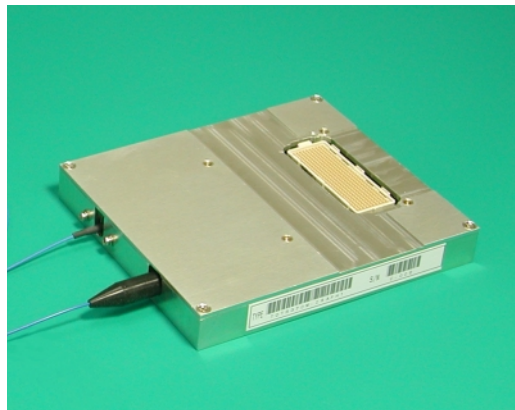


Optical Communication Devices

10 Gb/s Optical Transponder

TOTR370M-IR Series



APPLICATIONS

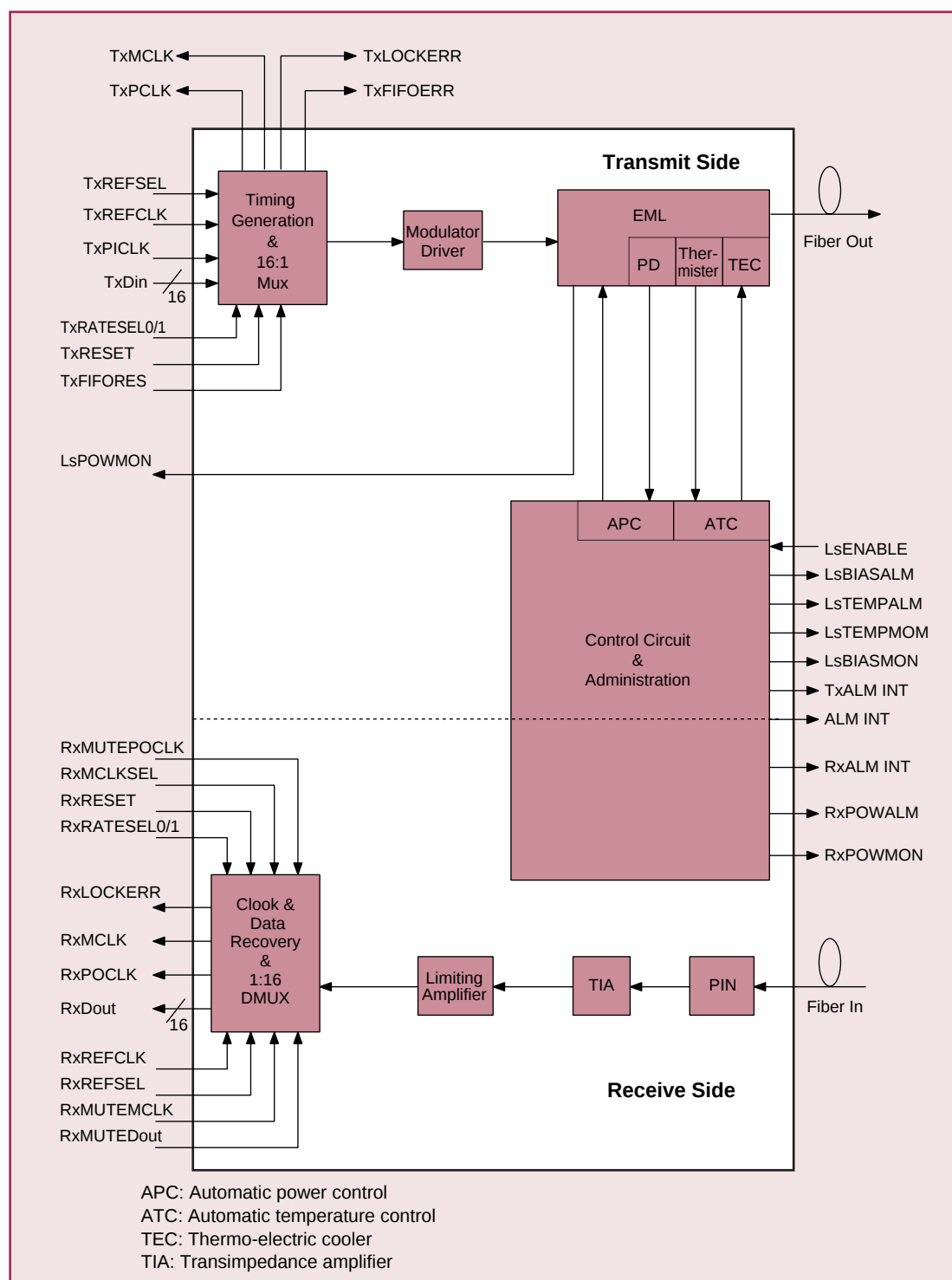
- SONET / SDH (OC-192 / STM-64) applications
- TOTR370M-IRA: Intra-office/Short-Reach
- TOTR370M-IRB: Short-haul/ Intermediate-Reach

FEATURES

- 10 Gb/s optical transceiver with 16 Channel Mux and DeMux
- Optical data rates: 9.953 Gb/s, 10.3 Gb/s, 10.664 Gb/s, 10.709 Gb/s (Selectable)
- Differential LVDS 622 Mb/s data and 622 MHz clock interface
- Optical input power range
 - TOTR370M-IRA: -17 to 0 dBm (@ BER = 10^{-12} , 9.9532Gb/s)
 - TOTR370M-IRB: -17 to 0 dBm (@ BER = 10^{-12} , 9.9532Gb/s)
- Optical output power range
 - TOTR370M-IRA: -4.0 to -2.0 dBm
 - TOTR370M-IRB: -0.5 to +1.5 dBm
- Target distance
 - TOTR370M-IRA: 25 km (500ps/nm)
 - TOTR370M-IRB: 40 km (800ps/nm)
- Tc: 0 °C to 70 °C
- Power supply: +5.0 V, +3.3 V and -5.2 V
- Package size: 4 x 3.5 x 0.53 inch (101.6 x 88.9 x 13.4 mm)
- Wavelength: 1530 to 1565 nm (C-band)
- Lower power consumption: 6W (typ.)
- Meg-Array® 300-pin receptacle

TOTR370M-IR Series

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings	Unit
Storage temperature	T _{stg}	-40 to +85	°C
Input data signal voltage	V _i	-0.5 to V _{DD} +0.5	V
Input optical peak power	—	6	dBm
Input optical average power	—	3	dBm
Positive supply 1 voltage	V _{CC}	0 to 6	V
Positive supply 2 voltage	V _{DD}	-0.5 to +3.8	V
Negative supply voltage	V _{EE}	-6.5 to +0.3	V

ELECTRICAL AND OPTICAL CHARACTERISTICS (BOL)

Operating Temperature

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

Optical Characteristics

Item		Min	Typ.	Max	Unit
Target distance	TOTR370M-IRA	–	25	–	km
	TOTR370M-IRB	–	40	–	
Dispersion	TOTR370M-IRA	–	–	500	ps/nm
	TOTR370M-IRB	–	–	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-IRA	–4.0	–	–2.0	dBm
	TOTR370M-IRB	–0.5	–	+1.5	
Extinction ratio		9	–	–	dB
Optical return loss		30	–	–	dB
Receiver					
Sensitivity (@ BER = 10 ^{–12} , 25°C, 9.95328 Gb/s)		–	–	–17	dBm
Overload		0	–	–	dBm
Reflectance		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}	–	–	120	mA
Positive supply 2 voltage	V _{DD}	+3.135	+3.3	+3.465	V
Positive supply 2 current	I _{DD}	–	–	2700	mA
Negative supply voltage	V _{EE}	–5.46	–5.2	–4.94	V
Negative supply current	I _{EE}	–	–	850	mA

Input Data/Clock signals (LVDS)

Item	Symbol	Conditions	Min	Typ.	Max	Unit
Input common mode voltage	V _{cm}	Avg	0	1200	2400	mV
Input peak differential voltage	V _{diff}	V _{ip} –V _{in}	100	–	800	mV
Differential input impedance	R _{in}	f = 622.08 MHz	80	100	120	Ω

Output Data/Clock signals (LVDS)

Item	Symbol	Conditions	Min	Typ.	Max	Unit
Output voltage high	V _{oh}	R _{load} = 100 Ω	–	–	1475	mV
Output voltage low	V _{ol}	R _{load} = 100 Ω	925	–	–	mV
Output differential voltage	V _{od}	R _{load} = 100 Ω	250	–	400	mV
Output offset voltage	V _{os}	R _{load} = 100 Ω	1125	–	1275	mV
Differential output impedance	R _o	V _{cm} = 1.0V and V _{cm} = 1.4V	80	100	280	Ω

Electrical Input and Output Signals (Digital Signal Characteristics)

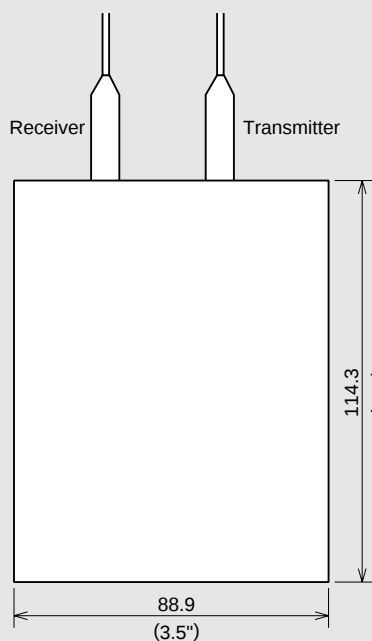
Item	Min	Typ.	Max	Unit
Alarm output high level	V _{DD} –0.5	–	V _{DD}	V
Alarm output low level	GND	–	0.5	V
Control input high level	V _{DD} –1.0	–	V _{DD}	V
Control input low level	GND	–	0.8	V

Electrical Input and Output Signals (Analog Signal Characteristics)

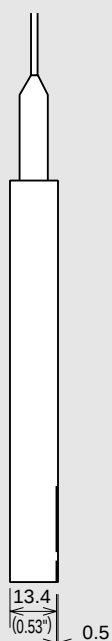
Item	Symbol	Min	Typ.	Max	Unit
Input power monitor voltage slope for PIN	RxPOWMON	0.8	–	1.26	V/mW
Normalized laser power monitor voltage	LsPOWMON	0.44	–	0.56	V
Laser disable mode	–	–20	–	20	mV
Laser monitor bias voltage slope	LsBIASMON	17.8	–	22.5	mV/mA
Laser monitor bias offset voltage	–	–20	–	20	mV

DIMENSIONAL OUTLINE AND PIN ASSIGNMENT

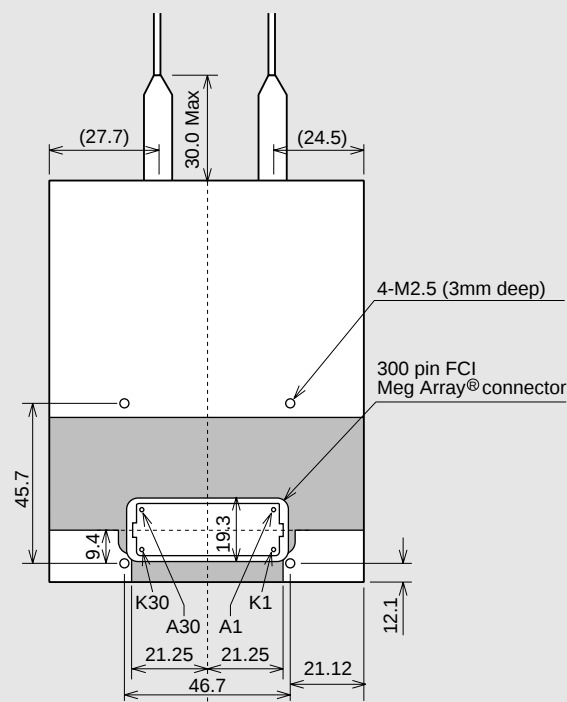
Unit: mm



Top view



Side view



Bottom view

Pin Map Overview

	K	J	H	G	F	E	D	C	B	A
1	5.0V Analog	NUC	Frame GND	RxDout12P	NUC	RxDout8P	Digital GND	RxDout4P	Digital GND	RxDout0P
2	5.0V Analog	NUC	Frame GND	RxDout12N	NUC	RxDout8N	Digital GND	RxDout4N	Digital GND	RxDout0N
3	RxRATESEL0	RxRATESEL1	NUC	Digital GND	RxPOWMON	Digital GND	NUC	Digital GND	NUC	Digital GND
4	3.3V Analog	NUC	Frame GND	RxDout13P	3.3V Digital	RxDout9P	Digital GND	RxDout5P	Digital GND	RxDout1P
5	3.3V Analog	NUC	Frame GND	RxDout13N	3.3V Digital	RxDout9N	Digital GND	RxDout5N	Digital GND	RxDout1N
6	RxRESET	NUC	NUC	Digital GND	RxPOWALM	Digital GND	NUC	Digital GND	RxMUTE Dout	Digital GND
7	NUC	NUC	Analog GND	RxDout14P	3.3V Digital	RxDout10P	Digital GND	RxDout6P	Digital GND	RxDout2P
8	NUC	NUC	Analog GND	RxDout14N	3.3V Digital	RxDout10N	Digital GND	RxDout6N	Digital GND	RxDout2N
9	RxMUTEPOCLK	NUC	NUC	Digital GND	NUC	Digital GND	NUC	Digital GND	NUC	Digital GND
10	-5.2V Analog	NUC	Analog GND	RxDout15P	-5.2V Digital	RxDout11P	Digital GND	RxDout7P	Digital GND	RxDout3P
11	-5.2V Analog	NUC	Analog GND	RxDout15N	-5.2V Digital	RxDout11N	Digital GND	RxDout7N	Digital GND	RxDout3N
12	RxMUTEMCLK	NUC	NUC	Digital GND	NUC	Digital GND	NUC	Digital GND	RxMCLKSEL	Digital GND
13	-5.2V Analog	NUC	Analog GND	NUC	-5.2V Digital	RxPOCLKP	Digital GND	RxMCLKP	Digital GND	RxREFCLKP
14	-5.2V Analog	RxALM INT	Analog GND	NUC	-5.2V Digital	RxPOCLKN	Digital GND	RxMCLKN	Digital GND	RxREFCLKN
15	NUC	NUC	ALM INT	Digital GND	RxREFSEL	Digital GND	NUC	Digital GND	RxLOCKERR	Digital GND
16	5.0V Analog	TxALM INT	Analog GND	TxDin12P	NUC	TxDin8P	Digital GND	TxDin4P	Digital GND	TxDin0P
17	5.0V Analog	NUC	Analog GND	TxDin12N	NUC	TxDin8N	Digital GND	TxDin4N	Digital GND	TxDin0N
18	NUC	NUC	NUC	Digital GND	LsBIASMON	Digital GND	LsPOWMON	Digital GND	NUC	Digital GND
19	3.3V Analog	NUC	Analog GND	TxDin13P	(+)3.3V Digital	TxDin9P	Digital GND	TxDin5P	Digital GND	TxDin1P
20	3.3V Analog	NUC	Analog GND	TxDin13N	(+)3.3V Digital	TxDin9N	Digital GND	TxDin5N	Digital GND	TxDin1N
21	TxRATESEL0/1	TxRATESEL0/1	NUC	Digital GND	LsENABLE	Digital GND	LsTEMPMON	Digital GND	NUC	Digital GND
22	3.3V Analog	NUC	Analog GND	TxDin14P	(+)3.3V Digital	TxDin10P	Digital GND	TxDin6P	Digital GND	TxDin2P
23	3.3V Analog	NUC	Analog GND	TxDin14N	(+)3.3V Digital	TxDin10N	Digital GND	TxDin6N	Digital GND	TxDin2N
24	TxRESET	NUC	NUC	Digital GND	LsBIASALM	Digital GND	NUC	Digital GND	NUC	Digital GND
25	-5.2V Analog	NUC	Frame GND	TxDin15P	-5.2V Digital	RxDin11P	Digital GND	TxDin7P	Digital GND	TxDin3P
26	-5.2V Analog	NUC	Frame GND	TxDin15N	-5.2V Digital	RxDin11N	Digital GND	TxDin7N	Digital GND	TxDin3N
27	TxFIFO RES	NUC	NUC	Digital GND	LsTEMPALM	Digital GND	NUC	Digital GND	NUC	Digital GND
28	-5.2V Analog	NUC	Frame GND	TxPICKLP	-5.2V Digital	TxPICKLP	Digital GND	TxMCLKP	Digital GND	TxREFCLKP
29	-5.2V Analog	NUC	Frame GND	TxPICKLN	-5.2V Digital	TxPICKLN	Digital GND	TxMCLKN	Digital GND	TxREFCLKN
30	TxFIFO ERR	NUC	NUC	Digital GND	TxREFSEL	Digital GND	NUC	Digital GND	TxLOCKERR	Digital GND

Control Tables

TxRATESEL1 (J 21)		TxRATESEL0 (K 21)	
0		0	10 Gb Ethernet rate of 10.3 Gb/ s selected
0		1	TBD
1		0	FEC rate of 10.664 Gb/ s and 10.709Gb/s selected
1		1	normal SONET rate of 9.953 Gb/ s selected
TxREFSEL (F 30)			
0			selects a TxREFCLK frequency of 155MHz
1			selects a TxREFCLK frequency of 622MHz
LsENABLE (F 21)			
0			normal operation
1			laser disable
TxRESET (K 24)			
0			asynchronous Mux system reset
1			normal operation
TxFLFORES (K 27)			
0			Mux FIFO reset
1			normal operation
RxRATESEL1 (J 3)		TxRATESEL0 (K 3)	
0		0	10 GB Ethernet rate of 10.3 Gb/ s selected
0		1	TBD
1		0	FEC rate of 10.664 Gb/ s and 10.709Gb/s selected
1		1	normal SONET rate of 9.953 Gb/ s selected
RxREFSEL (F 15)			
0			selects an RxREFCLK frequency of 155MHz
1			selects an RxREFCLK frequency of 622MHz
RxMCLKSEL (B 12)			
0			selects the RxMCLK frequency of 155MHz
1			selects the RxMCLK frequency of 622MHz
RxMUTEPOCLK (K 9)			
0			mutes the RxPOCLK
1			normal operation
RxMUTEMCLK (K 12)			
0			mutes the RxMCLK
1			normal operation
RxMUTEDout (B 6)			
0			mutes the RxDout[0:15]
1			normal operation
RxRESET (K 6)			
0			asynchronous DeMux system reset
1			normal operation

Note:When the input pins are open, these input logic signals are internally applied to each input pin by pull-up and pull-down circuitry in the module.

Alarm Tables

ALM INT (H 15)		
0		indicates alarm active
1		normal operation
TxALM INT (J 16)		
0		indicates alarm active
1		normal operation
RxALM INT (J 14)		
0		indicates alarm active
1		normal operation
TxFIFOERR (K 30)		
0		indicates a Mux FIFO error
1		normal operation
TxLOCKERR (B 30)		
0		indicates loss of PLL lock
1		normal operation
LsBIASALM (F 24)		
0		laser bias alarm active
1		normal operation
LsTEMPALM (F 27)		
0		laser temperature alarm active
1		normal operation
RxPOWALM (F 6)		
0		indicates alarm active
1		normal operation
RxLOCKERR (B 15)		
0		indicates loss of PLL lock
1		normal operation

PRECAUTIONS

- 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.
- The product should be grounded for obtaining the performance.
- Safety: The laser emits invisible light harmful to the human eyes. Direct viewing should be avoided.

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(As of May, 2002)

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