Finisar

Preliminary Product Specification

GPON ONU Class B+ Pigtailed RoHS Compliant Transceiver

FTGN3025 Q1TAx

PRODUCT FEATURES

- Bi-directional transceivers operating at 2.488 Gbit/s downstream, 1.244 Gbit/s upstream
- Integrated thin film filters supporting triple-play at 1310 nm digital Tx, 1490 nm digital Rx and 1555 nm analog Rx
- Burst-mode transmitter with DFB laser
- Continuous mode APD digital receiver and analog PIN receiver for video overlay
- 2”x2” package size with fiber pigtailed SC/APC connector in compliant with GR326
- 3.3V supply for digital and 12V for analog
- Industrial operating temperature range: -40°C to 85°C
- Built-in digital diagnostic functions

APPLICATIONS

- GPON ONU Tri-plexer
- ITU-T G.984.2 Class B+

Finisar’s FTGN3025Q1TAx bi-directional transceivers comply with the ITU-T GPON standard1[1] G984.2 Class B+ for operation at 2.488 Gbit/s downstream and 1.244 Gbit/s upstream. The tri-plexer function provides burst-mode transmitter at 1310nm, digital receiver at 1490 nm and analog receiver at 1555nm for video overlay. Digital diagnostics functions are available via the 2-wire serial bus specified in the SFP MSA.

PRODUCT SELECTION

FTGN3025Q1TAx		
x	S	Standard Pigtail Length

I. Pin Descriptions

Pin	Symbol	Name/Description	I/O Description	Ref.
1	GND	Ground		
2	GND	Ground		
3	Rx Vcc	Digital Rx Power Supply (+3.3V)		
4	SD	Signal Detect	LVTTL Output, Active HIGH, host to implement pull up resistor. Recommended value of 4.7-10KΩ	
5	RxD +	Rx Data Out Positive	LVPECL Output, AC-coupled, 100Ω differential termination recommended on host Board	
6	RxD -	Rx Data Out Negative	LVPECL Output, AC-coupled, 100Ω differential termination recommended on host Board	
7	BEN +	Burst Enable Positive	LVPECL Output, DC-coupled, Internal 100Ω differential termination	
8	BEN -	Burst Enable Negative	LVPECL Input, DC-coupled, Internal 100Ω differential termination	
9	GND	Ground		
10	TxD +	Tx Data In Positive	LVPECL Input, DC-coupled, Internal 100Ω differential termination	
11	GND	Ground		
12	TxD -	Tx Data In Negative	LVPECL Input, DC-coupled, Internal 100Ω differential termination	
13	Tx Vcc	Digital Tx Power Supply (+3.3V)		
14	SDA	Serial Data	LVTTL, host to implements pull up resistor. Recommended value of 4.7-10KΩ	
15	SCL	Serial Clock	LVTTL, host to implements pull up resistor. Recommended value of 4.7-10KΩ	
16	INT	Interrupt, Module Fail Detect	LVTTL Output, Active LOW, host to implement pull up resistor. Recommended value of 4.7-10KΩ	
17	A_Vcc	Analog Rx Power Supply (+12V)		
18	D_Vcd	Digital Power Supply (+3.3V)		
19	Reset	Reset	LVTTL, Active LOW, Implemented internal to the module pull up resistor of 50KΩ; Host to implement 10KΩ pull downistor	
20	GND	Ground		
21	RF GND	RF Ground		
22	RF OUT	RF Output	75Ω Termination	
23	RF GND	RF Ground		

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage (+3.3V)	Vcc	-0.5		4.0	V	
Maximum Supply Voltage (+12V)	Vcc	0		15	V	
Storage Temperature	T_S	-40		85	°C	
Case Operating Temperature	T_{OP}	-40		85	°C	1
Relative Humidity	RH	0		95	%	2
Fiber Output Power (no damage)	P_f			20	mW	
Optical Input Power (no damage)	P_{IN}			5	dBm	

Notes:
1. At the top center of the module
2. Non condensing

III. Electrical Characteristics (T_{OP} = -40 to 85 °C, V_{CC} = 3.1 to 3.5 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage -Digital (+3.3V)	Vcc	3	3.3	3.6	V	
Supply Voltage – Analog	VccA	11.4	12	12.6	V	
Supply Current – digital circuit	IccD			330	mA	
Supply Current – analog circuit	IccA			250	mA	
Power Dissipation – digital circuit				1260	mW	
Power Dissipation – analog circuit	P_A		1080	2250	mW	
Power Supply Rejection	PSNR			30	mVpp	1
Digital Transmitter						
Input differential impedance	R_{in}		100		Ω	
Differential Input Swing for Transmit Data and Burst Transmit Enable	Vin,pp	200		1600	mV	
Data rise/fall time	t_r			200	ps	2
Duty Cycle	R_{Duty}	95	100	105	%	3
Common Mode Input Voltage		1.40		Vcc-1.0	V	
Burst Transmit Enable/Disable Assert Time	BEN			12.8	ns	4
Digital Receiver						
Differential Output Swing for Receive Data	Vout,pp	300		1200	mV	
Data rise/fall time	t_r			160	ps	
SD Fault	$V_{SD\ fault}$	0		0.5	V	
SD Normal	$V_{SD\ norm}$	2		Vcc	V	
Jitter Tolerance			G.984.2		UI	
Jitter Transfer			G.984.2		dB	

Notes:
1. Upto 10MHz
2. 20 – 80 % of peak to peak amplitude
3. Rduty = (A/0.5*B))*100

4. 16 bits data at 1244.16Mb/s

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage -Digital (+3.3V)	Vcc	3.1	3.3	3.5	V	
Supply Voltage – Analog	VccA	11.4	12	12.6	V	
Supply Current – digital circuit	IccD			330	mA	
Supply Current – analog circuit	IccA			250	mA	
Power Dissipation – digital circuit				1260	mW	
Power Dissipation – analog circuit	P_A		1080	2250	mW	
Power Supply Rejection	PSNR			30	mVpp	1
Digital Transmitter						
Input differential impedance	R_{in}		100		Ω	
Differential Input Swing for Transmit Data and Burst Transmit Enable	Vin,pp	200		1600	mV	
Data rise/fall time	t_r			200	ps	2
Duty Cycle	R_{Duty}	95	100	105	%	3
Common Mode Input Voltage		1.40		Vcc-1.0	V	
Burst Transmit Enable/Disable Assert Time	BEN			12.8	ns	4
Digital Receiver						
Differential Output Swing for Receive Data	Vout,pp	300		1200	mV	
Data rise/fall time	t_r			160	ps	
SD Fault	$V_{SD\ fault}$	0		0.5	V	
SD Normal	$V_{SD\ norm}$	2		Vcc	V	
Jitter Tolerance			G.984.2		UI	
Jitter Transfer			G.984.2		dB	

Notes:

5. Upto 10MHz
6. 20 – 80 % of peak to peak amplitude
7. Rduty = (A/0.5*B))*100
8. 16 bits data at 1244.16Mb/s

IV. Optical Characteristics (T_{OP} = -40 to 85 °C, V_{CC} = 3.1 to 3.5 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Cross-talk 1310nm Tx to 1490 Rx				-47	dB	
Cross-talk 1310nm Tx to 1555nm Rx				-47	dB	
Isolation 1490nm ext. to 1555nm Rx		30			dB	
Isolation 1555nm ext. to 1490nm Rx		30			dB	
Back reflection at 1310 nm				-20	dB	
Back reflection at 1490 nm				-20	dB	
Back reflection at 1555 nm				-20	dB	
Transmitter						
Data Rate	BR		1244.16		Mb/s	1
Optical Wavelength	λ	1260	1310	1360	nm	
Spectral Width (-20dB)	σ			1	nm	
Output Optical Power	P_{OUT}	0.5		5	dBm	2
Optical Extinction Ratio	ER	10			dB	
Transmitter Ouput Power at Tx off				-45	dBm	
Optical Rise/Fall Time	t_r/ t_f			250	ps	3
Digital Receiver						
Data Rate	BR		2488.32		Mb/s	4
Optical Center Wavelength	λ_C	1480	1490	1500	nm	
Average Rx Sensitivity	R_{SENS1}		-30	-28	dBm	5
Overload	$R_{overload}$	-8			dBm	
Optical Input Return Loss	ORL	20			dB	
SD Assert	SD_A			-28	dBm	
SD De-Assert	SD_D	-38			dBm	
SD Hysteresis		0.5			dB	
SD Asser/De-assert time				100	µs	
Rx Power D.D. Accuracy				±3	dB	
Analog Receiver						
Operating Wavelength	λ_A	1550	1555	1560	nm	
Frequency Range		54		870	MHz	
Automatic gain control time constant	T_{AGC}	0.5			s	6
Channel Bandwidth				4	MHz	
Channel Spacing				6	MHz	
Channel Plan	40 Analog channels at 54-550MHz; 63 Digital chanels 6dB below analog (225-870MHz)					
Optical Return Loss	ORL	20			dB	
Optical Input Power	P_{IN}	-8		2	dBm	7
Optical modulation index (per channel)	OMI		4.3		%	
RF Output Power: 55 MHz 550 MHz 870 MHz			 18.5 20.1 22.5		 dBmV/ channel	
Responsivity (Target)	R	0.8			A/W	
EINC (optical thermal noise)				6.5	pA/rtHz	
RF Output Flatness		0		4	dB	
RF Output Return Loss	S_{22}	14			dB	
Output Impedance	Ω		75			
Composite Second Order Distortion	CSO			-55	dBc	

Composite Triple Beat	CTB			-55	dBc	
Carrier to Noise Ratio	CNR	46			dB	

Notes:
1. Line code is Scrambled NRZ, Burst Mode
2. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations. Please refer to ITU-T G.984.2 for the eye mask
3. Unfiltered, 20-80%
4. Line code is Scrambled NRZ, Continuous Mode
5. With worst-case extinction ratio. Measured with a PRBS 2^{23}-1 test pattern. BER is 10^{-10}
6. This requirement could be substitude by the AGC time constant or vice versa
7. Target is 10dB dynamic range

V. Fiber Pigtail Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Fiber Type			SMF-28E			
Jacket - Tight Buffer			900		μm	
Pigtail Length		560	620	640	mm	
Connector Type			SC/APC			
Bending Radius of fiber		25			mm	
Tensile Force on Pigtail				2	N	

Notes:

VI. Environmental Specifications

Industrial operating temperature:

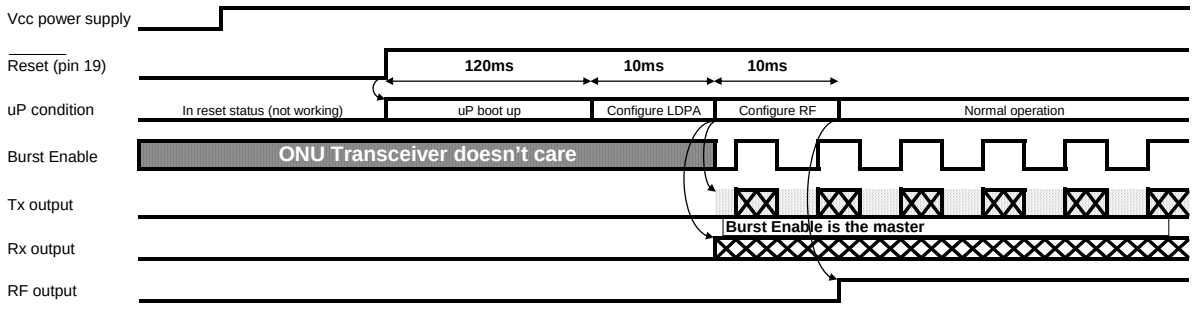
Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T_{op}	-40		85	°C	
Storage Temperature	T_{sto}	-40		85	°C	

VII. Regulatory Compliance

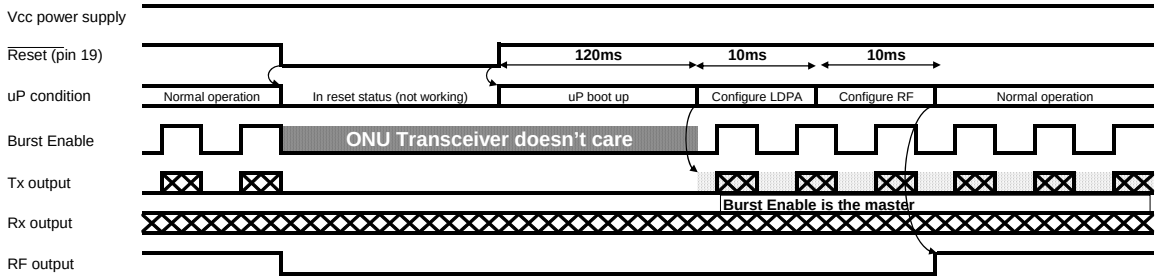
Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation upon request.

VIII. Reset Timing

Reset timing diagram during module boot up



Reset timing diagram during normal operation



IX. Digital Diagnostic Functions

Finisar FTGN3025Q1TAx transceivers support the 2-wire serial communication protocol as defined in the SFP MSA[1]. It is very closely related to the E^{2}PROM defined in the GBIC standard, with the same electrical specifications.

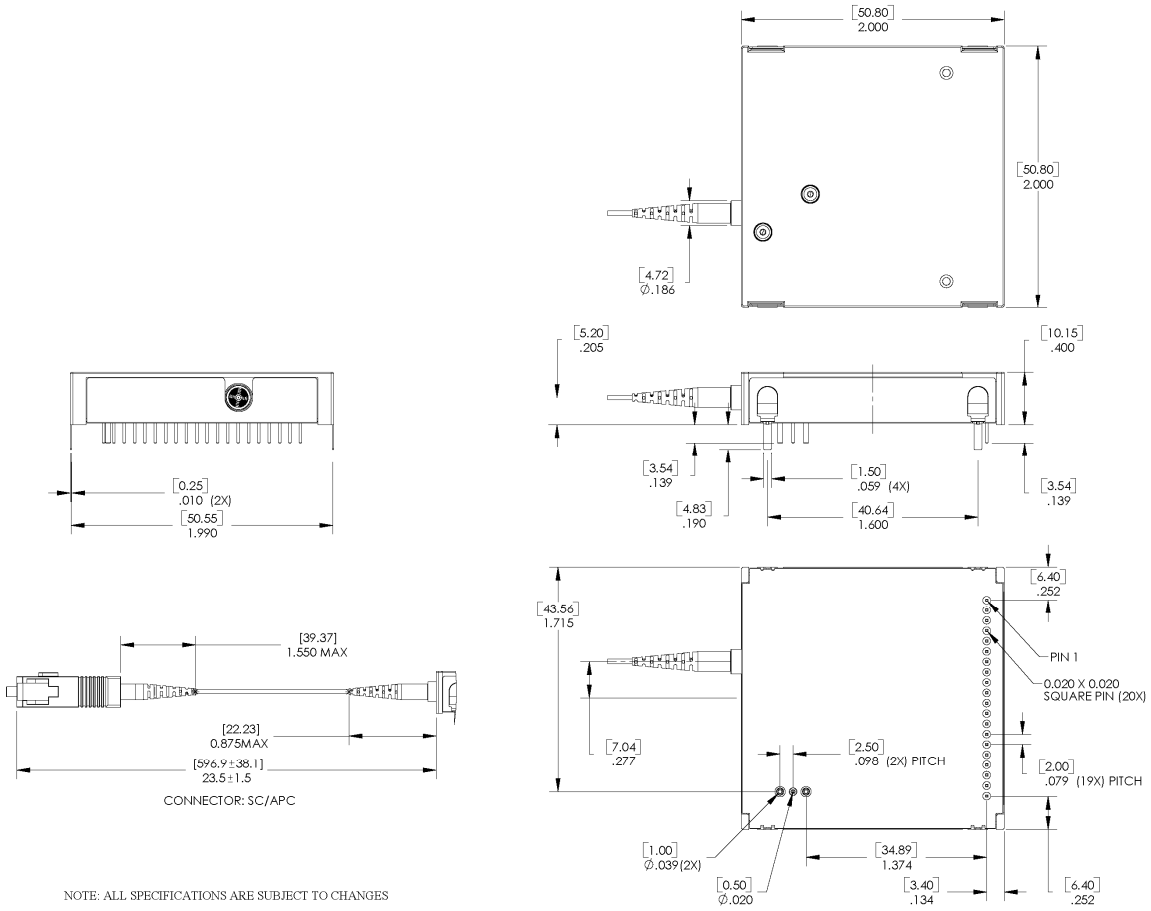
The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E^{2}PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional 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.

For more information, please contact Finisar.

X. Mechanical Specifications

Module label to be:

1) affixed at the opposite end of the fiber pigtail exit
2) include vendor part number and serial number, manufacturing date code, rev level
3) include regulatory compliance information



NOTE: ALL SPECIFICATIONS ARE SUBJECT TO CHANGES

FTGN3025Q1TAx

XI. References

1. Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) layer specification. ITU-T G.984.2 Class B+, and amendments dated February 2006.

2. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000. Documentation is currently available at Finisar upon request.

XII. For More Information

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