

## ESP8562-03D(I)

6.25Gbps SFP+ Optical Transceiver, 300M Reach

### PRODUCT FEATURES

- Supports up to 6.25Gbps bit rates
- Hot-pluggable SFP+ footprint
- 850nm VCSEL laser and PIN photodiode,
- Up to 500m for OM4-MMF transmission
- Up to 300m for OM3-MMF transmission
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Temperature Range:  
Commercial: 0°C ~70°C  
Industrial: -40°C ~85°C



### APPLICATIONS

- OBSAI rates 6.144Gb/s, 3.072 Gb/s
- CPRI rates 4.9152 Gb/s, 2.4576 Gb/s
- LTE systems
- Other Optical links

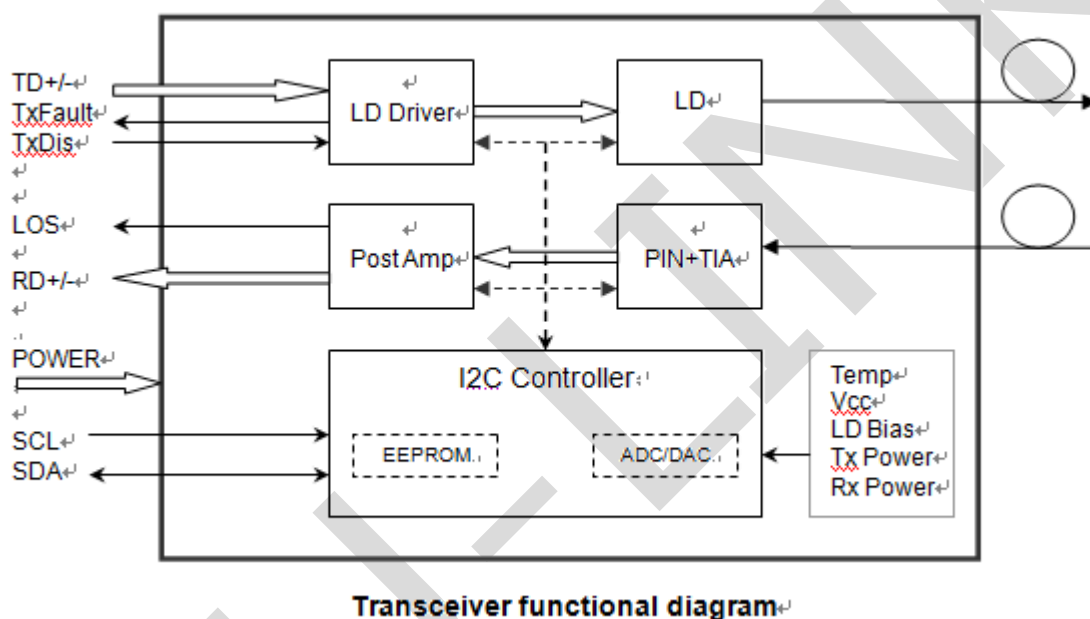
## DESCRIPTIONS

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 6.25Gbps.

The transceiver consists of three sections: a VCSEL laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

## Module Block Diagram



## Ordering Information

| Part No.     | Data Rate(optical) | Laser | Fiber Type | Distance | Optical Interface | Temp     | DDMI | Latch Color |
|--------------|--------------------|-------|------------|----------|-------------------|----------|------|-------------|
| ESP8562-03D  | 6.144/ 6.25Gbps    | VCSEL | MMF        | 300M     | LC                | 0~70°C   | Yes  | Black       |
| ESP8562-03DI | 6.144/ 6.25Gbps    | VCSEL | MMF        | 300M     | LC                | -40~85°C | Yes  | Black       |

## Absolute Maximum Ratings

| Parameter           | Symbol | Min  | Max | Unit |
|---------------------|--------|------|-----|------|
| Supply Voltage      | Vcc    | -0.5 | 4.5 | V    |
| Storage Temperature | Ts     | -40  | +85 | °C   |
| Operating Humidity  | -      | 5    | 85  | %    |

## Recommended Operating Conditions

| Parameter                  | Symbol          | Min. | Typical | Max. | Unit | Notes      |
|----------------------------|-----------------|------|---------|------|------|------------|
| Case Operating Temperature | Top             | 0    | -       | 70   | °C   | Commercial |
|                            |                 | -40  |         | 85   |      | Industrial |
| Power Supply Voltage       | V <sub>CC</sub> | 3.13 | 3.3     | 3.47 | V    |            |
| Power Supply Current       |                 |      |         | 1    | W    |            |
| Transmission Distance      | TD              | -    | -       | 300  | m    | Over MMF   |

## Electrical Characteristics

| Parameter                         | Symbol | Min. | Typ. | Max.        | Unit  | Note     |
|-----------------------------------|--------|------|------|-------------|-------|----------|
| Transmitter                       |        |      |      |             |       |          |
| Differential line input Impedance | RIN    |      | 100  |             | Ohm   |          |
| Differential Data Input Swing     | VDT    | 300  |      | 700         | mVp-p |          |
| Transmit Disable Voltage          | Vdis   | 2    |      | Vcc         | V     | LVTTTL   |
| Transmit Enable Voltage           | Ven    | Vee  |      | Vee+0.8     | V     |          |
| Receiver                          |        |      |      |             |       |          |
| Differential Data Output Swing    | VDR    | 400  |      | 850         | mVp-p | Note (1) |
| LOS Output Voltage-High           | VLOSH  | Vee  |      | Vee+0.8     | V     | LVTTTL   |
| LOS Output Voltage-Low            | VLOSL  | 2    |      | VccHOS<br>T | V     |          |

**Note:** Into 100Ω differential termination.

## Optical and Characteristics

| Parameter                   | Symbol           | Min  | Typical | Max  | Unit  | Notes |
|-----------------------------|------------------|------|---------|------|-------|-------|
| <b>Transmitter</b>          |                  |      |         |      |       |       |
| Centre Wavelength           | λ <sub>C</sub>   | 840  | 850     | 860  | nm    |       |
| Spectral Width (RMS)        | Δλ               |      |         | 0.65 | nm    |       |
| Side-Mode Suppression Ratio | SMSR             | -    | -       | -    | dB    |       |
| Average Output Power        | P <sub>out</sub> | -6.0 |         | -0.5 | dBm   | 1     |
| Extinction Ratio            | ER               | 3.0  |         |      | dB    |       |
| RIN                         | RIN              |      |         | -128 | dB/Hz |       |

|                               |                              |     |     |       |     |   |
|-------------------------------|------------------------------|-----|-----|-------|-----|---|
| Optical Return Loss Tolerance | ORL                          |     |     | -12   | dBm |   |
| Output Eye Mask               | Compliant with IEEE 0802.3ae |     |     |       |     |   |
| Receiver                      |                              |     |     |       |     |   |
| Centre Wavelength             | $\lambda_C$                  | 840 | 850 | 860   | nm  |   |
| Receiver Sensitivity          |                              |     |     | -10.5 | dBm | 2 |
| Receiver Overload             |                              | 0.5 |     |       | dBm | 2 |
| LOS De-Assert                 | LOS <sub>D</sub>             |     |     | -12   | dBm |   |
| LOS Assert                    | LOS <sub>A</sub>             | -30 |     |       | dBm |   |
| LOS Hysteresis                |                              | 0.5 |     |       | dB  |   |

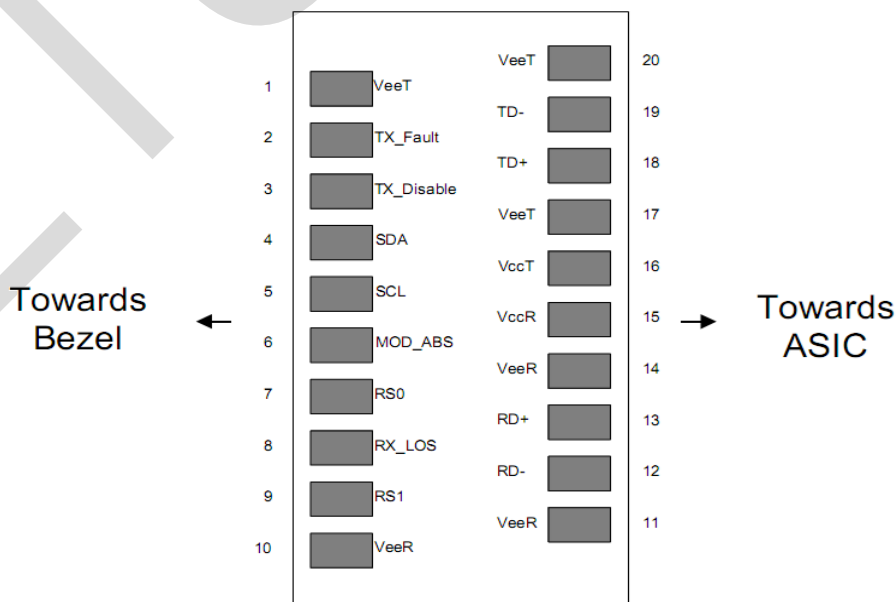
#### Notes:

1. The optical power is launched into MMF.
2. With worst-case extinction ratio. Measured with a PRBS 2<sup>31</sup>-1 test pattern, @6.25Gb/s, BER<10<sup>-12</sup>.

## Digital Diagnostics

| Parameter       | Range        | Accuracy | Unit | Calibration |
|-----------------|--------------|----------|------|-------------|
| Temperature     | -40 to 85    | ±3       | °C   | Internal    |
| Voltage         | 0 to 3.6     | ±3%      | V    | Internal    |
| Tx Bias Current | 0 to 10      | ±10%     | mA   | Internal    |
| Tx Output Power | -6 to -0.5   | ±3       | dB   | Internal    |
| Rx Input Power  | -10.5 to 0.5 | ±3       | dB   | Internal    |

## Pin Diagram



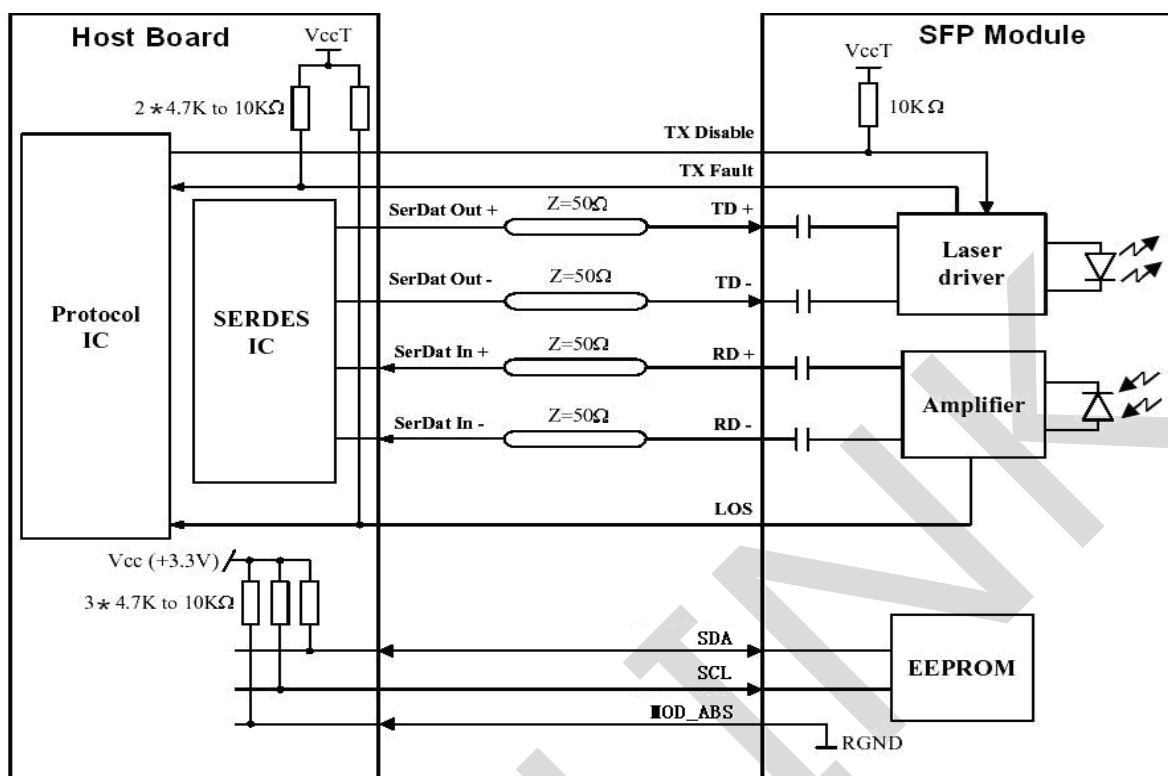
## Pin Definitions

| Pin | Symbol      | Name/Description                                               | Ref. |
|-----|-------------|----------------------------------------------------------------|------|
| 1   | $V_{EET}$   | Transmitter Ground (Common with Receiver Ground)               | 1    |
| 2   | $T_{FAULT}$ | Transmitter Fault.                                             | 2    |
| 3   | $T_{DIS}$   | 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                                                  | 5    |
| 8   | LOS         | Loss of Signal indication. Logic 0 indicates normal operation. | 6    |
| 9   | RS1         | No connection required                                         | 1    |
| 10  | $V_{EER}$   | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 11  | $V_{EER}$   | 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  | $V_{EER}$   | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 15  | $V_{CCR}$   | Receiver Power Supply                                          |      |
| 16  | $V_{CCT}$   | Transmitter Power Supply                                       |      |
| 17  | $V_{EET}$   | 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  | $V_{EET}$   | Transmitter Ground (Common with Receiver Ground)               | 1    |

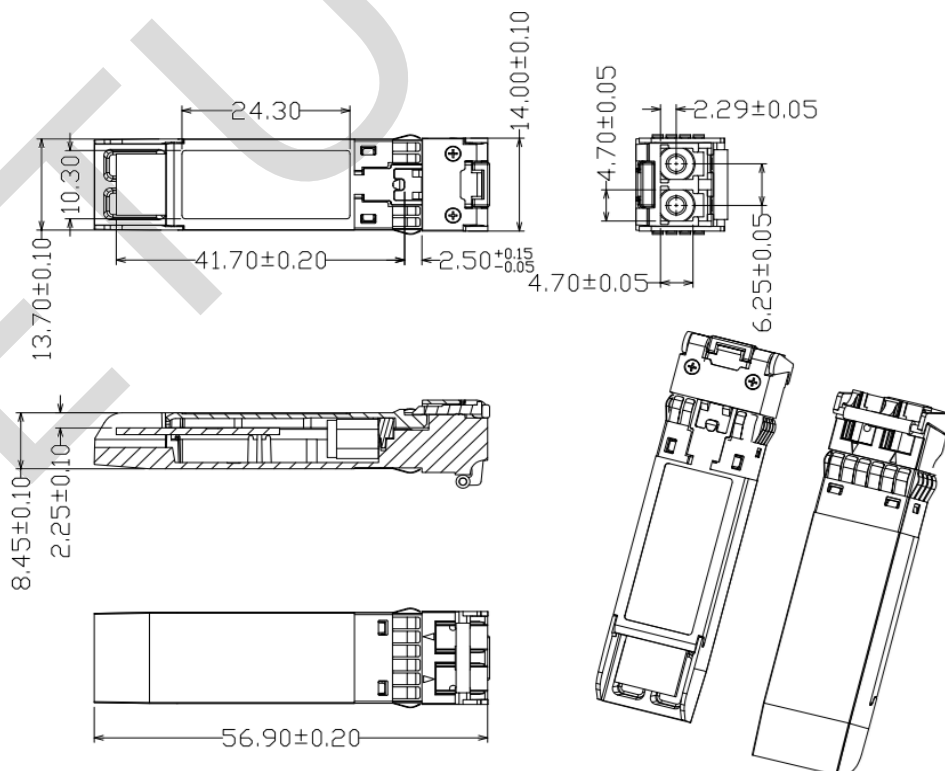
### Notes:

- 1) Circuit ground is internally isolated from chassis ground.
- 2)  $T_{FAULT}$  is an open collector/drain output, which should be pulled up with a 4.7kΩ– 10 kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0V to  $V_{CC} + 0.3V$ . 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  $T_{DIS} > 2.0V$  or open, enabled on  $T_{DIS} < 0.8V$ .
- 4) Should be pulled up with 4.7kΩ- 10kΩ on 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.

## Recommended Interface Circuit



## Mechanical Diagram



## Revision History

| Version No. | Date             | Description           |
|-------------|------------------|-----------------------|
| 1.0         | Sep 12, 2016     | Preliminary datasheet |
| 2.0         | October 25, 2019 | Product upgrades      |
| 3.0         | Aug 21, 2024     | Format change         |

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