Specification : TS-S96D009B
Date : March, 1998

SEI

Technical Specification
for
156Mbps Plastic Molded Fiber Optic Receiver Module

SDT8501-R_-QN
SDT8501-R_-QW

☑ 155.52Mb/s	☐ 622.08Mb/s	☐ other _____
☑ Short Haul Intermediate Reach	☑ Long Haul Long reach	☐ other _____
☐ Transmitter	☑ Receiver	☐ Transceiver
	(☑ 2R /☐ 3R)	(☐ 2R /☐ 3R)

SUMITOMO ELECTRIC INDUSTRIES, LTD.

SUMITOMO Electric reserves the right to make changes in the specification described hereinafter without prior notice.

1. General

SDT8501-R_-QN / SDT8501-R_-QW is compact and high performance digital fiber optic receiver module ideally designed for high speed data communication systems or telecommunication transmission systems including SDH STM-1 S-1.1, S-1.2 / L-1.1, L-1.2, L1.3 and SONET OC-3 IR-1, IR-2 / LR-1, LR-2, LR-3. The device also meets Bellcore TA-NWT-000253 requirement and ITU-TS G.957 / G.958 recommendation.

• Application	SDH STM-1 S-1.1, S-1.2 / L-1.1, L-1.2, L1.3 SONET OC-3 IR-1, IR-2 / LR-1, LR-2, LR-3
• Data Rate	155.52 Mbps
• Power Supply Voltage	Single +5V
• Electrical Interface	PECL
• Photo Diode	1300 nm InGaAs PIN-PD
• Connector Interface	FC or SC pigtail, 60cm - long
• Pin Configuration	20 Pin Dual in Line

The features of SDT8501-R_-QN / SDT8501-R_-QW are listed below. These features provide many functions and advantages for the system SDT8501-R_-QN / SDT8501-R_-QW used in.

• FEATURES	Low Power Consumption
	Plastic Molded Package
	Wide Dynamic Range
	Signal Detect (FLAG) Function
	Multi-sourced Footprint

Warnings and safety precautions

To avoid personal injury, follow all danger warnings on this product, as well as safety procedures established by your company. Also to avoid damage to equipment or interruption to service, follow all caution warnings on this product, as well as procedures established by your company.

The followings are samples of danger and caution warnings.

DANGER

Risk of personal injury

A danger warning informs the reader of a risk of personal injury

CAUTION

Risk of damage to equipment

A caution warning informs the reader of a risk of service interruption or equipment damage.

DANGER

Risk of electric shock

This warning advises you of a possible electrical hazard. When you see this warning, proceed with care, to avoid personal injury.

2. Block Diagram

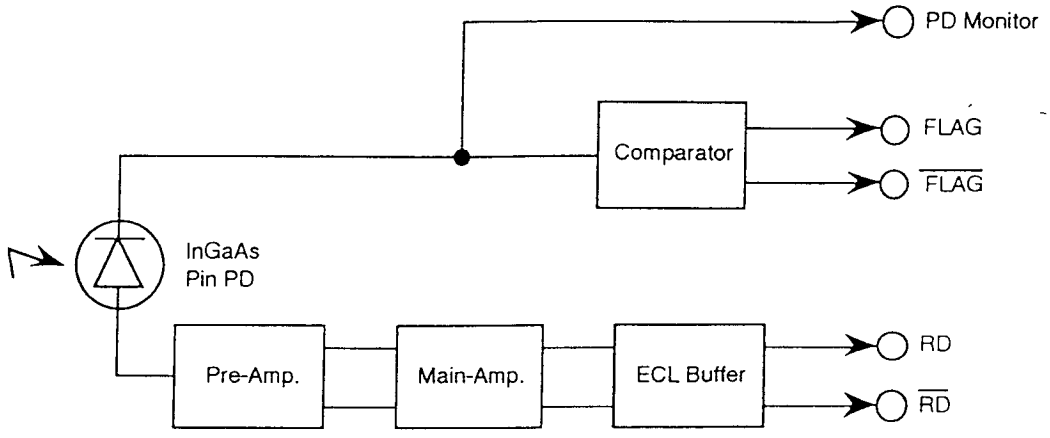


Figure 1 Block Diagram

3. Package Dimension

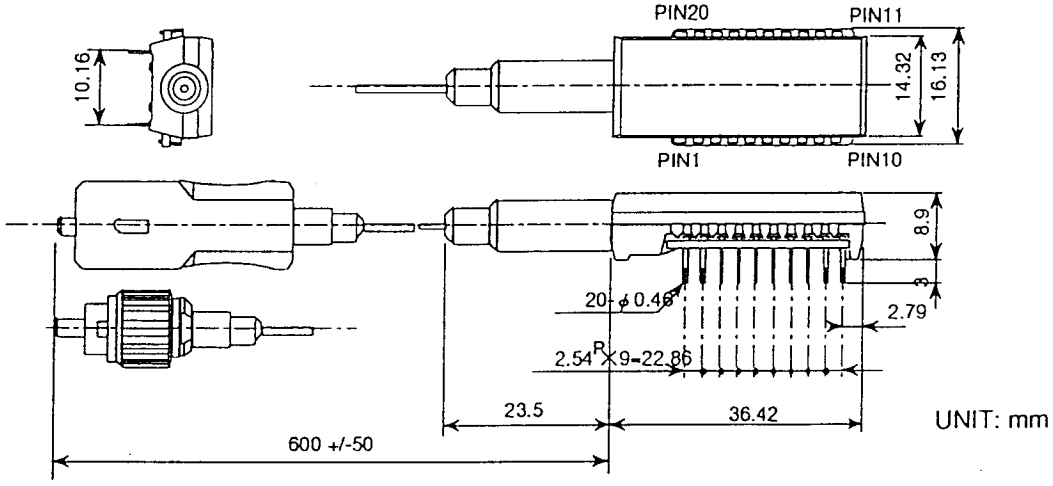


Figure 2. External View

DANGER

-Lead pin can penetrate the skin.Handle with care.

-The module consists semiconductor devices and electrical circuit. Taking it apart or making it over may cause short-circuit and electrical hazard.

CAUTION

-Mechanical shocks or over stress may cause the damage on the performance of this optical module. Please avoid them.

-This module is highly integrated Taking the module apart may cause some serious influences on its characteristics. Once it should be taken apart, no spesification on these sheets could be guaranteed.

4. Pin Assignment

No.	Symbol	Function
1	NC	Non Connection
2	NC	Non Connection
3	NC	Non Connection
4	NC	Non Connection
5	NC	Non Connection
6	GND	Ground
7	RD	Differential Data Output (Positive)
8	GND	Ground
9	$\overline{RD}$	Differential Data Output (Negative)
10	NC	Non Connection
11	Vcc	Power Supply (+) : +5V
12	FLAG	Differential Flag Output (Positive, Refer to Figure 3)
13	GND	Ground
14	$\overline{FLAG}$	Differential Flag Output (Negative, Refer to Figure 3)
15	GND	Ground
16	NC	Non Connection
17	NC	Non Connection
18	PD Monitor	Monitor Pin for Optical Input Power
19	NC	Non Connection
20	NC	Non Connection

Note

NC pins should be left open for additional functions in the future.

PD Monitor pin can be used to detect the incoming optical power level. External circuit for this purpose is shown by Figure 6. PLEASE DO NOT ALLOW LEAK CURRENT PATH for PD monitor pin to other lower voltages such as Vee. This leak may influence the precision of FLAG threshold level, because FLAG observes the PD current plus this leak current. Always keep this current less than 50nA.

DANGER

Risk of electric shock: Whenever the module on the circuit board may be handled, confirm that POWER SUPPLY IS NOT PROVIDED.

CAUTION

-The components should be handled in the same manner as ordinary semiconductor devices to prevent the electro-static damages. For safe keeping and carrying, the components should be packaged with ESD proof material. To assemble the components on PCB, the workbench, the soldering iron and the human body should be grounded.

-Never short-circuit. The device may be damaged.

5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Case Temperature	Ts	-40	85	°C	1
Operating Ambient Temperature	Ta	0	70	°C	1,2
		-40	85	°C	1,3
Supply Voltage	Vcc	0	7	V	
Lead Soldering (Temperature)			260	°C	4
(Time)			10	sec.	

Note 1. No condensation allowed 2. SDT8501-R_-QN 3. SDT8501-R_-QW
4. Measured on leads-pin at 2mm (0.079 inch) off the package bottom

CAUTION

-Any overstresses in excess of the Absolute Maximum Ratings shown above may cause permanent damages on the device. Functional operations of the device is not implied at these or any other conditions in excess of given in the operations sections of the data sheet. Exprosure to Absolute Maximum Ratings for extended periods may affect reliability of device.

-Please pay special attention to the atmosphere condition of the components because the dew on the module may cause some electrical damages.

6. Electrical Interface

(Unless otherwise specified, Vcc = 4.75 to 5.25 V and all operating temparature shall apply.)

Parameter		Symbo	Min.	Typ.	Max.	Units	Note
Supply Voltage		Vcc	4.75	5.00	5.25	V	
Supply Current		Idrx		70	130	mA	1
Output Voltage	High	Vrdh	Vcc-0.98		Vcc-0.81	V	2
RD & $\overline{RD}$	Low	Vrdl	Vcc-1.95		Vcc-1.63	V	
Output Voltage	High	Vflgh	Vcc-0.98		Vcc-0.81	V	
FLAG & $\overline{FLAG}$	Low	Vflgl	Vcc-1.95		Vcc-1.63	V	

Note 1. Output bias current is not included. Mark ratio 1/2 pattern at 155.52 Mbps.
2. ECL10KH:Vcc=5V,Ta=25°C,Termination condition : Rl=50Ω to Vcc-2V

7. Optical Interface

(Unless otherwise specified, Vcc-Vee = 4.75 to 5.25 V and all operating temparature shall apply.)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Wavelength			1261		1580	nm	
Data rate				155.52		Mbps	NRZ
Consecutive Identical Digit		CID	72	100		bits	1
Minimum Sensitivity		Pmin			-34	dBm	2
Over - load		Pmax	-8			dBm	2
FLAG level	assert	Pa	-52		-34	dBm	
	deassert	Pd	-53		-34		
FLAG Assert Time		Ta			100	µsec	
FLAG Deassert Time		Td	2.3		100	µsec	

Note 1. Embedded in PRBS of length greater than 4000bits
2. BER≤10^{-10}, 155.52Mbps, Mark ratio 1/2.

8. Relation between Input Signal and Optical Output Power

Received Optical Signal	Data Output	
	RD	$\overline{RD}$
"H"	"H"	"L"
"L"	"L"	"H"

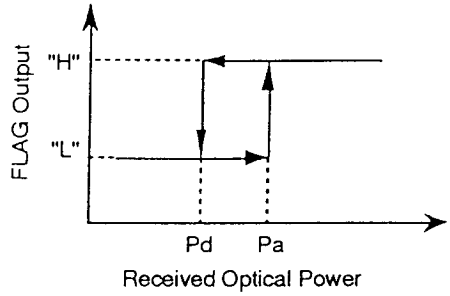


Figure 3 FLAG Assert Level and Deassert Level

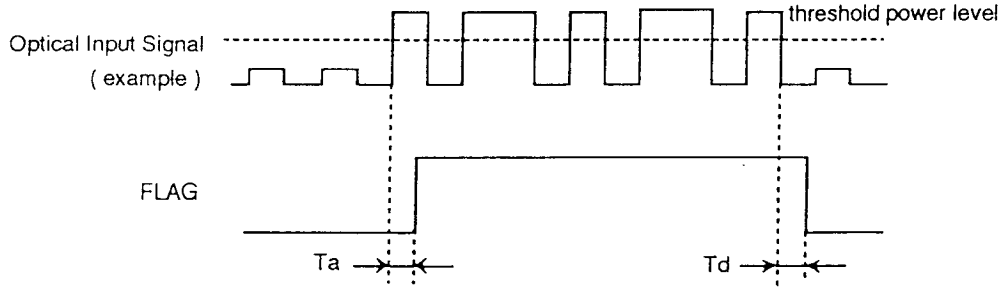


Figure 4 FLAG time chart

9. Fiber Pigtail Specification

Parameter	Min.	Typ.	Max.	Unit	Note
Core Diameter		62.5		μm	
Cladding Diameter		125		μm	
Outer Jacket Diameter		0.9		mm	
Optical Jacket Tensile Break Strength			9.8	N	
Bend Radius	30			mm	

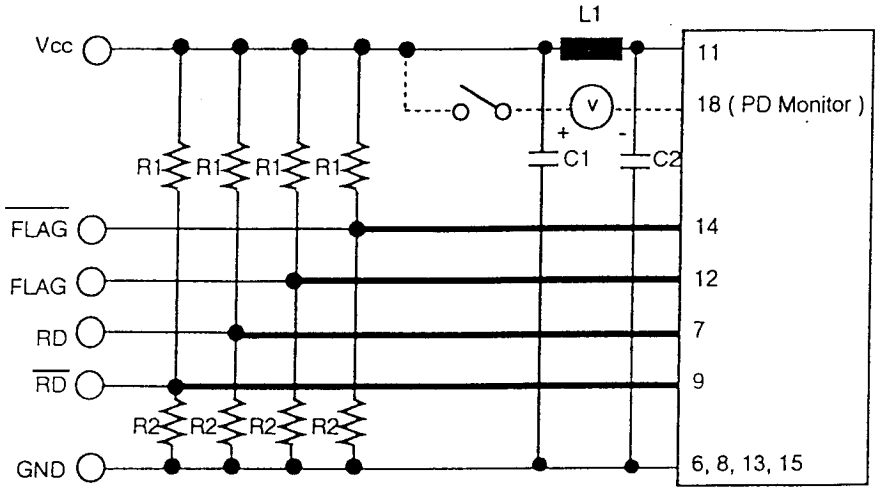
DANGER

-Exposed optical fiber may penetrate your skin. Especialy if it should penetrate your eyes, you may lose your sight. Handle with care. Never take the module apart nor make it over.

CAUTION

-The accessory cap should be attached to the connector part while the optical connector is not in use, because dust on the optical interface port may let the optical power or sensitivity degrade.
-The stress to the fiber pigtail may cause the damage on the performance. The fiber pigtail may snap off by dropping the module.

10. Recommended User Interface



Characteristic impedance 50Ω line

R1 = 82Ω (≥ 1/8 W)
R2 = 130Ω (≥ 1/8 W)
C1 = 100μF (TantalumElectrolytic or Aluminum Electrolytic Capacitor)
C2 = 1μF (Ceramic Capasitor)
L1 : Ferrite Bead ZBF 253D-00 (TDK)

Note

When the voltage between Vcc and PD Monitor is measured to the detect the received optical power level, the electrical output signal can not be guaranteed. PD monitor should be left open on ordinary operating condition. Figure 6 shows the relation between Vcc-Vpd and the received optical power level.

50Ω line connected to RD and $\overline{RD}$ should be symmetrical.

Figure 5 Recommended User Interface

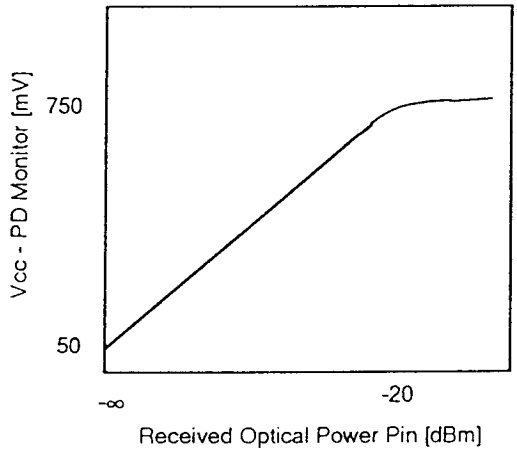


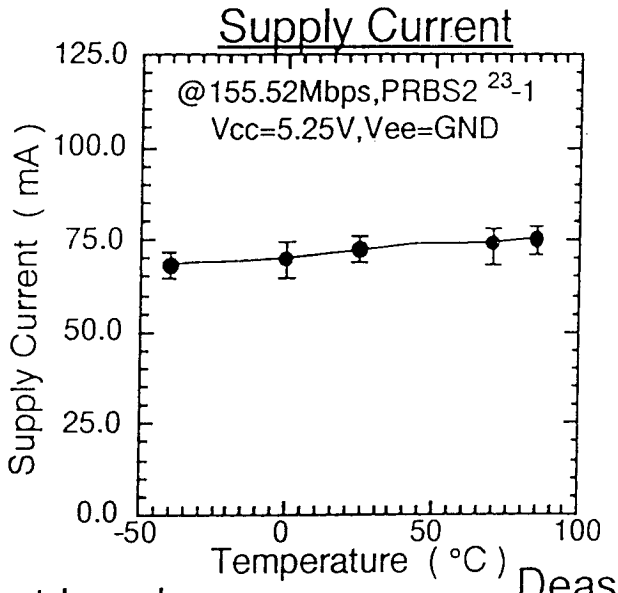
Figure 6 Relation between Received Optical Power and Vcc - PD monitor [mV]

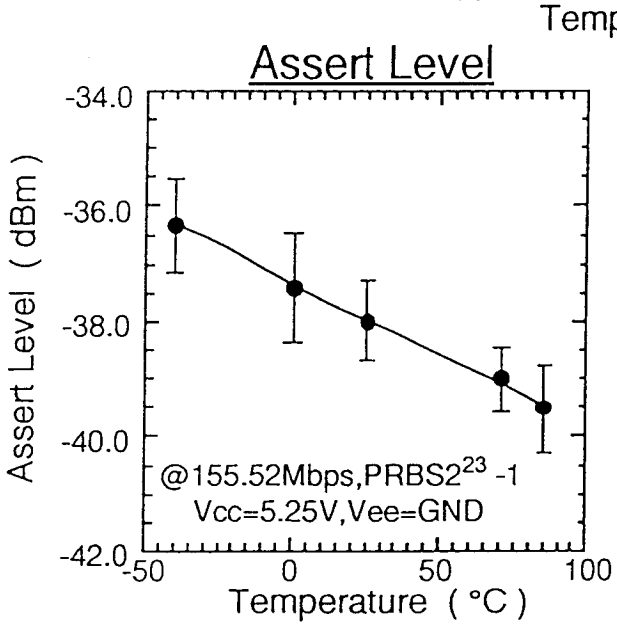
CAUTION

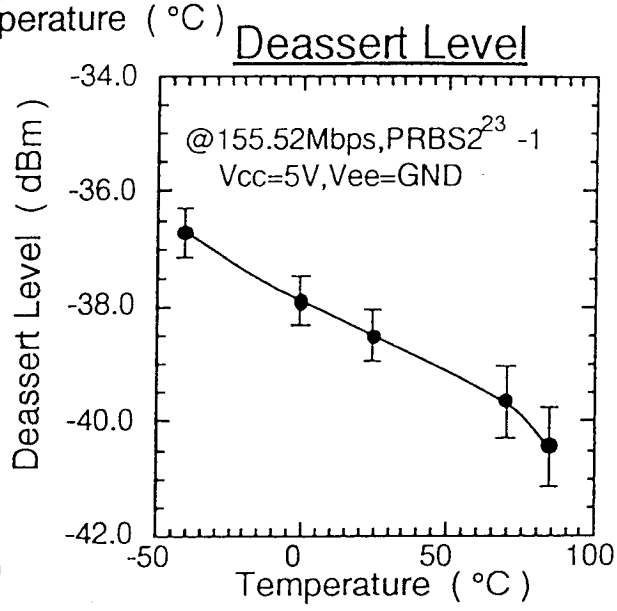
-To eliminate the ripple noise to supply voltage, a ripple filter should be placed as close to the component as possible.

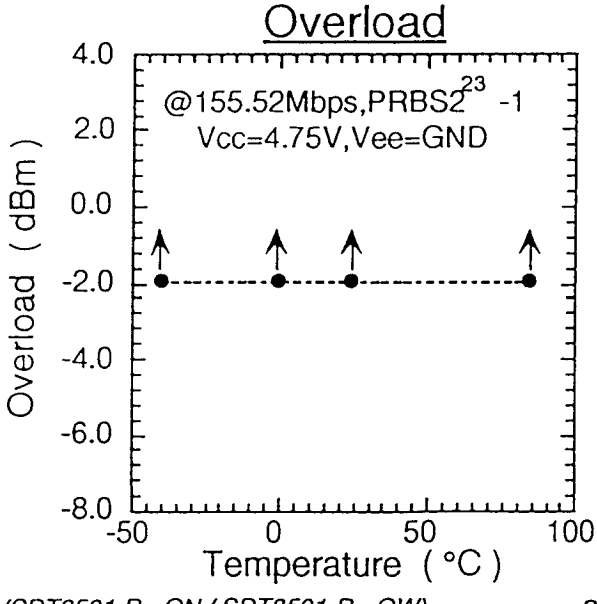
-The signal input and output terminals should not be short-circuited to supply voltage or ground.

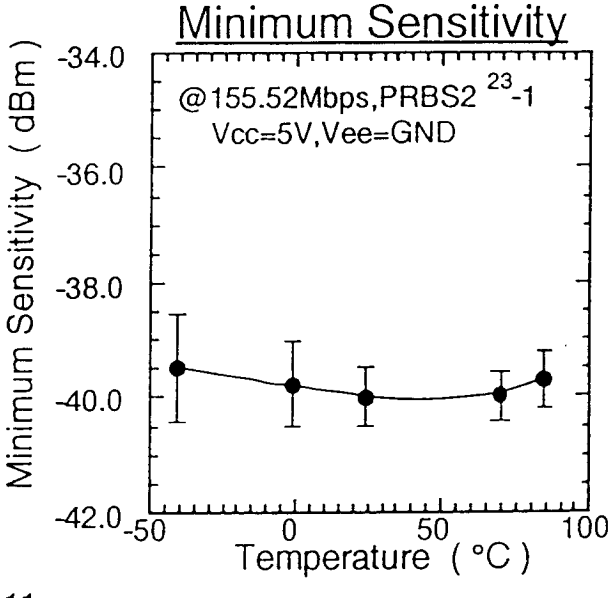
11. Typical Characteristics Information





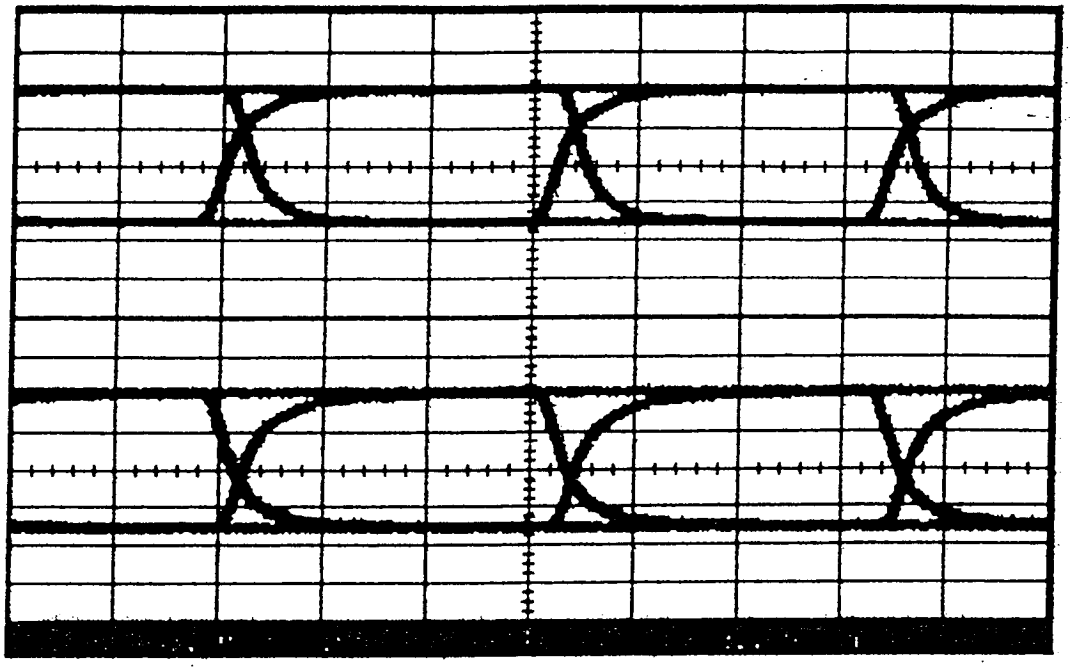




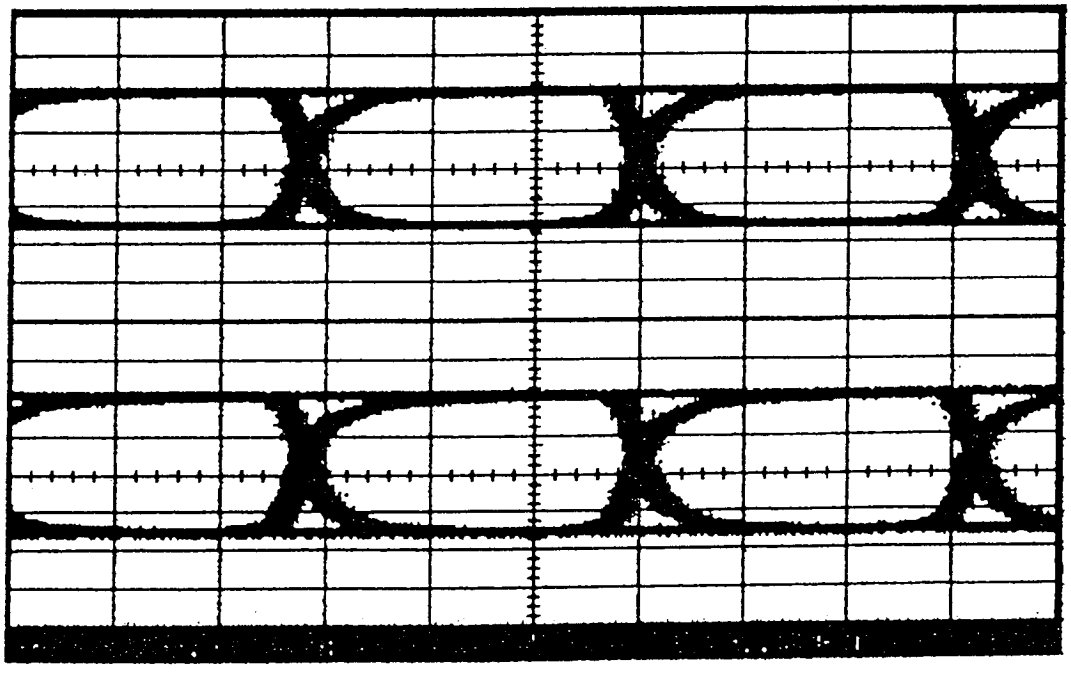


Typical Output Waveform

@155.52Mbps, PRBS 2^{23}-1, Vcc=5V, 25°C, Optical Input Power = -8dBm



@155.52Mbps, PRBS 2^{23}-1, Vcc=5V, 25°C, Optical Input Power = -34dBm



12.Reliability Test

Bellcore TA-TSY-000983							
Heading	Test	Reference	Condition	Sampling Plan		SEI Results	
				LTPD	SS	SS	F/C
Mechanical Integrity	Mechanical Shock	MIL-STD-883 Method 2002	Condition B 500 G 0.5 ms 5 times/axis	20%	11	11	0
	Vibration	MIL-STD-883 Method 2007	Condition A 20 G 20-2,000 Hz 4 min/cycle; 4 cycles/axis	20%	11	11	0
	Thermal Shock	MIL-STD-883 Method 1011	ΔT=100°C	20%	11	11	0
	Solderability	MIL-STD-883 Method 2003	(steam aging not required)	20%	11	11	0
	Fiber Pull		> 1 Kg; 3 times	20%	11	11	0
		(UNC)	> 2 Kg; 10 times	20%	11		
Endurance	Accelerated Aging	Section 6.26 1.5 x Vop	+85°C ambient; > 5,000 hrs.		SS>25	25	0
			+85°C ambient; >10,000 hrs.		10<SS<25		
	Low Temp. Aging	Section 6.26 1.5 x Vop	-40°C ambient; > 2,000 hrs.		SS>25	25	0
			-40°C ambient; > 4,000 hrs.		10<SS<25		
	Temperature Cycling	Section 6.29	- 40 °C to +85°C 400 times pass/fail 500 times for info.	20%	11		
		(UNC)	- 40 °C to +85°C 500 times pass/fail 1000 times for info.	20%	11	11	0
	Damp Heat (if using epoxy)	MIL-STD-202 M103 or IEC 68-2-3	40 °C , 95%, 56days	20%	11	11	0
	Cyclic Moisture Resistance	Section 6.32	(to be determined)	20%	11		
		(UNC)	(TBD) MIL-STD-883 M1004	20%	11	11	0
	High Temp. Storage	Section 6.30	+ 85°C ; > 2,000hrs.	20%	11		
	Low Temp. Storage	Section 6.31	-40°C ; > 2,000hrs.	20%	11	11	0
Special Tests	Internal Moisture	MIL-STD-883 Method 1018	< 5,000 ppm water vapor	20%	11	11	0
	Flammability	TR-TSY-000078					OK
	ESD Threshold	Section 6.37	> 500V, HBM		> 6	6	0

13.Other Precaution

Under such a strong vibration environment as in automobile, the permormance and reliability are not guaranteed.

The govermental approval is required to export this product to other countries. To dispose of these components, the appropriate procedure should be taken to prevent illegal exportation.

This module must be handled, used and diposed of according to your company's safe working practice.

14. Ordering Information

Connector type	Ordering Number	
	Ta=0~70℃	Ta=-40~85℃
FC - PC	SDT8501-RD-QN	SDT8501-RD-QW
SC	SDT8501-RC-QN	SDT8501-RC-QW

15. For More Information

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URL: http://www.sei.co.jp/Electro-optic/eopd_home_e.html