

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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Test & Measurement



Military/Aero, Satellite & Radar



5G/6G & Low-Latency Wireless Communication



Automotive/Telematics



Broadcast Video & 12G-SDI



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PRECISION RF PRODUCT OVERVIEW

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



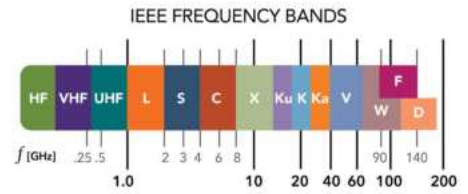
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Nitrowave™ High-Performance Microwave Cable Assemblies • Microwave Cable Assemblies
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Board Connectors • Cable Connectors • In-Series Adaptors • Between-Series Adaptors

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

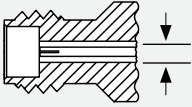

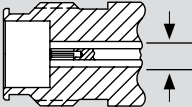

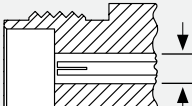

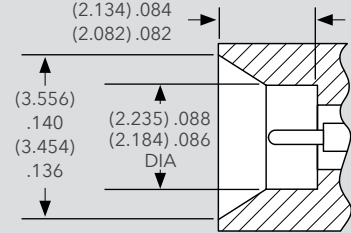

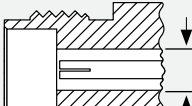

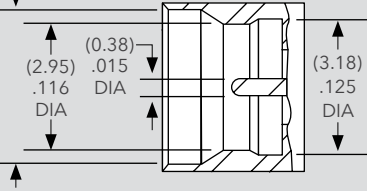



SMP3/SMP5 - 30% Smaller than SMPM



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

PRECISION RF STANDARD INTERFACE TYPES

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

*Please note: images and drawings are representative and not to scale. For complete specifications, please visit samtec.com/RF.

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



DC TO

110
GHz

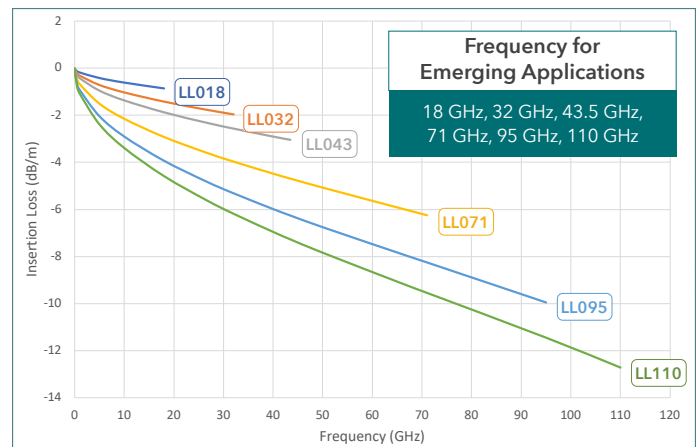
High-Performance Microwave Cable Assemblies

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 (Ω) | 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

**NITRO™
WAVE
CABLE**

- Samtec Orange FEP Jacket
- Silver Plated Copper Braid
- Interlayer
- Silver Plated Copper Helical Foil
- Low-Density PTFE Dielectric
- Silver Plated Copper Conductor

INTERLAYER IMPROVES STABILITY

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

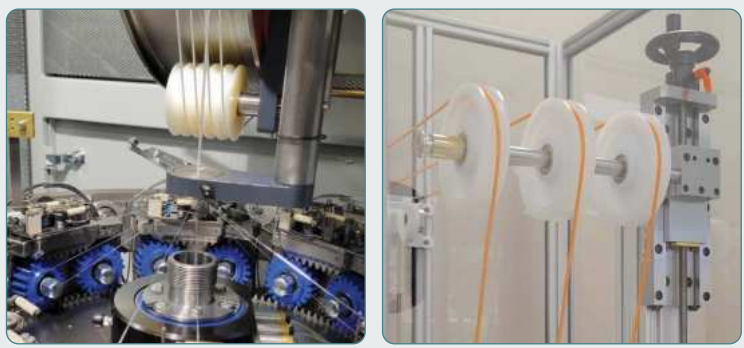
Good Stability vs Flexure **With Interlayer**

Poor Stability vs Flexure **Without Interlayer**

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 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"

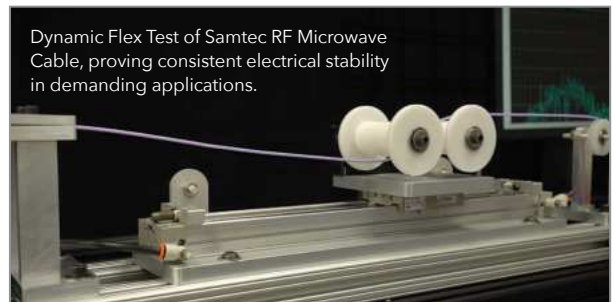
- Phase matching in pairs down to 1 ps
- Cable lengths as a standard up to 10 meters (>10 meters as a custom RSP)
- VSWR as low as 1.20 max and optimized signal integrity with copper foil shielding (RF23C Series)
- Interface types: 1.00 mm, 1.35 mm, 1.85 mm, 2.40 mm, 2.92 mm, SMA, SMPM, SMP, 3.50 mm, 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 to discuss your testing requirements.



| 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 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.

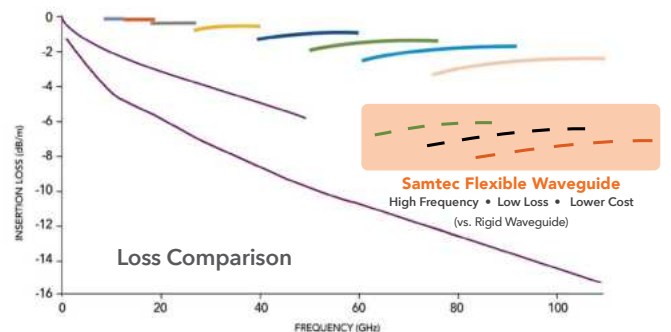
Samtec's innovative waveguide technology is a next generation alternative to rigid metallic waveguides, offering low-loss performance, flexibility, ease of use, and lower cost.

- 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)

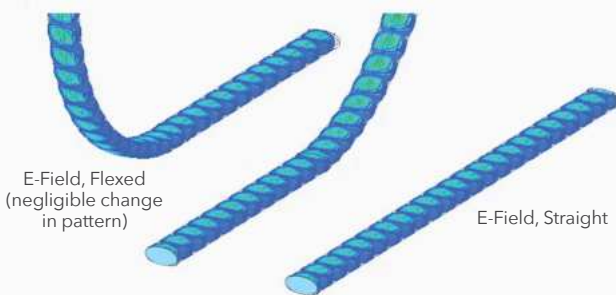
Standard Coax Cable

Standard, High Frequency Low Loss Cable Assemblies

Existing Rigid Waveguide Technology

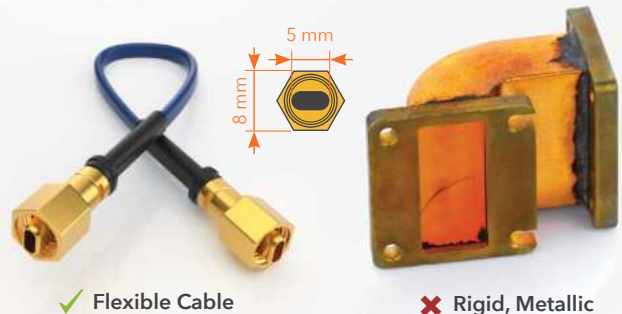
WR90 WR28 WR12
WR62 WR19 WR10
WR42 WR15

Dynamic Stability During Flexure (E-Band Waveguide)



Visit samtec.com/waveguide-dynamic-stability for E-Field animation.

Samtec's Waveguide Technology vs. Traditional Waveguide



BULLS EYE® TEST SOLUTIONS



BULLSEYE®
TEST POINT SYSTEM

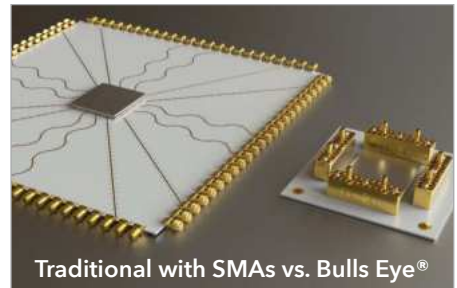
DC TO
90
GHz

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



| 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 4 224 Gbps |
| BE70A, 70 GHz | PAM 4 112 Gbps |
| BE40A, 50 GHz | PAM 4 56 Gbps |

MULTI-CHANNEL SOLUTIONS



MAGNUMRF
GANGED RF ASSEMBLIES

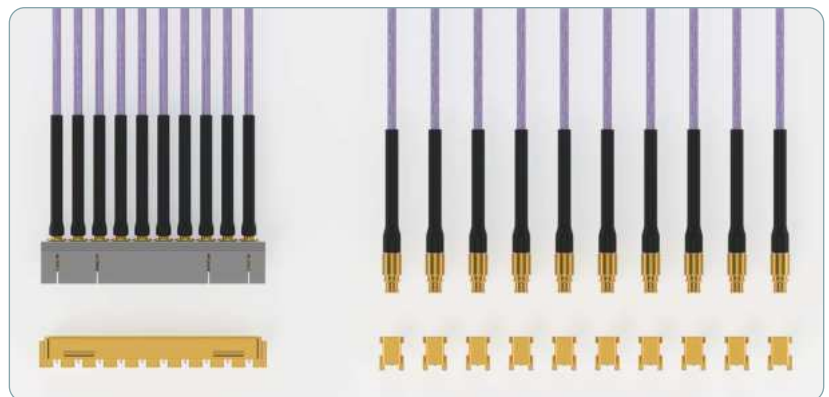
DC TO
65
GHz

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

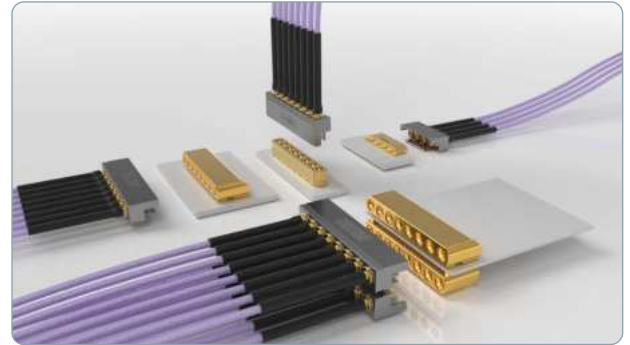


40% greater density, less processing time, and better positional alignment when more than one channel is required.



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 | | |

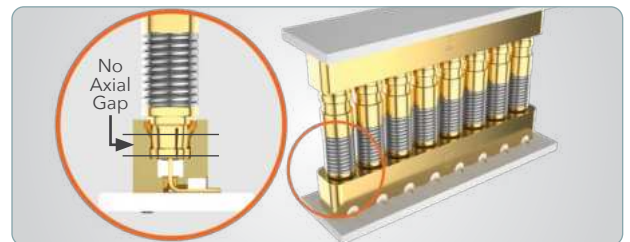


End 2 Options: ganged or discrete

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

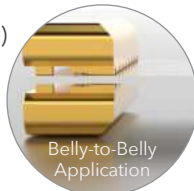
COMPRESSION MOUNT, TWO-PORT

- 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



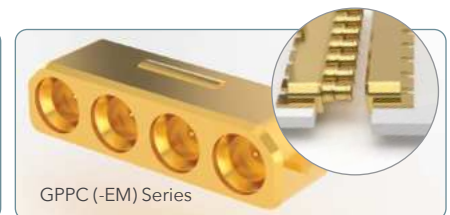
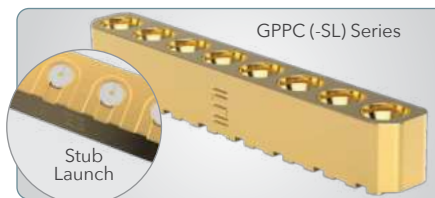
COMPRESSION MOUNT, RIGHT-ANGLE

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



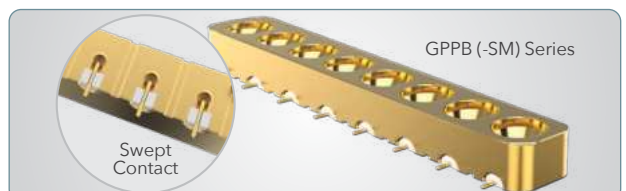
EDGE MOUNT OR STANDARD SURFACE MOUNT

- 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



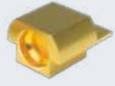





SINGLE-CHANNEL BOARD CONNECTORS



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 |

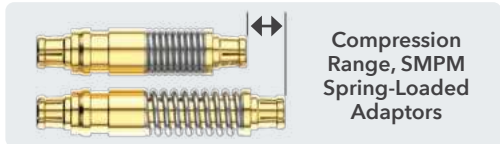
PRECISION RF ADAPTORS & BULLETS

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 |
| | | | | |
| | | | | 0.45 mm Length Compression Range .032" (see diagram) |
| | | | | |
| | | | | 16.5 mm Length Compression Range .100" (see diagram) |



BETWEEN-SERIES ADAPTORS

| 1.00 mm to 1.85 mm | 2.92 mm to SMPM |
|--------------------|-----------------|
| | |
| | |
| | |
| | |

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

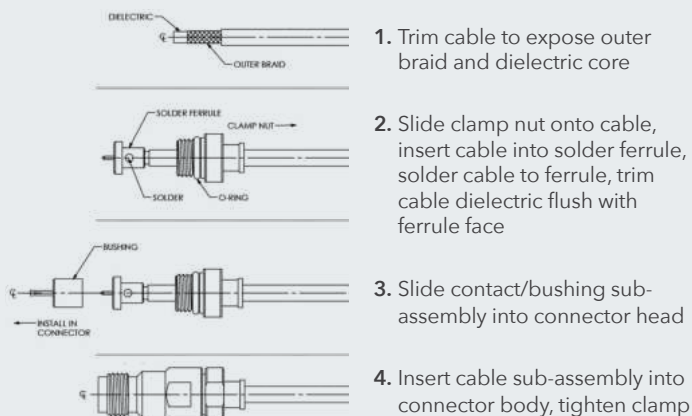
Samtec offers a variety of precision, high frequency cable connectors that are specifically designed to terminate to cables commonly used within the RF microwave/millimeter wave industry. Samtec's cable connectors are manufactured with a precise tolerance interface to ensure superior repeatability and high mechanical stability. Visit the Series page on samtec.com 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

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, or contact the Application Tooling Group at ATG@samtec.com for specifications and ordering information.



COMPRESSION MOUNT BOARD CONNECTORS



DC TO
110
GHz

Vertical & Edge Launch, Threaded Board Connectors

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) | |

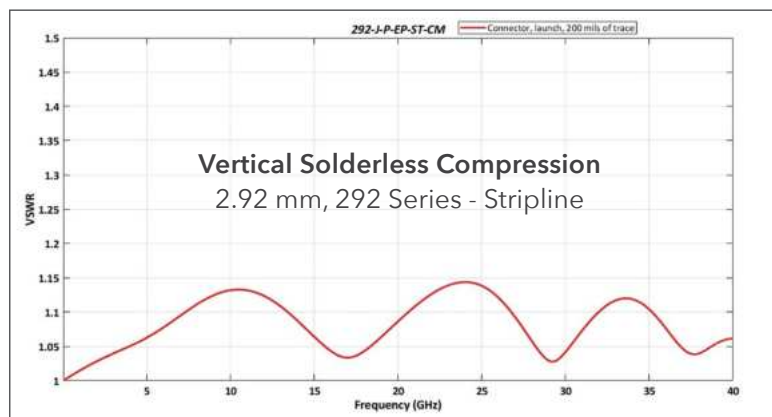


Series:
135, 185, 240, 292



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

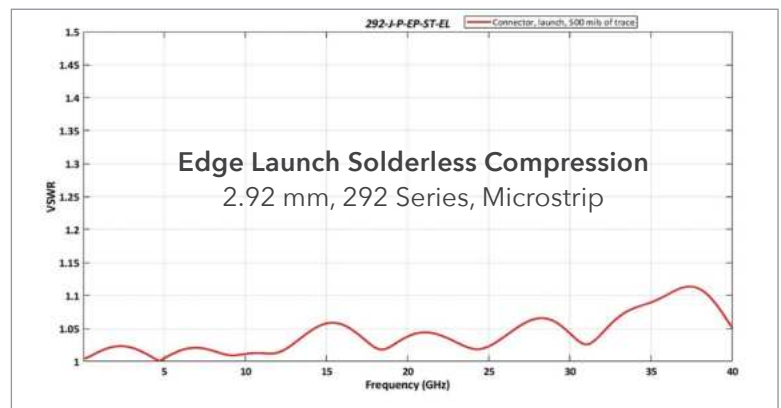
- 110 GHz, 65 GHz, 50 GHz, 40 GHz
- Small form factor improves density
- Threaded coupling with high mechanical stability
- Field replaceable, cost-effective assembly
- Applications: high-performance test & measurement
- Board thickness, torque spec & mating cable assemblies:

| 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 |

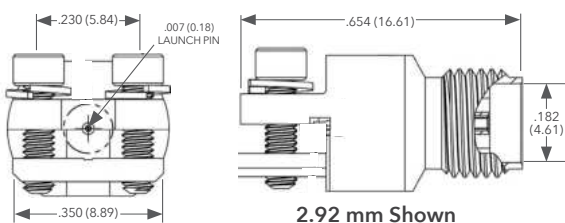
| 2.92 mm • 40 GHz, 50 Ohm • Solderless | |
|---------------------------------------|--------------------|
| 292 Series | Edge Launch |
| Board Thickness | 0.040" to 0.100" |
| Torque (board mount) | 0.5 ~ 0.8 in-lbs |



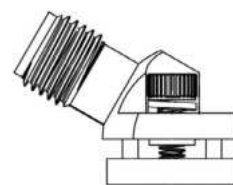
The VSWR used AFR on the measurement from the reference plane of the connector into 0.5" of board trace. Board construction was a straight microstrip trace on a 4 layer stackup with an outer 10 mil core of I-Tera MT40.

EDGE LAUNCH

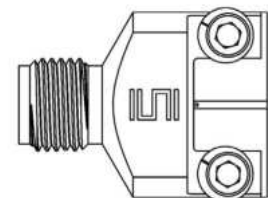
Narrow Body Design Improves Density



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, or contact our standards experts at VITA@samtec.com for additional information



38999 compatible Size 16 & 20 high frequency coax contacts for 50 Ω and 75 Ω 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.

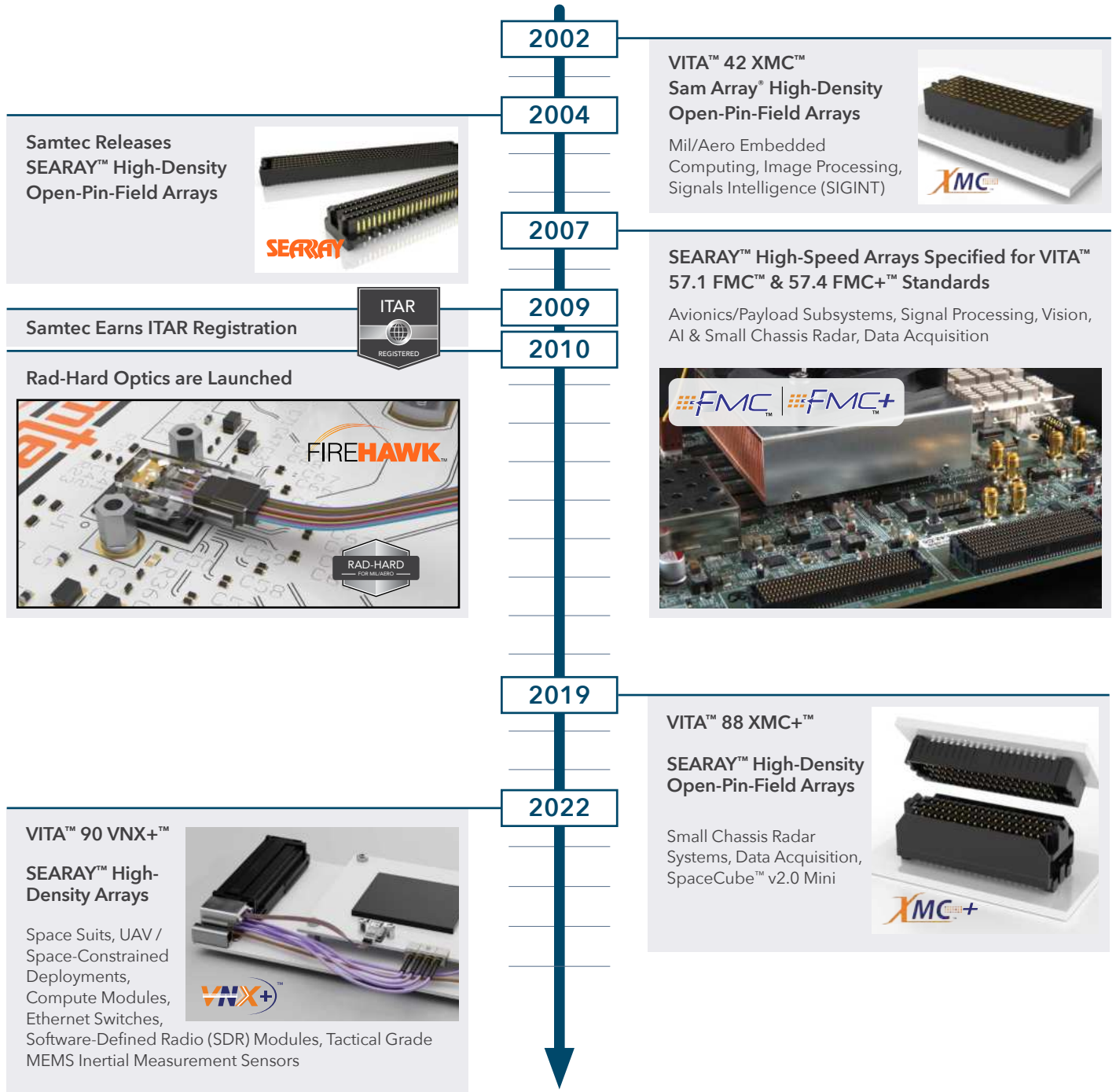


VITA, VNX, VNX+, FMC, FMC+, XMC and XMC+ are all respective trademarks of VITA.
SOSA is a trademark of The Open Group Limited.

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

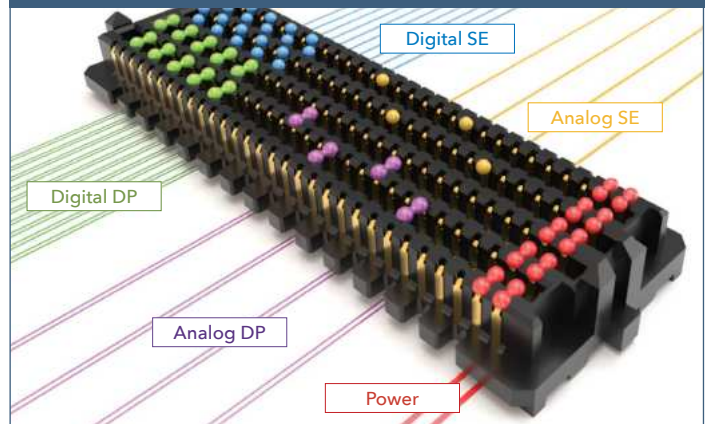
15
GHz

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 or 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)

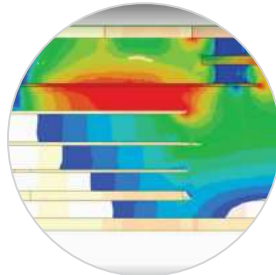


Vertical Compression Mount
SI Evaluation Kit (REF-228591-XX)

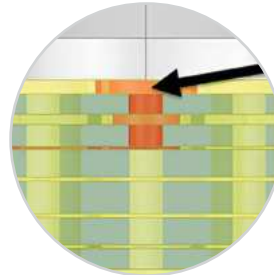
RF DESIGN, DEVELOPMENT & TECHNICAL SUPPORT

SIGNAL INTEGRITY & RF DESIGN EXPERTISE & SUPPORT

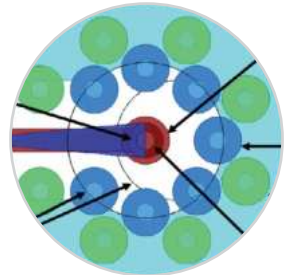
- Launch optimization & design services
- Simulation
- Prototyping
- Physical test and measurement verification
- Full channel analysis, system support
- Application specific design and development assistance



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://www.samtec.com/tech-library)

TECHNICAL REPORTS

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

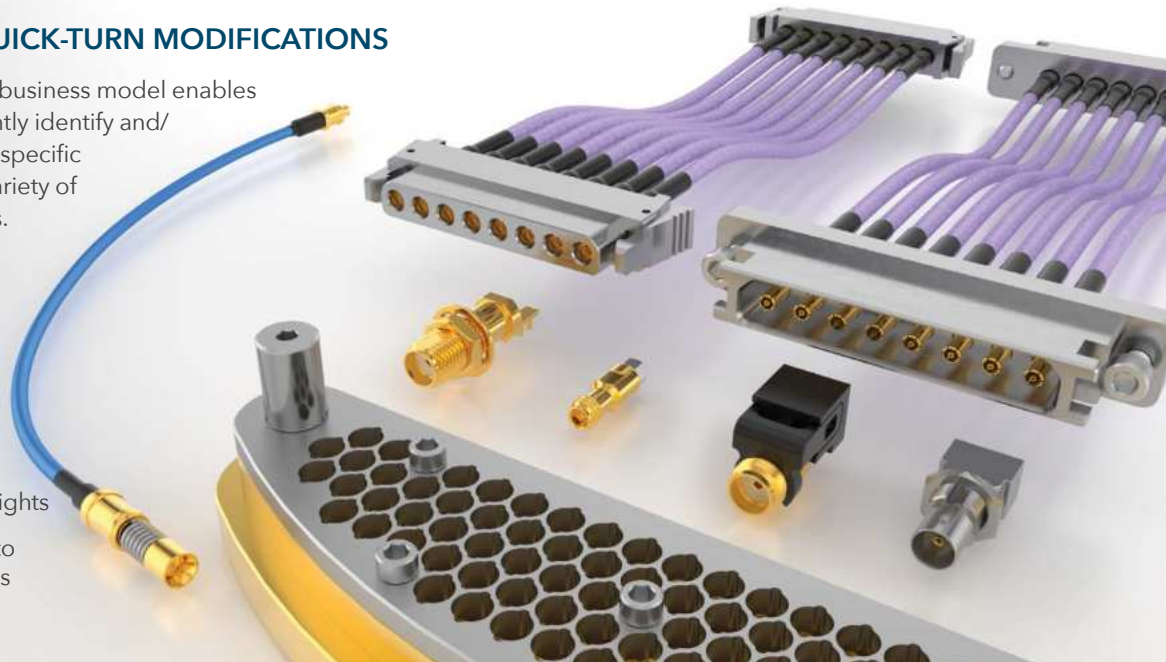
PRESENTATIONS & WEBINARS

- 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)

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 to discuss your system requirements



STANDARD LOW FREQUENCY SUB-6 GHz SOLUTIONS

50 Ω SOLUTIONS

| Type | | Micro High-Frequency | SMA | MCX | MMCX | TNC | BNC | SMB | |
|---------------------|------------------|---|---|--|---|---|--|--|--|
| 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 to discuss your application needs.



Environmentally Sealed SMA









Pick & Place Machine Designs (-BMXD options)



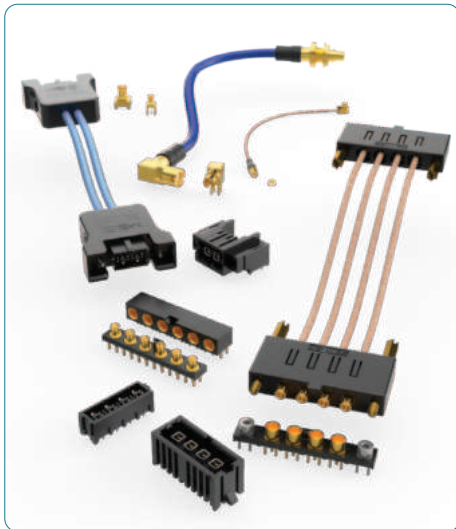
Counterweights for Automated Assembly

75 Ω 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 for specifications, and to explore Samtec's full line of Original RF Solutions.



Shielded Twisted Pair System

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

Ganged Micro-Mini System

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

IsoRate® High Isolation System

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

Mini & Micro-Mini Interconnects

- 75 Ω impedance MCX & MMCX
- 50 Ω 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



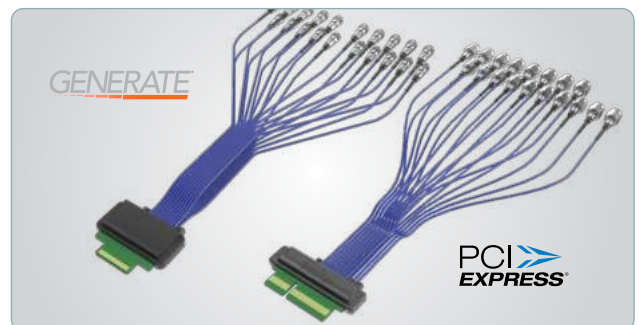
HIGH-SPEED CABLE ASSEMBLIES

- 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



SAMTEC SUDDEN SERVICE®



UNMATCHED LEAD-TIMES | Deliveries in Days, Not Weeks



Quickly and easily identify availability of over 200,000 of Samtec's most popular connectors and cables – guaranteed to ship in 1 day.



Free product samples, shipped in 24-hours. Visit samtec.com to quickly request your sample.



An innovative shipping program that bridges the gap between manufacturing facilities and customers. For details, contact ecustomerservice@samtec.com.

ONLINE TOOLS | Find, Design & Validate Your Solution

Picture Search

Browse through a highlight reel of Samtec's most popular products to find the ideal solution for your application, view specifications, check availability, order samples and more.



Downloadable Resources

Samtec offers immediate and unlimited access to all the resources needed to select the right solution – from 3D models, prints and footprints, to test reports, white papers and much more. Visit samtec.com to start exploring.



Solutionator®

Quickly build mated connector sets or design full cable assemblies using a wide variety of user-defined search parameters and filters, view specs and order samples in Samtec's online design tools.



samtec.com/rf-cablebuilder



samtec.com/hsb2b-solutionator



samtec.com/cablebuilder



samtec.com/optics-solutionator



samtec.com/flex-solutionator



samtec.com/discrete-cablebuilder

24/7 WORLDWIDE SUPPORT

Technical Support

Signal Integrity Group: sig@samtec.com

Application Support Group: asg@samtec.com

Interconnect Processing Group: ipg@samtec.com

Supply Chain Support

MySamtec™ Real-Time Account Access:
account.samtec.com

Personal Account Managers/CSRs:
eCustomerService@samtec.com

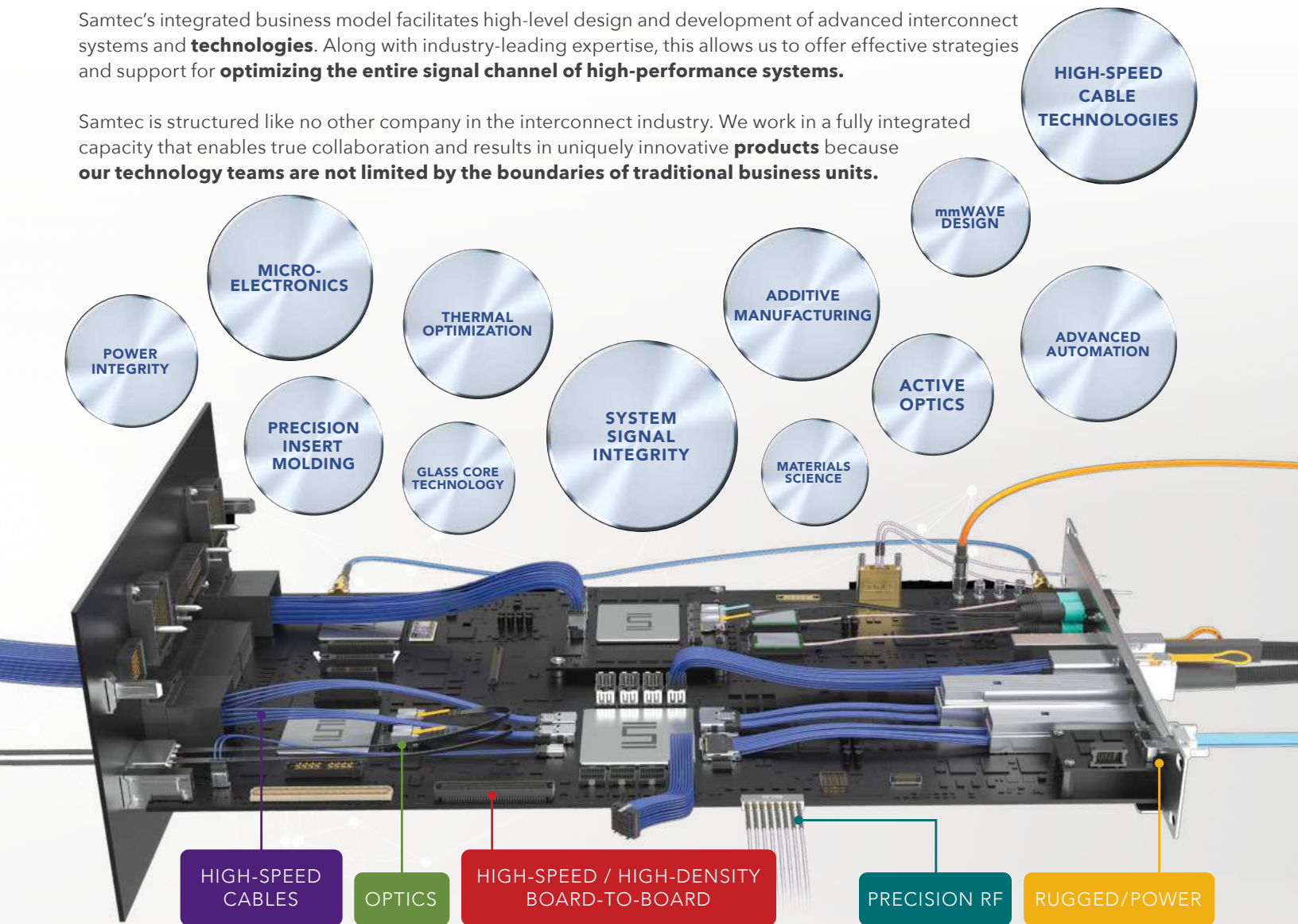
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INTEGRATION LEADS TO INNOVATION

FULL SYSTEM OPTIMIZATION FROM SILICON-TO-SILICON™

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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