

**2.67G DWDM SFP 80km Single-Mode (ASFP-16-80-S9XX-XX)**

- Multi-rate from 100M to 2.67Gbps
- Duplex SFP Transceiver
- DWDM wavelength 100G ITU-T grid

**Features:**

- Available in all C-Band Wavelengths on the 100GHz DWDM ITU Grid
- Data rates from 100Mbps to 2.67Gbps
- Temperature-Stabilized DWDM DFB Transmitter
- Duplex LC Connector
- Hot-Pluggable SFP Footprint
- Built-in Digital Diagnostic Functions as
- Specified in the SFF-8472 MSA
- Operating Case Temperature:
- Extended: -5°C to 70°C

**Applications:**

- SONET OC-48/SDH STM-16
- Amplified DWDM networks
- Fast Ethernet, Giga Ethernet
- Fiber Channel

**Description**

ASFP-16-80-S9XX-XX series single mode transceiver is small form factor pluggable module for duplex optical data communications. This module is designed for single mode fiber and operates at a nominal DWDM wavelength from 1528.77nm to 1563.86nm as specified by the ITU-T. It is designed to deploy in the DWDM networking equipment in metropolitan access and core networks.

It is with the SFP 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses a high sensitivity APD detector and a limiting post-amplifier IC.

The ASFP-16-80-S9XX-XX series are designed to be compliant with SFF-8472 Multi-Source Agreement (MSA).

**Absolute Maximum Ratings**

Absolute Maximum Ratings are those values, beyond which, some damages may occur to the

devices. Exposure to conditions above the Absolute Maximum Ratings listed in Table 1 may negatively impact the reliability of the products.

**Table 1 - Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>ST</sub>	-40	+85	°C
Operating Humidity	HOP	5	90	%
Power Supply Voltage	T <sub>CC</sub>	0	+3.6	V

## Recommended Operating Environment:

**Table 2 - Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	V <sub>CC</sub>	+3.13	+3.3	+3.47	V
Power Supply Current	I <sub>CC</sub>			380	ma
Operating Temperature	T <sub>OP</sub>	-5	-	+70	°C
Data Rate		100M		2.67G	bps

## Optical and Electrical Characteristics

**Table 3 - Transmitter Optical and Electrical Characteristics**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Output Center Wavelength	$\lambda_c$	1528		1564	nm	
Output Spectral Width	$\Delta\lambda$		-	0.3	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Channel space	$\Delta f$		100		GHz	
Deviation From Central Frequency @ EOL		-12		+12	GHz	
Average Output Power(BOL)	P <sub>o</sub>	-2	-	+3	dBm	1
Average Launch Power-OFF Transmitter	P <sub>E OFF</sub>			-45	dBm	1
Extinction Ratio	E.R.	8.2	-	-	dB	2
Rise/Fall Time (20%-80%)	R/TF			160	ps	3
TX_Disable Assert Time	t <sub>off</sub>			10	us	
Relative Intensity Noise	RIN			-135	dB/Hz	
Output Optical Eye	Compatible with ITU-T G.957					
Dispersion		0		1600	ps/nm	
Data Input Differential Swing	V <sub>IN</sub>	400		2000	mVpp	4

Input Differential Impedance	Z <sub>in</sub>	85	100	115	Ω	
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Note 1: Launched into 9/125um Single Mode Fiber.

Note 2: Measured with PRBS 31-1 test pattern @2.5 Gbit/s.

Note 3: Measured with the Bessel-Thompson filter OFF.

Note 4: Compatible with LVPECL input, AC coupled internally.

**Table 4 - Receiver Optical and Electrical Characteristics**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Operating Wavelength		1528		1564	nm	
Receive Sensitivity	P <sub>min</sub>	-	-30	-28	dBm	1
Saturation	P <sub>MAX</sub>	-8			dBm	1
Receiver Threshold Settling Time	TSET			400	ps	
LOS Assert Level	PLOSA	-	-	-40	dBm	2
LOS Deassert Level	PLOSD	-31	-	-	dBm	3
LOS Hysteresis		0.5		5	dB	
Data Output Differential Swing	VOUT	400	800	1200	mV	4
Output Differential Impedance	Z <sub>out</sub>	85	100	115	Ω	

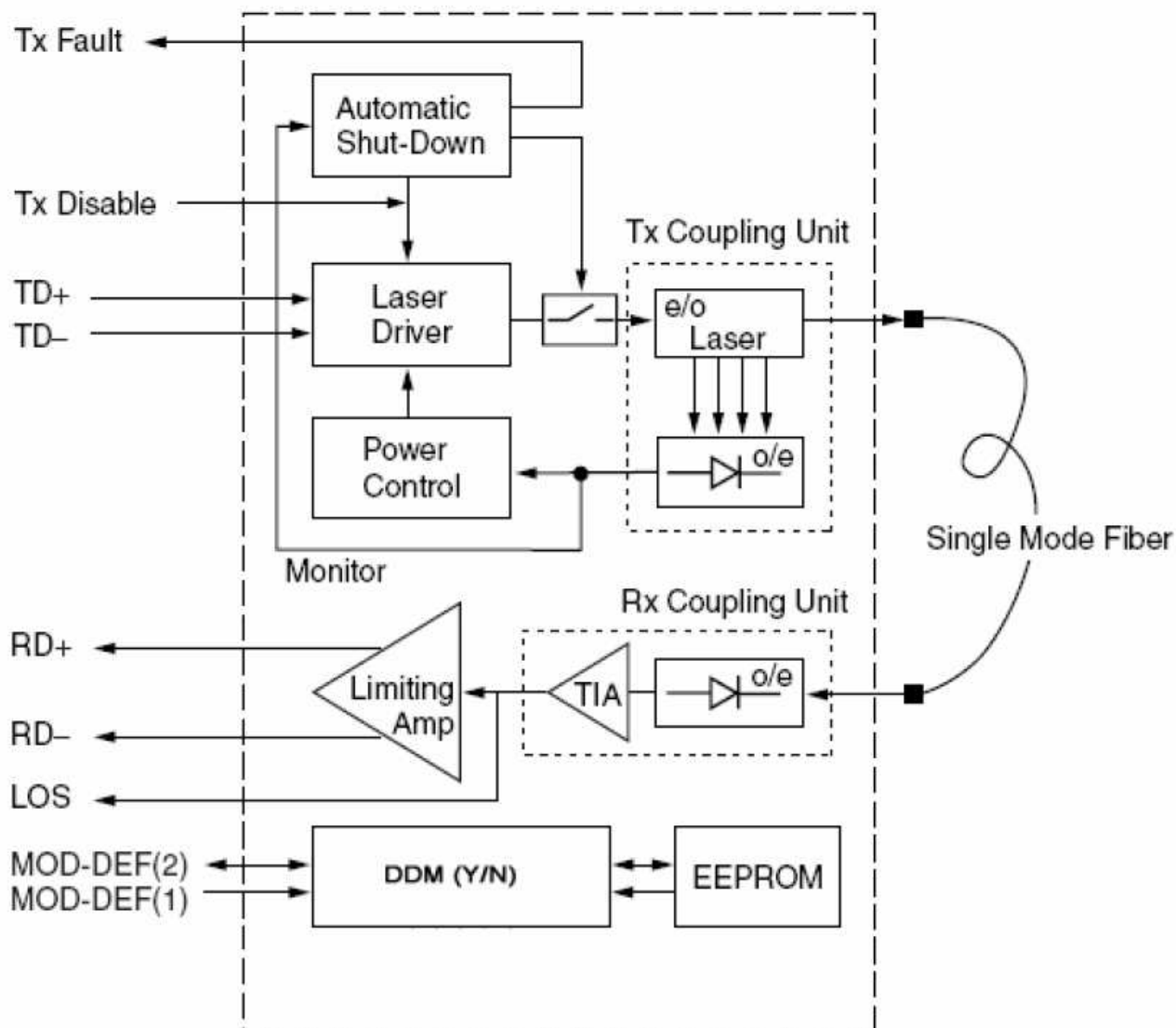
Note 1: Measured with a PRBS 31-1 test pattern @2.5Gbit/s, BER =10<sup>-12</sup>.

Note 2: An increase in optical power above the specified level will cause Loss of Single (LOS) output to switch from a high state to a low state.

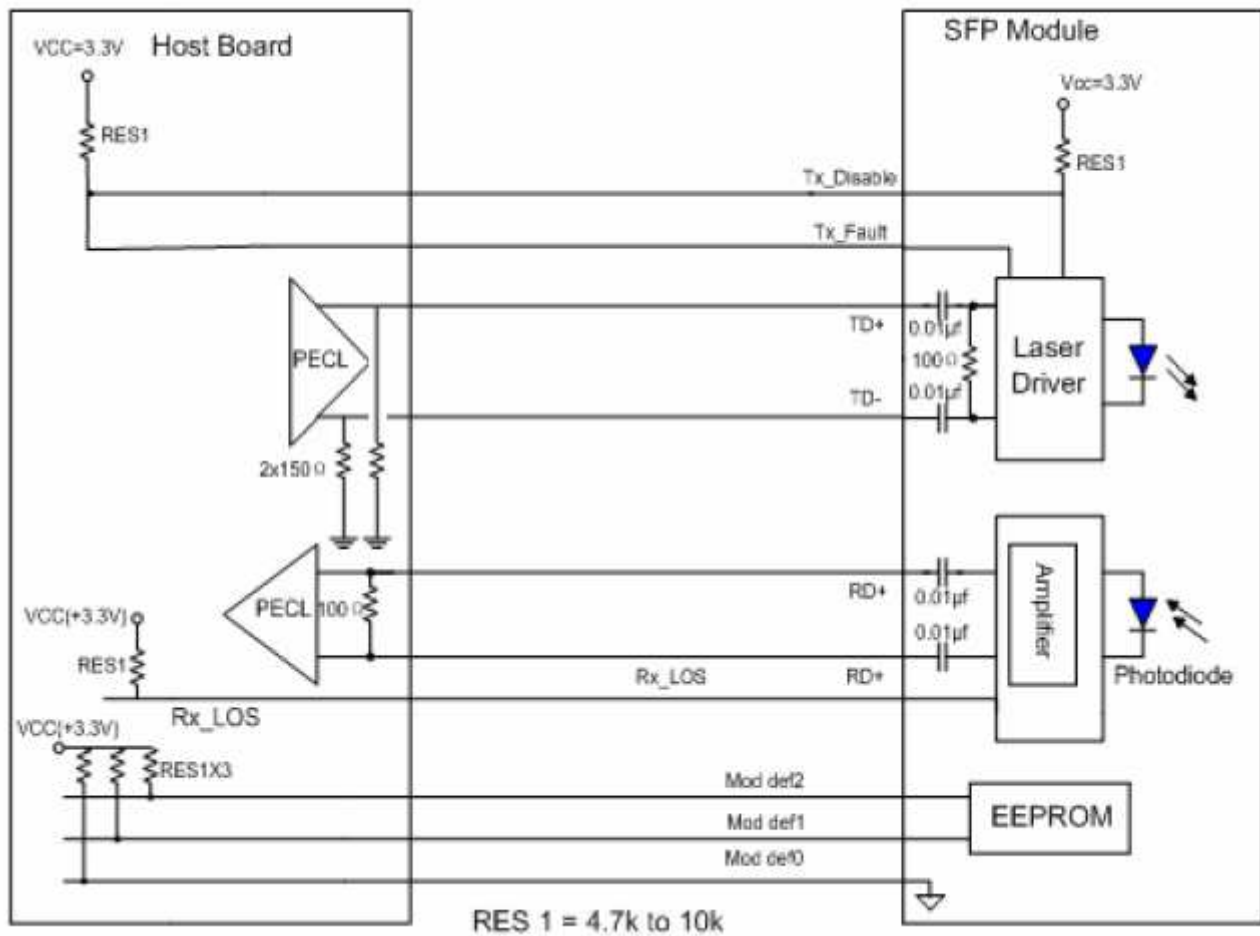
Note 3: A decrease in optical power below the specified level will cause Loss of Single (LOS) output to switch from a low state to a high state.

Note 4: LVPECL output, DC coupled internally, guaranteed in the full range of input optical power (-6dBm to -30dBm) (See Recommended Interface Circuit)

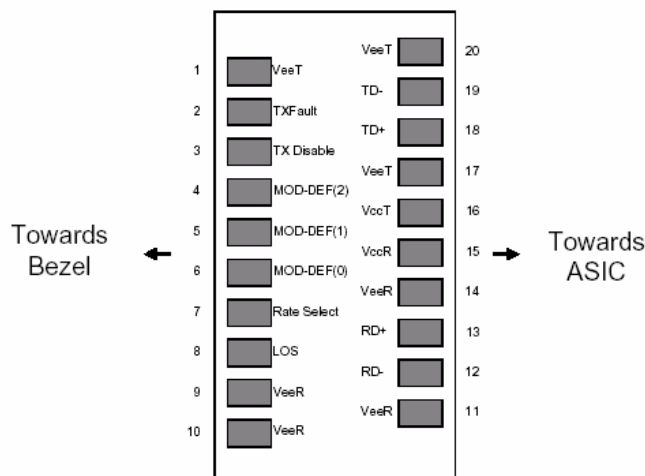
## Block Diagram:



## Recommend Circuit Schematic



## Pin Assignment:



## Pin Description:

Pin#	Name	Function	Notes
1	VeeT	Transmitter Ground	-
2	TX_Fault	Transmitter Fault Indication	Note 1
3	TX_DIS	Transmitter Disable	Note 2, Module disables on high or open
4	MOD-DEF2	Module Definition 2	Note 3, 2 wire serial ID interface
5	MOD-DEF1	Module Definition 1	Note 3, 2 wire serial ID interface
6	MOD-DEF0	Module Definition 0	Note 3, Grounded in Module
7	RSSI_TRI		
8	LOS	Loss of Signal	Note 4
9	VeeR	Receiver Ground	Note 5
10	VeeR	Receiver Ground	Note 5
11	VeeR	Receiver Ground	Note 5
12	RD-	Inv. Received Data Out	Note 6
13	RD+	Received Data Out	Note 6
14	VeeR	Receiver Ground	Note 5
15	VccR	Receiver Power	Note 7, 3.3V± 5%
16	VccT	Transmitter Power	Note 7, 3.3V± 5%
17	VeeT	Transmitter Ground	Note 5
18	TD+	Transmit Data In	Note 8
19	TD-	Inv. Transmit Data In	Note 8
20	VeeT	Transmitter Ground	Note 5

### Notes:

- TX\_Fault is an open collector/drain output, which should be pulled up with a 4.7K–10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.
- TX\_DIS is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7–10 KΩ resistor. Its states are:  
 Low (0 – 0.8V): Transmitter on  
 (>0.8, < 2.0V): Undefined  
 High (2.0 – 3.465V): Transmitter Disabled  
 Open: Transmitter Disabled
- Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.  
 Mod-Def 0 is grounded by the module to indicate that the module is present  
 Mod-Def 1 is the clock line of two wire serial interface for serial ID  
 Mod-Def 2 is the data line of two wire serial interface for serial ID
- LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the

output will be pulled to < 0.8V.

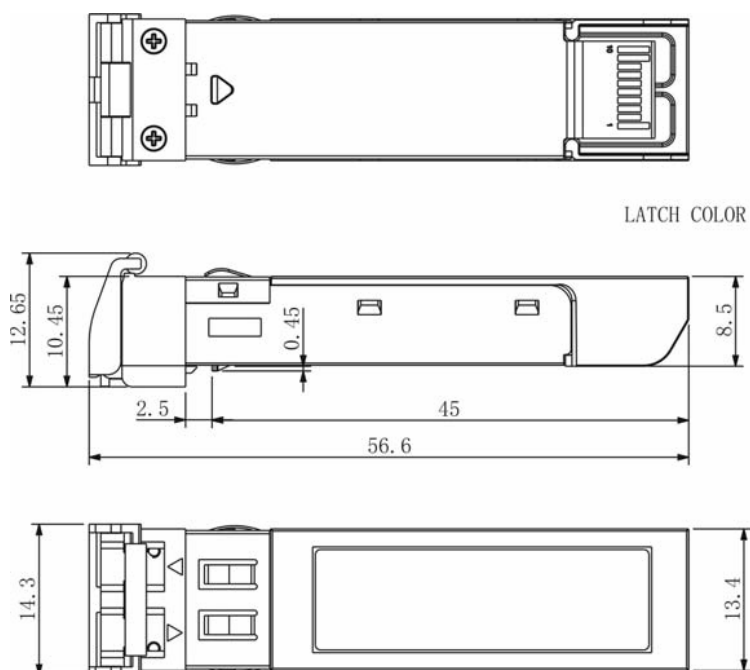
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+: These are the differential receiver outputs. They are DC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V 5% at the SFP connector pin. Maximum supply current is 400mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

## Serial ID Memory Contents(A0H):

Data Address	Length (Byte)	Name of Length	Description and Contents
<b>Base ID Fields</b>			
0	1	Identifier	Type of Serial transceiver (0Bh=DWDM SFP)
1	1	Reserved	Extended identifier of type serial transceiver (24h=DWDM, SFP, -5~70℃ )
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver Codes	Gigabit Ethernet 1000Base-SX & Fiber Channel
11	1	Encoding	05h=SONET scrambled
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID

40-55	16	Vendor PN	
56-59	4	Vendor rev	Revision level for part number
60-62	3	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
<b>Extended ID Fields</b>			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
<b>Vendor Specific ID Fields</b>			
96-127	32	Readable	specific date, read only

## Mechanical Dimensions:





## Ordering Guide:

Par Number	Description
ASFP08-80-S9XX-C	DWDM, 1.25Gbps, 80km, -5°C ~ +70°C
ASFP08-120-S9XX-C	DWDM, 1.25Gbps, 120km, -5°C ~ +70°C
ASFP16-80-S9XX-C	DWDM, 2.5Gbps, 80km, -5°C ~ +70°C
ASFP16-120-S9XX-C	DWDM, 2.5Gbps, 120km, -5°C ~ +70°C
<b>XX=17~61(ITU Channel C band)</b> <b>=62~99, 00~16(ITU Channel L band)</b>	

ITU C band Channel NO.	Frequency (THz)	Wavelength (nm)
17	191.7	1563.86
18	191.8	1563.05
19	191.9	1562.23
20	192.0	1561.42
21	192.1	1560.61
22	192.2	1559.79
23	192.3	1558.98
24	192.4	1558.17
25	192.5	1557.36
26	192.6	1556.55
27	192.7	1555.75
28	192.8	1554.94
29	192.9	1554.13
30	193.0	1553.33
31	193.1	1552.52
32	193.2	1551.72

33	193.3	1550.92
34	193.4	1550.12
45	193.5	1549.32
46	193.6	1548.51
37	193.7	1547.72
38	193.8	1546.92
39	193.9	1546.12
40	194.0	1545.32
41	194.1	1544.53
42	194.2	1543.73
43	194.3	1542.94
44	194.4	1542.14
45	194.5	1541.35
46	194.6	1540.56
47	194.7	1539.77
48	194.8	1538.98
49	194.9	1538.19
50	195.0	1537.4
51	195.1	1536.61
52	195.2	1535.82
53	195.3	1535.04
54	195.4	1534.25
55	195.5	1533.47
56	195.6	1532.68
57	195.7	1531.9
58	195.8	1531.12

59	195.9	1530.33
60	196.0	1529.55
61	196.1	1528.77

## Revision History

Revision	Initiated	Reviewed	Revision History	Date
V1.0	David.Deng	Harry.Lee	Creation	Mar21 2009
V2.0	David.Deng	Harry.Lee	Update EEPROM	Nov 07 2009

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