

GPON OLT CLASS

A-/B+/C+/C++/C+++

Transceiver With Digital

Diagnostic Function

Data Sheet



Features:

- Single fiber bi-directional data links asymmetric TX 2.488Gbps/RX 1.244Gbps application
- 1490nm DFB-LD Transmitter and 1310nm burst-mode APD-TIA Receiver
- Distance up to 20km
- Single 3.3V Power supply and TTL Logic Interface
- Receiver RESET, Signal Detect, RSSI function indication (RESET, RX_SD, RSSI)
- Single SC/UPC Connector Interface
- Hot Pluggable
- Compliant with MSA SFP Specification SFF-8472
- Compliant with ITU-T G.984
- Low EMI and Excellent ESD protection

Applications:

- FTTH
- Gigabit Passive Optical Networks

Product Description

The GPON OLT transceiver is small form factor pluggable module for serial optical data communications such as ITU-T G.984. It is with the SFP 20-pin connector to allow hot plug capability.

This module is designed for single mode fiber and operates at a nominal wavelength of 1490 nm.

The transmitter section uses a 1490nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.

Ordering information

Part No.	Data Rate	Laser	Fiber Type	Bail Color	Application	Optical Interface	Temp.	DDMI
TSP-GA21-43DCS	TX 2.488Gbps RX 1.244Gbps	DFB	Single-mode	Blue	Class A-	SC/UPC	C	Yes
TSP-GB21-43DCS	TX 2.488Gbps RX 1.244Gbps	DFB	Single-mode	Blue	Class B+	SC/UPC	C	Yes
TSP-GC21-43DCS	TX 2.488Gbps RX 1.244Gbps	DFB	Single-mode	Blue	Class C+	SC/UPC	C	Yes
TSP-GD21-43DCS	TX 2.488Gbps RX 1.244Gbps	DFB	Single-mode	Blue	Class C++	SC/UPC	C	Yes
TSP-GQ21-43DCS	TX 2.488Gbps RX 1.244Gbps	DFB	Single-mode	Blue	Class C+++	SC/UPC	C	Yes

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30 MHz to 6 GHz. Good system EMI design practice required to achieve Class B margins. System margins depend on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1kHz sine-wave, 80% AM, from 80 MHz to 1 GHz. No effect on transmitter/receiver performance is detectable between these limits.
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards ^{*note1}

Note1: For update of the equipment and strict control of raw materials, Trixon has the ability to supply the customized products since Sep.2008, which meets the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Trixon transceivers, because Trixon transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings^{*note2}

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T _s	-40	85	°C
Supply Voltage	VCC	0	4	V
Operating Relative Humidity	OH	5	95	%

Note2: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T _c	0		70	°C
Power Supply Voltage	VCC	3.13	3.3	3.47	V
Bit Rate			TX 2.488 RX 1.244		Gbps

Performance Specifications – Electrical

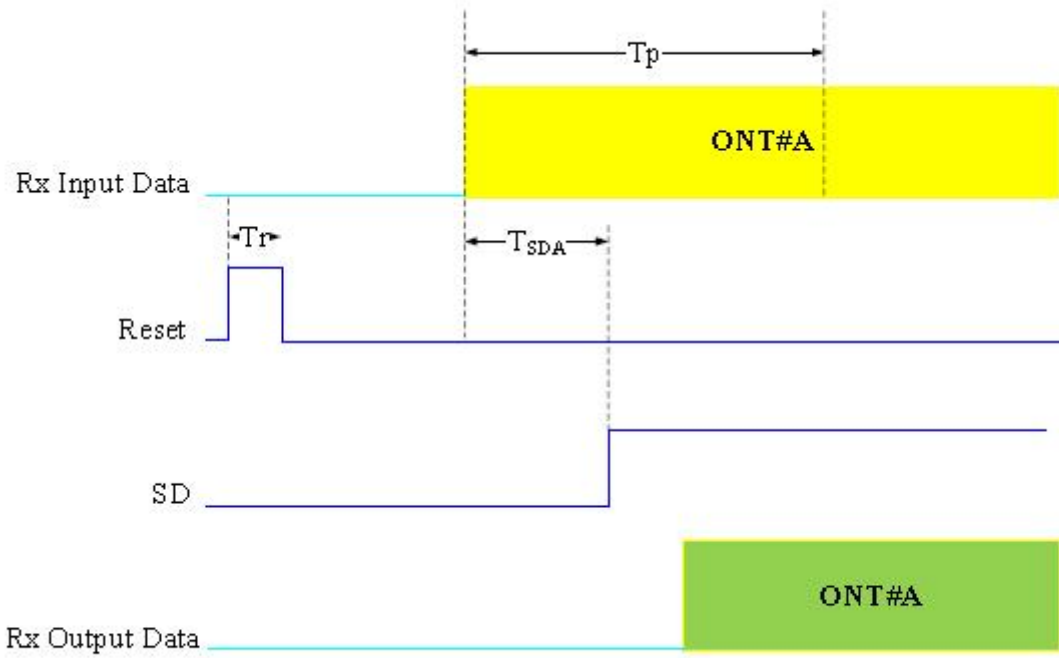
Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Transmitter						
LVPECL Inputs Voltage (Differential)	V _{in}	200		1600	mVpp	AC coupled inputs
Input Impedance (Differential)	Z _{in}	90	100	110	ohm	
Tx_DISABLE Input Voltage – High		2.0		VCC	V	
Tx_DISABLE Input Voltage – Low		0		0.8	V	
Tx_FAULT Output Voltage – High		2.4		VCC	V	
Tx_FAULT Output Voltage – Low		0		0.4	V	
Receiver						
LVPECL Outputs Voltage (Differential)	V _{out}	400		1600	mVpp	DC coupled outputs
Output Impedance (Differential)	Z _{out}	90	100	110	ohm	
Signal Detect Voltage – High		2.4		VCC	V	
Signal Detect Voltage – Low		0		0.4	V	
Reset width	T _{reset}	16			bits	
Reset-Low		0		0.4	V	
Reset-High		2.4		VCC	V	
RSSI Trigger-High		2.0		VCC	V	
RSSI Trigger-Low		0		0.8	V	

Timing Specifications

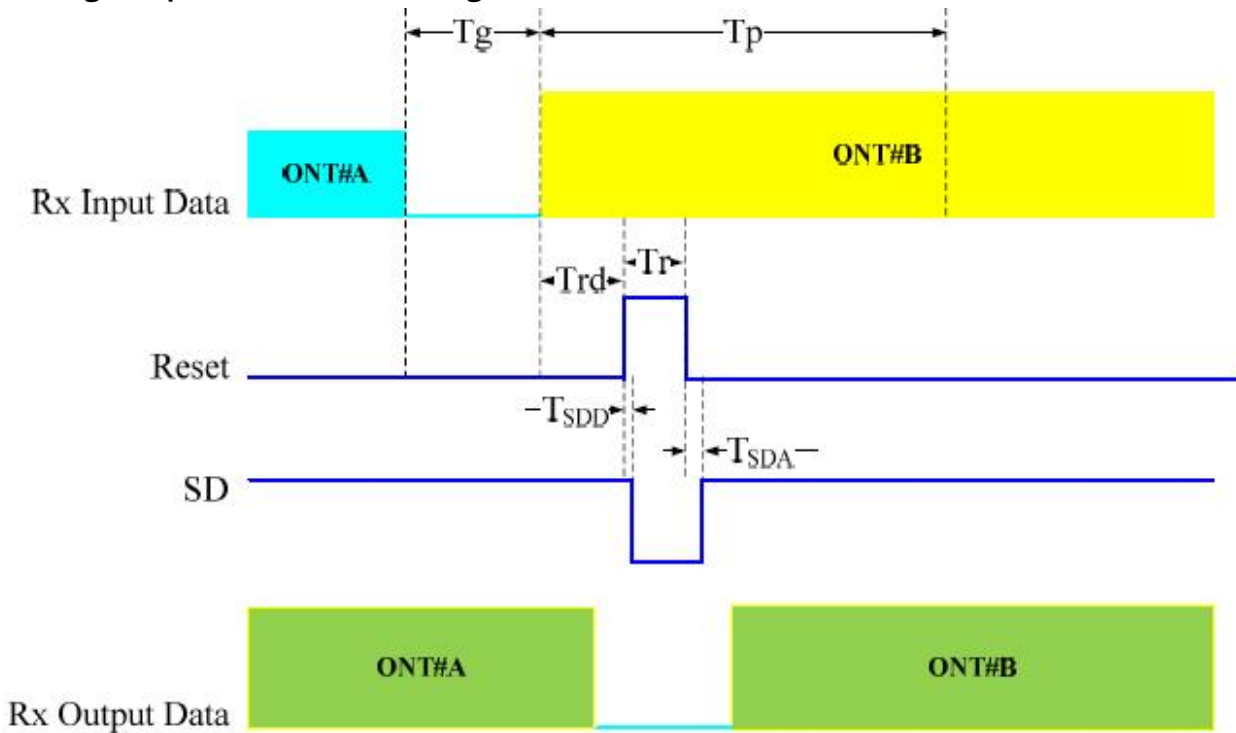
Parameter	Symbol	Min	Typ.	Max	Unit
TX Disable Assert Time	T _{off}			10	us
TX Disable Negate Time	T _{on}			1	ms
Time to initialize, include reset of TX_FAULT	T _{int}			300	ms
TX_FAULT from fault to assertion	T _{fault}			100	us
Signal Detect Assert Time				100	ns

Signal Detect De-Assert Time		12.8	ns
Guard Time	T_g	25.6	ns
Reset Pulse Width	T_r	12.8	ns
Reset Delay	T_{rd}	12.8	ns
RSSI Trigger Delay (T_{td})	T_{td}	25	ns
RSSI Trigger Pulse Width (T_w)	T_w	500	
Receiver Preamble Time (T_p)	T_p	140	ns
I2C Access Prohibited Time		100	500 us

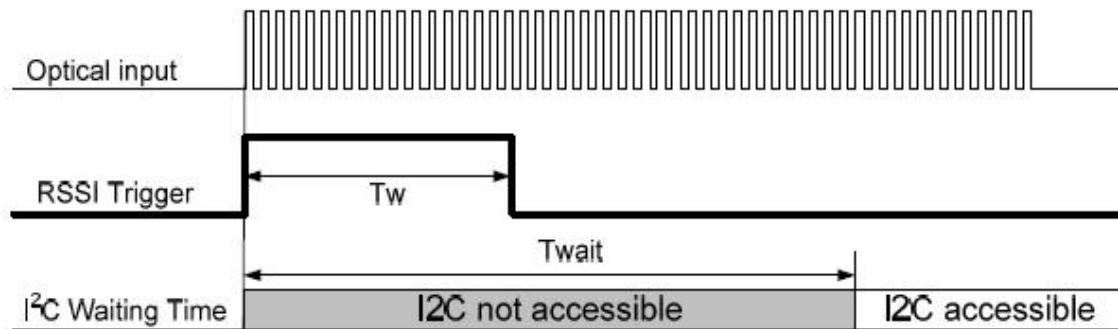
Timing Sequence for Ranging Mode



Timing Sequence for Working Mode



Fast RSSI Sequence



Performance Specifications – Optical

(CLASS A-)

Parameter	Symbol	Min	Typ.	Max	Unit
9µm Core Diameter SMF			20		Km
Data Rate			TX 2.488 RX 1.244		Gbps
Transmitter					
Centre Wavelength	λ_c	1480	1490	1500	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power	AOP	-4		0	dBm
Extinction Ratio	ER	8.2			dB
Average Power of OFF Transmitter				-39	dBm
Transmitter Dispersion Penalty	TDP			1	dB
Output Optical Eye		Compliant with ITU-T G.984.2			
Receiver					
Centre Wavelength		1260	1310	1360	nm
Sensitivity ^{*note3}	SEN			-22	dBm
Receiver Overload	SAT	0			dBm
Optical Return Loss				-20	dB
SD De-Assert				-32	dBm
SD Assert		-45			dBm
SD Hysteresis		0.5		4	dB

(CLASS B+)

Parameter	Symbol	Min	Typ.	Max	Unit
9µm Core Diameter SMF			20		Km
Data Rate			TX 2.488 RX 1.244		Gbps
Transmitter					
Centre Wavelength	λ_c	1480	1490	1500	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm

Average Output Power	AOP	+1.5	+5	dBm	
Extinction Ratio	ER	8.2		dB	
Average Power of OFF Transmitter			-39	dBm	
Transmitter Dispersion Penalty	TDP		1	dB	
Output Optical Eye	Compliant with ITU-T G.984.2				
Receiver					
Centre Wavelength		1260	1310	1360	nm
Sensitivity* ^{note3}	SEN			-28	dBm
Receiver Overload	SAT	-8			dBm
Optical Return Loss				-20	dB
SD De-Assert				-32	dBm
SD Assert		-45			dBm
SD Hysteresis		0.5	4		dB

(CLASS C+)

Parameter	Symbol	Min	Typ.	Max	Unit
9µm Core Diameter SMF			20		Km
Data Rate			TX 2.488 RX 1.244		Gbps
Transmitter					
Centre Wavelength	λ_c	1480	1490	1500	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power	AOP	+3		+7	dBm
Extinction Ratio	ER	8.2			dB
Average Power of OFF Transmitter				-39	dBm
Transmitter Dispersion Penalty	TDP			1	dB
Output Optical Eye	Compliant with ITU-T G.984.2				
Receiver					
Centre Wavelength		1260	1310	1360	nm
Sensitivity* ^{note3}	SEN			-30	dBm
Receiver Overload	SAT	-12			dBm
Receiver Burst Mode Dynamic Range		15			dB
Optical Return Loss				-20	dB
SD De-Assert				-33	dBm
SD Assert		-45			dBm
SD Hysteresis		0.5	4		dB

(CLASS C++)

Parameter	Symbol	Min	Typ.	Max	Unit
9µm Core Diameter SMF			20		Km
Data Rate			TX 2.488 RX 1.244		Gbps
Transmitter					
Centre Wavelength	λ_c	1480	1490	1500	nm

Spectral Width (-20dB)	$\Delta\lambda$		1	nm
Average Output Power	AOP	+5	+9	dBm
Extinction Ratio	ER	8.2		dB
Average Power of OFF Transmitter			-39	dBm
Transmitter Dispersion Penalty	TDP		1	dB
Output Optical Eye	Compliant with ITU-T G.984.2			

Receiver

Centre Wavelength		1260	1310	1360	nm
Sensitivity* ^{note3}	SEN			-32	dBm
Receiver Overload	SAT	-12			dBm
Receiver Burst Mode Dynamic Range		15			dB
Optical Return Loss				-20	dB
SD De-Assert				-33	dBm
SD Assert		-45			dBm
SD Hysteresis		0.5		4	dB

(CLASS C+ + +)

Parameter	Symbol	Min	Typ.	Max	Unit
9 μ m Core Diameter SMF			20		Km
Data Rate			TX 2.488 RX 1.244		Gbps

Transmitter

Centre Wavelength	λ_c	1480	1490	1500	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power	AOP	+7		+10	dBm
Extinction Ratio	ER	8.2			dB
Average Power of OFF Transmitter				-39	dBm
Transmitter Dispersion Penalty	TDP			1	dB
Output Optical Eye	Compliant with ITU-T G.984.2				

Receiver

Centre Wavelength		1260	1310	1360	nm
Sensitivity* ^{note3}	SEN			-33	dBm
Receiver Overload	SAT	-12			dBm
Receiver Burst Mode Dynamic Range		15			dB
Optical Return Loss				-20	dB
SD De-Assert				-33	dBm
SD Assert		-45			dBm
SD Hysteresis		0.5		4	dB

Note3: Minimum average optical power measured at the BER less than 1E-10, back to back. The measure pattern is PRBS 2²³-1+72CID@1244Mbps.

Pin Function Definitions

Pin No.	Symbol	Level / Logic	Description
1	VeeT		Module Transmitter Ground
2	Tx_Fault	LVTTL-O	Module Transmitter Fault
3	Tx_DIS	LVTTL-I	Laser output is disabled when this pin is asserted high or left unconnected
4	SDA	LVTTL-I	2-Wire Serial Interface Data Line
5	SCL	LVTTL-I/O	2-Wire Serial Interface Clock
6	MOD_ABS	LVTTL-O	Module Absent, connected to ground in the module
7	RX_Reset	LVTTL-I	Receiver RESET signal
8	RX_SD	LVTTL-O	Receiver Signal Detected Indication
9	RSSI_TRIG	LVTTL-I	Receiver RSSI Trigger signal
10	VeeR		Module Receiver Ground
11	VeeR		Module Receiver Ground
12	RD-	LVPECL-O	Receiver Inverted Data Output
13	RD+	LVPECL-O	Receiver Non-Inverted Data Output
14	VeeR		Module Receiver Ground
15	VccR		Module Receiver 3.3V Supply
16	VccT		Module Transmitter 3.3V Supply
17	VeeT		Module Transmitter Ground
18	TD+	LVPECL-I	Transmitter Non-Inverted Data Input
19	TD-	LVPECL-I	Transmitter Inverted Data Input
20	VeeT		Module Transmitter Ground

Digital Diagnostic Specifications

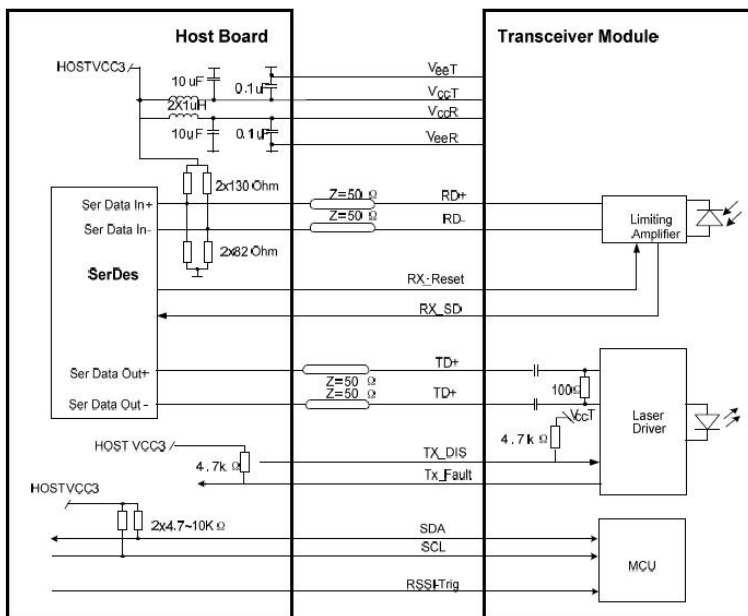
Parameter	Min	Typ	Max	Units	Ref
Monitor accuracy					
Internally measured transceiver temperature			±3	°C	
Internally measured transceiver supply voltage			±3%	mV	
Measured TX bias current			±10	%	
Measured TX output power			±1	dB	
Measured RX received average optical power			±3	dB	

Digital Diagnostic Functions:

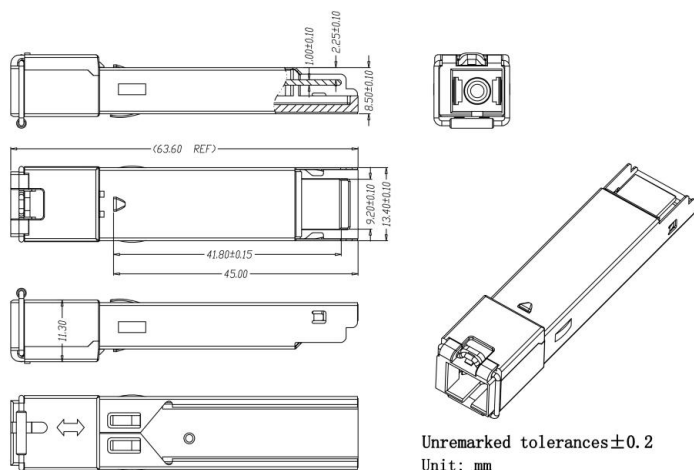
- 1) GPON OLT transceiver supports the 2-wire serial communication protocol as defined in SFF-8472: in which defines a 256-byte memory map in EEPROM at 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface be assigned with 8 bit address 1010001X (A2h). Additionally, SFP transceivers provide a unique digital diagnostic monitoring interface (DDMI), which allows real-time access to product operating parameters such as transceiver supply voltage, transceiver temperature, transmitted optical power, laser bias current and received optical power. It also defines alarm and warning threshold, which alerts end-users when particular operating parameters are outside of factory setting.

- 2) When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into those segments of the EEPROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-DCRectional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.
- 3) Digital diagnostics for the TSP-GB21-43DCS are internally calibrated by default: Calibration and alarm/warning threshold data is written during device manufacturing.

Recommended Circuit



Mechanical Dimension



Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

Obtaining Document

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Notice

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Applications that are described herein for any of the optical link products are for illustrative purposes only. Trixon makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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