





## **Connector Solutions for** Semiconductor Industry

FAE Seven Qi & Marcus Hu August 2022

INNOVATIVE TECHNOLOGIES. SUDDEN SERVICE . GLOBAL REACH

## **AGENDA**

- p Company Overview
- **P** Silicon to Silicon Solutions
  - High Speed B-B
  - High Speed Cable
  - Optics
  - RF
  - Micro/Rugged
  - Flexible Stacking







## ABOUT US

**Founded in 1976**, Samtec is much more than just another connector company, we put people first

with a commitment to exceptional service and quality products. We believe that taking care of our customers and our employees is paramount in how we approach our business. This belief is deeply ingrained throughout Samtec and means that you can expect **exceptional service** coupled with **technologies** that take the industry further

#### GLOBAL REACH



PRIVATELY
OWNED COMPANY

### SUDDEN SERVICE



MORE THAN 200k PART NUMBERS SHIP IN 1 DAY



24-HOUR FREE SAMPLES



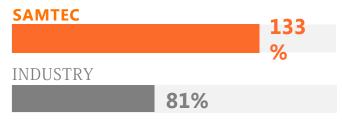
2 DAYS TRANSIT TO ALL MAJOR MARKETS



#1 CONNECTOR MANUFACTURER

#### INDUSTRY UPDATE





#### MARKETS SERVED









## **BUSINESS MODEL**

SILICON-TO-SILICON

**HIGH-SPEED BOARD-TO-BOARD** 

**OPTICS** 

RF

**CORE BOARD-TO-BOARD** 

MICRO/RUGGED

**FLEXIBLE STACKING** 

**SUDDEN SERVICE** 

**HIGH-SPEED CABLES** 



TECH SUPPORT





GLOBAL INFRASTRUCTURE

SALES

**ENGINEERING** 

**OPERATIONS** 

QUALITY

**DIGITAL BIZ** 





## **GLOBAL SUPPORT NETWORK**



## MANUFACTURING MIX GLOBAL BALANCE / DUAL OPERATIONS

#### **SAMTEC USA**

Board-to-Board, High-Speed Cable, Active Optical Cable, GCT, Machine, Tooling Design & Fabrication, Outside Sourcing/Vendor Base, Stamping & Steel Fabrication, Molding & Steel Fabrication, RF Production, Electroplating

#### **SAMTEC CABLE**

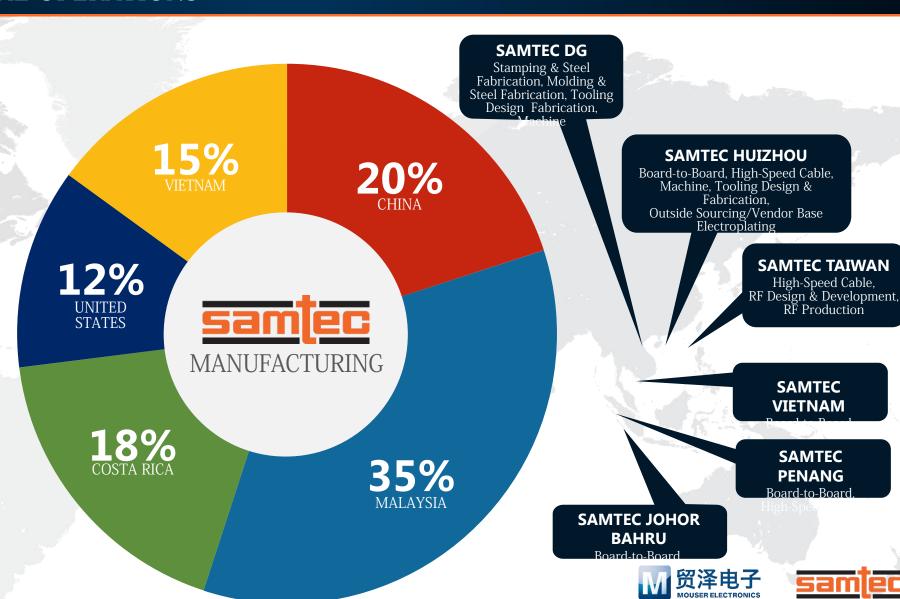
High-Speed Cable, Design & Development, R&D & Manufacturing of Precision Extruded Cable

> SAMTEC MICROELECTRONIC S

Active Optical Engines,

#### SAMTEC COSTA RICA

Board-to-Board, High-Speed Cable, Electroplating.



## MARKETS SERVED | PERCENT OF SALES

Based on 2021 Sales







COMPUTER/ **SEMICONDUCTOR** 





**DATACOM** 





**INSTRUMENTATIO** 





**MEDICAL** 





AERO/ **DEFENSE** 





**AUTO/TRANS/ TELEMATICS** 





**CONSUMER** 

3%

**Customer Base of 50,000** 

25,000 (Direct) + 25,000 (Digital)





www.**SAMTEC**.com

SUDDEN SERVICE Samtec has developed innovative search, design, and value of the right of the rig the right solution. Search by product name, characteristics, pictures, or build an assembly by entering physical specifications.



## Online FID, OLSGN & VALIDATE YOUR SOLUTION



Quickly build mated connector sets and cable assemblies using a wide variety of userdefined search parameters and filters.



Picture Search

Browse through Samtec's most popular products to find the ideal solution for your application.



## **Downloads**

3D MODELS, SPECS, PRINTS & MORE



Quickly configure, preview and download models in more than 150 different formats. including AutoCad, Solid Edge, Inventor and many more.



Samtec's user-friendly eCommerce platform allows you to quickly and easily check product availability and pricing, as well as place and manage your orders online.

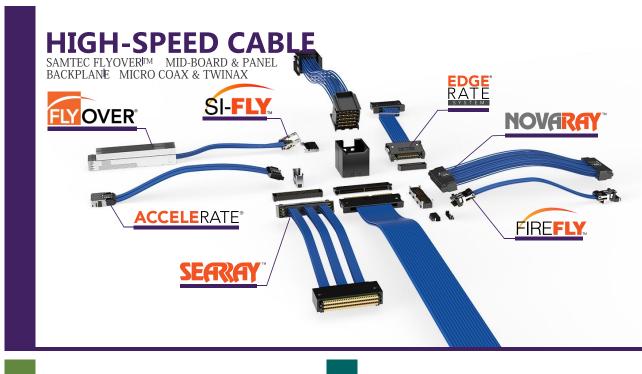


## SILICON-TO-SILICON CONNECTIVITY SOLUTIONS

















## LOW PROFILE GROUND PLANE

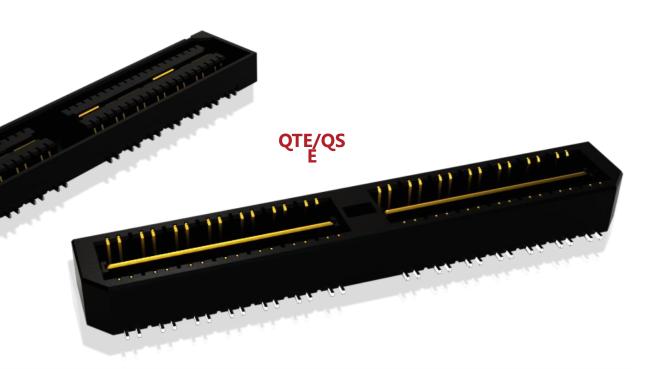
## COSUMNOS 5 mm and RS mm pitch

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













## RUGGED GROUND PLANE CONNECTORS

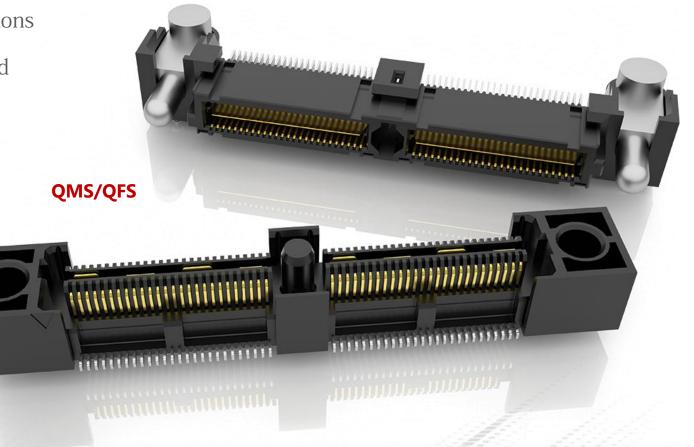
- 0.635 mm pitch
- Increased insertion depth for rugged applications
- Up to 156 signal pins/48 signal pairs standard
- Vertical, right-angle and edge mount
- Shielded systems available (QMSS/QFSS)

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











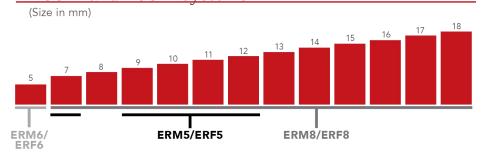


## **EDGE RATE® CONNECTOR STRIPS**

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

## 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
- S Designed simulated and optimized for 500 and 1000 systems ILITY









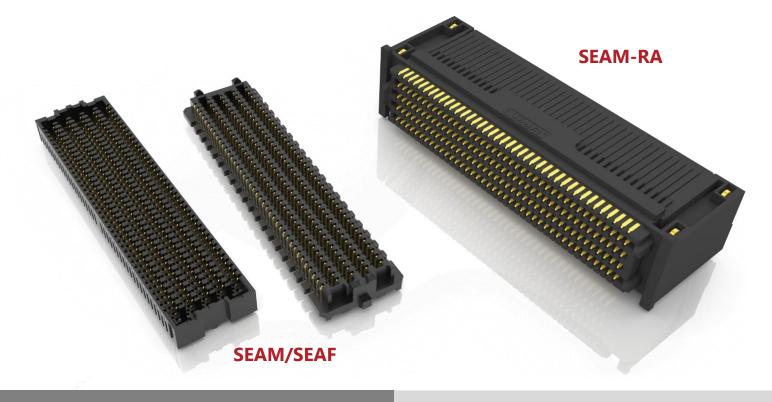
## 1.27mm / 0.8 mm PITCH ARRAYS

- 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™ NRZ PAM4



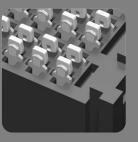








1.12 mm (.044") contact wipe



Solder charge terminations (IPC-A-610F & IPC J-STD-



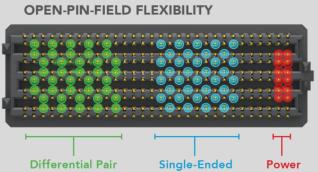
Elevated stack heights available (SEAR)



Press-fit tails available (SEAMP/SEAFP)



Jack screw standoffs (JSO)



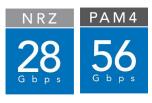
## LOW PROFILE ARRAYS

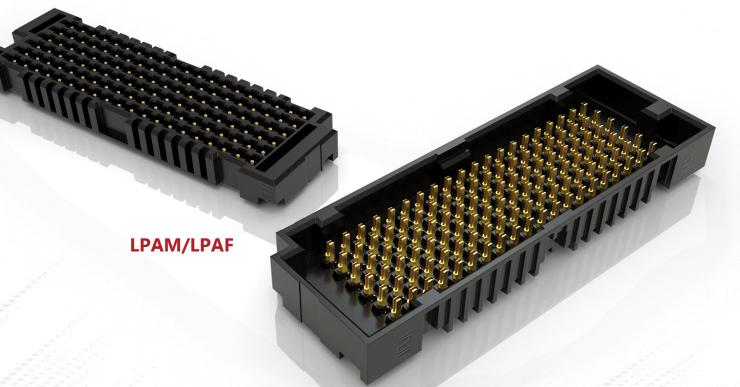
- Up to 400 total pins in 4, 6 or 8 rows
- 4 mm, 4.5 mm and 5 mm stack heights
- 1.27 mm pitch
- Solder crimped termination for ease of processing
- Press-in or threaded standoffs available to assist with unmating (JSO)
- Compatible with mPOWER® for power/signal flexibility



Dual blade contact with solder crimp tail











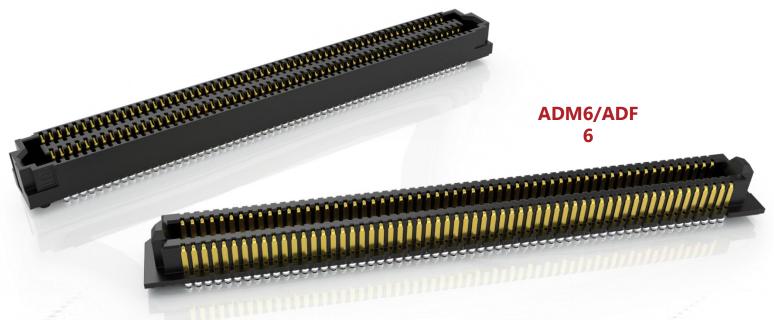
## **HIGH-DENSITY** ARRAYS

- 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
- Other stack heights in development
- PCIe® 5.0 capable
- Compatible with mPOWER® for power/signal flexibility









Right-angle in development (ADF6-RA)





## 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<sup>®</sup> 5.0 and 100 GbE
- Cable assembly with up to 96 pairs in development

ACCELERATE\*HP









## 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

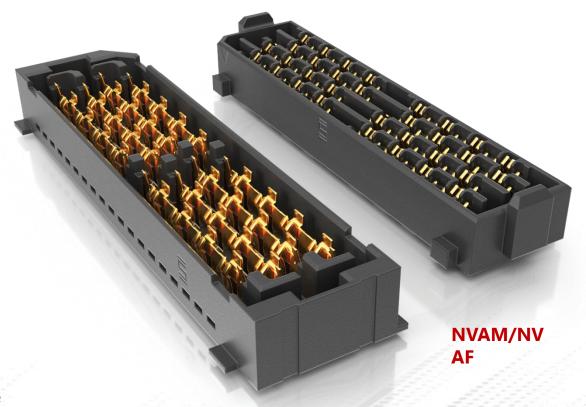


Mating assembly with 34 AWG Eye Speed® ultra low skew twinax cable





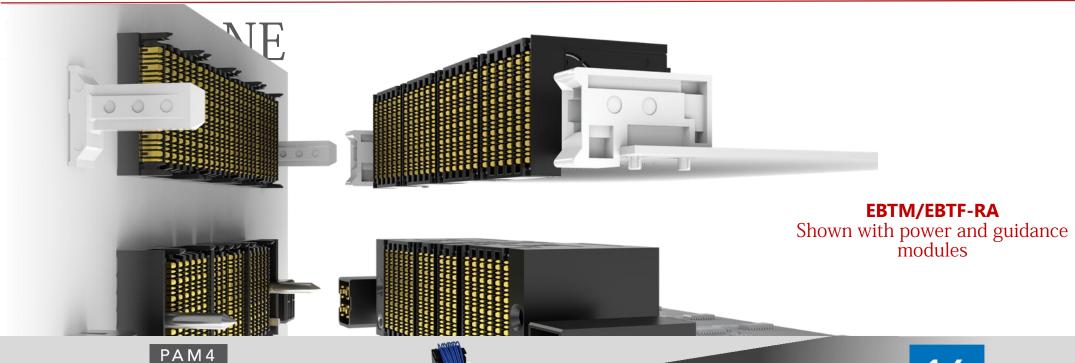






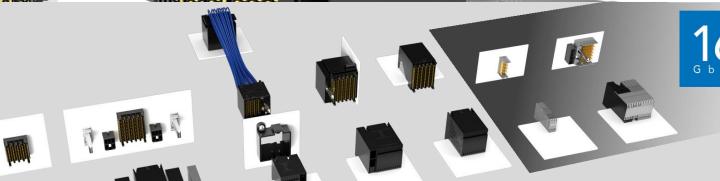


## **HIGH-SPEED AND HIGH-DENSITY**





- Traditional Backplane
- Add-on Power & Discrete Guidance Modules
- Cable Systems
- Direct-Mate Orthogonal
- Coplanar





#### **DENSITY**

- Traditional Backplane
- Modular Design with Guidance, Keying & Power Modules





## ULTRA LOW SKEW TWINAX

#### MICRO CELLULAR DIELECTRIC EXTRUSION

- Critical dimensions measured at every dielectric spool
- Inline laser and CAPAC devices for capacitance monitoring and diameter control
- In-process stats summary sheet for Cpk acceptance

# SAMTEC CABLE INDUSTRY CABLE CABLE CABLE Second design coupling with Samtec's coextruded ultra low skew twinax INDUSTRY Second design coupling with individually extruded conductors & drain wire skew twinax



#### NOMINAL PERFORMANCE SPECIFICATIONS

		28 AWG	30 AWG	32 AWG	34 AWG	36 AWG	
Eye Speed <sup>®</sup> Ultra Low Skew Twinax Cable							
14 GHz (28G NRZ/ 56G PAM4)	0.25 m	IL (dB)	-1.0	-1.2	-1.5	-1.8	-2.2
	1.00 m		-4.1	-4.7	-5.9	-7.5	-8.9
28 GHz (56G NRZ/ 112G PAM4)	0.25 m		-1.5	-1.8	-2.2	-2.7	-3.2
	1.00 m		-6.1	-7.1	-8.7	-10.9	-12.7
Density/Flexibility		Good	Good	Better	Best	Best	





## SAMTEC FLYOVER® TECHNOLOGY

#### THE PROBLEM

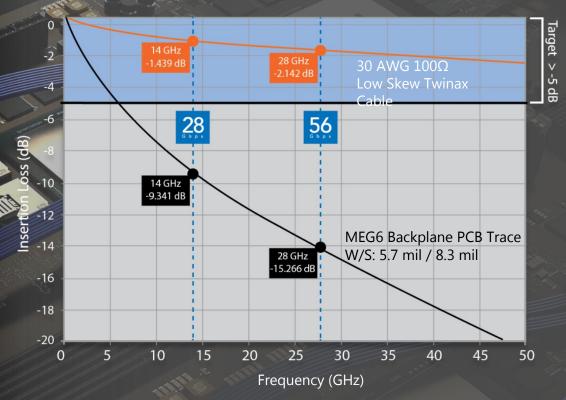
#### **PCB REACH AT NEXT GEN SPEEDS**

#### **BANDWIDTH VS. TRADITIONAL & HIGH-SPEED MATERIALS OPTICS** FR408 MEGTRON 6 MICRO TWINAX 10 Gbps 100 m+ 10"+ up to 39" 14 Gbps 100 m+ up to 33" 28 Gbps up to 100 m up to 2" up to 23" 56 0.0" up to 12" **TBD** up to 2" 112 Gbps 0.0" 0.0" **TBD**

(45 dB Loss Target, Reach Estimate, For QIF VSR applications.)

#### THE SOLUTION

#### SAMTEC LYOVER® SYSTEMS







## FLYOVER® MID-BOARD ASSEMBLIES

## **ACCELERATE®**

#### **SLIM CABLE ASSEMBLY**

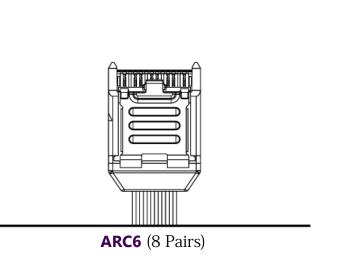
Slimmest cable assembly in the industry - 7.6 mm body width

High-density 2-row design

8, 16 and 24 differential pair configurations

Eye Speed® 34 AWG ultra low skew twinax











## FLYOVER® MID-BOARD ASSEMBLIES

## **NOVARAY®**

#### **EXTREME HIGH-SPEED, HIGH-DENSITY**

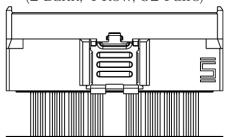
CABLE Industry leading aggregate data rate density - 2x the

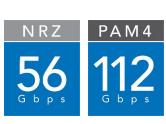
data rate in 60% of the space

Proprietary pin to ground configuration enables very low crosstalk (to 40 GHz) and very tight impedance control

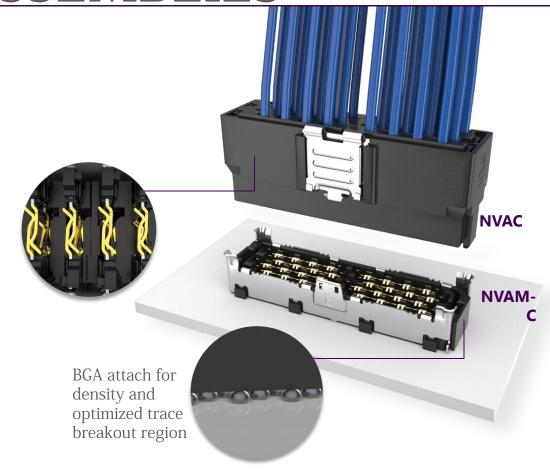
#### **NVAC**

(2 Bank, 4 Row, 32 Pairs)





8 to 32 signal pairs with two reliable points of contact guaranteed; 72 pairs in development







## FLYOVER® MID-BOARD ASSEMBLIES

## NOVARAY® I/O

#### **NOVARAY® I/O ASSEMBLIES**

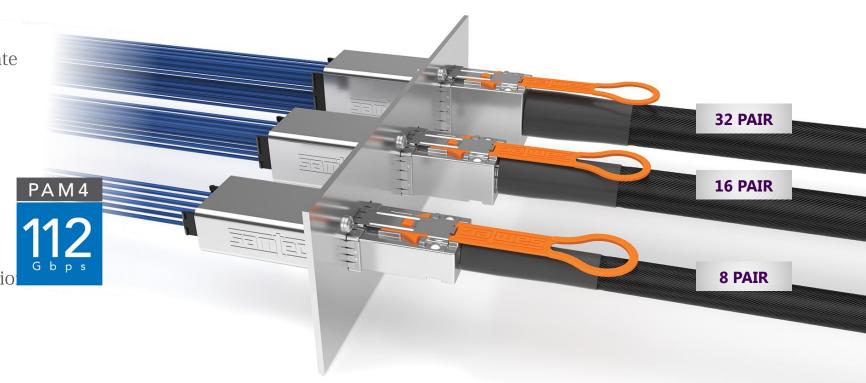
Up to 1024 Gbps PAM4 aggregate data rate

Cable-to-cable bulkhead panel connection

112 Gbps PAM4 solutions in 16 and 32 pair configurations

PCI Express<sup>®</sup> 6.0 solutions in x4 and x8 pair configurations

Rugged external shielding for EMI protection





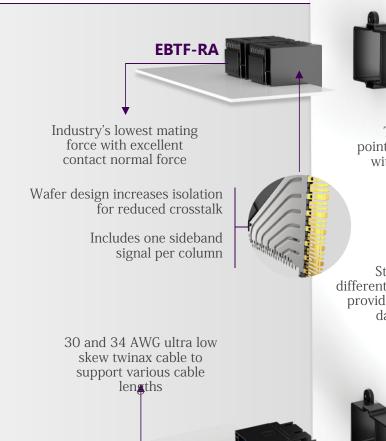


BACKPLANE CABLE ASSEMBLIE

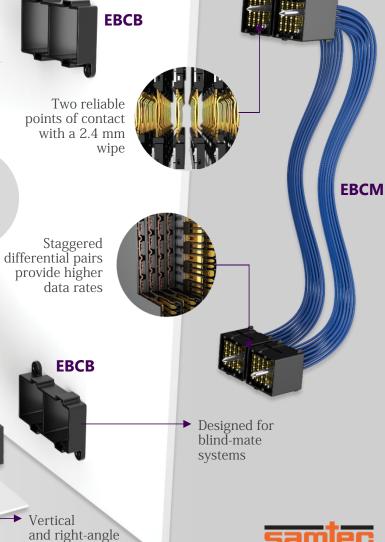
#### **HIGH-SPEED BACKPLANE CABLE**







**EBCM** 









## LOW PROFILE CO-PACKAGED CABLE

**SYSTEM**Ultra-High-Density Configuration Adjacent to the IC Package

- Up to 16 pairs in an incredibly low 3.8 mm profile
- An extremely low profile allows Si-Fly<sup>TM</sup> connectors to reside under heat sinks or other cooling hardware
- Co-packaged interconnect option eludes the BGA and routes signals from the silicon package through a long-reach cable, supporting 5x the signal reach of traditional PCB solutions
- Extreme channel performance enabling 25.6 TB aggregate with a path to 51.2 TB
- 112 Gbps PAM4 per lane

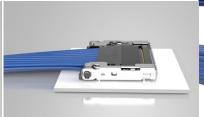




#### **SI-FLY**<sup>™</sup> Mating Step 1, 2, 3





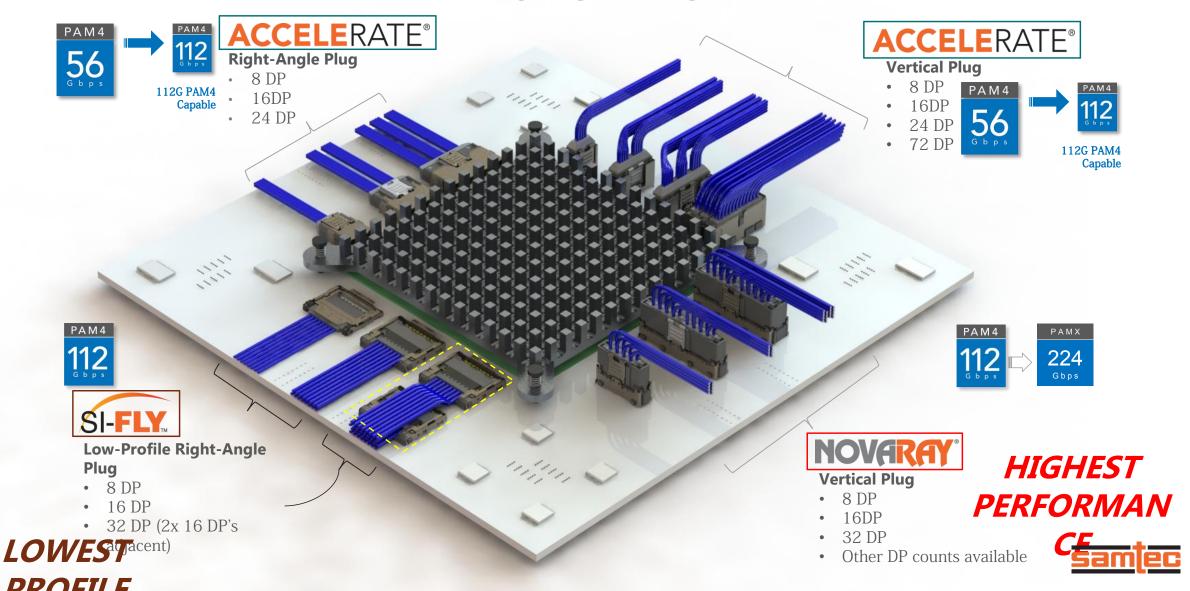






## OPTIMAL END 2 "ADJACENT-TO-CHIP PACKAGE" OPTIONS

#### HIGHEST DENSITY



## FIREFLY™ MICRO FLYOVER SYST

#### **FIREFLY™ COPPER SYSTEMS**

High-performance, high-density copper Samtec Flyover® solution

Pin compatible with FireFly® optical using the same connector system (ECUO)

x4, x8 and x12 configurations

PCIe® 4.0 system (PCUE)







**ECUE** (x12)



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

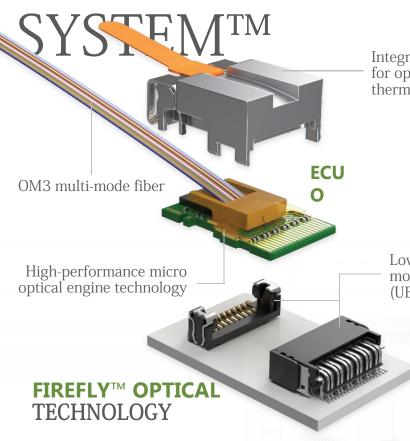


**ECUE** 

**UEC5/UCC8** 



## FIREFLYTM OPTICAL MICRO FLYOVER



Integral heat sink for optimized thermal conditions

> Low insertion force surface mount connector system (UEC5 and UCC8)

Data connection is taken "off board," simplifying board layout and enhancing signal integrity from IC to faceplate

Industry leading miniature footprint allows for higher density close to the data source

Rugged, simple to use system with easy insertion/removal and trace routing

Supports data center, HPC and FPGA protocols, including 10/40/100 GbE Ethernet, InfiniBand<sup>™</sup>, Fibre Channel, Aurora and PCIe®

Management .





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## RF SOLUTIONS

**High-Frequency, Precision RF** (>  $18~\mathrm{GHz}$ ) & Low Frequency, Standard RF (<  $18~\mathrm{GHz}$ )



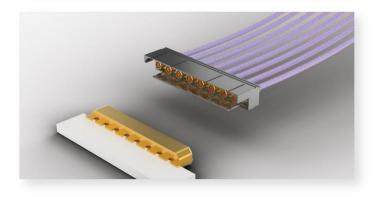
## **PRODUCT OVERVIEW**

50 Ohm			75	<u> </u>	• ←	100		
ECISION	LOW-FREQUENCY, <b>STANDARD RF</b>							
RF23C	MHF (U.FL, W.FL), SMA	MH081	MCX, MMCX, SMB, BNC, DIN 1.0/2.3	RF179	CJT (origina	C28S		
RF23S	MHF (U.FL), SMA	MH113	MCX, MMCX, SMB,	CDE7U C				
RF25S	HMHF1 (U.FL), SMA	RF047	BNC, DIN 1.0/2.3, Micro-Mini Ganged	(hybrid ganged)				
RF120	MMCX, MCX, SMA, SMB, BNC, TNC, N Type	RF178	Micro-Mini Ganged	GRF7-C				
RF405	MMCX(V), MCX, SMA,	RF174	HD-BNC™, DIN 1.0/2.3	RFB8T, RFC8T				
RF402	SMB, BNC, TNC, N Type	RF316	BNC, HD-BNC <sup>TM</sup> , DIN 1.0/2.3 RFA6T, RFC6T BNC, HD-BNC <sup>TM</sup> , DIN 1.0/2.3 RFB6T					
RF047-A	IsoRate®	IJ5C						
	MMCX, MCX, SMA, SMB	<b>IJ5H</b> (IsoRate® hybrid)						
RF085								
RF086	MMCX(V), MCX, SMA, SMB, BNC, TNC, N Type,	GRF1-C, GRF1H-C	CABLE ASSEMBLIES					
RF180	Micro-Mini Ganged	(hybrid/ganged)		†				
RF280	MMCX, MCX, SMA, BNC, TNC	RS316	+ BOAKD CONNECTORS					
Bulls Eye®	SMA, TNC, N Type	RF058	CABLE CO					
	RF23C RF23S RF25S RF120 RF405 RF402 RF047-A RF085 RF086 RF180 RF280 Bulls	RF23C MHF (U.FL, W.FL), SMA  RF23S MHF (U.FL), SMA  RF25S HMHF1 (U.FL), SMA  MMCX, MCX, SMA, SMB, BNC, TNC, N Type  RF405 MMCX(V), MCX, SMA, SMB, BNC, TNC, N Type  IsoRate®  RF047-A ISoRate®  MMCX, MCX, SMA, SMA, SMB, BNC, TNC, N Type  MMCX, MCX, SMA, SMB, BNC, TNC, N Type  MMCX, MCX, SMA, SMB  RF086 MMCX(V), MCX, SMA, SMB, BNC, TNC, N Type, Micro-Mini Ganged  MMCX, MCX, SMA, BNC, TNC  SMA, TNC, N Type  SMA, TNC, N Type	Chm           LOW-           RF23C         MHF (U.FL, W.FL), SMA         MH081           RF23S         MHF (U.FL), SMA         MH113           RF25S         HMHF1 (U.FL), SMA         RF047           MMCX, MCX, SMA, SMB, BNC, TNC, N Type         RF178           RF178           MMCX(V), MCX, SMA, SMA, SMB, BNC, TNC, N Type         RF316           IJSH (IsoRate® hybrid)           MMCX, MCX, SMA, SMB         GRF1-C, GRF1H-C (hybrid/ganged)           MMCX, MCX, SMA, BNC, TNC         RS316           Bulls         SMA, TNC, N Type         RF058	Cohm	Color	Color		

## RF COUPLING TYPES







#### **PUSH-ON**

- Quick attach
- High volume / high cycle & blind-mate applications
- Compensates for axial & radial misalignment (SMPM, SMP)

#### **THREADED**

- Larger, more robust
- Interoperability between (some) interface standards
- Superior repeatability, high mechanical stability

#### **GANGED SOLUTIONS**

- Push-on connectors / quick attach
- More channels
- High density applications





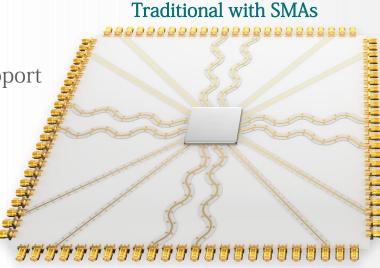
## **TEST & MEASUREMENT**

#### **OPTIMIZED PERFORMANCE TO 70 GHz**

#### **Bulls Eye® High-Performance Test**

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

- Compression interface to the board provides easy on/off and eliminates soldering costs
- High-density, space-saving design
- Enables smaller evaluation boards and shorter trace lengths
- Installation: while the attach process for each series is similar, Enables smaller evaluation boards & shorter trace each have unique specifications that need to be observed lengths
- Ideal for testing the latest silicon chips capable of 112 Gbps PAM4











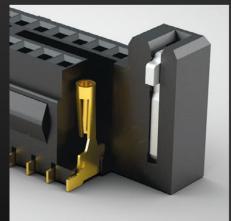
#### RUGGED FEATURES RUGGEDIZING

## **OPTIONS**



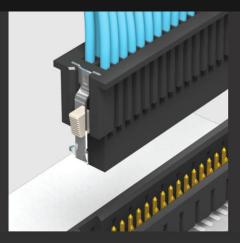
JACK SCREWS

Ideal for high normal force, zippering and other rugged applications



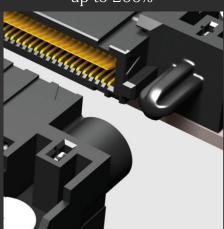
**WELD TABS** 

Significantly increase sheer resistance of connector to PCB



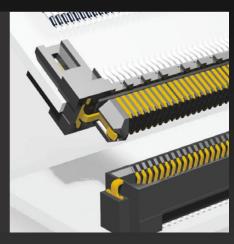
**POSITIVE LATCHING** 

Manually activated latches increase unmating force by up to 200%



**GUIDE POSTS** 

Easy and secure mating



**FRICTION LOCKS** 

Metal or plastic friction locks increase retention/withdrawal force



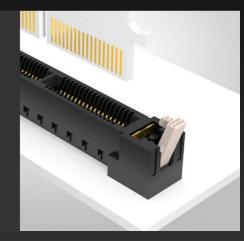
SHIELDING

360° shielding reduces EMI



**RETENTION PINS** 

Increase unmating force by up to 50%



**BOARD LOCKS** 

Boards are mechanically locked together



**SCREW DOWNS** 

Secure mechanical attachment to the board



**BOARD STANDOFFS** 

Precision machined standoffs for 5 mm to 25 mm board

## **ULTRA RUGGED TESTING**

#### EXTENDED LIFE PRODUCT™ TESTING & SEVERE ENVIRONMENT TESTING

**E.L.P.**™ products are tested to rigorous standards, which evaluate contact resistance in simulated storage and field conditions.

- 10 years Mixed Flowing Gas (MFG)
- High Mating Cycles (250 to 2,500)
- Certain plating and/or contact options will apply



#### **SET TESTING INCLUDES**

- Mating/Unmating/Durability
- Mechanical Shock/Random Vibration/LLCR
   Nanosecond Event Detection
- Temperature Cycling
- Non-Operating Class Temperature
- DWV at Altitude
- Electrostatic Discharge (ESD)
- Outgassing

#### **NASA**

Samtec's SET products are approved for NASA Class D missions that require high-reliability, quick-turn and cost-effective solutions for LEO and GEO satellites, SmallSats, CubeSats and other space exploration applications.







## **ULTRA MICRO POWER**

18 A PER BLADE • MICRO 2.00 mm PITCH • DESIGN FLEXIBILITY

#### 2.00 mm PITCH mPOWER®

- Use with Samtec's high-speed connector systems for a unique power/signal system.
- Tin or 10  $\mu$ " Gold plated power blades; 30  $\mu$ " Gold plating available to meet specific regulations.
- Latch option for mating with cable assembly.
- Standard creepage (2.20 mm) and clearance (1.65 mm).



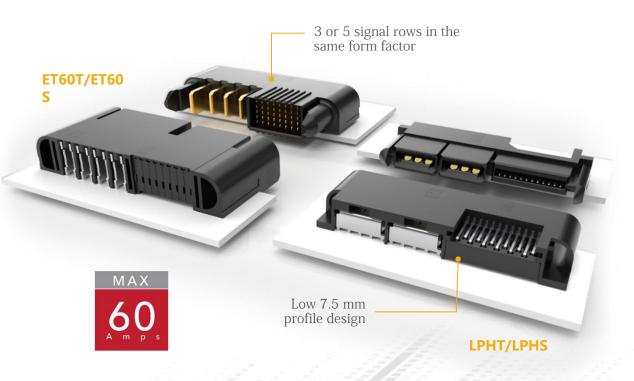
**UMPT** shown at 4 total positions



## **HIGH-POWER**

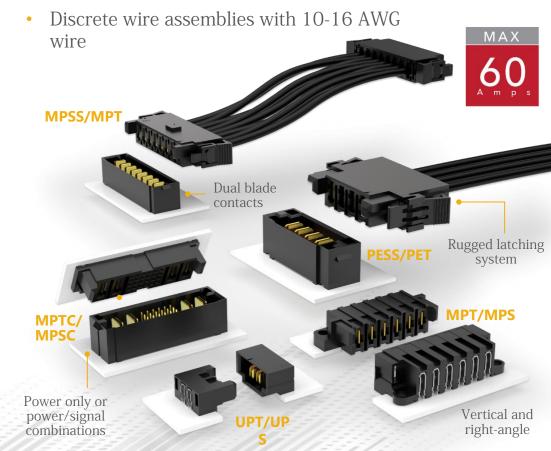
#### **EXTREME POWER**

- AC or DC power, AC-DC combos and split power options (ET60T/ET60S)
- High-density, double stacked power blades (LPHT/LPHS)



#### **POWERSTRIP™ SYSTEMS**

- 23.5 A/blade to 58.7 A/blade (1 blade powered)
- 3.81 mm, 5.00 mm and 6.35 mm pitch



## FLEXIBLE STACKING

#### **INCREDIBLE FLEXIBILITY**

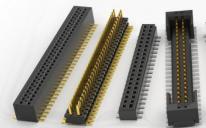
- Post height: Adjustable in .005" (0.13 mm) increments
- Body positions: Adjustable in .005" (0.13 mm) increments
- Board stacking distance: 1.65 mm (.065") 48.51 mm (1.910")
- Number of pins: 2-300
- Number of rows: 1-6

#### **CUSTOMIZABLE**

- Mix-and-match headers and sockets to find the right solution
- Quick and easy custom parts are available

#### **VARIETY OF PITCHES**

- 0.80 mm (.0315")
- 1.00 mm (.0394")
- .050" (1.27 mm)
- .050" x .050" (1.27 x 1.27 mm)
- .050" x .100" (1.27 x 2.54 mm)
- 2.00 mm (.0787")
- .100" (2.54 mm)
- .156" (3.96 mm)
- .200" (5.08 mm)



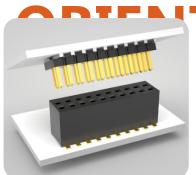
#### **BUILD IT YOURSELF**

Check out **Solutionator**® to quickly build a mated set for your specific application.





## VARIETY OF



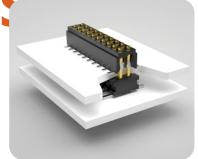
TstAlaTION

- Choice of contact system
- Single, double and triple row designs
- Largest variety



• Connect three or more boards

- Tiger Claw<sup>™</sup> & Tiger Beam<sup>™</sup> contact systems
- Surface mount or offset through-hole



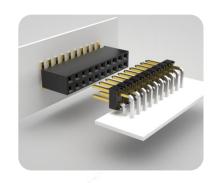
#### **Bottom Entry**

- Tiger Claw<sup>™</sup> contacts
- Access to components when mated
- Space savings



#### Low Profile

- Down to 1.65 mm (.065") stack height
- Tiger Claw<sup>™</sup> contacts
- Space saving



#### Right-Angle

- Design flexibility
- Tiger Claw<sup>™</sup> & Tiger Buy<sup>™</sup> contacts
- · Through-hole, surface mount



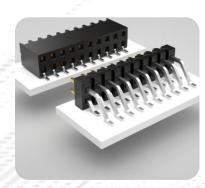
#### **Self-Nesting**

- Tiger Buy<sup>™</sup> contacts
- Press-fit or through-hole tails
- PC/104-Plus<sup>™</sup> embedded applications



#### Elevated

- Up to 48.51 mm (1.910") stack height
- Design flexibility
- Clearance, air flow



#### Coplanar

- 1-4 row designs
- · Surface mount, throughhole or mixed technology
- Tiger Claw<sup>™</sup> & Tiger Beam<sup>™</sup> contacts









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