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Data Sheet

SFP/XFP Transceivers

Small Form-Factor Pluggable Transceivers

- Fiber optic or electrical transceiver units, providing pluggable interfaces according to known standards and specifications
- MSA (Multi-Source Agreement) compliance

Fiber optic/electrical transceivers

SFP (Small Form-factor Pluggable) transceivers (SFPs) are hot-swappable input/output optical and electrical transceiver units, each providing a different interface according to known compliance standards and pre-determined specifications. The units are plugged into other products to provide the required interface, thus enabling optimal combination of Capex reduction, ease of network planning and stock flexibility.

RAD's SFP transceivers are fully compliant with the Multisource Agreement (MSA) specifications, and are fully interoperable with third-party standards-based devices.

On account of their small size, SFPs allow higher port densities than with other transceivers, resulting in more efficient host device design.

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SFP/XFP Transceivers

Small Form-Factor Pluggable Transceivers

The intuitive squeeze-and-pull mechanism makes it easy to install SFP transceivers and remove them. Rather than replacing an entire circuit board containing several soldered-in modules, individual SFPs are unplugged and replaced for repair or upgrade, with cost savings both in maintenance and in upgrading efforts.

Built-in digital diagnostic monitoring (DDM) functionality is available for designated SFP types, allowing users to monitor the unit's transmitter optical output power, receiver input optical power, internal temperature, supply voltage and transmitter bias current levels in real-time.

The XFP (10 Gigabit Small Form Factor Pluggable) is a transceiver designed for 10G network applications. XFP modules are hot-swappable providing different interfaces according to known compliance standards and pre-determined specifications.

RAD's XFP transceivers are fully compliant with the Multisource Agreement (MSA) specifications, and are fully interoperable with third-party standards-based devices.

The intuitive squeeze-and-pull mechanism makes it easy to install XFP transceivers and remove them. Rather than replacing an entire circuit board containing several soldered-in modules, individual XFPs are unplugged and replaced for repair or upgrade, with cost savings both in maintenance and in upgrading efforts.

XFP supports built-in digital diagnostic monitoring (DDM) functionality allowing users to monitor the unit's transmitter optical output power, receiver input optical power, internal temperature, supply voltage and transmitter bias current levels in real-time.

Specifications

FIBER OPTIC INTERFACES

Notes:

- *Commercial SFPs are designed to withstand temperatures between 0 "- 70 ˚C (32˚-158˚ C)*
- Some of RAD's SFPs are available in industrially hardened (H) versions, designed to withstand temperatures between -40˚- 85˚ C (-40˚ -185˚ F).
- *The specified typical range may vary according to the specific product in which the SFP is used. For more information, refer to the data sheet of the specific product.*
- *Legend:*
  H – industrially hardened SFP
  D – DDM calibration
  ED – external DDM calibration.

Table 1. Fiber Optic Fast Ethernet/STM-1/STM-4 SFPs

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm]		Output Power [dBm]		Typical Max. Range	
				[min]	[max]	[min]	[max]	[km]	[miles]
SFP-1 Fast Ethernet/STM-1, LC	1310, 62.5/125 multimode	100BaseFX, IEEE 802.3 (FE) ANSI T1 646-1995 (STM-1)	LED	-30	-14	-20	-14	2	1.2
SFP-1D Fast Ethernet/ STM-1, LC, DDM, internal calibration	1310, 62.5/125 multimode	100BaseFX, IEEE 802.3 (FE) ANSI T1 646-1995 (STM-1)	LED	-30	-14	-20	-14	2	1.2
SFP-2 Fast Ethernet/STM-1, LC	1310, 9/125 single mode	100BaseLX10, IEEE 802.3 (FE), G.957 S1.1 (STM-1)	Laser	-28	-8	-15	-8	15	9.3
SFP-2H Fast Ethernet/STM-1, LC, industrially hardened	1310, 9/125 single mode	100BaseLX10, IEEE 802.3 (FE), G.957 S1.1 (STM-1)	Laser	-28	-8	-15	-8	15	9.3
SFP-2D Fast Ethernet/ STM-1, LC, DDM, internal calibration	1310, 9/125 single mode	100BaseLX10, IEEE 802.3 (FE), G.957 S1.1 (STM-1)	Laser	-28	-8	-15	-8	15	9.3
SFP-2DH Fast Ethernet/ STM-1, LC, DDM, internal calibration Industrially hardened	1310, 9/125 single mode	100BaseLX10, IEEE 802.3 (FE), G.957 S1.1 (STM-1)	Laser	-28	-8	-15	-8	15	9.3
SFP-3 Fast Ethernet/STM-1, LC	1310, 9/125 single mode	G.957 L1.1 (STM-1)	Laser	-34	-10	-5	0	40	24.8
SFP-3H Fast Ethernet/STM-1, LC, industrially hardened	1310, 9/125 single mode	G.957 L1.1 (STM-1)	Laser	-34	-10	-5	0	40	24.8
SFP-3D Fast Ethernet/STM-1, LC, DDM, internal calibration	1310, 9/125 single mode	G.957 L1.1 (STM-1)	Laser	-34	-10	-5	0	40	24.8
SFP-4 Fast Ethernet/STM-1, LC	1550, 9/125 single mode	G.957 L1.2 (STM-1)	Laser	-34	-10	-5	0	80	49.7

Table 1. Fiber Optic Fast Ethernet/STM-1/STM-4 SFPs (cont.)

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm]		Output Power [dBm]		Typical Max. Range	
				[min]	[max]	[min]	[max]	[km]	[miles]
SFP-4D Fast Ethernet/STM-1, LC, DDM, internal calibration	1550, 9/125 single mode	G.957 L1.2 (STM-1)	Laser	-34	-10	-5	0	80	49.7
SFP-10A Fast Ethernet/STM-1, LC	Tx –1310/Rx –1550, 9/125 single mode (single fiber)	100BaseBX10, IEEE 802.3 (FE) G.957 (STM-1)	Laser (WDM)	-28	-8	-14	-8	20	12.4
SFP-10B Fast Ethernet/STM-1, LC	Tx –1550/Rx –1310, 9/125 single mode (single fiber)	100BaseBX10, IEEE 802.3 (FE) G.957 (STM-1)	Laser (WDM)	-28	-8	-14	-8	20	12.4
SFP-10AD Fast Ethernet/STM-1, LC, DDM, internal calibration	Tx –1310/Rx –1550, 9/125 single mode (single fiber)	100BaseBX10, IEEE 802.3 (FE) G.957 (STM-1)	Laser (WDM)	-28	-8	-14	-8	20	12.4
SFP-10BD Fast Ethernet/STM-1, LC, DDM, internal calibration	Tx –1550/Rx –1310, 9/125 single mode (single fiber)	100BaseBX10, IEEE 802.3 (FE) G.957 (STM-1)	Laser (WDM)	-28	-8	-14	-8	20	12.4
SFP-14D, STM-4, LC, DDM, internal calibration	1310, 62.5/125 multimode	–	Laser	-28	-14	-20	-14	0.5	0.3
SFP-15 STM-4, LC	1310, 9/125 single mode	G.957 S4.1	Laser	-28	-8	-15	-8	15	9.3
SFP-16 STM-4, LC	1550, 9/125 single mode	G.957 L4.2	Laser	-28	-8	-3	+2	80	49.7
SFP-18A Fast Ethernet/STM-1, LC	Tx –1310/Rx –1550, 9/125 single mode (single fiber)	–	Laser (WDM)	-28	-8	-5	0	40	24.8
SFP-18B Fast Ethernet/STM-1, LC	Tx –1550/Rx –1310, 9/125 single mode (single fiber)	–	Laser (WDM)	-28	-8	-5	0	40	24.8
SFP-18AED Fast Ethernet/STM-1, LC, DMM, external calibration	Tx –1310/Rx –1550, 9/125 single mode (single fiber)	–	Laser (WDM)	-28	-8	-5	0	40	24.8
SFP-18BED Fast Ethernet/STM-1, LC, DMM, external calibration	Tx –1550/Rx –1310, 9/125 single mode (single fiber)	–	Laser (WDM)	-28	-8	-5	0	40	24.8
SFP-19A Fast Ethernet/STM-1, LC	Tx –1490/Rx –1570, 9/125 single mode (single fiber)	–	Laser (WDM)	-30	-8	0	+5	80	49.7
SFP-19B Fast Ethernet/STM-1, LC	Tx –1570/Rx –1490, 9/125 single mode (single fiber)	–	Laser (WDM)	-30	-8	0	+5	80	49.7
SFP-24 Fast Ethernet/STM-1, LC	850, 50/125 Multimode	–	VCSEL	-25	-2	-10	-4	2	1.2
	850, 62.5/125 multimode	–	VCSEL	-25	-2	-10	-4	1	0.6

Table 2. Fiber Optic Gigabit Ethernet SFPs

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm]		Output Power [dBm]		Typical Max. Range	
				[min]	[max]	[min]	[max]	[km]	[miles]
SFP-5 Gigabit Ethernet, LC	850, 50/125 multimode	1000BaseSX, IEEE 802.3 (GbE)	VCSEL	-17	0	-9.5	0	0.55	0.3
SFP-5H Gigabit Ethernet, LC, industrially hardened	850, 50/125 multimode	1000BaseSX, IEEE 802.3 (GbE)	VCSEL	-17	0	-9.5	0	0.55	0.3
SFP-5D Gigabit Ethernet, LC, DDM, internal calibration	850, 50/125 multimode	1000BaseSX, IEEE 802.3 (GbE)	VCSEL	-17	0	-9.5	0	0.55	0.3
SFP-5DH Gigabit Ethernet, LC, DDM, internal calibration, industrially hardened	850, 50/125 multimode	1000BaseSX, IEEE 802.3 (GbE)	VCSEL	-17	0	-9.5	0	0.55	0.3
SFP-6 Gigabit Ethernet, LC	1310, 9/125 single mode	1000BaseLX10, IEEE 802.3 (GbE)	Laser	-20	-3	-9.5	-3	10	6.2
SFP-6H Gigabit Ethernet, LC, industrially hardened	1310, 9/125 single mode	1000BaseLX10, IEEE 802.3 (GbE)	Laser	-20	-3	-9.5	-3	10	6.2
SFP-6D Gigabit Ethernet, LC, DDM, internal calibration	1310, 9/125 single mode	1000BaseLX10, IEEE 802.3 (GbE)	Laser	-20	-3	-9.5	-3	10	6.2
SFP-6DH Gigabit Ethernet, LC, DDM, internal calibration, industrially hardened	1310, 9/125 single mode	1000BaseLX10, IEEE 802.3 (GbE)	Laser	-20	-3	-9.5	-3	10	6.2
SFP-7 Gigabit Ethernet, LC	1550, 9/125 single mode	–	Laser	-22	-3	0	+5	80	49.7
SFP-7D Gigabit Ethernet, LC, DDM, internal calibration	1550, 9/125 single mode	–	Laser	-22	-3	0	+5	80	49.7
SFP-7DH Gigabit Ethernet, LC, DDM, internal calibration, industrially hardened	1550, 9/125 single mode	–	Laser	-22	-3	0	+5	80	49.7
SFP-8 Gigabit Ethernet, LC	1310, 9/125 single mode	–	Laser	-21	-3	-4	+4	40	24.8
SFP-8H Gigabit Ethernet, LC, industrially hardened	1310, 9/125 single mode	–	Laser	-21	-3	-4	+4	40	24.8
SFP-8D Gigabit Ethernet, LC, DDM, internal calibration	1310, 9/125 single mode	–	Laser	-21	-3	-4	+4	40	24.8
SFP-8DH Gigabit Ethernet, LC, DDM, internal calibration, industrially hardened	1310, 9/125 single mode	–	Laser	-21	-3	-4	+4	40	24.8

Table 2. Fiber Optic Gigabit Ethernet SFPs (cont.)

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm] [min]	Input Power [dBm] [max]	Output Power [dBm] [min]	Output Power [dBm] [max]	Typical Max. Range [km]	Typical Max. Range [miles]
SFP-17A Gigabit Ethernet, LC	Tx –1310/Rx –1490, 9/125 single mode (single fiber)	1000BaseBX10, IEEE 802.3 (GbE)	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-17B Gigabit Ethernet, LC	Tx –1490/Rx –1310, 9/125 single mode (single fiber)	1000BaseBX10, IEEE 802.3 (GbE)	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-17AD Gigabit Ethernet, LC, DDM, Internal calibration	Tx –1310/Rx –1490, 9/125 single mode (single fiber)	1000BaseBX10, IEEE 802.3 (GbE)	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-17BD Gigabit Ethernet, LC, DDM, Internal calibration	Tx –1490/Rx –1310, 9/125 single mode (single fiber)	1000BaseBX10, IEEE 802.3 (GbE)	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-20 Gigabit Ethernet, LC	1550, 9/125 single mode	–	Laser	-32	-8	+1	+5	120	74.5
SFP-20EDH Gigabit Ethernet, LC, DDM, external calibration, industrially hardened	1550, 9/125 single mode	–	Laser	-30	-8	+1	+5	120	74.5
SFP-21A Gigabit Ethernet, LC	Tx –1310/Rx –1490, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-21B Gigabit Ethernet, LC	Tx –1490/Rx –1310, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-21AED Gigabit Ethernet, LC, DDM, external calibration	Tx –1310/Rx –1490, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-21BED Gigabit Ethernet, LC, DDM, external calibration	Tx –1490/Rx –1310, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-22A Gigabit Ethernet, LC	Tx –1490/Rx –1570, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	0	+5	80	49.7
SFP-22B Gigabit Ethernet, LC	Tx –1570/Rx –1490, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	0	+5	80	49.7
SFP-23A Gigabit Ethernet, LC	Tx –1310/Rx –1550, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-23B Gigabit Ethernet, LC	Tx –1550/Rx –1310, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-23AED Gigabit Ethernet, LC, DDM, external calibration	Tx –1310/Rx –1550, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8

Table 2. Fiber Optic Gigabit Ethernet SFPs (cont.)

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm] [min]	Input Power [dBm] [max]	Output Power [dBm] [min]	Output Power [dBm] [max]	Typical Max. Range [km]	Typical Max. Range [miles]
SFP-23BED Gigabit Ethernet, LC, DDM, external calibration	Tx –1550/Rx –1310, 9/125 single mode (single fiber)	–	Laser (WDM)	-24	-3	-5	0	40	24.8
SFP-28a Gigabit Ethernet, LC	9/125 single mode (single fiber) Tx – 1310 Rx – 1550	–	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-28b Gigabit Ethernet, LC	9/125 single mode (single fiber) Tx – 1550 Rx – 1310	–	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-28AD Gigabit Ethernet, LC, DDM, internal calibration	9/125 single mode (single fiber) Tx – 1310 Rx – 1550	–	Laser WDM)	-20	-3	-9	-3	10	6.2
SFP-28BD Gigabit Ethernet, LC, DDM, internal calibration	9/125 single mode (single fiber) Tx – 1550 Rx – 1310	–	Laser (WDM)	-20	-3	-9	-3	10	6.2
SFP-47DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range – 20˚ to 85˚ C (–4˚ to 185˚ F)	1470, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7
SFP-49DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range – 20˚ to 85˚ C (–4˚ to 185˚ F)	1490, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7
SFP-51DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range – 20˚ to 85˚ C (–4˚ to 185˚ F)	1510, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7
SFP-53DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range –20˚ to 85˚ C (–4˚ to 185˚ F)	1530, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7

Table 2. Fiber Optic Gigabit Ethernet SFPs (cont.)

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [μm]	Standards	Transmitter Type	Input Power [dBm] [min]	Input Power [dBm] [max]	Output Power [dBm] [min]	Output Power [dBm] [max]	Typical Max. Range [km]	Typical Max. Range [miles]
SFP-55DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range –20˚ to 85˚ C (–4˚ to 185˚ F)	1550, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7
SFP-57DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range –20˚ to 85˚ C (–4˚ to 185˚ F)	1570, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7
SFP-59DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range –20˚ to 85˚ C (–4˚ to 185˚ F)	1590, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7
SFP-61DH Gigabit Ethernet, LC, DDM, internal calibration, extended temperature range –20˚ to 85˚ C (–4˚ to 185˚ F)	1610, 9/125 single mode	G.694.2, CWDM grid compliant	Laser (CWDM)	-24	-3	0	+5	80	49.7

Table 3. Fiber Optic 10 Gigabit Ethernet XFPs

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm]		Output Power [dBm]		Typical Max. Range	
				[min]	[max]	[min]	[max]	[km]	[miles]
XFP-1D 10 Gigabit Ethernet, LC, DDM, internal calibration	1310, 9/125 single mode	10GBASE-LR/LW IEEE 802.3	Laser	-14.4	+0.5	-8.2	+0.5	10	6.2
XFP-1DH 10 Gigabit Ethernet, LC, DDM, Internal calibration , industrially hardened	1310, 9/125 single mode	10GBASE-LR/LW IEEE 802.3	Laser	-14.4	+0.5	-8.2	+0.5	10	6.2
XFP-2D 10 Gigabit Ethernet, LC, DDM, internal calibration	1550, 9/125 single mode	10GBASE-ZR/ZW IEEE 802.3	Laser	-24	-7	0	+4	80	49.7
XFP-3D 10 Gigabit Ethernet, LC, DDM, internal calibration	1550, 9/125 single mode	10GBASE-ER/EW IEEE 802.3	Laser	-15.8	-1	-4.7	+4	40	24.8
XFP-3DH 10 Gigabit Ethernet, LC, DDM, Internal calibration , industrially hardened	1550, 9/125 single mode	10GBASE-ER/EW IEEE 802.3	Laser	-15.8	-1	-4.7	+4	40	24.8
XFP-4D 10 Gigabit Ethernet, LC, DDM, internal calibration	850, 50/125 multi mode	10GBASE-SR/SW IEEE 802.3	VCSEL	-9.9	-1	-7.3	-1	0.3	0.186

Table 3. Fiber Optic Gigabit Ethernet XFPs (cont.)

Ordering Name, Interface, Connector	Wavelength, Fiber Type [nm], [µm]	Standards	Transmitter Type	Input Power [dBm] [min]	Input Power [dBm] [max]	Output Power [dBm] [min]	Output Power [dBm] [max]	Typical Max. Range [km]	Typical Max. Range [miles]
XFP-5D-19 10 Gigabit Ethernet, LC, DDM, internal calibration	1562.23 (C-Band, Channel 19), 9/125 single mode	10GBASE-ER/EW IEEE 802.3	Laser (DWDM)	-15.8	-1	-4.7	+4	40	24.8
XFP-5D-20 10 Gigabit Ethernet, LC, DDM, internal calibration	1561.42 (C-Band, Channel 20), 9/125 single mode	10GBASE-ER/EW IEEE 802.3	Laser (DWDM)	-15.8	-1	-4.7	+4	40	24.8
XFP-5D-59 10 Gigabit Ethernet, LC, DDM, internal calibration	1530.33 (C-Band, Channel 59), 9/125 single mode	10GBASE-ER/EW IEEE 802.3	Laser (DWDM)	-15.8	-1	-4.7	+4	40	24.8

Table 4. Electrical Interface SFPs

Ordering Name, Interface, Connector	Standards	Cable Type	Impedance [Ω]	Typical Max. Range (Attenuation) [m]	[ft]
SFP-9-GH Gigabit Ethernet, RJ-45, industrially hardened	1000BaseT, IEEE 802.3	UTP, CAT.5	100	100	328
SFP-9G Gigabit Ethernet, RJ-45	1000BaseT, IEEE 802.3	UTP, CAT.5	100	100	328
SFP-11 STM-1E, mini BNC, DIN 1.0/2.3	G.703, supports CMI encoder/decoder	Coaxial	75	135 (12.7 dB)**	442
SFP-11PP STM-1E, Push-Pull mini BNC, DIN 1.0/2.3	G.703, supports CMI encoder/decoder	Coaxial	75	135 (12.7 dB)**	442
SFP-30 Gigabit Ethernet, RJ-45, SGMII Interface	10/100/1000BaseT, IEEE 802.3	UTP, cat. 5	100	100	328

Notes:

** *With SFP-11/SFP-11PP, a 135m range is attainable when using RG59 B/U (at 78 MHz, in accordance with the square root of frequency law).*

SFP/XFP Transceivers

Small Form-Factor Pluggable Transceivers

Ordering

To order an SFP/XFP unit, use its ordering name as listed in *Tables 1–3*.

Note: *It is strongly recommended to order RAD products with original RAD SFPs/XFP's installed. This will ensure that prior to shipping; RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP/XFP devices.*

RAD cannot guarantee full compliance to product specifications for products using non-RAD SFPs/XFPs.

SUPPLIED ACCESSORIES

CBL-MINIBNC-BNC
Two adapter cables for converting mini BNC connectors to regular BNC coaxial connectors (for SFP-11)

CBL-MINIBNC/PP-BNC
Two adapter cables for converting mini BNC Push-Pull connectors to regular BNC coaxial connectors (for SFP-11/PP)

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