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dX3 Quint-speed 12-port Module

QSFP28 Test Module
100/50/40/25/10G

Overview

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

The Spirent dX3 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 10G from a single port.
Several speed configurations are available listed in the ordering information section below. The various module options allow maximum flexibility based on user needs and requirements.

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 N12U can support 144-ports or 24-ports from a single N4U chassis, highest density in the industry.

Data Center ToR and EoR Switches and Fabrics—Validate forwarding performance, latency, MAC capacity and functional capabilities of ultra-high-scale, next-generation enabled multi-terabit cloud data center fabrics.

Terabit Routers—Test 100G core routers with high-scale, multiprotocol topologies.

Features

- 12x 100G ports per dX3 module, delivers the highest density high-speed Ethernet solution per module, chassis or rack unit
- Each module supports the following port density 12x100G, 24x50G, 48x25G, 12x40G, 48x10G
- Support for optical fiber, active optical cables and direct access copper
- Support for Ethernet (FEC), (AN) and (LT)
- Protocol testing for L2/3 routing/switching and data center test cases

Benefits

- Affordable high-density 12-ports in a single slot with QSFP28 physical interfaces
- Orchestrate large scale testbeds
- 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

Productivity

Accurate Results – Purpose-built hardware delivers repeatable test execution and precise statistics

- When creating test beds at the scale needed the amount of data that is produced is astronomical. An advanced, highly efficient distributed database processes billons 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.

Technical Specifications				
dX3 Quint-speed 12-port Module				
Maximum Support	**Speed**	**Maximum Ports per Slot**	**Maximum Ports per STP-N11U Chassis**	**Maximum Ports per SPT-N4U Chassis**
DX3-100GQ-T12	100/50/40/25/10G	12/24/12/48/48	144/288/144/576/576	24/48/24/96/96
MSA interface	QSFP28			
Operational modes	100, 50, 40, 25, 10G			
Port CPU	Stackable multi-core CPU			
User reservation	Per QSFP28 port			
Test port speed configuration	(Per 1x3 QSFP28 cage group); 4 test port speed groups per blade			
Line clocking and packet time-stamping Spirent modules get their transmit line clocking and time-stamping from the control modules on the SPT-N12U and SPT-N4U.	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			

Technical Specifications (cont'd)

Spirent TestCenter Layer 2-3 Generator and Analyzer

Number of streams	• Stats/Streams @100G; Tx=8K Rx=16K/4K (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 at 100/50/40 only • Full Adv Seq Stats at 100/50/40 only
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 & 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 & 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 (100/50/40/25/10G)
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)	100/50/25/40G
Layer-1 debug tools & features	CR Tx Emphasis settings, Rx Eye view, FEC Counters, PRBS Gen/Check, Front-end L1 Summary Status, Xcvr I2C access

Ordering Information	
Part Number	**Description**
DX3-100GQ-T12	Spirent dX3 12-port 100 50 40 25 10G QSFP28
Accessories for QSFP28 Interfaces	
ACC-6095A	Optical transceiver QSFP28 100GBASE-SR4 MMF
ACC-6096A	Optical Transceiver QSFP28 100GBASE-LR4 SMF
Speed Chassis	
SPT-N12U-110	Spirent N12U chassis and controller with 110VAC power supplies
SPT-N12U-220	Spirent N12U chassis and controller with 220VAC power supplies
SPT-N12U-220-LC	Spirent N12U-LC 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

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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