

Datasheet

## 2.7 Gbps Multi-Rate Single Fiber Bidirectional 40 km SFP Transceivers

SFP-MR-451R2 and SFP-MR-541R2



### Highlights

- SFP transceiver
- Data Rates: 100 to 2700 Mbps
- Protocols:
  - IEEE 802.3ah
  - Gigabit Ethernet
  - OC-48/STM-16
- Single-mode fiber
- Single fiber, bi-directional
- Two wavelength options:
  - Tx 1490 nm and Rx 1570 nm
  - Tx 1570 nm and Rx 1490 nm
- 12 to 60 km
- Simplex LC connector
- Digital Diagnostics (SFF-8472)
- Industrial temperature models available
- Hot-swap

### Overview

Small Form-Factor Pluggable (SFP) interfaces from MRV Communications provide flexible high speed links in a small industry standard package. They deliver the deployment options and inventory control that network administrators demand for growing networks.

SFPs are designed to Multi-Source Agreement (MSA) standards to ensure network equipment compatibility. They are a perfect addition to MRV’s extensive lines of networking equipment.

Visit the MRV website at [www.mrv.com](http://www.mrv.com) or contact your nearest authorized MRV Communications dealer for more information.

### Specifications Overview

Data Rate	100 to 2700 Mbps
Tx Wavelength for SFP-MR-451R2	1490 nm
Tx Wavelength for SFP-MR-541R2	1570 nm
Tx Power (Minimum)	-2 dBm
Tx Dispersion Penalty	1 dB
Tx Extinction Ratio	8.2 dBm
Tx Disable	Yes
Rx Wavelength for SFP-MR-451R2	1480 to 1600 nm
Rx Wavelength for SFP-MR-541R2	1260 to 1360 nm
Rx Sensitivity	-18 dBm
Rx Saturation	0 dBm
Rx Damage Threshold	0 dBm
Operating Temperature Range	-5 to 70 °C
Operating Temperature Range (TH Models)	-40 to 85 °C
Power Consumption	1 Watt

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### Transmitter Specifications (Optical)

Parameter	Symbol	Min	Max	Unit	Notes
Optical Power	$P_{op}$	-2	3	dBm	-
Optical Crosstalk	XT	-	-45	dB	-
Average Launch Power of Off Tx	$P_{off}$	-	-45	dBm	-
Extinction Ratio	ER	8.2	-	dB	-
Eye Mask	-	IEEE 802.3 and SONET/SDH compliant			-
Optical Rise Time (20% to 80% values)	$t_r$	-	160	ps	-
Optical Fall Time (20% to 80% values)	$t_f$	-	160	ps	-
Mean Wavelength for SFP-MR-45IR2	$\lambda$	1480	1500	nm	-
Mean Wavelength for SFP-MR-54IR2	$\lambda$	1560	1580	nm	-
RMS Width (20 dB)	$\Delta\lambda$	-	1	nm	-
Side Mode Suppression Ratio	SMSR	30	-	dB	-
Dispersion Penalty (at 40 km)	dp	-	1	dB	1
Relative Intensity Noise	RIN	-	-120	dB/Hz	-
Transmitter Reflectance	-	-	-12	dB	-
Reflectance Tolerance	rp	-24	-	dB	-

**Notes:** 1. Measured at 2.7 Gbps,  $10^{-12}$  BER, PRBS 2<sup>23</sup>-1, at eye center

### Receiver Specifications (Optical)

Parameter	Symbol	Min	Max	Unit	Notes
Receive Power Low/High	$R_{sens,low/high}$	-18	0	dBm	1
Damage Threshold	$P_{in,damage}$	0	-	dBm	-
Wavelength for SFP-MR-45IR2	$\lambda$	1560	1580	nm	-
Wavelength for SFP-MR-54IR2	$\lambda$	1480	1500	nm	-
LOS Assert	-	-28	-	dBm	-
LOS De-assert	-	-	-18	dBm	-
LOS Hysteresis	-	0.5	-	dB	-
Receiver Reflectance	-	-	-12	dB	-

**Notes:** 1. Measured at  $10^{-10}$  BER, 2.7 Gbps, PRBS 2<sup>23</sup>-1, and  $10^{-12}$  BER, 1.25 Gbps, PRBS 2<sup>7</sup>-1

### Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature	-5 to 70	± 3	°C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Temperature (TH)	-40 to 85	± 3	°C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Voltage	0 to $V_{CC}$	± 0.1	V	External	$V(\text{Volts}) = V_{slope} * V_{ad}(16 \text{ bit unsigned integer}) + V_{offset}$
Bias Current	0 to 120	± 5	mA	External	$I(\text{mA}) = I_{slope} * I_{ad}(16 \text{ bit unsigned integer}) + I_{offset}$
TX Power	-2 to 3	± 3	dBm	External	$TX\_PWR(\mu W) = TX\_PWR_{slope} * TX\_PWR_{ad}(16 \text{ bit unsigned integer}) + TX\_PWR_{offset}$
RX Power	-18 to 0	± 3	dBm	External	$RX\_PWR(\mu W) = A_0 + A_1 * x + A_2 * x^2 + A_3 * x^3 + A_4 * x^4$

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### General Operations

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage	$V_{CC}$	3.135	3.465	V	-
Total Current	$I_{CC}$	-	300	mA	-
Power Supply Noise Rejection	PSR	100	-	mV <sub>p-p</sub>	-
Operating Case Temperature	$T_{opr}$	-5	70	°C	1
Operating Case Temperature (TH Models)	$T_{opr}$	-40	85	°C	-
Storage Temperature	$T_{stg}$	-40	85	°C	-
Data Rate OC-48	DR	-	2488.32	Mbps	-
Data Rate FEC	DR	-	2700	Mbps	-
Data Rate Gigabit Ethernet	DR	-	1250	Mbps	-
Data Rate Fibre Channel	DR	-	1062.5	Mbps	-
Data Rate 2 Gigabit Fibre Channel	DR	-	2125	Mbps	-

**Notes:** 1. Maximum Relative Humidity is 85%, non-condensing

### Transmitter Specifications (Electical)

Parameter	Symbol	Min	Max	Unit	Notes
Input Differential Impedence	$R_{in}$	80	120	$\Omega$	-
PECL Single Ended Data Input Swing	$V_{in,p-p}$	250	1200	mV	-
TxFault_Fault	$V_{fault}$	2	$V_{CC}$	V	-
TxFault_Normal	$V_{normal}$	$V_{EE}$	$V_{EE}+0.5$	V	-
TxDisable_Disable	$V_d$	2	$V_{CC}$	V	-
TxDisable_Enable	$V_{en}$	$V_{EE}$	$V_{EE}+0.8$	V	-

### Receiver Specifications (Electrical)

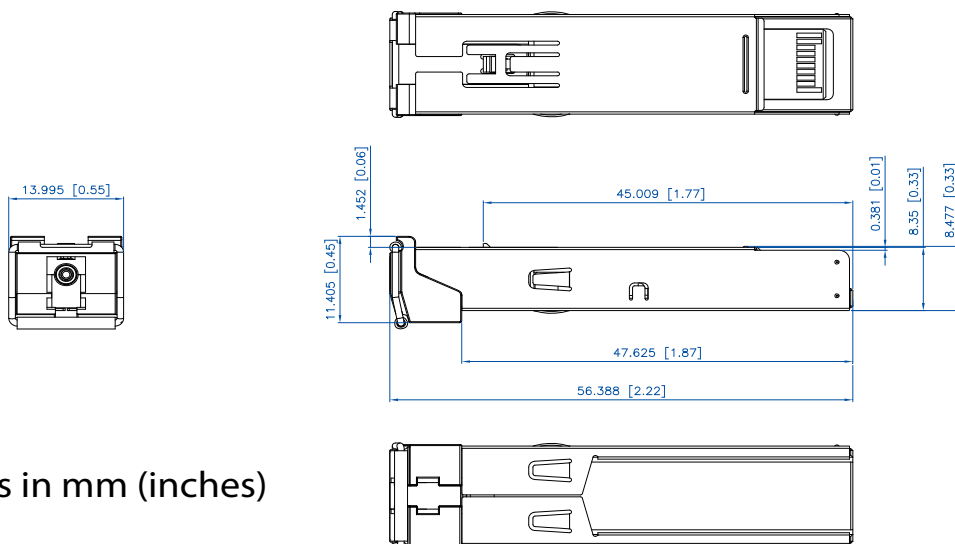
Parameter	Symbol	Min	Max	Unit	Notes
PECL Single Ended Data Output Swing	$V_{out,p-p}$	185	800	mV	-
Data Output Rise Time	$t_r$	-	175	ps	-
Data Output Fall Time	$t_f$	-	175	ps	-

### Electrical Specifications and Timing

Parameter	Symbol	Min	Max	Unit	Notes
Tx Disable Negate Time	$t_{on}$	-	1	ms	-
Tx Disable Assert Time	$t_{off}$	-	10	$\mu$ s	-
Time to Initialize, Including Reset of Tx Fault	$t_{init}$	-	300	ms	-
Tx Fault Assert Time	$t_{fault}$	-	100	$\mu$ s	-
Tx Disable To Reset	$t_{reset}$	10	-	$\mu$ s	-
LOS Assert Time	$t_{loss_{on}}$	-	100	$\mu$ s	-
LOS De-assert Time	$t_{loss_{off}}$	-	100	$\mu$ s	-
Serial ID Clock Rate	$f_{serial\_clock}$	-	100	KHz	-
RX_LOS Voltage (High)	$RX\_LOS_H$	2	$V_{CC}$	V	-
RX_LOS Voltage (Low)	$RX\_LOS_L$	-	0.8	V	-
LOS Output Voltage-Fault	$V_{LOS\ fault}$	2	$V_{CC}$	V	-
LOS Output Voltage-Normal	$V_{LOS\ normal}$	$V_{EE}$	$V_{EE}+0.5$	V	-
MOD_DEF (0:2)-High	$V_H$	2	$V_{CC}$	V	-
MOD_DEF (0:2)-Low	$V_L$	$V_{EE}$	$V_{EE}+0.5$	V	-

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Pin	Function	Name / Description	Notes
1	V <sub>ee</sub> T	Module Transmitter Ground	-
2	TX_FAULT	Open Collector	-
3	TX_DISABLE	Internally Pulled High	-
4	MOD_DEF2	Serial Data Input	-
5	MOD_DEF1	Serial Clock Input	-
6	MOD_DEF0	Internally Grounded	-
7	NC	Not Connected	-
8	LOS	Open Collector	-
9	V <sub>ee</sub> R	Module Receiver Ground	-
10	V <sub>ee</sub> R	Module Receiver Ground	-
11	V <sub>ee</sub> R	Module Receiver Ground	-
12	RXD-	Receiver Data Negative	-
13	RXD+	Receiver Data Positive	-
14	V <sub>ee</sub> R	Module Receiver Ground	-
15	V <sub>cc</sub> R	Module Receiver Power Supply	-
16	V <sub>cc</sub> T	Module Transmitter Power Supply	-
17	V <sub>ee</sub> T	Module Transmitter Ground	-
18	TXD+	Transmitter Data Positive	-
19	TXD-	Transmitter Data Negative	-
20	V <sub>ee</sub> T	Module Transmitter Ground	-

**Outline Drawing**




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## Ordering Information

Model	Description	Data Rate (Mbps)	Wavelength (nm)		Connector Type	Digital Diagnostics	Bail Latch Color	Distance Range (km)
			Tx	Rx				
SFP-MR-45IR2	SFP Multi-Rate Bidirectional Transceiver	100 - 2700	1490	1570	LC	Yes	Purple	12 - 60
SFP-MR-54IR2	SFP Multi-Rate Bidirectional Transceiver	100 - 2700	1570	1490	LC	Yes	Orange	12 - 60
SFP-MR-45IR2TH	SFP Multi-Rate Bidirectional Transceiver, <i>Temperature Hardened</i>	100 - 2700	1490	1570	LC	Yes	Purple	12 - 60
SFP-MR-54IR2TH	SFP Multi-Rate Bidirectional Transceiver, <i>Temperature Hardened</i>	100 - 2700	1570	1490	LC	Yes	Orange	12 - 60

## Regulatory and Industry Compliances

Class 1 Laser Product, complies with EN 60825-1 and 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007  
MSA SFF-8074i; Telcordia GR-468, GR 253/STM G.957, Digital Diagnostic SFF-8472;  
Certified by one or more of the following agencies: TÜV, UL, CSA  
RoHS Directive; China RoHS; California RoHS Law, REACH Directive SVHC; WEEE Directive  
The Quality Management System is certified to ISO 9001 by QMI-SAI Global  
The Environmental Management System is in compliance with ISO 14001

## Warnings

**Handling Precautions:** This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

**Laser Safety:** Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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