2003 THE CELLPHONE MARKET
2003

MIPI ALLIANCE FORMED TO STANDARDIZE CAMERA AND DISPLAY INTERFACES
MIPI Alliance Membership

27 Countries with MIPI members
MIPI Members in Taiwan

**Adopter Members**

- Aspeed Technology Inc.
- Chroma Ate Inc.
- Elan Microelectronics Corp.
- Explore Microelectronics Inc.
- Fitipower Integrated Technology Inc.
- FocalTech Systems Co., Ltd.
- Global Unichip Corp.
- Himax Technologies Inc.
- HTC Corporation
- iCatch Technology, Inc.
- III Technology Corp.
- iSentek Inc.
- ITE Tech, Inc.
- JMicron Technology Corp.
- King Yuan Electronics Co., Ltd.
- Novatek Microelectronics Corp.
- PixArt Imaging Inc.
- Raydium Semiconductor Corp.
- RichWave Technology Corporation
- Silicon Optronics, Inc.
- Sitronix Technology Corp.
- Sonix Technology Co. Ltd.
- Sunplus Innovation Technology, Inc.
- Walsin Technology Corporation
- Wistron Corporation

**Contributor Members**

- M31 Technology Corp.
- MediaTek Inc.
- Phison Electronics Corporation
- Realtek Semiconductor Corp.
- Silicon Motion, Inc.
Board and Contributor Members

**Contributor Members**

- AMD
- Avnet
- Analog Devices
- Analogix
- Apple
- Aquantia
- Arasan
- ARM
- Atmel
- Bitflyer
- Cadence
- CMC Microsystems
- Dadi
- Dell
- Dialog
- EDN
- Infineon
- InvenSense
- Keynology
- Lattice
- Linaro
- LogicVision
- M31
- Microsoft
- Mitsubishi
- mbed
- National Instruments
- NVIDIA
- NXP
- On Semiconductor
- OMII
- Parallax
- Paracel
- Phison
- Power Electronics
- Realtek
- Renesas
- Sci-Fi Pi
- SK Hynix
- Sony
- Spreadtrum
- Tektronix
- Texas Instruments
- TESLA
- Tensilica
- Texas Instruments
- Valens
- Western Digital
- Xilinx

**Board Members**

- Intel
- Bosch
- Samsung
- Synopsys
- Texas Instruments
- Toshiba
MIPI Alliance Member Ecosystem

- Automotive OEMs/ Tier 1 suppliers
- Application Processor Developers
- Device OEMs
- Consumer Electronics (Cameras, Tablets, PCs/Laptops, Peripherals, Wearables)
- Software Providers
- Semiconductors Companies
- Test Equipment Companies
- Test Labs
- IP and VIP Providers
- Application Processor Developers
- Consumer Electronics (Cameras, Tablets, PCs/Laptops, Peripherals, Wearables)
- Software Providers
- Semiconductors Companies
- Test Equipment Companies
- Test Labs
- IP and VIP Providers
MIPI Specifications Today

Number of current specifications

48+

MIPI specifications are crafted with these 3 key attributes:

1. Low power
2. High-bandwidth
3. Low electromagnetic interference (EMI)

All MIPI specifications are offered royalty-free for MIPI members
MIPI Specifications Leveraged Beyond Mobile

MIPI specifications can be found in billions of devices and in every smartphone on the market.
## 2019 MIPI Specifications

### Adopted in 2019
- SOUNDWIRE v1.2
- SPP v2.0
- C-PHY v2.0
- DISCO FOR I3C v1.0
- CSI-2 v3.0

### Targeted for Completion This Year
- I3C v1.1
- CCS v1.1
- MIPI D-PHY v2.5
The Mobile Evolution to 5G
Maintaining MIPI Leadership

Analog
AMPS

GSM, CDMA

Digital

HSPA, EVDO

Mobile Data

LTE, LTE-A

Mobile Broadband

1G
2 Gbps

1981

2 Kbps

1992

64 Kbps

2G

2 Mbps

2001

3G

100 Mbps

2010

4G

10 Gbps

2020

5G

Mobile Platform

Mockup: CTIA
Implications of 5G for MIPI Specifications

Considerations:
• 5G is not just mobile - broader application use cases
• 5G NR - key RF technology innovations
• Changing requirements: performance, reach, power, etc.

Examples of potential impacts / implications:
• MIPI RFFE\textsuperscript{SM} – Massive MIMO, mmWave
• MIPI CSI-2\textsuperscript{SM} – Movement from camera to vision and imaging in emerging use cases
• MIPI DSI-2\textsuperscript{SM} – Increase in display resolution, reach, expansion to touch and XR use cases
• MIPI I3C\textsuperscript{®} – More and more highly accurate sensors

Learn more about MIPI RFFE development in today's program
White Paper Assesses MIPI’s 5G Readiness

• Provides an overview and main use cases for 5G
• Details how each specification meets industry bandwidth, performance and feature requirements for a wide variety of 5G use cases
• All MIPI specifications relevant for applications in mobile platforms were found to be 5G ready
• Continued work underway for beyond mobile applications

https://mipi.org/mipi-specification-5G-readiness-assessment
Leveraging MIPI Specifications in IoT

- **A-PHY**
  - Long-reach physical layer (in development)

- **C-/D-PHY**
  - Short-and medium-reach physical layer

- **M-PHY/UniPro**
  - Storage

- **SoundWire/SW13S**
  - Audio

- **Debug**
  - Family of specifications

- **I3C**
  - Sensor data and control

- **CSI-2**
  - Camera

- **DSI-2**
  - Display

- **RFFE**
  - Radio control

- **Touch**
  - Human interface
CSI-2
Camera Serial Interface protocol
Protocol for cameras, lidar, radar sensors

DSI-2
Display Serial Interface protocol
Protocol for smartphone, IOT and automotive displays

C-PHY
3-phase physical layer for CSI-2 & DSI-2
Short-reach physical layer for cameras and displays

D-PHY
Differential physical layer for CSI-2 & DSI-2
Short-reach physical layer for cameras and displays

I3C
Control and data bus protocol and interface
Sensor and general purpose data and control interface within a module

RFFE
RF control protocol
Front end control within a wireless module

SoundWire & SWI3S
Digital audio and control interface
Audio interface within a module

UniPro for UFS
Data transport protocol for UFS over M-PHY
Transport protocol for UFS storage

M-PHY for UFS
Differential physical layer for UFS storage
Short-reach physical transport for UFS storage
New MIPI in Automotive White Paper

- Why MIPI specifications are being leveraged in automotive
- An overview of each MIPI specifications used in automotive today
- An in-depth look at the upcoming MIPI A-PHY

Visit mipi.org to download the paper
CSI-2 v3.0 New Features:

**Unified Serial Link**
for encapsulating connections between an image sensor module and application processor

Crucial for reducing the number of wires in a variety of platforms

**Smart Region of Interest**
for analyzing images, inferencing algorithms and making better deductions

Could enable medical devices to more surely recognize anomalies such as tumors

**RAW-24**
for representing individual image pixels with 24-bit precision

Could enable an autonomous vehicle to decipher whether darkness is a harmless shadow or a pothole

IN CSI-2 v4.0:

- Always On Sentinel Controller (AOSC)
- Functional Safety (FSAF)
- Imaging Security (ISEC)
- Adaptation Layer (ADAPL) for A-PHY
MIPI SneakPeek Protocol (MIPI SPP) v2.0 introduces MIPI TinySPP, a style of SneakPeek for low-bandwidth and potentially high-latency interfaces

MIPI System Software-Trace (MIPI SyS-T), a universal data format for transmitting software debug and trace information

MIPI Narrow Interface for Debug and Test (MIPI NIDnT), a specification that allows the use of functional ports on a device for debug/testing of finished products

MIPI System Trace Protocol (MIPI STP), a base protocol for application-specific trace functions

MIPI Trace Wrapper Protocol (MIPI TWP), a protocol enabling multiple source trace streams to be combined into a single trace stream

MIPI High-Speed Trace Interface (MIPI HTI) and MIPI Parallel Trace Interface (MIPI PTI), for exporting trace data

MIPI Gigabit Debug for USB (MIPI GbD USB) and MIPI Gigabit Debug for IP Sockets (MIPI GbD IPS), techniques for using the SPP and TWP protocols over USB and IP sockets
Purpose:

- Look at security efforts holistically across MIPI
- Determine a broader strategy and set of requirements that could provide working groups with a consistent solution

Deliverables:

- Recommend a MIPI security framework
- Provide documented guidance to working groups, including overarching requirements for MIPI and its members, and guiding principles for the work to be done
- Deliver recommendation(s) for the ongoing support model at the conclusion of the Security IG’s work
Wires Behind Wireless Blog

In the blog:

• Information on **new features and specification releases**
• **Use cases and applications** of MIPI specifications
• **Q&As** with working group chairs and other experts
• Latest MIPI Alliance news
• **Highlights and key takeaways** from webinars and MIPI DevCon presentations
• Details of MIPI participation in **industry events**

www.mipi.org/blog
THANK YOU