

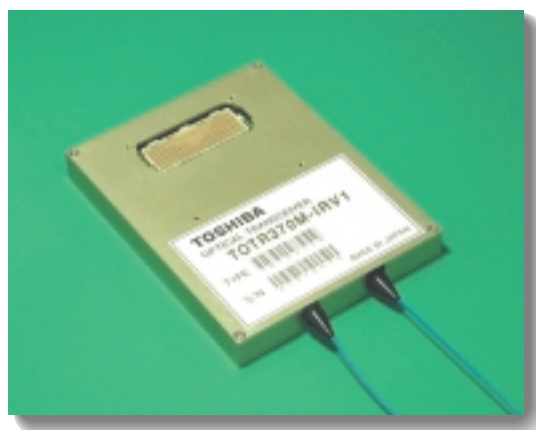
**TOSHIBA**

September 2001

# Optical Communication Devices

## 10 Gb/s Optical Transponder

**TOTR370M-IR Series**



### APPLICATION

- SONET / SDH (OC-192 / STM-64) applications

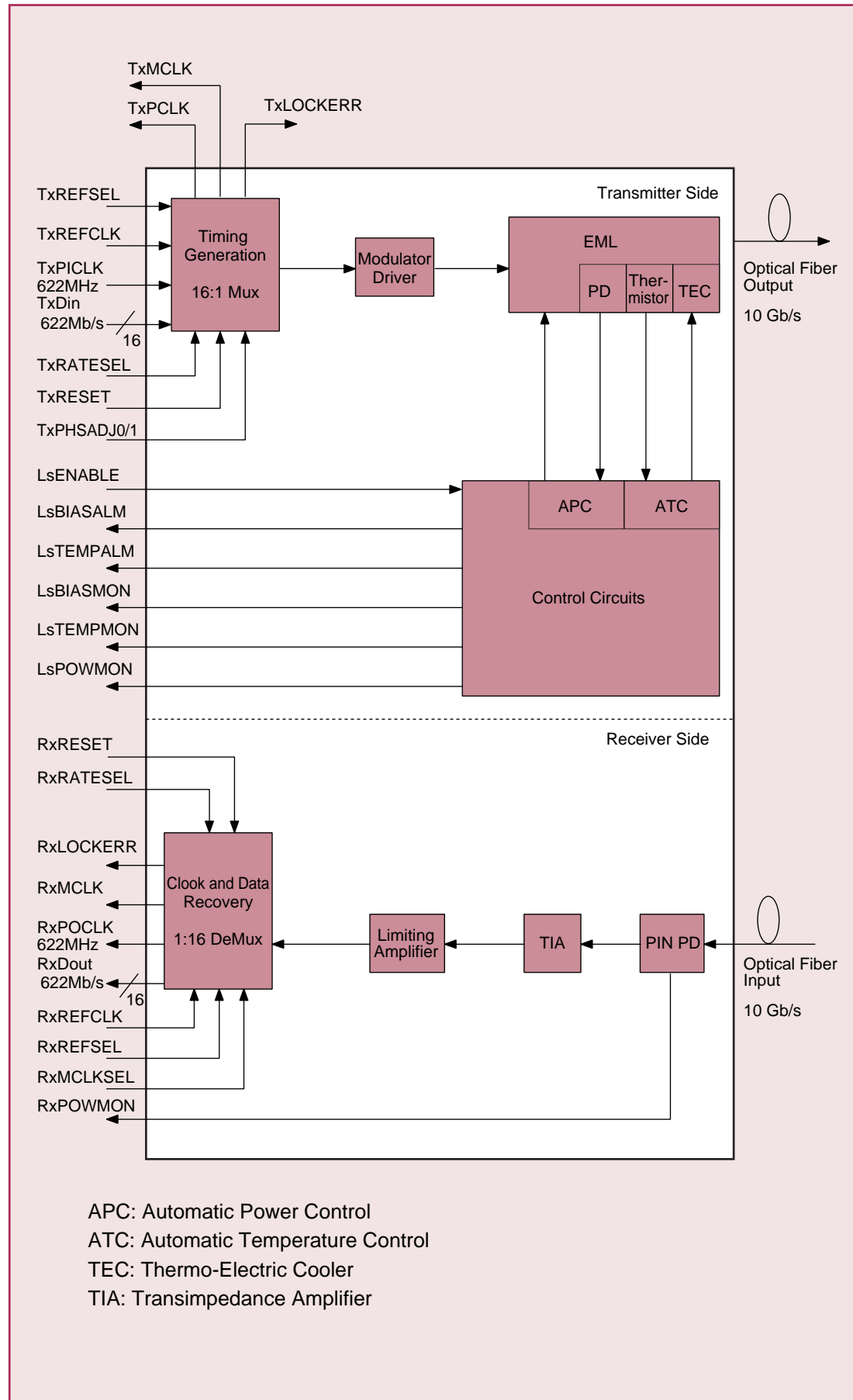
### FEATURES

- 10 Gb/s optical transceiver with 16 Channel Mux and DeMux
- Differential LVDS 622 Mb/s data and 622 MHz clock interface
- Optical input power range: -17 dBm (typ) to 0 dBm (@ BER =  $10^{-12}$ )
- Optical output power range: -4 dBm (typ) to -2 dBm / -0.5 dBm to +1.5dBm
- Target distance: 25 km/40 km
- Tc: 0 °C to 70 °C
- Power supply: +5.0 V, +3.3 V and -5.2 V
- Package size: 114 x 88.9 x 13.4 mm

# TOTR370M-IR Series

## TOTR370M-IR Series

### BLOCK DIAGRAM



### ABSOLUTE MA

Storage temperature
Input data signal volt
Input optical peak po
Input optical average
Positive supply 1 vol
Positive supply 2 vol
Negative supply volta

### ELECTRICAL A

#### Operating Tempe

Operating case temp
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#### Optical Character

Target distance
Dispersion
Operating wavelength
<b>Transmitter</b>
Spectral Width (@ 20
Side mode Suppress
Optical fiber output p
Extinction ratio
Optical return loss
<b>Receiver</b>
Sensitivity (@ BER =
Overload
Optical return loss
Optical path penalty

#### Electrical Power S

Positive supply 1 vol
Positive supply 1 cur
Positive supply 2 vol
Positive supply 2 cur
Negative supply volta
Negative supply curr

#### Electrical Input an

Alarm output high lev
Alarm output low lev
Control input high lev
Control input low lev

#### Electrical Input an

Input power monitor vol
Normalized laser power
50% variation of laser p
Laser disable mode
Laser monitor bias vo
Laser monitor bias of
Normalized laser temper
Normalized laser temper

## ABSOLUTE MAXIMUM RATINGS

Item	Ratings	Unit
Storage temperature	-40 to +85	°C
Input data signal voltage	GND-0.5 to V <sub>DD</sub> +0.5	V
Input optical peak power	+3	dBm
Input optical average power	0	dBm
Positive supply 1 voltage	0 to 6	V
Positive supply 2 voltage	-0.5 to +3.8	V
Negative supply voltage	-6.5 to +0.3	V

## ELECTRICAL AND OPTICAL CHARACTERISTICS

### Operating Temperature

Item	Min	Typ.	Max	Unit
Operating case temperature range	0	-	+70	°C

### Optical Characteristics

Item	Min	Typ.	Max	Unit	
Target distance	TOTR370M-IRV1A	-	25	-	km
	TOTR370M-IRV1B	-	40	-	
	TOTR370M-IRV1C	-	40	-	
Dispersion	TOTR370M-IRV1A	-	-	500	ps/nm
	TOTR370M-IRV1B	-	-	800	
	TOTR370M-IRV1C	-	-	800	
Operating wavelength range	1530	-	1565	nm	
<b>Transmitter</b>					
Spectral Width (@ 20 dB down)	-	-	1.0	nm	
Side mode Suppression Ratio	30	-	-	dB	
Optical fiber output power	TOTR370M-IRV1A	-4.0	-	-2.0	dBm
	TOTR370M-IRV1B	-0.5	-	+1.5	
	TOTR370M-IRV1C	-4.0	-	-2.0	
Extinction ratio	8.2	-	-	dB	
Optical return loss	30	-	-	dB	
<b>Receiver</b>					
Sensitivity (@ BER = 10 <sup>-12</sup> )	-	-17	-14	dBm	
Overload	0	-	-	dBm	
Optical return loss	27	-	-	dB	
Optical path penalty (@ Target distance)	-	-	2	dB	

### Electrical Power Supplies

Item	Symbol	Min	Typ.	Max	Unit
Positive supply 1 voltage	V <sub>CC</sub>	+4.75	+5.0	+5.25	V
Positive supply 1 current	I <sub>CC</sub>	-	-	250	mA
Positive supply 2 voltage	V <sub>DD</sub>	+3.135	+3.3	+3.465	V
Positive supply 2 current	I <sub>DD</sub>	-	-	2500	mA
Negative supply voltage	V <sub>EE</sub>	-5.4	-5.2	-5.0	V
Negative supply current	I <sub>EE</sub>	-	-	500	mA

### Electrical Input and Output Signals (Digital Signal Characteristics)

Item	Min	Typ.	Max	Unit
Alam output high level	V <sub>DD</sub> -0.5	-	V <sub>DD</sub>	V
Alam output low level	GND	-	0.5	V
Control input high level	V <sub>DD</sub> -1.0	-	V <sub>DD</sub>	V
Control input low level	GND	-	1.0	V

### Electrical Input and Output Signals (Analog Signal Characteristics)

Item	Symbol	Min	Typ.	Max	Unit
Input power monitor voltage slope for PIN	RxPOWMON	0.8	-	1.26	V/mW
Normalized laser power monitor voltage	LsPOWMON	0.44	0.5	0.56	V
50% variation of laser power (linear slope)	-	-	0.25	-	V
Laser disable mode	-	-20	-	20	mV
Laser monitor bias voltage slope	LsBIASMON	17.8	20	22.5	mV/mA
Laser monitor bias offset voltage	-	-20	-	20	mV
Normalized laser temperature monitor voltage	LsTEMPMON	-	2.5	-	V
Normalized laser temperature monitor slope	-	-	-40	-	mV/°C

## DIMENSIONAL OUTLINE

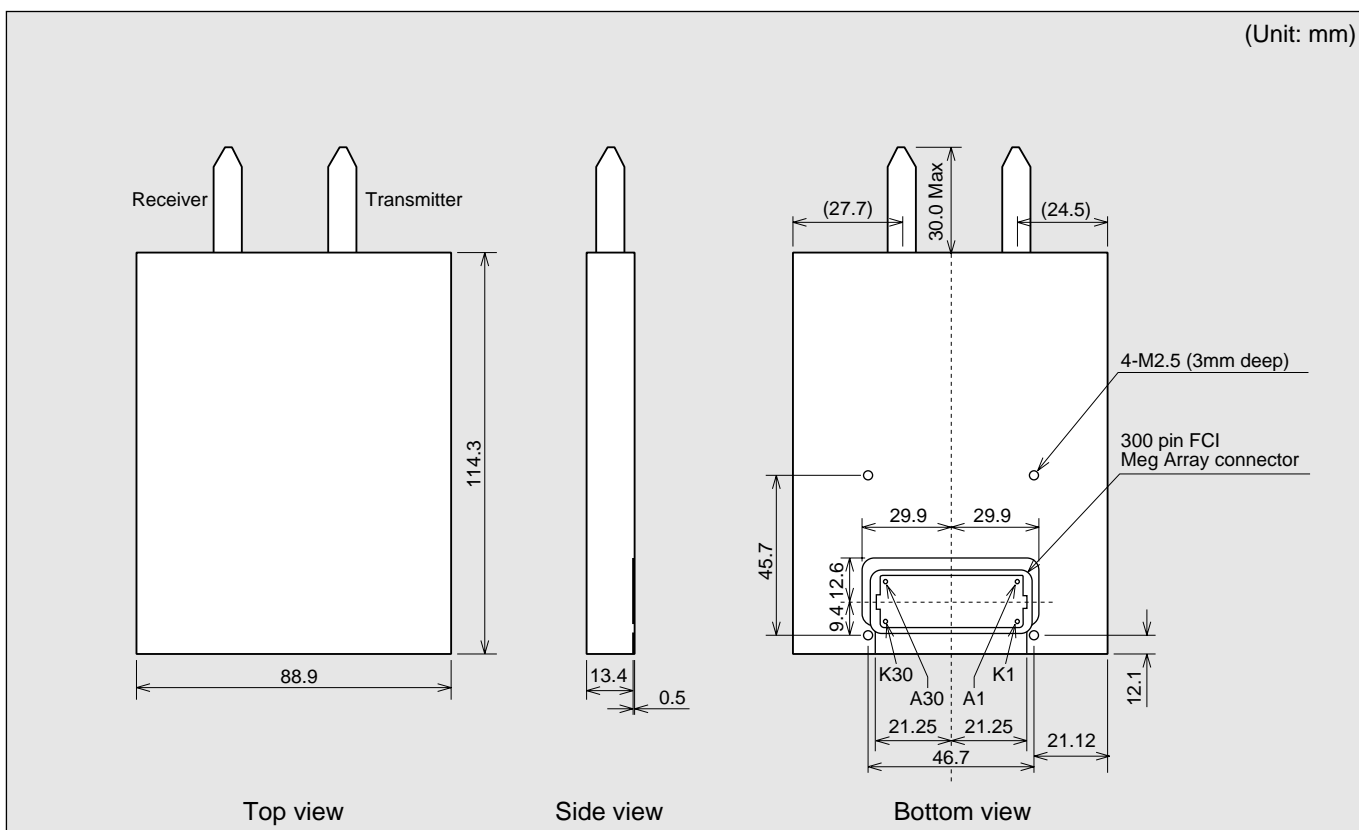
Receiver

Top view

### Pin Map Overview

	K	J
1	+5.0V	NC
2	+5.0V	NC
3	RxRATESEL	NC
4	+3.3V	NC
5	+3.3V	NC
6	RxRESET	NC
7	NC	NC
8	NC	NC
9	NC	NC
10	-5.2V	NC
11	-5.2V	NC
12	NC	NC
13	-5.2V	NC
14	-5.2V	NC
15	NC	NC
16	+5.0V	NC
17	+5.0V	NC
18	NC	NC
19	+3.3V	NC
20	+3.3V	NC
21	TxRATESEL	NC
22	+3.3V	NC
23	+3.3V	NC
24	TxRESET	NC
25	-5.2V	NC
26	-5.2V	NC
27	NC	NC
28	-5.2V	NC
29	-5.2V	NC
30	NC	NC

## DIMENSIONAL OUTLINE AND PIN ASSIGNMENT



### Pin Map Overview

	K	J	H	G	F	E	D	C	B	A
1	+5.0V	NC	GND	RxDout12P	NC	RxDout8P	GND	RxDout4P	GND	RxDout0P
2	+5.0V	NC	GND	RxDout12N	NC	RxDout8N	GND	RxDout4N	GND	RxDout0N
3	RxRATESEL	NC	NC	GND	RxPOWMON	GND	NC	GND	NC	GND
4	+3.3V	NC	GND	RxDout13P	+3.3V	RxDout9P	GND	RxDout5P	GND	RxDout1P
5	+3.3V	NC	GND	RxDout13N	+3.3V	RxDout9N	GND	RxDout5N	GND	RxDout1N
6	RxRESET	NC	NC	GND	NC	GND	NC	GND	NC	GND
7	NC	NC	GND	RxDout14P	+3.3V	RxDout10P	GND	RxDout6P	GND	RxDout2P
8	NC	NC	GND	RxDout14N	+3.3V	RxDout10N	GND	RxDout6N	GND	RxDout2N
9	NC	NC	NC	GND	NC	GND	NC	GND	NC	GND
10	-5.2V	NC	GND	RxDout15P	-5.2V	RxDout11P	GND	RxDout7P	GND	RxDout3P
11	-5.2V	NC	GND	RxDout15N	-5.2V	RxDout11N	GND	RxDout7N	GND	RxDout3N
12	NC	NC	NC	GND	NC	GND	NC	GND	RxMCLKSEL	GND
13	-5.2V	NC	GND	NC	-5.2V	RxPOCLKP	GND	RxMCLKP	GND	RxREFCLKP
14	-5.2V	NC	GND	NC	-5.2V	RxPOCLKN	GND	RxMCLKN	GND	RxREFCLKN
15	NC	NC	NC	GND	RxREFSEL	GND	NC	GND	RxLOCKERR	GND
16	+5.0V	NC	GND	TxDin12P	NC	TxDin8P	GND	TxDin4P	GND	TxDin0P
17	+5.0V	NC	GND	TxDin12N	NC	TxDin8N	GND	TxDin4N	GND	TxDin0N
18	NC	NC	NC	GND	LsBIASMON	GND	LsPOWMON	GND	NC	GND
19	+3.3V	NC	GND	TxDin13P	+3.3V	TxDin9P	GND	TxDin5P	GND	TxDin1P
20	+3.3V	NC	GND	TxDin13N	+3.3V	TxDin9N	GND	TxDin5N	GND	TxDin1N
21	TxRATESEL	NC	NC	GND	LsENABLE	GND	LsTEMPMON	GND	NC	GND
22	+3.3V	NC	GND	TxDin14P	+3.3V	TxDin10P	GND	TxDin6P	GND	TxDin2P
23	+3.3V	NC	GND	TxDin14N	+3.3V	TxDin10N	GND	TxDin6N	GND	TxDin2N
24	TxRESET	NC	NC	GND	LsBIASALM	GND	TxPHSADJ0	GND	NC	GND
25	-5.2V	NC	GND	TxDin15P	-5.2V	RxDin11P	GND	RxDin7P	GND	TxDin3P
26	-5.2V	NC	GND	TxDin15N	-5.2V	RxDin11N	GND	RxDin7N	GND	TxDin3N
27	NC	NC	NC	GND	LsTEMPALM	GND	TxPHSADJ1	GND	NC	GND
28	-5.2V	NC	GND	TxPICLKP	-5.2V	TxPCLKP	GND	TxMCLKP	GND	TxREFCLKP
29	-5.2V	NC	GND	TxPICLKN	-5.2V	TxPCLKN	GND	TxMCLKN	GND	TxREFCLKN
30	NC	NC	NC	GND	TxREFSEL	GND	NC	GND	TxLOCKERR	GND

Unit
°C
V
dBm
dBm
V
V
V

Unit
°C

Unit
km
ps/nm
nm
nm
dB
dBm
dB
dB
dBm
dBm
dB
dB

Max	Unit
+5.25	V
250	mA
+3.465	V
2500	mA
-5.0	V
500	mA

Unit
V
V
V
V

Max	Unit
1.26	V/mW
0.56	V
-	V
20	mV
22.5	mV/mA
20	mV
-	V
-	mV/°C

### Input Controls Truth Tables

RxRATESEL (Pin # K3)	
0	FEC rate of 10.664Gb/s and 10.709Gb/s selected
1 or NC	normal SONET rate of 9.953Gb/s or Ethernet rate of 10.3Gb/s selected

RxRESET (Pin # K6)	
0	asynchronous DeMux system reset
1 or NC	normal operation

RxREFSEL (Pin # F15)	
0	selects an RxREFCLK frequency of 155MHz
1 or NC	selects an RxREFCLK frequency of 622MHz

RxMCLKSEL (Pin # B12)	
0	selects an RxMCLK frequency of 155MHz
1 or NC	selects an RxMCLK frequency of 622MHz

TxRATESEL (Pin # K21)	
0	FEC rate of 10.664Gb/s and 10.709Gb/s selected
1 or NC	normal SONET rate of 9.953Gb/s or Ethernet rate of 10.3Gb/s selected

TxRESET (Pin # K24)	
0	asynchronous Mux system reset
1 or NC	normal operation

TxREFSEL (Pin # F30)	
0	selects a TxREFCLK frequency of 155MHz
1 or NC	selects a TxREFCLK frequency of 622MHz

TxPHSADJ1 (Pin # D27)	TxPHSADJ0 (Pin # D24)	
0 or NC	0 or NC	adjusts the phase of the TxPCLK by 0deg
0 or NC	1	adjusts the phase of the TxPCLK by 90deg
1	0 or NC	adjusts the phase of the TxPCLK by 180deg
1	1	adjusts the phase of the TxPCLK by 270deg

LsENABLE (Pin # F21)	
0 or NC	normal operation
1	laser disable

### Output Alarms Truth Tables

LsBIASALM (Pin # F24)	
0	laser bias alarm active
1	normal operation

LsTEMPALM (Pin # F27)	
0	laser temperature alarm active
1	normal operation

RxLOCKERR (Pin # B15)	
0	indicates loss of PLL lock
1	normal operation

TxLOCKERR (Pin # B30)	
0	indicates loss of PLL lock
1	normal operation

### PRECAUTIONS

- (a) Power supply: Transient electric spike may cause a damage to the laser, the photodiode or IC chips. A surge-free power supply and a slow starter circuit should be used.  
To avoid causing an electrical surge, pins should not be connected or disconnected on the test fixture before turning power off .
- (b) The product should be grounded for obtaining the performance.
- (c) Safety: The laser emits invisible light harmful to the human eyes. Direct viewing should be avoided.

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**TOSHIBA**

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