Cisco Provider Connectivity Assurance Sensor SFP

Formerly Accedian Skylight SFP Compute Sensor

Contents

Product overview

The Cisco Provider Connectivity Assurance Sensor SFP portfolio (formerly Accedian Skylight SFP Compute Sensor) offers customers a wide variety of high-performance Gigabit Ethernet pluggable service assurance and demarcation options for enhanced mobile, Carrier Ethernet, and IP service deployments.

Fully integrated with the Provider Connectivity Assurance platform, Assurance Sensor SFPs support service delivery automation, scalable metric collection, and reporting with actionable insight and machine learning-driven analytics to enable accelerated service rollout and improved operational efficiency.

Figure 1.
1G Short-Reach (SX) Transceiver

Figure 2.
1G Long Haul (LH) Transceiver

Figure 3.
100/1000bT (CU) Transceiver

Figure 4.
10G Short-Reach (SR) Transceiver

Figure 5.
10G Long-Reach (LR) Transceiver

Figure 6.
10G Extended-Reach (ER) Transceiver

Figure 7.
10G Long-Reach (LR) BiDirectional Transceivers (Upstream and Downstream)

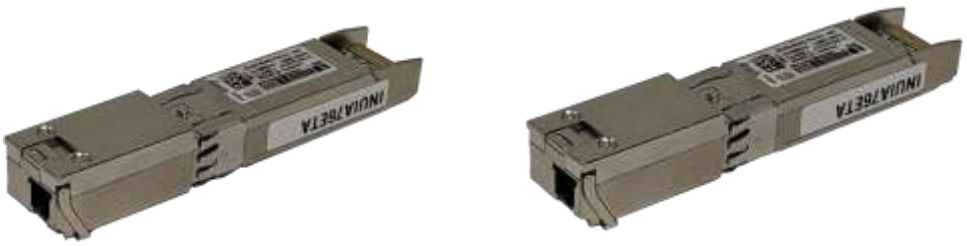

Figure 8.
10G Extended-Reach (ER) BiDirectional Transceivers (Upstream and Downstream)

Features and benefits of Provider Connectivity Assurance Sensor SFPs

- Compatible with other IEEE-compliant interfaces where applicable.
- Certified and tested on Cisco SFP+ platform ports for superior performance, quality, and reliability.
- Tested interoperability with standard Cisco SFP+ transceivers.
- End-to-end service performance assurance features include:
  - Service Activation Testing (SAT).
  - Performance Monitoring (PM).
- Features a fully featured FPGA capable of active Layer 2-4 traffic generation and measurement.
- Ideal for cost- and space-sensitive applications by avoiding usage of additional rackspace.
- Transceiver firmware and FPGA can be upgraded in network.
- Communications with Provider Connectivity Assurance platform using IP address.
- Industrial temperature range operation.

The S1G transceiver support service demarcation functions including:

- Wire-speed, MEF compliant Carrier Ethernet service delivery
- Precise, scalable Layer 2 service Operations, Administration, and Maintenance (OAM), including Y.1731

Table 1. Provider Connectivity Assurance Sensor SFP Portfolio

Currently available portfolio
SFP-1GbE Performance Monitoring, 100/1000bT I-temp
SFP-1GbE Performance Monitoring, SX, 850nm, 550m I-temp
SFP-1GbE Performance Monitoring, LH, 1310nn, I-temp
SFP-10GbE Performance Monitoring, SR, MM, 850nm, 150/150/150m OM3/4/5, E-temp
SFP-10GbE Performance Monitoring, LR, SM, 1310nm, 10km, I-Temp
SFP-10GbE Performance Monitoring, ER, SM, 1550nm, 40km, I-Temp
SFP-10GbE Performance Monitoring, LR-Bi-Directional*, SM, 1330/1270nm, 10km, I-Temp

Currently available portfolio
SFP-10GbE Performance Monitoring, LR-Bi-Directional*, SM, 1270/1330nm, 10km, I-Temp
SFP-10GbE Performance Monitoring, ER-Bi-Directional*, SM, 1330/1270nm, 40km, I-Temp
SFP-10GbE Performance Monitoring, ER-Bi-Directional*, SM, 1270/1330nm, 40km, I-Temp

*Bi-Directional enables full duplex operation on a single fiber by using different upstream and downstream wavelengths

Key Performance Indicators (KPI) using the Provider Connectivity Assurance platform and Sensor SFPs

Using the Provider Connectivity Assurance Sensor SFPs, the platform provides the following measurements and testing capabilities including:

- **TWAMP:** Two-Way Active Measurement Protocol
- **ETH-DM:** Ethernet Delay Measurement
- **ETH-LB:** Ethernet Loop Back
- **ICMP Echo:** Internet Control Message Protocol Echo
- **UDP Echo:** User Datagram Protocol Echo
- **ETH-VS:** Ethernet Vendor Specific
- **Y.1731:** Operation, Administration and Maintenance (OAM) functions and mechanisms for Ethernet-based networks
- **CCM:** Continuity Check Messages
- **DMM:** Delay and Delayed variation Measurements
- **SLM:** Synthetic Loss Measurements
- Link Trace
- Loop Back

KPIs include:

1. Synthetic active assurance and testing

One-way delay, PDV, and IPDV (jitter)

- Min/max/average
- Median (p50)
- Percentile 25/75/95/96/98/99
- Standard deviation

One-way packet statistics

- Packet lost (number and %)
- Loss bursts
- Longest loss burst
- Shortest loss burst
- Reordered packets (number and %)
- Packets duplicated (number and %)

One-way packet field and QoS metrics

- IP TOS max (DSCP diffserv)
- IP TOS min
- TTL max/min

VLAN Pbit max/min

- ETH-OAM MEG level max/min
- MOS
- R-value

Meta metrics

- Session ID
- Interval sequence number
- Interval timestamp (UTC)
- Interval length (Report interval)
- Up or downlink direction

2. Service Activation Testing (SAT)

Throughput validation – circuit readiness

- RFC2544 generation and reflection
- Y.1564 generation and reflection

3. Bandwidth metering

Throughput metrics

- Min Throughput – Per Flow
- Average Throughput – Per Flow
- Max Throughput – Per Flow

Provider Connectivity Assurance Sensor SFP zero-touch provisioning

Zero-Touch Provisioning (ZTP) and IPv4/IPv6 management make these Provider Connectivity Assurance Sensor SFPs easy and secure to deploy and manage. The Assurance Sensor SFP IP address can be assigned dynamically or manually.

ZTP is fully integrated with the Provider Connectivity Assurance platform. It also supports service delivery automation and scalable, real-time metrics collection and reporting of actionable insights for delivery and machine learning needed for accelerated service rollout and improved operational efficiencies.

Performance

TWAMP

- **Maximum sessions:** 4000 with a total of 80000 PPS
- **Maximum rate per session:** 250 PPS
- **Example:** 4000 sessions at 20 PPS or up to 320 sessions and 250 PPS.

Traffic loopback

- TWAMP reflector @ line rate for unlimited number of stateless sessions
- TWAMP reflector @ line rate for up 16 TWAMP stateful sessions
- User-configurable loopback Layer 2 to Layer 4 at line rate

RFC2544 and Y.1564

- Provider Connectivity Assurance Sensor SFPs support full line-rate test traffic generation.
- Provider Connectivity Assurance Sensor SFPs can create and analyze up to four Layer 2 or 3 unique fully fledged RFC-2544 and Y.1564 Service Activation Test (SAT) suite toward the Assurance platform or third-party endpoints.
    - This allows service providers to test a service path at turn-up and revalidate on-demand the capacity of a specific path or service during maintenance windows or when troubleshooting.
- Provider Connectivity Assurance Sensor SFPs can be located anywhere in the network, removing the limitation and expense of required head-end test equipment.
- Provider Connectivity Assurance Sensor SFPs support SAT testing at line rate for any packet size with 1-usec delay measurement accuracy.

Flowmeter

- The flowmeter capability precisely measures bandwidth and reveal transient peaks or microbursts that cause TCP throughput delays.
- Using Provider Connectivity Assurance platform, flowmeter processes per-flow bandwidth usage metrics from Sensor SFP time-stamps, and byte and packet counters, to accurately report minimum and maximum average bandwidth metrics for configurable reports on sub-second sampling intervals.
- When correlated together with packet loss and other measurements, service providers can detect network bottlenecks and plan capacity—key metrics to assure and enforce the delivery of off-net services.

- The flowmeter capability separately monitors upload and download usage statistics.
- Flowmeter's per-service metering enables usage-based billing, burst detection, trending, and traffic pattern analysis.

FlowBroker

- The FlowBroker is a flexible, remote packet capture solution that provides all-layer, end-to-end network visibility through efficient brokering, lossless delivery, and granular/shared filters.
- FlowBroker enables Deep Packet Inspection (DPI) to ensure the integrity of the data going through the network, as well as application reliability and network efficiency.
- Remote Packet Capture for 1G transceivers only.

Platform support

Provider Connectivity Assurance Sensor SFPs are currently in the certification process on many Cisco platforms. With respect to Cisco platforms the S1G's and S10G's have similar behavior to standard SFP's and SFP+'s and may work directly as unsupported transceivers. Please refer to the Transceiver Module Group (TMG) Compatibility Matrix. Also if the S1G's are S10G's are not listed please contact Cisco sales for an update on status of platform support.

Note: Provider Connectivity Assurance Sensor SFP are smart SFP using FPGA technology. The time to initialize exceed MSA specifications.

Technical specifications

Table 2. Cabling specification

PID	Wavelength (nm)	Cable Type	Optical Connector	Core Size (um)	Model Bandwidth (MHz/km)	Cable Distance
S1G-TE-PM-D-I	n/a	Cat5/6	-	-	-	100m
S1G-SX-PM-D-I	850	MMF	LC Duplex	50/62.5	-	550/275
S1G-LH-PM-D-I	1310	SMF	LC Duplex	G.652	-	10km
S10G-SR-PM-D-I	850	MMF	LC Duplex	50 50 50	2000 (OM3) 4700 (OM3) 4700 (OM4)	150m 150m 150m
S10G-LR-PM-D-I	1310	SMF	LC Duplex	G.652	-	10km
S10G-ER-PM-D-I	1550	SMF	LC Duplex	G.652	-	40km
S10G-BD-PM-D-I	1330	SMF	LC Simplex	G.652	-	10km
S10G-BU-PM-D-I	1270	SMF	LC Simplex	G.652	-	10km
S10G-B40D-PM-D-I	1330	SMF	LC Simplex	G.652	-	40km
S10G-B40U-PM-D-I	1270	SMF	LC Simplex	G.652	-	40km

Table 3. Optical transmit and receive specifications

PID	Transmit Power (dBm)		Receive Power (dBm)		Link Budget (dB)	Transmit and Receive Wavelengths (nm)
	Maximum	Minimum	Maximum	Minimum		
S1G-TE-PM-D-I	-	-	-	-	-	-
S1G-SX-PM-D-I	-3	-9.5	0	-17	9.5	830-860
S1G-LH-PM-D-I	-3	-9.5	-3	-19	12	1260-1360
S10G-SR-PM-D-I	-1	-7.3	-1	-9.9	4	840-860
S10G-LR-PM-D-I	0.5	-8.2	0.5	-14.4	9.4	1260-1355
S10G-ER-PM-D-I	4	-4.7	-1	-15.8	15	1350-1565
S10G-BD-PM-D-I	+0.5	-7	+0.5	-12	5	1320 to 1340 (Tx) 1260 to 1280 (Rx)
S10G-BU-PM-D-I	+0.5	-7	+0.5	-12	5	1260 to 1280 (Tx) 1320 to 1340 (Rx)
S10G-B40D-PM-D-I[*1]	+5	-1	-7	-18	17	1320 to 1340 (Tx) 1260 to 1280 (Rx)
S10G-B40U-PM-D-I[*1]	+5	-1	-7	-18	17	1260 to 1280 (Tx) 1320 to 1340 (Rx)

[*1]Requires 15dB attenuator if Link Distance < 5km.

Requires 10dB attenuator if Link Distance is between 5km and 15km.

Requires 5dB attenuator if Link Distance is between 15km and 25km.

Attenuator is available as a spare. The part numbers:

- **5dB:** 15216-ATT-LC-5=
- **10dB:** 15216-ATT-LC-10=
- **15dB:** 15216-ATT-LC-15=

Table 4. General specification

PID	Bail Color	Power (W)	Size (H x W x D) mm
S1G-TE-PM-D-I	-	3.0	8.5 x 13.4 x 63
S1G-SX-PM-D-I	Beige	1.75	8.5 x 13.4 x 56.6
S1G-LH-PM-D-I	Blue	1.75	8.5 x 13.4 x 56.6
S10G-SR-PM-D-I	Beige	2.6	8.5 x 13.4 x 64.5
S10G-LR-PM-D-I	Blue	2.7	8.5 x 13.4 x 64.5
S10G-ER-PM-D-I	Red	3.0	8.5 x 13.4 x 70.3
S10G-BD-PM-D-I	Blue	2.7	8.5 x 13.4 x 72
S10G-BU-PM-D-I	Blue	2.7	8.5 x 13.4 x 72
S10G-B40D-PM-D-I	Red	3.0	8.5 x 13.4 x 72
S10G-B40U-PM-D-I	Red	3.0	8.5 x 13.4 x 72

DHCP

- Dynamic Host Control Protocol is enabled so the transceivers can be discovered and managed in the network. Connectivity with a transceiver can be changed using Cisco Provider Connectivity Assurance Module Dock or with network commands.

LLDP

- Link Layer Discovery Protocol (LLDP) is enabled by default on the transceiver for network discovery. The transceiver works like a network element receiving LLDP from neighbor and transmiting LLDP. Configuration setting and LLDP neighbor can be access using Cisco Provider Connectivity Assurance Sensor Control.

Force Link Up

- When Force Link UP is enabled, the SFP reports a link up on the host interface even when the link is down on the media side, or the fiber is not connected.
- Force Link UP feature allows managing the SFP when fiber is not connected or link down.
- The feature is used for out of line deployment or for trouble shooting a link down on the fiber side.
- Force Link UP is enabled by default.

DOM

- Digital Optical Monitoring (DOM) functions according to industry standard SFF-8472 Multisource Agreement (MSA). This feature gives the end user the ability to monitor real time parameters of the SFP, such as optical output power, optical input power, temperature, laser bias current and transceiver supply voltage.

IEEE-1588 PTP

- Class B (Excludes S1G-TE-PM-D-I)

Encryption

- The control protocol is encrypted for authentication and after that the control protocol is signed. The encryption is Grain128a

GR-3108

- Class 2

Export classification

- 5A991.b

Management

- SFF-8742
- Cisco Provider Connectivity Assurance platform

Firmware update

- Via Provider Connectivity Assurance platform

Module weight

- Weight: Typically 75 grams or less

Environmental conditions (noncondensing)

- Operating temperature range:
  - Industrial temperature range -40 to 85C (-40 to 185F): S1G-TE-PM-D-I, S1G-SX-PM-D-I, S1G-LH-PM-D-I, S10G-LR-PM-D-I, S10G-ER-PM-D-I, S10G-BD-PM-D-I, S10G-BU-PM-D-I, S10G-B40D-PM-D-I, S10G-B40U-PM-D-I
  - Extended temperature range -5 to 85C (-10 to 185F): S10G-SR-PM-D-I
- Storage temperature range: -40 to 85C (-40 to 185F)

Ordering information

PID	Description
S1G-TE-PM-D-I	SFP-1GbE Performance Monitoring, 100/1000bT I-temp
S1G-SX-PM-D-I	SFP-1GbE Performance Monitoring, SX, 850nm, 550m I-temp
S1G-LH-PM-D-I	SFP-1GbE Performance Monitoring, LH, 1310nn, I-temp
S10G-SR-PM-D-I	SFP-10GbE Performance Monitoring, SR, MM, 850nm, 150/150/150m OM3/4/5, E-Temp
S10G-LR-PM-D-I	SFP-10GbE Performance Monitoring, LR, SM, 1310nm, 10km, I-Temp
S10G-ER-PM-D-I	SFP-10GbE Performance Monitoring, ER, SM, 1550nm, 40km, I-Temp
S10G-BD-PM-D-I	SFP-10GbE Performance Monitoring, LR-BiDi, SM, 1330/1270nm, 10km, I-Temp
S10G-BU-PM-D-I	SFP-10GbE Performance Monitoring, LR-BiDi, SM, 1270/1310nm, 10km, I-Temp
S10G-B40D-PM-D-I	SFP-10GbE Performance Monitoring, ER-BiDi, SM, 1330/1270nm, 40km, I-Temp
S10G-B40U-PM-D-I	SFP-10GbE Performance Monitoring, ER-BiDi, SM, 1270/1330nm, 40km, I-Temp

Warranty

Standard warranty: 1 year

- Expedited replacement available via a Cisco SMARTnet service support contract.

Regulatory and standards compliance

Standards:

- **GR-20-CORE:** Generic Requirements for Optical Fiber and Optical Fiber Cable
- **GR-326-CORE:** Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies
- **GR-1435-CORE:** Generic Requirements for Multifiber Optical Connectors
- **IEEE 802.3:** 10-Gigabit Ethernet (some exceptions for S10G-SR-PM-D-I)
- SFP+ MSA SFF-8431 (Optical Transceivers, Active Optical Cables, and Passive Twinax cables)
- SFF-8742 Management Interface for SFP+
- IEC 60603-7:2000: Generic Requirements for RJ-45 connectors

Safety:

- Laser Class 1 21CFR-1040 LN#50 7/2001
- Laser Class 1 IEC60825-1

Product sustainability

Table 5. Product sustainability

Sustainability topic	Reference	
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries, and packaging	WEEE compliance
	Information on product takeback and reuse program	Cisco Takeback and Reuse Program
	Sustainability inquiries	Contact: csr_inquiries@cisco.com
	Countries and regions supported	Regulatory compliance
Power	Power (including pluggable)	Power consumption
Material	Product packaging weight and materials	Contact: environment@cisco.com

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Additional information

For more information about Cisco Provider Connectivity Assurance Sensor SFPs, contact your sales representative or visit https://www.cisco.com/site/us/en/products/networking/optics-transceiver-modules/index.html.

Document history

Table 6. Document history

New or revised topic	Described In	Date
1st publication	-	February 2024
Update temperature range	Environmental conditions	April 2024
Branding, SR reach	Throughout	June 2024
Added new 1G and 10G PIDs including: S1G-TE-PM-D-I, S1G-SX-PM-D-I, S1G-LH-PM-D-I, S10G-BD-PM-D-I, S10G-BU-PM-D-I, S10G-B40D-PM-D-I, S10G-B40U-PM-D-I	Throughout the document	September 17, 2024

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