TELEDYNE LECROY
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Z100qx Loki

100Gbps Ethernet Traffic Generator with 4 QSFP28 ports

Key Features

- 4 x 100GE ports per module
- 5-speed flexibility for NRZ testing: 100GE, 50GE, 40GE, 25GE and 10GE in the same module
- Extensive software package with systems including test suites for RFC2544, RFC2889, Y.1564 and RFC3918
- Python based open-source automation framework (XOA)
- Ease of use

The Z100qx Loki is a 4 port Ethernet traffic generator capable of testing five NRZ speeds: 100GE, 50GE, 40GE, 25GE and 10GE.

This flexibility is provided via 4 physical transceiver cages, supporting QSFP28 transceivers.

The Z100qx Loki is available in a single-slot 1U Compact chassis, or in the modular B2400 chassis.

Users can configure up to 32 Loki 100G ports in a single B2400 chassis, or combine it with Odin, Loki, Thor and Freya traffic generators in the same chassis for unmatched convenience and flexibility.

The result is a versatile solution for performance and functional testing of network infrastructure and Ethernet equipment such as chips, switches, routers, NICs, taps, transceivers, cables, packet-brokers, and backhaul platforms.

Included with the Z100qx Loki is XenaManager (XM), the intuitive multi-user management software for generating and analyzing traffic. XenaManager makes it easy to configure and conduct complex testing across single or multiple systems from the same interface.

Xena OpenAutomation (XOA), an open-source Python Test Suite, which include XOA Core and test suite plugins is also provided. This comprehensive Python framework offers developers and test specialists well-defined APIs. With XOA Python Test Suites, developers and test specialists can easily harness the power of Xena test systems and effectively handle the configuration and control of the testing equipment making the most of Xena testers with tailored tests and standardized test methodologies like RFC2544, RFC2889 and RFC3918.

INTERFACE AND STANDARDS

Number of module cages/connectors	4 x QSFP28/QSFP+
Interface options in each cage *NOTE: Actual interface options depend on the capabilities of the inserted transceiver. All cages on a module run with the same interface configuration (e.g.100GE)*	1 x 100GBASE-SR4/LR4/CR4 802.3bj 2 x 50GBASE-SR2/LR2/CR2 ETC 25/50G 1 x 40GBASE-SR4/LR4/CR4 802.3ba 4 x 25GBASE-SR/LR/CR 802.3by or ETC 25/50G 4 x 10GBASE-SR/LR/CR 802.3ae

LAYER 1 FEATURES

Pattern Generation	• PRBS-13, PRBS-31 • Statistics: Lock status, PRBS errors, PRBS error rate
Physical Coding Sublayer	• PCS virtual lane-to-SerDes mapping configuration
Forward Error Correction (FEC)	• RS-FEC KR (528, 514, t=7), IEEE 802.3 Clause 91 (100GE) • RS-FEC KR (528, 514, t=7), IEEE 802.3 Clause 108 (25GE) • RS-FEC KR (528, 514, t=7), Ethernet Consortium 25/50G (25/50GE) • BASE-R FEC (Firecode) (2112, 2080), IEEE 802.3 Clause 74 (25GE, 10GE)
FEC Error Injection	• RS-FEC KR (528, 514, t=7) • Configuration: Consecutive, Errored Codewords, Total Codewords Per Cycle, Errored Symbols Per Codeword • Bit error mask modes: Static, Rotate, Increment • Pre-defined profiles: Max. Consecutive Uncorrectable w/o Link Loss, Min. Consecutive Uncorrectable with Link Loss • Loop modes: Single, Continuous, Repeat • Injection statistics: Injected FEC Errors; Total Codewords, Total Uncorrectable Codewords, Total Correctable Codewords, Total Error-Free Codewords, Codeword Error Ratio, and Total Symbol Errors
Reconciliation Sublayer (Local/Remote Fault feature)	• Normal: Acts according to 802.3 standard • Force Local: Port will continuously transmit “Local Fault indication”. • Force Remote: Port will continuously transmit “Remote Fault indication” . • Disabled: Port does not respond to Local/Remote Fault from DUT
PMA Error Injection	• Repeatable error injection periods at PMA layer with millisecond precision.
Link Flap	• Single shot or repeatable link-down with millisecond precision.
Equalization Controls	• Tx Transmit Equalization Controls Pre-emphasis • TxAttenuation • Tx Post-emphasis Signal Integrity Analysis • Rx Optional Auto-Tune of PHY 50 & 25Gbps Rx SerDes
Signal Integrity Analysis	• BER Eye-diagram with direct visual representation of the signal quality after RX equalization

TRANSMIT ENGINES	
Traffic Generation	• Wire-speed multi-stream traffic generation • Up to 256 hardware streams per port • Each stream can generate millions of traffic flows using field modifier
Transmit line clock adjustment	From -400 to 400 ppm in steps of 1 ppm (shared across all ports)
Oscillator Characteristics	• Initial Accuracy is +/- 3 ppm • Frequency drift over 1st year: +/- 3 ppm • Frequency drift over over 15 years: +/- 15 ppm • Temperature Stability +/- 20 ppm
Transmit Control	• Support adjustment of the effective line rate by forcing idle gaps equivalent to -1000 ppm (increments of 10 ppm) • Configurable Inter-Frame Gap (IFG) from 16 to 63 bytes, default is 20B (12B IFG + 8B preamble) • Support optical laser or copper link enable/disable
Loopback Modes	• L1 RX-to-TX: Any received packet is bounced back through TX • TX(on)-to-RX: Packet goes out of TX but also internally direct to RX • TX(off)-to-TX: Packet goes directly to RX (No link sync needed) • Port-to-Port: Any received packet goes out through the neighbor port
Port Transmit Scheduling Modes	• Normal (stream interleaved mode): Default scheduling mode, precise rates, minor variation in packet inter-frame gap. • Uniform: With 100% uniform packet inter-frame gap, minor deviation from configured rates is available. • Sequential: Streams are scheduled continuously in sequential order, with configurable number of packets per stream. • Burst: Packets in a stream are organized in bursts. Bursts from active streams form a burst group is available. The user specifies time from start of one burst group till start of next burst group.
Stream Profile	• Packet Length: Fixed; Incrementing, Random, Butterfly. Minumum 56 bytes, maximum 16K bytes. • Packet Payload: Incrementing 8-bit, custom pattern (up to 18B repeated) • Burst Traffic with configurable Burst Size, and Burst Density • Flow Control: PFC support for both VLAN tagged and untagged traffic
Stream Header Types	Ethernet, VLAN, ARP, IPv4, IPv6, UDP, TCP, LLC, SNAP, GTP, ICMP, RTP, RTCP, STP, SCTP, MacCtrl, MPLS, PBB, FCoE, FC, IGMPv2, GRE, GTP, VxLAN, NVGRE, DHCPv4, Geneve, eCPRI, RoE, PWE, PFC, Custom.
Stream Modifiers	• Maximum 8 x 24-bit modifiers per stream • 24-bit header field modifiers with incremental, decremental, or random mode. • Each modifier has configurable bit-mask, repetition, min, max, and step parameters.

TRANSMIT ENGINES, CONT.	
Layer 2 Error Injection	• Undersize (56 bytes min), and oversize (12288 bytes max.) packet lengths • FCS Error, Sequence Error, Misordering Error, Payload Integrity Error, Test Payload Error
Multicast	• Support for IPv4 • Up to 8 multicast group addresses • IGMPv2: Join (with configurable repeat interval), Leave All-Devices, Leave, General Query, Group Query • IGMPv3: Exclude (with configurable repeat interval), Include, Change-to-Exclude, Change-to-Include, Multi-group record support
ARP/NDP/Ping	• Auto address resolution • Auto reply to request per port and per stream
LLDP	• Configurable LLDP operation mode, timers, and TLVs • Support mandatory and optional TLV types • Display received LLDP information
Transmit Statistics	• Per-stream: bits/s, bytes/s, packets/s, packets, bytes • Per-port: ARP, NDP, Ping, requests and replies • Per-port injected errors: FCS Error, Sequence Error, Misordering Error, Payload Integrity Error, Test Payload Error • Two real-time histograms per port: TX Packet Length, IFG, or latency distribution for all traffic, a specific stream, or a filter
Packet Scheduling Modes	• Normal (stream interleaved mode) – standard scheduling mode, precise rates, minor variation in packet inter-frame gap. • Strict Uniform – with 100% uniform packet inter-frame gap, minor deviation from configured rates is available. • Sequential packet scheduling (sequential stream scheduling) is available. Streams are scheduled continuously in sequential order, with configurable number of packets per stream. • Burst. Packets in a stream are organized in bursts. Bursts from active streams form a burst group is available. The user specifies time from start of one burst group till start of next burst group.

RECEIVE ENGINE	
Traffic Receive Capability	Number of traceable Rx streams per port: 2016 (wire-speed)
Receive Statistics	• Per-stream: bits/s, bytes/s, packets/s, packets, bytes • Per-stream: Packet Loss, Misordered, Payload Errors • Per-stream: Latency and jitter with minimum, maximum and average • Per-port: ARP, NDP, Ping, with requests and replies • Per-port injected errors: FCS Error, Sequence Error, Misordering Error, Payload Integrity Error, Test Payload Error • Two real-time histograms per port: RX Packet Length, IFG, or latency distribution for all traffic, a specific stream, or a filter • Filter statistics: bits/s, bytes/s, packets/s, packets, bytes
Latency Measurement	• Latency can be measured on up to 256 streams • Accuracy: ±16 ns • Resolution: 1 ns • Measurement modes: Last-to-last, last-to-first, first-to-last, first-to-first • Can be calibrated to remove latency from transceiver modules
Jitter Measurement	• Jitter can be measured on up to 256 streams • Jitter (Packet Delay Variation) measurements compliant to MEF10 standard with 1ns accuracy.
Traffic Filter	• 6 x 64-bit configurable match-term patterns with mask, and offset • 6 x frame length comparator terms (longer, shorter) • 6 x configurable filters expressed in logical expressions of the match and length terms
Filter statistics (Counter size: 64 bits)	Per filter: • RX Mbit/s • packets/s • packets • bytes
Capture	• Start Trigger Criteria: FCS errors, filter match, payload error, manual • Stop Trigger Criteria: FCS errors, filter match, payload error, manual, buffer full • Capture Limit Per Packet: 16 – 12288 bytes • Wire-Speed Capture Buffer Per Port: 256kB for 100G, 128 kB for 40G • Low Speed Capture Buffer Per Port (10 Mbits/s): 4096 packets (any size) • Packet header auto decode

SPECIFICATION	
Max. Power	• 59W
Weight	• 2.32 lbs (1.05 kg)
Environmental	• Operating Temperature: 10 to 30ºC • Storage Temperature: -40 to 70ºC • Humidity: 8% to 90% non-condensing
Regulatory	• FCC (US) • CE (Europe)
User interface	• XenaManager3 (XM3), Xena OpenAutomation (XOA) and XOA CLI • Xena2544, Xena2889, Xena3918, Xena1564
Notes	• The Z100qx Loki occupies 1 slot in a B2400 chassis. Up to 9 can be installed in a single B2400 chassis. • The Z100qx Loki is also available as a single traffic generator in a standalone Compact chassis (P/N Z100qxc Loki)

Ordering Information

Product Description

- Z100qxc Loki XenaCompact 1U chassis with 100GE 5-speed, 4 port test module QSFP28
- Z100qx Loki 100GE 5-speed, 4 port test module QSFP28

Product Code

C-Loki-100G-5S-4P
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