

EDGE CARD

APPLICATION DESIGN GUIDE

EDGE CARD SOLUTIONS

Samtec offers a full line of edge card connectivity solutions for industries and applications including datacom, industrial, high-performance computing, and the PCI Express® market, along with a product roadmap to support 56 Gbps speeds and beyond. Solutions include a wide variety of options – a choice of pitches, pin counts, orientations and designs such as power/signal combos, press-fit tails, as well as ruggidizing features.

Connectivity Solutions from Early Gen PCI Express® to 56 Gbps & Beyond

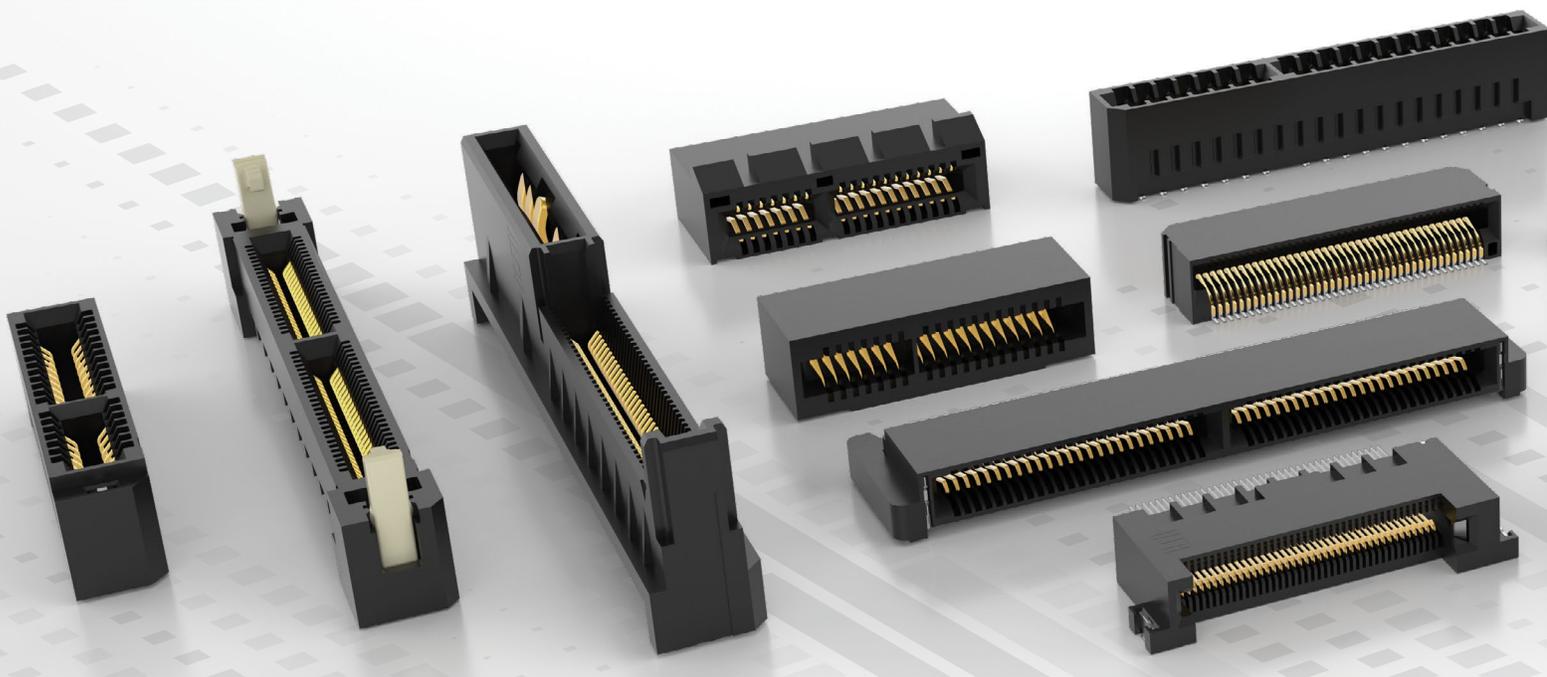
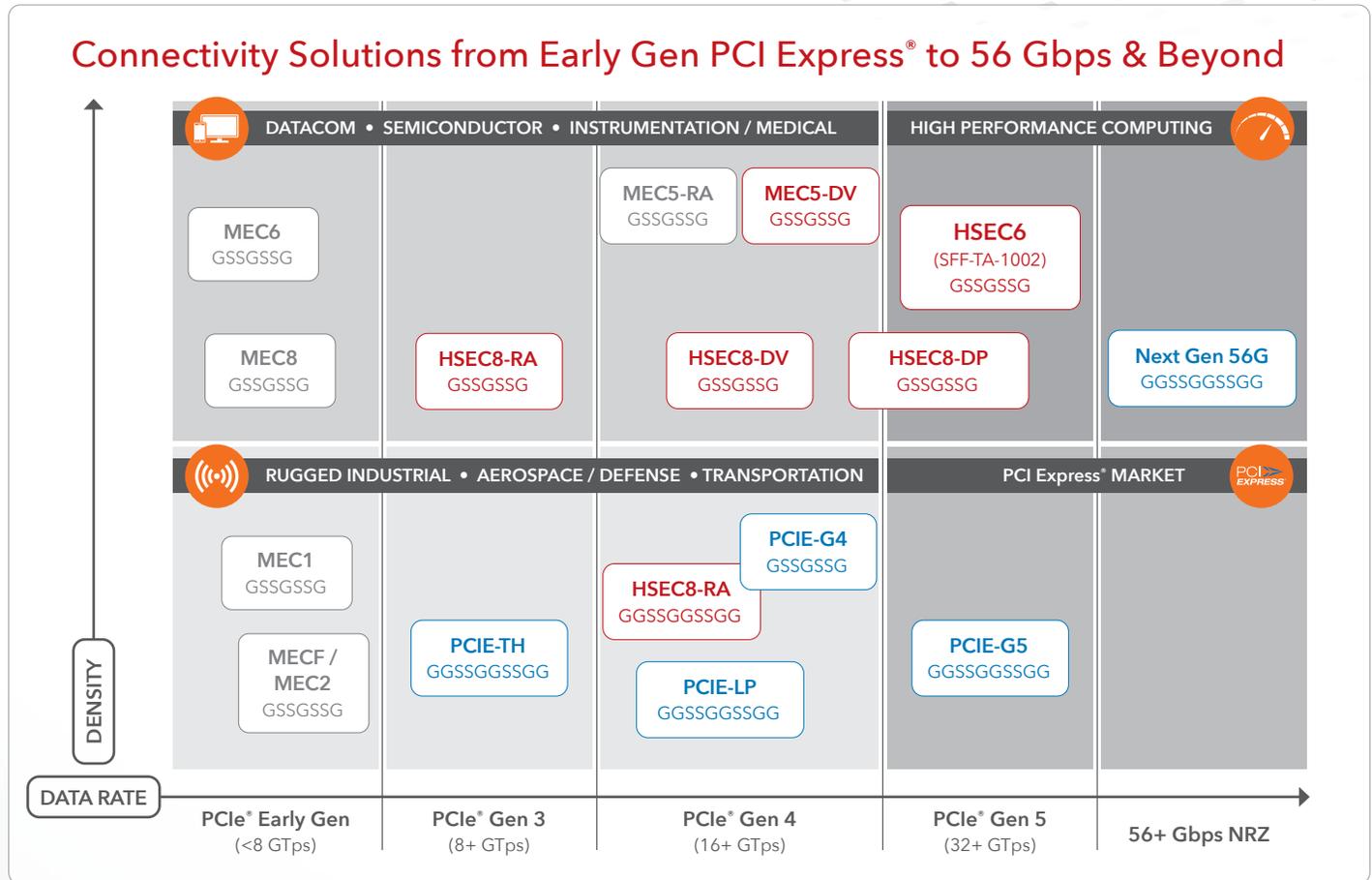


TABLE OF CONTENTS

High-Speed Edge Card Systems 4-5

Edge Rate® Contact System Connectors (Series: HSEC6, HSEC8, HTEC8, HSEC1)

Product Roadmap (Series: HSEC6, HSEC1-DP)

PCI Express® Systems 6-7

PCI Express® Gen 3 Edge Card Connector (Series: PCIE)

SATALink™ Compatible High-Speed Micro Plane Connector (Series: SAL1)

PCI Express® Gen 4 Low-Profile Edge Card Connectors (Series: PCIE-LP, PCIE-G4)

PCI Express® Gen 5 Edge Card Connectors (Series: PCIE-G5)

Product Roadmap: Next Generation 56 Gbps NRZ Edge Card System



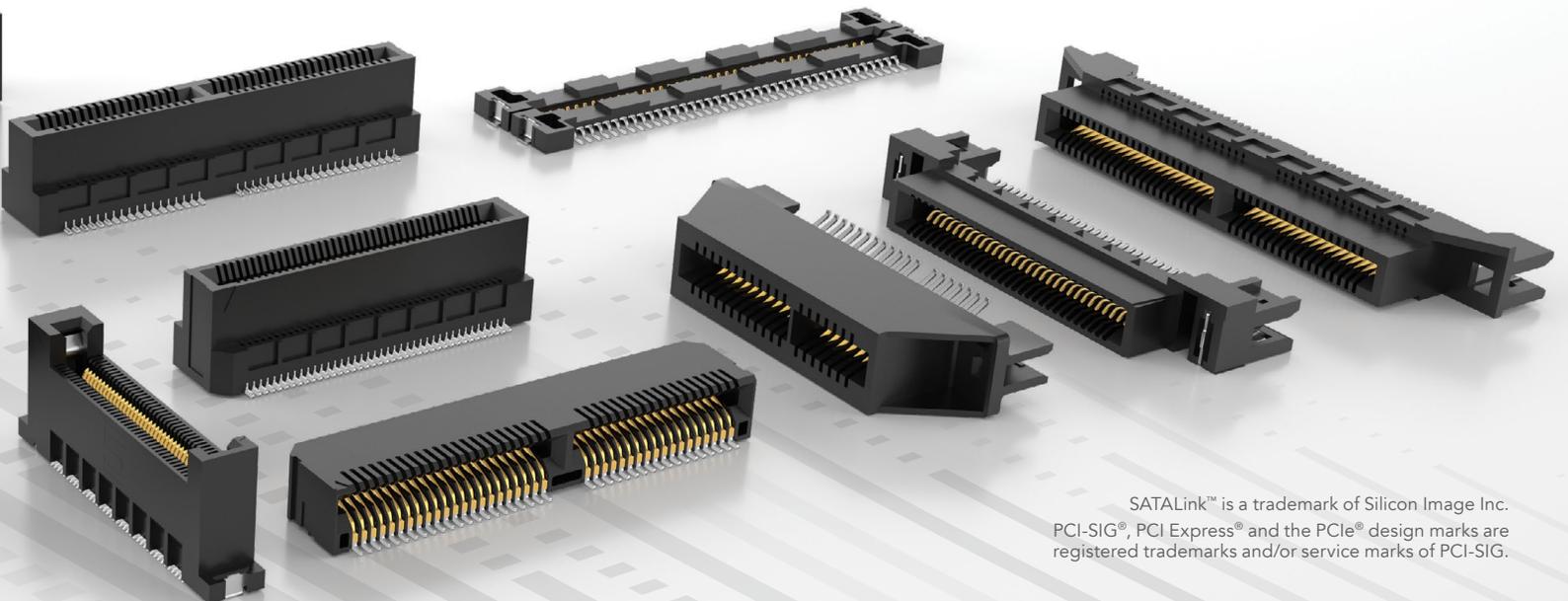
Micro Edge Card Systems 8-9

Micro & Mini Edge Card Connectors (Series: MEC6, MEC8, MEC1, MECF, MEC2)

Extreme Density High-Speed Edge Card Connectors (Series: MEC5)

Edge Card Reference / Specifications Guide 10

Samtec Technology Centers 11



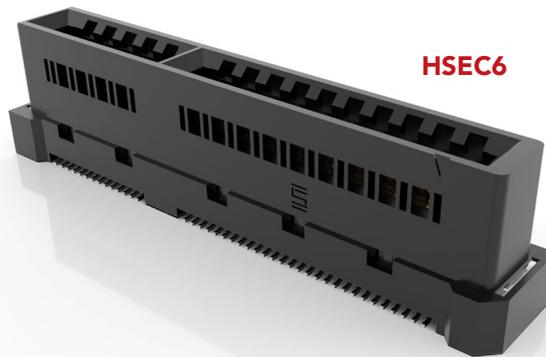
HIGH-SPEED EDGE CARD SYSTEMS

Choice of Pitches & Orientations
Performance to 28 Gbps & 56 Gbps
PCI Express® Gen 3/4/5 Compatible Options



0.60 mm PITCH DIFFERENTIAL PAIR HIGH-SPEED EDGE RATE® CONNECTOR

- Differential pair system
- Compliant to SFF-TA-1002:
 - x4 (1C)
 - x8 (2C)
 - x16 (4C and 4C+)
- Rugged Edge Rate® contacts optimized for signal integrity performance and cycle life
- Mates with .062" (1.60 mm) thick cards
- Currently in development



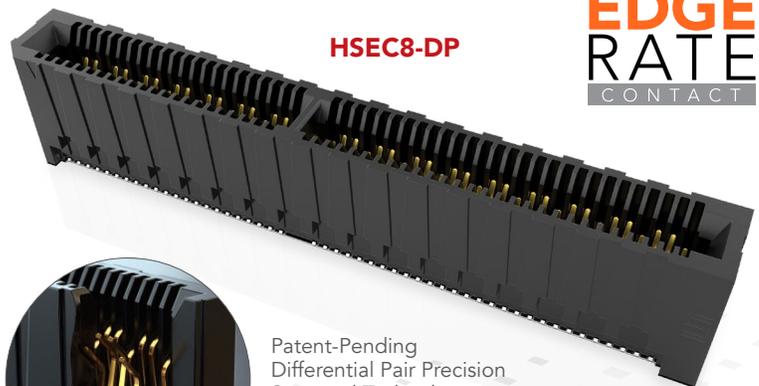
HSEC6



In Development
0.60 mm Pitch Mating
High-Speed
Cable Assembly

0.80 mm PITCH HIGH-SPEED DIFFERENTIAL PAIR EDGE RATE® CONNECTOR

- Choice of 4, 8, 12, 16, 24 or 32 pairs
- Accepts .062" (1.60 mm) thick cards
- Differential pair design optimized for even greater speeds
- Rugged Edge Rate® contacts optimized for signal integrity performance and cycle life
- Mating twinax cable assembly (ECDP Series) also available



HSEC8-DP



Patent-Pending
Differential Pair Precision
Stamped Technology
Enables Greater Speeds

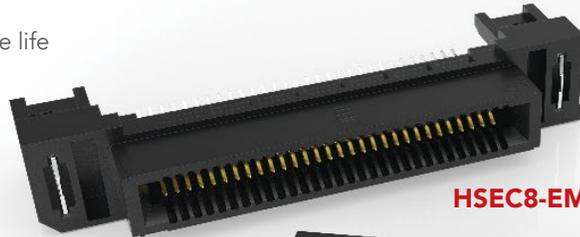




Samtec's edge card connectors meet transmission demands for broadcast video applications. Visit samtec.com/12gsdi for additional details.

0.80 mm PITCH HIGH-SPEED EDGE RATE® CONNECTORS

- Rugged Edge Rate® contacts optimized for signal integrity performance and cycle life
- Mates with .062" (1.60 mm) and .093" (2.36 mm) thick cards
- Up to 200 I/Os
- Surface mount, right-angle, edge mount and pass-through options
- Power/Signal combo available (HSEC8-PV Series)
- Optional board locks, cable latching and weld tabs
- Mating twinax cable assembly (ECDP Series) also available
- PCI Express® Gen 4 compatible rugged edge card socket with tucked beam technology (HTEC8 Series)



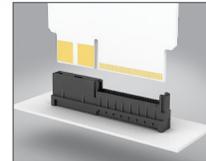
**EDGE
RATE**
CONTACT



PCI EXPRESS
GEN 3/4 COMPATIBLE



0.80 mm Edge Rate® Twinax Cable Assembly Mates with HSEC8-DV and HSEC8-RA Series Connectors

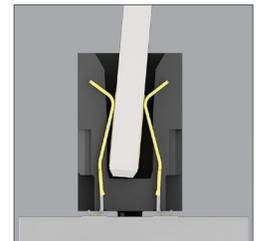


0.80 mm Pitch Edge Rate® High-Speed Signal/Power Combo Connector Also Available

1.00 mm PITCH HIGH-SPEED EDGE RATE® CONNECTORS

- Rugged Edge Rate® contacts optimized for signal integrity performance and cycle life
- Custom designs allow for misalignment mitigation
- Up to 140 I/Os
- Mates with .062" (1.60 mm) thick cards
- Optional weld tab for mechanical strength
- **Currently in Development:** PCI Express® Gen 5 compatible 1.00 mm pitch differential pair edge card system (HSEC1-DP Series)

**EDGE
RATE**
CONTACT



Custom Designs Allow for Misalignment in the X-Y Axes



PCI EXPRESS
GEN 3/4 COMPATIBLE

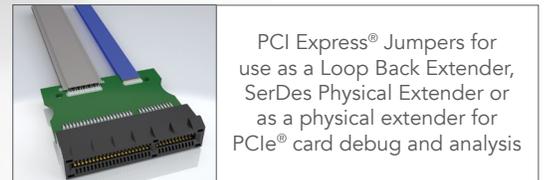
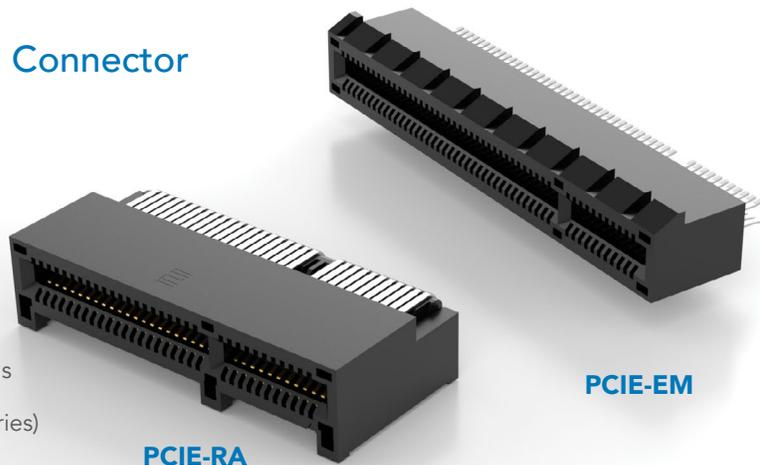
PCI Express® EDGE CARD SYSTEMS

Gen 3 Compliant and Gen 3, 4 & 5 Compatible Solutions
Support for 1, 4, 8 and 16 PCI Express® Links
Mates with PCI Express® Cable Assemblies



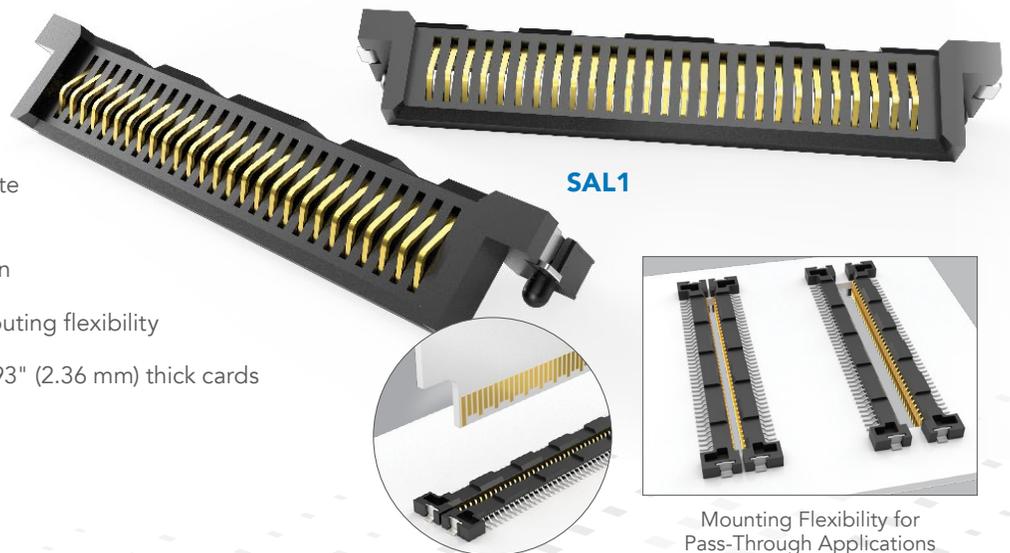
PCI Express® Gen 3 Edge Card Connector

- 1.00 mm (.0394") pitch
- Supports one, four, eight and sixteen PCI Express® links
- PCI Express® Gen 3 compliant
- Accepts .062" (1.60 mm) card
- Vertical, right-angle or edge mount orientations
- PCI Express® jumpers also available (PCIEC Series)



SATALink™ Compatible High-Speed Micro Plane Connector

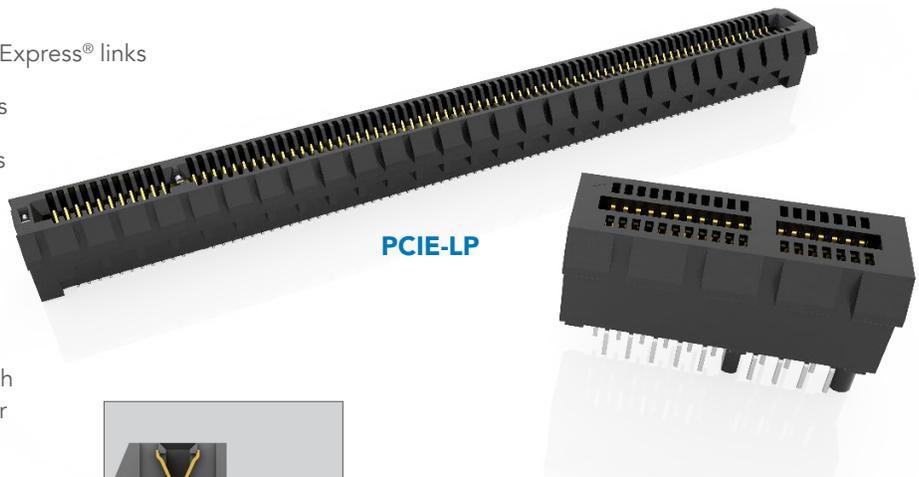
- 1.00 mm (.0394") pitch
- Low profile, surface mount
- 40 to 80 I/Os per pair
- Mounts in pairs on same or opposite sides for easy signal routing
- BeCu contacts with large deflection
- Tremendous board stacking and routing flexibility
- Mates with .062" (1.60 mm) and .093" (2.36 mm) thick cards



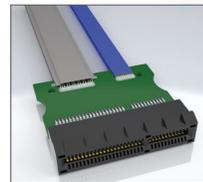
Mounting Flexibility for Pass-Through Applications

PCI Express® Gen 4 Low Profile Edge Card Connectors

- 1.00 mm (.0394") pitch
- Supports one, four, eight and sixteen PCI Express® links
- Compatible to PCI Express® Gen 4 speeds
- Low 8 mm profile design for space savings
- Mates with .062" (1.60 mm) thick cards
- Optional weld tabs
- PCI Express® jumpers also available
- PCIe-G4 Series slim, low profile socket with rugged Edge Rate® contacts optimized for signal integrity performance and cycle life



8 mm Low Profile Design
vs.
11 mm Standard Height

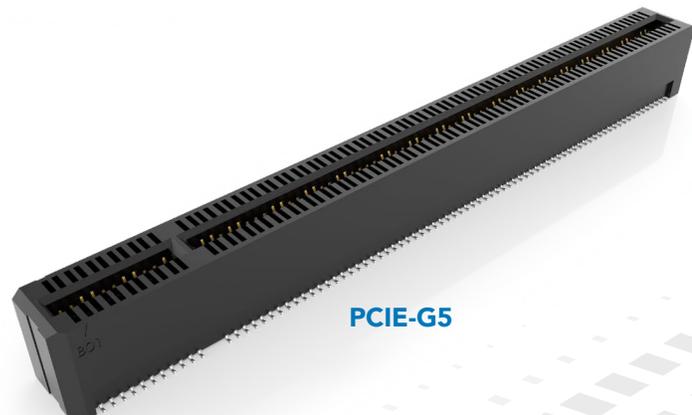


PCI Express® Jumpers for use as a Loop Back Extender, SerDes Physical Extender or as a physical extender for PCIe® card debug and analysis



PCI Express® Gen 5 Edge Card Connectors

- Currently in development; design-in today for future-proof data rates
- Differential pair system
- **Product Roadmap:**
Next generation 56 Gbps NRZ edge card system



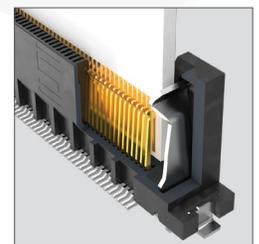
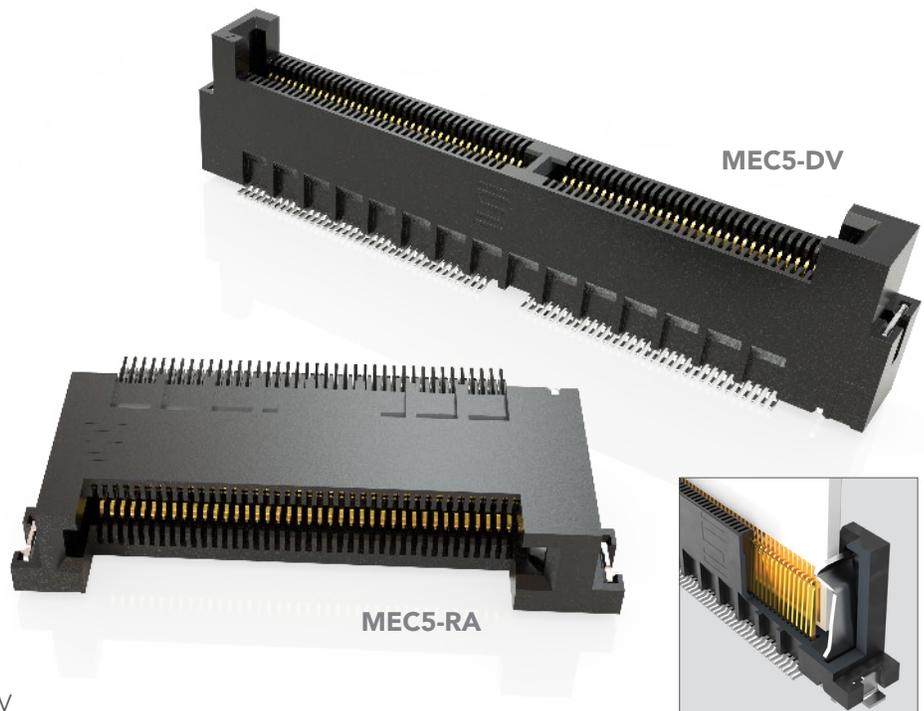
MICRO EDGE CARD SYSTEMS

Choice of Pitches & Orientations
Performance to 28 Gbps & 56 Gbps
Early Gen & Gen 4 PCI Express® Compatible Options

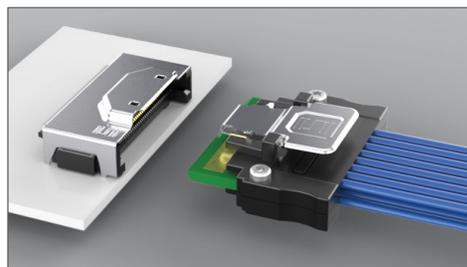


0.50 mm Pitch High-Speed Micro Edge Card Connectors

- Highest density in the industry
- Up to 300 total I/Os:
 - 60 - 200 positions (DV)
 - 60 - 160 positions (RA)
 - 300 positions in development
- Right-angle and vertical orientations
- Justification beam maintains ease of manufacturing and yield of mating card by permitting standard PCB tolerances on mating card
- Mates with .062" (1.60 mm) and .093" (2.36 mm) card thicknesses
- Optional board locks and weld tabs
- PCI Express® Gen 4 compatible
- Currently in Development:
 - 0.50 mm pitch high-speed differential pair micro edge card sockets (FCDP-DV and FCDP-RA Series) designed to mate with FEDP Series cable assembly
 - Signal integrity characterization kit for evaluation of FCDP Series high-speed micro edge card connectors



Side Justification Technology Forces Card and Body to Common Datum



In Development
0.50 mm Pitch High-Speed
Vertical and Right-Angle
Micro Edge Card Sockets
for Mating with FEDP Series
Cable Assembly

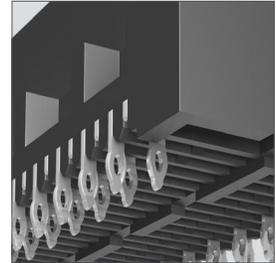




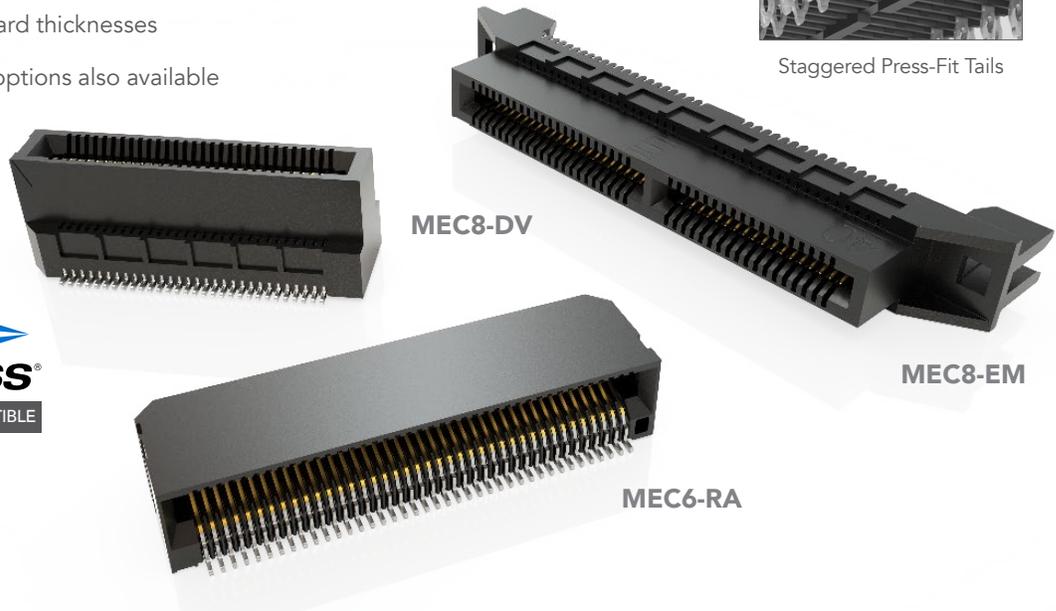
Samtec's edge card connectors meet transmission demands for broadcast video applications. Visit samtec.com/12gsdi for additional details.

0.635 mm & 0.80 mm Pitch Micro Edge Card Connectors

- Up to 140 total I/Os
- 0.635 mm pitch right-angle and vertical (MEC6 Series)
- 0.80 mm pitch right-angle, vertical and edge mount (MEC8 Series)
- Press-fit system on 0.80 mm pitch (MEC8-PV Series)
- Mates with .062" (1.60 mm) card thicknesses
- Alignment pins and latching options also available

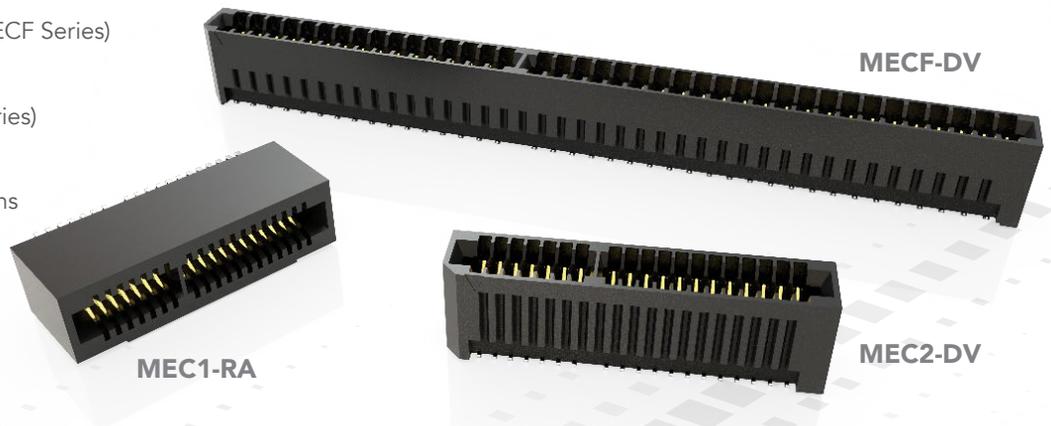


Staggered Press-Fit Tails



1.00 mm, 1.27 mm & 2.00 mm Pitch Mini Edge Card Connectors

- 1.00 mm pitch vertical, right-angle and edge mount (MEC1 Series) with up to 140 total I/Os
- 1.27 mm (.050") pitch vertical (MECF Series) with up to 100 total I/Os
- 2.00 mm pitch vertical (MEC2 Series) with up to 100 total I/Os
- Optional weld tabs, alignment pins and polarization
- Mates with .062" (1.60 mm) and .093" (2.36 mm) thick cards



EDGE CARD REFERENCE GUIDE

		MEC5	MEC6	MEC8	HSEC8	HSEC8-DP
Metrology	Pitch	0.50 mm	0.635 mm	0.80 mm		
	Total Pin Counts	60-300	20-140		18-200	16, 24, 32, 40, 64, 112
	Linear Density (circuits/mm)	3.30	2.67	2.19	2.28	
	Card Thickness	.062"		1.00 mm & .062"	.062" & .093"	.062"
	Orientations Available	Vertical, Right-Angle		Vertical, Right-Angle, Edge Mount, Press-Fit	Vertical, RA, Edge Mount, Pass-Through	Vertical
Mechanical Performance	Average Normal Force per Circuit (GRF)	50	100		60	
	Wipe (mm)	1.10	2.00	2.10	2.00	2.48
	Mating/Unmating Force per Circuit (GRF)	30/25	50/30		40/20	
Electrical Performance (Low Frequency)	Current Carrying Capacity (Amps)	1.5 (2 pins)	2.4 (2 pins)	1.8 (4 pins)	2.8 (2 pins)	TBD
	Working Voltage (VAC)	125	195	185	240	TBD
	PCIe® Compatibility (Gen)	4	2	2	4	5
Electrical Performance (High Frequency)	Designed to be Impedance Matched	Yes	No			Yes
	Channel Performance Metric (Gbps)	56 PAM4	14	25	28	56 PAM4
	Characteristic Impedance (Single-Ended, 30 ps rise time, Ohms)	42-55	46-58	41-56	43-58	Differential Pair
Environmental Performance	Durability (Cycles)	100	100	1,000		
	MFG Tested	No		Yes		No
	Au is the only interface finish available. Recommended operating environment is a controlled environment.					

		SAL1	MEC1	HSEC1	PCIe-LP	PCIe	MECF	MEC2
Metrology	Pitch	1.00 mm					1.27 mm	2.00 mm
	Total Pin Counts	20, 27, 30, 40	20-200	20-140	36 (x1), 64 (x4), 98 (x8), 164 (x16)		10-140	10-100
	Linear Density (circuits/mm)	1.96	1.88	1.76	1.84		1.48	0.97
	Card Thickness	Variable	.062"				.062" & .093"	
	Orientations Available	Pass-Through	Vertical, Right-Angle, Edge Mount	Vertical		Vertical, Right-Angle, Edge Mount	Vertical	
Mechanical Performance	Average Normal Force per Circuit (GRF)	80	60		TBD	55	70	
	Wipe (mm)	1.50	2.95	2.00	3.50		3.00	
	Mating/Unmating Force per Circuit (GRF)	40/30	40/20		TBD	30/15	45/20	
Electrical Performance (Low Frequency)	Current Carrying Capacity (Amps)	2.9 (2 pins)	2.2 (2 pins)	TBD	TBD	2.2 (2 pins)	3.5 (2 pins)	
	Working Voltage (VAC)	215	300		TBD	215	280	238
	PCIe® Compatibility (Gen)	2	2	4	4	3 (compliant)	2	2
Electrical Performance (High Frequency)	Designed to be Impedance Matched	No						
	Channel Performance Metric (Gbps)	14	14	28	28	14	25	14
	Characteristic Impedance (Single-Ended, 30 ps rise time, Ohms)	43-70	33-57	45-55	100	TBD	43-70	43-58
Environmental Performance	Durability (Cycles)	100	500	1,000	100			
	MFG Tested	No		Yes	No	Yes	No	
	Au is the only interface finish available. Recommended operating environment is a controlled environment.							

All products are tested to a standard amplitude and frequency; this parameter gives an average resistance change as a result of that standardized test.

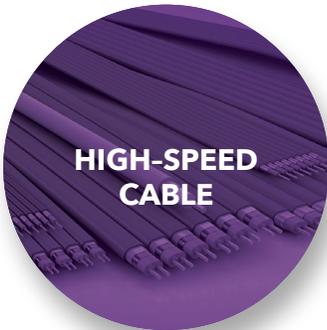
TECHNOLOGY CENTERS

SAMTEC TECHNOLOGY CENTERS ENABLE 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



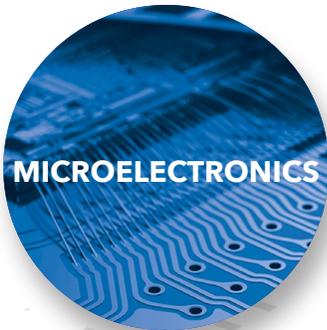
In-house R&D manufacturing of precision extruded cable and assemblies



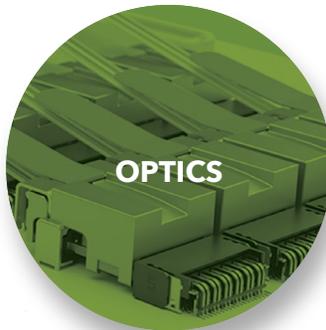
High precision stamping, plating, molding and automated assembly



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



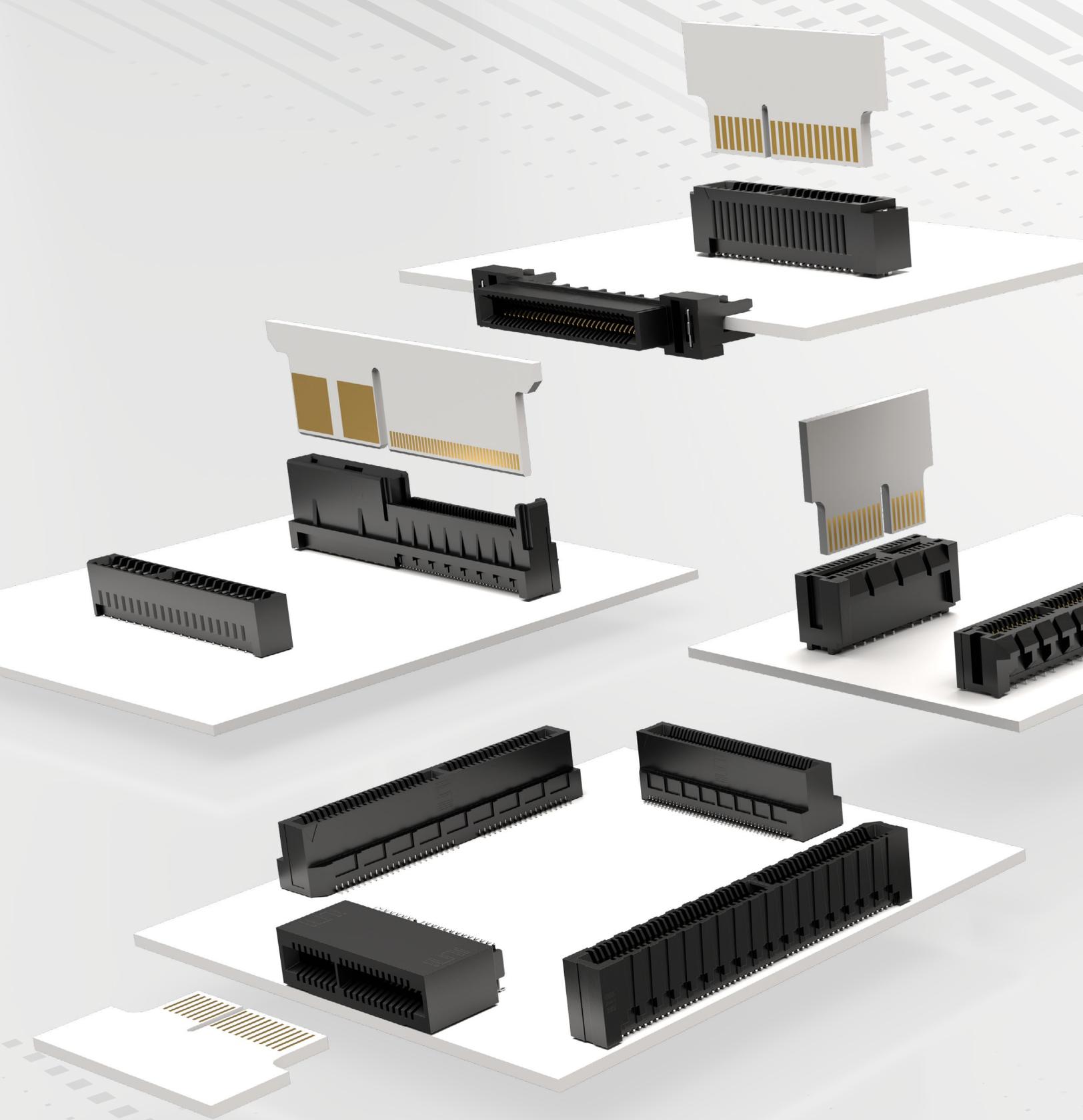
Advanced IC packaging design, support and manufacturing capabilities



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



RF interconnect design and development expertise, with testing to 65 GHz



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

JANUARY 2020