

# GPON ONU Triplexer Transceiver



## Features

- Single Fiber Triplexer
- 1.25Gbps data upstream /2.5Gbps data downstream /47~2600MHz CATV analog signal downstream
- Burst mode transmission with 1310nm DFB laser
- Continuous mode digital receiver with 1490nm APD-TIA
- Integrated WDM and analog CATV receiver with 1550nm InGaAs PIN detector
- -10dBm~0dBm Input CATV Optical Power
- ±1 dB Flatness In Band CATV (45-1000MHz)
- ±2.5 dB Flatness In BandSAT IF (>1000 MHz)
- RF output level up to 80dBuV
- +3.3V / +12V power supply
- CML compatible data input
- CML compatible data output
- LVPEC or CML transmitter burst-mode control
- LVTTTL I2C DDM interface
- LVTTTL TX\_SD / RX\_SD/Vedio\_SD
- Soft Enable/Disable TX and Video
- Fully RoHS Compliant
- All metal housing for superior EMI performance
- 0°C to 70°C operating case temperature

RTXM170-605 GPON ONU Triplexer Transceiver is designed for Gigabit-capable Passive Optical Network (GPON). The Triplexer comprise of a Burst Mode optical transmitter, a Continuous Mode optical receiver and an Analog CATV receiver.

The Digital transmitter uses a 1310nm DFB laser diode and an integrated Burst Mode laser driver which designed to perform very small burst enable/disable delay time. The transmitter also incorporates an Automatic Power Control(APC) circuit and an Automatic Temperature Control(ATC) circuit to keep the launch optical power and extinction ratio over an operating temperature of 0~+70°C.

The Digital receiver uses an integrated 1490nm APD photodiode and preamplifier mounted together. It has the function that indicates receiver signal-detected status (active high).

The Analog CATV receiver integrates a WDM and uses a 1550nm PIN photodiode and a high performance RF amplifier. It contains an Automatic Gain Control(AGC) circuit to keep the output effective voltage level over an input optical power range of -10dBm~0dBm and contains an Amplitude Equilibrium circuit to offer +/-1dB flatness over the frequency band of 45Mhz~1000Mhz and +/-2.5dB flatness over the frequency band of 1000MHz~2600MHz..

The Triplexer features a digital diagnostic and control function through a digital serial I2C interface.

## Specifications

(tested under recommended operating conditions, unless otherwise noted)

Parameter	Symbol	Unit	Min	Typ	Max	Note
<b>Digital Transmitter</b>						
Supply Voltage	V <sub>CC_T</sub>	V	3.13	3.3	3.47	-
Supply Current	I <sub>CC_T</sub>	mA	-	-	200	-
Bit Rate	-	Gbps	-	1.25	-	-
Operation Wavelength	λ <sub>P</sub>	nm	1290	1310	1330	
Spectral Width (@ -20dB)	Δλ	nm	-	-	1	-
SMSR	-	dB	30	-	-	-
Launch Optical Power	P <sub>O</sub>	dBm	0.5	-	5	1
Off Level Light	P <sub>OFF</sub>	dBm	-	-	-45	-
Extinction ratio	ER	dB	10	-	-	2
Burst turn on Time	T <sub>ON</sub>	ns	-	-	12	3
Burst turn off Time	T <sub>OFF</sub>	ns	-	-	12	3

# GPON ONU Triplexer Transceiver

- Excellent ESD/TVS protection
- 1×20 Pin and 2”×2” Package
- F Female RF connector
- Real time monitoring of:
  - Temperature
  - Supply voltage
  - Laser bias current
  - Transmitted optical power
  - Received optical power
  - Video Received optical power RF Output level

## Applications

- GPON ONU Side
- Voice/Data/Video FTTH
- CATV & SAT networks

## Standards

- ITU-T G.984.2 Class B+
- SFF-8472 Rev 9.5
- RoHS 6

Rise/Fall time	-	ps	-	-	260	1,4
Input Differential Voltage	-	mv	300	-	1200	5
Input Differential Impedance	Z <sub>i</sub>	Ω	90	100	110	-
Transmitter Dispersion Penalty	T <sub>DP</sub>	dB	-	-	1	6
Transmitter Eye Diagram	Compliant with ITU-T G.984.2					7
<b>Digital Receiver</b>						
Supply Voltage	V <sub>CC_R</sub>	V	3.13	3.3	3.47	-
Supply Current	I <sub>CC_R</sub>	mA	-	-	120	-
Bit Rate	-	Gbps	-	2.5	-	-
Operation Wavelength	λ <sub>p</sub>	nm	1480	1490	1500	-
Sensitivity	P <sub>Sen</sub>	dBm	-	-	-28	8
Overload Input Optical Power	P <sub>Over</sub>	dBm	-8	-	-	-
Damage Input Optical Power	P <sub>Dam</sub>	dBm	-	-	+5	-
Signal Detect Assert Level	P <sub>as</sub>	dBm	-	-	-31	9
Signal Detect De-assert Level	P <sub>das</sub>	dBm	-45	-	-	10
Signal Detect Hysteresis	P <sub>as</sub> - P <sub>das</sub>	dB	0.5	-	6	-
Signal Detect Assert Time	T <sub>Sda</sub>	us	-	-	10	-
Signal Detect De-assert Time	T <sub>Sdd</sub>	us	-	-	10	-
Output Differential Voltage	-	mv	300	-	1200	11
Output Differential Impedance	Z <sub>o</sub>	Ω	90	100	110	-
<b>Anoalog Receiver</b>						
Supply Voltage	V <sub>DD</sub>	V	+10.8	+12	+13.2	-
Supply Current	I <sub>DD</sub>	mA	-	160	200	-
Operation Wavelength	λ <sub>p</sub>	nm	1550	1555	1560	-
Frequency Range	F <sub>op</sub>	MHz	45		2600	
RF Output Level	L <sub>o</sub>	dBuv	74	76	78	12
Flatness In Band CATV (47-1000MHz)		dB		±1		
Flatness In Band SAT IF (>1000 MHz)		dB		±2.5		
Output Return Loss CATV (47-1000MHz)		dB		14		
Output Return Loss SAT IF (>1000 MHz)		dB		6		
Output Impedance	Z <sub>o</sub>	Ω		75		
CNR	CNR	dB	46			13

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CSO		CSO	dB	55			14
CTB		CTB	dB	55			14
AGC Input Optical Power		P <sub>opt</sub>	dBm	-8		+2	
Optical Return Loss		ORL	dB	12			
wavelength	Reflect	λ1	nm	1260	1310	1360	
	Reflect	λ2	nm	1480	1490	1500	
	Pass	λ3	nm	1550	1555	1560	
Isolation Ref-Pass IP1			dB	35			
Isolation Com-Pass IP2			dB	35			
Isolation Com-Ref CATV			dB	20			
Insertion Loss Reflect IP1			dB	1			
Insertion Loss Reflect IP2			dB	1			
Insertion Loss pass CATV			dB	1			

Note 1: Coupled into 9/125um.

Note 2: Measured with PRBS 2<sup>23</sup>-1 test pattern @ 1.25Gbps.

Note 3: Refer to Timing Parameter Definition in Burst Mode Sequence, See Figure 5.

Note 4: Measured with the Bessel-Thompson filter ON.

Note 5: DC coupled internally and terminated internally (see the recommended circuit below).

Note 6: Transmit on 20Km SMF.

Note 7: See Figure 6.

Note 8: Measured with PRBS 2<sup>23</sup>-1 test pattern @ 2.5Gbps with TX on, ER=10dB, BER=10E-12.

Note 9: An increase in optical power above the level will cause the Signal Detect output to switch from a low state to a high state, Refer to Timing Parameter Definition of RX ALM Assert/Dessert time, see Figure 7.

Note 10: A decrease in optical power below the level will cause the Signal Detect output to switch from a high state to a low state, Refer to Timing Parameter Definition of RX ALM Assert/Dessert time, see Figure 7.

Note 11: AC coupled internally (see the recommended circuit below)

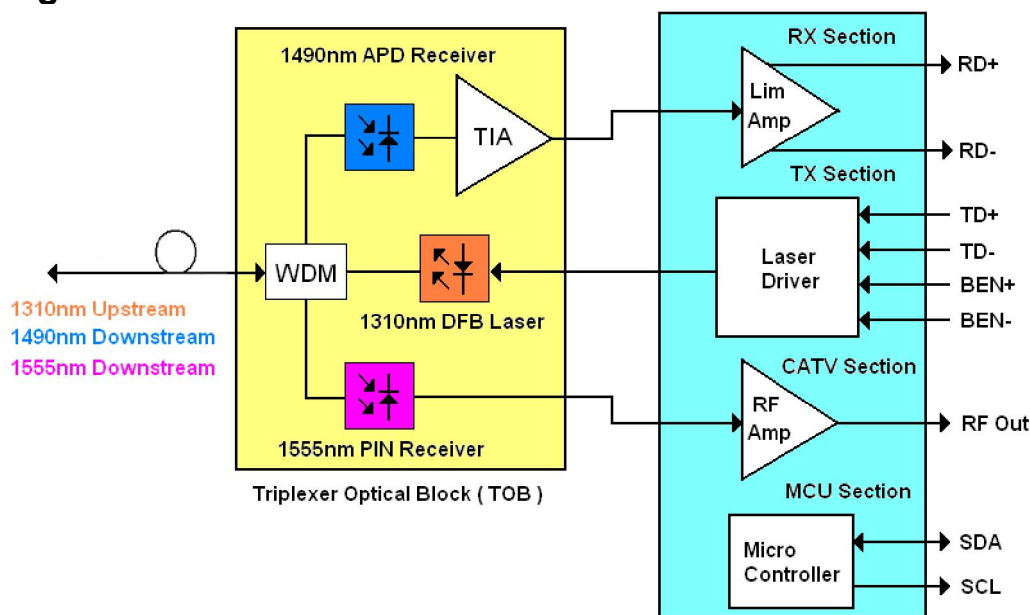
Note 12: Test at -8~+2dBm Optical Input Power, The 40 analog(NTSC) channels (OMI4.3%) and 63 digital(64 or 256 QAM) channels (OMI2.15%)。The equivalent value of the digital channels' RF level is 6dB lower than the analog channels'.

Note 13: Test at -7.6dBm Optical Input Power, The 40 analog(NTSC) channels (OMI4.3%) and 63 digital(64 or 256 QAM) channels (OMI2.15%)。The equivalent value of the digital channels' RF level is 6dB lower than the analog channels'.

Note 14: Test at +2dBm Optical Input Power, The 40 analog(NTSC) channels (OMI4.3%) and 63 digital(64 or 256 QAM) channels (OMI2.15%)。The equivalent value of the digital channels' RF level is 6dB lower than the analog channels'.

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## Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	T <sub>s</sub>	°C	-40	85
Operating Case Temperature Range	T <sub>o</sub>	°C	0	70
Relative Humidity	RH	%	0	95
Supply Voltage	Digital Transmitter	V <sub>CC,T</sub>	V	4.0
	Digital Receiver	V <sub>CC,R</sub>	V	4.0
	MCU	V <sub>MCU</sub>	V	4.0
	Video Receiver	V <sub>DD</sub>	V	10.8
Damaged Threshold	Digital Receiver	-	dBm	5
	Video Receiver	-	dBm	5
Lead soldering temperature	-	°C	-	260
Lead soldering duration	-	S	-	10
Bending Radius of pigtail fiber	-	mm	30	-
Tensile force on pigtail	-	kg	1.0	-
RF Connector	-		SMB -Jack	
Fiber Connector	-		SC/APC	

## Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Temperature Range	T <sub>o</sub>	°C	0	-	70
Supply Voltage	Digital Transmitter	V <sub>CC,T</sub>	V	+3.13	+3.47

# GPON ONU Triplexer Transceiver

	Digital Receiver	$V_{CC\_R}$	V	+3.13	+3.3	+3.47
	MCU	$V_{MCU}$	V	+3.13	+3.3	+3.47
	Video Receiver	$V_{DD}$	V	+10.8	+12	+13.2
Supply Current	Digital Transmitter	$I_{CC\_T}$	mA	-	-	200
	Digital Receiver	$I_{CC\_R}$	mA	-	-	120
	MCU	$I_{MCU}$	mA	-	-	20
	Video Receiver	$I_{DD}$	mA	-	-	200
Digital Transmitter Data Rate	$T_{DR}$	Gbps	-	1.25	-	
Digital Receiver Data Rate	$R_{DR}$	Gbps	-	2.5	-	
Analog Receiver Frequency	$R_{FR}$	Mhz	47	-	2600	

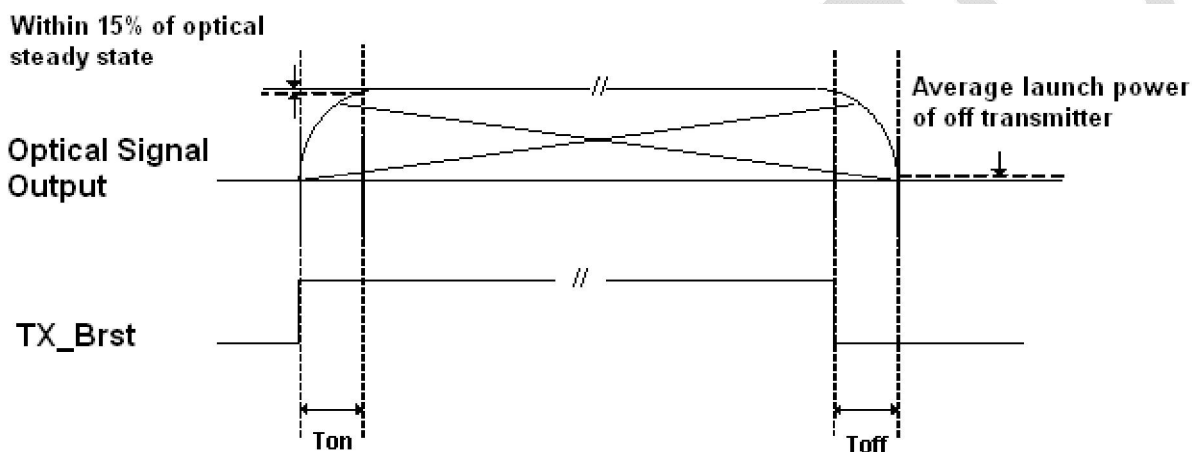


Figure 1 Timing Parameter Definitions in Burst Mode Sequence

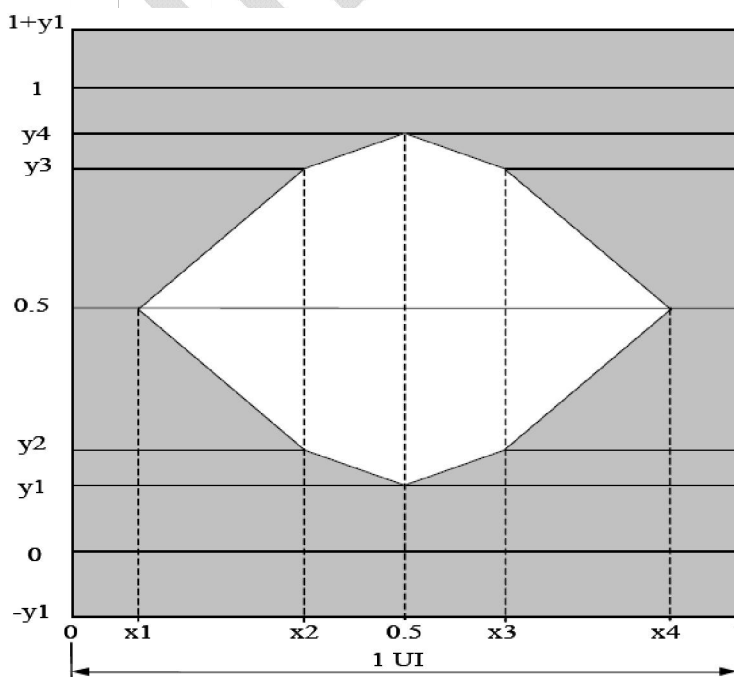


Figure 2 Transmitter Eye Mask Definitions

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## Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge(ESD) to the Electrical Pins	MIL-STD-833E Method 3015.7	Class 1(>1.5KV) Human Body Model
Electrostatic Discharge (ESD) Immunity	IEC61000-4-2	Class 2(>4.0kV)

## Ordering Information

Part No.	Specifications											Application	
	Package	Data rate Bandwidth	Laser	Optical Power	Detector	Sensitivity	Video Detector	AGC Range	RFcon	Top	Reach		Other
RTXM170	1×20	TX:1.25Gb/S	1310nm	+0.5~	1490nm	< -28dBm	1550nm	-8~	SMB	70	20Km	DDM	GPON ONU
-605	SFF	RX1:2.5 Gb/s RX2:47~2600Mhz	DFB	+5dBm	APD-TIA		PIN	+2dBm		°C			Triplexer

**Note :** The length of pigtail is normal 1000mm±100mm (the length of connector is included), but can be customer for specific requirement.