

# HL7138

## Dual Phase 35W Charge Pump Charger

### Overview

The HL7138 is the low voltage fast direct charger for 1 cell Li-ion and Li-polymer batteries. The device integrates a dual phase switched capacitor converter and reverse blocking MOSFET (QRB FET). The HL7138 has 97.4% efficiency at 4.5V output and 5A current with 2x22uF per phase.

The switched capacitor converter architecture and the integrated FETs in device are optimized to enable 50% duty cycle operation under charge pump (CP) mode. The CP mode allows output voltage (VOUT) to be around half of the input voltage (VIN) and output current to double the input current, reducing input power cable loss and limiting temperature rise in application. The dual-phase architecture reduces input capacitance requirements and input voltage ripple. Besides the CP mode, the device also has bypass (BP) mode. The BP mode allows VIN forwardly passing through internal power FETs to VOUT without any conversion.

The HL7138 provides CC (Constant Current) and CV (Constant Voltage) regulations through controlling the QRB FET for safe charging operation. The CC regulation is controlled through a closed loop of input current sensing or battery current sensing. The CV regulation is controlled through a closed loop of battery voltage sensing. In addition, the HL7138 also supports thermal regulation loop in case the CV/CC regulation causes overheating device.

The HL7138 has all the necessary protections to ensure the safe operation. The device includes OTP (Over-Temperature Protection), VIN UVP/OVP, IIN OCP/UCP, VOUT OVP/UVP, VBAT OVP, IBAT OCP, PMID to VOUT OV/UV, CFLY SCP (Short Circuit Protection), VIN SCP, VOUT SCP and watchdog timer.

Besides all the protections above, HL7138 also features 12-bit ADC that can offer VIN, IIN, VOUT, VBAT, IBAT, VTS, TDIE information to system for optimizing charging control.

The HL7138 is available in a 36-bump WLCSP package with 2.65mm x 2.61mm size.

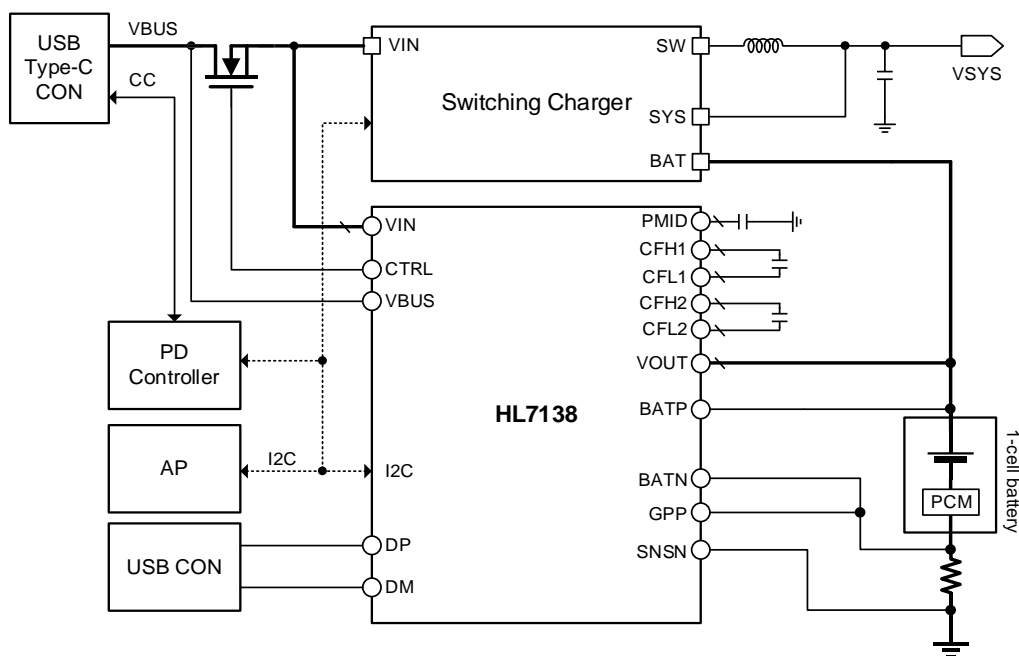
### Features

- High reliable AMR input/output pins
  - 37V AMR on VBUS
  - 20V AMR on VIN pin
  - 7V AMR on VOUT, BATH
- Built-in external input NFET control
- Wide range operating voltage
  - 3V to 11.7V Operational VIN voltage
  - 5.5V Max operational output voltage
- Dual conversion modes
  - 2:1 Charge pump mode (CP mode)
    - Optimized for 50% duty
  - 1:1 Bypass mode (BP mode)
- High efficiency charge pump
  - 97.4% Efficiency for VOUT = 4.5V\_5A with 2x22uF
  - 97.6% Efficiency for VOUT = 4.5V\_5A with 3x22uF
- Regulation loop for charging operation through QRB FET control.
  - Input current regulation
  - Battery voltage regulation
  - Battery current regulation
  - Thermal regulation
- Selectable switching frequency from 500kHz to 1.6MHz
- Integrated 12-bit ADC
  - Input voltage (VIN)
  - Input current (IIN)
  - Output voltage (VOUT)
  - Battery voltage (VBAT)
  - Battery current (IBAT)
  - NTC temperature (TS voltage)
  - Die temperature (TDIE)
- Multi-protection layers
  - Over die temperature protection
  - VIN over/under voltage protection
  - Voltage tracking protection
  - Input over/under current protection
  - VOUT over-voltage protection
  - VBAT over-voltage protection
  - IBAT over-current protection
  - VOUT short-circuit protection
  - VIN short-circuit protection
  - CFLY short-circuit protection
  - NTC protection
- Integrated customized proprietary protocol
- 2.65mm x 2.61mm 36-bump WLCSP

## Applications

- Smartphones
- Tablet PCs
- Mobile IoT Devices

## Simplified Application Diagram



## Ordering Information

Part Number	Silicon version	Top Marking	Package
HL7138WL01	AC	EQT16	36-Bump WLCSP 2.65mm x 2.61mm
HL7138WL02	AD / BA	EQT16M	36-Bump WLCSP 2.65mm x 2.61mm

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