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MIPI® Alliance Specification for Battery Interface (BIF)

- BIF is primarily an electrical communication interface between mobile device and battery pack.
- BIF also specifies register interfaces for battery functions and data structures for battery parameters.
- BIF is optimized for battery interface usage, but it’s usage is not limited to battery interfaces.
- BIF is not defining electromechanical or mechanical interface such as connectors or battery pack form factors.
- Version 1.0 was approved by MIPI Board 21-Feb-2011.
BIF Architecture

Characteristics

• Single master and multi slave
• All communication is initiated by Master, but Master may allow interrupts from Slaves
• Multi drop, but only one battery pack per communication line
Introduction

BIF consists of:

- **Physical Layer**
- **Protocol Layer**
- **Data Mapping**

Master side Hardware Abstraction Layer (HAL) has been published as a separate specification.
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Physical Layer

Characteristics:
• Single wire
• Single ended
• Open drain
• Slow speed (≈ 250kbit/s)
• 3 voltage levels in Master side ("Low", "High" and "Battery Removed")
• Fast battery insertion, presence and removal detection

$R_{ID}$ resistor
• Distinguishing between Smart Batteries and Low Cost Batteries
• Low cost battery identification
• Forcing communication line to power down, when battery pack is removed
• Part of battery removal detection
Protocol layer – Time Distance Coding

- Ones and zeros can be discriminated from each other based on pulse length
- No need for accurate oscillators
Protocol Layer

Characteristics:
- Time Distance Coding
- Training sequence in beginning of every word
- Unicast/Multicast
- Single / Burst accesses
- Payload 10 bit / word
- Error detection (4-bit Hamming Code)
- Inversion bit
- Error Codes
- Transaction Query
- Unique ID (UID) / UID Search
- Power Modes
- Reset by command / Reset by long low pulse
**Data Mapping Layer**

**Characteristics:**
- 16-bit address length
- Byte wide data
- DDB* L1
- DDB* L2 (Function Directory)
- Function Capabilities
- Function Registers
- Data Objects
- Enables proprietary Functions and (data) Objects

* DDB = Data Descriptor Block
BIF Functions and Objects

- Protocol Function
- Slave Control Function
- NVM Function
- Temperature Sensor Function
- Authentication Function

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- BIF Slave Device Manufacturer can define proprietary Functions
- Everybody with MIPI ManufacturerID is able to define proprietary Objects
- Additional Functions and Data Objects are being defined for Specification v1.1
Benefits for Different Parties in Ecosystem

Mobile terminal manufacturer
- Same interface supports both smart batteries and lowest cost batteries
- Possibility to use different chipsets from different chipset suppliers (HW interface compatibility and SW interface compatibility through HAL)

Chipset supplier
- Reduces number of battery interfaces which needs to be supported

Battery pack manufacturer
- Reduced number of interfaces which needs to be supported.
- Enables higher battery IC volumes and higher integration level for smart batteries. Lower cost of smart battery electronics may act as enabler for sales of new chemistries with different charging/discharging parameters.

Battery IC manufacturer
- BIF lowers the threshold to use smart battery solution. This opens new markets.
- Enables higher volume. Same BIF battery IC can be sold to multiple customers and applications
BIF Status

• MIPI Alliance Battery Interface Specification V1.0 was approved 21-Feb-2012
• MIPI Alliance BIF Hardware Abstraction Layer V1.0 specification was approved 02-May-2013.
• MIPI Alliance Battery Interface Specification V1.1 planned to be released in near future.
Availability of BIF Documents

- BIF data sheet, BIF White papers and BIF QA are freely available in internet without registration (http://mipi.org/specifications/battery-interface).
- BIF V1.0 Specification is available for all MIPI member companies (http://mipi.org/member-directory).
- BIF HAL V1.0 Specification is available for MIPI member companies (http://mipi.org/member-directory).
- BIF Working Group work towards new specification version is visible only for MIPI Contributor/Founder/Promoter level member companies.
Thank You!