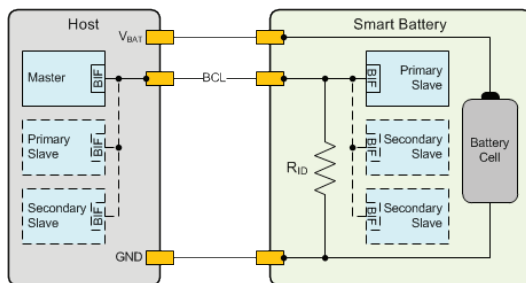# Battery Interface (BIF)

Smart, Safe, Performance-Enhanced Batteries for Mobile Devices

MIPI® Battery Interface v1.1 specification defines a cost-efficient and flexible single-wire communication solution between a mobile device Host and Battery Pack. It defines a method to communicate battery characteristics to ensure safe and efficient charging control under all operating conditions. Both a low-cost battery interface for basic safety and battery chemistry detection, and a smart battery interface are supported, with additional security features to protect against counterfeiting. Proprietary battery interfaces require proprietary HW and SW in mobile devices as well as resources to manage them through the product supply chain. A standardized battery interface saves manufacturing time, reduces chipset space and improves cost margins. MIPI BIF (with its Hardware Abstraction Layer specification "HAL," which may optionally be integrated into mobile software) is the only mobile-battery communication interface standard in the mobile industry. Mobile device manufacturers no longer need to coordinate, specify and maintain proprietary solutions from different parties in the ecosystem.

System Diagram

FEATURES

Target Applications

- Target Applications
- Mobile phone batteries
- Tablet batteries
- Laptop batteries
- Rechargeable batteries in general

Key Features

- Single wire communication
- Fast Battery Pack Presence / Removal Detection
- Smart (single-master / multi-slave) and Low-cost Battery support

Key Benefits

- Delivers improved battery performance
- Enables more efficient battery chemistries
- Provides enhanced consumer safety

New Features in BIF v1.1

- Fuel gauge function
- Battery Label, Serial Number, and Charging Parameter Data Objects
- NVM function enhancements to support power fail safe writing
- Temperature function enhancement to support multiple sensors
- Protocol robustness enhancements
- Data mapping enhancements

Battery Interface (BIF)

Detailed Summary

- Single wire communication interface
- Supports single low cost or smart battery pack on a communication line
- Fast Battery insertion, presence and removal detection
- Single master, multi-slave configuration up to 256 slaves
- Asynchronous master and slave clocks
- Interrupt capability over the communication line
- Protocol can be implemented on the host via software using GPIO
- Allows for low cost slave implementation
- Low gate count with no accurate slave time base required
- Enhances safety by providing support for temperature monitoring and authentication

Physical Layer and Protocol

The specification identifies a single wire, open-drain communication interface, scalable from 1.1V to 2.8V, supporting the latest low voltage semiconductor processes. The protocol is designed as a data transport interface. The protocol can be implemented in hardware or software with a scalable communication bit rate between 3.27 kbit/s – 250 kbit/s. The Specification is vendor customizable, compliant with other required battery standards and designed for easy manufacturability.

BIF Hardware Abstraction Layer

A low-level, versatile, software interface is specified in the MIPI BIF Hardware Abstraction Layer (HAL) specification. HAL enables BIF Slave suppliers to develop the BIF client driver for BIF Slave control on the host platform. Similarly, a mobile device maker can develop BIF Master high level software to control BIF Master devices from different suppliers. HAL is defined to support major Operating Systems for mobile platforms, but it can also be used with MCUs that have less processing power.

Interoperability and Testing

A full Conformance Test Suite (CTS) is available.

NEW FEATURE DETAILS

Fuel Gauge Function
- Provides monitoring capability of advanced battery charging/discharging status and battery health parameters

GPIO Function
- Provides configurable logical input / output channels with control and monitoring signals in a standardized register access format

NVM Function Enhancements
- Supports power fail safe writing
- Facilitates low effort manufacturing and logistics of smart batteries

Temperature Function Enhancement
- Supports multiple sensors
- Facilitates low effort manufacturing and logistics of smart batteries

Protocol Robustness Enhancements
- Defined measures for robust recovery from contact breaks and communication errors (e.g. glitch filtering, short contact break detection, bus timeout).

Data Mapping Enhancements
- Battery charging parameters defined to communicate the optimal charging recipe from battery to host.
- Object/Function Version Policy added
- Unique ID (UID) security protection for Class 2 batteries