2		200mA	200mA
I ² C Address		N/A	7-bit, 1Bh (0011011R/W)
Pre-charge current		0.2C	0.1C to 0.4C, I ² C programmable
I ² C/LEDs version		1~4LEDs	I ² C
TS function		Internal 50 μ A current source in both charging and boost mode	Internal 50 μ A current source in both charging and boost mode
T5 threshold (Hot temperature)	in charge mode	45 $^{\circ}$ C (50 $^{\circ}$ C, 55 $^{\circ}$ C, 60 $^{\circ}$ C by OTP)	45 $^{\circ}$ C default (50 $^{\circ}$ C, 55 $^{\circ}$ C, 60 $^{\circ}$ C over I ² C)
	in boost mode	172mV (Corresponding to 56 $^{\circ}$ C)	172mV (Corresponding to 56 $^{\circ}$ C, No I ² C)
T1 threshold (Cold temperature)	in charge mode	1230mV (Corresponding to 2 $^{\circ}$ C)	1230mV (Corresponding to 2 $^{\circ}$ C)
	in boost mode	1800mV (Corresponding to -6 $^{\circ}$ C)	1800mV (Corresponding to -6 $^{\circ}$ C)
Operation on ENB		Active-low to normal operation Logic-high to shutdown	Active-low to normal operation Logic-high to shutdown
Automatic load detection on OUT1 & OUT2		Yes	Yes
Auto boost enabled when a battery is attached only in no VIN		Yes	Yes
Sleep current via OUT1 and OUT2		By external R	Over I ² C (5mA, default)
Package		QFN	QFN
Packing method		Tape and Reel	Tape and Reel

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