

Spirent FlexE-100

QSFP28 Test Module

Features & Benefits

- Industry's highest density dedicated FlexE test solution
- Industry's first ITU-T G.mtn ready path and section layer test solution
- Industry's most feature rich SPN and ITU-T G.mtn based network slicing test solution
- 10x100GBASE-R PHY test ports per module
- Up to 63 emulated FlexE clients per FlexE group
- Comprehensive and scalable FlexE client protocol emulation with L2-L7 traffic generation
- Supports bonding up to 500G per port group
- Client MAC rates ranging from 5GbE, 10GbE, nx25GbE, 40GbE, 100GbE in 5GbE increments
- FlexE bonding, sub-rating and channelization testing
- FlexE shim layer calendar functional testing
- FlexE client bandwidth resizing, SPN and ITU-T G.mtn QoS and traffic isolation testing
- FlexE, SPN and ITU-T G.mtn overhead visibility and alarms error status/conditions
- SPN and ITU-T G.mtn network performance, scalability, and stress testing
- SPN and ITU-T G.mtn channel layer OAM testing
- Comprehensive FlexE client level and traffic stream level statistics
- Support for optical and direct attach cable interconnects

Flex Ethernet (FlexE) provides a generic mechanism for supporting a variety of Ethernet MAC rates that may or may not correspond to any existing Ethernet PHY rate. FlexE dissociates the Ethernet rate on the client end from the actual physical interface by introducing a new shim through the IEEE defined MAC and PCS layers. This includes MAC rates that are both greater than (through bonding) and less than (through sub-rate and channelization) the Ethernet PHY rates used to carry FlexE. It provides a hard pipe network slicing solution with calendar-based channelization.

ITU-T G.mtn (interfaces for a metro transport network) is an emerging international standard that defines two new layers (path and section) for metro networks to transport 5G radio access network (RAN) traffic, both centralized (C-RAN) and distributed (D-RAN), over standard Ethernet and FlexE. G.mtn provides an end to end transport network architecture with the ability to meet the most demanding 5G requirements for network slicing, ultra-low latency and high availability.

Spirent FlexE-100 module was developed as a dedicated solution to address 5G transport, SPN (Slicing Packet Network), and ITU-T G.mtn standard testing needs.

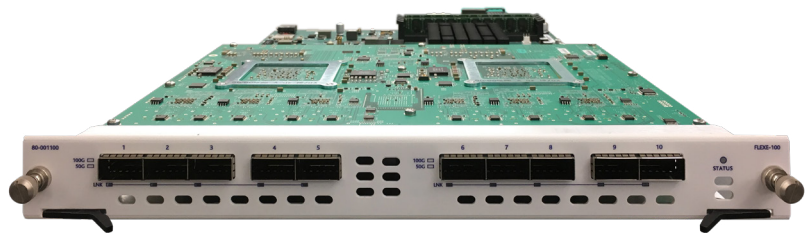
FlexE-100 delivers the highest port density FlexE 100GBASE-R PHY solution module in the industry. Each of the 10, QSFP28 interface ports can support 5GbE, 10GbE, n x 25GbE, 40GbE, 100GbE Client MAC rates.

Data Center and Service Providers—FlexE is a key technology for Service Providers and Data Centers high density requirements to deliver faster network speeds vs emerging ethernet solutions.

5G Transport and SPN—Network slicing is needed to meet diverse bandwidth, latency, security and time synchronization requirements as well as new 5G applications such as AR, IoT, industrial automation, and autonomous vehicles. FlexE provides a hard pipe network slicing solution enabling multiple slices to be created on a physical 5G transport network for different services and applications.

Decouple Transport Dependency—Maximize PHY to Bandwidth flexibility, decouple control and data plane from physical PHY.

Ethernet control in a Data Center environment—Provisioning of Ethernet traffic in a DCI scenario. Evaluate FlexE use cases topologies and network efficiency.



Cost Effective, Feature Rich, High Density FlexE, SPN and ITU-T G.mtn Testing

Spirent FlexE-100 module offers the highest port density and lowest cost of ownership compared to other test modules in its class with following features:

- Realistic network slicing testing with in-service FlexE client creation and deletion, bandwidth resizing, bandwidth oversubscription, and congestion isolation with multiple FlexE clients, and comprehensive and scalable FlexE client protocol emulation with L2-L7 traffic generation
- Complete end to end SPN STL (Slicing Transport Layer), SCL (Slicing Channel Layer) and SPL (Slicing Packet Layer) testing

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Technical Specifications				
Spirent FlexE-100				
Module	MAC Rate Clients	Maximum ports per slot	Maximum ports per SPT-N11/12U chassis	Maximum ports per SPT-N4U chassis
FlexE-100	100/50/40/25/10/5G	10	120	20
MSA Interface	QSFP28			
FlexE Client MAC Rates	100G, 40G, nX 25G, 10G, 5G configurable in 5GbE increments			
User reservation	Per QSFP28 port			
Test Port speed config	2 groups (5 QSFP28 cages per group = 500G) ability to bond 500G per group			
FlexE Calendar	<ul style="list-style-type: none">• Tx/Rx calendar status• PHY selection, Group number, enable disable• Edit PHY/Group numbers• Calendar A/B switch• Tx/Rx Client ID status and modifier			
FlexE Overhead Alarms/Status	<ul style="list-style-type: none">• PHY status indicators• Overhead error injection• Group ID status• Local PCS Fault• Loss of OH Lock• Loss of Multiframe lock• Remote PHY Fault• Group number mismatch• PHY number mismatch• PHY number invalid• PHY map mismatch• Calendar configuration mismatch• Active Calendar Mismatch• Active Calendar Changed• Calendar switch mismatch• FlexE Group level OAM			
FlexE PHY's	<ul style="list-style-type: none">• 2 available port groups, each port group supports maximum 5 QSFP28 PHY's• Up to 63 Clients per FlexE Group• Tx C, Tx CR, Rx CA• PHY status: OH Detect, CH Lock, MF Lock, Remote PHY Fault• Rx C, Rx CR, Tx CA• Client MAC rates ranging from 5GbE, 10GbE, nx25GbE, 40GbE, 100GbE in 5GbE increments for maximum flexibility of mixed client types			
Transmit / receive streams per FlexE group	8K transmit streams and 16K receive streams per FlexE group, shared by all emulated FlexE clients			
Stream blocks per FlexE group	64 stream blocks per FlexE group, shared by all emulated FlexE clients			
Route Insertion Table (RIT) Entries	8K route insertion table (RIT) entries per FlexE group, shared by all emulated FlexE clients			
VFDs and Variable Fields	4 VFD per stream			
Scheduler Mode Support	FlexE group based (rate per FlexE group), FlexE client based (rate per FlexE client), stream based (rate per stream), burst, timed			
Frame length range and controls	100% line rate for frames of 64-16383 bytes controlled by fixed, increment, decrement, random and IMIX modes			
Transmit clock adjustment	2.5 ns Tx timestamp resolution with intra-chassis and inter-chassis synchronization			

Technical Specifications

Spirent FlexE-100 (cont'd)

Capture buffer size	<ul style="list-style-type: none"> • 1MB capture buffer per FlexE group, shared by all emulated FlexE clients • Capture software includes sophisticated trigger and filtering controls
FlexE client level statistics	<ul style="list-style-type: none"> • 1MB capture buffer per FlexE group, shared by all emulated FlexE clients • Capture software includes sophisticated trigger and filtering controls • TX/RX frames • TX/RX bytes • L1 TX/RX bps rate • Drop count • TX/RX sig frames • TX/RX FCS frames • RX OOS frames
Stream level statistics	<ul style="list-style-type: none"> • TX/RX frames • TX/RX bytes • L1 TX/RX bps rate • RX OOS frames • Min/Max/Ave Latency • Min/Max/Ave Jitter
Histograms	FlexE group level and FlexE client level histogram modes for latency, jitter, interarrival time, frame length, sequence run length and sequence difference check
Module weight	2.5 kg, 5.45 lbs.
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
Layer 1 Functionality	
QSFP28 Interconnects	Optical, Copper
Layer-1 FlexE Debug Tools & Features	<ul style="list-style-type: none"> • PCS lane to Virtual lane mapping • Block Lock, Synced, MF Error, MF length Error, MF Request Error status • Frame Error and BIP Error counts • PCS status per PHY • PCS status align/align error, misaligned
SPN and ITU-T G.mtn Channel Layer OAM Emulation	
Performance and Scalability	Validate DUT channel layer OAM performance and scalability with large number of emulated FlexE clients
OAM service control	Enable and disable channel layer OAM on individual FlexE client
OAM service operation	FlexE client channel layer OAM insertion and extraction using idle blocks
OAM with fixed time interval	Sending and receiving channel layer OAM messages at user configurable fixed block or time interval
Event triggered OAM	Event triggered and on demand channel layer OAM messages
Multi code block OAM	Sequence numbers in multi code block channel layer OAM messages
CRC validation	CRC generation and validation for channel layer OAM messages
OAM priority scheduling	Channel layer OAM packet scheduling with different priorities
OAM function control	Enable and disable individual channel layer OAM function per FlexE client
Basic code block function	Channel layer OAM BAS (basic code block) functions such as REI, RDI, CS_LF, CS_RF, BIP
APS	Channel layer OAM APS (automatic protection switching) function
Connectivity verification	Channel layer OAM CV (connectivity verification) function
Client signal	Channel layer OAM CS (client signal) function
Delay measurement	Channel layer OAM one way and two-way DM (delay measurement) function

Technical Specifications

FlexE Client Protocol Emulation

Routing and Switching	BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, BFD, IGMPv1/v2/v3, MLDv1/v2, PIM-SM/SSM, MSDP, LISP, STP/RSTP/PVST/RPVST/MSTP, Link Aggregation (LACP)
MPLS	RSVP-TE, Fast Reroute, LDP, L2VPN (PWE3, LDP Signaled VPLS, BGP Signaled VPLS, VPWS), L3VPN, 6VPE, 6PE, EVPN/PBB-EVPN, Multicast VPN Rosen Draft, NG Multicast VPN, mLDP, P2MP-TE, LSP Ping, MPLS-TP, MPLS-TP Y1731 OAM
Data Center	VXLAN, EVPN, LLDP/DCBX, FC/FCoE, TRILL, Shortest Path Bridging, OTV, Cisco OpFlex, VEPA
Software Defined Networking	Segment Routing, SR-TE, SRv6, BGP Link State, PCEP, VXLAN, EVPN, Openflow, Openflow Switching Emulation, OVSD, BGP FlowSpec
Carrier Ethernet	EOAM, Link OAM, 802.1ag CFM, Y.1731, PBB, PBB-TE, IEEE 1588v2/PTP, Synchronous Ethernet, TWAMP
Broadband Access	ANCP, PPPoXv4/v6, DHCPv4/v6 Server/Client/Relay Agent, L2TPv2, L2TPv3, PPPoL2TPv2, PPPoL2TPv3, IPv6 Autoconfiguration, IGMPv1/v2/v3, MLDv1/v2, 802.1X
5G Fronthaul	eCPRI, NGFI/RoE, xRAN, CPRI over RoE

Ordering Information

Test Modules		Spirent Application	
Part Number	Hardware Description	Spirent TestCenter	Avalanche Commander
FlexE-100	SPIRENT FLEXE Solution QSFP28 10-PORT	X	
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-N12U-110	Spirent N12U chassis and controller with 110VAC power supplies		
SPT-N12U-220	Spirent N12U 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		

Contact Us

For more information, call your Spirent sales representative or visit us on the web at www.spirent.com/ContactSpirent.

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