HIGH-SPEED BOARD-TO-BOARD
OPEN PIN-FIELD ARRAYS | GROUND PLANE STRIPS | EDGE CARDS | ULTRA MICRO | BACKPLANE

MICRO/RUGGED
RUGGED CONTACT SYSTEM | FLEX POWER | RUGGED SI | MICRO SEALED I/O

FLEXIBLE STACKING
LOW PROFILE | PASS-THROUGH | ONE-PIECE | SKYSCRAPERS | SHROUDED HEADERS | IDC SYSTEMS
SUDDEN SERVICE® ADVANTAGE

Samtec, the service leader in the electronic interconnect industry, was founded in 1976 and is headquartered in New Albany, Indiana. We are committed to providing exceptional service, quality products, innovative technologies and convenient design tools.

SOLUTION BLOCKS

From standard cataloged products to unique high-performance designs, Samtec’s solution blocks are designed to support any interconnectivity need, regardless of application, performance requirements or environment.

Silicon-to-Silicon

Core Board-to-Board

TECHNOLOGY CENTERS | www.samtec.com/tech-centers

Our Technology Centers are comprised of industry-leading experts who provide effective strategies, technical support and advanced product solutions for optimizing the entire signal path of a system.

- **ADVANCED INTERCONNECTS**
  High precision stamping, plating, molding and automated assembly

- **HIGH-SPEED CABLE**
  In-house R&D and manufacturing of precision extruded cable and assemblies

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

- **SYSTEM SIGNAL INTEGRITY**
  Full channel signal and power integrity analysis, testing and validation services

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

- **MICROELECTRONICS**
  Advanced IC packaging design, support and manufacturing capabilities
SUDDEN SERVICE®

Global Operations Network
Fast lead times - typically in days, not weeks - with upfront and aggressive 24 hour quotes, and no MOQs on standard catalog products.

Online Tools - Design in a Minute
Innovative design tools, resources and support to make the design and implementation of your application simple.

24/7 Worldwide Tech Support
www.samtec.com/support
TECHNOLOGY CENTERS

Silicon-to-Silicon Expertise & Support for the Demands of Today and the Challenges of Tomorrow.

HIGH-SPEED CABLE
- Precision & Low Skew Cable Design
- Micro Cellular Dielectric Extrusion
- High-Speed Cable Automation
- 28 / 56 / 112 Gbps Solutions

ADVANCED INTERCONNECTS
- Advanced Automation & Insert Molding
- Materials Science Expertise

SYSTEM SIGNAL INTEGRITY
- Full System Simulation & Analysis
- High-Level Design & Engineering Support
- Glass Core Technology
INTEGRATION LEADS TO INNOVATION

Increasingly complex systems with escalating bandwidths and shrinking footprints drive Samtec to continually expand and develop our technical expertise and capabilities.

Our Technology Centers are comprised of industry-leading experts who are dedicated to the design and development of innovative products and technologies, as well as effective strategies and technical support for optimizing the entire signal path of a system. Samtec Tech Centers are not limited by the boundaries of traditional business units, thus, allowing us to work in a fully integrated capacity that enables true collaboration and innovation for solutions to meet the demands of today, and the challenges of tomorrow.
# HIGH-DENSITY ARRAYS

*samtec.com/arrays*

![Image of high-density arrays](image)

## HIGH-DENSITY ARRAYS

<table>
<thead>
<tr>
<th>NVAM/NVAF</th>
<th>SEAM/SEAF</th>
<th>SEAR</th>
<th>SEAM8/SEAF8</th>
<th>LPAM/LPAF</th>
<th>TPAR/TPAF</th>
<th>ZA8</th>
<th>ZA8H</th>
<th>ZA1</th>
<th>GMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NovaRay™</td>
<td>SEARAY™</td>
<td>SEARAY™ 0.80 mm</td>
<td>LP Array™</td>
<td>SkyRay™</td>
<td>Z-Ray*</td>
<td>Compression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.80 mm x 1.80 mm pitch</td>
<td>1.27 mm x 1.27 mm pitch</td>
<td>0.80 mm pitch</td>
<td>1.27 mm x 1.27 mm pitch</td>
<td>1.50 mm x 1.75 mm pitch</td>
<td>0.80 mm pitch</td>
<td>1.00 mm pitch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 &amp; 10 mm stack heights</td>
<td>7-18.5 mm stack heights</td>
<td>30 &amp; 40 mm stack heights</td>
<td>7 &amp; 10 mm stack heights</td>
<td>4, 4.5, 5 mm stack heights</td>
<td>35 mm stack height</td>
<td>1 mm stack height</td>
<td>0.33 mm stack height</td>
<td>1 mm stack height</td>
<td>1.27 &amp; 2 mm stack heights</td>
</tr>
<tr>
<td>8, 12, 16, 24, 32 pairs</td>
<td>40-560 pins</td>
<td>240-500 pins</td>
<td>40-720 pins</td>
<td>40-400 pins</td>
<td>50, 100, 150 pins</td>
<td>100, 200, 300, 400 pins</td>
<td>24, 42, 48, 84, 96, 168 pins</td>
<td>100, 200, 300 pins</td>
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</tr>
</tbody>
</table>

## LOW-PROFILE ARRAYS

<table>
<thead>
<tr>
<th>NVAM/NVAF</th>
<th>SEAM/SEAF</th>
<th>SEAR</th>
<th>SEAM8/SEAF8</th>
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<th>ZA1</th>
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</thead>
<tbody>
<tr>
<td>NovaRay™</td>
<td>SEARAY™</td>
<td>SEARAY™ 0.80 mm</td>
<td>LP Array™</td>
<td>SkyRay™</td>
<td>Z-Ray*</td>
<td>Compression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.80 mm x 1.80 mm pitch</td>
<td>1.27 mm x 1.27 mm pitch</td>
<td>0.80 mm pitch</td>
<td>1.27 mm x 1.27 mm pitch</td>
<td>1.50 mm x 1.75 mm pitch</td>
<td>0.80 mm pitch</td>
<td>1.00 mm pitch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 &amp; 10 mm stack heights</td>
<td>7-18.5 mm stack heights</td>
<td>30 &amp; 40 mm stack heights</td>
<td>7 &amp; 10 mm stack heights</td>
<td>4, 4.5, 5 mm stack heights</td>
<td>35 mm stack height</td>
<td>1 mm stack height</td>
<td>0.33 mm stack height</td>
<td>1 mm stack height</td>
<td>1.27 &amp; 2 mm stack heights</td>
</tr>
<tr>
<td>8, 12, 16, 24, 32 pairs</td>
<td>40-560 pins</td>
<td>240-500 pins</td>
<td>40-720 pins</td>
<td>40-400 pins</td>
<td>50, 100, 150 pins</td>
<td>100, 200, 300, 400 pins</td>
<td>24, 42, 48, 84, 96, 168 pins</td>
<td>100, 200, 300 pins</td>
<td></td>
</tr>
</tbody>
</table>
EXTREME PERFORMANCE ARRAYS

- 4.0 Tbps aggregate data rate
- Very low crosstalk to 40 GHz+
- Incredibly tight impedance control
- 40% less space vs. traditional arrays with the same data throughput
- 112 differential pairs per square inch
- BGA for high-density, improved breakout region
- Guaranteed two points of contact for a more reliable connection

OPEN-PIN-FIELD ARRAYS

- Maximum grounding and routing flexibility
- Up to 560 single-ended I/Os or 140 differential pairs
- Rugged Edge Rate® contacts
- Solder charged terminations (IPC-A-610F & IPC J-STD-001F Class 3)
- Press-fit tails available (SEAMP/SEAFP)
- Standoffs available (JSO)
- Compatible with UMPT/UMPS for power/signal flexibility

ULTRA-HIGH DENSITY ARRAYS

- Up to 720 Edge Rate® contacts
- 2x the density of a 1.27 mm pitch SEARAY™
- Compatible with UMPT/UMPS for power/signal flexibility
- 2.00 mm extended wipe version in development
- Standoffs available (JSO)

LOW-PROFILE ARRAYS

- 4 mm, 4.5 mm and 5 mm stack heights
- 4, 6 and 8 row designs, up to 400 total pins
- Dual beam contact system
- Solder crimped termination for ease of processing
- Compatible with UMPT/UMPS for power/signal flexibility
- Board stacking standoffs available (JSO)

ULTRA-LOW PROFILE ONE-PIECE ARRAYS

- Z-Ray™ is ultra-flexible with custom or standard configurations in an incredibly low profile
- GMI Series is an ideal low-cost solution for board stacking, module-to-board or LGA interfaces

TECHNOLOGY ROADMAP

NOVARAY™ RIGHT-ANGLE
Right-angle NovaRay™ in development for increased mating flexibility, in high-speed applications (NVAM-RA).

EXTREME DENSITY ARRAYS
NovaRay™ extension with higher bank and row counts for greater density in less space than traditional arrays (NVAM/NVAF).

For full SI Performance data visit samtec.com or contact sig@samtec.com. Other stack heights and pin counts available.
For full SI Performance data visit [samtec.com](http://samtec.com) or contact sig@samtec.com. Other stack heights and pin counts available.
Low Profile 5 mm stack height and up to 25 mm elevated height
Choice of 0.50 mm, 0.635 mm or 0.80 mm pitch
Compatible with UMPT/UMPS for power/signal flexibility
Vertical, perpendicular and coplanar mating
Latching, weld tabs and guide posts available for mating/retention

Low-Profile Ground Plane Connectors

Slim 4.60 mm body width saves board space

Slim Ground Plane Connectors

Increased insertion depth for rugged applications
Compatible with UMPT/UMPS for power/signal flexibility
Vertical, right-angle and edge mount
Integral power/ground plane
Rugged shielding option
0.635 mm pitch

Rugged Ground Plane Connectors

Choice of 0.50 mm, 0.635 mm or 0.80 mm pitch
Up to 40% PCB space savings with 0.50 mm pitch system vs. 0.80 mm pitch system
Extremely slim 2.5 mm body width on 0.635 mm pitch system
Stack heights from 5-18 mm
Rugged latching, locking and 360º shielding
Up to 1.5 mm contact wipe
Compatible with UMPT/UMPS for power/signal flexibility

Rugged High-Speed Strips

Signal integrity optimized
Edge Rate* contact system reduces broadside coupling

Technology Roadmap

0.635 mm Pitch Edge Rate*
High-density, slim 2.5 mm body design with 56 Gbps PAM4 performance (ERM6/ERF6).

Accelerate®
High-speed 56 Gbps NRZ interconnects for next generation applications (APM6/APF6).
ULTRA MICRO INTERCONNECTS

For full SI Performance data, visit samtec.com or contact sig@samtec.com. Other stack heights and pin counts available.
ULTRA-DENSE STRIPS

- Up to 240 I/Os in a 4 row design
- 5 mm stack height and slim 5 mm body width
- Edge Rate® contacts optimized for signal integrity performance

ACCELERATE® HD

- Open-pin-field design for grounding and routing flexibility
- Compatible with UMPT/UMPS for power/signal flexibility

RUGGED HERMAPHRODITIC CONNECTORS

- Razor Beam™ contact for high-speed and fine-pitch systems
- 0.50 mm, 0.635 mm and 0.80 mm pitch
- 4-6x greater mating/unmating forces vs. typical micro pitch connectors
- Rugged 360° shielding available

RAZOR® BEAM

- Self-mating connectors reduce inventory costs and can be interchanged for varying stack heights
- Jack screw standoffs available to assist with unmating (JSO)
- 0.50 mm pitch hermaphroditic cable assembly available (HLCD)

LOW-PROFILE STRIPS

- Ultra low stack height down to 2 mm
- Slim body designs for increased PCB space savings
- Ultra fine 0.40 mm and 0.50 mm pitch

RAZOR® BEAM LP

- Jack screw standoffs (JSO Series) available for unmating assistance and protection from component damage
- Ultra-micro power available for power/signal applications (UMPT/UMPS)

BASIC BLADE & BEAM CONNECTORS

- Lower cost without integral ground plane
- 0.50 mm and 0.635 mm pitch
- Right-angle available for perpendicular application

BLADE & BEAM CONTACT

- Polarized
- E.L.P.™ certified systems

TECHNOLOGY ROADMAP

ULTRA-DENSE STRIPS

0.635 mm AcceleRate® HD high-density interconnects in stack heights from 6 mm to 16 mm and higher pin counts to 100 per row (ADM6/ADF6).

ACCELERATE® HD RIGHT-ANGLE

AcceleRate® HD right-angle socket for increased design flexibility and 56 Gbps PAM4 performance (ADF6-RA).
# HIGH-SPEED EDGE CARD

samtec.com/edgecard

## HIGH-SPEED EDGE CARD SOCKETS

<table>
<thead>
<tr>
<th></th>
<th>HSEC8-PV</th>
<th>HSEC8/RU8</th>
<th>HSEC8-DP</th>
<th>HSEC1-DV</th>
<th>PCIE-LP/PCIE</th>
<th>SAL1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power/Signal Combo</td>
<td>PCI Express®, XAUI, SATA</td>
<td>Differential Pair</td>
<td>Mini Edge Card</td>
<td>PCI Express®</td>
<td>SATALink™</td>
<td>Variable Card Thickness</td>
</tr>
<tr>
<td>0.80 mm pitch</td>
<td>1.60 mm thick card</td>
<td>1.60 &amp; 2.36 mm thick cards</td>
<td>1.60 mm thick card</td>
<td>36 (x1), 64 (x4), 98 (x8), 164 (x16) pins</td>
<td>40, 54, 60, 80 pins per pair</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>MEC5</th>
<th>MEC6</th>
<th>MEC8</th>
<th>MEC1</th>
<th>MECF</th>
<th>MEC2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50 mm pitch</td>
<td>0.635 mm pitch</td>
<td>0.80 mm pitch</td>
<td>1.00 mm pitch</td>
<td>1.27 mm pitch</td>
<td>2.00 mm pitch</td>
<td></td>
</tr>
<tr>
<td>High-Density Edge Card</td>
<td>Micro Edge Card</td>
<td>Mini Edge Card</td>
<td>Mini Edge Card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.60 mm thick card</td>
<td>1.00 &amp; 1.60 mm thick card</td>
<td>1.60 &amp; 2.36 mm thick cards</td>
<td>1.60 &amp; 2.36 mm thick cards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-200 pins</td>
<td>20–140 pins</td>
<td>10–140 pins</td>
<td>10–100 pins</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
0.80 mm & 1.00 mm PITCH SOCKETS

- Edge Rate® contacts optimized for signal integrity performance
- Power/Signal combo (HSEC8-PV)
- Custom designs allow for misalignment mitigation
- 0.80 mm pitch 30 AWG twinax cable assembly (ECDP)

0.50 mm PITCH HIGH-DENSITY SOCKETS

- Justification beam enables use of standard PCB tolerance for lower costs and decreases mating tolerance by 50%
- Up to 300 total I/Os
- PCIe® Gen 4 compatible
- Vertical and right-angle

EDGE CARD PITCH VARIETY

- 0.635 mm, 0.80 mm, 1.00 mm, 1.27 mm and 2.00 mm pitch stamped contacts
- Right-angle, vertical and edge mount
- Surface mount and through-hole
- Solutions for .062" (1.60 mm) and .093" (2.36 mm) thick cards

PCI EXPRESS® EDGE CARD SOCKETS

- Supports one, four, eight and sixteen PCI Express® links
- Compatible up to Gen 4 speeds (PCIE-LP)
- Low profile version for space savings
- Standard jumpers and extenders available (PCIEC)
- 1.00 mm pitch differential pair socket compatible to PCIe® Gen 5 in development (PCIE-G5)

1.00 mm PITCH THROUGH BOARD SOCKETS

- 40 to 80 I/Os per pair
- Mounts in pairs to simplify signal routing
- Low profile design
- Mounting flexibility for pass-through applications

TECHNOLOGY ROADMAP

- 0.60 mm PITCH EDGE CARD
  Differential pair Edge Rate® contact connector compliant to SFF-TA-1002: x4 (1C), x8 (2C), x16 (4C & 4C+)

- PCIe® GEN 5 SOCKET
  PCIe® Gen 5 compatible edge card connector with differential pair design for next generation performance (PCIE-G5).

For full SI Performance data visit samtec.com or contact sig@samtec.com. Other pin counts available. PCI-SIG®, PCI Express® and the PCIe® design marks are registered trademarks and/or service marks of PCI-SIG.
### HIGH-SPEED BACKPLANE

For full SI Performance data visit samtec.com or contact sig@samtec.com. Other pair and column counts available.

<table>
<thead>
<tr>
<th>EXAMAX®</th>
<th>XCEDE® HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBTM/EBTF</td>
<td>EBDM-RA</td>
</tr>
<tr>
<td>Traditional &amp; Coplanar Backplane</td>
<td>Direct-Mate Orthogonal</td>
</tr>
<tr>
<td>2.00 mm pitch</td>
<td>36–72 total differential pairs</td>
</tr>
<tr>
<td>24–72 total differential pairs</td>
<td>6 pairs/column</td>
</tr>
<tr>
<td>4 &amp; 6 pairs/column</td>
<td>6, 8, 10 &amp; 12 columns (12 only available with 6-pair)</td>
</tr>
</tbody>
</table>
**HIGH-SPEED BACKPLANE SYSTEMS**

- 2.00 mm column pitch with up to 72 pairs
- Meets industry specifications such as PCI Express®, Intel OPI and VPI, SAS, SATA, Fibre Channel, InfiniBand™ and Ethernet
- Lowest mating force on the market: 0.36 N max per contact
- Press-fit termination
- Engineered for 92 Ω impedance to address both 85 Ω and 100 Ω applications
- Keying, guidance, power and staging available
- Coplanar available (EBTM-RA) to bypass the midplane for a direct connection between the front and rear cards
- Backplane cable available for cable-to-board, cable-to-ExaMAX® or cable-to-cable applications

*ExaMAX® is a registered trademark of AFCL.

**DIRECT-MATE ORTHOGONAL**

- Eliminates the need for a midplane
- Shorter signal path for improved signal integrity
- Two fewer connectors for decreased cost
- Optimizes system airflow and cooling for increased thermal efficiency
- Integral guidance for blind mating

**HIGH-DENSITY BACKPLANE SYSTEMS**

- Small form factor and modular design provides significant space-savings and flexibility
- 1.80 mm column pitch with up to 48 pairs
- Up to 84 differential pairs per linear inch
- Up to a 3 mm contact wipe on signal pins
- Power, guidance, keying and end wall options available
- 85 Ω and 100 Ω options
- Right-angle modules can be built into a single customizable part (BSP). Corresponding vertical modules are individually mounted to the backplane

*Xcede® is a registered trademark of Amphenol Corporation.
SAMTEC FLYOVER™ SYSTEMS
Extended Reach at Next Gen Speeds

As bandwidth requirements rapidly increase, routing signals through lossy PCBs, vias and other components has become a complex challenge.

Samtec’s Flyover™ system design breaks the constraints of traditional signaling substrate and hardware offerings, resulting in a cost-effective, high-performance answer to the challenges of 56 Gbps bandwidths and beyond.
Samtec's Flyover™ connector designs provide end option flexibility to create a high-speed application specific solution to meet next gen speeds.

**ULTRA LOW SKEW CABLE TECHNOLOGY**
Samtec’s proprietary co-extruded, low loss twinax cable technology eliminates the performance limitations and inconsistencies of individually extruded dielectric twinax cabling, improving signal integrity, bandwidth and reach.

- Ideal for 28-56+ Gbps applications
- Tight coupling between signal conductors
- Ultra low skew twinax < 3.5 ps/meter

**NEXT GEN PERFORMANCE AND COST ADVANTAGES**
High-performance, low loss twinax cable systems support 56+ Gbps speeds for extended reach and system architecture design flexibility – without adding cost to the overall system.

<table>
<thead>
<tr>
<th>Performance Advantages</th>
<th>Cost Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduced Thermal Challenges</td>
<td></td>
</tr>
<tr>
<td>• Simplified Board Layout</td>
<td></td>
</tr>
<tr>
<td>• 28-56 Gbps NRZ &amp; Beyond</td>
<td></td>
</tr>
<tr>
<td>• Eliminate Expensive Re-timers</td>
<td></td>
</tr>
<tr>
<td>• Fewer PCB Layers</td>
<td></td>
</tr>
<tr>
<td>• Less Expensive PCB Materials</td>
<td></td>
</tr>
</tbody>
</table>

**SUPPORT**
Fully integrated, complimentary and cross-functional Technology Centers for full system interconnect performance and cost optimization from Silicon-to-Silicon. For more information about Samtec’s High-Speed Cable Group visit [samtec.com/tech-centers](http://samtec.com/tech-centers).
FLYOVERS
samtec.com/flyover

FLYOVER QSFP28  NOVARAY™  ACCELERATE™  DIRECT CONNECT™  FIREFLY™  EXAMAX™

<table>
<thead>
<tr>
<th>QSFPP</th>
<th>QSFPP-DD</th>
<th>NVAC</th>
<th>ARC6</th>
<th>DCH</th>
<th>ECUE</th>
<th>ECUE-2</th>
<th>PCUE</th>
<th>EBCM/EBCF</th>
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</thead>
<tbody>
<tr>
<td>56 Gbps PAM4</td>
<td>112 Gbps PAM4</td>
<td>56 Gbps PAM4</td>
<td>14 Gbps</td>
<td>28 Gbps NRZ</td>
<td>PCIe® Gen 4</td>
<td>112 Gbps PAM4</td>
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Ultra Low Skew Twinax  Twinax  Ultra Low Skew Twinax

<table>
<thead>
<tr>
<th>AWG</th>
<th>AWG</th>
<th>AWG</th>
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<tr>
<td>30 or 34</td>
<td>34</td>
<td>30 or 34</td>
<td>34</td>
<td>30</td>
<td>34 or 36</td>
<td>34</td>
</tr>
<tr>
<td>0.80 mm pitch</td>
<td>0.635 mm pitch</td>
<td>0.80 mm pitch</td>
<td>2.00 mm pitch</td>
<td></td>
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</tr>
</tbody>
</table>


High-speed channel performance rating based on Samtec reference channel. For full SI Performance data visit samtec.com or contact sig@samtec.com.
**DIRECT ATTACH QSFP28 SYSTEMS**

- 4 or 8 channels
- Up to ~200 Gbps NRZ (~400 Gbps PAM4)
- Belly-to-belly mating for maximum density (FQSFP-DD)
- Sideband signals are routed through press-fit contacts for increased airflow
- Contacts directly solder to the Eye Speed® cable for improved signal integrity

**EXTREME SPEED/DENSITY SYSTEMS**

- 112 Gbps PAM4 per channel in 40% less space than traditional arrays
- 4.0 Tbps aggregate data rate – 9 IEEE 400G channels
- Fully shielded differential pair design
- Very low crosstalk (to 40 GHz) and very tight impedance control
- 8 to 32 signal pairs; 72 pairs in development

**SLIM BODY ASSEMBLIES**

- Incredibly slim 7.6 mm body width
- Direct attach technology: contacts directly soldered to cable for improved signal integrity
- High-density 2-row design
- 8 and 16 pair configurations
- Rugged metal latching and shielding

**DIRECT CONNECT™ HORIZONTAL SYSTEMS**

- High-retention press-fit termination; custom compression contacts available
- Ultra-low 3 mm profile
- 4 and 8 pair configurations
- Supports and surpasses PCIe® Gen 3 speeds to 2 meters

**FIREFLY™ COPPER SYSTEMS**

- High-performance, high-density copper Flyover™ solution
- Pin compatible with FireFly™ optical using the same connector system
- x4 bidirectional and x12 unidirectional configurations
- Low-cost solution for seamless integration of new or existing designs
- PCIe® Gen 4 protocol compatible system (PCUE)

**HIGH-SPEED BACKPLANE SYSTEMS**

- Cable-to-board, cable-to-cable and cable-to-ExaMAX® applications
- Customizable with modular flexibility
- Reduced cost due to lower layer counts
- 4 and 6 pairs/column; 6, 8, 10 and 12 columns
- Intermateable with all ExaMAX® connectors

**TECHNOLOGY ROADMAP**

**NOVARAY™**

Custom routing of single-ended signal and power for increased design flexibility (NVAC).

**ACCELERATE®**

Incredibly slim body cable plus sidebands for 10 additional single-ended lines (ARC6). A 24-pair configuration also in development.
ACTIVE & PASSIVE OPTICS

samtec.com/optics

FIREFLY™ MICRO FLYOVER SYSTEM™

<table>
<thead>
<tr>
<th>ECUE</th>
<th>ECUO</th>
<th>ETUO</th>
<th>PCUO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FireFly™ Copper</td>
<td>FireFly™ Optical</td>
<td>Extended Temp FireFly™</td>
<td>PCIe®–Over–Fiber</td>
</tr>
<tr>
<td>14 Gbps</td>
<td>14 Gbps</td>
<td>10 Gbps, x4, x12”</td>
<td>8 Gbps</td>
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<tr>
<td>x4”</td>
<td>x4”</td>
<td>x4, x12”</td>
<td>Gen 3</td>
</tr>
<tr>
<td>x12”</td>
<td></td>
<td>25 Gbps in development</td>
<td>x4, x8, x16</td>
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</table>

<table>
<thead>
<tr>
<th>PCUE</th>
<th>PTUO</th>
<th>PCOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIe®–Over–FireFly™ Copper, Gen 4</td>
<td>PCIe®–Over–Fiber Extended Temp FireFly™</td>
<td>PCIe®–Over–Fiber Gen 3 Adaptor Card with FireFly™</td>
</tr>
<tr>
<td>28 Gbps</td>
<td>25 Gbps</td>
<td>8 Gbps</td>
</tr>
<tr>
<td>x4”</td>
<td>x4”</td>
<td>Gen 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>x4, x8, x16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gen 4 in development</td>
</tr>
</tbody>
</table>

* 4-channel, full duplex copper cable or optical transceiver
** 12-channel, unidirectional copper cable
*** 12-channel optical transmitter or receiver module

TECHNOLOGY ROADMAP

Submersible
Design capable of immersion for liquid cooling in development

Rugged
Rugged optical engine design for harsh environments

Advanced Optics
Advanced Optics in development for 56+ Gbps
ACTIVE OPTICAL MICRO FLYOVERS

• Designed for flexibility, FireFly™ optical (ECUO) for greater distances and FireFly™ copper (ECUE) for shorter reach
• Data connection taken “off board” simplifies board layout and enhances signal integrity from IC to faceplate
• 56 Gbps connector
• 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
• Optical and copper use the same surface mount connector system (UEC5/UCC8)
• Variety of End 2 options for high-density and rugged applications such as: MTP®, MT, MXC®, ARIB, Amphenol® MT38999 and ARINC 801
• Variety of standard integral heat sinks for optimized thermal operating conditions
• PCIe®-Over-FireFly™ (PCUO) supports PCIe® protocol for low latency, power savings and guaranteed transmission
• -40 °C to +85 °C extended temp system (ETUO); PCIe® version available (PTUO)

PASSIVE & ACTIVE OPTICAL SOLUTIONS

• Industry standard passive MPO-to-MPO panel adaptor (OPA) and optical patch cable (FOPC)
• FireFly™ is compatible with multiple industry standard optical backplane systems
• High-density solutions for front panel or backplane applications with MXC® connectors
• Optical and copper use the same surface mount connector system (UEC5/UCC8)
• Variety of End 2 options for high-density and rugged applications such as: MTP®, MT, MXC®, ARIB, Amphenol® MT38999 and ARINC 801
• 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
• 56 Gbps connector
• 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
• MXC® is a registered trademark of US Conec Ltd.

PCIe®-OVER-FIBER SOLUTIONS

• x4 and x8 Gen 3 (8.0 GT/s)
• Distances up to 100 meters
• Half cable options available
• PCIEO Series

TESTING SOLUTIONS

• FireFly™ Test Kit allows a designer real-time evaluation of an actively running copper or optical FireFly™ system in their lab, with their inputs (FIK-FIREFLY-XX)
• 14 Gbps FireFly™ FMC Kit (REF-193429-01) is VITA 57.1 compliant with up to 140 Gbps full-duplex bandwidth connecting an FPGA to fiber optic cable
• 25/28 Gbps FireFly™ FMC+ Kit (REF-200772-XXX-XX-01) is VITA 57.4 compliant with up to 400/448 Gbps full-duplex bandwidth connecting an FPGA to fiber optic cable
• For more information visit samtec.com/kits
# HIGH-SPEED CABLE SYSTEMS

samtec.com/HDR

---

**STANDARD COAX & TWINAX CABLE ASSEMBLIES**

<table>
<thead>
<tr>
<th>HLCD</th>
<th>HQCD</th>
<th>EQCD</th>
<th>EQRD</th>
<th>ERCD</th>
<th>ESCA</th>
<th>SEAC</th>
<th>FEDP</th>
<th>ECDP</th>
<th>HQDP</th>
<th>EQDP</th>
<th>ERDP</th>
<th>PCIEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Razor Beam™</td>
<td>Q Series™</td>
<td>Q Rate™</td>
<td>Edge Rate™</td>
<td>SEARAY™ 0.80 mm</td>
<td>SEARAY™</td>
<td>Edge Card</td>
<td>Q Pairs™</td>
<td>Edge Rate™</td>
<td>PCI Express™</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eye Speed® Coax</th>
<th>Eye Speed® Twinax</th>
<th>PCI Express® Twinax</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 AWG 0.50 mm pitch</td>
<td>34 AWG 0.80 mm pitch</td>
<td>32 AWG 1.27 mm pitch</td>
</tr>
<tr>
<td>36 AWG 0.50 mm pitch</td>
<td>34 AWG 0.80 mm pitch</td>
<td>34 AWG 0.50 mm pitch</td>
</tr>
<tr>
<td>32 AWG 0.80 mm pitch</td>
<td>30 AWG 0.80 mm pitch</td>
<td>30 or 32 AWG 1.00 mm pitch</td>
</tr>
</tbody>
</table>

|---------------|-----------------|----------------|-----------------|-----------------|-----------------|-------------|------------|-------------|----------------|----------------|----------------|------|

TECHNOLOGY CENTER

HIGH-SPEED CABLE GROUP

In-house R&D and manufacturing of precision extruded micro coax and twinax cable used for high-speed/high-density cable assemblies. Capabilities include 26-38 AWG center conductors, 50/75/85/100 Ω impedance, and systems rated at 56 Gbps and beyond with low skew twinax cable construction.

MICRO COAX & TWINAX CABLE ASSEMBLIES

- Single-ended 50 Ω standards for Q Series®, Q Rate®, Edge Rate® and Razor Beam™ high-speed connectors
- Differential 100 Ω standards for Q Pairs®, Edge Rate® and PCI Express® high-speed connectors
- SEARAY™ and SEARAY™ 0.80 mm high-density cable assemblies
- Micro rugged edge card assemblies
- Rugged features and options including strain relief, plastic housings, screw downs, latches and locks, etc.
- Many non-cataloged standards available including 75 Ω micro coax and high-density twinax solutions

CUSTOM HIGH-SPEED CABLE ASSEMBLIES

- Any high-speed connector, any breakout configuration, any high-speed precision cable to create a solution for any specific application. Contact HDR@samtec.com.
- Support and expertise: engineering and design support, dedicated engineers and technicians, 24-hour quotes and samples, flexible quick-turn manufacturing

HIGH-SPEED I/O SYSTEMS

- Eye Speed® HD is the industry’s densest I/O cable system with HyperTransport™ HT 3.1 performance (HDLSP)
- Eye Speed® I/O is designed for space savings and high cycles (EPLSP)
- SFP+ passive jumpers for up to 10 Gbps data transmission (SFPE)

<table>
<thead>
<tr>
<th>HDLSP</th>
<th>EPLSP</th>
<th>SFPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Speed® HD</td>
<td>Eye Speed® I/O</td>
<td>SFP+, SFP, XFP &amp; XENPAK</td>
</tr>
<tr>
<td>Rugged, High-Speed, Panel-to-Panel</td>
<td>SFP+, SFP, XFP &amp; XENPAK</td>
<td></td>
</tr>
<tr>
<td>32 AWG Low Skew Pair Cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Signal Pairs</td>
<td>9 or 17 Signal Pairs, 5 Power, 2 Clock</td>
<td>Connectors, Cages &amp; Kits Available</td>
</tr>
</tbody>
</table>

For full SI Performance data, contact sig@samtec.com or visit samtec.com.
HIGH-PERFORMANCE TEST TO 50 GHz

samtec.com/bullseye

**BULLS EYE® HIGH-PERFORMANCE TEST TO 50 GHz**

- Optimized performance to 50 GHz; to 65 GHz in development
- Compression interface to the board for easy on/off and no soldering costs
- Small footprint design significantly saves space on the board
- Assembly options: Dual row (BE40A, BDRA) and quad row (BQRA)
- BE40A is backward compatible to BDRA
- Enhanced system design with signal and ground pogo pins (BE40A)
- **Installation:** The attach process for each series is similar but unique specifications need to be observed. Contact RFTechnicalGroup@samtec.com

<table>
<thead>
<tr>
<th>BULLS EYE® ASSEMBLIES</th>
<th>BE40A</th>
<th>BDRA</th>
<th>BQRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 50 GHz</td>
<td>Up to 20 GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 AWG low loss microwave cable, additional shielding</td>
<td>23 AWG low loss microwave cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microstrip or Stripline PCB transmission</td>
<td>Stripline PCB transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground: Pogo-pin design on Bulls Eye® probe end</td>
<td>Ground: Elastomer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 x 3, 4, 6, 8, 10, 12, 14 and 16 positions</td>
<td>2 x 12 positions</td>
<td>20 (Quad Row) positions</td>
<td></td>
</tr>
<tr>
<td>End 2: 2.92 mm and 2.40 mm</td>
<td>End 2: 2.92 mm and SMA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Go to samtec.com/catalog to order or view the RF Interconnect Catalog.
# PRECISION RF INTERCONNECTS

samtec.com/RF

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Dimensions</th>
<th>Interconnect Details</th>
</tr>
</thead>
</table>
| **34 GHz** | 3.50 mm | Edge mount with screw downs  
High-performance microwave cable assembly: 23 AWG (RF23S) |
| **2.92 mm** | Compression mount with 2-hole flange in various board thicknesses  
High-performance microwave cable assembly: 23 AWG (RF23C) |
| **40 GHz** | **SMP** | Straight & right-angle, full detent & smooth bore  
Blind-mate with axial alignment  
High-performance microwave cable assembly: 24 AWG (RF405), 25 AWG (RF25S) and .047 cable (in development) |
| **2.40 mm** | Compression mount with 2-hole flange in various board thicknesses  
High-performance microwave cable assembly: 23 AWG (RF23C) |
| **50 GHz** | **SMPM** | Straight & edge mount, full detent & smooth bore  
Blind-mate with axial alignment  
High-performance microwave cable assembly: .047 & .086 cable (in development) |
| **1.85 mm** | Compression mount with 2-hole flange in various board thicknesses  
High-performance microwave cable assembly |
| **65 GHz** | **1.20 mm** | Edge mount  
High-performance microwave cable assembly: .047 cable (in development)  
Simple snap-on coupling |
| **70 GHz** | **TECHNOLOGY ROADMAP** | Expanding family of Precision RF cables and board level interconnects in development.  
Line of SMPM interconnects including ganged configurations in development.  
Bulls Eye® high-performance test system to 65+ GHz in development. |

## SERVICE & TECHNICAL SUPPORT

- Launch Optimizations  
- Simulations  
- Test & Measurements  
- Customs  

**RF Technical Group**  
RFTechnicalGroup@samtec.com  
**Signal Integrity Group**  
SIG@samtec.com
MIX-AND-MATCH END OPTIONS
Standard cable assemblies with standard pricing and lead times

<table>
<thead>
<tr>
<th>CABLE</th>
<th>AWG</th>
<th>END OPTIONS</th>
<th>SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWC-2350CU-01</td>
<td>23</td>
<td>2.92 mm, 2.40 mm, SMA, SMP</td>
<td>RF23C</td>
</tr>
<tr>
<td>MWC-2350-01</td>
<td>23</td>
<td>3.50 mm</td>
<td>RF23S</td>
</tr>
<tr>
<td>MWC-2550-01</td>
<td>25</td>
<td>SMA, SMP</td>
<td>RF25S</td>
</tr>
<tr>
<td>CCA-047</td>
<td>28</td>
<td>HMHF1, SMA</td>
<td>RF047</td>
</tr>
<tr>
<td>RG 405</td>
<td>24</td>
<td>SMA, SMP</td>
<td>RF405</td>
</tr>
<tr>
<td>RG 402</td>
<td>19</td>
<td>SMA</td>
<td>RF402</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CABLE</th>
<th>AWG</th>
<th>END OPTIONS</th>
<th>SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG 179</td>
<td>30</td>
<td>MCMX, MMCX7, SMB, BNC, DIN 1.0/2.3</td>
<td>RF179</td>
</tr>
<tr>
<td>1855A</td>
<td>32</td>
<td>MCF1, SMA</td>
<td>MCF13</td>
</tr>
<tr>
<td>RG 174</td>
<td>26</td>
<td>MMCX, MMCX7, SMB, BNC, N Type</td>
<td>RF174</td>
</tr>
<tr>
<td>RG 405</td>
<td>24</td>
<td>SMA, SMB, BNC, TNC, N Type</td>
<td>RF405</td>
</tr>
<tr>
<td>RG 402</td>
<td>19</td>
<td>SMA, TNC, N Type</td>
<td>RF402</td>
</tr>
</tbody>
</table>

Go to samtec.com/catalog to order or view the RF Interconnect Catalog.
50 Ω RF CABLES & CONNECTORS

- High-frequency cables: semi-flexible, solid, foamed or air enhanced dielectric
- Micro high-frequency U.FL/W.FL cable assemblies
- Wide variety of industry standard cables with mix-and-match end options
- Double-shielded RG 316 cable
- Wide variety of terminations: jacks and plugs, bulkhead jacks, straight and right-angle
- 3.50 mm, 2.92 mm, SMP, 2.40 mm, 1.85 mm and SMPM Precision interconnects
- Board level interconnects in a choice of orientations

75 Ω RF CABLES & CONNECTORS

- Wide variety of industry standard cables with mix-and-match end options
- RFB8T Series (with Belden 1855A cable)
- Wide variety of terminations: BNC, HD-BNC™, DIN 1.0/2.3, SMB
- Straight and right-angle, die cast options
- Board level interconnects in a choice of orientations
- High-density BNC provides 4X the panel density of traditional BNCs
- 12G-SDI optimized 75 Ω interconnects

12G-SDI BROADCAST VIDEO SOLUTIONS

- Samtec has the largest variety of 12G-SDI optimized products
- Analysis and launch optimization: RFTechnicalGroup@samtec.com
- Visit samtec.com/12gsdi

NON-MAGNETIC RF SOLUTIONS

- Truly non-magnetic RF solutions; 100% inspected for magnetic permeability
- Nearly all Samtec interconnects can be ordered as non-magnetic, contact RFTechnicalGroup@samtec.com
- Supported by Samtec’s quick-turn lead times and unmatched service
- Ideal for medical imaging, advanced driver assistance systems, hand held devices, etc.

ORIGINAl SOLUTIONS

- Machined U.FL to 500 cycles (HMHF1/RF047)
- High vibration and 75 Ω MMCX (MMCXV and MMCX7)
- Circular RF shielded twisted pair system (C28S/CJT)
- IsoRate® isolated signal systems for 90% performance of traditional RF at 50% of the cost (IJ5C and IJ5H)
RUGGED TIGER EYE™ SYSTEMS

samtec.com/tigereye

<table>
<thead>
<tr>
<th>SFM/TFM, SFML/TFML, SFC/TFC</th>
<th>SFSX(T)</th>
<th>SFMC</th>
<th>FOLC/MOLC</th>
<th>S2M/T2M</th>
<th>S2SD(T)</th>
<th>SMM/TMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board-to-Board and Cable-to-Board</td>
<td>Board-to-Board</td>
<td>Board-to-Board and Cable-to-Board</td>
<td>Board-to-Board</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.27 mm pitch</td>
<td>2.00 mm pitch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SM, RA &amp; T/H</td>
<td>Cable Assembly</td>
<td>SM &amp; T/H</td>
<td>SM, T/H &amp; MT</td>
<td>SM &amp; T/H (Socket)</td>
<td>SM, RA &amp; T/H (Terminal)</td>
<td>Cable Assembly</td>
</tr>
<tr>
<td>6-12 mm stack heights</td>
<td>28 &amp; 30 AWG</td>
<td>6-12 mm stack heights</td>
<td>6-11.4 mm stack heights</td>
<td>6 &amp; 7 mm stack heights</td>
<td>24, 26, 28 &amp; 30 AWG</td>
<td>Various Heights</td>
</tr>
<tr>
<td>3-100 pins</td>
<td>3-100 pins</td>
<td>4-100 pins</td>
<td>80-200 pins</td>
<td>10-60 pins</td>
<td>10-60 pins</td>
<td>1-200 pins</td>
</tr>
</tbody>
</table>
1.27 mm PITCH SYSTEMS
- Samtec’s most rugged contact system, rated to 1,000+ mating cycles
- Board-to-board, discrete wire, flat and twisted pair IDC cable systems
- Cable components and tooling available
- Surface mount and through-hole
- Shrouded, polarized and keyed
- Friction latching, locking clip, dual screw down or weld tab ruggedizing options
- Extended Life Product™ testing available

2.00 mm PITCH SYSTEMS
- Board-to-board, discrete wire and IDC cable systems
- Locking clip, weld tab or dual screw down ruggedizing features
- Surface mount and through-hole
- Vertical and right-angle for micro backplane applications
- Cable components and tooling available

0.80 mm PITCH SYSTEMS
- Board-to-board and discrete wire cable systems
- Locking clip, alignment pin or weld tab ruggedizing features
- Micro pitch and slim body for space savings
- Cable components and tooling available

1.00 mm PITCH CABLE ASSEMBLIES
- Low profile down to 3.2 mm
- 2 through 40 I/Os, single or double row
- Crimp-style dual leaf contact system
- Panel mount and cable-to-cable terminal assemblies available
- Cable components and tooling available

IDC CABLE SYSTEMS
- 0.50” (1.27 mm) or 2.00 mm (.0787”) pitch
- Choice of socket and plug terminations
- Ejector and shrouded headers
- Rugged strain relief option

TECHNOLOGY ROADMAP
SHIELDED TIGER EYE™
2.00 mm EMI shielded discrete wire assembly with board level and panel mount flexibility (SS2SD/ST2M).
## RUGGED SI SYSTEMS

samtec.com/rugged

<table>
<thead>
<tr>
<th>EDGE RATE® SYSTEMS</th>
<th>EDGE CARD SOCKETS</th>
<th>RAZOR BEAM™</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERM5/ERF5</td>
<td>HSEC8-PV</td>
<td>LSHM</td>
</tr>
<tr>
<td>ERM6/ERF6</td>
<td>HSEC8</td>
<td>LSHM</td>
</tr>
<tr>
<td>ERM8/ERF8</td>
<td>HSEC8-DP</td>
<td>LSHM</td>
</tr>
<tr>
<td></td>
<td>HSEC1-DV</td>
<td>LSS</td>
</tr>
<tr>
<td>0.50 mm pitch</td>
<td>0.80 mm pitch</td>
<td>1.00 mm pitch</td>
</tr>
<tr>
<td>5 mm stack heights</td>
<td>5-12 mm stack heights</td>
<td>6-12 mm stack heights</td>
</tr>
<tr>
<td>7 mm stack heights</td>
<td>7-18 mm stack heights</td>
<td>5-12 mm stack heights</td>
</tr>
<tr>
<td>SM &amp; RA (Socket)</td>
<td>Accepts: 1.60 mm thick card</td>
<td>SM &amp; RA</td>
</tr>
<tr>
<td>SM (Terminal)</td>
<td>SM (signal) &amp; T/H (power)</td>
<td>SM</td>
</tr>
<tr>
<td>SM</td>
<td>SM, RA &amp; Edge Mount</td>
<td>SM</td>
</tr>
<tr>
<td>20-150 pins</td>
<td>SM, RA, Edge Mount</td>
<td>SM &amp; RA</td>
</tr>
<tr>
<td>20-120 pins</td>
<td>SM, RA, Edge Mount</td>
<td>SM &amp; RA</td>
</tr>
<tr>
<td>10-200 pins</td>
<td>SM, RA, Edge Mount</td>
<td>SM &amp; RA</td>
</tr>
<tr>
<td>40, 60, 80 (Signal) &amp; 2, 4 (Power) pins</td>
<td>18-200 pins</td>
<td>10-100 pins</td>
</tr>
<tr>
<td>18-200 pins</td>
<td>16-112 pins</td>
<td>20-100 pins</td>
</tr>
<tr>
<td>40, 60, 80 (Signal) &amp; 2, 4 (Power) pins</td>
<td>20-140 pins</td>
<td>40-100 pins</td>
</tr>
</tbody>
</table>
0.50 mm, 0.635 mm & 0.80 mm SYSTEMS

• Edge Rate® contacts for up to 56 Gbps PAM4
• 1.50 mm contact wipe on 0.80 mm pitch
• 1.00 mm contact wipe on 0.50 mm pitch
• Up to 40% PCB space savings with 0.50 mm system
• 0.635 mm pitch with slim 2.5 mm body width
• Rugged metal latching, solder locks and 360° shielding available
• Micro power available for power/signal applications (UMPT/UMPS)

RUGGED EDGE CARD SOCKETS

• Edge Rate® contacts optimized for signal integrity performance
• 0.80 mm and 1.00 mm pitch
• Surface mount, right-angle, edge mount and pass-through
• Power/Signal combo (HSEC8-PV)
• Custom designs allow for misalignment mitigation
• 0.80 mm pitch 30 AWG twinax cable assembly (ECDP)

RUGGED HERMAPHRODITIC CONNECTORS

• Razor Beam™ contact for high-speed and fine-pitch systems
• 0.50 mm, 0.635 mm and 0.80 mm pitch
• 4–6x greater mating/unmating forces vs. typical micro pitch connectors
• Rugged 360° shielding available
• Self-mating connectors reduce inventory costs and can be interchanged for varying stack heights
• Jack screw standoffs available to assist with unmating (JSO)
• 0.50 mm pitch hermaphroditic cable assembly available (HLCD)

RAZOR BEAM™ STACK HEIGHT FLEXIBILITY (Actual size in mm)

EDG RATE® STACK HEIGHT FLEXIBILITY (Actual size in mm)

Sockets shown actual size at 40 total positions

ERX5
ERX6
ERX8

56 Gbps PAM4 with differential pair (HSEC8-DP)

Sockets shown actual size at 20 positions per row

LSHM
LSS
LSEM
# FLEXIBLE POWER SOLUTIONS

samtec.com/power

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## FLEXIBLE POWER SOLUTIONS

<table>
<thead>
<tr>
<th>LPHT/LPHS</th>
<th>ET60T/ET60S</th>
<th>PEX/PEXC</th>
<th>PESS</th>
<th>MPX/MPXC/MPPT</th>
<th>MPSS</th>
<th>MPCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 A/power pin (4 pins powered)</td>
<td>60 A/power pin (2 pins powered)</td>
<td>Up to 58.7 A/pin</td>
<td>34.5 A/pin</td>
<td>28.8 A/pin</td>
<td>19.7 A/pin</td>
<td>Signal 3.4 A/pin † Power to 23.2 A/pin</td>
</tr>
<tr>
<td>12.00 mm pitch</td>
<td>6.35 mm pitch</td>
<td>5.00 mm pitch</td>
<td>19 mm stack height</td>
<td>10 &amp; 12 AWG</td>
<td>14 mm stack height</td>
<td>14 &amp; 16 AWG</td>
</tr>
<tr>
<td>2-10 power pins* 16, 20, 24, 32 signal pins</td>
<td>2-20 power pins* 0-40 signal pins</td>
<td>2-8 power pins* 12, 40 signal pins</td>
<td>2-8 power pins</td>
<td>2-10 power pins* 16, 24, 40, 80 signal pins</td>
<td>2-8 power pins</td>
<td>4 power pins</td>
</tr>
<tr>
<td>5.63 mm Creepage**</td>
<td>3.02 mm Creepage**</td>
<td>3.66 mm Creepage**</td>
<td>2.95 mm Creepage**</td>
<td>2.69 mm Clearance**</td>
<td>1.87 mm Clearance**</td>
<td>3.31 mm Clearance**</td>
</tr>
</tbody>
</table>

* Asymmetric power pins and other signal pin counts available. ** Selectively loading contacts achieves customer specific creepage and clearance requirements. Contact ASP@samtec.com. † 4 adjacent pins powered.
**ULTRA MICRO POWER SYSTEMS**

- 5 mm to 20 mm stack heights
- Design flexibility as power-only system or two-piece system for power/signal applications
- Higher position counts and stack heights in development
- Use with Samtec’s high-speed connector systems (Edge Rate®, SEARAY™, AcceleRate® HD, Q Series®, Tiger Eye™, Razor Beam™ LP, LP Array™, etc.)

![Image of Ultra Micro Power System](image)

**HIGH POWER SYSTEMS**

- Individually shrouded contacts
- Board-to-board and discrete wire cable systems
- Reliable Tiger Buy™ contacts (IPT1/IPS1, MMSX(T))
- Optional polarization
- Elevated stack height options
- Vertical and right-angle for parallel, perpendicular and coplanar applications
- Rugged metal or plastic latching systems
- Cable components and tooling available

**EXTREME POWER SYSTEMS**

- Small form factor high power systems
- 20 A, 30 A and 40 A options
- Power only, or power/signal combinations
- Board-to-board and discrete wire cable systems
- Hermaphroditic (MPPT & UPPT) and “hinging” (FMPT/FMPS) designs available
- 60 A system with 3 or 5 row signals in the same form factor (ET60T/ET60S)
- 30 A system with double stacked blades for higher density and power (LPHT/LPHS)
- Cable components and tooling available

**FLEXIBLE POWER SOLUTIONS**

<table>
<thead>
<tr>
<th>UPT/UPS/UPPT</th>
<th>UMPT/UMPS</th>
<th>IPBT/IPBS</th>
<th>PMSX(T)</th>
<th>IPT1/IPS1</th>
<th>MMSX(T)</th>
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<tr>
<td>23 A (-V)/pin</td>
<td>17.1 A/pin</td>
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<td>10.3 A/pin (PMSD/IPBT)</td>
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<td>3.81 mm pitch</td>
<td>2.00 mm pitch</td>
<td>4.19 mm pitch</td>
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<tr>
<td>7 &amp; 10 mm stack heights</td>
<td>5-20 mm stack heights</td>
<td>15.25 &amp; 16.84 mm stack heights</td>
<td>16, 18, 20, 22 &amp; 24 AWG</td>
<td>11.05-35 mm stack heights</td>
<td>20, 22, 24, 26, 28 &amp; 30 AWG</td>
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<td>2, 4, 6, 8 power pins*</td>
<td>2-5 power pins*</td>
<td>2-30 power pins*</td>
<td>2-30 power pins</td>
<td>10-50 power pins*</td>
<td>2-50 power pins</td>
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<td>5.80 mm Creepage**</td>
<td>1.65 mm Creepage**</td>
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<td>1.51 mm Clearance**</td>
<td>2.20 mm Clearance**</td>
<td>3.05 mm Clearance**</td>
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<td>1.91 mm Clearance**</td>
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**TECHNOLOGY ROADMAP**

- Right-angle Ultra Micro Power (2 to 10 positions) with a rugged latch for cable mating (UMPT).
- Ultra Micro Power cable assembly with rugged latching for a more secure connection.
- Ultra Micro Power 25 A system in development for higher power in a compact design.
SEALED I/O SYSTEMS

samtec.com/sealed

RUGGED SEALED SYSTEMS

- IP67 miniature push-pull latching system with lightweight plastic shell
- IP68 bayonet-style latching circulars with metal or plastic shells and flexible configurations
- Cost-effective crimp version available

ACCLIMATE™

- Rectangular design for maximum panel area savings
- IP68 threaded circulars with rugged overmold design
- Right-angle and cable-to-cable options in development (ACX, CCX)

ACCLIMATE™ CABLE PLUG & RECEPTACLES

<table>
<thead>
<tr>
<th>MCP/MCR (IP67)</th>
<th>CCP/CCR (IP68)</th>
<th>ACP/ACR (IP68)</th>
<th>RPBX/RPCX/RCX</th>
<th>SCRUS/SCRES</th>
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<td>ACP-22</td>
<td>RPB-U</td>
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<td>MCR</td>
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<td>SFSD SFSD</td>
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<td>RCU RCU</td>
<td>ACR-22</td>
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<tr>
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<tr>
<td>mini</td>
<td>12 pins</td>
<td>12 pins</td>
<td>8 pins</td>
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<tr>
<td>28 AWG (crimp)</td>
<td>24, 28 AWG</td>
<td>16, 24, 28 AWG</td>
<td>8 pins</td>
<td>Ethernet (CAT3, CAT5, CAT5e) / USB (Type A &amp; B)</td>
</tr>
</tbody>
</table>

Kitted components for efficient field assembly
RUGGED TESTING

SEVERE ENVIRONMENT TESTING

Severe Environment Testing is a new Samtec initiative to test our products beyond typical industry standards and specifications, many set forth by common requirements for rugged industries. Several of our products will undergo additional testing to ensure they are more than suitable for industrial, military, automotive and other extreme applications.

TESTING WILL INCLUDE:
• Higher mating cycle testing
• Intense shock and vibration
• Altitude testing
• ESD testing
• Temperature cycling
• And more

PRODUCTS TO BE TESTED:
• Rugged Tiger Eye™ connectors
• Hermaphroditic Razor Beam™ connectors
• SEARAY™ high-density arrays
• Edge Rate® rugged signal integrity connectors
• AcceleRate® HD ultra-micro connectors
• Ultra Micro Power systems
• High-speed coax and twinax cable assemblies

Please contact set@samtec.com for more information and test results when available.

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 or email the Customer Engineering Support Group at ASG@samtec.com

<table>
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<th>PITCH</th>
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<td>BSH/BTH</td>
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<td>BSS/BTS</td>
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<td>ERF8/ERMB</td>
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<td>HSECB</td>
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<td>SEM/TEM</td>
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<td>CLM/FTMH</td>
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<td>SMM/TMM</td>
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<td>CLT/TMMH</td>
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<td>Strip</td>
<td>Tiger Claw™</td>
<td>SSM/TSM</td>
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</tbody>
</table>

* Tested socket/terminal combination shown. Other mating headers also available. Contact Samtec if header design you need is not shown.
FLEXIBLE STACKING
samtec.com/flexiblestacking

With the largest variety of board-to-board interconnects, Samtec makes it easy to find board stackers for any application. Header and socket systems are available in a variety of pitch, density, stack height, orientation and many more standard or custom options.

INCREASING 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

BUILD IT YOURSELF
Check out Solutionator® to quickly build a mated set for your specific application. Visit samtec.com/solutionator

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)

CUSTOMIZABLE
- Mix-and-match headers and sockets to find the right solution
- Quick and easy custom parts are available. Contact asp@samtec.com
VARIETY OF CONTACTS

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

- **Low Profile**
  - Down to 1.65 mm (.065”) stack height
  - Tiger Claw™ contacts
  - Space saving

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

- **Pass-Through**
  - Connect three or more boards
  - Tiger Claw™ & Tiger Beam™ contact systems
  - Surface mount or offset through-hole

- **Right-Angle**
  - Design flexibility
  - Tiger Claw™ & Tiger Buy™ contacts
  - Through-hole, surface mount

- **Coplanar**
  - 1-4 row designs
  - Surface mount, through-hole or mixed technology
  - Tiger Claw™ & Tiger Beam™ contacts

- **Bottom Entry**
  - Tiger Claw™ contacts
  - Access to components when mated
  - Space savings

- **Self-Nesting**
  - Tiger Buy™ contacts
  - Press-fit or through-hole tails
  - PC/104-Plus™ embedded applications

VARIETY OF ORIENTATIONS/APPLICATIONS

- **Tiger Claw™ contacts**
  - Pass-through
  - Ultra-low profile
  - Dual wipe contact

- **Tiger Eye™ contact**
  - High-reliability
  - High mating cycles
  - Multi-finger contact

- **Tiger Buy™ contact**
  - High-retention
  - Cost-effective
  - Tuning fork contact

- **Tiger Beam™ contact**
  - Best cost
  - Reliable performance
  - Post & beam contact
# BOARD STACKING REFERENCE

Focused/most popular series in charts. For all flexible stacking solutions visit [samtec.com/connectors](http://samtec.com/connectors).

## ONE-PIECE, 0.80 mm (.0315") & 1.00 mm (.0394") PITCH

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<th>FSI</th>
<th>SEI</th>
<th>SIB</th>
<th>CLE</th>
<th>FTE</th>
<th>CLM</th>
<th>FTMH/FTM</th>
<th>MLE</th>
<th>MW</th>
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<td>1.00 mm (.0394&quot;)</td>
<td>.100&quot; (2.54 mm)</td>
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<td>1.00 mm (.0394&quot;)</td>
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## .050" (1.27 mm) PITCH HEADERS & SOCKETS

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<th>FTS</th>
<th>FTS</th>
<th>FW</th>
<th>SOLC</th>
<th>TOLC</th>
<th>DWM/HDWM</th>
<th>FTR</th>
<th>RSM</th>
<th>SLM</th>
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<td>V &amp; RA</td>
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### 2.00 mm (.0787") PITCH HEADERS & SOCKETS

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<th>SERIES</th>
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<th>ZLTMM</th>
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<th>ESQT/ -368</th>
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<th>SMM</th>
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<th>SQW</th>
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### .100" (2.54 mm) PITCH HEADERS & SOCKETS

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<th>TSW/ HTSW</th>
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<td>SSW, SSQ, ESW, ESQ, CES, SLW, BSW, BCS, SSM, HLE, PHF</td>
<td>SSW, SSQ, ESW, ESQ, CES, SLW, BSW, BCS, SSM, HLE, PHF</td>
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</tbody>
</table>

2.00 mm (.0787") PITCH HEADERS & SOCKETS

- Series: MMT, TMM/M TMM, TMMH, TW, ZLTMM, CLT, ESQT/ -368, MMS, SMM, SQT, SQW, TLE

.100" (2.54 mm) PITCH HEADERS & SOCKETS

- Series: DW, EW, ZW, MTSW, HMTSW, TLW, MTLW, TSM, TSW, HTSW, BCS, ESW, SSM, SQT, SSQ, SSW

**Contact Systems:**
- Tiger Claw™
- Tiger Buy™
- Tiger Eye™
- Tiger Beam™

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**IDC SYSTEMS**

samtec.com/IDC

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**.050” & 2.00 mm PITCH IDC SYSTEMS**

- Exceptionally low-profile design
- Choice of socket and plug terminations
- Single or double ended
- Twisted pair or flat cable

- Tiger Eye™ board level mates
- Mating shrouded and ejector terminal strips
- Variety of options including rugged strain relief, polarization and standard wiring configurations

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**FLEXIBLE FLAT RIBBON IDC SYSTEMS**

- Low profile with no bulky side locks
- Choice of dual beam socket or plug terminations

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**MOLDED-TO-POSITION IDC ASSEMBLIES**

- Low profile and skinny side locks
- Plugs with .025” (0.64 mm) square tail headers

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### IDC CABLE ASSEMBLIES & HEADERS

<table>
<thead>
<tr>
<th>IDMX/IDSX</th>
<th>HCMX/HCSX</th>
<th>TCSD/TCMD</th>
<th>FFSD/FFMD</th>
<th>FFTP/FMTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>.100” (2.54 mm) pitch</td>
<td>.050” (1.27 mm) pitch</td>
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</tr>
<tr>
<td>28 AWG Color Coded (standard) or Gray (optional)</td>
<td>28 AWG Gray</td>
<td>30 AWG Gray</td>
<td>30 AWG Twisted Pair</td>
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</tr>
<tr>
<td>Dual Beam Contacts</td>
<td>Tiger Eye™ Contacts</td>
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<tr>
<td>Low Profile &amp; Slim Body</td>
<td>Low Profile</td>
<td>Strain Relief Available</td>
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</tbody>
</table>

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**TIGER® EYE**

High-reliability, high cycle Tiger Eye™ IDC contacts
MODIFIED & CUSTOM SOLUTIONS
samtec.com/custom

WILLINGNESS, SUPPORT & EXPERTISE

Customs and Modifications make up about 28% of Samtec’s total sales.

- **23%** Express Modifications
- 92% do not require engineering or tooling charges
- **5%** Engineered Customs

A substantial percentage of Samtec’s product segments are custom.

- High-Speed Board-to-Board: 22.8%
- High-Speed Cables: 67%
- RF Interconnects: 32%
- Micro Rugged: 19.7%
- Flex Stacking & IDC: 24.6%

INDUSTRY LEADING CUSTOMER SERVICE

FLEXIBLE IN-HOUSE MANUFACTURING

SIGNAL INTEGRITY EXPERTISE

FLEXIBLE CAPABILITIES

- Full engineering, design and prototype support
- Design, simulation and processing assistance
- Quotes and samples turned around in 24 hours
- Flexible, quick-turn manufacturing
- Dedicated Application Specific Product engineers and technicians
- Modified or custom options for board level connectors and cable assemblies including: contacts, bodies, stamping, plating, wiring, molding, ruggedizing features and much more
- Contact the Application Specific Products Group at asp@samtec.com for express modifications or engineered customs.

ENGINEERED CUSTOM
- Multi-power staging, power/signal combo, header/socket combo & custom body

EXPRESS MODIFICATION
- .100" (2.54 mm) pitch Mini Mate® discrete wire assembly with custom color coded breakout
Advanced Microelectronics

Next Generation Solutions

Next-generation 56+ Gbps integrated circuits require robust signal integrity, optimized power integrity, compact packages and advanced assembly techniques. Samtec’s team of technical experts, including packaging and assembly designers, Signal / Power Integrity engineers, material scientists and system architects, collaborate to identify the ideal solution for any application. Contact sme@samtec.com to discuss your application.
THE FUTURE OF IC PACKAGING AT 56 Gbps & BEYOND

Integrated Stacking: 2.5D & 3D Packaging

As miniaturization and integration demands increase, the concept of stacking microchips is gaining more traction; stacked chips offer the benefits of electrical efficiency, less heat and power, and increased bandwidths. Samtec’s proprietary Glass Core Technology enables solutions to aid in the development of these next generation packages.

- Because microchips require micro bumps, which are too small for direct attach to typical substrates or PCBs, 2.5D & 3D packaging is much more challenging.
- Using glass as an interposer between the microchips and package substrate is an ideal solution, as it can be used to convert the top side micro bumps to fine pitch BGAs on the bottom side.
- Additional benefits of using glass include increased signal integrity, active interposers, fine pitch / high-count I/Os, and mixed chip technologies with common bumping, and endless possibilities for integrated stacking.
- Other end product applications for glass include CMOS Imaging Sensors (CIS), high-performance RF packages, SiPho packages, high-speed multichip modules and system-in-packages.
- Contact Samtec’s technical experts at sme@samtec.com to discuss your design needs.

MICROELECTRONICS EXPERTISE AND GLASS CORE TECHNOLOGY

**THROUGH-GLASS VIA (TGV)**
Copper Metalization

- Borosilicate, Sapphire and Fused Silica
- Hermetic Sealing and Copper Via Fill
- High-Reliability Copper Filled Vias Enable Miniaturization & Integration

**REDISTRIBUTION LAYER (RDL)**
Circuit Patterning

- Borosilicate and Fused Silica
- Basic Single-Layer Fan-Out Top and Bottom
- Lower Cost Compared to Silicon-Based Interposers

**ADVANCED IC PACKAGING**
Design & Assembly

- Traditional and Glass Substrates
- Precision Die Attach
- Fine Pitch and Low Profile Wire Bond
- Flip Chip & Underfill Finishing

**GLASS-BASED COMPONENTS**
1-Layer Passives

- Borosilicate and Fused Silica
- High-Reliability, High-Density, Precision Solutions
- Antennae, Inductors, Caps, Resistors and RF Filters

**GLASS-BASED MICROFLUIDICS**
Channels & Shapes

- Basic Surface Level Channel Geometry
- Basic Buried Channel Geometry
- Biomedical Devices
- Lab-on-Chip Sensors