

## Datasheet

# Multi-Rate (2 Gbps) CWDM 96 km SFP Transceivers

SFP-27DCWLR-xx and SFP27DCWLRTH-xx



### Features

- SFP transceiver
- Data Rates: 100 - 2700 Mbps
- Protocols:
  - Ethernet (100 Mbps, 1 Gbps)
  - Fibre Channel (1 and 2 Gbps)
  - OC-3/STM-1 to OC-48/ STM-16 and OC-48 with FEC
  - ESCON
- Single-mode fiber
- CWDM wavelength per ITU-T G.694.2
- 40 to 96 km range
- Duplex LC connector
- Digital Diagnostics (SFF-8472)
- Hot-swap
- Industrial temperature models available
- Compliances (see last page for details)

### 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 - 2700 Mbps
Tx Wavelength	CWDM wavelength (see Wavelength Guide for xx values)
Tx Power (Minimum)	-2 dBm
Dispersion Penalty	2 dB
Tx Disable Option	Yes
Rx Wavelength Range	1200 - 1625 nm
Rx Sensitivity	-28 dBm
Rx Saturation	-6 dBm
Rx Damage Threshold	4 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 <sub>op</sub>	-2	3	dBm	-
Average Launch Power Tx_Off	P <sub>off</sub>	-	-45	dBm	-
Extinction Ratio	ER	8.2	-	dB	-
Eye Mask	IEEE 802.3ah, SONET/SDH compliant				-
Optical Jitter Generation	J <sub>gen</sub>	-	0.007	UI	-
Optical Rise/Fall Time	t <sub>r</sub>	-	160	ps	1
Mean Wavelength	λ	1xxx - 6.5 nm	1xx1 + 6.5 nm	nm	-
Spectral Width (20 dB)	Δλ	-	1	nm	-
Dispersion Penalty at 80 km	dp	-	2	dB	2
Relative Intensity Noise	RIN	-	-120	dB/Hz	-
Reflection Tolerance	rp	-24	-	dB	3

- Notes:**
1. 20%~80% values
  2. Measured at BER of 1E<sup>-12</sup>, PRBS of 2<sup>23</sup>-1, at eye center
  3. 1 dB degradation of receiver sensitivity

### Receiver Specifications (Optical)

Parameter	Symbol	Min	Max	Unit	Notes
Receive Power Low	R <sub>sens,low</sub>	-	-28	dBm	1
Receive Power High	R <sub>sens,high</sub>	-6	-	dBm	1
Damage Threshold For Receiver	P <sub>in,damage</sub>	4	-	dBm	-
Wavelength	λ	1200	1625	nm	-
Maximum Reflectance Of Receiver	RX_r	-	-27	dB	-
LOS Assert	-	-42	-	dBm	-
LOS De-assert	-	-	-28	dBm	-
LOS Hysteresis	-	0.5	-	dB	-

- Notes:**
1. 10<sup>-10</sup> BER, PRBS 2<sup>23</sup>-1, for SONET, 10<sup>-12</sup> BER, PRBS 2<sup>7</sup>-1, for Gigabit Ethernet

### Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature	-5 to 70	± 3	° C	External	T <sub>c</sub> (C)=T <sub>slope</sub> *T <sub>ad</sub> (16 bit signed twos complement value) + T <sub>offset</sub>
Temperature (TH Models)	-40 to 85	± 3	° C	External	T <sub>c</sub> (C)=T <sub>slope</sub> *T <sub>ad</sub> (16 bit signed twos complement value) + T <sub>offset</sub>
Voltage	0 to V <sub>CC</sub>	0.1	V	External	V(Volts)=V <sub>slope</sub> *V <sub>ad</sub> (16 bit unsigned integer) + V <sub>offset</sub>
Bias Current	0 to 120	5	mA	External	I(mA)=I <sub>slope</sub> *I <sub>ad</sub> (16 bit unsigned integer)+I <sub>offset</sub>
TX Power	-2 to 3	±3 dB	dBm	External	TX_PWR(μW)=TX_PWR <sub>slope</sub> *TX_PWR <sub>ad</sub> (16 bit unsigned integer) +TX_PWR <sub>offset</sub>
RX Power	-28 to -6	±3 dB	dBm	External	RX_PWR(μW)=A0+A1*x+A2*x^2+A3*x^3+A4*x^4

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### General Operating

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage	$V_{CC}$	3.135	3.465	V	-
Total Current, -40 to -5 °C	$I_{CC}$	-	500	mA	1
Total Current, -5 to 85 °C	$I_{CC}$	-	300	mA	-
Total Current Each Supply Pin	$I_{CCR}, I_{CCT}$	-	300	mA	-
Power Supply Noise Rejection	PSR	100	-	mVp-p	2
Operating Case Temperature	$T_{opr}$	-5	70	°C	3
Operating Case Temperature (TH Models)	$T_{opr}$	-40	85	°C	3
Storage Temperature	$T_{stg}$	-40	85	°C	-
Data Rate	DR	100	2700	Mbps	-

- Notes:**
1. Denotes deviation from MSA
  2. 20Hz to 155MHz
  3. Please refer to ordering information

### Transmitter Specifications (Electrical)

Parameter	Symbol	Min	Max	Unit	Notes
Input Differential Impedance	$R_{in}$	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/Fall Time	$t_r, t_f$	-	175	ps	-

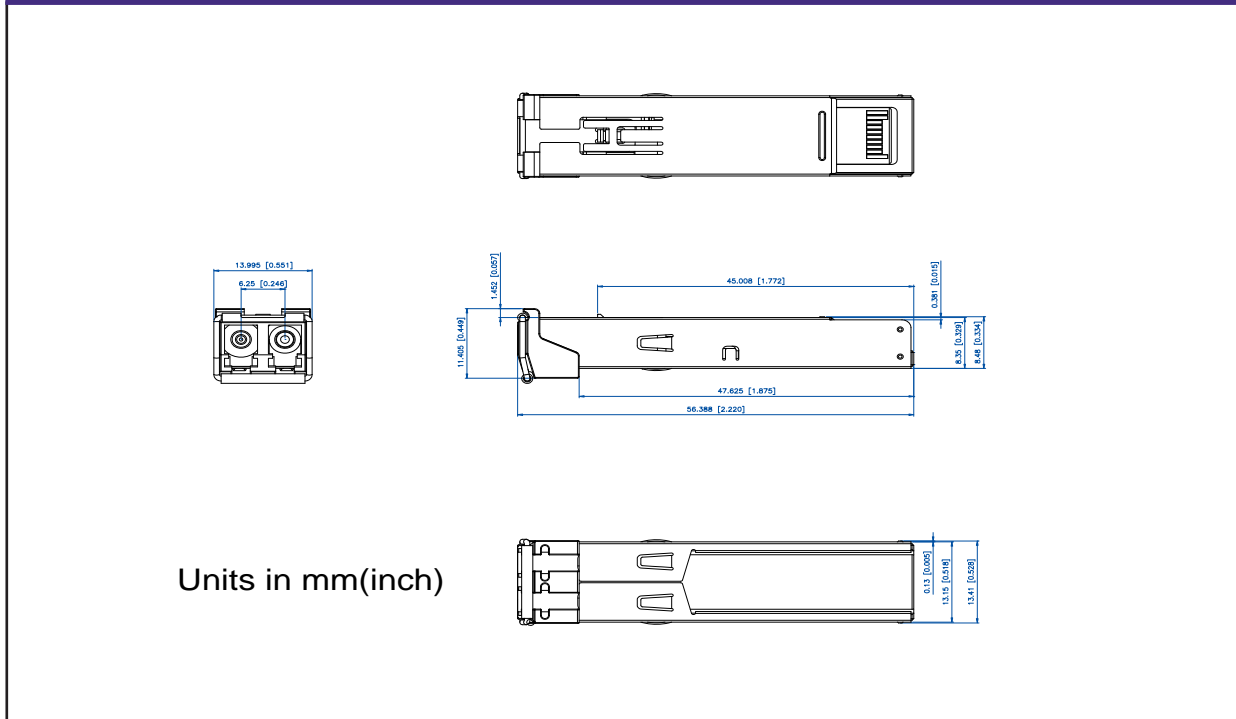
### Timing and Electrical

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	-
RX_LOS Voltage (Low)	$RX\_LOS_L$	-	0.8	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	-
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	-

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Pin	Function	Notes
1	VeeT	TX GND
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	VeeR	RX Ground
10	VeeR	RX Ground
11	VeeR	RX Ground
12	RXD-	RX Data Negative
13	RXD+	RX Data Positive
14	VeeR	RX GND
15	VccR	RX Power
16	VccT	TX Power
17	VeeT	TX GND
18	TXD+	TX Data Positive
19	TXD-	TX Data Negative
20	VeeT	TX GND

## Outline Drawing



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Ordering Information

Model	Description	Data Rate (Mbps)	Wavelength (nm)	Distance Range (km)
SFP-27DCWLR-xx *	Multi-Rate CWDM SFP Transceiver	100 - 2700	xx (see Wavelength Guide below)	40 - 96
SFP27DCWLRTH-xx *	Multi-Rate CWDM SFP Transceiver, <i>Temperature Hardened</i>	100 - 2700	xx (see Wavelength Guide below)	40 - 96

\*See Wavelength Guide below for "xx" values

λc Wavelength Guide per ITU-T G.694.2

Code	λc	Unit	Bail Latch Color	Code	λc	Unit	Bail Latch Color
27	1271	nm	Yellow	45	1451	nm	Yellow
29	1291	nm	Yellow	47	1471	nm	Grey
31	1311	nm	Yellow	49	1491	nm	Purple
33	1331	nm	Yellow	51	1511	nm	Blue
35	1351	nm	Yellow	53	1531	nm	Green
37	1371	nm	Yellow	55	1551	nm	Yellow
39	1391	nm	Yellow	57	1571	nm	Orange
41	1411	nm	Yellow	59	1591	nm	Red
43	1431	nm	Yellow	61	1611	nm	Brown

Regulatory and Industry Compliances

Class 1 Laser Product, Complies with 21CFR 1040.10, 1040.11 and EN 60825;  
 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.

MRV has more than 50 offices throughout the world. Addresses, phone numbers and fax numbers are listed at [www.mrv.com](http://www.mrv.com). Please e-mail us at [sales@mrv.com](mailto:sales@mrv.com) or call us for assistance.

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