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Agenda

- MIPI Overview
- MIPI Touch Architecture
- Q & A
About MIPI Alliance

We are a global, collaborative organization comprised of over 280 member companies spanning the mobile and mobile-influenced ecosystems.

MIPI Alliance is leading innovation in mobile interface technology.
MIPI Alliance Member Ecosystem

- Handset Manufacturers
- IP and VIP Providers
- Test Labs
- Test Equipment Companies
- Device OEMs
- Semiconductor Companies
- Software Providers
- Application Processor Developers
- Consumer Electronics – Camera, Tablet, PC/Laptop, Peripherals
Active Technical Working Groups

- Camera
- Debug
- Display
- Low Latency Interface
- Low Speed Multipoint Link
- PHY (C/D/M)
- Reduced Input Output
- RF Front End
- Sensor / I3C<sup>SM</sup>
- Software
- Test
- UniPro<sup>SM</sup>
Announcing a MIPI Touch Interface architecture
Leveraging MIPI Specifications

Motivation for MIPI Touch
Current industry touch status

• Non-standard software or commands
• Multiple interfaces use a non-standard protocol
  – SPI
  – I²C-bus
• Not optimized
  – low-power mobile performance
  – low-cost pin-count interfaces
• Require more touch bandwidth
Standardizing touch

1. MIPI identified multiple usages for standard touch and stylus

2. Build MIPI Touch from within the MIPI ecosystem
Requirements

• Usages: Phones, tablets, automotive, appliances
• < 50 cm trace length
• FCC compliancy
• Improve time to market
• OS-agnostic approach
• Standard software
• PHY-agnostic approach
• Plus...

1. All members *Call for Proposals* (2016)
MIPI Touch bandwidth

- Lowest power
- Transports sufficient data
- Effective latency
- Low protocol burden

<table>
<thead>
<tr>
<th>Bus speed</th>
<th>Higher speed technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Mb/s</td>
<td>I²C-bus</td>
</tr>
<tr>
<td>&lt; 10 Mb/s</td>
<td>I³C</td>
</tr>
<tr>
<td>&lt; 40 Mb/s</td>
<td>MIPI I³C</td>
</tr>
<tr>
<td>&gt; 40 Mb/s</td>
<td>Higher speed technologies</td>
</tr>
</tbody>
</table>

Bus speed: I²C, SPI, I³C
Power vs. bit rate requirement

- **1 Mb/s:**
  - Standby: 5uW
  - Active: 1 nJ/bit

- **10 Mb/s:**
  - Standby: 5uW
  - Active: 0.1 nJ/bit
System topology
MIPI Touch / topology

MIPI Touch software

MIPI Touch interface

OS Apps

Instructions

Touch data'

AP

Commands

Touch data

TC/AFE
Topology inside the module

- Point-to-point or
- Multi-drop
MIPI Touch architecture

- OS Touch Driver Stack
- I3C drivers
- Touch commands
- I3C profile
- MIPI I3C

Touch specific

2017

2016
MIPI Touch architecture keys

• Standardized command set
  – OS agnostic and OS independent
  – Reduced effort for software development
• A two-way street for sensing and feedback
• To support touch or pen data
• MIPI Touch uses the new MIPI I3C℠
MIPI Touch leverages MIPI I3C

- Optimized for speed and power
- Pin-optimized using in-band interrupt eliminated GPIO interrupts
- Robust protocols for bus management
- Improved bandwidth
Example touch commands

<table>
<thead>
<tr>
<th>Class</th>
<th>Example commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>S/W Reset, Configure Normal / Idle / Sleep</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Activate self-test, calibrate, Get diagnostics</td>
</tr>
<tr>
<td>RAW touch data</td>
<td>Get/set RAW tixel coordinate mapping, Read proprietary raw</td>
</tr>
<tr>
<td>Processed touch data</td>
<td>Get/set processed tixel coordinate mapping, Read standard processed touch reports, Get/set other commands</td>
</tr>
<tr>
<td>Mapping for proprietary registers</td>
<td>Get/set vendor specific information or data</td>
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</tbody>
</table>
## Cross-functional support for MIPI Touch

<table>
<thead>
<tr>
<th>Group</th>
<th>Support Area</th>
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<tbody>
<tr>
<td>Software WG</td>
<td>Drivers and OS compatibility</td>
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<tr>
<td>Sensor WG</td>
<td>I3C Specification</td>
</tr>
<tr>
<td>USI (Universal Stylus Initiative)</td>
<td>Liaisons on active stylus and touch data commands</td>
</tr>
<tr>
<td>OS vendors and published information</td>
<td>OS compatibility and analysis of touch data structures</td>
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</table>
### Execution plan / schedule

<table>
<thead>
<tr>
<th>2016 AUG</th>
<th>SEPT</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>2017</th>
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<tr>
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<td>Drafts 0.2 to 0.4</td>
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<td>Final Specification</td>
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Conclusions and call
Conclusions

• Standard open software
• Touch profiles simplifies design for touch
• Standard commands speed TTM
• MIPI I3C is optimized for speed/power
• MIPI I3C has in-band interrupts no extra “IRQ” pins
Next steps

• If not a member, join the MIPI Alliance
• Join the MIPI Display Working Group to engage with experts on touch specifications
• Start implementations of MIPI I3C
• Refer to the MIPI I3C webinar and white paper for more information (www.mipi.org)
Acknowledgements

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Q&A

Thank you!