



Mixed-Signal Excellence

A **SILVACO** Company

Why Mixel should be your Interface IP partner

Who we are

- Leading provider of mixed-signal IP since 1998, joined Silvaco in 2025
- Industry leader in MIPI[®] interfaces and contributing member of the MIPI Alliance since 2006
- First IP provider to demonstrate silicon-proven D-PHY[™], C-PHY[™], and M-PHY[®]
- Customer-centric focus
- We customize our IPs to help differentiate our customers' products
 - Our methodology has been optimized to achieve first-time silicon success, no exception
 - We consistently go the extra-mile for our customers

What we do

- Mixed-signal IP provider with emphasis on PHY
 - MIPI PHY: D-PHY, C-PHY, M-PHY
 - Automotive SerDes Alliance: ASA-ML SerDes
 - Multi-standard SerDes: C-PHY/D-PHY Combo, LVDS/D-PHY Combo
 - LVDS SerDes
- Complete integrated solution includes PHY, controller, and platform
- Widest support of optimized PHY configurations using patented topologies
- Widest coverage of process nodes and foundries: silicon-proven in **12 different nodes** and **9 different foundries**

What makes us different

- Consistent predictable excellence
 - Strong and nimble team with outstanding Mixed-Signal expertise
 - Proven track record over 25 years—delivering consistently exceptional, high-quality product with high yield
- Legorithmic[™] methodology
 - Enables us to deliver differentiated product at record time while maintaining our “First-time success is the rule, no exception” track record
- Support
 - Outstanding customer support through transfer to production. First year support is included in License fee
 - Many of our customers become long-term partners

Mixel Values: P-R-I-D-E



Partnership

- Customers & partners success is our success

Responsibility

- We say what we do, and we do what we say

Integrity

- Practice our values in every area of our lives

Diversity

- We take pride in ensuring equality for all

Excellence

- Constant Improvement

Customer Testimonials



“We needed a high quality MIPI IP that worked the first time. Mixel's differentiated solution, wide coverage of nodes and track record of success made our IP provider selection quite easy. Mixel's IP quality and support throughout the development phase were outstanding. We look forward to future collaboration with Mixel.”

-Sheethal Nayak, Senior Director of Engineering, Microsoft

“For over 10 years now, Mixel has been a trusted partner. Mixel provided us with numerous mixed-signal IPs that has been integrated into multiple generations of NXP flagship ICs and deployed by various NXP global organizations. It has been a great collaborative effort between our two teams. Mixel consistently goes the extra mile to address our requirements and help differentiate our products.”



-Mike Leary, Vice President of Engineering, NXP



“We worked very closely with the Mixel Engineering teams from pre-sales through silicon validation. We are impressed by the breadth of their knowledge and outstanding level of support and have enjoyed their constructive and responsive attitude. Achieving first-time silicon-success... is testament to Mixel's engineering excellence and their long-proven methodology. We are looking forward to future collaborations with Mixel.”

-Pascal Mellot, Imaging System & Silicon Products Director, STMicroelectronics

Customer Testimonials



“When it came to vendor selection, we trusted Mixel to provide a high-quality differentiated IP that worked the first time. Choosing Mixel’s MIPI IP for our new CrossLink-NX family of FPGAs is a testament to our long-term partnership with Mixel and their commitment to our success.”

-Gordon Hands, Director of Product Marketing, Lattice Semiconductor

“Mixel’s differentiated MIPI IP offering along with their leadership position in the MIPI IP market played a key role during the selection of our MIPI IP provider. We were not only impressed with Mixel’s unique MIPI solution, but also with the outstanding support throughout the product development and bring-up phases. We’re looking forward to a long-term collaboration with Mixel”



-Jeff Lukanc, Senior Director of Interface Solutions, Synaptics



“We have worked with Mixel for many years on multiple generations of our automotive CVPs, with each design delivering on all performance and quality goals. We have been consistently impressed with their technical excellence. And while we work with a lot of IP vendors, we believe that **Mixel offers the best customer support in the IP business.**”

-Kent Goodin, VP of Engineering, GEO

Customer Testimonials



“Over the years, we have integrated multiple Mixel MIPI IPs with various configurations. All our joint projects have been first-time silicon-success. Mixel has provided us with outstanding support, working collaboratively to address our specific needs, and has become a key contributor to our product development.”

- Jim Hall, Vice President of Hardware, Perceive

“With the stringent safety requirements that come with designing automotive MCUs, we placed highest priority on the reliability and testability of the IP. Given Mixel’s reputation of delivering first silicon success, their extensive automotive functional safety experience, and their unique MIPI solution supporting in-system loopback testability, it was an easy decision to partner with Mixel.

-Nadav Katsir, General Manager, Lumissil Microsystems



“Given the first-time silicon success and excellent support from the Mixel team during our first project, it was an easy decision to work with Mixel for Topaz. We continue to be impressed by Mixel’s technical excellence and expertise and look forward to continued collaboration.”

-Arnaud Foucher, Marketing Director, Teledyne e2v

Customer Testimonials



“For our latest generation of Traveo II® automotive microcontrollers, we had aggressive power, area and performance requirements in a challenging process node. The Mixel development team worked well with Cypress and went the extra mile to deliver a differentiated, patented MIPI D-PHY IP for automotive clusters that will enable our customers to meet their design requirements with Traveo II MCUs. Cypress looks forward to continued collaboration with Mixel.”

-Sean Foley, Vice President, Cypress Semiconductor

“After winning the Best FPGA of the Year Award at the 2020 China IC Design Achievement Award Ceremony, working with Mixel a second time was an easy choice. We needed a silicon-proven MIPI C-PHY/D-PHY combo solution and we trusted Mixel to provide us with a high-quality subsystem that meets our requirements. This was the first time for us working with MIPI C-PHY and Mixel never fails to impress us with their technical excellence and outstanding experience.”

-Qingrui Zhou, Sr. Product Director, Hercules Microelectronics

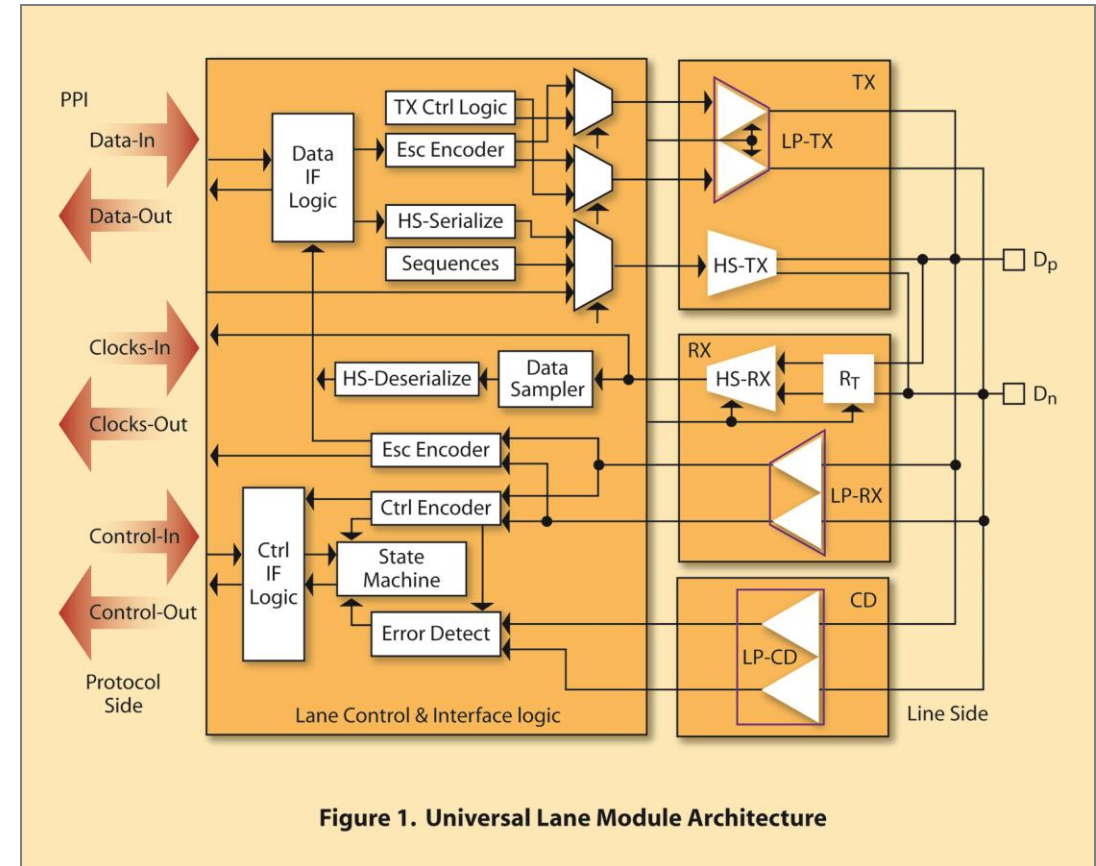


“We chose Mixel because of its track record of supporting right-first-time silicon success. The low power and small footprint of its MIPI IP are also attractive. Utilizing the Mixel MIPI IP allowed us to optimize our sensor product’s power consumption and size. We are looking forward to continued collaboration with Mixel.”

-Peter Vandersteegen, Marketing Manager for CMOS Image Sensors, ams OSRAM

MIPI D-PHY Overview

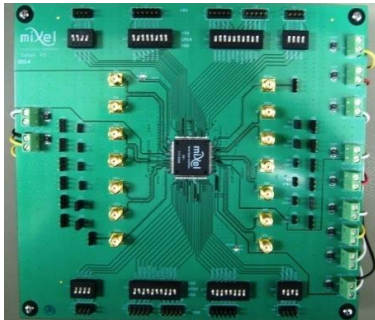
- Complete MIPI D-PHY solution
 - SerDes
 - Transceiver
 - PLL (if needed)
 - RTL for Digital section
- Controller
 - DSI
 - CSI
- Platform



5 Generations of Mixel D-PHY

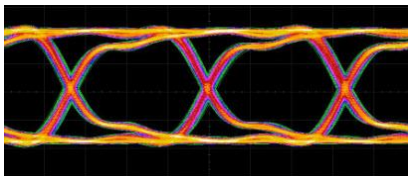
Mixel 1st Generation D-PHY

- Operates up to 1.0Gbps



Mixel 2nd Generation D-PHY

- Operates up to 1.5Gbps

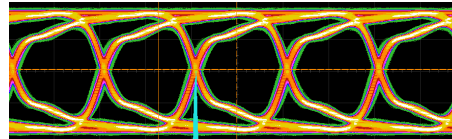


1.5 Gbps



Mixel 3rd Generation D-PHY

- Operates up to 2.5Gbps

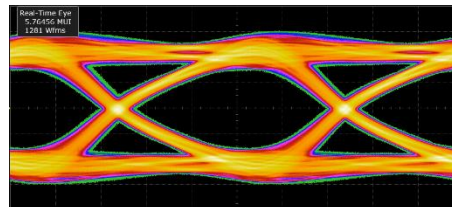


2.5 Gbps



Mixel 4th Generation D-PHY

- Operates up to 4.5Gbps

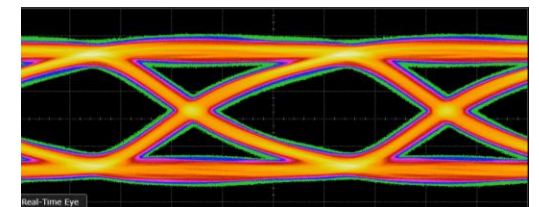


4.5 Gbps



Mixel 5th Generation D-PHY

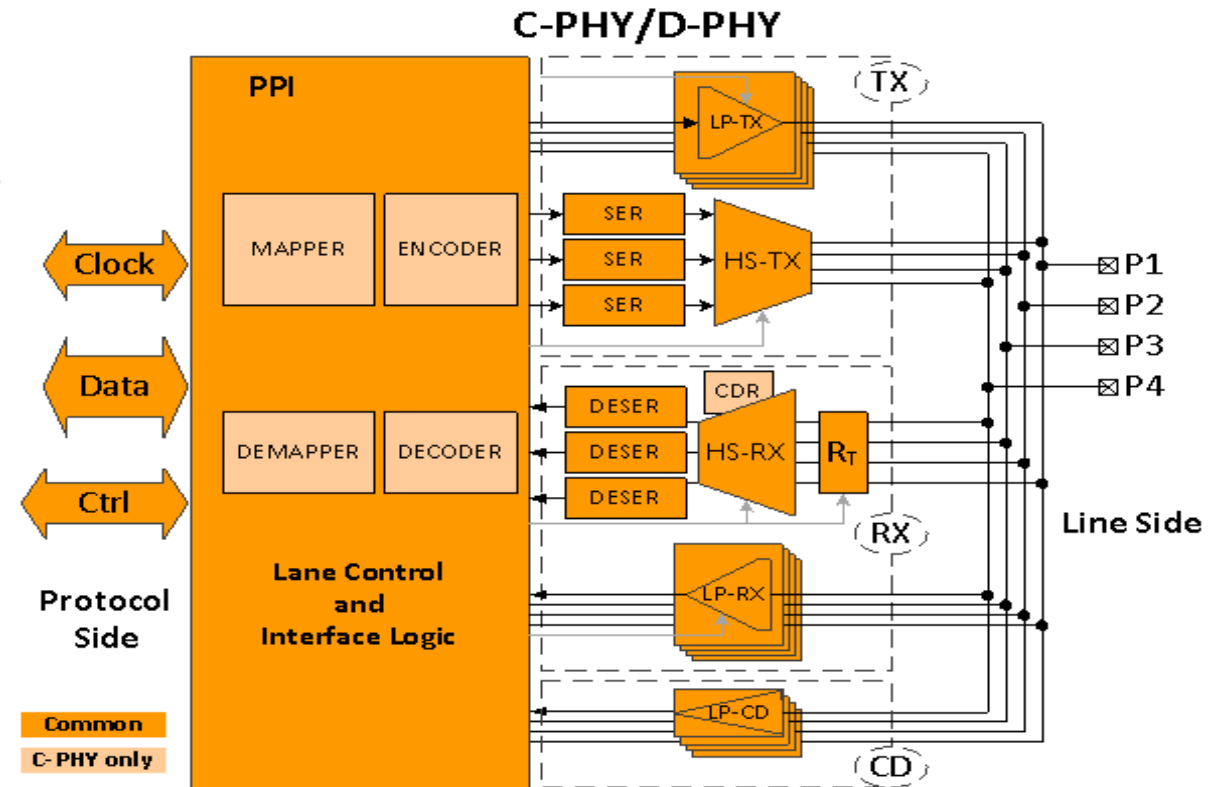
- Operates up to 6.5Gbps



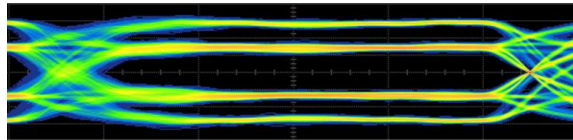
6.5 Gbps

MIPI C-PHY/D-PHY Combo Overview

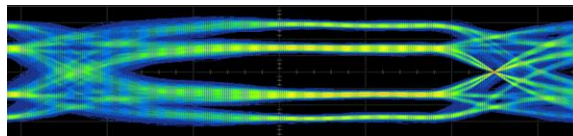
- Combo PHY can be configured as either a C-PHY or D-PHY
 - Configurable for transmit (TX) and receive (RX), plus additional optimized configurations for TX and RX provide smaller area and higher performance
 - Supports Camera Serial Interface (MIPI CSI-2) and Display Serial Interface (MIPI DSI, MIPI DSI-2)
- MIPI D-PHY mode supports MIPI D-PHY v3.5
 - Up to 6.5 Gbps data rate per lane with De-skew calibration
 - Up to 4 lanes, 18Gbps aggregate bandwidth
- MIPI C-PHY mode supports MIPI C-PHY v2.1
 - 80 Msps to 8.0 Gsps symbol rate per lane in high-speed mode
 - Up to 3 trios, 24.0Gsps/54.72Gbps aggregate bandwidth



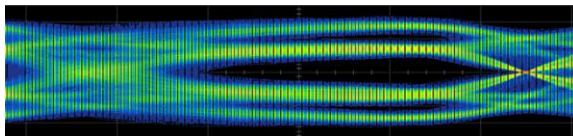
3 Generations of Mixel MIPI C-PHY/D-PHY



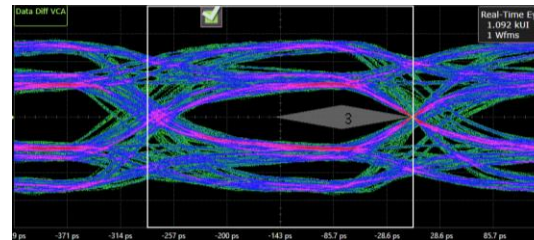
C-PHY @ 1.0 Gbps



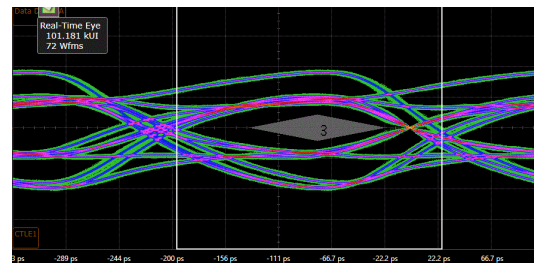
C-PHY @ 1.5 Gbps



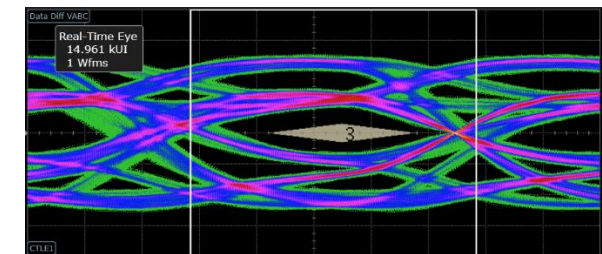
C-PHY @ 2.5 Gbps



C-PHY @ 3.5 Gbps



C-PHY @ 4.5 Gbps



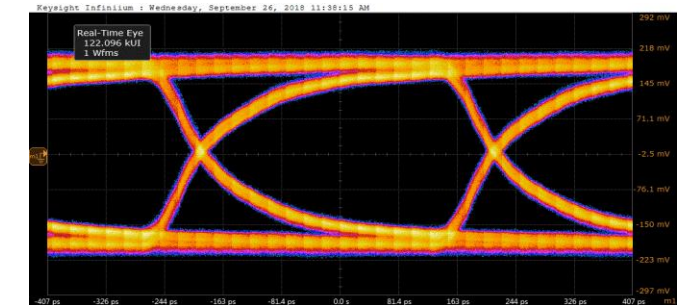
C-PHY @ 8.0 Gbps

Synaptics in Production

- VR Display application using Mixel C/D-PHY combo IP
- First time silicon success, as always
- In production
- Co-authored and co-presented at the MIPI Alliance 2018 DevCon in Seoul on the Synaptics IC and Mixel differentiated IP
- Have a demo showcasing the solution
- See [here](#) for presentation, [here](#) for press release, [here](#) for demo

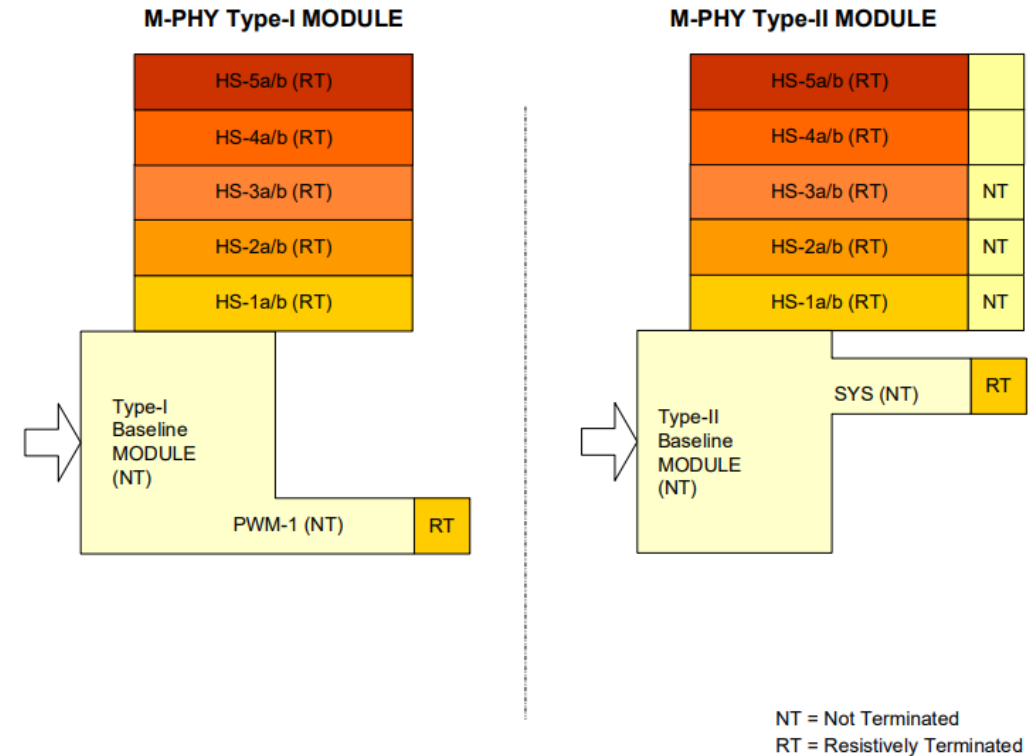
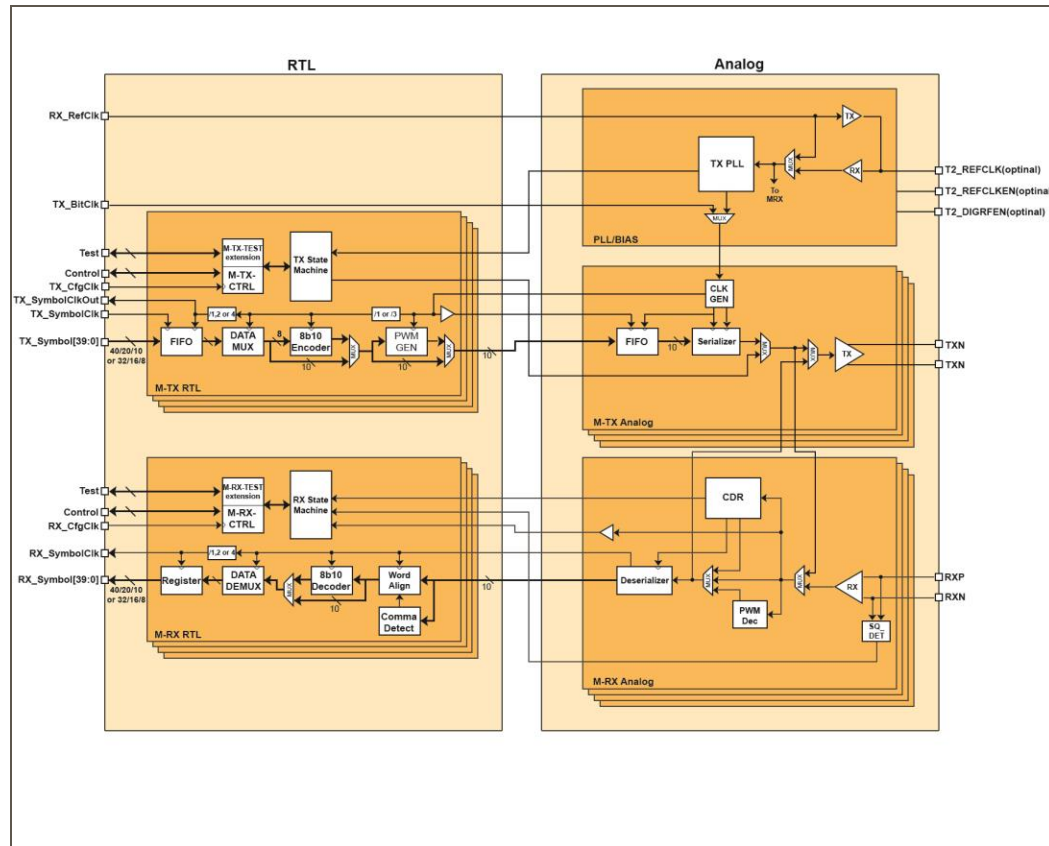


C-PHY @ 2.5Gbps = 5.7Gbps



D-PHY @ 2.5 Gbps

MIPI M-PHY Overview



Functional Options for MODULEs in Type I and Type II M PORTs

M-PHY Platform

M-PHY Daughter Cards

Mixel M-PHY platform supports all M-PHY use cases



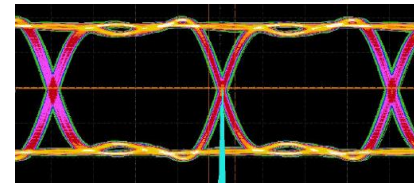
1st Generation



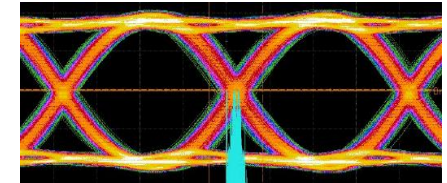
2nd Generation



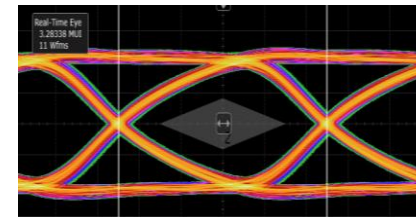
HS-G1



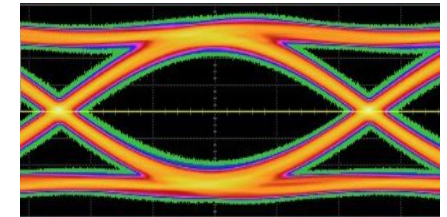
HS-G2



HS-G3



HS-G4



Deliverables

- Data Sheet/Specifications
- Integration guidelines
- GDS II data base
- LEF file
- LVS netlist
- Timing model
- Verilog model
- IBIS model
- RTL
- Test Benches
- First-class customer support through production

Business Model

- IP
 - Licensing
 - ☐ Single use
 - ☐ Multiple use
 - Royalty
- IP Customization
 - NRE tied to agreed upon milestones
 - Last milestone is always silicon functionality

Publications

- [MIPI in FPGAs for Mobile-Influenced Devices](#)
 - Co-authored with Hercules Microelectronics (京微齐力)
- [MIPI Deployment in Ultra-low-power Streaming Sensors](#)
 - Co-authored with ams OSRAM
- [MIPI in Next Generation of AI IoT Devices at the Edge](#)
 - Co-authored with Perceive
- [MIPI Drives Performance for Next-Generation Displays](#)
 - Co-authored with Rambus
- [It's Time To Look At FD-SOI \(Again\)](#)
 - Co-authored with NXP
- [Towards Self-driving Cars: MIPI D-PHY Enabling Advanced Automotive Applications](#)
 - Co-authored with GEO Semiconductor
- [Dual Mode C-PHY/D-PHY: Enabling Next Generation of VR Displays](#)
 - Co-authored with Synaptics
- [Demystifying MIPI C-PHY/D-PHY subsystem](#)
 - Co-authored with Qualcomm
- [Turning Cars Into Mobile Devices: MIPI](#)
 - Co-authored with NXP
- [MIPI D-PHY RX+: An Optimized Test Configuration](#)
 - Co-authored with Freescale
- [M-PHY Benefits and Challenges](#)
 - Co-authored with ST
- [A PHY for all Seasons: MIPI M-PHY](#)
 - Co-authored with Nanotech

Conclusion

- Mixel has been a successful mixed-signal IP provider with emphasis on PHY since 1998
- We are the undisputed MIPI IP leader as evident by the large number of **satisfied** and **loyal** MIPI customers
- Mixel's established [MIPI ecosystem](#) partnerships encompass the complete MIPI supply chain, addressing customers' requirements all the way to production
- Our unique MIPI platform is a valued tool that enables Mixel customers to reach system bring-up in record time
- ISO 9001 and ISO 26262 certified
- Mixel continues to announce world's firsts, thus solidifying our MIPI leadership
- Mixel is in best position to be your preferred MIPI IP partner

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