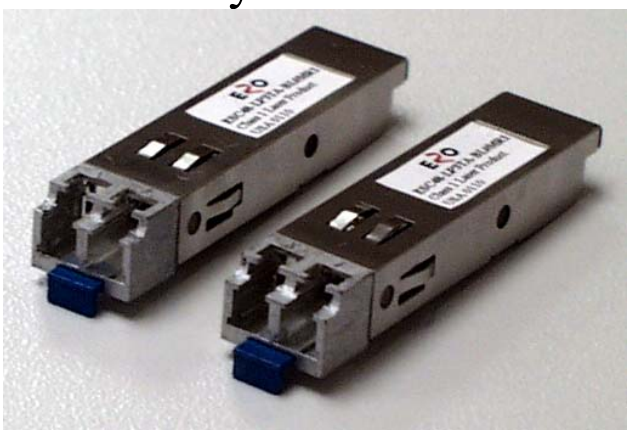
# 3.3V Single-Mode LC SFP Transceiver
## For Fibre Channel

# ES212-LP3TA-x-y-z
# Preliminary Data Sheet



## Features

- **1300nm Fabry Perot or DFB Lasers**
- **Available for 10 and 25 km Distances**
- **Temperature Ranges: 0 to 70°C or –40 to 85°C**
- **1.06 and 2.125 Gbps Operating Data Rate (Fibre Channel as well as IEEE 802.3z Gigabit Ethernet specifications for 1.25 Gbps)**
- **Compliant with ANSI specifications for Fibre Channel Applications at 2.125 Gbps**
- **Class 1 Laser Safety Conformance**
- **EMI meets FCC Class B Limit**
- **Industry Standard Duplex LC Optical Connector**
- **Operates with 9/125 µm single mode optical fibers**
- **Conforms to Small Form-factor Pluggable (SFP) Multi-Source Agreement**
- **Compatible with Industry Standard RFT Electrical Connector & Cage**
- **EEPROM with Serial ID Functionality**

## Product Description

The ES212-LP3TA from E2O Communications is a hot pluggable duplex-LC transceiver designed for use in Fibre Channel applications. It operates with a single +3.3V power supply. The transceiver is compatible with the industry standard RFT connector and cage and conforms to the Small Form-factor Pluggable (SFP) multi-source agreement (MSA). It meets the mezzanine height requirement of 9.8 mm.

The transceiver consists of an optical subassembly housing both the transmitter and the receiver, and an electrical subassembly. All are packaged together with a top metal cover and bottom shield.

The optical subassembly consists of 2 parts. The transmitter side has a high-performance 1300-nm FP laser and back facet monitor. The receiver side has an InGaAs PIN and a preamplifier.

All ES212-LP3TA transceivers also include a Loss of Signal detection circuit, which provides a TTL logic high output when there is an unusable input optical signal level. The Tx Disable and Tx Fault pins use TTL logic for communication with the host board. See MSA for details.

A serial EEPROM in the transceiver allows the user to access information. Details of the Serial Identification Protocol will be contained in the SFP Multi-Source Agreement.

**Electromagnetic Interference (EMI) & Immunity**

Most equipment designs utilizing high-speed transceivers will be required to meet the requirements of FCC in the United States, CENELEC EN55022 (CISPR 22) in Europe and VCCI in Japan.

The ES212-LP3TA transceivers, with their shielded design, perform to the specified limits to assist the designer in the management of the overall equipment EMI performance. They meet the FCC Class B limits.

The ES212-LP3TA transceiver has been designed to provide good immunity to radio-frequency electromagnetic fields. Key components to achieve the good electromagnetic performance (EMC) are the internal and bottom shields, the metal cover, and the RFT cage. The RFT cage is designed to provide protection for EMI emission and EMI susceptibility. All transceivers conform to the FCC Class B limits.

**Eye Safety**

The ES212-LP3TA 1300-nm laser-based transceivers have been designed to meet Class 1 eye safety. They conform to FDA 21CFR1040.10 and 1040.11 and IEC 60825-1.

**Ordering Information**

ES212-LP3TA -w -x -y -z

- z (Actuator)
  - MS = MSA Compliant
  - MB = Bail Latch
- y (Reach)
  - LC1= 10 Km
  - 251 = 25 Km
- x (Laser)
  - F1=FP (LC1 only)
  - D0=DFB (251 only)
- w (Temp)
  - A= -40 to +85 deg C
  - B= 0 to +70 deg C

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | NOTES |
|---|---|---|---|---|---|---|
| Storage Temperature | $T_S$ | -40 | | +85 | °C | |
| Supply Voltage | $V_{CC}$ | | | 3.5 | V | |

**RECOMMENDED OPERATING CONDITIONS**

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | NOTES |
|---|---|---|---|---|---|---|
| Ambient Operating Temperature | $T_A$ | 0 | | +70 | °C | Version "B" |
| | | -40 | | +85 | °C | Version "A" |
| Supply Voltage | $V_{CC}$ | 3.1 | | 3.5 | V | |
| Transmitter Differential Input Voltage | $V_D$ | 0.6 | | 2.0 | V | |
| Transmit Disable Input Volt - Lo | $TD_{Lo}$ | | | 0.3 | V | |
| Transmit Disable Input Volt - Hi | $TD_{Hi}$ | 2.3 | | | V | |

**ELECTRICAL CHARACTERISTICS** (Over Specified $T_{op}$ Range, $V_{CC}$ = +3.1V to +3.5V)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | NOTES |
|---|---|---|---|---|---|---|
| **TRANSMITTER** | | | | | | |
| Supply Current | $I_{CCT}$ | | | 150 | mA | |
| TX Fault Output - High | Voh, TTL | 2.0 | | Vcc | V | |
| TX Fault Output - Low | Vol, TTL | 0.0 | | 0.8 | V | |
| **RECEIVER** | | | | | | |
| Supply Current | $I_{CCR}$ | | | 130 | mA | |
| Data Output Voltage Swing (Differential) | Vdiff | 0.5 | | 1.9 | V | |
| Data Output Rise & Fall Times | $t_r$,$t_f$ | | | 0.15 | ns | 20% - 80% |
| Loss of Signal Detect Output - High | Voh, TTL | 2.0 | | Vcc | V | |
| Loss of Signal Detect Output - Low | Vol, TTL | 0.0 | | 0.8 | V | |

**OPTICAL CHARACTERISTICS** (Over Specified $T_{op}$ Range, $V_{CC}$ = +3.1V to +3.5V)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | NOTES |
|---|---|---|---|---|---|---|
| **TRANSMITTER** | | | | | | |
| Output Optical Power 9/125 µm, NA = 0.10 fiber | $P_{OUT}$ | -9.5 | | -3 | dBm avg. | For FP option |
| Output Optical Power 9/125 µm, NA = 0.10 fiber | $P_{OUT}$ | -4 | | +1 | dBm avg. | For DFB option |
| Optical Extinction Ratio | | 9 | | | dB | |
| Center Wavelength | $\lambda_C$ | 1270 | | 1355 | nm | |
| Spectral Width – rms | $\sigma$ | | | 4 | nm | For FP option |
| Spectral Width – rms | $\sigma$ | | | 0.1 | nm | For DFB option |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | Applies to DFB option only |
| Optical Rise/Fall Time | $t_r$ / $t_f$ | | | 0.15 | ns | 20-80% |
| Optical Modulation Amplitude (1.06 Gbps Data Rate) | OMA | 160 | | | µW | Pk to Pk |
| Optical Modulation Amplitude (2.125 Gbps Data Rate) | OMA | 196 | | | µW | Pk to Pk |
| Relative Intensity Noise | RIN | | -122 | -117 | dB/Hz | |
| Transmitter Optical Contributed Jitter (TOTAL) | TJ | | | 150 | ps | |
| **RECEIVER** | | | | | | |
| Minimum Optical Input Power (Sensitivity) | $P_{IN}$ | | | -19 | dBm avg. | |
| Maximum Optical Input Power (Saturation) | $P_{IN}$ | -3 | | | dBm avg. | |
| Operating Center Wavelength | $\lambda_c$ | 1270 | | 1380 | nm | |
| Optical Modulation Amplitude (1.06 Gbps Data Rate) | OMA | 31 | | | µW | Pk to Pk |
| Optical Modulation Amplitude (2.125 Gbps Data Rate) | OMA | 49 | | | µW | Pk to Pk |
| Return Loss | | 12 | | | dB | |
| Loss of Signal – Deasserted | $P_A$ | | | -19 | dBm avg. | |
| Loss of Signal – Asserted | $P_D$ | -30 | | | dBm avg. | |
| Loss of Signal – Hysteresis | $P_A$ - $P_D$ | 1.0 | | 5.0 | dB | |

**Table 1: SFP PIN DEFINITION**

| PIN | SYMBOL | DESCRIPTION OF FUNCTION |
|---|---|---|
| 1 | VeeT | Transmitter Signal Ground |
| 2 | TX Fault | Transmitter Fault Indication |
| 3 | TX Disable | Transmitter Disable |
| 4 | MOD-DEF2 | Module Definition 2 |
| 5 | MOD-DEF1 | Module Definition 1 |
| 6 | MOD-DEF0 | Module Definition 0 |
| 7 | Rate Select | Select between full or reduced receiver bandwidth |
| 8 | LOS | Loss of Signal |
| 9 | VeeR | Receiver Signal Ground |
| 10 | VeeR | Receiver Signal Ground |
| 11 | VeeR | Receiver Signal Ground |
| 12 | RD- | Received Data Inverted Differential Output |
| 13 | RD+ | Received Data Non-Inverted Differential Output |
| 14 | VeeR | Receiver Signal Ground |
| 15 | VccR | +3.3V Receiver Power Supply |
| 16 | VccT | +3.3V Transmitter Power Supply |
| 17 | VeeT | Transmitter Signal Ground |
| 18 | TD+ | Transmitter Data Non-Inverted Differential Input |
| 19 | TD- | Transmitter Data Inverted Differential Input |
| 20 | VeeT | Transmitter Signal Ground |

**Mechanical Specs:**

**Figure 1: SFP Transceiver Package Outline (-MS Version shown)**