

## DATASHEET

### FEATURES:

- Multi-Source Package with Duplex LC Connector
- Up to 2.7Gb/s Data Links
- Single +3.3V Power Supply
- Hot-Pluggable
- Compliant with Bellcore TA-NWT-000983
- Compliant with Specifications for IEEE802.3Z
- Eye Safety Designed to Meet Laser Class1, Compliant with IEC60825
- Monitoring Interface Compliant with SFF-8472, Real time monitoring of:
  - Transmitter optical power
  - Receiver optical power
  - Laser bias current
  - Temperature
  - Supply voltage
- RoHS Compliant Products

### APPLICATIONS:

- SDH STM-16/SONET OC-48
- 1x, 2x Fiber Channel
- Gigabyte Ethernet
- Other Optical Links

### SPECIFICATIONS:

**Electrical and Optical Characteristics: (Condition:  $T_a=T_{OP}$ )**

| Parameter                           | Symbol          | Min. | Typical | Max.            | Unit   |
|-------------------------------------|-----------------|------|---------|-----------------|--------|
| Transmitter Differential Input Volt | +/-TX_DAT       | 200  |         | 2400            | mV p-p |
| Supply Current                      | I <sub>CC</sub> |      | 130     | 180             | mA     |
| Tx_Disable Input Voltage – Low      | V <sub>IL</sub> | 0    |         | 0.8             | V      |
| Tx_Disable Input Voltage – High     | V <sub>IH</sub> | 2.0  |         | V <sub>CC</sub> | V      |
| Tx_Fault Output Voltage – Low       | V <sub>OL</sub> | 0    |         | 0.8             | V      |
| Tx_Fault Output Voltage – High      | V <sub>OH</sub> | 2.0  |         | V <sub>CC</sub> | V      |
| Receiver Differential Output Volt   | +/-RX_DAT       | 600  |         | 1400            | mV p-p |
| Rx_LOS Output Voltage- Low          | V <sub>OL</sub> | 0    |         | 0.8             | V      |
| Rx_LOS Output Voltage- High         | V <sub>OH</sub> | 2.0  |         | V <sub>CC</sub> | V      |

**Transmitter:**

| Parameter                   | Symbol                     | Min.          | Typical | Max.          | Unit |
|-----------------------------|----------------------------|---------------|---------|---------------|------|
| Data Rate                   | B                          | -             | 2.5     | -             | Gb/s |
| Centre Wavelength           | $\lambda_c$                | 1296          | 1310    | 1330          | nm   |
| Output Spectral Width(RMS)  | $\Delta\lambda$            | -             | -       | 4             | nm   |
| Average Output Power        | $P_o$                      | -10           | -       | -3            | dBm  |
| Extinction Ratio            | E.R.                       | 8.2           | -       | -             | dB   |
| Rise and Fall time (20~80%) | $T_r$                      | -             | -       | 0.15          | ns   |
| Data Input Voltage-High     | $V_{IHS}$                  | $V_{cc}-1.16$ | -       | $V_{cc}-0.89$ | V    |
| Data Input Voltage -Low     | $V_{ILS}$                  | $V_{cc}-1.82$ | -       | $V_{cc}-1.48$ | V    |
| Supply Current              | $I_{cc}$                   | -             | 90      | 120           | mA   |
| Output Optical Eye          | Compliant with ITU-T G.957 |               |         |               |      |

**Receiver:**

| Parameter                   | Symbol      | Min.          | Typical | Max.          | Unit |
|-----------------------------|-------------|---------------|---------|---------------|------|
| Date Rate                   | B           | -             | 2.5     | -             | Gb/s |
| Receive Sensitivity         | $P_{min}$   | -             | -       | -18           | dBm  |
| Maximum Input Power         | $P_{MAX}$   | -3            | -       | -             | dBm  |
| Operating Wavelength        | $\lambda_c$ | 1100          | -       | 1620          | nm   |
| RX_LOS Assert Level         | LOS A       | -30           | -       | -             | dBm  |
| RX_LOS De Assert Level      | LOS D       | -             | -       | -20           | dBm  |
| Hysteresis                  | -           | -             | 2.0     | -             | dB   |
| Supply Current              | $I_{cc}$    | -             | 80      | 110           | mA   |
| Rise and Fall time (20~80%) | $T_r/T_f$   | -             | -       | 0.15          | ns   |
| Output High Voltage         | $V_{OH}$    | $V_{cc}-1.03$ | -       | $V_{cc}-0.89$ | V    |
| Output Low Voltage          | $V_{OL}$    | $V_{cc}-1.82$ | -       | $V_{cc}-1.63$ | V    |
| Alarm Output Interface      | LVTTTL      |               |         |               |      |

**Absolute Maximum Ratings:**

| Parameter             | Symbol          | Min. | Max. | Unit |
|-----------------------|-----------------|------|------|------|
| Storage Temperature   | T <sub>ST</sub> | -40  | +85  | °C   |
| Operating Temperature | T <sub>IP</sub> | 0    | +70  | °C   |
| Input Voltage         | T <sub>CC</sub> | 0    | +5   | V    |

**Recommended Operating Environment:**

| Parameter             | Symbol          | Min. | Typical | Max. | Unit |
|-----------------------|-----------------|------|---------|------|------|
| Supply Voltage        | V <sub>CC</sub> | +3.0 | +3.3    | +3.6 | V    |
| Operating Temperature | T <sub>OP</sub> | 0    | -       | +70  | °C   |

**Timing Characteristics:**

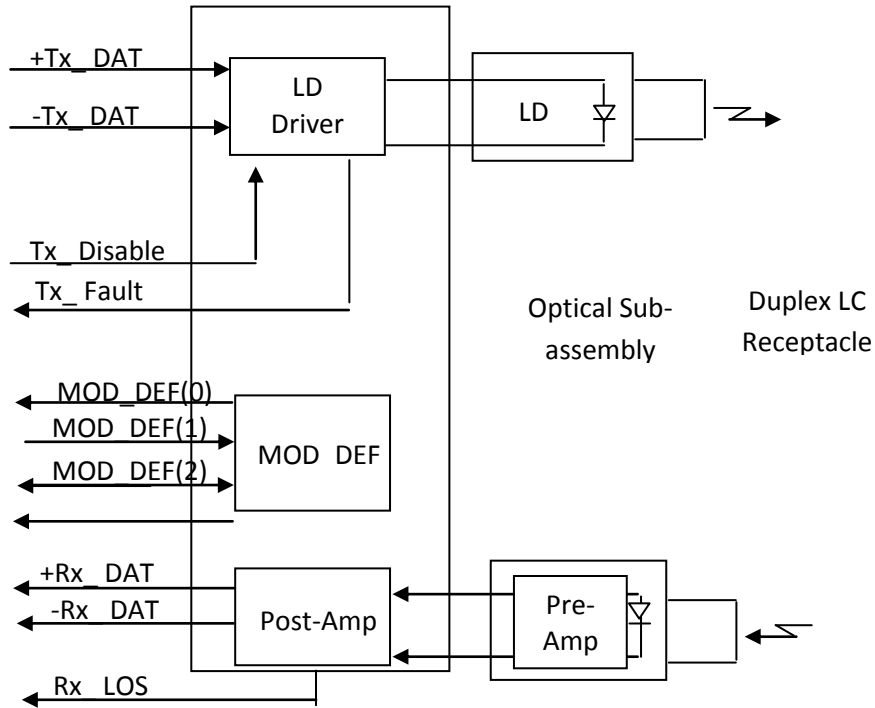
| Parameter                                       | Symbol                | Min. | Typical | Max. | Unit |
|---|-----------------------|------|---------|------|------|
| TX_DISABLE Assert Time                          | t <sub>off</sub>      |      | 3       | 10   | usec |
| TX_DISABLE Negate Time                          | t <sub>on</sub>       |      | 0.5     | 1    | msec |
| Time to Initialize Include Reset of TX_FAULT    | t <sub>int</sub>      |      | 30      | 300  | msec |
| TX_FAULT from Fault to Assertion                | t <sub>fault</sub>    |      | 20      | 100  | usec |
| TX_DISBEL Time to Start Reset                   | t <sub>reset</sub>    | 10   |         |      | usec |
| Receiver Loss of Signal Assert Time (Off to On) | T <sub>A,RX_LOS</sub> |      |         | 100  | usec |
| Receiver Loss of Signal Assert Time (On to Off) | T <sub>d,RX_LOS</sub> |      |         | 100  | usec |

**Digital Diagnostic Monitor Characteristics:**

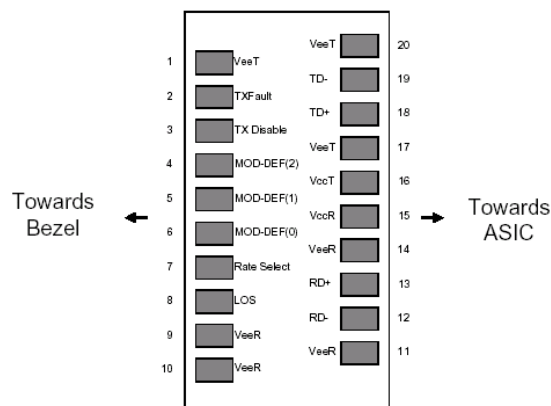
| Parameter                                    | Min. | Unit |
|--|------|------|
| Tx Output Power Accuracy                     | ±3.0 | dBm  |
| Rx Input Power Accuracy                      | ±3.0 | dBm  |
| Laser Bias Current Accuracy                  | ±1.0 | %    |
| Transceiver Internal Temperature Accuracy    | ±3.0 | °C   |
| Transceiver Internal Supply Voltage Accuracy | ±0.1 | V    |

**2.5Gb/s Hot Pluggable  
Duplex LC, +3.3V, 1310nm, FP,  
Single-Mode SFP Optical Transceiver with DDMI  
PSFP-48-3311S-22F**

**Block Diagram of Transceiver:**



**Pin Assignment:**



**Pin out of Connector Block on Host Board**



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**Pin Description:**

| Pin | Symbol             | Name/Description  | Ref. |
|-----|--------------------|---|------|
| 1   | V <sub>FET</sub>   | Transmitter Ground (Common with Receiver Ground)                      | 1    |
| 2   | T <sub>FAULT</sub> | Transmitter Fault. <b>Low normal operation, High Fault indication</b> |      |
| 3   | T <sub>DIS</sub>   | Transmitter Disable. Laser output disabled on high or open.           | 2    |
| 4   | MOD_DEF(2)         | Module Definition 2. Data line for Serial ID.                         | 3    |
| 5   | MOD_DEF(1)         | Module Definition 1. Clock line for Serial ID.                        | 3    |
| 6   | MOD_DEF(0)         | Module Definition 0. Grounded within the module.                      | 3    |
| 7   | Rate Select        | No connection required  |      |
| 8   | LOS                | Loss of Signal indication. Logic 0 indicates normal operation.        | 4    |
| 9   | V <sub>FERR</sub>  | Receiver Ground (Common with Transmitter Ground)                      | 1    |
| 10  | V <sub>FERR</sub>  | Receiver Ground (Common with Transmitter Ground)                      | 1    |
| 11  | V <sub>FERR</sub>  | Receiver Ground (Common with Transmitter Ground)                      | 1    |
| 12  | RD-                | Receiver Inverted DATA out. AC Coupled                                |      |
| 13  | RD+                | Receiver Non-inverted DATA out. AC Coupled                            |      |
| 14  | V <sub>FERR</sub>  | Receiver Ground (Common with Transmitter Ground)                      | 1    |
| 15  | V <sub>CCR</sub>   | Receiver Power Supply   |      |
| 16  | V <sub>CCT</sub>   | Transmitter Power Supply  |      |
| 17  | V <sub>FET</sub>   | Transmitter Ground (Common with Receiver Ground)                      | 1    |
| 18  | TD+                | Transmitter Non-Inverted DATA in. AC Coupled.                         |      |
| 19  | TD-                | Transmitter Inverted DATA in. AC Coupled.                             |      |
| 20  | V <sub>FET</sub>   | Transmitter Ground (Common with Receiver Ground)                      | 1    |

**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. MOD\_DEF(0) pulls line low to indicate module is plugged in.
4. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

**Serial ID Memory Contents:**

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| Data Address                     | Length (Byte) | Name of Length | Description and Contents  |
|----------------------------------|---------------|----------------|---|
| <b>Base ID Fields</b>            |               |                |   |
| 0                                | 1             | Identifier     | Type of Serial transceiver (03h=SFP)  |
| 1                                | 1             | Reserved       | Extended identifier of type serial transceiver (04h)  |
| 2                                | 1             | Connector      | Code of optical connector type (07=LC)  |
| 3-10                             | 8             | Transceiver    | SONET   |
| 11                               | 1             | Encoding       | NRZ (03h)   |
| 12                               | 1             | BR,Nominal     | Nominal baud rate, unit of 100Mbps  |
| 13-14                            | 2             | Reserved       | (0000h)   |
| 15                               | 1             | Length(9um)    | Link length supported for 9/125um fiber, units of 100m  |
| 16                               | 1             | Length(50um)   | Link length supported for 50/125um fiber, units of 10m  |
| 17                               | 1             | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m  |
| 18                               | 1             | Length(Copper) | Link length supported for copper, units of meters   |
| 19                               | 1             | Reserved       |   |
| 20-35                            | 16            | Vendor Name    | SFP vendor name: PeakOptical®   |
| 36                               | 1             | Reserved       |   |
| 37-39                            | 3             | Vendor OUI     | SFP transceiver vendor OUI ID   |
| 40-55                            | 16            | Vendor PN      | Part Number: "PSFP-xxxxxx" (ASCII)  |
| 56-59                            | 4             | Vendor rev     | Revision level for part number  |
| 60-62                            | 3             | Reserved       |   |
| 63                               | 1             | CCID           | Least significant byte of sum of data in address 0-62   |
| <b>Extended ID Fields</b>        |               |                |   |
| 64-65                            | 2             | Option         | Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |
| 66                               | 1             | BR, max        | Upper bit rate margin, units of %   |
| 67                               | 1             | BR, min        | Lower bit rate margin, units of %   |
| 68-83                            | 16            | Vendor SN      | Serial number (ASCII)   |
| 84-91                            | 8             | Date code      | PeakOptical®'s Manufacturing date code  |
| 92-94                            | 3             | Reserved       |   |
| 95                               | 1             | CCEX           | Check code for the extended ID Fields (addresses 64 to 94)  |
| <b>Vendor Specific ID Fields</b> |               |                |   |
| 96-127                           | 32            | Readable       | PeakOptical® specific date, read only   |

**Serial ID Memory Contents: (A2H)**

| Address | # Bytes | Name                  | Description                              |
|---------|---------|-----------------------|--|
| 00-01   | 2       | Temp High Alarm       | MSB at low address                       |
| 02-03   | 2       | Temp Low Alarm        | MSB at low address                       |
| 04-05   | 2       | Temp High Warning     | MSB at low address                       |
| 06-07   | 2       | Temp Low Warning      | MSB at low address                       |
| 08-09   | 2       | Voltage High Alarm    | MSB at low address                       |
| 10-11   | 2       | Voltage Low Alarm     | MSB at low address                       |
| 12-13   | 2       | Voltage High Warning  | MSB at low address                       |
| 14-15   | 2       | Voltage Low Warning   | MSB at low address                       |
| 16-17   | 2       | Bias High Alarm       | MSB at low address                       |
| 18-19   | 2       | Bias Low Alarm        | MSB at low address                       |
| 20-21   | 2       | Bias High Warning     | MSB at low address                       |
| 22-23   | 2       | Bias Low Warning      | MSB at low address                       |
| 24-25   | 2       | TX Power High Alarm   | MSB at low address                       |
| 26-27   | 2       | TX Power Low Alarm    | MSB at low address                       |
| 28-29   | 2       | TX Power High Warning | MSB at low address                       |
| 30-31   | 2       | TX Power Low Warning  | MSB at low address                       |
| 32-33   | 2       | RX Power High Alarm   | MSB at low address                       |
| 34-35   | 2       | RX Power Low Alarm    | MSB at low address                       |
| 36-37   | 2       | RX Power High Warning | MSB at low address                       |
| 38-39   | 2       | RX Power Low Warning  | MSB at low address                       |
| 40-55   | 16      | Reserved              | Reserved for future monitored quantities |



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| Address | # Bytes | Name           | Description   |
|---------|---------|----------------|---|
| 56-59   | 4       | Rx_PWR(4)      | Single precision floating point calibration data - Rx optical power.<br>Bit 7 of byte 56 is MSB. Bit 0 of byte 59 is LSB.                           |
| 60-63   | 4       | Rx_PWR(3)      | Single precision floating point calibration data - Rx optical power.<br>Bit 7 of byte 60 is MSB. Bit 0 of byte 63 is LSB.                           |
| 64-67   | 4       | Rx_PWR(2)      | Single precision floating point calibration data - Rx optical power.<br>Bit 7 of byte 64 is MSB, bit 0 of byte 67 is LSB.                           |
| 68-71   | 4       | Rx_PWR(1)      | Single precision floating point calibration data - Rx optical power.<br>Bit 7 of byte 68 is MSB, bit 0 of byte 71 is LSB.                           |
| 72-75   | 4       | Rx_PWR(0)      | Single precision floating point calibration data - Rx optical power.<br>Bit 7 of byte 72 is MSB, bit 0 of byte 75 is LSB.                           |
| 76-77   | 2       | Tx_I(Slope)    | Fixed decimal (unsigned) calibration data, laser bias current.<br>Bit 7 of byte 76 is MSB, bit 0 of byte 77 is LSB.                                 |
| 78-79   | 2       | Tx_I(Offset)   | Fixed decimal (signed two's complement) calibration data,<br>laser bias current.<br>Bit 7 of byte 78 is MSB, bit 0 of byte 79 is LSB                |
| 80-81   | 2       | Tx_PWR(Slope)  | Fixed decimal (unsigned) calibration data,<br>transmittercoupled output power.<br>Bit 7 of byte 80 is MSB, bit 0 of byte81 is LSB.                  |
| 82-83   | 2       | Tx_PWR(Offset) | Fixed decimal (signed two's complement) calibration data,<br>transmitter coupled output power.<br>Bit 7 of byte 82 is MSB, bit 0 of byte 83 is LSB. |
| 84-85   | 2       | T(Slope)       | Fixed decimal (unsigned) calibration data,<br>internal module temperature.<br>Bit 7 of byte 84 is MSB, bit 0 of byte 85 is LSB.                     |
| 86-87   | 2       | T(Offset)      | Fixed decimal (signed two's complement) calibration data,<br>internal module temperature.<br>Bit 7 of byte 86 is MSB, bit 0 of byte 87 is LSB.      |
| 88-89   | 2       | V(Slope)       | Fixed decimal (unsigned) calibration data,<br>internal module supply voltage.<br>Bit 7 of byte 88 is MSB, bit 0 of byte 89 is LSB.                  |
| 90-91   | 2       | V(Offset)      | Fixed decimal (signed two's complement) calibration data,<br>internal module supply voltage.<br>Bit 7 of byte 90 is MSB. Bit 0 of byte 91 is LSB.   |
| 92-95   | 4       | Reserved       | Reserved  |





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| Byte   | Bit | Name                 | Description   |
|--|-----|----------------------|---|
| <b>Converted analog values. Calibrated 16 bit data</b> |     |                      |   |
| 96   | All | Temperature MSB      | Internally measured module temperature.                                 |
| 97   | All | Temperature LSB      |   |
| 98   | All | Vcc MSB              | Internally measured supply voltage in transceiver.                      |
| 99   | All | Vcc LSB              |   |
| 100  | All | TX Bias MSB          | Internally measured TX Bias Current.                                    |
| 101  | All | TX Bias LSB          |   |
| 102  | All | TX Power MSB         | Measured TX output power.   |
| 103  | All | TX Power LSB         |   |
| 104  | All | RX Power MSB         | Measured RX input power.  |
| 105  | All | RX Power LSB         |   |
| 106  | All | Reserved MSB         | Reserved for 1st future definition of digitized analog input            |
| 107  | All | Reserved LSB         | Reserved for 1st future definition of digitized analog input            |
| 108  | All | Reserved MSB         | Reserved for 2nd future definition of digitized analog input            |
| 109  | All | Reserved LSB         | Reserved for 2nd future definition of digitized analog input            |
| <b>Optional Status/Control Bits</b>                    |     |                      |   |
| 110  | 7   | TX Disable State     | Digital state of the TX Disable Input Pin. Not supported.               |
| 110  | 6   | Soft TX Disable      | Read/write bit that allows software disable of laser.<br>Not supported. |
| 110  | 5   | Reserved             |   |
| 110  | 4   | RX Rate Select State | Digital state of the SFP RX Rate Select Input Pin.<br>Not supported.    |
| 110  | 3   | Soft RX Rate Select  | Read/write bit that allows software RX rate select.<br>Not supported.   |
| 110  | 2   | TX Fault             | Digital state of the TX Fault Output Pin.                               |
| 110  | 1   | LOS                  | Digital state of the LOS Output Pin.                                    |
| 110  | 0   | Data Ready           | Indicates transceiver has achieved power up and data is ready           |
| 111  | 7-0 | Reserved             | Reserved.   |



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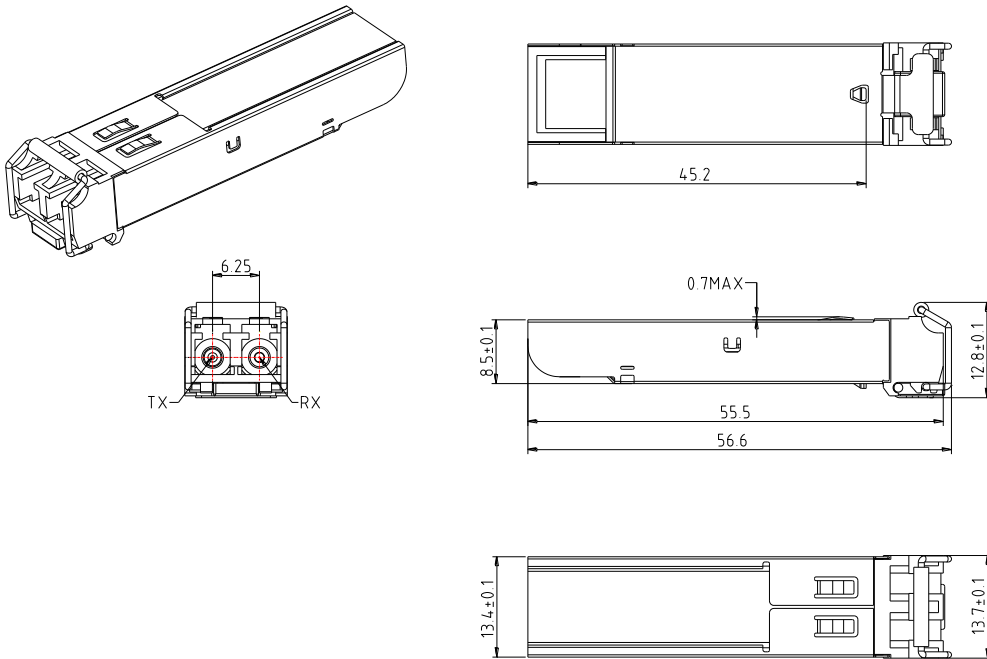
| Byte   | Bit | Name                  | Description  |
|--|-----|-----------------------|--|
| <b>Reserved Optional Alarm and Warning Flag Bits</b> |     |                       |  |
| 112  | 7   | Temp High Alarm       | Set when internal temperature exceeds high alarm level.      |
| 112  | 6   | Temp Low Alarm        | Set when internal temperature is below low alarm level.      |
| 112  | 5   | Vcc High Alarm        | Set when internal supply voltage exceeds high alarm level.   |
| 112  | 4   | Vcc Low Alarm         | Set when internal supply voltage is below low alarm level.   |
| 112  | 3   | TX Bias High Alarm    | Set when TX Bias current exceeds high alarm level.           |
| 112  | 2   | TX Bias Low Alarm     | Set when TX Bias current is below low alarm level.           |
| 112  | 1   | TX Power High Alarm   | Set when TX output power exceeds high alarm level.           |
| 112  | 0   | TX Power Low Alarm    | Set when TX output power is below low alarm level.           |
| 113  | 7   | RX Power High Alarm   | Set when Received Power exceeds high alarm level.            |
| 113  | 6   | RX Power Low Alarm    | Set when Received Power is below low alarm level.            |
| 113  | 5   | Reserved Alarm        |  |
| 113  | 4   | Reserved Alarm        |  |
| 113  | 3   | Reserved Alarm        |  |
| 113  | 2   | Reserved Alarm        |  |
| 113  | 1   | Reserved Alarm        |  |
| 113  | 0   | Reserved Alarm        |  |
| 114  | All | Reserved              |  |
| 115  | All | Reserved              |  |
| 116  | 7   | Temp High Warning     | Set when internal temperature exceeds high warning level.    |
| 116  | 6   | Temp Low Warning      | Set when internal temperature is below low warning level.    |
| 116  | 5   | Vcc High Warning      | Set when internal supply voltage exceeds high warning level. |
| 116  | 4   | Vcc Low Warning       | Set when internal supply voltage is below low warning level. |
| 116  | 3   | TX Bias High Warning  | Set when TX Bias current exceeds high warning level.         |
| 116  | 2   | TX Bias Low Warning   | Set when TX Bias current is below low warning level.         |
| 116  | 1   | TX Power High Warning | Set when TX output power exceeds high warning level.         |
| 116  | 0   | TX Power Low Warning  | Set when TX output power is below low warning level.         |
| 117  | 7   | RX Power High Warning | Set when Received Power exceeds high warning level.          |
| 117  | 6   | RX Power Low Warning  | Set when Received Power is below low warning level.          |
| 117  | 5   | Reserved Warning      |  |
| 117  | 4   | Reserved Warning      |  |
| 117  | 3   | Reserved Warning      |  |
| 117  | 2   | Reserved Warning      |  |
| 117  | 1   | Reserved Warning      |  |
| 117  | 0   | Reserved Warning      |  |
| 118  | All | Reserved              |  |
| 119  | All | Reserved              |  |

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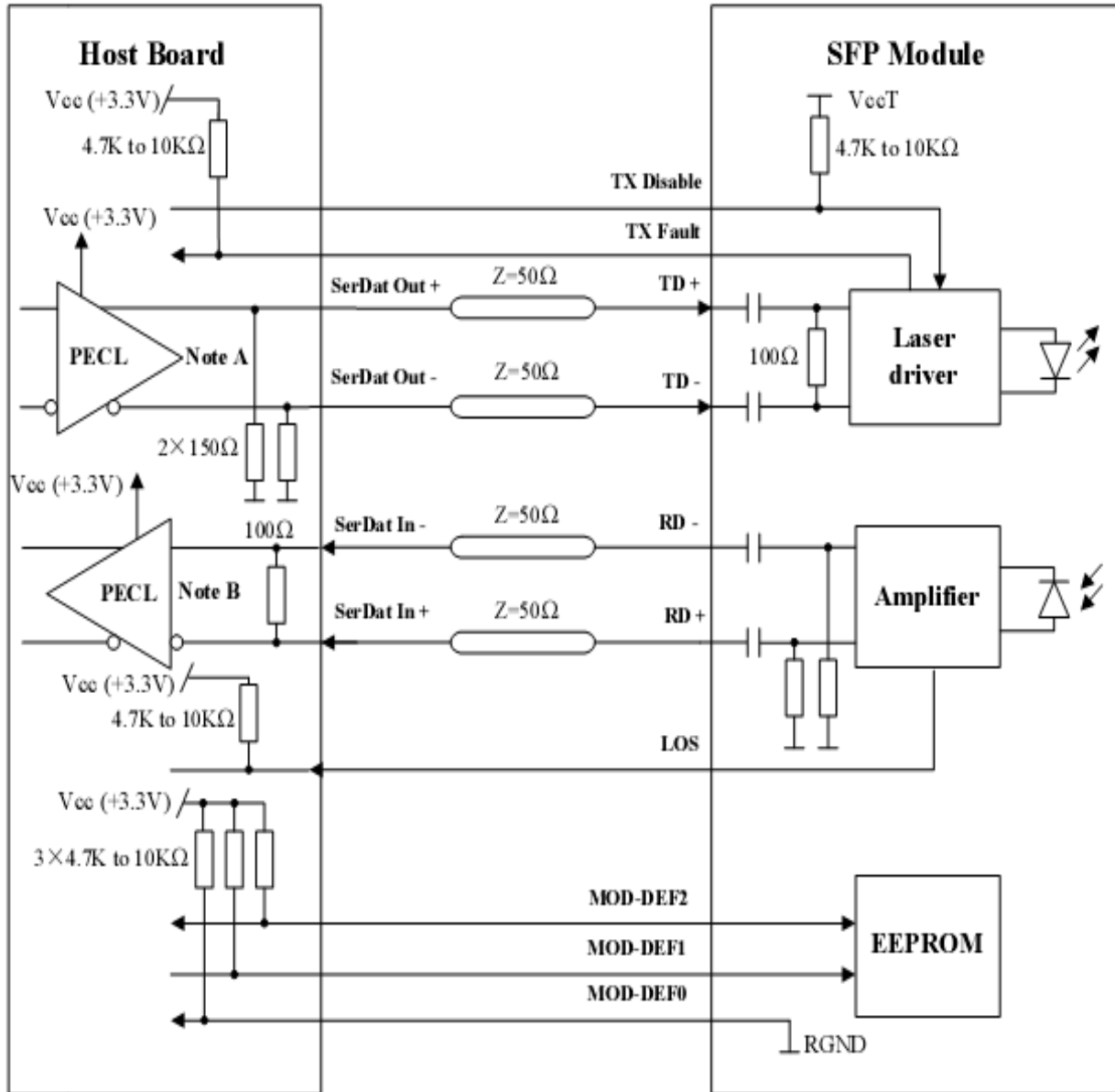
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| Byte    | # Byte | Name            | Description     |
|---------|--------|-----------------|-----------------|
| 120-127 | 8      | Vendor Specific | 00h.            |
| 128-255 | 128    |                 | Writable Memory |

**Mechanical Dimensions:**



**Recommended Circuit:**



**Note A:** Circuit assumes open emitter output

**Note B:** Circuit assumes high impedance internal bias @ $V_{cc}$ -1.3V