8751 VSG

TECHNICAL SPECIFICATIONS

z8751
Vector Signal Generator
PXI, PXIe

LITEPOINT

Port Descriptions

Front Panel

Label	Type	Description
I OUT +,-	SMA	Differential baseband I output
Q OUT +,-	SMA	Differential baseband Q output
EXT IN	SMB	External input for trigger or reference
EXT OUT	SMB	External output for trigger, reference or event
RF OUT	SMA	RF output
LO IN	SMA	Local oscillator input
DIO[1]	Header, 8-pin, 0.05” spacing	Digital input/output, 4-signal (e.g. MIPI, SPI, I2C)

[1]DIO connector available only on PXIe product revision 3 and later.

RF Output

RF Output Channel

Specification	Value
RF Channel	One single-ended output, RF OUT
Output Impedance	50 Ω, nominal
Output VSWR** (250 MHz to 6 GHz, RF Level < 0 dBm)	≤ 1.4:1
Connector	SMA

RF Output Frequency

Specification	Value
Output Frequency Range	250 MHz to 6 GHz
Output Frequency Resolution	1 Hz
Output Frequency Switching Speed	≤ 1 ms, end-to-end

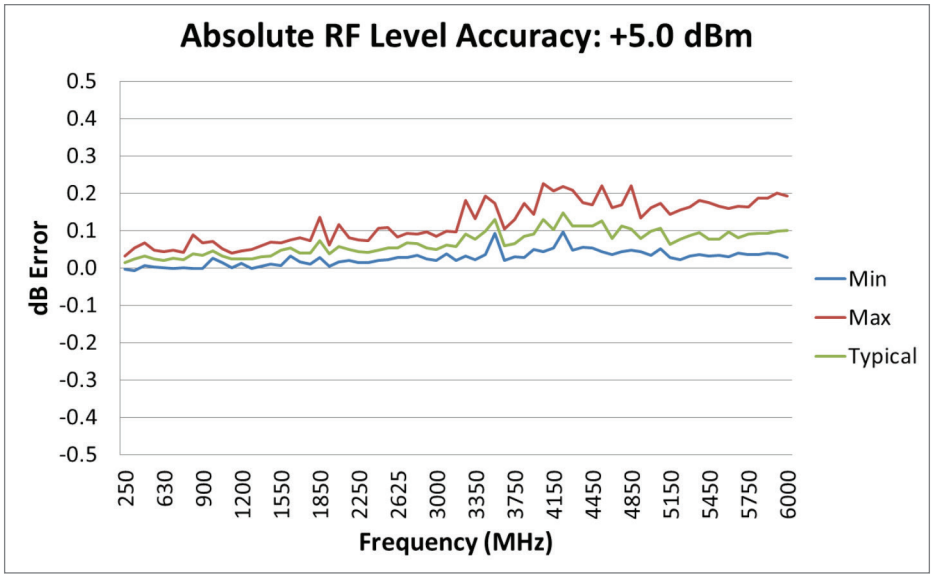
RF Output Level

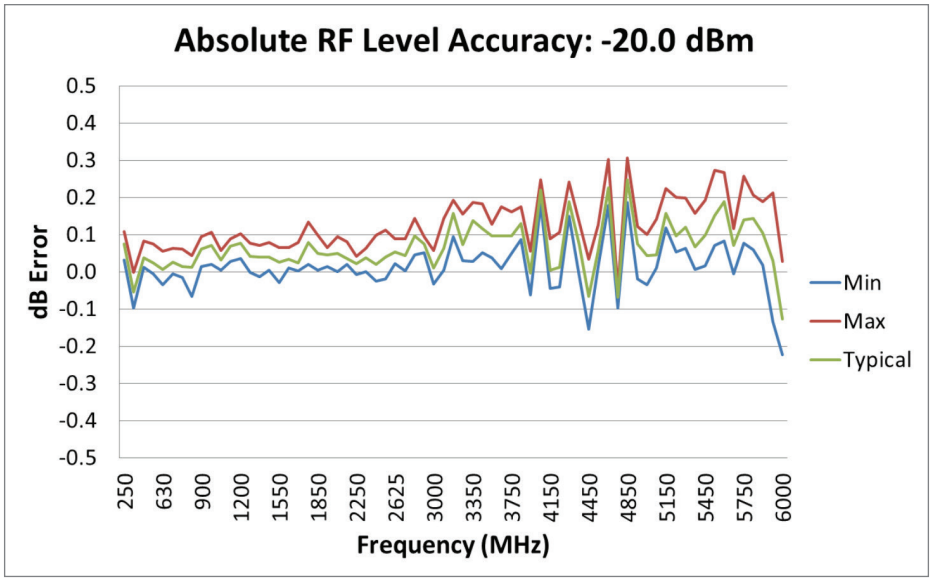
Specification	Value
Output Level Control Range (Peak Power)	-120 dBm to +20 dBm[2]
Output Level Resolution	0.01 dB
Output Absolute Level Accuracy (25°C ambient) RF Level +10 dBm to -80 dBm RF Level -80 dBm to -105 dBm RF Level -105 dBm to -120 dBm	 ≤ ±0.5 dB (≤ ±0.25 dB Typical)[3] ≤ ±0.75 dB (≤ ±0.5 dB Typical) ≤ ±1.5 dB (≤ ±1.0 dB Typical)
Output Relative Level Accuracy (25°C ambient) RF Level +10 dBm to -80 dBm RF Level -80 dBm to -105 dBm RF Level -105 dBm to -120 dBm	 ≤ ±0.2 dB (≤ ±0.1 dB Typical)[4] ≤ ±0.5 dB (≤ ±0.25 dB Typical) ≤ ±1.5 dB (≤ ±1.0 dB Typical)
Digital Scaling (digital level adjust by command)	0 to -20 dB usable range 0.01 dB relative accuracy 0.01 dB resolution (up to -3 dB) 0.08 dB resolution (up to -20 dB)
Output Level Temperature Drift**	-0.04 dB/°C
Output Level Switching Speed	≤ 1 ms, end-to-end

[2] For modulated signal generation, the crest factor limits the maximum average power output for linear operation

[3] Limited to +9 dBm above 5.8 GHz (see Maximum RF output level specification)

[4] Limited to +9 dBm above 5.8 GHz (see Maximum RF output level specification)


Absolute RF Level Accuracy: +5.0 dBm
dB Error
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
250
630
900
1200
1550
1850
2250
2625
3000
3350
3750
4150
4450
4850
5150
5450
5750
6000
Frequency (MHz)
Min
Max
Typical


Absolute RF Level Accuracy: -20.0 dBm
dB Error
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
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250
630
900
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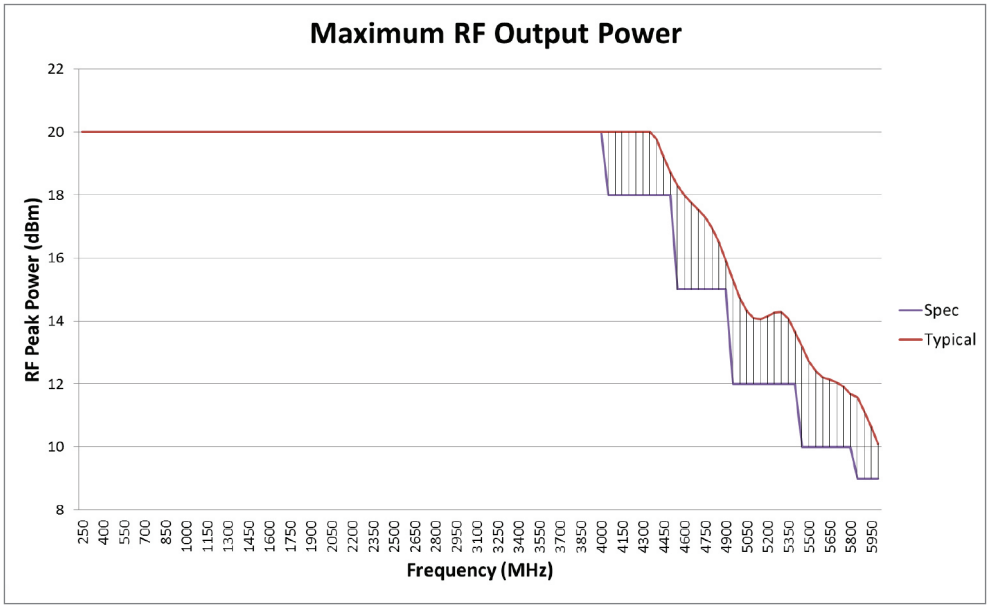
1550
1850
2250
2625
3000
3350
3750
4150
4450
4850
5150
5450
5750
6000
Frequency (MHz)
Min
Max
Typical

Maximum RF Output Level

Specification	Value
Max Leveled RF Output Power (Peak Power)	
250 MHz to 4000 MHz	+20 dBm
4000 MHz to 4500 MHz	+18 dBm
4500 MHz to 4900 MHz	+15 dBm
4900 MHz to 5400 MHz	+12 dBm
5400 MHz to 5800 MHz	+10 dBm
5800 MHz to 6000 MHz	+9 dBm (+10 dBm Typical)



RF Output Instantaneous IF Bandwidth

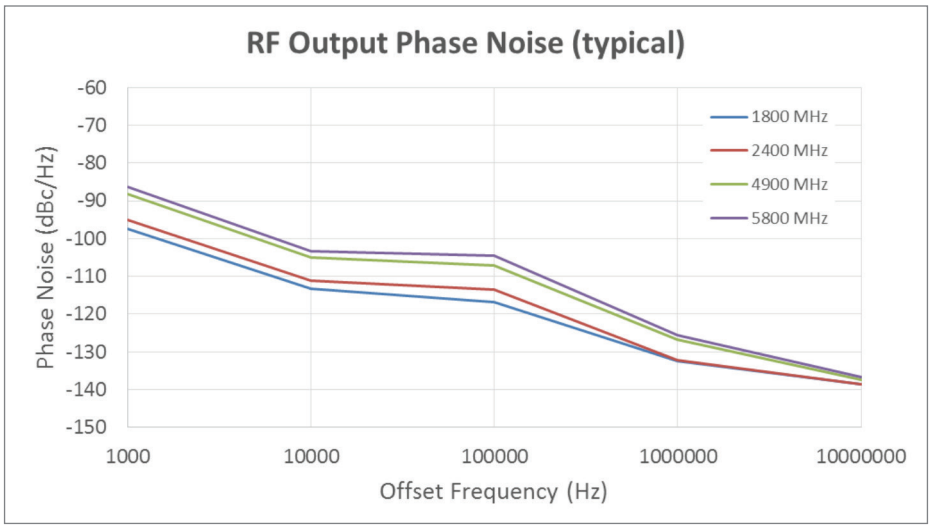
Specification	Value
IF Modulation Bandwidth (-3 dB)	Up to 500 MHz (f0 ± 250 MHz)
IF Magnitude Flatness (f0 ± 225 MHz)	≤ ±1 dB
IF Phase Linearity (f0 ± 225 MHz)	≤ ±2°

RF Output Dynamic Performance

Specification	Value
Spurious-Free Dynamic Range (excluding harmonics)	≥ 75 dBc
Third-Order Intermodulation Distortion (IM3)	≥ 60 dBc
RF Output Harmonics	≤ -40 dBc

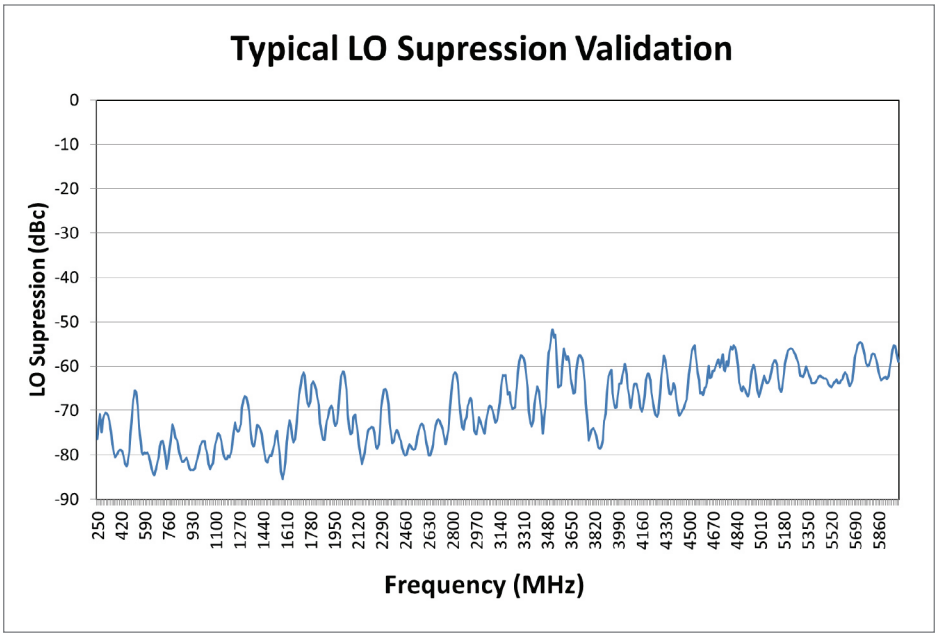
RF Output Single Sideband (SSB) Phase Noise

Specification	Center Frequency	Value	Typical
Phase Noise, SSB, 10 kHz Offset	1800 MHz	-110 dBc/Hz	-113 dBc/Hz
	2400 MHz	-108 dBc/Hz	-111 dBc/Hz
	4900 MHz	-103 dBc/Hz	-105 dBc/Hz
	5800 MHz	-101 dBc/Hz	-103 dBc/Hz



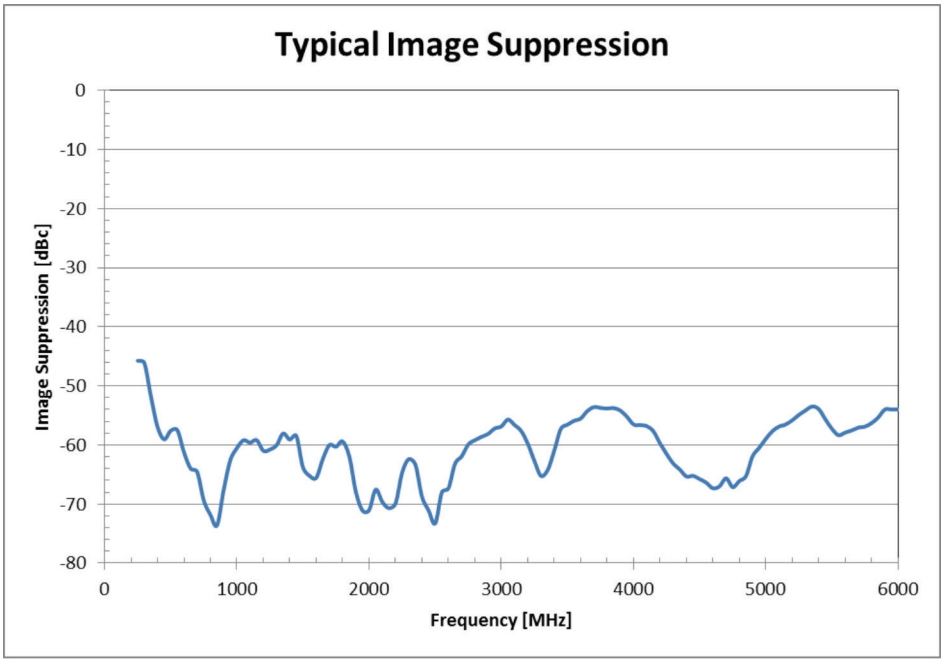
LO Residual Power

Specification	Value	Typical
LO Suppression Temperature Compensated 0°C to +50°C (internal LO using factory calibration)		
250 MHz to 1000 MHz	-60 dBc	-70 dBc
1000 MHz to 3000 MHz	-55 dBc	-60 dBc
3000 MHz to 4000 MHz	-50 dBc	-55 dBc
4000 MHz to 5000 MHz	-45 dBc	-50 dBc
5000 MHz to 6000 MHz	-40 dBc	-55 dBc



Residual Sideband Image

Reference Level	Value	Typical
Image Suppression Temperature Compensated 0°C to +50°C (factory calibration)		
250 MHz to 375 MHz	-45 dBc	-50 dBc
375 MHz to 3000 MHz	-55 dBc	-60 dBc
3000 MHz to 6000 MHz	-50 dBc	-55 dBc



Local Oscillator Input

Local Oscillator (LO) Input Channel

Specification	Value
LO Channel	One single-ended input, LO IN
Input Impedance	50 Ω, nominal
Input VSWR**	≤ 1.6:1, 250 MHz to 6 GHz
Connector	SMA
Expected Input Level	+4 dBm nominal, ±3 dB

I/Q Outputs

I/Q Output Channels

Specification	Value
I/Q Channels	Two Differential Outputs, I± OUT and Q± OUT
Output Impedance Single-ended Differential	 50 Ω 100 Ω
Output VSWR, DC to 250 MHz**	≤1.3:1
Connectors	SMA

I/Q Output Voltage and Current

Specification	Value
Absolute Maximum Output (no damage)**	
Single-ended Voltage (no load)	± 5 V
Differential Voltage (no load)	± 10 Vd
Output Current	Indefinite Short to Ground
Output Voltage Limit (no clipping)	
Single-ended (no load)	±3 V
Differential (no load)	±6 Vd
Output Voltage Ranges	
Single-ended (no load)	40 mVpp to 4 Vpp
Differential (no load)	80 mVppd to 8 Vppd
Output Voltage Range Adjustment Resolution	
Single-ended (no load)	
Range: 250 mVpp to 4 Vpp	0.05%
Range: 80 mVpp to 250 mVpp	250 µV
Differential (no load)	
Range: 500 mVppd to 8 Vppd	0.1%
Range: 80 mVppd to 500 mVppd	500 µV
Output Voltage Range Accuracy (no load)	
80 mVppd to 8 Vppd	≤ ± (0.1% + 1 mV)
Temperature Coefficient (per °C)**	≤ ± 0.005% of range
Output Current**	
Linear Operation	±50 mA
Maximum (outputs short circuited)	±200 mA

I/Q Output DC Offset Adjustment

Specification	Value
Output Common Mode Offset Adjustment (no load)	
Resolution	100 µV resolution
Output Common Mode Offset Accuracy (no load)	
| CM Offset | ≤ 3.0V	≤ ±500 µV
Temperature Coefficient (per °C)**	≤ ±0.005% of offset
Output Differential Offset Adjustment (no load)	± 1 V
Resolution	35 µV
Output Differential Offset Accuracy (no load)	
| Diff Offset | ≤ 0.98V	≤ ±500 µV
| Diff Offset | > 0.98V	≤ ±5 mV
Temperature Coefficient (per °C)**	≤ ±0.0025% of offset

I/Q Output Frequency Response

Specification	Value
Analog Bandwidth, I or Q Passband Flatness (±0.5 dB) -3 dB Bandwidth Stopband Rejection	 DC to 165 MHz DC to 250 MHz ≥ 50 dB at 500 MHz
I/Q Complex Modulation Bandwidth -3 dB Bandwidth	 up to 500 MHz
I/Q Channel-to-Channel Isolation DC to 80 MHz DC to 165 MHz > 165 MHz	 ≥ 70 dB ≥ 60 dB ≥ 55 dB
I/Q Channel-to-Channel Match, DC to 100 MHz Magnitude Time Skew	 < ±0.05 dB, <±0.01 dB typical < ±25 ps, <±10 ps typical

I/Q Output Dynamic Performance

Specification	Limit Value	Typical Value
Spurious-Free Dynamic Range (excluding harmonics) 10.7 MHz, 100 Ω load		
2 Vppd	≥ 74 dBc	81 dBc
1 Vppd	≥ 69 dBc	77 dBc
500 mVppd	≥ 64 dBc	73 dBc
200 mVppd	≥ 60 dBc	67 dBc
100 mVppd	≥ 58 dBc	65 dBc
40 mVppd	≥ 52 dBc	61 dBc
Total Harmonic Distortion (2nd - 6th harmonics) 1.8 Vppd, 100 Ω load		
1 MHz	≥ 71 dBc	78 dBc
10.7 MHz	≥ 72 dBc	78 dBc
20.7 MHz	≥ 70 dBc	73 dBc
40.7 MHz	≥ 62 dBc	65 dBc
80.7 MHz	≥ 55 dBc	60 dBc
Third-Order Intermodulation Distortion (IM3) two-tones ±100 kHz, 10.7 MHz, 100 Ω load		
1 Vppd per tone	≥ 66 dBc	77 dBc
500 mVppd per tone	≥ 71 dBc	83 dBc
250 mVppd per tone	≥ 76 dBc	88 dBc
100 mVppd per tone	≥ 78 dBc	91 dBc
50 mVppd per tone	≥ 87 dBc	101 dBc
20 mVppd per tone	≥ 90 dBc	106 dBc
Output Noise Floor	≤ -142 dBm/Hz	-144 dBm/Hz
Phase Noise at 10.7 MHz, Internal Timebase		
1 kHz offset (PXI)	≤ -110 dBc/Hz	-119 dBc/Hz
1 kHz offset (PXIe)	≤ -110 dBc/Hz	-113 dBc/Hz
10 kHz offset	≤ -125 dBc/Hz	-127 dBc/Hz
100 kHz offset	≤ -128 dBc/Hz	-130 dBc/Hz
1 MHz offset	≤ -127 dBc/Hz	-129 dBc/Hz

I/Q Digital-to-Analog Converter (DAC)

Specification	Value
DAC Configuration	Simultaneous Sampling Dual DAC
DAC Vertical Resolution	16 bits 0.0015% of Full-Scale Range
DAC Clock Frequency (simultaneous I/Q sampling)	1 GS/s 2x or 4x DAC interpolation
DAC Clock Jitter**	≤ 500 fs rms
I/Q Data Rate (simultaneous I & Q)	250 MS/s or 500 MS/s
I/Q Data Memory Total Memory Memory per I/Q Channel	 512 MiByte total, 128 MiSample (134,217,724 Samples)
I/Q Waveform Size (matched I/Q sizes)	16 Sample to 128 MiSample 4 Sample resolution
I/Q Waveform Types	DC, Sine, Arbitrary
I/Q Center Frequency	DC to ± 500 MHz
I/Q Phase Adjustment (I to Q)	± 30°, π/6 radians
I/Q Delay Adjustment (I to Q)	± 100 ps

Timebase Reference

Specification	Value
Timebase Frequency	100 MHz or 10 MHz
Timebase Source	Internal TCXO External Input (front panel) PXI/PXIe Backplane
Internal TCXO Timebase Accuracy	≤ ± 2.5 ppm
Timebase Output (10 MHz only)	External Output (front panel)

Modes of Operation

Arbitrary Waveforms Only

Specification	Value
Operation Mode Continuous Burst	 Generate waveform continuously Generate waveform once
Trigger Mode Immediate Triggered	 Start immediately Start upon trigger event
Stop Mode Immediate (hard stop) Upon end of waveform (soft stop)	 Stop immediately Stop at end of waveform

Trigger

Specification	Value
Trigger Source	External Input (front panel), PXI/PXIe Backplane Trigger 0-7, PXI/PXIe Backplane Star Trigger, Internal Trigger, Software
Trigger Edge	Rising or Falling
Trigger Delay (programmable delay between trigger and waveform start)	0 ns to 30 s 8 ns resolution (excluding trigger latency)
Trigger Re-arm Time (minimum)**	≤ 3 µs
Trigger Latency (trigger event to output on)** Average Latency (500 MS/s) Average Latency (250 MS/s) Jitter (500 MS/s) Jitter (250 MS/s)	 448 ns 702 ns ≤ 17 ns peak-to-peak ≤ 32 ns peak-to-peak
Internal Trigger (programmable period, synchronous to sample clock)	8 ns to 34.36 s period (125 MHz to 0.029 Hz rep rate) 8 ns resolution

Marker Outputs

Specification	Value
Marker Channels	Two independent digital outputs
Functionality	Trigger Event, Frame Clock, Symbol Clock, Programmable Time Marker
Output Routing	External Output (front panel), PXI/PXIe Backplane Trigger 0-7
Programmable Time Marker	User-selectable time and width
Marker to Output Latency (marker at point 0)** Average Latency (500 MS/s) Average Latency (250 MS/s) Jitter	 3.2 ns 2.0 ns < 0.25 ns

External Input (front panel)

Specification	Value
Functionality	Trigger Input, Timebase Reference Input
Absolute Maximum Input (no damage)	≤ ± 5 V (DC + peak AC), CAT I
Input Trigger Level Adjustment	-2 V to +2 V 0.5 mV resolution ≤ 20 mV accuracy 20 mV overdrive (input hysteresis)
Input Bandwidth (-3 dB)	≥ 250 MHz
Input Impedance	1 MΩ ‖ 30 pF or 50 Ω ≤ ±2% accuracy
Connector	SMB

External Output (front panel)

Specification	Value
Functionality	Trigger Output, Event Output, Marker Output, Timebase Reference Output, Programmable Clock Output, Programmable Pulse Output, Constant Level, Trigger Sync (PA Enable)
Output Event Source	Trigger Event, Waveform Complete Event
Polarity	High or Low Truth
Programmable Event Pulse Width	50 ns to 163 ms
Programmable Clock	Period: 26.667 ns to 100 seconds 13.333 ns resolution 50% Duty Cycle
Programmable Pulse Pulse Repetition Interval Pulse Width	 16 ns to 65.5us (sync/ marker) 4 ns resolution (sync/ marker)
Output Level	Programmable Level: Default: +3.3V into open load Open load: 0 to +5V 50 Ω load: 0 to +4.1V Level accuracy: ±5% Output Drive: ≥ ±90 mA
Output Enable	Tri-State Output Capability
Current Sense	±90 mA current sense range Triggered or immediate capture 0.1mA resolution
Connector	SMB

Digital Input/Output (DIO) Front Panel[5]

Specification	Value
Functionality	4-bit bi-directional Digital I/O software programmable. Supports serial interfaces such as MIPI, SPI, I2C, etc.
Programmable Clock Rate	Up to 125 MHz
Programmable Logic	≥ 5 ns resolution
Programmable Direction	Input (52 kΩ pull-down) or Output
Programmable Source/Destination	Backplane triggers, external in/out, trigger event
Output Level	Programmable Level: Default: +1.2 V into open load Range: +1.2 V to +3.6 V into open load Level accuracy: ±5%
Output Drive	≥ ±3 mA @ 1.2 V ≥ ±8 mA @ 1.8 V ≥ ±12 mA @ 3.6 V
Output Enable	Tri-State Output Capability
Connector	8-pin Latching Header

[5]DIO connector available only on PXIe product revision 3 and later.

Backplane Trigger 0-7

Specification	Value
Functionality	Multi-Instrument Synchronization Trigger, Marker
Direction	Input or Output
Polarity	High or Low Truth
Programmable Pulse Width (Trigger & Markers)	16 ns to 65.5 µs 4 ns resolution

Instrument Stored States

Specification	Value
Functionality	Non-volatile storage of instrument setup configuration
Stored States	30 State 0 is Reset State Power-On State programmable

LED Indicators

Specification	Value
RDY (Ready)	OFF: Hardware failure ON: Passed power-up self-test TOGGLE: Error pending in queue
TRG (Trigger)	OFF: Trigger event not detected ON/PULSE: Trigger Event Detected

PXI Interface

Specification	Value
PCI Bus Data Interface	33 MHz, 32 bit 132 MByte/s burst up to 120 MByte/s sustained[6]
PCI Voltage	Universal, +3.3 V or +5 V
PCI Standard Compatibility	Version 2.2
PXI Slot Compatibility	PXI Standard Slot and PXIe Hybrid Slot Compatible
PXI Timing & Triggering Signals (XJ4 Connector)	PXI_TRIG[0:7] input/output PXI_STAR input PXI_CLK10 input
PCI Identification Primary ID Secondary ID	 3712 ($0E80_{16}$) 8550 (2166_{16})

[6] Sustained PXI and PXIe transfer rates are dependent upon host system configuration

PXIe Interface

Specification	Value
PCIe Bus Data Interface	x1 single-lane PCIe 250 MByte/s burst, up to 200 MByte/s sustained[6]
PCIe Standard Compatibility	Version 1.1
PXIe Slot Compatibility	PXIe Standard Slot and PXIe Hybrid Slot Compatible
PXI Timing & Triggering Signals (XJ4 Connector)	PXI_TRIG[0:7] input/output PXI_STAR input PXI_CLK10 input
PXIe Timing & Triggering Signals (XJ3 Connector)	PXIe_DSTARA input PXIe_CLK100 input PXIe_SYNC100 input
PCI Identification Primary ID Secondary ID	 3712 ($0E80_{16}$) 8550 (2166_{16})

Power & Cooling

Power Supplies

Platform	Voltage	Typical Current	Maximum Current
PXI	+3.3 VDC +5 VDC +12 VDC -12 VDC	2.32 A 1.22 A 0.38 A 0.02 A	2.37 A 1.41 A 0.40 A 0.02 A
PXIe	+3.3 VDC +12 VDC -12 VDC	1.34 A 1.47 A 0.04 A	1.41 A 1.58 A 0.04 A

Total Cooling & Power Consumption

Platform	Typical Cooling & Power	Maximum Cooling & Power
PXI	18.3 W	19.9 W
PXIe	22.6 W	24.2 W

[6] Sustained PXI and PXIe transfer rates are dependent upon host system configuration

Physical & Environmental

Size & Weight

Specification	Value
Physical Size	Double-Wide 3U PXI or PXIe Instrument
Dimensions (L x W x H)	8.25 in. x 1.59 in. x 5.25 in. 20.96 cm x 4.03 cm x 13.34 cm
Weight	27.1 oz. or 0.768 kg

Temperature Range

Specification	Value
Operating	0°C to +50°C ambient (MIL-PRF28800F Class 3)
Storage	-40°C to +75°C (MIL-PRF28800F Class 3)
Over-Temperature	Automatic shutdown if internal temperature exceeds +65°C
Calibration Range	+20°C to +30°C ambient, after a 20 minute warm-up period, to meet all calibration specification accuracies

Relative Humidity

Specification	Value
Operating or Storage Up to +30°C +30°C to +40°C above +40°C	 5 to 95% ± 5% non-condensing 5 to 75% ± 5% non-condensing 5 to 45% ± 5% non-condensing

Altitude

Specification	Value
Operating	Up to 5 km
Storage	Up to 15 km

Terminology

Numeric Prefixes

When referring to numeric values, this document will use SI (International System of Units) and IEC (International Electrotechnical Commission) standard prefixes. Prefix definitions are in the following table.

Prefix	Multiplier
n (nano)	1/(1000x1000x1000)
µ (micro)	1/(1000x1000)
m (milli)	1/1000
k/K (kilo)	1000
M (Mega)	1000x1000
G (Giga)	1000x1000x1000
Ki (Kibi)	1024
Mi (Mebi)	1024x1024
Gi (Gibi)	1024x1024x1024

Differential Outputs

Single-Ended is used to refer to the output on either the + or – output pin

Differential is used to refer to the output between the + and- output pins

Vd indicates Volts differential

Vppd indicates Volts peak-to-peak differential

Safety

This product is designed to meet the requirements of the following standard of safety for electrical equipment for measurement, control and laboratory use: EN 61010-1

Electromagnetic Compatibility

CE Marking EN 61326-1:1997 with A1:1998 and A2:2001 Compliant

FCC Part 15 (Class A) Compliant

Emissions

EN 55011	Radiated Emissions, ISM Group 1, Class A, distance 10 m, emissions < 1 GHz
EN 55011	Conducted Emissions, Class A, emissions < 30 MHz Immunity
EN 61000-4-2	Electrostatic Discharge (ESD), 4 kV by Contact, 8 kV by Air
EN 61000-4-3	RF Radiated Susceptibility, 10 V/m
EN 61000-4-4	Electrical Fast Transient Burst (EFTB), 2 kV AC Power Lines
EN 61000-4-5	Surge
EN 61000-4-6	Conducted Immunity
EN 61000-4-8	Power Frequency Magnetic Field, 30 A/m
EN 61000-4-11	Voltage Dips and Interrupts

CE Compliance

This product meets the necessary requirements of applicable European Directives for CE Marking as follows:

73/23/EEC Low Voltage Directive (Safety)
89/336/EEC Electromagnetic Compatibility Directive (EMC)

See Declaration of Conformity for this product for additional regulatory compliance information.

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