T-155M-SM-T3-60KM

**Single-Mode 100M/155M FE/SDH/SONET
SC / LC Single Fiber SFP Transceiver**

Features

Operating Data Rate up to 155Mbps

1310nm DFB TX 1550nm RX

60km with 9/125 μm SMF

Single 3.3V Power Supply and TTL Logic Interface

Hot-Pluggable SFP Footprint Simplex LC/SC Connector Interface

Class 1 FDA and IEC60825-1 Laser Safety Compliant

Operating Temperature

Standard: 0°C ~+70°C

Industrial:-40°C ~+85°C

Compliant with MSA SFP Specification

Digital Diagnostic Monitor Interface Compatible with SFF-8472

Applications

SONET OC-3/SDH STM1

WDM Fast Ethernet Links

Other Optical Links

Description

The T-155M-SM-T3-60KM   is small form factor pluggable module for IEE 802.3ah 100BASE-BX10 and OC-3/STM-1 SONET/SDH single fiber applications by using 1310nm/1550nm transmitter and 1550nm/1310nm receiver. It is with the SFP 20-pin connector to allow hot plug capability. .

The transmitter section uses a multiple quantum well A type and B type laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated A type/B type detector preamplifier (IDP) s detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

The T-155M-SMD-T3-60KM is designed to be compliant with SFF-8472 SFP Multi-source Agreement (MSA).

Recommended Operating Conditions

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: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent 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 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL File E317337 TüV Certificate No. 50135086 (CB scheme)

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
Supply Voltage	VCC	-0.5	3.6	V
Operating Relative Humidity		-	95	%

*Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	TA		0		+70	°C
			-40		+85	
Power Supply Voltage	Vcc		3.15	3.3	3.45	V
Power Supply Current	Icc				300	mA
Date Rate	OC-3			155		Mbps
	100M			100		

Performance Specifications – Electrical

Parameter		Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter							
LVPECL Inputs(Differential)		Vin	400		2000	mVpp	AC Coupled Inputs
Input Impedance (Differential)		Zin	85	100	115	ohms	Rin > 100 kohms @ DC
TX_Dis	Disable		2		Vcc+0.3	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		Vcc+0.3	V	
	Normal		0		0.5		
Receiver							
LVPECL Outputs (Differential)		Vout	370		2000	mVpp	AC Coupled Outputs
Output Impedance (Differential)		Zout	85	100	115	ohms	
RX_LOS	LOS		2		Vcc+0.3	V	
	Normal		0		0.8	V	
MOD_DEF (0:2)		VoH	2.5			V	With Serial ID
		VoL	0		0.5	V	

Optical and Electrical Characteristics 1310nm DFB and PIN, 60KM

Parameter		Symbol	Min.	Typical	Max.	Unit
9µm Core Diameter SMF		L		60		km
Data Rate			100	155		Mbps
Transmitter						
Center Wavelength		λc	1260	1310	1360	nm
Spectral Width (RMS)		Δλ			4	nm
Average Output Power		Pout	-5		0	dBm
Extinction Ratio		ER	9			dB
Rise/Fall Time (20%~80%)		tr/tf			90	ps
Output Optical Eye		IUT-T G.957 Compliant				
TX_Disable Assert Time		t_off			10	us
Pout @TX Disable Asserted		Pout			-45	dBm
Receiver						
Center Wavelength		λc	1500	1550	1580	nm
Receiver Sensitivity	OC-3	Pmin			-33	dBm
	100M				-34	dBm
Receiver Overload		Pmax	-10			dBm
Optical Path Penalty					1	dB
LOS De-Assert		LOSD			-35	dBm
LOS Assert		LOSA	-40			dBm
LOS Hysteresis			0.5			dB

SFP Transceiver Electrical Pad Layout
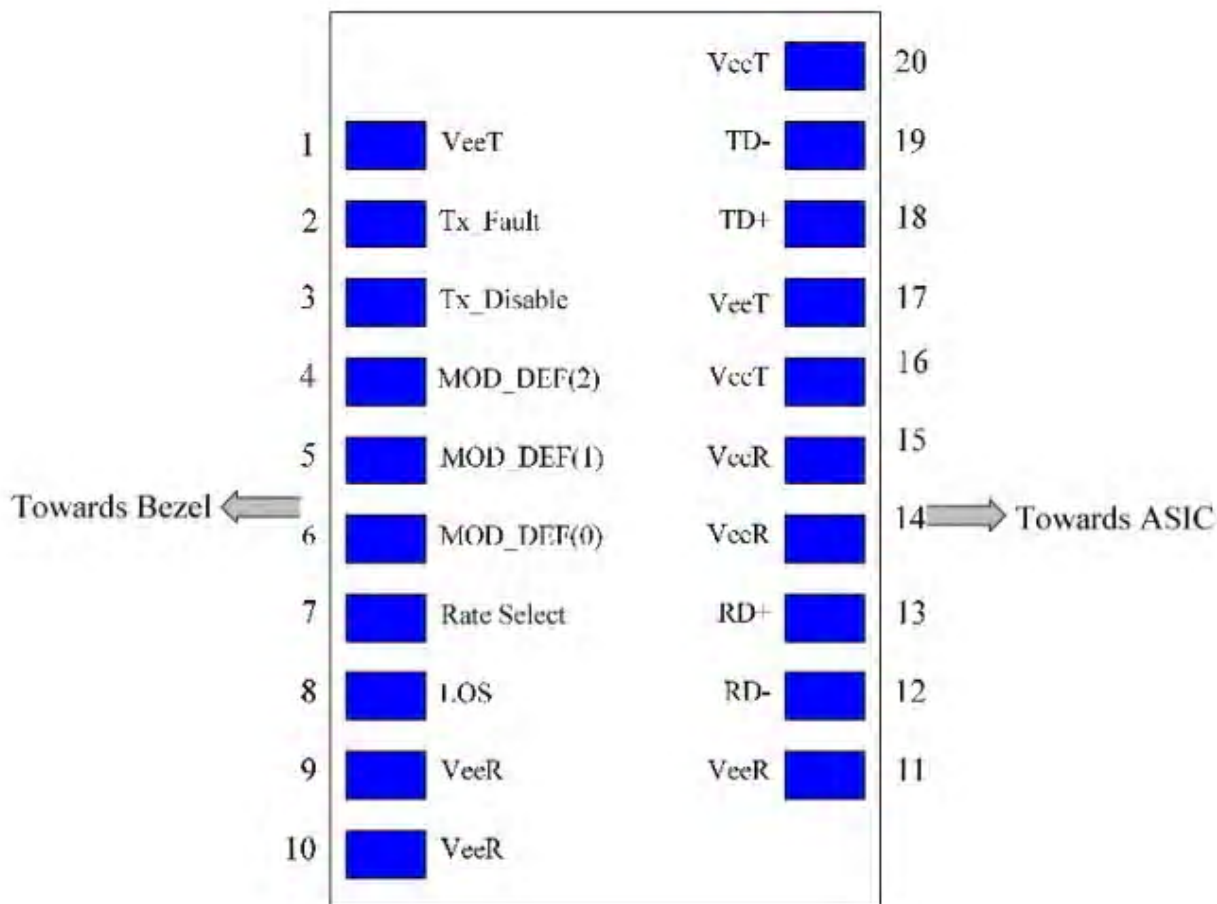
Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2) Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	3) Data line for Serial ID.
5	MOD-DEF1	Module Definition 1	3	3) Clock line for Serial ID.
6	MOD-DEF0	Module Definition 0	3	3) Grounded within the module.

7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	4)
9	VeeR	Receiver Ground	1	5)
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	6)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	7) 3.3 ± 5%
16	VccT	Transmitter Power	2	7) 3.3 ± 5%
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	5)

Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 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 4.7 – 10 KΩ resistor. Its states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 3.465V): Transmitter Disabled

Open: Transmitter Disabled

3) Modulation Absent, connected to VEET or VEER in the module.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K –10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low

indicates normal operation. In the low state, the output will be pulled to <0.8V.

5) VeeR and VeeT may be internally connected within the SFP module.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ωdifferential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400 and 2000 mV differential (200 –1000 mV single ended) when properly terminated.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100_ differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400 – 2000mV   (200 – 1000mV single-ended).

EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) 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.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2H. The digital diagnostic memory map specific data field define as following .For detail

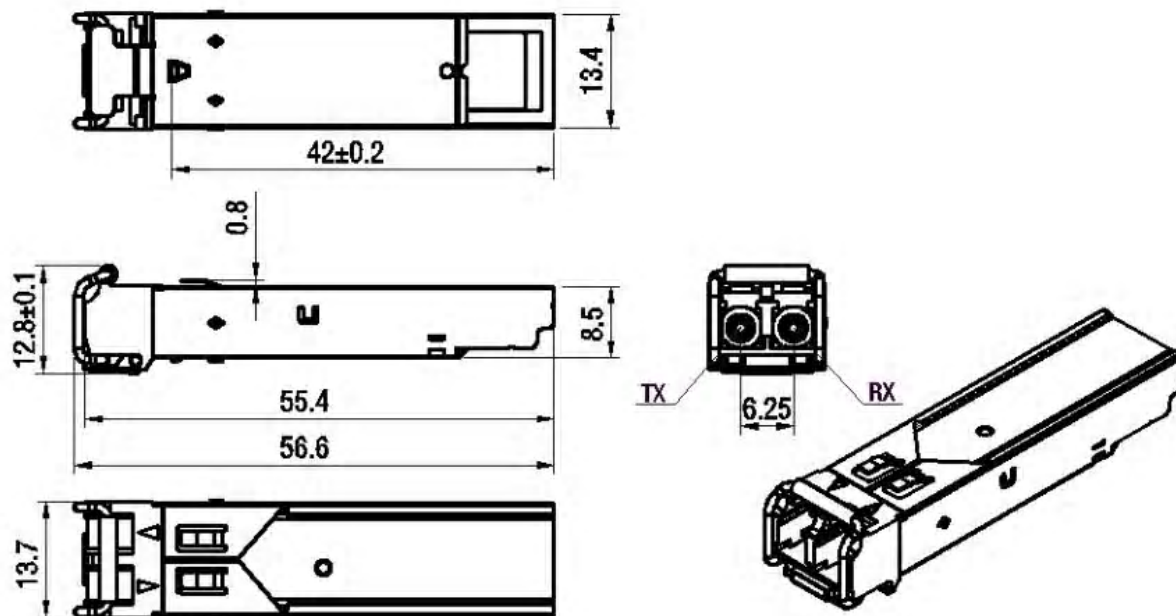EEPROM information, please refer to the related document of SFF 8472 Rev 9.3.

2 wire address 1010000X (A0h)	2 wire address 1010001X (A2h)
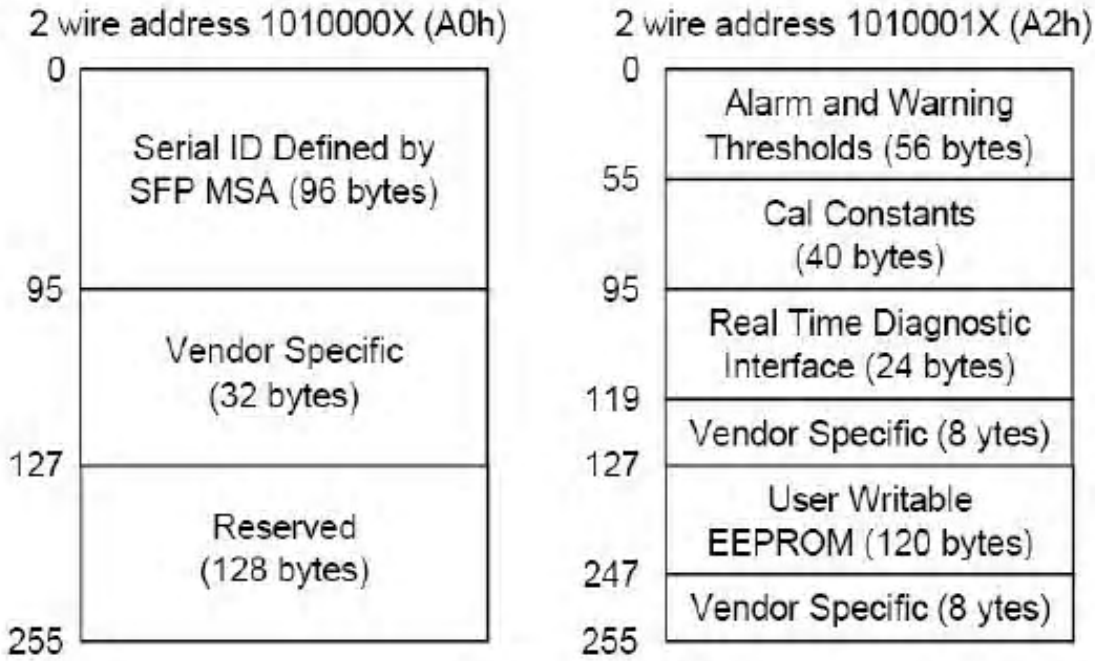
Recommend Circuit Schematic

RES 1 = 4.7k to 10k
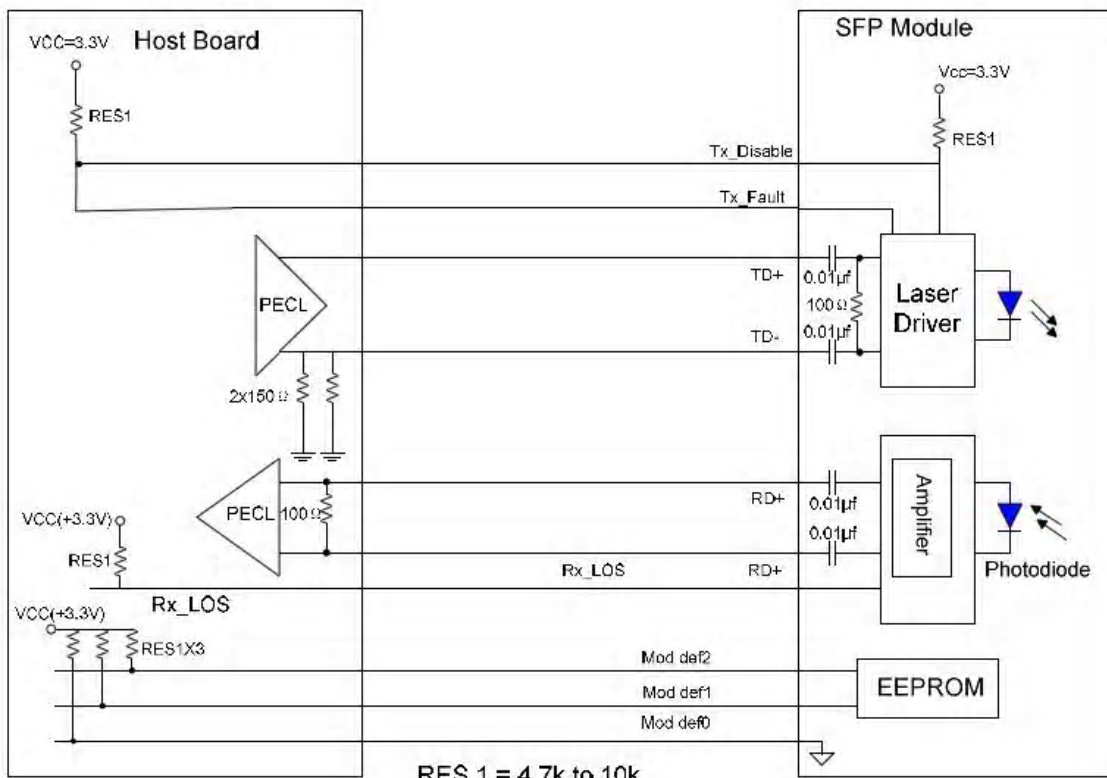
Mechanical Specifications

Ordering information

Part No.	Data Rate	Wavelength	Distance	Interface	Temperature	DDMI
T-155M-SM-T3-60KM	155Mbps	1310nm	60km	SC / LC	Standard	No
T-155M-SMI-T3-60KM	155Mbps	1310nm	60km	SC / LC	Industrial	No
T-155M-SMD-T3-60KM	155Mbps	1310nm	60km	SC / LC	Standard	Yes
T-155M-SMDI-T3-60KM	155Mbps	1310nm	60km	SC / LC	Industrial	Yes

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