# ESP5524-30D(I)-2

**155M-2.5Gbps SFP Transceiver, Single Mode, 30km Reach**

## PRODUCT FEATURES

- **Supports data rate from 155M to 2.5Gbps**
- **Hot-pluggable SFP footprint**
- **1550nm DFB laser and PIN photo detector, Up to 30km for SMF 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**
- **Operating case temperature:**

  **Standard: 0 to +70°C**

  **Industrial: -40 to +85°C**

## APPLICATIONS

- **2.5Gbps Optical systems**
- **Fiber Channel**
- **Other Optical links**

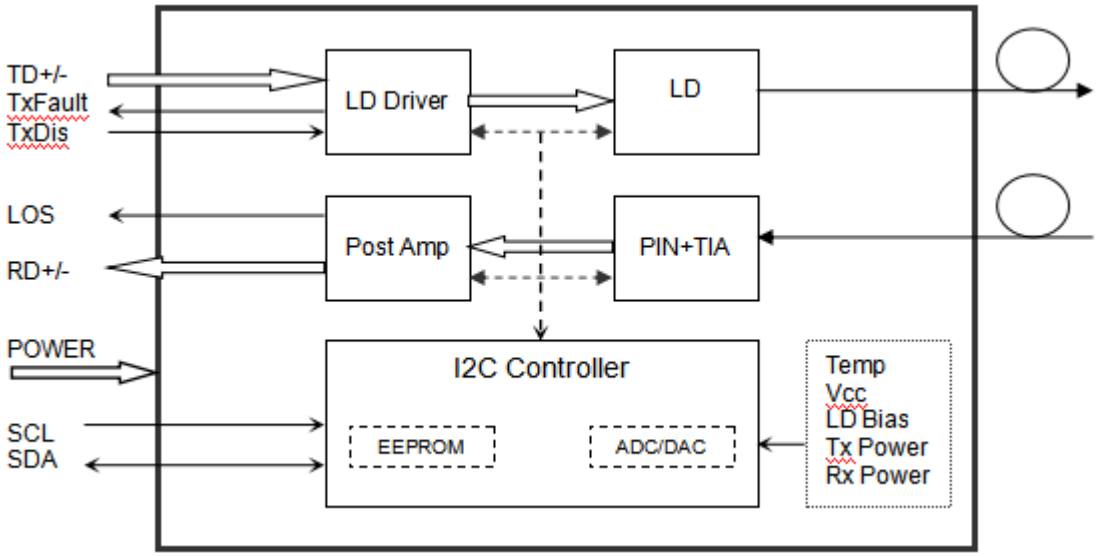
## DESCRIPTIONS

The SFP transceivers are high performance, cost effective modules supporting data rate of 155M-2.5Gbps with 30km transmission distance with SMF.

The transceiver consists of three sections: a DFB 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 |
|---|---|---|---|---|---|---|---|---|
| ESP5524-30D-2 | 155M-2.5Gbps | DFB | SMF | 30KM | LC | 0~70℃ | Yes | yellow |
| ESP5524-30DI-2 | 155M-2.5Gbps | DFB | SMF | 30KM | LC | -40~85℃ | Yes | yellow |

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

## Optical and Electrical Characteristics

| Parameter | | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | | |
| Centre Wavelength | | λc | 1530 | 1550 | 1570 | nm | |
| Spectral Width（-20dB） | | Δλ | | | 1 | nm | |
| Side-Mode Suppression Ratio | | SMSR | 30 | - | - | dB | |
| Average Output Power | | $P_{out}$ | -5 | | +3 | dBm | 1 |
| Extinction Ratio | | ER | 8.2 | | | dB | |
| Data Input Swing Differential | | $V_{IN}$ | 180 | | 1200 | mV | 2 |
| Input Differential Impedance | | $Z_{IN}$ | 90 | 100 | 110 | Ω | |
| TX Disable | Disable | | 2.0 | | Vcc | V | |
| | Enable | | 0 | | 0.8 | V | |
| TX Fault | Fault | | 2.0 | | Vcc | V | |
| | Normal | | 0 | | 0.8 | V | |
| **Receiver** | | | | | | | |
| Centre Wavelength | | λc | 1270 | | 1610 | nm | |
| Receiver Sensitivity | | | | | -19 | dBm | 3 |
| Receiver Overload | | | -1 | | | dBm | 3 |
| LOS De-Assert | | $LOS_D$ | | | -20 | dBm | |
| LOS Assert | | $LOS_A$ | -35 | | | dBm | |
| LOS Hysteresis | | | 0.5 | | | dB | |
| Data Output Swing Differential | | $V_{out}$ | 600 | 800 | 1000 | mV | 4 |
| LOS | | High | 2.0 | | Vcc | V | |
| | | Low | | | 0.8 | V | |

**Notes:**

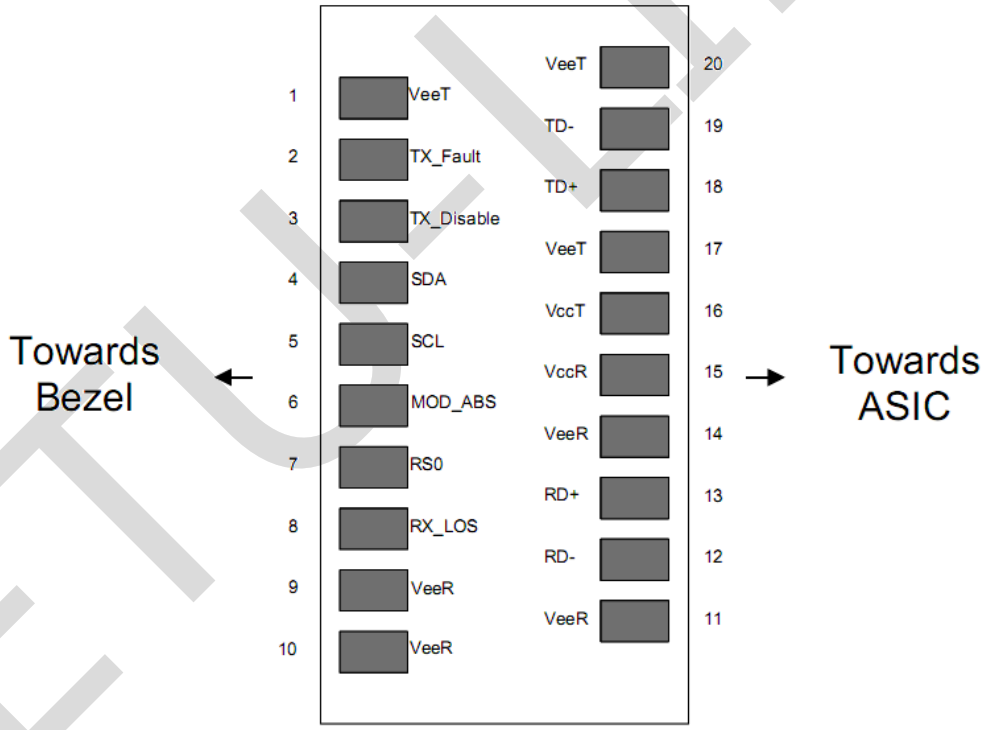
1. The optical power is launched into SMF.

2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS $2^{23}$-1 test pattern @2500Mbps, BER ≤$1\times10^{-12}$.
4. Internally AC-coupled.

## Digital Diagnostics

| Parameter | Range | Unit | Accuracy | Calibration |
|---|---|---|---|---|
| Temperature | -40 to +85 | ºC | ±3 | Internal |
| Voltage | 3.0 to 3.6 | V | ±3% | Internal |
| Bias Current | 0 to 100 | mA | ±10% | Internal |
| TX Power | -5 to +3 | dBm | ±3dB | Internal |
| RX Power | -19 to -1 | dBm | ±3dB | Internal |

## Pin Diagram




## Pin Definitions

| Pin | Name | Function | Notes |
|---|---|---|---|
| 1 | $V_{EET}$ | Transmitter Ground | 1 |
| 2 | TX FAULT | Transmitter Fault Indication | 3 |

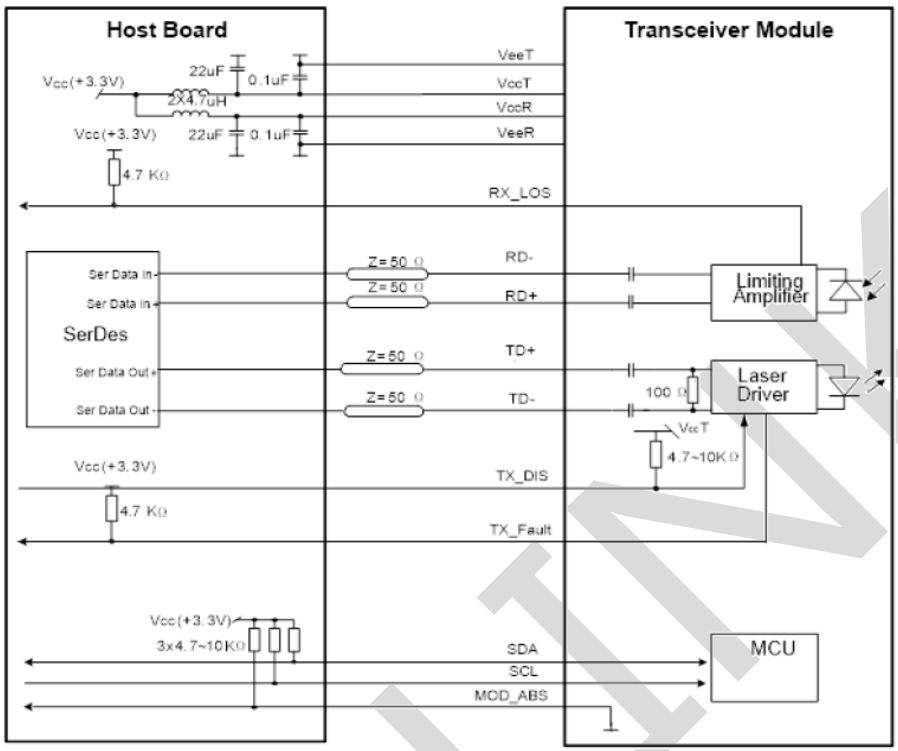
| Pin | Name | Function | Notes |
|---|---|---|---|
| 3 | TX DISABLE | Transmitter Disable | 3 |
| 4 | SDA | SDA Serial Data Signal | 3 |
| 5 | SCL | SCL Serial Clock Signal | 3 |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 3 |
| 7 | RS0 | Not Connected | 3 |
| 8 | LOS | Loss of Signal | 3 |
| 9 | $V_{EER}$ | Receiver ground | 1 |
| 10 | $V_{EER}$ | Receiver ground | 1 |
| 11 | $V_{EER}$ | Receiver ground | 1 |
| 12 | RD- | Inv. Received Data Out | 3 |
| 13 | RD+ | Received Data Out | 3 |
| 14 | $V_{EER}$ | Receiver ground | 1 |
| 15 | $V_{CCR}$ | Receiver Power Supply | 2 |
| 16 | $V_{CCT}$ | Transmitter Power Supply | 2 |
| 17 | $V_{EET}$ | Transmitter Ground | 1 |
| 18 | TD+ | Transmit Data In | 3 |
| 19 | TD- | Inv. Transmit Data In | 3 |
| 20 | $V_{EET}$ | Transmitter Ground | 1 |

**Notes:**

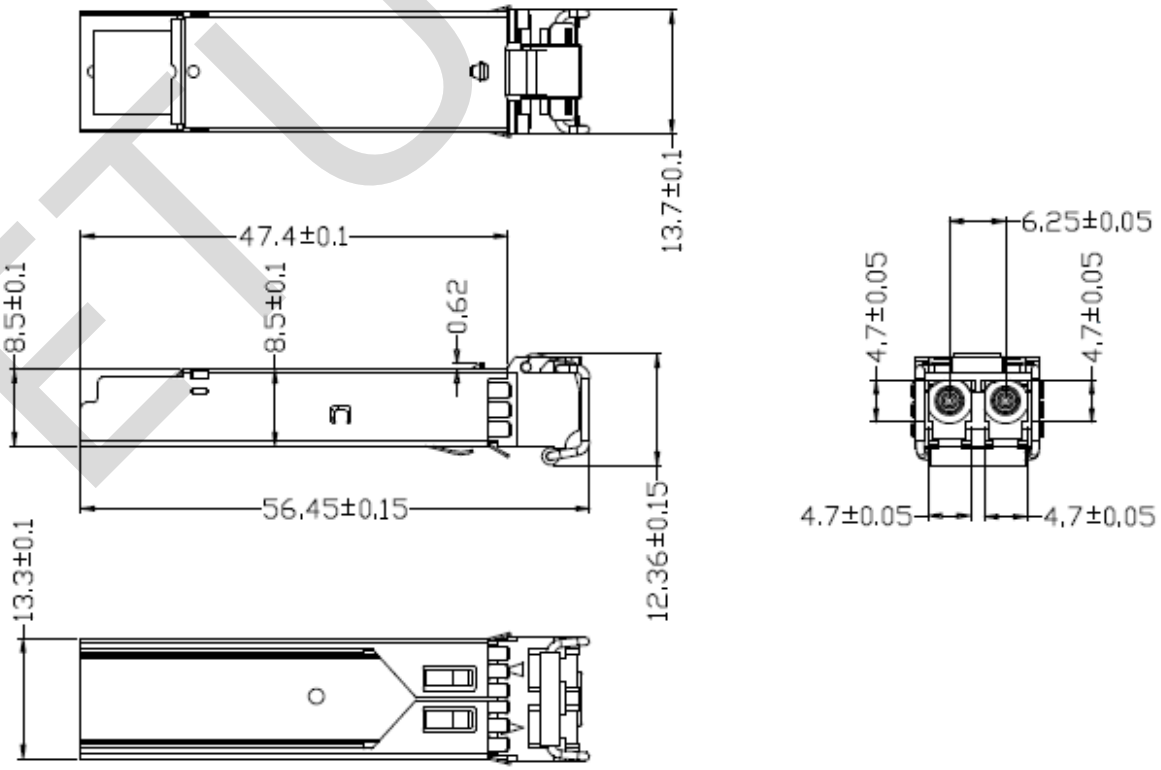
Plug Seq.: Pin engagement sequence during hot plugging.

1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3) LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
4) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
5) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

## Recommended Interface Circuit




## Mechanical Diagram



## Revision History

| Version No. | Date | Description |
|---|---|---|
| 1.0 | February 8, 2016 | Preliminary datasheet |
| 2.0 | October 11,2023 | Product upgrades |
| 3.0 | July 29, 2024 | Format change |

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