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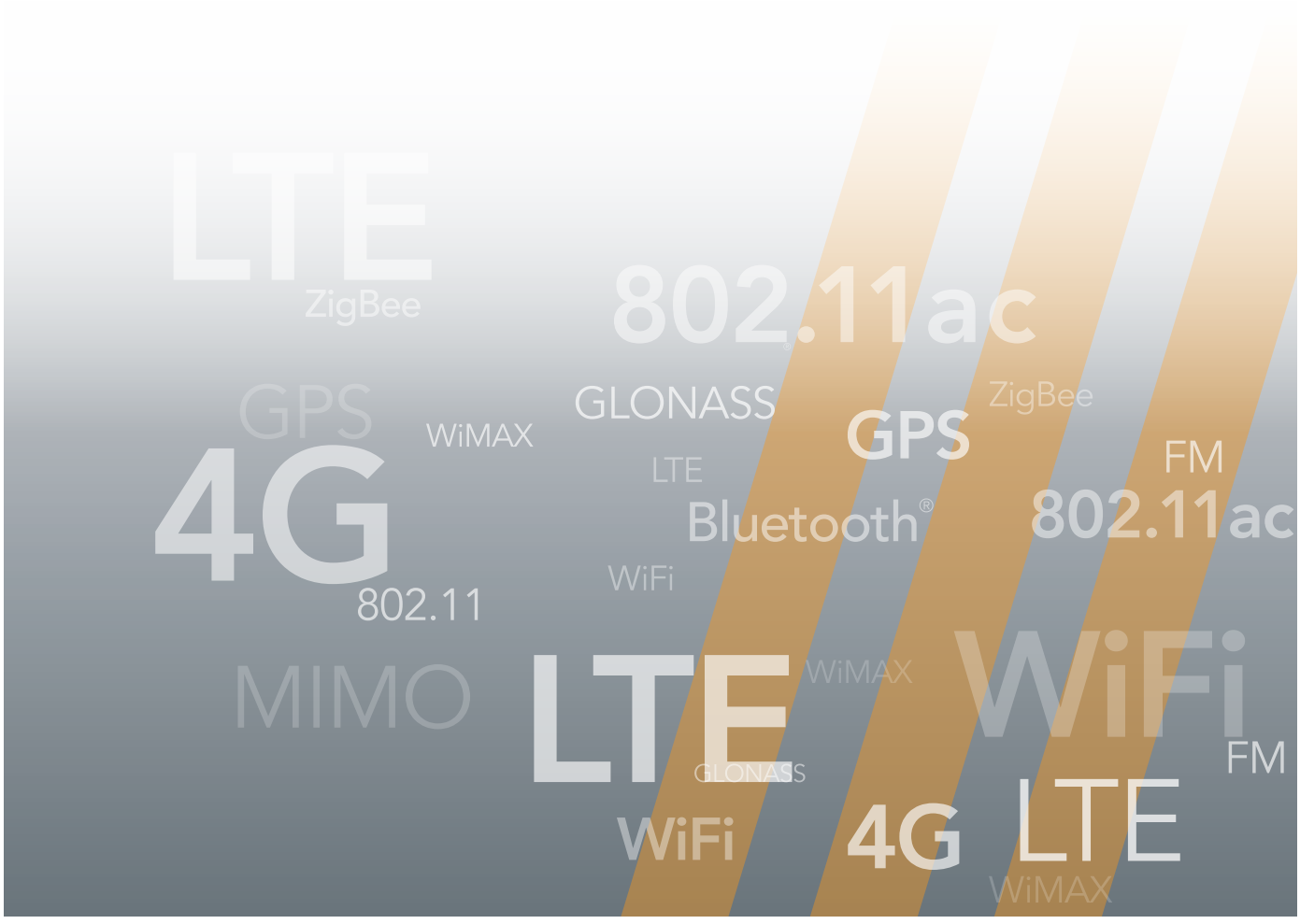
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8551
I/Q AWG

TECHNICAL SPECIFICATIONS

z8551
I/Q Waveform Generator
PXI, PXIe



LITEPOINT

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Port Descriptions



Front Panel

Label	Type	Description
I OUT +,-	SMA	Differential Baseband I Output
Q OUT +,-	SMA	Differential Baseband Q Output
EXT IN	SMA	External input for trigger or reference
EXT OUT	SMA	External output for trigger, reference or event

I/Q Outputs

I/Q Output Channels

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

I/Q Output DC Offset Adjustment

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

I/Q Output DC Offset Adjustment

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	 DC to 500 MH
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 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) 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 ǁ 30 pF or 50 Ω ≤ ±2% accuracy
Connector	SMB

External Ouput (front panel)

Specification	Value
Functionality	Trigger Output, Marker Output, Timebase Reference Output
Polarity	High or Low Truth
Programmable Pulse Width (Trigger & Markers)	16 ns to 65.5 µs 4 ns resolution
Output Level	TTL Compatible into ≥ 200 Ω ≥ ±24 mA Output Drive
Output Enable	Tri-State Output Capability
Connector	SMB

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
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

PXIe Interface

Specification	Value
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

Power & Cooling

Power Supplies

Platform	Voltage	Typical Current	Maximum Current
PXI	+3.3 VDC +5 VDC +12 VDC -12 VDC	1.73 A 0.69 A 0.02 A 0 A (not used)	2.04 A 0.69 A 0.03 A 0 A (not used)
PXIe	+3.3 VDC +12 VDC	1.20 A 0.68 A	1.30 A 0.76 A

Total Cooling & Power Consumption

Platform	Typical Cooling & Power	Maximum Cooling & Power
PXI	9.2 W	10.2 W
PXIe	12.1 W	13.4 W

Physical & Environmental

Size & Weight

Specification	Value
Physical Size	Single-Wide 3U, PXI or PXIe Instrument 8.25 in. x 0.8 in. x 5.25 in. (L x W x H) 20.96 cm x 2.02 cm x 13.34 cm (L x W x H)
Weight	16 oz. or 0.45 kg

Temperature Range

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

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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Doc: 1075-1004-001
March 2014 Rev 1

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