Spirent **PX3 12 Port QUINT SPEED**

QSFP28 Test Module

Features

- 12 100GbE ports per PX3 module, delivers the highest density high speed Ethernet solution per module, chassis or rack unit
- The industry's highest emulation performance for high density 100G testing.
- Protocol testing for L2/3 routing/ switching and data center test cases
- Each module supports the following port density 12x100GbE, 24x50GbE, 48x25GbE, 12x40GbE, 48x10GbE
- Support for optical fiber, active optical cables and direct access copper
- Support for Ethernet FEC, AN, and LT

Benefits

- Affordable high-density 12-ports in a single slot with native QSFP28 physical interfaces
- Orchestrate large scale testbeds
- Perform high protocol scale testing for port dense 100G core routing platforms and data center fabrics
- Conduct performance, stress, and industry standard benchmark tests
- Enables scalability to meet the requirements of IP/Ethernet mobile networks while maintaining enhanced realism and performance

Network bandwidth needs continue to grow at a rapid pace, Network equipment manufacturers are developing highly flexible products to support 100/50/40/25/10GbE from a single port. Service providers and Hyper-scale data centers are deploying high-density multi-rate networking infrastructure solutions to meet these demands.

The Spirent PX3 QUINT speed module architecture was developed to meet these specific needs, offering multi rate support, high density and performance testing for this growing market. This flexibility is needed to validate the next-generation data center fabrics and service provider routers.

Equipment Manufacturers are rapidly increasing port densities. This module delivers the highest port density QSFP28 form factor module in the industry. Each QSFP28 interface can support 100, 50, 40, 25 and 10GbE from a single port.

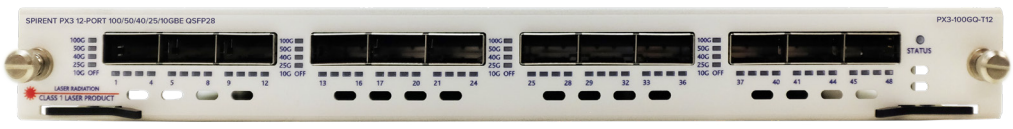
High Density—Validate data plane QoS on thousands of flows at line rate and test complex routing, data center and access protocols on switches and routers. A single N11U can support 144-ports or 24-ports from a single N4U chassis, highest density in the industry.

Service Provider Core and Edge Routers—Verify scale, reliability, and performance of Layer 2 & 3 services including IP data and video delivered via unicast routing, multicast routing, switching and MPLS VPN technologies.

High Capacity Multiservice Routers—Validate IP throughput with thousands of subscribers and per-port line-rate data with minimum-sized packets.

Data Center Top of Rack, Spine and Core Switches—Benchmark capacity of high-density and capacity fabrics using IETF RFC 2544, RFC 2889 and RFC 3918 methodologies with easy test setup using dynamically bound traffic and automated wizards.

Carrier Ethernet—Verify scale, reliability, performance of Ethernet services delivered via Ethernet OAM, MPLS-TP, VPLS, PWE3 Psuedowires, bridged Ethernet, packet transport protocols or combinations of these technologies.



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Cost Effective, high scale protocol testing

The Spirent PX3 module has a lower cost of ownership compared to other test modules in its class:

- High emulation scale is combined with industry-leading port density to provide a cost-effective platform for testing the next generation of core routers and data center fabrics.
- More total throughput than the competition for a given power footprint.
- Topology emulation lowers Capex by eliminating the need for multiple DUTs in multiprotocol tests
- Faster boot and firmware upgrade times mean less downtime in continuous running 24x7 regression test beds

Productivity

- Intelligent Results™
- When creating test beds at the scale needed the amount of data that is produced is astronomical. An advanced, highly efficient distributed database processes billions of real-time results to validate tests and identify problems, giving engineers the immediate feedback they need to debug problems and accelerate development
- Delivers more results with tight correlation, and more information to find those obscure bugs. With more coverage and more information, Spirent answers questions faster, and in a single test run, where multiple runs are necessary with other test tools
- Interesting streams uses real-time results data mining to dynamically filter through mountains of data and display the results that matter
- Powerful automation with Command Sequencer (Visual Programming) and GUI to Script empowers the test operator to:
  - Construct sophisticated, stressful, automated test cases without programming experience
  - Combine numerous individual test cases into a single run to save regression test time
  - Develop a catalog of broad automated test cases in a fraction of the time
  - Export automated test cases to run from a command line for headless test execution that can be integrated with any automated regression system

Extensive, flexible reporting

Real-time statistics for critical variables across all protocols. Using Spirent's iTest platform, your device under test results can easily be correlated and compared with Spirent's results.

Technical specifications				
Spirent PX3 module				
Maximum support	Speed	Maximum ports per slot	Maximum ports per SPT-N11U chassis	Maximum ports per SPT-N4U chassis
PX3-100GQ-T12	100/50/40/25/10 G	12/24/12/48/48	144/288/144/576/576	24/48/24/96/96

MSA Interface	QSFP28
Operational modes	100,50,40,25,10 GbE
Port CPU	Stackable multi-core CPU
User reservation	Per QSFP28 port
Test Port speed config	(Per 1x3 QSFP28 cage group); 4 test port speed groups per blade
Line clocking and packet time-stamping	Stratum-3 rated oscillator is the default time source. Transmit line clock is at the precise nominal Ethernet rate ± < 1 PPM on initial shipment. Accurate to ± 4.6 PPM 15 years of operation ■ Frame time-stamp resolution of 2.5ns ■ GPS and CDMA-based external time sources are supported ■ IEEE 1588v2 and NTP packet-based external time sources are supported ■ TIA/EIA-95B-based external time sources are supported
Inter-module and inter-chassis time synchronization	Modules in the same chassis are phased-locked to the timing source of the control module. For more modules in separate chassis: ■ Spirent-patented self-calibrating inter-chassis timing chain using dedicated port on chassis control module delivers precise synchronization ± 20ns ■ Synchronization via external GPS or CDMA network ■ Using IEEE 1588 or NTP packet-based approaches ■ With TIS/EIA-95B timing inputs
Module weight	3.219 kg, 5.45lbs.
Module predicted MTBF	56,330 hours. Hours of continuous operation
Operating temperature range	Supported for 41° to 95° F (5° to 35° C) ambient temperature. 20% to 80% relative humidity
Max power draw per module	Maximum of 420W per slot

Spirent TestCenter Layer 2-3 generator and analyzer	
Number of streams (basic and latency mode)	■ Stats/Streams @100G ; Tx=8K Rx=32K*/16K/4K (Performance/ Basic Stats/ Latency stats) ■ Stats/Streams @50/40G; Tx=8K Rx=8K/2K (Basic Stats/ Latency stats) ■ Stats/Streams @25/10G; Tx=4K Rx=4K/1K (Basic Stats/ Latency stats) ■ Stream fields can be varied to create billions of flows
Frame transmit modes	Port based (rate per port), stream based (rate per stream), burst, timed
Min/max frame size (w/CRC)	60 to 16,004
Min/max Tx rates	1 packet per 3.43 seconds to 101% of line rate
Real-time Tx stream adjustments	Change rate and frame length settings without stopping the generator or analyzer for truly interactive, cause and effect analysis
Per-stream statistics analyzed in real time	Tx and Rx frame counts and rates ■ Tx and Rx Layer 1 byte counts and rates ■ Out of sequence errors ■ FCS errors and rate ■ Min, Max and Average Latency (16383 streams) ■ Real Time Dropped Frame count ■ Previous, Max, Total Jitter ■ Full Adv Seq Stats at 100/50/40 only ■ 100G Performance mode*: Rx Frame count, Rx Byte Count, Rx Bit Count, first and last arrive time, dropped frame count, dropped frame count %, average latency, total sequence errors
Per-port statistics analyzed in real time	Tx and Rx frame counts and rates ■ Tx and Rx Layer 1 byte counts and rates ■ Out of sequence errors ■ PRBS errors ■ FCS errors and rate
Transmit timestamp resolution	2.5 ns Tx timestamp resolution with intra-chassis and inter-chassis synchronization
Supported encapsulations	■ Layer 2: Ethernet II, 802.1Q, 802.1ad, FCoE ■ Layer 3/4: IPv4, IPv6, TDP, UDP
Supported Tx signature capability	Fully compatible with Spirent hardware; contains sequence number and highly accurate timestamp
Capture buffer size	8 MB per port
Capture buffer controls—Spirent TestCenter's unique capture capability allows maximum effectiveness when debugging hard to find hardware or protocol problems.	Several modes of operation that include: Filter by protocol fields, filter by byte offset and range; store slices or full-frames; store signature or all frames; store tx/rx control plane with data plane; real-time mode for control plane traffic; wrap or stop buffer at end. User defined pattern definitions can logically combine 8 filters of up to 32 total bytes. Patterns can be applied to start, filter (quality) or stop capture. In addition to user-patterns, filtering, starting and stopping capture contains the following pre-defined events: FCS, PRBS, IPv4 checksum, TCP/UDP/IGMP checksum, and sequence errors; undersize, oversize, jumbo, and user-defined frame length; IPv4, IPv6, TCP, UDP and IGMP packets; test signature present and test stream ID match. Each event can be independently set to ignore, include or exclude.
Latency modes	Benchmark tests support LIFO, LILO, FIFO or FILO latency calculation methods
Route Insertion Table (RIT) Entries per port	8K 4-byte entries for dynamic label or random IP/MAC address assignments
RIT or List VFD Entries per Stream	8 RIT insertions per stream and 4 VFD insertions per stream
Layer 1 Functionality	
QSFP28 Interconnects	CR, SR, LR, CWDM, CLR, PSM, at multi-rate (100/50/40/25/10GBE)
Media support and FEC options See accessory table below for part numbers*	Support varies by module speed mode ■ 100G: 100GBASE-SR4, 100GBASE-CR4, 100GBASE-LR4, plus additional MSA PMDs ■ 50G: 25/50G Consortium 50GBASE-CR2, ■ 40G: 40GBASE-SR4, 40GBASE-CR4, 40GBASE-LR4 ■ 25G: 802.3by 25GBASE-CR, 25GBASE-CRS, 25GBASE-SR ■ 10G: 10GBASE-SR, 10G Copper DAC ■ QSFP28 to SFP28 breakout cable options ■ Auto-Negotiation and Link Training for 100G, 50G, 40G and 25G ■ Clause 74 BASE-R FEC, Clause 91 RS-FEC, and Clause 108 RS-FEC ■ 25/50G Consortium 50GBase-R FEC CL74, 25/50G Consortium 50GBase RS-FEC CL91 ■ IEEE 25GBASE CR CL74, CL108, CR-S CL74, SR FEC CL108 ■ 25/50G Consortium 25GBase-R FEC CL74, 25/50G Consortium 25GBase RS-FEC CL91
AN/LT (Enable/Disable)	100/50/25/40 GBE
Layer-1 Debug Tools & Features	CR Tx Emphasis settings, Front-end L1 Summary Status, Xcvr I2C access

* Future software release

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Technical specifications (cont'd)

Layer 4-7 application and security	
IP Version Supported	IPv4 and IPv6
Encapsulation Protocols	802.1Q and 802.1 Q-in-Q
Transport Protocols	TCP, UDP
Data Protocols	HTTP, SIP and FTP, Unicast/Multicast RTSP and RAW TCP
Authentication Protocols	802.1x
Network Access Protocol	DHCP and PPPoE
Network Realism Fragmentation	Line speed limitation, network latency, packet loss and fragmentation
Video Protocols	RTSP/RTP, Multicast streaming, IGMPv2, IGMPv3 and MLDv2
Video Codecs	H.263 and H.264
Video Quality Measurement	MDI measurements along with additional statistics to detect picture quality
Voice Codecs	G711A, G711U, G.723.1, G726-32, G.728 and G729AB
Voice Protocols	SIP over UDP
(See accessory table below for part numbers)	■ 100GBASE-CR4 ■ COPPER DAC QSFP28 1M ■ COPPER DAC QSFP28 3M ■ COPPER DAC QSFP28 5M ■ Copper DAC breakouts to 4x25G SFP28 (1-3-5m) ■ Copper Breakouts to 2x50G QSFP28 (1-3-5m) ■ ACTIVE OPTICAL CABLE ■ 100GBASE-SR4 ■ 100GBASE-LR4 ■ 100GBASE-CWDM4 ■ 100GBASE-CLR4 ■ 100GBASE-PSM4

Spirent TestCenter Protocol Emulation

Spirent TestCenter protocols available as separately licensed packages. Below is a sample list of supported protocols. Contact Spirent for a full list of capabilities and packages.

Enterprise and data center switch protocol support	■ OpenFlow 1.3 / 1.0: OpenFlow switch and controller emulation and switch conformance testing ■ Routing, multicast and bridging: All major IPv4 and IPv6 unicast and multicast routing protocols, IGMPv1/v2/v3, MLDv1/v2, LACP, STP, RSTP and MSTP ■ Data center: DCBX, FCoE, FIP, 802.1Qbb ■ Stateful L4-7: HTTP, SIP and FTP
Service Provider protocol support	■ SDN/NFV: PCE and Segment Routing ■ Routing and MPLS: All major IPv4 and IPv6 unicast and multicast routing protocols, RSVP-TE, LDP, VPLS-LDP, VPLS-BGP, BGP/MPLS-VPN, Fast Reroute, EVPN, mVPN, P2MP-TE, BFD, TWAMP and PWE3 (RFC4447) ■ Access: ANCP, PPPoE, DHCP, L2TP, IGMPv1/v2/v3, MLDv1/v2, DHCPv6 and PPPoEv6 ■ Carrier Ethernet and bridging: LACP, STP, RSTP and MSTP, 802.1ag CFM, Y.1731, PBB, PBB-TE, Link OAM ■ Stateful L4-7: HTTP, SIP and FTP, Unicast/Multicast RTSP and RAW TCP ■ Mobile Backhaul: MPLS-TP, 1588v2 and Synchronous Ethernet

Ordering Information

		Spirent Application	
Part Number	Description	Spirent TestCenter	Avalanche Commander
Test modules			
PX3-100GQ-T12	SPIRENT PX3 12-PORT 100 50 40 25 10 GBE QSFP 28	X	
Accessories for QSFP28 interfaces*			
ACC-6095A	Optical transceiver QSFP28 100GBASE-SR4 MMF 850NM		
ACC-6096A	Optical Transceiver QSFP28 100GBASE-LR4 SMF 1310NM		
ACC-1034A	Copper DAC QSFP28 100GBASE-CR4 1M		
ACC-1035A	Copper DAC QSFP28 100GBASE-CR4 3M		
ACC-1038A	Copper DAC QSFP28 100GBASE-CR4 5M		
ACC-1036A	Active Optical Cable (AOC) QSFP28, 5M		
Spirent chassis			
SPT-N11U-110	Spirent N11U chassis and controller with 110VAC power supplies		
SPT-N11U-220	Spirent N11U chassis and controller with 220VAC power supplies		
SPT-N4U-110	Spirent N4U chassis and controller with 110VAC power supplies		
SPT-N4U-220	Spirent N4U chassis and controller with 220VAC power supplies		

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Requirements:

- Spirent chassis and controller (see table)
- Windows-based workstation with 10/100/1000 Mbps Ethernet NIC; mouse and color monitor required for GUI operation
- Linux or Windows-based workstation for scripting
- Mac, Linux or Windows based workstation for Rest API support

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