

Product Specification Sheet

TISG4325S-CD20TC

RoHS Compliant GPON SFP OLT C+ Optical Transceiver



PRODUCT FEATURES

- ◆ Single Fiber Transceiver with single mode SC receptacle
- ◆ 1490nm continuous-mode transmitter with DFB laser
- ◆ 1310nm burst-mode receiver with APD-TIA
- ◆ Single 3.3V power supply
- ◆ Reset burst-mode receiver design
- ◆ Burst mode signal detect output which is LVTTTL compatible.
- ◆ Burst mode received signal strength indication (RSSI) output
- ◆ 20Km Reach 28dB link budget
- ◆ Complies with ITU-T G984.2 Class C+
- ◆ Digital diagnostic interface compliant with SFF-8472 Rev 9.4 ,
- ◆ Complies with RoHS directive (2002/95/EC)
- ◆ Operating case temperature: Standard : 0 to +70°C

APPLICATIONS

- ◆ Gigabit Passive Optical Networks (G-PON) - OLT side

PRODUCT DESCRIPTIONS

The TISG4325S-CD20TC transceiver is the high performance module for single fiber by using 1490nm continuous-mode transmitter and 1310nm burst-mode receiver. It is optical line terminal(OLT) for ITU-T G984.2. The optical transceiver is compliant with the Small Form- Factor Pluggable (SFP) Multi-Source Agreement (MSA).

The transmitter section uses a 1490nm DFB LD with automatic power control (APC) function and temperature compensation circuitry to ensure stable extinction ratio over all operating temperature range. and is Class I laser compliant IEC825 and CDRH standards. The receiver has a hermetically packaged burst-mode APD-TIA (trans-impedance amplifier) pre-amplifier and a burst-mode limiting amplifier with LVPECL compatible differential outputs.

The receiver also includes the function of burst mode signal detect output and fast RSSI output which is enabled by a trigger. When the burst optical power is on, the receiver outputs high level; when the burst optical power is off, the receiver outputs low level. Fast RSSI function can satisfy more severe timing demand to monitor the power from any ONU.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Temperature	Tst	-40	+85	°C	
Operating Case Temperature	Tc	0	70	°C	
Relative Humidity	RH	5	90	%	
Input Voltage	-	GND	Vcc	V	
Power Supply Voltage	Vcc-Vee	0	3.6	V	

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Supply Voltage	Vcc	3.13	3.3	3.47	V	
Supply Current	Icc			500	mA	
Operating Case Temp.	Tc	0		70	°C	

ELECTRICAL INPUT/OUTPUT CHARACTERISTICS

- Transmitter

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Data input Swing Differential	V_{IN}	200		2400	mV	1
Tx Disable	Disable	2.0		V_{CC}	V	
	Enable	0		0.8		
Tx Fault	Fault	2.0		V_{CC}	V	
	Normal	0		0.8		
Input Diff. Impedance	Z_{IN}	90	100	110	Ω	

- Receiver

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Rx LOS Output	H	V_{OH}	$V_{CCR}-1.05$	$V_{CCR}-0.85$	V	2
	L	V_{OL}	$V_{CCR}-1.84$	$V_{CCR}-1.60$		
BRST_Det	H	V_{DETH}	2.4	V_{CC}		
	L	V_{DETL}	0	0.4		

Note 1) PECL input, internally AC-coupled and terminated

Note 2) Internally DC-coupled.

OPTICAL CHARACTERISTICS

- Transmitter

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Operating Wavelength		1480		1500	nm	
Ave. output power (Enabled)	P_o	+3		+7	dBm	1
Data Rate			2.5		Gb/s	
Average Launch Power-OFF Transmitter	P_{off}			-40	dBm	
Rise/Fall time (20%~80%)	T_r/T_f			160	ps	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	10			dB	
Spectral Width	$\Delta\lambda$		0.4	1	nm	
Output Optical Eye	Compliant with G984.2					

- Receiver

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Data Rate			1.25		Gb/s	
Operating Wavelength	λ_c	1260		1360	nm	
Sensitivity	P_{sen}			-32	dBm	2
Receiver Overload	Sat	-8			dBm	2
Receiver CID Tolerance		72			Bit	
Receiver Reflectance				-20	dB	
Burst Detect De-assert	BSD_D	-45			dBm	
Burst Detect Assert	BSD_A			-34	dBm	
Burst Detect Hysteresis		1		6	dBm	
Receiver Power DDM (RSSI) Error	RXDDM			+/-3	dBm	3

Note 1) The optical power is launched into SMF.

Note 2) Measured with a PRBS $2^{23}-1$ test pattern @1250Mbps, $BER \leq 1 \times 10^{-10}$.

Note 3) RSSI DDM working range is between -8 to -28 dBm. RSSI DDM accuracy is better than +/- 3dB for input power levels between -12 to -28 dBm, the accuracy reduces to +/- 5 dBm for other input power levels.

DIAGNOSTIC SPECIFICATION

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
Tx Power	1 to 8	dBm	±3dB	Internal / External
RX Power	-34 to -9	dBm	±3dB	Internal / External

TIMING CHARACTERISTICS FOR DIGITAL RSSI

Parameter	Symbol	Min.	Typ	Max.	Unit
Trigger Delay	Td	30			ns
Sample Time	Ts	300			ns
Internal I2C Delay	TI2C			500	ns
Digital RSSI		Figure 1			

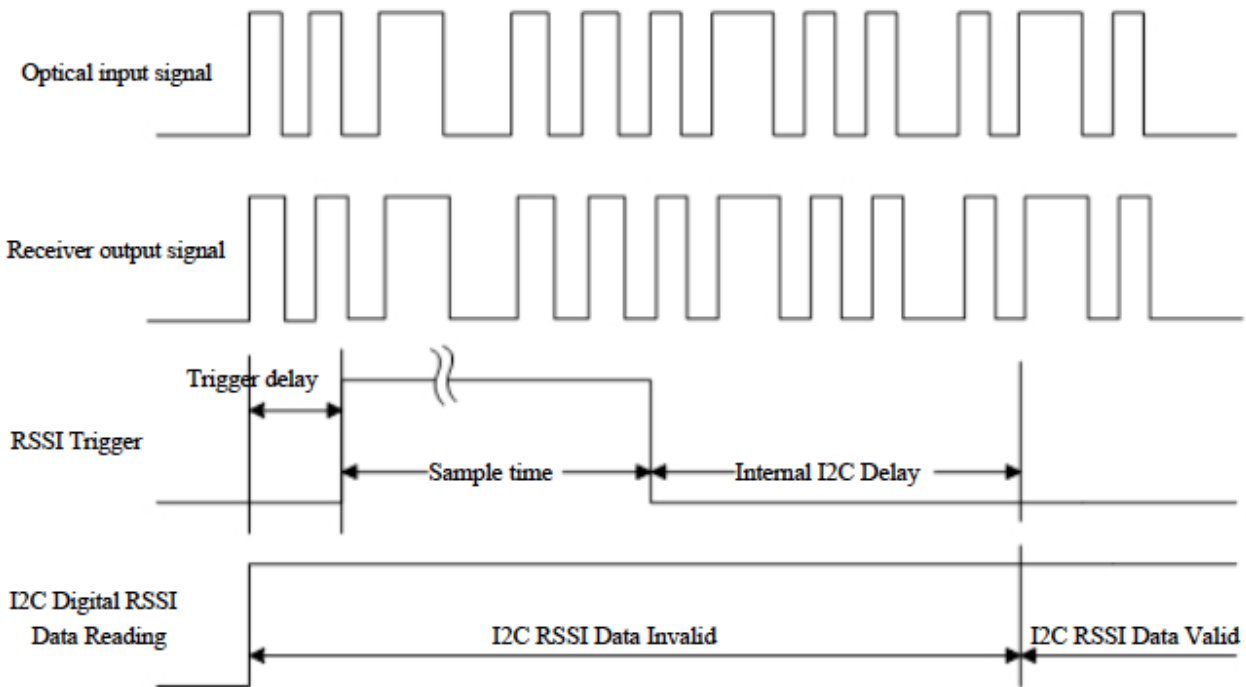


Figure 1. Digital RSSI Timing

TIMING CHARACTERISTICS FOR RESET

Parameter	Symbol	Min.	Typ	Max	Unit
RESET Input Signal	Reset		LVTTL		

(RESET+)					
RESET Signal Width	T_r		24		Bits
Guard Timing	T_g	32			Bits
Preamble Timing	T_p	44			Bits
Reset Delay	Δt			$T_g - T_r$	Bits
Burst Signal Detect On	T_{BSD_On}			20	ns
Burst Signal Detect Off	T_{BSD_Off}			20	ns
IRESET Timing			Figure 2		

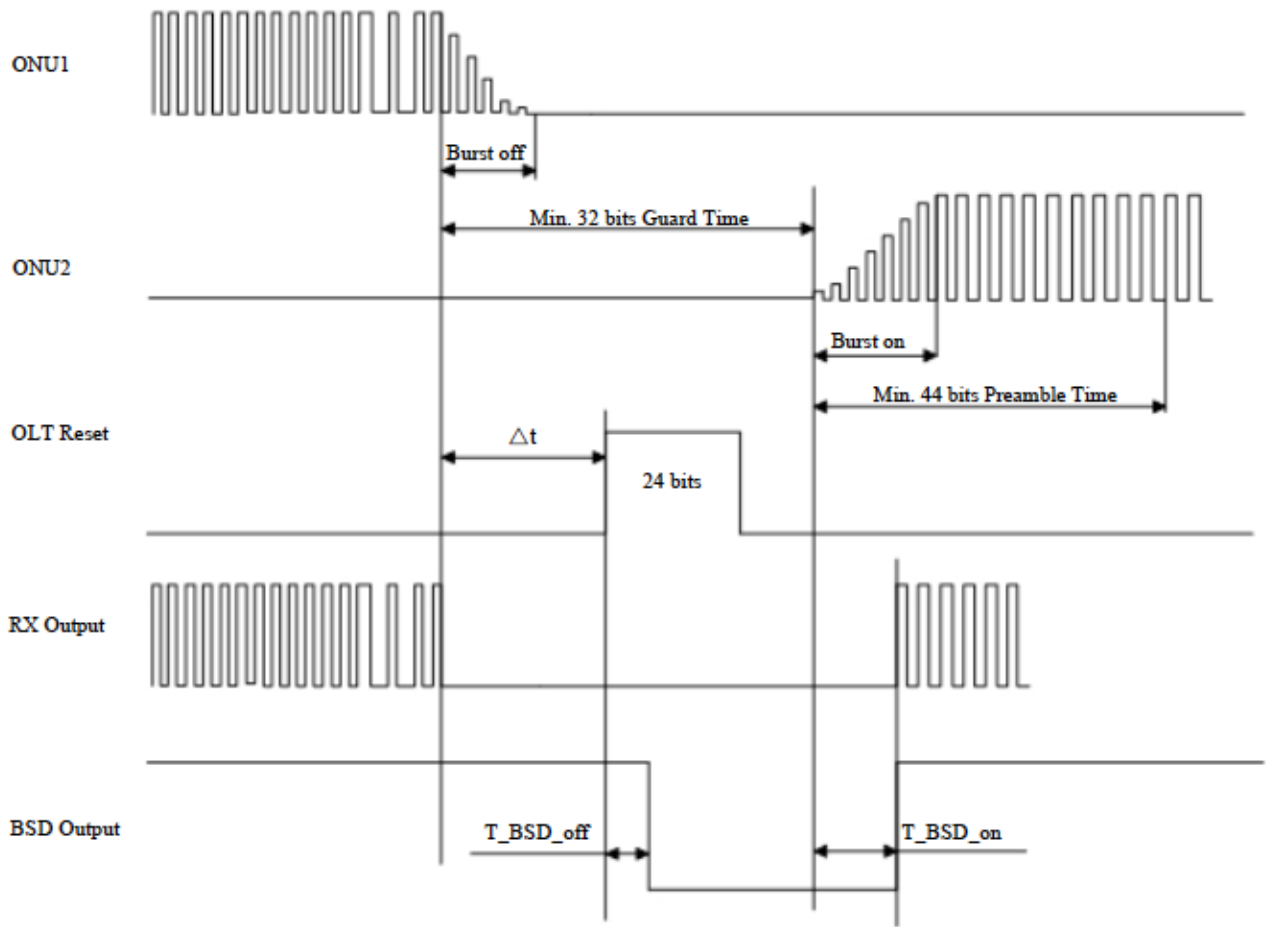
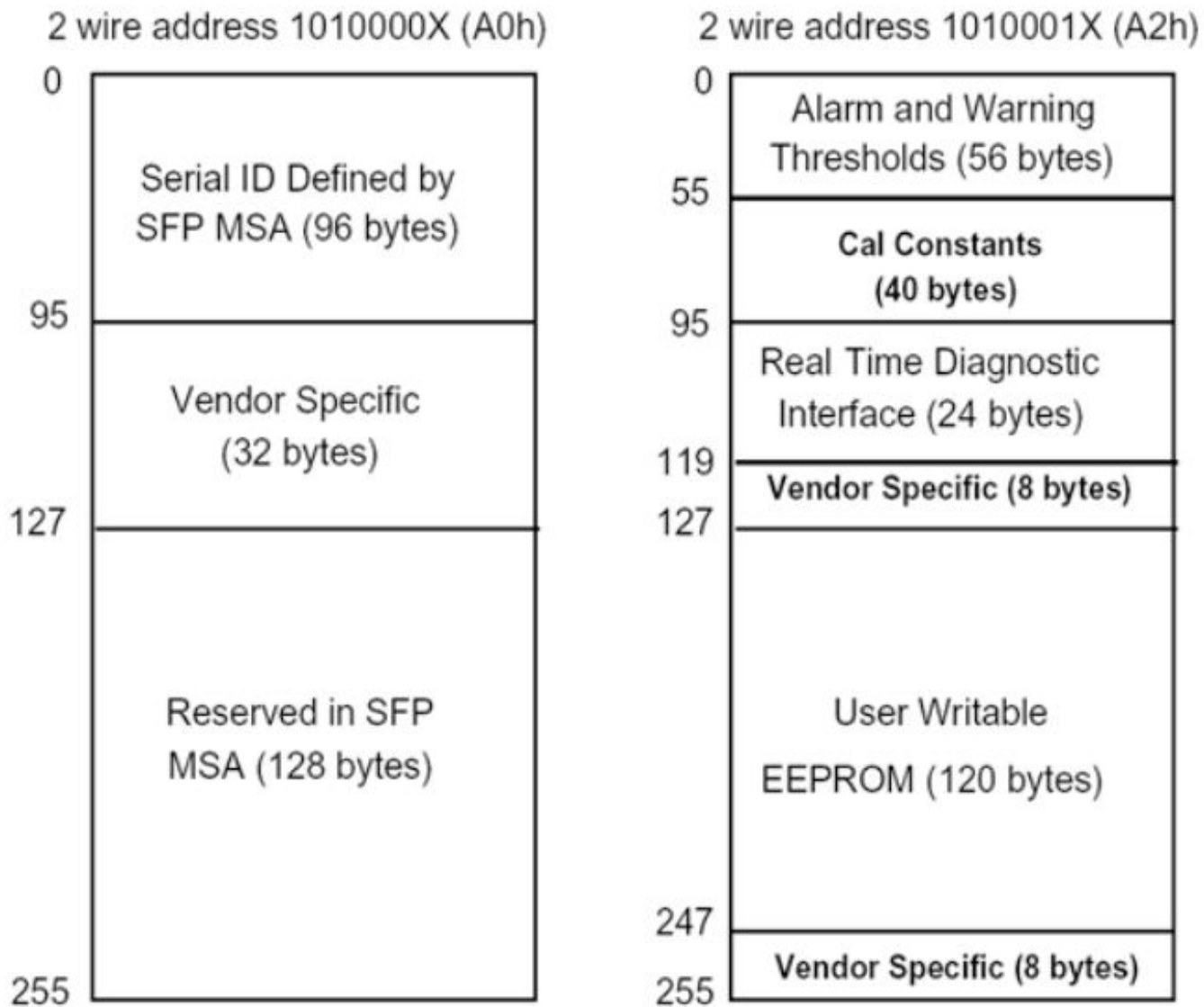


Figure 2 Reset Timing

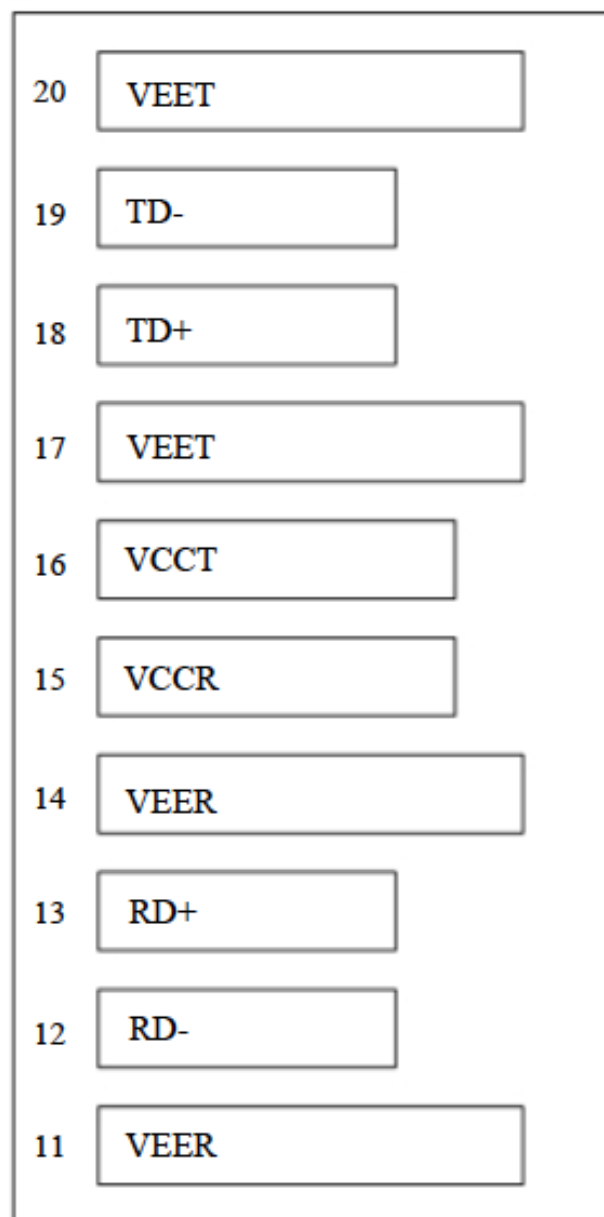
DIGITAL DIAGNOSTIC MEMORY MAP

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

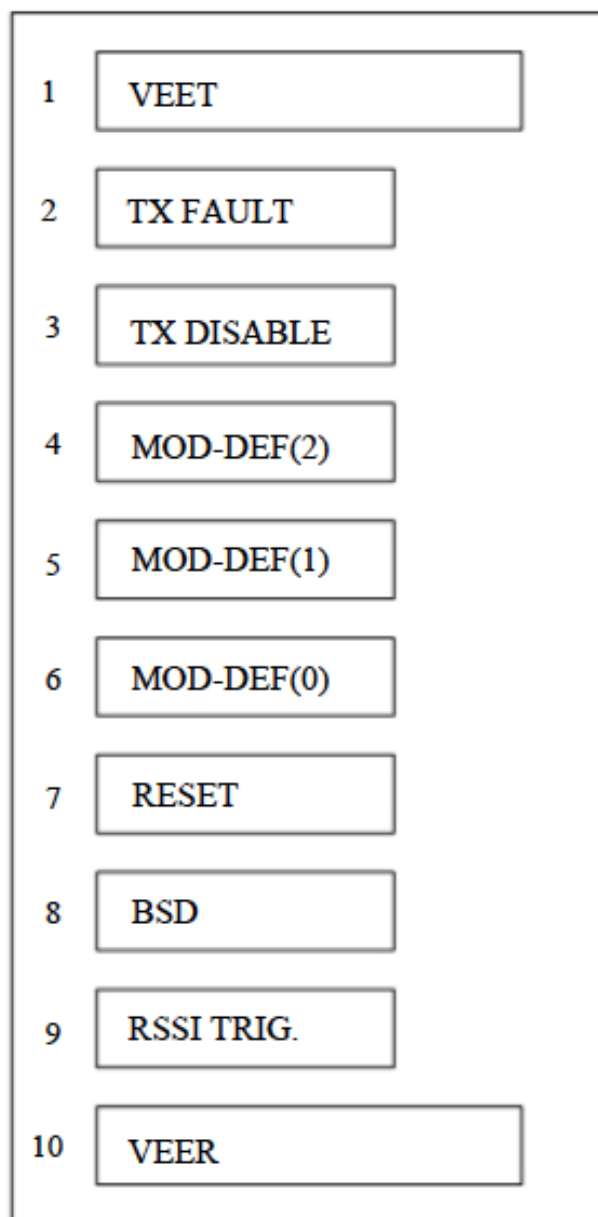
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring. The digital diagnostic memory map specific data field defines as following.



PIN DIAGRAM



Top of Board



Bottom of Board

PIN DESCRIPTIONS

PIN #	Name	Function	Plug Seq.	Notes
1	V _{EET}	Module transmitter ground	1	
2	Tx Fault	Module Fault Indication	3	1
3	Tx Disable	Transmitter Disable;	3	2
4	MOD_DEF(2)	SDA Serial Data Signal	3	3
5	MOD_DEF(1)	SDA Serial Clock Signal	3	3
6	MOD_DEF(0)	TTL Low	3	3
7	RESET	LVTTL input. Assert "Reset" high at the end of previous burst, 16 bits in duration	3	4
8	BSD	Burst signal detect	3	5
9	RSSI TRIG	CMOS input. Assert high at the beginning of the monitored burst package at least 300ns in duration	3	6
10	V _{EER}	Module receiver ground	1	
11	V _{EER}	Module receiver ground	1	
12	RD-	Receiver inverted data out put	3	7
13	RD+	Receiver non-inverted data out put	3	7
14	V _{EER}	Module receiver ground	1	
15	V _{CCR}	Module Receiver Power Supply	2	
16	V _{CCT}	Module Transmitter Power Supply	2	
17	V _{EET}	Module transmitter ground	1	
18	TD+	Transmitter Data In	3	8
19	TD-	Transmitter Inverted Data In	3	8
20	V _{EET}	Module transmitter ground	1	

Plug Seq.: Pin engagement sequence during hot plugging.

1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

2) TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V):	Transmitter on
(>0.8V, < 2.0V):	Undefined
High (2.0 to 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be V_{ccT} or V_{ccR}.

Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID

Mod-Def 2 is the data line of two wire serial interface for serial ID

4) RESET is a LVTTL input. When the previous burst signal package is end, the host will give a "high" RESET to restore the state of LA. Internal pull-down 10K resistor to GND.

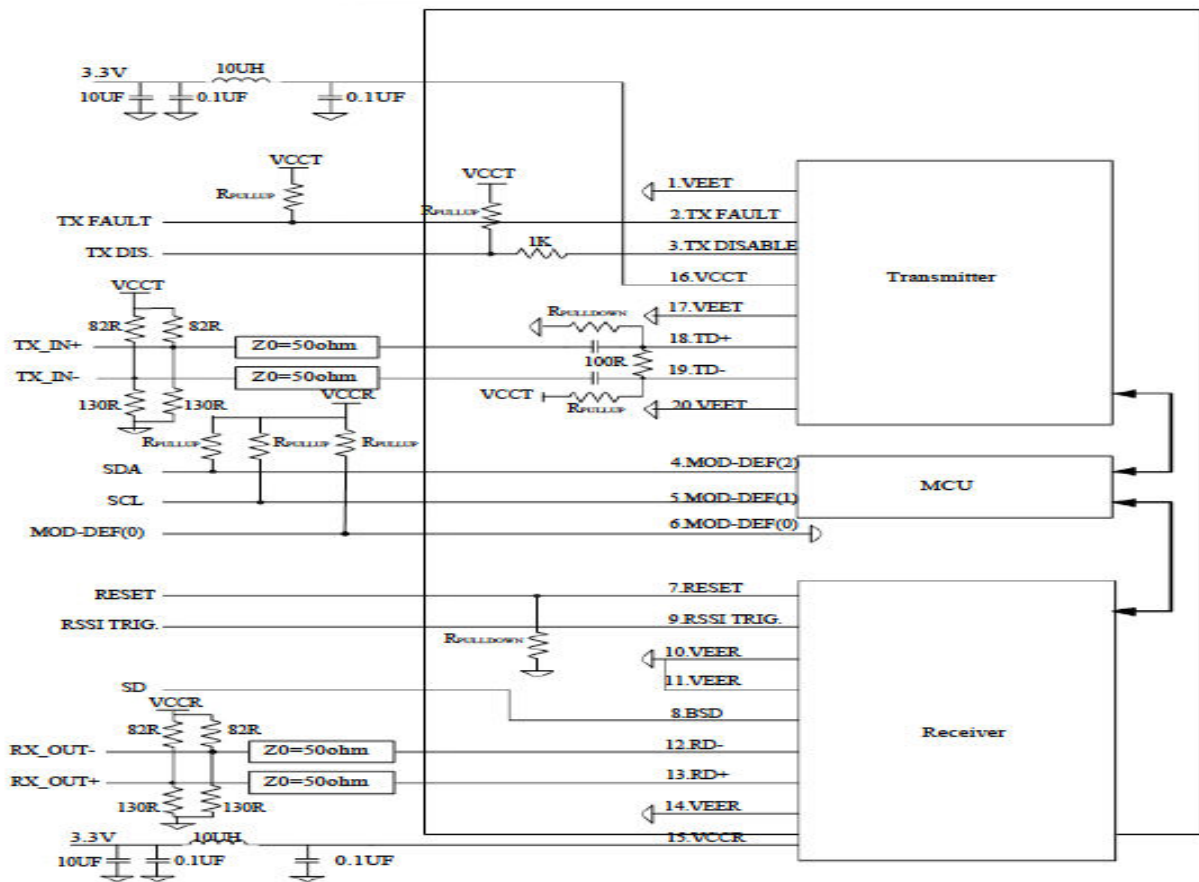
5) BSD can track the state of receiving burst signal. Logic 0 indicates loss of signal; Logic1 indicates receiving signal packages.

6) RSSI TRIG is a CMOS input. Assert high after 30ns delay time of the beginning of the monitored burst package at least 300ns in duration.

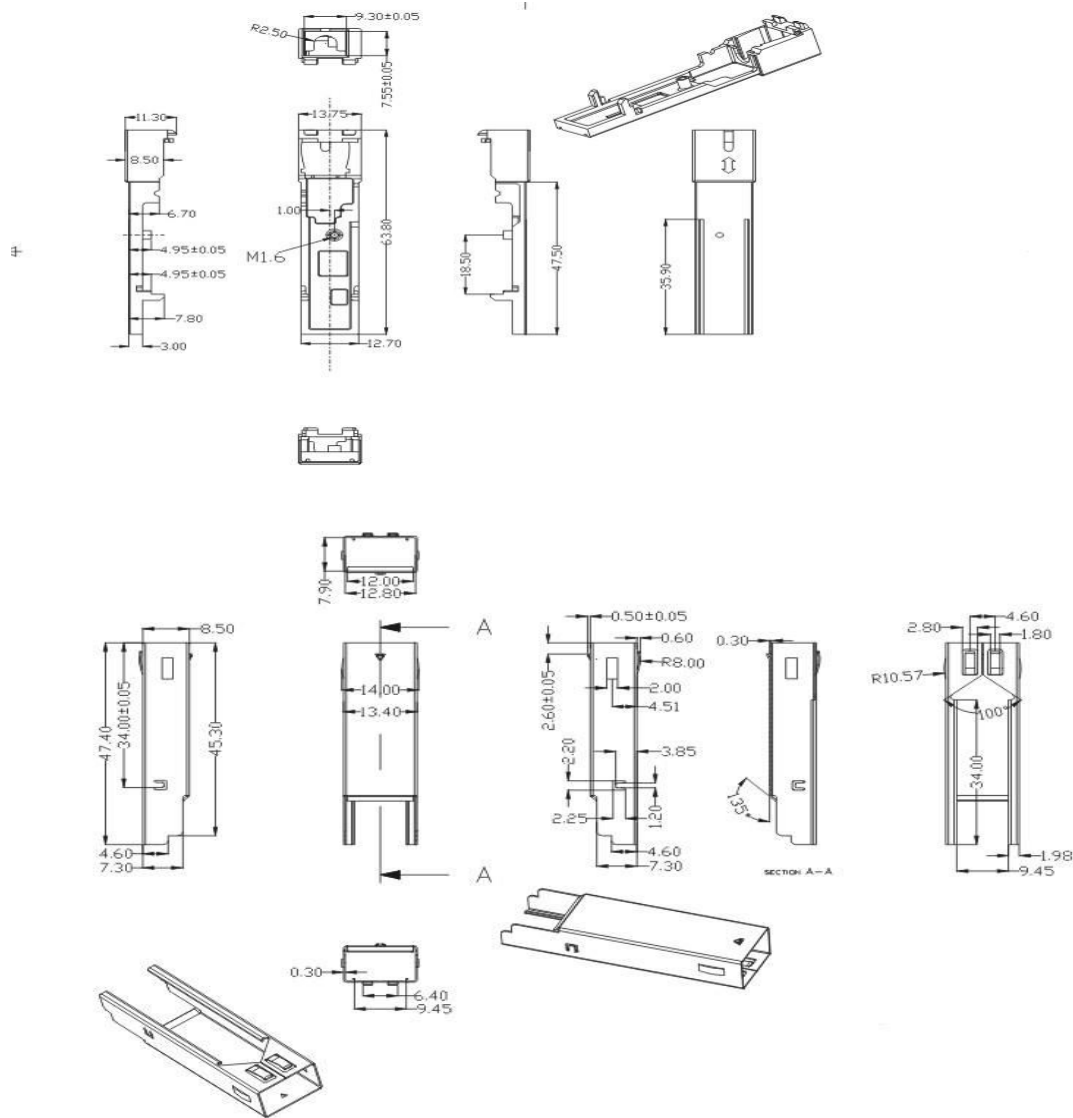
7) RD-/+ : These are the differential receiver outputs. They are internally DC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

8) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

RECOMMENDED INTERFACE CIRCUIT



PACKAGE DIMENSIONS



ORDERING INFORMATION

Part Number	Description
TISG4325S-CD20TC	Tx1490nm/ Rx1310nm , 2.5Gbps/ 1.25Gbps, Class C+, 0°C ~ +70°C With DDM; OLT Type
TISG4325S-CD20TB	Tx1490nm/ Rx1310nm , 2.5Gbps/ 1.25Gbps, Class B+, 0°C ~ +70°C With DDM; OLT Type