FLYOVER® TECHNOLOGY

samtec.com/flyover
THE PROBLEM
PCB REACH AT NEXT GEN SPEEDS

As bandwidth requirements rapidly increase, effectively managing heat and routing signals through lossy PCBs, vias and other components have become complex challenges.

THE SOLUTION
SAMTEC FLYOVER® SYSTEMS

Samtec Flyover® design breaks the constraints of traditional signaling substrate and hardware offerings, resulting in a cost–effective, high–performance and heat efficient answer to the challenges of 56 Gbps bandwidths and beyond.

BANDWIDTH VS. TRADITIONAL & HIGH-SPEED MATERIALS

<table>
<thead>
<tr>
<th></th>
<th>FR408</th>
<th>MEGTRON 6</th>
<th>MICRO TWINAX</th>
<th>OPTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Gbps</td>
<td>up to 10&quot;</td>
<td>10&quot;+</td>
<td>up to 39&quot;</td>
<td>100 m+</td>
</tr>
<tr>
<td>14 Gbps</td>
<td>up to 5&quot;</td>
<td>up to 10&quot;</td>
<td>up to 33&quot;</td>
<td>100 m+</td>
</tr>
<tr>
<td>28 Gbps</td>
<td>up to 2&quot;</td>
<td>up to 5&quot;</td>
<td>up to 23&quot;</td>
<td>up to 100 m</td>
</tr>
<tr>
<td>56 Gbps</td>
<td>0.0&quot;</td>
<td>up to 2&quot;</td>
<td>up to 12&quot;</td>
<td>TBD</td>
</tr>
<tr>
<td>112 Gbps</td>
<td>0.0&quot;</td>
<td>0.0&quot;</td>
<td>up to 6&quot;</td>
<td>TBD</td>
</tr>
</tbody>
</table>

(-5 dB Loss Target, Reach Estimate. For OIF VSR applications.)
Samtec Flyover® design provides end option flexibility to create a high-speed application specific solution to meet next gen speeds.

ULTRA LOW SKEW CABLE TECHNOLOGY

- Ideal for 28-112+ Gbps applications
- Tight coupling between signal conductors
- Ultra low skew twinax < 3.5 ps/meter

PERFORMANCE & COST ADVANTAGES

- 28-56 Gbps NRZ & Beyond
- Simplified Board Layout
- Fewer PCB Layers
- Less Expensive PCB Materials
- Eliminate Expensive Re-timers

THERMAL IMPROVEMENT

SUPPORT

Fully integrated Technology Centers for full system optimization from Silicon-to-Silicon, including Samtec’s High-Speed Cable Group.

Standard Network Switch vs. Samtec Flyover® Technology

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DIRECT ATTACH QSFP28 SYSTEMS

QSFP28 systems utilize Samtec Flyover® technology to route data above lossy PCB, simplifying board layout and extending signal reach. The modular design enables optimized systems that improve heat management, increase signal integrity performance, build in scalability for future upgrades and reduce costs by creating a multifunction board.

Standard 1U rack tray with side stackable configurations

Increases panel density and optimizes airflow

samtec.com/flyover
FLYOVER® QSFP28 SYSTEM

4 Channels (x4 bidirectional, 8 differential pairs)

~100 Gbps 28G NRZ aggregate
(~200 Gbps 56G PAM4; ~400 Gbps 112G PAM4)

Compatible with all MSA QSFP pluggables

Heat dissipation: ~3.5 W/cable

Eye Speed® 30 or 34 AWG twinax cable

Multiple end 2 options for design flexibility

Evaluation Kits available, visit samtec.com/kits

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FLYOVER® QSFP DOUBLE DENSITY SYSTEM

8 Channels (x8 bidirectional, 16 differential pairs)

~200 Gbps 28G NRZ aggregate
(~400 Gbps 56G PAM4; ~800 Gbps 112G PAM4)

Belly-to-belly mating for maximum density

Backward compatible with QSFP modules

Heat dissipation: ~7+ W/cable

 Variety of end 2 options

Evaluation Kits available, visit samtec.com/kits

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PRODUCT ROADMAP:
FLYOVER® QSFP-DD 800G

- Single to multiple ganged ports
- Belly-to-belly and mezzanine stack configurations
- Contact HDR@samtec.com for more information

samtec.com/flyover
EXTREME HIGH-SPEED, HIGH-DENSITY CABLE

Industry leading aggregate data rate density — 2x the data rate in 60% of the space

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

Evaluation Kit available, visit samtec.com/kits

<table>
<thead>
<tr>
<th>Aggregate Data Rate (NRZ)</th>
<th>448 Gbps</th>
<th>672 Gbps</th>
<th>896 Gbps</th>
<th>1344 Gbps</th>
<th>1792 Gbps</th>
<th>4032 Gbps*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Bank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Bank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Row</td>
<td>3 Row</td>
<td>4 Row</td>
<td>2 Row</td>
<td>3 Row</td>
<td>4 Row</td>
<td>6 Row*</td>
</tr>
<tr>
<td>8 Pairs</td>
<td>12 Pairs</td>
<td>16 Pairs</td>
<td>24 Pairs</td>
<td>32 Pairs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*In development

samtec.com/novaray

FLYOVER® MID-BOARD ASSEMBLIES

NOVARAY®

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

BGA attach for density and optimized trace breakout region

NVAM-C

NVAC

(2 Bank, 4 Row, 32 Pairs)
SLIM CABLE ASSEMBLY

Slimmest cable assembly in the industry – 7.6 mm body width

- High-density 2-row design
- 8 and 16 pair configurations (24 pair in development)
- Eye Speed® 34 AWG ultra low skew twinax

Evaluation Kits available, visit samtec.com/kits

PRODUCT ROADMAP

Higher pin counts, higher density and right-angle solutions are in development for the industry’s slimmest high-speed cable system.

Differential Pair, Ganged AcceleRate® Cable-to-AcceleRate® HP Vertical

Direct Attach • 56 to 112 Gbps PAM4
Highest Aggregate Data Rate in the Industry

AcceleRate® HP High Data Rate / High Pin Count Cable System

Transition Card • 400 to 800 Pin Counts

Ganged AcceleRate® Cable-to-AcceleRate® HP Right-Angle

Mixed DP/SE/Power • 32/64 Gbps PAM4
Blind Mate/High Pin Count

samtec.com/accelerate
**SI-FLY™**

**ASIC-ADJACENT TECHNOLOGY**

112 Gbps PAM4, LOW-PROFILE HIGH-DENSITY CABLE SYSTEM

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**Ultra-high density configuration adjacent to the IC package**

Up to 16 pairs in an incredibly low 3.4 mm profile

An extremely low profile allows Si-Fly™ connectors to reside under heatsinks or other cooling hardware

Co-packaged interconnect option eludes the BGA and routes signals from the silicon package through a long-reach cable, supporting 5x the PCB solutions

112 Gbps PAM 4 per lane

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**PRODUCT ROADMAP**

In Development: Rugged latching configuration provides a secure connection directly adjacent to the IC package for increased signal integrity performance

Co-packaged interconnect configuration for advanced 112G+ data rate requirements

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**EXTREME CHANNEL PERFORMANCE**

**Current**

**Future**

- **25.6 TB**
  - 2020-2021
  - 256 Lanes, 512 DP

- **51.2 TB**
  - 2022-2023
  - 512 Lanes, 1024 DP

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samtec.com/si-fly
FIREFLY™ COPPER SYSTEMS

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

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

x4, x8 and x12 configurations

PCIe® 4.0 system (PCUE)

Evaluation Kit available, visit samtec.com/kits

FIREFLY™ OPTICAL SYSTEMS

Designed for flexibility, optical (ECUO) for greater distances and copper (ECUE) for cost optimization

x4 and x12 configurations

Multiple end 2 options including MTP®, MXC®, MT and ARINC 801

PCI Express®-Over-FireFly™ (PCUO) supports PCIe® protocol for low latency, power savings and guaranteed transmission; 3.0 and 4.0 solutions

-40 °C to +85 °C extended temperature system (ETUO)

samtec.com/firefly
Utilizes Samtec’s Eye Speed® ultra low skew twinax cable technology for improved signal integrity, increased flexibility and routability

Highly customizable with modular flexibility

Reduce costs due to lower PCB layer counts

Evaluation Kit available, visit samtec.com/kits

ExaMAX® is a registered trademark of AFCI.
4 and 6 pairs; 4–16 columns

Intermateable with all ExaMAX® connectors (EBTM/EBTF-RA)

Integrated guidance and keying options

Cable-to-DMO (Direct Mate Orthogonal)

Industry’s lowest mating force with excellent contact normal force

Wafer design increases isolation for reduced crosstalk

Includes one sideband signal per column

30 and 34 AWG ultra low skew twinax cable to support various cable lengths

Vertical and right-angle

Two reliable points of contact with a 2.4 mm wipe

Staggered differential pairs provide higher data rates

Designed for blind-mate systems

samtec.com/examax