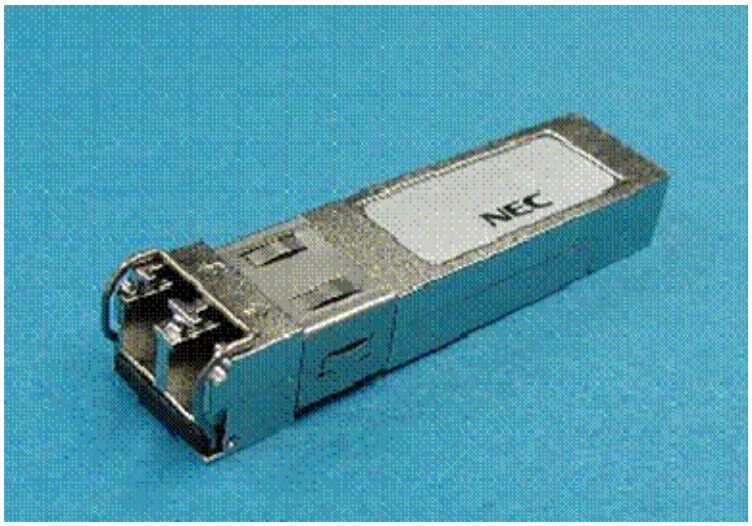
DATA SHEET

NEC

2.5Gbps Optical Transceiver
OD-J8836/J8837/J8838/J8839

2.5Gbps SFP Optical Transceiver



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- Contents -

1. Description

OD-J8836/ J8837/ J8838/ J8839 are "small form factor pluggable" optical transceiver modules designed for 2.5Gbps SONET/SDH/ATM Systems.

2. Feature

- ■ Designed for SONET/SDH/ATM Systems
- ■ Small Form Factor Pluggable (SFP)
- ■ Single +3.3V Power Supply
- ■ Long Distance Transmission
- ■ Wide Operating Temperature Range
- ■ LC Optical Duplex Receptacle
- ■ Digital Diagnostic Monitoring Function

3. Ordering Information

Product Number	Specification	Optical Connector	Latch Mechanism
OD-J8836-xxxx	SONET OC-48 SR, ITU-T G.957 I-16	LC duplex	Bail type
OD-J8837-xxxx	SONET OC-48 IR-1, ITU-T G.957 S-16.1		
OD-J8838-xxxx	SONET OC-48 LR-1, ITU-T G.957 L-16.1		
OD-J8839-xxxx	SONET OC-48 LR-2, ITU-T G.957 L-16.2		

Product Number	Operating Case Temperature Range
OD-xxxxx-5C01	0 to +75 deg. C
OD-xxxxx-5D01	-10 to +85 deg. C

These show standard part number. When customizing, e.g., labeling, memory or etc., is requested, special part number shall be provided.

4. Specifications

4-1. Absolute Maximum Ratings

Parameter	Unit	Specification		Note
		Min	Max	
Storage Temperature[1]	deg.C	-40	+85	
Supply Voltage (VccT, VccR)	V	-0.3	+4.0	
Input Data Signal Levels (AC coupled)	Vpp		+3.0	
Relative Humidity (non-condensing)	%		85	
Static Discharge Voltage (human body model)	V		500	
Peak Optical Input Power	dBm		+3	OD-J8836 OD-J8837
			-6	OD-J8838 OD-J8839

[1] Temperature range for storage without device damage.

4-2. Environmental Conditions

Parameter	Unit	Specification		Note
Data Rate[2]	bps	2.48832G		
Data Format		Scrambled NRZ		Scrambler is not included.
Transmission Cable		SMF (ITU-T G.652)		
Operating Case Temperature Range	deg.C	0 to +75		OD-xxxxx-5C01
		-10 to +85		OD-xxxxx-5D01
Supply Voltage (Vcc)	V	+3.3 +/−5%		
Power Consumption	W (Typ)	OD-J8836	0.6	@+25 deg.C, +3.3V
		OD-J8837	0.6	
		OD-J8838	0.6	
		OD-J8839	0.6	
	W (Max)	OD-J8836	1.0	@+85 deg.C, +3.465V
		OD-J8837	1.0	
		OD-J8838	1.4	
		OD-J8839	1.4	
Inrush Current	A	0.03 max		
Connector to PCB board		20 pins serial		
Electrical Signal		Serial		

[2] All descriptions here are specified by STM-16/ SONET OC-48 (2.48832Gbps)

4-3. Optical Signal Interface Specifications

Transmitter

Parameter	Unit	OD-J8836	OD-J8837	OD-J8838	OD-J8839
Laser Diode Type	-	MLM-LD	SLM-LD		
Center Wavelength	nm	1270 - 1360		1280 - 1335	1500 - 1580
Maximum RMS Width	nm	4	–		
Maximum -20dB Width	nm	–	1		
Minimum SMSR	dB	–	–30		
Mean Launched Power	dBm	–10 to –3	–5 to 0	–2 to +3	
Extinction Ratio	dB	≥ 8.2			
Optical Output Eye Diagram[4]	-	ITU-T G.957 compliant (Fig.1)			
Optical Output Rise/Fall Time (20%-80%)	ps	<150			
Output power with transmitter disabled	dBm	<–45			
Optical Signal Polarity	-	Positive logic			

[4] As per ITU-T G.957 at 2.48832Gbps

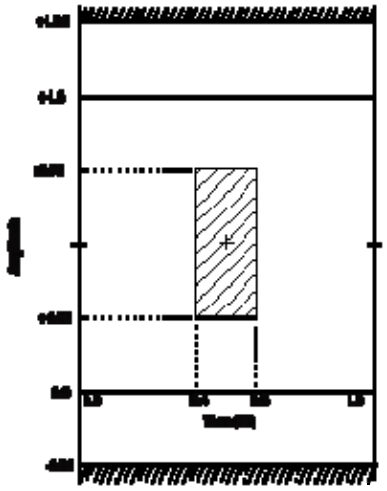


Fig. 1 Optical output signal mask specifications of SONET/ITU standard specified by the waveform after passing through 4th order Bessel-filter which has cut-off frequency of 2.48832GHz ×0.75.

Optical Path

Parameter	Unit	OD-J8836	OD-J8837	OD-J8838	OD-J8839
Attenuation Range[5]	dB	0 to 7	0 to 12	10 to 24	
Residual Chromatic Dispersion	Ps/nm	<12	NA		<1600
Optical Path Penalty	dB	<1			<2
Discrete Reflectance Between S_n and R_n[6]	dB	<−27			
Return Loss at Point S_n[6] (including any connectors)	dB	>24			

[5] The 10dB instead 12dB is achieved using external optical attenuator. (OD-J8838, J8839)

[6] S and R are the point at the transmitter and the point at the receiver following the definition of the ITU-T G.957.

Receiver

Parameter	Unit	OD-J8836	OD-J8837	OD-J8838	OD-J8839
Photo Diode Type		PIN-PD		APD	
Operating Wavelength Range	nm	1260 – 1580			
Minimum sensitivity[7](@BER=1E-10)	dBm	–18		–27	–28
Minimum overload[7]	dBm	-3	0	-9	
Reflectance of Receiver	dB	<-27			
Optical Signal Polarity	-	Positive logic			

[7] Back-to-back as per ITU-T G.957 under over all operating conditions, transmitter extinction ratio 8.2dB and PRBS=2^{23}-1 at 2.48832 Gbit/s.

4-4. Electrical Signal Interface Specifications

4-4-1. Transmitter

Parameter		Unit	Specification			Note
			Min	Typ	Max	
Differential Input Signal Level		mVp-p	500		2400	
Differential Input Resistance		Ohm	85	100	115	
TX Fault[8]	Fault condition	V	O.C.			
	Normal condition		0		0.4	3mA Sink
TX Disable	Disable state	V	2		VccT	
	Enable state		0		0.8	

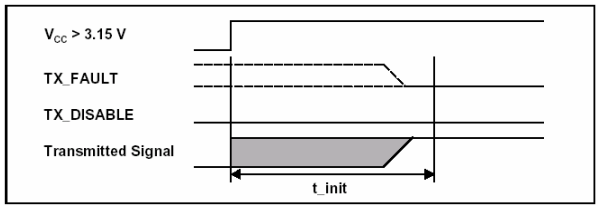
4-4-2. Receiver

Parameter		Unit	Specification			Note
			Min	Typ	Max	
Differential Output Voltage		mVp-p	370		1200	
LOS Output level[8]	Fault condition	V	O.C.			
	Normal condition		0		0.4	1.2mA Sink

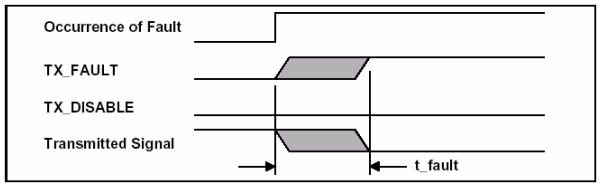
[8] Open collector output.

4-5. Timing Requirements of Control and Status I/O

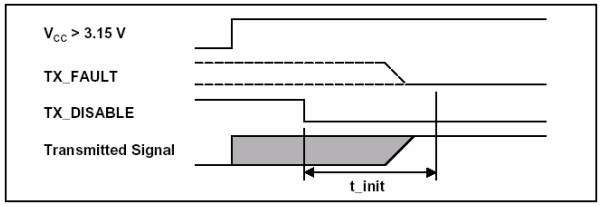
Parameter	Symbol	Unit	Min	Max	Note
TX Disable Assert Time	t_off	us		10	
TX Disable Negate Time	t_on	ms		1	
Time to initialize, including reset of TX_Fault	t_init	ms		300	
TX Fault Assert Time	t_fault	us		100	
TX Disable to reset	t_reset	us	10		
LOS Assert Time	t_loss_on	us		100	
LOS Deassert Time	t_loss_off	us		100	
Serial ID Clock Rate	f_serial_clock	kHz		100	



Power on initialization of SFP, Tx_Disable negated.

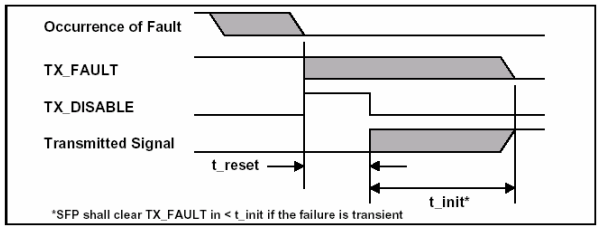


Detection of transmitter safety fault condition

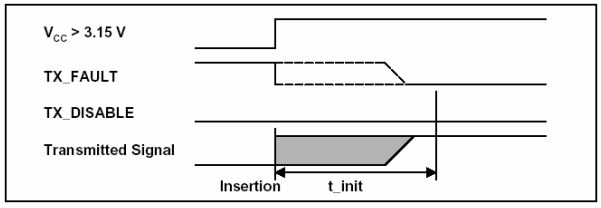


Power on initialization of SFP, Tx_Disable asserted.

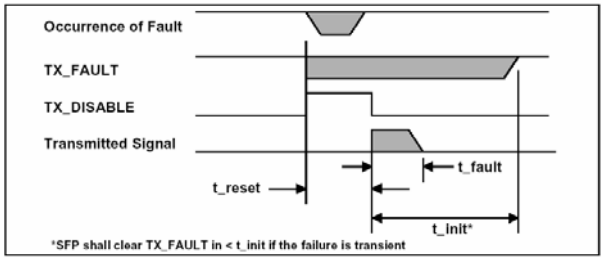
Initialization during hot plugging of SFP.



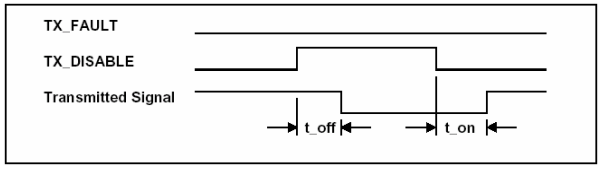
Successful recovery from transient safety fault condidion



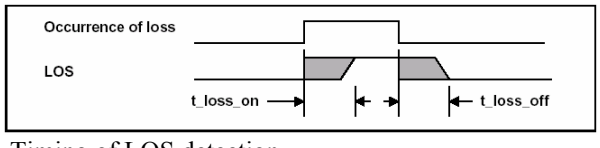
Example of initialization during hot plugging, Tx_Disable negated.



Unsuccessful recovery from safety fault condition

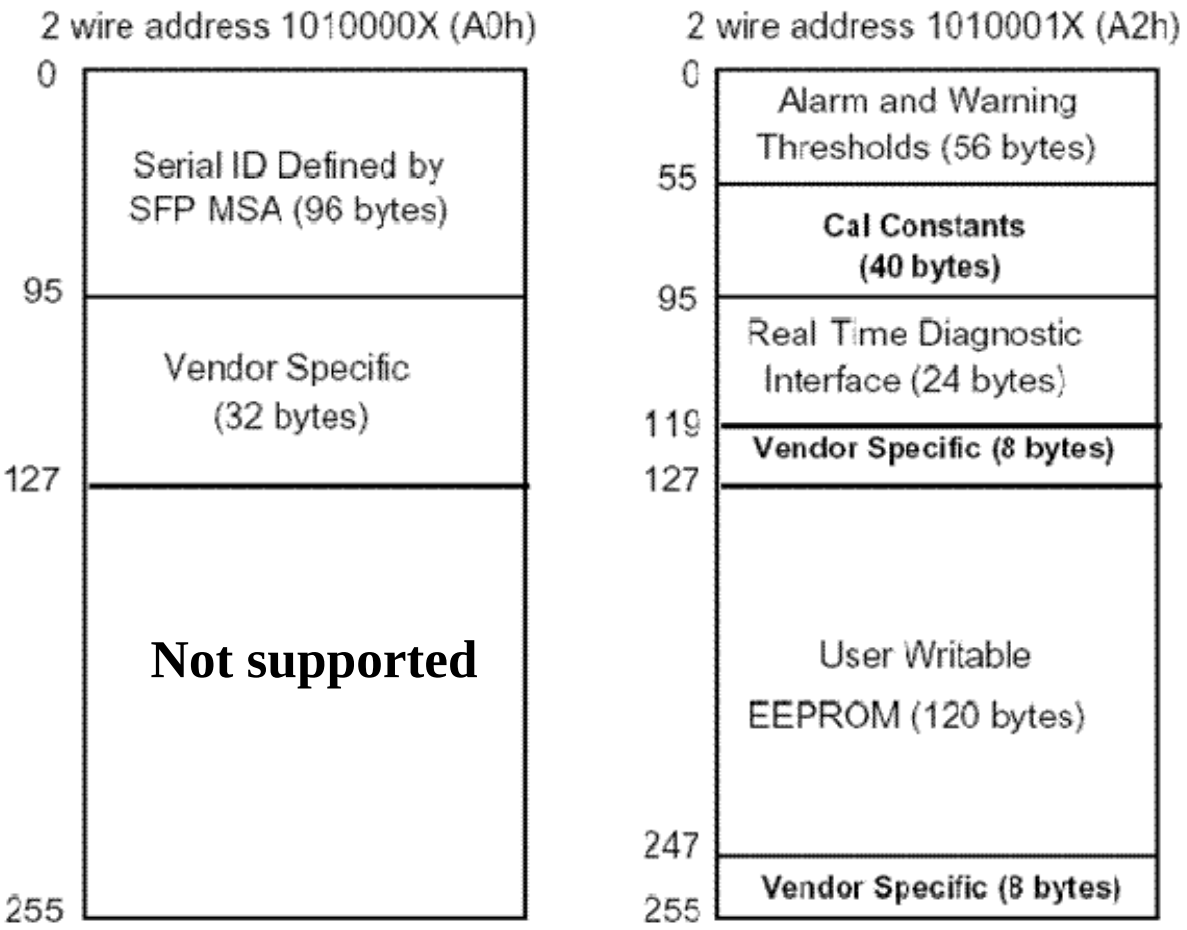


SFP Tx_Disable timing during normal operation.



Timing of LOS detection

5. Memory map



Memory contents herein are for NEC standard products. Customizing is available.

2 wire address 1010000x (A0h) memory

Data Address	Name of Field	Value (Hex)	Description
BASE ID FIELDS			
0	Identifier	03	SFP
1	Ext. Identifier	04	by Serial ID
2	Connector	07	LC
3	Transceiver	00	
4	Transceiver	01	OC-48 SR (OD-J8836)
		12	OC-48 IR-1 (OD-J8837)
		14	OC-48 LR-1 (OD-J8838)
		0C	OC-48 LR-2 (OD-J8839)
5	Transceiver	00	
6	Transceiver	00	
7	Transceiver	00	
8	Transceiver	00	
9	Transceiver	00	
10	Transceiver	00	
11	Encoding	05	SONET Scrambled
12	BR, Nominal	19	2.5Gbps
13	Reserved	00	
14	Length(9um)-km	02	2km (OD-J8836)
		0F	15km (OD-J8837)
		28	40km (OD-J8838)
		50	80km (OD-J8839)
15	Length (9um)	14	2000m (OD-J8836)
		96	15000m (OD-J8837)
		FF	>25500m (OD-J8838)
		FF	>25500m (OD-J8839)
16	Length (50um)	00	
17	Length (62.5um)	00	
18	Length (Copper)	00	
19	Reserved	00	
20-35	Vendor name	4E 45 43 20 43 4F 52 50 4F 52 41 54 49 4F 4E 20	NEC_CORPORATION_
36	Reserved	00	
37-39	Vendor OUI	00 00 4C	NEC OUI code
40-55	Vendor PN	4F 44 2D 4A 38 38 33 36 2D 35 43 30 31 20 20 20	OD-J8836-5C01___ (OD-J8836)
		4F 44 2D 4A 38 38 33 37 2D 35 43 30 31 20 20 20	OD-J8837-5C01___ (OD-J8837)
		4F 44 2D 4A 38 38 33 38 2D 35 43 30 31 20 20 20	OD-J8838-5C01___ (OD-J8838)
		4F 44 2D 4A 38 38 33 39 2D 35 43 30 31 20 20 20	OD-J8839-5C01___ (OD-J8839)
56-59	Vendor rev	30 30 30 31	0001
60-61	Wavelength	05 1E	1310nm (OD-J8836/J8837/J8838)
		06 0E	1550nm (OD-J8839)
62	Reserved	00	
63	CC_BASE		check sum of byte 0 to 62
EXTENDED ID FIELDS			
64	Options	00	Reserved
65	Options	1A	TX_DISABLE, TX_FAULT, LOS
66	BR, max	00	Unspecified
67	BR, min	00	Unspecified
68-83	Vendor SN		serial number
84-91	Date code		year, month
92	Diagnostic Type	58	External calibration
93	Enhanced Options	B0	Soft TX_FAULT, RX_LOS
94	SFF-8472	01	Compliance
95	CC_EXT		check sum of byte 64 to 94
VENDOR SPECIFIC ID FIELDS			
96-127	Vendor Specific	00 all	

2 wire address 1010001x (A2h) memory

Alarm and Warning Threshold

Address	Bytes	Name	Description
00-01	2	Temp High Alarm	+85 deg. C
02-03	2	Temp Low Alarm	-40 deg. C
04-05	2	Temp High Warning	5C01; +75 deg. C, 5D01; +85deg. C
06-07	2	Temp Low Warning	5C01; 0 deg. C, 5D01; -10deg. C
08-09	2	Vcc High Alarm	+ 4.0 V
10-11	2	Vcc Low Alarm	+ 3.13 V
12-13	2	Vcc High Warning	+ 3.47 V
14-15	2	Vcc Low Warning	+ 3.13 V
16-17	2	Bias High Alarm	100 mA
18-19	2	Bias Low Alarm	0 mA
20-21	2	Bias High Warning	80mA
22-23	2	Bias Low Warning	0 mA
24-25	2	Tx Power High Alarm	J8836; -3dBm, J8837; 0dBm, J8838/J8839; +3dBm
26-27	2	Tx Power Low Alarm	J8836; -10dBm, J8837; -5dBm, J8838/J8839; -2dBm
28-29	2	Tx Power High Warning	J8836; -3dBm, J8837; 0dBm, J8838/J8839; +3dBm
30-31	2	Tx Power Low Warning	J8836; -10dBm, J8837; -5dBm, J8838/J8839; -2dBm
32-33	2	Rx Power High Alarm	J8836; -2dBm, J8837; 1dBm, J8838/J8839; -8dBm
34-35	2	Rx Power Low Alarm	J8836/J8837; -19dBm, J8838/J8839; -29dBm
36-37	2	Rx Power High Warning	J8836; -3dBm, J8837; 0dBm, J8838/J8839; -9dBm
38-39	2	Rx Power Low Warning	J8836/J8837; -18dBm, J8838/J8839; -28dBm
40-55	16	Reserved	Reserved

Calibration data

Address	Bytes	Name	Description
56-59	4	Rx_PWR_4	Single precision floating-point calibration data for receiving power. Bit 7 of byte 56 is MSB. Bit 0 of byte 59 is LSB.
60-63	4	Rx_PWR_3	Single precision floating-point calibration data for receiving power. Bit 7 of byte 60 is MSB. Bit 0 of byte 63 is LSB.
64-67	4	Rx_PWR_2	Single precision floating-point calibration data for receiving power. Bit 7 of byte 64 is MSB. Bit 0 of byte 67 is LSB.
68-71	4	Rx_PWR_1	Single precision floating-point calibration data for receiving power. Bit 7 of byte 68 is MSB. Bit 0 of byte 71 is LSB.
72-75	4	Rx_PWR_0	Single precision floating-point calibration data for receiving power. Bit 7 of byte 72 is MSB. Bit 0 of byte 75 is LSB.
76-77	2	Tx_I_{Slope}	Fixed decimal (unsigned) calibration data for laser bias current. Bit 7 of byte 76 is MSB. Bit0 of byte 77 is LSB.
78-79	2	Tx_I_{Offset}	Fixed decimal (signed 2's complement) calibration data for laser bias current. Bit 7 of byte 78 is MSB. Bit0 of byte 79 is LSB.
80-81	2	Tx_PWR_{Slope}	Fixed decimal (unsigned) calibration data for optical output power. Bit 7 of byte 80 is MSB. Bit0 of byte 81 is LSB.
82-83	2	Tx_PWR_{Offset}	Fixed decimal (signed 2's complement) calibration data for optical output power. Bit 7 of byte 82 is MSB. Bit0 of byte 83 is LSB.
84-85	2	T_{Slope}	Fixed decimal (unsigned) calibration data for module temperature. Bit 7 of byte 84 is MSB. Bit0 of byte 85 is LSB.
86-87	2	T_{Offset}	Fixed decimal (signed 2's complement) calibration data for module temperature. Bit 7 of byte 86 is MSB. Bit0 of byte 87 is LSB.
88-89	2	V_{Slope}	Fixed decimal (unsigned) calibration data for module supply voltage. Bit 7 of byte 88 is MSB. Bit0 of byte 89 is LSB.
90-91	2	V_{Offset}	Fixed decimal (signed 2's complement) calibration data for module supply voltage. Bit 7 of byte 90 is MSB. Bit0 of byte 91 is LSB.
92-94	3	Reserved	Reserved
95	1	Checksum	Low order 8 bits of the sum of bytes 0 to 94.

A/D monitor value

Address	Bytes	Name	Description
96	1	Temperature Upper Byte	Internally measured module temperature
97	1	Temperature Lower Byte	
98	1	Vcc Upper Byte	Internally measured supply voltage in transceiver
99	1	Vcc Lower Byte	
100	1	TX Bias Upper Byte	Internally measured TX Bias Current
101	1	TX Bias Lower Byte	
102	1	Tx Power Upper Byte	Measured TX output power
103	1	Tx Power Lower Byte	
104	1	Rx Power Upper Byte	Measured RX input power
105	1	Rx Power Lower Byte	
106	1	Reserved	Reserved
107	1	Reserved	
108	1	Reserved	Reserved
109	1	Reserved	

Status bit

Address	#Bit	Name	Description
110	7	TX Disable state	
	6	Soft TX Disable command	
	5	Reserved	
	4	RX rate select state	
	3	Soft RX rate select command	
	2	TX Fault state	Digital state of the TX Fault output pin.
	1	LOS state	Digital state of the LOS output pin.
	0	Data Ready Bar	
111	7-0	Reserved	

Real time diagnostic resister

Address	#Bit	Name	Description
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level
	6	Temp Low Alarm	Set when internal temperature is below low alarm level
	5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level
	4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level
	3	TX Bias High Alarm	Set when TX Bias current exceeds high alarm level
	2	TX Bias Low Alarm	Set when TX Bias current is below low alarm level
	1	TX Power High Alarm	Set when TX output power exceeds high alarm level
	0	TX Power Low Alarm	Set when TX output power is below low alarm level
113	7	RX Power High Alarm	Set when RX receiving power exceeds high alarm level
	6	RX Power Low Alarm	Set when RX receiving power is below low alarm level
	5-0	Reserved	
114	7-0	Reserved	
115	7-0	Reserved	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level
	6	Temp Low Warning	Set when internal temperature is below low warning level
	5	Voltage High Warning	Set when internal supply voltage exceeds high warning level
	4	Voltage Low Warning	Set when internal supply voltage is below low warning level
	3	TX Bias High Warning	Set when TX Bias current exceeds high warning level
	2	TX Bias Low Warning	Set when TX Bias current is below low warning level
	1	TX PWR High Warning	Set when TX output power exceeds high warning level
	0	TX PWR Low Warning	Set when TX output power is below low warning level
117	7	RX PWR High Warning	Set when RX receiving power exceeds high warning level
	6	RX PWR Low Warning	Set when RX receiving power is below low warning level
	5-0	Reserved	

The others

Address	Bytes	Name	Description
118-119	2	Reserved	
120-127	8	Vender specific	Reserved
128-247	120	User writable EEPROM	00 all
248-255	8	Vender specific	00 all

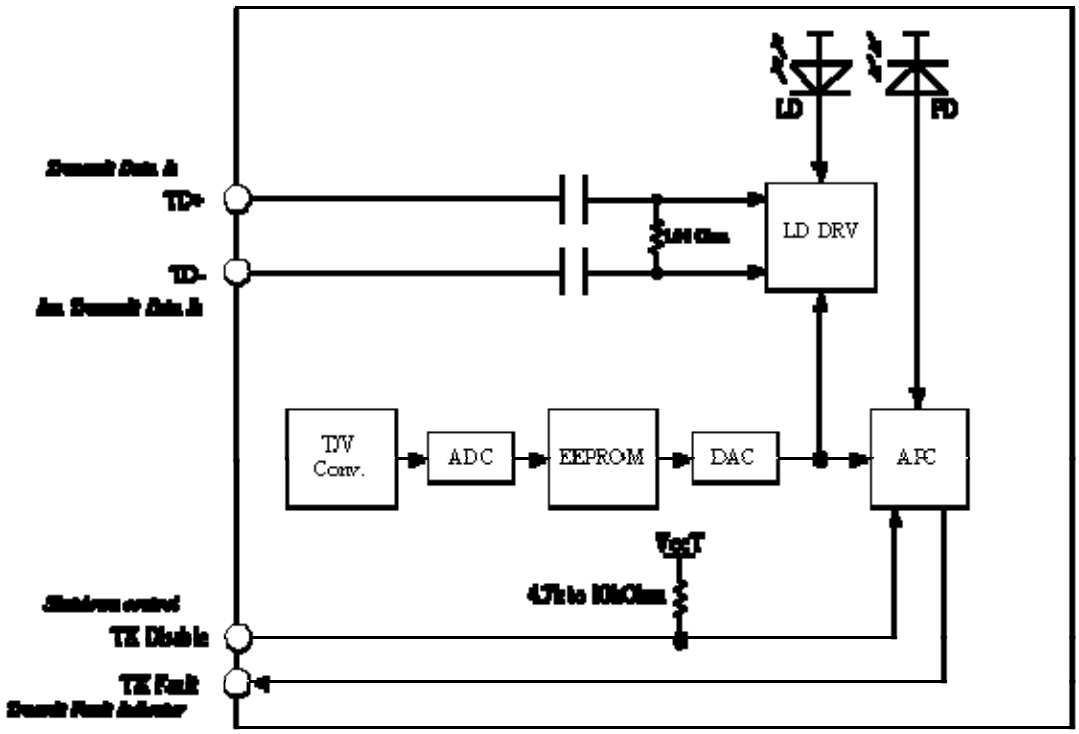
6. Digital Diagnostic Monitor

Parameter	Unit	OD-J8836	OD-J8837	OD-J8838	OD-J8839
Tx Optical Power	dB	+/– 3 (-10 to -3 dBm)	+/– 3 (-5 to 0 dBm)	+/– 3 (-2 to +3 dBm)	
Rx Optical Power	dB	+/– 3 (-3 to –18 dBm)	+/– 3 (0 to -18dBm)	+/– 3 (–9 to –28dBm)	
Bias Current	%	+/– 10 (5 to 100mA)			
Power Supply Voltage	%	+/– 3 (3.13 to 3.47V)			
Transceiver Case Temperature	deg. C	+/– 3 (5C01:0 to +75deg.C, 5D01: -10 to +85deg.C)			

7. Functional Block Diagram

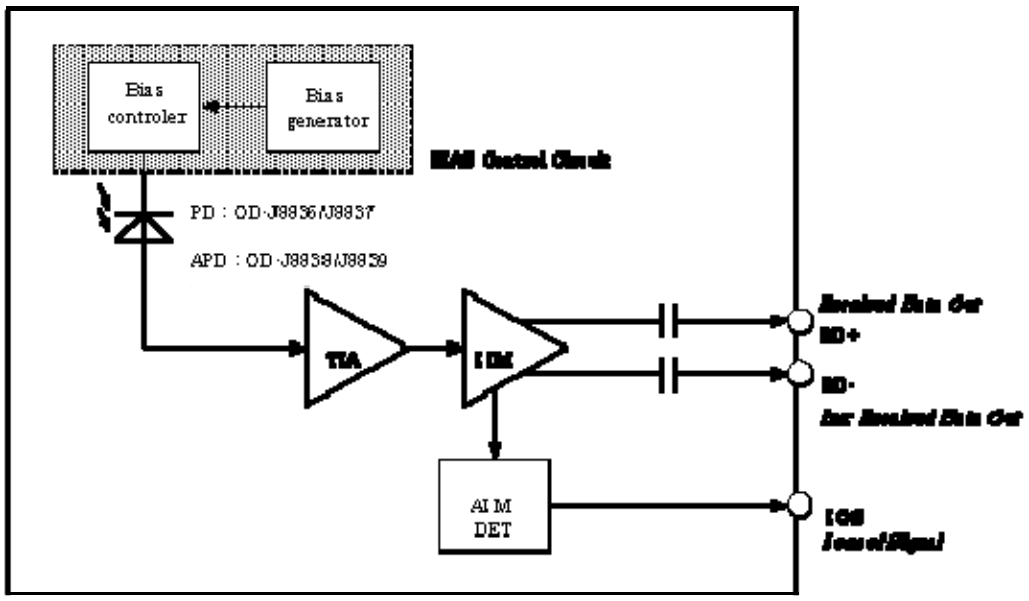
7-1. Functional Block Diagram

a) Transmitter



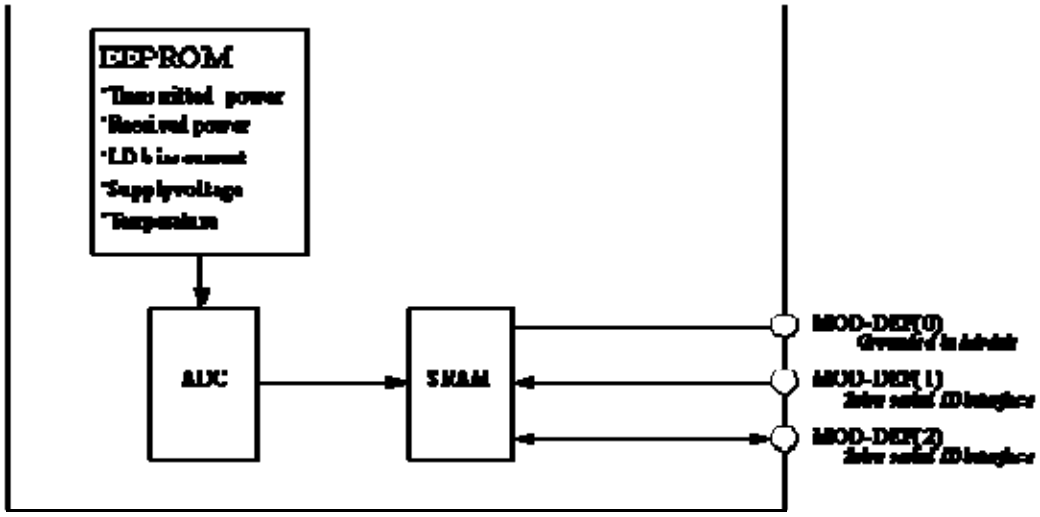
LD DRV: Laser diode driver, DAC: Digital to analogue converter, T/V Conv.: Temperature to voltage converter, APC: Automatic power control circuit, ADC: Analogue to digital converter, EEPROM: Electronic erasable ROM, PD: Photo Diode, LD: LASER Diode

b) Receiver



APD: Avalanche Photo Diode, TIA: Trans Impedance Amplifier, LIM: Limiting amplifier, ALM DET: alarm detector

C) Digital diagnostic monitor Side

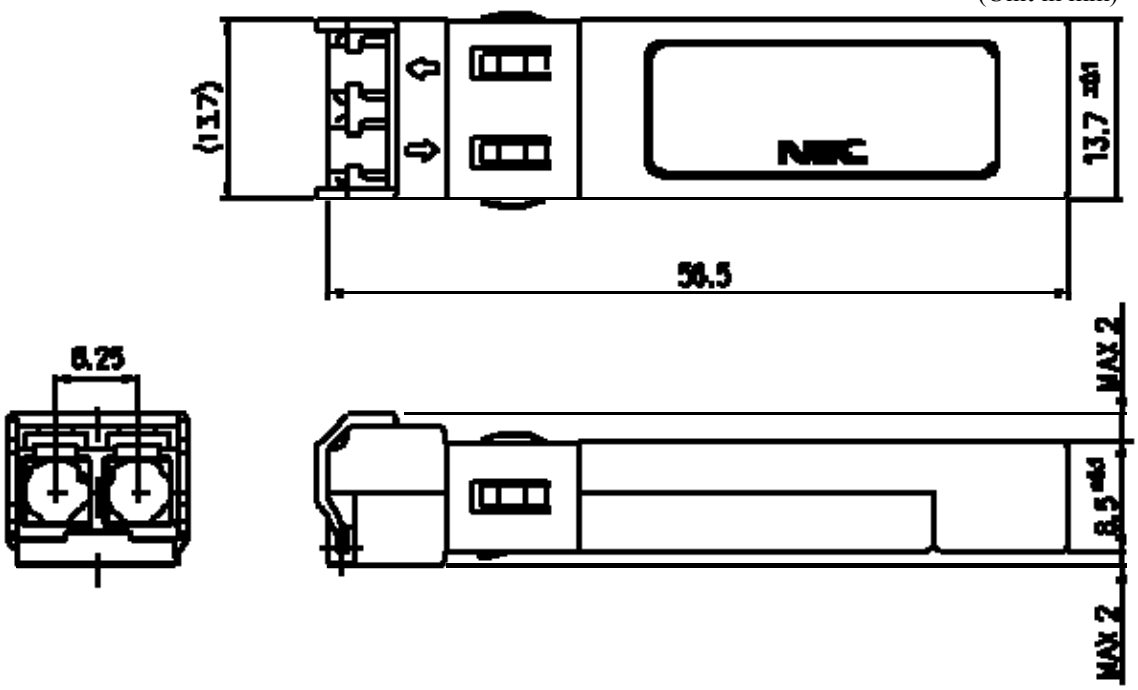


ADC: Analogue to digital converter

8. Package size, Pin Assignment

8-1. Outline

(Unit in mm)



8-2. Pin Description

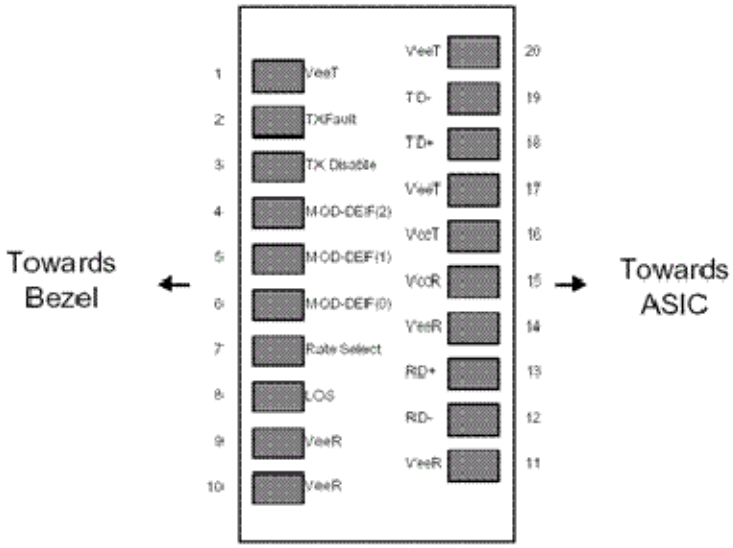


Fig. Diagram of Host Board Connector Block Pin Numbers and Names

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

Plug Seq: Pin engagement sequence during hot plugging.

1) TX Fault is an open collector output, which should be pulled up with a 4.7k-10kΩ resister on the host board. Pull up voltage between 2.0V and VccT. 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.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k-10kΩ resister.

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k-10kΩ resister 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

4) LOS(Loss of Signal) is an open collector output, which should be pulled up with a 4.7k-10kΩ resister. Pull up voltage between 2.0V and VccR. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

5) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω(differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

6) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. Recommended host board power supply filtering is shown Fig.7-2.

7) 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.

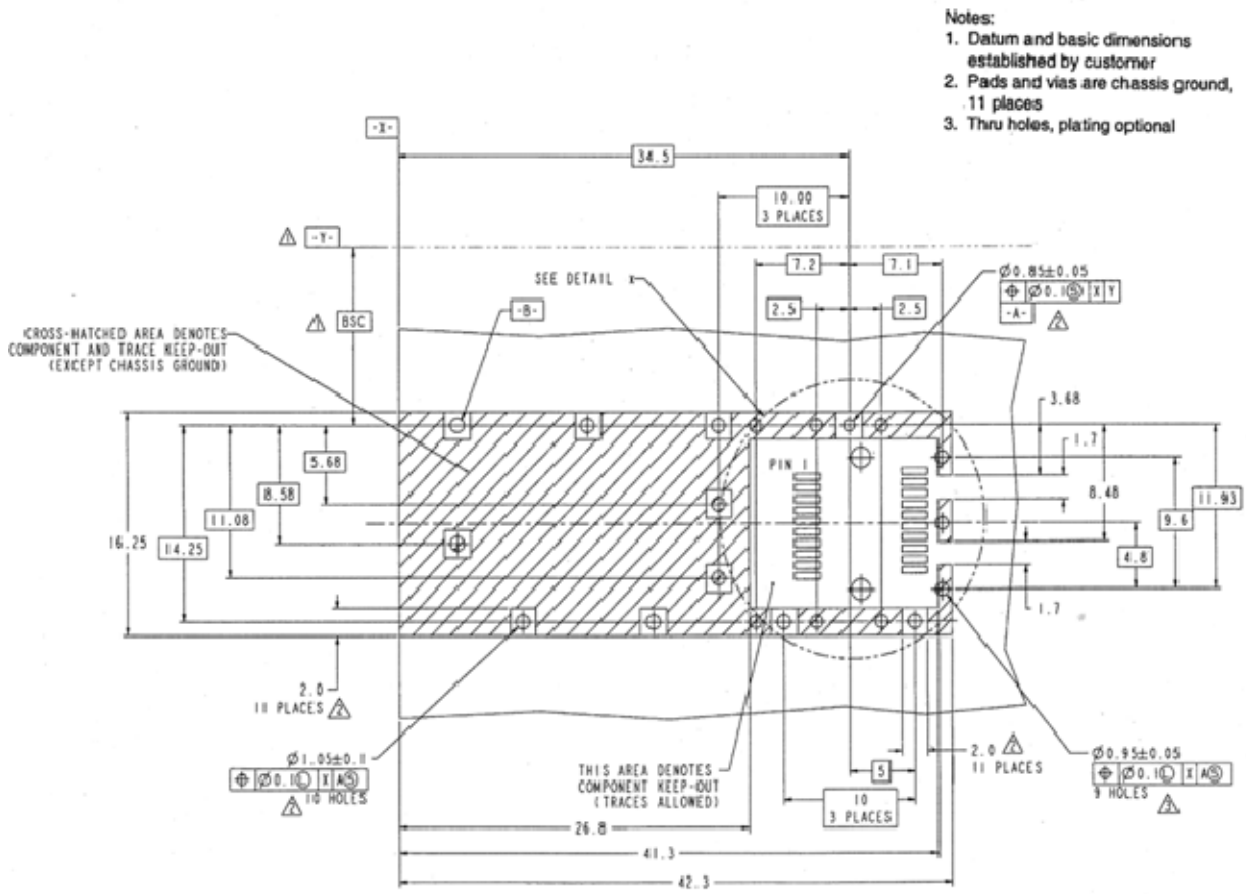


Fig. SFP Host Board Mechanical Layout

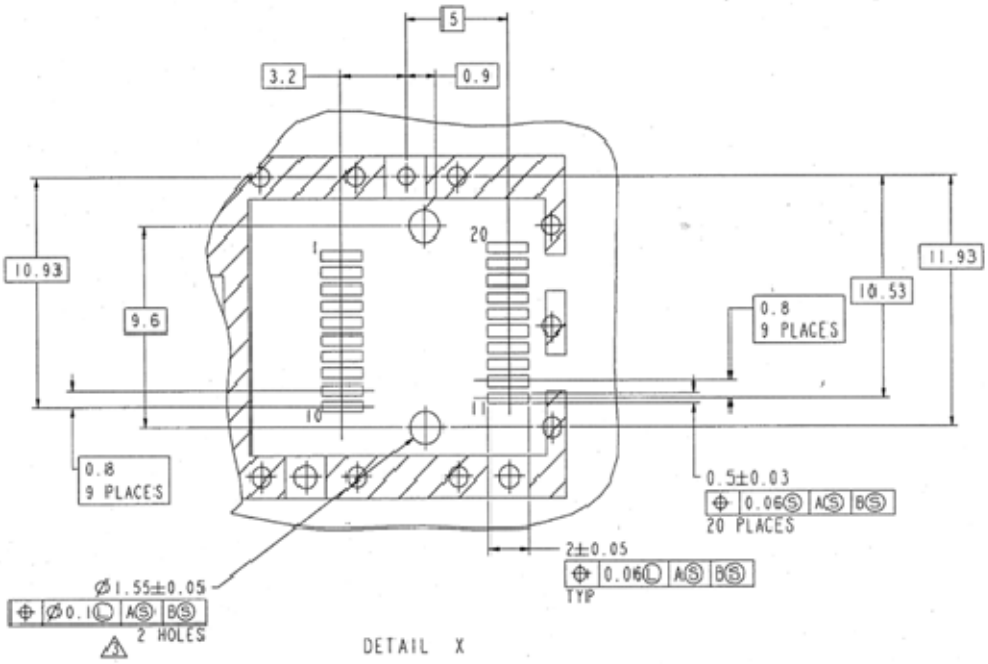
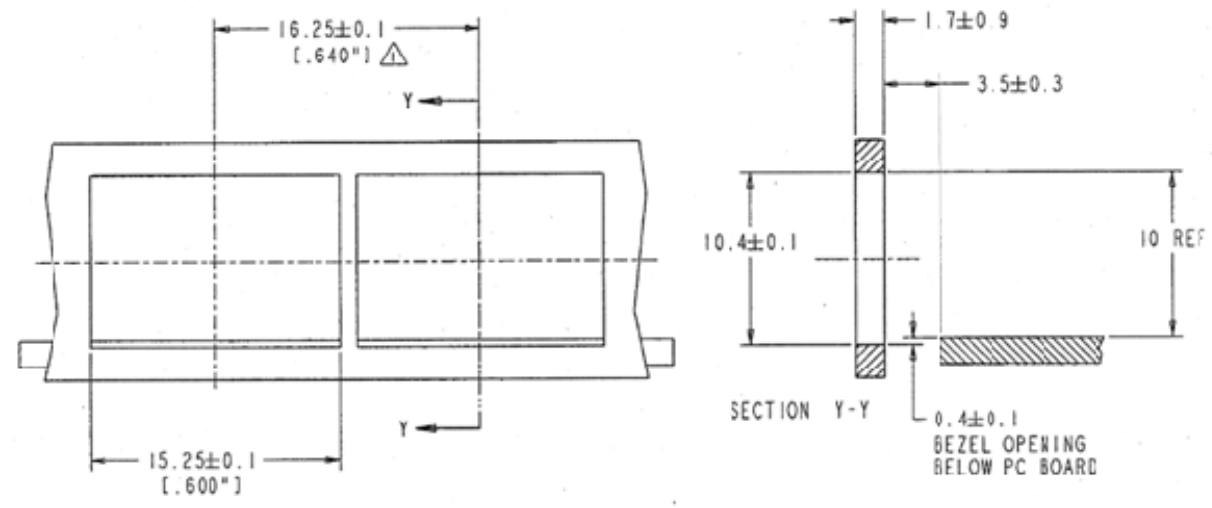


Fig. SFP Host Board Mechanical Layout (Cont.)



NOTES:

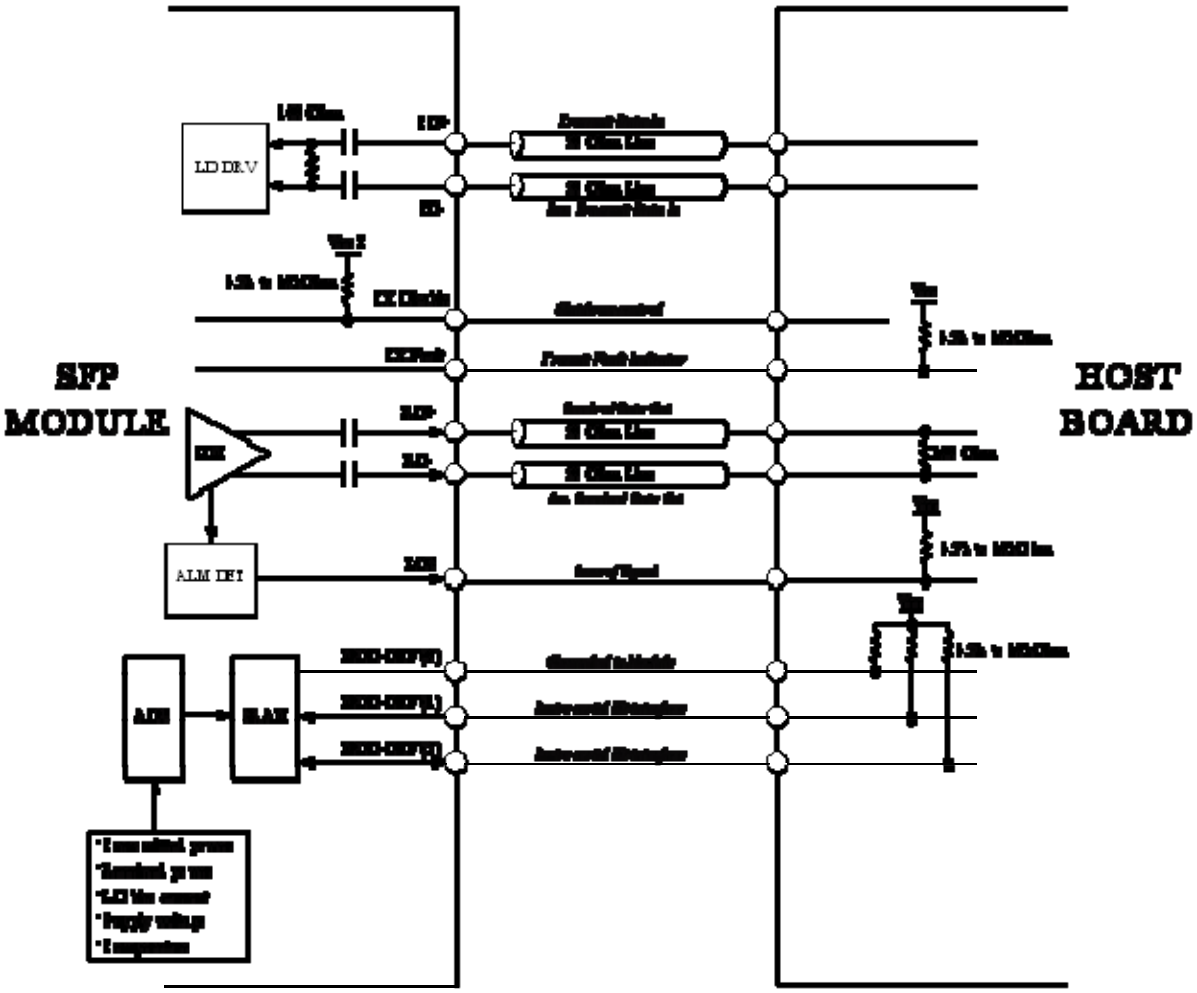
⚠ MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY

2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

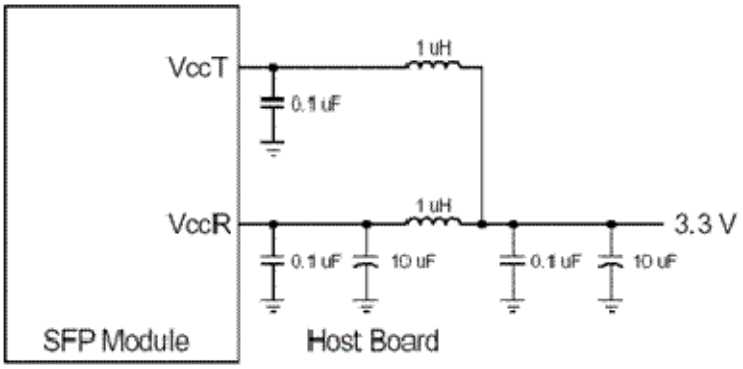
Fig. Recommended Bezel Design

9. Recommended peripheral circuit

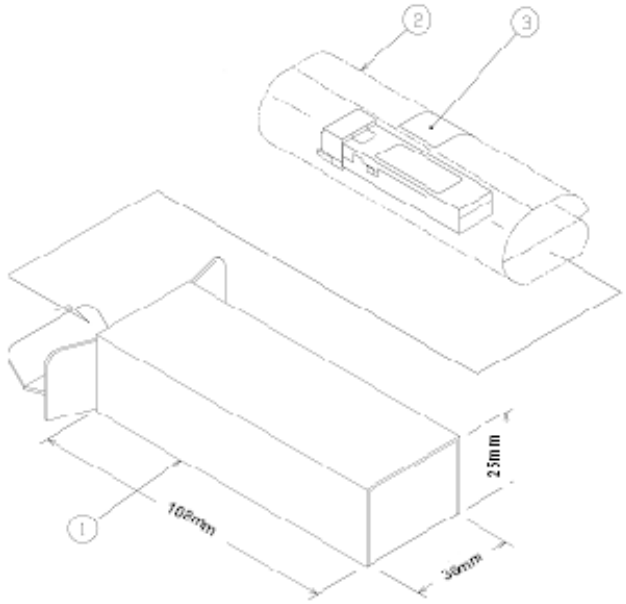
9-1. Interface Circuit



9-2. Recommended Host Board Supply Filtering Network



10. Shipment Packing



① Outer Carton
② ESC Air-cap
③ Adhesive Tape

11. Reliability

11-1. FIT rate

@ 45 deg. C

	Total FIT rate
OD-J8836-xxxx	359 FIT
OD-J8837-xxxx	623 FIT
OD-J8838-xxxx	657 FIT
OD-J8839-xxxx	504 FIT

11-2. Reliability test

GR468-CORE

12. Certifications

12-1. LASER Eye Safety

IEC 60825-2 CLASS 1

12-2. Flammability

To be qualified by UL94V1

12-3. Electromagnetic compatibility

FCC PART15 Class B

13. Application Precautions

a) To prevent optical connector surface from crack or stain, please put the dust cap while this device is not in use.
When the connector surface is stained, please wipe with a kind of lens paper.

b) Optical components are mounted inside this device. Please handle with care. Mechanical shock due to falling could lead permanent damage.

c) The device performance given in this manual is guaranteed for correct applications. Device performances are not guaranteed under incorrect use.

d) Sudden heating or cooling by dryer or cooling spray could lead permanent damage to the device. The device may not work normally while sudden heating or cooling.

e) This product should be handled as a CMOS product.

f) Don't insert the module upside down. If the module is inserted into the cage on the host-board upside down, it may cause circuit to short out in the host-board. See Insert direction below.

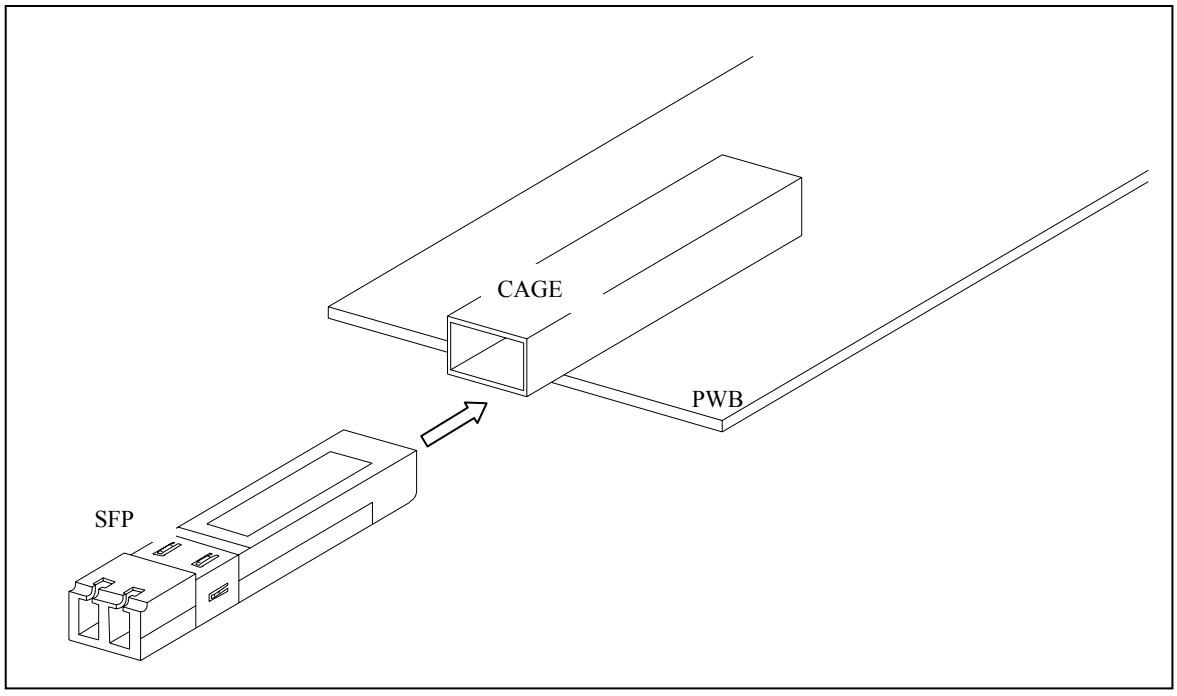


Fig. Insert direction

- Revision history -

Revision	Date	Contents
1.0	December 5, 2003	First release
2.0	January 20, 2004	p.3, 4-1. Average optical input power +2dBm to +3dBm for OD-J8836/ 8837
3.0	March 3, 2004	p.14, 8-1 Outline; revised p.20, 11-1 FIT rate; revised
4.0	April.9.2004	p.4, 4-3 Transmitter side; revised add BOL Specifications Receiver side ; revised add BOL Specifications p.9, 5 Memory map; revised Tx Power Alarm, Warning Rx Power Alarm, Warning p.12, 6 Digital Diagnostic Monitor Accuracy P.21, 13 Application Precautions; revised
5.0	June 15, 2004	p.4, 4-2 Power Consumption (Max) for OD-J8839 reduced to 1.2W. p.4, 4-3 Operating condition for the data rate is corrected to 2.48832Gbps. p.9, 5 Data values in A0h memory area are corrected. BRmax, BRmin, Diagnostic Type and Vendow Specific.
6.0	December 16, 2004	Sales office address and phone number are changed.
7.0	October 11, 2006	Product number ; revised and added Group name changed : from “0x01” to lead free group name : “5x01” Add squelch function enable products : “OD-xxxxx-5C01”and “OD-xxxxx-5D01” Shipment packing ; added
8.0	March, 2009	Deleted Grp.5A01 and 5B01
9.0	June, 2009	Changed contact information

Areas of caution in the handling of laser diode products.

- This product complies with IEC 60825-2.
- It is correspond to the category “Class 1 Laser Product” under IEC regulation.
- During operations, the laser diode discharges red beams and infrared beams invisible to the eye. Since it is very hazardous if these beams directly, or bypassing through a lens, get in one’s eyes, please try to avoid this.
- Take proper Electrostatic-discharge (ESD) precautions while handling the device. The device is sensitive to ESD.
- May cause of damage if drop or subject to shock. This product includes optical parts.
- Caution-use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Areas of caution in handling GaAs.

There are some products in our catalogue that use GaAs. Please strictly adhere to the caution items appearing below, in order to prevent dangerous situations.

- ○Do not put the product in your mouth.
- ○Do not turn the product into a vaporous or powdered form through burning, grinding or chemical processing.
- ○When disposing of the product, follow related laws, and your company’s internal waste control regulations.

Areas of caution in handling optical fiber products.

- Be careful not to pierce your skins as the tips of optical fibers are extremely sharp. Especially you must attention in case of hazardous if they pierce one’s eyes.
- Do not apply extreme stress to optical fiber, or it may cause deterioration of characteristics or disconnection. The force of pull should be less than 200gf, and, a radius for bending should be larger than R30 mm
- Do not hold only optical fiber or module package, because extreme stress is easy to apply to the optical fiber edge of the module

In generally, failure occurs in electronic components with a certain probability. We at NEC work to improve the quality and reliability of industrial electronic components, but it is impossible to reduce such probability to zero. This being the case, users of NEC industrial electronic components are requested to provide redundant design, counterburning design, malfunction prevention design and other safety design to prevent failures that may cause possible accidents involving injuries of death, fire, social damages, etc.

NEC classifies the quality standard of its industrial electronic components into three categories, from the “Standard level” for lower quality upward to “Special level” and “specific level” for which customers are requested to designate their own quality assurance program. Respective quality levels are intended to being used for the following applications. In this connection, users considering to use NEC components for other than the “Standard level” application are always requested to contact an NEC sales representative in advance.

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Special level: Transportation machinery (automobiles, trains, ships, etc.), traffic signal equipment, disaster/crime prevention devices, various safety devices, and medical equipment not directly intended for life support.

Specific level: Aeronautical equipment, aerospace equipment, submarine relay equipment, nuclear control system, and medical equipment, devices or systems for life support.

NEC does not manufacture, as standard items, products recommendable to such “specific” applications as aerospace equipment, submarine relay equipment, nuclear control system and life-support medical equipment, which all require a very high levels of reliability. Customers planning to use our products for the above-mentioned applications or those planning to use our products of “standard” or “special” quality level for other application than intended by us, are requested to contact in addition, please note that NEC industrial electronic components listed in catalogs, data sheets, data books and other materials published by NEC without the indication of their quality level are all of the standard quality level.

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Contact information:

NEC Corporation
Fiber Optic Devices Division
(Shin Tamachi Building) 34-6, Shiba 5-chome, Minato-ku, Tokyo
108-0014, Japan
Tel: +81-3-3798-5864 Fax: +81-3-3798-5857

NEC Corporation of America（USA & CANADA)
FiberOptech Division
Mail Stop# NC1000
2880 Scott Blvd, Santa Clara, CA 95050, U.S.A.
Tel:+1-408-844-1082 Fax: +1-408-844-1090

NEC Electronics (Europe) GmbH
Sales and marketing of semiconductors across Europe
Arcadiastrasse 10, D-40472 Dusseldorf, Germany
Tel: +49-211-6503-0 Fax: +49-211-6503-1344