# Impedance and Coupling

| | |
|---|---|
| Input impedance (software-selectable) | 50 Ω ± 2.0%<br>1 MΩ ± 0.75% in parallel with a nominal capacitance of 29 pF |
| Input coupling (software-selectable) | AC[1]<br>DC<br>GND |

# Voltage Levels

**Table 1.** Full Scale (FS) Input Range and Programmable Vertical Offset

| Range ($V_{pk-pk}$) | Vertical Offset Range | |
|---|---|---|
| | 50 Ω Input | 1 MΩ Input |
| 0.2 V | ±0.1 V | |
| 0.4 V | ±0.2 V | |
| 1 V | ±0.5 V | |
| 2 V | ±1 V | |
| 4 V | ±2 V | |
| 10 V | — | ±5 V |
| 20 V (1 MΩ only) | — | — |

| | |
|---|---|
| Maximum input overload | |
| 50 Ω | 7 $V_{rms}$ with \|Peaks\| ≤10 V |
| 1 MΩ | \|Peaks\| ≤42 V |

# Accuracy

| | |
|---|---|
| Resolution | 14 bits |

[1] AC coupling available on 1 MΩ input only.

**Table 2.** DC Accuracy[2], Warranted

| Input Range ($V_{pk-pk}$) | DC Accuracy |
|---|---|
| 0.2 V and 0.4 V | ±(0.65% of input + 1.0 mV) |
| 1 V | ±(0.65% of input + 1.2 mV) |
| 2 V | ±(0.65% of input + 1.6 mV) |
| 4 V and 10 V | ±(0.65% of input + 8.0 mV) |
| 20 V (1 MΩ only) | ±(0.65% of input + 13.0 mV) |

Programmable vertical offset accuracy[3] ±0.5% of offset setting, Warranted

**Table 3.** DC Drift, nominal

| Input Range ($V_{pk-pk}$) | 50 Ω and 1 MΩ |
|---|---|
| 0.2 V, 0.4 V, 1 V, and 2 V | ±(0.057% of input + 0.006% of FS + 100 µV) per °C |
| 4 V, 10 V | ±(0.057% of input + 0.006% of FS + 900 µV) per °C |
| 20 V (1 MΩ only) | |

AC amplitude accuracy

- 50 Ω: ±0.06 dB (±0.7%) at 50 kHz
- 1 MΩ: ±0.09 dB (±1.0%) at 50 kHz

Crosstalk[4] ≤-100 dB at 10 MHz

# Bandwidth and Transient Response

Bandwidth (±3 dB)[5]

- 0.2 V input range: 80 MHz up to 40 °C,[6] warranted
- All other input ranges: 100 MHz, warranted

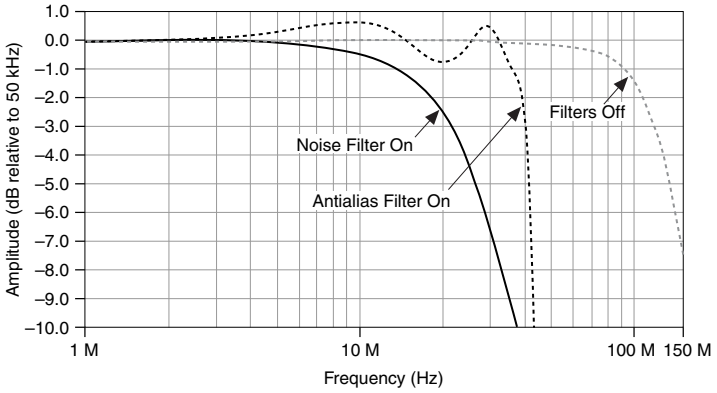
[2] Programmable vertical offset = 0 V. Within ±5 °C of self-calibration temperature.
[3] Within ±5 °C of self-calibration temperature.
[4] CH 0 to/from CH 1 and External Trigger to CH 0 or CH 1.
[5] Filters off.
[6] 78 MHz above 40 °C.

| | |
|---|---|
| Rise/fall time | |
| 0.2 V input range | 4.2 ns |
| All other input ranges | 3.5 ns |
| Bandwidth limit filters[7] | |
| Noise filter (2-pole Bessel) | 20 MHz |
| Anti-alias filter (6-pole Chebyshev) | 40 MHz (-6 dB)<br>35 MHz (±3 dB), warranted |
| AC coupling cutoff (-3 dB)[8] | 12 Hz |

**Table 4.** Passband Flatness[9]

| Filter Settings | Input Range ($V_{pk-pk}$) | 50 Ω and 1 MΩ |
|---|---|---|
| Filters off | 0.2 V | ±0.4 dB (DC to 20 MHz)<br>±1 dB (20 MHz to 40 MHz) |
| | All other input ranges | ±0.4 dB (DC to 20 MHz)<br>±1.0 dB (20 MHz to 50 MHz) |
| Anti-alias filter on | All ranges | ±1.2 dB (DC to 16 MHz)<br>±1.6 dB (16 MHz to 32 MHz) |

**Figure 1.** PXIe-5122 Frequency Response, Measured




[7] Only one filter can be enabled at any given time. The anti-alias filter is enabled by default.
[8] AC coupling available on 1 MΩ input only.
[9] Referenced to 50 kHz.

# Spectral Characteristics

**Table 5.** Spurious-Free Dynamic Range with Harmonics (SFDR)[10]

| Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ |
|---|---|---|
| 0.2 V | 75 dBc | 70 dBc |
| 0.4 V | 75 dBc | 70 dBc |
| 1 V | 75 dBc | 70 dBc |
| 2 V | 75 dBc | 70 dBc |
| 4 V | 65 dBc | 70 dBc |
| 10 V | 65 dBc | 60 dBc |
| 20 V | — | 60 dBc |

**Table 6.** Total Harmonic Distortion (THD)[11]

| Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ |
|---|---|---|
| 0.2 V | -75 dBc | -68 dBc |
| 0.4 V | -75 dBc | -68 dBc |
| 1 V | -75 dBc | -68 dBc |
| 2 V | -73 dBc | -68 dBc |
| 4 V | -63 dBc | -68 dBc |
| 10 V | -63 dBc | -58 dBc |
| 20 V | — | -58 dBc |

Intermodulation distortion[12] -75 dBc

[10] 10 MHz, -1 dBFS input signal. Includes the 2nd through the 5th harmonics. Measured from DC to 50 MHz.

[11] 10 MHz, -1 dBFS input signal. Includes the 2nd through the 5th harmonics.

[12] 0.2 V to 2.0 V input range. 50 Ω input impedance. Two tones at 10.2 MHz and 11.2 MHz. Each tone is -7 dBFS.

**Table 7.** Signal-to-Noise Ratio (SNR)[13]

| Range ($V_{pk-pk}$) | 50 Ω | | 1 MΩ | |
|---|---|---|---|---|
| | Filters Off | Anti-alias Filter On | Filters Off | Anti-alias Filter On |
| 0.2 V | 60 dB | 60 dB | 56 dB | 60 dB |
| 0.4 V | 62 dB | 62 dB | 61 dB | 62 dB |
| 1 V | 62 dB | 62 dB | 62 dB | 62 dB |
| 2 V | 62 dB | 62 dB | 62 dB | 62 dB |
| 4 V | — | — | 61 dB | 62 dB |

**Table 8.** Signal to Noise and Distortion (SINAD)[14]

| Range ($V_{pk-pk}$) | 50 Ω | | 1 MΩ | |
|---|---|---|---|---|
| | Filters Off | Anti-alias Filter On | Filters Off | Anti-alias Filter On |
| 0.2 V | 60 dB | 60 dB | 56 dB | 59 dB |
| 0.4 V | 62 dB | 62 dB | 60 dB | 61 dB |
| 1 V | 62 dB | 62 dB | 61 dB | 61 dB |
| 2 V | 62 dB | 62 dB | 61 dB | 61 dB |
| 4 V | — | — | 60 dB | 61 dB |

[13] 10 MHz, -1 dBFS input signal. Excludes harmonics. Measured from DC to 50 MHz.
[14] 10 MHz, -1 dBFS input signal. Includes harmonics. Measured from DC to 50 MHz.

**Figure 2.** PXIe-5122 Dynamic Performance, 50 Ω, 1 V Range, Measured

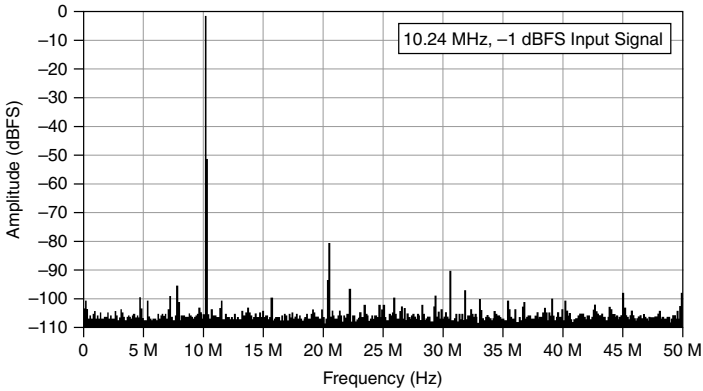



**Table 9.** RMS Noise (Noise Filter On)[15]

| Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ |
|---|---|---|
| 0.2 V | 46 $\mu V_{rms}$ (0.023% FS) | 60 $\mu V_{rms}$ (0.030% FS) |
| 0.4 V | 92 $\mu V_{rms}$ (0.023% FS) | 92 $\mu V_{rms}$ (0.023% FS) |
| 1 V | 230 $\mu V_{rms}$ (0.023% FS) | 230 $\mu V_{rms}$ (0.023% FS) |
| 2 V | 460 $\mu V_{rms}$ (0.023% FS) | 460 $\mu V_{rms}$ (0.023% FS) |
| 4 V | 920 $\mu V_{rms}$ (0.023% FS) | 920 $\mu V_{rms}$ (0.023% FS) |
| 10 V | 2.3 $mV_{rms}$ (0.023% FS) | 2.3 $mV_{rms}$ (0.023% FS) |
| 20 V | — | 4.6 $mV_{rms}$ (0.023% FS) |

**Table 10.** RMS Noise (Anti-alias Filter On)[15]

| Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ |
|---|---|---|
| 0.2 V | 66 $\mu V_{rms}$ (0.033% FS) | 80 $\mu V_{rms}$ (0.040% FS) |
| 0.4 V | 100 $\mu V_{rms}$ (0.025% FS) | 120 $\mu V_{rms}$ (0.030% FS) |
| 1 V | 250 $\mu V_{rms}$ (0.025% FS) | 300 $\mu V_{rms}$ (0.030% FS) |
| 2 V | 500 $\mu V_{rms}$ (0.025% FS) | 600 $\mu V_{rms}$ (0.030% FS) |
| 4 V | 1 $mV_{rms}$ (0.025% FS) | 1.2 $mV_{rms}$ (0.030% FS) |

[15] 50 Ω terminator connected to input.