



# MILITARY & AEROSPACE SOLUTIONS

RUGGED, HIGH-PERFORMANCE INTERCONNECTS FOR MIL/AERO APPLICATIONS



# MILITARY & AEROSPACE

## INTERCONNECT & DESIGN CAPABILITIES

Samtec delivers Sudden Service<sup>®</sup> solutions for standard and application-specific military and aerospace designs to meet the stringent quality, production and compliance requirements of our customers. The combined efforts of Samtec's on-going Severe Environment Testing initiative with our extremely flexible high-speed interconnects provides a quick turn and cost-effective solution for military and aerospace applications that require reliable performance and durability.

### SEVERE ENVIRONMENT TESTING (SET)

Samtec products tested beyond typical industry standards for performance confidence in rugged military and aerospace applications.



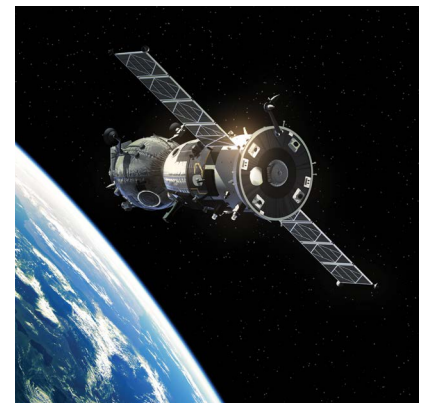
### RUGGED SOLUTIONS

COTS, ASP or MAP interconnect solutions with a wide variety of rugged features to ensure quality and durability in any application.



### HIGH-SPEED PERFORMANCE

Rugged signal integrity solutions with speeds to 112 Gbps PAM4 and extreme design flexibility for performance reliability in harsh environments.



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## MIL/AERO PRODUCT SOLUTIONS

### COMMERCIAL OFF-THE-SHELF (COTS)

- Certified ISO-9001
- Cost-Effective
- Short Lead-Times
- No Minimum Order Quantity
- Full Qualification Testing Online

#### ADDITIONAL CAPABILITIES

Up to 30 μ" Gold  
Tin Lead  
-55 °C to +125 °C operating temperature on most connectors; -40 °C to +125 °C on THV/FEP cables

### APPLICATION SPECIFIC PRODUCT (ASP)

- Modified COTS Built to Samtec's Print
- AS9102 FAI Available
- Non-Standard Options Available
- Similar Part Qualification Testing Online

#### ADDITIONAL CAPABILITIES

Customer specified plating (up to 50 μ" Gold, Tin Lead)  
Non-standard product options

### MILITARY/AEROSPACE PRODUCT (MAP)

- Modified COTS Built to Samtec's Print
- Manufacturing Location Control Available
- Product Specification Control Available
- Non-Standard Options Available
- AS9102 FAI Available
- ITAR Control Available

#### ADDITIONAL CAPABILITIES

Customer specified plating (up to 50 μ" Gold, Tin Lead)  
Non-standard product options  
ITAR control available

## CERTIFICATIONS

Samtec is ISO 9001 and ISO 14001 certified with AS9102 First Article Inspections available, and fully integrated with in-house tooling, plating and automated manufacturing capabilities that provide for advanced development, low-cost, quick turn and high volume production. In addition, Samtec is International Traffic and Arms Regulations (ITAR) registered and products are compliant with Export Administration Regulations (EAR) to protect the national security of the United States. Please visit [samtec.com/quality](http://samtec.com/quality).



# TESTING

Samtec interconnects are subject to a wide variety of standard test procedures that push the industry limits to help ensure quality and durability in any application.



## SEVERE ENVIRONMENT TESTING

Severe Environment Testing (SET) is a Samtec initiative to test products beyond typical industry standards and specifications, many set forth by common requirements for rugged / harsh environment industries. These products undergo additional testing to ensure they are more than suitable for military, space, automotive, industrial and other extreme applications.

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.

Visit [samtec.com/SET](http://samtec.com/SET) or contact [set@samtec.com](mailto:set@samtec.com) for additional information and current available test results.

### ADDITIONAL TESTING INCLUDES:

#### MATING/UNMATING/DURABILITY

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

#### MECHANICAL SHOCK/RANDOM VIBRATION/LLCR & NANOSECOND EVENT DETECTION:

Measures the product's ability to withstand a series of mechanical shocks and random vibration. LLCR is a before and after check for damage. Event detection monitors continuity during testing (40G Peak, 11 ms, Half Sine & 12gRMS, 5 - 2,000 Hz, 1 Hour/Axis).

#### TEMPERATURE CYCLING

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

#### NON-OPERATING CLASS TEMPERATURE

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

#### DWV AT ALTITUDE

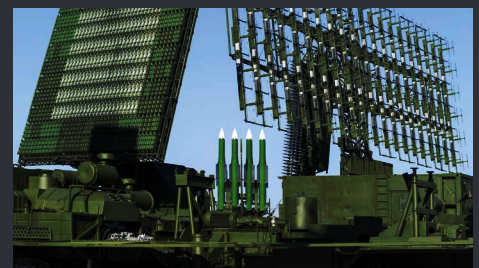
Measures the peak voltage that a product can withstand before dielectric breakdown at high altitudes (70,000 ft).

#### ELECTROSTATIC DISCHARGE (ESD)

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

#### OUTGASSING

Measures the level of gases and vapors released from non-metallic materials when exposed to extreme heat and/or a vacuum. Visit [outgassing.nasa.gov](http://outgassing.nasa.gov) for data.



## EXTENDED LIFE PRODUCT™

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

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

For complete details on Samtec's E.L.P.™ program, a list of qualifying products and test results, please visit [samtec.com/ELP](http://samtec.com/ELP) or email the Customer Engineering Support Group at [ASG@samtec.com](mailto:ASG@samtec.com)



## DESIGN QUALIFICATION TESTING

All Samtec series undergo Design Qualification Testing (DQT), which includes:

- Gas Tight
- Normal Force
- Thermal Aging
- Mating/Unmating/Durability
- IR/DWV
- Current Carrying Capacity (CCC)
- Mechanical Shock/Random Vibration/LLCR
- Mechanical Shock/Random Vibration/Event Detection



## TESTING REFERENCE CHART

TEST	SET	E.L.P.™	DQT
Gas Tight	X*	X*	X
Normal Force	X*	X*	X
Thermal Aging	X*	X*	X
Mating / Unmating / Durability (240 Hrs)	X (100% RH, 250 Cycles)	X* (90-98% RH, 100 Cycles)	X (90-98% RH, 100 Cycles)
IR / DWV	X (At Altitude of 70,000 Feet)	X*	X
CCC	X*	X*	X
Mechanical Shock / Random Vibration / LLCR & Nanosecond Event Detection	X (40 G Peak, 11 ms, Half Sine & 12gRMS, 5 - 2,000 Hz, 1 Hr / Axis)	X* (100 G Peak, 6 ms, Half Sine & 7.56gRMS Avg, 2 Hr / Axis)	X (100 G Peak, 6 ms, Half Sine & 7.56gRMS Avg, 2 Hr / Axis)
Temperature Cycling (500 Cycles)	X	N/A	N/A
Non-Operating Class Temperature	X	N/A	N/A
Electrostatic Discharge (ESD)	X	N/A	N/A
10 Year MFG (Mixed Flowing Gas)	N/A	X	N/A
Mating Cycles (250 to 2,500)	N/A	X	N/A

\*Completed as part of initial Design Qualification Testing (DQT). E.L.P.™ and SET testing are performed in addition to DQT.

# MICRO RUGGED SOLUTIONS

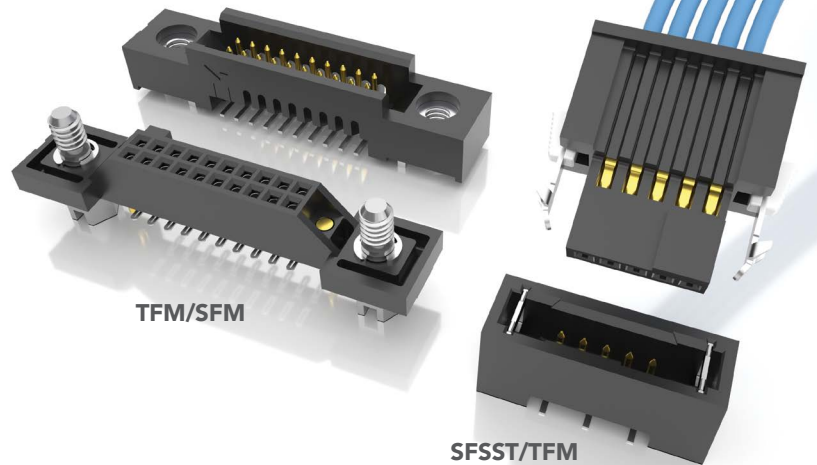
## 1.27 mm PITCH TIGER EYE™

- Screw down, locking clip, friction latching and weld tab ruggedizing options
- Shrouded, polarized and keyed
- 6 - 12 mm stack heights
- Compatible with mPOWER™ for power/signal flexibility
- Discrete wire assemblies with Teflon® wire option; components and tooling available



IDC cable assemblies with rugged strain relief (FFSD/FFMD, FFTP/FMTP)

Locking for increased unmating force (SFML/TFML)

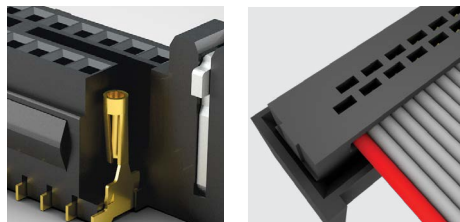


TFM/SFM

SFSST/TFM

## 2.00 mm PITCH TIGER EYE™

- Rugged screw downs, weld tabs and locking clips
- Wide range of stack heights
- Right-angle mating headers available
- Discrete wire assemblies available with Teflon® wire option; components and tooling available



Multi-finger BeCu contacts for high-reliability & cycles

IDC cable assemblies with rugged strain relief and wiring options



T2M/S2M

S2SD/T2M

## 0.80 mm PITCH TIGER EYE™

- Locking clip, alignment pins and weld tab ruggedizing features
- Compatible with mPOWER™ for power/signal flexibility
- Discrete wire assembly with Teflon® wire option
- Extended Life Product™ testing available



TEM/SEM

DuPont™ Teflon® is a registered trademark of the E.I. du Pont de Nemours and Company or its affiliates.

# EDGE RATE<sup>®</sup> CONTACT

## 0.80 mm PITCH EDGE RATE<sup>®</sup>

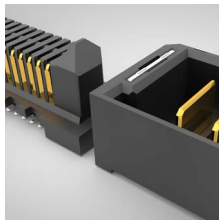


28  
Gbps

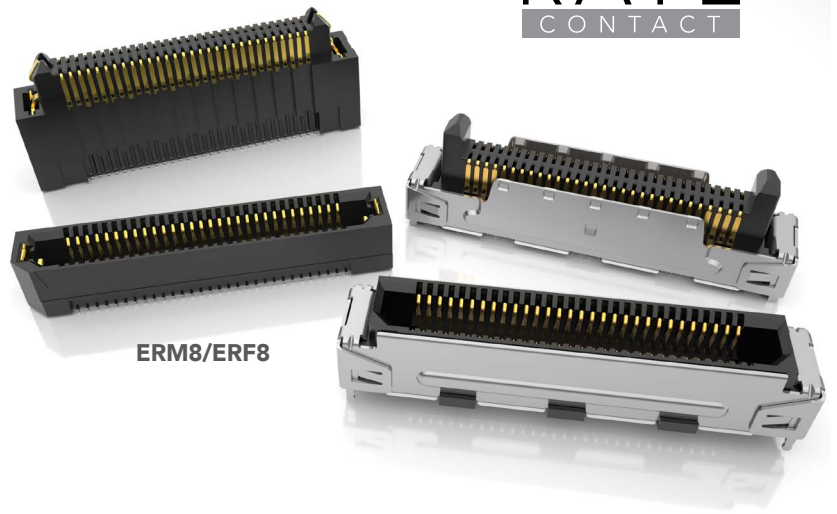
- 1.50 mm extended wipe for a reliable connection
- 7 mm to 18 mm stack heights
- Rugged metal latching for increased retention force
- 360° shielding option reduces EMI
- Compatible with mPOWER™ for flexible power/signal solutions
- Cost-effective metal solder lock in development for a more secure connection to the board



Mating coax and twinax cable assemblies with rugged latching



Power/signal combination with mPOWER™

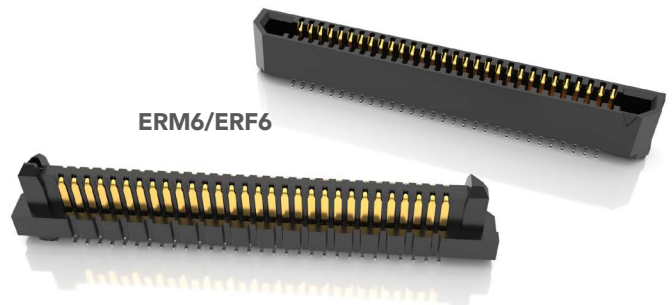


ERM8/ERF8

## 0.635 mm PITCH EDGE RATE<sup>®</sup>

PAM4  
56  
Gbps

- Extremely slim 2.5 mm body width
- Up to 120 positions in a 2-row design
- 5 mm stack height with others in development
- Compatible with mPOWER™ for flexible power/signal solutions

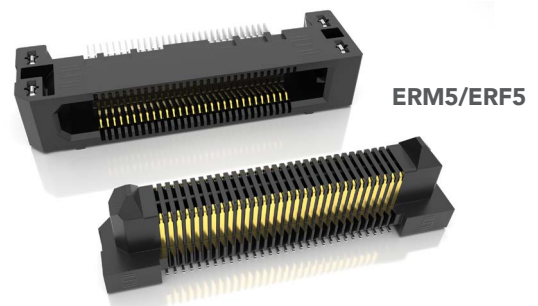


ERM6/ERF6

## 0.50 mm PITCH EDGE RATE<sup>®</sup>

28  
Gbps

- 1.00 mm contact wipe for a reliable connection
- Rugged friction locks and weld tabs available
- Up to 40% PCB savings vs. ERM8/ERF8
- Compatible with mPOWER™ for flexible power/signal solutions



ERM5/ERF5

## TIGER EYE™

- Samtec's most rugged contact system rated to 1,000+ cycles
- High-reliability, BeCu multi-finger design
- Increased mating cycles and lower contact resistance
- Surface mount, micro slot tail for higher joint strength



## EDGE RATE<sup>®</sup>

- Smooth milled mating surface for durability
- Lower insertion and withdrawal forces
- Robust when "zippered" during unmating
- Reduced broadside coupling and crosstalk
- Optimized for 50 Ω and 100 Ω systems



# MICRO RUGGED SOLUTIONS

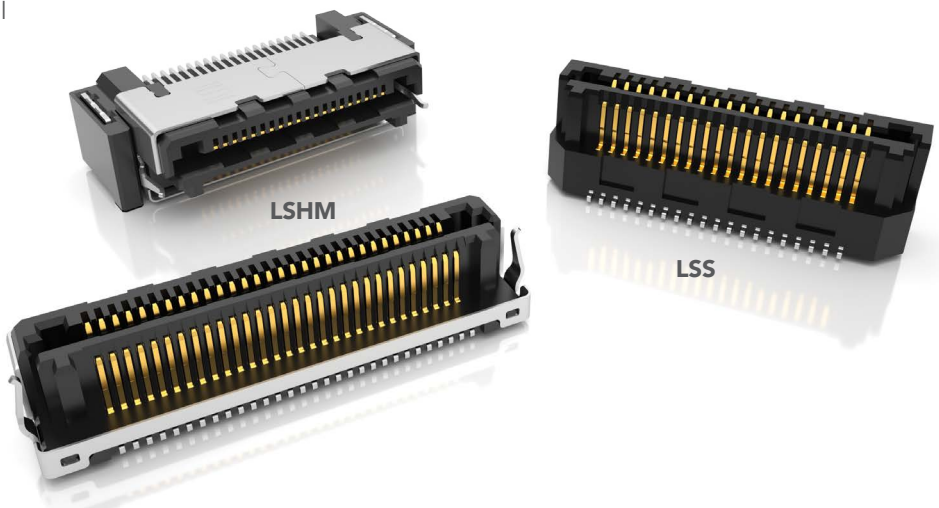
## RUGGED HERMAPHRODITIC INTERCONNECTS



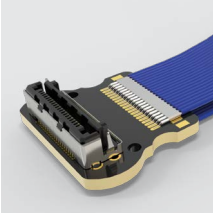
PAM4  
56  
Gbps

- High-retention, high-speed Razor Beam™ contacts
- 0.50 mm, 0.635 mm and 0.80 mm pitch
- 4-6x greater mating/unmating forces vs. typical micro pitch connectors
- EMI shielding available to limit signal degradation and optimize performance
- Stack height flexibility from 5 - 12 mm

RAZOR  
**BEAM**  
SYSTEM



Razor Beam™ contacts for rugged, fine pitch systems



Mating cable assembly with shielding and optional screw downs (HLCD)

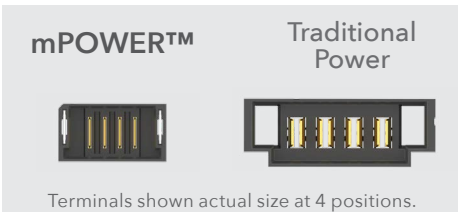
## ULTRA MICRO POWER INTERCONNECTS



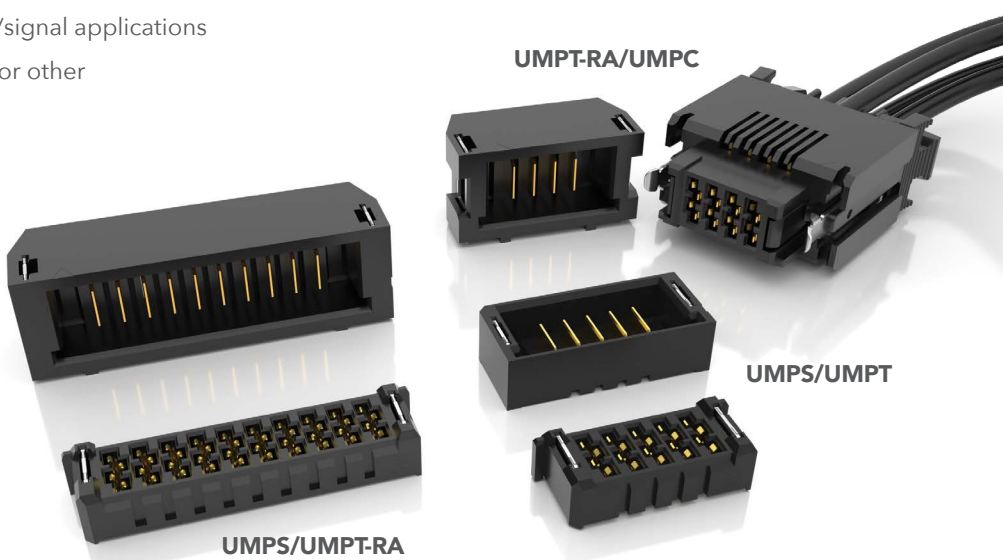
MAX  
21  
Amps

- Up to 21 A per blade on a micro 2.00 mm pitch
- Design flexibility for power-only or power/signal applications
- Extremely small form factor allows space for other components on the board
- Selectively loaded contacts for specific creepage and clearance requirements
- Right-angle available
- Mating cable assemblies with rugged latching available

mPOWER™



mPOWER™ delivers the same 21 Amps in a smaller form factor than traditional power solutions

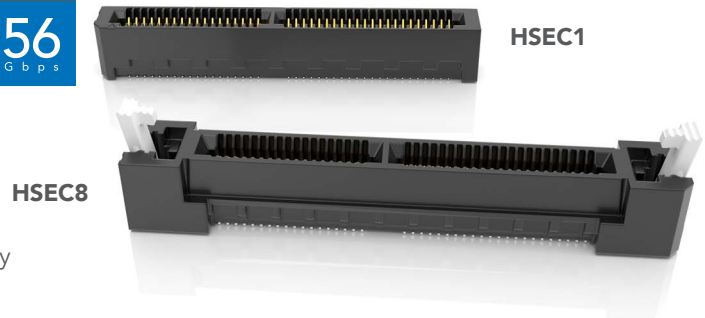




## HIGH-SPEED EDGE CARD SYSTEMS

- Rugged, high-speed Edge Rate® contacts
- Optional rugged latches and weld tabs
- 0.60 mm, 0.80 mm and 1.00 mm pitch
- Power/signal combo to 60 A per power bank
- PCIe® Gen 4 socket with rugged tucked beam technology
- Extended Life Product™ testing available

PAM4  
**56**  
Gbps

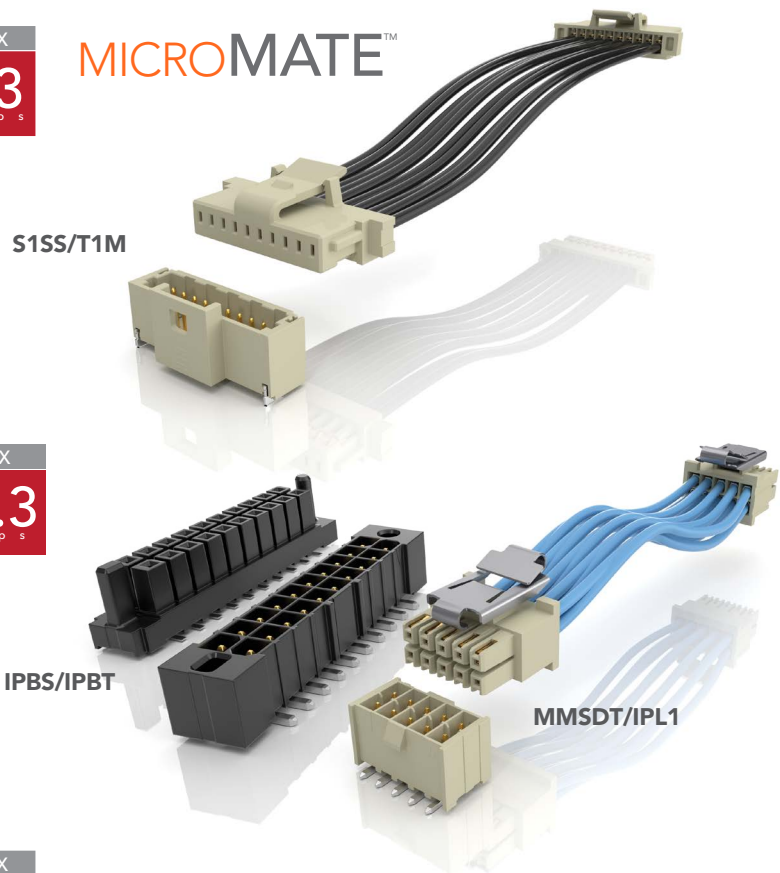


## MICRO 1.00 mm PITCH DISCRETE WIRE SYSTEMS

- Reliable crimp style dual leaf contacts
- Cable-to-board, cable-to-cable and cable-to-panel
- Rugged single or double latching for increased retention
- Teflon® wire option for high temp or halogen free applications

MAX  
**3.3**  
Amps

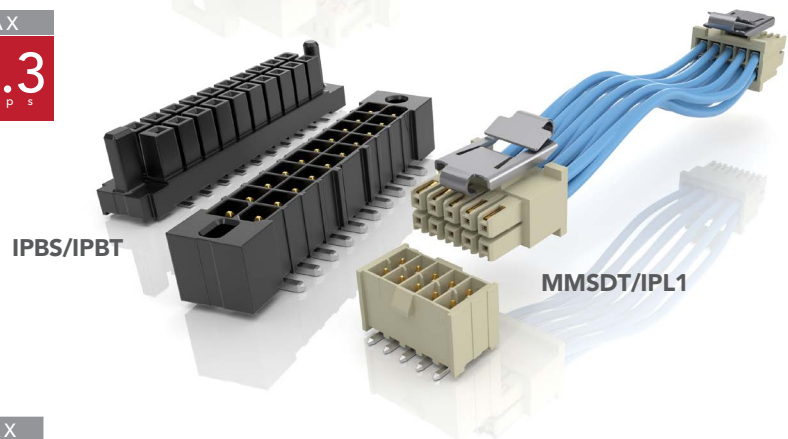
MICROMATE™



## RUGGED POWER SYSTEMS

- Individually shrouded contacts for electrical and mechanical protection
- .100" (2.54 mm) and .165" (4.19 mm) pitch
- Reliable, cost-effective Tiger Buy™ contacts
- Selectively loaded contacts for specific creepage and clearance requirements

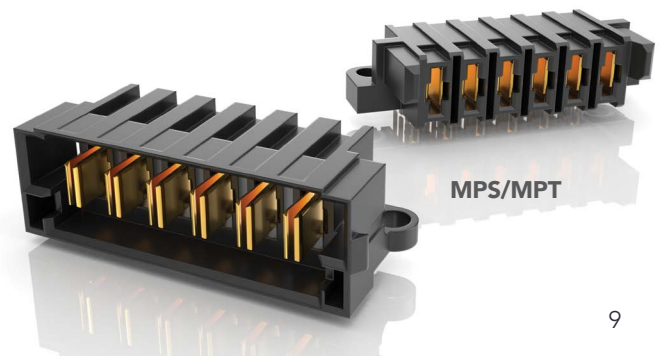
MAX  
**10.3**  
Amps



## FLEXIBLE HIGH POWER SYSTEMS

- 23.5 A/blade to 58.7 A/blade solutions
- Small form factor high power systems
- 5.00 mm and 6.35 mm pitch
- Power only or power/signal combinations
- Selectively loaded contacts for specific creepage and clearance requirements

MAX  
**60**  
Amps



# HIGH-SPEED SOLUTIONS

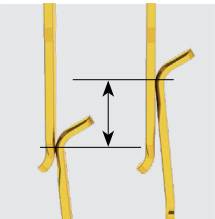
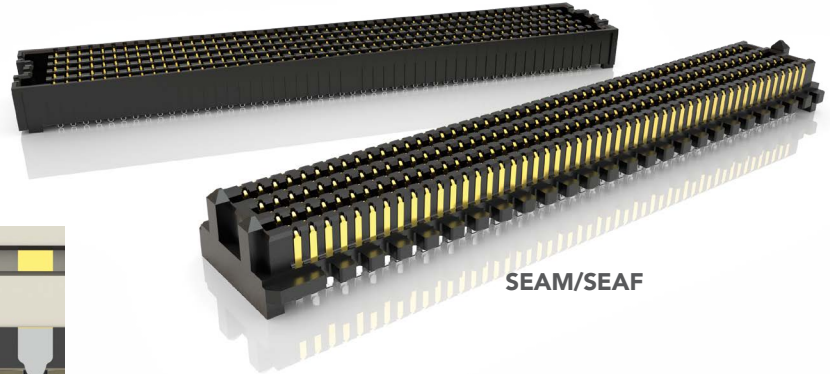
## SEARAY™ 1.27 mm PITCH OPEN-PIN-FIELD ARRAYS



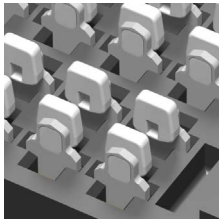
NRZ	PAM4
28 Gbps	56 Gbps

# SEARAY™

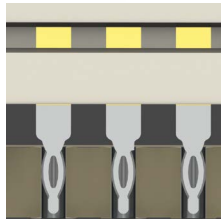
- Open-pin-field design for maximum grounding and routing flexibility
- Up to 560 Edge Rate® contacts
- Solder charge terminations meet IPC J-STD-001F and IPC-A-610F Class 3 criteria
- 7 mm to 40 mm stack heights; right-angle available



1.15 mm (.045") contact wiper



Solder charge terminations



Press-fit tails available (SEAMP/SEAFP)

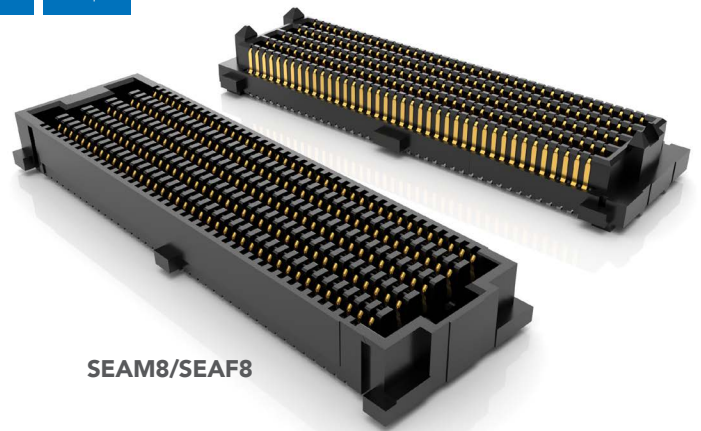
## SEARAY™ 0.80 mm PITCH HIGH-DENSITY ARRAYS



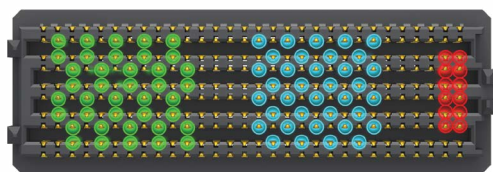
NRZ	PAM4
28 Gbps	56 Gbps

# SEARAY™.8mm

- 2x the density of 1.27 mm pitch arrays
- Up to 720 Edge Rate® contacts
- 7 mm and 10 mm stack heights; right-angle available
- Guide post option for blind mating
- IPC Class 3 qualification in process



Jack screw standoffs (JSO) assist with unmating



Differential Pair

Single-Ended

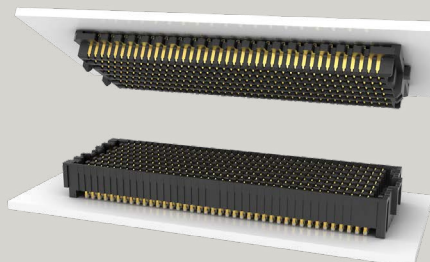
Power

Open-pin-field design

## VITA STANDARDS

- VITA 42 XMC - SamArray®
- VITA 57 FMC/FMC+ - SEARAY™ Vertical
- VITA 66 - FireFly™ XT Micro Flyover System™
- VITA 67 - SMP and SMPM (coming soon)
- VITA 74 VNX - SEARAY™ Right-Angle

Visit [samtec.com/VITA](http://samtec.com/VITA) for details.



# VITA

Open Standards, Open Markets

## MICRO BLADE & BEAM ULTRA-LOW PROFILE STRIPS

- 0.40 mm and 0.50 mm pitch
- 2 mm to 6 mm stack heights
- Slim body design for increased board space savings
- 20 - 160 positions
- Compatible with mPOWER™ for power/signal flexibility

PAM4  
56  
Gbps

ST5/SS5



## LP ARRAY™ LOW PROFILE ARRAYS

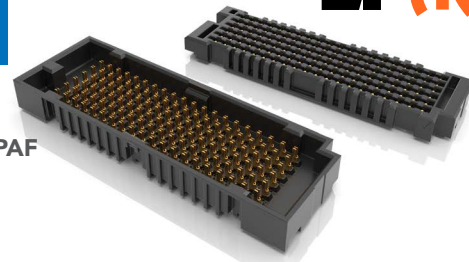
- 4 mm, 4.5 mm and 5 mm stack heights
- Dual beam contact system
- Up to 400 I/Os on a 1.27 mm pitch
- Standard solder crimp termination for improved solder joint reliability and ease of processing; IPC Class 3 qualification in process

NRZ  
28  
Gbps

PAM4  
56  
Gbps

LPAM/LPAF

LPARRAY™



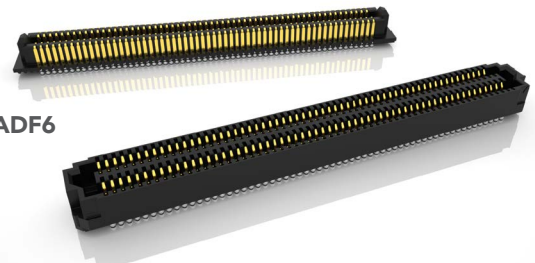
## ACCELERATE® HD ULTRA-DENSE STRIPS

- 0.635 mm pitch rugged Edge Rate® contacts
- Up to 400 I/Os in a 4-row design
- Open-pin-field design for grounding and routing flexibility
- 5 mm stack height and slim 5 mm width

PAM4  
56  
Gbps

ACCELERATE® HD

ADM6/ADF6



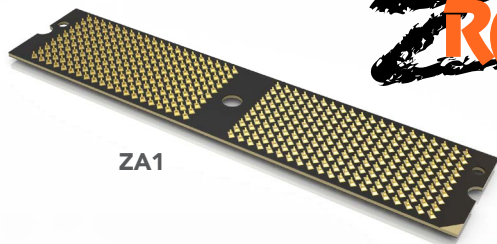
## Z-RAY® HIGH-SPEED COMPRESSION INTERPOSERS

- 0.80 mm and 1.00 mm pitch with up to 400 pins standard
- Dual compression or single compression with solder balls
- Customizable in the X, Y and Z axes, stack height, pin count, shape, plating thickness, etc.
- Alignment/compression hardware available

NRZ  
56  
Gbps

ZRAY®

ZA1



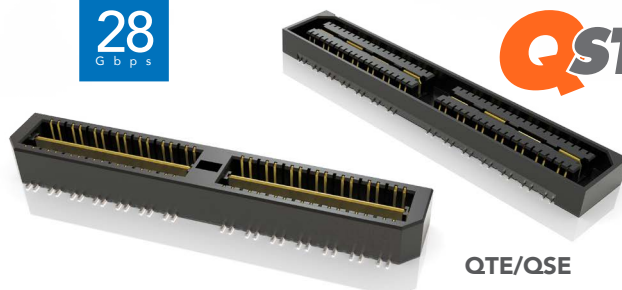
## Q STRIP® LOW PROFILE GROUND PLANE STRIPS

- 0.50 mm, 0.635 mm and 0.80 mm pitch
- Ground/power plane between two signal rows improves electrical performance
- Latching, weld tabs and guide posts available
- Extended Life Product™ testing available

28  
Gbps

QSTRIP®

QTE/QSE



# HIGH-SPEED CABLE SOLUTIONS

## FLYOVER® QSFP28 & DOUBLE DENSITY QSFP SYSTEMS

- Up to ~200 Gbps NRZ (~400 Gbps PAM4)
- Up to ~7+ W/cable heat dissipation
- Contacts directly solder to ultra low skew twinax cable for improved signal integrity
- Sideband signals are routed through press-fit contacts for increased airflow
- Belly-to-belly mating for maximum density (FQSFP-DD)
- Multiple end 2 options for design flexibility

NRZ	PAM4
56 Gbps	112 Gbps

FQSFP

FQSFP-DD

## FIREFLY™ COPPER FLYOVER® SYSTEMS

- High-performance, high density and low cost copper Flyover® solution
- Pin compatible with FireFly™ optical using the same micro connector set
- Variety of end 2 termination options
- PCI Express® Gen 4 compatible version

PAM4
56 Gbps

**FIREFLY™**

ECUE/UEC5-2/UCC8

## EYE SPEED® MICRO COAX & TWINAX CABLE ASSEMBLIES

- Excellent signal integrity, small bend radii and dynamic high flexing cycles
- Mix-and-match end options for extensive customization
- -25 °C to +125 °C standard operating temperature
- Rugged shielding, latching, locking and screw down options available
- SEARAY™, Edge Rate®, Razor Beam™, Q Strip® and 0.80 mm pitch edge card assemblies

14 Gbps
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**EYE SPEED®**  
CABLE

HLCD/LSHM

HQCD/QTH

## COLLABORATIONS

The collaboration of Samtec and its partners proves the incredible capabilities available to design solutions that meet certain requirements or fit specific applications.



## CENTAUR

Centaur: An Amphenol® Aerospace and Samtec collaboration - ExaMAX® cable with MIL-DTL-38999 shell in sizes 23 (4 x 8) and 25 (4 x 10).

# RUGGED OPTICS

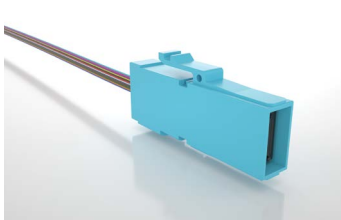
## EXTENDED TEMP FIREFLY™

- Lane speeds of 10 Gbps and 25 Gbps
- Size, Weight and Power (SWAP) optimized
- Operational temperature range of -40 °C to +85 °C
- Shock and vibration per MIL-STD 810G
- Relative humidity to 95% non-condensing
- Option for secure firmware
- High-volume manufacturing
- Flat and grooved heatsinks for conduction cooling
- Multiple connector options including MT38999, MT, MTP®, MXC®, and VITA 66.X

10 Gbps	x4 x12	25 Gbps	x4
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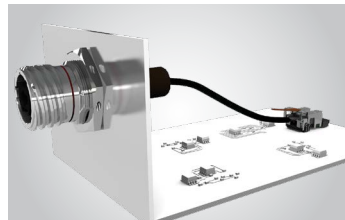


## END OPTION FLEXIBILITY



### MXC®

High-density connectors for front panel or backplane applications



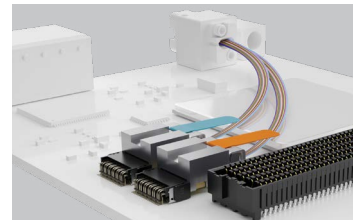
### Amphenol® MT38999

Bulkhead interconnects for rugged, passive optical solutions



### MPO (MTP®)

High-density connectors for panel applications and minimal keep-out areas on the board



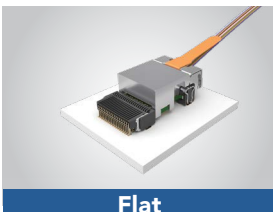
### VITA 66.X Interface

MT ferrule attach to blind mate fiber optic interconnects for VPX backplanes and plug-in modules

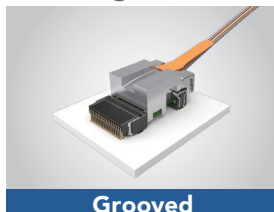
MTP® and MXC® are registered trademarks of US Conec Ltd.

## HEAT SINK FLEXIBILITY

### Conduction Cooling



#### Flat



#### Grooved

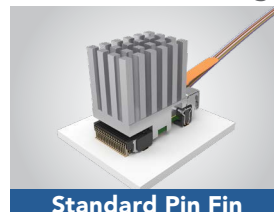
Groove allows ribbon cables to pass through so FireFly™ can be placed closer together



#### PCIe® Pin Fin

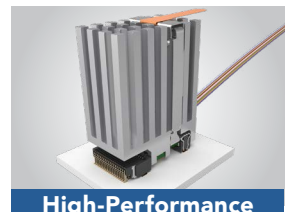
PCIe® card height compliant

### Convection Cooling



#### Standard Pin Fin

Accommodates applications with specific power and temperature requirements



#### High-Performance

# MODIFIED SOLUTIONS

Samtec has the willingness, expertise and manufacturing flexibility to support product modifications and customs for Military and Aerospace applications. Contact Customer Engineering Support at [asp@samtec.com](mailto:asp@samtec.com)

## DESIGN & MANUFACTURING FLEXIBILITY

- Up to 50  $\mu$ " Gold and Tin Lead plating available
- Polarized positions
- Modified stack heights
- Modified latching and screw downs
- Customer specific testing - AS9102 FAIs available
- ITAR compliant with U.S. based manufacturing

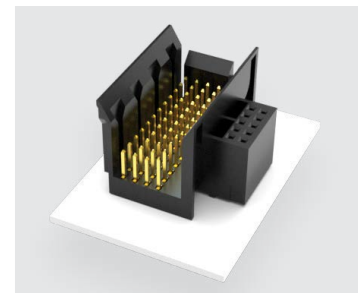
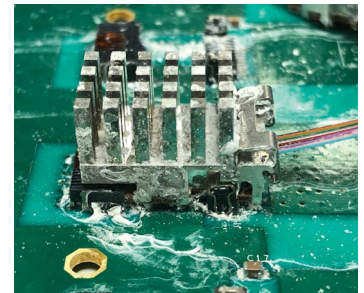


## FLEXIBLE RUGGED SOLUTIONS

- Full engineering, design and prototype support
- Design, simulation and processing assistance
- Dedicated Application Specific Product engineers and technicians

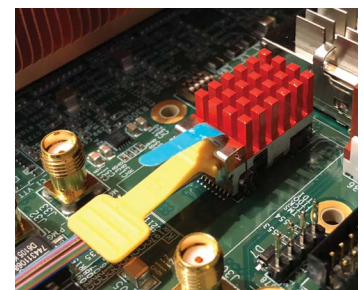
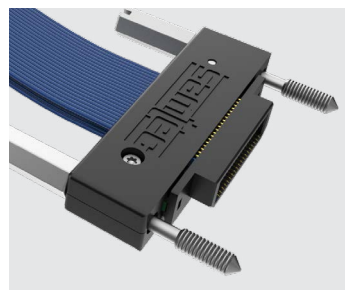
### Modified Rugged Options for Board Level Connectors & Cable Assemblies

- Modified contacts, bodies, stamping, plating, wiring, molding and much more
- Ruggedizing features including strain relief, plastic housings, screw downs, latches, locks, etc.
- Mix-and-match cable end options for application specific requirements
- Many non-cataloged cable standards available including 75  $\Omega$  micro coax and high-density twinax solutions



### Optics for Extreme Environments (in development)

- Samtec MIL-coat protected
- Salt-fog impenetrable
- Mitigation for tin whiskers
- Fungal resistant
- Extreme shock and vibration
- Full support for liquid immersion cooling



# RUGGED FEATURES & APPLICATIONS

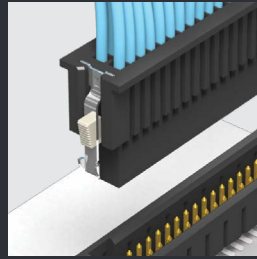
OPTIONS FOR HIGH-RELIABILITY, HIGH-RETENTION AND HIGH-CYCLE LIFE

## RUGGEDIZING OPTIONS



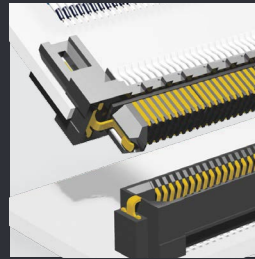
### JACK SCREWS

Ideal for high normal force, zippering and other rugged applications



### POSITIVE LATCHING

Manually activated latches increase unmating force by up to 200%



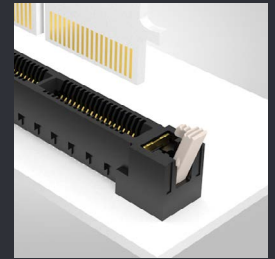
### FRICTION LOCKS

Metal or plastic friction locks increase retention/withdrawal force



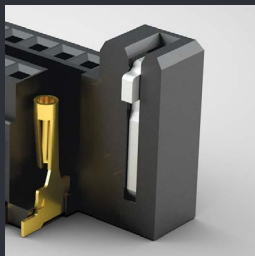
### RETENTION PINS

Increase unmating force by up to 50%



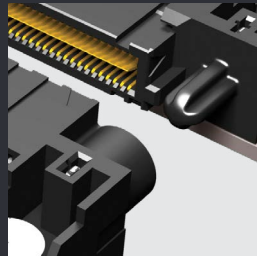
### BOARD LOCKS

Boards are mechanically locked together



### WELD TABS

Significantly increase shear resistance of connector to PCB



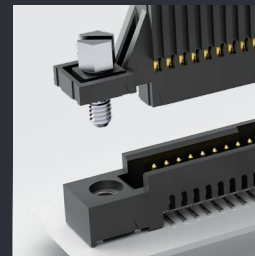
### GUIDE POSTS

Easy and secure mating



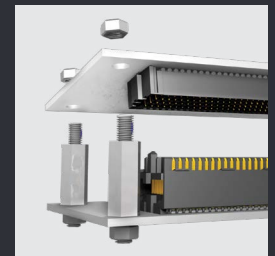
### SHIELDING

360° shielding reduces EMI



### SCREW DOWNS

Secure mechanical attachment to the board



### BOARD STANDOFFS

Precision machined standoffs for 5 mm to 25 mm board spacing

[samtec.com/microrugged](http://samtec.com/microrugged)

## MIL/AERO APPLICATION | F-35 FIGHTER JET PHASE ARRAY RADAR

F-35 fighter jets feature Samtec's MAP product solutions, with modified contacts and body, in the nose cone phase array radar. Our capabilities allow us to provide a wide variety of military and aerospace solutions, including:

- Customer specific designs with MAP product solutions
- Performance testing
  - FAI testing
  - Testing to customer print
  - Salt fog testing
  - Amplified shock and vibration testing
- Lot testing (typically 50 pieces per lot)



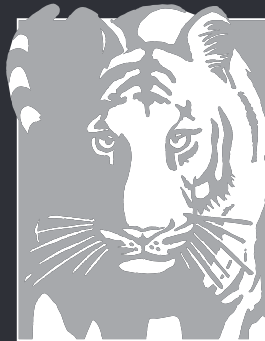
# GLOBAL MANUFACTURING & SUPPORT



**FREE SAMPLES**  
IN 24 HOURS



**#1 CONNECTOR**  
**MANUFACTURER**  
BISHOP & ASSOCIATES



**samtec**

SUDDEN SERVICE™



Powell.com

samtecinfo@powell.com

800-235-7880

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