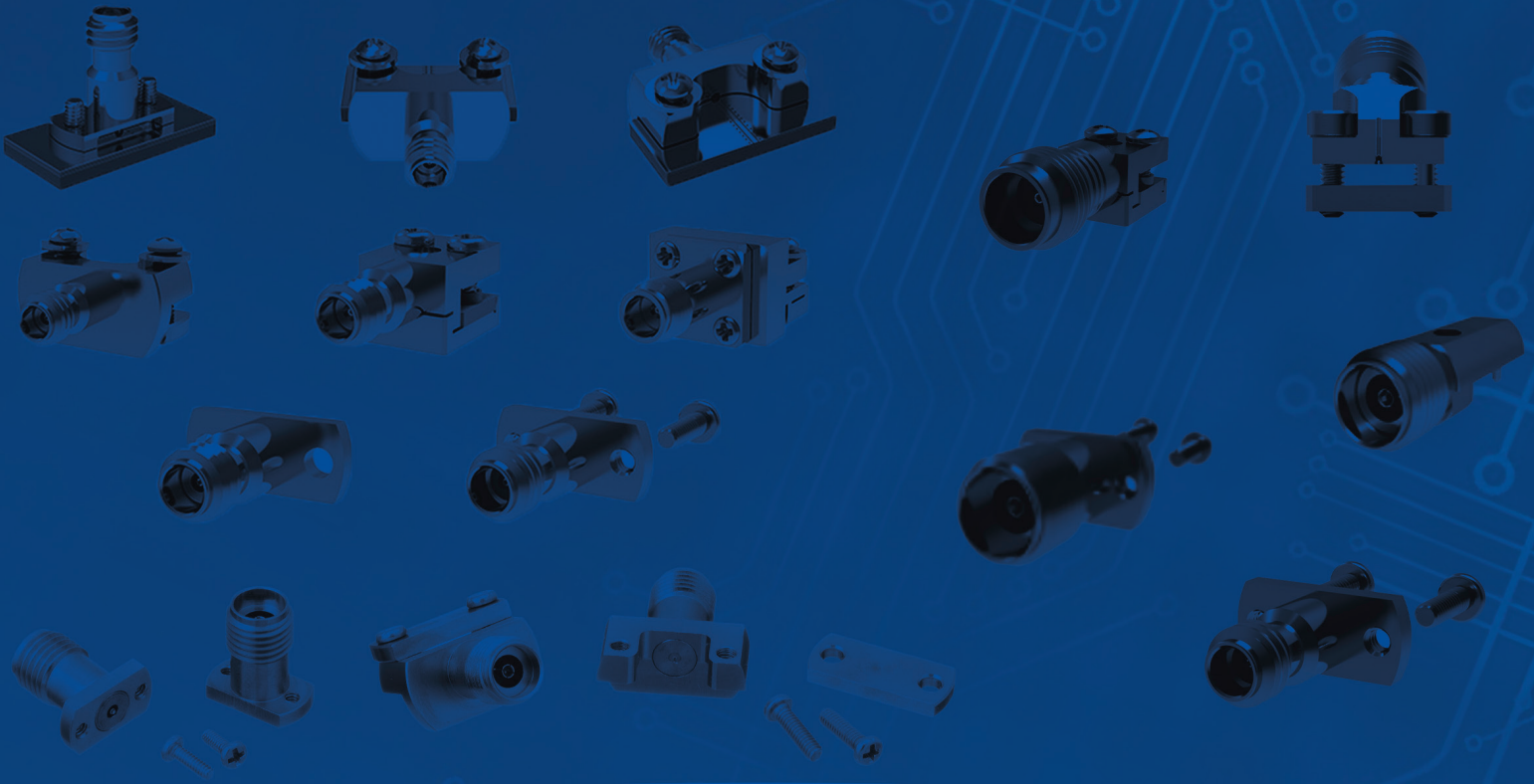


CARLISLE[®]

INTERCONNECT TECHNOLOGIES



Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

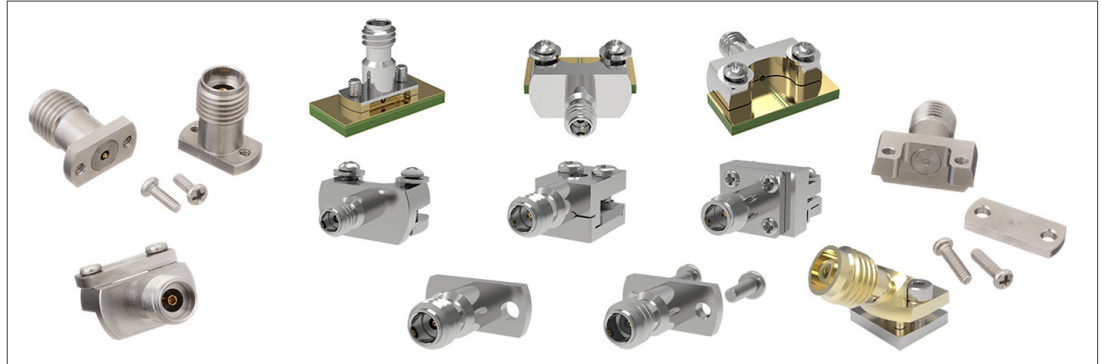


Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions



3.5, 2.92, 2.40, and 1.85 mm
Solder-Mount Solutions



3.5, 2.92, 2.40, 1.85, 1.35, and 1.00 mm
Solderless/Field-Replaceable Solutions

INTRODUCTION

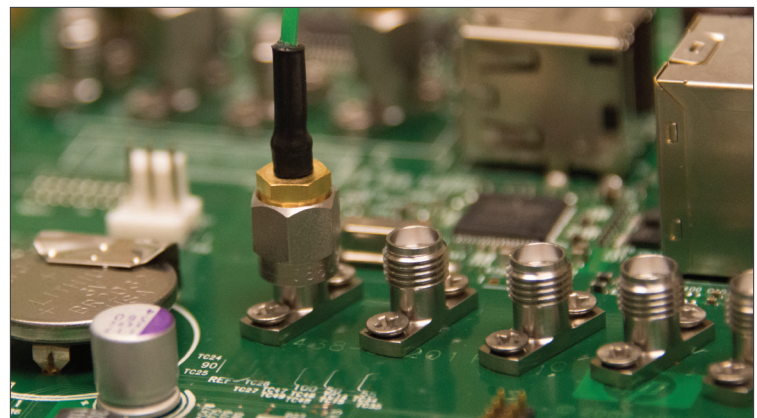
Carlisle Interconnect Technologies (CarlisleIT) offers a wide portfolio of low-loss, high-frequency Precision RF Connectors in various configurations for design flexibility and multiple applications.

- » 50 Ω impedance
- » Frequencies supported up to 110 GHz
- » Multiple mating interfaces available: 1.00 mm, 1.35 mm, 1.85 mm, 2.4 mm, 2.92 mm, and 3.5 mm
- » CarlisleIT will provide your board layout and optimized footprint based on your board stack-up

FEATURES	BENEFITS
1.00 mm, 1.35 mm, 1.85 mm, 2.4 mm, 2.92 mm, and 3.5 mm mating interfaces	• Multiple interface options cover a wide frequency band, offering readily-available standard stock with working frequencies up to 110 GHz
Solderless/Field-Replaceable options available	• Elimination of soldering allows the high-performance connectors to be installed quickly and easily and to be removed/reused without causing damage to the board
Vertical flange-mount, edge-launch, and board-mount options	• Provides design flexibility for density limitations and allows placement anywhere on the PCB
Gold-plated brass bodies (solder connectors only)	• Improved solderability and corrosion resistance
Rated to 500 mating/de-mating cycles	• Robust design ensures high signal integrity in a long-life package

SUGGESTED APPLICATIONS

- » High-Speed Digital Systems
- » Vector Network Analyzer (VNA)
- » Oscilloscope
- » Bit Error Ratio Tests (BERT)
- » Switch Matrix
- » Automatic Test Equipment (ATE)
- » Semiconductors
- » Design Validation Testing
- » Integrators
- » Military/Defense
- » Electronic Sensors
- » Radar/Guidance Systems






Learn more: CarlisleIT.com/prod-info/precision-rf-connectors

Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

PRECISION SOLDER-MOUNT RF CONNECTORS PRODUCT NUMBERS & SPECIFICATIONS

Size	Frequency	Termination	Description	P/N	Product
Vertical Mount					
1.85 mm	DC - 65 GHz	Solder Mount; Stripline Trace	1.85 mm Female Straight	TMB-V8FS-3SM	
2.4 mm	DC - 50 GHz		2.4 mm Female Straight	TMB-V4FS-3SM	
2.92 mm	DC - 40 GHz		2.92 mm Female Straight	TMB-V9FS-3SM	
3.5 mm	DC - 34 GHz		3.5 mm Female Straight	TMB-V5FS-3SM	
3.5 mm	DC - 34 GHz		3.5 mm Female Straight, Long Leads	TMB-V5FS-3SM-01	
Edge Launch - Standard					
1.85 mm	DC - 65 GHz	Solder Mount; CPW Trace	1.85 mm Female Straight	TMB-E8FS-1S1	
2.4 mm	DC - 50 GHz		2.4 mm Female Straight	TMB-E4FS-1S1	
2.92 mm	DC - 40 GHz		2.92 mm Female Straight	TMB-E9FS-1S1	
3.5 mm	DC - 34 GHz		3.5 mm Female Straight	TMB-E5FS-1S1	
Edge Launch - Surface Mount - Pick and Place					
1.85 mm	DC - 65 GHz	Solder Mount; CPW Trace	1.85 mm Straight Jack, Shielded	TMB-E8FS-1ST	
2.4 mm	DC - 50 GHz		2.4 mm Straight Jack, Shielded	TMB-E4FS-1ST	
2.92 mm	DC - 40 GHz		2.92 mm Straight Jack, Shielded	TMB-E9FS-1ST	
3.5 mm	DC - 34 GHz		3.5 mm Straight Jack, Shielded	TMB-E5FS-1ST	

Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

SOLDERLESS/FIELD-REPLACEABLE CONNECTORS PRODUCT NUMBERS & SPECIFICATIONS

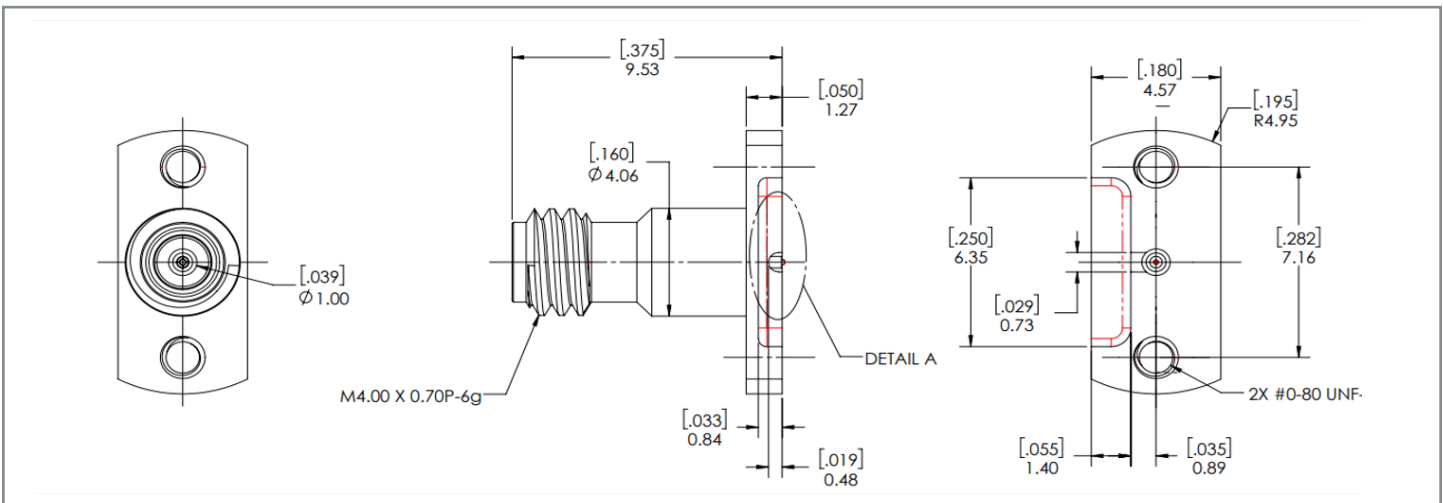
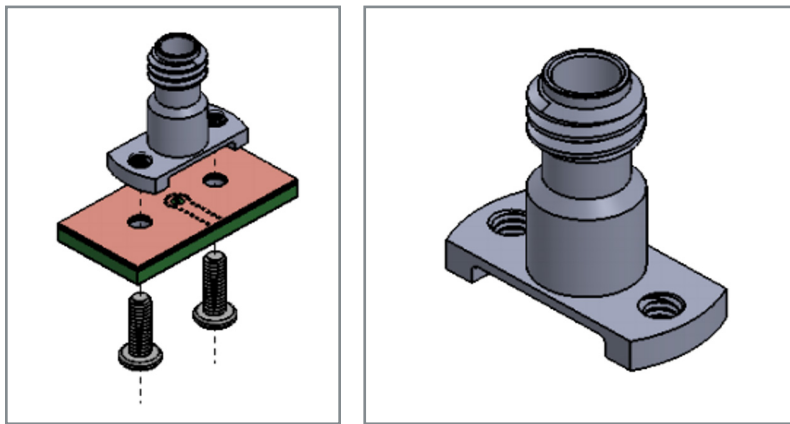
Size	Frequency	Termination	Description	P/N	Product
Vertical Mount - CPW					
1 mm	DC - 110 GHz	Solderless/Field-Replaceable; CPW Trace	1 mm Female; 2 Hole Flange Type	TMB-V1F2-3LC-0X	
1.85 mm	DC - 65 GHz		1.85 mm Female; 2 Hole Flange Type	TMB-V8F2-3LC	
2.4 mm	DC - 50 GHz		2.4 mm Female; 2 Hole Flange Type	TMB-V4F2-3LC	
2.92 mm	DC - 40 GHz		2.92 mm Female; 2 Hole Flange Type	TMB-V9F2-3LC	
3.5 mm	DC - 34 GHz		3.5 mm Female; 2 Hole Flange Type	TMB-V5F2-3LC	
Vertical Mount - Stripline					
1 mm	DC - 110 GHz	Solderless/Field-Replaceable; Stripline Trace	1 mm Female; 2 Hole Flange Type	TMB-V1F2-2L1	
1.85 mm	DC - 65 GHz		1.85 mm Female; 2 Hole Flange Type	TMB-V8F2-3L1	
2.4 mm	DC - 50 GHz		2.4 mm Female; 2 Hole Flange Type	TMB-V4F2-3L1	
2.92 mm	DC - 40 GHz		2.92 mm Female; 2 Hole Flange Type	TMB-V9F2-3L1	
3.5 mm	DC - 34 GHz		3.5 mm Female; 2 Hole Flange Type	TMB-V5F2-3L1	
Edge Launch - Solderless Standard					
1 mm	DC - 110 GHz	Solderless/Field-Replaceable; CPW Trace	1 mm Female Straight	TMB-E1F2-1L1	
1.85 mm	DC - 65 GHz		1.85 mm Female Straight	TMB-E8F2-1L1	
2.4 mm	DC - 50 GHz		2.4 mm Female Straight	TMB-E4F2-1L1	
2.92 mm	DC - 40 GHz		2.92 mm Female Straight	TMB-E9F2-1L1	
3.5 mm	DC - 34 GHz		3.5 mm Female Straight	TMB-E5F2-1L1	
Edge Launch - Solderless Narrow Body					
1.85 mm	DC - 65 GHz	Solderless/Field-Replaceable; CPW Trace	1.85 mm Female Narrow Body	TMB-E8F2-1L1-01	
2.4 mm	DC - 50 GHz		2.4 mm Female Narrow Body	TMB-E4F2-1L1-01	
2.92 mm	DC - 40 GHz		2.92 mm Female Narrow Body	TMB-E9F2-1L1-01	
3.5 mm	DC - 34 GHz		3.5 mm Female Narrow Body	TMB-E5F2-1L1-01	
Edge Launch - 30° Angled					
1.85 mm	DC - 65 GHz	Solderless/Field-Replaceable; CPW Trace	1.85 mm Angled Connector Jack	TM14-0089-00	
2.4 mm	DC - 50 GHz		2.4 mm Angled Connector Jack	TM14-0143-00	
2.92 mm	DC - 40 GHz		2.92 mm Angled Connector Jack	TM14-0141-00	
3.5 mm	DC - 34 GHz		3.5 mm Angled Connector Jack	TM14-0142-00	

Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

VERTICAL-MOUNT SPECIFICATIONS

Vertical-mount connectors are available in both solderless/ field-replaceable and solder-mount configurations and support both stripline and CPW-type PCB traces. Solder-mount-type connectors are available in standard 3.5, 2.92, 2.4, and 1.85 mm sizes and support frequencies up to 65 GHz. However, solderless/ field-replaceable connectors support frequencies up to 110 GHz with the addition of new 1.0 mm RF connectors. With a maximum VSWR of 1.5 and a minimum insertion loss of 1.26 dB, our new 1.0 mm RF connectors offer excellent signal integrity for some of the most advanced RF interfaces in the world. We also offer the board-side footprint and board stack up optimized for minimum losses for the entire operating frequency range.



PERFORMANCE SPECIFICATIONS

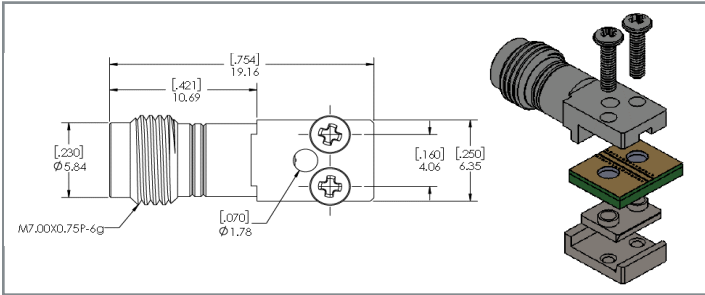
Size	Mounting	PCB Trace	Frequency	VSWR (Max)	Height
1.85 mm, 2.4 mm, 2.92 mm, 3.5 mm	Solder-Mount	Stripline	DC - 65 GHz	1.3 (@ 65 GHz)	12.81 mm (Soldered)
1.00 mm, 1.35mm, 1.85 mm, 2.4 mm, 2.92 mm, 3.6 mm	Solderless/Field-Replaceable	Stripline; CPW	DC - 110 GHz	1.5 (@ 110 GHz)	9.53 mm (Mounted)

Learn more: CarlisleIT.com/prod-info/precision-rf-connectors

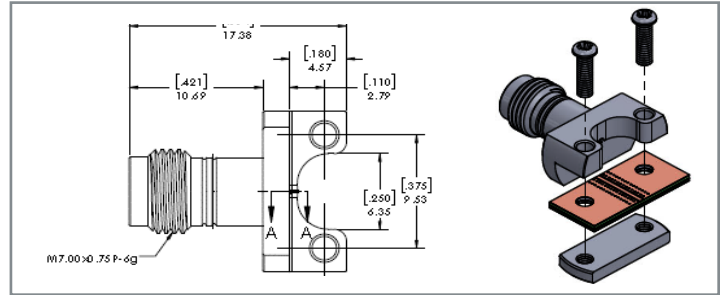
Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

EDGE-LAUNCH SPECIFICATIONS



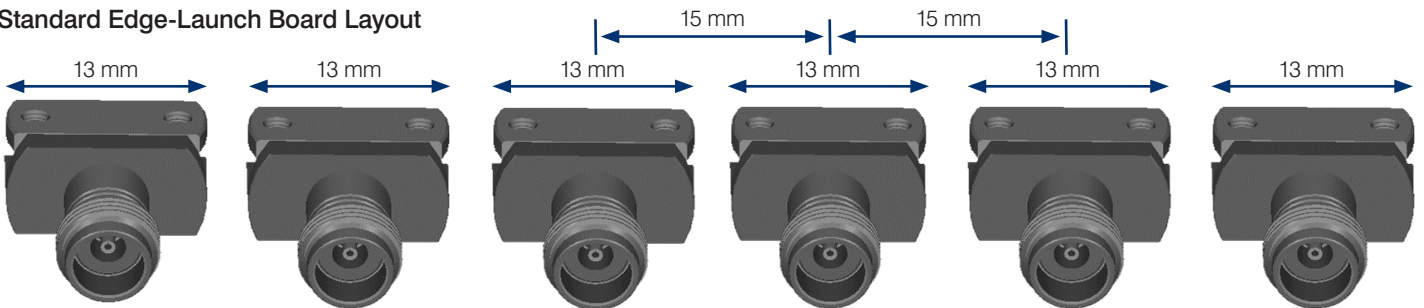
Narrow Body Edge-Launch Field-Replaceable Connector



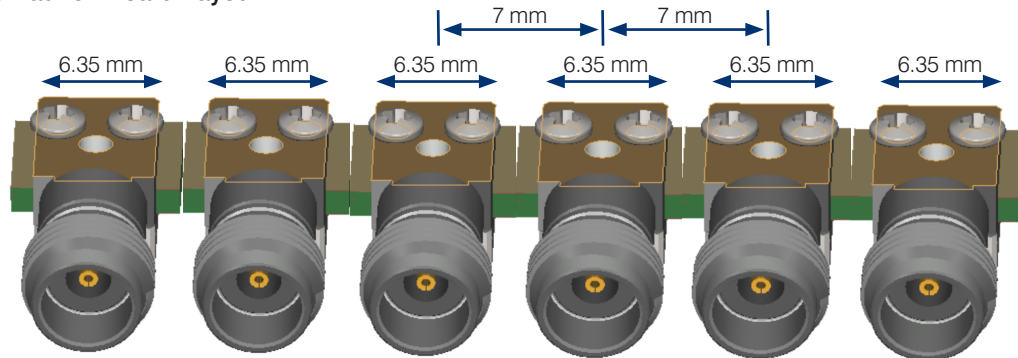
Standard Edge-Launch Field-Replaceable Connector

Narrow body edge-launch field-replaceable connectors have about 50% less width compared to standard edge-launch connectors. Minimum center-to-center pitch between narrow body connectors can be as little as 7 mm. Compared to 15 mm standard connectors, this saves approximately 50% PCB space in dense layouts, as shown in the illustrations below.

Standard Edge-Launch Board Layout



Narrow Body Edge-Launch Board Layout



PERFORMANCE SPECIFICATIONS

Connector Series	Frequency Rating	Connector Only		Connector & PCB	
		Return Loss (-20 dB max)	Insertion Loss (-0.2 dB max)	Return Loss (-15 dB max)	Insertion Loss (-0.6 dB max)
1.85 mm	DC - 65 GHz		67 GHz		67 GHz
2.4 mm	DC - 50 GHz		50 GHz		50 GHz
2.92 mm	DC - 40 GHz		40 GHz		40 GHz
3.5 mm	DC - 34 GHz		34 GHz		34 GHz

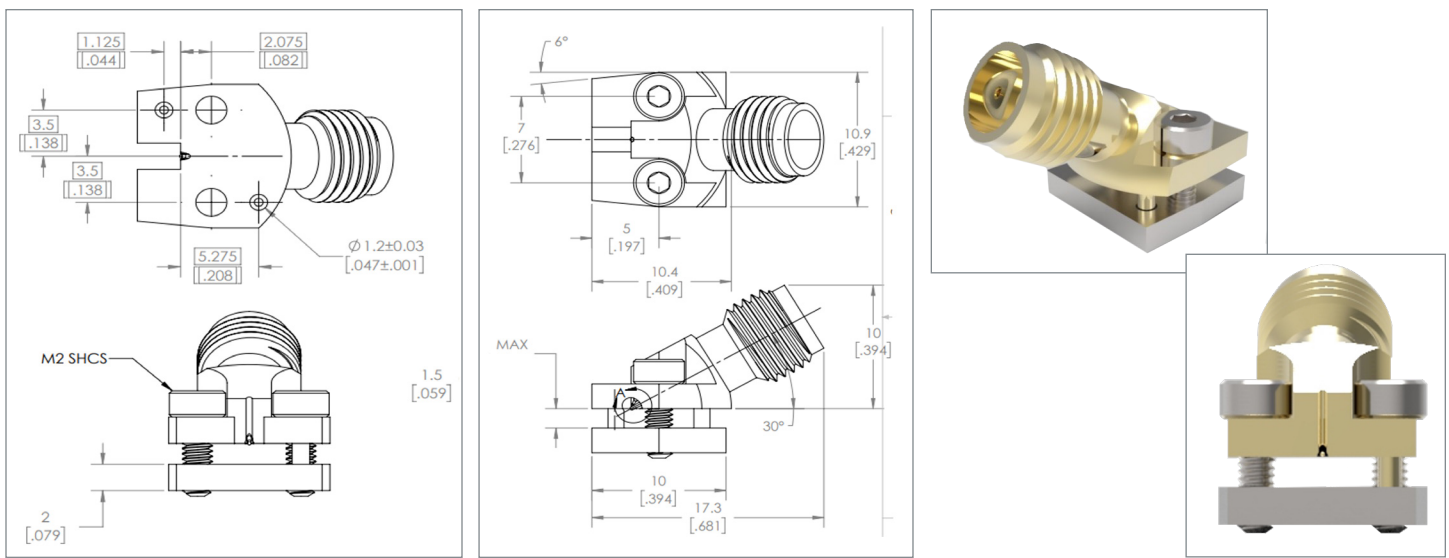
Learn more: CarlisleIT.com/prod-info/precision-rf-connectors

Precision RF Connectors

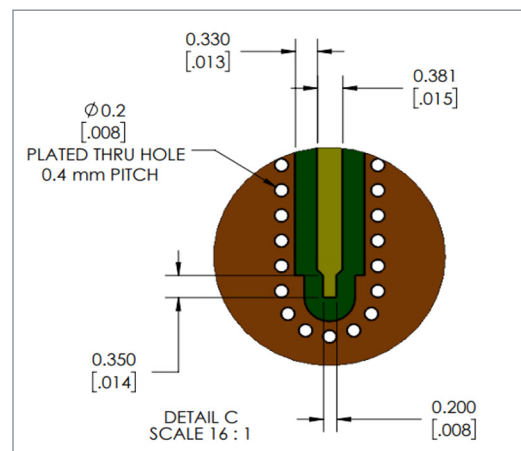
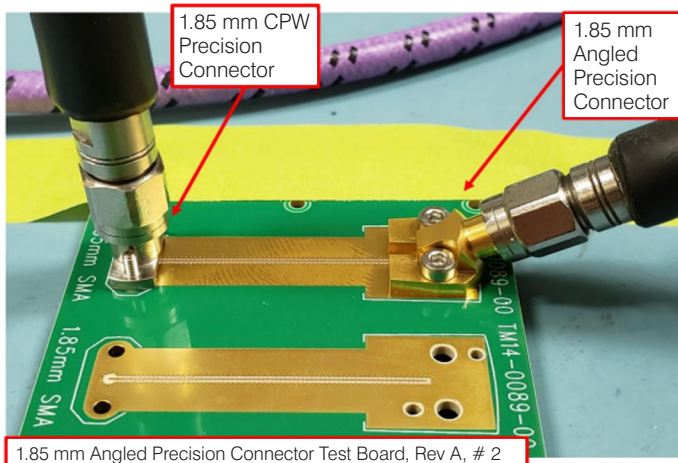
Solder-Mount & Solderless/Field-Replaceable Solutions

30° ANGLED PRECISION RF CONNECTORS

Sometimes there is need to launch high-frequency RF signals to and from a trace away from the edge of a PCB with limited vertical clearance. Our 30° Angled Precision RF Connectors address this need without compromising signal integrity or reliability. With the 30° launch angle, the strain on the cable is minimized, thereby extending the life and reliability of the cable assembly. With a portfolio of 1.85 mm, 2.4 mm, 2.92 mm, and 3.5 mm BeCu, gold-plated connector signals in the frequency range of DC – 65 GHz can be supported. Maximum return loss for 1.85 mm connectors is limited to -14 dB max, and insertion loss is minimized to 0.41 dB max in the range of 60 – 70 GHz. The typical operating temperature range for this product line is -40 °C – 85 °C, which meets the thermal shock, corrosion, vibration, and shock requirements per the IEC 61169-1 standard.



CarlisleIT offers optimized board layouts and PCB footprints for angled connectors (both in CPW and stripline trace formats) to achieve optimum signal integrity performance. An evaluation board with Precision RF Connectors is also offered, allowing signal integrity measurement, including S-Parametric data for signals traveling over the length of the 1" board.



Learn more: CarlisleIT.com/prod-info/precision-rf-connectors

Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

SIGNAL INTEGRITY PERFORMANCE

CarlisleIT's evaluation board can be used to measure signal integrity, including the TDR data for all three configurations of available field-replaceable Precision RF Connectors (i.e. vertical-mount, 30° angle-mount, and compression-mount CoreHC™ types). The orderable part number for the available evaluation boards, along with the supported connector configurations and images, are shown in table below.

Part Number	Description	Connector Configuration
TM13-0097-01	CPW Precision to Precision	Vertical - Vertical:
TM13-0098-01	Stripline Precision to Precision	
TM13-0097-02	CPW Angled to Precision	Angled - Vertical:
TM13-0098-02	Stripline Angled to Precision	
TM13-0097-03	CPW HC 1P to Angled	CoreHC - Angled:
TM13-0098-03	Stripline HC to Angled	
TM13-0097-04	CPW HC to CPW HC	CoreHC - CoreHC:
TM13-0098-04	Stripline HC to Stripline HC	
TM13-0097-05	CPW Angled to CPW Angled	Angled - Angled:
TM13-0098-05	Stripline Angled to Stripline Angled	

A TDR plot for the evaluation board using 30° angled connectors on each end of the CPW trace is shown in Figure 1 below. The impedance of the complete channel, including the connectors and 1" CPW trace on the board, is maintained in the range of 53 Ω - 54 Ω, which results in excellent insertion and return loss performance over the complete frequency range of DC - 70 GHz.

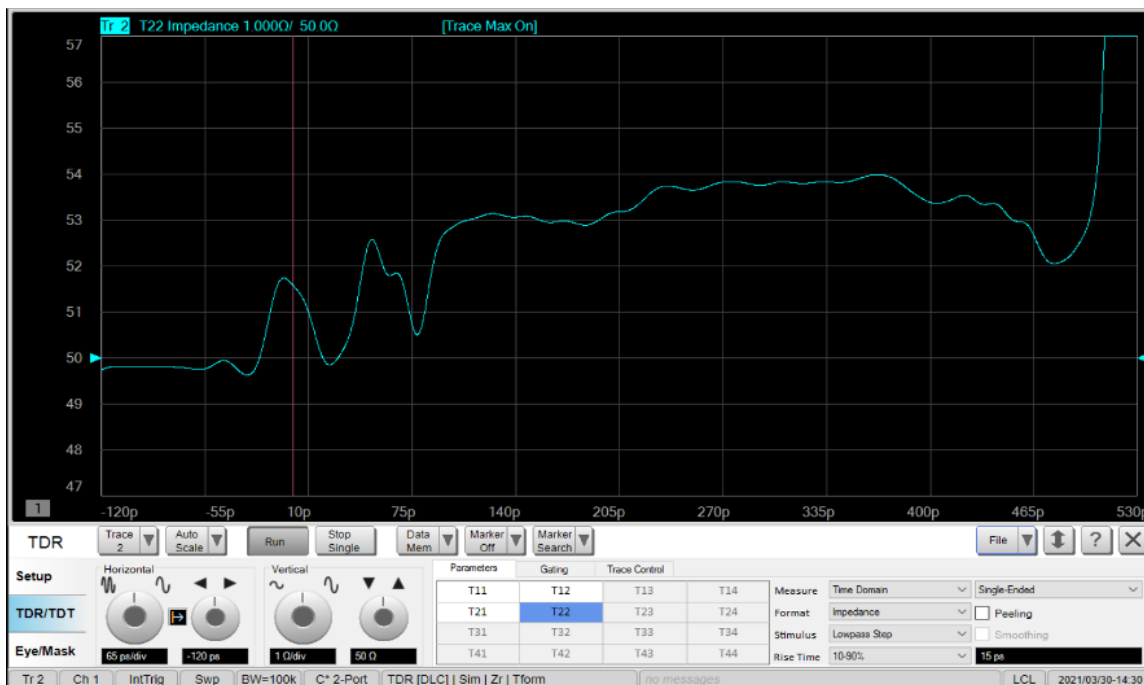


Figure 1: Time Domain Response Plot for 30° Angled Precision RF Connectors

Learn more: CarlisleIT.com/prod-info/precision-rf-connectors

Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

SIGNAL INTEGRITY PERFORMANCE

CarlisleIT Precision RF Connectors have a consistent impedance profile and perform well on a component level with no resonances. Figure 2 shows the insertion loss and return loss of a 2.92 mm vertical-mount field-replaceable connector. Minimum return loss of -25 dB and maximum insertion loss of -0.02 dB are seen at 70 GHz, making these connectors suitable for use in high-frequency applications. Since these connectors can be moved easily between the connector footprints on the same or different PCBs, they provide excellent design and maintenance flexibility in RF systems.

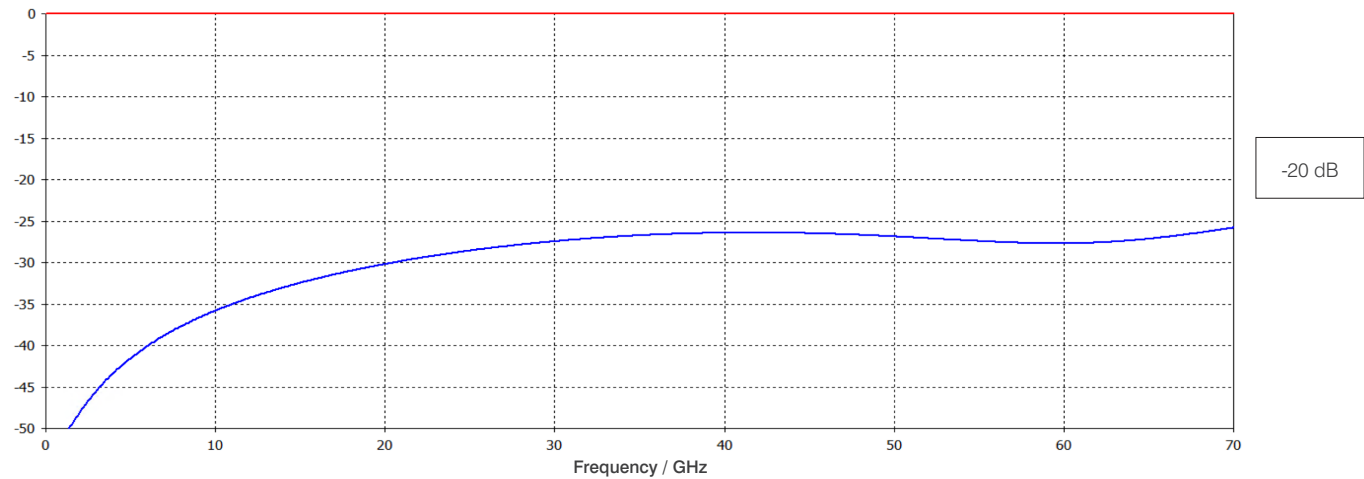


Fig 2: Insertion Loss and Return Loss of a 2.92 mm Vertical-Mount Field-Replaceable Connector

Similarly, the time domain response of the same connector is shown in Figure 3 below, illustrating that the impedance profile remains consistent at 50 Ω with minimal variations seen at transition interfaces.

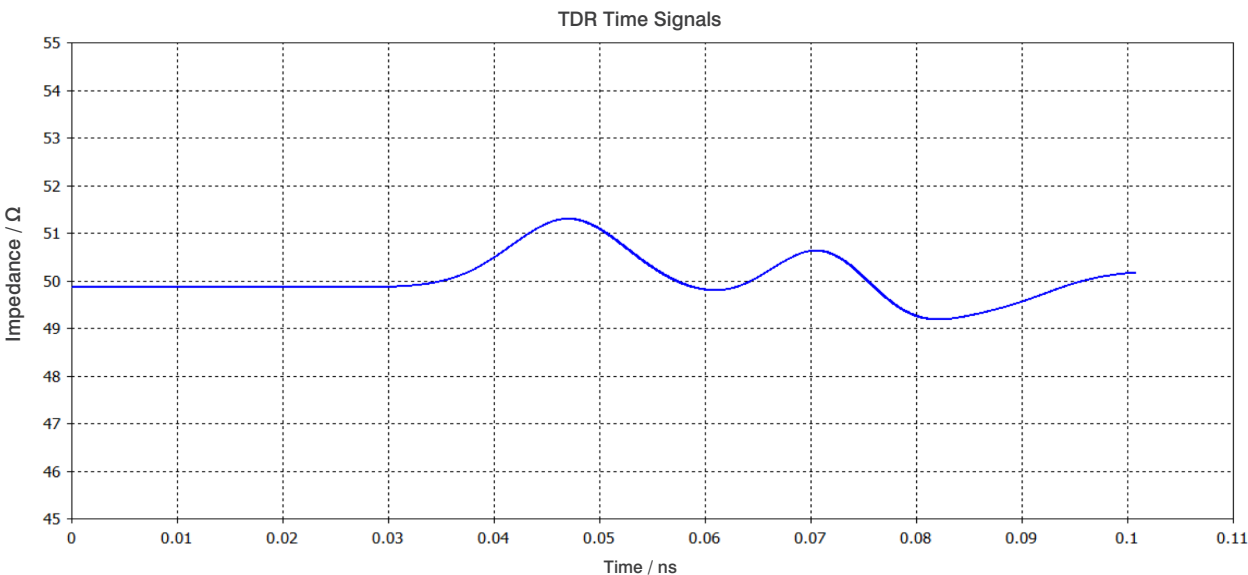


Fig. 3: Time Domain Response of a 2.92 mm Vertical-Mount Field-Replaceable Connector

Precision RF Connectors

Solder-Mount & Solderless/Field-Replaceable Solutions

SIGNAL INTEGRITY PERFORMANCE CONT'D.

Soldered RF connectors are more suitable for applications that have fixed interfaces which require no field replacement or RF channel changes on the boards. They provide ruggedness and reliability, especially for operations in harsh conditions like vibrations, high-speed movement, law enforcement, military use, etc. Figure 4 shows the insertion loss and return loss of a 2.92 mm soldered connector. Minimum return loss of -20 dB and maximum insertion loss of -0.06 dB are seen at 70 GHz.

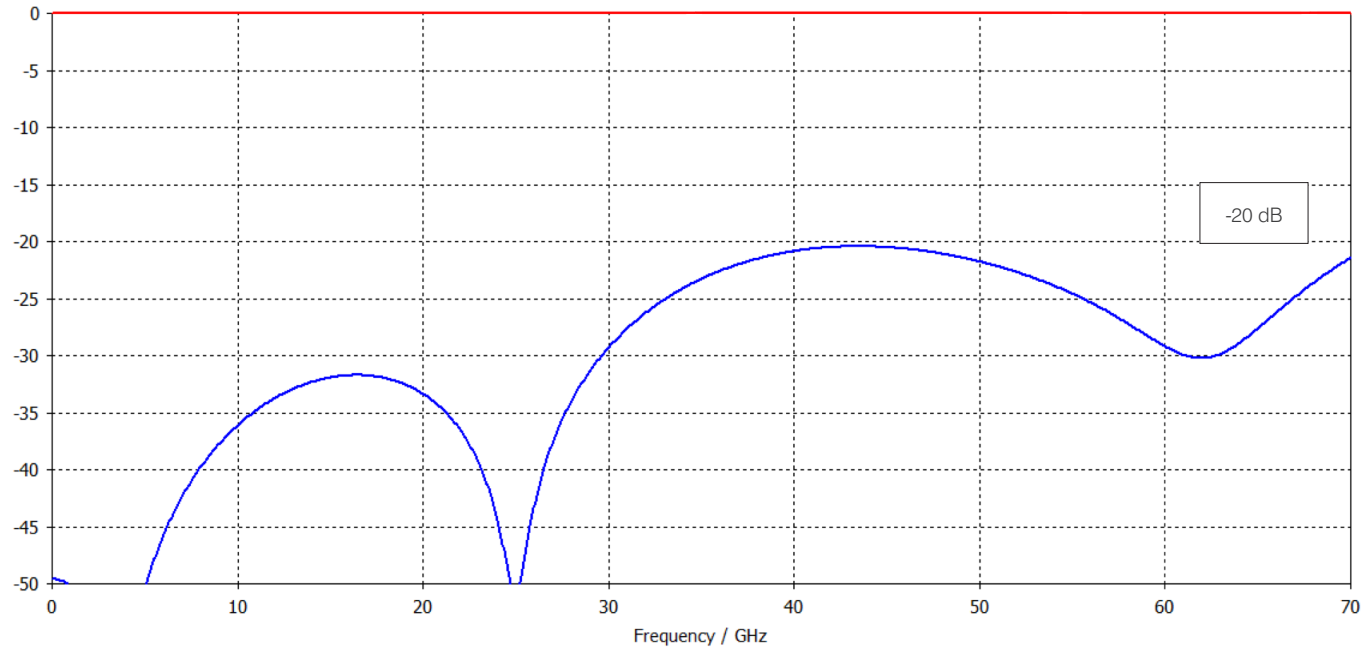


Fig. 4: Insertion Loss and Return Loss of a 2.92 mm Soldered Vertical-Mount Connector

Similarly, the time domain response of the same connector is shown in Figure 5 below, illustrating that the impedance profile remains consistent at 50 Ω and is very similar to the profile of the field-replaceable connectors.

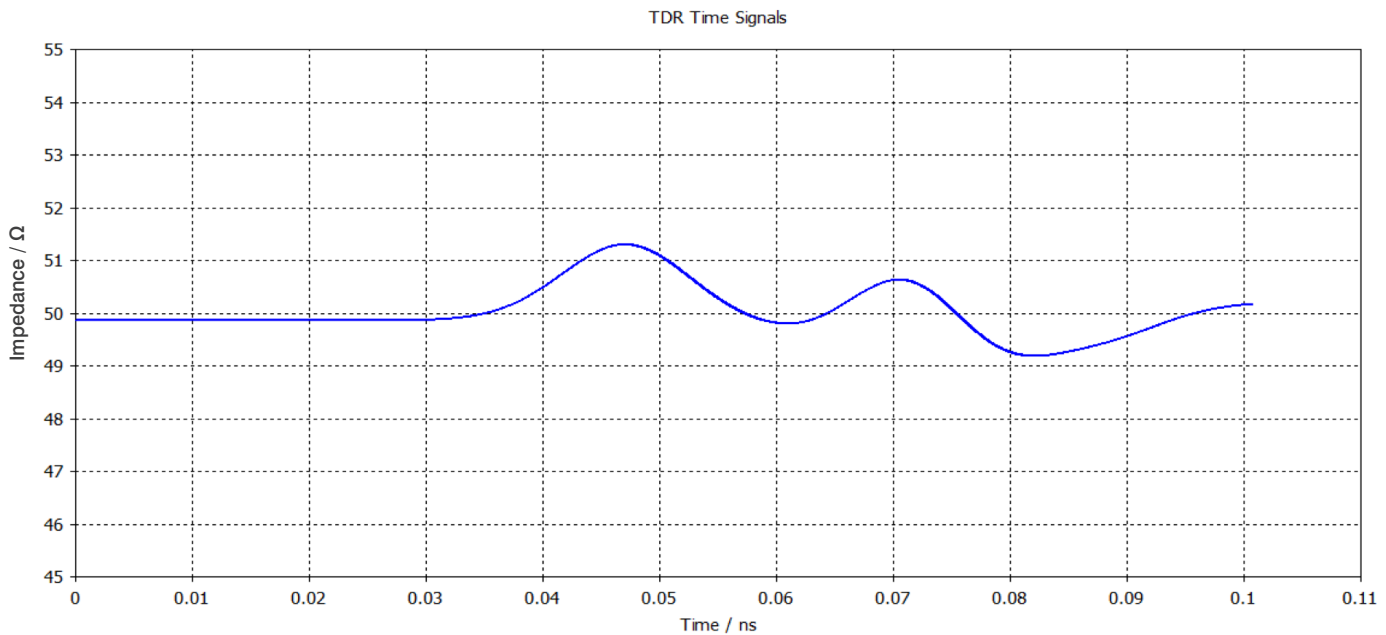


Fig. 5: Time Domain Response of a 2.92 mm Soldered Vertical-Mount Connector

We Are Interconnect.

At Carlisle Interconnect Technologies, we do more than make interconnect technologies for a spectrum of industries. We deliver the critical connections and products that make amazing performances possible.



Carlisle Operating System (COS)

Driving the Industry Forward

We're leading the way with our Carlisle Operating System (COS). COS is our standardized methodology using the tools of Lean Manufacturing and Six Sigma to drive continuous improvement for our customers and our business. It promotes the systems and culture of safety, employee involvement, quality, and on-time delivery — all of this with our customers in mind.

The COS methodology is woven into our leadership fabric and everything we do. This thought process is both supported and driven by our top leadership and ensures the sustainability of our successes with our customers and our business. Every CarlisleIT location participates with the goal of continuous improvement at all facilities.

With COS, companies working with CarlisleIT know they're partnering with a world-class interconnect manufacturer dedicated to providing comprehensive, next-level solutions they can't get anywhere else.

Nine Key Metrics

- » MDI - Managing for Daily Improvement
- » TPM - Total Preventative Maintenance
- » Culture
- » Supply Chain
- » Environment
- » Safety
- » Quality
- » Delivery
- » Cost

The COS Operational Excellence program recognizes and rewards facility performance with a specific and defined level of achievement, providing each facility a road map for continuous success. The program allows CarlisleIT to monitor and track performance to ensure we're achieving our performance goals.



Global Manufacturing. Local Support.

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



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PRODUCT CERTIFICATIONS



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



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