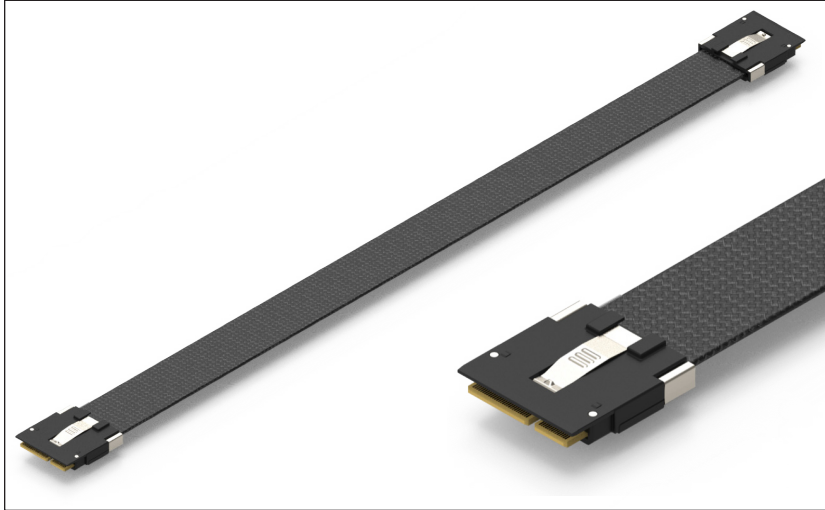
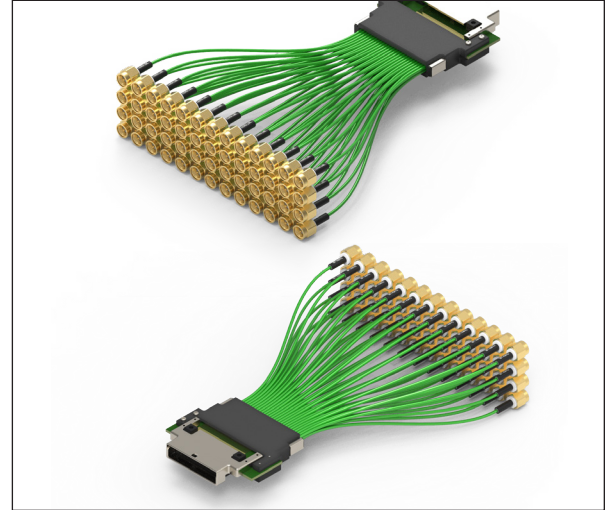


## Gen-Z PCI Express Interconnect Solutions

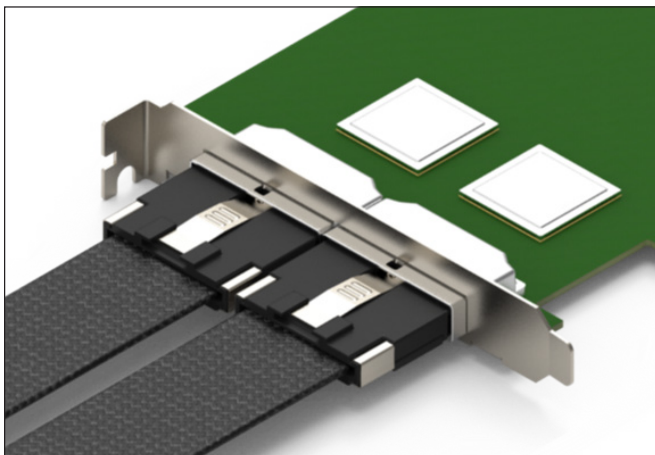
### Twinax High-Speed Assemblies



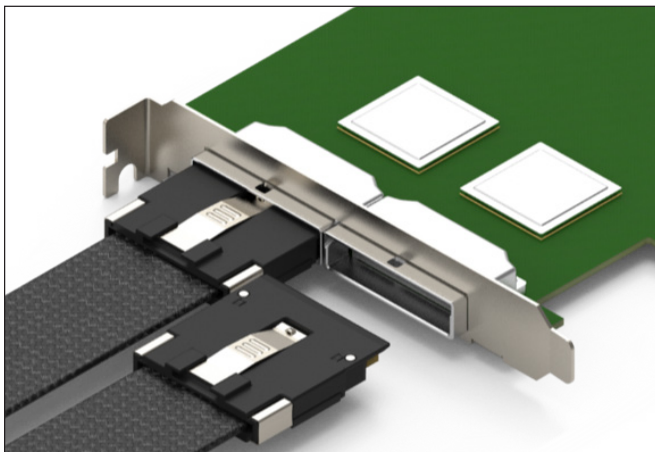
2C Cable Assembly



Gen-Z to SMA Breakout



Gen-Z to Gen-Z



Gen-Z to Custom Bezel

### Gen-Z Cables Enabling PCIe Gen 5 Speeds

Gen-Z is a new data access architecture and technology that increases the data rates and bandwidths of the links between processors and peripheral components, including memory devices up to 400 GT/s. As a result, there is less latency in data access on/between applications like:

- » Devices & clouds
- » Social media apps & phones/tablets
- » High-resolution video streaming

At the same time, the Ethernet packet architecture is modified for scalability and power efficiency, making the complete system simpler and faster, reducing overall power consumption for the entire system. Integrated isolation and security enables solutions to dial-in the protection they desire without compromising interoperability and simplicity.

The physical layer of this entire protocol introduces multiple, high-density connectors that can support and scale the data access lanes. This physical layer, which is a new protocol-agnostic modular form factor, can be used by multiple technologies, including (but not limited to):

- » PCIe
- » Gen 5
- » Gen 6
- » SaAS
- » SATA
- » SATA Express
- » NVMe

The Gen-Z connector is a card-edge, high-density, discrete-pin connector that supports vertical, right-angle, and cabled installations. The connector provides high-performance signal integrity capable of supporting line rates up to 112 GT/s PAM4 without requiring Forward Error Correction (FEC), thus enabling Gen-Z to deliver low-latency communications.

# Gen-Z PCI Express Interconnect Solutions

## Twinax High-Speed Assemblies

Gen-Z connectors are available in the following sizes, where “C” stands for chiclet, a building block of bandwidth:

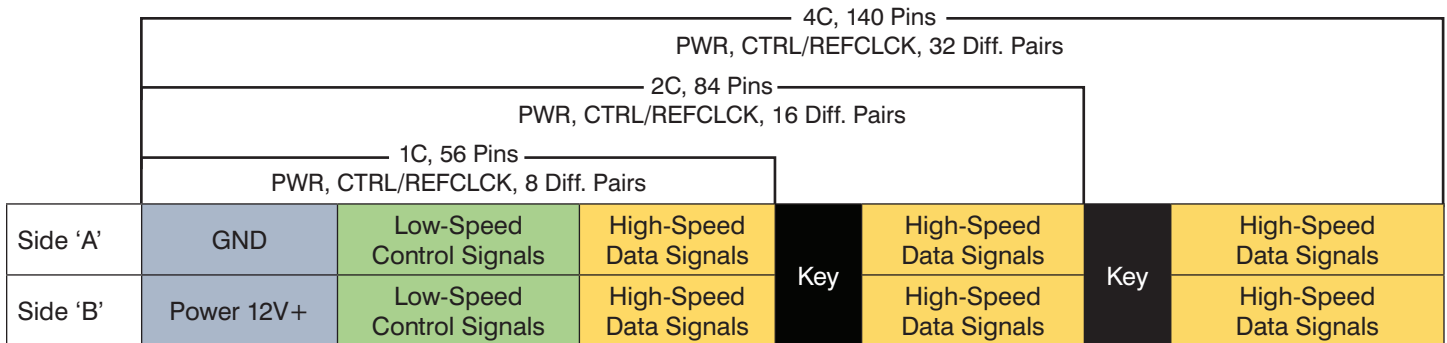
- » 1C / -1C
- » 2C / -2C
- » 4C / -4C / -4C+

An A1 chiclet (or 1C connector) supports power, management, and eight differential pairs of high-speed signals. A 2C connector maintains the functionality of the 1C connector, but supports an additional eight differential pairs, and likewise the 4C connector supports an additional 16 differential pairs. Gen-Z connectors support both symmetric and asymmetric traffic, so differential pairs can be dynamically assigned as transmit or receive based on workload.

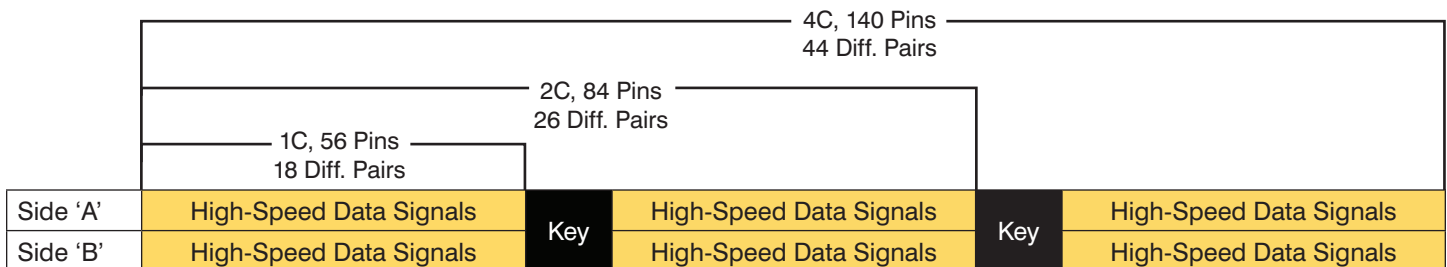
### Applications

- » Internal add-in cards
- » Hot pluggable modules
- » Electrical & optical active modules
- » Storage applications like SAS & NVMe, PCIe, & memory

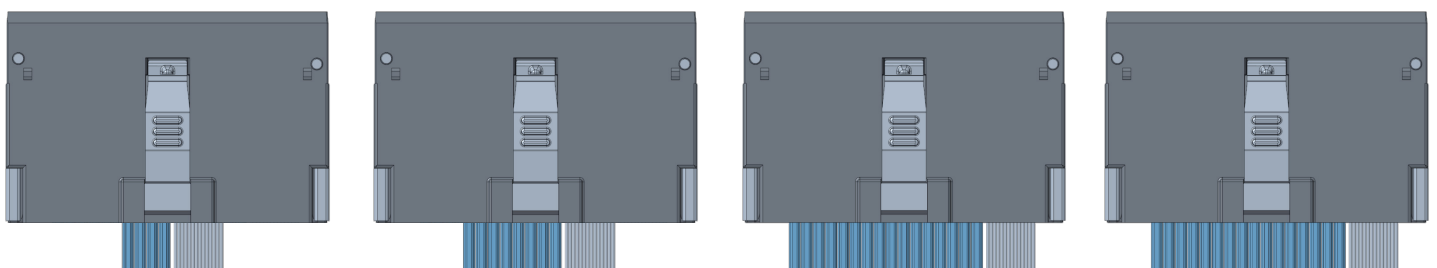
### STANDARD SFF CONFIGURATION



### MAX DIFF. PAIRS CONFIGURATION



| 1C Width                        | 2C Width                            | 4C Width                           | 4C+ Width                         |
|---------------------------------|-------------------------------------|------------------------------------|-----------------------------------|
| 56 Contacts                     | 84 Contacts                         | 140 Contacts                       | 168 Contacts                      |
| 28 Pins Top and Btm rows        | 42 Pins Top and Btm rows            | 70 Pins Top and Btm rows           | 84 Pins Top and Btm rows          |
| 18 Differential Pairs           | 26 Differential Pairs               | 44 Differential Pairs              | 52 Differential Pairs             |
| 9 Pins Top Row + 9 Pins Btm Row | 13 Pairs Top Row + 13 Pairs Btm Row | 22 Pins Top Row + 22 Pairs Btm Row | 22 Pins Top Row + 22 Pins Btm Row |



# Gen-Z PCI Express Interconnect Solutions

## Twinax High-Speed Assemblies

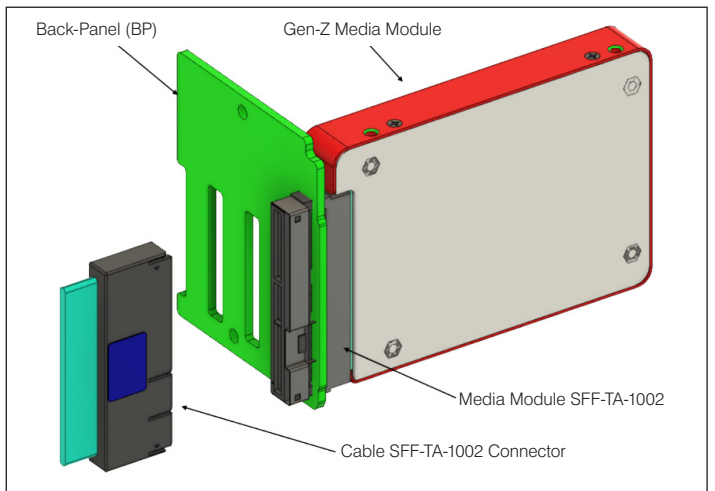
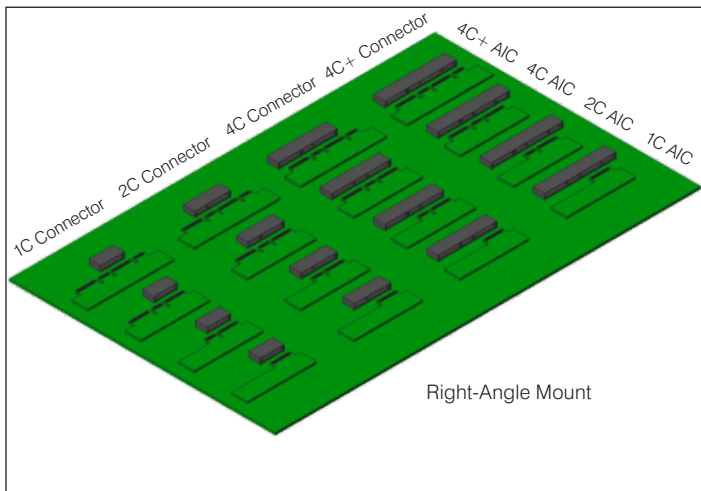
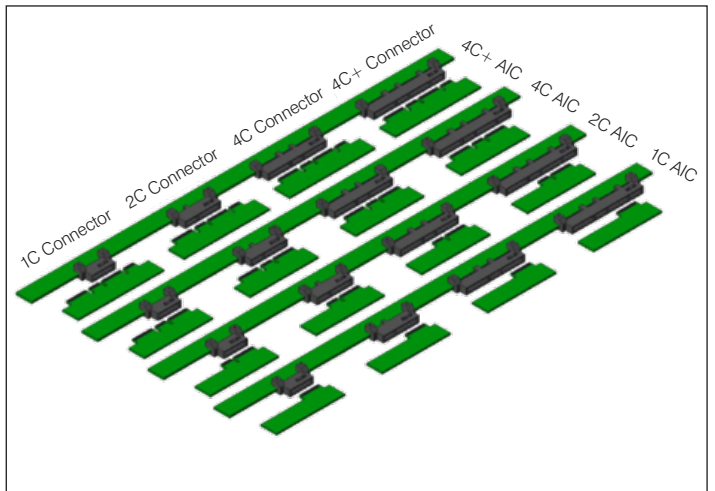
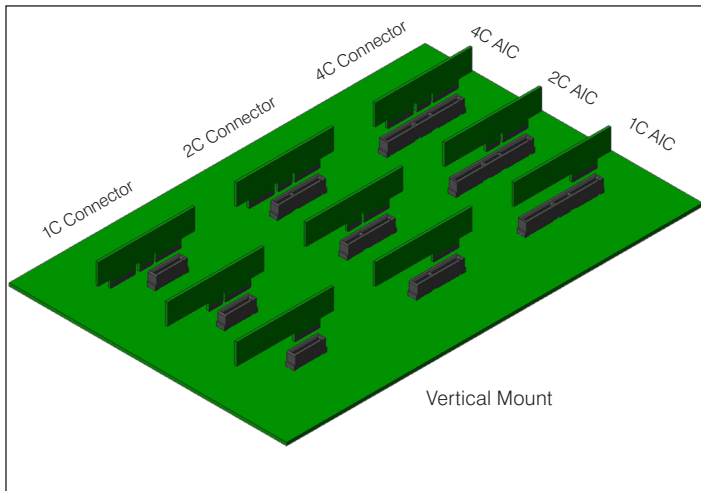
### COMMON CABLE HEAD

|        |        |
|--------|--------|
| GND    | GND    |
| SIGNAL | SIGNAL |
| SIGNAL | SIGNAL |
| GND    | GND    |
| SIGNAL | SIGNAL |
| SIGNAL | SIGNAL |
| GND    | GND    |

SFF-TA-1002 Connector  
GSSGSSG Pin Configuration

### BOARD-MOUNT CONNECTOR STYLES

Vertical, right-angle, and edge-mount board-side connectors are used for Gen-Z interconnect solutions and for media bay applications where a media module (like a protocol analyzer with a Gen-Z interface) accepts a user-pluggable module (like a high-speed cable assembly with a Gen-Z connector), as shown in the figure below.



# Gen-Z PCI Express Interconnect Solutions

## Twinax High-Speed Assemblies

### GEN-Z CABLE ASSEMBLIES

We offer standard and custom interconnect solutions for high-speed Gen-Z compliant data communication. These standard-based solutions use Twinax cables for high-speed data, and ribbonized coax cables for control and management signals.

Some highlights and features of these solutions include:

- » Readily available 1C & 2C standard pinout-compliant assemblies
- » Meet SFF-TA-1002 pinout specifications
- » Readily available 1C & 2C max differential pairs configuration cable assemblies
- » Maximum number of high-speed differential channels
- » No sideband signals; there are 10 additional pairs of signals compared to the standard pinout solution
- » 4C & 4C+ standard pinout-compliant cable assemblies available upon request

Gen-Z to SMA break-out interconnect solutions are available for Gen-Z connector characterization or debugging applications. These interconnect solutions include Gen-Z connectors with 1C and 2C pinouts, coaxial cables and SMA connectors. Features and highlights include:

- » Readily available 1C, 2C type to SMA solutions
- » 4C & 4C+ type to SMA solutions available upon request

#### Custom Solutions Include:

- » Straight Gen-Z to Gen-Z cable assemblies
- » Gen-Z to Gen-Z 'Y' cable assemblies

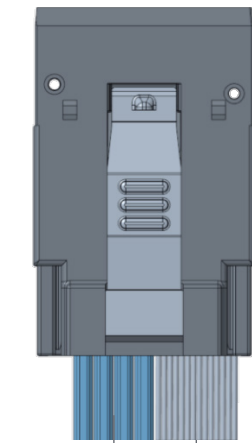
The straight Gen-Z to Gen-Z custom solution is a 2C pinout-compliant cable assembly for full-duplex, high-speed upstream/downstream communication between Gen-Z compliant systems. It is comprised of 16 28 AWG Twinax cables:

- » 8 cables (4 pairs/differential channels) for upstream communication
- » 8 cables (4 pairs/differential channels) for downstream communication

For control and management signals, there are 20 sideband channels (10 for the Tx side and 10 for Rx side). Sideband channels use 50 Ω ribbonized coax cables.

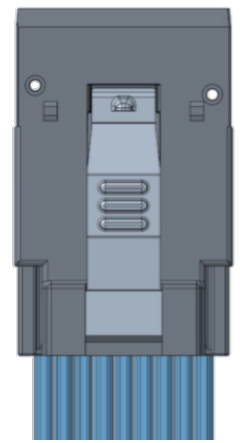
The Gen-Z to Gen-Z 'Y' custom solution uses the same configuration for sideband and high-speed signals as the straight Gen-Z to Gen-Z solution, except the 'Y' solution is used in applications where upstream and downstream traffic is happening between one host and two devices. In other words, the host system is transmitting the data to one device and receiving the data from a different device either at the same time or sequentially.

#### 1C Pinout-Compliant



8 Diff. Pairs (4+4) Ribbonized Coax

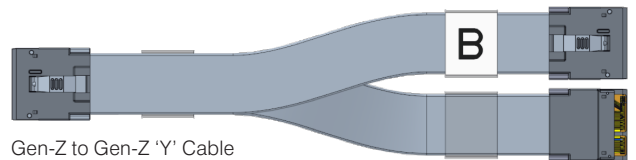
#### 1C Max Diff. Pairs



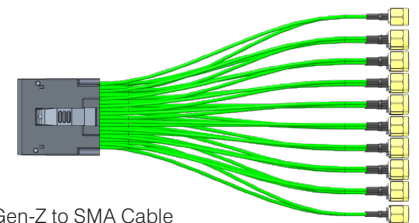
18 Diff. Pairs (9+9)



Gen-Z to Gen-Z Cable



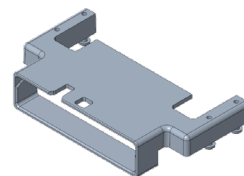
Gen-Z to Gen-Z 'Y' Cable



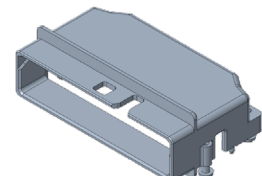
Gen-Z to SMA Cable

### BOARD-MOUNT BEZELS FOR GEN-Z CONNECTORS

When it comes to board-mount bezels, we offer right-angle and edge-launch types for 2C-type connectors. Custom-sized bezels can also be tooled upon request.



Right-angle board-mount



Edge-launch board-mount



# Gen-Z PCI Express Interconnect Solutions

## Twinax High-Speed Assemblies

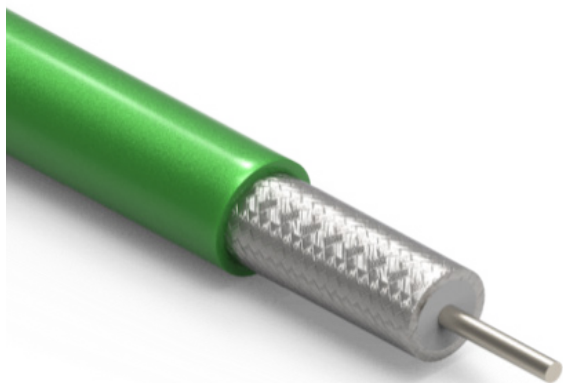
### TWINAX/COAX SPECIFICATIONS

The Twinax and coax cables used for our Gen-Z cable assemblies feature the following specifications:



85 Ω Twinax  
28 AWG  
Suck-out free to 32 GHz

| Twinax Performance   |                       |
|--|-----------------------|
| Electrical Characteristics   |                       |
| Min. Insulation DC Resistance  | 100 MΩ/km             |
| Dielectric Strength  | 0.50 kV/min           |
| Max DC Resistance @ 20 °C  | 277 Ω/km              |
| Impedance<br><i>TDR Rise Time: 45 ps (10-90%),<br/>Range: 0.8-1.8 ns</i> | 85 ± 5 Ω              |
| Delay Skew   | < =10 ps/m            |
| Max Delay  | 5.2 ns/m              |
| Max Attenuation  | 4.31 dB/m @ 8 GHz     |
|  | 4.93 dB/m @ 11.25 GHz |
|  | 7.32 dB/m @ 20 GHz    |
|  | 8.94 dB/m @ 26.50 GHz |



50 Ω 0.047" Microwave-Grade Coax  
29 AWG

| Coax Performance                  |                        |
|-----------------------------------|------------------------|
| Electrical Characteristics        |                        |
| Impedance (nominal)               | 50±2 Ω                 |
| Capacitance (nominal)             | 29 pF/ft               |
| Inductance (nominal)              | 71 nH/ft               |
| Time Delay (nominal)              | 1.45 nS/ft             |
| Velocity of Propagation (nominal) | 70%                    |
| Operating Frequency               | 70 GHz                 |
| Max Cut-Off Frequency             | 110 GHz                |
| Shielding Effectiveness           | >90 dB                 |
| Phase Stability vs. Flexure       | 3° @ 10 GHz            |
|                                   | 4° @ 18 GHz            |
| Attenuation (nominal)             | 0.460 dB/ft @ 1 GHz    |
|                                   | 0.697 dB/ft @ 3 GHz    |
|                                   | 1.171 dB/ft @ 6 GHz    |
|                                   | 1.520 dB/ft @ 10 GHz   |
|                                   | 1.430 dB/ft @ 12 GHz   |
|                                   | 2.090 dB/ft @ 18 GHz   |
|                                   | 2.600 dB/ft @ 26.5 GHz |

# Gen-Z PCI Express Interconnect Solutions

## Twinax High-Speed Assemblies

### PERFORMANCE: GEN-Z 2C-TYPE CABLE ASSEMBLY

Figure 1 shows the test set-up for Gen-Z 2C-type cable assemblies. 85 Ω, 0.047” coax cables are terminated on a card-edge PCB with differential signal traces on it. Gen-Z connectors are mounted on the cable-side of the PCB to connect to the cable under test, and short RF coax jumpers are connected on the other side to connect to the VNA.

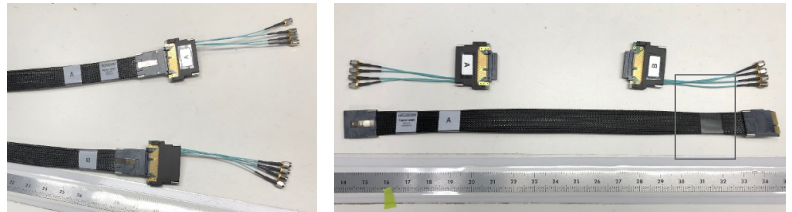


Fig 1: 2C-type Gen-Z cable assembly with test fixture for VNA measurement

Figure 2 shows a 2X calibration board which is used to de-embed the measured data for just the Gen-Z cable assembly (excluding test fixture).

Figure 3 shows the measured insertion loss and return loss for a one-meter-long 2C-type Gen-Z cable assembly. The test results include the losses in adapter edge card test boards and jumper cables.

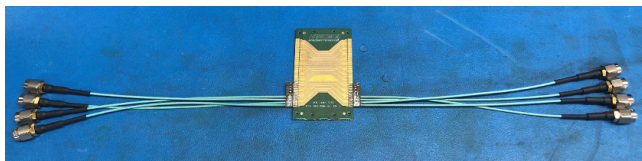


Fig 2: 2X calibration board with test fixture

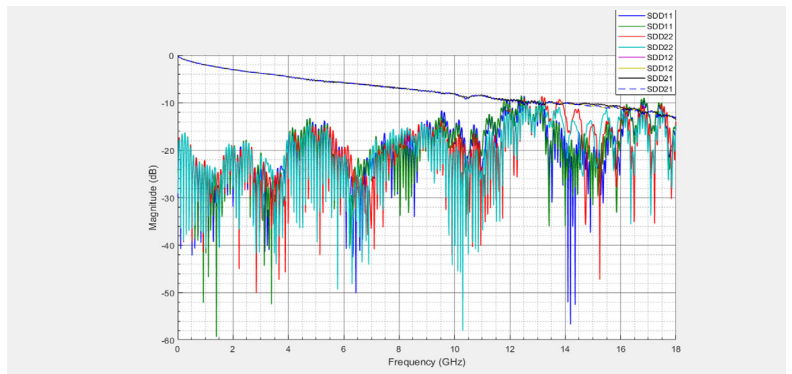


Fig 3: Measured insertion loss and return for one-meter-long 2C-type Gen-Z cable assembly, including test fixture

Figure 4's green-plotted area shows the de-embedded insertion and return loss performance of a one-meter-long 2C-type cable assembly (excluding the test fixture).

It can be seen that the insertion loss is ~5 dB at 8 GHz and ~8 dB at 16 GHz, while our Gen-Z cable assemblies have a return loss of ~-24 dB at 8 GHz and ~-12 dB at 16 GHz. With this signal integrity performance, our Gen-Z cable assemblies are the perfect solution for various high-speed interfaces and protocols, including PCIe Gen 4 and Gen 5 systems.

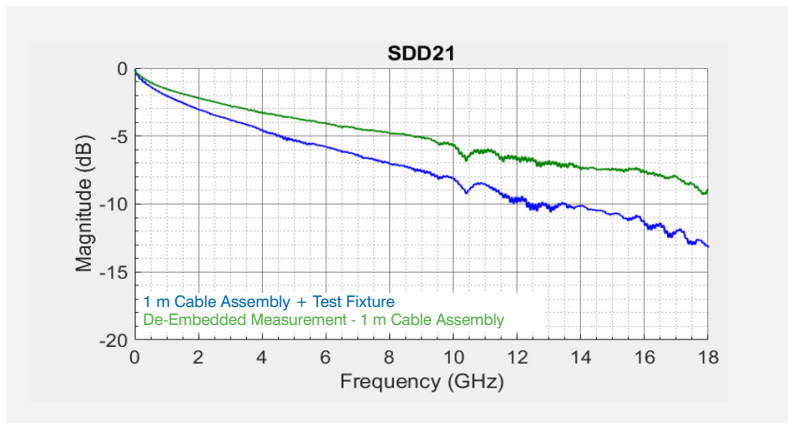
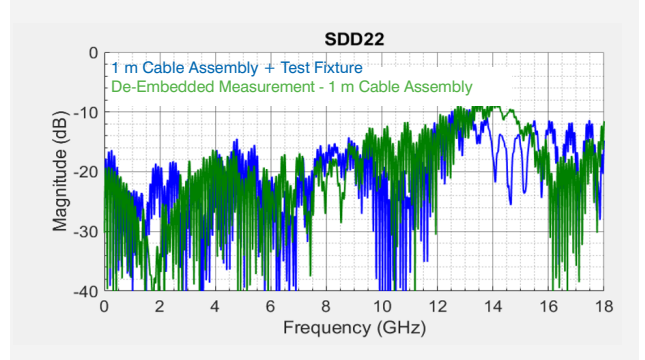
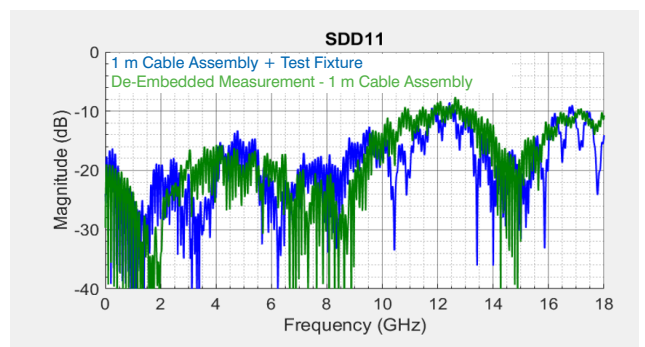


Fig 4: De-embedded insertion and return loss performance of a 2C-type Gen-Z cable assembly (excluding test fixture)



# Gen-Z PCI Express Interconnect Solutions

## Twinax High-Speed Assemblies

### GEN-Z CABLE ASSEMBLY PART NUMBERS

| Part Number        | Configuration   | Type                  | Impedance | Length |
|--------------------|-----------------|-----------------------|-----------|--------|
| TMG-S-S-1C-S-8-200 | SFF             | Standard Straight 1C  | 85 Ω      | 2 m    |
| TMG-S-S-2C-S-8-200 | SFF             | Standard Straight 2C  | 85 Ω      | 2 m    |
| TMG-S-S-4C-S-8-200 | SFF             | Standard Straight 4C  | 85 Ω      | 2 m    |
| TMG-S-S-4P-S-8-200 | SFF             | Standard Straight 4C+ | 85 Ω      | 2 m    |
| TMG-S-S-1C-M-8-200 | Max Diff. Pairs | Standard Straight 1C  | 85 Ω      | 2 m    |
| TMG-S-S-2C-M-8-200 | Max Diff. Pairs | Standard Straight 2C  | 85 Ω      | 2 m    |
| TMG-S-S-4C-M-8-200 | Max Diff. Pairs | Standard Straight 4C  | 85 Ω      | 2 m    |
| TMG-S-S-4P-M-8-200 | Max Diff. Pairs | Standard Straight 4C+ | 85 Ω      | 2 m    |
| TMG-S-S-1C-S-8-150 | SFF             | Standard Straight 1C  | 85 Ω      | 1.5 m  |
| TMG-S-S-2C-S-8-150 | SFF             | Standard Straight 2C  | 85 Ω      | 1.5 m  |
| TMG-S-S-4C-S-8-150 | SFF             | Standard Straight 4C  | 85 Ω      | 1.5 m  |
| TMG-S-S-4P-S-8-150 | SFF             | Standard Straight 4C+ | 85 Ω      | 1.5 m  |
| TMG-S-S-1C-M-8-150 | Max Diff. Pairs | Standard Straight 1C  | 85 Ω      | 1.5 m  |
| TMG-S-S-2C-M-8-150 | Max Diff. Pairs | Standard Straight 2C  | 85 Ω      | 1.5 m  |
| TMG-S-S-4C-M-8-150 | Max Diff. Pairs | Standard Straight 4C  | 85 Ω      | 1.5 m  |
| TMG-S-S-4P-M-8-150 | Max Diff. Pairs | Standard Straight 4C+ | 85 Ω      | 1.5 m  |
| TMG-S-S-1C-S-8-100 | SFF             | Standard Straight 1C  | 85 Ω      | 1 m    |
| TMG-S-S-2C-S-8-100 | SFF             | Standard Straight 2C  | 85 Ω      | 1 m    |
| TMG-S-S-4C-S-8-100 | SFF             | Standard Straight 4C  | 85 Ω      | 1 m    |
| TMG-S-S-4P-S-8-100 | SFF             | Standard Straight 4C+ | 85 Ω      | 1 m    |
| TMG-S-S-1C-M-8-100 | Max Diff. Pairs | Standard Straight 1C  | 85 Ω      | 1 m    |
| TMG-S-S-2C-M-8-100 | Max Diff. Pairs | Standard Straight 2C  | 85 Ω      | 1 m    |
| TMG-S-S-4C-M-8-100 | Max Diff. Pairs | Standard Straight 4C  | 85 Ω      | 1 m    |
| TMG-S-S-4P-M-8-100 | Max Diff. Pairs | Standard Straight 4C+ | 85 Ω      | 1 m    |
| TMG-S-S-1C-S-8-050 | SFF             | Standard Straight 1C  | 85 Ω      | 0.5 m  |
| TMG-S-S-2C-S-8-050 | SFF             | Standard Straight 2C  | 85 Ω      | 0.5 m  |
| TMG-S-S-4C-S-8-050 | SFF             | Standard Straight 4C  | 85 Ω      | 0.5 m  |
| TMG-S-S-4P-S-8-050 | SFF             | Standard Straight 4C+ | 85 Ω      | 0.5 m  |
| TMG-S-S-1C-M-8-050 | Max Diff. Pairs | Standard Straight 1C  | 85 Ω      | 0.5 m  |
| TMG-S-S-2C-M-8-050 | Max Diff. Pairs | Standard Straight 2C  | 85 Ω      | 0.5 m  |
| TMG-S-S-4C-M-8-050 | Max Diff. Pairs | Standard Straight 4C  | 85 Ω      | 0.5 m  |
| TMG-S-S-4P-M-8-050 | Max Diff. Pairs | Standard Straight 4C+ | 85 Ω      | 0.5 m  |

# Global Manufacturing. Local Support.

Wherever you are, so are we. With manufacturing centers around the globe, our highly qualified team is up to any challenge. Our extensive worldwide manufacturing capabilities, coupled with end-to-end local project management and engineering support, allow us to design, build, test, and certify your product in-house, saving you the time and hassle of managing multiple vendors.



## FACILITIES CERTIFICATIONS



Visit our website to view certifications listed by site.

## HEADQUARTERS

100 Tensolite Drive  
St. Augustine, FL 32092  
United States

## PRODUCT CERTIFICATIONS



**AmphenolCIT**  
Cable & Interconnect Technologies

Contact us directly for products engineered to your specific compliance needs.

Learn More:  
[Amphenol-CIT.com](http://Amphenol-CIT.com)

+1 (800) 458-9960