

## FC9686MS21-AO

Fujitsu® FC9686MS21 Compatible TAA 1000Base-DWDM SFP Transceiver 100GHz (SMF, 1540.56nm, 40km, LC, DOM)

### Features

- INF-8074 and SFF-8472 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



### Applications

- 1x Fibre Channel
- Gigabit Ethernet over DWDM
- Access, Metro and Enterprise

### Product Description

This Fujitsu® FC9686MS21 compatible SFP transceiver provides 1000Base-DWDM throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1540.56nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Fujitsu® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. 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.

AddOn's 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."



## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Wavelength Guide (100GHz ITU-T Channel)

ITU Channel #	Frequency (THZ)	Center Wavelength (nm)
61	196.1	1528.77
60	196.0	1529.55
59	195.9	1530.33
58	195.8	1531.12
57	195.7	1531.90
56	195.6	1532.68
55	195.5	1533.47
54	195.4	1534.25
53	195.3	1535.04
52	195.2	1535.82
51	195.1	1536.61
50	195.0	1537.40
49	194.9	1538.19
48	194.8	1538.98
47	194.7	1539.77
46	194.6	1540.56
45	194.5	1541.35
44	194.4	1542.14
43	194.3	1542.94
42	194.2	1543.73
41	194.1	1544.53
40	194.0	1545.32
39	193.9	1546.12
38	193.8	1546.92
37	193.7	1547.72
36	193.6	1548.51
35	193.5	1549.32
34	193.4	1550.12
33	193.3	1550.92
32	193.2	1551.72
31	193.1	1552.52
30	193.0	1553.33
29	192.9	1554.13
28	192.8	1554.94
27	192.7	1555.75
26	192.6	1556.55

25	192.5	1557.36
24	192.4	1558.17
23	192.3	1558.98
22	192.2	1559.79
21	192.1	1560.61
20	192.0	1561.42
19	191.9	1562.23
18	191.8	1563.05
17	191.7	1563.86

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Maximum Supply Voltage	Vcc	-0.5	4.0	V
Storage Temperature	TS	-40	85	°C
Operating Case Temperature	Tc	0	70	°C
Operating Humidity	RH	5	85	%

### Electrical Characteristics (TOP=25°C, Vcc=3.3Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	Vcc	3.14	3.30	3.46	V	
Power Supply Current	Icc			450	mA	
Supply Voltage	V <sub>MAX</sub>	-0.5		4	W	
<b>Transmitter</b>						
Differential data input voltage (TD +/-)		200		1200	mVp-p	1
Low speed output: Tx Fault/ Loss of Signal (LOS)	VOH	2.0		VCC	V	2
	VOL	0		0.8	V	
Low speed output: Tx Disable / MOD_DEF1, MOD_DEF 2	VOH	2.0		VCC	V	3
	VOL	0		0.8	V	
<b>Receiver</b>						
Differential data output voltage		600		1200	mVp-p	4

### Notes

1. Internally AC coupled and terminated to 100Ω differential load.
2. Pulled up externally with a 4.7KΩ-10KΩ resistor on the host board to VCCT,R.
3. Mod\_Def1 and Mod\_Def2 must be pulled up externally with a 4.7KΩ-10KΩ resistor on the host board to VCCT,R.

4. Internally AC coupled, but requires a  $100\Omega$  differential termination or internal to Serializer/Deserializer.

### Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
<b>Wavelength Spacing</b>			100		GHz	
<b>Optical Wavelength</b>	$T_\lambda$	x-0.1	x	X+0.1	nm	
<b>Optical Power (average)</b>	$P_{AVE}$	0		4	dBm	1
<b>Transmitter and Dispersion Penalty</b>	TDP			3	dB	
<b>Optical Extinction Ratio</b>	ER	8.0			dB	
<b>Spectral Width</b>	$\Delta\lambda$			0.3	nm	
<b>Sidemode Suppression Ratio</b>	SMSR	30			dB	
<b>Optical Rise/Fall Time (20%-80%)</b>	$t_r/t_f$			260	ps	
<b>Eye Diagram</b>		Compatible with IEEE 802.3				
<b>Receiver</b>						
<b>Receiver Wavelength</b>	$\lambda_C$	1528		1566	nm	
<b>Receiver Sensitivity (average)</b>	$R_{AVE}$			-20	dBm	2
<b>Receiver overload</b>	$P_{max}$	-1			dBm	3
<b>LOS Assert</b>	$LOS_A$	-35			dBm	
<b>LOS De-Assert</b>	$LOS_D$			-22	dBm	
<b>LOS Hysteresis</b>	$LOS_H$	0.5			dBm	

### Notes:

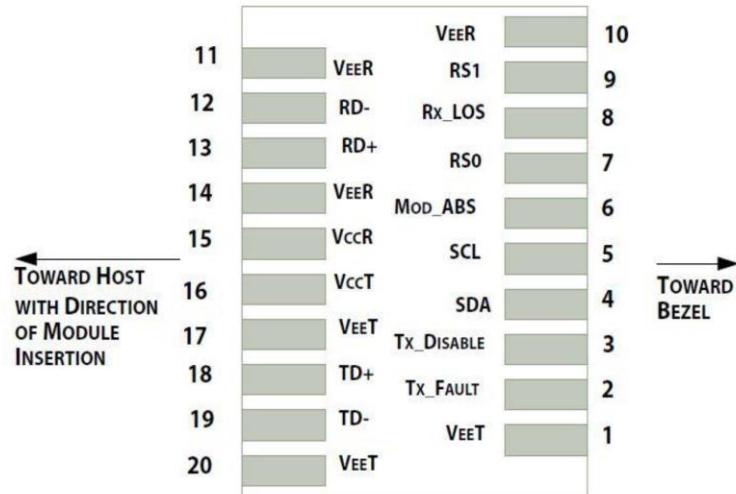
1. Coupled into a Single-mode fibre
2. Average power, back-to-back, @1.25Gbps, BER  $1E^{-12}$ , PRBS  $2^{31}-1$ .
3. Exceeding the Receiver overload can physically damage the module. Please use appropriate attenuation.

## Pin Descriptions

Pin	Symbol	Name/Descriptions	Ref.
1	VeeT	Transmitter Ground (Common with Receiver Ground).	1
2	TX Fault	Transmitter Fault. LVTTL-O	2
3	TX Disable	Transmitter Disable. Laser output disabled on high or open. LVTT-I.	3
4	SDA	2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTL-I/O.	
5	SCL	2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTL-I.	
6	MOD_ABS	Module Absent, Connect to VeeT or VeeR in Module.	4
7	RS0	Rate Select 0. Not used	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation. LVTTL-O.	2
9	RS1	Rate Select 1. Not used	5
10	VeeR	Receiver Ground (Common with Transmitter Ground).	1
11	VeeR	Receiver Ground (Common with Transmitter Ground).	1
12	RD-	Receiver Inverted DATA out. AC Coupled. CML-O.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled. CML-O.	
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 Non-Inverted DATA in. AC Coupled. CML-I.	
19	TD-	Transmitter Inverted DATA in. AC Coupled. CML-O.	
20	VeeT	Transmitter Ground (Common with Receiver Ground).	1

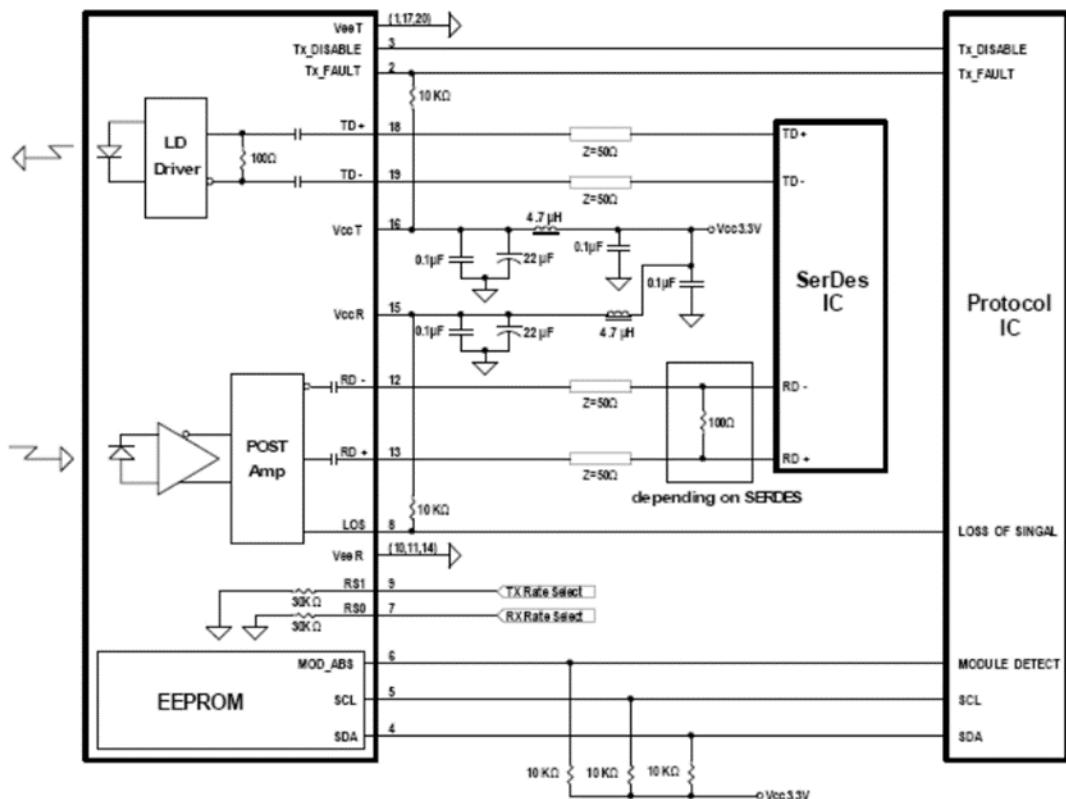
### Notes:

1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output and should be pulled up to the Vcc\_Host with resistor in the range 4.7KΩ to 10KΩ. Pull ups can be connected to one or several power supplies, however the host board design shall ensure that no module contact has voltage exceeding module VccT/R +0.5.V.
3. Tx\_Disable is an input contact with a 4.7KΩ to 10KΩ pull-up resistor to VccT inside module.
4. Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contact up to Vcc\_Host with a resistor in the range from 4.7KΩ to 10KΩ. Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
5. Internally pulled down per SFF-8431



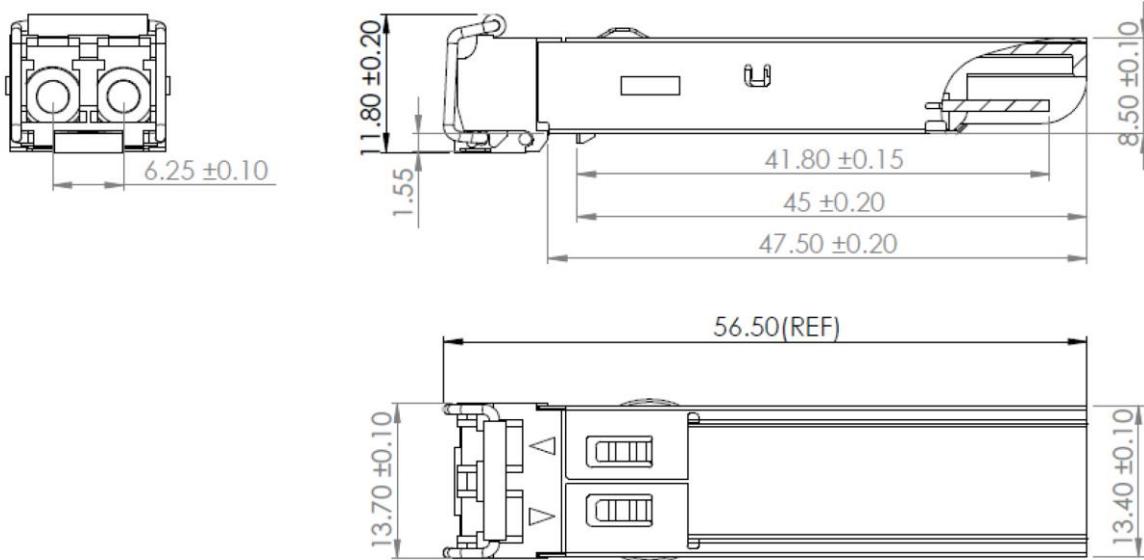
Pin-out of connector Block on Host board

### Recommended Circuit Schematic



## Mechanical Specifications

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



## EEPROM Information

EEPROM memory map specific data field description is as below:

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
0	Serial ID Defined by SFP MSA (96 bytes)	0	Alarm and Warning Thresholds (56 bytes)
95	Vendor Specific (32 bytes)	55	Cal Constants (40 bytes)
127	Reserved, SFF8079 (128 bytes)	95	Real Time Diagnostic Interface (24 bytes)
255		119	Vendor Specific (8 bytes)
		127	User Writable EEPROM (120 bytes)
		247	Vendor Specific (8 bytes)
		255	

## **About AddOn Networks**

In 1999, AddOn Networks entered the market with a single product. Our founders fulfilled a severe shortage for compatible, cost-effective optical transceivers that compete at the same performance levels as leading OEM manufacturers. Adhering to the idea of redefining service and product quality not previously had in the fiber optic networking industry, AddOn invested resources in solution design, production, fulfillment, and global support.

Combining one of the most extensive and stringent testing processes in the industry, an exceptional free tech support center, and a consistent roll-out of innovative technologies, AddOn has continually set industry standards of quality and reliability throughout its history.

Reliability is the cornerstone of any optical fiber network and is engrained in AddOn's DNA. It has played a key role in nurturing the long-term relationships developed over the years with customers. AddOn remains committed to exceeding industry standards with certifications from ranging from NEBS Level 3 to ISO 9001:2005 with every new development while maintaining the signature reliability of its products.

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