As bandwidth requirements rapidly increase, routing signals through lossy PCBs, vias and other components has become one of the most complex challenges designers face.

<table>
<thead>
<tr>
<th>BANDWIDTH VS. TRADITIONAL &amp; HIGH-SPEED MATERIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR408</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>10 Gbps</td>
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<tr>
<td>14 Gbps</td>
</tr>
<tr>
<td>28 Gbps</td>
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<tr>
<td>56 Gbps</td>
</tr>
<tr>
<td>112 Gbps</td>
</tr>
</tbody>
</table>
Samtec’s “Flyover” design approach breaks the constraints of traditional signaling substrate and hardware offerings, resulting in a cost-effective, high-performance answer to the challenges of 28 Gbps bandwidths and beyond.

**THE SOLUTION | SAMTEC FLYOVER™ SYSTEMS**

Samtec’s “Flyover” design approach breaks the constraints of traditional signaling substrate and hardware offerings, resulting in a cost-effective, high-performance answer to the challenges of 28 Gbps bandwidths and beyond.

**Ultra Low Skew Twinax vs. PCB Traces**

- **30 AWG 100 Ω Low Skew Twinax Cable**
- **Backplane PCB trace, 5.7 mil wide, 8.3 mil space**
Samtec has developed the industry’s only collection of fully integrated, complementary, and cross-functional Technology Centers designed to ensure full system interconnect performance and cost optimization - from Silicon-to-Silicon™.
Samtec's high-performance, low loss twinax cable systems support 28 Gbps and beyond while providing for extended signal reach and system architecture design flexibility - without adding cost to the overall system.

**NEXT GEN PERFORMANCE | WITHOUT ADDED COST**

Perfomance advantages:
- Reduced Thermal Challenges
- Simplified Board Layout
- 28-56 Gbps NRZ & Beyond

Cost advantages:
- Eliminate Expensive Re-timers
- Fewer PCB Layers
- Less Expensive PCB Materials
28+ Gbps INTERCONNECT TECHNOLOGY

**FIREFLY™ MICRO FLYOVER™ SYSTEMS**

- x12 systems on 36 AWG ultra low skew twinax ribbon cable
- x4 (34 AWG) and x12 (36 AWG) bidirectional systems with passive equalization provide a performance boost or allow longer cable lengths
- x4 (4 pair Tx, 4 pair Rx) active equalized system with 100 Ω 34 AWG cable provides even greater performance boost or longer cable lengths (currently in development)
- Variety of end two termination options
- Future-proof design: pin compatible with optical FireFly™

**HIGH-SPEED EDGE CARD CONNECTORS**

- 0.80 mm pitch Edge Rate® sockets; 0.60 mm design in development
- Cost-efficient 28+ Gbps interconnect solutions
- Rugged Edge Rate® contacts optimized for signal integrity
- Vertical and right-angle orientations
- Single-ended or differential pair
- Card slot: .062” (1.60 mm)
- Optional board locks, cable latching features, and weld tab / solder tabs for mechanical strength

**DIRECT CONNECT™ SYSTEMS**

- Eye Speed® 85 Ω, 92 Ω and 100 Ω 30 AWG ultra low skew twinax cable
- High-retention press-fit termination directly to PCB
- 28 - 56 Gbps NRZ and beyond
- Multiple pair counts available from 4 to 72
- Right-angle press-fit & vertical array press-fit designs
- Stitched ground pins for improved signal integrity & easy routing
ULTRA LOW SKEW CABLE TECHNOLOGY

EYE SPEED® ULTRA LOW SKEW TWINAX CABLE

Ultra Low Skew Twinax | Micro Cellular Dielectric | Manufacturing Technology Innovation

Samtec’s co-extruded twinax cable technology eliminates the performance limitations and inconsistencies of individually extruded dielectric twinax cabling, improving signal integrity, bandwidth and reach for high-performance system architectures.

Ultra Low Skew Twinax
- Tight coupling between signal conductors
- Improved bandwidth and reach
- Improved signal integrity and eye pattern opening
- Low skew over extended lengths

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

Manufacturing Technology Innovation
- World class in-house expertise, R&D and test & measurement
- Real-time closed-loop control to adjust process parameters
- Internally developed proprietary processes

Contact Samtec’s High-Speed Cable Group at DR@samtec.com.

NOMINAL PERFORMANCE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Eye Speed® Ultra Low Skew Twinax Cable</th>
<th>28 AWG</th>
<th>30 AWG</th>
<th>32 AWG</th>
<th>34 AWG</th>
<th>36 AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 GHz (28 Gbps)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25 m</td>
<td>-1.0</td>
<td>-1.2</td>
<td>-1.5</td>
<td>-1.8</td>
<td>-2.2</td>
</tr>
<tr>
<td>1.00 m</td>
<td>-3.9</td>
<td>-4.7</td>
<td>-5.9</td>
<td>-7.2</td>
<td>-8.7</td>
</tr>
<tr>
<td>28 GHz (56 Gbps)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25 m</td>
<td>-1.5</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-2.6</td>
<td>-3.2</td>
</tr>
<tr>
<td>1.00 m</td>
<td>-6.0</td>
<td>-7.0</td>
<td>-8.7</td>
<td>-10.6</td>
<td>-12.7</td>
</tr>
<tr>
<td>Density / Flexibility</td>
<td>Good</td>
<td>Good</td>
<td>Better</td>
<td>Best</td>
<td>Best</td>
</tr>
</tbody>
</table>

Eye Speed® Ultra Low Skew Twinax Cable is available in engineered impedance configurations of 85 Ω, 92 Ω and 100 Ω.
FLYOVER PRACTICAL APPLICATIONS

ULTRA HIGH-DENSITY MID-BOARD FLYOVER SYSTEM
Chip Placement Flexibility | Extended Signal Reach

- Ultra high-density, 28+ Gbps solution engineered for on-board and embedded applications
- Allows drivers to be remotely located for design flexibility and control over thermal cooling
- Use of Eye Speed® ultra low skew twinax cable eliminates the need for expensive PCB materials and re-timers
- Choice of terminations including High-Speed Edge Card and Direct Connect Press-Fit

DIRECT ATTACH TO MULTI-CHIP MODULE
Bypass Signal Traffic & Loss | Controlled Impedance

- Eye Speed® ultra low skew twinax direct-to-MCM solution
- Design bypasses BGA signal traffic and loss associated with host boards
- Chip-to-Chip impedance-controlled link with ultra low skew twinax cabling

BACKSIDE INTERCONNECT ULTRA HIGH-SPEED LOW SKEW TWINAX FABRIC
Save Valuable Real Estate | Eliminate Complex Routing

- Takes advantage of real estate on the bottom side of the PCB to distribute critical data to multiple locations
- Z-Ray® high-density, ultra low profile micro interposers + Eye Speed® ultra low skew twinax cable
- BGA-to-BGA high-speed signal “flyover”
- Customizable selective signal mapping
56+ Gbps DIRECT ATTACH TECHNOLOGY

Samtec’s Direct Attach Technology enables ultra high-performance 56 Gbps and beyond for Chip-to-Backplane and Chip-to-I/O applications.

QSFP DIRECT ATTACH FLYOVER SYSTEMS

- Chip Placement Flexibility | No Re-timers Required | Ultra High-Performance

- Allows drivers to be remotely located, enabling flexibility in system architecture and more control over thermal cooling
- Need for re-timers is eliminated, resulting in reduced costs and power consumption
- Backward compatible with all QSFP cable assemblies
- Eye Speed® 30 AWG 100 Ω ultra low skew twinax cable provides inherently lower attenuation

- Wide variety of configurations and end connector options

HIGH-SPEED BACKPLANE FLYOVER SYSTEMS

- Cable-to-Board Press-Fit | Cable-to-ExaMAX® Right-Angle & Vertical | Cable-to-Cable

- 28+ Gbps Direct Connect™ system
  Flyover Backplane applications or adjacent to the chip on a host board
  Internateable with ExaMAX® Press-fit

- 28 - 56 Gbps NRZ performance
  Pluggable Flyover Backplane applications
  Mates to existing ExaMAX® right-angle and vertical connectors

- 56+Gbps NRZ performance
  Move high-speed signals off the backplane and the line card
  “Flyunder” Backplane applications

*ExaMAX® is a trademark of FCI