

# PRECISION RF

MICROWAVE/MILLIMETER WAVE  
INTERCONNECT SOLUTIONS GUIDE

# PRECISION RF INTERCONNECT SOLUTIONS

Samtec's RF product line includes 18 to 110 GHz High Frequency, Precision RF solutions for microwave and mmWave applications, including full cable assemblies, cable connectors and board level interconnects.

Our focus is on delivering high-quality RF products that meet precision and performance expectations, along with industry-leading system-level signal integrity expertise.

## VERTICAL INTEGRATION ENABLES FULL SYSTEM SUPPORT

### CABLES

Design & Fabrication of Raw Cable  
Cable Assemblies

### CONNECTORS

Design & Fabrication  
Cable Connectors  
Board Connectors

### TECH SUPPORT

Launch Optimization  
Simulation & Testing  
Full System Optimization





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Military/Aero, Satellite & Radar



5G/6G & Low-Latency Wireless Communication



Automotive/Telematics



Broadcast Video & 12G-SDI



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18 GHz to 110 GHz • Interface Standards & Original Solutions • Full Mated Sets



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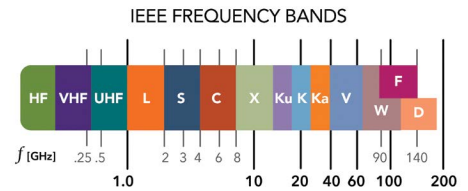
Nitrowave™ High-Performance Microwave Cable Assemblies • Microwave Cable Assemblies  
Flexible Waveguide Technology



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Bulls Eye® High-Performance Test to 90 GHz • Magnum RF® SMPM Ganged, Multi-Port Solutions





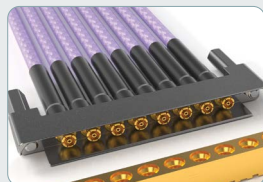
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Board Connectors • Cable Connectors • In-Series Adaptors • Between-Series Adaptors

## TECHNOLOGY ROADMAP • 2024 – 2025+



URSA® I/O with RF Coax  
& High Speed Digital  
Contacts



Magnum RF® with  
Screw Down Option



Next Gen Bulls Eye®  
Low Profile and  
Non-Magnetic Designs



Flexible Waveguide  
Blind Mate & D-Band  
(110-170 GHz)



Next Gen Magnum RF® -  
30% Smaller than Current  
Design



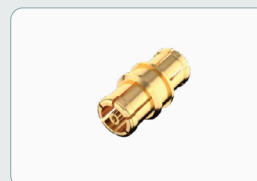
Blind Mate RF  
VNX+™ Solutions



Threaded SMPM Board  
Connectors



1.00 mm Vertical Compression  
Mount Connector

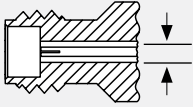

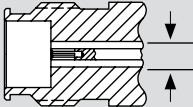

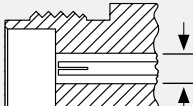

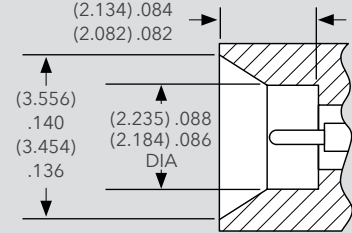

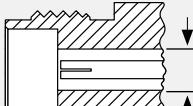

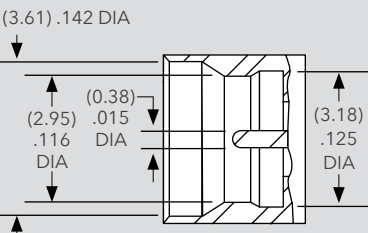



SMP3/SMPS - 30%  
Smaller than SMPM



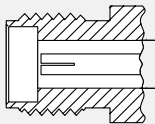

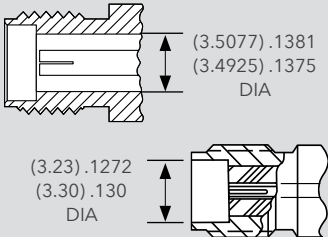

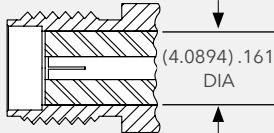

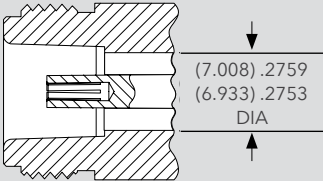

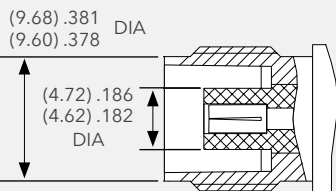

38999 Contacts: Size 16,  
Size 20 & Size 12 SMPM

# PRECISION RF STANDARD INTERFACE TYPES

Type	Standard	Mated Sets
<b>110 GHz, 1.00 mm</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>PCB: compression mount</li> </ul>	 <p>(1.0051) .03957 (0.9949) .03917 DIA</p>	<b>Cable:</b> LL110, LL095, RF047-A <b>Cable Connector:</b> PRF10 <b>Board Connector:</b> 100-EL 
<b>90 GHz, 1.35 mm</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>PCB: compression mount</li> </ul>	 <p>(1.356) .0534 (1.341) .0528 DIA</p>	<b>Cable:</b> RF047-A <b>Cable Connector:</b> PRF13 <b>Board Connector:</b> 135 (-CM, -CMM) 
<b>65 GHz, 1.85 mm</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>PCB: compression mount</li> <li>Intermateable with 2.40 mm</li> </ul>	 <p>(1.857) .0731 (1.841) .0725 DIA</p>	<b>Cables:</b> LL071, RF047-A, RF086 <b>Cable Connector:</b> PRF18 <b>Board Connectors:</b> 185 (-CM, -CMM, -EL) 
<b>65 GHz, SMPM</b> <ul style="list-style-type: none"> <li>Push-on coupling</li> <li>30% smaller than SMP</li> <li>Detents: full, smooth bore or catcher's mitt</li> <li>PCB: solder termination</li> </ul>	 <p>(2.134) .084 (2.082) .082 (3.556) .140 (2.235) .088 (3.454) .136 (2.184) .086 DIA</p>	<b>Cables:</b> LL110, LL095, RF047-A, RF086, RF23C <b>Cable Connector:</b> PRFM0 <b>Bullet Adaptor:</b> PRFIA <b>Board Connectors:</b> SMPM (-SM, -MT, -STTH, -RA-TH, -EM) (Ganged, Magnum RF® solutions also available) 
<b>50 GHz, 2.40 mm</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>PCB: compression mount</li> <li>Intermateable with 1.85 mm</li> </ul>	 <p>(2.4079) .0948 (2.3927) .0942 DIA</p>	<b>Cables:</b> LL043, RF047-A, RF086, RF23C, RF085 <b>Cable Connector:</b> PRF24 <b>Board Connectors:</b> 240 (-CM, -CMM, -EL) 
<b>40 GHz, SMP</b> <ul style="list-style-type: none"> <li>Push-on coupling</li> <li>Compensates for misalignment</li> <li>Detent: full, limited, smooth bore, catcher's mitt</li> <li>PCB: solder termination</li> </ul>	 <p>(3.61) .142 DIA (0.38) .015 DIA (2.95) .116 DIA (3.18) .125 DIA</p>	<b>Cables:</b> RF047-A, RF086, RF23C, RF25S, RF405 <b>Cable Connectors:</b> PRF00 <b>Bullet Adaptor:</b> SMP-B <b>Board Connectors:</b> SMP (-SM, -TH, -MT, -EM) 

\*Please note: images and drawings are representative and not to scale. For complete specifications, please visit [samtec.com/RF](http://samtec.com/RF).



Type	Standard	Mated Sets	
<b>40 GHz, 2.92 mm</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>PCB: compression mount</li> <li>Intermateable with 3.50 mm and SMA</li> </ul>		<b>Cables:</b> LL043, LL032, RF047-A, RF086, RF23C, RF085 <b>Cable Connector:</b> PRF92 <b>Board Connectors:</b> 292 (-CM, -CMM, -EL)	
<b>34 GHz, 3.50 mm &amp; SSMA</b> <ul style="list-style-type: none"> <li>3.50 mm is intermateable with 2.92 mm and SMA</li> <li>SSMA features a reduced size for high-density</li> <li>SSMA available as cable connector only (PRFS1)</li> </ul>		<b>Cable:</b> RF23S (3.50 mm) <b>Cable Connectors:</b> PRF35 (3.50 mm), PRFS1 (SSMA)	
<b>18/26.5 GHz, SMA</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>PCB: solder termination</li> <li>Intermateable with 2.92 mm and 3.50 mm</li> </ul>		<b>Cables:</b> LL071, LL043, LL018, RF047-A, RF086, RF23C, RF180, RF280, RF25S, RF405, RF402 <b>Cable Connector:</b> PRF01 <b>Board Connectors:</b> SMA (-TH, -SM, -MT, -EM)	
<b>18 GHz, N Type</b> <ul style="list-style-type: none"> <li>Robust threaded coupling</li> <li>Superior power handling</li> </ul>		<b>Cables:</b> RF180, RF280 <b>Cable Connector:</b> PRF06	
<b>18 GHz, TNCA</b> <ul style="list-style-type: none"> <li>Robust interface with environmental seal and threaded coupling</li> </ul>		<b>Cables:</b> RF180, RF280 <b>Cable Connector:</b> PRF04	

## PRECISION RF, 50 Ω

Interface	1.00 mm	1.35 mm	1.85 mm	2.40 mm	2.92 mm	3.50 mm	SSMA	SMA	Ganged SMPM	SMPM	SMP	N Type	TNCA
Frequency	110 GHz	90 GHz	65 GHz	50 GHz	40 GHz	34 GHz	34 GHz	18/26.5 GHz	65 GHz	65 GHz	40 GHz	18 GHz	18 GHz

# PRECISION RF CABLE ASSEMBLIES

**NITRO™  
WAVE**  
C A B L E

DC TO

**110**  
GHz

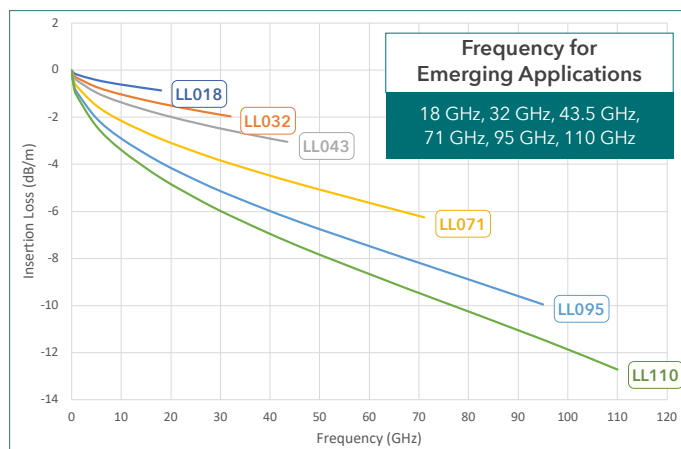
## High-Performance Microwave Cable Assemblies

Samtec's new **Nitrowave™ Phase & Amplitude Stable RF Cable** offers improved stability with flexure over time. The coaxial structure – with an outer jacket colored in **distinctive Samtec orange** – is designed to meet the demands of aerospace, defense, datacom, computer/semiconductor, and instrumentation markets. Performance is optimized at frequencies beyond traditional industry targets to support emerging applications.

### NITROWAVE™ CABLE TECHNOLOGY

- High-performance, low-loss microwave cable assemblies
- Phase and amplitude stable with flexure
- Consistent contact resistance between layers
- Lower density dielectric minimizes loss
- State-of-the-art shielding techniques and interlayer
- Silver plating enhancements mitigate corrosion potential
- Electrical performance optimized at next gen frequencies (GHz): 18, 32, 43.5, 71, 95, 110
- Mechanical and environmental robustness
- Phase vs. Bending =  $< 0.2^\circ \times F(\text{GHz})$
- VSWR = 1.4:1 @ 43.5 GHz (LL043 Series)
- Typical phase vs. temp & power handling: see product spec sheet

### MAXIMUM INSERTION LOSS (dB/m)



**"We challenged every assumption** about what makes a great cable and did not rest until we optimized every element. We invested in new technologies, and new materials, allowing for better process controls and ultimately better overall performance and stability."

~ Microwave Cable Engineering Manager, Samtec



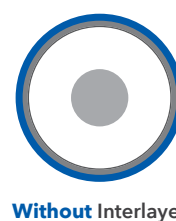
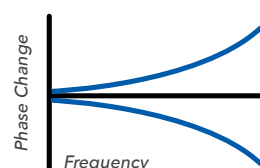
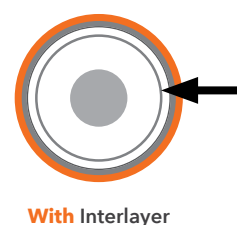
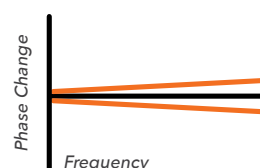
Series	LL018	LL032	LL043	LL071	LL095	LL110
Impedance ( $\Omega$ )	50					
Max Frequency (GHz)	18	32	43.5	71	95	110
Outer Dia. (inches)	0.306	0.182	0.143	0.096	0.078	0.068
Min Static Bend Radius (inches)	1.25	0.375	0.25	0.25	0.125	0.125
Velocity of Propagation (%)	77					
Min Shielding Effectiveness (dB)	-100					
Temp Range ( $^{\circ}\text{C}$ )	-65 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$					
Insertion Loss	See Maximum IL Chart on Facing Page					
End 1 / End 2	1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm, 2.92 mm, SMPM, SMP, SMA, N Type, TNCA					

#### LOW-LOSS CABLE CONSTRUCTION WITH INTERLAYER



#### INTERLAYER IMPROVES STABILITY

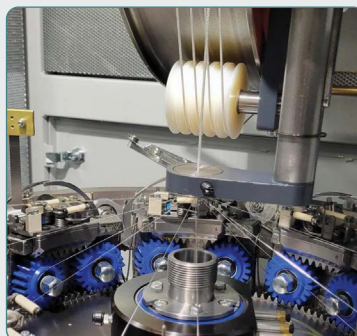
The addition of an interlayer improves stability resulting in more accurate, dependable performance.



#### TESTING & TECHNICAL SUPPORT

High-level design and development of advanced interconnect systems along with industry leading expertise allow us to offer effective strategies and support for optimizing the entire signal channel. RF technical support includes launch optimization, simulation, and testing.

Contact [RFGroup@samtec.com](mailto:RFGroup@samtec.com) to discuss your application and testing requirements.



# PRECISION RF CABLE ASSEMBLIES



DC TO

**110**  
GHz

## Microwave Cable Assemblies

Samtec offers a variety of low-loss microwave cable assemblies from .047" to .277". Larger diameter RF coaxial cable assemblies may be used for applications that require even lower loss over longer distances. Smaller diameter cable assemblies are commonly used in higher frequency applications at shorter distances. Optimized assembly design ensures precise, repeatable electrical results.

### FLEXIBLE SOLUTIONS FOR CABLE TYPES FROM .047" TO .277"

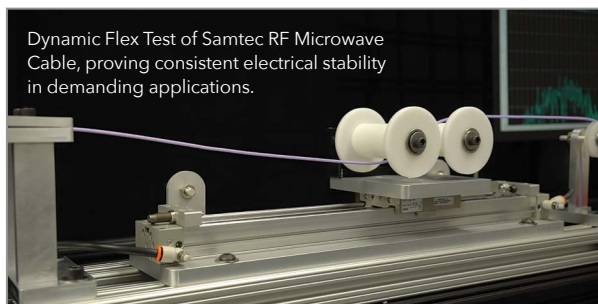
- Phase matching in pairs down to 1 ps
- Cable lengths as a standard up to 10 meters (>10 meters as a custom RSP)
- VSWR as low as 1.20 max and optimized signal integrity with copper foil shielding (RF23C Series)
- Interface types: 1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm, 2.92 mm, SMA, SMPM, SMP, 3.50 mm, N Type, TNCA
- Cable management solutions available
- Small diameter cables for higher frequencies and tighter bend radius
- Larger diameter cables for even lower loss over longer distances
- Quality products with precise, repeatable electrical and mechanical results

### PRODUCT TESTING CAPABILITIES

Samtec RF microwave cable assemblies are subject to dynamic flex testing proving electrical stability under high stress and flexure.



In addition, each product series undergoes rigorous initial design qualification test (DQT) procedures before product release. DQT tests include thermal aging, insulation resistance, mechanical shock and vibration, mating/unmating durability, and more.

Contact [RFGroup@samtec.com](mailto:RFGroup@samtec.com) to discuss your testing requirements.



Dynamic Flex Test of Samtec RF Microwave Cable, proving consistent electrical stability in demanding applications.



Series	RF280	RF180	RF23C	RF086	RF047-A
Cable Construction	 Shown at ~1/3 scale.	 Shown at ~1/2 scale.			
Impedance (Ω)	50				
Max Frequency (GHz)	18		50	67	110
Outer Diameter (inches)	.300	.195	.105	.100	.056
Min Static Bend Radius (inches)	1.500	0.976	0.125	0.350	0.125
Velocity of Propagation (%)	83	80	70	80	70
Temp Range (°C)	-55°C to +125°C		-65°C to +125°C	-55°C to +125°C	-65°C to +125°C
End 1 / End 2	SMA, TNCA, N Type		2.40 mm, 2.92 mm, SMA, SMP, SMPM	1.85 mm, 2.40 mm, 2.92 mm, SMA, SMP, SMPM, Ganged SMPM (Magnum RF®)	1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm, 2.92 mm, SMA, SMP, SMPM, Ganged SMPM (Magnum RF®)

**Also Available:** Series RF25S, RF405, RF085, RF23S, RF402. Visit [samtec.com/RF-CableAssemblies](http://samtec.com/RF-CableAssemblies) for more information.

## MIX & MATCH RF CABLE ASSEMBLY FLEXIBILITY

Samtec offers a variety of end options for each product series. This blends application-specific customization with the simplicity and lead-time efficiencies of an off-the-shelf assembly.

Quickly and easily build RF cable assemblies using Samtec's innovative online RF Cable Solutionator®. Choose a connector and cable type, and create a final part number in under a minute. Results include product specifications, pricing and availability, models and prints.



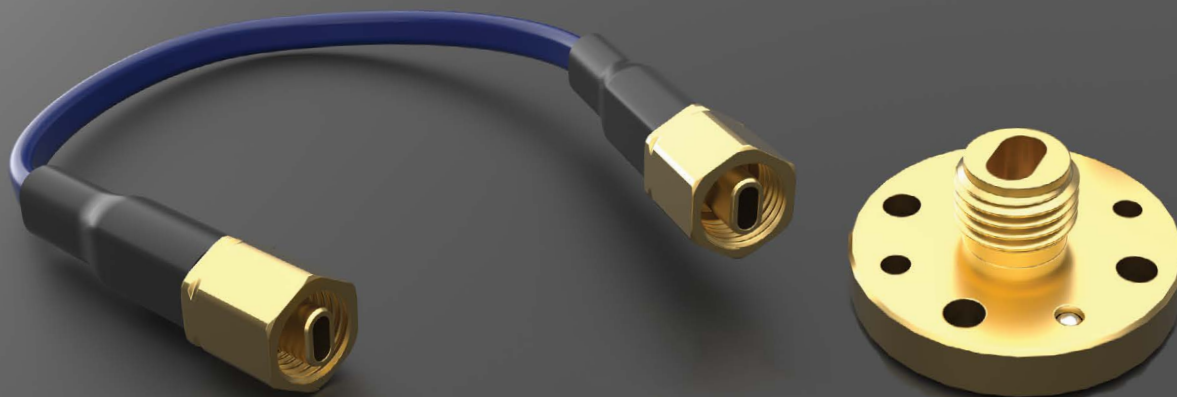
ANY  
RF Connector

ANY  
Microwave Cable

ANY  
Application



# NEXT GENERATION WAVEGUIDE TECHNOLOGY



## Flexible Micro Waveguide Technology

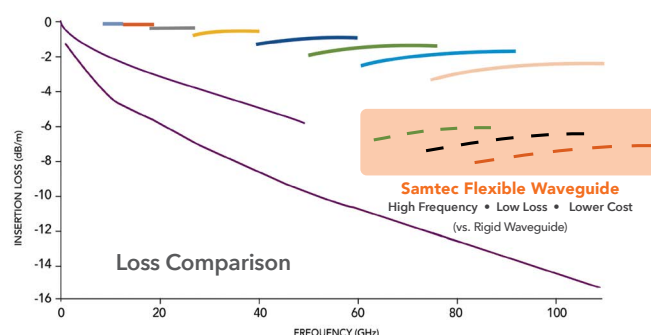
Samtec's new **High Frequency Micro Waveguide Technology** is designed to support the demands of next gen mmWave systems. Its cable design allows flexibility, a reduced size, and supports frequencies up to 90 GHz (E-band), while maintaining loss performance that is greatly improved over coaxial cables.

Samtec's innovative waveguide technology is a next generation alternative to rigid metallic waveguides, offering low-loss performance, flexibility, ease of use, and lower cost.

- 60 GHz to 90 GHz, E-Band & 50 GHz to 75 GHz, V-Band
- Flexible cable with dynamic stability
- Loss performance similar to traditional rigid waveguides
- Easy to use, ultra-small form factor

Product	Series	Frequency Band	Dimensions
Waveguide	WF12 = Cross section: 3.10 mm (.122") x 1.55 mm (.061") nom.	E (60 to 90 GHz)	Overall Length: 102 mm (4.00") Min. Threaded Plug: 5 mm (.196") x 8 mm (.314")
Adaptor	WGBA = UG-387 to Threaded Waveguide Jack		Diameter: 19.05 mm (.750") (mates with WR12 standard flange)
V-Band (50 to 75 GHz) WF15 Series: 3.76 mm (.148") x 1.88 mm (.074") nom. cross-section; UG-385 flange adaptor to threaded waveguide jack			

Samtec Flexible Waveguide VS. Coax VS. Rigid Waveguide



Samtec Flexible Waveguide

High Frequency, Low Loss,  
Lower Cost  
(vs. Rigid Waveguide)

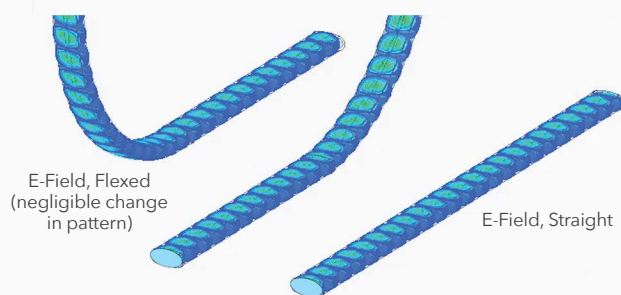
Standard Coax Cable

Standard, High  
Frequency Low Loss  
Cable Assemblies

Existing Rigid Waveguide Technology

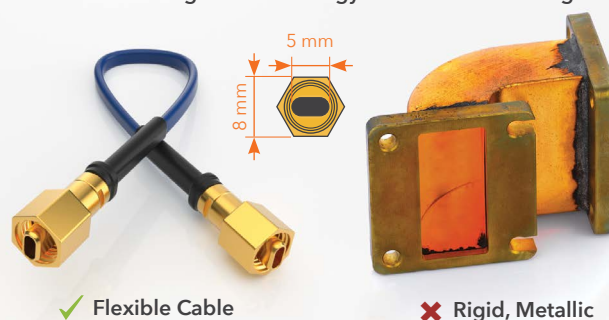
WR90 WR28 WR12  
WR62 WR19 WR10  
WR42 WR15

Dynamic Stability During Flexure (E-Band Waveguide)



Visit [samtec.com/waveguide-dynamic-stability](http://samtec.com/waveguide-dynamic-stability) for E-Field animation.

Samtec's Waveguide Technology vs. Traditional Waveguide



# BULLS EYE® TEST SOLUTIONS



**BULLSEYE®**  
TEST POINT SYSTEM

DC TO

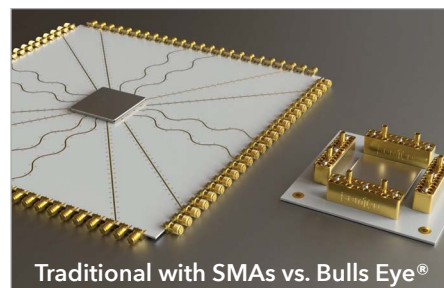
**90**  
GHz

## High-Performance Test to 90 GHz

**Bulls Eye® is a proven test & measurement solution**, ideal for SerDes characterization, clock/data recovery (CDR), mmWave radar systems, automated test equipment, next gen FR2 5G networks, and a variety of high-density high-performance designs.

Bulls Eye® High-Performance Test Assemblies feature a high-density, space-saving design that enables smaller evaluation boards and shorter trace lengths in test and measurement applications to 90 GHz.

- Compression mounts to the board for placement directly adjacent to the SerDes being characterized
- Solderless design improves cost and ease of use within a lab setting
- Single row or double row
- End 2 connection to instrumentation: 1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm or 2.92 mm
- Custom solutions also available



Traditional with SMAs vs. Bulls Eye®

ASSEMBLY	90 GHz	70 GHz	50 GHz	40 GHz
Block Bottom View				
End 2 Connector	1.00 & 1.35 mm	1.85 mm	2.40 mm	2.92 mm
Samtec Series	BE90A	BE70A	BE40A	
Cable Type	.047	.086	MWC-2350CU-01	
Cable Management	Yes			
PCB Transition	Microstrip/CPW or Stripline			
Bulls Eye®	Spring-Loaded Contact; 360° Grounding		Pogo-Pin for Signal & Ground	
No. of Rows	Single or Double		Double	
No. of Positions	1x: 2, 4, 8, 12 2x: 4, 8, 12, 16	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			
FPGA Development Kit	—		AMD® Xilinx® Zynq® UltraScale+™ RFSoc ZCU1275	
SI Evaluation Kit	Contact: RFgroup@samtec.com	70 GHz: REF-213864-01	50 GHz: REF-213497-01	

Test Assembly	SerDes Characterization
BE90A, 90 GHz	PAM 4 <b>224</b> Gbps
BE70A, 70 GHz	PAM 4 <b>112</b> Gbps
BE40A, 50 GHz	PAM 4 <b>56</b> Gbps



# MULTI-CHANNEL SOLUTIONS



**MAGNUMRF**  
GANGED RF ASSEMBLIES

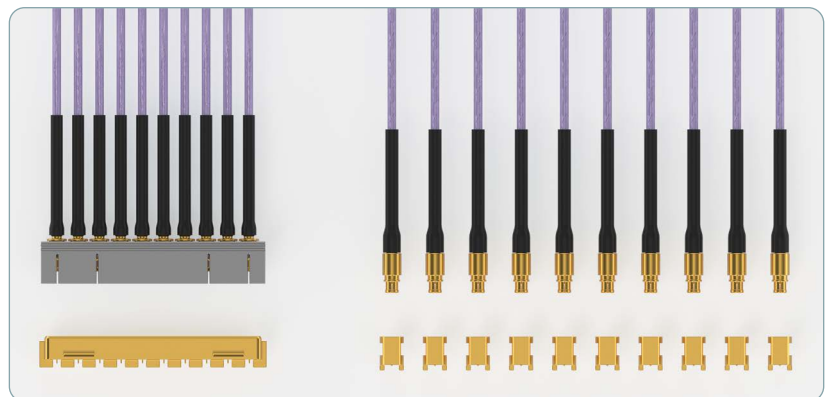
DC TO  
**65**  
GHz

## Ganged Multi-Port SMPM

Samtec's **Magnum RF® Ganged, Multi-Port Interconnect System** leverages the performance, density and blind mate advantages of the push-on SMPM connector. Magnum RF® is ideal for applications where space is limited and a high operating frequency is required, including 5G/6G Networking, Military/Defense, Radar, and Test & Measurement.

### GANGED, MULTI-PORT RF BLOCKS, CABLE ASSEMBLIES AND ADAPTORS

- Mode-free operation up to 65 GHz supports low- or mid-band system requirements
- Micro-miniature, high-density design
- Design also lends itself to smaller diameter materials and smaller bundle sizes for weight savings and increased airflow for cooling when integrated with cable assemblies
- Interconnects are available for meeting both cable-to-board and board-to-board mating requirements
- 3.56 mm (0.140") channel pitch



40% greater density, less processing time, and better positional alignment when more than one channel is required.



Blocks:  
GPPC or GPPB Series

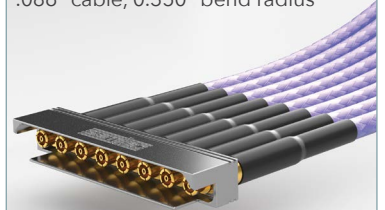
**Bullet Adaptors:**  
PRFIA Series (standard or spring-loaded)



**Cable Assembly GC47 Series:**  
.047" cable, 0.125" bend radius

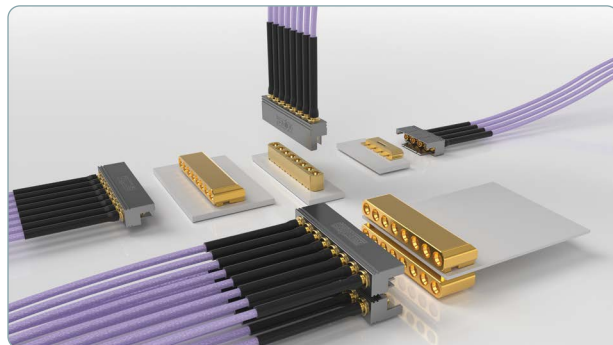


**Cable Assembly GC86 Series:**  
.086" cable, 0.350" bend radius



## CABLE-TO-BOARD

Low Profile			Vertical Launch	
Mated Sets			Mated Sets	
Edge Mount	Block	GPPC-EM	Surface Mount	GPPC-SL or GPPC-CMM
	Cable Assembly	GC47 or GC86		
Right-Angle (Belly-to-Belly or Mid-Board)	Block	GPPC-RA-SM	Cable Assembly	GC47 or GC86
	Cable Assembly	GC47 or GC86		

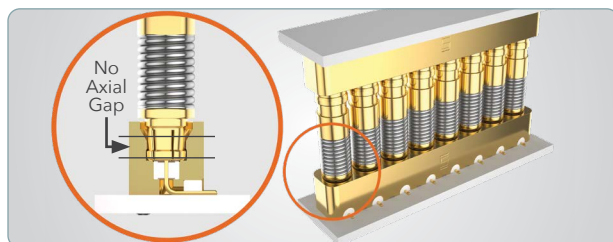


**End 2 Options:** ganged or discrete

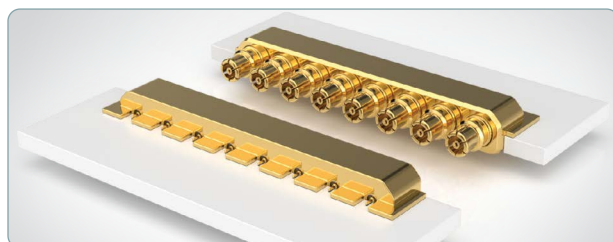
**Discrete End 2 Options:** 1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm, 2.92 mm, SMPM, SMA

## BOARD-TO-BOARD

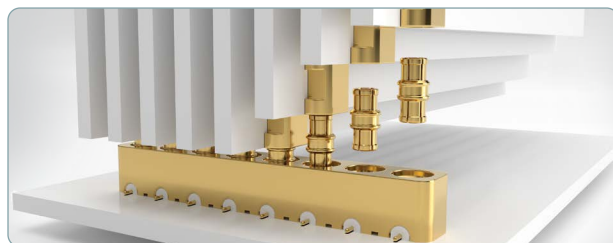
Mezzanine	
Mated Sets	
Surface Mount	GPPB-SM, GPPC-SL or GPPC-CMM
Bullet	PRFIA
Surface Mount	GPPB-SM, GPPC-SL or GPPC-CMM



Coplanar	
Mated Sets	
Edge Mount	GPPC-EM
Bullet	PRFIA
Edge Mount	GPPC-EM



Perpendicular	
Mated Sets	
Edge Mount	GPPC-EM or SMPM-EM
Bullet	PRFIA
Surface Mount	GPPB-SM, GPPC-SL or GPPC-CMM



- Bullet adaptors accommodate axial, radial misalignment in blind mate applications
- Spring-loaded adaptors provide higher axial misalignment tolerance for maintaining consistent signal contact
- Customized solutions include multiple rows, channel counts and channel pitches

# MULTI-CHANNEL BOARD CONNECTORS

DC TO  
**65**  
GHz

## Ganged, SMPM Push-On Connectors

**MAGNUMRF**  
GANGED RF ASSEMBLIES

3.56 mm (.140") Channel Pitch

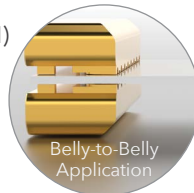
### COMPRESSION MOUNT, TWO-PORT

- Differential pair test & measurement
- Two-port SMPM with a solderless compression mount design (-CMM)
- Saves board real estate (2x savings)
- Cable-to-board or board-to-board
- Board thickness: 0.016" to 0.125"
- Torque (board mount): 0.9~1.3 in-lbs
- Alignment features ensure peak connector performance



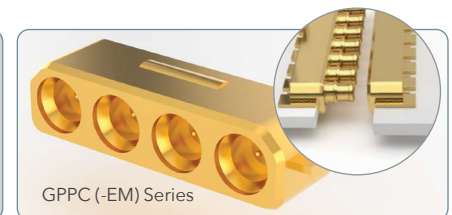
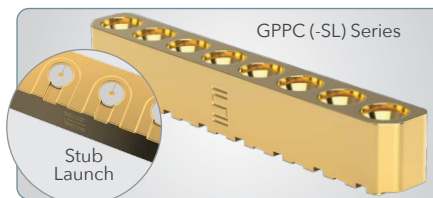
### COMPRESSION MOUNT, RIGHT-ANGLE

- Extremely low profile, right-angle connector (-RA-SM)
- Belly-to-belly, surface mount PCB connection for maximum density
- Body height: 3.94 mm (.155")



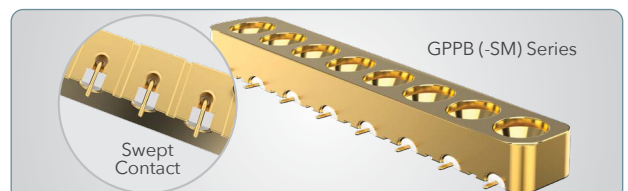
### EDGE MOUNT OR STANDARD SURFACE MOUNT

- Single row; 2, 4, 6, 8, 10 positions
- Custom pitch and row counts available
- Edge mount (-EM) or standard surface mount (-SL Stub Launch) with alignment pins



### SURFACE MOUNT WITH SWEEP CONTACT

- Swept right-angle contact allows visible trace alignment with slight performance tradeoffs





# SINGLE-CHANNEL BOARD CONNECTORS



SMP & SMPM Push-On Connectors

## SMP SERIES

- Compensates for misalignment when paired with SMP-B bullet adaptors
- Push-on design for quick, easy mating and blind mate
- Board-to-board and cable-to-board mated sets
- Full detent, limited detent, catcher's mitt and smooth bore
- 20 GHz options: edge mount or through-hole
- 40 GHz options: edge mount, through-hole, surface mount or mixed-technology

SMP Series	Edge Mount	Through-Hole	Surface Mount	Mixed Technology	Bullet Adaptor	Mating Cable Assemblies
20 GHz	SMP-EM3	SMP-TH2	N/A	N/A	SMP-B	RF25S, RF405
40 GHz	SMP-EM	SMP-TH	SMP-SM, stub launch	SMP-MT, stub launch		RF23C, RF086, RF047-A

## SMPM SERIES

- Miniature = 30% smaller than SMP
- Compensates for misalignment when paired with PRFIA bullet adaptors (standard and spring-loaded available)
- Push-on design for quick, easy mating and blind mate
- Board-to-board and cable-to-board mated sets
- Full detent, catcher's mitt and smooth bore
- 65 GHz options: edge mount, through-hole, surface mount or mixed technology



















SMPM Series	Edge Mount	Through-Hole	Surface Mount	Mixed Technology	Bullet Adaptor	Mating Cable Assemblies
65 GHz	SMPM-EM	SMPM-ST-TH (straight) SMPM-RA-TH (right-angle)	SMPM-SM, swept contact	SMPM-MT, swept contact	PRFIA, standard or spring-loaded	RF23C, RF086, RF047-A, LL110, LL095

# PRECISION RF ADAPTORS & BULLETS

DC TO  
**110**  
GHz

Samtec offers precision RF adaptors with well-performing VSWR and insertion loss. Plug-to-plug, jack-to-jack or plug-to-jack adaptors are available with threaded or push-on coupling. Interfaces support applications to 110 GHz. Spring-loaded bullet adaptors maintain consistent signal contact in high axial misalignment applications to ensure excellent performance through the system.

## IN-SERIES ADAPTORS

1.85 mm	2.40 mm	2.92 mm	SMPM	
			Standard	Spring-Loaded
				
PRFIA-185-J-J-S Jack-to-Jack	PRFIA-240-J-J-S Jack-to-Jack	PRFIA-292-J-J-S-1 Jack-to-Jack	PRFIA-SMPM-J-J-S-1 Jack, 5.33 mm Length	PRFIA-SMPM-J-J-SP-1, Jack 0.45 mm Length
				
PRFIA-185-P-P-S Plug-to-Plug	PRFIA-240-P-P-S Plug-to-Plug	PRFIA-292-P-P-S Plug-to-Plug	PRFIA-SMPM-J-J-S-2 Jack, 8.31 mm Length	PRFIA-SMPM-J-J-SP-2, Jack 0.45 mm Length
				
PRFIA-185-P-J-S Plug-to-Jack	PRFIA-240-P-J-S Plug-to-Jack	PRFIA-292-P-J-S Plug-to-Jack	PRFIA-SMPM-J-J-S-3 Jack, 12.7 mm Length	PRFIA-SMPM-J-J-SP-3, Jack 0.45 mm Length
 <p><b>Compression Range, SMPM Spring-Loaded Adaptors</b></p>				
			PRFIA-SMPM-J-J-S-4 Jack, 4.22 mm Length	PRFIA-SMPM-J-J-SP-4, Jack 0.45 mm Length

## BETWEEN-SERIES ADAPTORS

1.00 mm to 1.85 mm	2.92 mm to SMPM
	
PRFBA-100-J-185-J-S Jack-to-Jack	PRFBA-292-J-SMPM-J-S-1 Jack-to-Jack
	
PRFBA-100-J-185-P-S 1 mm Jack-to-1.85 mm Plug	PRFBA-292-P-SMPM-J-S 2.92 mm Plug-to-SMPM Jack
	
PRFBA-100-P-185-J-S 1 mm Plug-to-1.85 mm Jack	PRFBA-292-J-SMPM-PX-S 2.92 mm Jack-to-SMPM Plug
	
PRFBA-100-P-185-P-S 1 mm Plug-to-1.85 mm Plug	PRFBA-292-P-SMPM-PX-S 2.92 mm Plug-to-SMPM Plug

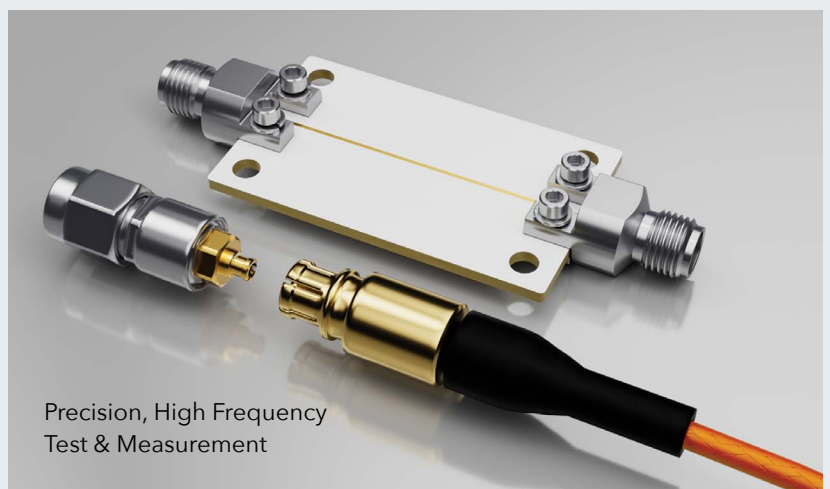
## APPLICATIONS

### Mezzanine Board-to-Board

- High density
- Blind mate, push-on coupling
- Compensates for axial and radial misalignment
- See pages 14-17

### Precision Test & Measurement

- High frequency precision test
- Used in a lab setting











# PRECISION RF CABLE CONNECTORS

DC TO

110  
GHz

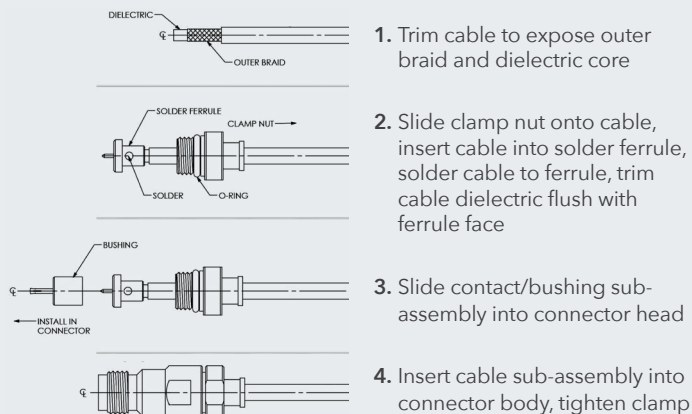
Samtec offers a variety of precision, high frequency cable connectors that are specifically designed to terminate to cables commonly used within the RF microwave/millimeter wave industry. Samtec's cable connectors are manufactured with a precise tolerance interface to ensure superior repeatability and high mechanical stability. Visit the Series page on [samtec.com](https://www.samtec.com) for access to prints with termination instructions, and view the [Cable Connector Compatibility Guide](#) to reference compatibility with industry standard cables.

## CABLE CONNECTORS

FREQUENCY / TYPE / SERIES			
			
110 GHz, 1.00 mm, PRF10 Series	50 GHz, 2.40 mm, PRF24 Series	34 GHz, SSMA, PRFS1 Series	40 GHz, SMP, PRF00 Series
			
90 GHz, 1.35 mm, PRF13 Series	40 GHz, 2.92 mm, PRF92 Series	18 GHz & 26.5 GHz, SMA, PRF01 Series	18 GHz, N Type, PRF06 Series
			
65 GHz, 1.85 mm, PRF18 Series	34 GHz, 3.50 mm, PRF35 Series	65 GHz, SMPM, PRFM0 Series	18 GHz, TNCA, PRF04 Series

Series	PRF10	PRF13	PRF18	PRF24	PRF92	PRF35	PRFS1	PRF01	PRFM0	PRF00	PRF06	PRF04
Type	1.00 mm	1.35 mm	1.85 mm	2.40 mm	2.92 mm	3.50 mm	SSMA	SMA	SMPM	SMP	N Type	TNCA

## TERMINATE TO ANY INDUSTRY STANDARD CABLE



Note: Assembly instructions vary. See print for details.

## RF APPLICATION TOOLING • [samtec.com/tooling](https://www.samtec.com/tooling)

Samtec offers a variety of tooling for the assembly and installation/extraction of our interconnect systems. Products for RF include Crimp Hand Tools, Torque Wrenches and Hand Torque Tools.

Visit [samtec.com/tooling](https://www.samtec.com/tooling), or contact the Application Tooling Group at [ATG@samtec.com](mailto:ATG@samtec.com) for specifications and ordering information.





# COMPRESSION MOUNT BOARD CONNECTORS



## Vertical & Edge Launch, Threaded Board Connectors

DC TO

**110**  
GHz

### VERTICAL CONNECTORS

- 90 GHz, 65 GHz, 50 GHz, 40 GHz
- Alignment features for peak connector performance
- Threaded coupling with high mechanical stability
- Field replaceable, cost-effective assembly
- Stripline or microstrip/CPW
- Applications: high-performance test & measurement
- Board thickness, torque spec & mating cable assemblies:

**1.35 mm • 90 GHz, 50 Ohm • Solderless**

#### 135 Series

#### Vertical

Board Thickness	0.016" to 0.125"
Torque (board mount)	0.5 ~ 0.8 in-lbs

**1.85 mm • 65 GHz, 50 Ohm • Solderless**

#### 185 Series

#### Vertical

Board Thickness	0.016" to 0.125"
Torque (board mount)	0.5 ~ 0.8 in-lbs

**2.40 mm • 50 GHz, 50 Ohm • Solderless**

#### 240 Series

#### Vertical

Board Thickness	0.016" to 0.125"
Torque (board mount)	0.5 ~ 0.8 in-lbs

**2.92 mm • 40 GHz, 50 Ohm • Solderless**

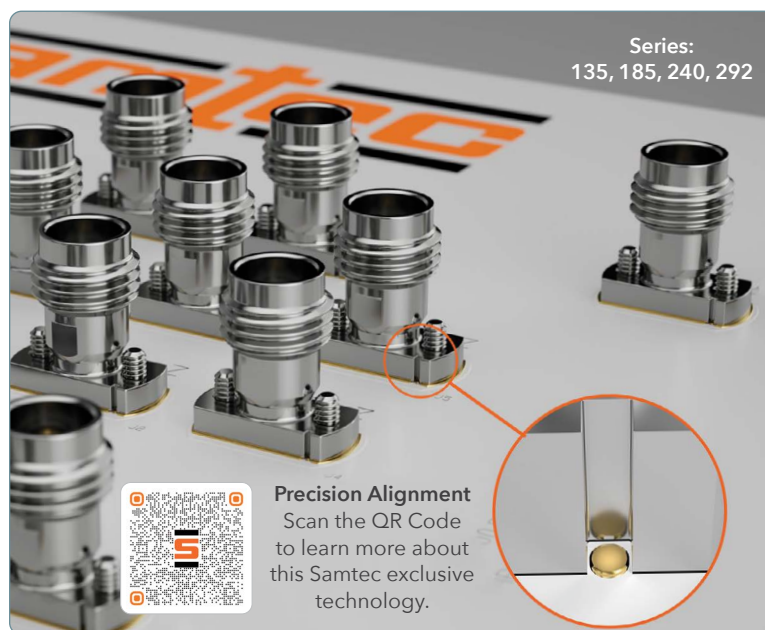
#### 292 Series

#### Vertical

Board Thickness	0.016" to 0.125"
Torque (board mount)	0.5 ~ 0.8 in-lbs

#### Mating Cable Assemblies

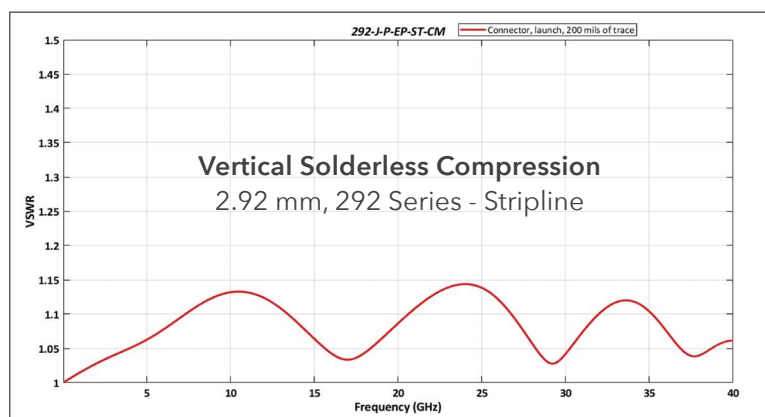
RF047-A, RF086, RF23C, RF085,  
LL110, LL095, LL071, LL043, LL032  
(see pages 8-11 for details)



Series:  
135, 185, 240, 292

**Precision Alignment**  
Scan the QR Code  
to learn more about  
this Samtec exclusive  
technology.

Alignment grooves facilitate easy visual matching to fiducial markers on the PCB and ensure repeatable peak connector performance.



The VSWR used AFR on the measurement from the reference plane of the connector into 0.2" of board trace. Board construction was a straight stripline trace on a 6-layer Tachyon 100G board.

## EDGE LAUNCH CONNECTORS

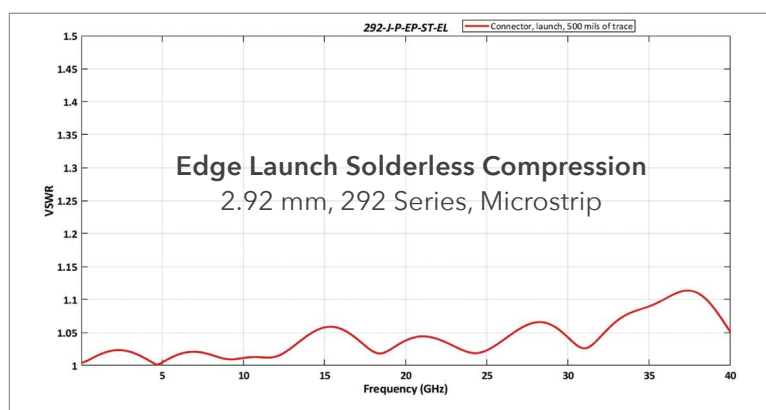
- 110 GHz, 65 GHz, 50 GHz, 40 GHz
- Small form factor improves density
- Threaded coupling with high mechanical stability
- Field replaceable, cost-effective assembly
- Applications: high-performance test & measurement
- Board thickness, torque spec & mating cable assemblies:

1.00 mm - 110 GHz, 50 Ohm • Solderless	
100 Series	Edge Launch
Board Thickness	0.040" to 0.100"
Torque (board mount)	0.5 ~ 0.8 in-lbs

1.85 mm • 65 GHz, 50 Ohm • Solderless	
185 Series	Edge Launch
Board Thickness	0.040" to 0.100"
Torque (board mount)	0.5 ~ 0.8 in-lbs

2.40 mm • 50 GHz, 50 Ohm • Solderless	
240 Series	Edge Launch
Board Thickness	0.040" to 0.100"
Torque (board mount)	0.5 ~ 0.8 in-lbs

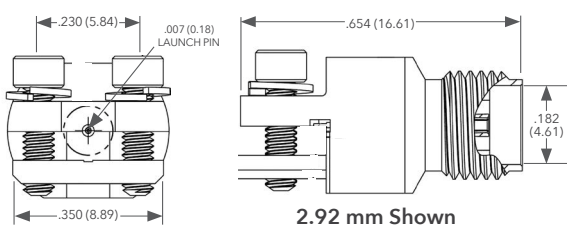
2.92 mm • 40 GHz, 50 Ohm • Solderless	
292 Series	Edge Launch
Board Thickness	0.040" to 0.100"
Torque (board mount)	0.5 ~ 0.8 in-lbs



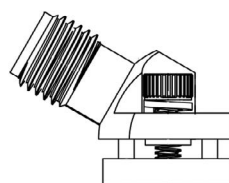
The VSWR used AFR on the measurement from the reference plane of the connector into 0.5" of board trace. Board construction was a straight microstrip trace on a 4 layer stackup with an outer 10 mil core of I-Tera MT40.

### EDGE LAUNCH

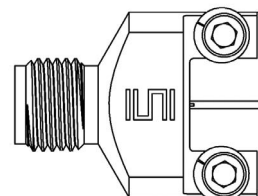
Narrow Body Design Improves Density



CUSTOM SOLUTIONS ALSO AVAILABLE: 1.85 mm, 2.40 mm, 2.92 mm



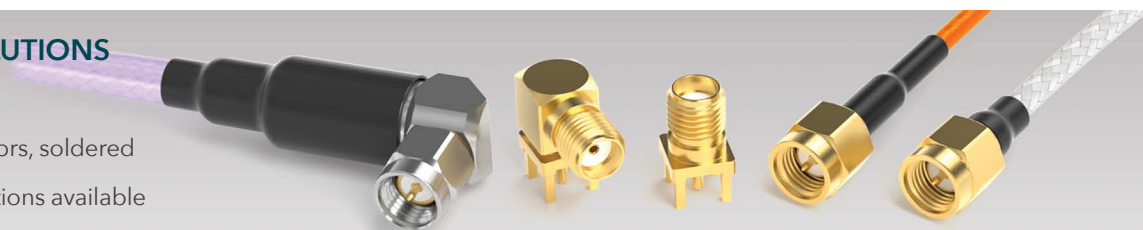
Angled Vertical Launch



Wide Body Edge Launch

## SOLDERED, SMA SOLUTIONS

- Series: SMA
- Threaded board connectors, soldered
- 26.5 GHz and 18 GHz options available



# APPLICATION-SPECIFIC INDUSTRY STANDARDS

DC TO  
**110**  
GHz

## Standardized Solutions for Mil/Aero Applications

### VITA™ 90 VNX+™ SOLUTIONS

- The next generation of open-systems small-form-factor embedded computing
- RF backplane system to support 110 GHz with high-density size 20 contacts; size 16 contacts in development
- Rugged blind mate solution
- SWaP-C reductions make this ideal for military and aerospace applications
- Configured with Samtec's SEARAY™ right-angle array and rugged optics
- Standard COTS solutions (versus customs) offer the flexibility to quickly upgrade or modernize hardware for keeping up with evolving threats
- Please visit [samtec.com/VNX-plus](http://samtec.com/VNX-plus), or contact our standards experts at [VITA@samtec.com](mailto:VITA@samtec.com) for additional information



38999 compatible Size 16 & 20 high frequency coax contacts for 50  $\Omega$  and 75  $\Omega$  applications.

### WHAT IS VITA™ 90 VNX+™

The SOSA™ Technical Standards Group and VITA™ collaborate to bring standardization to the defense and space communities with a goal of integrating sensors into everything. VNX+™ (VITA™ 90) is an evolution of the existing VITA™ architecture where SWaP-C attributes make it a natural fit for weapons, communications and surveillance systems.

The form factor of an entire VNX+™ embedded module can fit within a 5-inch tube. It enables high-performance sensor interfaces to be in close proximity to signal processors, computers and radios. VNX+™ modules are designed with standard COTS interfaces supported by Samtec and use a variety of predefined combinations of high-speed digital (56 Gbps), rugged optical and coaxial RF (110 GHz) solutions.



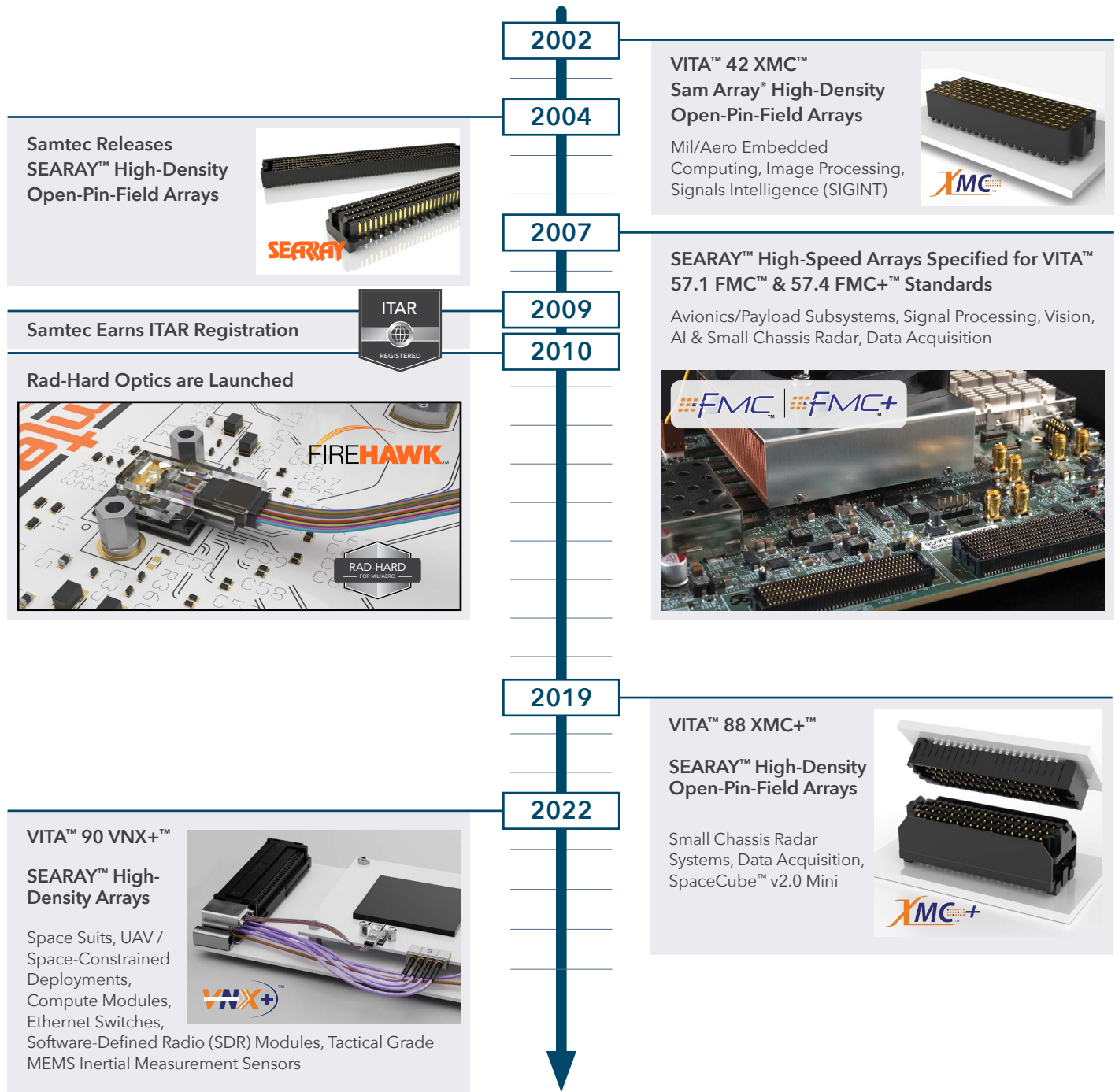
VITA, VNX, VNX+, FMC, FMC+, XMC and XMC+ are all respective trademarks of VITA.  
SOSA is a trademark of The Open Group Limited.



## SAMTEC INDUSTRY STANDARDS & SPACE HERITAGE

For 25+ years, Samtec has been engaged in developing products and supporting standards for systems that launch into space. The first stage of Samtec's space heritage began when one of Samtec's earliest products, the Sam Array® High-Density Open-Pin-Field Array, was selected as part of the VITA™ 42 XMC™ standard in 2002.

Since then, Samtec engineers have continued to engage with numerous standards bodies to develop the standards and interconnects that make leading-edge space-qualified designs possible and continue to expand on Samtec's space heritage.



# APPLICATION-SPECIFIC ANALOG OVER ARRAY™

## SIMULTANEOUSLY RUN ANALOG, DIGITAL AND POWER SIGNALS

DC TO

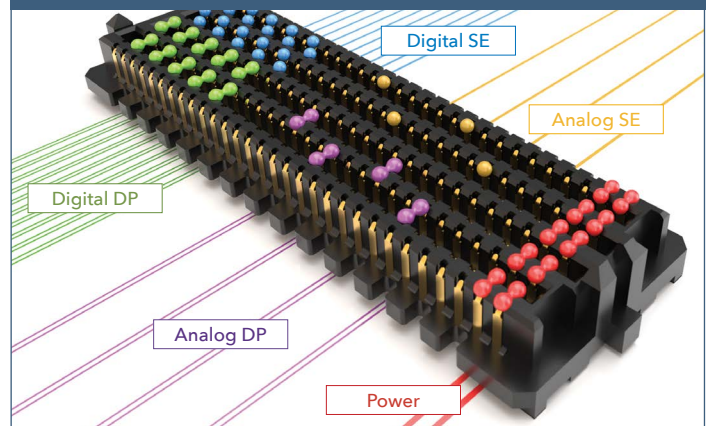
15  
GHz

High-density RF applications typically require up to hundreds of individual RF connectors. Samtec's Analog Over Array™ Connectors can replace dozens of precision RF connectors offering a smaller footprint, less weight and cost optimization. Samtec's Analog Over Array™ connectors are dense, high frequency, open-pin-field solutions supporting digital and analog differential or single-ended signaling.

- Samtec high-density array connectors are already proven in high-speed, high-performance digital applications
- Analog Over Array™ Reference Designs achieve industry-leading differential crosstalk and return loss performance beyond 8 GHz
- Connectors feature an open-pin-field design with maximum routing and grounding flexibility
- Analog and digital signals (differential pairs and/or single-ended) plus power through the same interconnect
- Differential ground pattern supports RF SOCs
- Single-ended ground pattern

**ANALOG  
OVER  
ARRAY™**

Enhanced Open-Pin-Field Design: Samtec's Analog Over Array™ technology adds analog differential pairs and single-ended signals



## SEARAY™ HIGH-DENSITY OPEN-PIN-FIELD ARRAYS

- 560-pin single array connector can support up to 26 differential RF signals
- 560-pin single array connector can support six differential RF signals plus digital I/O and power
- Reference Design & Evaluation Kits for additional Samtec open-pin-field arrays are in development for SEAX8, NVAX, APX6, LPAX, and GMI Series



Initial Differential Via Design



Final Optimized BOR

## PRECISION RF & ANALOG OVER ARRAY™ EVALUATION KITS

Samtec offers easy-to-use platforms for the evaluation of our high-performance RF products and Analog Over Array™ technology. Please contact our technical experts at [KitsAndBoards@samtec.com](mailto:KitsAndBoards@samtec.com) or [RFGroup@samtec.com](mailto:RFGroup@samtec.com) for details.



50 GHz Bulls Eye® SI Evaluation Kit  
(REF-213497-01)



70 GHz Bulls Eye® SI Evaluation Kit  
(REF-213864-01)

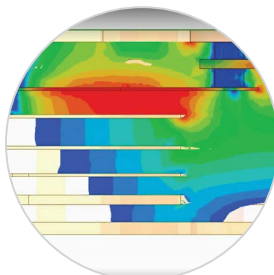


Vertical Compression Mount  
SI Evaluation Kit (REF-228591-XX)

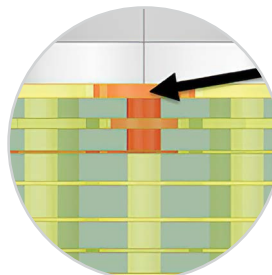
# RF DESIGN, DEVELOPMENT & TECHNICAL SUPPORT

## SIGNAL INTEGRITY & RF DESIGN EXPERTISE & SUPPORT

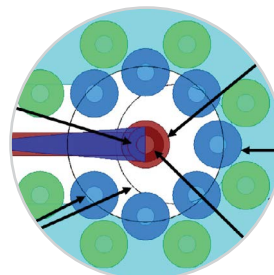
- Launch optimization & design services
- Simulation
- Prototyping
- Physical test and measurement verification
- Full channel analysis, system support
- Application specific design and development assistance



E-field Simulation



3D Modeling



Launch Optimization

## TECHNICAL RESOURCES

Samtec's Technical Library contains white papers, application/technical notes, published papers, webinars and presentations on high-performance system design. These resources 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://samtec.com/tech-library)

### TECHNICAL REPORTS

- Precision Alignment in Test and Measurement Applications: [samtec.com/alignment](https://samtec.com/alignment)

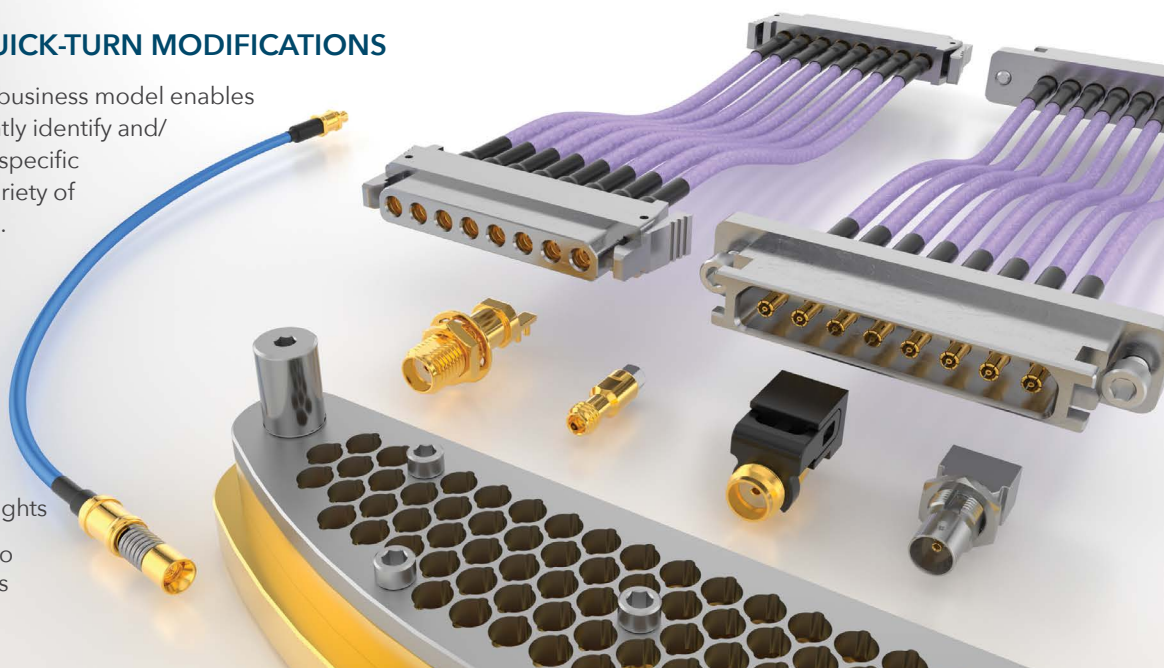
### PRESENTATIONS & WEBINARS

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

## CUSTOM SOLUTIONS & QUICK-TURN MODIFICATIONS

Samtec's fully vertically integrated business model enables the flexibility to quickly and efficiently identify and/or develop innovative, application-specific interconnect solutions to meet a variety of demands in digital/analog systems.





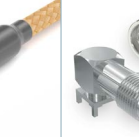


- Board termination types
- Tin dipping capabilities
- Heat-shrink tubing
- Alternate platings
- Pick & place machine designs
- Automated assembly counterweights
- Contact [RFGroup@samtec.com](mailto:RFGroup@samtec.com) to discuss your system requirements





# STANDARD LOW FREQUENCY SUB-6 GHz SOLUTIONS

## 50 Ω SOLUTIONS

		Micro High-Frequency	SMA	MCX	MMCX	TNC	BNC	SMB
Type								
Max Frequency (GHz)		6						4
Series	Cable Assemblies	MH081 & MH113	RF174, RF316, RS316, RF178, RF058, GRF1H-C	RF174, RF178, RF316, RS316, GRF1H-C	RF174, RF316, RF316, RF178, GRF1H-C	RF174, RF316, RF316, RF178, RF058, GRF1H-C	RF174, RF178, RF316, RS316, GRF1H-C	RF174, RF316, RF178, GRF1H-C
	Cable Connectors	Right Angle Plug (-MH1RP, -MH3RP, -MH4RP)	SMA-CA Jack & Plug	MCX-CA Jack & Plug	MMCX-CA Plug; MMCXV-CA High-Vibration Jack or Plug	TNC-CA Plug & Jack	BNC5-CA Jack or Plug	SMB5-CA Jack or Plug
	Board Connectors	RSP-122811 (-01, -02, -03)	SMA Jack (-TH, -SM, -MT, -EM)	MCX Jack & Plug (-TH, -SM, -EM, -MT)	MMCX Jack & Plug (-TH, -SM, -MT, -EM); Switchable Jack (-SW); High-Vibration Plug (-TH); High-Vibration Jack (-TH, -EM)	TNC Jack (-TH)	N/A	SMB5 Jack (-TH)
Features & Benefits		Space-saving, high-performance design	Non-magnetic options for medical and aerospace applications	30% smaller than SMBs; non-magnetic options for medical and aerospace applications	Simple snap-on coupling; non-magnetic options for medical and aerospace applications	Reverse polarity straight plug available; non-magnetic options for medical and aerospace applications	Quick connect & disconnect with bayonet coupling	Simple snap-on coupling; non-magnetic options for medical and aerospace applications

## APPLICATION-SPECIFIC RF SOLUTIONS

Samtec has the flexibility to quickly and efficiently identify and/or develop innovative, application-specific interconnect solutions to meet a variety of demands in digital/analog systems.

Contact the [RFGroup@samtec.com](mailto:RFGroup@samtec.com) to discuss your application needs.



Environmentally Sealed SMA









Pick & Place Machine Designs (-BMXD options)



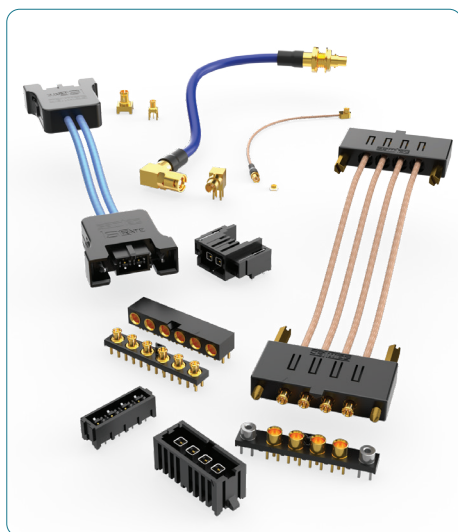
Counterweights for Automated Assembly

## 75 $\Omega$ SOLUTIONS

		BNC	DIN 1.0/2.3	HD-BNC	MCX	MMCX	SMB
Type							
Max Frequency (GHz)		12			6		4
Series	Cable Assemblies	RFC6T, RF179, RFA6T, RFB6T, GRF7H-C	RFC6T, RFC8T, RF179, RFA6T, RFB6T, RFB8T, GRF7H-C	RFC6T, RFC8T, RFA6T, RFB6T, RFB8T	RF179, GRF7H-C	RF179, GRF7H-C	RF179, GRF7H-C
	Cable Connectors	BNC7T-CA Jack & Plug	DIN7A-CA Plug	HDBNC-CA Plug	MCX7-CA Plug	MMCX7-CA Jack & Plug	SMB7H-CA Plug
	Board Connectors	BNC7T Jack (-TH, -BH, -BM, -EM) Diecast & Machined	DIN7A Jack (-TH); Bulkhead Jack (-BH)	HDBNC Jack (-TH, -EM); Bulkhead Jack (-BM, -BH)	MCX7 Jack & Plug (-TH)	MMCX7 Jack & Plug (-TH)	SMB7H Jack (-TH, -EM)
Features & Benefits		Optimized for 12G-SDI Broadcast Video solutions		4x the panel density and 20% lighter compared to standard BNC; 12G-SDI solution	30% smaller than SMBs	Simple snap-on coupling	Simple snap-on coupling

## SAMTEC LOW FREQUENCY ORIGINAL SOLUTIONS • DC to 10 GHz

Visit [samtec.com/OriginalRF](https://www.samtec.com/OriginalRF) for specifications, and to explore Samtec's full line of Original RF Solutions.



### Shielded Twisted Pair System

- 100  $\Omega$  differential pair system
- 28 AWG shielded twisted pair cable
- High reliability BeCu contacts
- 1/4-turn bayonet lock

### Ganged Micro-Mini System

- 50  $\Omega$  & 75  $\Omega$  board stacking and cable assemblies
- High performance rugged contacts
- Variety of End 2 connectors

### IsoRate® High Isolation System

- 50  $\Omega$  board stacking & cable assemblies
- Half the cost of traditional RF at virtually the same performance

### Mini & Micro-Mini Interconnects

- 75  $\Omega$  impedance MCX & MMCX
- 50  $\Omega$  high-vibration MMCX

### High Cycle U.FL Cable Plug

- 500 cycle U.FL compatible plug
- .047" DIA flexible cable

# HIGH-SPEED CABLE & FLYOVER® TECHNOLOGY

## HIGH-DENSITY CABLE ASSEMBLIES

- 1.27 mm (SEAC) and 0.80 mm pitch (ESCA)
- 34 or 36 AWG coax; 32 AWG twinax
- Mates with SEARAY™ and SEARAY™ 0.80 mm arrays



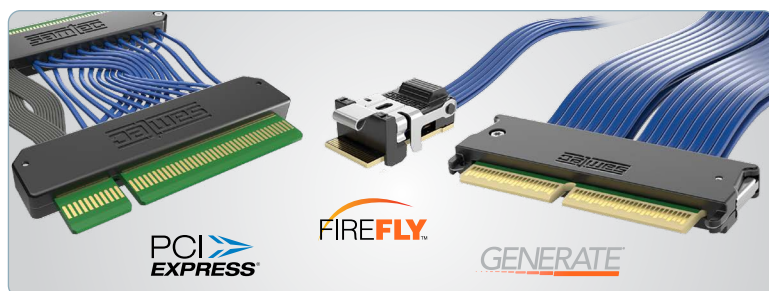
## GROUND PLANE CABLE ASSEMBLIES

- 34 and 38 AWG coax
- 0.50 mm (HQCD/HQDP)
- 30 AWG twinax
- 0.80 mm pitch (EQCD/EQDP/EQRD)
- Mates with Q Series® and Q Rate® connectors



## EDGE CARD CABLE ASSEMBLIES

- 30 AWG twinax (ECDP); mates with Generate® 0.80 mm pitch edge cards (HSEC8)
- PCI Express® twinax assemblies (PCIEC) support 3.0/4.0/5.0/6.0 data transfer rates
- FireFly™ copper available as standard (14 Gbps), optimized (56 Gbps PAM4) & PCIe® 4.0



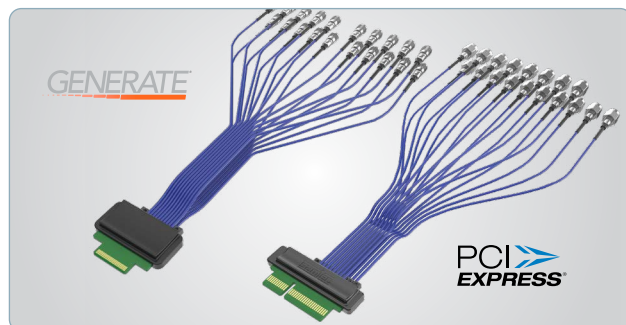
## HIGH-SPEED CABLE ASSEMBLIES

- Ultra-micro hermaphroditic Razor Beam™ coax assemblies with rugged shielding (HLCD)
- 0.80 mm pitch Edge Rate® coax & twinax assemblies (ERCD, ERDP)
- 38 AWG coax & 30 AWG twinax assemblies



## HIGH-SPEED TEST CABLES

- Breakout test cables with 2.92 mm plug or jack RF end options
- Capable of supporting PCIe® 4.0/5.0 (PCRF-G4/-G5)
- Supports 1, 4, 8 & 16 PCI Express® links
- 29 AWG low loss microwave coax cable
- Capable of supporting 56 Gbps PAM4 (GC6RF)



PCI Express® is a registered trademark of PCI-SIG.



## FLYOVER® TECHNOLOGY • PANEL ASSEMBLIES

- NovaRay® I/O Extreme Performance Panel Mount Cable Assembly
- ExaMAX® I/O Shielded, High-Density External Cable System
- Flyover® QSFP, QSFP-DD and QSFP-D8 Cable Assemblies
- Flyover® OSFP 224 Gbps PAM4 Panel Assembly



## FLYOVER® TECHNOLOGY • MID-BOARD ASSEMBLIES

- Si-Fly® LP Low Profile ASIC-Adjacent Cable System
- Si-Fly® HD High-Density On-Package Cable System
- AcceleRate® Slim, Direct Attach Cable Assembly
- AcceleRate® HP Extreme Density Cable Assembly
- AcceleRate® Mini Flyover® Extreme Performance System
- Generate® High-Speed Edge Card Cable Assembly
- NovaRay® Extreme Density & Performance Cable Assembly



## FLYOVER® TECHNOLOGY • HIGH-SPEED BACKPLANE ASSEMBLIES

- NovaRay® Micro Rugged Backplane System
- ExaMAX® High-Speed Backplane System



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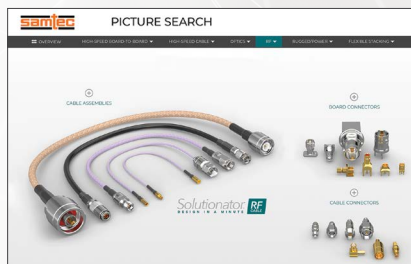
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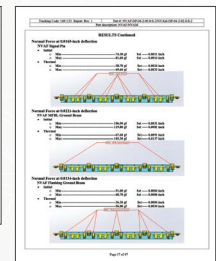
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## 24/7 WORLDWIDE SUPPORT

### Technical Support

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Application Support Group: [asg@samtec.com](mailto:asg@samtec.com)

Interconnect Processing Group: [ipg@samtec.com](mailto:ipg@samtec.com)

### Supply Chain Support

MySamtec™ Real-Time Account Access:  
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Personal Account Managers/CSRs:  
[eCustomerService@samtec.com](mailto:eCustomerService@samtec.com)

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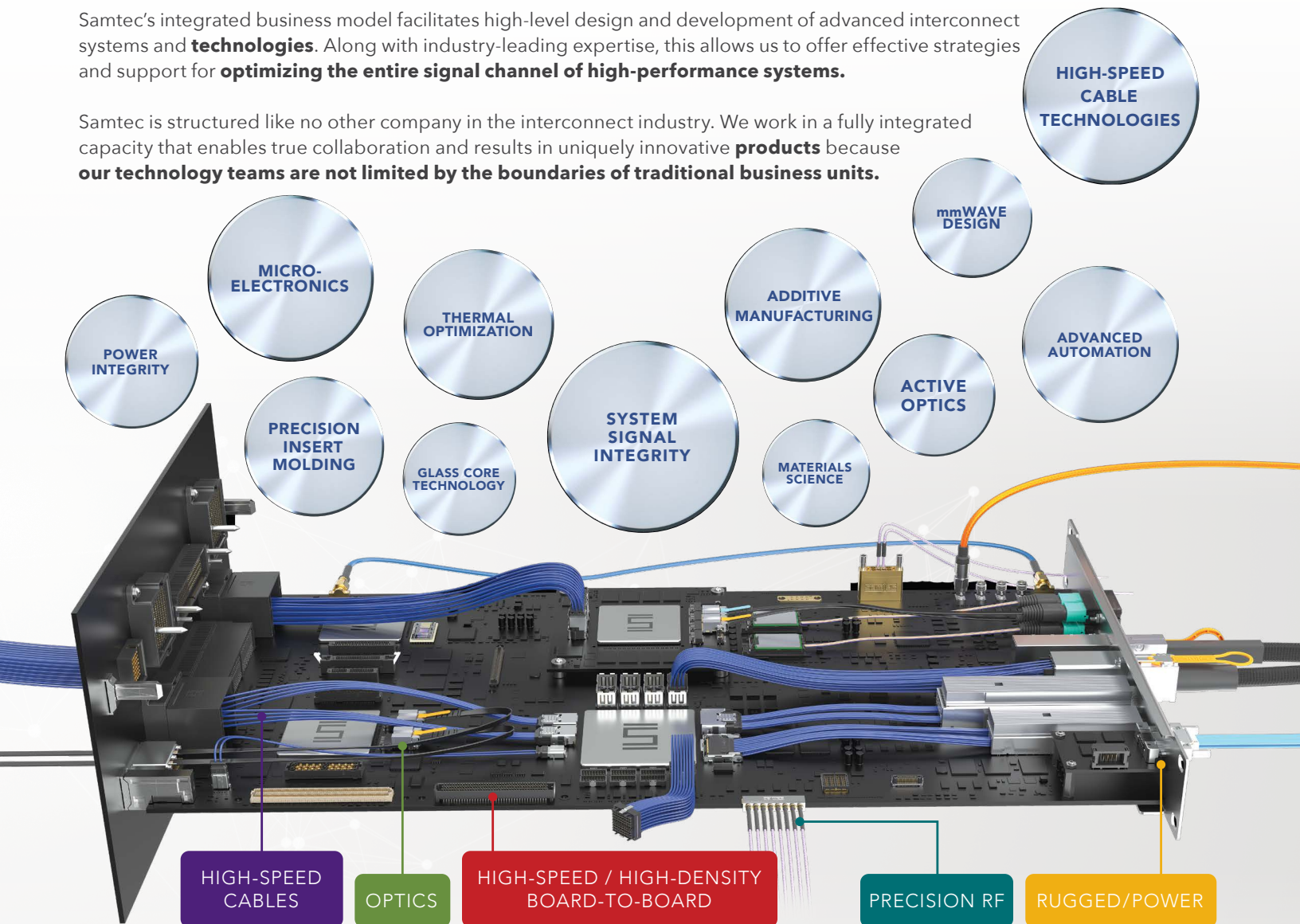


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Samtec's integrated business model facilitates high-level design and development of advanced interconnect systems and **technologies**. Along with industry-leading expertise, this allows us to offer effective strategies and support for **optimizing the entire signal channel of high-performance systems**.

Samtec is structured like no other company in the interconnect industry. We work in a fully integrated capacity that enables true collaboration and results in uniquely innovative **products** because **our technology teams are not limited by the boundaries of traditional business units**.



## SILICON-TO-SILICON™ SOLUTIONS

NEXT GENERATION CONNECTIVITY TO 224 Gbps & BEYOND

As bandwidth, scale and power requirements continue to challenge conventional engineering methods, Samtec strives to help **optimize the landscape of your entire system** - and develop solutions, together.

**Samtec's industry-leading signal integrity expertise**, full system optimization strategies, and innovative products and technologies help address the challenges of **next gen data transmission to 224 Gbps & beyond**.



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