

## Industrial 1.25Gbps SFP Transceiver

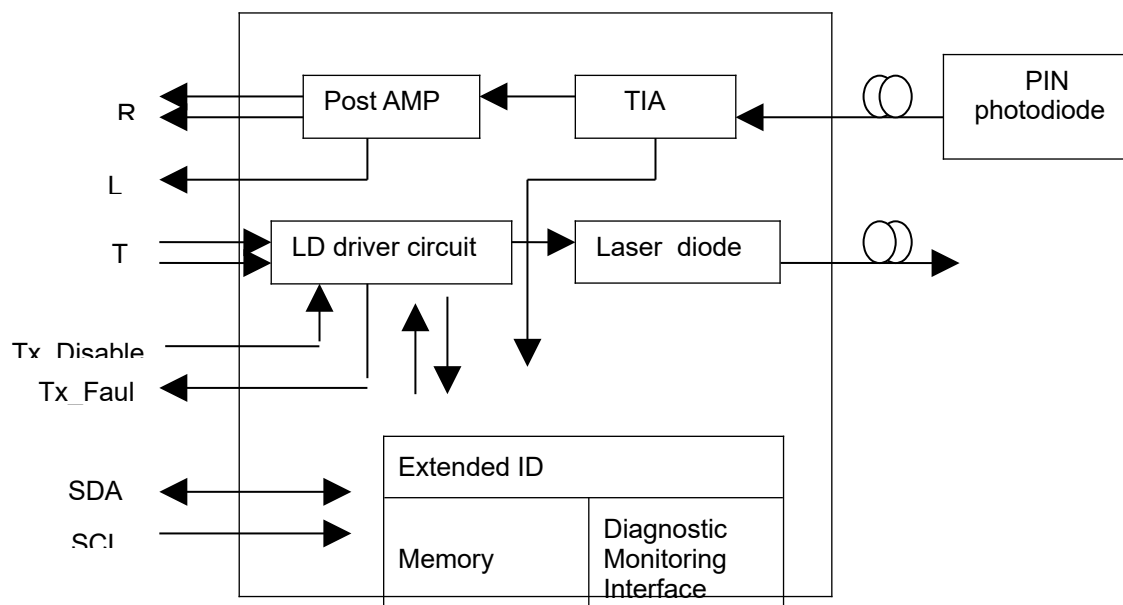
### Особенности:

- Industrial: -40°C~+85°C
- до 30 км на 9/125 μm SMF
- 1310nm FP лазер + PIN фотоприемник
- цифровая диагностика (DDMI) в соответствии с SFF-8472
- соответствие спецификации SFP MSA
- возможность горячей замены
- двойной LC разъем

### Области применения:

- Gigabit Ethernet 1000Base-LX
- STM-4

### Функциональная схема:



## Recommended Operating Conditions

| Parameter            |     | Symbol          | Min. | Typical | Max. | Unit |
|----------------------|-----|-----------------|------|---------|------|------|
|                      |     | SFP-1.25G-30-DI | -40  |         | +85  |      |
| Power Supply Voltage |     | V <sub>CC</sub> | 3.15 | 3.3     | 3.45 | V    |
| Power Supply Current |     | I <sub>CC</sub> |      |         | 300  | mA   |
| Date Rate            | GBE |                 |      | 1.25    |      | Gbps |

## Performance Specifications - Electrical

| Parameter                       |         | Symbol | Min. | Typ. | Max     | Unit | Notes                      |
|---------------------------------|---------|--------|------|------|---------|------|----------------------------|
| Transmitter                     |         |        |      |      |         |      |                            |
| LVPECL Inputs(Differential)     |         | Vin    | 400  |      | 2000    | mVpp | AC coupled inputs*(note5)  |
| Input Impedance (Differential)  |         | Zin    | 85   | 100  | 115     | ohms | Rin > 100 kohms @ DC       |
| Tx_Dis                          | Disable |        | 2    |      | Vcc     | V    |                            |
|                                 | Enable  |        | 0    |      | 0.8     |      |                            |
| Tx_FAUL T                       | Fault   |        | 2    |      | Vcc+0.3 | V    |                            |
|                                 | Normal  |        | 0    |      | 0.5     |      |                            |
| Receiver                        |         |        |      |      |         |      |                            |
| LVPECL Outputs (Differential)   |         | Vout   | 400  |      | 2000    | mVpp | AC coupled outputs*(note5) |
| 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

| Parameter                                | Symbol   | Min. | Typical | Max. | Unit |
|--|--|------|---------|------|------|
| 9µm Core Diameter SMF                    | L  |      | 30      |      | km   |
| Data Rate                                |  |      | 1.25    |      | Gbps |
| <b>Transmitter</b>                       |  |      |         |      |      |
| Centre Wavelength                        | λ <sub>c</sub>                                       | 1260 | 1310    | 1360 | nm   |
| Spectral Width (RMS)                     | Δλ   |      |         | 3    | nm   |
| Average Output Power <sup>*(note3)</sup> | P <sub>out</sub>                                     | -5   |         | 0    | dBm  |
| Extinction Ratio <sup>*(note4)</sup>     | ER   | 9    |         |      | dB   |
| Rise/Fall Time(20%~80%)                  | tr/tf  |      |         | 0.26 | ns   |
| Total Jitter                             | TJ   |      |         | 0.43 | UI   |
| Output Optical Eye <sup>*(note4)</sup>   | Compliant with IEEE 802.3ah-2004 <sup>*(note7)</sup> |      |         |      |      |
| TX_Disable Assert Time                   | t <sub>off</sub>                                     |      |         | 10   | us   |
| P <sub>out</sub> @TX Disable Asserted    | P <sub>out</sub>                                     |      |         | -45  | dBm  |

| Receiver                                 |           |      |  |      |     |
|--|-----------|------|--|------|-----|
| Centre Wavelength                        | $\lambda$ | 1260 |  | 1600 | nm  |
| Receiver Sensitivity <sup>*(note6)</sup> | Pmin      |      |  | -24  | dBm |
| Receiver Overload                        | Pmax      | -3   |  |      | dBm |
| LOS De-Assert                            | LOSD      |      |  | -25  | dBm |
| LOS Assert                               | LOSA      | -42  |  |      | dBm |
| LOS Hysteresis <sup>*(note8)</sup>       |           | 0.5  |  |      | dB  |

Note3: Output is coupled into a 9/125 $\mu$ m single-mode fiber.

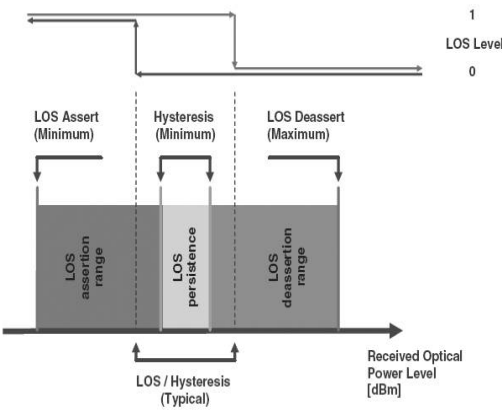
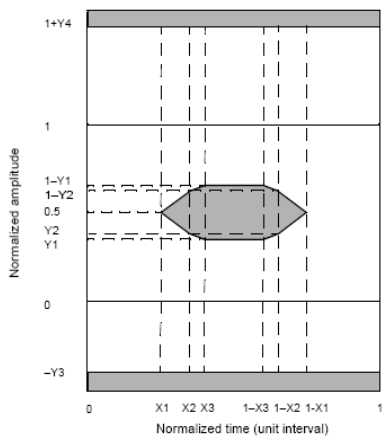
Note4: Filtered, measured with a PRBS 2<sup>7</sup>-1 test pattern @1.25Gbps

Note5: LVPECL logic, internally AC coupled.

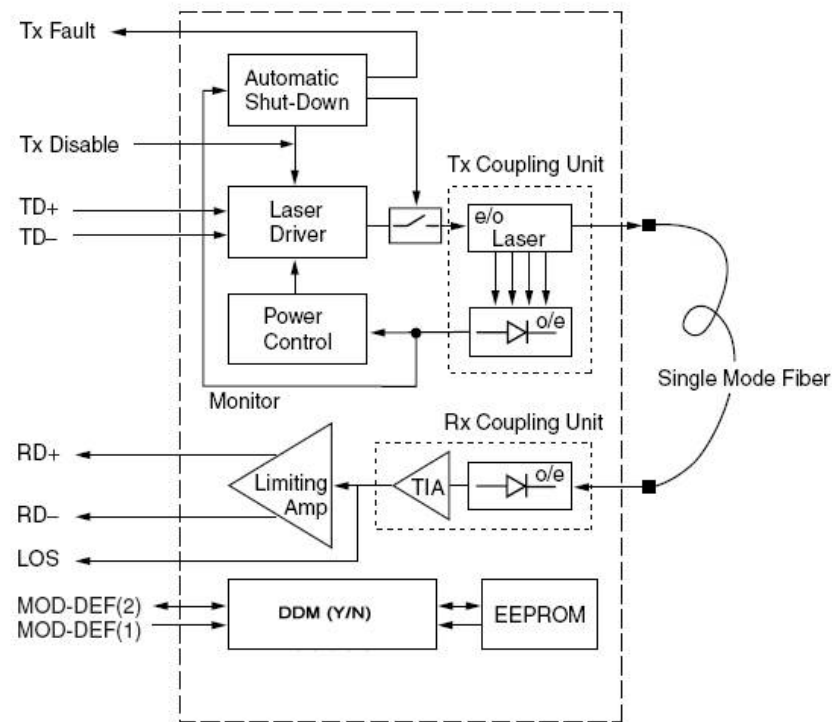
Note6: Minimum average optical power at BER less than 1E-12, with a 2<sup>7</sup>-1 NRZ PRBS and ER=9 dB.

Note7: Eye pattern mask

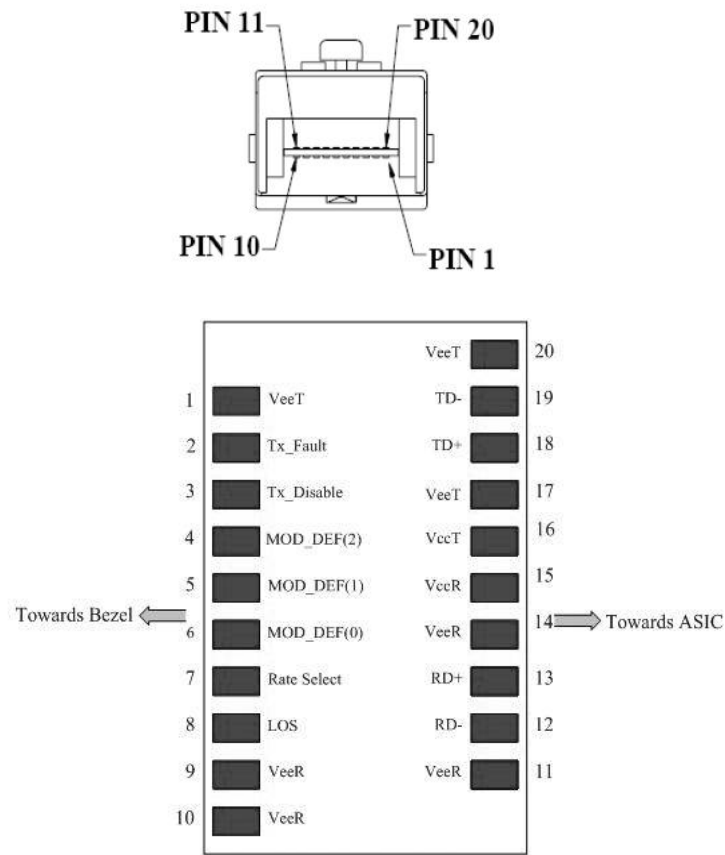
Note8: LOS Hysteresis



Functional Description of Transceiver



SFP Transceiver Electrical Pad Layout



Pin Function Definitions

| Pin Num. | Name        | Function                     | Plug | 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 | 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 – 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 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. 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.

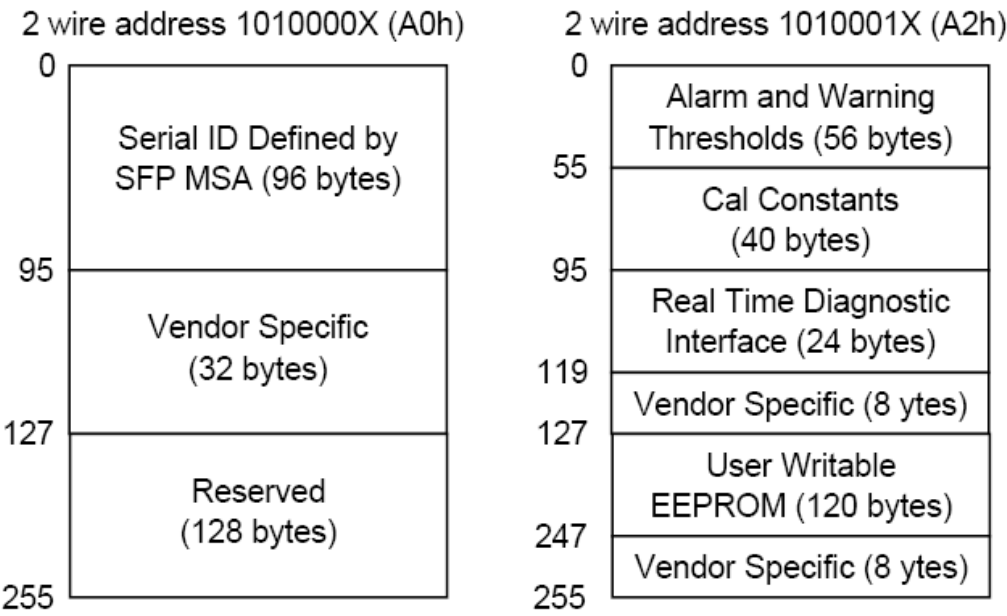
8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not

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 write-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.



EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X(A0H). Memory Contents of Serial ID are shown in Table 1.

Table 1 Serial ID Memory Contents

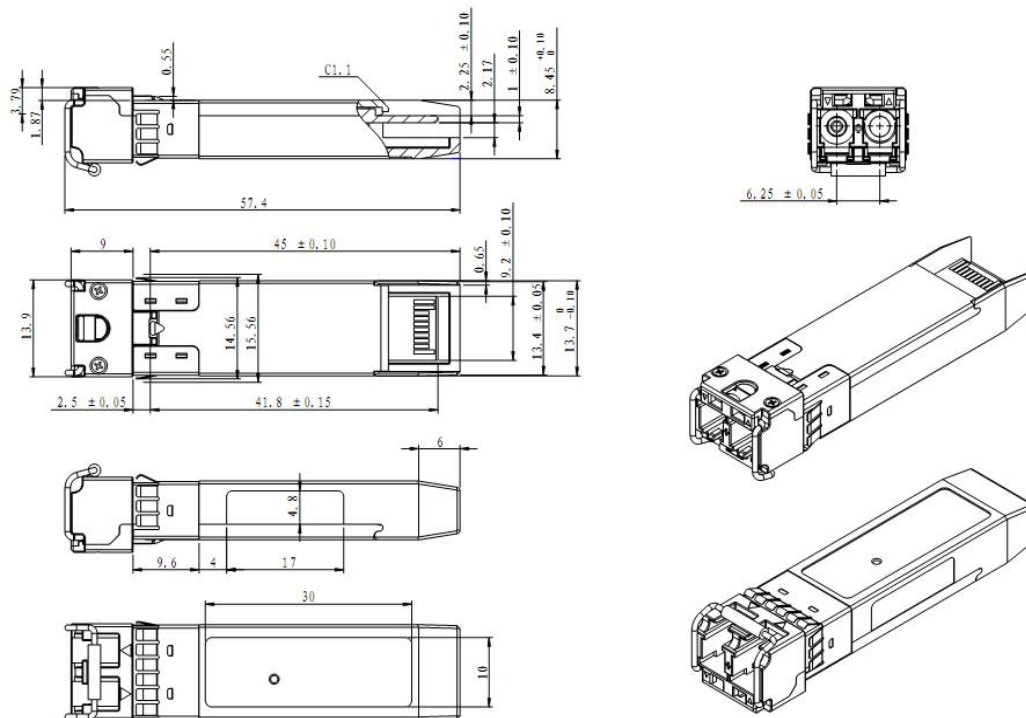
| Add.                      | Size (Bytes) | Name of Field              | Hex  | Description  |
|---------------------------|--------------|----------------------------|--|--|
| <b>BASE ID FIELDS</b>     |              |                            |  |  |
| 0                         | 1            | Identifier                 | 03   | SFP  |
| 1                         | 1            | Ext. Identifier            | 04   | SFP function is defined by serial ID only                    |
| 2                         | 1            | Connector                  | 07   | LC Connector   |
| 3-10                      | 8            | Transceiver                | XX <sup>(note9)</sup>  | Transmitter Code   |
| 11                        | 1            | Encoding                   | 01   | 8B10B  |
| 12                        | 1            | BR, Nominal                | 0D   | 1.25Gbps   |
| 13                        | 1            | Reserved                   | 00   |  |
| 14                        | 1            | Length (9μm) km            | 0A/0F/14/1E/28   | Transceiver Transmit Distance                                |
| 15                        | 1            | Length(9μm) 100m           | 64/96/C8/FF/FF   |  |
| 16                        | 1            | Length (50μm) 10m          | 00   |  |
| 17                        | 1            | Length(62.5μm)10m          | 00   |  |
| 18                        | 1            | Length (Copper)            | 00   | Not Compliant  |
| 19                        | 1            | Reserved                   | 00   |  |
| 20-35                     | 16           | Vendor name                | XX XX XX XX XX XX<br>XX XX <sup>(note9)</sup> 20 20 20<br>20 20 20 20 20 | Vendor name (ASCII)  |
| 36                        | 1            | Reserved                   | 00   |  |
| 37-39                     | 3            | Vendor OUI                 | 00 00 00   |  |
| 40-55                     | 16           | Vendor PN                  | XX XX XX XX XX<br>XX XX XX XX XX XX<br>XX XX XX XX XX                    | Transceiver part number                                      |
| 56-59                     | 4            | Vendor rev                 | XX XX XX XX <sup>(note9)</sup>   | ASCII<br>(31 30 20 20 means 1.0 revision )                   |
| 60-61                     | 2            | Wavelength                 | 05 1E  | 1310nm   |
| 62                        | 1            | Reserved                   | 00   |  |
| 63                        | 1            | CC_BASE                    | Check Sum<br>(Variable)  | Check Code for Base ID Fields                                |
| <b>EXTENDED ID FIELDS</b> |              |                            |  |  |
| 64-65                     | 2            | Options                    | 00 1A  | TX_DISABLE, TX_FAULT and Loss of Signal implemented.         |
| 66                        | 1            | BR, max                    | 00   |  |
| 67                        | 1            | BR, min                    | 00   |  |
| 68-83                     | 16           | Vendor SN                  | XX XX XX XX XX XX<br>XX XX 20 20 20 20<br>20 20 20 20 <sup>(note9)</sup> | Serial Number of transceiver (ASCII). For example "B000822". |
| 84-91                     | 8            | Date Code                  | XX XX XX XX XX XX<br>XX XX <sup>(note9)</sup>                            | Manufactory date code.<br>For example "080405".              |
| 92                        | 1            | Diagnostic Monitoring Type | XX <sup>(note9)</sup>  | Digital Diagnostic Monitoring Implemented                    |
| 93                        | 1            | Enhanced Options           | XX <sup>(note9)</sup>  | Optional Flags   |
| 94                        | 1            | SFF_8472 Compliance        | XX <sup>(note9)</sup>  | 01 for Rev9.3 SFF-8472.                                      |
| 95                        | 1            | CC_EXT                     | Check Sum<br>(Variable)  | Check Sum for Extended ID Field.                             |



| VENDOR SPECIFIC ID FIELDS |     |                 |           |                                 |
|---------------------------|-----|-----------------|-----------|---------------------------------|
| 96-127                    | 32  | Vendor Specific | Read Only | Depends on Customer Information |
| 128-255                   | 128 | Reserved        | Read Only |                                 |

Note9: The “XX” byte should be filled in according to practical case. For more information, please refer to the related document of SFP Multi-Source Agreement (MSA).

## Mechanical Specifications



## Laser Emission

