

## SFP56-64GFC-SW-C

MSA and TAA 64GBase-SW Fibre Channel SFP56 (MMF, 850nm, 100m, LC, DOM)

### Features:

- Supports 16GFC, 32GFC, and 64GFC Data Rates
- Up to 100m Transmission on Multi-Mode Fiber
- VCSEL Laser and PIN Receiver
- Single 3.3V Power Supply
- Power Dissipation of 1.5W
- LC Connector
- Hot-Pluggable
- Operating Temperature: 0 to 70 Celsius
- RoHS Compliant and Lead-Free



### Applications:

- 64GBase Fibre Channel
- Access and Enterprise

### Product Description

This MSA compliant SFP56 transceiver provides 64GBase-SW Fibre Channel throughput up to 100m over multi-mode fiber (MMF) using a wavelength of 850nm via an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S.-made or designated country end products.")



## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum Supply Voltage	Vcc	-0.3		4	V	
Storage Temperature	Tstg	-40		85	°C	
Operating Case Temperature	Tc	0		70	°C	
Signaling Rate	64GFC		28.9		GBd	
	32GFC		28.05		GBd	
	16GFC		14.025		GBd	
Transmission Distance	64GFC			70 (OM3) 100 (OM4/OM5)	m	
	32GFC			20 (OM2) 70 (OM3) 100 (OM4)	m	
	16GFC			35 (OM2) 100 (OM3) 125 (OM4)	m	
Bit Error Rate	64GFC	$10^{-10}$	$1.31 \times 10^{-4}$			1
	32GFC		$10^{-12}$			2
Coupled Fiber			Multi-Mode Fiber			3

### Notes:

1. PRBS31Q for 64GFC.
2. PRBS31 for 32GFC/13GFC.
3. 50/125µm MMF.

## 64G Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Module Supply Voltage	Vcc	3.135	3.3	3.465	V	
Module Supply Current	Icc		400		mA	
<b>Transmitter</b>						
Differential Input Voltage Tolerance		900			mV	
Differential Termination Resistance Mismatch				10	%	
Differential Return Loss SDD11	SDD11, SDD22 (dB)	$\begin{cases} -9.5+0.368 \cdot f & 0.01 < f < 8\text{GHz} \\ -4.75+7.4 \cdot \log_{10}(f/14.025\text{GHz}) & 8 < f \leq 21\text{GHz} \end{cases}$			dB	
Differential-Mode to Common-Mode Conversion SCD11	SDC22, SCD11 (dB) <	$\begin{cases} -22 + 20 \cdot f/25.78 \text{ GHz} & 0.01 < f < 12.89\text{GHz} \\ -15 + 6 \cdot f/25.78 \text{ GHz} & 12.89 < f < 21 \text{ GHz} \end{cases}$			dB	
Input Equalization				10	dB	
<b>Receiver</b>						
Differential Voltage (Pk-Pk)				900	mV	
Differential Voltage With Transmitter Disabled (Pk-Pk)				35	mV	
Common-Mode Noise (RMS)				17.5	mV	
Differential Termination Resistance Mismatch				10	%	1
Differential Return Loss SDD22	SDD11, SDD22 (dB)	$\begin{cases} -9.5+0.368 \cdot f & 0.01 < f < 8\text{GHz} \\ -4.75+7.4 \cdot \log_{10}(f/14.025\text{GHz}) & 8 < f \leq 21\text{GHz} \end{cases}$			dB	
Common-Mode to Differential-Mode Conversion SDC22	SDC22, SCD11 (dB) <	$\begin{cases} -22 + 20 \cdot f/25.78 \text{ GHz} & 0.01 < f < 12.89\text{GHz} \\ -15 + 6 \cdot f/25.78 \text{ GHz} & 12.89 < f < 21 \text{ GHz} \end{cases}$			dB	
Source Transition Time (20-80%)		9.5			ps	
Eye Width at 10 <sup>-5</sup> Probability EW5		0.265			UI	
Eye Height at 10 <sup>-5</sup> Probability EH5		70			mV	
Vertical Eye Closure (VEC)				12	dB	
Output Emphasis				5	dB	
<b>Low-Speed Signals</b>						
Tx_Fault, Rx_LOS Output Voltage	VOL	-0.3		0.4	V	2
Tx_Disable, RS0, RS1 Input Voltage	VIL	-0.3		0.8	V	
	VIH	2.0		Vcc+0.3	V	

### Notes:

1. At 1MHz.
2. At 0.7mA.

### 32G Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Module Supply Voltage	Vcc	3.135	3.3	3.465	V	
Module Supply Current	Icc		400		mA	
<b>Transmitter</b>						
Differential Termination Resistance Mismatch				10	%	
Differential Return Loss SDD11	SDD11, SDD22 (dB)	$\begin{cases} -11 & 0.05 < f < 4\text{GHz} \\ -6.0+9.2 \cdot \log_{10}(f/14.025\text{GHz}) & 4 < f \leq 28.05\text{GHz} \end{cases}$			dB	
Common-Mode to Differential-Mode Conversion SDC11	SDC11, SCD11 (dB) <	$\begin{cases} -22 + 14 \cdot f/28.05\text{GHz} & 0.05 < f < 14.025\text{GHz} \\ -18 + 6 \cdot f/28.05\text{GHz} & 14.025 < f < 28.05\text{GHz} \end{cases}$			dB	
Differential-Mode to Common-Mode Conversion SCD11	SDC11, SCD11 (dB) <	$\begin{cases} -22 + 14 \cdot f/28.05\text{GHz} & 0.05 < f < 14.025\text{GHz} \\ -18 + 6 \cdot f/28.05\text{GHz} & 14.025 < f < 28.05\text{GHz} \end{cases}$			dB	
Input Equalization				10	dB	
<b>Receiver</b>						
Differential Voltage (Pk-Pk)				900	mV	
Common-Mode Noise (RMS)				17.5	mV	
Differential Termination Resistance Mismatch				10	%	1
Differential Return Loss SDD22	SDD11, SDD22 (dB)	$\begin{cases} -11 & 0.05 < f < 4\text{GHz} \\ -6.0+9.2 \cdot \log_{10}(f/14.025\text{GHz}) & 4 < f \leq 28.05\text{GHz} \end{cases}$			dB	
Common-Mode to Differential-Mode Conversion SDC22	SDC11, SCD11 (dB) <	$\begin{cases} -22 + 14 \cdot f/28.05\text{GHz} & 0.05 < f < 14.025\text{GHz} \\ -18 + 6 \cdot f/28.05\text{GHz} & 14.025 < f < 28.05\text{GHz} \end{cases}$			dB	
Differential-Mode to Common-Mode Conversion SCD22	SDC11, SCD11 (dB) <	$\begin{cases} -22 + 14 \cdot f/28.05\text{GHz} & 0.05 < f < 14.025\text{GHz} \\ -18 + 6 \cdot f/28.05\text{GHz} & 14.025 < f < 28.05\text{GHz} \end{cases}$			dB	
Common-Mode Return Loss SCC22				-2	dB	
Source Transition Time (20-80%)		9.5			ps	
Vertical Eye Closure				4	dB	
Eye Width at 10 <sup>-6</sup> Probability EW6		0.65			UI	
Eye Height at 10 <sup>-6</sup> Probability EH6		250			mV	
Output Emphasis				5	dB	
<b>Low-Speed Signals</b>						
Tx_Fault, Rx_LOS Output Voltage	VOL	-0.3		0.4	V	2
Tx_Disable, RS0, RS1 Input Voltage	VIL	-0.3		0.8	V	
	VIH	2.0		Vcc+0.3	V	

#### Notes:

- At 1MHz.
- At 0.7mA.

## 16G Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Module Supply Voltage	Vcc	3.135	3.3	3.465	V	
Module Supply Current	Icc		400		mA	
<b>Transmitter</b>						
Common-Mode Voltage (RMS)				30	mV	
Common-Mode Voltage (Spectral Peak) (RMS)				20	mV	
Input Equalization				10	dB	
<b>Receiver</b>						
Output Emphasis				5	dB	
<b>Low-Speed Signals</b>						
Tx_Fault, Rx_LOS Output Voltage	VOL	-0.3		0.4	V	1
Tx_Disable, RS0, RS1 Input Voltage	VIL	-0.3		0.8	V	
	VIH	2.0		Vcc+0.3	V	

### Notes:

1. At 0.7mA.

## 64GFC Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Center Wavelength		840	850	860	nm	
RMS Spectral Width				0.6	nm	
TDECQ				5.5	dB	
TDECQ-10log10(Ceq)				5.5	dB	
OMA <sub>outer</sub>		-4.5		3	dBm	
OMA <sub>outer</sub> Extinction Ratio		3			dB	
Launched Power in OMA <sub>outer</sub> Minus TDECQ		-5.9			dBm	
Average Launch Power		-7.5		4	dBm	
RIN <sub>12</sub> OMA				-128	dB/Hz	
Transition Time (20-80%)				34	ps	
Encircled Flux		≥86% at 19μm, ≤30% at 4.5μm				
<b>Receiver</b>						
Damage Threshold		5			dBm	
Average Receive Power		-9.4		4	dBm	1
Receiver Power (OMA <sub>outer</sub> )				3	dBm	
Return Loss of Receiver		12			dB	
Receiver Sensitivity (OMA <sub>outer</sub> )				-7	dBm	
Stressed Receiver Sensitivity (OMA <sub>outer</sub> )				-2.4	dBm	
LOS De-Assert				-14	dBm	
LOS Assert		-30		-17	dBm	

### Notes:

1. The receiver should be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level. The receiver does not have to operate correctly at this received power.

### 32GFC Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Center Wavelength		840	850	860	nm	
RMS Spectral Width				0.570	nm	
Average Launch Power		0.240 (-6.2)		1.585 (2)	mW (dBm)	
Optical Modulation Amplitude		0.476 (-3.2)			mW (dBm)	
Vertical Eye Closure Penalty (VECPq)				3.13	dB	
RIN <sub>12</sub> OMA				-129	dB/Hz	
Encircled Flux		≥86% at 19μm, ≤30% at 4.5μm				
<b>Receiver</b>						
Average Receive Power				1.585 (2)	mW (dBm)	
Unstressed Receiver Sensitivity (OMA)				0.095 (-10.2)	mW (dBm)	
Return Loss of Receiver		12			dB	
Rx Jitter Tracking Test (OMA)		0.295(-5.3)			mW(dBm)	
Rx Jitter Tracking Test, Jitter Frequency, and Pk-Pk Amplitude		(500,1)(100,5)			(kHz,UI)	
Receiver Electrical 3dB Upper Cutoff Frequency				32	GHz	
Stressed Receiver Sensitivity (OMA)				0.263 (-5.8)	mW (dBm)	
LOS De-Assert				-14	dBm	
LOS Assert		-30		-17	dBm	

## 16GFC Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Center Wavelength		840	850	860	nm	
RMS Spectral Width				0.59	nm	
Average Launch Power		-7.8		0	dBm	1
Optical Modulation Amplitude		0.331 (-4.8)			mW (dBm)	
Vertical Eye Closure Penalty (VECPq)				2.56	dB	
RIN <sub>12</sub> OMA				-128	dB/Hz	
Encircled Flux		≥86% at 19μm, ≤30% at 4.5μm				
<b>Receiver</b>						
Average Received Power				0	dBm	
Unstressed Receiver Sensitivity (OMA)				0.089 (-10.5)	mW (dBm)	
Return Loss of Receiver		12			dB	
Rx Jitter Tracking Test (OMA)		0.214(-6.7)			mW(dBm)	
Rx Jitter Tracking Test, Jitter Frequency, and Pk-Pk Amplitude		(840,1)(168,5)			(kHz,UI)	
Receiver Electrical 3dB Upper Cutoff Frequency				18	GHz	
Stressed Receiver Sensitivity (OMA)				0.17 (-7.7)	mW (dBm)	
LOS De-Assert				-14	dBm	
LOS Assert		-30		-17	dBm	

### Notes:

1. Maximum average launch power shall be the less of the value listed here or the Class 1 laser safety limits (CDRH and EN 60825).

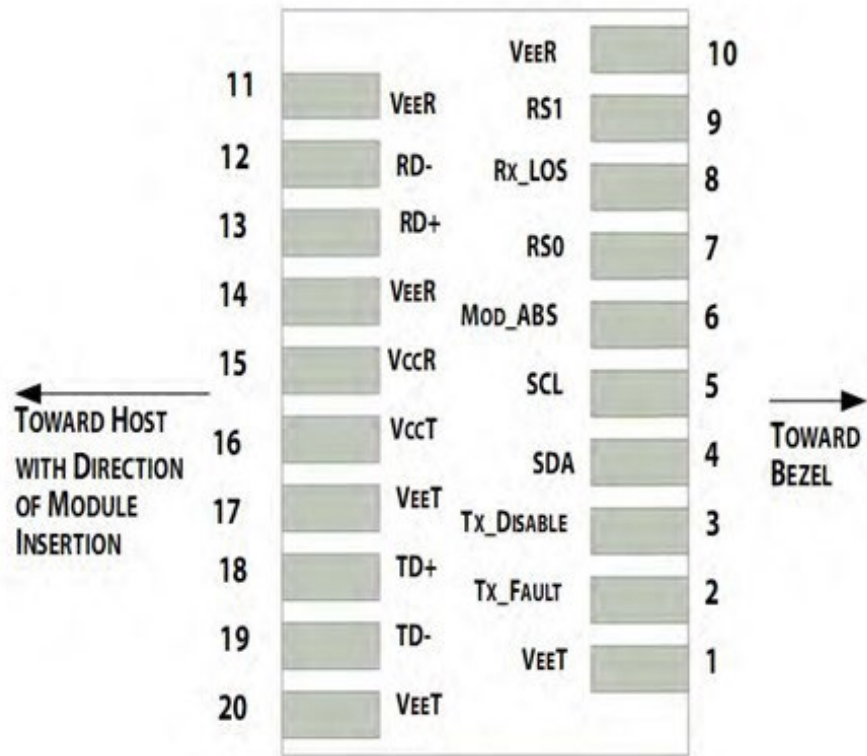
## Pin Descriptions

Pin	Symbol	Name/Description	Notes
1	VeeT	Transmitter Ground (Common with Receiver Ground).	1
2	Tx_Fault	Transmitter Fault.	
3	Tx_Disable	Transmitter Disable. Logic 1 disables laser output.	
4	SDA	2-Wire Serial Interface Data Line.	
5	SCL	2-Wire Serial Interface Clock Line.	
6	MOD_ABS	Module Absent. Grounded within the module.	2
7	RS0	Rate Selection 0. Rx Signaling Rate.	3
8	Rx_LOS	Loss of Signal Indication. "Logic 1" indicates loss of signal.	
9	RS1	Rate Selection 1. Tx Signaling Rate.	3
10	VeeR	Receiver Ground (Common with Transmitter Ground).	1
11	VeeR	Receiver Ground (Common with Transmitter Ground).	1
12	RD-	Inverse Receiver Data Out. AC Coupled.	
13	RD+	Received Data Out. AC Coupled.	
14	VeeR	Receiver Ground (Common with Transmitter Ground).	1
15	VccR	Receiver Power Supply.	
16	VccT	Transmitter Power Supply.	
17	VeeT	Transmitter Ground (Common with Receiver Ground).	1
18	TD+	Transmitter Data In. AC Coupled.	
19	TD-	Inverse Transmitter Data In. AC Coupled.	
20	VeeT	Transmitter Ground (Common with Receiver Ground).	1

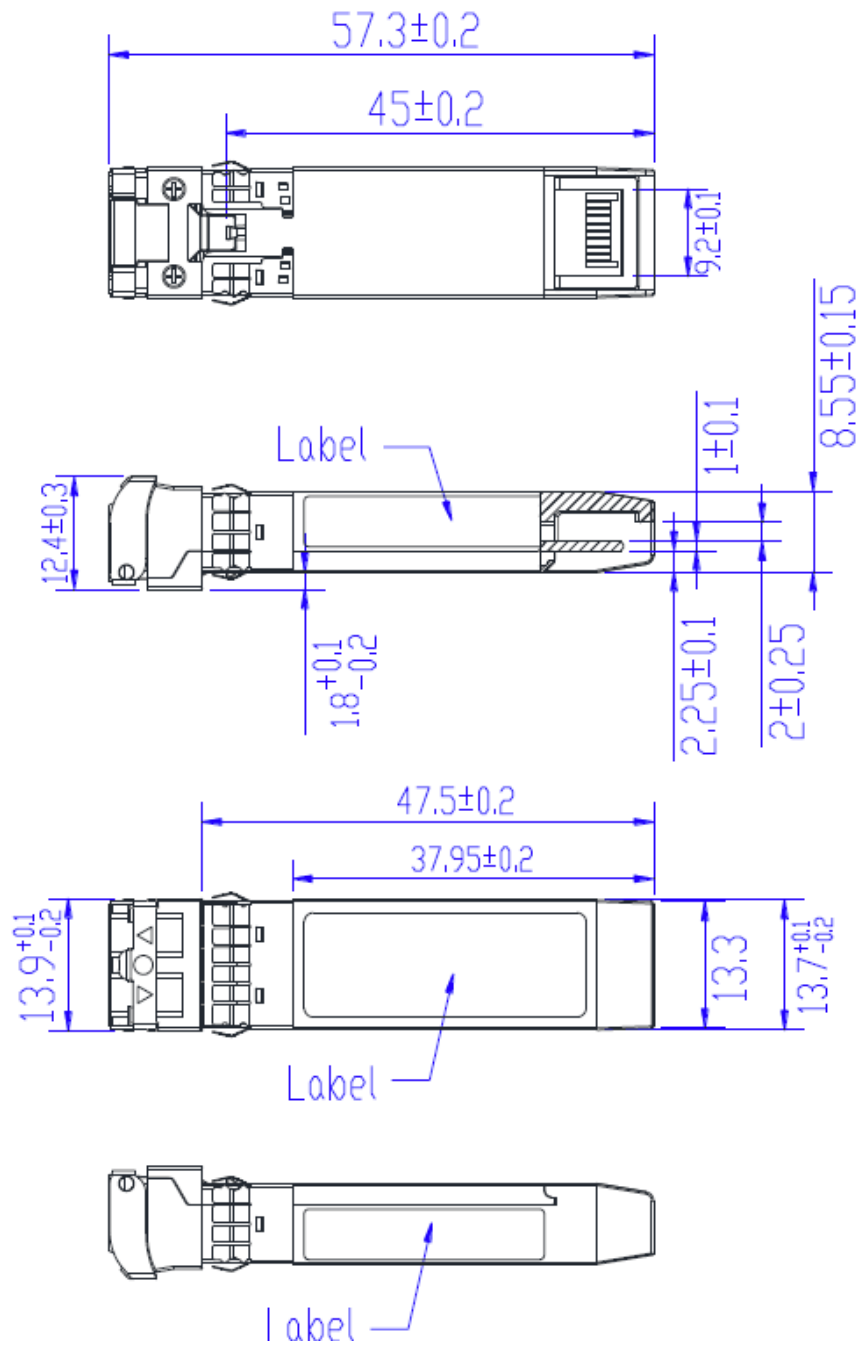
### Notes:

1. The circuit ground is internally isolated from the chassis ground.
2. MOD\_ABS is pulled low in the module to indicate that the module is plugged in.
3. The signal is internally pulled down per SFF-8431 Rev. 4.1.

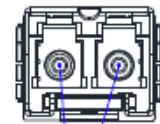
# Electrical Pin-Out Details



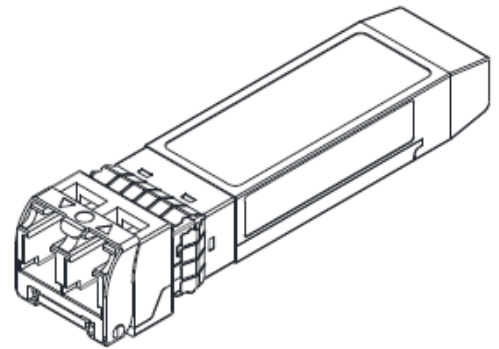
**Mechanical Specifications**



Units in mm



LC connector



## About ProLabs

Our extensive experience comes as standard. For over 20 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with more than 100 optical switching and transport platforms.

## A Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 1.6T while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



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