

# Technical Specification

## for

### 5.0V / 156Mbps Fiber Optic Transmitter Module

#### SDT8296-T\_-QW

- |   |  |   |
|---|--|---|
| <input checked="" type="checkbox"/> 155.52Mb/s                | <input type="checkbox"/> 622.08Mb/s            | <input type="checkbox"/> other _____                          |
| <input type="checkbox"/> Short Haul                           | <input checked="" type="checkbox"/> Long Haul  | <input type="checkbox"/> other _____                          |
| <input type="checkbox"/> Intermediate Reach                   | <input checked="" 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 checked="" type="checkbox"/> 1.3 $\mu$ m               | <input 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

SUMITOMO Electric reserves the right to make changes in the specification described hereinafter 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.



**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 thereafter.



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

## 1. General

SDT8296-T\_-QW 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-1 L-1.1 and SONET OC-3 LR-1. The device also meets GR-253-CORE requirement and ITU-T G. 957 / G. 958 recommendation.

* Data Rate	155.52Mbps
* Power Supply Voltage	Single +5V ( or -5V )
* Electrical Interface	PECL ( or ECL )
* Laser Diode	1300nm DFB-LD
* Connector Interface	FC / SC connector
* Pin Configuration	20 pin Dual in Line

The features of SDT8296-T\_-QW are listed below.

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

## 2. Block Diagram

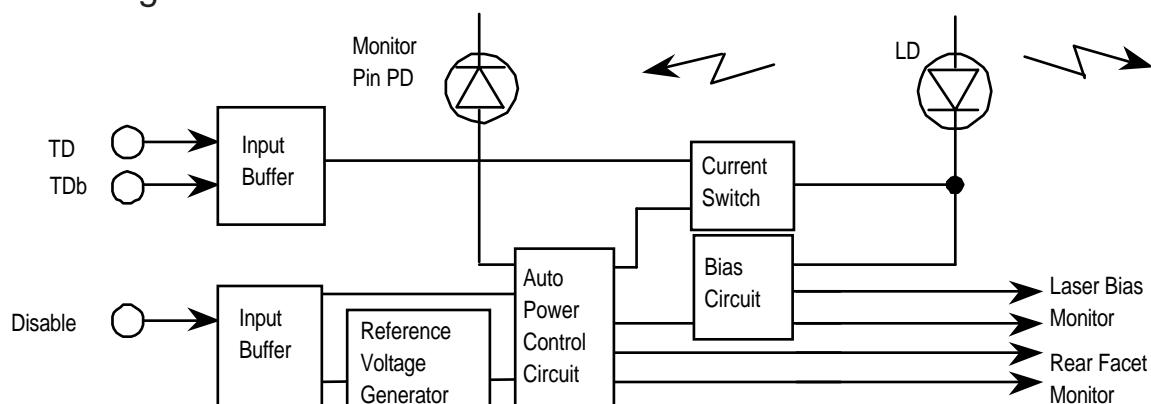


Figure 1 Block Diagram

## 3. Package Dimension

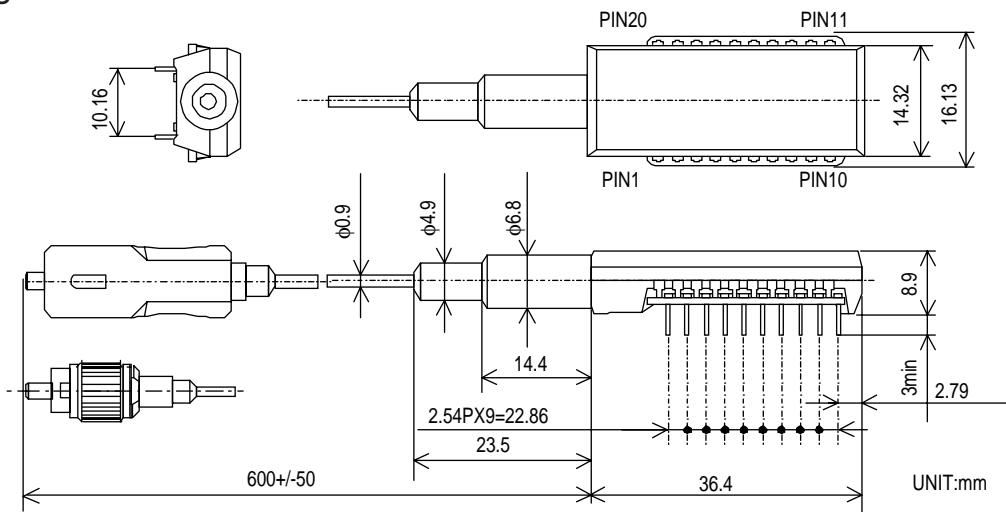


Figure 2. External View

### Caution



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

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

## 4. Pin Assignment

No.	Symbol	Function	No.	Symbol	Function
1	NC	Non Connection	11	NC	Non Connection
2	BM (+)	LD Bias Current Monitor (Refer to Figure 3)	12	Vcc	Power Supply (+)*
3	NC	Non Connection	13	NC	Non Connection
4	BM (-)	LD Bias Current Monitor (Refer to Figure 3)	14	Vee	Power Supply (-)*
5	Vee	Power Supply (-)*	15	TDb	Negative Data Input (Refer to Section 6)
6	Vcc	Power Supply (+)*	16	TD	Positive Data Input (Refer to Section 6)
7	Disable	LD Disable Input (Refer to Section 9)	17	RFM (-)	Rear Facet Current Monitor (Refer to Figure 3)
8	Vcc	Power Supply (+)*	18	Vcc	Power Supply (+)*
9	Vcc	Power Supply (+)*	19	RFM (+)	Rear Facet Current Monitor (Refer to Figure 3)
10	NC	Non Connection	20	NC	Non Connection

\*Note: If +5V is used, connect Vcc to +5V and Vee to GND.

If -5V is used, connect Vcc to GND and Vee to -5V.

## 5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Case Temperature	Ts	-40	85	°C	1
Operating Case Temperature	Tc	-40	85	°C	1
Supply Voltage	Vcc-GND	0.0	6.0	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.  $V_{cc} > V_{ee}$ ,  $V_{ee} = GND$  for  $V_{cc} = +5V$  or  $V_{cc} = GND$  for  $V_{ee} = -5V$ .

### 3. TD, TD<sub>b</sub> and Disable

4. Measured on lead-pin at 2mm off of 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,  $V_{CC}-V_{EE} = 4.75$  to  $5.25$  V and all temperature shall apply. )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	$V_{CC}$	4.75	5.00	5.25	V	
Supply Current	$I_{DRX}$		90	200	mA	1, 2
Input Voltage	High	$V_{IH}$	$V_{CC}-1.17$		V	3, 4
	Low	$V_{IL}$	$V_{CC}-1.95$	$V_{CC}-1.45$		
Input Current	High	$V_{OH}$	-10	150	$\mu A$	3, 4
	Low	$V_{OL}$	-10	10		
Signal Input Rise / Fall Time				1.5	nsec	5
Disable Input Voltage	$V_{DI}$	$V_{EE}+2.0$		$V_{CC}$	V	6
Disable Input Current	$I_{DI}$	-10	200	$\mu A$		6
LD Bias Monitor Voltage	$V_{BM}$	0.01	0.55	V		7
Rear Facet Monitor Voltage	$V_{RFM}$	0.01	0.20	V		7

Note 1. Input bias current is not included in Supply Current. 155.52Mbps. 2. 50% duty cycle data

3.  $V_{CC}-V_{EE}=5V$  4.  $T_c=25^{\circ}C$  5. 10-90%

6. 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 )

7. The Laser Bias and Rear Facet Monitor currents are calculated as ratios of the corresponding voltages to their current-sensing resistors,  $10\Omega$  and  $200\Omega$ , respectively ( See Figure 3 ). Upon measuring or utilizing these values, use a device whose input impedance is high enough ( $>1M\Omega$ ) compared with those resistors.

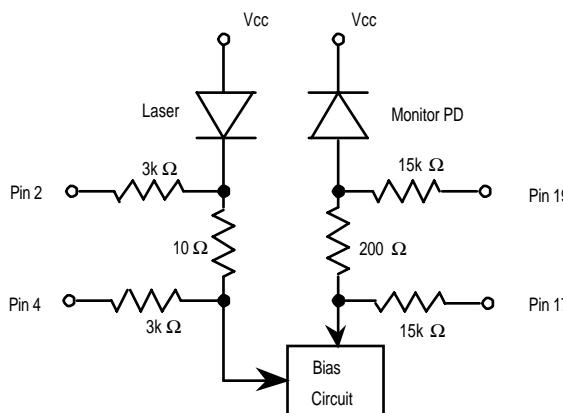


Figure 3 Monitor Circuit Schematic Diagram

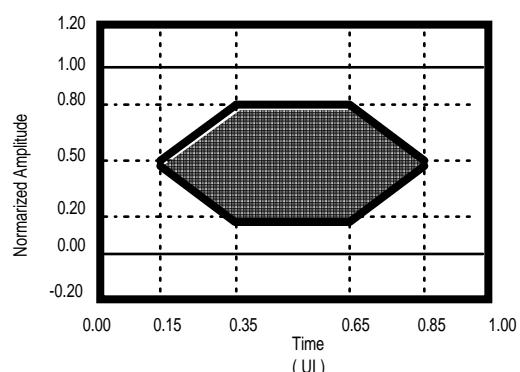


Figure 4 Eye Mask for Optical Output with Fourth Order Bessel-Thomson Filter Specified in ITU-T G.957

### ⚠ 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.

### ⚠ Warning

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

## 7. Optical Interface

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	Poe	-5.0		0.0	dBm	1
Extinction Ratio	Er	10.0			dB	2
Center Wavelength	$\lambda_c$	1280		1335	nm	
Spectral Width (@ -20dB)	20			1.0	nm	
Side Mode Supression Ratio	Sr	30.0			dB	
Eye Mask for Optical Output	Refer to Figure 4					

Note 1. Measured at the bit rate of 155.52Mbps (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	TD <sub>b</sub>	Power
"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 )

## 10. Fiber Pigtail Specification

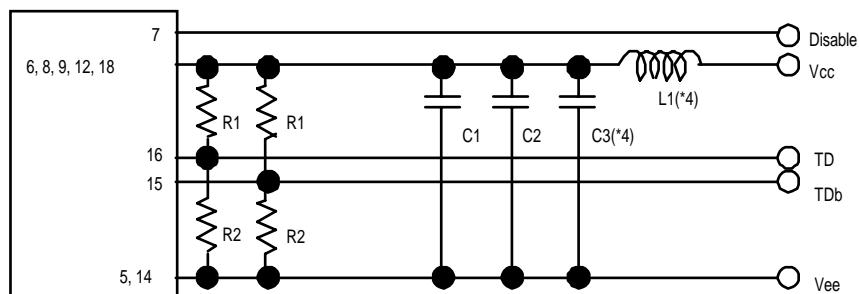
Parameter	Min.	Typ.	Max.	Unit	Note
Mode Field Diameter		9.5		μm	
Cladding Diameter		125		μm	
Outer Jacket Diameter		0.9		mm	
Optical Fiber Tensile Break Strength			9.8	N	1
Bend Radius	30			mm	

Note 1. Strength between receiver body and optical fiber should be less than 9.8 N.

### ⚠ 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 $\mu$ F / (Ceramic Chip Capacitor)

C2 = 1 $\mu$ F / (Ceramic Chip Capacitor)

R1 = 82 $\Omega$  ( 1/8 W )

R2 = 130 $\Omega$  ( 1/8 W )

Note : 1. Terminated resistors (R1, R2) should be located as close to the module as possible.

2. 50 $\Omega$  impedance lines are recommended for TD and TDb.

3. Please refer to Figure 3 for Pin 2, 4, 17, 19.

4. C3 = 470 $\mu$ F, L1 = 100 $\mu$ H 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.
- ⚠ Do not put this product or components of this product into your mouth. This product contains material harmful to health.

### ⚠ Caution

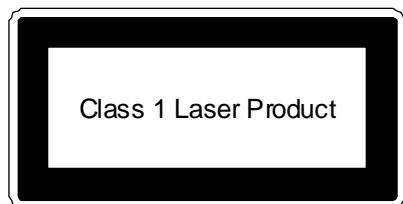
- ⚠ Be sure to turn the power off when you touch this product connected to the printed circuit boards. Otherwise, electric shock may occur.
- ⚠ Dispose this product or equipment including this product properly as an industrial waste according to the regulations.

## 12. Reliability Test

Bellcore TA-NWT-000983 Issue 2, December 1993							
Heading	Test	Reference	Condition	Sampling		SEI	Results
				LTPD	SS		
Mechanical Integrity	Mechanical Shock	MIL-STD-883 Method 2002	Condition B	20%	11	0	---
			5 times/axis				
			500G, 1.0 ms	20%	11	0	11 0
	Vibration	MIL-STD-883 Method 2007	1,500G, 0.5ms	20%	11	0	---
			Condition A	20%	11	0	11 0
	Thermal Shock	MIL-STD-883 Method 1011	20 G				
Endurance	Solderability	MIL-STD-883 Method 2003	20-2,000 Hz	20%	11	0	11 0
			4 min/cycle; 4 cycles/axis				
	Fiber Pull		T=100°C	20%	11	0	11 0
			1 Kg; 3 times; 5sec.	20%	11	0	---
	Accel. Aging (High Temp.)	(R)-453 Section 5.18	2 Kg; 3 times; 5sec.	20%	11	0	---
			+85°C; rated power				
Special Tests	High Temp. Storage	-----	>5,000hrs.	---	25	---	25 0
			>10,000hrs.	---	10	---	---
	Low Temp. Storage	-----	max. storage T (T=85°C)	20%	11	0	---
			>2,000hrs.				
	Temperature Cycling	Section 5.20	min. storage T (T=-40°C)	20%	11	0	11 0
			>2,000hrs.				
	Damp Heat (if using epoxy)	MIL-STD-202 M103 IEC 68-2-3	- 40 °C to +85°C	20%	11	0	---
			400 times pass/fail	---	11	---	---
	Cyclic Moisture Resistance	Section 5.23	500 times for info.	20%	11	0	11 0
			500 times pass/fail	---	11	---	---
			1,000 times for info.				
	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.



### ⚠ 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.

## 14. Ordering Information

Connector type	Ordering Number
	Tc = -40 ~ 85°C
FC - PC	SDT8296-TD-QW
SC - PC	SDT8296-TC-QW

## 15. 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.

## 16. For More Information

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