ARTIFICIAL INTELLIGENCE

CONNECTIVITY SOLUTIONS FOR AI & MACHINE LEARNING APPLICATIONS

ARTIFICIAL INTELLIGENCE

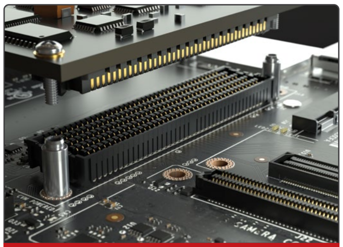
& MACHINE LEARNING CONNECTIVITY

Rapidly-growing technologies like Artificial Intelligence are driving new system architectures that demand increased speeds, bandwidths, frequencies and densities, along with scalability and configurability. To meet these challenges, Samtec offers innovative connectivity solutions – from testing and development to interconnects that meet or exceed industry standards – ideal for next generation AI/ML applications.

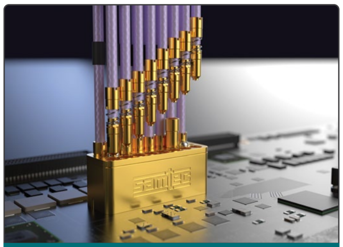
samtec.com/AI

Interconnect Solutions for Emerging Architectures

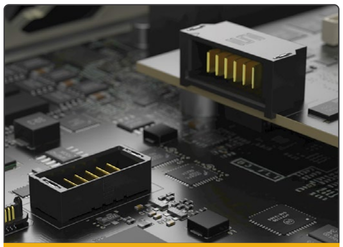
High-Performance • Thermal Efficiencies • Small Form Factors • Extreme Density • Signal Integrity



HIGH-SPEED MEZZANINE & HIGH-DENSITY ARRAYS



HIGH-PERFORMANCE TEST & PRECISION RF



ULTRA MICRO / HIGH POWER

HIGH-PERFORMANCE CABLE SYSTEMS

AI/ML Applications

AI **CHIPSETS**

COMPUTING PLATFORMS • REFERENCE DESIGNS • CHARACTERIZATION KITS & BOARDS

Samtec offers a full line of high-density, high-performance interconnects to support the increasing performance demands of AI chipsets (e.g. SoC, CPU, GPU, TPU, Digital and Analog Compute). Samtec interconnects help link multiple AI reference designs to prototype AI system development.

HIGH-DENSITY ARRAYS | For additional solutions, please visit **samtec.com/Arrays**.

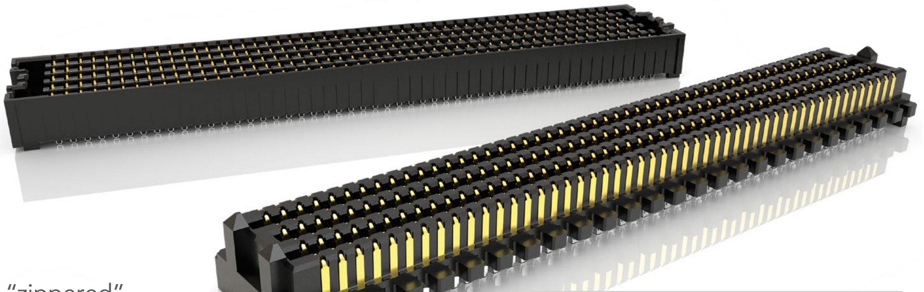
SEARAY™ High-Density Open-Pin-Field Arrays

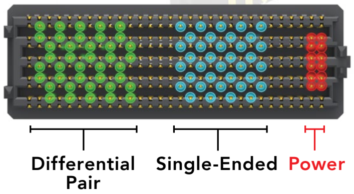
SEARAY™

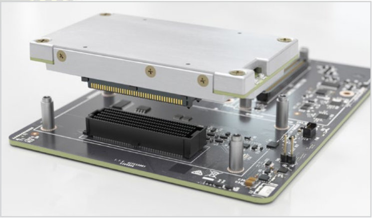
NRZ 28 Gbps

PAM4 56 Gbps

- SEARAY™ 1.27 mm pitch open-pin-field arrays (SEAM/SEAF Series)
- Maximum routing and grounding flexibility
- Performance to 28 Gbps NRZ/56 Gbps PAM4 (up to 32 Gbps NRZ at certain stack heights; contact **sig@samtec.com**)
- VITA 57 (FMC, FMC+), VITA 74 (VNX), PISMO™ 2 certified
- Rugged Edge Rate® contact system can be “zippered” during mating/unmating
- Up to 560 I/Os; 7 – 40 mm stack heights
- Vertical, right-angle and press-fit designs
- Meets Extended Life Product™ (E.L.P.™) standards







Performance to 28 Gbps NRZ , hundreds of I/Os, and high-density stacking capabilities are ideal for SoM/CoM applications.

PRECISION RF | For additional solutions, please visit **samtec.com/RF**.

Precision RF Board Connectors

- Microwave/mmWave interconnects
- Compression board level interconnects for stripline or microstrip transmission
- Launch designs, custom product solutions, simulations, and physical test and measurement verifications
- High-frequency bands from 40 GHz to 90 GHz
  - 1.35 mm, performance up to 90 GHz
  - 1.85 mm, 2.40 mm, 2.92 mm, SMA, SMPM, SMP

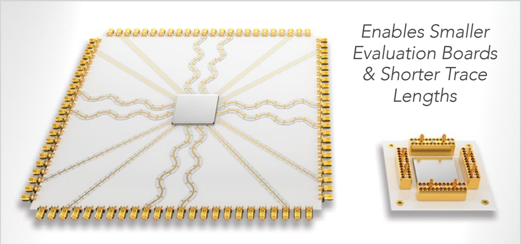
HIGH-PERFORMANCE TEST | For additional solutions, please visit **samtec.com/BullsEye**.

Bulls Eye® High-Performance Test to 70 GHz

The high-density array designs and advanced cabling solutions within Samtec's Bulls Eye® product family support test and measurement applications to 70 GHz (BE70A Series).

BULLSEYE®
TEST POINT SYSTEM

- Compression interface to the board provides easy on/off and eliminates soldering costs
- High-density, space-saving design
- Provides 4x the high-bandwidth signals of traditional SMAs in the same amount of space
- Enables smaller evaluation boards, shorter trace lengths & fewer layers
- RF Group: personal support for meeting specific challenges; contact **RFGroup@samtec.com**


Enables Smaller Evaluation Boards & Shorter Trace Lengths

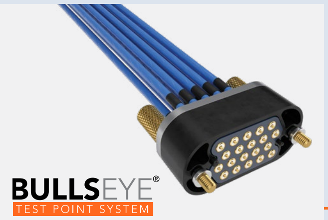
Traditional with SMAs vs. Bulls Eye®

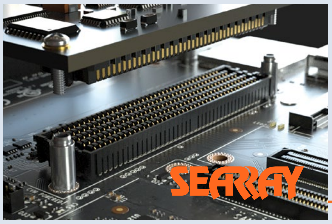
APPLICATION: Xilinx® Virtex® UltraScale™ FPGA VCU1287 Characterization Kit

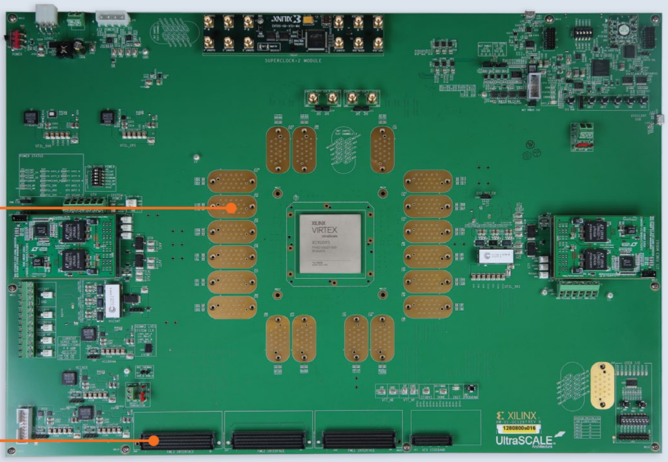
The Xilinx® VCU1287 Kit leverages Samtec SEARAY™ VITA 57.1 FPGA Mezzanine Card (FMC) High Pin Count (HPC) Connectors and Bulls Eye® High-Performance Test Point System for **flexibility, density and high-speed connectivity**.

For additional information, visit:

- **samtec.com/bullseye**
- **samtec.com/searay**
- **samtec.com/standards**







AI **EMBEDDED PLATFORMS**

SYSTEM ON MODULES (SoM) • COMPUTER ON MODULES (CoM) • CARRIER CARDS

AI systems can consist of multiple SoMs / CoMs, and many of these new systems require increased speed and density in very small footprints. Samtec offers a variety of high-density, high-performance, small form factor interconnect solutions ideal for routing system I/O and peripherals within these new architectures.

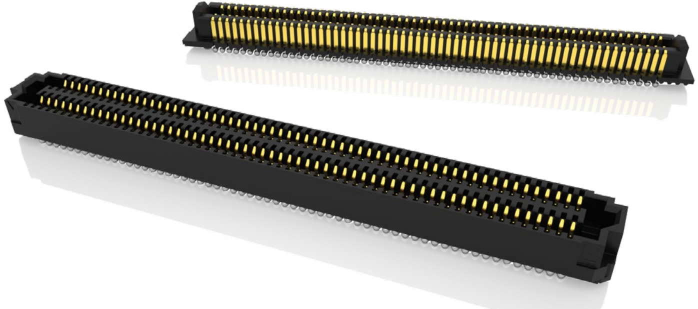
HIGH-PERFORMANCE ARRAYS | For additional solutions, please visit **samtec.com/Arrays**.

AcceleRate® HD Ultra-Dense, Slim Body Arrays

- Up to 400 I/Os in a 4-row design
- Open-pin-field design for grounding & 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
- PCIe® 5.0 capable

ACCELERATE® HD

PAM4 56 Gbps



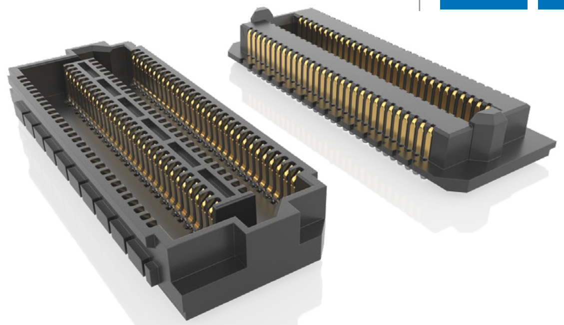
AcceleRate® HP High-Performance Arrays

- Flexible open-pin-field design
- Cost optimized, extreme performance solution
- Four rows with up to 400 total pins (roadmap to 1,000+ pins) on a 0.635 mm pitch
- Low-profile 5 mm stack height, up to 10 mm
- Data rate capable with PCIe® 5.0 and 100 GbE

ACCELERATE® HP

NRZ 56 Gbps

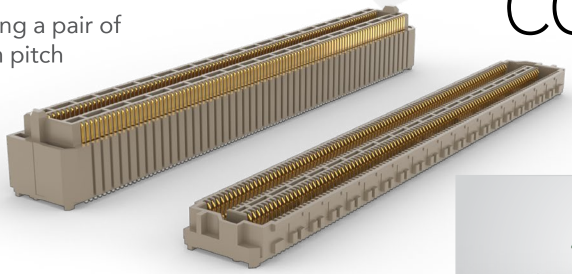
PAM4 112 Gbps

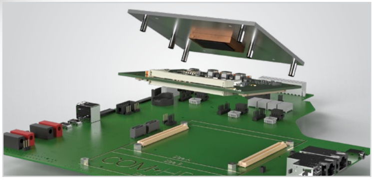


COM-HPC® High-Density Interconnect System

- Meets the COM-HPC® standard for high-performance CoMs
- Provides system and interface flexibility by adopting a pair of 400 pin connectors (800 pins total) on a 0.635 mm pitch
- Up to 32 Gbps per channel (4,096 Gbps max aggregate, 2,088 Gbps/in²)
- Ultra-high speed performance and extended connectivity, with limitless scalability
- Data rate capable with PCIe® 5.0 and 100 GbE
- Visit samtec.com/COMHPC for additional information

COM-HPC®





Client Carrier with Samtec COM-HPC® module. Image courtesy of congatec GmbH.

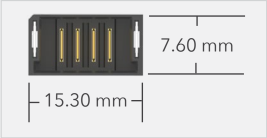
PCI-SIG®, PCI Express® and the PCIe® design marks are registered trademarks and/or service marks of PCI-SIG. The COM-HPC® name and logo are registered trademarks of the PCI Industrial Computers Manufacturers Group.

HIGH POWER SYSTEMS | For additional solutions, please visit **samtec.com/Power**.

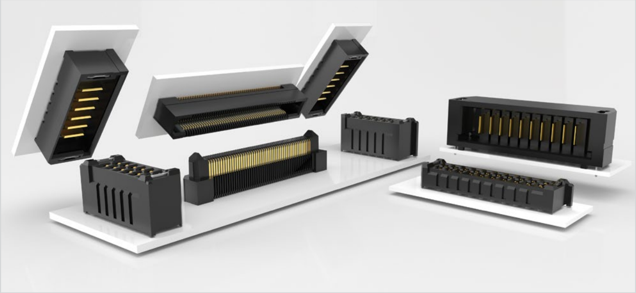
mPOWER® Ultra Micro High Power Interconnects

- 2–10 positions
- Micro 2.00 mm pitch
- Up to 18 A per blade
- 5 mm to 20 mm stack heights
- Design flexibility as a power-only system or a two-piece system for power/signal applications
- Use with Samtec's high-speed mezzanine connector systems for a unique power / signal combo system
- Selectively loading contacts achieves customer specific creepage and clearance requirements; please contact asp@samtec.com to discuss your application

MAX
18
Amps



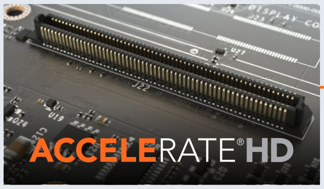
4 position UMPT Series



Pair mPOWER® with Samtec high-speed connectors (ERF5/ERM5 Series shown) for a signal / power combo, or use alone as a power-only system.

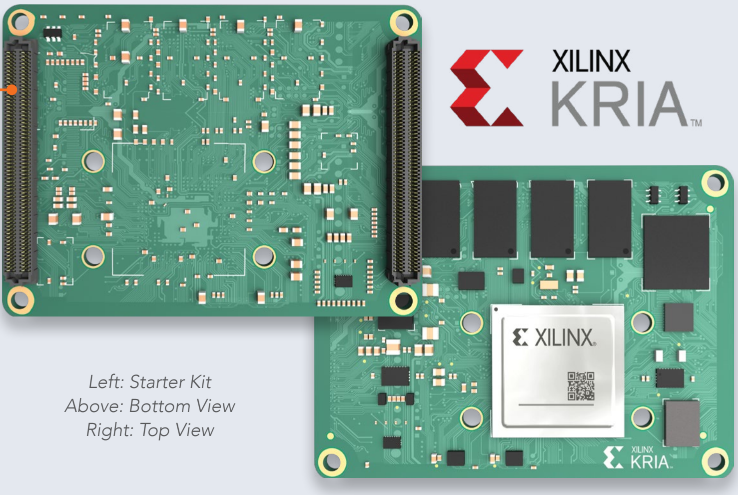
APPLICATION: Xilinx® Kria™ Adaptive System-on-Modules

Xilinx® Kria™ Adaptive SoMs offer unmatched AI performance via pre-built hardware and software.



Kria™ features a pair of 240-pin AcceleRate® HD Ultra-Dense Slim Body Arrays. The small form factor and 56 Gbps PAM4 performance enable AI edge applications.

For additional information, please visit: samtec.com/accelerateHD.



Left: Starter Kit
Above: Bottom View
Right: Top View

AI ACCELERATORS

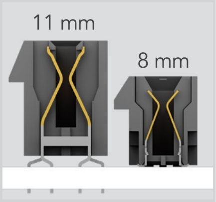
LOW-LATENCY • HIGH BANDWIDTH • PERFORMANCE SCALABILITY

Samtec offers a full line of high-performance cables and connectors that support the bandwidth, scalability and density demands of AI Accelerators. Solutions include high-speed connectors and high-performance cable systems that support a variety of industry-standard form factors, including PCIe® CEM AIC and PECFF.

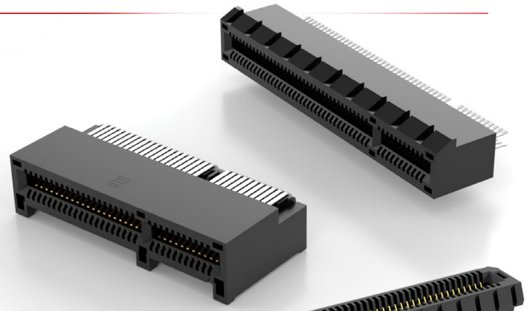
HIGH-SPEED EDGE CARD | For additional solutions, visit **samtec.com/PCIe** & **samtec.com/EdgeCard**.

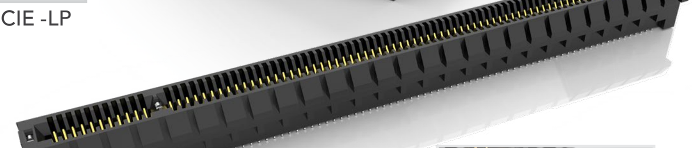
PCI Express® High-Speed Edge Card Sockets

- PCIe® 3.0 Capable (PCIE Series)
  - 1.00 mm (.0394") pitch
  - Supports 4, 8 and 16 PCI Express® links
  - Vertical, right-angle or edge mount
- PCIe® 4.0 Capable
  - Low-profile (PCIE-LP) and slim body (PCIE-G4) designs
  - 1.00 mm pitch in x1 (36P), x4 (64P), x8 (98P) and x16 (164P) configurations
  - In Development: through-hole tails (PCIE-LP)
- PCIe® 5.0 Capable (PCIE-G5)
  - Design-in today for future-proof data rates
  - Mates with standard PCIe® expansion cards
  - 1, 4, 8 and 16 PCI Express® 5.0 link options
  - In Development: 56 Gbps NRZ edge card system

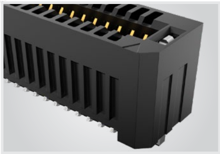


PCIE PCIE -LP

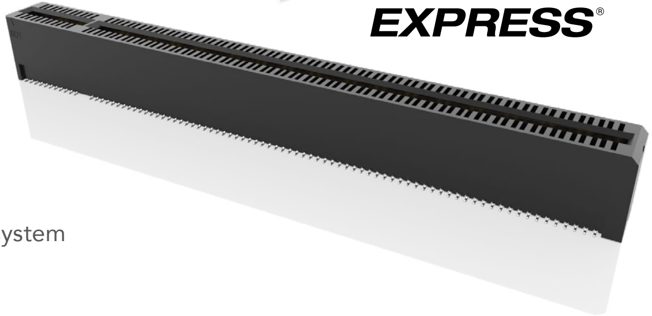




PCI EXPRESS®



PCIe® 4.0 slim body socket with Edge Rate® contacts (PCIE-G4)

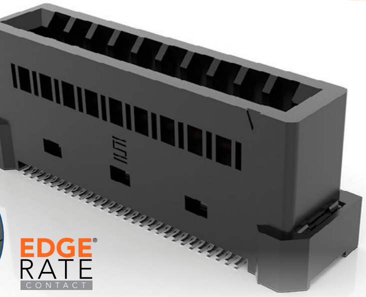


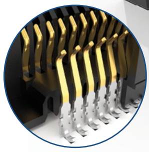
Generate™ High-Speed Edge Card Socket

- 0.60 mm pitch differential pair system
- PCIe® 5.0 capable; meets Gen-Z™ specifications
- Compliant to SFF-TA-1002: x4 (1C), x8 (2C), x16 (4C & 4C+)
- Rugged Edge Rate® contact system, optimized for signal integrity performance and high cycle life
- Standard weld tab for mechanical strength
- 112 Gbps PAM4 system in development

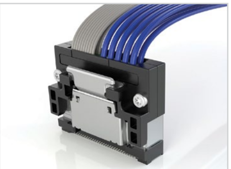
GENERATE™

PAM4 56 Gbps





EDGE® RATE CONTACT



High-speed cable system in development.

PCI-SIG®, PCI Express® and the PCIe® design marks are registered trademarks and/or service marks of PCI-SIG.

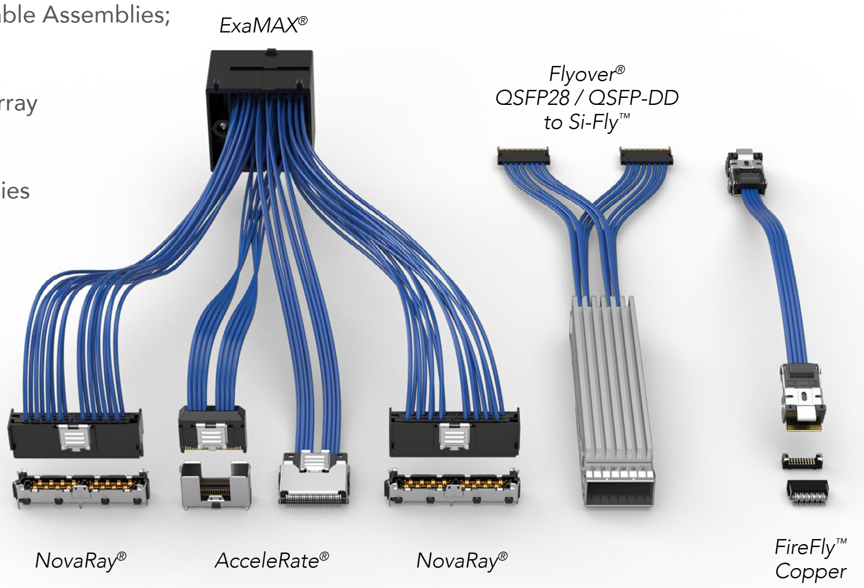
FLYOVER® TECHNOLOGY | For additional solutions, visit **samtec.com/Flyover.**

Samtec Flyover® systems help extend signal reach and density to achieve next gen speeds by routing signals via ultra low skew twinax cable versus through lossy PCB.

FLYOVER® PAM4 56 Gbps PAM4 112 Gbps

Flyover® Solutions:

- Direct Attach Flyover® QSFP28 & QSFP-DD Cable Assemblies; QSFP-DD800 solutions in development
- NovaRay® Extreme Density, 112 Gbps PAM4 Array Cable Assemblies
- AcceleRate® Slim Direct Attach Cable Assemblies
- Si-Fly™ 112 Gbps PAM4 Ultra-High Density Co-Packaged Cable System
- FireFly™ Future-Proof Copper and Optical Ultra Micro Flyover System™
- ExaMAX® High-Speed Backplane Systems



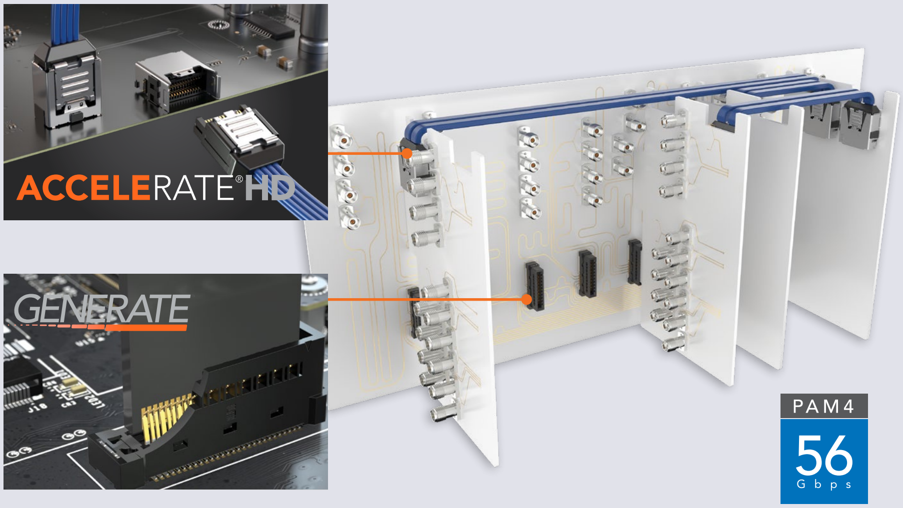
APPLICATION: Samtec 32 GT/s Test Platform for AI & ML Applications

Leveraging Gen Z™ PECFF, **Samtec's innovative, scalable test platform** validates Signal Integrity evaluation with realistic topology loss ranges over Samtec high-speed connector and cabling solutions.

Optimized for performance, AcceleRate® HD **slim, high-density cable** assemblies and Generate™ **high-speed edge card** connectors enable 32 GT/s PCIe® 5.0 speeds in targeted AI-HPC architectures.

For additional information, please visit:

- **samtec.com/accelerate**
- **samtec.com/edgecard**



AI **APPLICATION SPECIFIC**

ULTRA-LOW LATENCY • HIGH DATA RATES • LOW PING

Emerging application-specific AI hardware systems require optimized channel performance to support increased data rates, smaller footprints, and longer signal reach. Samtec offers a wide variety of high-performance cabling solutions engineered to support extreme data rates and density, while providing optimized signal integrity and design flexibility.

HIGH-PERFORMANCE CABLE SYSTEMS | For additional solutions, visit **samtec.com/HighSpeedCable.**

Si-Fly™ 112 Gbps PAM4 Co-Packaged Cable System

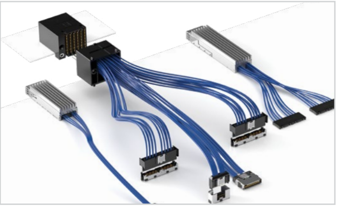
- Copper Flyover® cable assembly in development; co-packaged interconnect configuration for advanced 112G+ data rates on the roadmap
- Ultra-high density configuration adjacent to the IC package, eludes the BGA, routing signals directly from the silicon package through a long-reach cable, providing 5x the reach of traditional PCB solutions
- Up to 16 pairs in an incredibly low 3.4 mm profile, which allows connectors to reside under heat sinks or other cooling hardware
- Extreme channel performance: 112 Gbps PAM4 per lane, enabling 25.6 TB aggregate, with a path to 51.2 TB

SI-FLY™

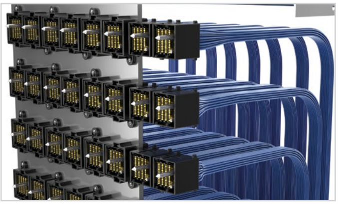
NRZ 56 Gbps | PAM4 112 Gbps

ExaMAX® High-Speed High-Density Backplane Cable System

- Samtec's Eye Speed® 30 & 34 AWG ultra low skew twinax cable technology provides improved signal integrity, increased flexibility and routability
- Highly customizable with modular flexibility
- Reduced costs due to lower PCB layer counts
- Two reliable points of contact with a 2.4 mm wipe
- Multiple end options provide increased density, flexibility and space savings



FireFly™, NovaRay®, AcceleRate® & Flyover® QSFP-DD end options



Increases architectural flexibility for high-density applications

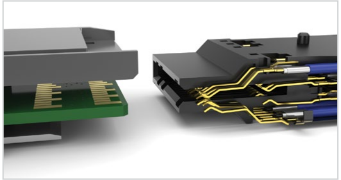
ExaMAX®

NRZ 56 Gbps | PAM4 112 Gbps

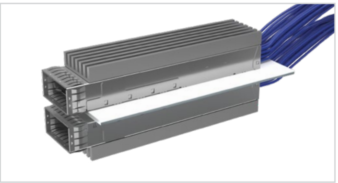
ExaMAX® is a registered trademark of AFCI.

Double-Density Flyover® QSFP Cable System

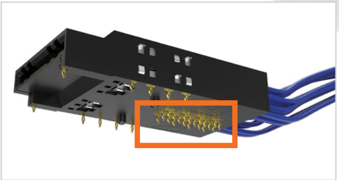
- 8 Channels (x8 Bidirectional, 16 Differential Pairs)
- Up to 800 Gbps 112G PAM4 aggregate
- Eye Speed® ultra low skew twinax cable technology (< 3.5 ps/meter)
- Flyover® technology simplifies board layout and extends signal reach
- Localized press-fit control & power contacts
- Multiple End 2 options for design flexibility
- Heat dissipation: ~7+ W/cable
- Cages and heat sinks support a variety of airflow patterns



High–speed contacts directly soldered to Eye Speed® ultra low skew twinax



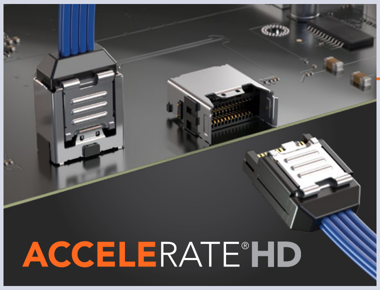
Belly-to-belly mating for maximum density



Sideband signals are routed through press–fit contacts for increased airflow

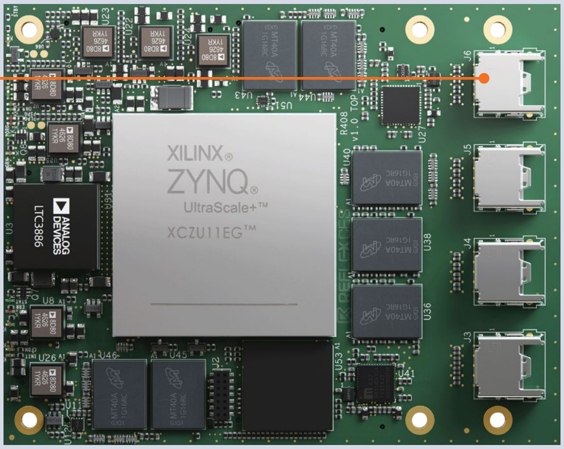
APPLICATION: REFLEX CES Zeus Zynq® UltraScale+™ MPSoC System-on-Module

The REFLEX CES Zeus SoM, based on Xilinx® ZU11EG Zynq® UltraScale+™ MPSoC FPGAs, offers optimized multi-core performance for embedded AI applications.



Samtec's AcceleRate® HD slim body, high-performance, high-density cable assemblies easily route 25 Gbps XCVRs from Zeus throughout any embedded AI system.

Please visit samtec.com/accelerateHD for additional information.

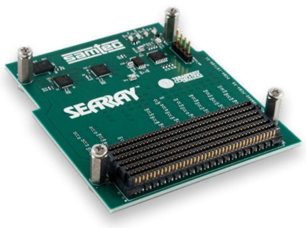


*Please visit **www.reflexces.com/modules/xilinx-zynq-ultrascale-mpsoc** for additional information.*
Xilinx®, the Xilinx® logo, UltraScale+™ and Zynq® are trademarks of Xilinx®.

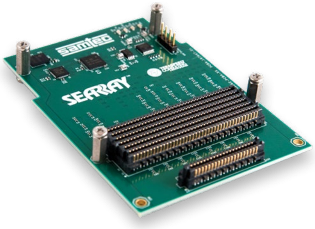
TECHNICAL RESOURCES

Samtec-designed Evaluation & Development Kits simplify the design process and reduce time to market. Kits are available for many of our high-performance connector sets, high-speed cable assemblies and optical solutions. Custom kits are also available. Visit samtec.com/kits or contact kitsandboards@samtec.com for a full list of availability.

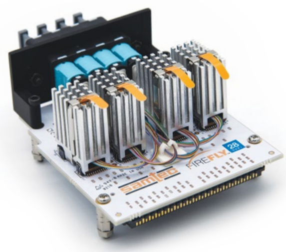
FPGA DEVELOPMENT BOARDS



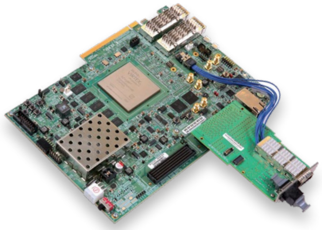
VITA 57.4 FMC+
HSPC Loopback Card



VITA 57.4 FMC+
HSPC / HSPCe Loopback Card

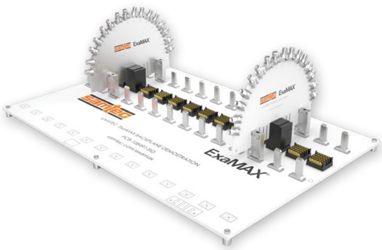


VITA 57.4 FMC+
25/28 Gbps FireFly™ Module



FMC+ HSPC Loopback Card
Supporting Xilinx® Virtex®
UltraScale™+ VCU118 Kit

SI EVALUATION KITS: BOARD-TO-BOARD SYSTEMS



ExaMAX® High-Speed Backplane
System (EBTF/EBTM)

Generate™ High-Speed
Edge Card Socket (HSEC6-DV)

Generate™ Differential Pair
Edge Card Socket (HSEC8-DP)

AcceleRate® HD High-Density
Arrays (ADM6/ADF6)

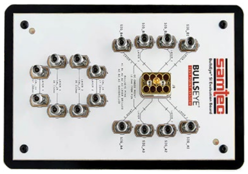
SI EVALUATION KITS: CABLE SYSTEMS

ExaMAX® Backplane
Cable System
(EBCM/EBTF-RA)

AcceleRate® Flyover® Slim
Direct Attach Cable Assembly
(ARC6/ARF6)

Flyover® QSFP28 Cable System
(FQSFP to ARC6/DCH)

Flyover® QSFP Double-Density
Cable System (FQSFP-DD to
NVAC/ARC6)



Bulls Eye® 50 GHz
High-Performance Test
System (BE40A)

Samtec's Signal Integrity Engineers address next generation system design challenges with industry-leading expertise in high-performance interconnect systems, along with testing and validation services, system optimization support, and easy-to-use design and development tools. Contact sig@samtec.com to discuss your application needs.

SIGNAL INTEGRITY SERVICES & SUPPORT

Frontline Engineering Services

- High Data Rate Simulations
- Channel Analysis
- Signal Integrity Models
- PCB / BOR Designs
- Connector Selection

Technical Application Support

- Signal / Power Integrity Expertise
- Testing, Validation & Analysis
- Full Channel SI Analysis / Optimization
- PCB Layout & Routing Assistance
- Full System Design Support

Industry Standards Support

- Member/Participant of 30+ Industry, Corporate & De Facto Standards
- Compatible/compliant products include: VITA, PC/104™, PISMO™, IEEE, SFF-SIG, SATA, Xilinx®, Altera®, Arm®
- Visit samtec.com/standards

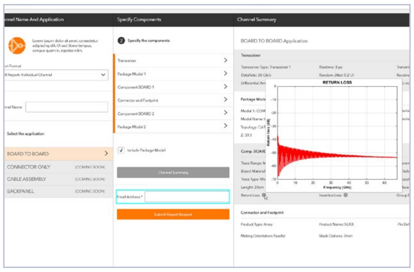
ONLINE DESIGN & DEVELOPMENT TOOLS

Digital Design Tools

- Easy-to-use tools developed in-house help streamline and simplify the design process
  - Solutionator® Parametric Search Tool
  - Channelyzer® Online Full Channel Simulation and Analysis Tool

Development Tools

- A full library of evaluation and development test platforms for high-speed interconnect systems
- Partnerships with SerDes vendors demonstrate next generation interconnect solutions



TESTING & VALIDATION CAPABILITIES

Design Qualification Testing (DQT)

- Standard testing undergone by all Samtec products to verify the product design meets our intent

Extended Life Product™ (E.L.P.™)

- Rigorous testing that evaluates contact resistance including 10 year Mixed Flow Gas (MFG) & High Mating Cycles (250 to 2,500); visit samtec.com/ELP

Severe Environment Testing (SET)

- Additional testing ensures products are suitable for rugged and/or harsh environments and other extreme applications; visit samtec.com/SET

Signal Integrity Screening

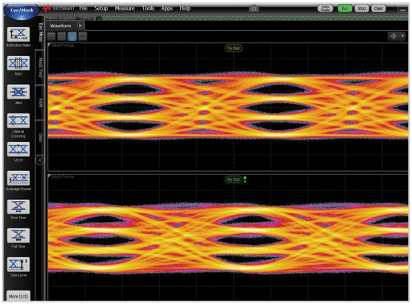
- VNA based test system screens for manufacturing process anomalies that could lead to Signal Integrity degradation in higher data rate products

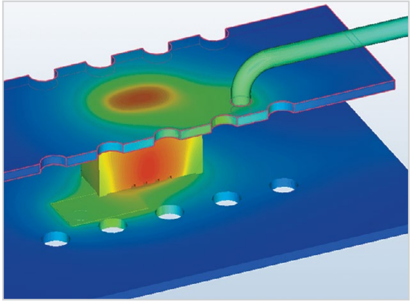
Leakage Testing

- Test platform developed in-house for applications with higher voltage levels and extremely sensitive current leakage specifications

SET
SEVERE ENVIRONMENT
TESTED

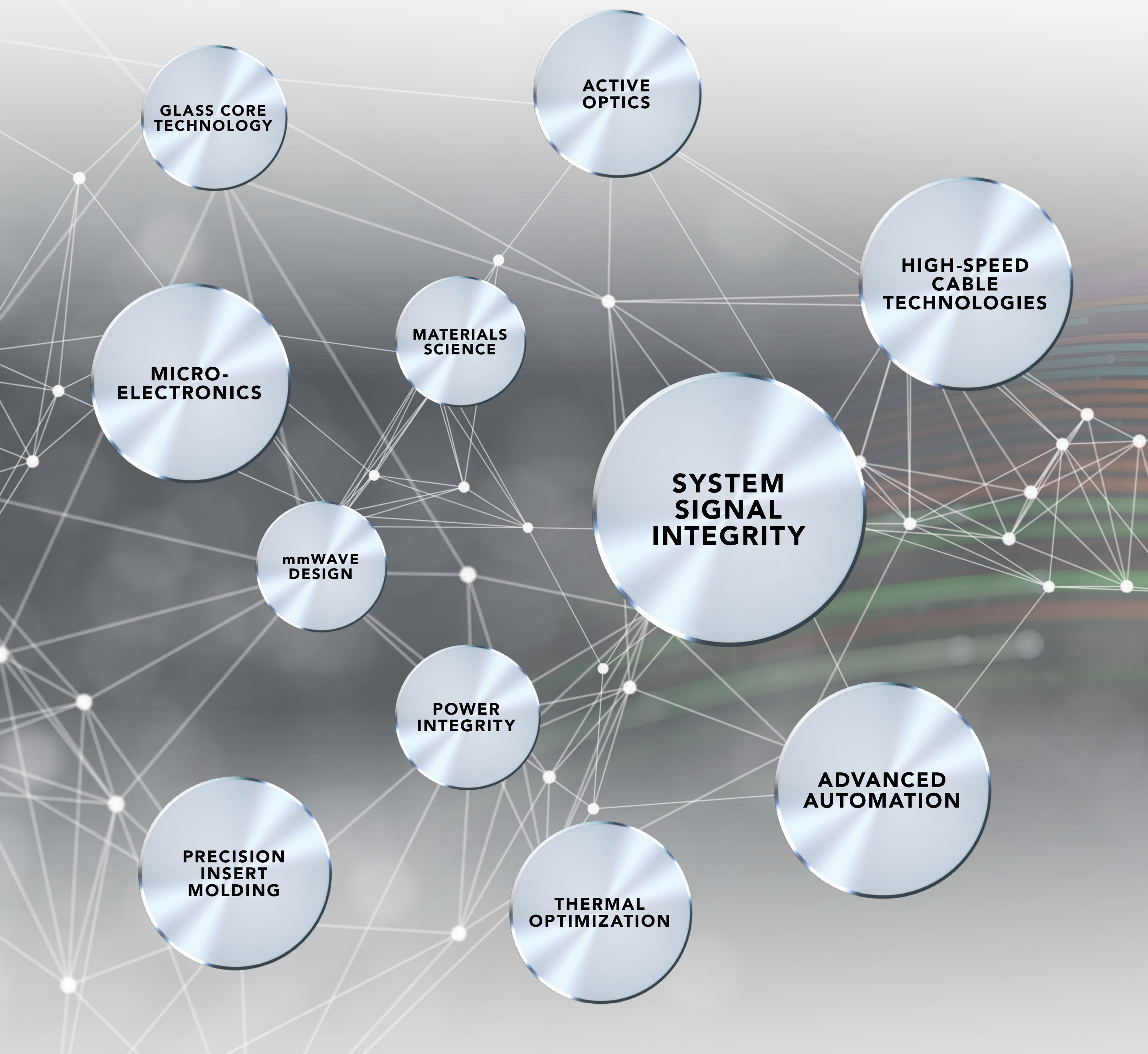
10 YEAR MFG
EXTENDED LIFE PRODUCT
HIGH MATING CYCLES





INTEGRATION LEADS TO

Samtec's integrated approach provides high-level design and development of advanced interconnect systems and **TECHNOLOGIES**, along with industry-leading expertise that allows us to offer effective strategies and support for **optimizing the entire serial channel of high-performance systems.**



GLASS CORE TECHNOLOGY

ACTIVE OPTICS

HIGH-SPEED CABLE TECHNOLOGIES

MICRO-ELECTRONICS

MATERIALS SCIENCE

SYSTEM SIGNAL INTEGRITY

mmWAVE DESIGN

POWER INTEGRITY

ADVANCED AUTOMATION

PRECISION INSERT MOLDING

THERMAL OPTIMIZATION

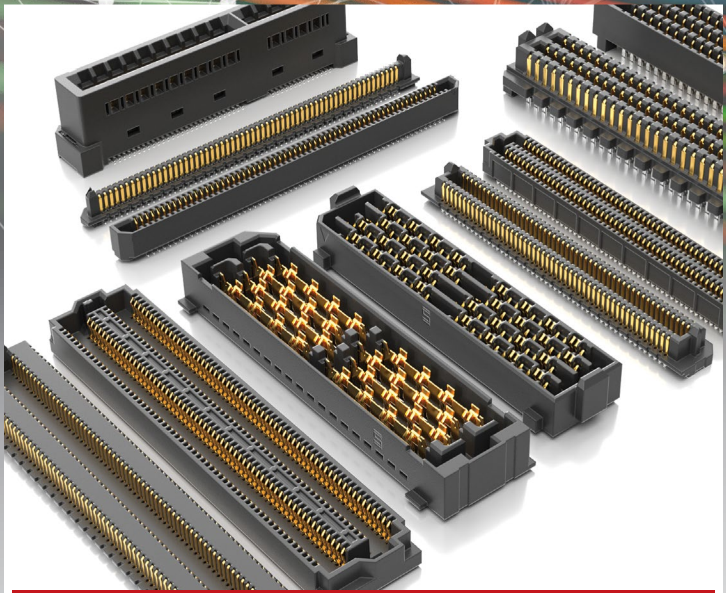
INNOVATION

Samtec is structured like no other company in the interconnect industry. We work in a fully integrated capacity that enables true collaboration and results in uniquely innovative **PRODUCTS** because **our technology teams are not limited by the boundaries of traditional business units.**

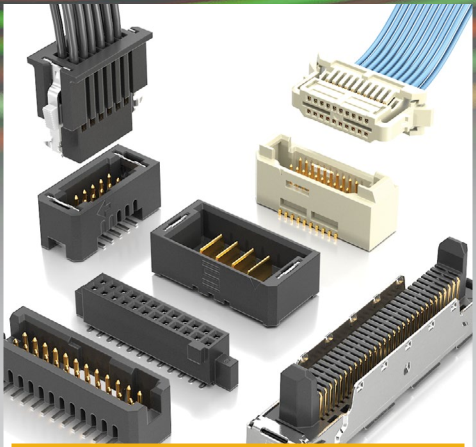
OPTICS

HIGH-SPEED CABLES

PRECISION RF



HIGH-SPEED / HIGH-DENSITY BOARD-TO-BOARD



MICRO RUGGED / POWER

GLOBAL MANUFACTURING & SUPPORT

samtec

SUDDEN SERVICE®