# HIGH-SPEED
## BOARD-TO-BOARD & BACKPLANE

INTERCONNECT SOLUTIONS GUIDE

# HIGH-SPEED
# BOARD-TO-BOARD & BACKPLANE

Samtec offers the largest variety of high-speed board-to-board and backplane interconnects in the industry with full engineering support, online tools and an unmatched service attitude.

### HIGH-SPEED PERFORMANCE

Speeds to 112 Gbps PAM4

More than 4.0 Tbps of aggregate bandwidth

Extremely low crosstalk to 40 GHz

### APPLICATION FLEXIBILITY

10 – 3,000 positions

0.33 mm – 40 mm stack heights

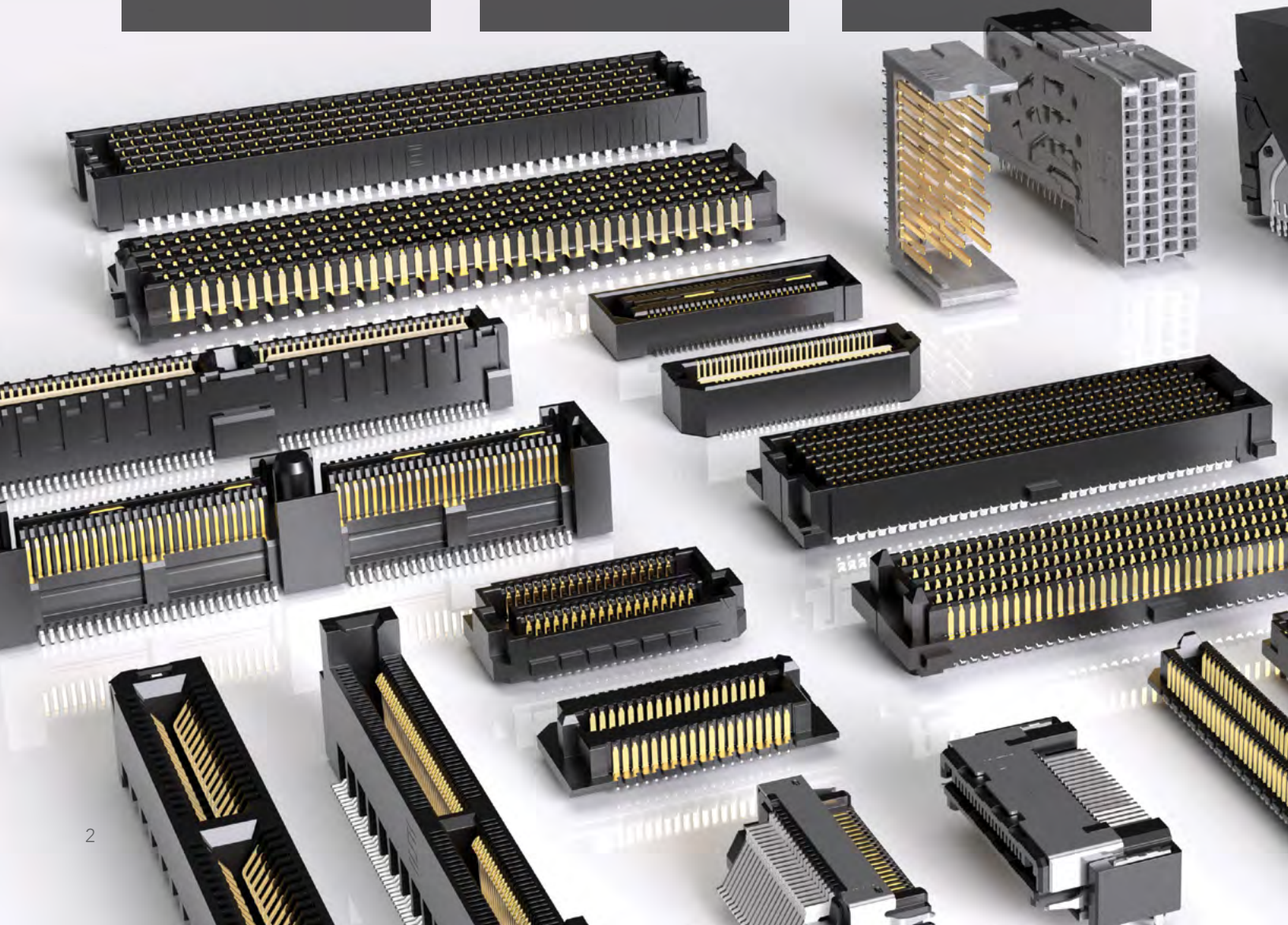
Vertical, right-angle, edge mount

### SIGNAL INTEGRITY SUPPORT

Free test reports, models, app notes, Break Out Region

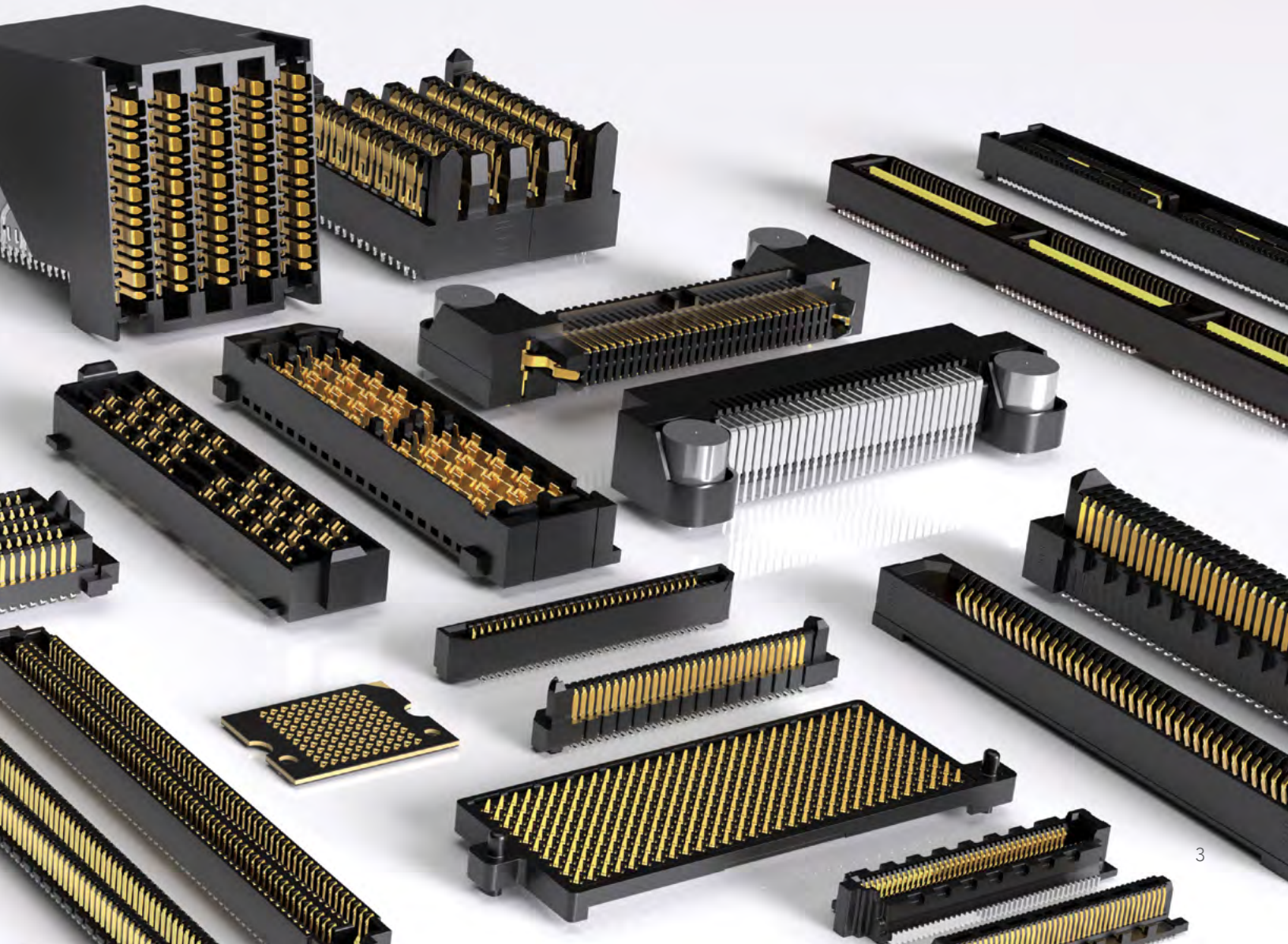
Easy access to live EE support

Online tools: Simulator™ and Channelyzer®



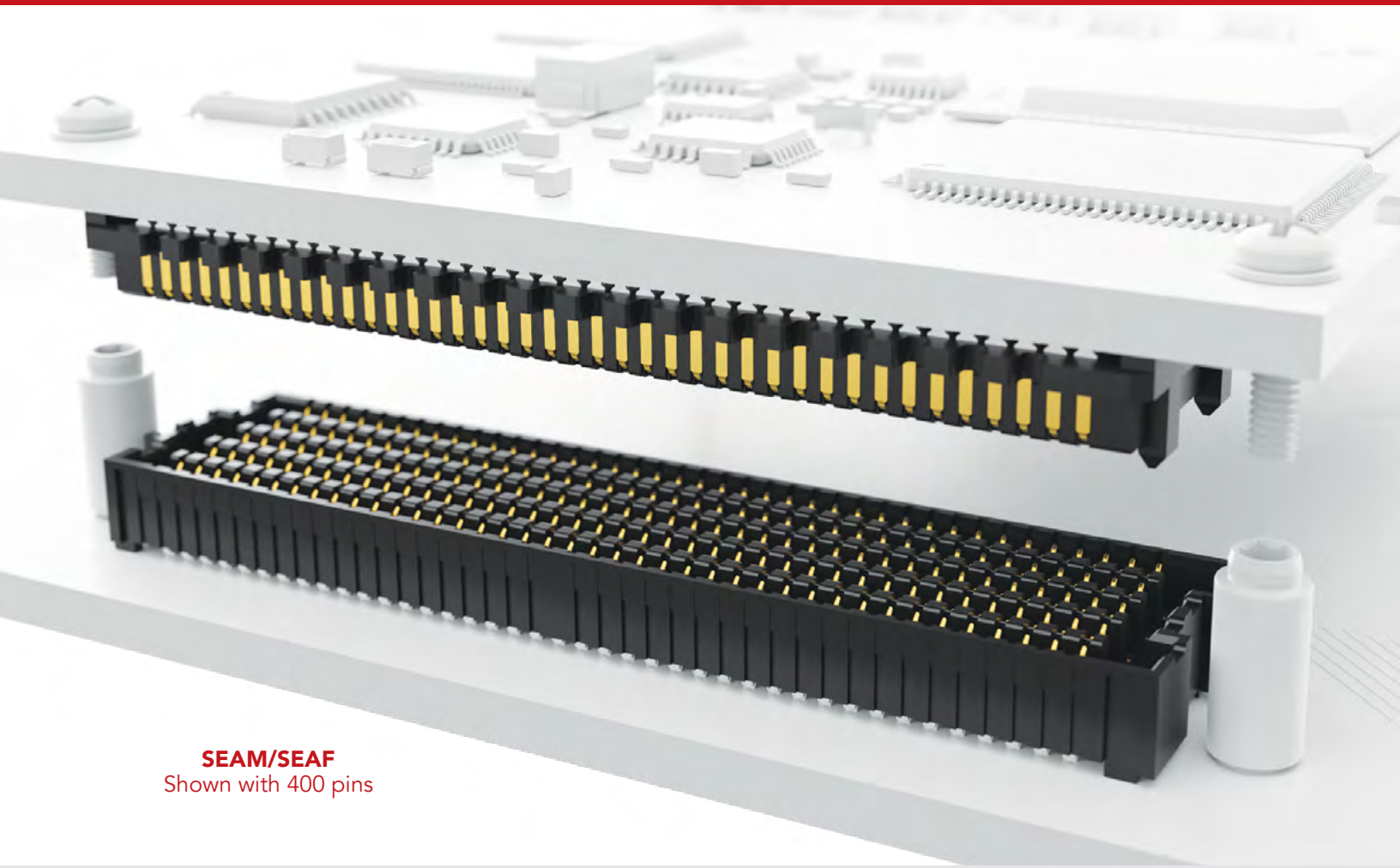
Learn more at
**samtec.com**





# HIGH-DENSITY ARRAYS

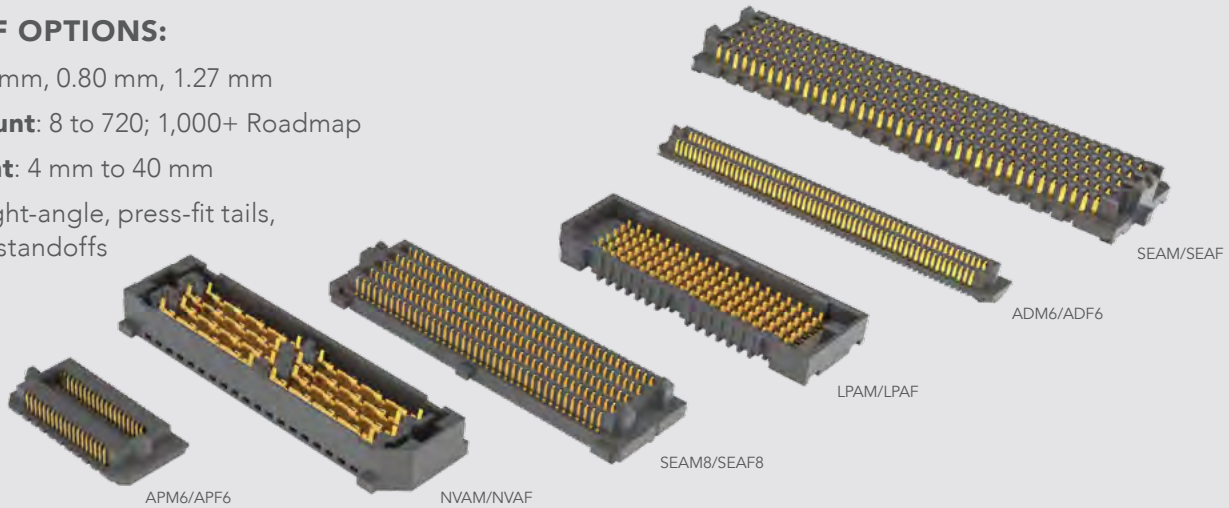
## EXTREME PERFORMANCE • OPEN-PIN-FIELD • LOW-PROFILE



**SEAM/SEAF**
Shown with 400 pins

### VARIETY OF OPTIONS:

- **Pitch**: 0.635 mm, 0.80 mm, 1.27 mm
- **Pin/Pair Count**: 8 to 720; 1,000+ Roadmap
- **Stack Height**: 4 mm to 40 mm
- **Options**: Right-angle, press-fit tails, 85 Ω tuned, standoffs



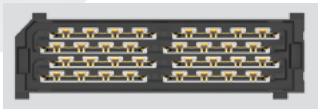
## EXTREME PERFORMANCE ARRAYS

- 4.0 Tbps aggregate data rate - 9 IEEE 400G channels
- Two points of contact ensure a more reliable connection
- Fully shielded differential pair design
- Extremely low crosstalk (to 40 GHz) and incredibly tight impedance control
- Minimal variance in data rate as stack height increases
- Utilizes 40% less space with the same data throughput as compared to traditional arrays
- Terminal with latching available to mate with NovaRay® cable (NVAM-C)

NOVARAY® NRZ 56 Gbps PAM4 112 Gbps

**NVAM/NVAF**

Right-angle in development (NVAM-RA)



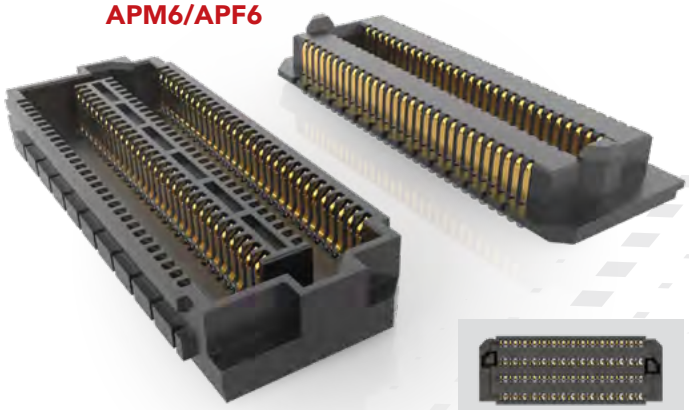
NVAM Series; 32 pairs (actual size shown)

## HIGH-PERFORMANCE ARRAYS

- Flexible open-pin-field and cost optimized, extreme performance solution
- Low-profile 5 mm stack height and up to 10 mm
- 0.635 mm pitch
- Four row design with up to 400 total pins; roadmap to 1,000+ pins
- Data rate compatible with PCIe® Gen 5 and 100 GbE
- Cable assembly in development

ACCELERATE®HP NRZ 56 Gbps PAM4 112 Gbps

**APM6/APF6**





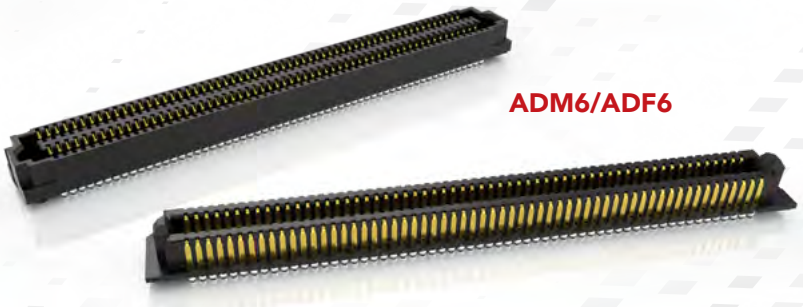
APF6 Series; 120 pins (actual size shown)

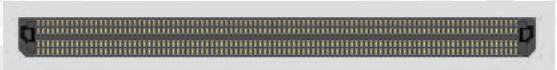
## HIGH-DENSITY MULTI-ROW STRIPS

- Up to 400 I/Os in a 4-row design
- Open-pin-field design for grounding and routing flexibility
- 0.635 mm pitch Edge Rate® contacts
- Low profile 5 mm stack height and slim 5 mm width
- Right-angle and other stack heights in development (ADF6-RA)

ACCELERATE®HD PAM4 56 Gbps

**ADM6/ADF6**



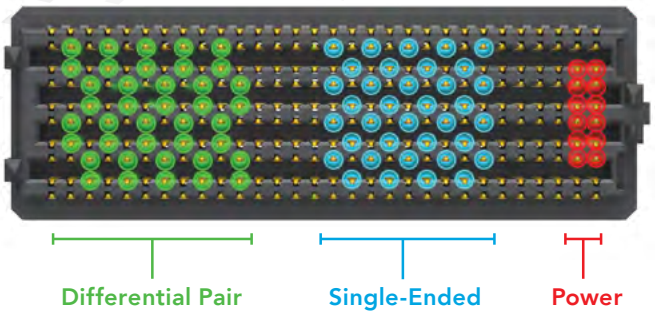


ADF6 Series; 400 pins (actual size shown)

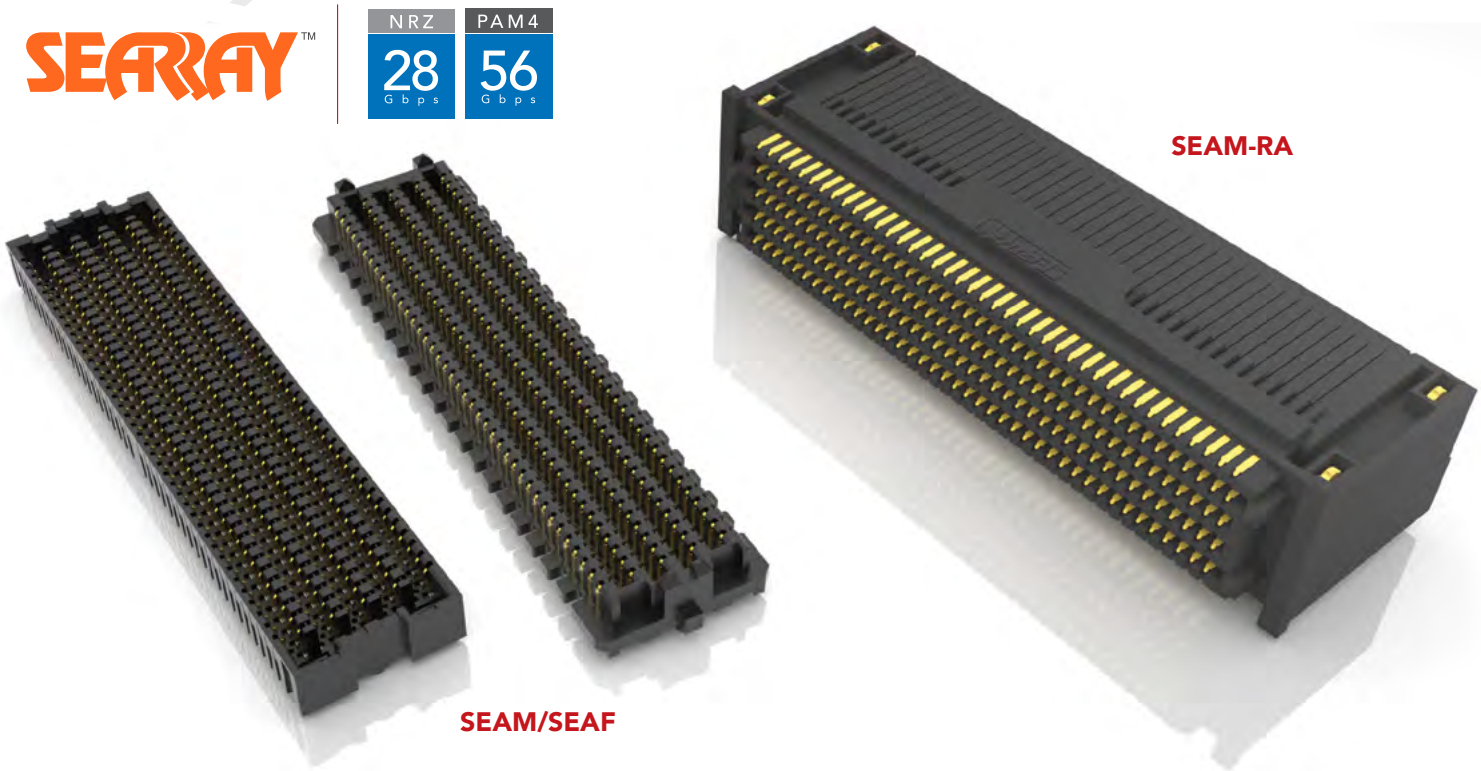
## 1.27 mm PITCH ARRAYS

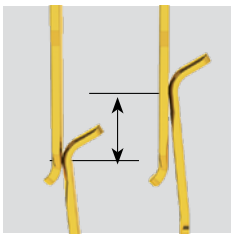
- Maximum grounding and routing flexibility
- Up to 560 Edge Rate® contacts optimized for signal integrity performance
- 7 mm to 40 mm stack heights; right-angle available
- Supports high-speed protocols such as Ethernet, PCI Express®, Fibre Channel and InfiniBand™
- Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

### OPEN-PIN-FIELD FLEXIBILITY




SEARAY™ NRZ 28 Gbps PAM4 56 Gbps

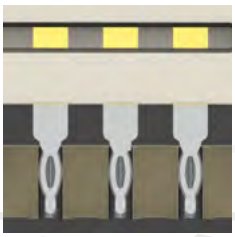


1.15 mm (.045") contact wipe

Solder charge terminations (IPC-A-610F & IPC J-STD-001F Class 3)

Elevated stack heights available (SEAR)



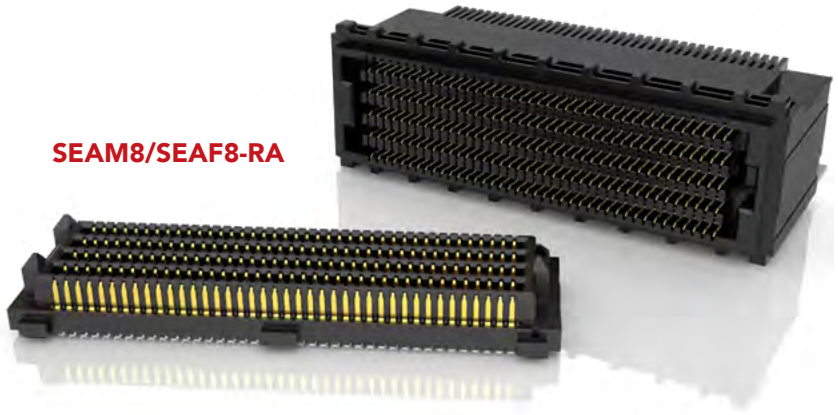
Press-fit tails available (SEAMP/SEAFP)

Jack screw standoffs (JSO)

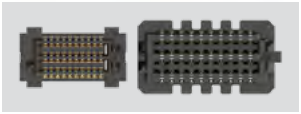
## HIGH-DENSITY 0.80 mm PITCH ARRAYS

- 2x the density of 1.27 mm pitch arrays
- Up to 720 Edge Rate® contacts; higher pin counts in development
- 7 mm and 10 mm stack heights
- 2 mm extended wipe in development
- Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

**SEAM8/SEAF8-RA**



SEARAY™ .8mm | NRZ 28 Gbps | PAM4 56 Gbps

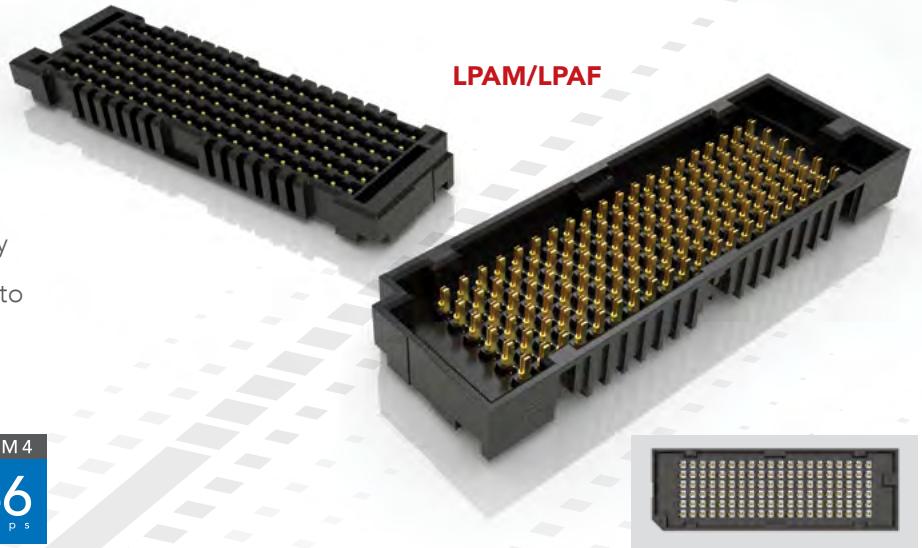


0.80 mm pitch vs. 1.27 mm pitch
(actual size shown; 60 pins)

## LOW PROFILE ARRAYS

- Up to 400 total pins in 4, 6 or 8 rows
- 4 mm, 4.5 mm and 5 mm stack heights
- 1.27 mm pitch dual beam contacts
- Solder crimped termination for ease of processing
- Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility
- Press-in or threaded standoffs available to assist with unmating (JSO)

**LPAM/LPAF**



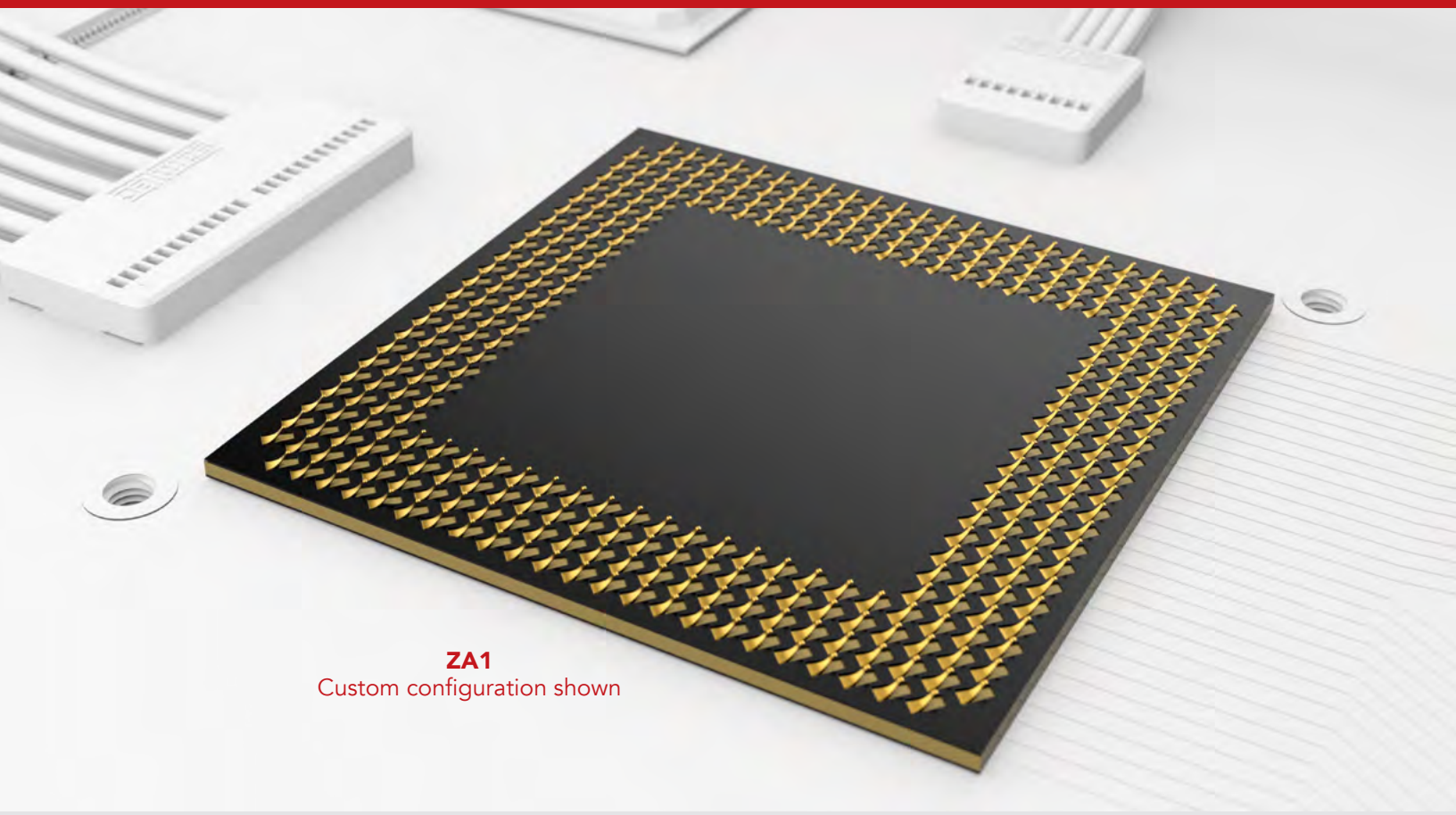
LP ARRAY™ | NRZ 28 Gbps | PAM4 56 Gbps



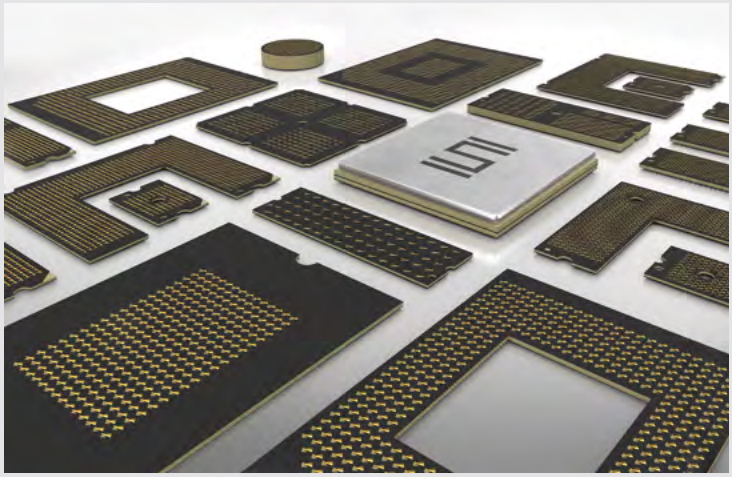
LPAM Series; 120 pins
(actual size shown)

# HIGH-SPEED COMPRESSION INTERPOSERS

## ULTRA-LOW PROFILE • HIGH-DENSITY • EXTREME FLEXIBILITY



**ZA1**
Custom configuration shown

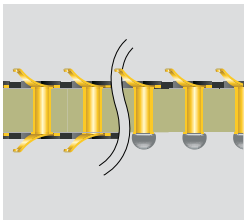


### Z-Ray® ULTIMATE DESIGN FLEXIBILITY

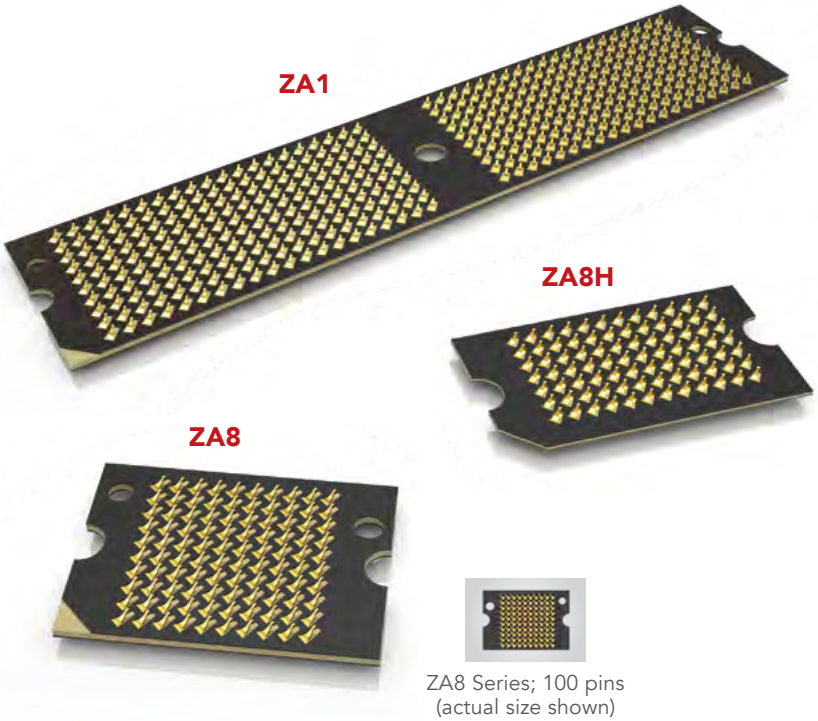
- Configurations for any application, complete with detailed footprints
- Dual compression or single compression with solder balls
- Customer-specific stack heights, pin counts, insulator shapes, and plating thicknesses
- Customizable in the X, Y, and Z axes
- Wide variety of custom geometries
- Quick-turn customization with minimal NRE and tooling charges
- Variety of compression and alignment hardware available

## ULTRA-LOW PROFILE COMPRESSION INTERPOSERS

- 0.80 mm or 1.00 mm pitch
- 1 mm body height (ZA8/ZA1); 0.33 mm body height provides the shortest signal path (ZA8H)
- Up to 400 pins standard; 3,000+ pins with custom capabilities
- Customizable in X, Y, and Z axes, stack height, pin count, shape, plating thickness, etc.
- High-speed performance to 14 Gbps (ZA8/ZA1) and 56 Gbps NRZ (ZA8H)
- Alignment/compression hardware available (ZHSI, ZSO, ZD)



Dual compression, or single compression with solder balls



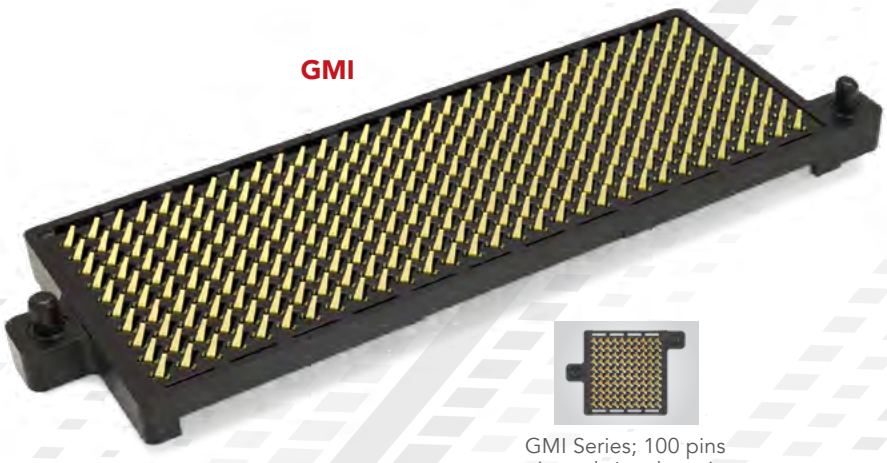



ZA8 Series; 100 pins (actual size shown)

ZRAY® NRZ 56 Gbps

## LOW PROFILE COMPRESSION INTERPOSERS

- 1.00 mm pitch
- 1.27 mm body height
- 100, 200 or 300 pins
- Dual compression
- Ideal for low cost board stacking, module-to-board and LGA interfaces
- Minimizes thermal expansion issues



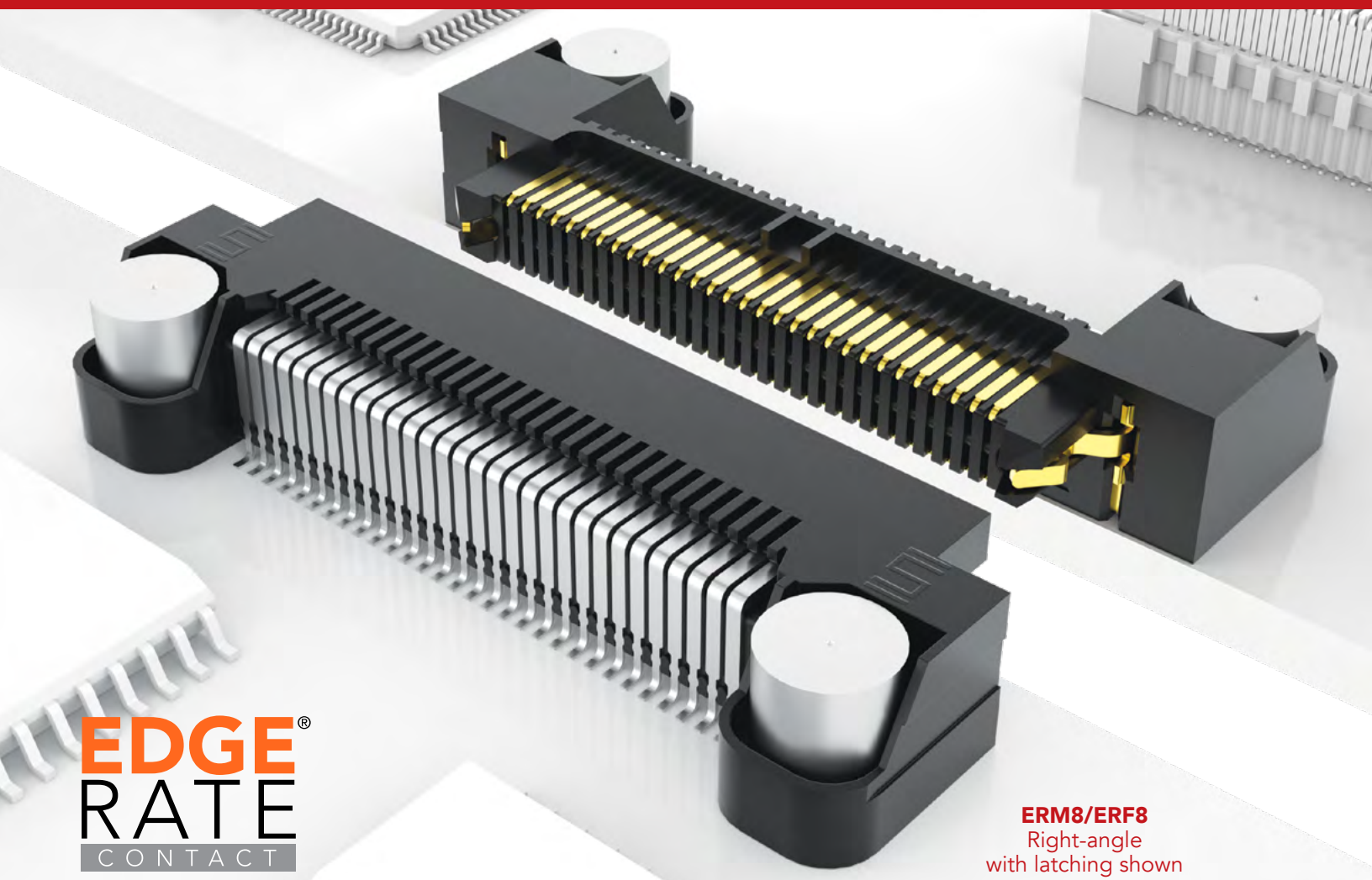



GMI Series; 100 pins (actual size shown)

PAM4 56 Gbps

# EDGE RATE® CONNECTOR STRIPS

**OPTIMIZED FOR SPEED • HIGH CYCLES • INCREASED CONTACT WIPE**



EDGE® RATE CONTACT

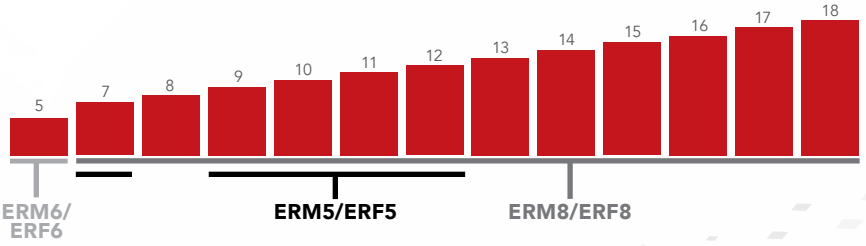
**ERM8/ERF8**
Right-angle
with latching shown

**EDGE RATE® CONTACT SYSTEM:**

- Smooth milled mating surface reduces wear and increases durability
- Lower insertion and withdrawal forces
- Robust when "zippered" during unmating
- Minimized parallel surface area reduces broadside coupling and crosstalk
- Designed, simulated and optimized for 50 Ω and 100 Ω systems

## STACK HEIGHT FLEXIBILITY

(Actual size in mm)



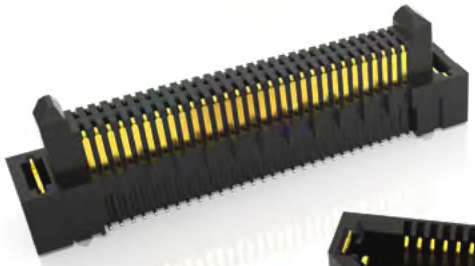



samtec.com/edgerate

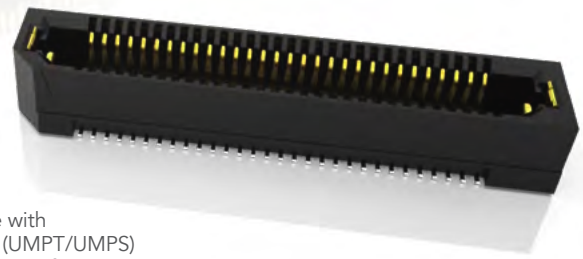
## 0.80 mm PITCH SYSTEM

- 1.5 mm contact wipe for a reliable connection
- Differential pair and hot swap options
- Stack heights from 7 mm to 18 mm
- Supports high-speed protocols including Ethernet and PCI Express®
- Right-angle and edge mount available

PAM4 56 Gbps



**ERM8/ERF8**



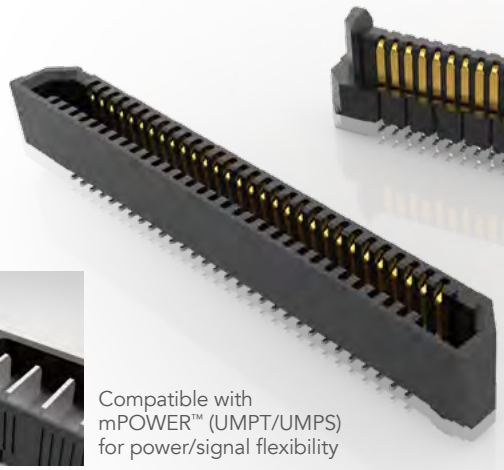
Rugged 360° shielding and metal latching options

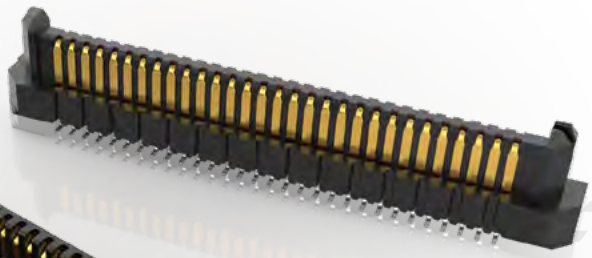
Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

## 0.635 mm PITCH SYSTEM

- Extremely slim 2.5 mm body width
- Up to 120 positions in a 2-row design
- 5 mm stack height (others in development)

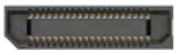
PAM4 56 Gbps





**ERM6/ERF6**

**Sockets shown actual size at 40 total positions**



**ERX8**

**ERX6**

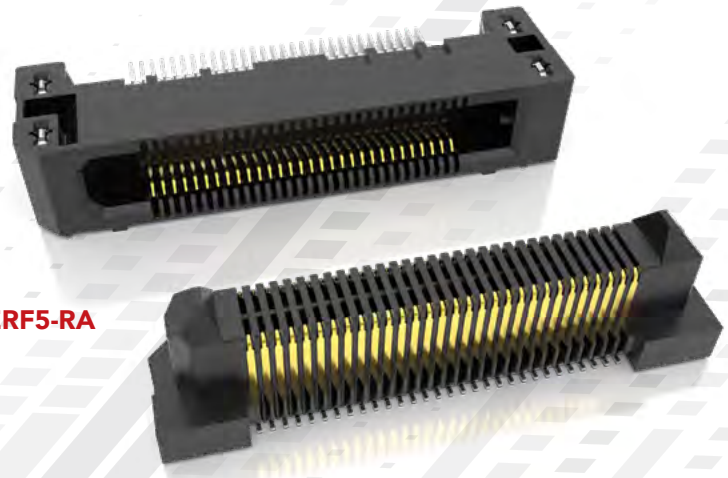
**ERX5**

Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

## 0.50 mm PITCH SYSTEM

- 1.00 mm contact wipe
- Up to 40% PCB space savings with 0.50 mm pitch vs. 0.80 mm pitch
- Stack heights from 7 mm to 12 mm
- 20 to 150 total positions

28 Gbps

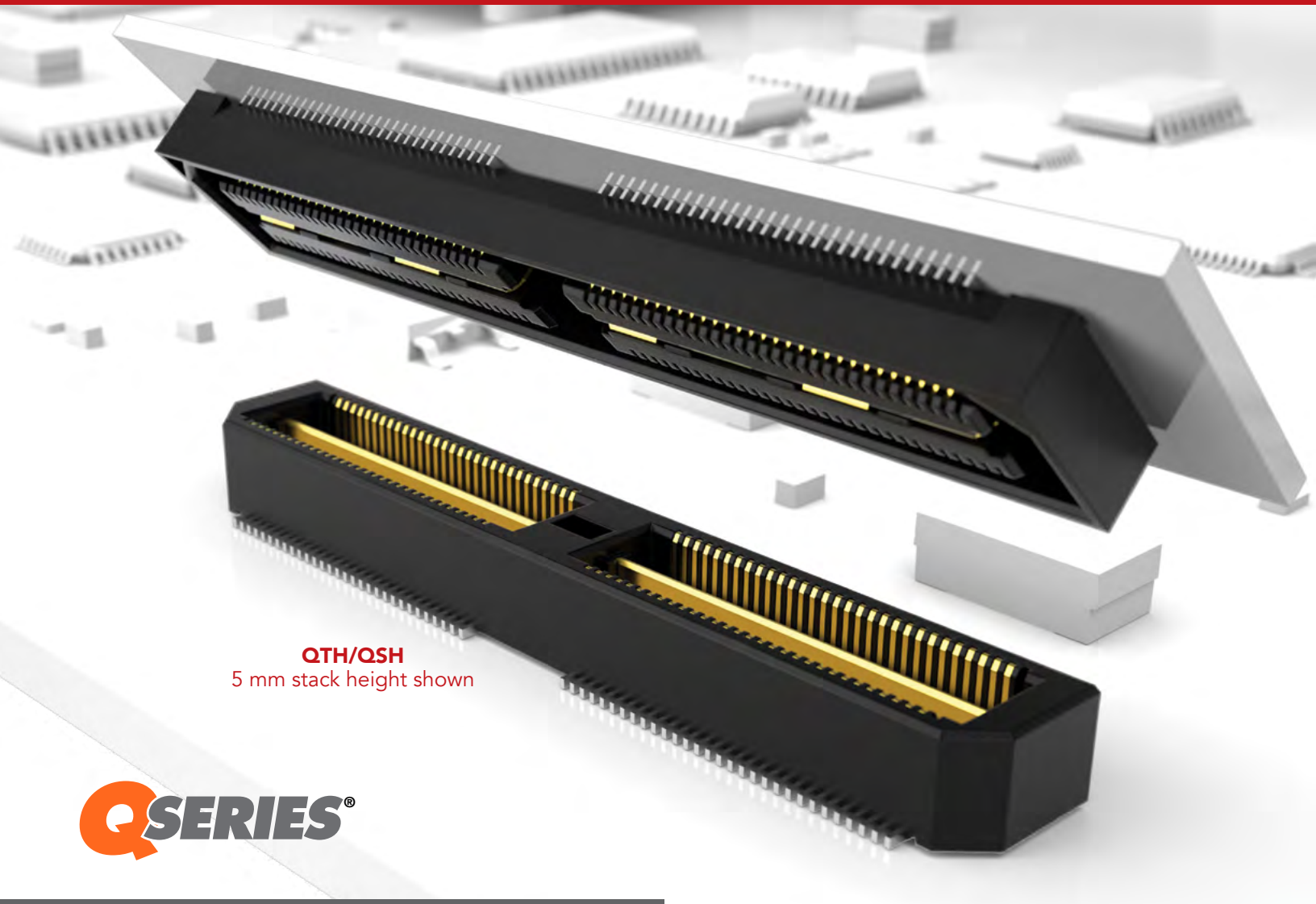


**ERM5/ERF5-RA**

Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

# GROUND PLANE CONNECTORS

**RELIABLE SI PERFORMANCE • LOW-PROFILE • SLIM FOOTPRINT**

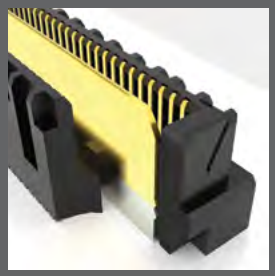


**QTH/QSH**
5 mm stack height shown

QSERIES®

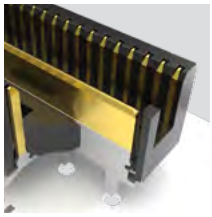
### INTEGRAL GROUND/POWER PLANE

- Surface mount ground plane between two signal rows improves electrical performance
- Significantly reduces row-to-row crosstalk
- Integral metal plane for power to 25 Amps

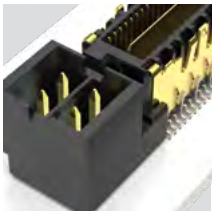


## FEATURES

Differential pairs reduce noise



Mixed technology (MIT/MIS)



Options for power, retention & RF

## LOW PROFILE GROUND PLANE CONNECTORS

- 0.50 mm, 0.635 mm and 0.80 mm pitch
- 5 mm to 25 mm stack heights
- Integral ground/power plane
- Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility
- Differential pairs and edge mount options available

QSTRIP® 28 Gbps

25 A per plane

QTE/QSE

## SLIM GROUND PLANE CONNECTORS

- 0.80 mm pitch and 1.20 mm contact wipe
- Edge Rate® contacts optimized for superior signal integrity performance
- Right-angle available for coplanar and perpendicular mating
- Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

QRATE® 28 Gbps

QRM8/QRF8

8.6 A per plane

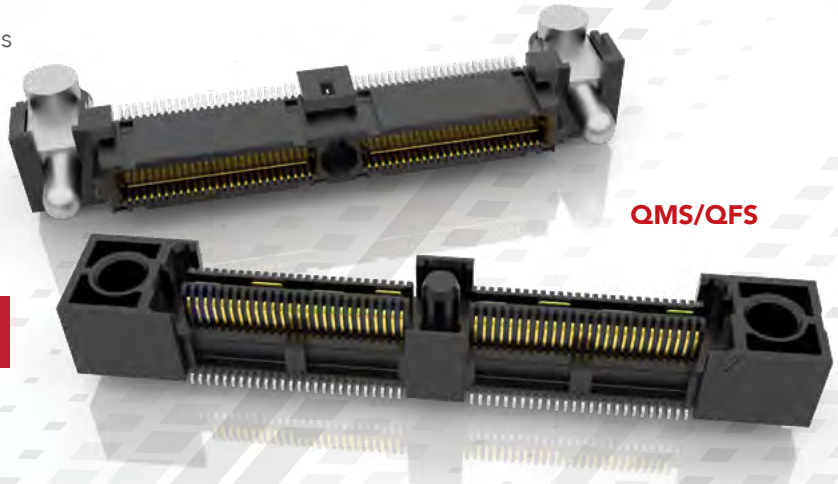
Slim 4.60 mm body width saves board space

## RUGGED GROUND PLANE CONNECTORS

- 0.635 mm pitch
- Increased insertion depth for rugged applications
- Up to 156 signal pins/48 signal pairs standard
- Vertical, right-angle and edge mount
- Shielded systems available (QMSS/QFSS)
- Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

Q2™ 25 Gbps

15.7 A per plane



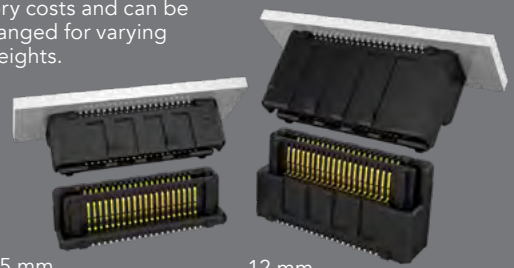
QMS/QFS

# ULTRA MICRO INTERCONNECTS

## SPACE SAVING DESIGNS • HERMAPHRODITIC • HIGH-DENSITY

**LSHM**
80 total
positions shown

Self-mating connectors reduce inventory costs and can be interchanged for varying stack heights.

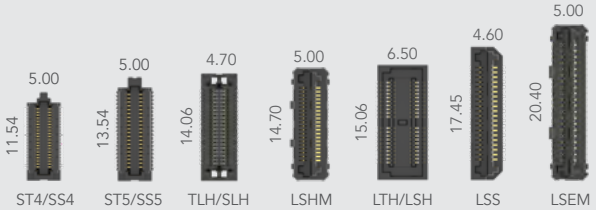


5 mm
stack height

12 mm
stack height

### SLIM BODY DESIGNS - ACTUAL SIZE SHOWN

(40 total positions each)



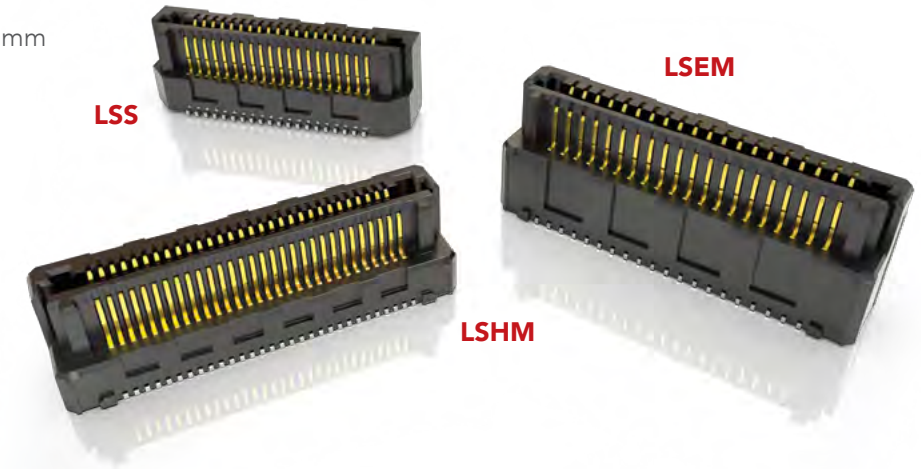



samtec.com/ultra-micro

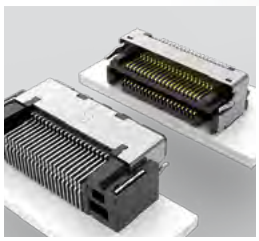
## RUGGED HERMAPHRODITIC CONNECTORS

- Razor Beam™ contacts for high-speed and fine-pitch systems
- 0.50 mm, 0.635 mm and 0.80 mm pitch
- Ten stack height options from 5 mm to 12 mm
- 10 - 100 positions
- Right-angle available for perpendicular and coplanar applications

RAZOR™ BEAM SYSTEM | 25 Gbps




Razor Beam™ contacts for ultra low profile designs



Optional shielding for EMI protection (LSHM)

Jack screw standoffs (JSO) assist with unmating

## MICRO BLADE & BEAM STRIPS

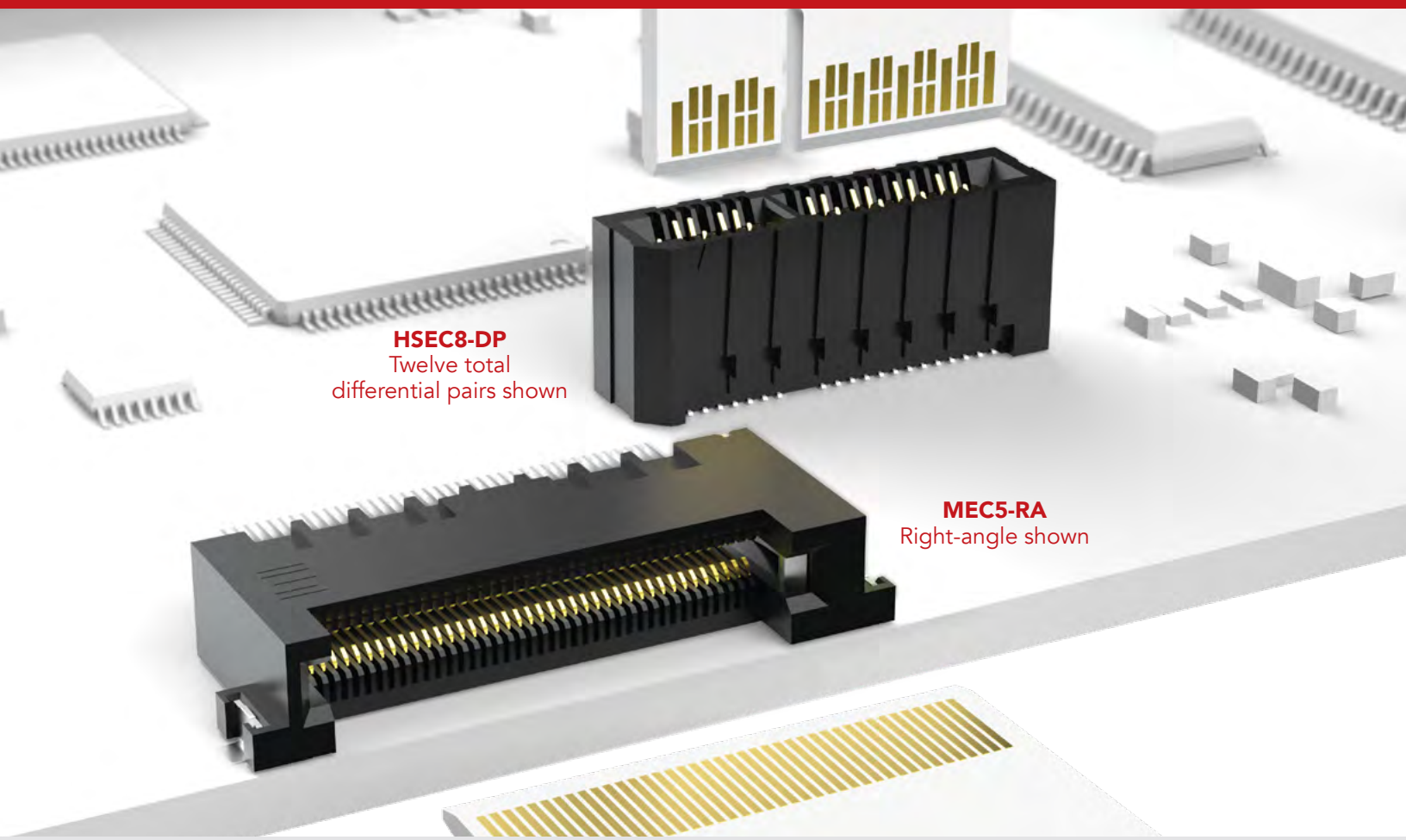
- Ultra-fine 0.40 mm and 0.50 mm pitch
- Low profile stack heights from 2 to 6 mm
- Slim body designs for increased PCB space savings
- 20 - 160 positions

PAM4 56 Gbps


Compatible with mPOWER™ (UMPT/UMPS) for power/signal flexibility

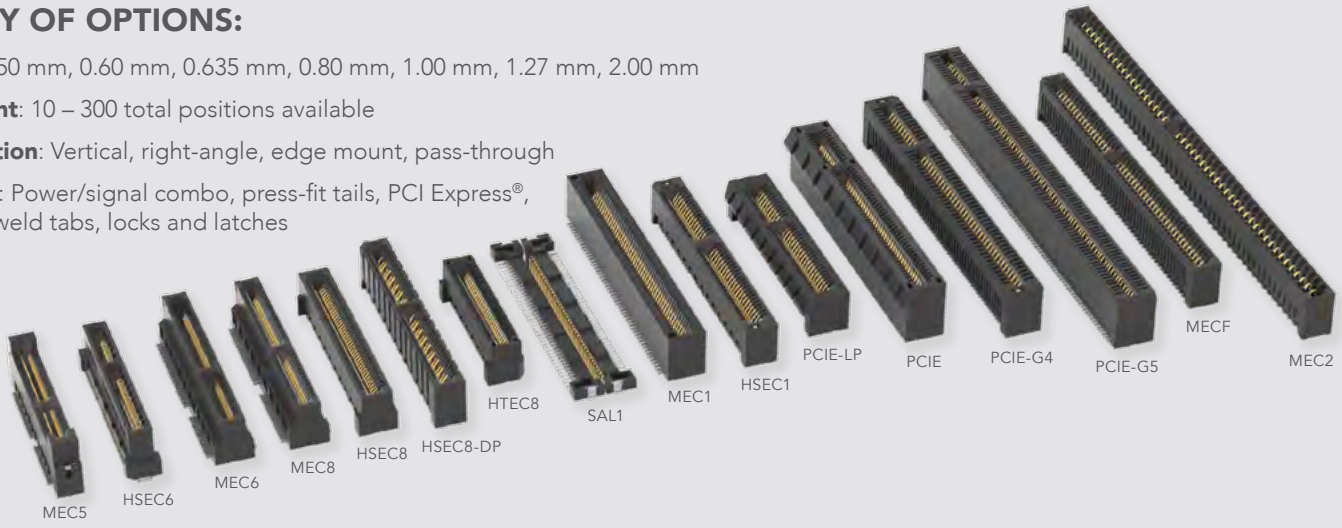
# EDGE CARD SYSTEMS

## SPEEDS TO 56 Gbps • EDGE RATE® CONTACTS • VARIETY OF OPTIONS



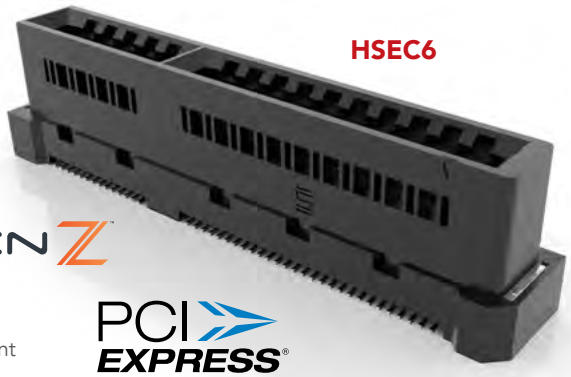

### VARIETY OF OPTIONS:

- **Pitch**: 0.50 mm, 0.60 mm, 0.635 mm, 0.80 mm, 1.00 mm, 1.27 mm, 2.00 mm
- **Pin Count**: 10 – 300 total positions available
- **Orientation**: Vertical, right-angle, edge mount, pass-through
- **Options**: Power/signal combo, press-fit tails, PCI Express®, rugged weld tabs, locks and latches

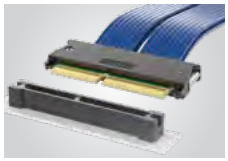


## 0.60 mm PITCH SOCKETS

- Differential pair Edge Rate® contacts
- Compliant to SFF-TA-1002: x4 (IC), x8 (2C), x16 (4C and 4C+)
- Mates with .062" (1.60 mm) thick cards
- PCI Express® Gen 4, Gen 5 and Gen-Z™ compliant




EDGE® RATE CONTACT | PAM4 56 Gbps



0.60 mm pitch mating high-speed cable assembly in development

GEN Z

PCI EXPRESS® GEN 4/5 COMPLIANT

## 0.80 mm PITCH SOCKETS

- Up to 200 high-speed Edge Rate® contacts
- Mates with .062" (1.60 mm) and .093" (2.36 mm) thick cards
- Power/signal combo (HSEC8-PV)
- PCI Express® Gen 3/4 compatible; Gen 4/5 compatible differential pair socket (HSEC8-DP)



EDGE® RATE CONTACT | PAM4 56 Gbps

Rugged PCIe® Gen 4 compatible socket with tucked beam technology (HTEC8)

## 1.00 mm PITCH SOCKETS

- Edge Rate® contact system for decreased crosstalk
- 20 – 140 positions
- Mates with .062" (1.60 mm) thick cards
- PCI Express® Gen 3/4 compatible; Gen 5 compatible differential pair socket in development (HSEC1-DP)


EDGE® RATE CONTACT | PAM4 56 Gbps

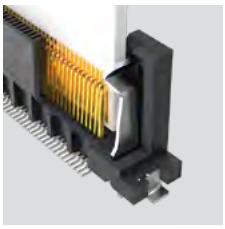
Custom designs can aid with misalignment in the X-Y axes

**samtec.com/edgecard**

# EDGE CARD SYSTEMS

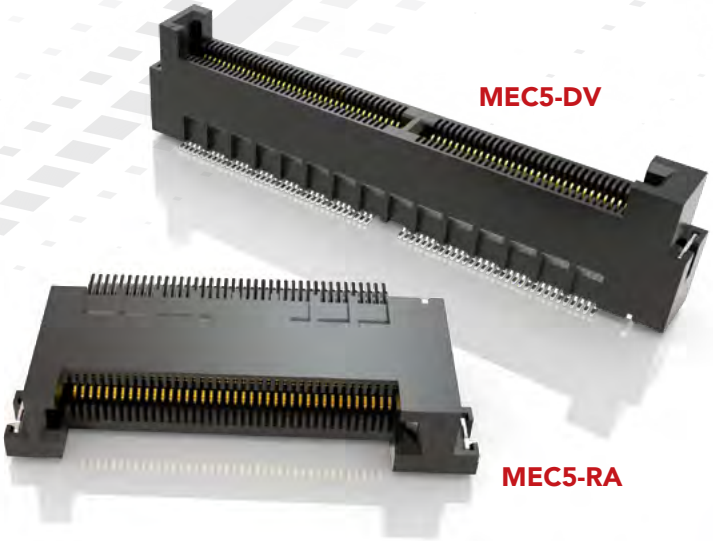
## 0.50 mm PITCH HIGH-SPEED, LOW-COST SOCKETS

- Justification beam enables use of standard PCB tolerance
- Up to 300 total I/Os
- PCIe® Gen 4 compatible
- Mates with .062" (1.60 mm) thick cards



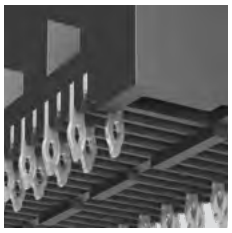
Beam ensures card and body are flush

PAM4 56 Gbps



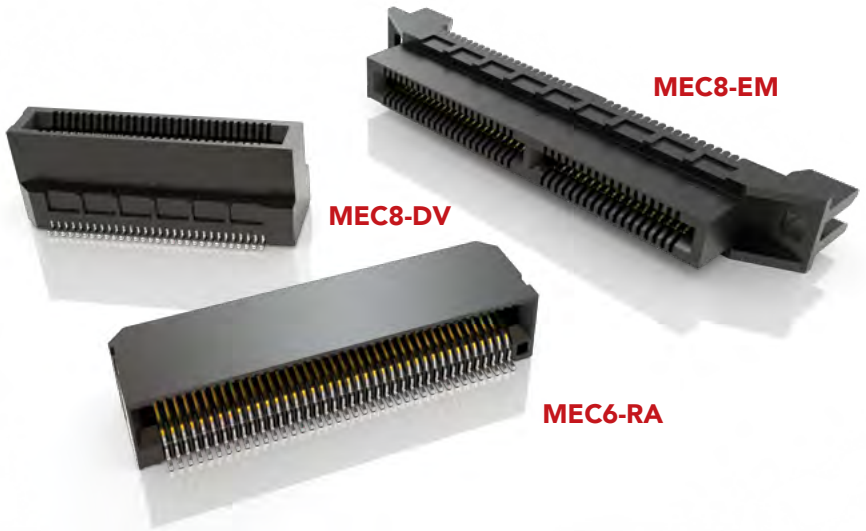

## 0.635 mm & 0.80 mm PITCH MICRO SOCKETS

- Up to 140 total I/Os
- Vertical and right-angle; edge mount (MEC8)
- Press-fit tails available (MEC8 -VP)
- Mates with .062" (1.60 mm) thick cards



Staggered press-fit tails

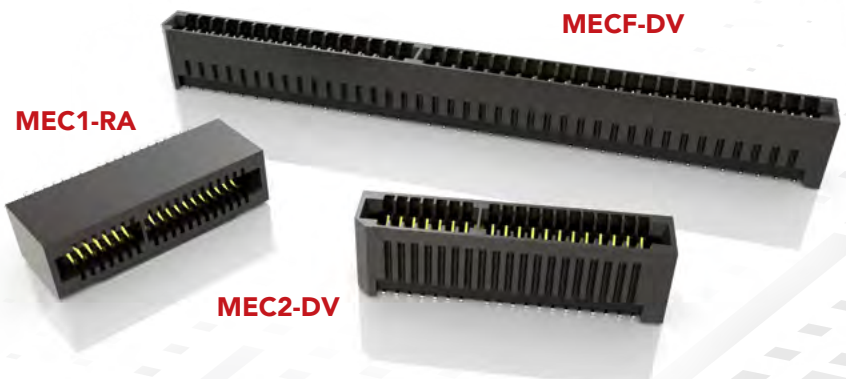
25 Gbps




## 1.00 mm, 1.27 mm & 2.00 mm PITCH SOCKETS

- Up to 140 total I/Os
- Right-angle and edge mount available (MEC1)
- Optional weld tabs, alignment pins and polarization
- Mates with .062" (1.60 mm) and .093" (2.36 mm) thick cards

25 Gbps



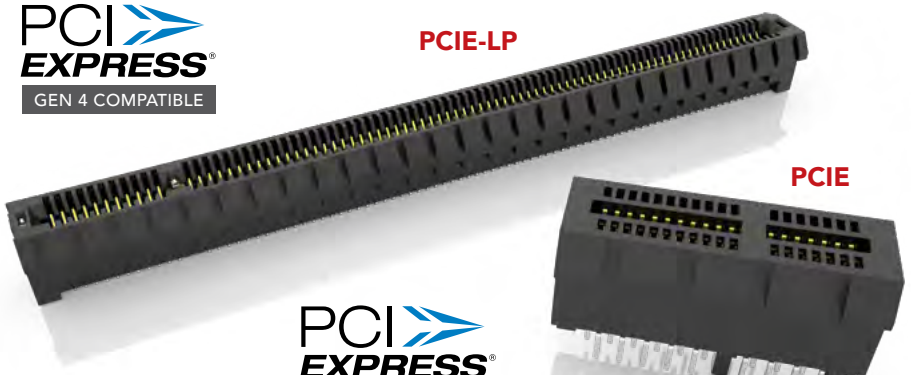



samtec.com/edgecard

## GEN 3 & 4 PCI EXPRESS® SOCKETS

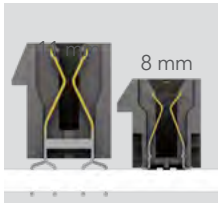
- 1.00 mm pitch in x1, x4, x8 or x16
- Gen 3 compliant (PCIE) and Gen 4 compatible (PCIE-LP)
- Low profile version for space savings; through-hole tails in development
- PCI-Express® Jumpers available
- Mates with .062" (1.60 mm) thick cards

PCI EXPRESS® GEN 4 COMPATIBLE




PCI EXPRESS® GEN 3 COMPLIANT



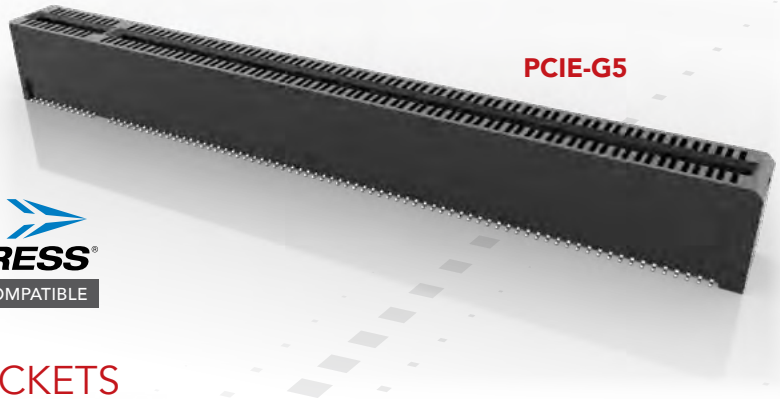

PCIE PCIE -LP

Gen 4 slim body socket with Edge Rate® contacts (PCIE-G4)

## GEN 5 PCI EXPRESS® SOCKETS

- Differential pair system
- 1.00 mm pitch
- Design-in today for future-proof data rates
- Mates with standard PCIe® expansion cards
- 1, 4, 8 and 16 PCI Express® Gen 5 link options
- Currently in development

PCI EXPRESS® GEN 5 COMPATIBLE

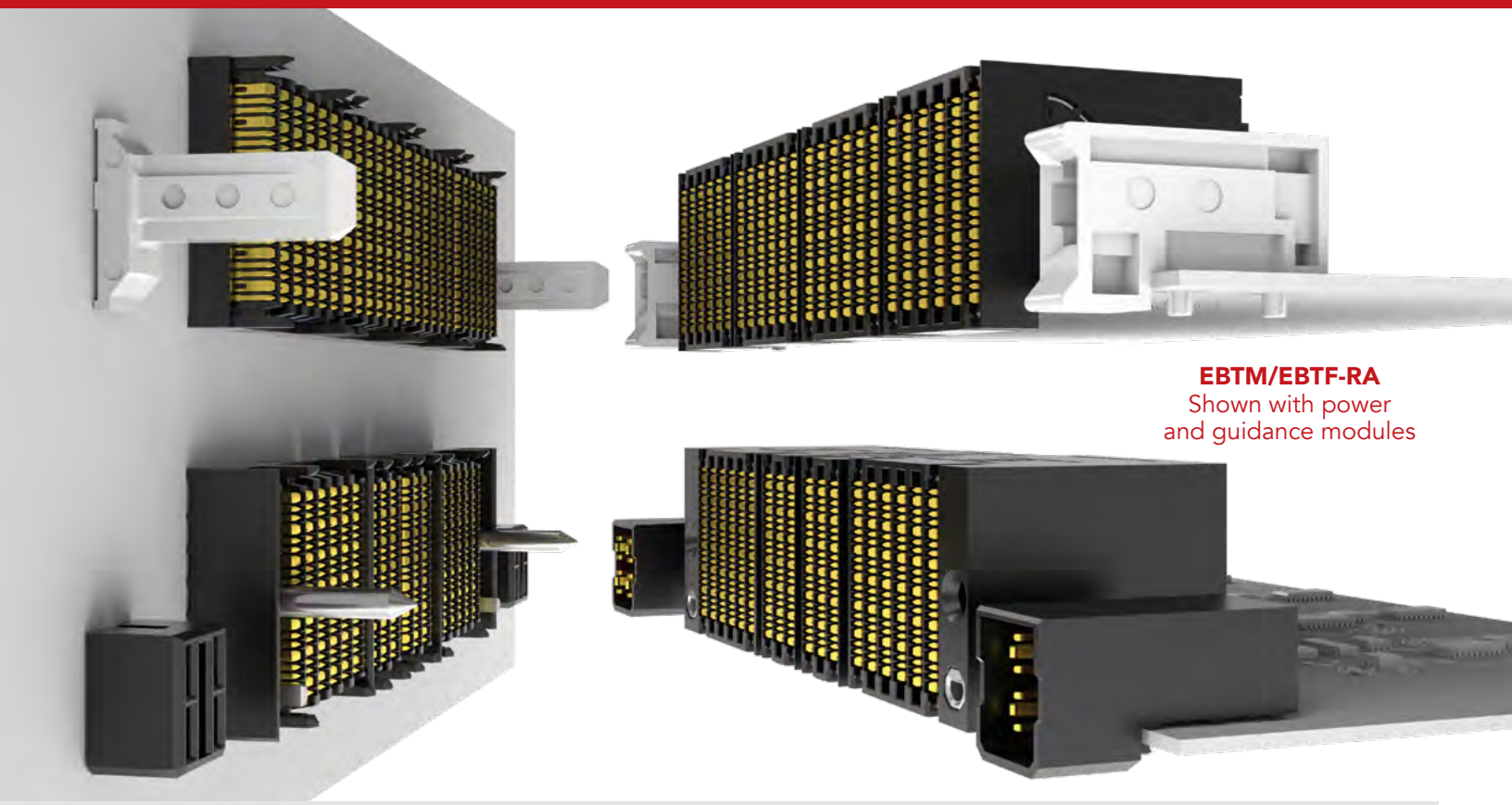



## 1.00 mm PITCH MICRO PLANE SOCKETS

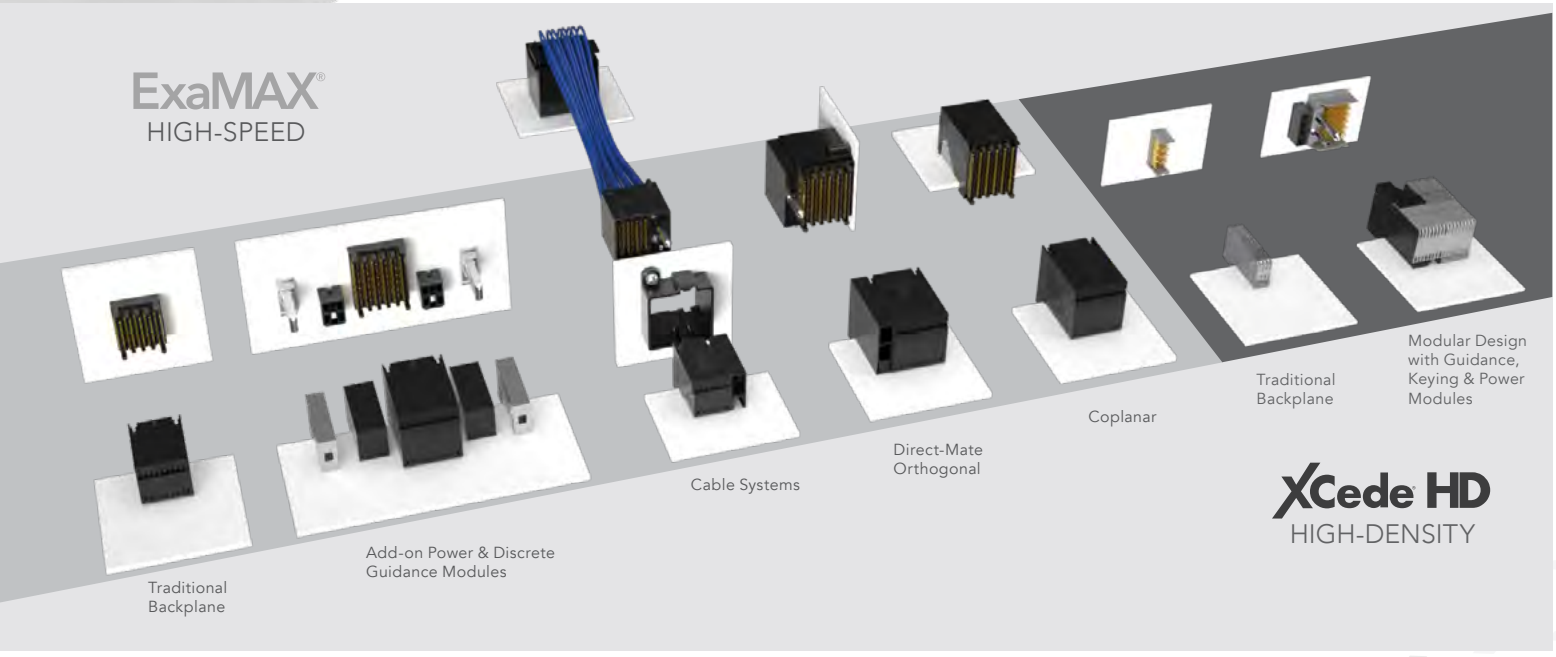
- 40 to 80 I/Os per pair
- Mounts in pairs on same or opposite sides for easy signal routing
- BeCu contacts with large deflection
- PCI Express® Gen 3 compatible
- Mounting flexibility for variable mating card thickness and pass-through applications

# HIGH-SPEED BACKPLANE SYSTEMS

## HIGH-DENSITY • DESIGN FLEXIBILITY • HIGH RELIABILITY



**EBTM/EBTF-RA**
Shown with power
and guidance modules

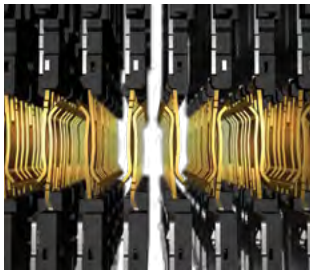


# EXAMAX® HIGH-SPEED BACKPLANE

- Meets industry specifications such as PCI Express®, Intel OPI and VPI, SAS, SATA, Fibre Channel, InfiniBand™ and Ethernet
- Exceeds OIF CEI-28G-LR specification for 28 Gbps standards
- 24 - 72 pair designs (4 and 6 pairs; 6, 8, 10 and 12 columns)
- Wafer design increases isolation for reduced crosstalk
- Press-fit tails provide a reliable electrical connection
- Cable assemblies available (see pages 24 - 25)

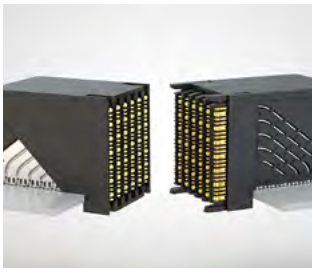
**EBTM/EBTF-RA**

ExaMAX® | PAM4 56 Gbps

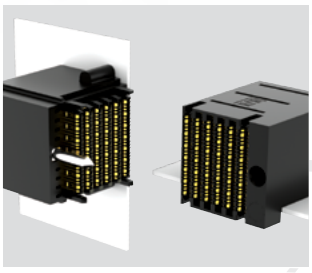


Two reliable points of contact

Staggered differential pair design with an embossed ground plane



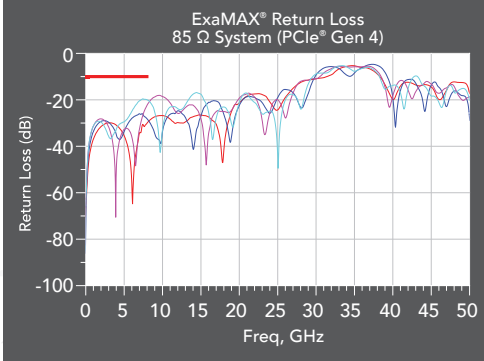
Coplanar available to bypass the midplane (EBTM-RA)

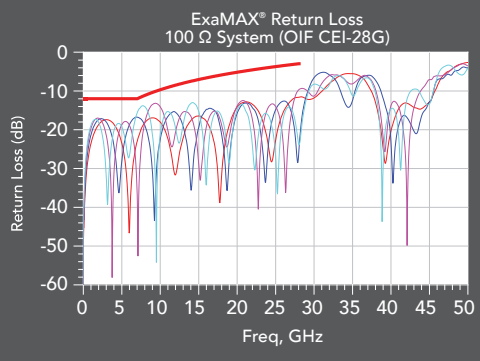


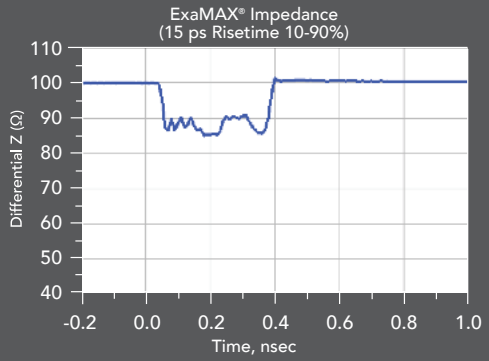
Direct-mate orthogonal (EBDM-RA) eliminates the midplane for a shorter signal path

## PERFORMANCE CHARTS

ExaMAX® is engineered for 92 Ω impedance to address both 85 Ω and 100 Ω applications



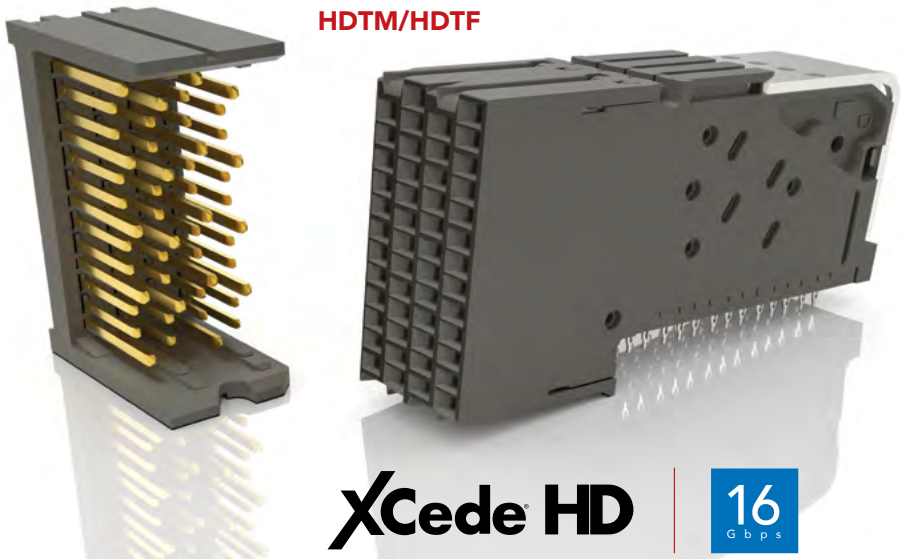



# HIGH-SPEED BACKPLANE SYSTEMS

## XCEDE® HD HIGH-DENSITY BACKPLANE

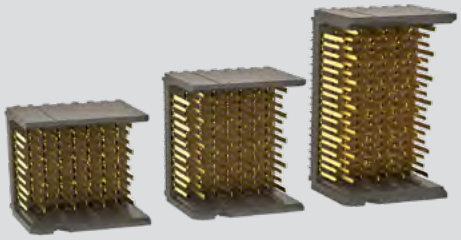
- Small form factor and modular design provides significant space-savings and flexibility
- High-performance system
- Up to 84 differential pairs per linear inch
- 3, 4 and 6-pair designs on 4, 6 and 8 columns
- Integrated power, guidance, keying and end walls available
- 85 Ω and 100 Ω options
- Combine any configuration of modules to create one integrated receptacle (BSP Series); corresponding terminal modules are individually mounted to the backplane



**HDTM/HDTF**

XCede HD | 16 Gbps

### SMALL FORM FACTOR



3, 4 and 6-pair designs
(actual size shown with 8 columns)

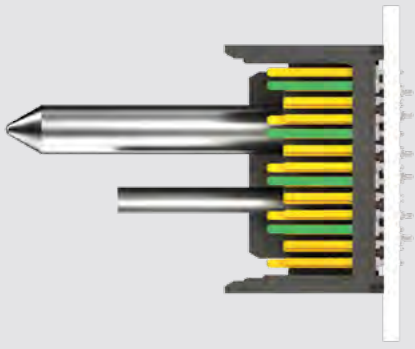
### DENSITY COMPARISON

**XCede® HD**
Up to 84 pairs per linear inch

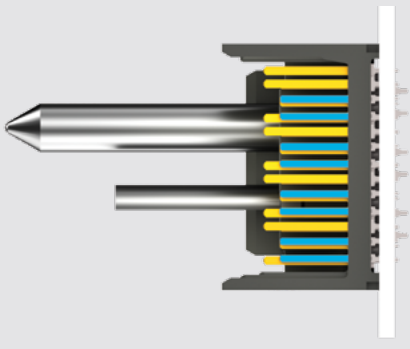
**Traditional Backplane**
Up to 76 pairs per linear inch

(Both shown with six 4-pair, 8 column receptacles)

### SIGNAL/GROUND PIN STAGING



**Ground Pins**
Ground pins mate before signal pin pairs for hot plugging, preventing system downtime



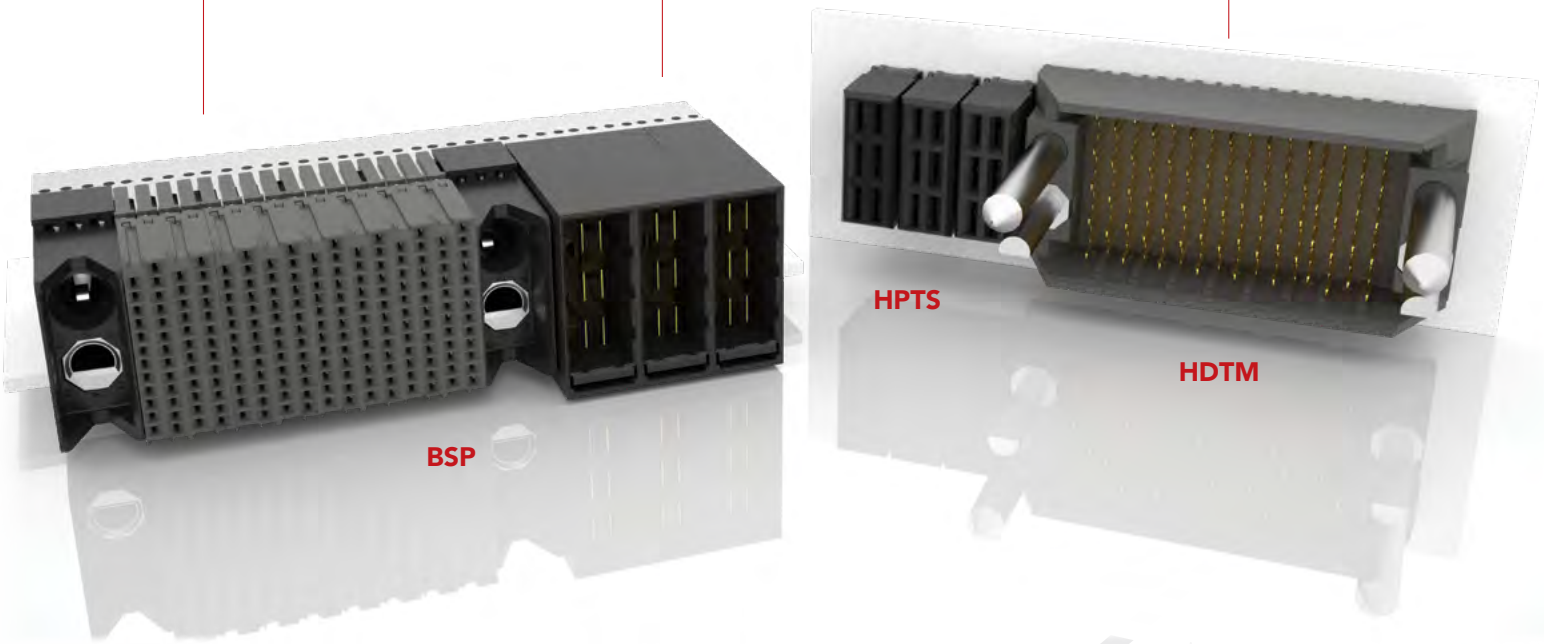
**Signal Pins**
Signal pin pairs achieve up to 3.00 mm contact wipe for a reliable connection

## MODULAR DESIGN

XCede® HD consists of signal, power and keying/guidance modules for incredible design flexibility. The modules can be customized in any configuration to meet specific application requirements. Contact HSBP@samtec.com for more information about building a full XCede® HD solution.

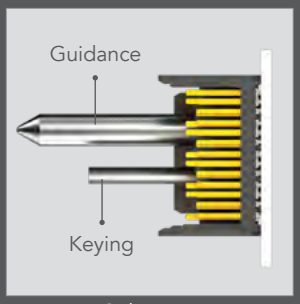
### How to build a full solution:

1. Right-angle modules can be built into a single customizable BSP
2. Build a BSP part by combining any number, in any configuration, of HDTFs, power and keying/guidance modules to create one receptacle
3. Header modules mount to the backplane individually, in any configuration of HDTM and HPTS Series

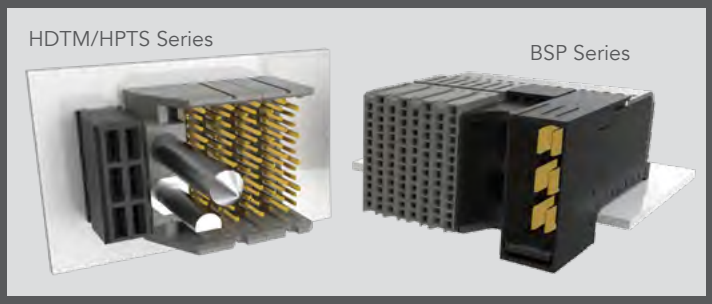





### PRODUCT BREAKDOWN
### (BSP Custom Configuration Shown)




Side View
(HDTM/HPTS Series)




## EXAMAX® BACKPLANE CABLE ASSEMBLIES

- Utilizes Samtec's Eye Speed® ultra low skew twinax cable technology for improved signal integrity, increased flexibility and routability
- Highly customizable with modular flexibility
- Reduce costs due to lower layer counts
- 30 and 34 AWG
- Multiple end options available

ExaMAX® | PAM4 112 Gbps

**EBCF**

**EBTM/ EBCL**

### DESIGN FLEXIBILITY

4 and 6 pairs;
4-16 columns

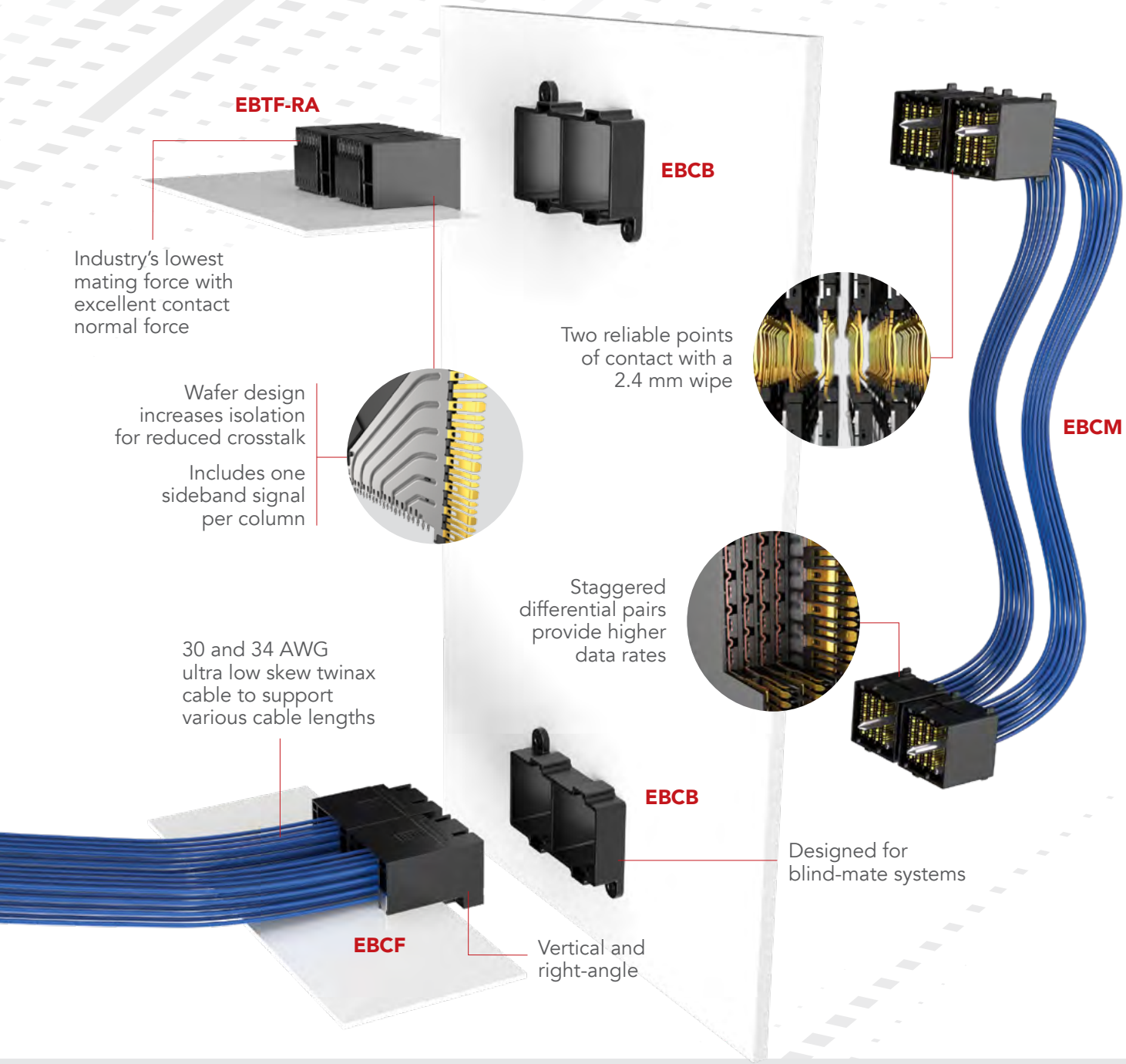
Intermateable with all ExaMAX® connectors

Integrated guidance and keying options

Cable-to-DMO
(Direct Mate Orthogonal)

### HIGH-DENSITY APPLICATION

Increases architectural flexibility by overcoming the limitations of traditional connector-to-connector backplane

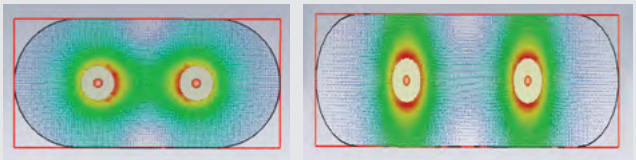



## ULTRA LOW SKEW TWINAX CABLE

Samtec's Eye Speed® co-extruded twinax cable technology eliminates the performance limitations and inconsistencies of individually extruded dielectric twinax cabling, improving signal integrity, bandwidth and reach for high-performance system architectures.

- Tight coupling between signal conductors
- Improved bandwidth and reach
- Improved signal integrity and eye pattern opening

EYE® SPEED CABLE



✔ **Good** design coupling with co-extruded low skew twinax

✖ **Bad** design coupling with paralleled pair twinax

# HIGH-SPEED CABLE ASSEMBLIES

## EYE SPEED® COAX & TWINAX CABLE • MIX & MATCH

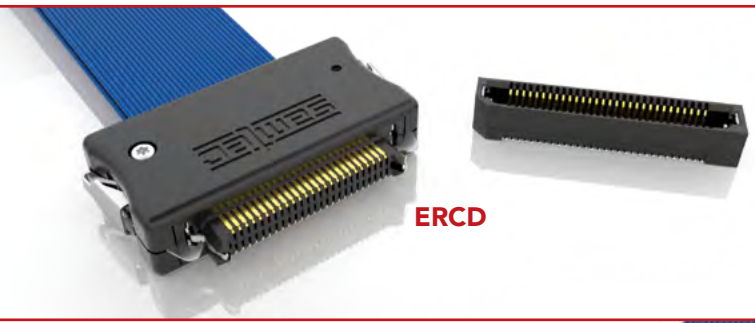
Samtec offers both sides of the system – high-speed connectors and mating cable assemblies.
This vertical integration allows for the ultimate combination of design flexibility and customer service.

### HIGH-DENSITY ASSEMBLIES

- NovaRay® up to 112 Gbps PAM4; 34 AWG ultra low skew twinax (NVAC/NVAM-C)
- SEARAY™ up to 14 Gbps; 34 AWG coax (ESCA), and 36 AWG coax or 34 AWG twinax (SEAC)
- Mates with NovaRay®, SEARAY™ and SEARAY™ 0.80 mm (pages 4-7)

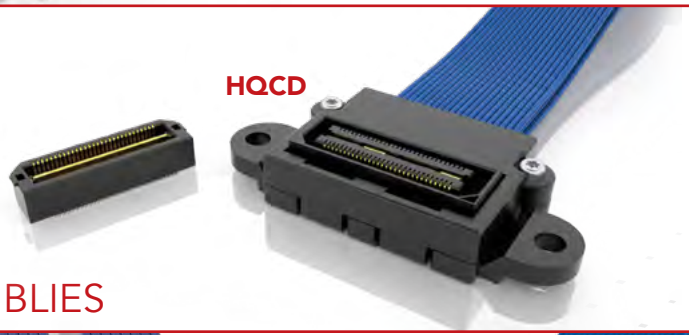

### EDGE RATE® ASSEMBLIES

- Up to 14 Gbps
- 34 AWG coax (ERCD); 30 AWG twinax (ERDP)
- Mates with 0.80 mm Edge Rate® connectors (pages 10 - 11)



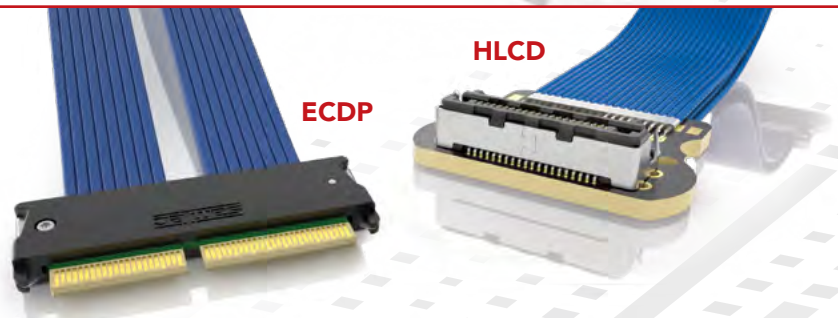

### Q SERIES® ASSEMBLIES

- Up to 14 Gbps
- 34 and 38 AWG coax; 30 AWG twinax
- 0.50 mm (HQCD/HQDP) and 0.80 mm pitch (EQCD/EQDP/EQRD)
- Mates with Q Series® connectors (pages 12 - 13)




### ULTRA MICRO & EDGE CARD ASSEMBLIES

- Up to 14 Gbps
- 38 AWG coax mates with 0.50 mm pitch Razor Beam™ (HLCD; pages 14 - 15)
- 30 AWG twinax mates with 0.80 mm pitch edge card sockets (ECDP; pages 16 - 17)
- Mating assembly for PCI Express® edge cards (PCIEC; page 19)



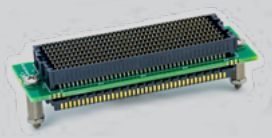



**samtec.com/high-speed-cables**

# EVALUATION AND DEVELOPMENT KITS

## SIMPLIFY THE DESIGN PROCESS • REDUCE TIME TO MARKET

| SI Evaluation Kits | Name | Kit Number | Description |
|---|---|---|---|
|  | AcceleRate® HD SI Evaluation Kit | REF-212056-X.XX-XXX | The AcceleRate® HD SI Evaluation Kit routes eight high-precision differential pairs in an ADM6/ADF6 Series mated connector pair with user-selected stack heights and RF connector options. |
|  | ExaMAX® Backplane SI Evaluation Kit | REF-205463-01 | This SI test platform routes eight, high-precision differential pairs over a backplane using ExaMAX® connectors in a 4x10 configuration. It supports configurable backplane trace lengths via user-selected paddleboard placement. |
|  | HSEC6-DV SI Evaluation Kit | REF-213543-X.XX-XX | SI test platform for evaluating 0.60 mm Edge Rate® vertical high-speed edge card connectors. |
|  | HSEC8-DP SI Evaluation Kit | REF-210637-X.XX-XX | SI test platform for evaluating 0.80 mm pitch Edge Rate® differential pair high-speed edge card connectors. |
|  | NovaRay® SI Evaluation Kit | REF-212761-X.XX-XX | The NovaRay® SI Evaluation Kit routes sixteen high-precision differential pairs in an NVAM/NVAF Series mated connector pair with user-selected stack heights and RF connector options. |

| FPGA Kits | Name | Kit Number | Description |
|---|---|---|---|
|  | FMC+ HSPC Loopback Card | REF-197618-01 | Samtec's VITA 57.4 FMC+ HSPC Loopback Card provides FPGA designers an easy to use loopback option for testing low-speed and high-speed multi-gigabit transceivers on any FPGA development board or FPGA carrier card. |
|  | FMC+ HSPC/HSPCe Loopback Card | REF-197693-01 | Samtec's VITA 57.4 FMC+ HSPC/HSPCe Loopback Card provides an easy to use loopback option for testing low and high-speed multi-gigabit transceivers on any FPGA development board or carrier card and, is an ideal substitute for 28 Gbps test equipment. |
|  | FMC+ Extender Card | REF-212564-01 | Samtec's VITA 57.4 FMC+ Extender Card increases board-to-board spacing on any FPGA development board or carrier card. |

# ONLINE TOOLS

## DESIGN • PERFORMANCE • SIMULATION

### QUICKLY BUILD MATED CONNECTOR SETS ONLINE

- Wide variety of search parameters and filters: pitch, signaling, stack height, pin count, etc.
- Easily sort search results to find the right mated set
- Live chat with engineers for custom options
- Immediately download models and open Specs Kit
- **samtec.com/solutionator**

Solutionator®
DESIGN IN A MINUTE


### REAL-TIME HIGH-SPEED PERFORMANCE SIMULATIONS

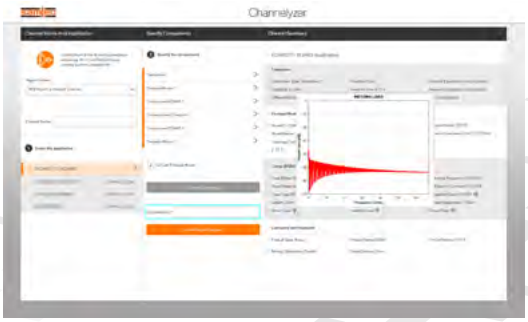
- Integrates and blends data from models to project performance in the user-defined system
- Outputs include:
  - Insertion and return loss
  - Crosstalk (NEXT and FEXT)
  - Eye diagrams
- **samtec.com/simulator**

Simulator™
SIMULATE IN A MINUTE

### ONLINE FULL CHANNEL SIMULATION & ANALYSIS

- Channel modeling based on inputs provided by the user
- Results for standards and transceivers at varying equalization levels and data rates
- Individual receiver performance data per Tx/Rx assignments
- Channel overview and strategies for improved performance
- **samtec.com/channelyzer**

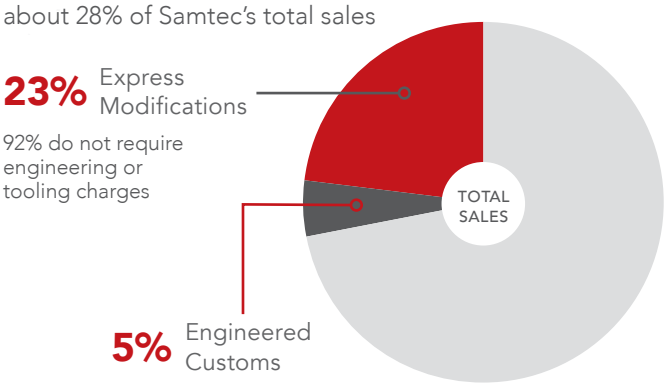
Channelyzer®
FULL CHANNEL DESIGN



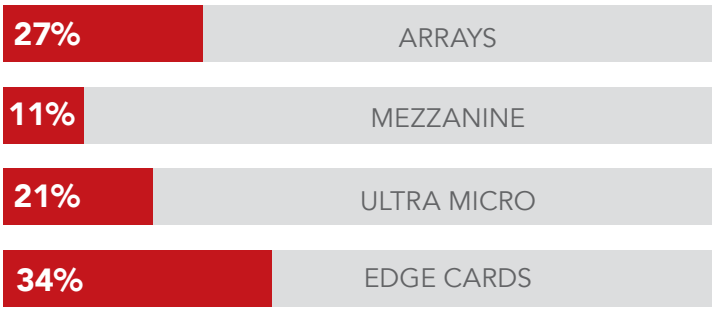
# MODIFIED & CUSTOM SOLUTIONS

## WILLINGNESS, SUPPORT & EXPERTISE

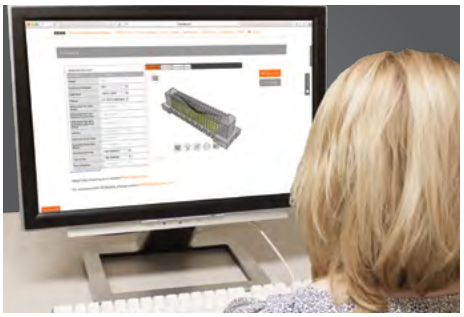
Customs and Modifications make up about 28% of Samtec's total sales




A substantial percentage of Samtec's high-speed board-to-board product segments are custom

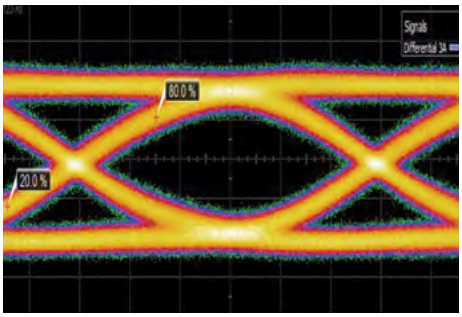



**INDUSTRY LEADING CUSTOMER SERVICE**



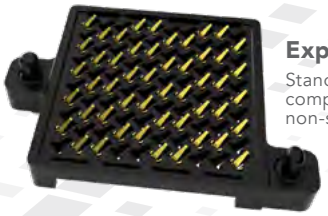
**FLEXIBLE IN-HOUSE MANUFACTURING**

**SIGNAL INTEGRITY EXPERTISE**

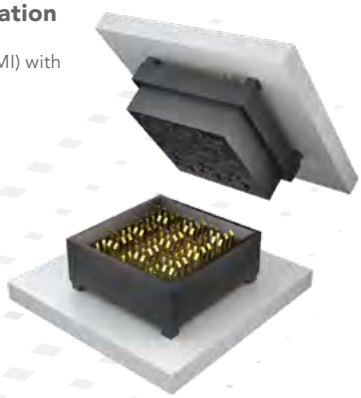



## FLEXIBLE CAPABILITIES

- Full engineering, design and prototype support
- Design, simulation and processing assistance
- Quotes and samples turned around in 24 hours
- Flexible, quick-turn manufacturing
- Dedicated Application Specific Product engineers and technicians
- Modified or custom options for board level connectors and cable assemblies including: contacts, bodies, stamping, plating, wiring, molding, ruggedizing features and much more



**Express Modification**
Standard low-profile compression array (GMI) with non-standard pin-out



**Engineered Custom**
Custom body and pin layout with rotated pairs to cancel magnetic coupling

Contact the Application Specific Products Group at **asp@samtec.com** for express modifications or engineered customs.

# SEVERE ENVIRONMENT TESTING

## INDUSTRIAL, MILITARY, AUTOMOTIVE & OTHER EXTREME APPLICATIONS

Severe Environment Testing (SET) is a new Samtec initiative to test our products beyond typical industry standards and specifications, many set forth by common requirements for rugged industries.

Several of our products undergo additional testing to ensure they are more than suitable for industrial, military, automotive and other extreme applications. Please visit **samtec.com/set** or contact **set@samtec.com** for more information and test results when available.

### SET QUALIFIED PRODUCTS:

- Tiger Eye™ 1.27 mm Pitch Micro Rugged System (TFM/SFM)
- SEARAY™ 1.27 mm Pitch High-Density Arrays (SEAM/SEAF)
- SEARAY™ 0.80 mm Pitch Ultra-High Density Arrays (SEAM8/SEAF8)
- Razor Beam™ 0.50 mm Pitch Hermaphroditic Strips (LSHM)
- .100" Pitch Square Post Header and Socket (TSM/SSM)
- .050" Pitch Header and Socket (FTSH/CLP)
- Edge Rate® 0.80 mm Pitch Rugged High-Speed Strips (ERM8/ERF8)

### PRODUCTS TO BE TESTED:

- Q Strip® 0.50 mm Pitch Low Profile Ground Plane Connectors (QTH/QSH)
- Q Rate® 0.50 mm Pitch Slim Body Ground Plane Connectors (QRM8/QRF8)
- Edge Rate® 0.80 mm Pitch Edge Card Socket (HSEC8)



### TESTING INCLUDES:

**MATING/UNMATING/DURABILITY:** Measures the change in LLCR and mating/unmating after products have been cycled and exposed to various environmental conditions (100% relative humidity, 250 cycles).

**MECHANICAL SHOCK/RANDOM VIBRATION/LLCR:** Measures the product's ability to withstand a series of mechanical shocks and random vibration. LLCR is a before and after check for damage (40G Peak, 11 ms, Half Sine & 12gRMS, 5 – 2,000 Hz, 1 Hour/Axis).

**MECHANICAL SHOCK/RANDOM VIBRATION/ NANOSECOND EVENT DETECTION:** Measures the product's ability to withstand a series of mechanical shocks and vibrations. Event detection monitors continuity during testing (40G Peak, 11 ms, Half Sine & 12gRMS, 5 – 2,000 Hz, 1 Hour/Axis).

**TEMPERATURE CYCLING:** Evaluates the product's reliability through thermal fatigue by cycling through two temperature extremes (-65 °C to 125 °C, 30 minute dwell time at each extreme; 500 cycles).

**NON-OPERATING CLASS TEMPERATURE:** Determines the temperature range at which the product operates at peak level (-55 °C to 125 °C at 100 cycles and -65 °C to 125 °C at 100 cycles; 200 total cycles).

**DWV AT ALTITUDE:** Measures the peak voltage that a product can withstand before dielectric breakdown at high altitudes (70,000 feet).

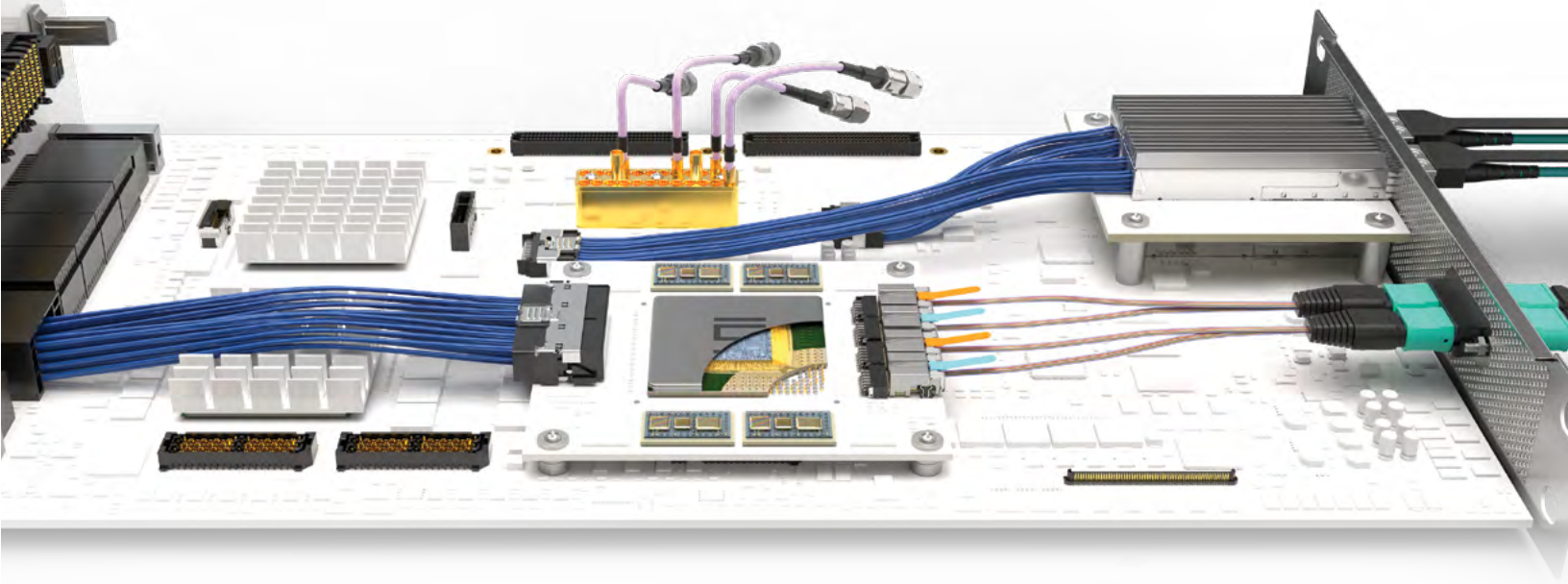
**ELECTROSTATIC DISCHARGE (ESD):** Measures the level of electrostatic voltage the product can withstand (exposure to 5k, 10k and 15k Volts, repeated 10 times).

# TECHNOLOGY CENTERS

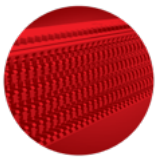
## COMPLETE SYSTEM OPTIMIZATION FROM SILICON-TO-SILICON™

Samtec's Technology Centers offer high-level design and development of advanced interconnect systems and technologies, along with industry-leading signal integrity expertise which allows us to provide effective strategies and technical support for optimizing the entire serial channel of high-performance systems.

Because Samtec's Technology Centers are not limited by the boundaries of traditional business units, we are able to work in a fully integrated capacity that enables true collaboration and innovation to support the demands of today, and the challenges of tomorrow.



## INTEGRATION LEADS TO INNOVATION



### ADVANCED INTERCONNECTS

High precision stamping, plating, molding and automated assembly

### HIGH-SPEED CABLE

In-house R&D and manufacturing of precision extruded cable and assemblies

### OPTICS

R&D, design, development and support of micro optical engines and assemblies

### SYSTEM SIGNAL INTEGRITY

Full channel signal and power integrity analysis, testing and validation services

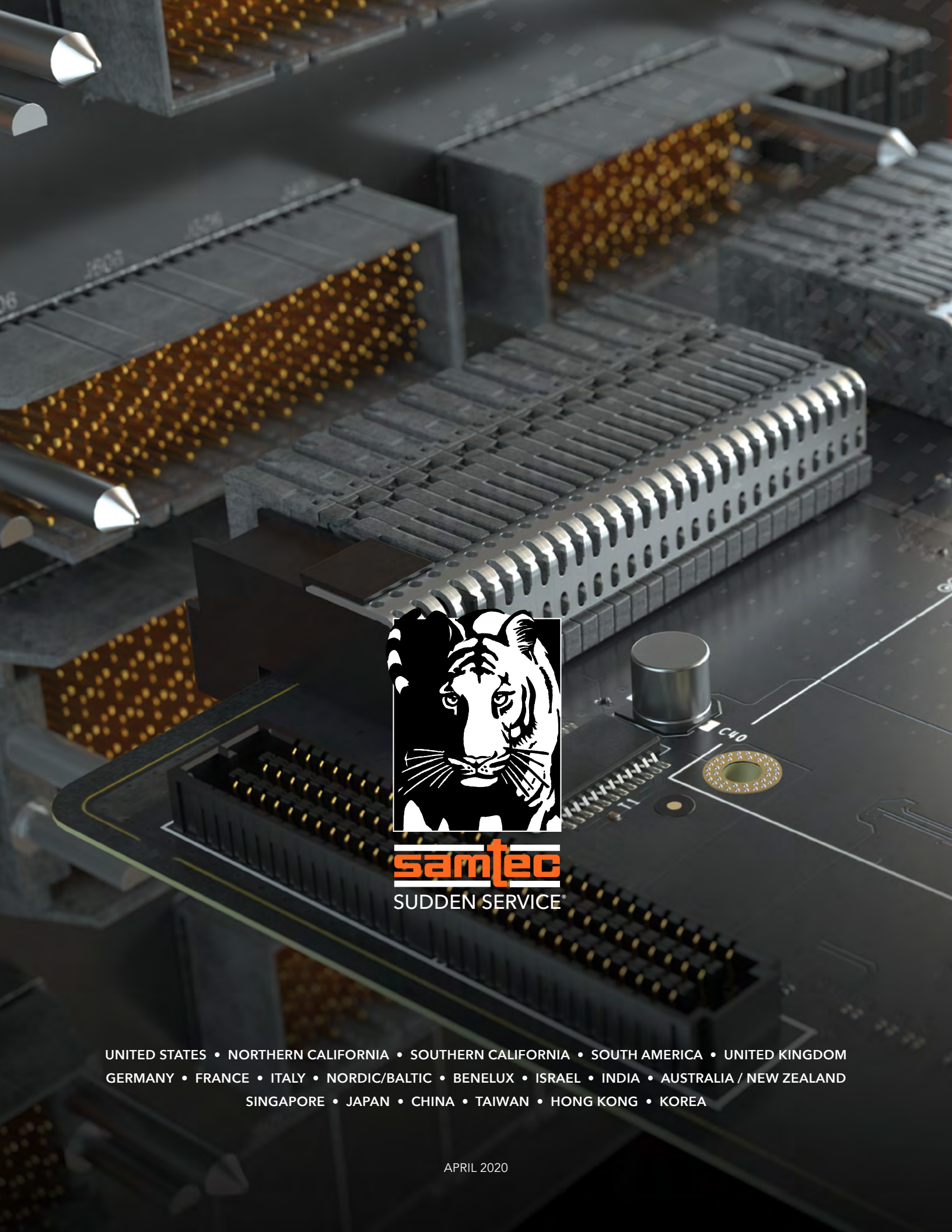
### PRECISION RF

RF interconnect design and development expertise, with testing to 70 GHz

### MICROELECTRONICS

Advanced glass substrate and IC packaging design, support and manufacturing capabilities

**samtec.com/tech-centers**



samtec
SUDDEN SERVICE®

UNITED STATES • NORTHERN CALIFORNIA • SOUTHERN CALIFORNIA • SOUTH AMERICA • UNITED KINGDOM
GERMANY • FRANCE • ITALY • NORDIC/BALTIC • BENELUX • ISRAEL • INDIA • AUSTRALIA / NEW ZEALAND
SINGAPORE • JAPAN • CHINA • TAIWAN • HONG KONG • KOREA

APRIL 2020