Specification : TS-S96D046B
Date : May, 1998

Technical Specification
for
622Mbps Plastic Molded Fiber Optic Transmitter Module

SDT8212-T_-Q_

☐ 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.

●Safety Precaution

Picture 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.

⚠ Warning	Wrong operation without following this instruction may lead to human death or serious injury.
⚠ Caution	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 nearby.

❗ indicates sompulsory actions or instructions. Action details are explained near by.

1. General

SDT8212-T_-Q_ is a compact and high performance digital fiber optic transmitter module ideally designed for high speed data communication systems or telecommunication transmission systems, including SDH STM-4 L-4.1 and SONET OC-12 LR-1. The device also meets GR-253-CORE requirement and ITU-T G. 957 / G. 958 recommendation.

- Data Rate — 622.08 Mbps
- Power Supply Voltage — Single +5V (or -5V)
- Electrical Interface — PECL (or ECL)
- Laser Diode — 1300nm InGaAsP / InP, DFB-LD
- Connector Interface — FC / SC connector
- Pin Configuration — 20 pin Dual in Line

The features of SDT8212-T_-Q_ are listed below.

- Features
  - Low Power Consumption
  - Plastic Molded Package
  - Uncooled Laser with Automatic Optical Power Control Circuit
  - Optical Output Shutdown (Disable)
  - Laser Bias Monitor
  - Laser Rear Facet Monitor
  - Multi-sourced Footprint

2. Block Diagram

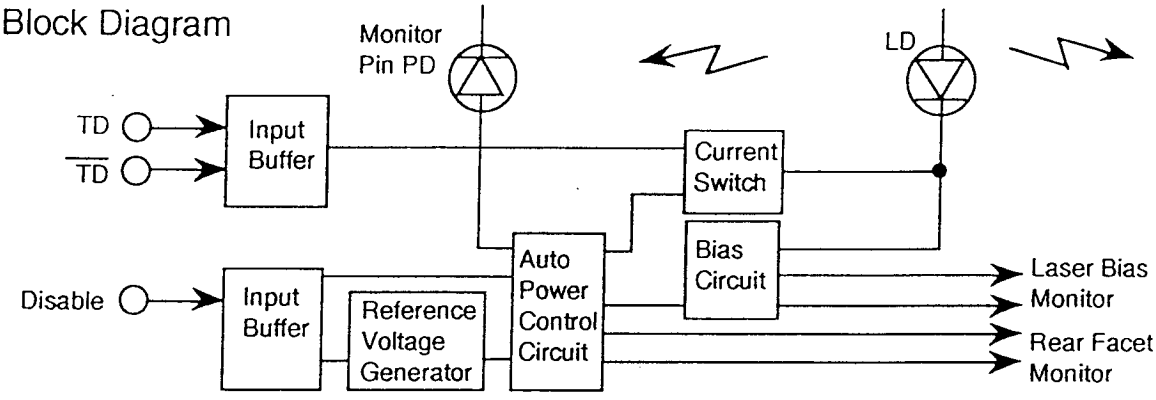


Figure 1 Block Diagram

3. Package Dimension

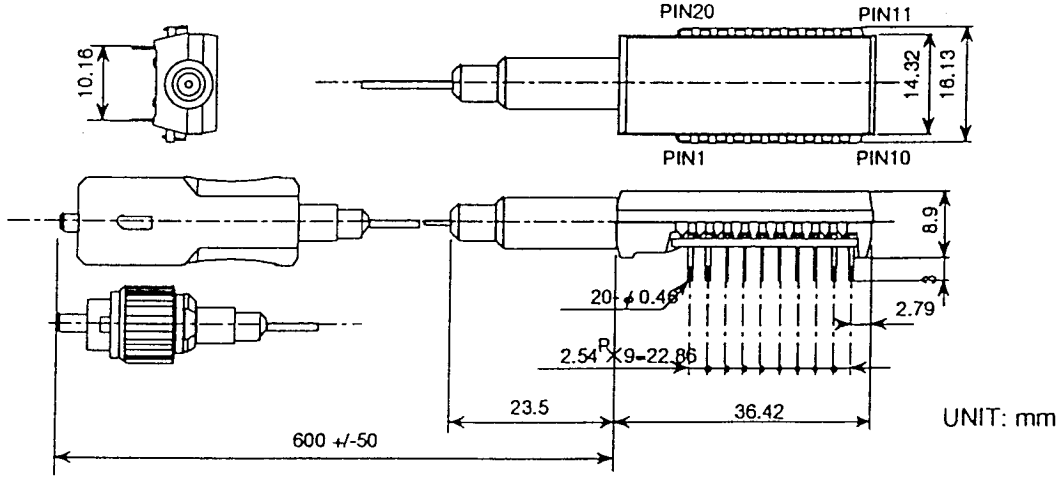


Figure 2. External View

⚠ Caution

- Do not disassemble this product. Otherwise, failure, electrical shock overheating or fire may occur.
- Handle the lead pin carefully. Use assisting tools or prospective aids as required. A lead pin may injure skin or human body

4. Pin Assignment

No.	Symbol	Function
1	NC	Non Connection
2	BM (+)	LD Bias Current Monitor (Refer to Figure 3)
3	NC	Non Connection
4	BM (-)	LD Bias Current Monitor (Refer to Figure 3)
5	Vee	Power Supply (-)*
6	Vcc	Power Supply (+)*
7	Disable	LD Disable Input (Refer to Section 9)
8	Vcc	Power Supply (+)*
9	Vcc	Power Supply (+)*
10	NC	Non Connection

No.	Symbol	Function
11	NC	Non Connection
12	Vcc	Power Supply (+)*
13	NC	Non Connection
14	Vee	Power Supply (-)*
15	$\overline{TD}$	Negative Data Input (Refer to Section 6)
16	TD	Positive Data Input (Refer to Section 6)
17	RFM (-)	Rear Facet Current Monitor (Refer to Figure 3)
18	Vcc	Power Supply (+)*
19	RFM (+	Rear Facet Current Monitor (Refer to Figure 3)
20	NC	Non Connection

*Note: When single +5V would be supplied, connect Vcc to +5V and Vee to GND.
Else when single -5V would be supplied, connect Vee to GND and Vcc to -5V.

5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Case Temperature	Ts	-40	85	℃	1
Operating Case Temperature	Ta	-40	85	℃	1
Supply Voltage	Vcc-GND	0.0	7.0	V	2
Input Voltage	Vi	Vee	Vcc+0.5	V	3
Lead Soldering Temperature / Time	—	—	250/10	°C / sec	4

Note 1. No condensation allowed 2. Vcc > Vee, Vee = GND for Vcc = +5V or Vcc = GND for Vee = -5V.
3. TD, $\overline{TD}$ and Disable 4. Measured on leads-pin at 2mm(0.079inch) off the package bottom

⚠ Warning

Use the product with the rated voltage described in the specification. If the voltageexceeds 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 much moisture or dampness, where there is acid gas or corrosive gas, orother extreme conditions. Otherwise, failure, overheating or fire may occur.

6. Electrical Interface

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

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		Vcc	4.75	5.00	5.25	V	
Supply Current		Idrx		90	200	mA	1
Input Voltage	High	Vih	Vcc-1.17		Vcc-0.73	V	2
TD & TD	Low	Vil	Vcc-1.95		Vcc-1.45		
Input Current	High	Voh	-10		150	μA	3
TD & TD	Low	Vol	-10		10		
Signal Input Rise / Fall Tim					0.5	nsec	
Disable Input Voltage		Vdi	Vee+2.0		Vcc	V	4,5
Disable Input Current		Idi	-10		200	mA	4,5
LD Bias Monitor Voltage		Vbm	0.01		0.50	V	
Rear Facet Monitor Voltage		Vrfm	0.01		0.20	V	6

Note 1. Input bias current is not included in Supply Current. 622.08Mbps. 2. Mark Ratio 1/2
3. Vcc-Vee=5V 4. Ta=25°C 5. 20 - 80% 6. Output load resistance: Rl=510Ω to Vee
7. The transmitter is enabled as default state and requires an external voltage only to disable.
(Refer to 9. Relation between Disable Input Voltage and Optical Output Power)
8. The Laser Bias and Rear Facet Monitor currents are calculated as ratios of the corresponding voltages to thier current-sensing resistors, 10 Ω and 200 Ω, respectively (See Figure 3). Upon measuring or utilizing these values, use a device whose input impedance is high enough (>1MΩ) compared with those resistors.

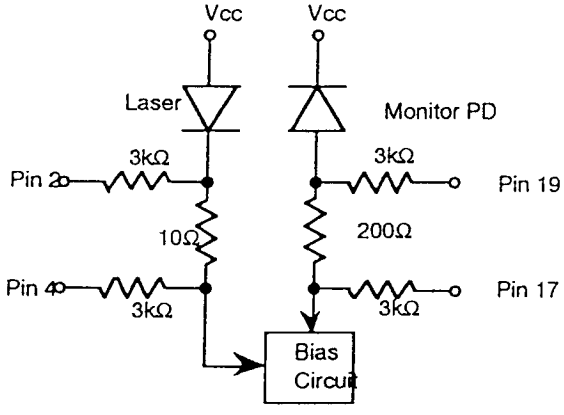


Figure 3 Monitor Circuit Schematic Diagram

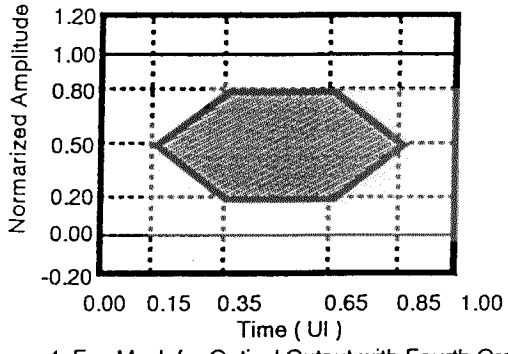


Figure 4 Eye Mask for Optical Output with Fourth Order Bessel-Thomson Filter Specified in ITU-T G.957

⚠ Warning

⃠ Do not connect RFM (rear facet monitor) terminal to the Vee terminal , or to terminals or circuits with lower potential than the grounding potential. Overcurrent runs through the laser equipment and such strong laser beam may cause eye injury, overheating or fire.

7. Optical Interface

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	Poe	-3.0		+2.0	dBm	1
Extinction Ratio	Er	10.0			dB	2
Center Wavelength	λ c	1280		1335	nm	
Spectral Width (RMS)	$\Delta\lambda$			1.0	nm	
Side Mode Suppression Ratio	Rs	30.0			dB	
Eye Mask for Optical Output	Refer to Figure 4					

Note 1. Measured at the bit rate of 622.08Mbps (2^{23} -1)PRBS NRZ 2. 50% duty cycle data

⚠ 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. Relation between Input Signal and Optical Output Power

Input Signal		Optical Output Power
TD	$\overline{TD}$	
"H"	"L"	ON ("H")
"L"	"H"	OFF ("L")
"H"	"H"	undefined
"L"	"L"	undefined

9. Relation between Disable Input Voltage and Optical Output Power

Disable Input Voltage [V]	Optical Output Power
"L" (Vee ~ Vee+0.8)	Enabled
"H" (Vee+2.0 ~ Vcc)	Disabled (<-45dBm)

Note 1. Enabled for no Disable input (Pin 7 opened)
2. Refer to Figure 6, if interface condition is not suitable.

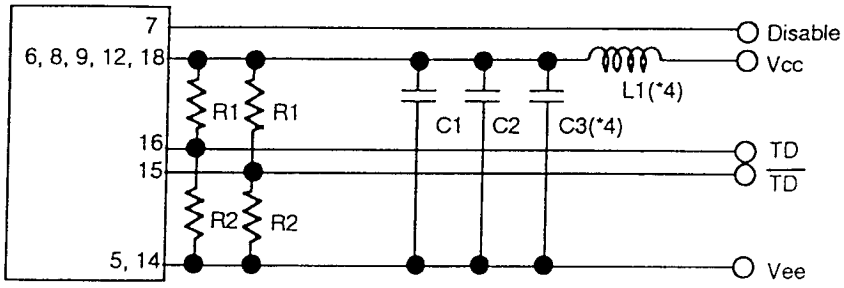
10. Fiber Pigtail Specification

Parameter	Min.	Typ.	Max.	Unit	Note
Mode Field Diameter		9.5		μm	
Cladding Diameter		125		μm	
Outer Jacket Diameter		0.9		mm	
Optical Fiber Tensile Break 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.

11. Recommended User Interface



C1 = 0.022 μF / (Ceramic Chip Capacitor)
C2 = 1 μF / (Ceramic Chip Capacitor)
R1 = 82 Ω (≥1 / 8 W), R2 = 130 Ω (≥1 / 8 W), R3 = 510 Ω (≥1 / 8 W)

Note : 1. Terminated resistors (R1, R2) should be located as close to the module as possible.
2. 50Ω impedance lines are recommended for TD and $\overline{TD}$.
3. Please refer to Figure 3 for Pin 2, 4, 17 19.
4. C3 = 470 μF, L1 = 100 μH are effective when ripple of power supply is large.

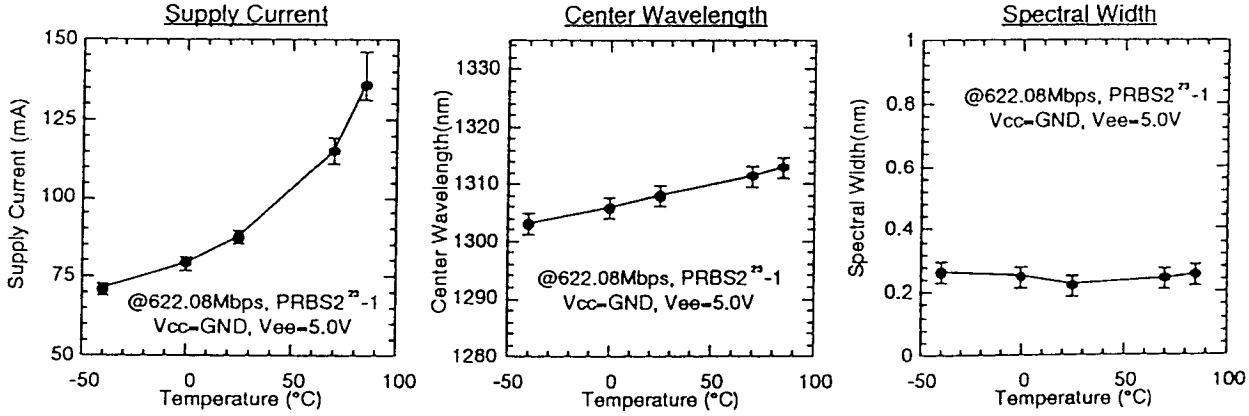
Figure 5 Recommended User Interface

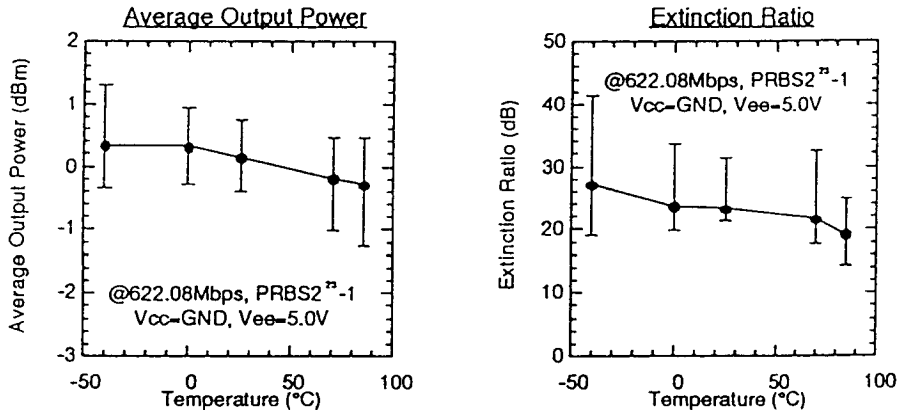
⚠ Warning

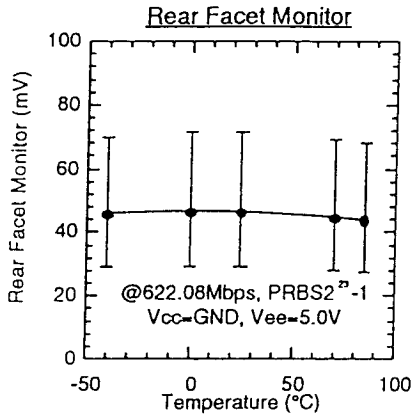
Be sure to carry out correct soldering for connection to peripheral circuits in order to prevent contact failure or short-circuit. Otherwise, a strong laser beam may cause eye injury, overheating or fire.

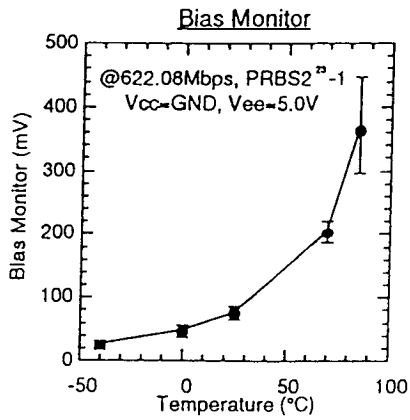
⚠ Caution

Be sure to turn the power off when you touch this product connected to the printed circuit boards. Otherwise, electric shock may occur.





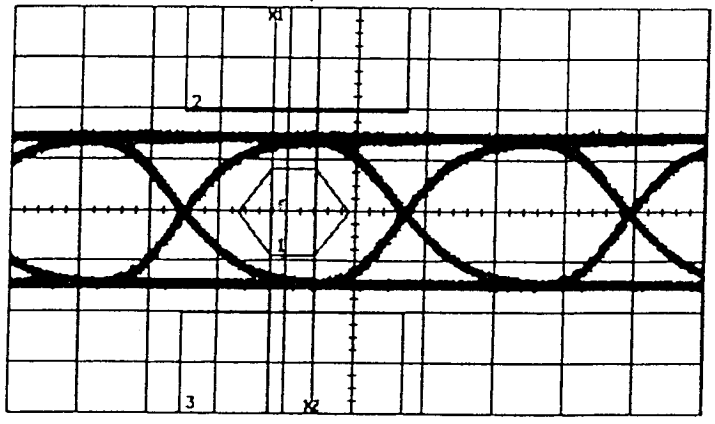




Typical Output Waveform

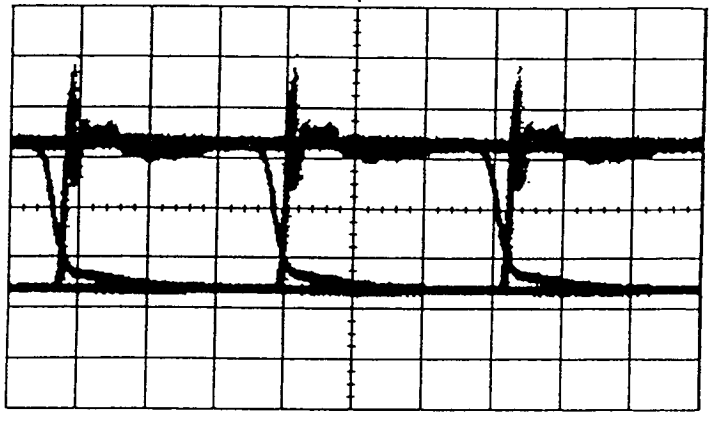
@622.08Mbps, PRBS 2^{23}-1, Vcc=+5V, Vee=GND, 25°C

with fourth order Bessel-Thomson Filter specified in ITU-T G.957



Horizontal Axis : 0.5nsec / div.
Vertical Axis : 10mV / div.

without fourth order Bessel-Thomson Filter specified in ITU-T G.957



Horizontal Axis : 0.5nsec / div.
Vertical Axis : 10mV / div.

12. Reliability Test

Bellcore TA-NWT-000983 Issue 2, December 1993								
Heading	Test	Reference	Condition	Sampling			SEI Results	
				LTPD	SS	C	SS	F/C
Mechanical ntegrity	Mechanical Shock	MIL-STD-883 Method 2002	Condition B 5 times/axis	20%	11	0	—	—
			500G, 1.0 ms	20%	11	0	11	0
			1,500G, 0.5ms	20%	11	0	—	—
	Vibration	MIL-STD-883 Method 2007	Condition A 20 G 20-2,000 Hz 4 min/cycle; 4 cycles/axis	20%	11	0	11	0
	Thermal Shock	MIL-STD-883 Method 1011	ΔT=100°C	20%	11	0	11	0
	Solderability	MIL-STD-883 Method 2003	(steam aging not required)	20%	11	0	11	0
	Fiber Pull		1 Kg; 3 times; 5sec.	20%	11	0	11	0
			2 Kg; 3 times; 5sec.	20%	11	0	—	—
Endurance	Accel. Aging (High Temp.)	(R)-453 Section 5.18	+85°C; rated power >5,000hrs.	—	25	—	25	0
			>10,000hrs.	—	10	—	—	—
	High Temp. Storage	———	max. storage T (T=85°C) >2,000hrs.	20%	11	0	—	—
	Low Temp. Storage	———	min. storage T (T=-40°C) >2,000hrs.	20%	11	0	11	0
	Temperature Cycling	Section 5.20	- 40 °C to +85°C 400 times pass/fail	20%	11	0	—	—
			500 times for info.	—	11	—	—	—
			500 times pass/fail	20%	11	0	11	0
			1,000 times for info.	—	11	—		
	Damp Heat (if using epoxy)	MIL-STD-202 M103	40 °C , 95%, 56days	20%	11	0	11	0
		IEC 68-2-3	85°C /85%RH, 2000hrs.	20%	11	0	—	—
	Cyclic Moisture Resistance	Section 5.23	———	20%	11	0	11	0
Special Tests	Internal Moisture	MIL-STD-883 Method 1018	< 5,000 ppm water vapor	20%	11	0	11	0
	Flammability	TR357:Sec. 4.4.2.5	———	—	—	—	—	OK
	ESD Threshold	Section 5.22	———	—	6	—	6	0

13. 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 under normal operation. If a special kind of error should occur or if this product should be operated under condition not recommended in the specification, this module may become a laser class 3B product acc. IEC 825-1.

⚠ Warning

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.

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

⃠ Do not put this product or components of this product into your mouth. This product contains material harmful to health.

⚠ Caution

⃠ Dispose this product or equipment including this product properly as an industrial waste according to the regulations.

15. Ordering Information

Connector type	Operating Temperature Range	
	0~70°C	-40~85°C
FC / PC	SDT8212-TD-QN	SDT8212-TD-QW
SC	SDT8212-TC-QN	SDT8212-TC-QW

16. For More Information

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