



# Technical Specification for 2.5Gbps Fiber Optic Transmitter Module

## SDT8078-T\_-Q\_

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> 155.52Mb/s                    | <input type="checkbox"/> 622.08Mb/s                           | <input checked="" type="checkbox"/> other <u>2488.32Mbps</u>              |
| <input type="checkbox"/> Short Haul                    | <input checked="" type="checkbox"/> Long Haul                 | <input checked="" type="checkbox"/> other <u>STM16 L-16.2 / OC48 LR-2</u> |
| <input checked="" type="checkbox"/> Intermediate Reach | <input type="checkbox"/> Long Reach                           | <input type="checkbox"/> other _____                                      |
| <input checked="" type="checkbox"/> Single 5.0 V       | <input type="checkbox"/> Single 3.3 V                         | <input type="checkbox"/> other _____                                      |
| <input type="checkbox"/> 1.3 $\mu$ m                   | <input checked="" type="checkbox"/> 1.55 $\mu$ m              | <input type="checkbox"/> other _____                                      |
| <input checked="" type="checkbox"/> Transmitter        | <input type="checkbox"/> Receiver                             | <input type="checkbox"/> Transceiver                                      |
|  | ( <input type="checkbox"/> 2R / <input type="checkbox"/> 3R ) | ( <input type="checkbox"/> 2R / <input type="checkbox"/> 3R )             |

SUMITOMO ELECTRIC INDUSTRIES, LTD.

Sumitomo Electric reserves the right to make changes in the specification without prior notice.

**#Safety Precaution** Symbols This specification uses various picture symbols to prevent possible injury to operator or other persons or damage to properties for appropriate use of the product. The symbols and definitions are as shown below. Be sure to be familiar with these symbols before reading this specification.

	<b>Warning</b> Wrong operation without following this instruction may lead to human death or serious injury.
	<b>Caution</b> Wrong operation without following this instruction may lead to human injury or property damage.

Example of picture symbols



indicates prohibition of actions. Action details are explained thereafter.



indicates compulsory actions or instructions. Action details are explained thereafter.

(SDT8078-T\_-Q\_)

## 1. General

The features of SDT8078-T\_-Q\_ are listed below:

- \* SDH STM-16 L-16.2 / SONET OC-48 LR-2 Compliant
- \* Power Supply Voltage                      Single +5V ( or -5V )
- \* Low Power Supply Current                150mA (typ.)
- \* Compact Package Size                    36 X 15 X 9 mm
- \* Pin Configuration                        24 pin Dual in Line
- \* Uncooled Laser Diode with Automatic Optical Power Control Circuit
- \* Laser Diode                                1550nm InGaAsP / InP, DFB-LD
- \* Optical Output Shut-down Function (Disable Function)
- \* Laser Bias Current Alarm Function.
- \* Laser Bias Monitor / Rear Facet Monitor Function.
- \* Clocked / Non-clocked mode selector
- \* Optical Connector Interface            FC / SC connector

## 2. Block Diagram

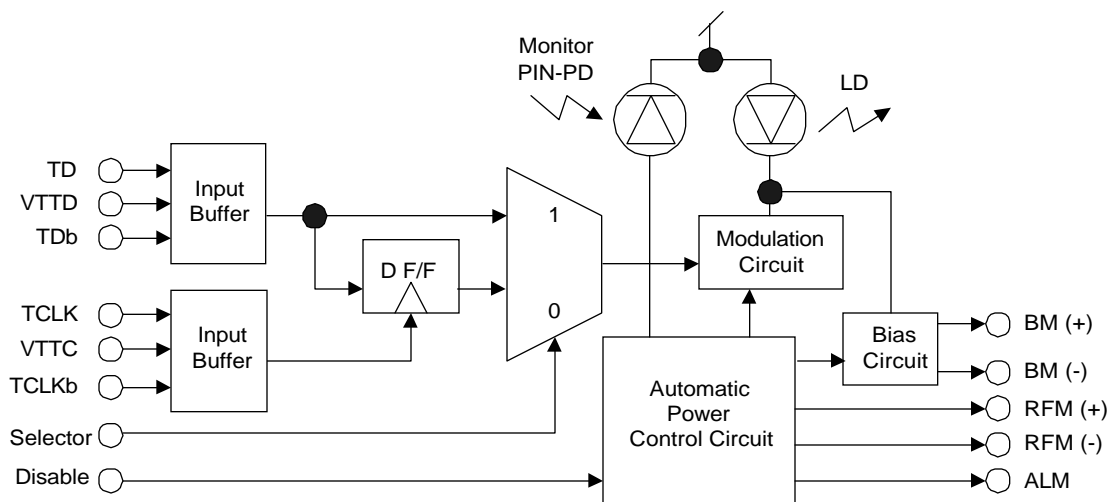


Figure 1 Block Diagram

\*Clocked Operation Mode  
(Vs=Vslct)

Data Input				Optical
TD	TDb	TCLK	TCLKb	Output
H	L	↗	↘	H
L	H	↗	↘	L
φ	φ	L	H	Q0

H:High Level, L:Low Level, φ:H or L  
Q0:Previous optical output status  
before data input condition defined

\*Non-Clocked Operation Mode  
(Vs=Vnslct)

Data Input		Optical
TD	TDb	Output
H	L	H
L	H	L

H:High Level, L:Low Level

### 3. Package Dimension

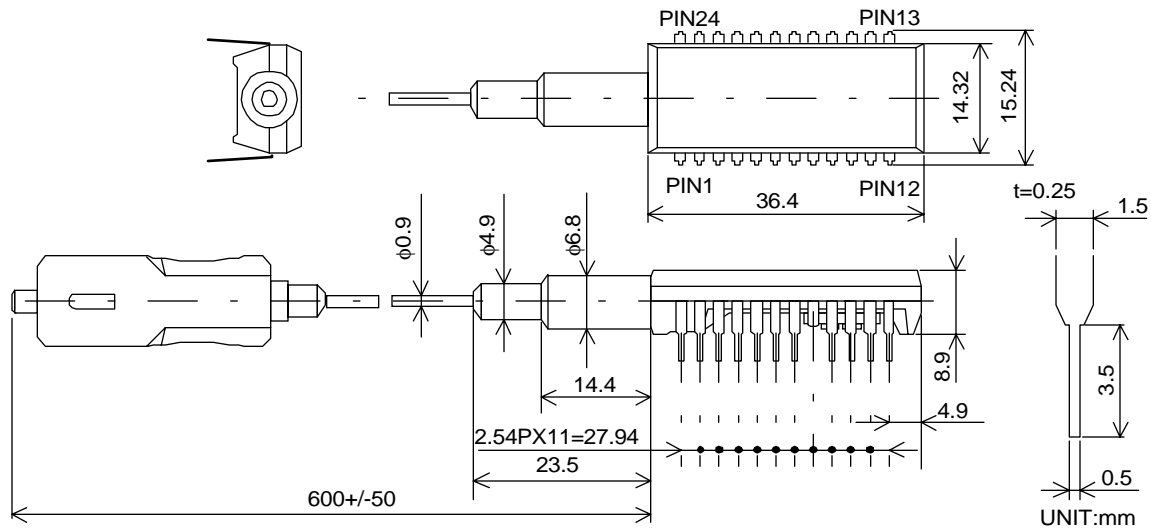


Figure 2. Package Dimension

### ⚠ Caution



Do not disassemble this product. Otherwise, failure, electrical shock, overheating or fire may occur.

Handle the lead pins carefully. Use assisting tools or prospective aids as required. A lead pin may injure skin or human body

### 4. Pin Assignment

Pin	Symbol	I/O	Level	Description
1	Vcc		+5V	Positive power supply (+5V)
2	Vcc		+5V	Positive power supply (+5V)
3	RFM(+)	O	Analog	Rear facet PD current monitor voltage (positive)
4	RFM(-)	O	Analog	Rear facet PD current monitor voltage (negative)
5	TDb	I	PECL	Differential data input (negative)
6	VTTD		Vcc-2V (AC GND)	Data input signal termination, Vcc-2V supply for DC PECL interface. Or pull down to GND via a capacitor for AC coupled interface.
7	TD	I	PECL	Differential data input (positive)
8	Omit			Connected to daughter board attached to the module. Must not be connected to customer's circuit board.
9	Vcc		+5V	Positive power supply (+5V)
10	Vcc		+5V	Positive power supply (+5V)
11	Vee		GND	Negative power supply (GND)
12	Vee		GND	Negative power supply (GND)
13	Vee		GND	Negative power supply (GND)
14	Omit			Connected to daughter board attached to the module. Must not be connected to customer's circuit board.
15	ALM	O	TTL	LD bias current alarm, normal low, active high
16	Disable	I	TTL	Transmitter disable input. Default (open) LOW and transmitter is enabled.
17	Selector	I		Signal input mode selector, clocked or non-clocked. Default (open) LOW and clocked mode.
18	TCLK	I	PECL	Differential clock input (positive)
19	V TTC		Vcc-2V (AC GND)	Clock input signal termination, Vcc-2V supply for DC PECL interface. Or pull down to GND via a capacitor for AC coupled interface
20	TCLKb	I	PECL	Differential clock input (negative)
21	BM(-)	O	Analog	LD bias current monitor voltage (negative)
22	BM(+)	O	Analog	LD bias current monitor voltage (positive)
23	Vcc		+5V	Positive power supply (+5V)
24	Vcc		+5V	Positive power supply (+5V)

## 5. Absolute Maximum Ratings

Parameter	Symbol	min.	Max	Unit	Note
Storage Case Temperature	T <sub>s</sub>	-40	85	°C	1
Operating Case Temperature	T <sub>C</sub>	0	70	°C	1
Supply Voltage	V <sub>cc-Vee</sub>	0.0	6.0	V	2
Input Voltage	V <sub>i</sub>	V <sub>ee</sub>	V <sub>cc</sub>	V	3
Lead Soldering (Temperature) (Time)			260 10	°C sec.	4

Note 1. No condensation allowed. 2. V<sub>cc</sub>>V<sub>ee</sub>, V<sub>cc</sub>=+5.0V for V<sub>ee</sub>=GND or V<sub>cc</sub>=GND for V<sub>ee</sub>=-5.0V  
3. Data, Clock, Disable and Selector 4. Measured on lead pins 2mm (0.079in.) off the package bottom

### Warning

Use the product with the rated voltage described in the specification. If the voltage exceeds the maximum rating, overheating or fire may occur.

### Caution

Do not store the product in the area where temperature exceeds the maximum rating, where there is too much moisture or dampness, where there is acid gas or corrosive gas, or other extreme conditions. Otherwise, failure, overheating or fire may occur.

## 6. Electrical Interface

( Unless otherwise specified, V<sub>cc-Vee</sub> = 4.75 to 5.25 V @2488.32Mbps, PRBS2<sup>23</sup>-1, 50% duty and all operating temperature shall apply.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V <sub>cc-Vee</sub>	4.75	5.00	5.25	V	
Supply Current	I <sub>d</sub>		150	220	mA	1
Input Impedance ( Data and Clock)	R <sub>in</sub>		50		Ω	2
Input Voltage (Data and Clock, for ECL or PECL interface)	High	V <sub>IH</sub>	V <sub>cc</sub> -1.00	V <sub>cc</sub> -0.90	V <sub>cc</sub> -0.70	V
	Low	V <sub>IL</sub>	V <sub>cc</sub> -1.90	V <sub>cc</sub> -1.70	V <sub>cc</sub> -1.60	V
Differential Input Voltage Swing for AC coupled interface	V <sub>in</sub>	0.45	0.80	1.20	V <sub>p-p</sub>	
Input Signal Rise Time (20% - 80%)	T <sub>r</sub>		100	120	ps	
Input Signal Fall Time (20% - 80%)	T <sub>f</sub>		100	120	ps	
Set up Time (for clocked mode)	T <sub>set</sub>	130			ps	3
Hold Time (for clocked mode)	T <sub>hold</sub>	75			ps	3
Disable Input Voltage	Disable	V <sub>disbl</sub>	V <sub>ee</sub> +2.00	V <sub>cc</sub>	V	4
	Enable	V <sub>enbl</sub>	V <sub>ee</sub>	V <sub>ee</sub> +0.8	V	
Selector Input Voltage	Clocked	V <sub>slct</sub>	V <sub>ee</sub>	V <sub>ee</sub> +1.5	V	5
	Non Clocked	V <sub>ncldt</sub>	V <sub>cc</sub> -1.5	V <sub>cc</sub>	V	
LD Bias Alarm Output Voltage	Normal	V <sub>alml</sub>	V <sub>ee</sub>	V <sub>ee</sub> +0.5	V	6
	Abnormal	V <sub>almh</sub>	V <sub>cc</sub> -1.00	V <sub>cc</sub>	V	
LD Bias Monitor Voltage (between pin 22 and pin 21)	V <sub>bm</sub>	0.01	0.10	0.50	V	7, 9
Rear Facet PD monitor Voltage (between pin 3 and pin 4)	V <sub>rfm</sub>	0.01	0.10	0.25	V	8, 9

1. Termination current is not included. 2. Measured between each signal input and VT<sub>TD</sub> or VT<sub>TC</sub>. Refer to Figure 3.  
3. Refer to Figure 4. 4. Default (Open) normal operation. 5. Default (Open) clocked mode. 6. Alarm will be launched when LD bias current exceeds 70mA typ. 7. LD bias current can be monitored by measuring the voltage difference between BM(+) Pin 22 and BM(-) Pin 21. Please refer to Figure 5. 8. Rear Facet PD current can be monitored by measuring the voltage difference between RFM(+) Pin 3 and RFM(-) Pin 4. Please refer to Figure 5. 9. High input impedance (> 1MΩ) device is required to measure this voltage.

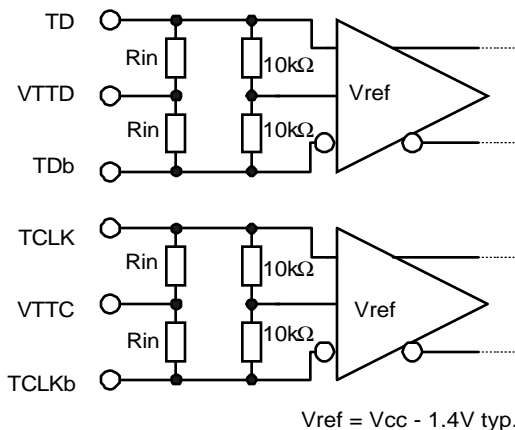


Figure 3 Data and Clock Input Interface  
(SDT8078-T-Q-)

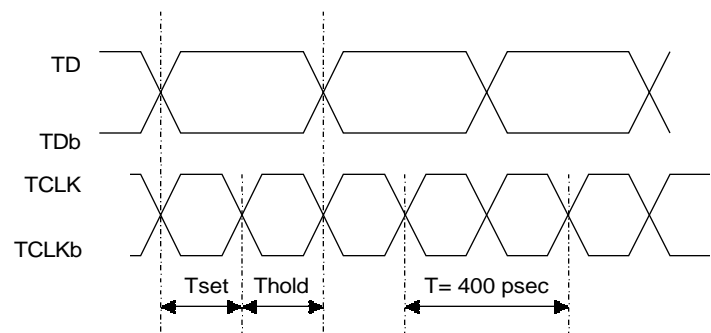


Figure 4 Input Data and Clock Timing

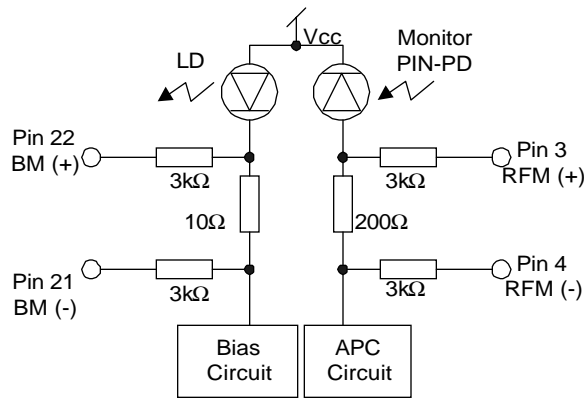


Figure 5 BM and RFM Interface

7. Optical Interface

( Unless otherwise specified, Vcc-Vee = 4.75 to 5.25 V @2488.32Mbps, PRBS2^23-1, 50% duty and all operating temperature shall apply. )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Output Power	Po	-2.0		3.0	dBm	
Optical Output Power (disable)	Podis			-45.0	dBm	
Extinction Ratio	Er	8.2			dB	
Side Mode Suppression Ratio	Sr	30			dB	
Center Wavelength	$\lambda_c$	1500		1580	nm	
Spectral Width (-20dB)	$\Delta\lambda_{20}$			1.0	nm	
Dispersion Penalty	Dp			2.0	dB	1
Output Eye Diagram	Compliant with Bellcore G-253 CORE and ITU G957					2

Note1. Less than 2dB penalty is guaranteed when connected to SDT8978-R@-@@.  
Note2. Refer to Figure 6 for the eye diagram mask

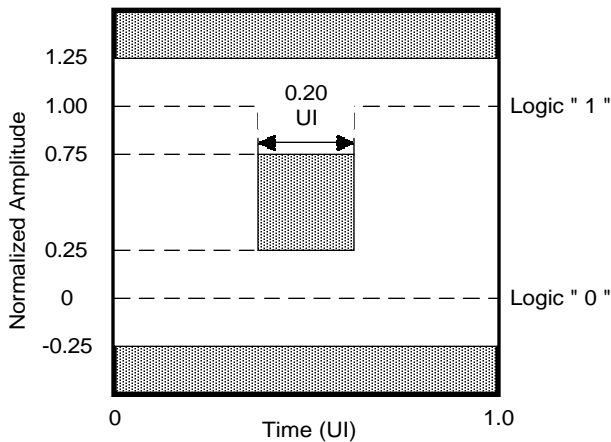


Figure 6 Eye Diagram Mask for Optical Output

Warning

Do not look at the laser beam projection area (e.g. end of optical connector) with naked eyes or through optical equipment while the power is supplied to this product. Otherwise, your eyes may be injured.

## 8. Recommended User Interface

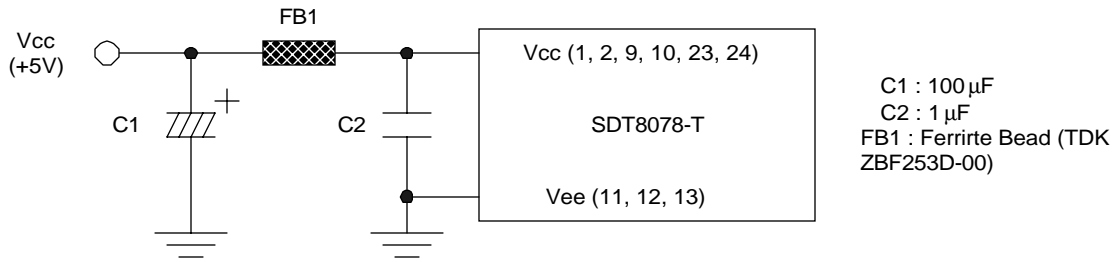


Figure 7 Recommended Power Supply Filtering

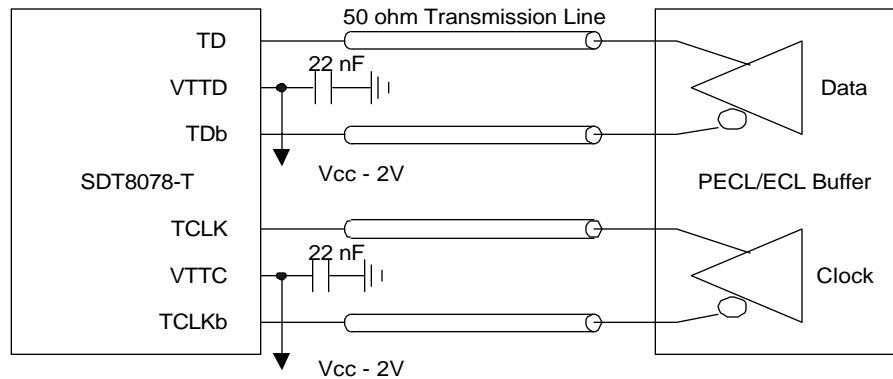
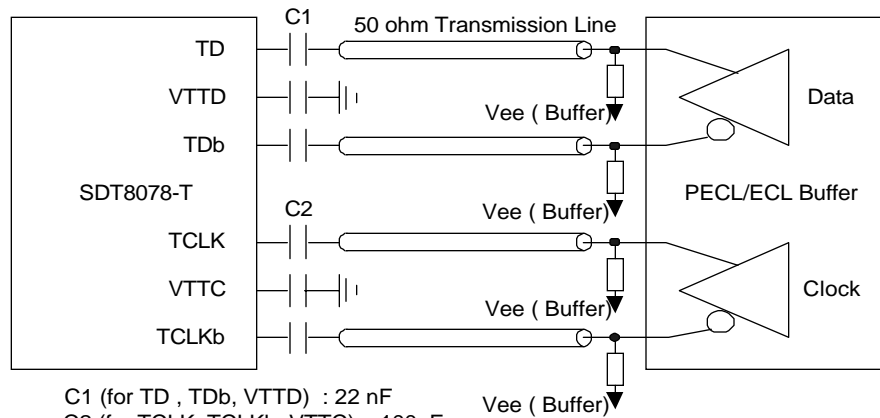


Figure 8 Data and Clock Interface with PECL/ECL Device (DC coupled Interface)



C1 (for TD , TDb, VTDD) : 22 nF  
C2 (for TCLK, TCLKb, VTTC) : 100pF

Figure 9 Data and Clock Interface with PECL/ECL Device (AC coupled Interface)

## 9. Fiber Pigtail Specification

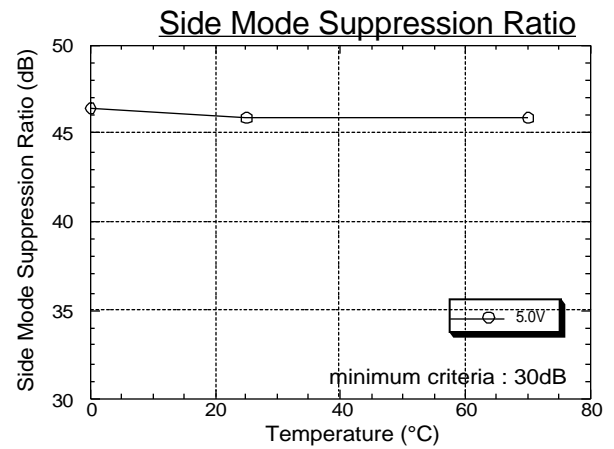
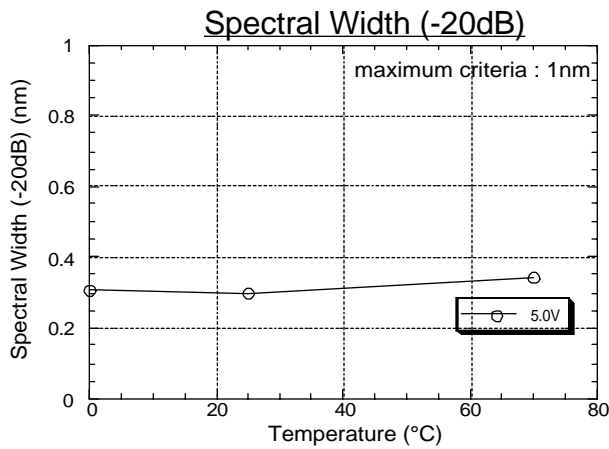
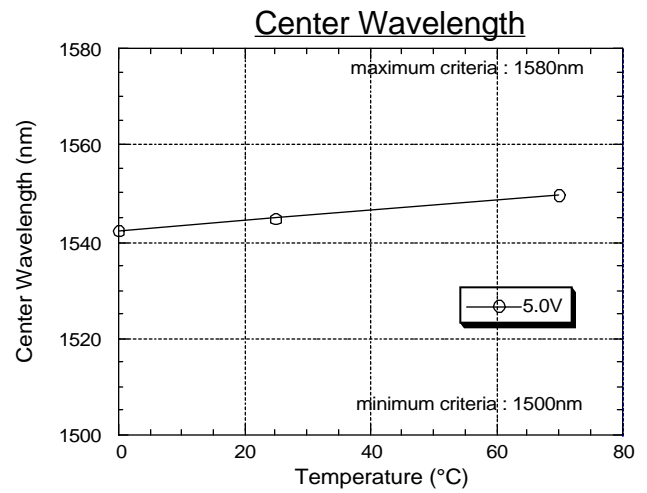
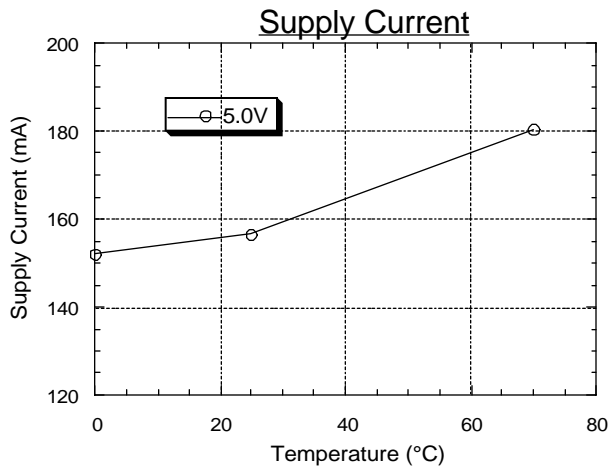
Parameter	Min.	Typ.	Max.	Unit	Note
Core Diameter		9.5		µm	
Cladding Diameter		125		µm	
Outer Diameter		0.9		mm	
Optical Cord Tensile Beak Strength			9.8	N	
Bend Radius	30			mm	

### ⚠ Caution

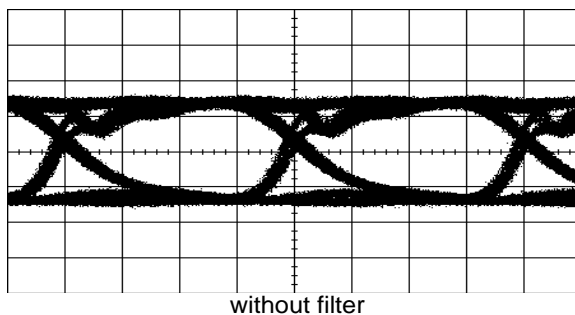
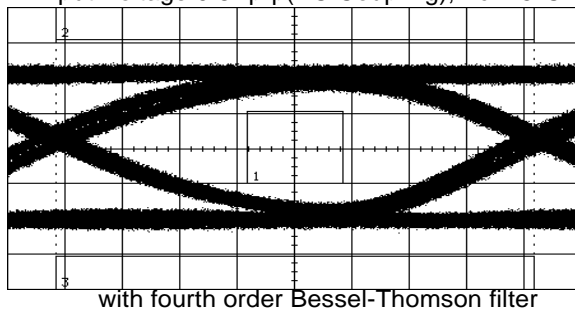
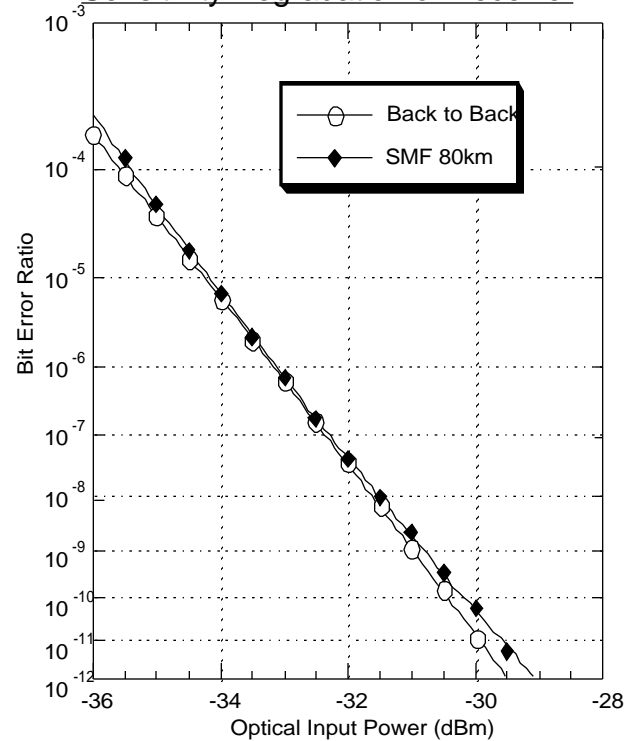


Do not give undue force or impact to the optical fiber pigtail. A broken optical fiber may injure skin or human body, or a strong laser beam may cause eye injury. Operate the equipment carefully. Use assisting tools or prospective aids as required.

## 10. Characteristic Information

**Typical Output Waveform**

Input Voltage 0.8Vp-p(AC Coupling), Tc=25°C

**Sensitivity Degradation of Receiver**

## 11. Reliability Test (Under qualification)

Bellcore TA-NWT-000983 Issue 2, December 1993								
Heading	Test	Reference	Condition	Sampling			SEI Result	
				LTPD	SS	C	SS	F/C
Mechanical Integrity	Mechanical Shock	MIL-STD-883 Method 2002	Condition B					
			5 times/axis					
	Vibration	MIL-STD-883 Method 2007	500G, 1.0 ms	20%	11	0	---	---
			1,500G, 0.5ms	20%	11	0	11	0
			Condition A	20%	11	0	11	0
			20 G					
Endurance	Thermal Shock	MIL-STD-883 Method 1011	20-2,000 Hz					
			4 min/cycle; 4 cycles/axis					
	Solderability	MIL-STD-883 Method 2003	ΔT=100°C	20%	11	0	11	0
			(steam aging not required)	20%	11	0	11	0
	Fiber Pull		1 Kg; 3 times; 5sec.	20%	11	0	---	---
			2 Kg; 3 times; 5sec.	20%	11	0	---	---
	Accel. Aging (High Temp.)	(R)-453 Section 5.18	+85°C; rated power					
			>5,000hrs.	---	25	---	25	0
	High Temp. Storage	-----	>10,000hrs.	---	10	---	---	---
			max. storage T (T=85°C)	20%	11	0	---	---
	Low Temp. Storage	-----	>2,000					
			min. storage T (T=-40°C)	20%	11	0	11	0
Special Tests	Temperature Cycling	Section 5.20	- 40°C to +85°C					
			400 times pass/fail	20%	11	0	---	---
	Damp Heat (if using epoxy)	MIL-STD-202 M103 or IEC 68-2-3	500 times for info.	---	11	---	---	---
			500 times pass/fail	20%	11	0	11	0
	Cyclic Moisture Resistance	Section 5.23	1000 times for info.	---	11	---	11	0
			40°C , 95%, 56days	20%	11	0	11	0
	ESD Threshold	Section 5.22	or 85°C /85%RH 2,000hrs.	20%	11	0	---	---
Special Tests	Internal Moisture	MIL-STD-883 Method 1018	-----	20%	11	0	11	0
			< 5,000 ppm water vapor					
	Flammability	TR357:Sec. 4.4.2.5	-----	---	---	---	---	OK
Special Tests	ESD Threshold	Section 5.22	-----	---	6	---	6	0
			-----	---	6	---	6	0

## 12. Laser Safety

This product uses a semiconductor laser system and is a laser class 1 product acc. FDA, complies with 21CFR1040. 10 and 1040.11. Also this product is a laser class 1 product acc. IEC 825-1.

Class 1 Laser Product

### Caution



If this product is used under conditions not recommended in the specification or this product is used with unauthorized revision, classification for laser product safety standard is invalid. Classify the product again at your responsibility and take appropriate actions.

## 13. Ordering Information







Ordering Number	Connector type
SDT8078-TC-QN	SC
SDT8078-TD-QN	FC / PC

## 14. Other Precaution

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

The governmental 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 disposed of according to your company's safe working practice.

 Warning	
	Be sure to carry out correct soldering for connection to peripheral circuits in order to prevent contact failure or short-circuit. Otherwise, a strong laser beam may cause eye injury, overheating or fire.
	Do not put this product or components of this product into your mouth. This product contains material harmful to health.
 Caution	
	Be sure to turn the power off when you touch this product connected to the printed circuit boards. Otherwise, electric shock may occur.
	Dispose this product or equipment including this product properly as an industrial waste according to the regulations.

## 15. For More Information

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