

Cascade

InfinityQuad™ Probe

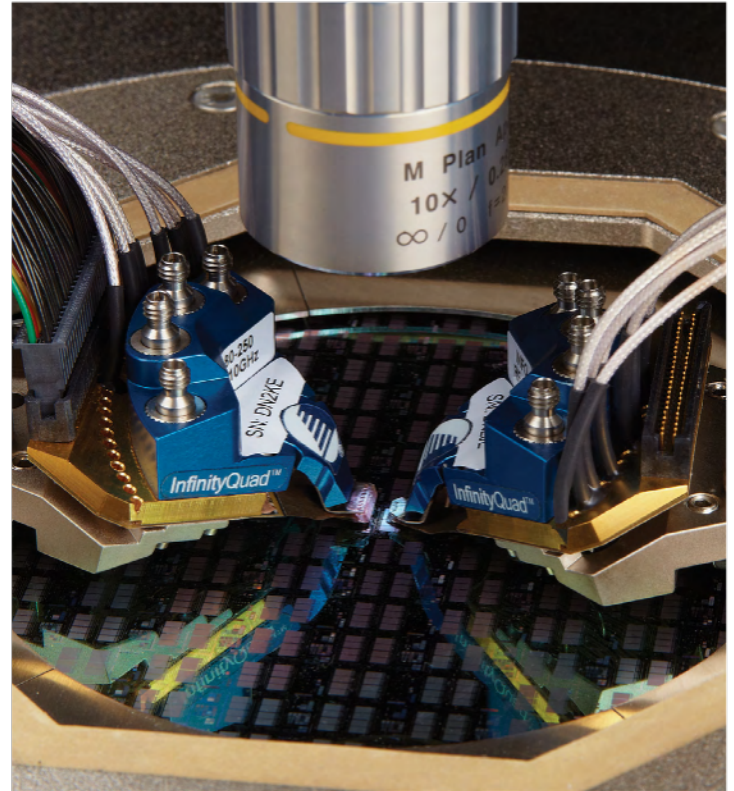
Fine-Pitch Multi-Contact RF/mmW Probe

000111100010

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 $30\ \mu\text{m} \times 50\ \mu\text{m}$ 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 | <ul style="list-style-type: none">• 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 ($< 0.05\ \Omega$), ensuring accurate results• High-performance power bypassing enables low-impedance and oscillation-free testing |
| Lithographic fabricated tip | <ul style="list-style-type: none">• Fine-pitch probe tips enable probing of pitches as small as $75\ \mu\text{m}$ and pads as small as $30\ \mu\text{m} \times 50\ \mu\text{m}$ with minimum pad damage |
| Flexible configuration | <ul style="list-style-type: none">• Mix multiple contact types: DC, RF, power, ground, logic |
| Durable probe structure | <ul style="list-style-type: none">• Long probe life (more than 250,000 contacts) with minimum maintenance reduces the overall cost-of-test |
| Full-range thermal | <ul style="list-style-type: none">• Able to measure from -40°C to $+125^\circ\text{C}$ without compromising performance or accuracy of specifications |
| Intuitive design capture tool | <ul style="list-style-type: none">• Complex probe configuration can be quickly designed, minimizing errors and ensuring accurate design and fast product delivery |

> Mechanical Specifications

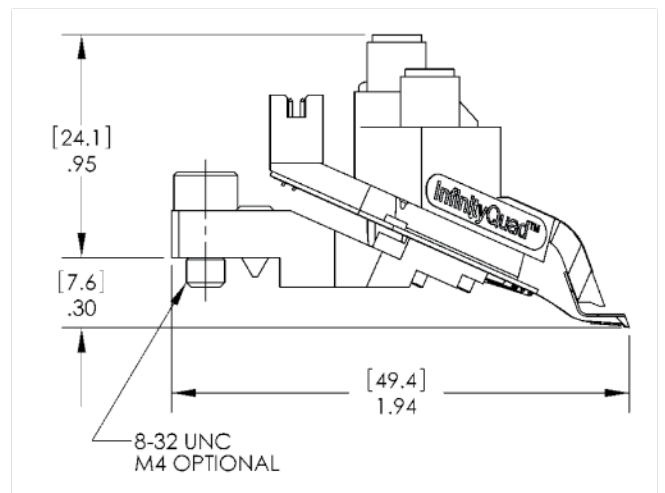
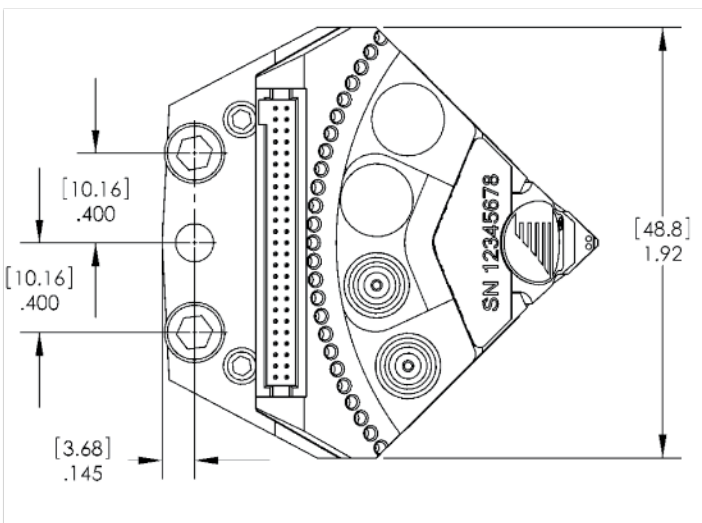
| | |
|------------------------------|--|
| Number of contacts | From 4 to 25 |
| Number of 'premium' channels | Up to four 40, 50, 67 or 110 GHz premium channels |
| Available contact pitch | 75, 80, 100, 125, 150, 200 and 250 μm |
| Tip material | Non-oxidizing nickel alloy tips |
| Minimum pad size* | 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.

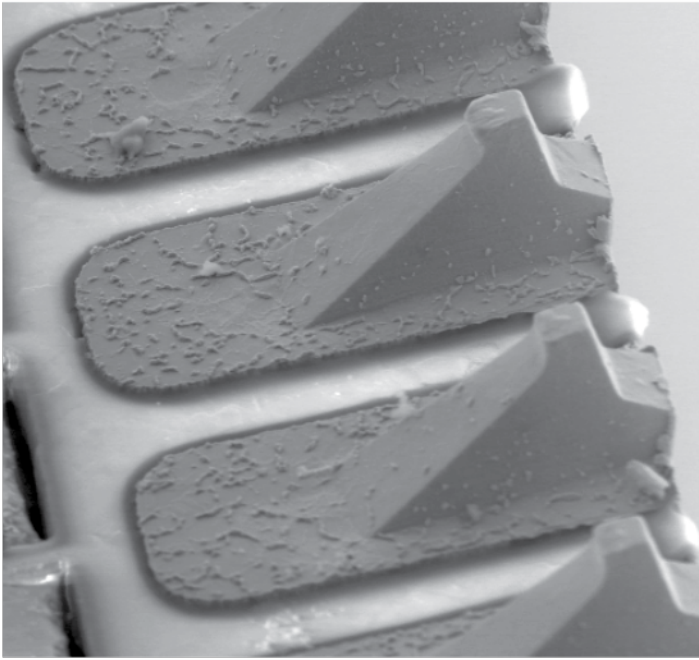
> Electrical Specifications

| | |
|---|---|
| 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 M Ω |
| 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) |

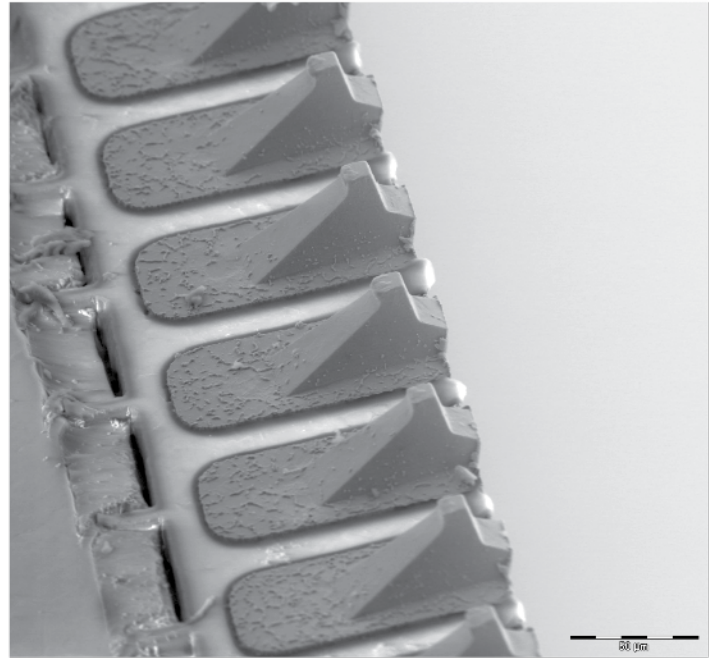
> Physical Dimensions



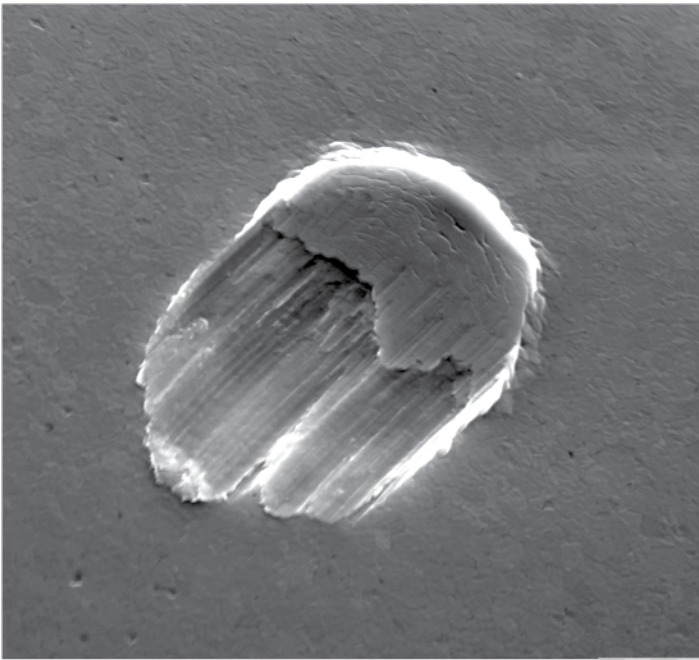
➤ Probe Tip Images



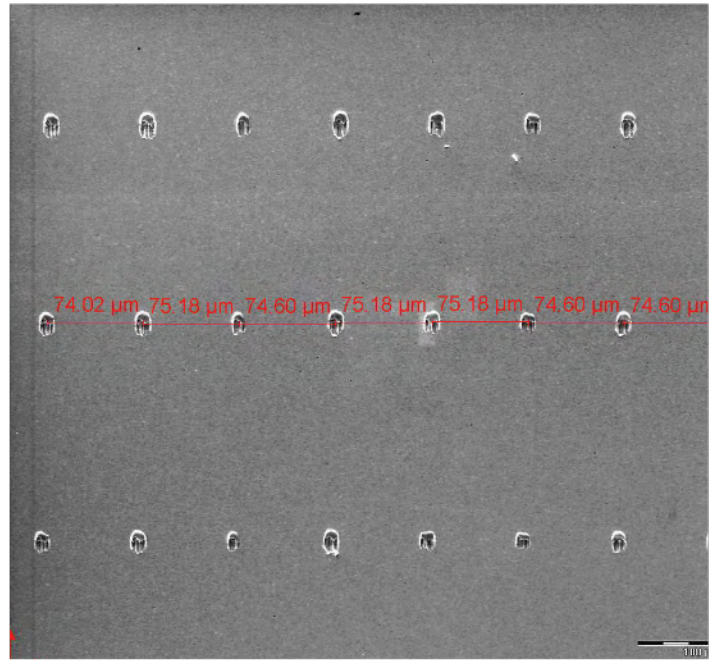
Small contact area of InfinityQuad tips.



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 $<1 \mu\text{m}$ 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 μ m 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 μ m 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 μ m 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 μ m pitch, 35 dB for 125-250 μ m pitch Configuration (DC – 0.5 GHz): LL (not separated by G) Minimum isolation: 20 dB for 75–100 μ m pitch, 25 dB for 125-250 μ m 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 μ m pitch GSP^ (DC – 10, 20 GHz): 3 dB for 75-100 μ m pitch, 4 dB for 125-250 μ m pitch PSP† (DC – 10 GHz): 3 dB for 75-250 μ m pitch PS* † (DC – 10 GHz): 4 dB for 75-250 μ m pitch SS* & (2 – 18 GHz): 4 dB for 100-250 μ m pitch |
| Return loss (includes Insertion loss ~ 1 dB of the 5" coaxial pigtail) | GS* (DC – 20 GHz): 13 dB for 75-250 μ m pitch GSP^ (DC – 10, 20 GHz): 13 dB for 75-250 μ m pitch PSP† (DC – 10 GHz): 11 dB for 75-250 μ m pitch PS* † (DC – 10 GHz): 10 dB for 75-250 μ m pitch SS* & (2 – 18 GHz): 10 dB for 100-250 μ m pitch |
| Minimum isolation | Configuration (DC – 20 GHz): SGS (separated by G) Minimum isolation: 30 dB for 75–250 μ m pitch Configuration (DC – 20 GHz): SS (not separated by G) Minimum isolation: 20 dB for 75–250 μ m 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 μ m pitch and measured as GS up to 20 GHz for 125-250 μ m 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 μ m pitch, 4 dB for 200-250 μ m pitch GQG (DC – 50 GHz): 4 dB for 75-150 μ m pitch, 5 dB for 200-250 μ m pitch GVG (DC – 67 GHz): 5 dB for 75-150 μ m pitch, 6 dB for 200-250 μ m pitch GWG (DC – 110 GHz): 7 dB for 75-100 μ m pitch, 8 dB for 125-150 μ m pitch GK* (DC – 40 GHz): 4 dB for 75-150 μ m pitch, 5 dB for 200-250 μ m pitch GQ* (DC – 50 GHz): 5 dB for 75-150 μ m pitch, 6 dB for 200-250 μ m pitch GV* (DC – 67 GHz): 6 dB for 75-150 μ m pitch, 7 dB for 200-250 μ m pitch |
| Return loss | GKG (DC – 40 GHz): 14 dB for 75-150 μ m pitch, 13 dB for 200-250 μ m pitch GQG (DC – 50 GHz): 13 dB for 75-150 μ m pitch, 12 dB for 200-250 μ m pitch GVG (DC – 67 GHz): 12 dB for 75-150 μ m pitch, 11 dB for 200-250 μ m pitch GWG (DC – 110 GHz): 11 dB for 75-100 μ m pitch, 10 dB for 125-150 μ m pitch GK* (DC – 40 GHz): 13 dB for 75-150 μ m pitch, 12 dB for 200-250 μ m pitch GQ* (DC – 50 GHz): 12 dB for 75-150 μ m pitch, 11 dB for 200-250 μ m pitch GV* (DC – 67 GHz): 11 dB for 75-150 μ m pitch, 10 dB for 200-250 μ m pitch |
| Minimum isolation: Contacts separated by G | KKG (DC – 40 GHz): 30 dB for 75-250 μ m pitch QQG (DC – 50 GHz): 30 dB for 75-250 μ m pitch VVG (DC – 67 GHz): 30 dB for 75-100 μ m pitch, 25 dB for 125-250 μ m pitch WVG (DC – 110 GHz) : 25 dB for 75-250 μ m pitch |
| Contacts not separated by G | KK (DC – 40 GHz): 20 dB for 75-100 μ m pitch, 25 dB for 125-250 μ m pitch QQ (DC – 50 GHz): 15 dB for 75-250 μ m pitch VV (DC – 67 GHz): 15 dB for 75-250 μ m pitch WW (DC – 110 GHz): 15 dB for 75-250 μ m pitch |

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

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

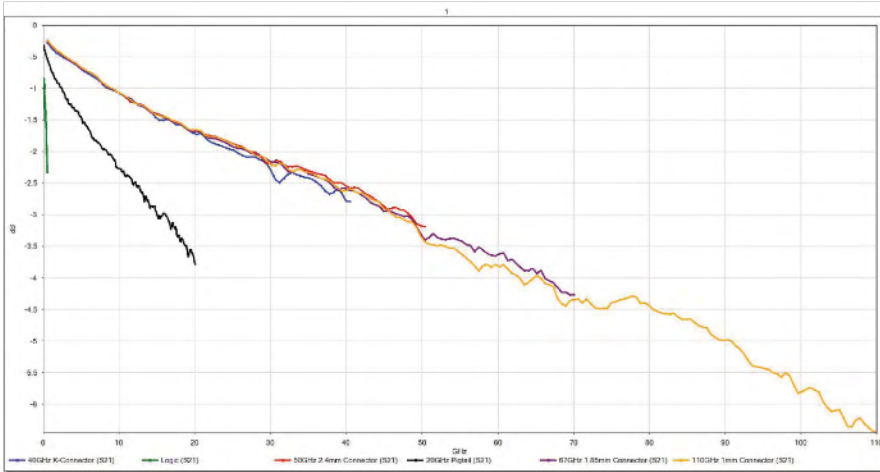
* The signal can be at the edges (1st or last) or be adjacent to any type, except G. If the adjacent type is a P, the specs only applies to pitches 125 -250 μ m and its measured as GSG.

➤ Maximum Pad Sizes

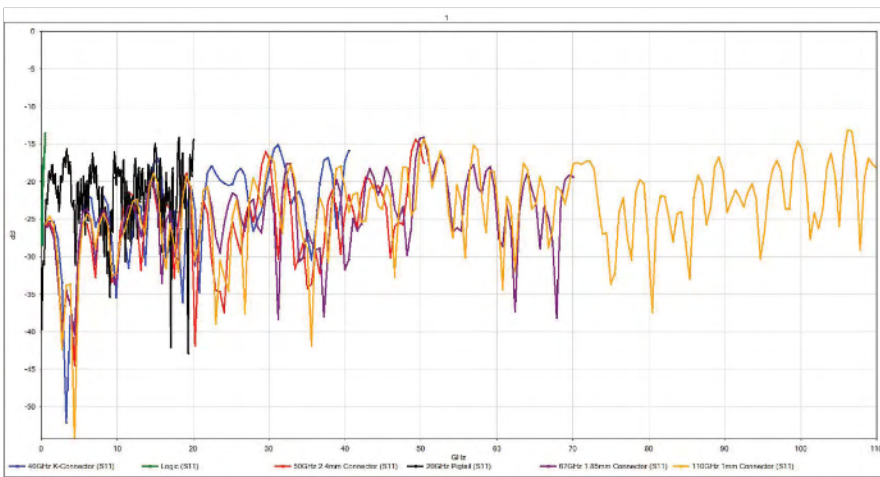
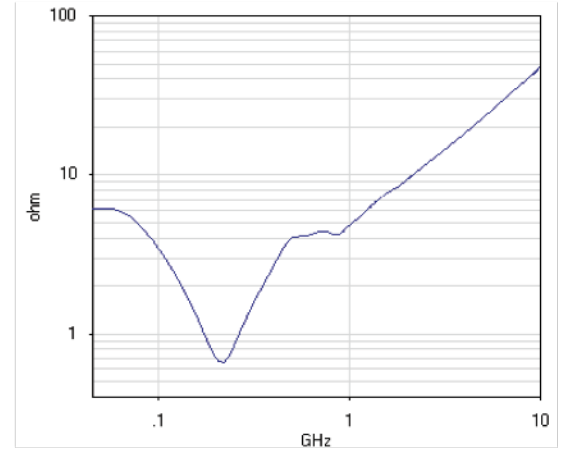
| Number of Contacts (including X) | 75 μm pitch | 80 μm pitch | 100 μm pitch | 125 μm pitch | 75 μm pitch | 150 μm pitch | 250 μm pitch |
|----------------------------------|------------------------|------------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|
| 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

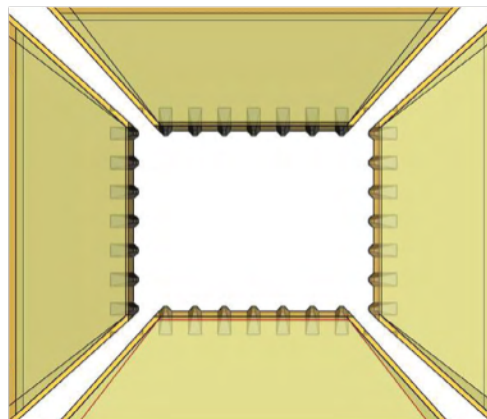
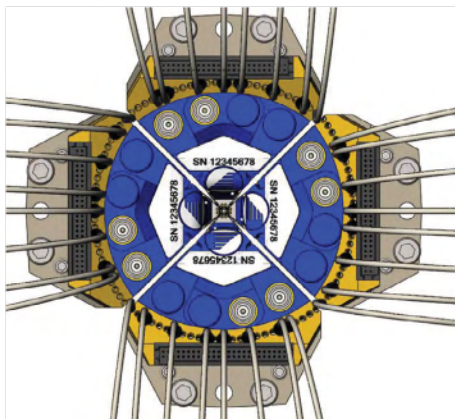


DC Power De-coupling Performance



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 IZI Probes®. Probing of corner pads is possible with equal pad spacing. For more details, see InfinityQuad Design Layout Rules.

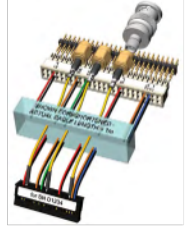


> Ordering Information

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 |

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