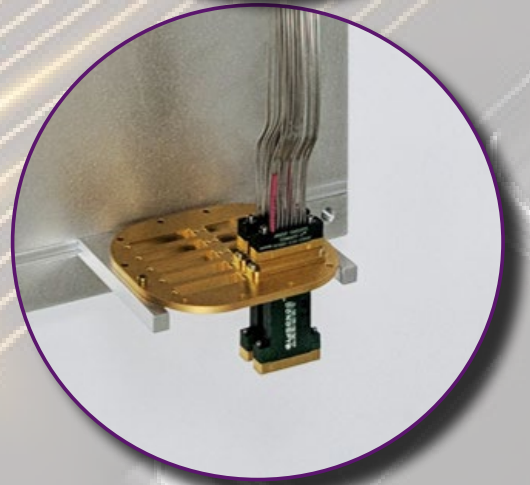
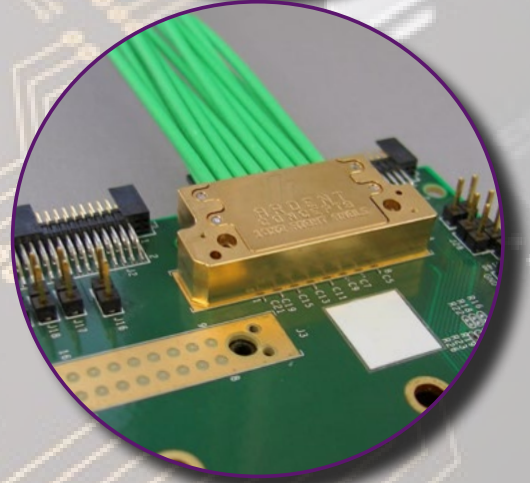
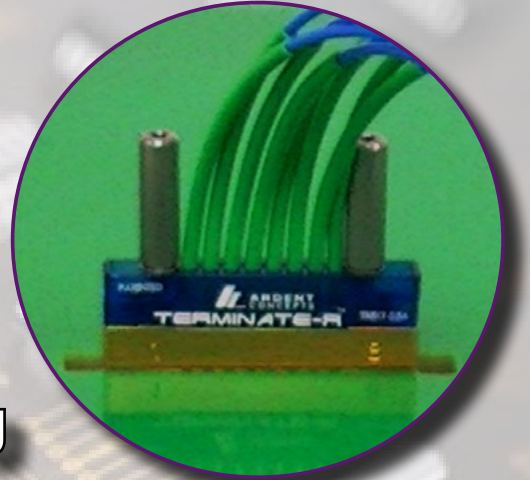
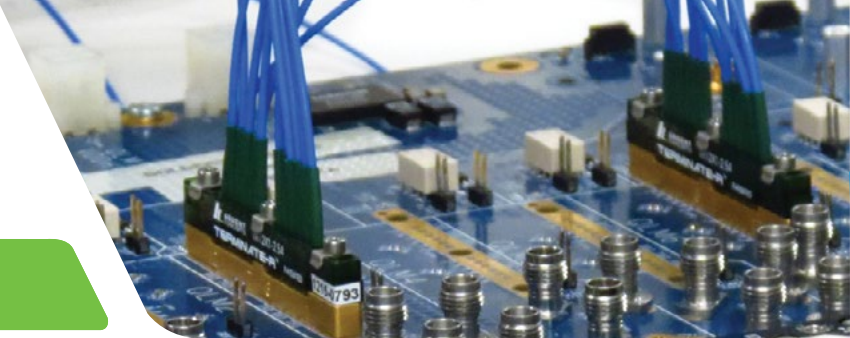




# TR™ Series Multicoax Catalog

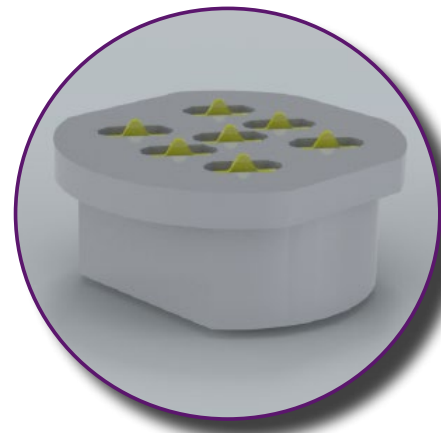
## High Speed | Solderless





# TR Series Multicoax Connectors

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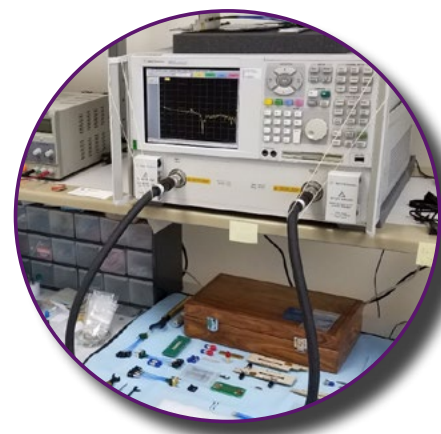
## DESIGN

**Ardent engineers bring novel approaches to solving even the most difficult connector challenges by working with customers to identify their electrical and mechanical needs.**



## SIMULATE

**Advanced HFSS simulation lets our Signal Integrity Engineers ensure that our proprietary contacts will perform at the ever increasing speeds demanded by the markets we support.**



## MEASURE

**We recognize that simulation on its own is not always sufficient. Ardent's in house Signal Integrity Lab features 40 GHz & 67.5 GHz PNAs, and equipment to ensure that your connectors and interposers are measured to ensure success.**



# TR Multicoax Connector

## Description

TR™ Multicoax delivers superior signal integrity from multiple high speed analog or digital channels. With a choice of 20 GHz, 40 GHz, or 70 GHz+ configurations, users can upgrade their connectors as bandwidth requirements on their applications increases. TR is the highest density high speed multicoax connector on the market. The interface is compression mount which drives lower total cost of testing by avoiding costly solder-down components that can't be recovered, encouraging reuse across programs.

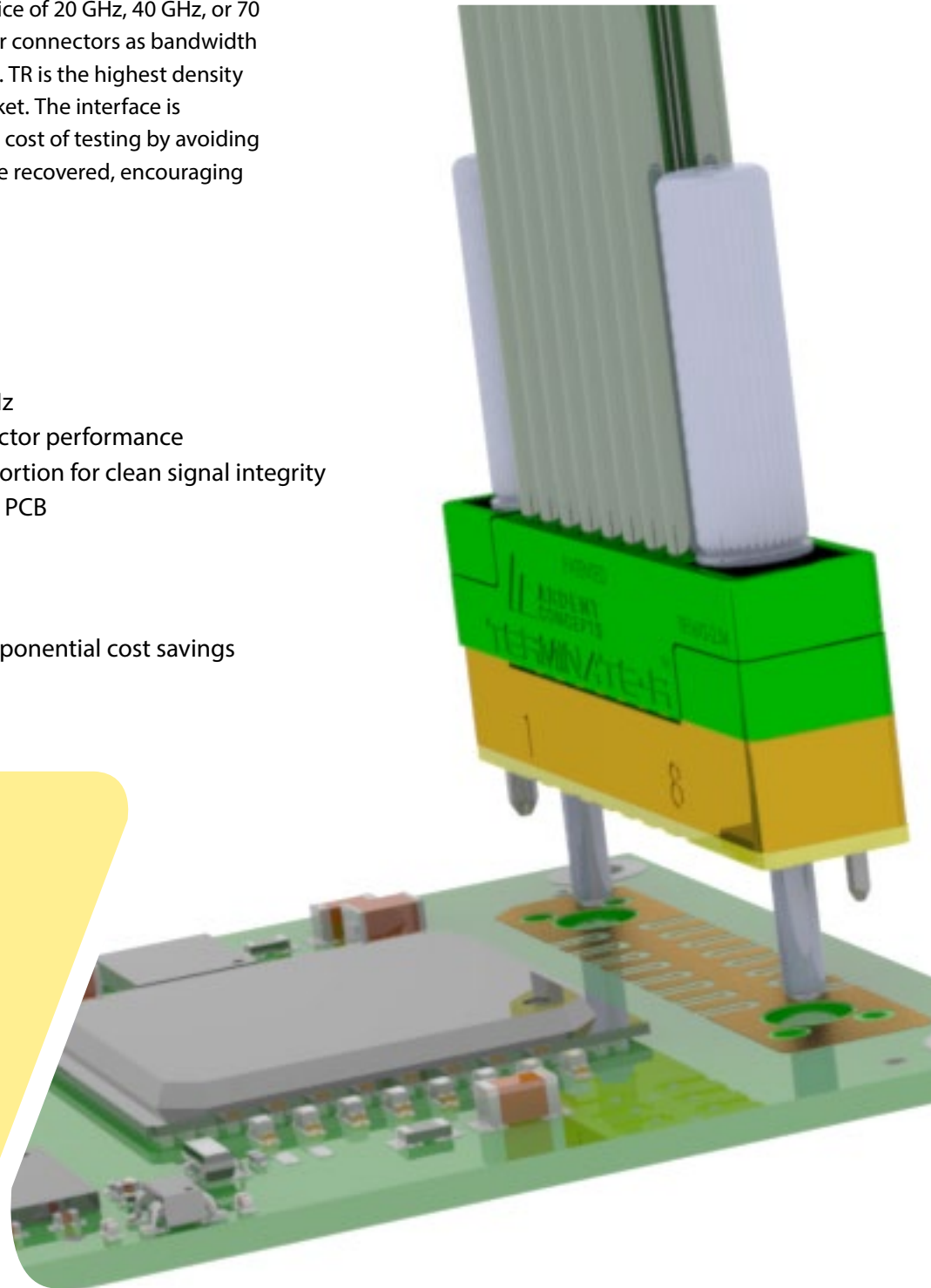
## Key Benefits

- Superior signal integrity out past 70 GHz
- Better long term repeatability of connector performance
- Solderless system eliminates signal distortion for clean signal integrity
- Quick connection of multiple signals to PCB
- 80% space savings over SMPs
- High density gets TR closer to the DUT
- No more failing of snap-in connectors
- Reusable across programs promotes exponential cost savings

## Applications

TR Multicoax connectors are ideal for use in:

- > Semiconductor Design & Test
  - Customer Evaluation Boards
  - PCIe
  - Pam4
  - High Speed SerDes
- > Automated Test & Measurement
- > Communications
  - Clock/Data Recovery (CDR)
  - Backplane Connector Characterization
- > Quantum Computing
  - Shielding Can Connector
  - Cryogenic Testing
- > Defense/Aerospace
- > Server/Data
- > Medical
- > Custom Applications

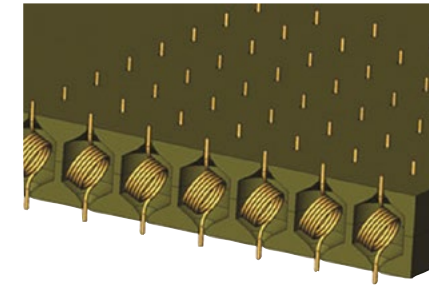


Let us help you choose the right contact set for your application

### Spring Probe™



- Scalable solutions for connectors down to .4 mm Pitch
- Eliminates the barrel and the plunger from a traditional “pogo” style spring pin (Less mechanical components to fail)
- Patented “wipe action” of the coils causes contact to behave like a solid element Instead of behaving like an inductor. The result is exceptionally clean AC performance in an extremely short electrical path

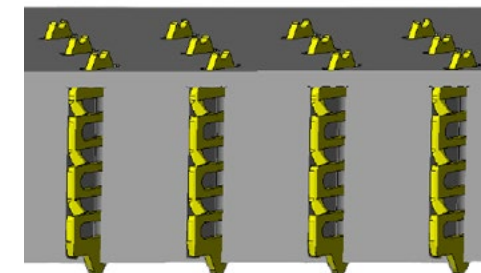


Specifications	
Pitch	0.4 mm and above
Frequency	70 GHz+
Insertion Loss	-1 dB at 40 GHz @ 1 mm pitch
Self-Inductance	.5 nH
Mated Height	.76 mm and above

### Connect-R™



- Cost-Effective Automation Loaded Contacts
- High Performance
- Stamped Contact for Area Array Applications Down to .6mm Pitch



Specifications	
Pitch	0.8 mm and above (area), .6 mm and above (linear)
Frequency	40 GHz+
Insertion Loss	-1 dB at 40 GHz @ 1 mm pitch
Self-Inductance	.5 nH
Mated Height	1.57 mm

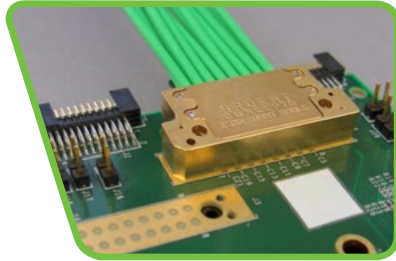




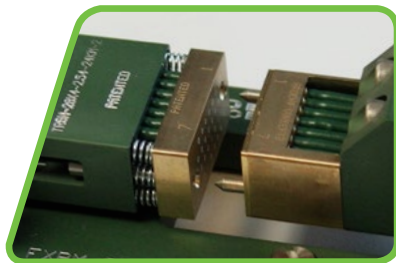
**Straight Mount** allows users to mount to a solderless footprint on your PCB with two or three thumb screws, ensuring a quick and reliable/repeatable connection out past 70 GHz for over 1000 mates and demates.



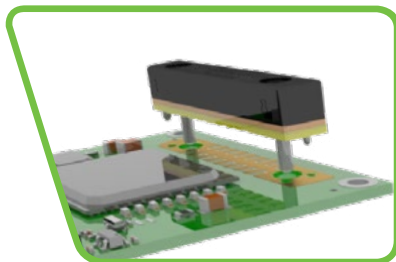
**Quantum Computing** form factors are designed to support the many unique challenges of Quantum Computing applications (e.g. density, substantial environmental changes, an increasing need for more high-speed lanes). By utilizing custom cabling materials (e.g. CuNi, NbTi) and our existing patented contact technology, engineers will be able to drastically decrease real estate required by individual connectors and increase their channel count while improving signal integrity in their systems.



**Right Angle** adds the ability to get high speed signals off the board in situations where you are Z-height limited. For example, to take signals from underneath the board, to go from board to board, or to get the cables out under a thermal shroud.



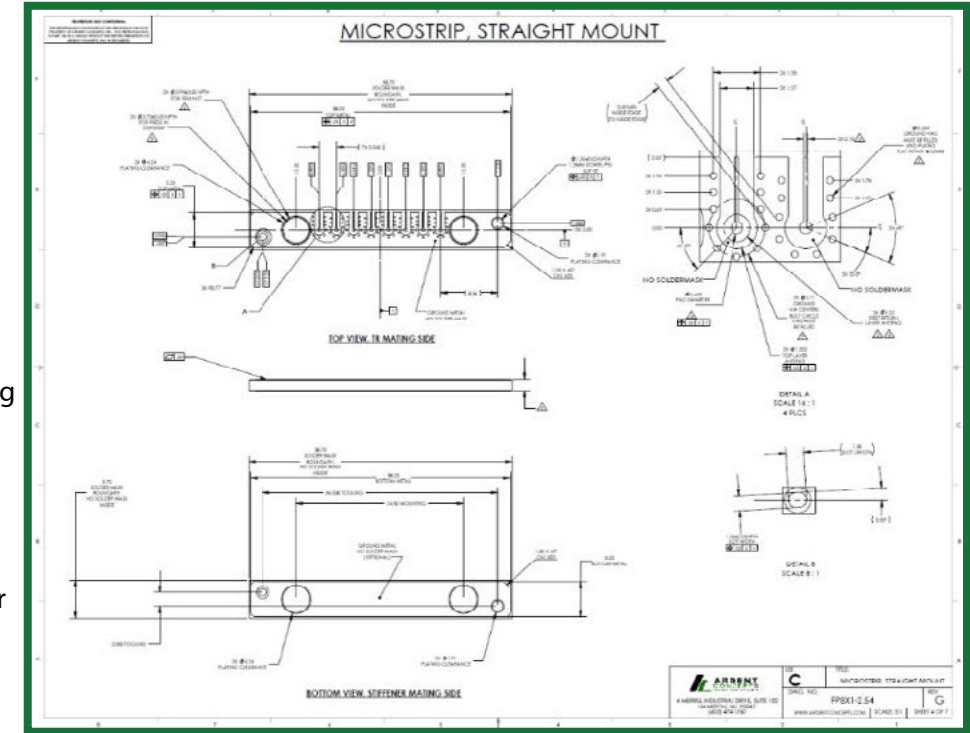
**Blind Mate Test Head Interface** solutions are ideal for applications where engineers need superior signal integrity with multiple reliable and repeatable connections out past 70 GHz. With precision designed interconnect solutions from Ardent, these connections can be designed into an automated mate/de-mate process capable of thousands of insertions with no degradation. Connectors can be cable to cable or cable to PCB.



**Loopback** Allows engineers to test SERDES interfaces for at-speed defects in the analog transmission (TX) and reception (RX) buffers.

**The Footprint:**

- Unique footprint technology is a piece of artwork printed directly onto the PCB.
- The straight mount and right angle TR Multicoax connectors mount to the PCB using either a board stiffener or a PEM nut.
- While they can be installed in the lab, it is best to install the stiffener or PEM nut during the fabrication process.
- A standard microstrip footprint is shown in the image to the right. This footprint is optimized for up to 20 GHz applications. For anything over 20 GHz, we recommend the performance of a Footprint Optimization, which is a service that Amphenol Ardent offers.



**Plating:**

In the footprint document, the notes call out for hard gold over nickel plating. It is important to note that this is not the only acceptable form of plating and that ENIG, ENIPIG, or any other form of noble metal plating is acceptable. Tin or lead plating is prohibited.

**Important Notes When Reviewing Footprint:**

- The TR Footprint requires no soldermask within the artwork. Soldermask is often uneven and causes planarity issues, which is problematic for the TR's compression mount technology as it relies on a flat surface to make a proper connection.
- There are two different sized callouts for the TR's mounting holes:
  - 3.99mm diameter mounting holes for PCBs that have a thickness greater than 93 mils (2.36mm)
  - 3.73mm diameter mounting holes for PCBs that have a thickness of less than 93 mils (2.36mm)
- The TR Footprint has an alternating ground via bolt pattern, which is shown in the footprint. This is important to implement as it severely cuts down on crosstalk between TR channels.



# Coaxial Launch Optimization

## Description

Our patented TR Series compression mount, high frequency connector assembly stands alone as the only industry solution for high density multicoax cable assembly capable of measurements out past 70 GHz.

Due to the highly precise and high performance nature of the assembly, Ardent Concepts strives to optimize all aspects of the TR Series design, including the PCB launch (footprint). The PCB launch for the TR connector is integral in producing the maximum performance from the TR connector.

## Key Benefits

Each optimization is uniquely performed around the customer's specific PCB design to account for differences in:

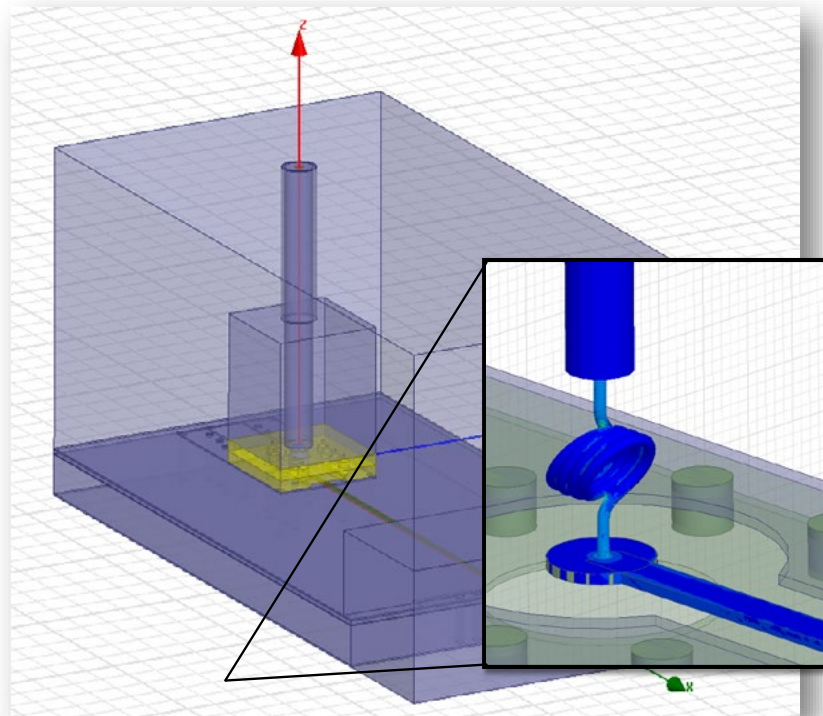
- Board materials (dielectric constants)
- Layer thicknesses
- Complete PCB stack-up

3D models of the customer's PCB board and along with in-house 3D models of the TR connectors, advanced electro-magnetic 3D simulation is used to analyze and provide corrective solutions for the optimal launch configuration.

## What's Provided?

Included in your Launch Optimization:

- > Dimensional results
  - Signal pad
  - Top layer anti-pad
  - Return layer anti-pad
  - Ground via depth
  - Narrow trace (under the connector)
- > Modeling results
  - Insertion loss (S21)
  - Return loss (S11)
  - TDR
- > S-Parameter file (.S2P)
- > Footprint review
- > xlsx data output



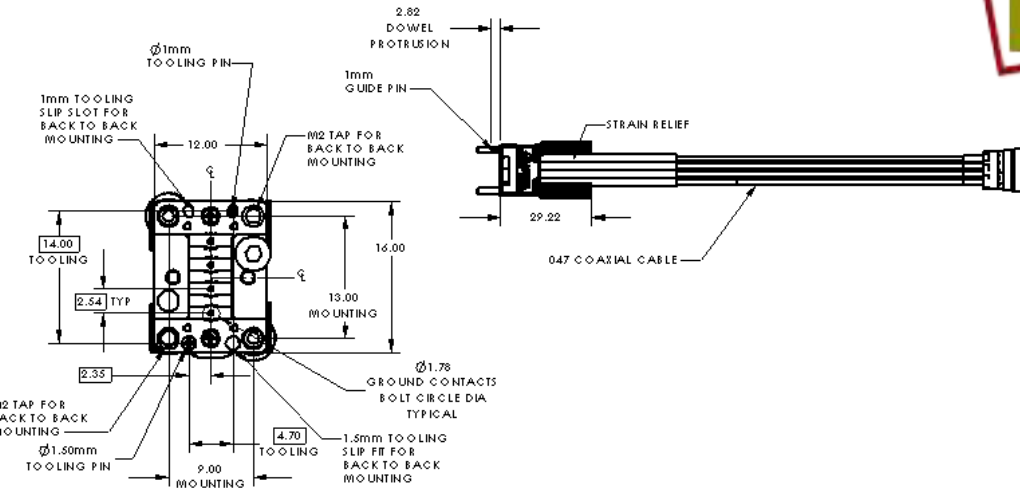
Example of 3-D EM model created with ANSYS® HFSS

## Simple 'Optimization Checklist'

1. What is the maximum operating frequency?  
12 GHz
2. What type of signal?  
Digital  Analog
3. How many channels will the TR Multi-coax cable have?  
1  4  8  12  16  24
4. What is the pitch of the connector? (NOTE: The standard pitch is 2.54mm)  
Standard
5. Is the PCB stack-up included? (NOTE: The PCB stack-up must be included to start work on order)  
YES  NO
6. What is the PCB total thickness?  
See stackup file
7. Is the PCB trace design microstrip or stripline?  
Microstrip  Stripline
8. If the PCB trace design is microstrip, is the transmission line CPWG?  
CPWG  NON-CPWG
9. What layers are there to be signals launched on?  
microstrip
10. What is the dielectric constant of the PCB material surrounding the signal layers?  
Meg 6
11. How many total layers does the PCB have?  
MS routing - no vias in design
12. If the PCB stack does not specify, indicate reference/ground layer numbers  
See stackup
13. If the PCB stack does not specify, indicate power layers' numbers  
See stackup
14. If the PCB stack does not specify, indicate signal layers' numbers  
See stackup
15. Is the TR mounted on Top (Layer 1) or the Bottom of the PCB?  
Top (Layer 1)  Bottom
16. Via drill diameters are .010" (.25mm) as standard. Will these drill diameters be used?  
If not, what is the desired drill diameter?  
10mil
17. What is the desired return loss at a given frequency of the optimization?  
The default is: [-20 dB to 20 GHz] and [-12 dB to 40GHz]  
Default is o.k.

Consult factory for checklist

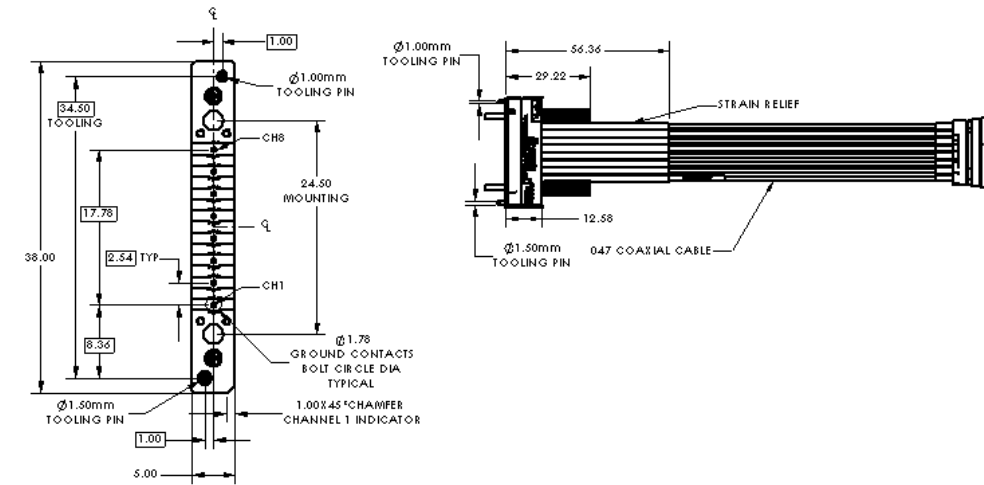
# TR MULTICOAX 4x1 (20/40/70 GHz CONFIGURATIONS AVAILABLE)



Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	.047" diameter cables <sup>3</sup>
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	V (1.85 mm)
Crosstalk	-70 dB through 70 GHz	Cable Length	6"/152 mm, 12"/304 mm, 24"/608 mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable.		Footprint	Microstrip & Stripline compatible

<sup>3</sup>Consult factory for additional cable options.

# TR MULTICOAX 8x1 (20/40/70 GHz CONFIGURATIONS AVAILABLE)

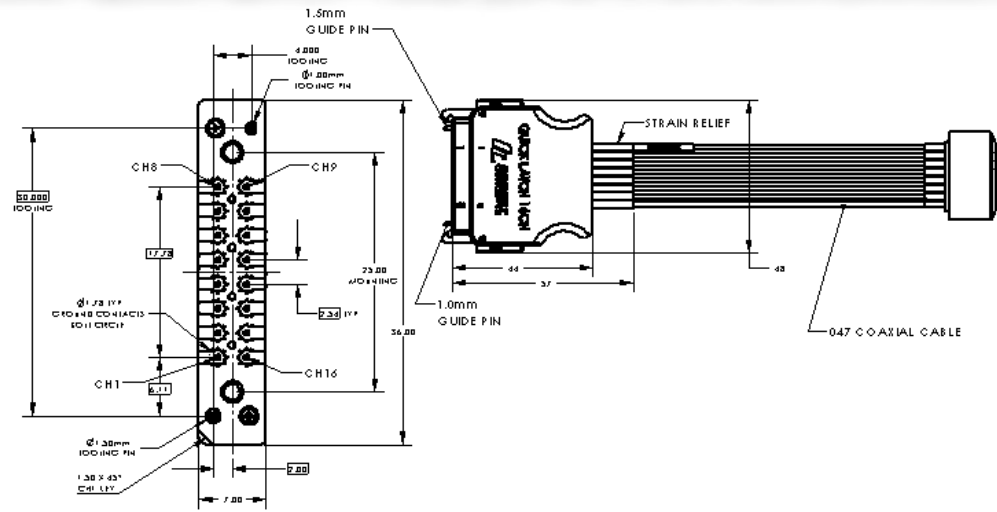


Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	.047" diameter cables <sup>3</sup>
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	V (1.85 mm)
Crosstalk	-70 dB through 70 GHz	Cable Length	6"/152 mm, 12"/304 mm, 24"/608 mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable.		Footprint	Microstrip & Stripline compatible

<sup>3</sup>Consult factory for additional cable options.

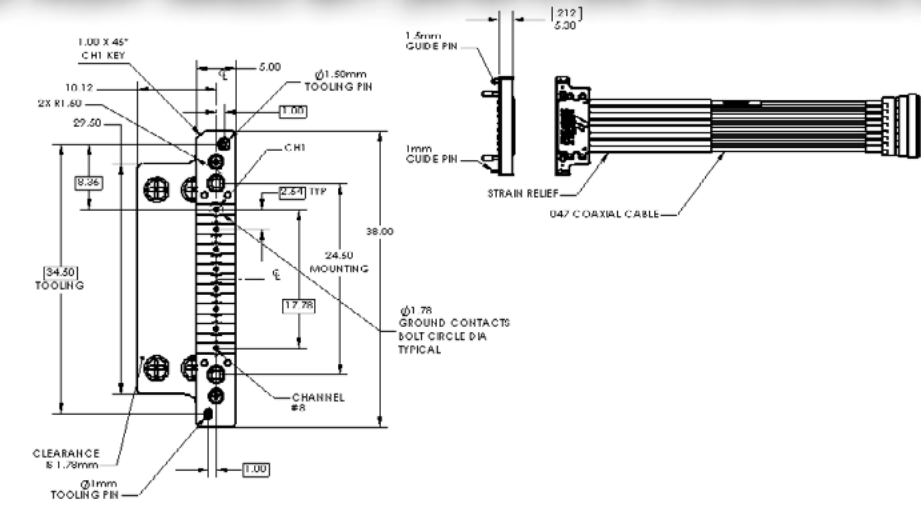


## TR MULTICOAX QUICK LATCH 16x2 (20/40/70 GHz CONFIGURATIONS AVAILABLE)



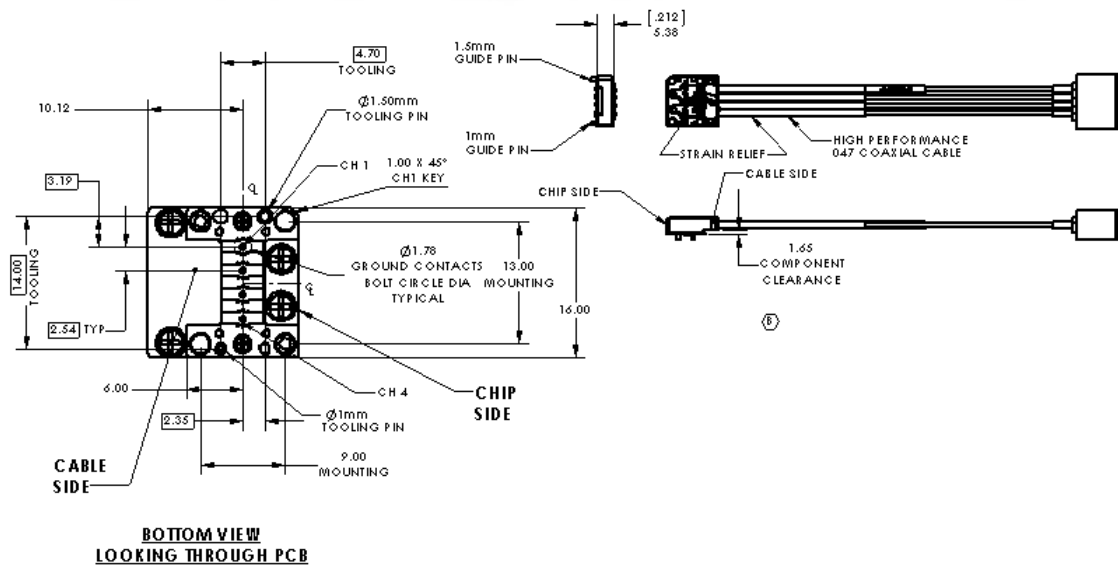
Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	.047" diameter cables <sup>3</sup>
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	V (1.85 mm)
Crosstalk	-70 dB through 70 GHz	Cable Length	6"/152 mm, 12"/304 mm, 24"/608 mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable. <sup>3</sup> Consult factory for additional cable options.		Footprint	Microstrip & Stripline compatible

## TR MULTICOAX RIGHT ANGLE 8x1 (20/40/70 GHz CONFIGURATIONS AVAILABLE)



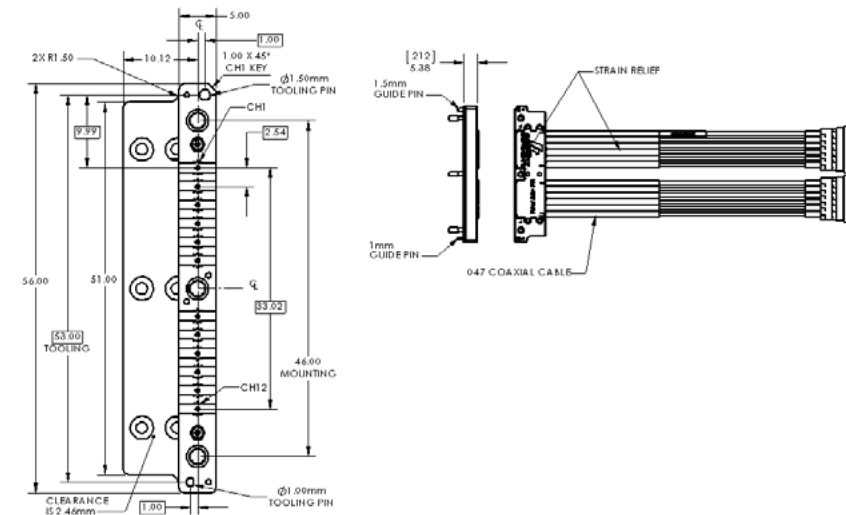
Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	.047" diameter cables <sup>3</sup>
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	V (1.85 mm)
Crosstalk	-70 dB through 70 GHz	Cable Length	6"/152 mm, 12"/304 mm, 24"/608 mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable. <sup>3</sup> Consult factory for additional cable options.		Footprint	Microstrip & Stripline compatible

## TR MULTICOAX RIGHT ANGLE 4x1 (20/40/70 GHz CONFIGURATIONS AVAILABLE)



Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	.047" diameter cables <sup>3</sup>
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	V (1.85 mm)
Crosstalk	-70 dB through 70 GHz	Cable Length	6"/152 mm, 12"/304 mm, 24"/608 mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable. <sup>3</sup> Consult factory for additional cable options.		Footprint	Microstrip & Stripline compatible

## TR MULTICOAX RIGHT ANGLE 12x1 (20/40/70 GHz CONFIGURATIONS AVAILABLE)

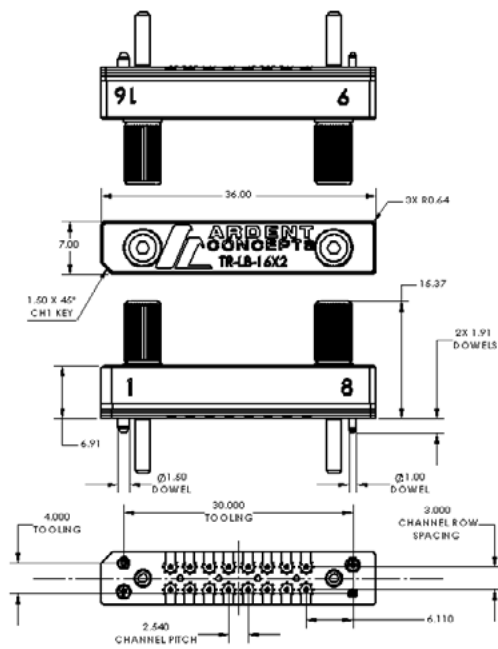


Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	.047" diameter cables <sup>3</sup>
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	V (1.85 mm)
Crosstalk	-70 dB through 70 GHz	Cable Length	6"/152 mm, 12"/304 mm, 24"/608 mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable. <sup>3</sup> Consult factory for additional cable options.		Footprint	Microstrip & Stripline compatible



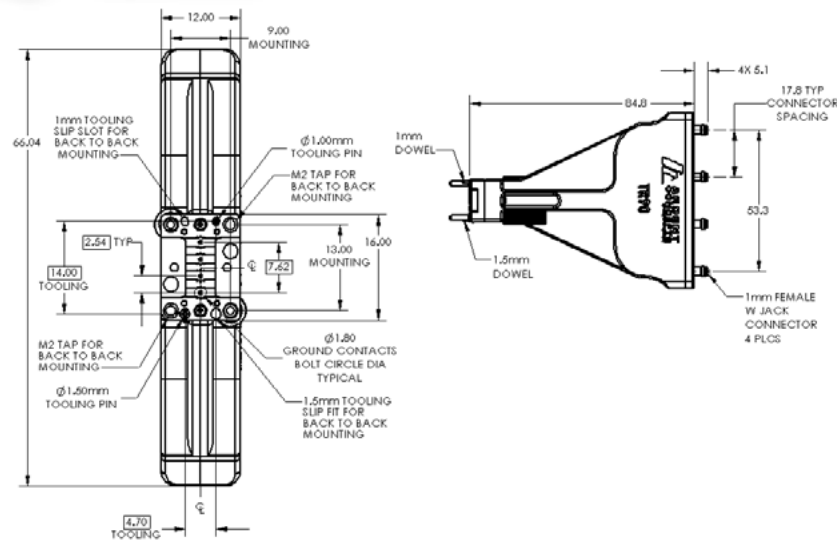


# TR LOOPBACK



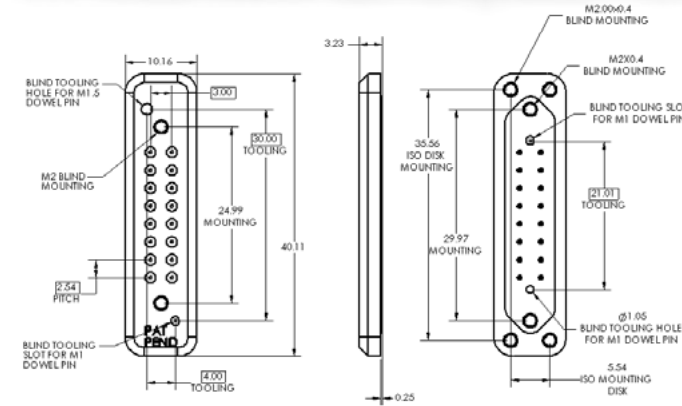
Electrical Specifications		Mechanical Specifications	
Frequency Range	DC to 70 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-18 dB through 70 GHz	Cables	
Insertion Loss <sup>2</sup>	-1.5 dB through 40 GHz, -3 dB through 70 GHz	Connectors	
Crosstalk	-70 dB through 70 GHz	Cable Length	
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable.		Footprint	Microstrip & Stripline compatible
<sup>3</sup> Consult factory for additional cable options.			

# TR90 (90 GHz) PRELIMINARY



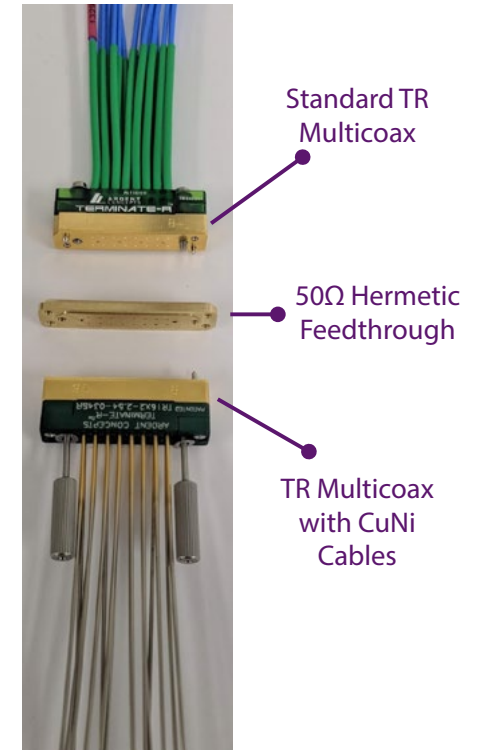
Electrical Specifications		Mechanical Specifications	
Frequency Range	70 - 90 GHz+	Pitch	2.54 mm
Return Loss <sup>1</sup>	-10 dB or better from 71 GHz to 90 GHz	Cables	Semirigid
Insertion Loss <sup>2</sup>	No resonance out to 90 GHz	Connectors	1.0 mm female
Crosstalk	-30 dB from 71 GHz to 86 GHz	Cable Length	3"/76mm
Impedance <sup>1</sup>	50 Ω +/- 2.5 Ω	Insertion Life	1,000+ mating cycles
Phase Matching	+/- 2 ps standard	Field Replaceable Interface	Yes
Notes: <sup>1</sup> Largely a function of PCB design. <sup>2</sup> Measurement includes 3" of cable.		Footprint	Microstrip & Stripline compatible
<sup>3</sup> Consult factory for additional cable options.			

# TR MULTICOAX SERIES | 50Ω HERMETIC FEEDTHROUGH



## Description

TR Multicoax Series connectors mated with our 50Ω Hermetic Feedthrough are ideal for applications where hermeticity is crucial to the transmission of high speed signals. In these applications, TR connectors are mated to the hermetic feedthrough on either end ensuring an impedance matched 50Ω channel between any two chambers. The feedthrough is fixed to a flange (such as an ISO disk) with screws in blind-holes from the inside of the vacuum. Lastly, the hermetic feedthrough is completely sealed using an epoxy potting.



## Key Benefits

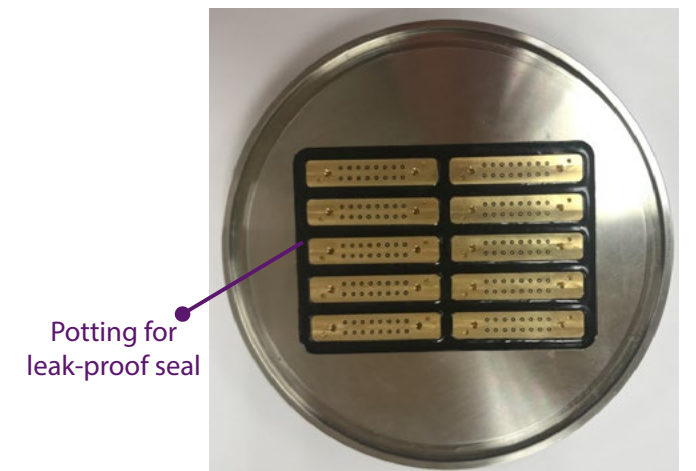
- Leak-proof design (Max leak rate 2.00E<sup>-09</sup> LTorr)
- Variety of coaxial cable materials available (Flexible, CuNi, NbTi, BeCu)
- Extremely dense form factor (160+ channels in standard ISO disc)
- Easily mate/de-mate multiple high-speed lanes

## Applications

The 50Ω Hermetic feedthrough is ideal for use in:

- > Dilution refrigerators/Cryogenic devices
- > Quantum Computing
- > Vacuum Chambers
- > Anywhere where RF signals need to be passed through a sealed wall

## Highly Scalable



Ten (10) 16-channel Hermetic Feedthroughs

## FAQ Corresponding Tables

TR 20	Mounting Option	# of channels (Form Factor)	Pitch (mm)	Cable Length & Connector Type	
	Straight Mount (SM)	4 (4X1), 8 (8X1), 12 (12X1), 16 (16X2), 24 (24X2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24) SMA Female (AF), SMA Male (AM)	
	Quick Latch (QL)	8 (8X1), 16 (16X2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24) SMA Female (AF), SMA Male (AM)	
	Leap Frog (LF)	8 (8x1), 12 (12x1)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24) SMA Female (AF), SMA Male (AM)	
	Right Angle (RA)	4 (4X1), 8 (8X1), 12 (12X1), 16 (16x2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24) SMA Female (AF), SMA Male (AM)	
TR 40	Mounting Option	# of channels (Form Factor)	Pitch (mm)	Cable Length	Connector Type
	Straight Mount (SM)	4 (4X1), 8 (8X1), 12 (12X1), 16 (16X2), 24 (24X2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	SMK 2.92 mm Female (KF), SMK 2.92 mm Male (KM)
	Quick Latch (QL)	8 (8X1), 16 (16X2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	SMK 2.92 mm Female (KF), SMK 2.92 mm Male (KM)
	Leap Frog (LF)	8 (8x1), 12 (12x1)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	SMK 2.92 mm Female (KF), SMK 2.92 mm Male (KM)
	Right Angle (RA)	4 (4X1), 8 (8X1), 12 (12X1), 16 (16x2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	SMK 2.92 mm Female (KF), SMK 2.92 mm Male (KM)
TR 70	Mounting Option	# of channels (Form Factor)	Pitch (mm)	Cable Length	Connector Type
	Straight Mount (SM)	4 (4X1), 8 (8X1), 12 (12X1), 16 (16X2), 24 (24X2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	V 1.85 mm Female (VF), V 1.85 mm Male (VM)
	Quick Latch (QL)	8 (8X1), 16 (16X2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	V 1.85 mm Female (VF), V 1.85 mm Male (VM)
	Leap Frog (LF)	8 (8x1), 12 (12x1)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	V 1.85 mm Female (VF), V 1.85 mm Male (VM)
	Right Angle (RA)	4 (4X1), 8 (8X1), 12 (12X1), 16 (16x2)	2.54 mm	03" (03), 6" (06), 12" (12), 24" (24)	V 1.85 mm Female (VF), V 1.85 mm Male (VM)
TR Equal Trace	Mounting Option	# of channels (Form Factor)	Pitch (mm)	Cable Length	Connector Type
	Straight Mount (SM)	16 (16x1)	3.6 mm	6" (06), 12" (12), 24" (24)	V 1.85 mm Female (VF), V 1.85 mm Male (VM)



	RC04-04 RC Springprobe™	RC05-01 RC Springprobe™	RC08-02 RC Springprobe™	RC10-07 RC Springprobe™	RC10-04 RC Springprobe™	RC12-06 RC Springprobe™	CR08-062 RC Connect-R™
Contact Material	Gold Plated Beryllium Copper	Gold Plated Beryllium Copper	Gold Plated Beryllium Copper	Gold Plated Beryllium Copper	Gold Plated Beryllium Copper	Gold Plated Beryllium Copper	Gold Plated Beryllium Copper
Mated Height (in/mm)	0.030/0.76	0.030/0.76	0.045/1.14	0.055/1.40	0.085/2.16	0.090/2.29	.062/1.57
Pitch (in/mm)	0.0157/0.40	0.0197/0.50	0.0315/0.80	0.0394/1.00	0.0394/1.00	0.0500/1.27	0.0315/0.80
Compression Force/Contact (grams +/-20%)	20	20	20	24	22	34	45
Compression Range (in/mm)	0.006/0.15	0.006/0.15	0.009/0.23	0.010/0.25	0.015/0.38	0.015/0.38	0.010/0.25
Contact Resistance (mΩ)	60	45	60	50	66	65	<50
Self Inductance (nH)	~.50	0.45	0.73	0.92	1.35	~1.50	0.61
High Freq Capacity (-1 dB point, GHz)	~20	25	20	37	11	~20	40 (@1mm Pitch)
Characteristic Impedance at Native Pitch (Ohms)	56	65	61	73			57 (@1mm Pitch)
Durability (cycles)*	10,000	10,000	10,000	10,000	10,000	10,000	1000+
Current Carrying Capacity (single contact at 30C temp offset, Amps)	~1	~1	1.8	~4	3.3	3.55	~2

## SIGNAL INTEGRITY DATA

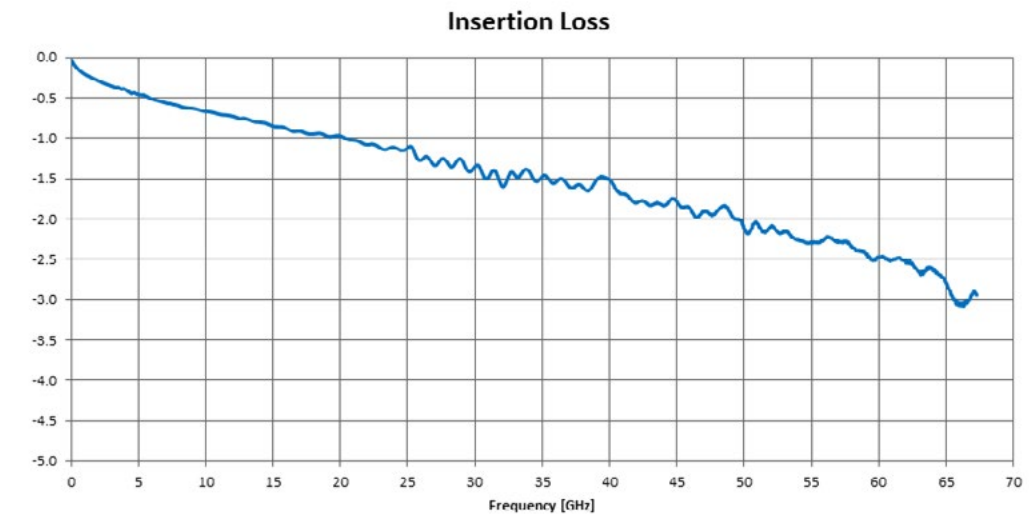


### Benefits and SI Measurements

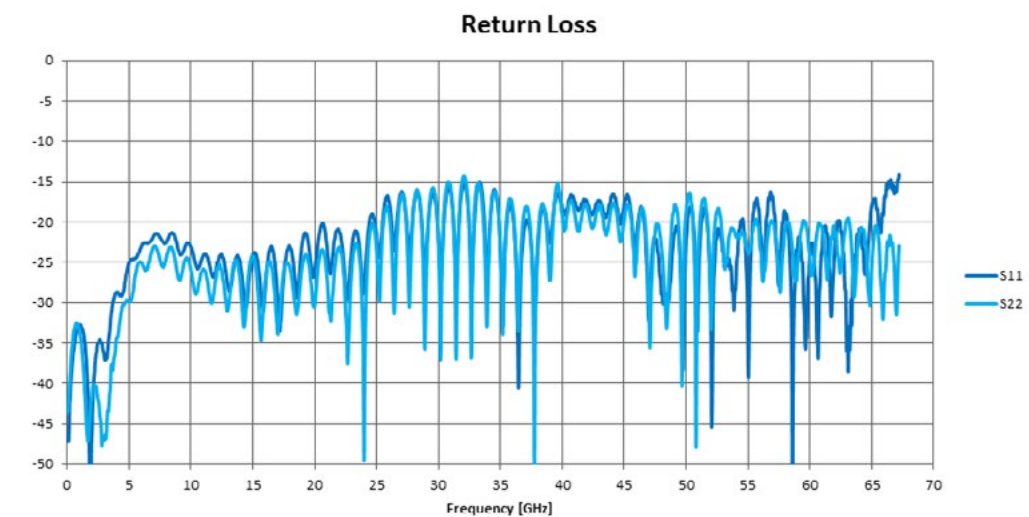
**TR20™ - Low loss, production quality, cost saving alternative to cumbersome surface mount connectors**

**TR40™ - Industry proven, reliable high frequency, space saving performance in today's leading edge applications from an industry proven product**

**TR70™ - True 70 GHz performance for tomorrow's highest frequency applications**



❖ Through Only De-Embedding of the TR70-03VF with 2 mm of PCB Launch de-embedded from the fixture with end launch and 0.5" GCPW Trace using the 1" ThroughX2 Fixture.



❖ Through Only De-Embedding of the TR70-03VF with 2 mm of PCB Launch de-embedded from the fixture with end launch and 0.5" GCPW Trace using the 1" ThroughX2 Fixture.

# REPEATABILITY

Our connectors demonstrate repeatability over 1000 cycles and we have the data to prove it:

- Measurements of 56 different channels (4 different channels on 14 different TR™ assemblies), all other transmission lines are the same.
- Repeatability of single channel over 1000 cycles.
- Measurements at 0, 50, 100, 500, and 1000 cycles.

De-Embedded Interface Only

S-Parameters

