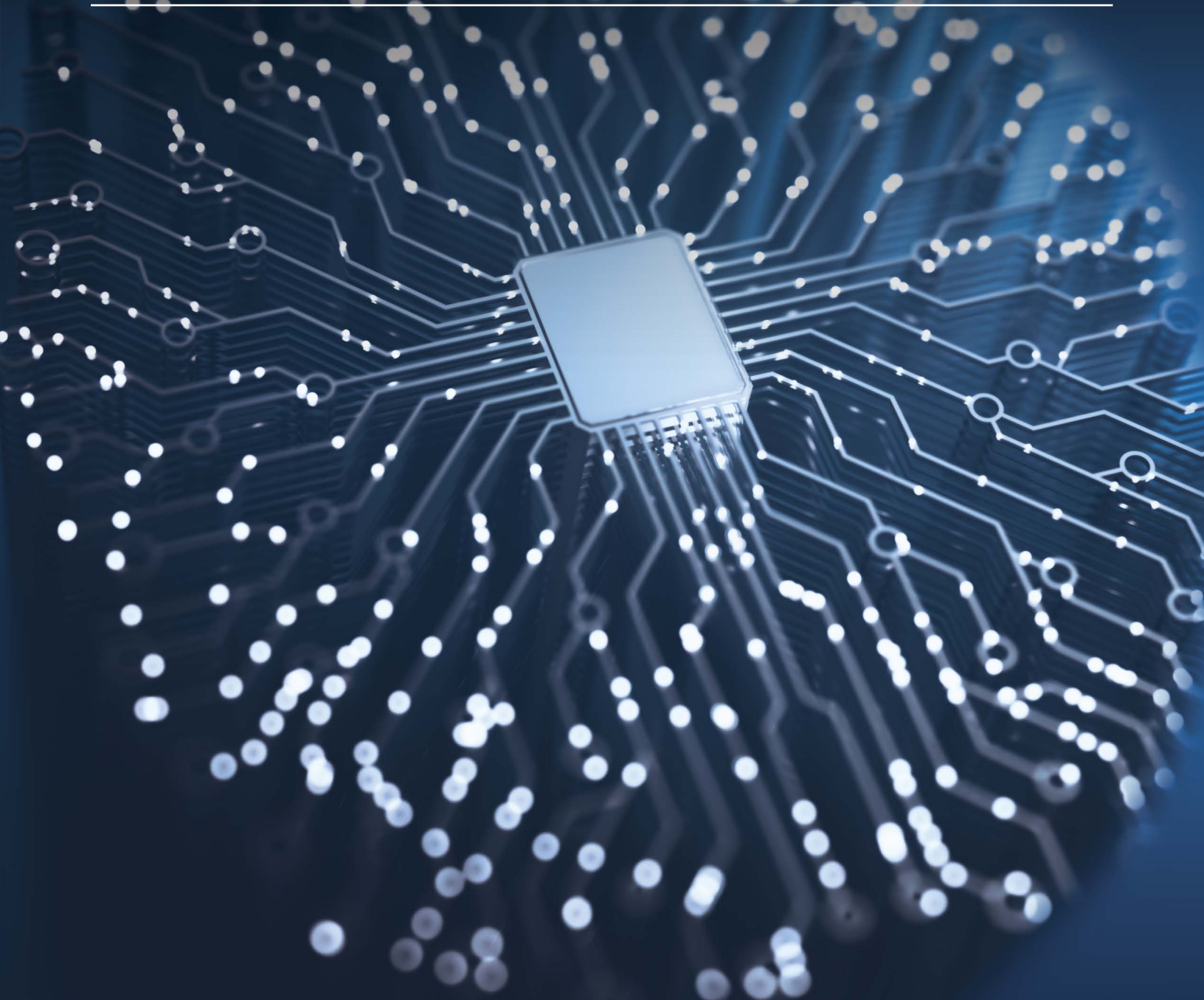
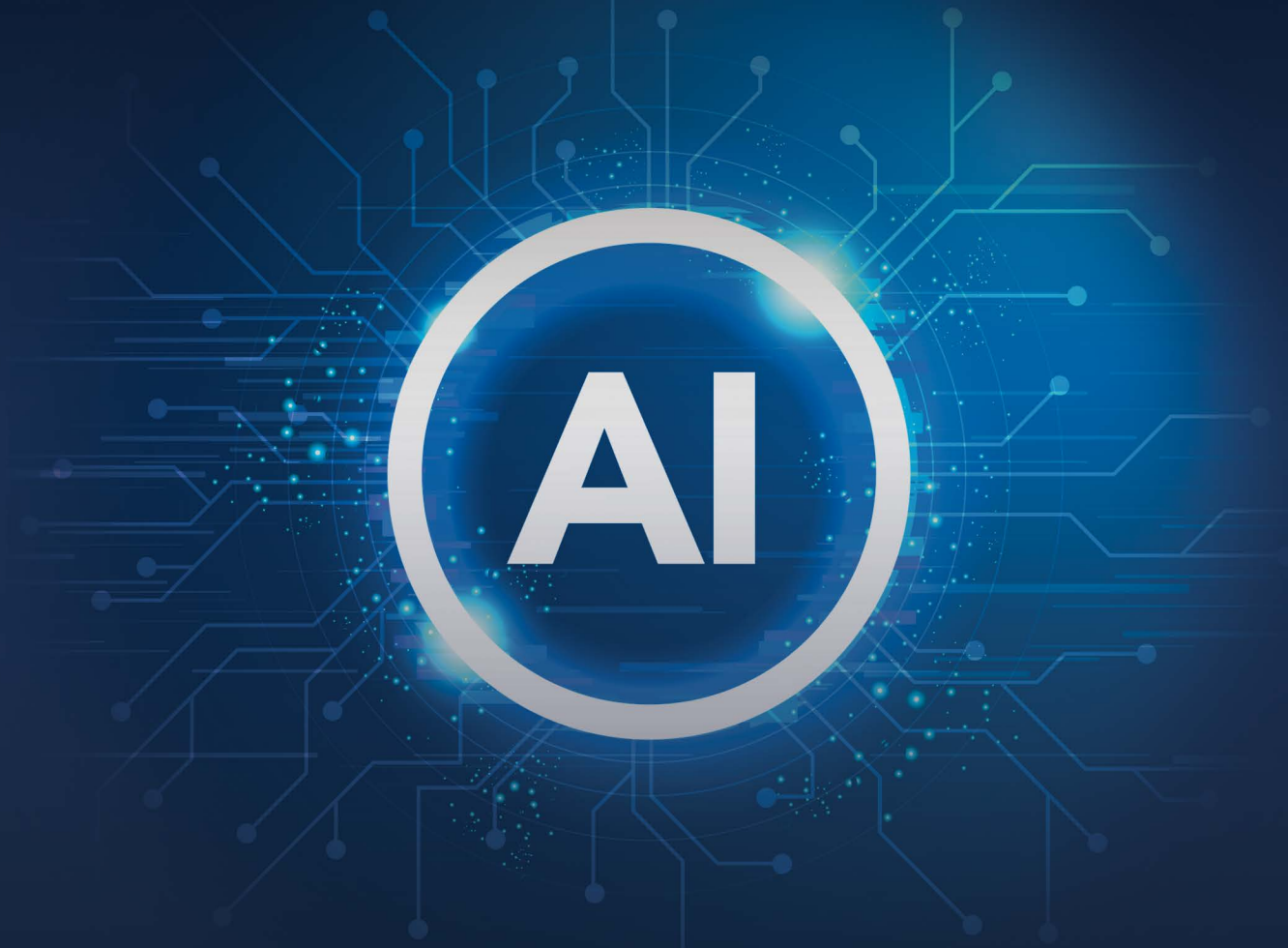
ARTIFICIAL INTELLIGENCE
SOLUTIONS GUIDE

HIGH-PERFORMANCE INTERCONNECT SOLUTIONS FOR AI/ML APPLICATIONS



CONNECTIVITY SOLUTIONS FOR AI & ML APPLICATIONS

Artificial Intelligence and Machine Learning technologies are driving new system architectures that demand increased speeds, bandwidths, frequencies and densities, along with scalability and configurability. Samtec offers innovative connectivity solutions with small form factors, extreme data rates and density, and signal integrity optimized performance – ideal for meeting the challenges of next generation AI/ML applications.



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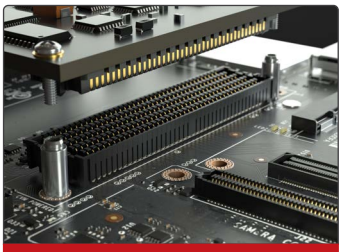
HIGH-PERFORMANCE SOLUTIONS FOR EMERGING ARCHITECTURES

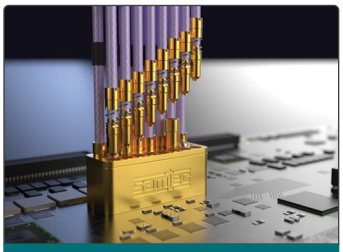
Samtec's extensive line of high-performance interconnect systems are ideal for AI & ML applications, providing benefits including thermal efficiencies, small form factors, extreme data rates and density, and signal integrity optimized performance.

HIGH-SPEED CABLE SYSTEMS



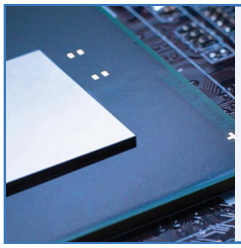
HIGH-SPEED MEZZANINE & HIGH-DENSITY ARRAYS

RUGGED/POWER

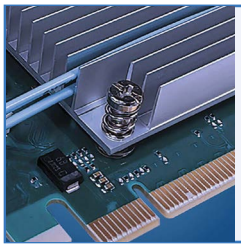


HIGH-PERFORMANCE TEST & PRECISION RF

AI CHIPSETS (SoCs, CPUs, digital and analog compute platforms) benefit from **high-density, high-performance interconnects**. Samtec products are engineered for high-performance applications, targeting edge AI, neuromorphic and quantum computing platforms, reference designs, as well as characterization kits and boards.



AI EMBEDDED SYSTEMS can consist of multiple SoMs, CoMs, FPGAs, and carrier cards. Many of these systems require increased speed and density in a very small footprint, especially in areas such as IoT and robotics. Samtec's **high-density, high-performance small form factor interconnects** are ideal for routing system I/O and peripherals within these architectures.



AI ACCELERATORS (GPUs, TPUs, VPUs) are low latency, high-bandwidth applications that require performance scalability. Samtec solutions include **high-speed connectors** and **high-performance cables** that support industry-standard form factors, including PCIe® CEM AIC and PECFF.

AI DOMAIN-SPECIFIC ARCHITECTURES, such as Natural Language Processing (NLP), computer vision and speech processing architectures, require optimized channel performance to support increased data rates, smaller footprints, longer signal reach and low latency. Samtec **high-performance copper and optical cabling solutions** are engineered to support extreme data rates and density, along with optimized signal integrity and design flexibility.

AI/ML ALIGNED SOLUTIONS

HIGH-SPEED CABLE SYSTEMS

Flyover® Technology • Extreme High-Density • Industry-Leading Data Rates
High-Performance • Mix-and-Match End Options

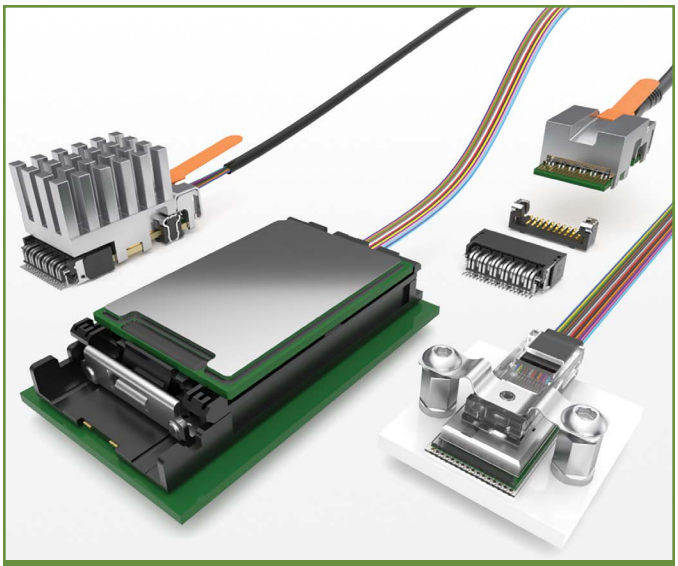
HIGH-DENSITY ARRAYS & MEZZANINE SYSTEMS

Signal Integrity Optimized • Ultra-High Density • Design Flexibility
Rugged Contact Systems • High-Reliability & Durability

Samtec offers a robust line of interconnect solutions designed to support the demands of Artificial Intelligence and Machine Learning applications. Visit **samtec.com/AI** for details.

RUGGED/POWER SYSTEMS

High Mating Cycles • Rugged Contacts
Power/Signal • Small Form Factors



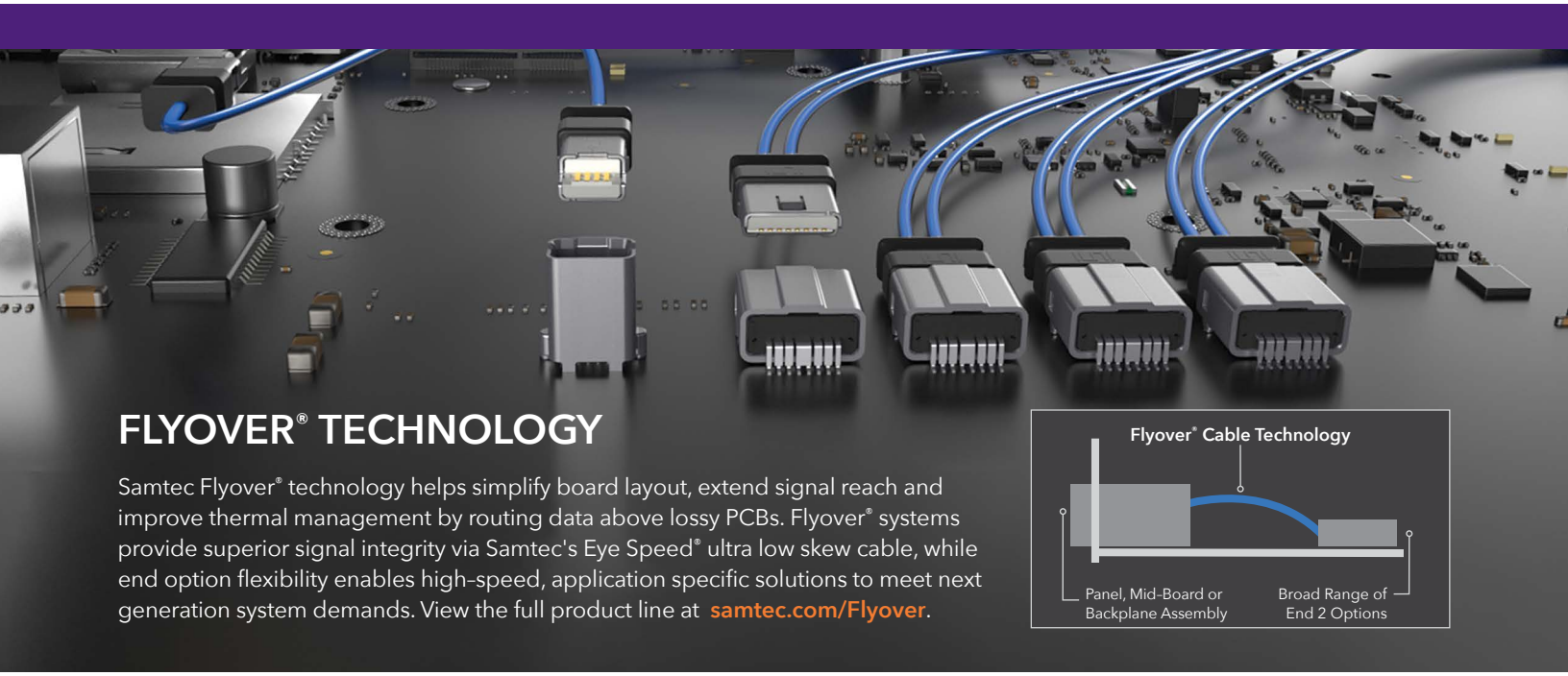
OPTICS

High-Performance • Extended Temp
Ultra Micro Footprints

PRECISION RF SOLUTIONS

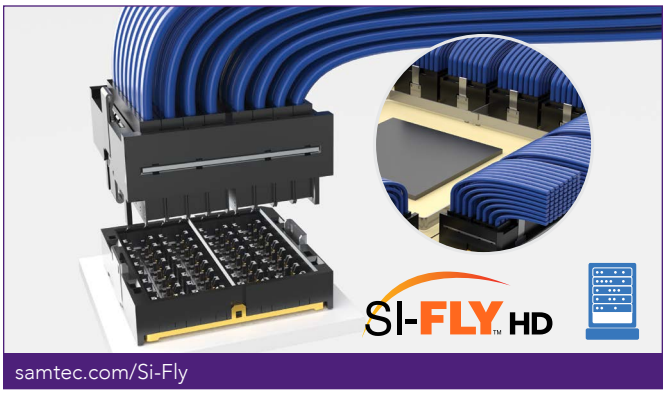
18 to 110 GHz • High-Performance Test to 90 GHz • Ganged Systems
Phase & Insertion Loss Stable Cable • High Isolation

HIGH-SPEED CABLE SYSTEMS

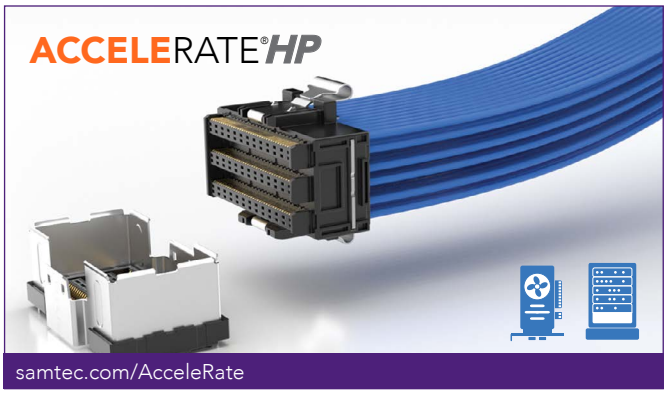


FLYOVER® TECHNOLOGY

Samtec Flyover® technology helps simplify board layout, extend signal reach and improve thermal management by routing data above lossy PCBs. Flyover® systems provide superior signal integrity via Samtec's Eye Speed® ultra low skew cable, while end option flexibility enables high-speed, application specific solutions to meet next generation system demands. View the full product line at **samtec.com/Flyover**.



samtec.com/Si-Fly



samtec.com/AcceleRate

PAM4 224 Gbps — SI-FLY™ HD ON-PACKAGE OR ASIC ADJACENT CABLE SYSTEM

- Industry's highest density on-package or ASIC adjacent cable system; designed for HDI and package substrates
- 207 Differential Pairs per square inch
- Eye Speed® AIR™ hyper low skew 33 AWG twinax cable
- Samtec Flyover® Cable Technology provides excellent signal integrity performance
- Also available: Si-Fly™ LP cable system with a low 3.8 mm profile, ideal for placement adjacent to the IC package or under cooling hardware; supports 112 Gbps PAM4 per lane enabling 25.6 TB aggregate with a path to 51.2 TB

NRZ 56 Gbps / PAM4 112 Gbps — ACCELERATE® HIGH-DENSITY / HIGH-PERFORMANCE CABLES

- **AcceleRate® HP Extreme Density:** the industry's highest density 112 Gbps PAM4 cable-to-board system; data rate compatible with PCIe® 6.0/CXL® 3.1 and 100 GbE
- **AcceleRate® Mini Extreme Performance:** Eye Speed® 34 AWG, 92 Ω Thinax™ ultra performance twinax cable for smaller, more dense connectors
- **AcceleRate® Slim Body System:** PCIe® 6.0/CXL® 3.1 capable, ultra-slim 7.6 mm width, and excellent signal integrity
- AcceleRate® cable systems offer design flexibility with a variety of End 2 options

samtec.com/backplane

NRZ 56 Gbps PAM4 112 Gbps

HIGH-SPEED / HIGH-DENSITY BACKPLANE CABLE SYSTEMS

- Cable-to-cable, cable-to-board, mid-board and panel applications
- Highly customizable for design flexibility
- **NovaRay® Micro Rugged Backplane System:** offset footprint for optimal signal integrity support, along with reliable two-points of contact, and optional guidance and keying for blind mating
- **ExaMAX® High-Speed Backplane System:** integrated guidance and keying, and available with multiple end 2 options
- **Technology Roadmap:** Si-Fly™ Extreme Performance Backplane System with Eye Speed® AIR™ low latency 33 AWG twinax cable

samtec.com/QSFP-Flyover

NRZ 56 Gbps PAM4 112 Gbps

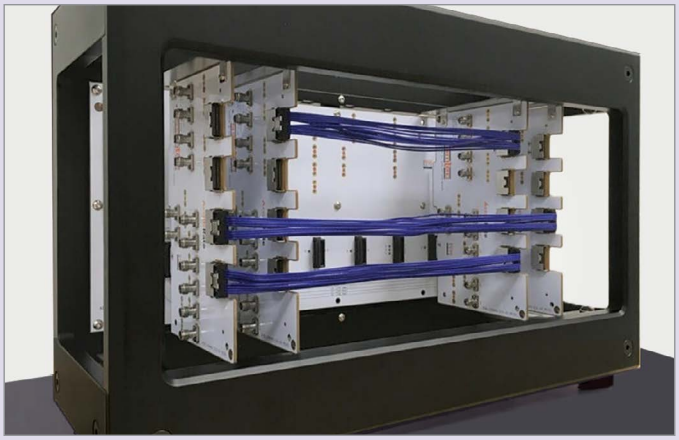
FLYOVER® SMALL FORM FACTOR TRANSCEIVERS

- SI-optimized direct attach contacts
- Heat sink options for optimal dissipation/thermal performance
- End 2 Variety: FireFly™, Si-Fly™, AcceleRate®, NovaRay®, ExaMAX®
- PCIe® 6.0/CXL® 3.1 capable
- **Flyover® QSFP:** up to 400 Gbps aggregate (112 Gbps PAM4)
- **Double Density Flyover® QSFP:** up to 400 Gbps aggregate data rate (56 Gbps PAM4)
- **800G Double Density Flyover® QSFP:** up to 800 Gbps aggregate data rate (112 Gbps PAM4)
- **Flyover® OSFP:** up to 1.6 Tbps aggregate data rate (224 Gbps PAM4), Eye Speed® AIR™ low latency 33 AWG twinax cable

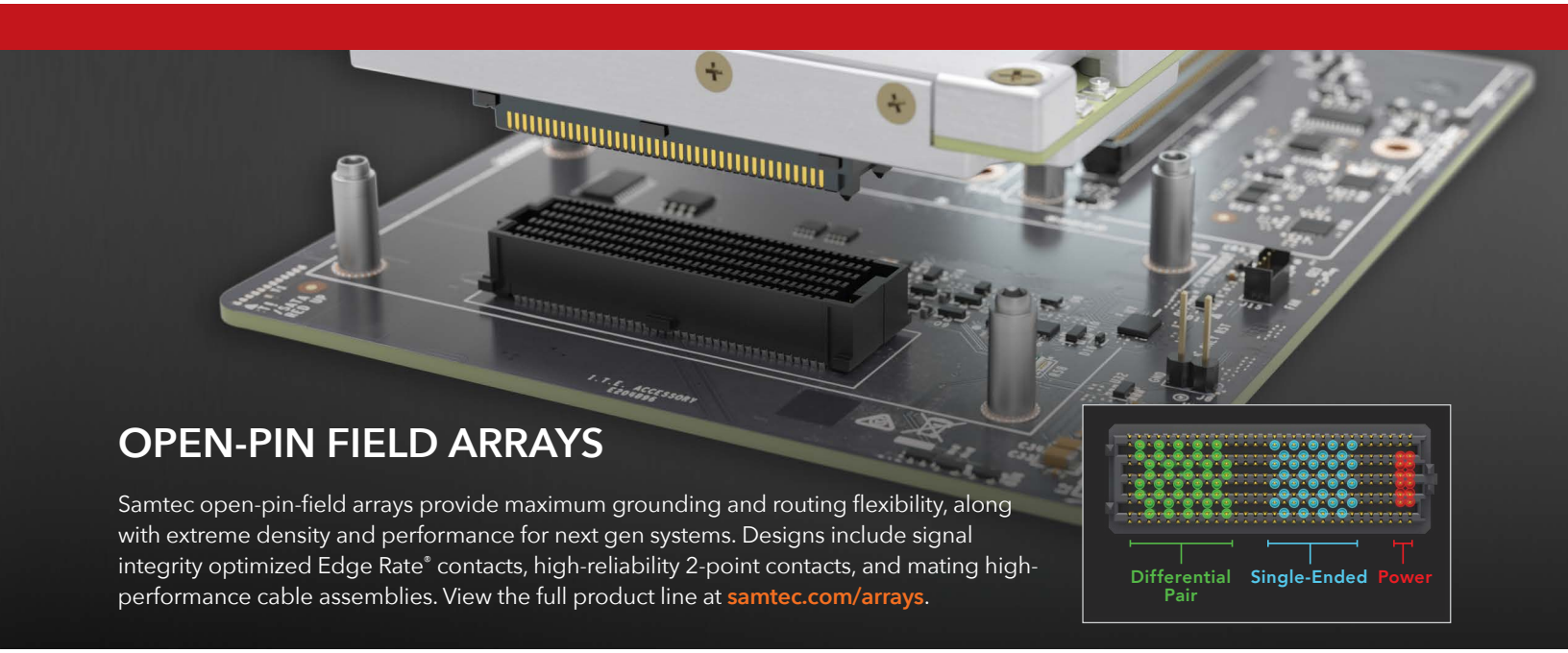
APPLICATION: 64 GT/S AI TEST PLATFORM

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® Slim, High-Density Cables** and **Generate® High-Speed Edge Card Connectors** enable 64 GT/s PCIe® 6.0 speeds in targeted AI-HPC architectures.

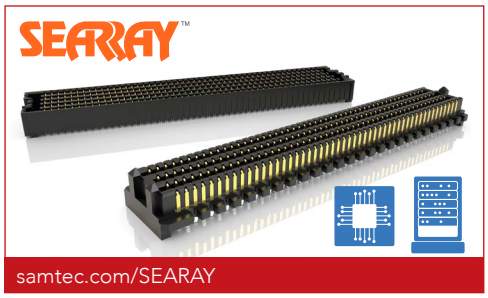


HIGH-DENSITY ARRAYS



OPEN-PIN FIELD ARRAYS

Samtec open-pin-field arrays provide maximum grounding and routing flexibility, along with extreme density and performance for next gen systems. Designs include signal integrity optimized Edge Rate® contacts, high-reliability 2-point contacts, and mating high-performance cable assemblies. View the full product line at samtec.com/arrays.

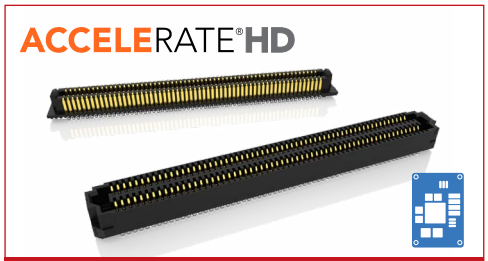


samtec.com/SEARAY

PAM4 56 Gbps

SEARAY™ HIGH-DENSITY OPEN-PIN-FIELD ARRAYS

- VITA 57 (FMC, FMC+), VITA 74 (VNX) and PISMO™ 2 certified
- Rugged Edge Rate® contact system, optimized for signal integrity
- **High-Density 1.27 mm Pitch System:** up to 560 I/Os, 1.12 mm contact wipe
- **Ultra High Density 0.80 mm Pitch System:** up to 500 I/Os, optional guide post for blind mating

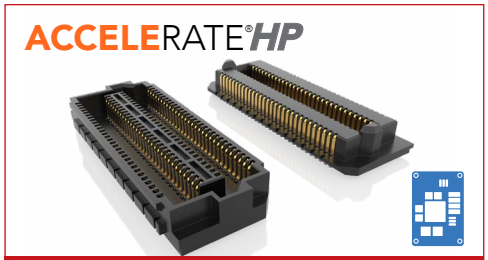


samtec.com/AcceleRateHD

PAM4 64 Gbps

ACCELERATE® HD ULTRA DENSE, SLIM BODY ARRAYS

- Incredibly dense: up to 400 total I/Os
- 5 mm to 16 mm stack heights and slim 5 mm width
- 4-row design; 10–100 positions/row
- Rugged Edge Rate® contact system, optimized for signal integrity
- PCIe® 6.0/CXL® 3.1 capable
- Right-angle & cable in development



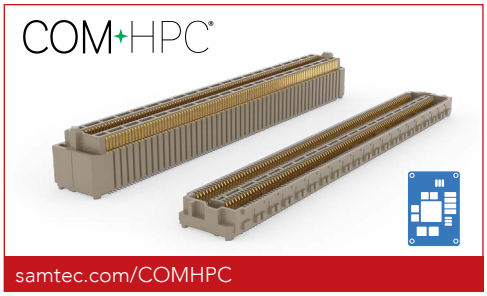
samtec.com/AcceleRateHP

PAM4 112 Gbps

ACCELERATE® HP HIGH-PERFORMANCE, HIGH-DENSITY ARRAYS

- 0.635 mm pitch open-pin-field array
- Cost optimized solution
- 5 mm and 10 mm stack heights
- Up to 400 total pins available; roadmap to 1,000+ pins
- Data rate compatible with PCIe® 6.0/ CXL® 3.1 and 100 GbE

HIGH-SPEED MEZZANINE



samtec.com/COMHPC

The COM-HPC® name and logo are registered trademarks of the PCI Industrial Computers Manufacturers Group.

PAM4 112 Gbps

COM-HPC® HIGH-SPEED INTERCONNECT SYSTEM

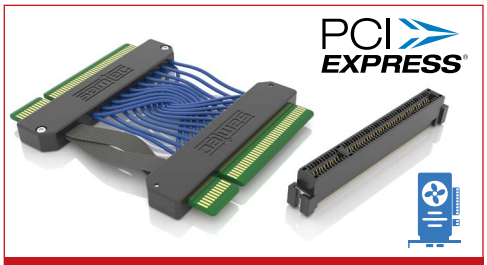
- Meets the COM-HPC® standard for high-performance CoMs
- High pin count system with 400 total pins on a 0.635 mm pitch
- BGA mount increases density and performance
- Up to 32 Gbps/channel (4,096 Gbps max aggregate/2,088 Gbps/in²)
- Ultra-high speed performance and extended connectivity, with limitless scalability
- PCIe® 5.0 & 100 GbE data rate capable

samtec.com/edgecard060

PAM4 64 Gbps

GENERATE® HIGH-SPEED EDGE CARD SYSTEM

- 0.60 mm pitch differential pair system
- PCIe® 6.0/CXL® 3.1 capable
- Compliant to SFF-TA-1002: x4 (1C), x8 (2C), x16 (4C & 4C+)
- Edge Rate® contacts optimized for signal integrity performance
- 0.60 mm pitch mating high-speed cable assembly (GC6) available



samtec.com/PCIe

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

PAM4 64 Gbps

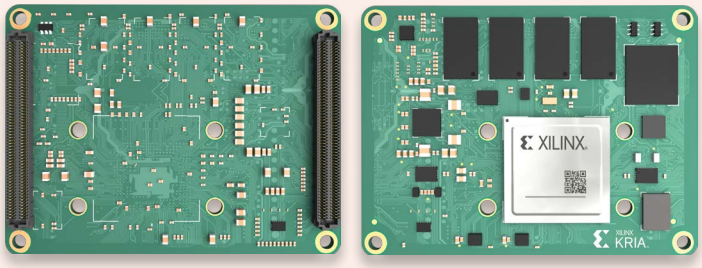
PCI EXPRESS® 5.0/6.0 HIGH-SPEED INTERCONNECTS

- CXL® capable connector and cable
- Edge card socket (PCIE-G5) with differential pair signaling on a 1.00 mm pitch, available in vertical, right-angle & edge mount designs
- Cable assembly (PCIEC-G5) with x1, x4, x8 and x16 link options, mates with PCIE-G5 and standard PCIe® expansion cards
- Visit **samtec.com/pcie** for details

APPLICATION: AMD XILINX® KRIA™ ADAPTIVE SoMs

AMD Kria™ Adaptive System-on-Modules offer unmatched AI performance via pre-built hardware and software. Kria™ features two Samtec **240-pin AcceleRate® HD Ultra-Dense Slim Body Arrays**.

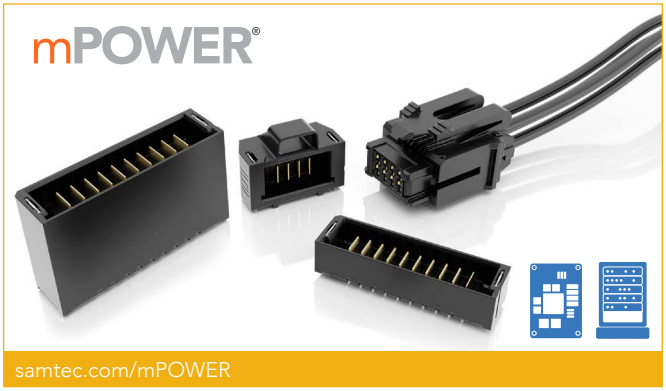
The small form factor and 64 GTps PAM4 performance enable AI edge applications. For additional details, please visit: **samtec.com/AcceleRateHD**.



RUGGED/POWER SYSTEMS

RELIABLE CONNECTIVITY FOR HARSH ENVIRONMENTS

Ultra rugged features, flexible power systems, rugged contacts, and rugged signal integrity solutions are the foundation of Samtec's Rugged/Power product line. Designed for high cycle, high power and high speed applications, products are available with full engineering support and free online design tools. View the full product line at **samtec.com/rugged**.



samtec.com/mPOWER

samtec.com/AcceleRateMP

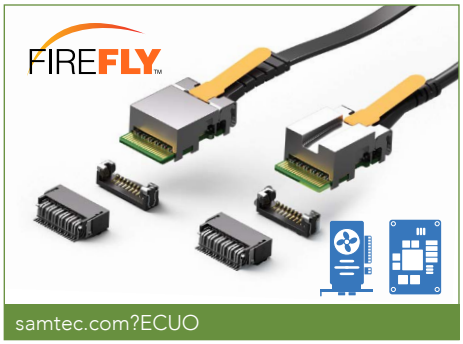
MAX 18 Amps — mPOWER® ULTRA MICRO HIGH POWER INTERCONNECTS

- Up to 18 A per blade; 2–10 positions on a 2.00 mm pitch
- 5 mm to 20 mm stack heights; vertical and right-angle
- Small form factor designed for board-to-board, cable-to-board and cable-to-cable applications
- Mating cable assemblies with plastic (top) or metal (side) latching available
- SureWare™ guide post standoffs (GPSO/GPSOM) assist with misalignment and blind mating
- Selectively loading contacts achieves customer specific creepage and clearance requirements; please contact **asp@samtec.com** to discuss your application

PAM4 64 Gbps MAX 22 Amps — ACCELERATE® mP HIGH-SPEED POWER/SIGNAL ARRAYS

- Power blades rotated 90° provides equal access to heat escape for uniform cooling, increased current capacity and reduced crowding
- Up to 22 Amps per power blade; 4 or 8 total power blades; up to 10 in development
- PCIe® 6.0/CXL® 3.1 capable
- 60 or 240 total signal positions on 0.635 mm pitch; additional counts in development
- Low profile 5 mm stack height; up to 16 mm in development
- Optional alignment pins, weld tabs for a secure connection to the board; polarized guide posts for blind mating

OPTICS SOLUTIONS

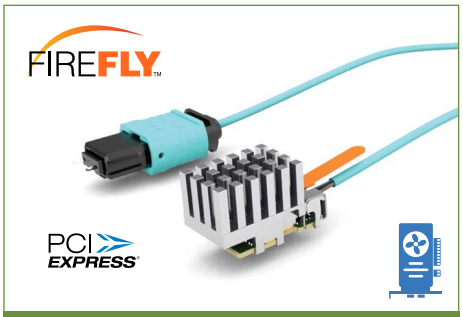


samtec.com?ECUO

NRZ 28 Gbps

COMMERCIAL OPTICAL FIREFLY™

- Up to 28 Gbps per channel via optical cable for greater reach
- Simple to use system with easy insertion/removal and trace routing, no through-holes, and a surface mount connector system
- Miniature footprint allows for higher density close to the data source
- Supports data center, HPC and FPGA protocols, including 10/40/100 GbE Ethernet, InfiniBand™, Fibre Channel and Aurora

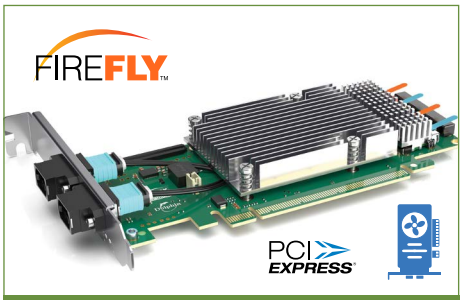


samtec.com?PCUO

32 GTps

PCIe®-OVER-FIBER FIREFLY™ OPTICAL SYSTEM

- Transmits PCIe® 3.0/4.0/CXL® data rates through FireFly™ up to 100 m
- Supports PCIe® protocol for low latency, power savings and guaranteed transmission
- Extended temperature design with range of -40 °C to +85 °C
- Duplex auxiliary signals allow both transparent & non-transparent bridging
- Micro optical engines allow for easy design into downstream systems, ultimately making these systems smaller
- **Roadmap:** PCIe® 5.0 in development



samtec.com?PCOA

32 GTps

ADAPTOR CARD WITH FIREFLY™ OPTICAL SYSTEM

- FireFly™ optical cable enables computer-to-computer or computer-to-endpoint communications over longer distances
- Supports PCIe® 3.0/4.0/CXL®
- PCIe® x16 edge card connection
- Reconfigurable host or target operation
- Scalable configurations for cost optimized performance
- Transparent or non-transparent bridging for system flexibility and multi-processor support
- **Roadmap:** PCIe® 5.0 in development

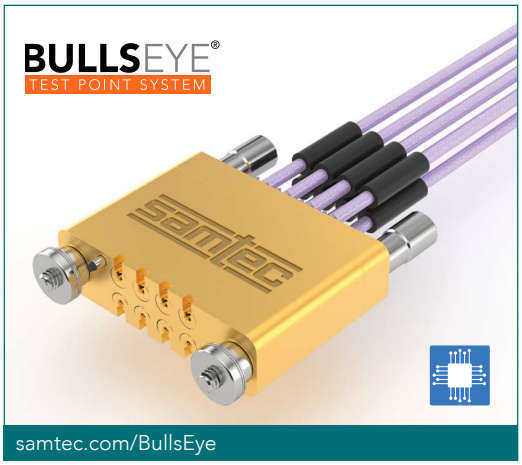
samtec.com/optics

PAM4 112 Gbps

HALO™ NEXT GEN OPTICS

- Up to 112 Gbps PAM4 per lane; up to 16 channels (8 channel bidirectional)
- Low 6.5 mm profile with a 2-piece contact system
- Optically pluggable for easy replacement and increased uptime
- Designed to withstand high shock/vibration, with a low center of gravity that enables stable connection to the board

PRECISION RF & TEST SYSTEMS



samtec.com/BullsEye

DC TO 90 GHz

BULLS EYE® HIGH-PERFORMANCE TEST SYSTEM

- High-performance test assemblies (90 GHz, 70 GHz, 50 GHz, 40 GHz)
- Enables smaller evaluation boards and shorter trace lengths
- Compression mounts to the board for placement directly adjacent to the SerDes being characterized
- Solderless design improves cost and is easy to use within a lab setting
- Microstrip/CPW or stripline PCB transmission types
- Test boards available for performance verification
- 1.00 mm, 1.85 mm, 2.40 mm and 2.92 mm connection to instrumentation
- Single- or double-row options

samtec.com/PrecisionRF

DC TO 110 GHz

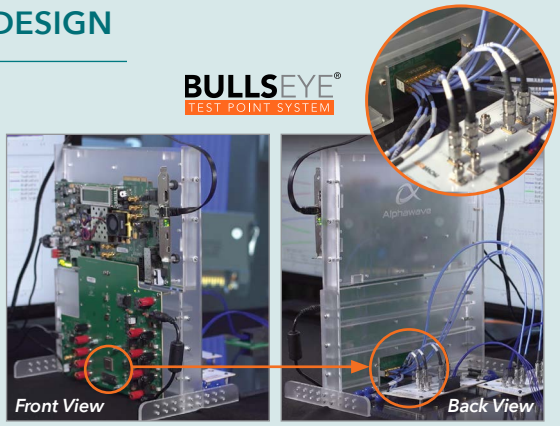
HIGH FREQUENCY, PRECISION RF SOLUTIONS

- Solutions begin at K band (18-26.5 GHz) and support extreme low latency wireless communication, test and measurement applications
- Cable assemblies include low loss microwave/mmWave with cable types from .047 to .277, high-density ganged, test & Samtec-optimized varieties
- Cable connectors for a wide variety of industry standard cables, manufactured with a precise tolerance interface to ensure superior repeatability and high mechanical stability
- Board connectors for cable-to-board or board-to-board, ganged and blind-mate applications

APPLICATION: ALPHAWAVE PIPECORE™ REFERENCE DESIGN

The Alphawave PipeCORE™ is an ultra-low-power, highly configurable SerDes IP based on Multi-Standard SerDes (MSS) IP. Tuned specifically for PCI Express® 1.0 to 6.0, it provides extreme bit error rate margin for 32+ dB bump-bump lossy channel.

PipeCORE™ includes **Samtec's Bulls Eye® high-performance test system**, which is compression mounted to the board, directly adjacent to the SerDes being characterized. When combined with Alphawave's KappaCORE (CXL® protocol) and PiCORE (PCIe® protocol) controller IP, this design offers a full solution for CXL®/PCIe® applications.



PRODUCT RESOURCES

INDUSTRY STANDARDS

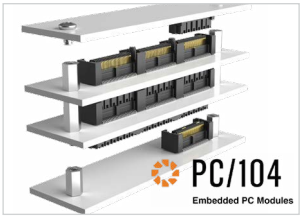
Samtec products interact with many types of hardware and software, which drives us to adhere to and engage in the development of a variety of industry standards, including:

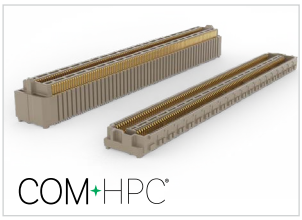
- PICMG®
- OIF
- USB
- IEEE
- CXL®
- PCI-SIG®
- OSFP
- OCP®

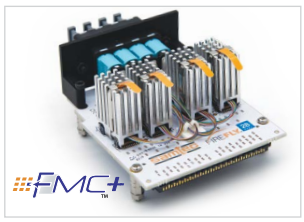
Samtec is part of various MSA committees involved in the design and development of next generation systems, and we partner with key Standards committees, including:

- Open Compute Project®
- Fibre Channel Industry Assoc.
- OIF
- PCI-SIG®
- COMPUTE EXPRESS LINK®
- Open Data Center Committee

Visit **samtec.com/standards** or contact **standards@samtec.com**.







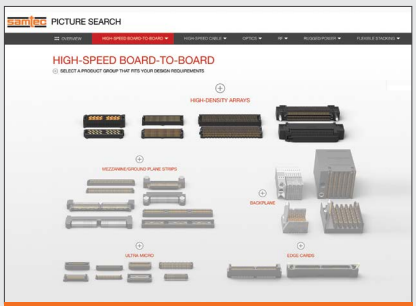
ONLINE TOOLS

Find, Design & Validate Your Solution: **samtec.com/digital-tools**

Samtec is committed to developing innovative design tools, and offering high-level technical resources and engineering support to make finding, designing and ordering the right product as easy and streamlined as possible. These include:

Picture Search

Browse through a highlight reel of Samtec's most popular products to find the ideal solution for your application, view specifications, check availability, order samples and more.



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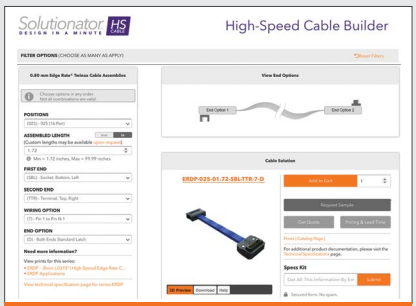
Solutionator® Mated Set Builder

Quickly build mated connector sets or design full cable assemblies using a wide variety of user-defined search parameters and filters, view specs and order samples.



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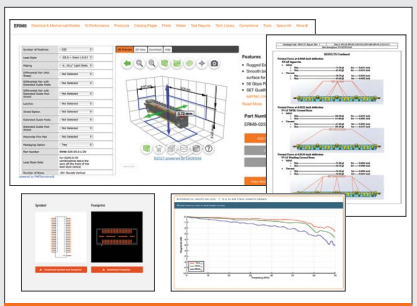
Free Downloads

Testing and qualification reports, 3D models, PCB footprint & eCAD models, product videos and demos, technical webinars, and a vast technical library with app notes, white papers and more.



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SIGNAL INTEGRITY
CENTER OF EXCELLENCE

INDUSTRY LEADERSHIP • TECHNICAL EXPERTISE & SUPPORT • EDUCATION & RESOURCES

Samtec is the Industry Leader in Signal Integrity. Our technical experts provide support for all aspects of high-performance system design and development. Our capabilities include support for the testing, simulation and analysis of high-speed interconnects, as well as full system SI optimization strategies, along with support for thermal and power considerations.

Samtec has also developed the industry's most comprehensive library of free online tools and resources to help streamline your design process. Visit **samtec.com/s2s** or contact **sig@samtec.com** to discuss your application with a specialist.

- Full System Signal Integrity Optimization
- Signal Integrity Testing, Simulation & Analysis
- PDN/Thermal Modeling, Simulation & Testing
- Power Architecture System Design & Routing
- Online Design Tools & Technical Resources
- Live & On-Demand Technical Education

SIGNAL INTEGRITY EVALUATION & DEVELOPMENT KITS

Samtec-designed Evaluation and Development Kits simplify the interconnect design process and help reduce time to market. The industry's most comprehensive set of kits are available for a variety of Samtec's high-performance connectors, high-speed cable assemblies, and optical solutions. Visit **samtec.com/kits** or contact **kitsandboards@samtec.com** for current availability.

Generate®
High-Speed Edge Card Connectors (HSEC6)

AcceleRate® HP
High-Performance Arrays (APM6/APF6)

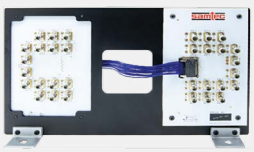
AcceleRate® HD
High-Density Slim Body Arrays (ADM6/ADF6)

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

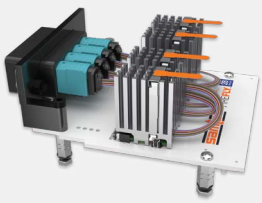
AcceleRate® Mini Flyover®
Extreme Performance Cable Assembly (ARM6/AMF6)

Flyover® QSFP Double Density
Cable Assembly (FQSFP-DD to NVAC or ARX6)

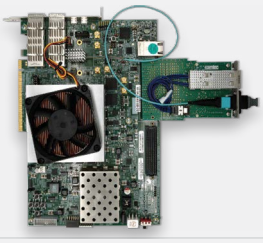
Flyover® QSFP to AcceleRate®
Cable Assembly (FQSFP to ARX6)



Si-Fly™ Flyover®
Low Profile High-Density 112 Gbps PAM4 Cable System (CPI/CPC)



25/28 Gbps FireFly™
FMC+ Module (ECUO, UCC8/UEC5-2)



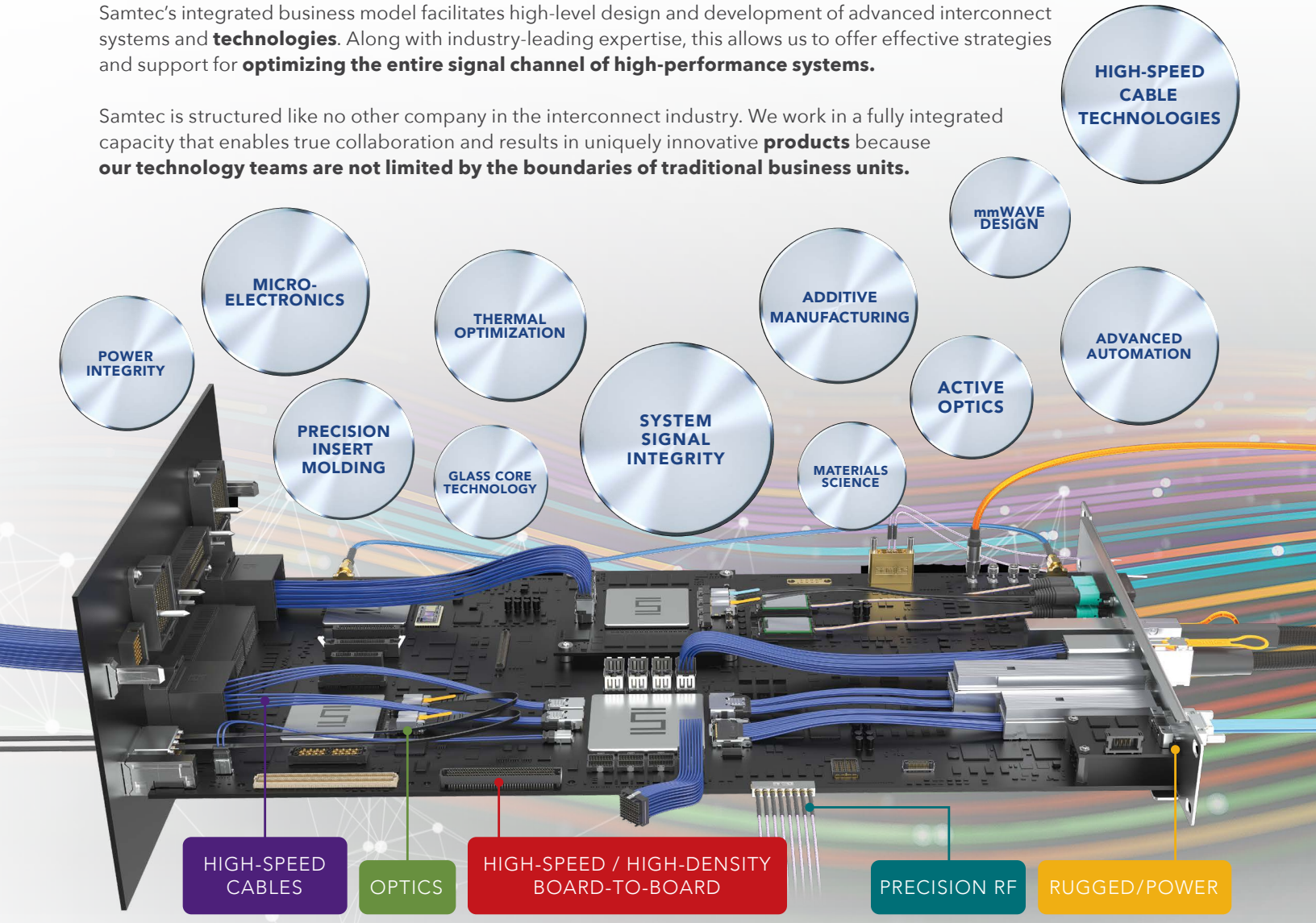
FMC+ HSPC Loopback Card
Supports AMD Virtex® UltraScale™+ VCU118 Kit

INTEGRATION LEADS TO INNOVATION

FULL SYSTEM OPTIMIZATION FROM SILICON-TO-SILICON™

Samtec's integrated business model facilitates high-level design and development of advanced interconnect systems and **technologies**. Along with industry-leading expertise, this allows us to offer effective strategies and support for **optimizing the entire signal channel of high-performance systems.**

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.**



SILICON-TO-SILICON™ SOLUTIONS

NEXT GENERATION CONNECTIVITY TO 224 Gbps & BEYOND

As bandwidth, scale and power requirements continue to challenge conventional engineering methods, Samtec strives to help **optimize the landscape of your entire system** – and develop solutions, together.

Samtec's industry-leading signal integrity expertise, full system optimization strategies, and innovative products and technologies help address the challenges of **next gen data transmission to 224 Gbps & beyond.**

GLOBAL SUPPORT NETWORK

samtec
SUDDEN SERVICE®