

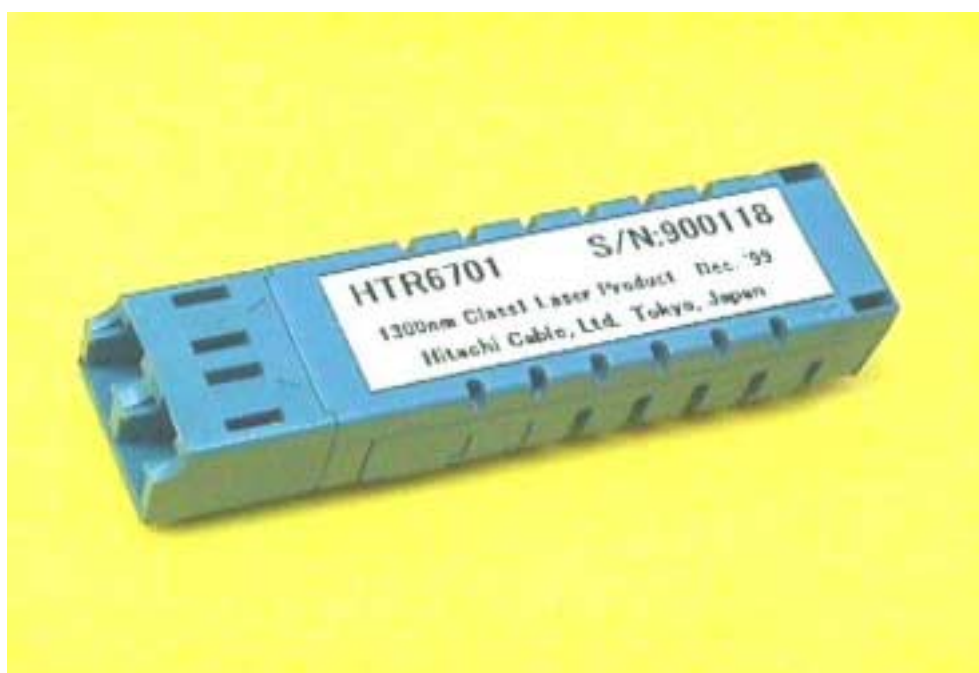
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**Hitachi Cable**

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PRODUCT DATA SHEET  
**SFF TRANSCEIVER**  
for SONET/SDH

**HTR6701** Series  
for OC-3 IR (up to 15km)



## Features

- SONET OC-3 IR / SDH STM-1 S1.1(155.52Mbit/s,15km) Compliant.
- Full comply with industry standard 2x5pin Small Form Factor transceiver.
- AEL class 1 laser product per FDA/CDRH and EN60825-1 laser safety regulations.
- LC duplex receptacle.
- +3.3V single power supply.
- Low power consumption (0.3W(typ.)).

## 1. General

This document specifies the characteristics of the Small Form Factor optical transceiver (Type:HTR6701) with LC duplex receptacle for an OC-3 Intermediate Reach interface (IR-1, up to 15km).

## 2. Function

This transceiver is powered from a single +3.3V power supply and operated at a data rate of 155.52Mbps(NRZ). Optical output power is held constant by automatic power control over the specified operating temperature and voltage ranges. Electrical data inputs and outputs have PECL logic level. The optical output is disabled by a TTL logic level input for that purpose. A signal Detect (SD) output is provided to indicate the presence of an incoming optical signal. SD is a LVTTTL compliant signal.

Dimensions and pin assignment fully comply with MSA (Multi Source Agreement) for 2 by 5 type optical transceiver.

## 3. Absolute Maximum Ratings

Stresses in excess of the ratings listed in Table 1 can cause permanent damage to the device and affect device reliability. Functional operation of the device is not implied at any condition in excess of those given in the operating specification.

Table 1. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V <sub>CC</sub>	0	4.0	V
Data Input Voltage	V <sub>IN</sub>	V <sub>EE</sub>	V <sub>CC</sub> +0.3	V
Operating Ambient Temperature	T <sub>A</sub>	0	70	deg-C
Storage Case Temperature	T <sub>stg</sub>	-40	85	deg-C
Lead Soldering Temperature/Time	-	-	250/10	deg-C / s
Operating Relative Humidity (non-condensing)	H <sub>A</sub>	5	85	%

#### 4. Optical and Electrical Characteristics of Transmitter Portion

Optical and electrical characteristics of transmitter portion are shown in Table 2. Unless otherwise stated, minimum and maximum values are specified over the operating ambient temperature, and humidity ranges, DC power supply voltage range, from beginning to end of life, using 2<sup>23</sup>-1 pseudo random bit stream with a 50% duty factor.

The logic sense for the DATA input is such that a logic “1”(High) corresponds to the maximum level of an amplitude modulated light source (Light on), while a logic “0”(Low) corresponds to a minimum level of an amplitude modulated light source (Light off).

Table 2. Transmitter Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Optical Output Power	P <sub>o</sub>	-15	-	-8	dBm
Center Wavelength	lambda	1261	-	1360	nm
Spectral Width(RMS)	delta lambda	-	-	7.7	nm
SONET Eye Mask	-	compliant with GR253 spec.			-
Extinction Ratio	-	8.2	-	-	dB
DC Power Supply Voltage	V <sub>cc</sub>	3.135	3.3	3.465	V
DC Power Supply Current	I <sub>cc</sub>	-	-	100	mA
Data Input Voltage					
Low	V <sub>IL</sub>	V <sub>cc</sub> -1.81	-	V <sub>cc</sub> -1.47	V
High	V <sub>IH</sub>	V <sub>cc</sub> -1.17	-	V <sub>cc</sub> -0.88	V
Tx Disable Voltage	V <sub>D</sub>	V <sub>cc</sub> -1.3	-	V <sub>cc</sub>	V
Tx Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>	-	V <sub>EE</sub> +0.8	V

## 5. Optical and Electrical Characteristics of Receiver Portion

Optical and electrical characteristics of receiver portion are shown in Table 3. Unless otherwise stated, minimum and maximum values are specified over the operating ambient temperature, and humidity ranges, DC power supply voltage range and wavelength range, from beginning to end of life, using a  $2^{23}$ -1 pseudo random bit stream with a 50% duty factor.

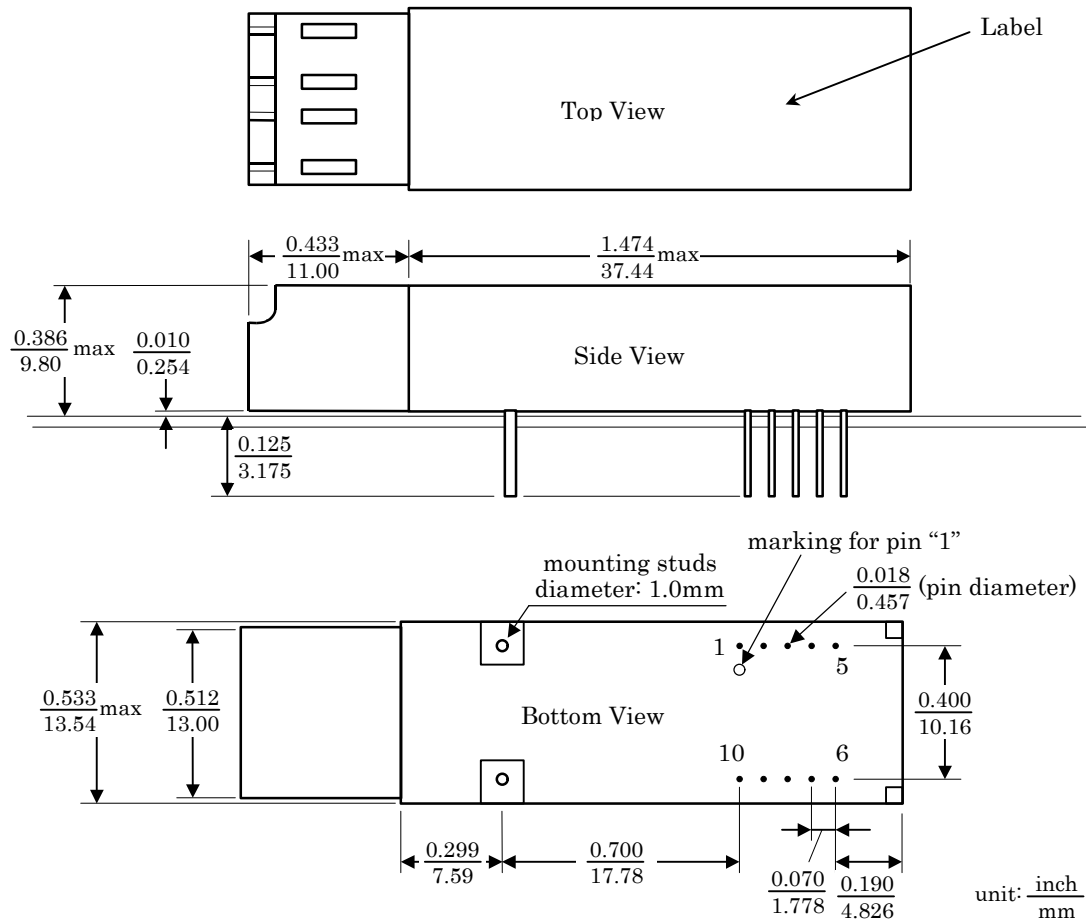
Table 3. Receiver Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Average Sensitivity <sup>a</sup>	P <sub>RL</sub>	-	-	-28	dBm
Maximum Input Power	P <sub>RH</sub>	-7	-	-	dBm
Signal Detect Threshold:					
Decreasing Light Input	SDT <sub>D</sub>	-45	-	-	dBm
Increasing Light Input	SDT <sub>I</sub>	-40	-	-31	dBm
Hysteresis	SDT <sub>H</sub>	0.5	-	5	dB
DC Power Supply Voltage	V <sub>CC</sub>	3.135	-	3.465	V
DC Power Supply Current <sup>b</sup>	I <sub>CC</sub>	-	-	80	mA
Data Output Voltage: <sup>c</sup>					
Low	V <sub>OL</sub>	V <sub>CC</sub> -1.81	-	V <sub>CC</sub> -1.62	V
High	V <sub>OH</sub>	V <sub>CC</sub> -1.10	-	V <sub>CC</sub> -0.88	V
Output Transition Time <sup>d</sup>	t <sub>o</sub>	-	-	2.0	ns
Signal Detect Output Voltage: <sup>e</sup>					
Low	V <sub>OL</sub>	-	-	V <sub>EE</sub> +0.4	V
High	V <sub>OH</sub>	V <sub>CC</sub> -0.9	-	-	V
Signal Detect Response Time:					
Decreasing Light Input	SDRT <sub>D</sub>	-	-	300	us
Increasing Light Input	SDRT <sub>I</sub>	-	-	100	us

- At a BER of  $1 \times 10^{-10}$  and an extinction ratio of 8.2dB
- Without PECL loads.
- PECL compatible, R<sub>L</sub> is 50 ohm to V<sub>CC</sub>-2V
- Between 20% and 80% (50% duty cycle)
- TTL compatible.

## 6. Physical Design

The outline for transceiver package is shown in Figure 1.



Unless otherwise stated, typical values are shown

<Label>



Figure 1. Package Outline

## 7. PINOUT

Pinout is shown in Table 4. The mounting studs are for mechanical attachment to the circuit board and are not connected to internal circuit.

Table 4. Pin Designations

Name	Symbol	Pin		Pin	Symbol	Name
Receive Ground	RGND	1		10	$\overline{\text{DI}}$	$\overline{\text{TX DATA}}$
Receive V <sub>CC</sub>	RVCC	2		9	DI	TX DATA
Signal Detect	SD	3		8	TD	Transmit Disable
$\overline{\text{RX DATA}}$	$\overline{\text{DO}}$	4		7	TGND	Transmit Ground
RX DATA	DO	5		6	TVCC	Transmit V <sub>CC</sub>

## 8. Inspection

Inspection items are as follows:

- (1) Appearance
- (2) Dimensions
- (3) Optical output power
- (4) Optical input power
  - a) Average Sensitivity
  - b) Signal Detect / Decreasing Light Input
  - c) Signal Detect / Increasing Light Input
- (5) Power supply current

## 9. Packing

The optical transceiver shall be packed in sturdy carton box(es) when shipping.

## 10. Caution

- (1) Do not stare into optical output port although this product is designed to meet the class1 laser regulation per FDA/CDRH, complies with 21CFR 1040.10 and 1040.11. Also this product is the class1 laser regulation per IEC 60825-1.
- (2) The housing of the transceiver is possible to crack or dissolve against the particular chemicals. Although we recommend to use the aqueous fluid in the cleaning, the below chemicals are checked not to affect to the housing. Pay attention in the solder flux and cleaning process. We recommend checking the appropriateness of the cleaning fluid in advance.

/ methyl alcohol, ethyl alcohol, butyl alcohol, isopropyl alcohol, hexane, cyclohexane, naphtha, tetrachloroethylene, propylene glycol,

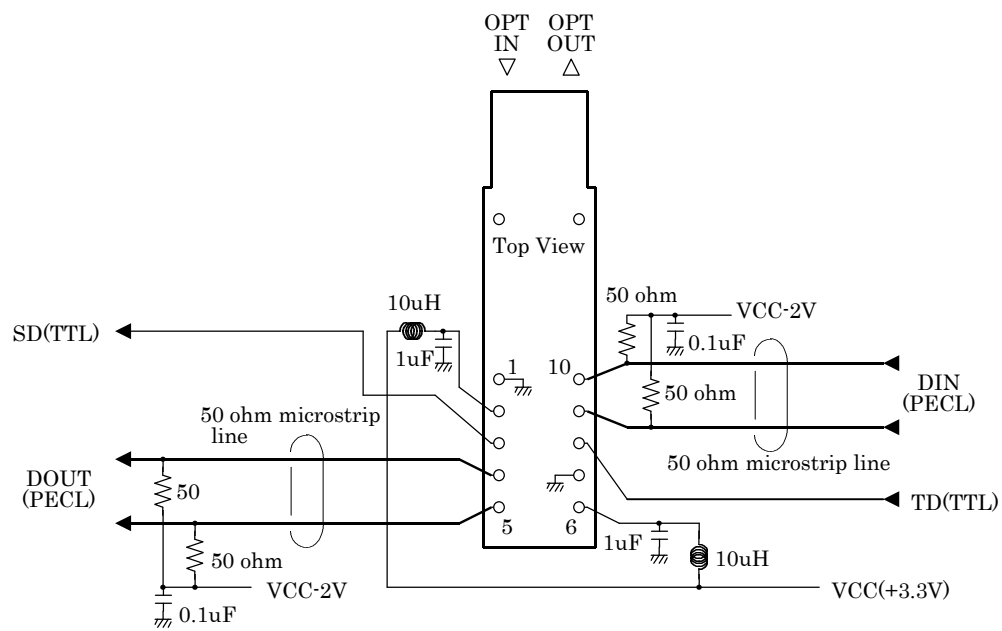
< Do not use : Chemicals which are checked to crack or dissolve>

/ trichloroethylene, trichloroethane, benzen, methyl ethyl ketone, chloroform, toluene, acetone, phenol, ethyl acetate, methylene di chloride, isophtalic acid dimethyl ester

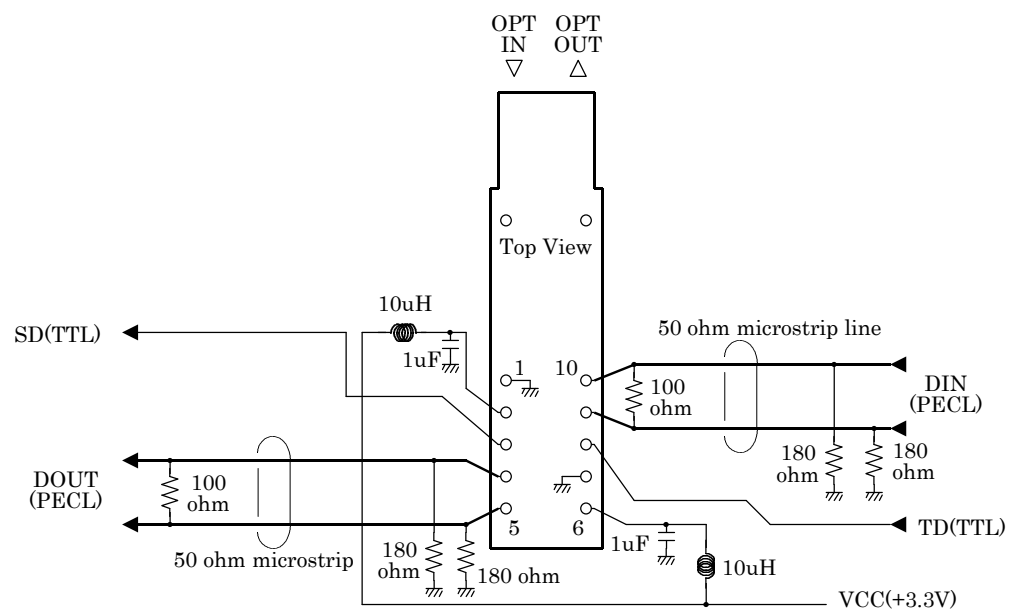
- (3) Optical connectors should be cleaned completely by proper cleaning process before insertion to optical receptacles of the transceiver to avoid contamination inside the optical receptacle. The contamination may cause serious degradation of transmission performance. Using forced nitrogen and some kind of cleaning stick ("CLETOP, stick type" for LC/MU connector supplied by NTT international is recommended) should be used if the receptacle get contaminated by miss-treating optical connectors.

## 11. Recommended Circuit

Recommended decoupling and termination for HTR6701 is illustrated in Figure 2 . This recommendation will provide a good performance of the optical transceiver.



Normal Termination



Alternative Termination ( for Single Power Supply)

Figure 2. Recommended decoupling and termination



= MEMO =

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