

TECHNICAL OVERVIEW

Power Limiters

N9355/6B: 10 MHz to 18 GHz
N9355/6C: 10 MHz to 18 GHz
N9355F: 10 MHz to 50 GHz
N9355G: 10 MHz to 54 GHz

Key Features

- Broad frequency range up to 54 GHz maximizes the operating range of your instrument
- High power protection prevents damage by undesired ESD and excess RF power – Exceptional return loss improves calibration accuracy
- Low insertion loss maximizes available power
- Bi-directional utilization eliminates orientation errors
- Integrated DC block provides protection from DC transients

Description

N935x Series of high-performance power limiters are designed for high volume manufacturers and R&D sectors in telecommunications, component test, and aerospace/ defense industries. Keysight Technologies power limiters provide the best broadband input protection from excess RF power, DC transients and ESD, for a variety of RF and microwave instruments and components. For example, the input circuitry of spectrum analyzers, network analyzers, frequency counters or amplifiers can be protected from unintentional inputs up to 3 watts average power. At even greater power levels, failure mode for the limiter is either an open circuit or a short circuit to ground, thereby protecting the instrument from damage.

KEYSIGHT TECHNOLOGIES

N9355B and N9356B

The Keysight N9355B and N9356B are 10 MHz to 18 GHz limiters that come with power limiting thresholds of 10 and 25 dBm, respectively. Both versions are furnished with a high-quality male and female Type-N connectors on each side.

N9355C and N9356C

The Keysight N9355C and N9356C are wideband 10 MHz to 26.5 GHz limiters that come with power limiting thresholds of 10 and 25 dBm, respectively. Both versions are furnished with a high-quality male and female 3.5 mm connector on each side.

N9355F

The Keysight N9355F is a wideband 10 MHz to 50 GHz limiter that comes with a power limiting threshold of 10 dBm. It is furnished with a high-quality male and female 2.4 mm connector on each side.

N9355G

The Keysight N9355G is a wideband 10 MHz to 54 GHz limiter that comes with a power limiting threshold of 23 dBm. It is furnished with a high-quality male and female 1.85 mm connector on each side.

Application

Our limiters offer superb low insertion loss and linear operation at low input levels while providing protection against transients or short duration overloads. Typical applications are shown in Figures 1 and 2. In Figure 1, port 2 of an ENA is protected from an inadvertent overload due to high- level signals from the amplifier under test. In Figure 2, the input mixer of a spectrum analyzer is protected from an inadvertent overload due to high-level signals from an antenna.

Keysight limiters also include a DC block integrated into both input and output ports that will block signals below 10 MHz and pass signals up to 54 GHz.

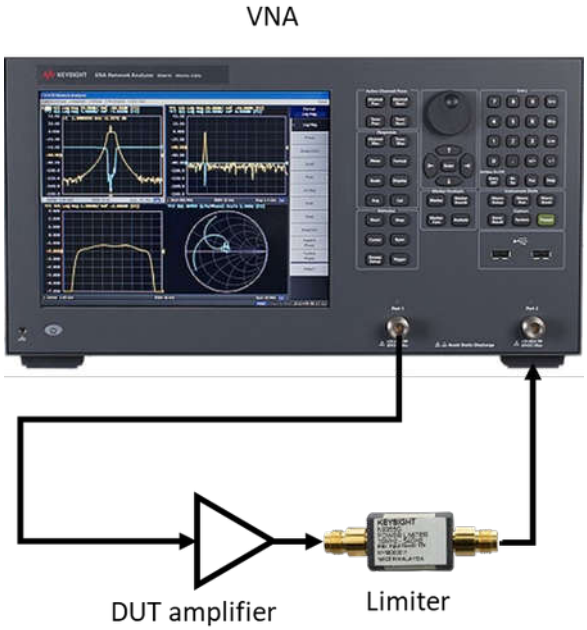


Figure 1. Typical application

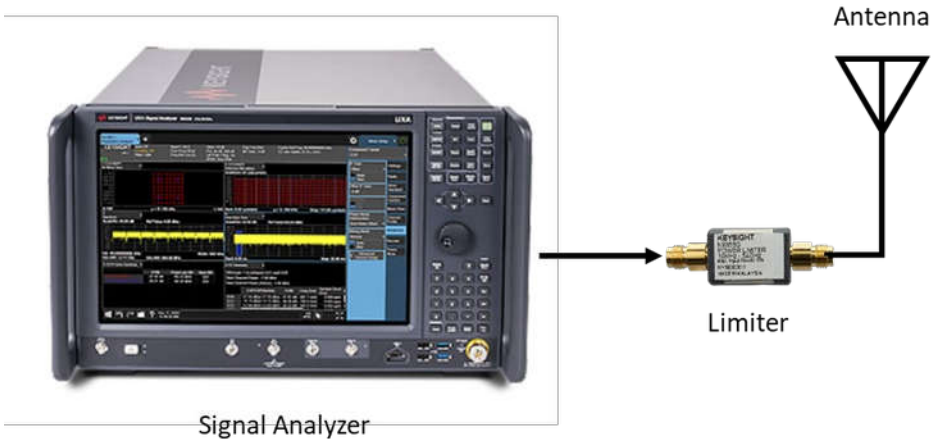


Figure 2. Typical application

Specifications

Specifications describe the limiter's warranted performance over the temperature range 0 to +55 °C (except where noted). Supplemental and typical characteristics are intended to provide typical but non-warranted performance parameters. These are denoted as "typical," "nominal" or "approximate."

Specifications	N9355/6B	N9355/6C	N9355F	N9355G
Frequency range	10 MHz to 18 GHz:	10 MHz to 26.5 GHz	10 MHz to 50 GHz	10 MHz to 54 GHz
Insertion loss	1.75 dB	N9355C: 2 dB N9356C: 2.25 dB	10 MHz to 26.5 GHz: 2 dB 26.5 to 40 GHz: 2.75 dB 40 to 50 GHz: 3.5 dB	10 to 30 MHz: 2.75 dB 30 MHz to 26.5 GHz: 2.75 dB 26.5 to 40 GHz: 3.5 dB 40 to 50 GHz: 4.5 dB 50 to 54 GHz: 6.0 dB
Return loss, (VSWR)	15 dB (1.43)[1]		10 dB (1.92)[1]	10 to 30 MHz: 8.5 dB (2.2) 30 MHz to 54 GHz: 9.5 dB (2.0)

Supplemental Specifications and Characteristic

Supplemental characteristics are intended to provide useful information. They are typical but non-warranted performance parameters

Specifications	N9355/6B	N9355/6C	N9355F	N9355G
Impedance	50 ohms			
Maximum input power levels (continuous)	N9355B: 1 W N9356B: 6 W	N9355C: 1 W N9356C: 4 W	0.63 W	1W
Limiting threshold	N9355B: 10 dBm N9356B: 25 dBm	N9355C: 10 dBm N9356C: 25 dBm	10 dBm	23 dBm
Maximum leakage power[2]	N9355B: 24 dBm N9356B: 27 dBm	N9355C: 24 dBm N9356C: 27 dBm	24 dBm	24 dBm
Maximum DC voltage	At 25 °C: 30 V, At 75 °C: 16			
Turn on time	< 100 ps			
Connectors	Type-N	3.5 mm	2.4 mm	1.85 mm

1. Return loss specification from 10 MHz to 30 MHz is 8.5 dB (VSWR: 2.2)
2. At maximum continuous input power level

Typical Performance

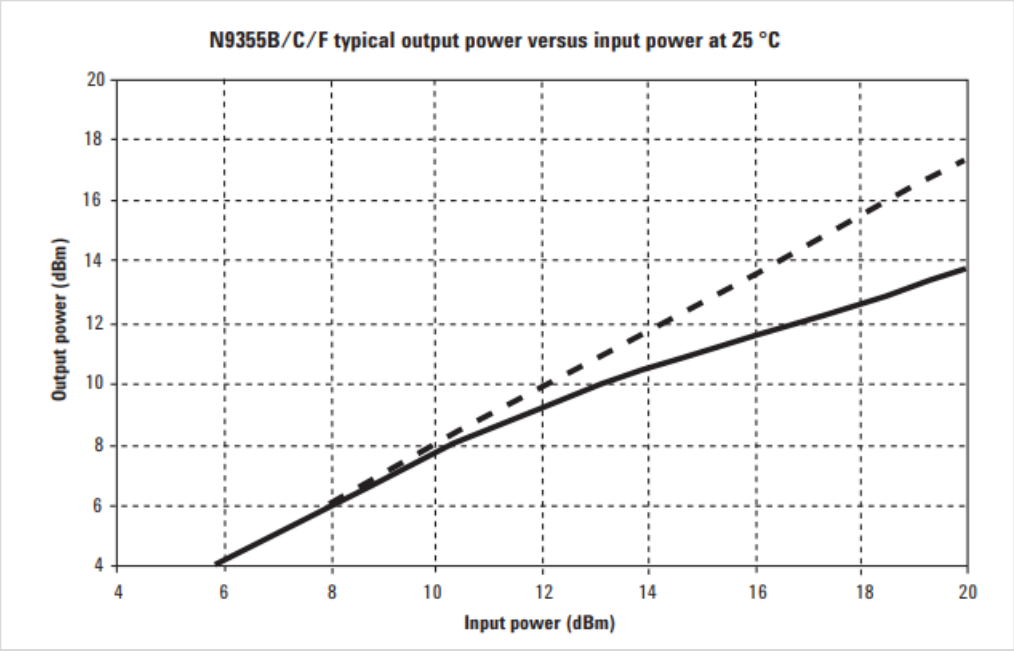


Figure 3. N9355B/C/F typical output versus input power

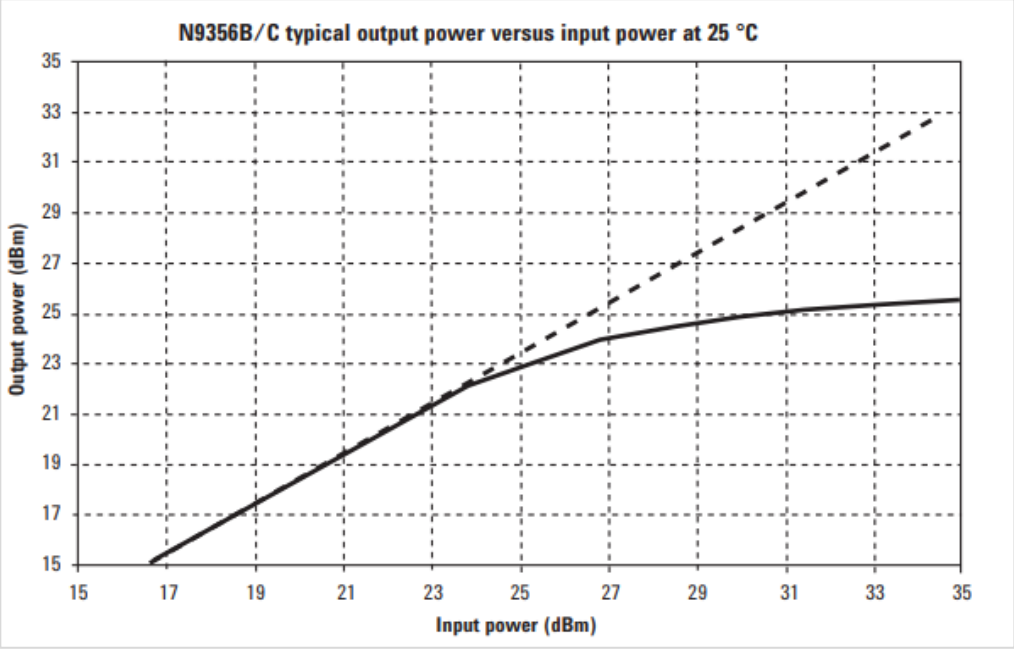


Figure 4. N9356B/C/F typical output versus input power

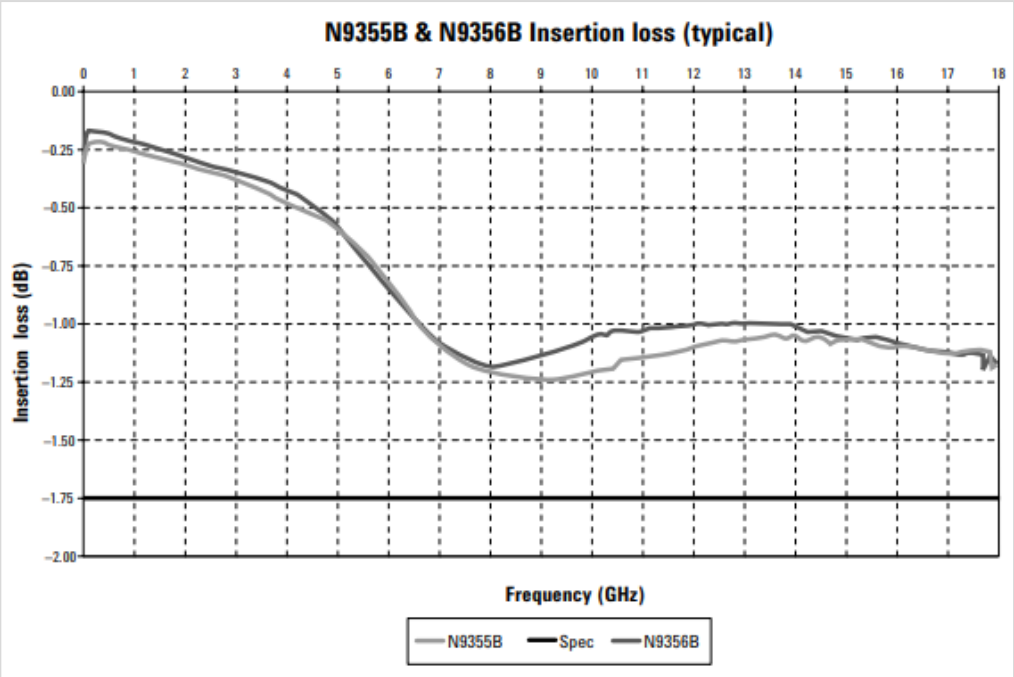


Figure 5. N9355/6B typical insertion loss versus frequency

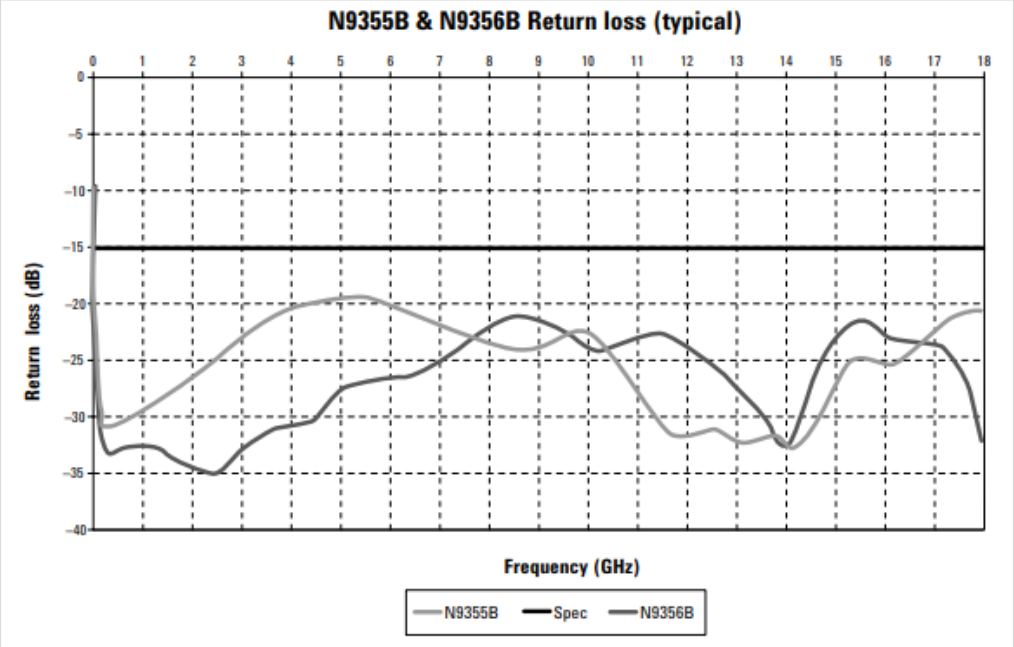


Figure 6. N9355/6B typical return loss versus frequency

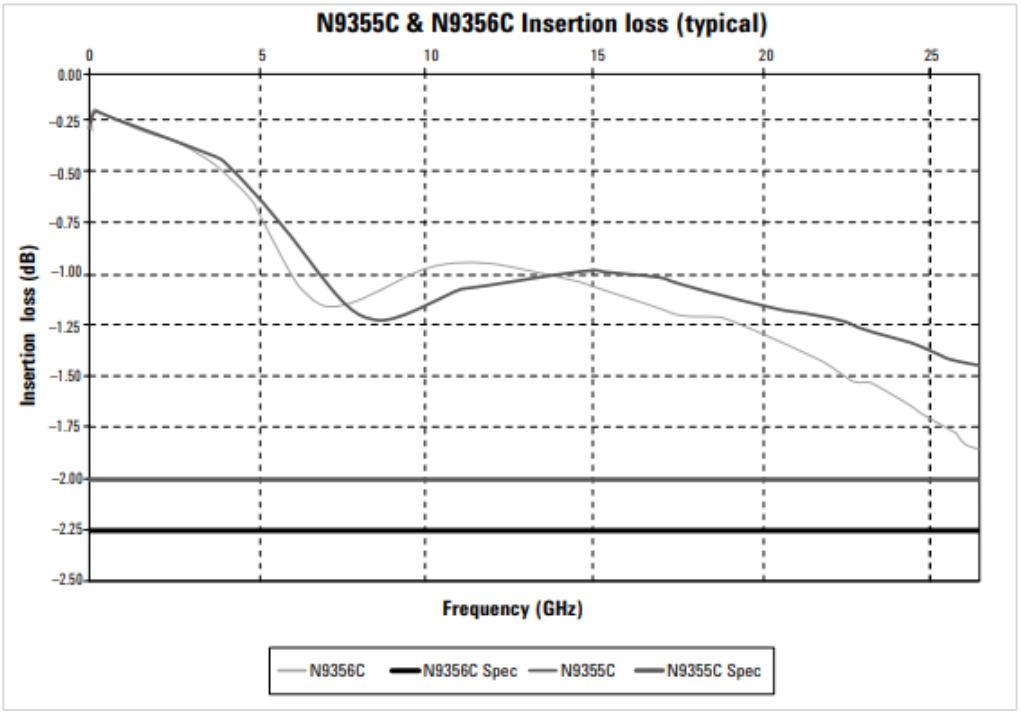


Figure 7. N9355/6C typical insertion loss versus frequency

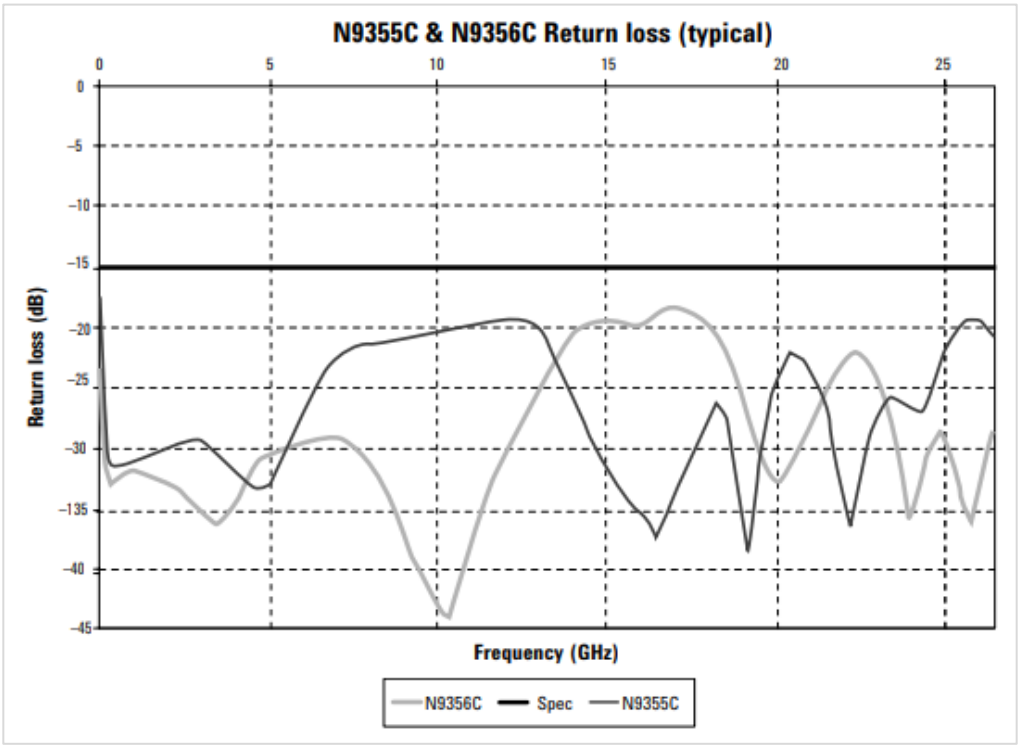


Figure 8. N9355/6C typical return loss versus frequency

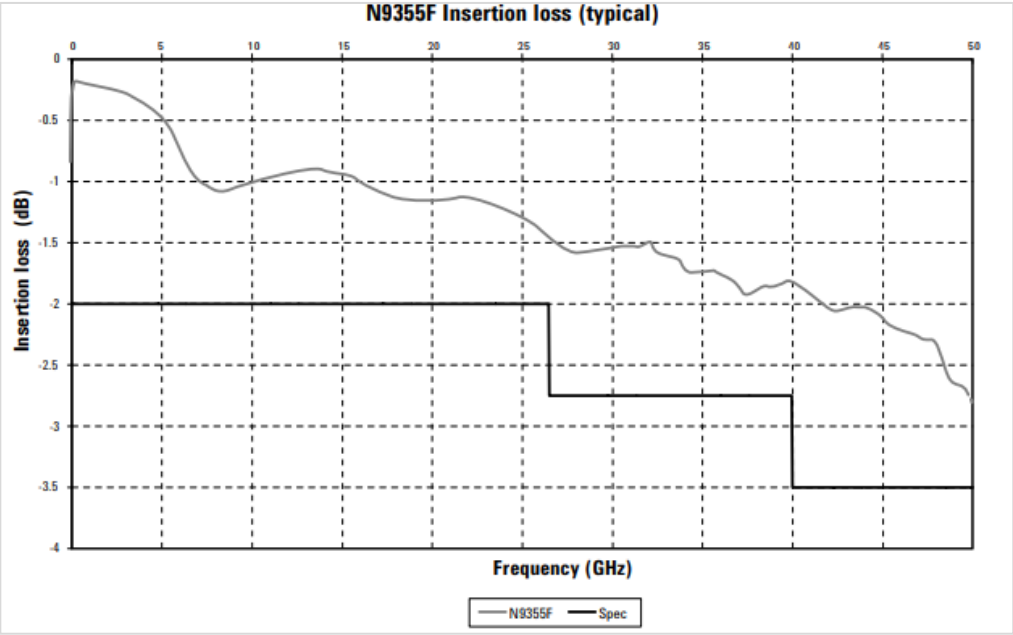


Figure 9. N9355F typical insertion loss versus frequency

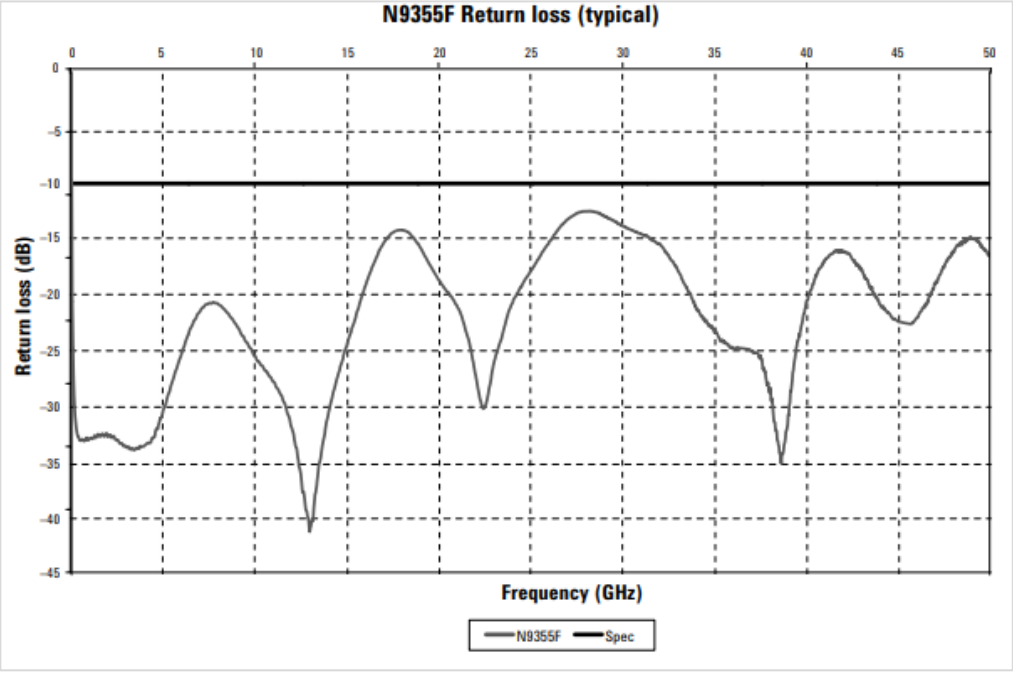


Figure 10. N9355F typical return loss versus frequency

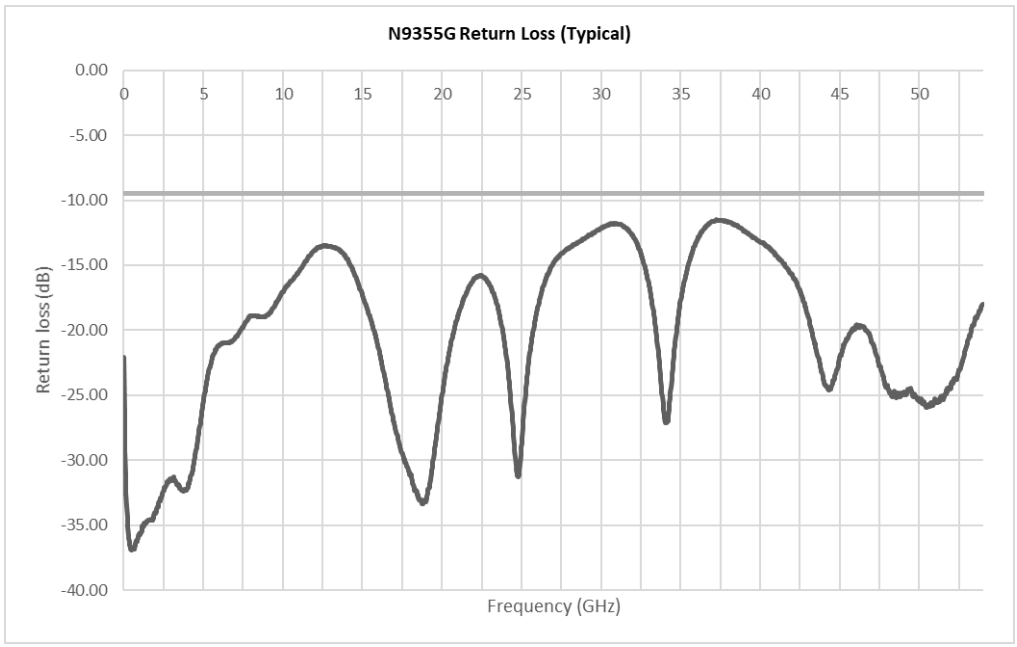


Figure 11. N9355G typical return loss versus frequency

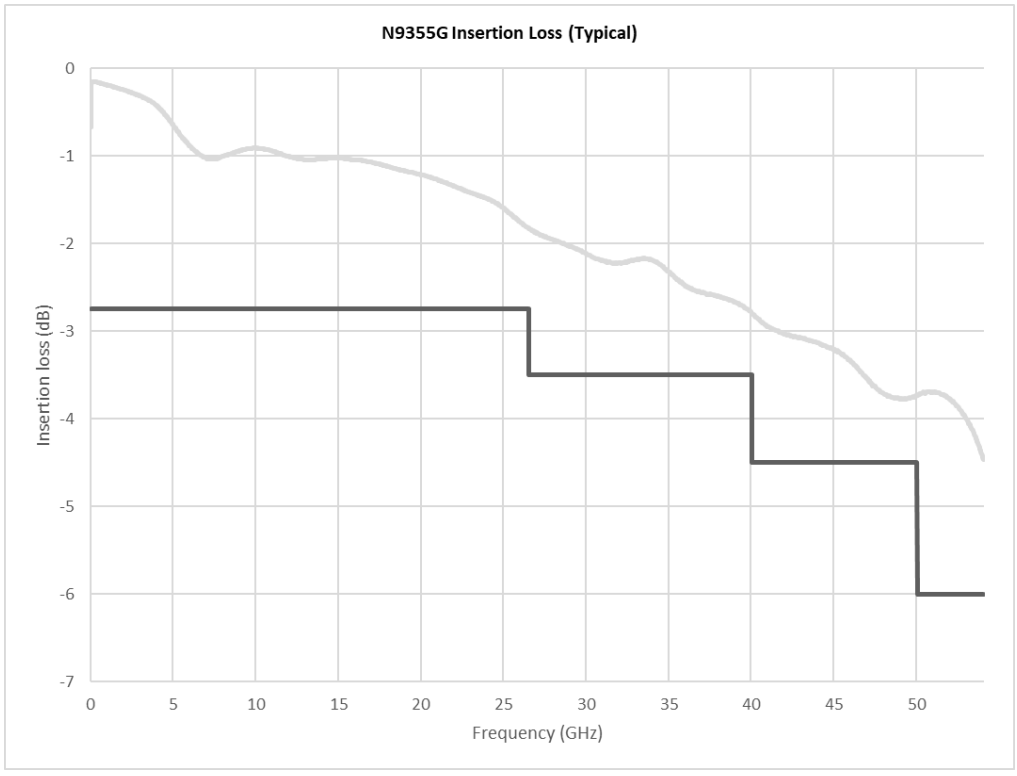


Figure 12. N9355G typical insertion loss versus frequency

Environmental specifications

The N9355/6x limiters are designed to fully comply with Keysight Technologies' product operating environment specifications. The following summarizes the environmental specifications for these products.

Environment condition	N9355/6B/C and N9355F
Temperature Operating Storage Cycling	 0 to +55 °C –40 to +70 °C –65 to +150 °C, 10 cycles at 20 °C per minute, 20 minutes dwell time per MIL-STD-833F, Method 1010.8, Condition C (modified)
Humidity Operating	85 °C and 85% RH, 10 days, per JESD22-A101-B (modified)
Shock Half-sine, smoothed	1000 G at 0.5 ms, 3 shock pulses per orientation, 18 total per MIL-STD-833F, Method 2002.4, Condition B (modified)
Vibration Broadband random	50 to 2000 Hz, 7.3 G rms, 15 minutes, per MIL-STD-833F, Method 2026-1 (modified)
Altitude Non-operating	15,000 feet / 4.6 km
ESD immunity	2.0 kV for N9355B/C/F per MIL-STD-833B center contact discharge 6.0 kV for N9356B/C per IEC1000-4-2 center contact discharge

Environment condition	N9355G
Temperature Operating Storage Cycling	 0 to +55 °C -40 to +70 °C -65°C to +150°C, 10 cycles @ 20°C per minute, 20 minutes dwell time per MIL-STD-833F, Method 1010.8, Condition C (modified)
Humidity Operating Condensation Resistance	 95% RH at 40°C, 24 hours cycling, 5 cycles 95% RH at -10°C to 25°C, Method 2 85% RH at 85°C, 10 Days per JEDEC HAST Standard
Shock End-user handling Mechanical Transportation	 Delta-V: 3m/s ±5%, Duration <3ms at 6 faces 1000 G @ 0.5 ms, 3 shock pulses per orientation, 18 total per MIL-STD-833F, Method 2002.4, Condition B (modified) 50g, delta-V: 8m/s at 6 faces
Vibration Survival random	 7.0 Grms, 50-2000 Hz
Altitude Operating Non-operating	 4,600 meters (15,092 feet) 4,600 meters (15,092 feet)
ESD immunity Contact discharge Air discharge	 6 kV (to center conductor) 15 kV (to outer conductor)

Mechanical Dimension

Dimensions are in mm (inches) nominal, unless otherwise specified

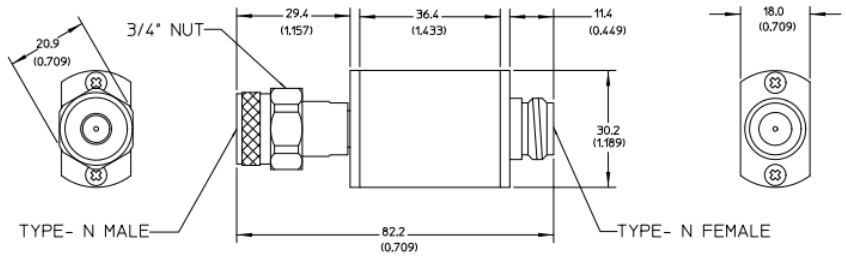


Figure 13. N9355/6B mechanical dimension

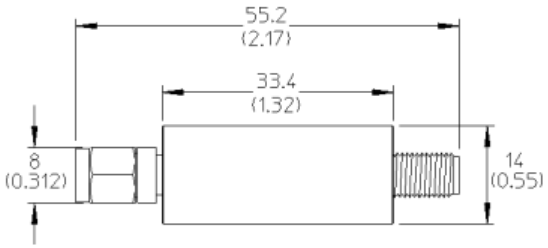


Figure 14. N9355/6C mechanical dimension

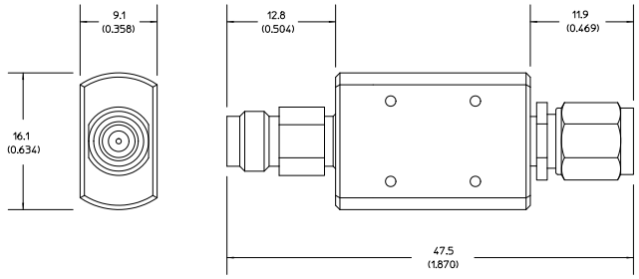


Figure 15. N9355F mechanical dimension

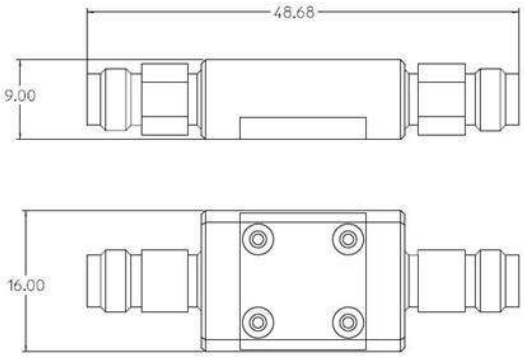


Figure 16. N9355G mechanical dimension

Ordering Information

Model	Description
N9355B	0.01 to 18 GHz power limiter with 10 dBm limiting threshold
N9355C	0.01 to 26.5 GHz power limiter with 10 dBm limiting threshold
N9356B	0.01 to 18 GHz power limiter with 25 dBm limiting threshold
N9356C	0.01 to 26.5 GHz power limiter with 25 dBm limiting threshold
N9355F	0.01 to 50 GHz power limiter with 10 dBm limiting threshold
N9355G	0.01 to 54 GHz power limiter with 23 dBm limiting threshold

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KEYSIGHT TECHNOLOGIES

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