



# 20km EPON ONU Optical Transceiver Transceiver SFF Module

## RTXM169-402

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### Features

- *Integrated Single fiber bi-directional optical subassembly*
- *1310nm DFB laser Burst-mode Transmitter and 1490nm PIN/TIA Continuous receiver(with WDM)*
- *SFF 2x5 metallic package*
- *+3.3V single power supply*
- *Low power consumption*
- *0 to 70oC operating ambient temperature*
- *LVPECL compatible data input/output interface*
- *LVTTL transmitter burst mode control*
- *Burst Enable: L active*
- *LVTTL receiver signal-detected indication*
- *Class 1 Laser eye safety standard*
- *Excellent EMI and EMC characteristics*
- *ESD protection function*
- *RoHS compliant*

## Application

- *Optical transceiver for Gigabit Ethernet Passive Optical Networks (EPON) ONU side*

## Standard

- *IEEE802.3ah 1000BASE-PX20*
- *Small Form Factor Transceiver Multisource Agreement July 5,2000*
- *Description*
- *The EPON ONU Transceiver module is designed for Gigabit Ethernet Passive Optical Network (EPON) 10km transmission. The module incorporates 1310nm burst-mode transmitter and 1490nm continuous-mode receiver.*
- *The transmitter section uses a 1310nm DFB laser and an integrated BM laser driver which is designed to perform very small burst enable/disable delay time. The laser driver also includes APC and temperature compensation circuit, which are used for keeping the launch optical power and extinction ratio constant over temperature and aging.*
- *The receiver section uses an integrated 1490nm InGaAs PIN photodiode and preamplifier mounted together. It has the function that indicates receiver signal-detected status (active high).*
- *An integrated WDM coupler can separate 1490nm input light and 1310nm output light.*
- *The metallic package guarantees excellent EMI and EMC characteristics, which totally comply with international relevant standards.*

## Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Operating Temperature Range	Tc	°C	0	70
Storage Temperature Range	Ts	°C	-40	85
Relative Humidity	RH	%	5	95
Power Supply Voltage	Vcc	V	0	4.6
Pin Input Voltage		V	GND	Vcc
Receiver Damage Threshold		dBm	+4	–
Lead Solder Temperature		°C	–	260
Lead Solder Duration		S	–	10
Fiber Yield Strength		kgf	–	0.5
Fiber Bend Radius		mm	30	–

## Recommended operating conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Voltage	V <sub>cc</sub>	V	3.13	3.3	3.47
Operating Temperature Range	T <sub>op</sub>	°C	0	–	70
Operating Data Rate		Gbps	–	1.25±100ppm	–

## Specifications (0°C < T<sub>op</sub> < 70°C and 3.13V < V<sub>cc</sub> < 3.47V)

Parameter	Symbol	Unit	Min	Typ	Max	Notes
<b>Electrical Characteristics</b>						
Supply Current	I <sub>cc</sub>	mA	–	–	300	
LVPECL Single Ended Data Input Swing		mV	100	–	800	1
LVPECL Single Ended Data Output Swing		mV	300	–	500	2
Differential Data input impedance		Ω	–	100	–	1
Signal Level(LVTTL H)		V	2.4	–	V <sub>cc</sub>	
Signal Level(LVTTL L)		V	0	–	0.8	
<b>Optical transmitter Characteristics</b>						
Data Rate		Mbps	–	1250	–	
Center Wavelength Range	λ <sub>c</sub>	nm	1280	–	1350	
Spectral Width(@-20dB)	Δλ	nm	–	–	1	
Launch Optical Power	P <sub>o</sub>	dBm	-1	–	+4	3
Off level light		dBm	–	–	-45	
<b>Extinction Ratio</b>						
<b>Extinction Ratio</b>	<b>EX</b>	<b>dB</b>	<b>10</b>	<b>–</b>	<b>–</b>	<b>4</b>
Burst turn on/off time	T <sub>on</sub> /T <sub>off</sub>	ns		16		5
Rise/Fall time(20%~80%)	T <sub>r</sub> /T <sub>f</sub>	ps	–	–	260	6
RIN15OMA		dB/Hz	–	–	-113	
Optical Return Loss Tolerance		dB	–	–	15	
Maximum reflectance		dB	–	–	-12	λ=1.31μm
Transmitter dispersion penalty	TDP	dB	–	–	2.8	7
Eye Diagram	Compliant with IEEE Std 802.3ah					8
<b>Optical receive Characteristics</b>						
Data Rate		Mbps	–	1250	–	
Receiver Sensitivity	S	dBm	–	–	-26	9
Overload Input Optical Power	P <sub>in</sub>	dBm	-3	–	–	9
Center Wavelength Range	λ <sub>c</sub>	nm	1480	1490	1500	
Receiver reflectance		dB	–	–	-12	λ=1.49μm
SD(LVTTL)	Optical Dessert	dBm	-44	–	–	
	Optical Assert		–	–	-26	
LOS Hysteresis		dB	0.5	–	6	

**Note1:** AC coupled internally (see the recommended circuit below).

**Note2:** LVPECL output, AC coupled internally (see the recommended circuit below).

**Note3:** Coupled into 9/125 SMF

**Note4:** Measured with PRBS 27-1 test pattern @1.25Gbps.

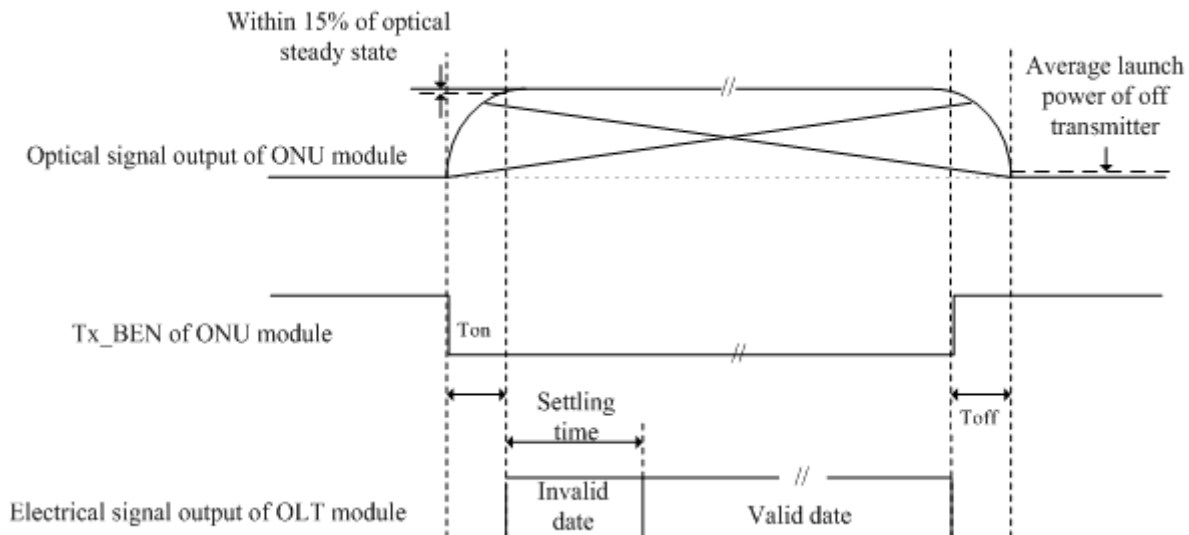
**Note5:** see Figure 1.

**Note6:** Measured with the Bessel-Thompson filter OFF.

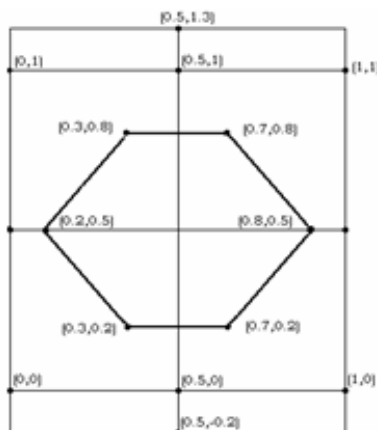
**Note7:** Note7: Transmit on 20km SMF.

**Note8:** See Figure 2.

**Note9:** Measured with PRBS 27-1 test pattern @1.25Gbps with Tx on, ER=10dB, BER=10E-12.



**Figure1 Burst\_mode Reciever Dynamic range in EPON system**



**Mask of diagram**

**Figure2 Mask of diagram**

## Pin Description

Pin Name	Description	Pin Name	Description
1	Rx GND Receiver ground	6	Tx V <sub>CC</sub> Transmitter power supply
2	Rx V <sub>CC</sub> Receiver power supply	7	Tx GND Transmitter ground
3	SD LVTTTL Signal detect	8	Tx DIS LVTTTL Transmitter burst mode control, "H": Tx OFF
4	RD- Receiver data output- (AC coupled internally)	9	TD+ LVPECL Data input+ (AC coupled)
5	RD+ Receiver data output+ (AC coupled internally)	10	TD- LVPECL Data input- (AC coupled)

## Block Diagram

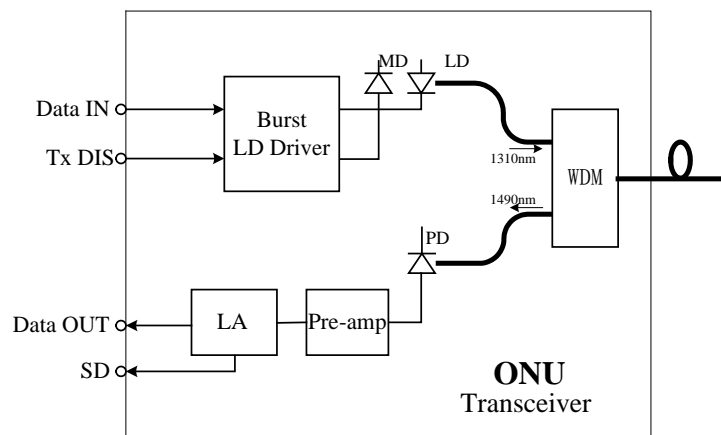


Figure3 Functional block diagram

## Typical Application Circuit

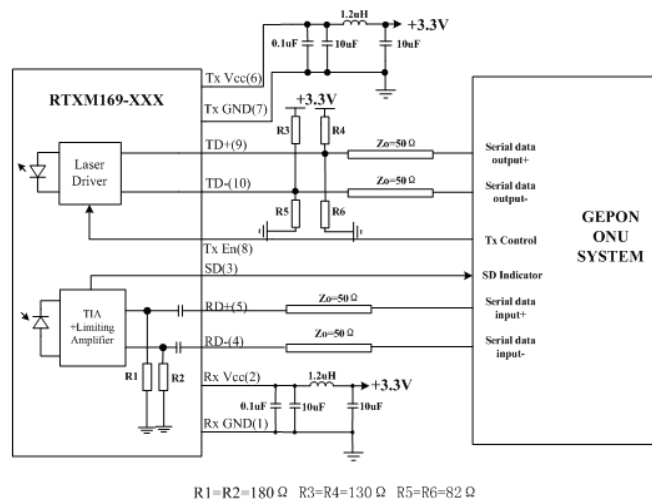


Figure4 Typical application circuit

## Package Outline

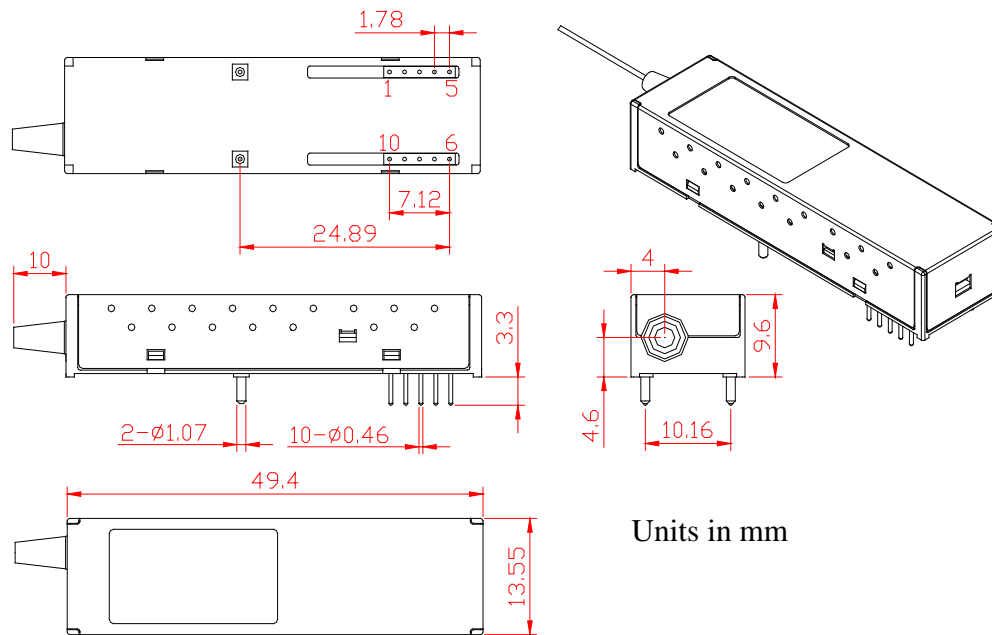


Figure5 Package outline

## Regulatory Compliance

Feature	Test Method	Performance
Electrostatic (ESD) to the Electrical Pins	Discharge MIL-STD-883E Method 3015.7	Class 1 (>1.5kV) – Human Body Model
Electrostatic (ESD) Immunity	Discharge IEC61000-4-2	Class 2 (>4.0kV)
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class B	Compliant with standards
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.
Eye Safety	FDA 21 CFR 1040.10 and 1040.11 UL TUV EN 60825-1	Compliant with Class 1 laser product

## Ordering Information

Part No.	Specifications									Application
	Package	Datarate	Laser	Optical Power	Detector	Sensitivity	Temp	Reach	others	Code
RTXM169-402	SFF 2×5	1.25Gb/s	1310nm DFB	-1 ~ +4dBm	PIN	< -26dBm	0~70°C	20km	Tx DIS1	1000BASE-PX20

**Note1:** The "LVTTTL transmitter burst mode control" is set as "Tx Disable at high level"

**Note2:** The length of pigtail is normal 540±40mm (the length of connector is not included), but can be customized for specific requirement.

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