T-10G-SM-20KM

Single-Mode 1310nm SFP+, With Diagnostic Monitoring
10G Base-LW/LR
Duplex SFP+ Transceiver

Features

Operating Data Rate up to 10.3Gbps
1310nm DFB-LD Laser Transmitter
Distance up to 10km with 9/125 μm SMF
Single 3.3V Power Supply and TTL Logic Interface
Hot-Pluggable SFP Footprint Duplex LC Connector Interface
Compliant with MSA SFP+ Specification SFF-8431
Compliant with IEEE 802.3ae 10GBASE-LR/LW
Power Dissipation＜1.0W .
Operating Temperature
Standard: -5~+70℃
Industrial: -40~+85℃

Applications

- 10GBase-ER at 10.31Gbps
- 10GBase-EW at 9.95Gbps
- Other Optical Links

Ordering Information

Part No.	Data Rate	Fiber	Distance	Interface	Temperature	DDMI
T-10GSM-20KM	9.95~10.3Gbps	SMF	20KM	LC	Standard	YES
T-10G-SM-20KMI	9.95~10.3Gbps	SMF	20KM	LC	Standard	YES

Product Description

The T-10GSM-20KM series multi-mode transceiver is SFP+ module for serial optical data communications such as 10GBASE-LR and 10GBASE-LW. 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 1310 nm.
The transmitter section uses a 1310nm multiple quantum well VCSEL laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.
The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC..

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: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. 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
Input Voltage	Vin	-0.5	Vcc	V
Output Current	Io	-	50	mA

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	TA		-5		+70	°C
			-40		+85	
Power Supply Voltage	V_{cc}		3.15	3.3	3.45	V
Power Supply Current	I_{cc}				300	mA
Surge Current	I_{surge}				+30	mA
Baud Rate	10GBASE-LR			10.31		Gbps
	10GBASE-LW			9.95		

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	Vin	150		1200	mVpp	AC Coupled Inputs
Input Impedance (Differential)	Zin	85	100	115	ohms	Rin > 100 kohms @ DC
Tx_Disable Input Voltage-High		2		Vcc+0.3	V	
Tx_Disable Input Voltage-Low		0		0.8		
TX_FAULT Output Voltage-High		2		Vcc+0.3	V	Io = 400μA; Host Vcc
TX_FAULT Output Voltage-Low		0		0.8		Io = -4.0mA
Receiver						
CML Outputs (Differential)	Vout	350		700	mVpp	AC Coupled Outputs
Output Impedance (Differential)	Zout	85	100	110	ohms	
RX_LOS Output Voltage-High		2		Vcc+0.3	V	Io = 400μA; Host Vcc
RX_LOS Output Voltage-Low		0		0.8	V	Io =- 4.0mA
MOD_DEF (0:2)	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

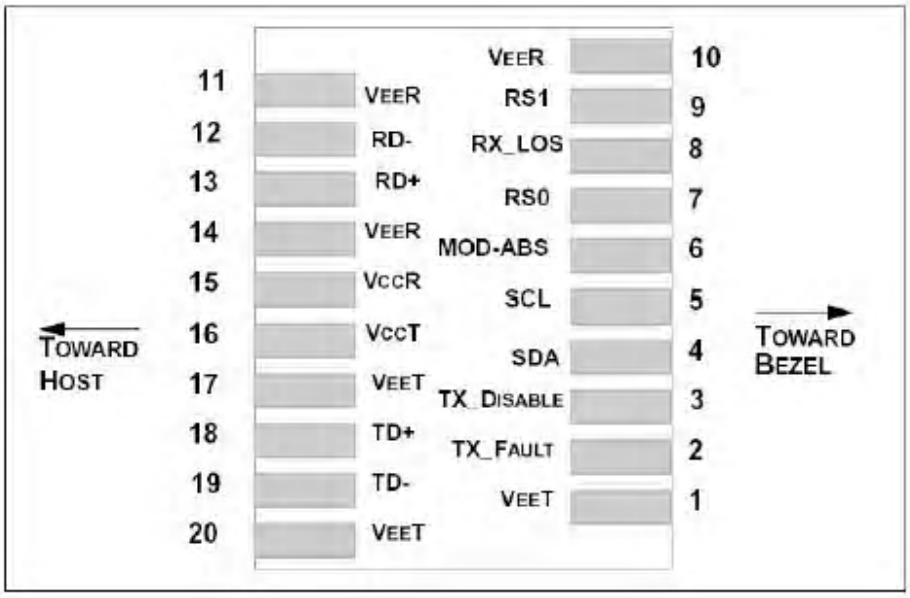
Optical and Electrical Characteristics

1310nm DFB and PIN 10KM

Parameter	Symbol	Min.	Typical	Max.	Unit
9μm Core Diameter SMF			10		km
Data Rate				10.3	Gbps

Transmitter						
Center Wavelength		λc	1270	1310	1355	nm
Spectral Width (RMS)		Δ_λ			1	nm
Average Output Power		P_{out}	-6		0	dBm
Extinction Ratio		ER	3.5			dB
Average Power of OFF Transmitter		P_{off}			-30	dBm
Side Mode Suppression Ratio		SMSR	30			dB
Transmitter Dispersion Penalty		TDP			3.2	dB
Input Differential Impedance		Z_{IN}	90	100	110	Ω
TX Disable	Disable		2.0		Vcc+0.3	V
	Enable		0		0.8	
TX_Fault	Fault		2.0		Vcc+0.3	V
	Normal		0		0.8	
TX_Disable Assert Time		t_off			10	us
TX_Disable Negate Time		t_on			1	ms
TX_BDHisable time to start reset		t_reset	10			us
Time to initialize, include reset of TX_FAULT		t_init			300	ms
TX_FAULT from fault to assertion		t_fault			100	us
Total Jitter		TJ			0.28	UI(p_p)
Data Dependant Jitter		DDJ			0.1	UI(p-p)
Uncorrelated Jitter		UJ			0.023	RMS
Receiver						
Center Wavelength		λc	1260		1565	nm
Receiver Sensitivity		Pmin			-14.4	dBm
Receiver Overload[2]		P_{max}	0.5			dBm
Optical Return Loss		ORL			-12	dBm
LOS De-Assert		LOS_D			-15	dB
LOS Assert		LOS_A	-25			dB
LOS	High		2.0		Vcc+0.3	V
	Low		0		0.8	

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	SDA	Module Definition 2	3	Data line for Serial ID.
5	SCL	Module Definition 1	3	Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	3)
7	RSo	RX Rate Select(LVTTL)	3	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
8	LOS	Loss of Signal	3	4)
9	RS1	TX Rate Select(LVTTL).	1	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
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	7)
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 – 10K_ 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 4.7K~10 K _ 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 (185 –350 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.

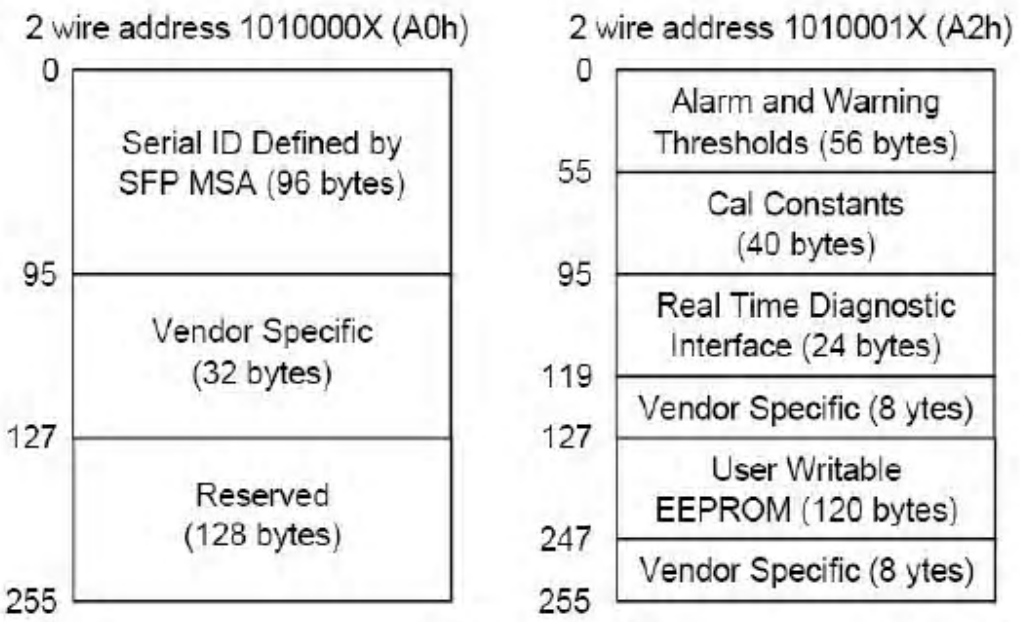
8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100_ differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400 – 2000mV (200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

EEPROM

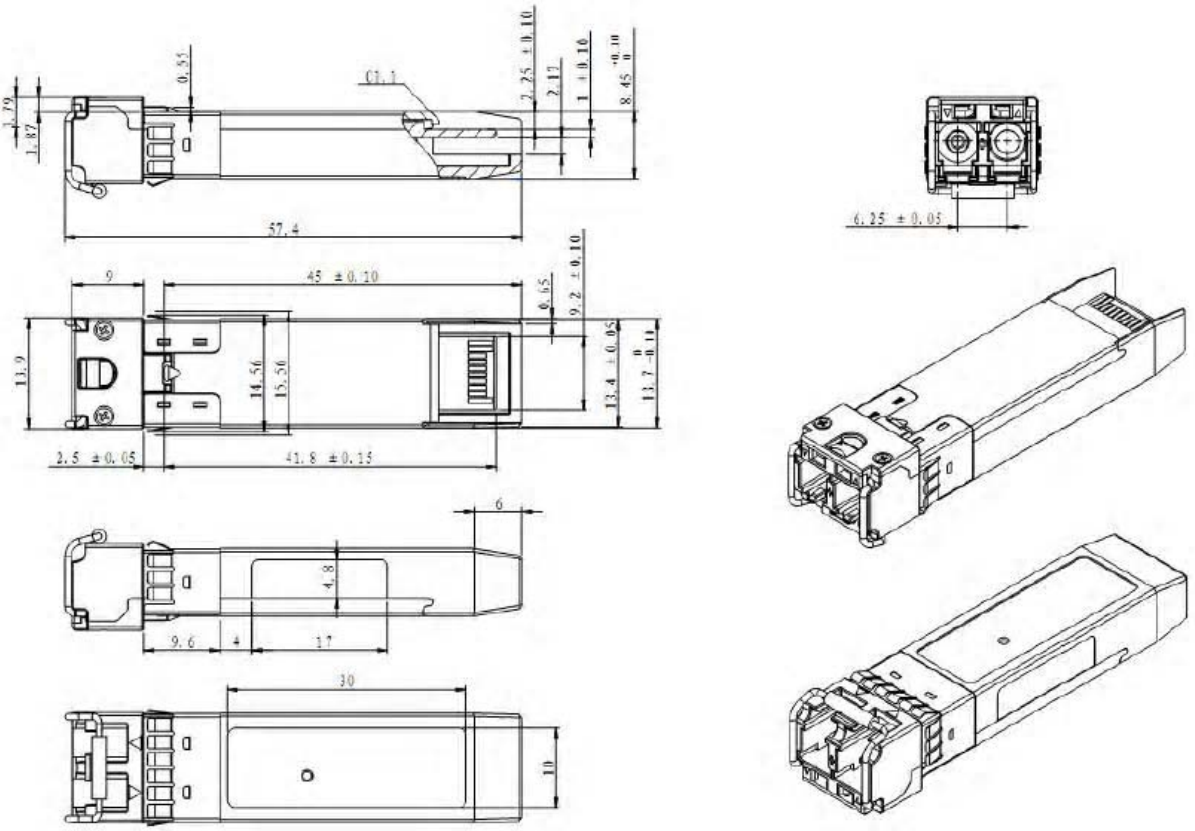
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected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



Mechanical Specifications



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