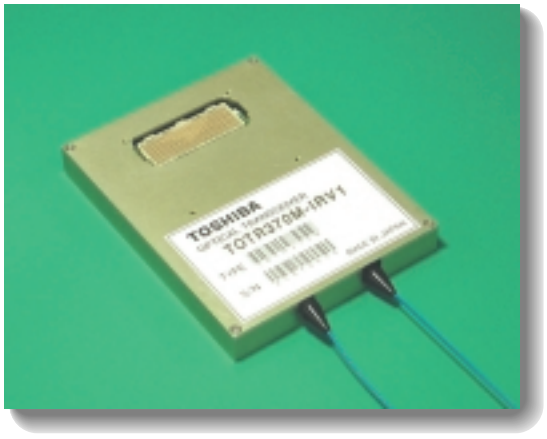
TOSHIBA

September 2001

Optical Communication Devices

10 Gb/s Optical Transponder

TOTR370M-IR Series



APPLICATION

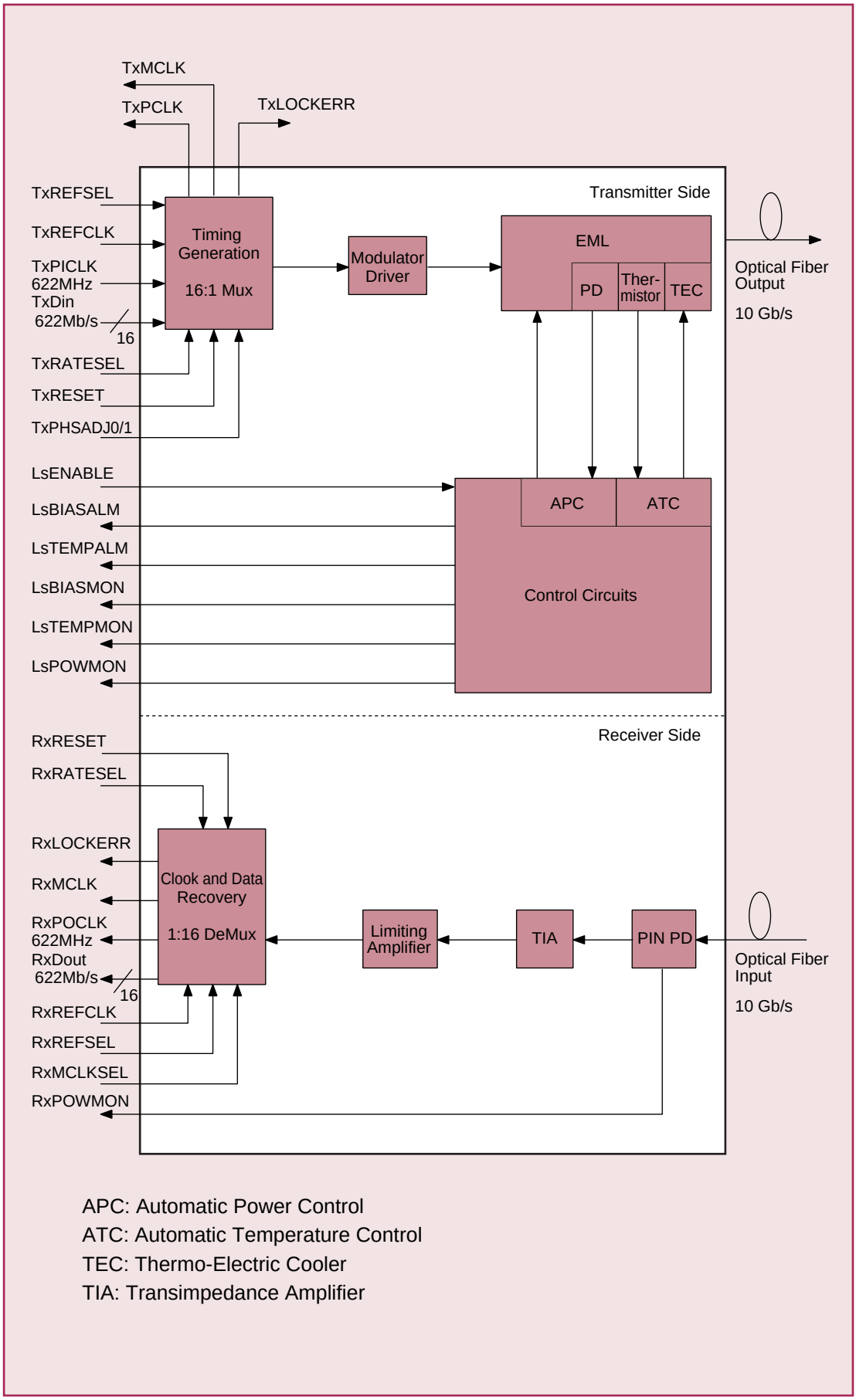
- SONET / SDH (OC-192 / STM-64) applications

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

BLOCK DIAGRAM



APC: Automatic Power Control
ATC: Automatic Temperature Control
TEC: Thermo-Electric Cooler
TIA: Transimpedance Amplifier

TOTR370M-IR Series

ABSOLUTE MAXIMUM RATINGS

Item	Ratings	Unit
Storage temperature	–40 to +85	˚C
Input data signal voltage	GND–0.5 to V_{DD}+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
Transmitter					
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
Receiver					
Sensitivity (@ BER = 10^{-12})		–	–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_{CC}	+4.75	+5.0	+5.25	V
Positive supply 1 current	I_{CC}	–	–	250	mA
Positive supply 2 voltage	V_{DD}	+3.135	+3.3	+3.465	V
Positive supply 2 current	I_{DD}	–	–	2500	mA
Negative supply voltage	V_{EE}	–5.4	–5.2	–5.0	V
Negative supply current	I_{EE}	–	–	500	mA

Electrical Input and Output Signals (Digital Signal Characteristics)

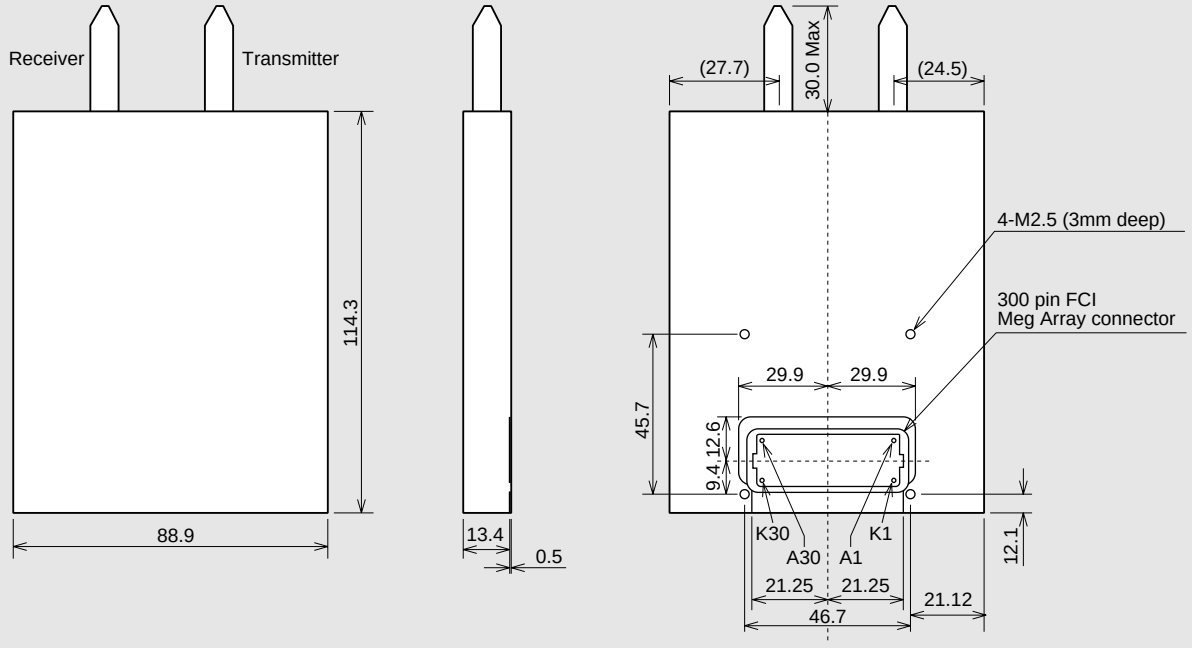
Item	Min	Typ.	Max	Unit
Alam output high level	V_{DD}–0.5	–	V_{DD}	V
Alam output low level	GND	–	0.5	V
Control input high level	V_{DD}–1.0	–	V_{DD}	V
Control intput low level	GND	–	1.0	V

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 AND PIN ASSIGNMENT

(Unit: mm)



Top view Side view Bottom view

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

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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