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**Hitachi Cable**

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

**HTR6545** Series  
for OC-48 SR (up to 2km)



## Features

- SONET OC-48 SR (2.5Gbit/s, 2km) compliant.
- Fully comply with industry standard 2x10pin Small Form Factor transceiver with LD, PD monitor functions, without clock recovery.
- LC duplex receptacle.
- +3.3V single power supply.
- Low power consumption (0.5W(typ.)).

### 1. General

This document specifies the characteristics of the Small Form Factor optical transceiver (Type:HTR6545) with LC duplex receptacle for an OC-48 Short Reach interface (SR, up to 2km).

### 2. Function

This transceiver is powered from a single +3.3V power supply and operated at a data rate of 2488.32Mbps(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 CML 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 TTL compliant signal. Received optical power, laser bias current and laser monitor current can be monitored using pins for that purpose.

Dimensions and pin assignment fully comply with MSA (Multi Source Agreement) for 2 by 10 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	$V_{CC}$	0	4.0	V
Data Input Voltage	$V_{IN}$	$V_{EE}$	$V_{CC}+0.3$	V
Operating Ambient Temperature	$T_A$	0	70	deg-C
Storage Case Temperature	$T_{stg}$	-40	85	deg-C
Lead Soldering Temperature/Time	-	-	250/10	deg-C / s
Operating Relative Humidity (non-condensing)	$H_A$	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  $2^{23}$ -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>	-10	-	-3	dBm
Center Wavelength	$\lambda$	1266	-	1360	nm
Spectral Width(RMS)	$\Delta\lambda$	-	-	4.0	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					
Input V Range	V <sub>IA</sub> , V <sub>IB</sub>	V <sub>CC</sub> -1.2	-	V <sub>CC</sub> +0.2	V
Common Mode Input V	V <sub>CI</sub>	-	V <sub>CC</sub> -0.2	-	V
Diff'l Input Swing	V <sub>ID SWING</sub>	300	-	1200	mV <sub>p-p</sub>
Diff'l Input Impedance	Z <sub>ID</sub>	85	100	115	ohm
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
Optical input Power (Average) <sup>a</sup>	$P_{IN}$	-18	-	-3	dBm
Signal Detect Threshold:					
Decreasing Light Input	$SDT_D$	-28	-	-18	dBm
Increasing Light Input	$SDT_I$	-	-	-18	dBm
Hysteresis	$SDT_H$	0.5	-	6	dB
DC Power Supply Voltage	$V_{CC}$	3.135	-	3.465	V
DC Power Supply Current	$I_{CC}$	-	-	80	mA
Data Output Voltage: <sup>b</sup>					
Output V	$V_{OA}, V_{OB}$	$V_{CC}-0.5$	-	$V_{CC}$	V
Diff'l Output Swing	$V_{OD\ SWING}$	640	800	1000	mV <sub>p-p</sub>
Output Offset V	$V_{CO}$	-	$V_{CC}-0.2$	-	V
Diff'l Output Impedance	$V_{OD}$	85	100	115	ohm
Output Transition Time <sup>c</sup>	$t_o$	-	-	150	ps
Signal Detect Output Voltage: <sup>d</sup>					
Low	$V_{OL}$	-	-	0.4	V
High	$V_{OH}$	$V_{CC}-0.9$	-	-	V
Signal Detect Response Time:					
Decreasing Light Input	$SDRT_D$	-	-	300	us
Increasing Light Input	$SDRT_I$	-	-	100	us

a. At a BER of  $1 \times 10^{-10}$  and an extinction ratio of 8.2dB

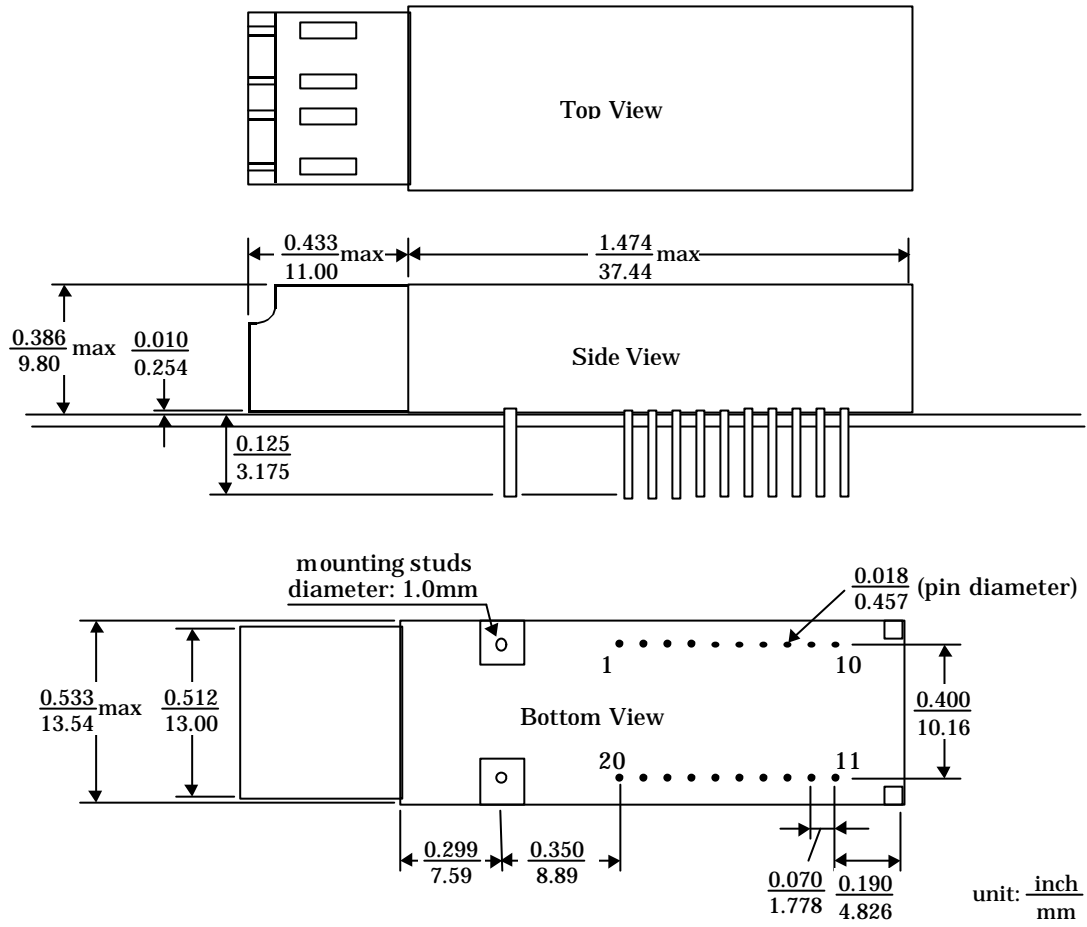
b. CML compatible,  $R_L$  is 50 ohm to  $V_{CC}$ .

c. Between 20% and 80% (50% duty cycle)

d. TTL compatible.

## 6. Physical Design

The outline for transceiver package is shown in Figure 1.



Unless otherwise stated, typical values are shown

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
Received Power Monitor (PD bias / APD monitor)	RMON	1		20	PMON+	LD Power Monitor(positive)
Receiver Ground	RGND	2		19	PMON-	LD Power Monitor(Negative)
Receiver Ground	RGND	3		18	BMON+	LD Bias Monitor(positive)
No Internal Connection	NC	4		17	BMON-	LD Bias Monitor(Negative)
No Internal Connection	NC	5		16	TGND	Transmitter Ground
Receiver Ground	RGND	6		15	$\overline{DI}$	$\overline{\text{Transmit DATA}}(\text{CML})$
Receiver VCC(+3.3V)	RVCC	7		14	DI	Transmit DATA(CML)
Signal Detect(TTL)	SD	8		13	TD	Transmitter Disable(TTL)
$\overline{\text{Received DATA}}(\text{CML})$	$\overline{DO}$	9		12	TGND	Transmitter Ground
Received DATA(CML)	DO	10		11	TVCC	Transmitter VCC(+3.3V)

Pin 17 to Pin20 are outputs of laser monitoring function. These pins should be connected to high impedance voltage sensing circuit. Internal circuit is shown in Figure 2. If these function are not used, the pins should be open.

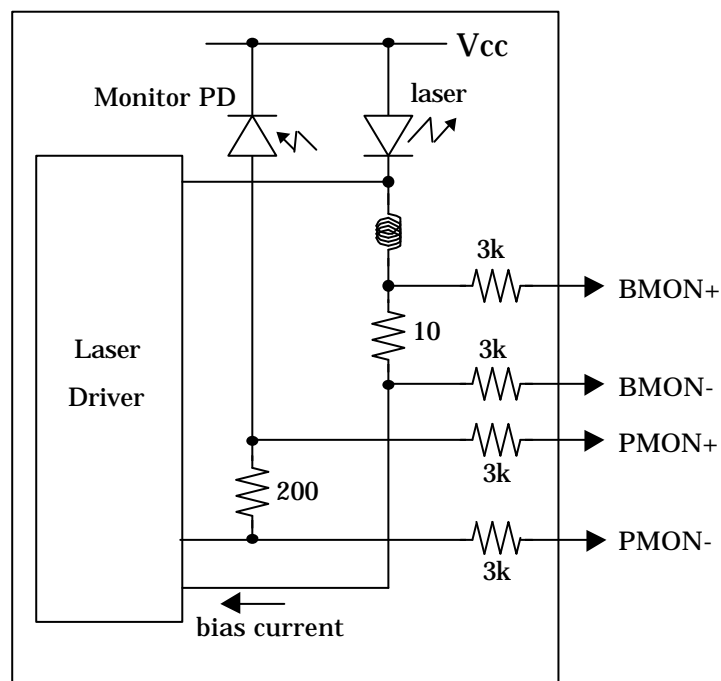


Figure 2. Equivalent internal circuit of PMON, BMON

Pin 1 (RMON) could be used for received power monitoring. Equivalent internal circuit of RMON is shown in Figure 3. RMON should be connected to VCC via sensing resistor:  $R_s$  ( $R_s$  is recommended less than 150ohm.). Typical response coefficient of the PD is 0.85 A/W. If this function is not used, connect this pin to VCC directly.

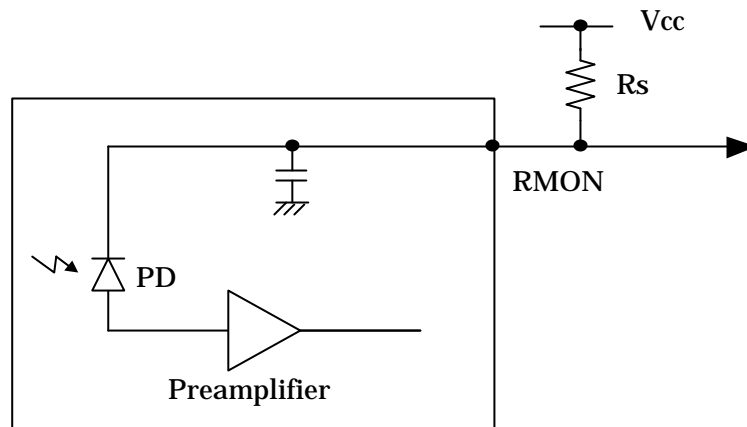


Figure 3. Equivalent internal Circuit of RMON

## 8. Inspection

Inspection items are as follows:

- (1) Appearance
- (2) Dimensions
- (3) Optical output power
- (4) Optical waveform
- (5) Optical input power
  - a) Average Sensitivity
  - b) Signal Detect / Decreasing Light Input
  - c) Signal Detect / Increasing Light Input
- (6) 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 class 1 laser regulation.
- (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 HTR6545 is illustrated in Figure 4 . This recommendation will provide a good performance of the optical transceiver.

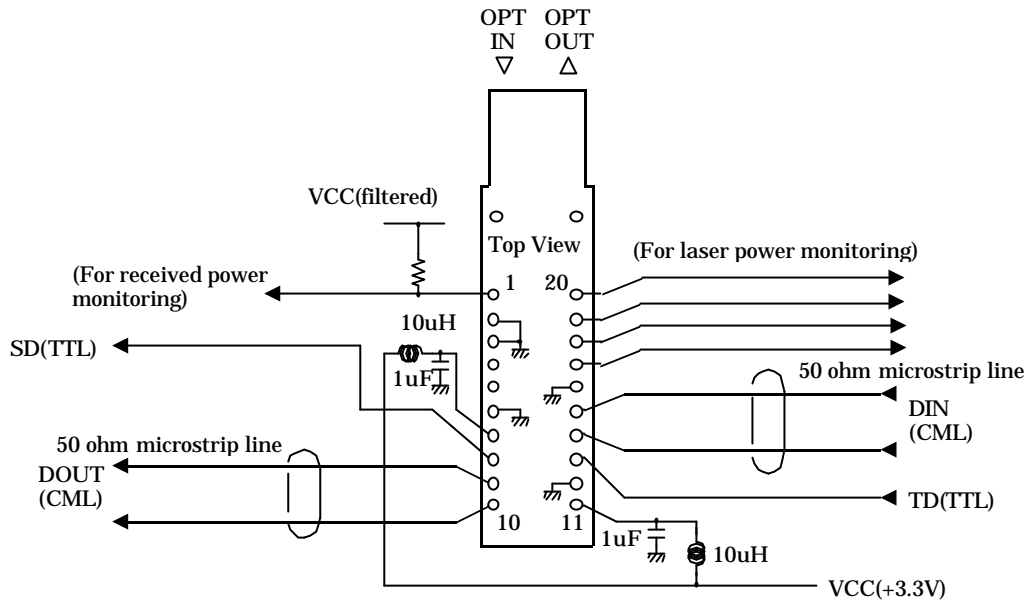
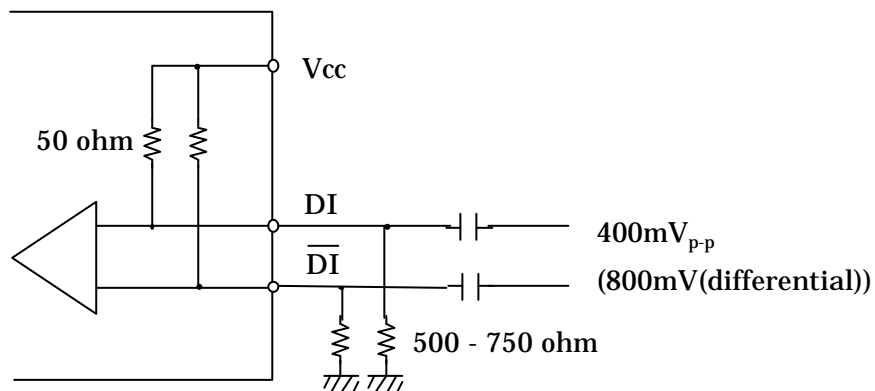


Figure 4. Recommended decoupling and termination

Remark : HTR6545 has input termination resistors (50 ohms to Vcc) inside the package. If AC coupling is needed, place bias resistors outside the package to prevent the input signal voltage from exceeding Vcc.



= MEMO =

= Notice =

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