

## Extreme Compatible Compatible 10504 Quick Spec:

|                 |                    |
|-----------------|--------------------|
| Part Number:    | 10504<br>10504-IND |
| Form Factor:    | SFP28              |
| TX Wavelength:  | 1310nm             |
| Reach:          | 10km               |
| Cable Type:     | SMF                |
| Rate Category:  | 25G                |
| Interface Type: | LR                 |
| DDM:            | Yes                |
| Connector Type: | Dual-LC            |



## Extreme Compatible Compatible 10504 Features

- Duplex LC connector, support from 10Gb/s to 28Gb/s bit rates
- Compliant with SFP28 MSA
- Electrical interface compliant to SFF-8431
- Hot-pluggable SFP28 footprint
- Built-in digital diagnostic functions
- Up to 10 km on 9/125um SMF G.652
- Single power supply 3.3V
- RoHS6/6 compliant
- Class 1 laser product complies with EN 60825-1
- Power consumption <1.5W
- Operating Case Temperature
  - Standard: 0°C ~ +70°C
  - Industrial: -40°C ~ +85°C

## Extreme Compatible Compatible 10504 Applications

- 25GBase-LR

## Product Description

The **Extreme Compatible Compatible 10504** is high performance, cost effective modules supporting data rate of 25Gbps. The transceiver is compliant with SFF-8431. It offers previously unavailable system cost, upgrade, and reliability benefits by virtue of being hot-pluggable.

## Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

| Parameter                            | Symbol          | Min  | Max | Unit | Notes |
|--------------------------------------|-----------------|------|-----|------|-------|
| Storage Temperature                  | TS              | -40  | 85  | °C   |       |
| Operating Case Temperature           | TOP             | 0    | 70  | °C   |       |
| Power Supply Voltage                 | V <sub>CC</sub> | -0.5 | 3.6 | V    |       |
| Relative Humidity (non-condensation) | RH              | 5    | 95  | %    |       |

## Recommended Operating Conditions and Power Supply Requirements

| Parameter                   | Symbol          | Min   | Typical | Max   | Unit | Notes |
|-----------------------------|-----------------|-------|---------|-------|------|-------|
| Operating Case Temperature  | TOP             | 0     |         | 70    | °C   |       |
| Power Supply Voltage        | V <sub>CC</sub> | 3.135 | 3.3     | 3.465 | V    |       |
| Power Consumption           |                 |       |         | 1.5   | W    |       |
| Power Supply Current @ 3.3V | I <sub>CC</sub> |       |         | 350   | mA   |       |

## Optical Characteristics - Transmitter

All parameters are specified under the recommended operating conditions unless otherwise specified..

| Parameter                              | Symbol                    | Min  | Typical | Max     | Unit | Notes |
|--|---------------------------|------|---------|---------|------|-------|
| Support data rate                      | -                         | -    | -       | 28      | Gb/s | -     |
| Peak Wavelength                        | $\lambda_p$               | 1290 | 1310    | 1330    | nm   | 4     |
| Spectral Width (-20dB)                 | $\Delta\lambda$           | -    | -       | 1       | nm   | -     |
| Side Mode Suppression Ratio            | SMSR                      | 30   |         |         | dB   |       |
| Average Optical Output Power           | Po                        | -8.4 | -       | 3       | dBm  |       |
| Extinction Ratio                       | Er                        | 3.5  | -       | -       | dB   |       |
| Transmitter and dispersion penalty     | TDP                       |      |         | 3       | dB   |       |
| Output Power with Transmitter Disabled | Poff                      |      |         | -30     | dBm  |       |
| Transmitter Enable Voltage             | VEN                       | -0.3 | -       | 0.8     | V    |       |
| Transmitter Disable Voltage            | VD                        | 2.0  | -       | Vcc+0.3 | V    |       |
| Differential Data Input Swing          | VINpp                     | 180  | -       | 700     | mV   |       |
| Optical return loss tolerance          |                           |      |         | -12     | dB   |       |
| Output Eye Diagram                     | Compliant with IEEE 802.3 |      |         |         |      | 1     |
| <b>Receiver</b>                        |                           |      |         |         |      |       |

## Optical Characteristics - Receiver

| Parameter                                   | Symbol     | Min  | Typical | Max   | Unit | Notes |
|---|------------|------|---------|-------|------|-------|
| Support data rate                           | -          | -    | -       | 28    | Gb/s |       |
| Operate Wavelength                          | -          | 1260 | -       | 1360  | nm   |       |
| Receiver sensitivity (BER of 1E-12) @25Gb/s | Sen        | -    | -       | -10.4 | dBm  | 2     |
| Saturation(BER of 1E-12)                    | Psat       | 0.5  | -       | -     | dBm  | 2     |
| LOS Asserted                                | T_loss_on  | -30  | -       | -     | dBm  |       |
| LOS De-Asserted                             | T_loss_off | -    | -       | -16   | dBm  |       |
| LOS Hysteresis                              | T_loss_Hs  | 0.5  | -       | 5.0   | dB   |       |
| Differential Data Output Swing              | VOUTPP     | 450  | -       | 1050  | mV   |       |
| LOS Low Voltage                             | VLout      | -    | -       | 0.4   | V    |       |
| LOS High Voltage                            | VHout      | 2.0  | -       | -     | V    |       |

### Notes:

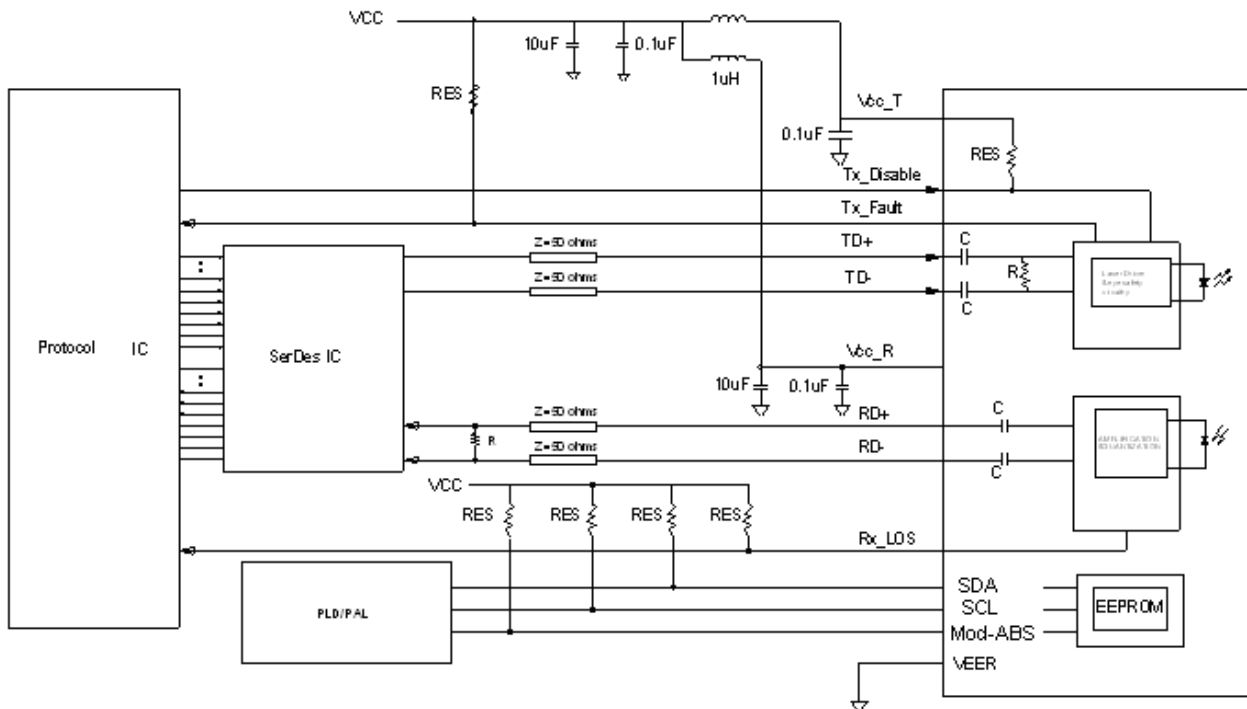
1. At least 1000 waveforms acquired, with minimum 5% margin against 802.3 mask
2. Test at 25.78125Gb/s, PRBS 231-1, BER of 1E-12, NRZ and including back to back

## Digital Diagnostic Functions

Digital diagnostics monitoring function is available on MindPhotonics product. A 2-wire serial interface provides user to contact with module. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales stuff.

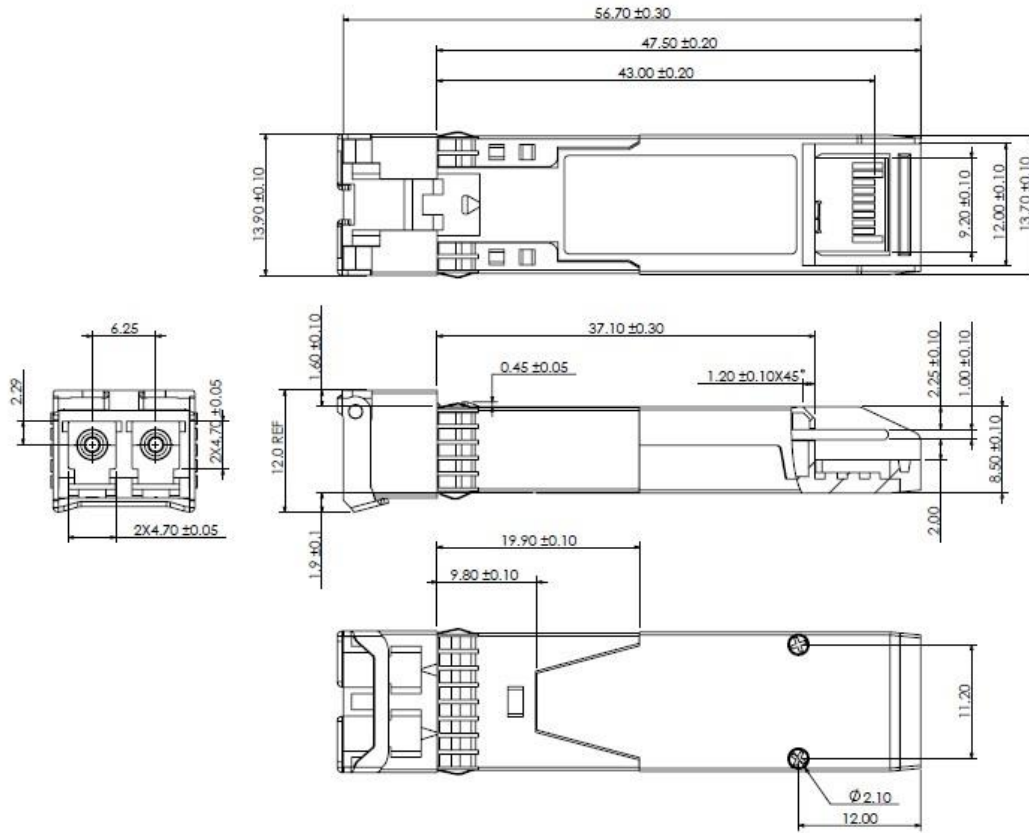
| Parameter                             | Symbol    | Min  | Max  | Unit | Notes |
|---------------------------------------|-----------|------|------|------|-------|
| Temperature monitor absolute error    | DMI_Temp  | -3   | +3   | °C   |       |
| Supply voltage monitor absolute error | DMI_VCC   | -3%  | +3%  | V    |       |
| TX power monitor absolute error       | DMI_RX    | -3   | +3   | dB   |       |
| RX power monitor absolute error       | DMI_RX    | -3   | +3   | dB   |       |
| Bias current monitor                  | DMI_Ibias | -10% | +10% | mA   |       |

## Recommended Circuit

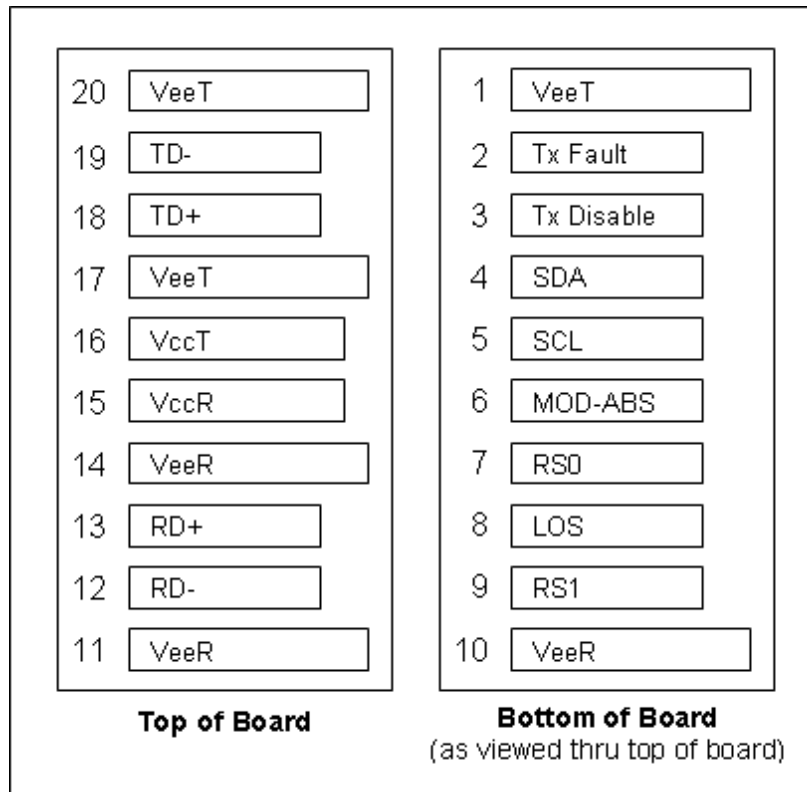


NOTE: 4.7K ohms<RES<10K ohms

## Mechanical Dimensions



## Pin Assignment and Description



## Pin Assignment

| PIN # | Symbol     | Description  | Notes                                   |
|-------|------------|--|---|
| 1     | VeeT       | Transmitter Ground   |   |
| 2     | TX Fault   | Transmitter Fault Indication   | Note 1                                  |
| 3     | TX Disable | Transmitter Disable  | Note 2, Module disables on high or open |
| 4     | SDA        | 2-wire Serial Interface Data Line(Same as MOD-DEF2 in INF-8074i)                 |   |
| 5     | SCL        | 2 Wire Serial Interface Data Line (Same as MOD-DEF1 as defined in the INF-8074i) |   |
| 6     | MOD-ABS    | Module Absent,Connected to VeeT or VeeR in the module.                           | Note 3                                  |
| 7     | RS0        | SFP+ RX Rate Select, optional  | Rate Select0, Not used.Note 9           |
| 8     | LOS        | Loss of Signal   | Note 4                                  |
| 9     | RS1        | SFP+ TX Rate Select, optional  | Rate Select 1, Not used.Note 9          |
| 10    | VeeR       | Receiver Ground  | Note 5                                  |
| 11    | VeeR       | Receiver Ground  | Note 5                                  |
| 12    | RD-        | Inv. Received Data Out   | Note 6                                  |
| 13    | RD+        | Received Data Out  | Note 6                                  |
| 14    | VeeR       | Receiver Ground  | Note 5                                  |
| 15    | VccR       | Receiver Power   | Note 7, 3.3V □ 5%                       |
| 16    | VccT       | Transmitter Power  | Note 7, 3.3V □ 5%                       |
| 17    | VeeT       | Transmitter Ground   | Note 5                                  |
| 18    | TD+        | Transmit Data In   | Note 8                                  |
| 19    | TD-        | Inv. Transmit Data In  | Note 8                                  |
| 20    | VeeT       | Transmitter Ground   | Note 5                                  |

### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- 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 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 de fined 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 1Ω 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 30 m A greater than the steady state value. 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.
- Internally pulled down per SFF-8431 Rev 4.1.