



# DO-LY<sub>xx</sub>L-E00

## SFP28 25Gb/s CWDM 10km Transceiver

### PRODUCT FEATURES

- Up to 25.78Gbps Data Links
- Up to 10km transmission on SMF
- CWDM EML Laser and PIN receiver
- Metal enclosure, for lower EMI
- Hot-pluggable SFP28 footprint
- Specifications compliant with SFF 8472
- Compliant with SFF-8402 with LC connector
- Single 3.3V power supply
- 2-wire interface with integrated Digital Diagnostic monitoring
- Power dissipation < 2W
- Case operating temperature

Commercial: 0°C to +70°C

Industrial: -40°C to +85°C

### APPLICATIONS

- Switch to Switch Interface
- Switched Backplane Applications
- Router/Server Interface
- Other Optical Links



## PRODUCT DESCRIPTION

DO-LYxxL-E00 Small Form Factor Pluggable (SFP) transceivers are compatible with the SFP28 Multi-Sourcing Agreement (MSA). The transceiver consists of four sections: the LD driver, the limiting amplifier, the CWDM EML laser and photo-detector. The module data link up to 10KM in 9/125um single mode fiber. The optical output can be disabled by a TTL logic high-level input of Tx Disable. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner.

## Ordering information

| Product part Number | Data Rate (Gbps) | Media             | Wavelength (nm) | Transmission Distance(km) | Temperature Range (Tcase) (°C) |            |
|---------------------|------------------|-------------------|-----------------|---------------------------|--------------------------------|------------|
| DO-LYxxL-E00        | 25.78            | Single mode fiber | 1471~1571       | 10                        | 0~70                           | Commercial |
| DO-LYxxl-EI00       | 25.78            | Single mode fiber | 1471~1571       | 10                        | -40~85                         | Industrial |

## Product selection

| Wavelength | xx | Wavelength | xx |
|------------|----|------------|----|
| 1471 nm    | 47 | 1531 nm    | 53 |
| 1491 nm    | 49 | 1551 nm    | 55 |
| 1511 nm    | 51 | 1571 nm    | 57 |

## Absolute Maximum Ratings

| Parameter                         | Symbol          | Min.                 | Typ. | Max.                 | Unit | Note |
|-----------------------------------|-----------------|----------------------|------|----------------------|------|------|
| Storage Temperature               | T <sub>s</sub>  | -40                  | -    | 85                   | °C   |      |
| Relative Humidity(Non-condensing) | R <sub>H</sub>  | 0                    | -    | 85                   | %    |      |
| Power Supply Voltage              | V <sub>CC</sub> | -0.3                 | -    | 4                    | V    |      |
| Signal Input Voltage              | V <sub>SI</sub> | V <sub>CC</sub> -0.3 | -    | V <sub>CC</sub> +0.3 | V    |      |

## Recommended Operating Conditions

| Parameter                  | Symbol            | Min. | Typ.  | Max. | Unit | Note            |
|----------------------------|-------------------|------|-------|------|------|-----------------|
| Case Operating Temperature | T <sub>case</sub> | 0    | -     | 70   | °C   |                 |
|                            |                   | -40  |       | 85   | °C   |                 |
| Power Supply Voltage       | V <sub>CC</sub>   | 3.14 | 3.3   | 3.47 | V    |                 |
| Power Supply Current       | I <sub>CC</sub>   | -    |       | 550  | mA   |                 |
|                            |                   |      |       | 600  | mA   | F               |
| Data Rate                  | BR                |      | 25.78 |      | Gbps | TX Rate/RX Rate |
| Transmission Distance      | TD                |      | 10    |      | km   |                 |

|               |                   |             |
|---------------|-------------------|-------------|
| Coupled fiber | Single mode fiber | 9/125um SMF |
|---------------|-------------------|-------------|

## Optical Characteristics

| Parameter   | Symbol               | Min.                               | Typ. | Max.            | Unit  | Note     |
|---|----------------------|------------------------------------|------|-----------------|-------|----------|
| <b>Transmitter</b>  |                      |                                    |      |                 |       |          |
| Average Launched Power  | $P_o$                | 0                                  |      | +6.0            | dBm   |          |
| Center Wavelength Range   | $\lambda_c$          | $\lambda - 6.5$                    | -    | $\lambda + 6.5$ | nm    | Note(1)  |
| Spectrum Bandwidth(-20dB)   | $\Delta\lambda$      | -                                  | -    | 1               | nm    |          |
| Side-Mode Suppression Ratio   | SMSR                 | 30                                 | -    | -               | dB    |          |
| Extinction Ratio  | ER                   | 6                                  |      | -               | dB    | Note (2) |
| Relative Intensity Noise  | RIN <sub>20OMA</sub> |                                    |      | -130            | dB/Hz |          |
| Average Launched Power(Laser Off)   | $P_{off}$            | -                                  | -    | -30             |       |          |
| Optical return loss tolerance   |                      |                                    |      | 20              | dB    |          |
| Transmitter reflectance   |                      |                                    |      | -12             | dB    |          |
| Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} Hit ratio $5 \times 10^{-5}$ hits per sample |                      | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4} |      |                 |       | Note (3) |
| <b>Receiver</b>   |                      |                                    |      |                 |       |          |
| Input Optical Wavelength  | $\lambda_{IN}$       | 1270                               | -    | 1610            | nm    |          |
| Damage threshold  |                      | 3                                  |      |                 | dBm   |          |
| Receiver Sensitivity  | $P_{sen1}$           | -                                  | -    | -13.3           | dBm   | Note (4) |
| Input Saturation Power (Overload)   | $P_{SAT}$            | 2.0                                | -    | -               | dBm   | Note (4) |
| Los Of Signal Assert  | $P_A$                | -30                                | -    | -               | dBm   |          |
| Los Of Signal De-assert   | $P_D$                | -                                  | -    | -15             | dBm   |          |
| LOS -Hysteresis   | $P_{Hys}$            | 0.5                                |      | 6               | dB    |          |

**Note:**

Note (1):  $\lambda$  is: 1471~1571 (nm), please refer to ‘product selection’

Note (2): Measured with a PRBS  $2^{31}-1$  test pattern, @25.78Gb/s.

Note (3): Transmitter eye mask definition, Compliant with IEEE 802.3cc.

Note (4): Measured with Light source 1XX0nm, ER=6dB; BER  $\leq 5 \times 10^{-5}$  @PRBS= $2^{31}-1$  NRZ.

## Electrical Interface Characteristics

| Parameter                         | Symbol              | Min. | Typ. | Max.                 | Unit | Note |
|-----------------------------------|---------------------|------|------|----------------------|------|------|
| <b>Transmitter</b>                |                     |      |      |                      |      |      |
| Input differential impedance      | R <sub>in</sub>     |      | 100  |                      | Ω    | 1    |
| Single ended data input swing     | V <sub>in,pp</sub>  | 180  |      | 700                  | mV   |      |
| Transmitter Fault Output-High     | V <sub>FaultH</sub> | 2    | -    | V <sub>cc</sub> +0.3 | V    |      |
| Transmitter Fault Output-Low      | V <sub>FaultL</sub> | 0    | -    | 0.8                  | V    |      |
| Transmitter Disable Voltage- High | V <sub>DisH</sub>   | 2    | -    | V <sub>cc</sub> +0.3 | V    |      |
| Transmitter Disable Voltage- low  | V <sub>DisL</sub>   | 0    | -    | 0.8                  | V    |      |
| <b>Receiver</b>                   |                     |      |      |                      |      |      |
| Differential data output swing    | V <sub>out,pp</sub> | 300  |      | 850                  | mV   | 2    |
| LOS Output Voltage-High           | V <sub>LOSH</sub>   | 2    | -    | V <sub>cc</sub> +0.3 | V    |      |
| LOS Output Voltage-Low            | V <sub>LOSL</sub>   | 0    | -    | 0.8                  | V    |      |

### Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Into 100 ohms differential termination.

## Pin Description

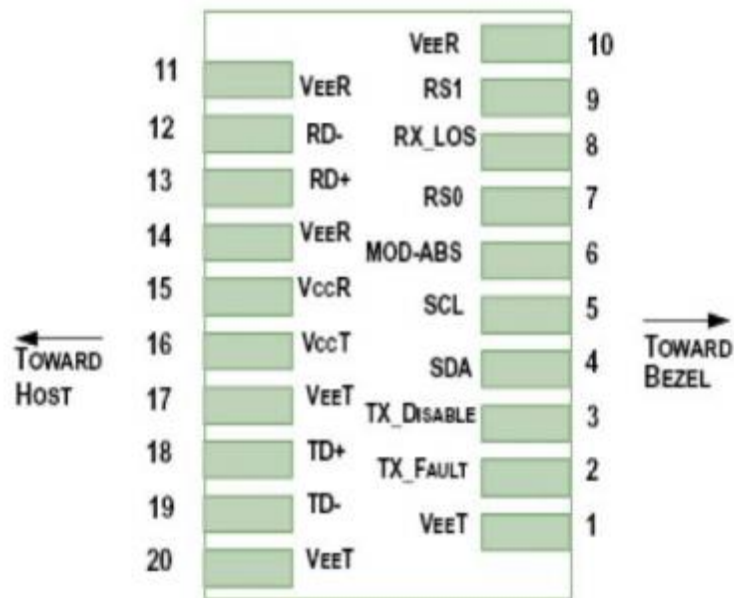


Diagram of Host Board Connector Block Pin Numbers and Name

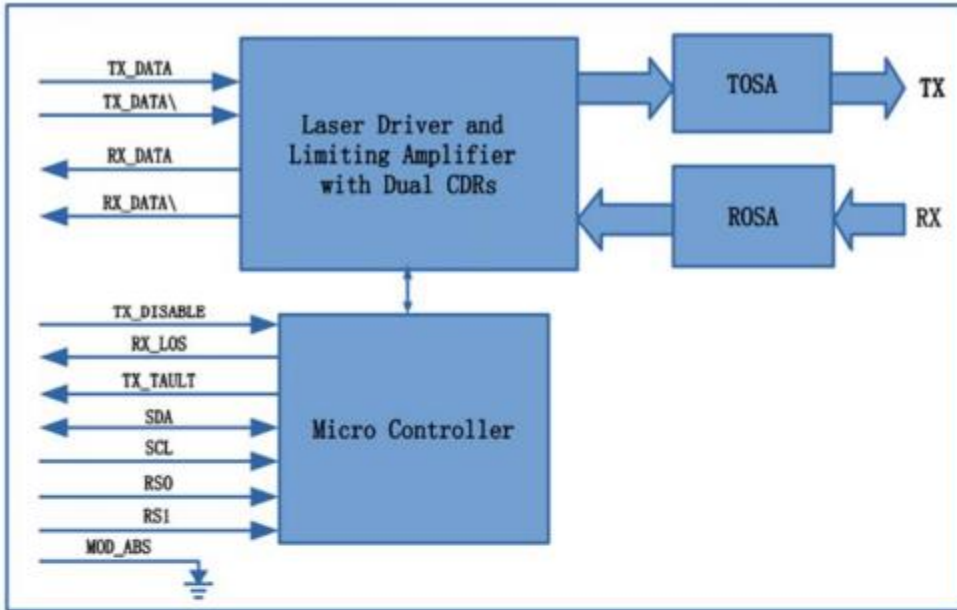
| Pin | Symbol           | Name/Description                                 | NOTE |
|-----|------------------|--|------|
| 1   | V <sub>EET</sub> | Transmitter Ground (Common with Receiver Ground) | 1    |

| Pin | Symbol             | Name/Description   | NOTE |
|-----|--------------------|--|------|
| 2   | T <sub>FAULT</sub> | Transmitter Fault.   | 2    |
| 3   | T <sub>DIS</sub>   | Transmitter Disable. Laser output disabled on high or open.    | 3    |
| 4   | SDA                | 2-wire Serial Interface Data Line                              | 4    |
| 5   | SCL                | 2-wire Serial Interface Clock Line                             | 4    |
| 6   | MOD_ABS            | Module Absent. Grounded within the module                      | 4    |
| 7   | RS0                | Rate Select 0, internal pull down                              | 5    |
| 8   | LOS                | Loss of Signal indication. Logic 0 indicates normal operation. | 6    |
| 9   | RS1                | Rate Select 1, internal pull down                              | 5    |
| 10  | V <sub>EER</sub>   | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 11  | V <sub>EER</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>EER</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>EET</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>EET</sub>   | Transmitter Ground (Common with Receiver Ground)               | 1    |

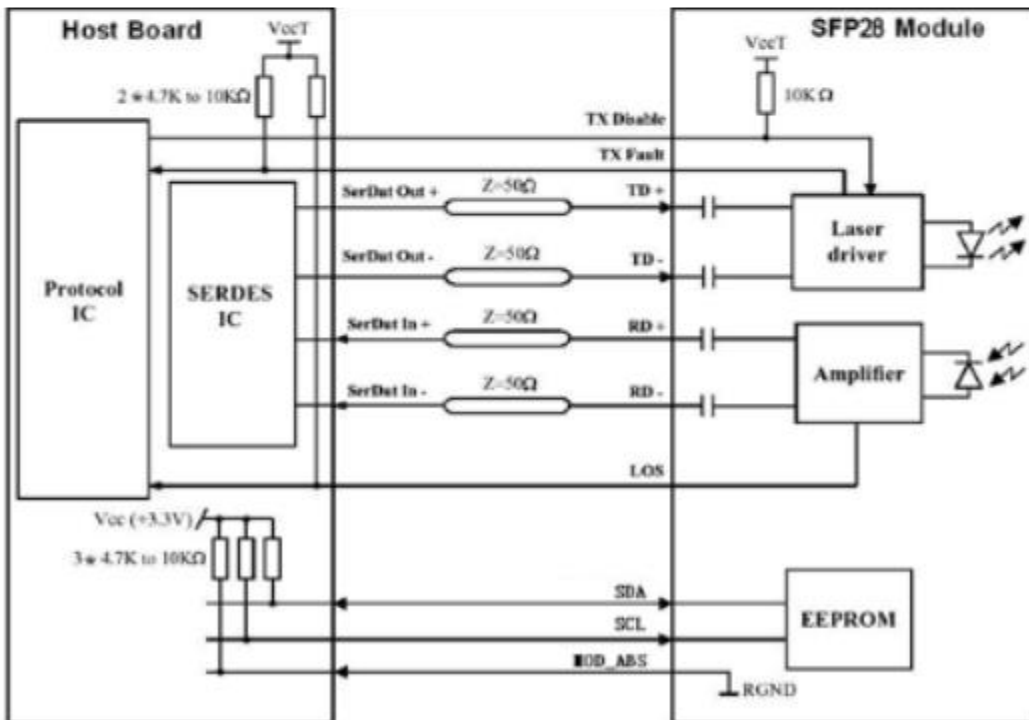
**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. T<sub>FAULT</sub> is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to V<sub>cc</sub> + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on T<sub>DIS</sub>>2.0V or open, enabled on T<sub>DIS</sub><0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD\_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

### Block Diagram of Transceiver



### Recommended Interface Circuit



## Outline Dimensions

