

PRODUCT SPECIFICATION

► Product Features

- Transceiver unit with independent 1310nm FP Laser transmitter
1550nm PIN photodiode receiver
- Compliant with SFP MSA SFF-8472
- Metal enclosure for lower EMI
- Simplex LC connector interface
- Power consumption < 1W
- Laser Class 1 IEC/CDRH compliant
- Links of 20 km with 9/125 μm single mode fiber (SMF) of maximum interconnect distances



► Applications

- LTE optical repeater application
- 1.25GBASE-LW/LR 1.25G Ethernet
- High-speed storage area networks

► Regulatory Compliance

Feature	Standard	Performance
ESD threshold Electrostatic Discharge(ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7 EIA /TIA 455-129 (FOPT-129)	Class 1C(>1000V)
Electrostatic Discharge(ESD) to the Faceplate	IEC 61000-4-2	Compatible with standards, ±8KV contact &±15KV air discharge
Electromagnetic interference(EMI)	FCC 47CFR Part 15, class B EN55022 Class B (CISPR 22B)	Compatible with Standards
Laser Safety	FDA 21CFR 1040.10 and 1040.11 EN60825-1; EN60825-2	Class 1 Laser Product
RoHS Compliance	2011/65/EU	Compatible with Standards With exemption: 7c(1)

► Performance Specifications

● Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature (Non-operating)	T _{stg}	-5	+70	°C	
Relative Humidity	RH	0	85	%	
Operating case temperature	T _{case}	-40	+85	°C	MTSBC31MIL-STW
	T _{case}	-5	+70	°C	MTSBC31MCL-STW
Input Voltage		GND	V _{cc}	V	
Power Supply Voltage	V _{cc} -V _{ee}	-0.5	+3.6	V	

● Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Notes
Power Supply Voltage	V _{cc}	3.13	3.3	3.46	V	
Power Supply Current@3.3	I _{cc}			300	mA	
Data Rate			1.25		Gb/s	
I ² C clock frequency			100	400	KHz	
Power consumption Max				1	W	

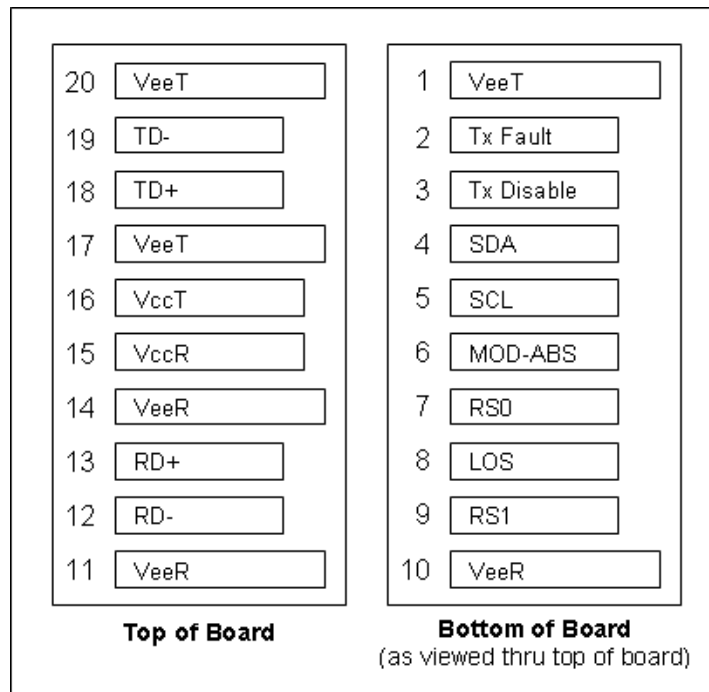
● Optical and Electrical Characteristics

Transmitter optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Support data rate	-		1.25		Gb/s	
Center Wavelength	λ	1260	1310	1360	nm	
Spectral Width (RMS)	Δλ			3	nm	
Average Optical Output Power	P _o	-9		-3	dBm	
Extinction Ratio	E _r	9			dB	
Transmitter jitter	U _{lp-p}			0.1		
Data Input Swing Differential	V _{INPP}	360		1400	mV	
Relative intensity Noise	R _{in}			-128	dB/Hz	
Optical return loss tolerance				12	dB	
Output Eye Diagram	Compliant with IEEE802.3 z					

Receiver Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Support data rate			1.25		Gb/s	
Operate Wavelength		1530	1550	1570	nm	
Sensitivity (EOL)	S_{en}			-23	dBm	
Saturation	P_{sat}	-3			dBm	
LOS Asserted		-35			dBm	
LOS De-Asserted				-24	dBm	
LOS Hysteresis		0.5			dB	
Data Output Swing Differential	V_{OUTPP}	600		1200	mV	
Receiver reflectance	RRx			-12	dB	

► Pin Definitions

- Host PCB Pinout Top View



Pin Description			
Pin	Name	Description	Note
1	VeeT	VeeT	Transmitter Ground
2	TX Fault	TX Fault	Transmitter Fault Indication
3	TX Disable	TX Disable	Transmitter Disable
4	MOD-DEF2	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i)
5	MOD-DEF1	SCL	2 Wire Serial Interface Data Line (Same as MOD-DEF1 as defined in the INF-8074i)
6	MOD-DEF0	MOD-ABS	Module Absent, Connected to VeeT or VeeR in the module.
7	Rate Select	RS0	SFP+ RX Rate Select, optional
8	LOS	LOS	Loss of Signal
9	VeeR	RS1	SFP+ TX Rate Select, optional
10	VeeR	VeeR	Receiver Ground
11	VeeR	VeeR	Receiver Ground
12	RD-	RD-	Inv. Received Data Out
13	RD+	RD+	Received Data Out

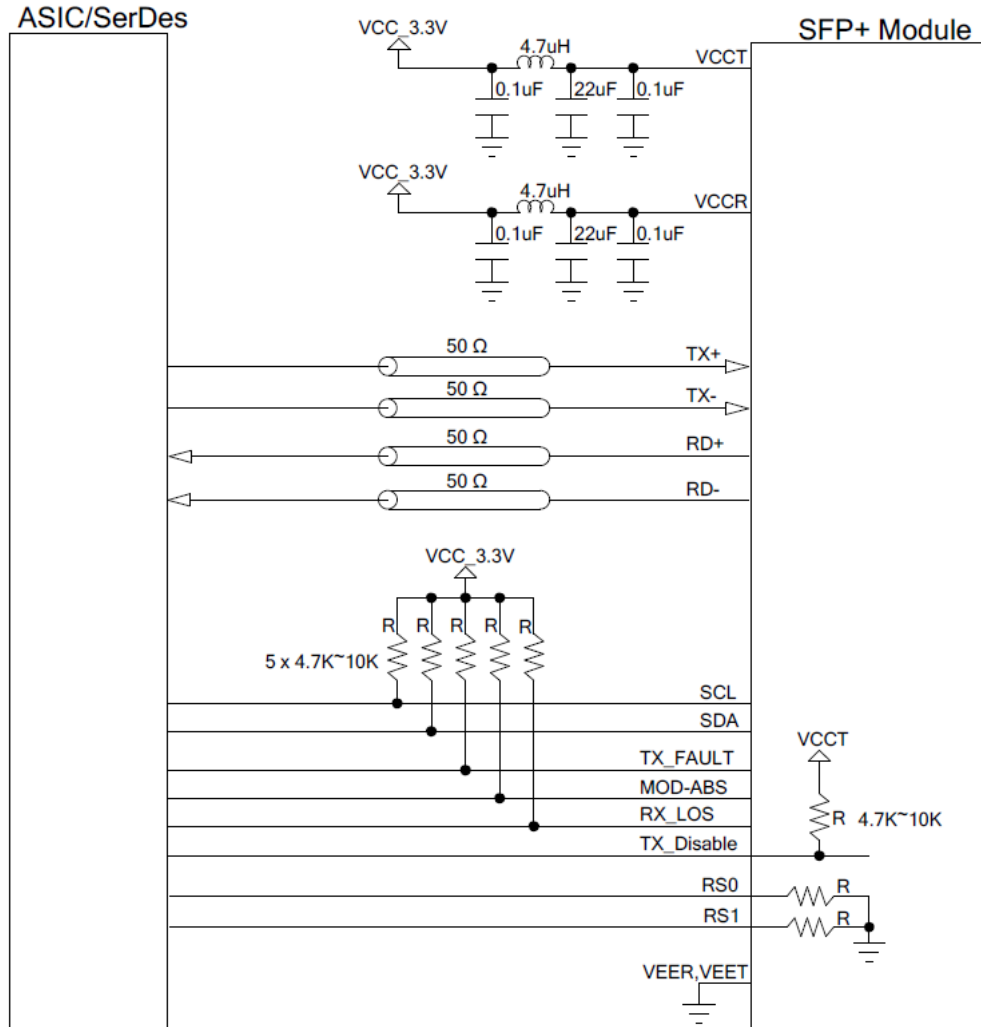
14	VeeR	VeeR	Receiver Ground
15	VccR	VccR	Receiver Power
16	VccT	VccT	Transmitter Power
17	VeeT	VeeT	Transmitter Ground
18	TD+	TD+	Transmit Data In
19	TD-	TD-	Inv. Transmit Data In
20	VeeT	VeeT	Transmitter Ground

Notes:

- 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 +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 < 0.4V.
- 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 (-0.3 – 0.8V): Transmitter on
 (>0.8, < 2.0V): Undefined
 High (2.0 –VccT+0.3V): Transmitter Disabled
 Open: Transmitter Disabled
- Mod-ABS shall be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
- 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 VccR+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 < 0.4V.
- VeeR and VeeT may be internally connected within the SFP+ module.
- RD-/+ : These are the differential receiver outputs. They are AC coupled 100Ω differential 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.
- VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. VccR and VccT may be internally connected within the SFP transceiver module.
- TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.
- RS0 and RS1 Internally pulled down per SFF-8431 Rev 4.1.

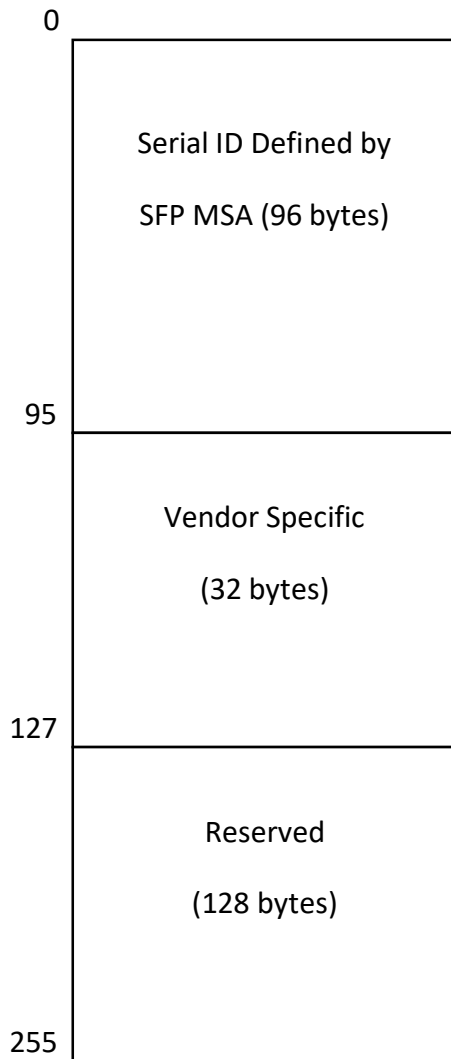
► Recommended Circuit

- Recommended Host Board Power Supply Circuit

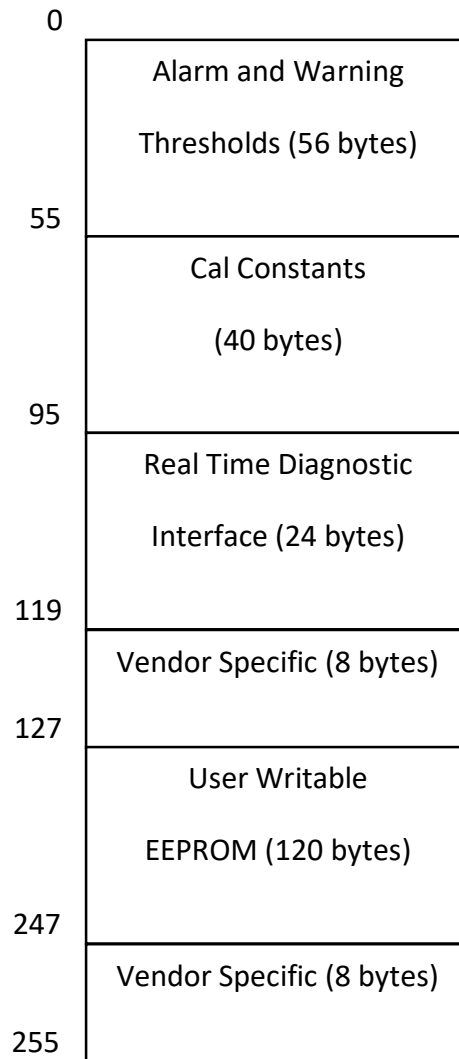


► EEPROM Information

2 wire address 1010000X (A0h)



2 wire address 1010001X (A2h)



Memory Content Definition for Page A0h				
Address	Size	Name	Description	Value(Hex)
0	1	Identifier	SFP	03
1	1	Ext. Identifier	MODE4	04
2	1	Connector	LC	07
3-10	8	Transceiver	SM 1000BASE-LX	00 00 00 02 00 00 00 00
11	1	Encoding	NRZ	03
12	1	BR, nominal	1.25G	0D
13	1	Reserved	-	00
14	1	Length (9um)-km	20KM	14
15	1	Length (9um)-100m	20KM	C8
16	1	Length (50um)		00
17	1	Length (62.5um)		00
18	1	Length (copper)		00
19	1	Reserved		00
20-35	16	Vendor name	"APATOE"(ASCII)	41 50 41 54 4F 45 20 20 20 20 20 20 20 20 20 20
36	1	Reserved	-	00
37-39	3	Vendor OUI	-	FA BA 85
40-55	16	Vendor PN	"MTSBC31MI(C)L"(ASC II)	4D 54 53 42 43 33 31 4D 49 4C 2D 53 54 57 20 20
56-59	4	Vendor rev	"A"(ASC II)	41 20 20 20
60-61	2	Wavelength	1310	05 1E
62	1	Reserved		00
63	1	CC BASE	Check sum of bytes 0 - 62	
64-65	2	Options	LOS,TX_FAULT and TX_DISABLE	00 1A
66	1	BR, max		00
67	1	BR, min		00
68-83	16	Vendor SN	ASCII	

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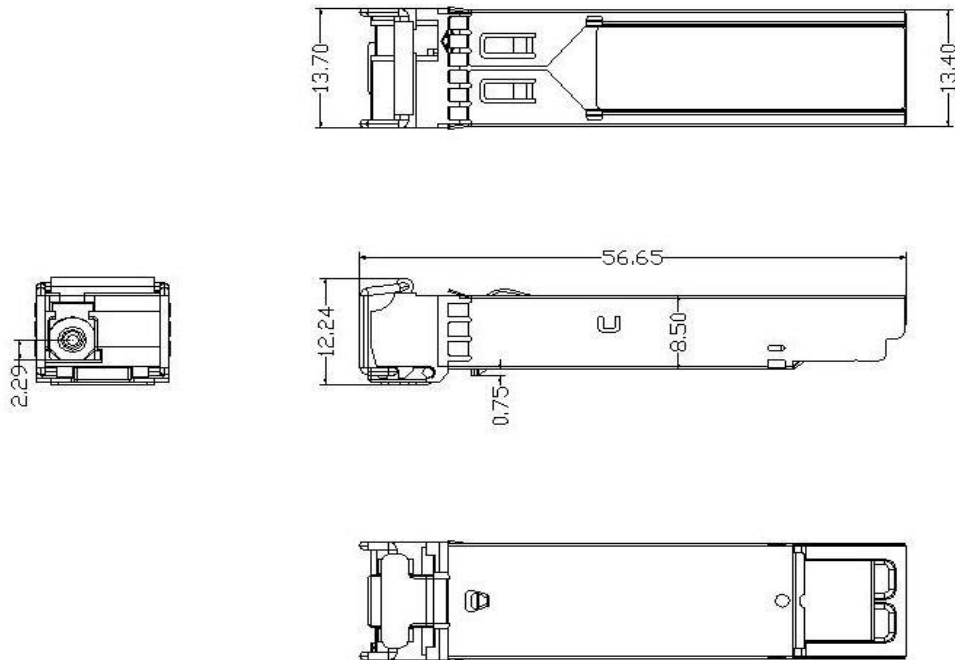
84-91	8	Vendor date	Year (2 bytes, Month (2 bytes), Day (2 bytes))	
92	1	DDM Type	Internal calibrated	68
93	1	Enhanced Option	LOS, TX_FAULT and Alarm/warning flags implemented	F0
94	1	SFF-8472 Compliance	SFF-8472 Rev12.2	08
95	1	CC EXT	Check sum of bytes 64 - 94	
96-127	32	Vendor specific		All 20

Alarm and Warning Thresholds (Serial ID A2h)

Parameter(Unit)	Temp(°C)	Voltage(V)	Bias(mA)	TX Power (dBm)	RX Power (dBm)
High Alarm	95(80)	3.63	80	-1	-1
Low Alarm	-55(-15)	2.97	0	-11	-25
High Warning	85(70)	3.47	70	-2	-2
Low Warning	-40(-5)	3.14	0	-10	-24

Digital Diagnostic Monitoring Characteristic

Parameter	Range		Accuracy
Transceiver Temperature	T	Recommended operation conditions	±3°C
Supply Voltage	Vcc	Recommended operation conditions	±3%
TX Bias Current	Id	Id: 1-100mA, Recommended operation conditions	±10%
TX Output Power	Po	Po: -9~-3dBm, Recommended operation conditions	±3dB
Received Optical Power	Pi	Pi: -23~-3dBm, Recommended operation conditions	±3dB

► Mechanical Dimension

(Unit: mm)

► Specification for Environment Protection

The material (Excluded exempted material) comply with threshold value of RoHS6 banned substance in homogenous material.

► Package Information

This is the executive standard of product package of APATOE.

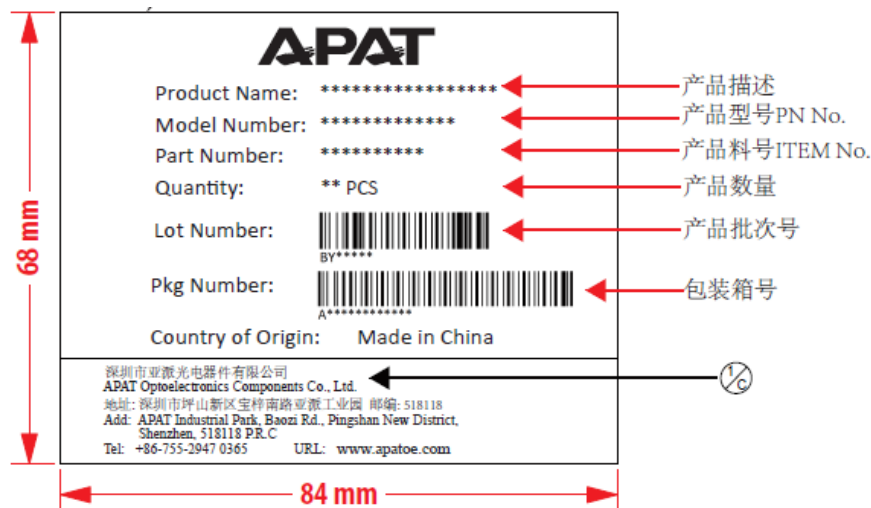
Please contact our sales representative for your customized requirements, includes label/package/customized programmed EEPROM information, etc.

► Label Information

- Schematic of the labeling on the SFP facet



- Schematic of the labeling on the package box



► Ordering Information

Model Number	Description	Operation Case Temperature
MTSBC31MIL-STW	1.25Gbps BIDI T1310R1550 20KM SFP Transceiver	-40~85°C
MTSBC31MCL-STW	1.25Gbps BIDI T1310R1550 20KM SFP Transceiver	-5~70°C

► Warning Notice

Handling Precautions:

This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow proper ESD procedures.

Laser Safety:

Radiation emitted by laser devices can be hazard to human eyes. Avoid eye exposure to direct or indirect radiation.