



# BULLSEYE<sup>®</sup>

## PRODUCT OVERVIEW

Test &  
Measurement

High-Speed  
Digital Test

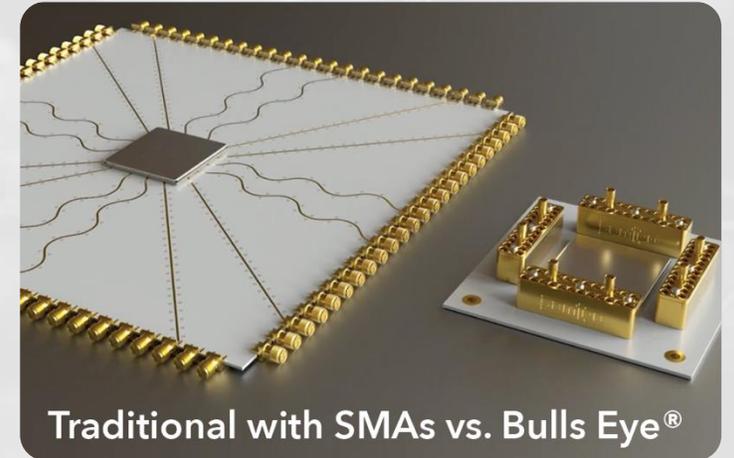
SerDes  
Characterization

ATE

Multi-Port  
High-Density  
High-Performance

## BULLS EYE<sup>®</sup> HIGH-PERFORMANCE TEST ASSEMBLIES

- Features a high-density, space-saving design that enables smaller evaluation boards and shorter trace lengths in test and measurement applications
- Compression mounts to the board for placement directly adjacent to the SerDes being characterized
- Reducing trace length reduces associated loss
- One-piece, solderless design improves cost and ease of use within a lab setting
- Phase-matching available at 0.5, 1, 2, and 5 picoseconds (cable dependent)
- Single row or double row options
- End 2 connection to instrumentation: 1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm or 2.92 mm
- Custom solutions available
- 50 Ohm impedance
- To learn more, visit: [Samtec.com/BullsEye](https://www.samtec.com/BullsEye)

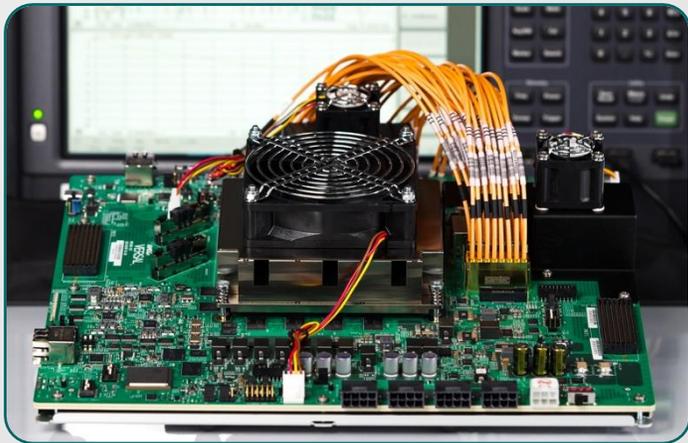


# APPLICATIONS

Test & Measurement. High-speed digital test, SerDes characterization and ATE. Also, suitable for high-density multi-port panel & I/O connection, including Quantum Computing racks, or high-density cable-to-board.

## Adjacent to SerDes/DUT

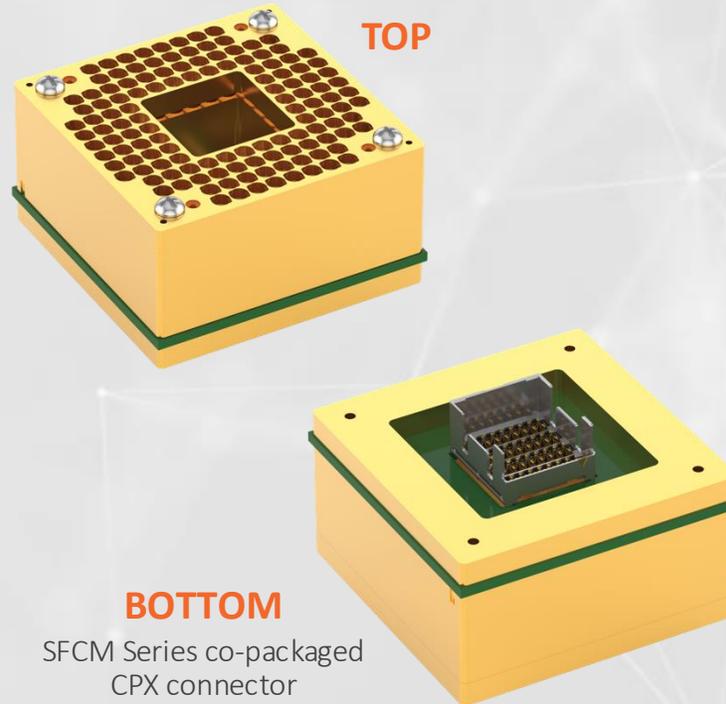
End 2 Connects to Instrumentation



\*Board courtesy of AMD

## Substrate-to-Cable or HDI-to-Cable

Up to 128 channels in a 1.25" square footprint



## Multi-Port Panel & I/O

BERT/Instrumentation | Rack Unit/Quantum Computing



# HIGH-PERFORMANCE TEST ASSEMBLIES



**BE40A**  
- 50 GHz, 56 Gbps PAM4

**BE70A**  
- 70 GHz, 112 Gbps PAM4

**BE71A**  
- Best phase matching and lowest IL  
- Nitrowave™ cable technology  
- 71 GHz, 224 Gbps PAM4

**BE90A**  
- Smallest footprint and highest density  
- 90+ GHz, 224 Gbps PAM4/448 Gbps

**BE130**  
(In Development)  
- Next gen test solution  
- 130 GHz, 448 Gbps

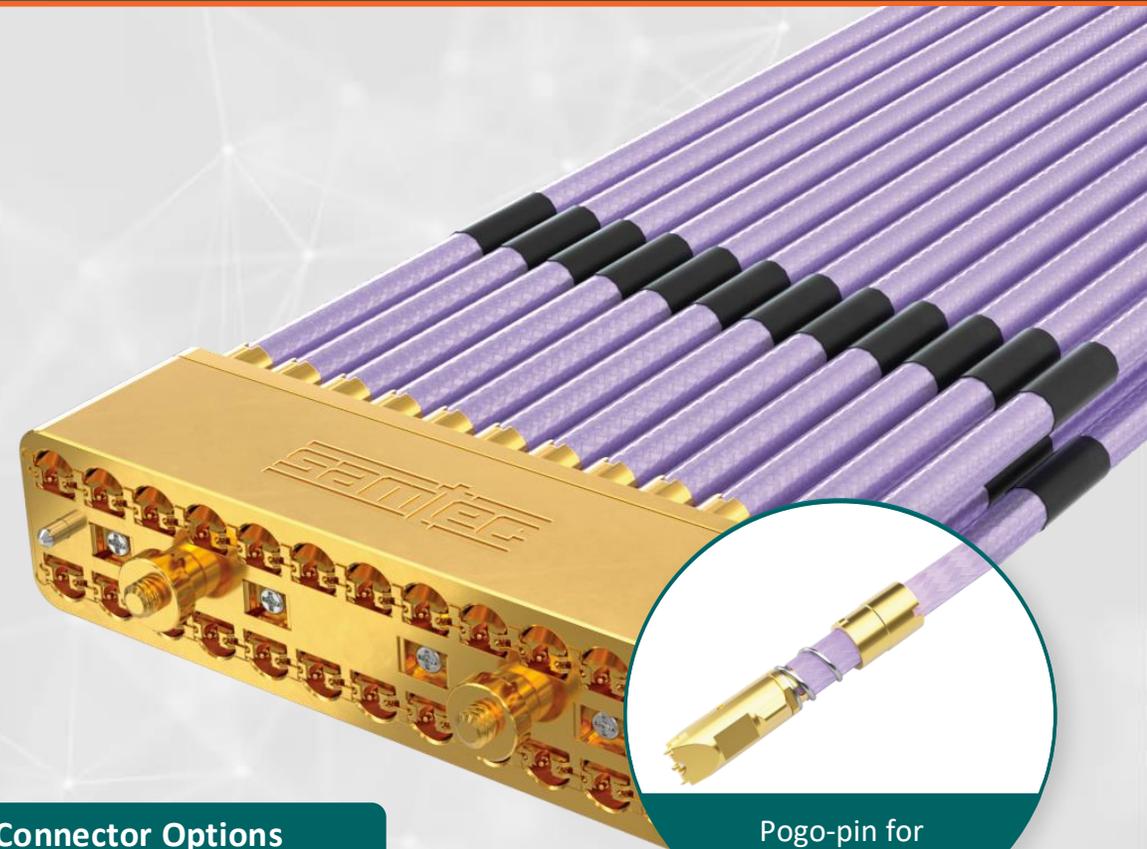
<p>PAM4</p> <p><b>56</b> Gbps</p>	<p>PAM4</p> <p><b>112</b> Gbps</p>	<p>PAM4</p> <p><b>224</b> Gbps</p>	<p>PAM4</p> <p><b>224</b>   <b>448</b> Gbps   Gbps</p>	<p><b>448</b> Gbps</p>
<p><b>BE40A</b> 50 GHz</p>	<p><b>BE70A</b> 70 GHz</p>	<p><b>BE71A</b> 71 GHz</p>	<p><b>BE90A</b> 90+ GHz</p>	<p><b>BE130</b> 130 GHz</p>
<p>2.40 mm &amp; 2.92 mm</p>	<p>1.85 mm</p>	<p>1.85 mm + Nitrowave™</p>	<p>1.00 mm &amp; 1.35 mm</p>	<p>1.00 mm + Nitrowave™</p>

## Bulls Eye<sup>®</sup> + Nitrowave<sup>™</sup> Cable Technology

As repeatability and loss margins at millimeter wave frequencies continue to narrow, Bulls Eye<sup>®</sup> products are now incorporating Samtec's proprietary **Nitrowave<sup>™</sup> cable technology** (recognizable by its distinctive orange color) for improved electrical performance with lower IL and phase matching down to 0.5-picosecond.

## 50 GHZ BULLS EYE® HIGH-PERFORMANCE TEST ASSEMBLY

- Double row with 3, 4, 6, 8, 10, 12, 14, 16 positions per row
- Phase Matching option: 2 or 5 ps
- Pitch: 4 mm (.157")
- Footprint and launch compatible with legacy BDRA Series
- Mating cycles: 1,000
- Recommended PCB thickness: .06" to .16"
- For PCBs < .092": stiffener plate recommended
- Cable: 23 AWG solid dielectric low loss microwave with copper shielding ([MWC-2350CU-01](#))
- Min bend radius: 3.18 mm
- Operating Temperature: -65 °C to +125 °C
- Replacement components: [BE40C](#) (cable), [BE40B](#) (block)
- [Installation instructions](#)
- Evaluation kit: [REF-213497-01](#)



### End 2 Connector Options Jack or Plug



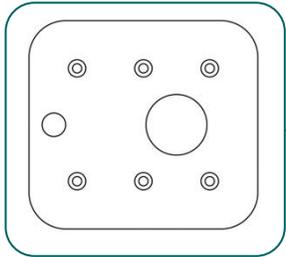
2.40 mm



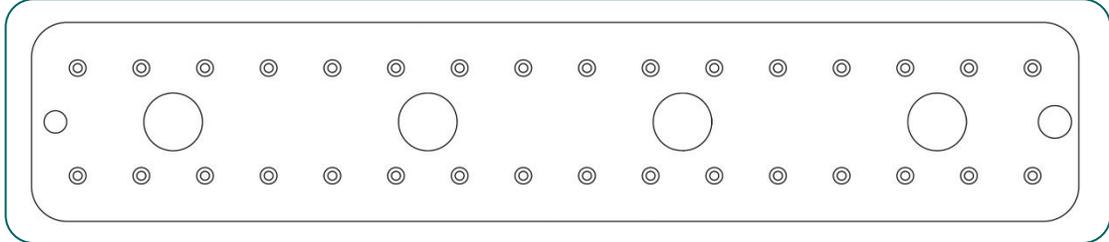
2.92 mm

Pogo-pin for  
signal and ground

## BE40A FOOTPRINT: Minimum/Maximum | Not to Scale

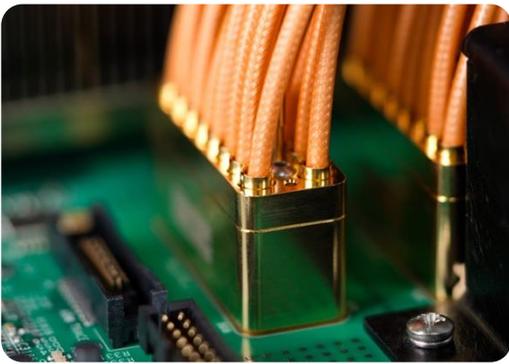
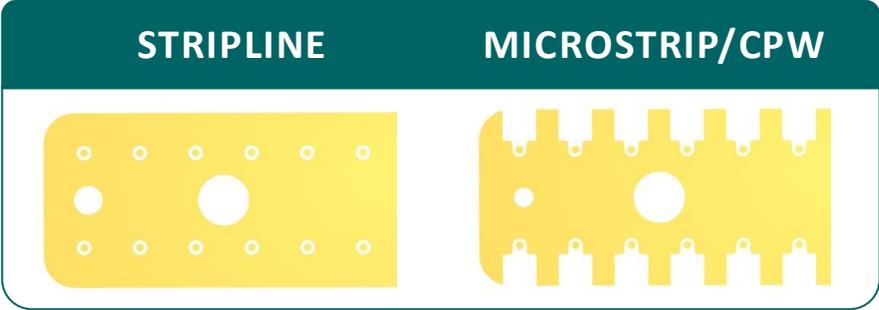


**2x3** (minimum)  
13.80 mm (.543") x 12.65 mm (.498")



**2x16** (maximum)  
65.80 mm (2.591") x 12.65 mm (.498")

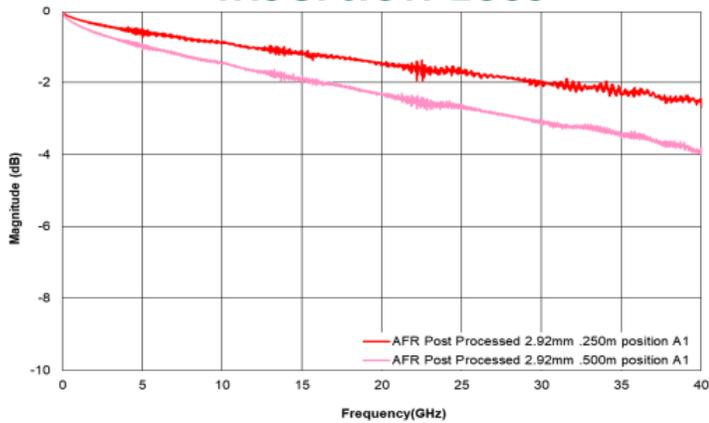
Footprint and launch compatible with legacy BDRA Series



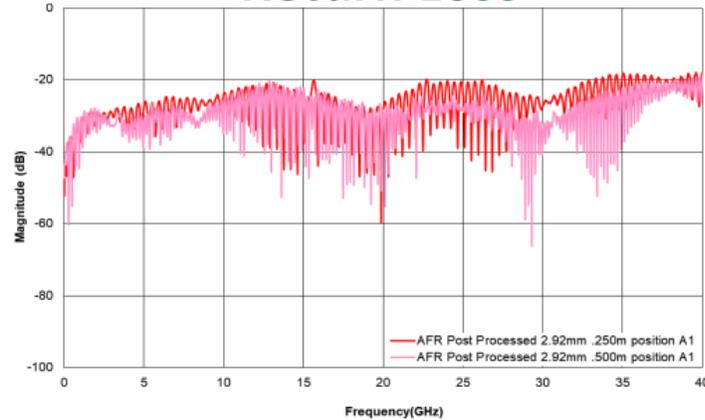
### BOARD LAUNCH OPTIMIZATION

All RF launch features must be tuned to ensure energy between the PCB trace and the connector, over the full bandwidth, remains as high as possible. Samtec's RF engineers & Signal Integrity experts can assist with your specific challenges.

## Insertion Loss



## Return Loss

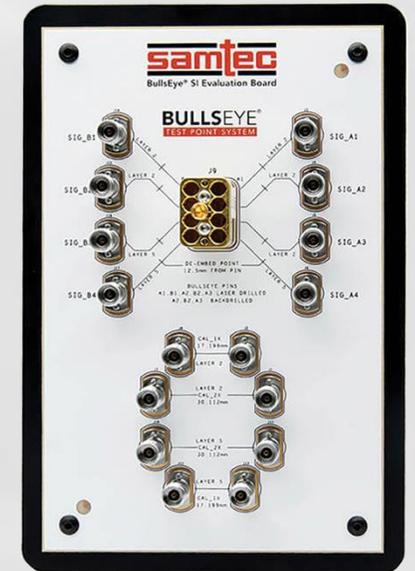


## Single Ended Performance

Measured performance of a BE40A, 2x4-S (stripline) block on a controlled depth drilled via board launch, 0.25-meter and 0.50-meter cable samples and 2.92 mm end 2 connectors. All other effects have been removed by de-embedding.

## 50 GHz Bulls Eye<sup>®</sup> SI Evaluation Kit

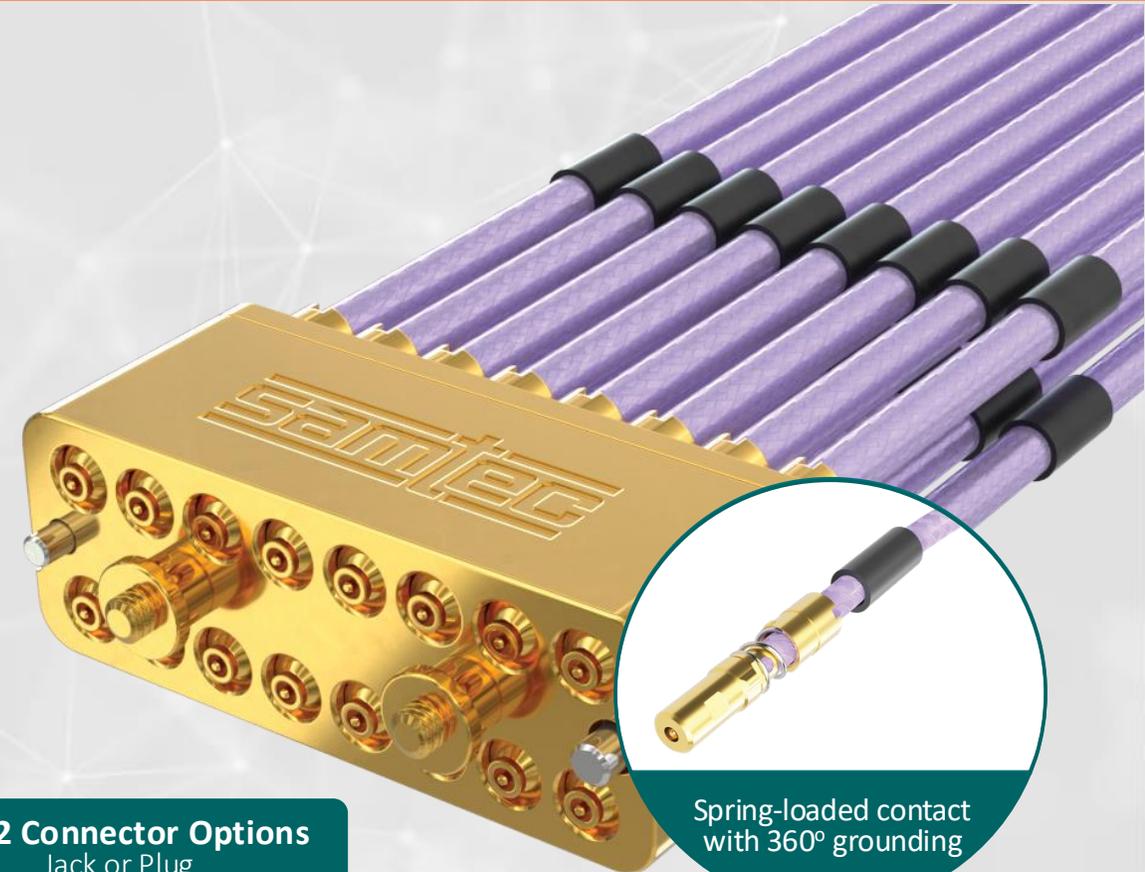
Route high-frequency signals from Bulls Eye<sup>®</sup> double row test system (BE40A) to high-precision RF connector options (2.40 mm, 2.92 mm, SMA)



Part Number:  
REF-213497-01

## 70 GHZ BULLS EYE<sup>®</sup> HIGH-PERFORMANCE TEST ASSEMBLY

- Single row or double row
- Positions per row: (1x) 2, 4, 8, 12 or (2x) 3, 4, 6, 8, 10, 12, 14, 16
- Phase Matching option: 2 or 5 ps
- Pitch: 4 mm (.157")
- Footprint and launch compatible with BE71A Series
- Mating cycles: 1,000
- Recommended PCB thickness: .06" to .16"
- For PCBs < .092": stiffener plate recommended
- Cable: .086" low-loss flexible, 23 AWG
- Min bend radius: 8.9 mm
- Operating Temperature: -65 °C to +125 °C
- Replacement components: [BE70C](#) (cable), [BE70B](#) (block)
- [Installation instructions](#)
- Evaluation kit: [REF-213864-01](#)



### End 2 Connector Options

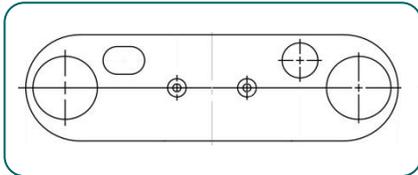
Jack or Plug



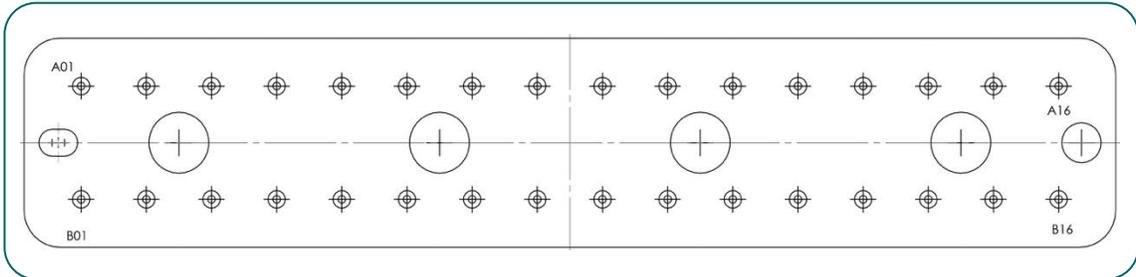
1.85 mm

Spring-loaded contact  
with 360° grounding

## BE70A FOOTPRINT: Minimum/Maximum | Not to Scale

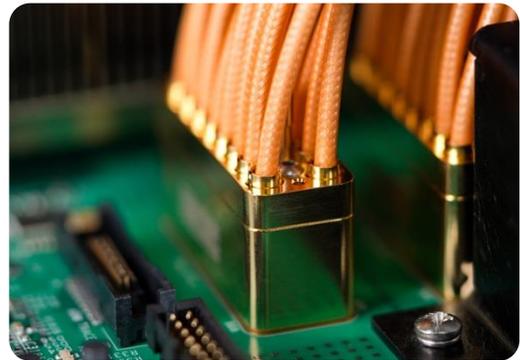
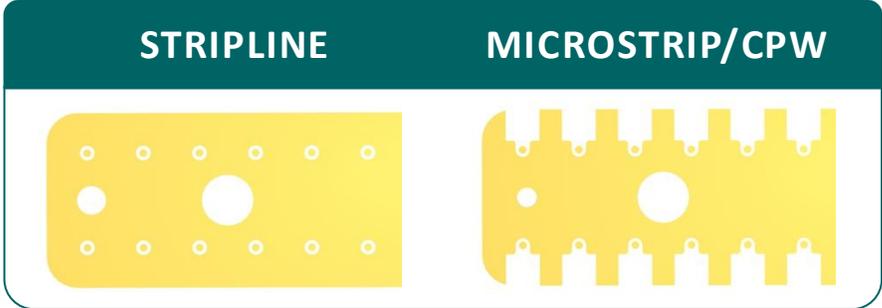


**1x2 (minimum)**  
21.27 mm (.837") x 6.20 mm (.244")



**2x16 (maximum)**  
67 mm (2.638") x 12.65 mm (.498")

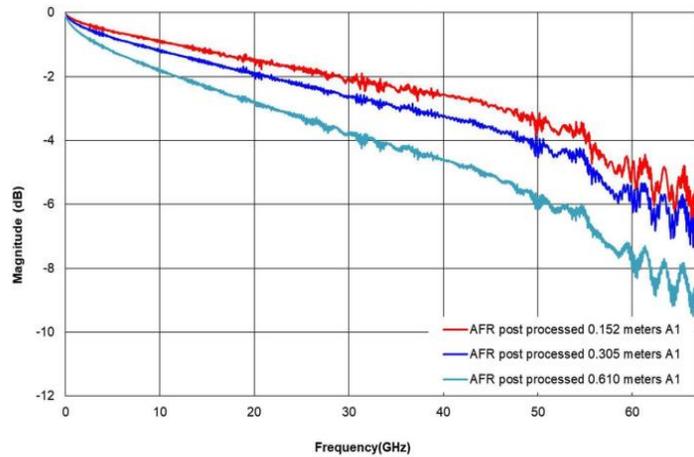
Footprint and launch compatible with BE71A Series



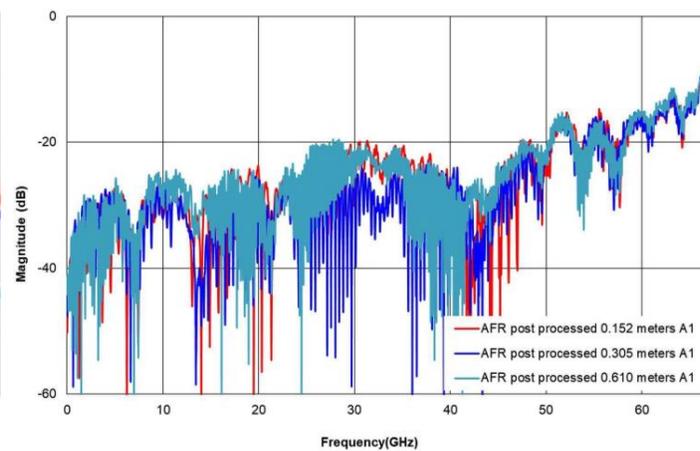
### BOARD LAUNCH OPTIMIZATION

All RF launch features must be tuned to ensure energy between the PCB trace and the connector, over the full bandwidth, remains as high as possible. Samtec's RF engineers & Signal Integrity experts can assist with your specific challenges.

**Insertion Loss**



**Return Loss**

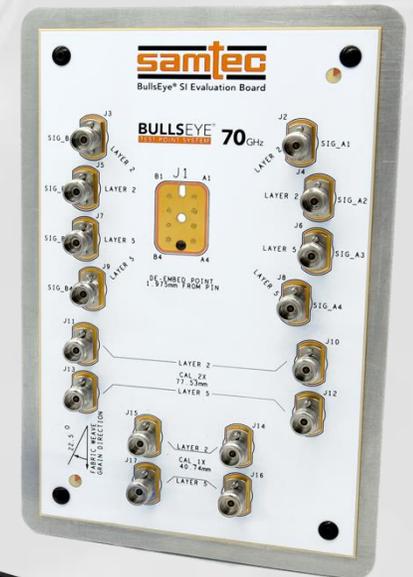


**Single Ended Performance**

Measured performance of a BE70A, 2x4-S (stripline) block on a laser drilled board launch, 0.152-meter and 0.305-meter and 0.610-meter cable samples and 1.85 mm end 2 connectors. All other effects have been removed by de-embedding.

**70 GHz Bulls Eye<sup>®</sup> SI Evaluation Kit**

Route high-frequency referential signals from Bulls Eye<sup>®</sup> double row test system (BE70A) to Precision RF compression mount connectors

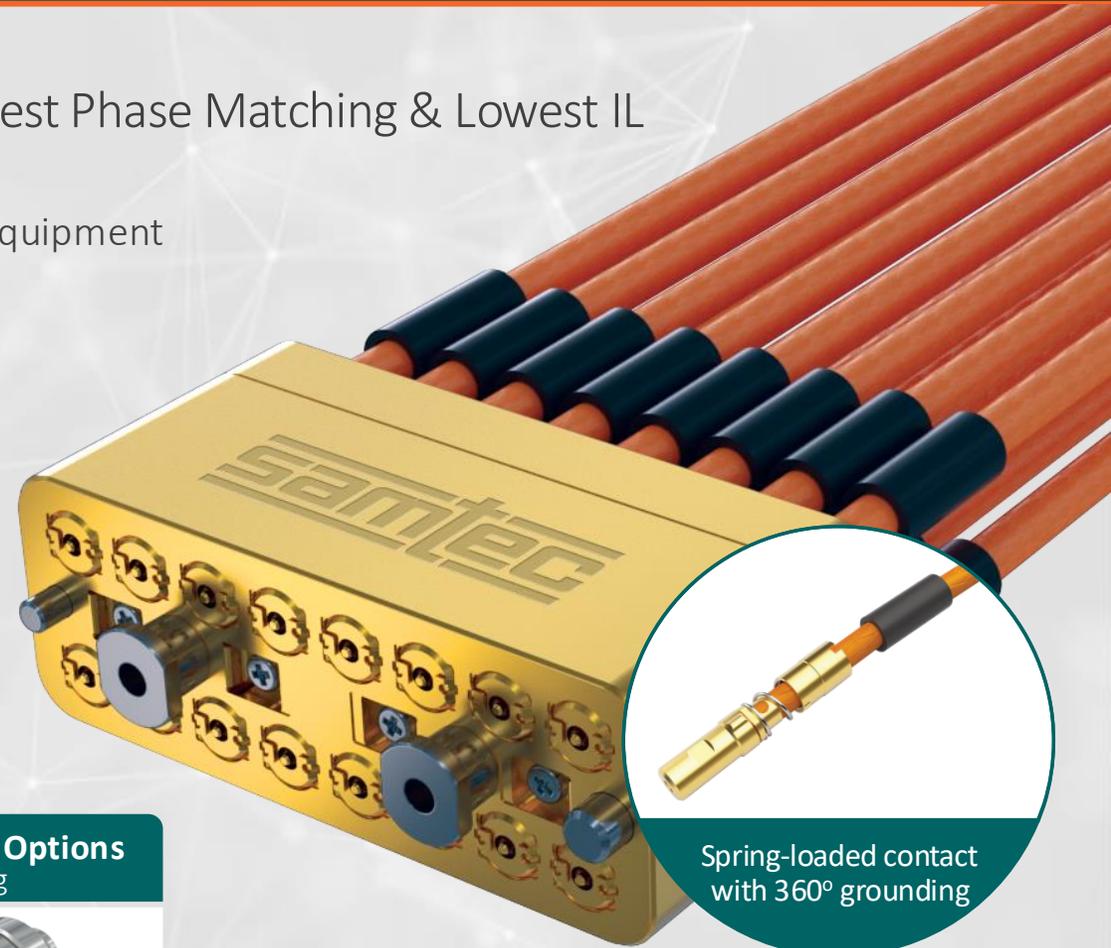


Part Number:  
REF-213864-01



## 71 GHZ BULLS EYE<sup>®</sup> HIGH-PERFORMANCE TEST ASSEMBLY | Best Phase Matching & Lowest IL

- Improved IL and phase stability over flexure, Nitrowave™ cable technology
- Excellent performance without having to upgrade to more costly 1.0 mm equipment
- Double row with 4 and 8 positions per row
- Phase Matching option: 0.5 (half), 1, 2 or 5 ps
- Commonly used for 224 Gbps PAM4 test
- Pitch: 4 mm (.157")
- Footprint and launch compatible with BE70A Series
- Mating cycles: 1,000
- Recommended PCB thickness: .06" to .16"
- For PCBs < .092": stiffener plate recommended
- Cable: .086" low-loss flexible, 23 AWG
- Min bend radius: 3.18 mm
- Operating Temperature: -65 °C to +125 °C
- Replacement components: [BE71C](#) (cable), [BE71B](#) (block)
- [Installation instructions](#)



### End 2 Connector Options Jack or Plug

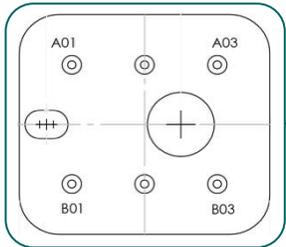


1.85 mm

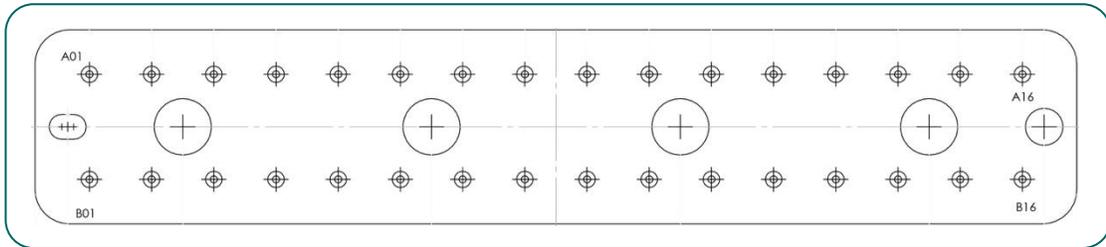


Spring-loaded contact  
with 360° grounding

## BE71A FOOTPRINT: Minimum/Maximum | Not to Scale

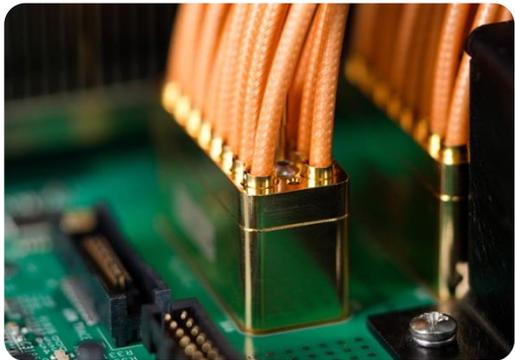
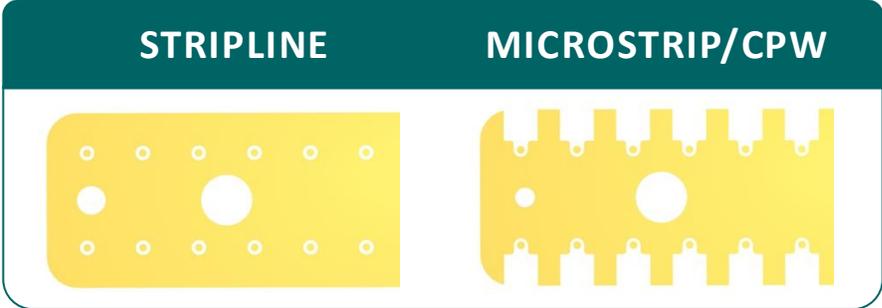


**2x3** (minimum)  
13.80 mm (.543") x 12.65 mm (.498")



**2x16** (maximum)  
67 mm (2.638") x 12.65 mm (.498")

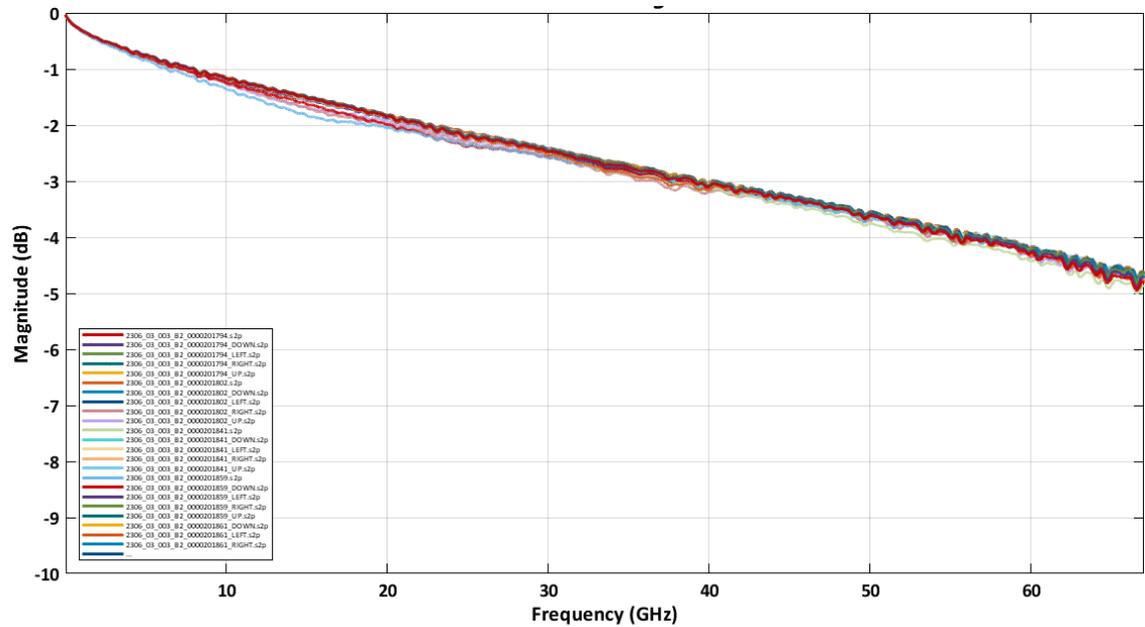
Footprint and launch compatible with BE70A Series



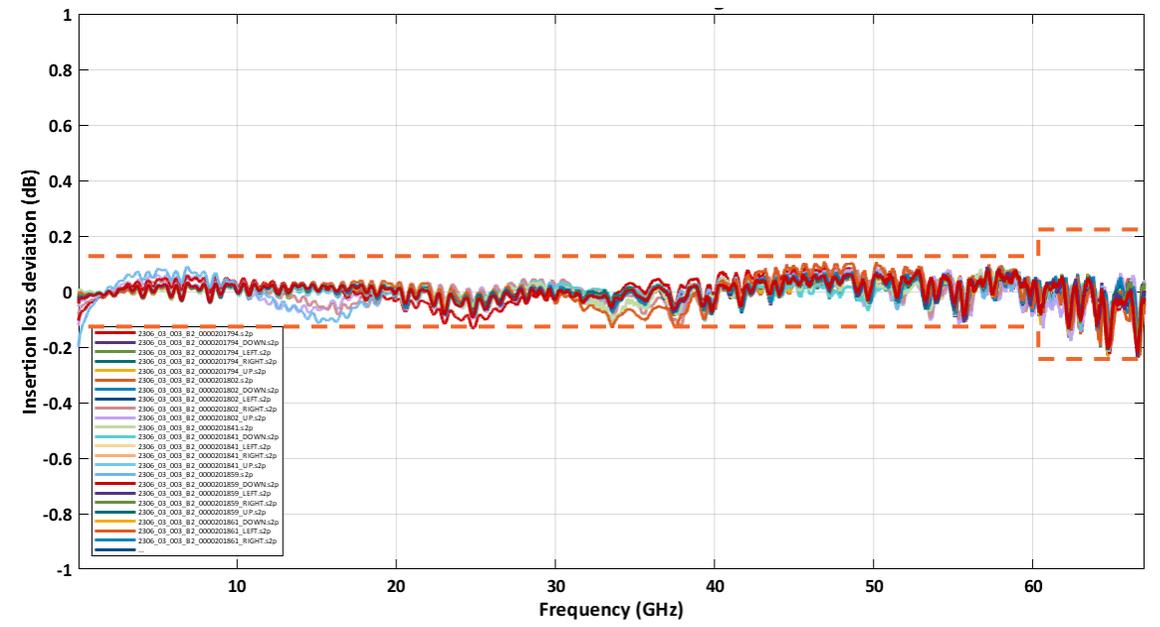
### BOARD LAUNCH OPTIMIZATION

All RF launch features must be tuned to ensure energy between the PCB trace and the connector, over the full bandwidth, remains as high as possible. Samtec's RF engineers & Signal Integrity experts can assist with your specific challenges.

## Insertion Loss



## Insertion Loss Deviation



Single ended performance under 90-degree cable movement

## 90 GHZ BULLS EYE<sup>®</sup> HIGH-PERFORMANCE TEST ASSEMBLY | Smallest Footprint, Highest Density

- 40% smaller than BE70A/BE71A
- Single row or double row
- Positions per row: (1x) 2, 4, 8, 12 or (2x) 4, 8, 12, 16
- Phase Matching option: 1, 2 or 5 ps
- Pitch: 3 mm (.118")
- Mating cycles: 1,000
- Recommended PCB thickness: .06" to .16"
- For PCBs < .092": stiffener plate recommended
- Cable: .047" low-loss flexible, 29 AWG
- Min bend radius: 3.18 mm
- Operating Temperature: -65 °C to +125 °C
- Replacement components: [BE90C](#) (cable), [BE90B](#) (block)
- [Installation instructions](#)



### End 2 Connector Options Jack or Plug

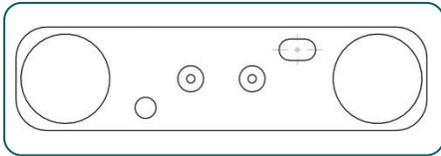


1.00 mm

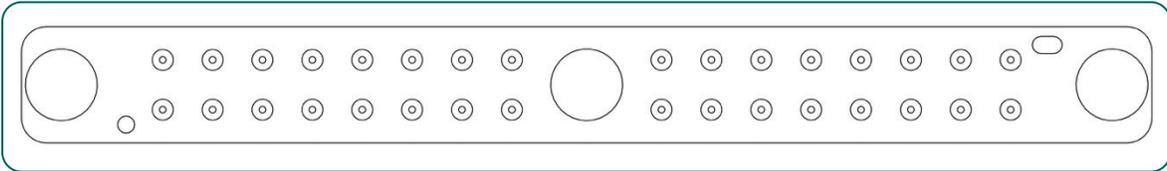
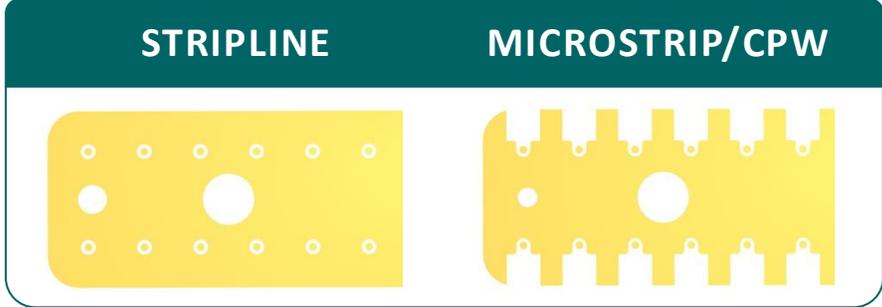


1.35 mm

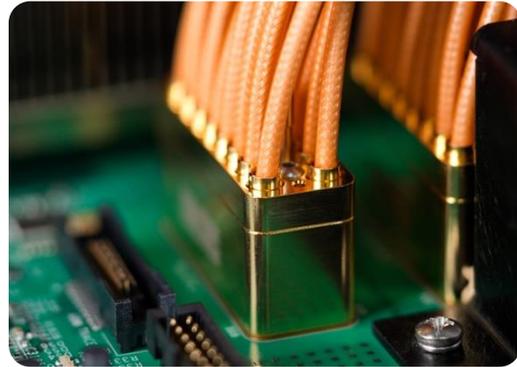
## BE90A FOOTPRINT: Minimum/Maximum | Not to Scale



**1x2 (minimum)**  
20 mm (.787") x 5 mm (.197")



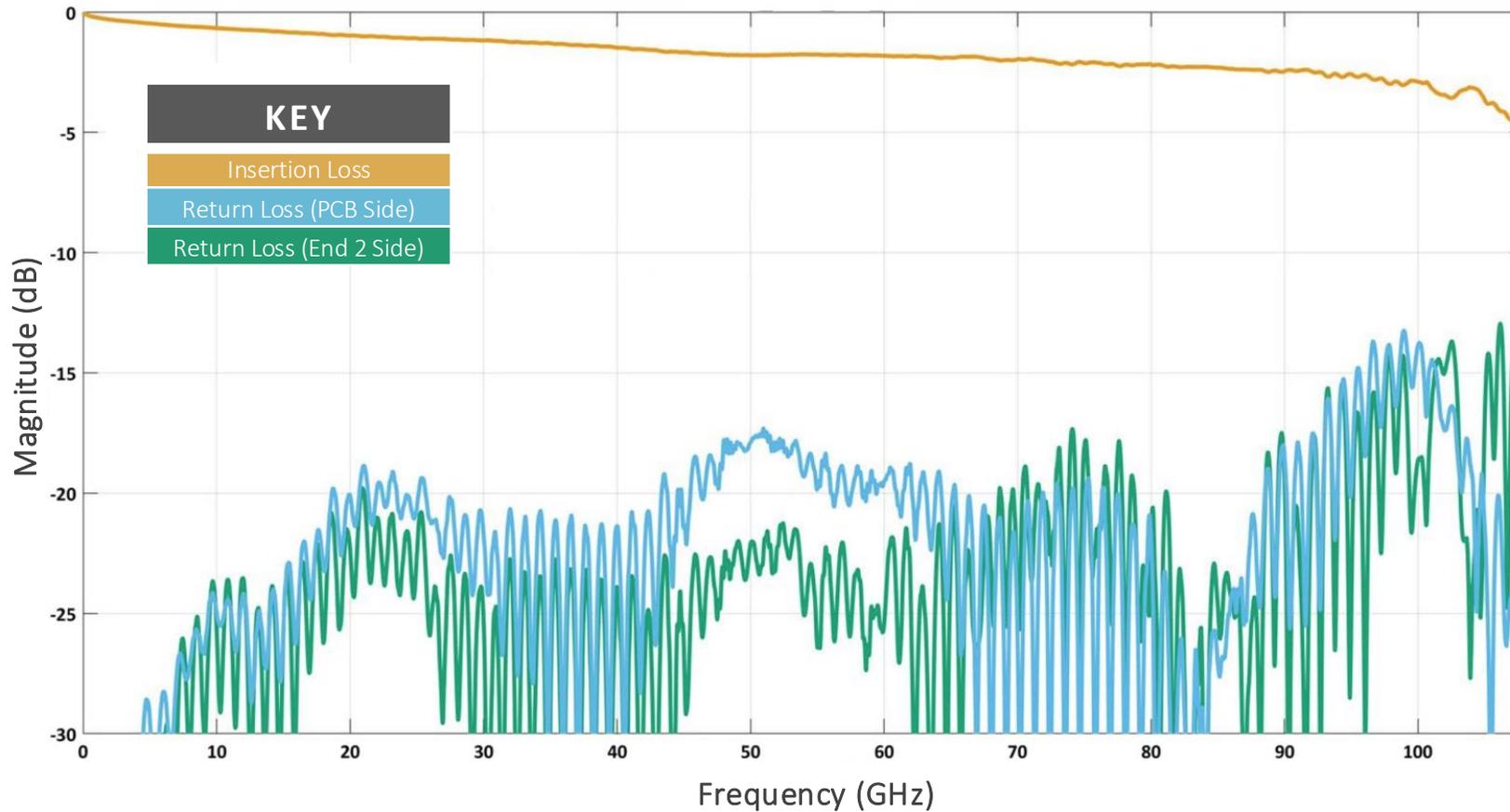
**2x16 (maximum)**  
68 mm (2.677") x 7 mm (.276")



### BOARD LAUNCH OPTIMIZATION

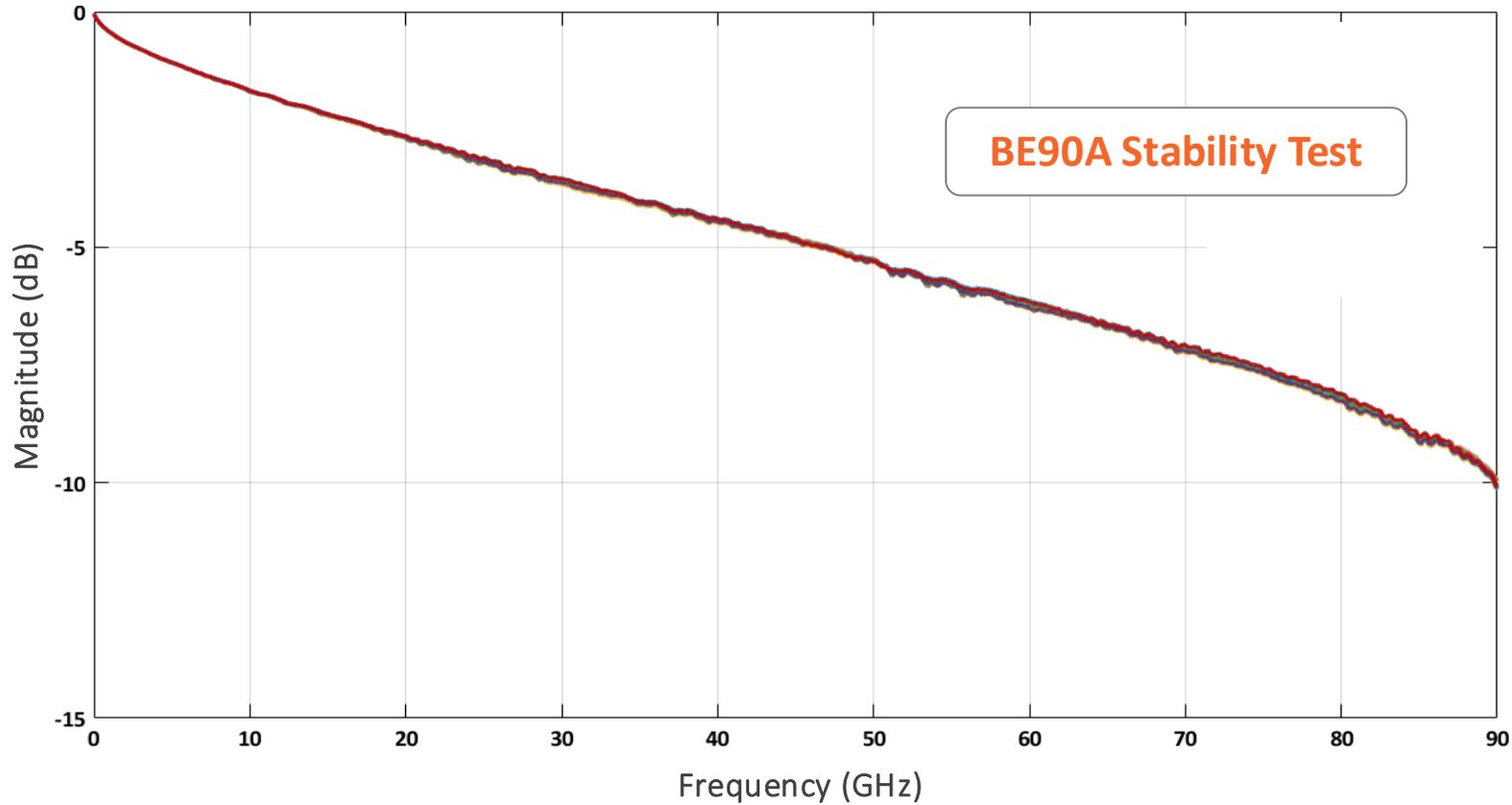
All RF launch features must be tuned to ensure energy between the PCB trace and the connector, over the full bandwidth, remains as high as possible. Samtec's RF engineers & Signal Integrity experts can assist with your specific challenges.

## Insertion Loss & Return Loss



Measured performance of a BE90A, 1.75 mm stripline trace, 100 mm low-loss microwave cable and 1.00 mm end 2 connectors. All other effects have been removed by de-embedding.

## Insertion Loss



Performance under 90-degree cable movement: Excellent stability for 224 Gbps PAM4 test (Single Ended Performance)

## 130 GHz BULLS EYE<sup>®</sup> HIGH-PERFORMANCE TEST ASSEMBLY | Next Gen Test Solution (In Development)

- Mode free performance to 130 GHz
- Lowest IL and highest frequency possible for 1.0 mm-based equipment
- Expanded mode-free bandwidth beyond 448 Gbps fundamental frequency
- Ideal for 1.0 mm-based test equipment, which is less costly than 0.8 mm or 0.5 mm solutions
- Nitrowave™ cable technology: phase and amplitude stable during flexure
- Single row or double row
- Positions per row: (1x) 2, 4, 8, 12 or (2x) 4, 8, 12, 16
- Phase matching down to 0.5 ps
- Pitch: 3 mm (.118")
- Cable: .047" low-loss flexible, 29 AWG
- Operating Temperature: -65 °C to +125 °C
- Replacement components: BE130C (cable), BE130B (block)



### End 2 Connector Options Jack or Plug

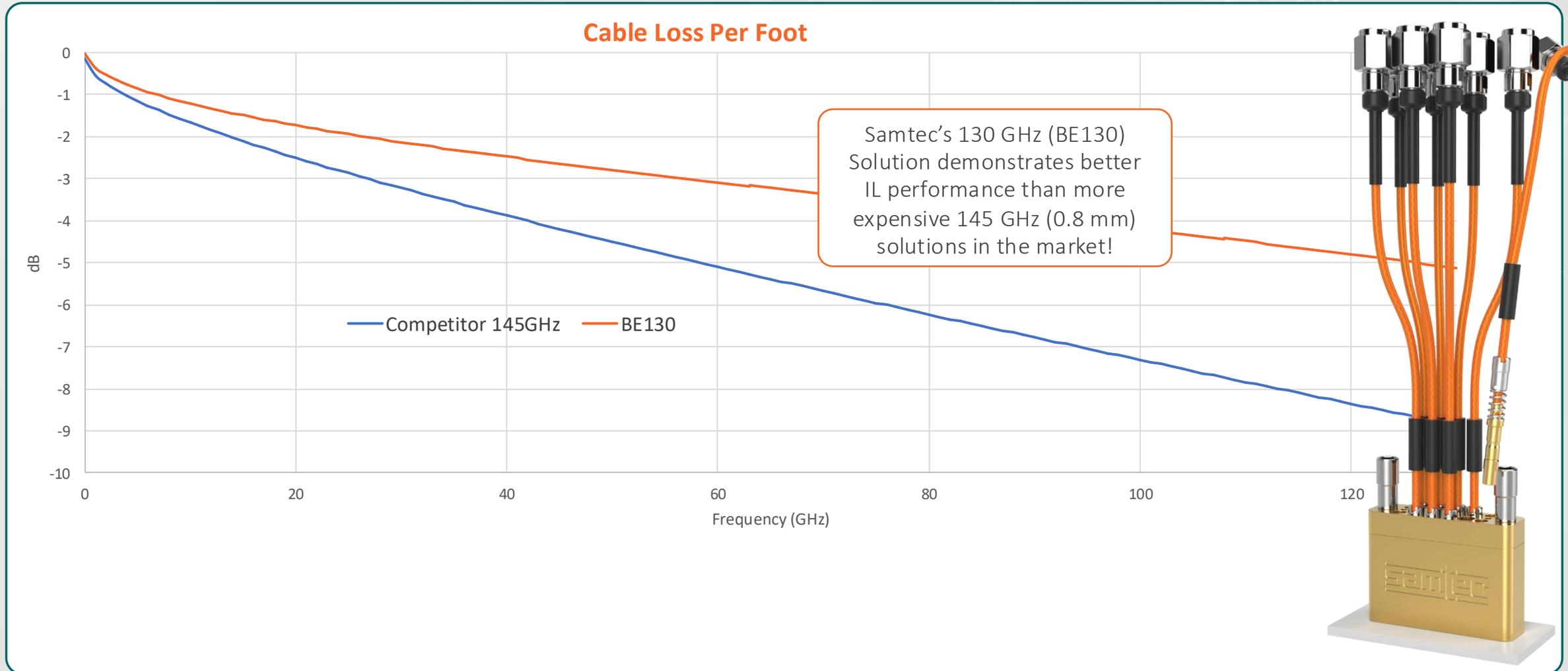


1.00 mm

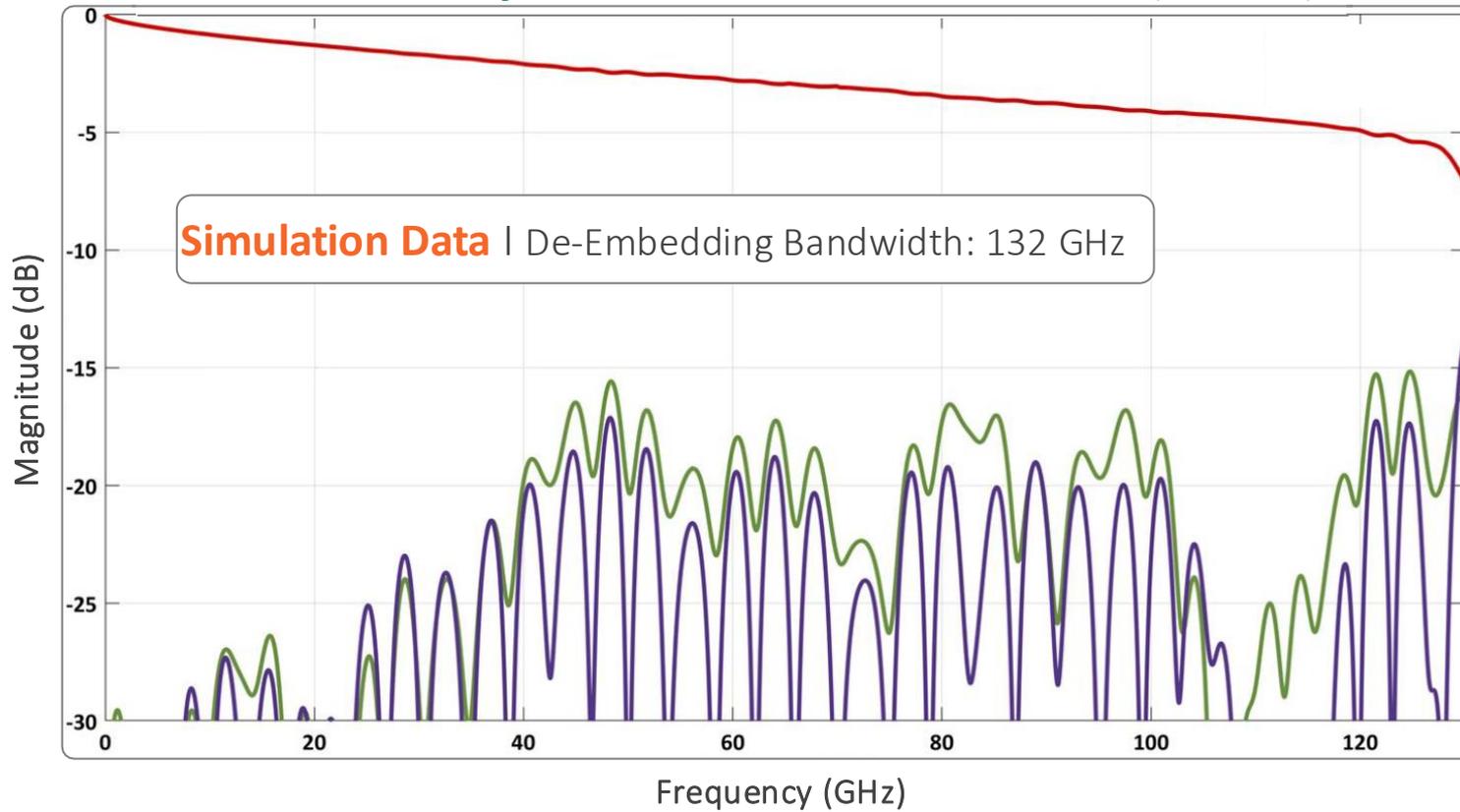


Spring-loaded contact  
with 360° grounding

## BE130 (1.0 mm) VS. 145 GHz (0.8 mm) COMPETITOR COAX CABLE



## BE130-S Layer 4 Raw Measurement Path (20 mm)



### KEY

Insertion Loss (S12)

Return Loss (S22)

Return Loss (S11)

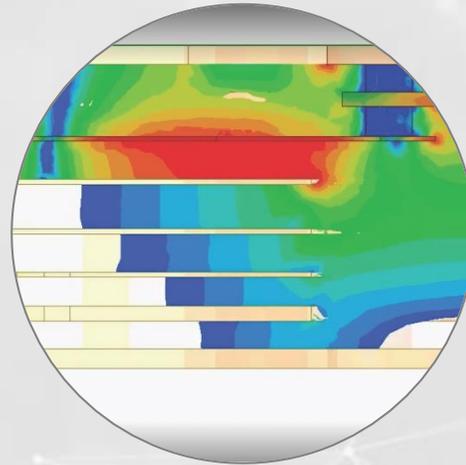
Included in data: 1.0 mm PCB connector, 20 mm stripline trace, BE130 launch, BE130 tip

## PRODUCT FAMILY CROSS REFERENCE GUIDE

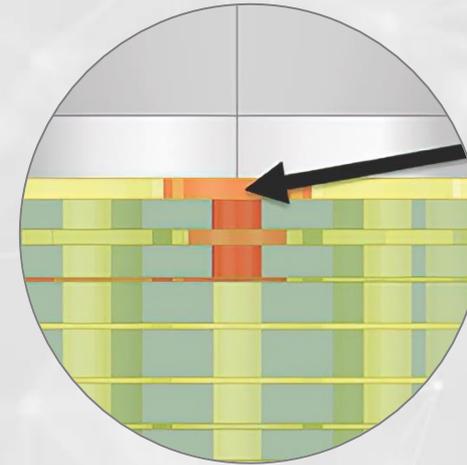
ASSEMBLY	130 GHz	90 GHz	71 GHz	70 GHz	50 GHz	40 GHz
Block Bottom View						
SerDes Characterization	448 Gbps	448/224 Gbps PAM4	224 Gbps PAM4	112 Gbps PAM4	56 Gbps PAM4	
Phase Matching	0.5 (half) ps	1, 2 or 5 ps	0.5 (half), 1, 2 or 5 ps	2 or 5 ps	2 or 5 ps	
End 2 Connector	1.00 mm	1.00 mm; 1.35 mm	1.85 mm	1.85 mm	2.40 mm	2.92 mm
Cable Type	High-Performance Nitrowave™	.047	High-Performance Nitrowave™	.086	MWC-2350CU-01	
PCB Transition	Microstrip/CPW or Stripline					
Bulls Eye® Connector Design	Spring-Loaded Contact; 360° Grounding				Pogo-Pin for Signal & Ground	
Number of Rows/Positions	1x: 2, 4, 8, 12 2x: 4, 8, 12, 16		2x: 4, 8	1x: 2, 4, 8, 12 2x: 3, 4, 6, 8, 10, 12, 14, 16		2x: 3, 4, 6, 8, 10, 12, 14, 16
Impedance	50 Ω					
Samtec Series	BE130	BE90A	BE71A	BE70A	BE40A	

## SIGNAL INTEGRITY & RF DESIGN EXPERTISE & SUPPORT

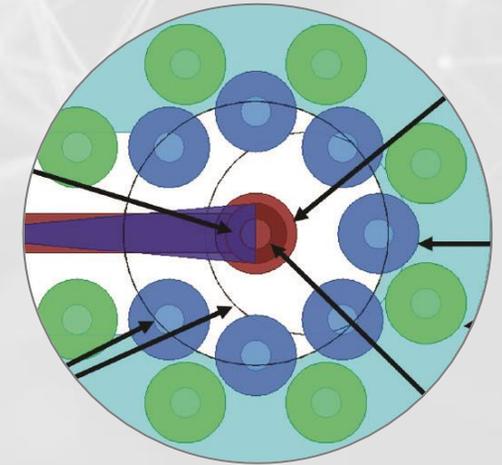
- Launch optimization & design services
- Simulation
- Prototyping
- Physical test and measurement verification
- Full channel analysis, system support
- Application specific design and development assistance
- To learn more, visit [samtec.com/rf](https://samtec.com/rf)



**E-field Simulation**



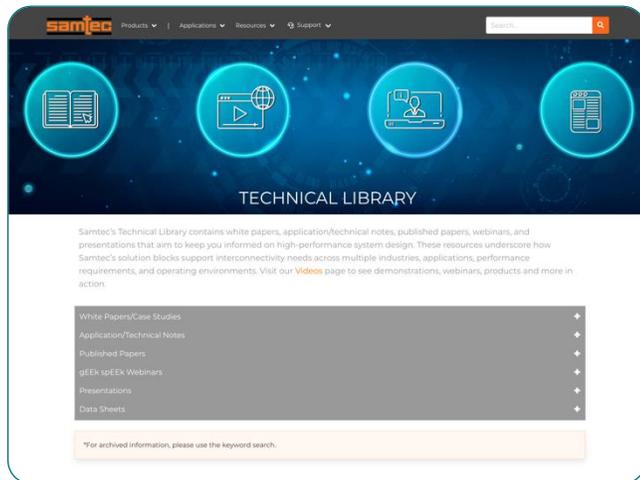
**3D Modeling**



**Launch Optimization**

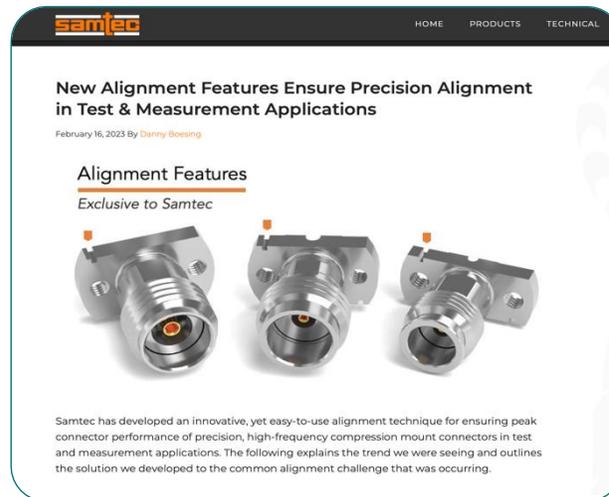
Samtec's Technical Library contains resources that underscore how Samtec supports interconnectivity needs across multiple industries, applications, performance requirements and operating environments.

## White Papers



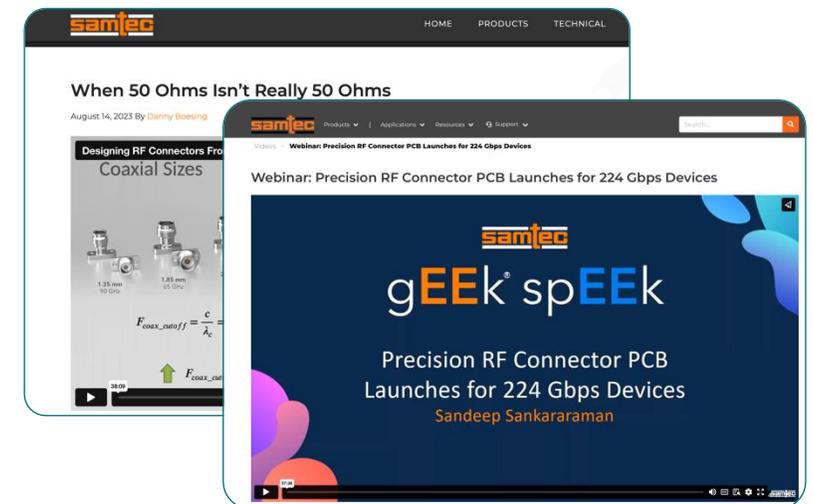
- Wideband RF Launches
- Impacts of Solder Reflow on RF Connectors
- Millimeter Wave Design
- Visit: [samtec.com/tech-library](https://www.samtec.com/tech-library)

## Technical Reports



- Precision Alignment in Test and Measurement Applications: [samtec.com/alignment](https://www.samtec.com/alignment)
- Pathway to [448](#)

## Presentations & Webinars



- Understanding Transmission Line Discontinuities: [samtec.com/system-impedance](https://www.samtec.com/system-impedance)
- Precision RF Connector PCB Launches for 224 Gbps Devices: [samtec.com/rf-launches-224](https://www.samtec.com/rf-launches-224)

**BULLSEYE**<sup>®</sup>

TEST POINT SYSTEM

[samtec.com/bullseye](https://samtec.com/bullseye)