Cascade

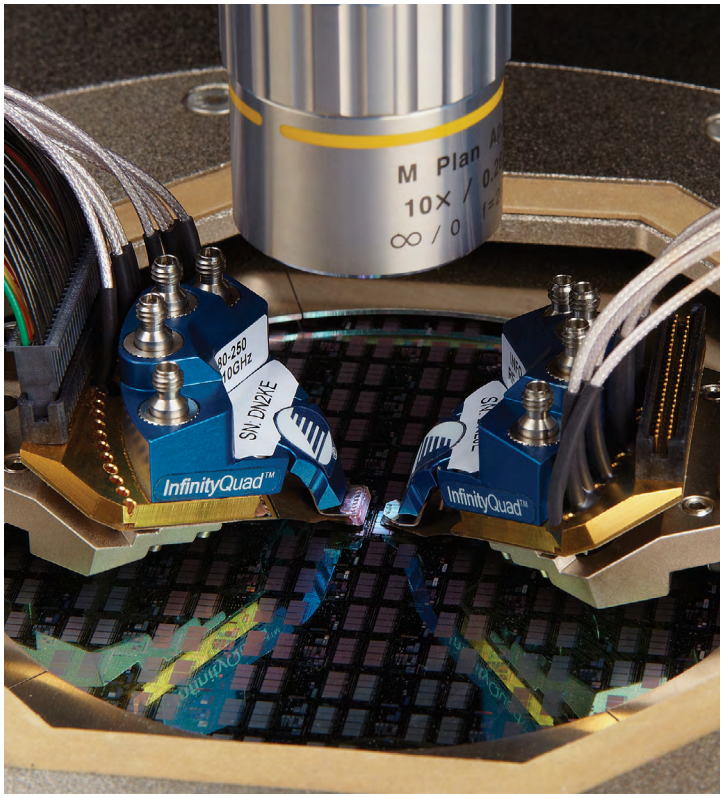
InfinityQuad™ Probe

Fine-Pitch Multi-Contact RF/mmW Probe

Overview

For repeatable and precise engineering and production of DC, logic, RF and mmWave RFIC devices, FormFactor's InfinityQuad probe ensures reliable measurement results up to 110 GHz. The InfinityQuad probe uses the same technology as the industry-leading Infinity Probes® and Pyramid-MW probe cards. The photo-lithographically defined fine-pitch tip structure enables automatic, over-temperature probing of pads as small as 30 µm x 50 µm with minimum pad damage, and provides consistent, low contact resistance. Its durable design extends probe life to over 250,000 cycles with minimal maintenance. The easy-to-use design capture tool reduces the chance of design errors and enables fast delivery time.

The InfinityQuad probes are fully quadrant compatible with FormFactor probe stations, MicroChamber® and ProbeShield™ technologies, and also compatible in a quadrant arrangement with other FormFactor quadrant-compatible probes.



Features / Benefits

Superior high-frequency and electrical performance	• Signal paths up to 110 GHz provides wide bandwidth for RF/Microwave or high-speed digital connections • Low and repeatable contact resistance on aluminum pads (< 0.05 Ω), ensuring accurate results • High-performance power bypassing enables low-impedance and oscillation-free testing
Lithographic fabricated tip	• Fine-pitch probe tips enable probing of pitches as small as 75 µm and pads as small as 30 µm x 50 µm with minimum pad damage
Flexible configuration	• Mix multiple contact types: DC, RF, power, ground, logic
Durable probe structure	• Long probe life (more than 250,000 contacts) with minimum maintenance reduces the overall cost-of-test
Full-range thermal	• Able to measure from -40°C to +125°C without compromising performance or accuracy of specifications
Intuitive design capture tool	• Complex probe configuration can be quickly designed, minimizing errors and ensuring accurate design and fast product delivery

Mechanical Specifications

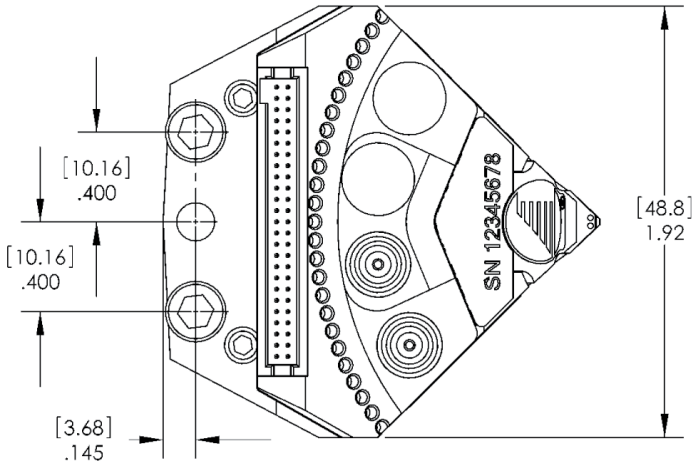
Number of contacts	From 4 to 25
Number of 'premium' channels	Up to four 40, 50, 67 or 110 GHz premium channels
Available contact pitch	75, 80, 100, 125, 150, 200 and 250 µm
Tip material	Non-oxidizing nickel ally tips
Minimum pad size*	30 µm x 50 µm
Contact area	W12 µm x L8 µm (nominal)
Operating temperature	-40°C to +125°C (maximum temperature range: -55°C to +150°C)
Contact life	> 250,000 cycles on Al and Au pads
Recommended overtravel	75 µm
Maximum safe overtravel	250 µm
Overtravel to skate ratio	2.5:1 (75 µm overtravel : 30 µm skate)

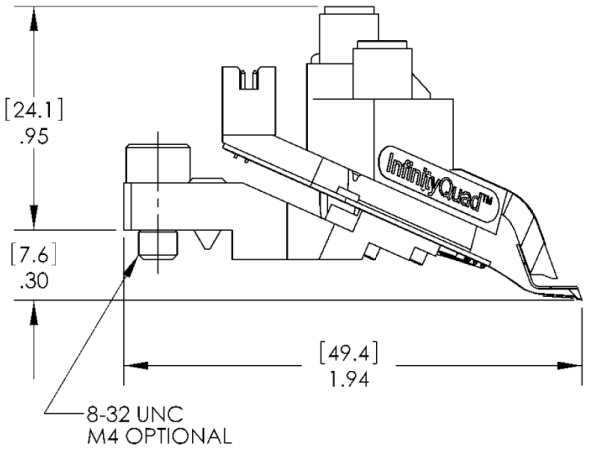
* *For more details, refer to InfinityQuad Design Layout Rules.*

Electrical Specifications

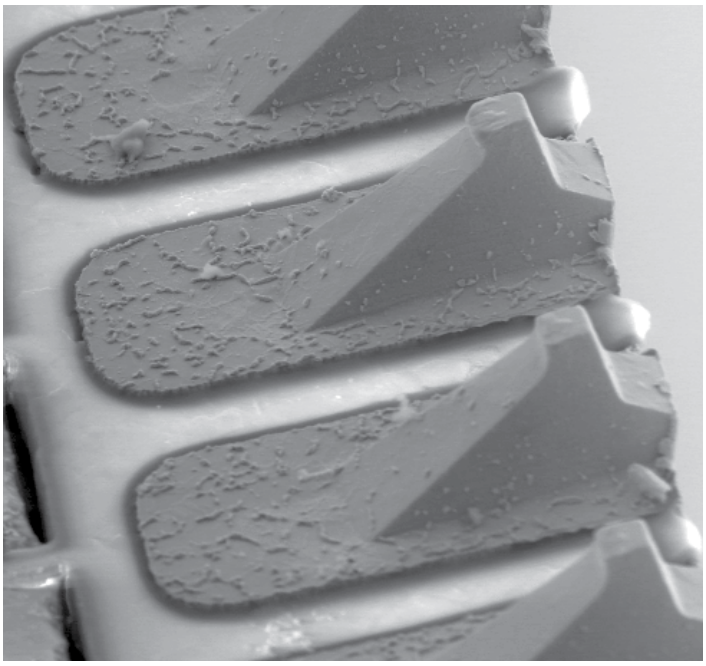
Maximum DC current	400 mA
Maximum DC voltage	50 V power bypass (100 V other)
DC series resistance with cable accessories	3 Ω
Isolation resistance	200 MΩ
RF signal line connector	Direct cable attach with 5" (12.7 cm) coaxial pigtail to female 2.92 mm K connector
Premium RF connector (maximum 4)	2.92 mm (K), 2.4 mm (Q), 1.85 mm (V), 1.0 mm (W) – Any combination (all vertical female probe-mounted connectors)
DC/Logic connector	2x25 0.5" connector Semtec header
Contact resistance on Al pads at 25 °C	< 0.05 Ω (< 0.02 Ω on Au pads)
Maximum RF power handling	> 4 W (20 GHz), 2 W (67 GHz), 1 W (110 GHz)

Physical Dimensions

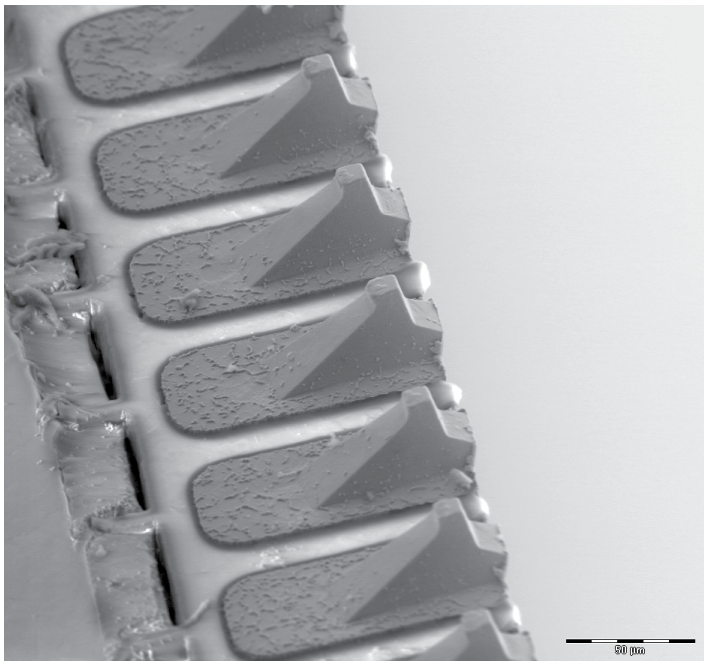




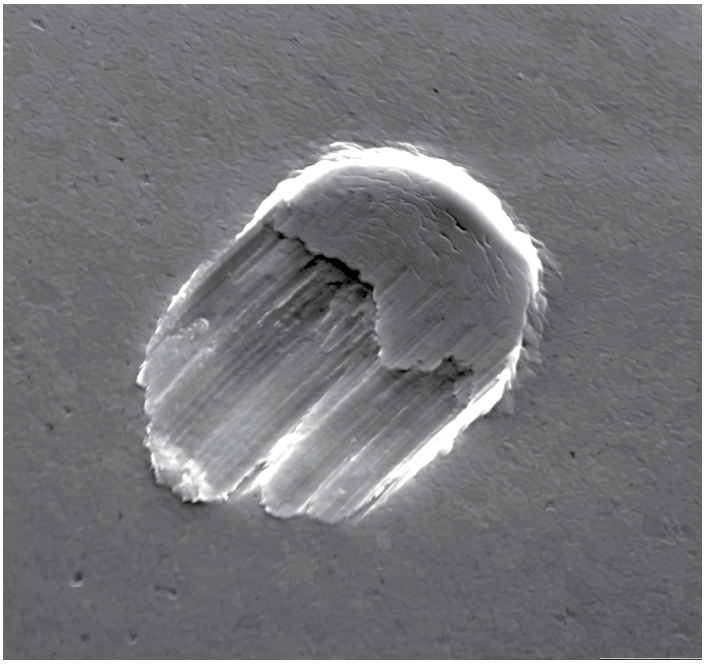
Probe Tip Images



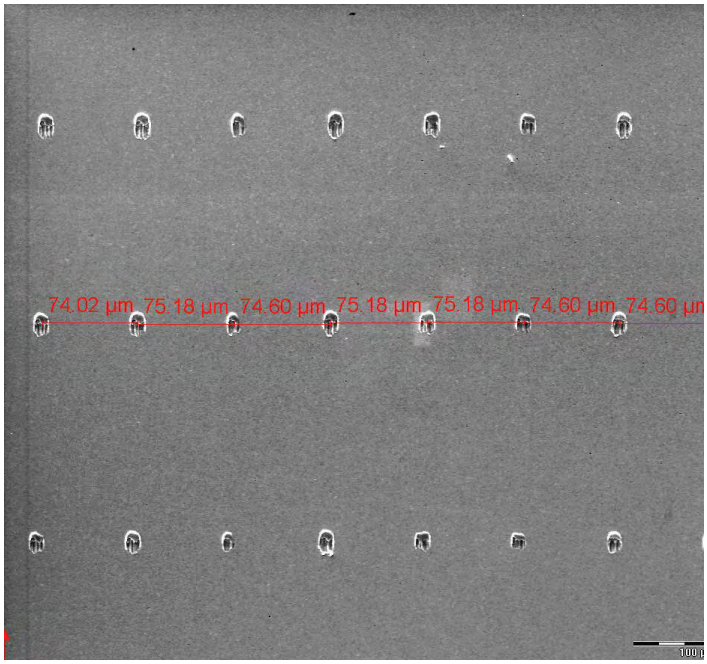
Small contact area of InfinityQuad tips.



Uniform, tight-pitch contacts of InfinityQuad probes offer a parallel micro-scrub action with no side skate.



InfinityQuad probe mark on Al pad. Total damage window is typically W12 µm x L15 µm with scrub.



SEM images showing InfinityQuad tip-to-tip positioning accuracy <1 µm at ambient.

Contact Types

Ground (Contact Type Code in Design Capture Tool: G)

Effective inductance	< 0.5 nH

Power (Contact Type Code in Design Capture Tool: P)

Connector	2x25 0.05 µm pitch (cable supplied - see “Optional Accessories” for details)
High-frequency effective inductance	< 0.8 nH (3 - 6 GHz)
Low-frequency peak impedance	< 7 Ω (45 MHz - 1 GHz)

Logic (Contact Type Code in Design Capture Tool: L)

Connector	2x25 0.05 µm pitch (cable supplied - see “Optional Accessories” for details)
Bandwidth	500 MHz (when using one-meter long upgraded coax lines)
Delay mismatch	< 100 ps for adjacent lines, < 250 ps for all lines
Insertion loss and return loss of probe and cable (when using one-meter long upgraded coax lines)	Configuration (DC – 0.5 GHz) : GLG, GL*, GLP, PLP, PL* Pitch: 75, 80, 100, 125, 150, 200 and 250 µm Maximum insertion loss: 3 dB Minimum return loss: 14 dB
Minimum isolation (when using one-meter long upgraded coax lines)	Configuration (DC – 0.5 GHz): LGL (separated by G) Minimum isolation: 30 dB for 75–100 µm pitch, 35 dB for 125-250 µm pitch Configuration (DC – 0.5 GHz): LL (not separated by G) Minimum isolation: 20 dB for 75–100 µm pitch, 25 dB for 125-250 µm pitch

* *The signal can be at the edges (first or last) or adjacent to any type.*

RF Signal (Contact Type Code in Design Capture Tool: S)

Connector	Direct cable attach with 5” (12.7 cm) coaxial pigtail to female 2.92 mm K connector
Bandwidth	20 GHz
Delay mismatch	< 6 ps for adjacent lines, < 20 ps for all lines
Insertion loss (includes Insertion loss ~ 1 dB of the 5” coaxial pigtail)	GSG (DC – 20 GHz) GS* (DC – 20 GHz): 4 dB for 75-250 µm pitch GSP^ (DC – 10, 20 GHz): 3 dB for 75-100 µm pitch, 4 dB for 125-250 µm pitch PSP‡ (DC – 10 GHz): 3 dB for 75-250 µm pitch PS *† (DC – 10 GHz): 4 dB for 75-250 µm pitch SS *& (2 – 18 GHz): 4 dB for 100-250 µm pitch
Return loss (includes Insertion loss ~ 1 dB of the 5” coaxial pigtail)	GS* (DC – 20 GHz): 13 dB for 75-250 µm pitch GSP^ (DC – 10, 20 GHz): 13 dB for 75-250 µm pitch PSP‡ (DC – 10 GHz): 11 dB for 75-250 µm pitch PS *† (DC – 10 GHz): 10 dB for 75-250 µm pitch SS *& (2 – 18 GHz): 10 dB for 100-250 µm pitch
Minimum isolation	Configuration (DC – 20 GHz): SGS (separated by G) Minimum isolation: 30 dB for 75–250 µm pitch Configuration (DC – 20 GHz): SS (not separated by G) Minimum isolation: 20 dB for 75–250 µm pitch

* *The signal can be at the edges (first or last) or be adjacent to any type, except G or P.*
^ *Measured as GSG up to 10 GHz for 75-100 µm pitch and measured as GS up to 20 GHz for 125-250 µm pitch.*
‡ *Measured as GSG.*
† *Measured as GS.*
& *Measured as differential S+S- with no grounds.*

Contact Types (continued)

Premium-RF (Contact Type Code in Design Capture Tool: K, Q, V or W)

Connector: Probe-mounted connector, female, vertical	40 GHz (K) - 2.94 mm (K-connector) 50 GHz (Q) – 2.4 mm connector 67 GHz (V) – 1.85 mm connector 110 GHz (W) – 1 mm connector
Bandwidth	40 GHz (K), 50 GHz (Q), 67 GHz (V), or 110 GHz (W)
Delay mismatch	< 60 ps
Insertion loss	GKG (DC – 40 GHz): 3 dB for 75-150 µm pitch, 4 dB for 200-250 µm pitch GQG (DC – 50 GHz): 4 dB for 75-150 µm pitch, 5 dB for 200-250 µm pitch GVG (DC – 67 GHz): 5 dB for 75-150 µm pitch, 6 dB for 200-250 µm pitch GWG (DC – 110 GHz): 7 dB for 75-100 µm pitch, 8 dB for 125-150 µm pitch GK* (DC – 40 GHz): 4 dB for 75-150 µm pitch, 5 dB for 200-250 µm pitch GQ* (DC – 50 GHz): 5 dB for 75-150 µm pitch, 6 dB for 200-250 µm pitch GV* (DC – 67 GHz): 6 dB for 75-150 µm pitch, 7 dB for 200-250 µm pitch
Return loss	GKG (DC – 40 GHz): 14 dB for 75-150 µm pitch, 13 dB for 200-250 µm pitch GQG (DC – 50 GHz): 13 dB for 75-150 µm pitch, 12 dB for 200-250 µm pitch GVG (DC – 67 GHz): 12 dB for 75-150 µm pitch, 11 dB for 200-250 µm pitch GWG (DC – 110 GHz): 11 dB for 75-100 µm pitch, 10 dB for 125-150 µm pitch GK* (DC – 40 GHz): 13 dB for 75-150 µm pitch, 12 dB for 200-250 µm pitch GQ* (DC – 50 GHz): 12 dB for 75-150 µm pitch, 11 dB for 200-250 µm pitch GV* (DC – 67 GHz): 11 dB for 75-150 µm pitch, 10 dB for 200-250 µm pitch
Minimum isolation:	
Contacts separated by G	KGK (DC – 40 GHz): 30 dB for 75-250 µm pitch QGQ (DC – 50 GHz): 30 dB for 75-250 µm pitch VGV (DC – 67 GHz): 30 dB for 75-100 µm pitch, 25 dB for 125-250 µm pitch WGW (DC – 110 GHz) : 25 dB for 75-250 µm pitch
Contacts not separated by G	KK (DC – 40 GHz): 20 dB for 75-100 µm pitch, 25 dB for 125-250 µm pitch QQ (DC – 50 GHz): 15 dB for 75-250 µm pitch VV (DC – 67 GHz): 15 dB for 75-250 µm pitch WW (DC – 110 GHz): 15 dB for 75-250 µm pitch

Void (Contact Type Code in Design Capture Tool: X)

Description:	Tip removed so that it does not make physical contact with the pad

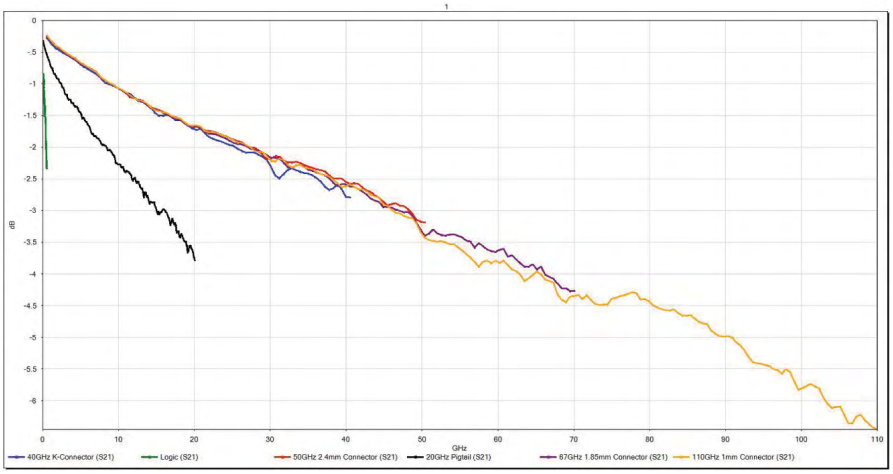
* *The signal can be at the edges (1st or last) or be adjacent to any type, except G. If the adjacent type is a P, the specs only applies to pitches 125 -250 µm and its measured as GSG.*

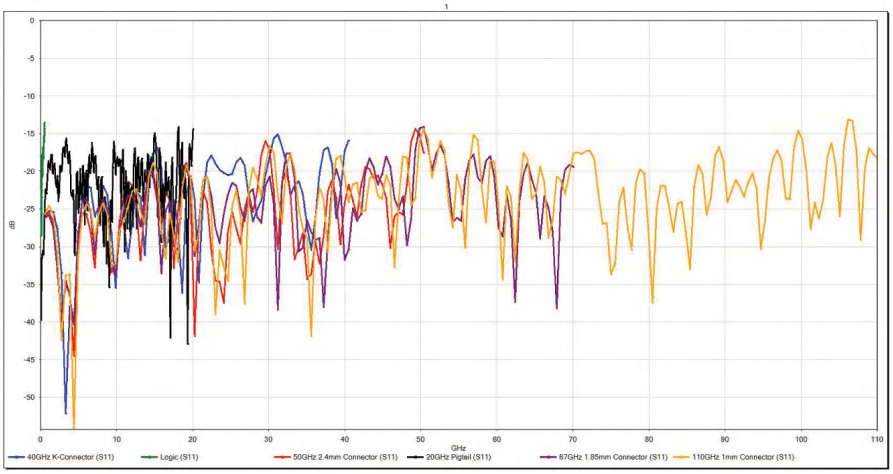
Maximum Pad Sizes

Number of Contacts (including X)	75 µm pitch	80 µm pitch	100 µm pitch	125 µm pitch	75 µm pitch	150 µm pitch	250 µm pitch
4	25 x 45 µm						
5							
6							
7							
8							
9			30 x 50 µm				
10							
11							
12							
13							
14							
15							
16					35 x 55 µm		
17							
18							
19						40 x 60 µm	
20							
21							
22							
23							45 x 65 µm
24							
25							

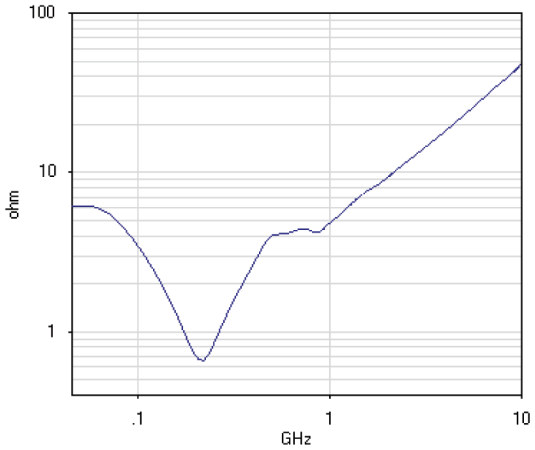
Maximum Pad Sizes

Typical Insertion Loss and Return Loss for 125 µm GSG Signals



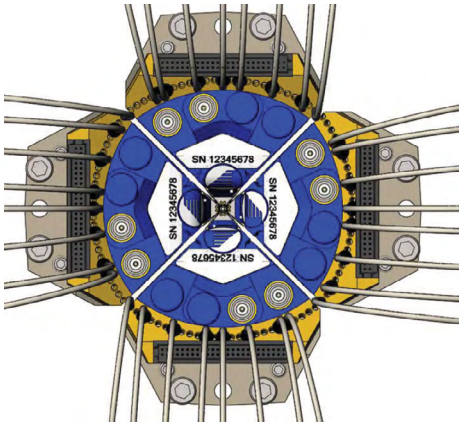


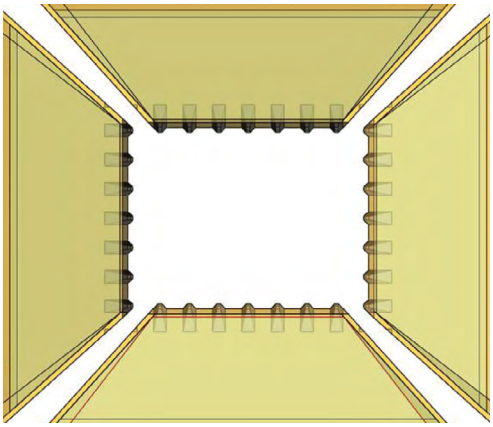
DC Power De-coupling Performance



Quadrant Compatibility

InfinityQuad probes are fully quadrant compatible with FormFactor probe stations, MicroChamber and ProbeShield technologies. InfinityQuad probe are also compatible in a quadrant arrangement with other FormFactor quadrant-compatible probes such as Infinity Probes, ACP probes and |Z| Probes®. Probing of corner pads is possible with equal pad spacing. For more details, see InfinityQuad Design Layout Rules.



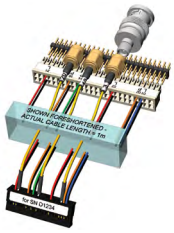


Ordering Information

InfinityQuad probes can be easily configured online. The intuitive online form will configure pitch and number of contact and contact types, and you can request a quote on our website: www.formfactor.com/products/probes/infinityquad

Supplied Accessories

- One-meter long cable, 0.05” pitch 2x25 connector (probe side) to 0.1” pitch 2x25 female connector (instrument side)
  - Upgradable power or logic channels with optional one-meter long coax lines with SMA male or BNC male connector instrument side) - requested in the configurator tool
- 2x25 0.1” pitch male – male adapter
- Metric and imperial mounting hardware
- Cable strain relief kit



Optional Accessories

PART NUMBER	DESCRIPTION
148-837	Enhanced InfinityQuad probe mount
149-653	110 GHz cable, 8.27” (21 cm), 1 mm (male) to 1 mm (female) connector, 90° bend
132-422	67 GHz cable, 36” (91.4 cm), 1.85 mm (male) to 1.85 mm (female) connector, 90° bend
132-421	50 GHz cable, 48” (121.9 cm), 2.4 mm (male) to 2.4 mm (female) connector, 90° bend
132-420	40 GHz cable, 48” (121.9 cm), 2.92 mm (male) to 2.92 mm (female) connector, 90° bend
154-072	20 GHz cable, 48” (121.9 cm), 3.5 mm (male) to 3.5 mm (female) connector, straight

Corporate Headquarters
7005 Southfront Road
Livermore, CA 94551
Phone: 925-290-4000
www.formfactor.com

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