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Specification

Small Form Factor Pluggable

Duplex LC Receptacle – SFP

Optical Transceivers

1000BASE-LX

1250Mbit/s



Ordering Information


T S D - S x C A 1 - G 1 1



Category
SD : DDMI Product



Voltage / Temperature
1: 3.3V / +0°C~ +70°C
2: 3.3V / -40°C~ +85°C

| Model Name | Voltage | Category | Device type | Interface | SD/LOS | Temperature | Distance | Latch Color |
|---------------|---------|-----------|-------------|---------------------|--------|---------------|----------|---|
| TSD-S1CA1-G11 | 3.3V | With DDMI | FP / PIN | AC / AC Coupling | LVTTTL | + 0°C~ + 70°C | 20km | Blue |
| TSD-S2CA1-G11 | | | | | | -40°C~ + 85°C | |  |

Features

- **ROHS Compliant**
- **Standard Small Form Factor Pluggable Package – SFP MSA Compliant**
- **Digital Diagnostic SFF-8472 Rev.10.2 Compliant**
- **Gigabit Ethernet Standard (IEEE802.3Z 1000BASE-LX) Compliant**
- **Fibre Channel Standard (100-SM-LC-L) Compliant**
- **Laser Class 1 Product – IEC60825-1 Compliant**
- **Standard Duplex LC Receptacle Optical Interface**
- **Single + 3.3 V Power Supply**
- **Differential LVPECL Data Input and Output**
- **LVTTTL Loss of Signal**
- **Serial ID through I²C Interface**
- **Low Power Consumption**

Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ | Max | Unit |
|-----------------------------|-----------------|-----|-----|-----------------|------|
| Storage temperature | T _S | -40 | | 85 | °C |
| Supply voltage | V _{CC} | 0 | | 4 | V |
| Operating Relative Humidity | - | 5 | | 95 | % |
| Input voltage | V _{IN} | 0 | | V _{CC} | V |

Operating Conditions

| Parameter | Symbol | Min | Typ | Max | Unit |
|--|-----------------|-----|-----|-----|------|
| Supply Voltage | V _{CC} | 3.1 | 3.3 | 3.5 | V |
| Operating Case temperature (TSD-S1CA1-G11) | T _C | 0 | - | 70 | °C |
| Operating Case temperature (TSD-S2CA1-G11) | | -40 | | 85 | |
| Total Current (Transmitter + Receiver) | I _{CC} | - | - | 250 | mA |



SFP Gigabit Ethernet Transceiver

PRODUCT NUMBER: TSD-SXCA1-G11

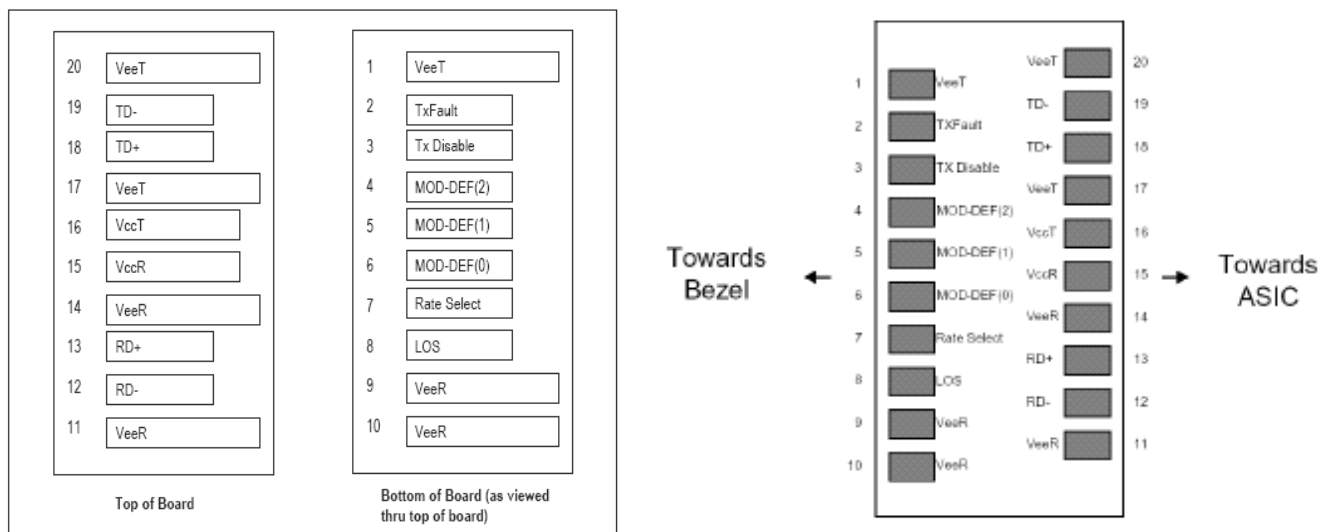
Transmitter Specifications ($V_{CC}=3.1V\sim 3.5V$; $T_C=0^{\circ}C\sim 70^{\circ}C$ / $T_C=-40^{\circ}C\sim 85^{\circ}C$)

| Parameter | Symbol | Min | Typ | Max | Unit |
|------------------------------------|----------------------------|------|------|--------------|-------|
| Optical Characteristics | | | | | |
| Output Optical Power | P_{out} | -5 | -- | 0 | dBm |
| Extinction Ratio | ER | 9 | -- | -- | dB |
| Center Wavelength | λ_C | 1270 | 1310 | 1355 | nm |
| Spectral Width (RMS) | σ | -- | -- | 4 | nm |
| Rise/Fall time (20-80%) | $T_{r,f}$ | -- | -- | 260 | ps |
| Relative Intensity Noise | RIN | -- | -- | -120 | dB/Hz |
| Output Eye | Compliant with IEEE 802.3z | | | | |
| Max. P_{out} TX-DISABLE Asserted | P_{OFF} | -- | -- | -45 | dBm |
| Electrical Characteristics | | | | | |
| Differential Input Voltage | V_{DIFF} | 0.4 | -- | 2.0 | V |
| Tx_Disable_Input_High | V_{DISH} | 2.0 | -- | $V_{CC}+0.3$ | V |
| Tx_Disable_Input_Low | V_{DISL} | 0 | -- | 0.8 | V |
| Tx_Fault_Output_High | V_{FH} | 2.0 | -- | $V_{CC}+0.3$ | V |
| Tx_Fault_Output_Low | V_{FL} | 0 | -- | 0.8 | V |

Receiver Specifications ($V_{CC}=3.1V\sim 3.5V$; $T_C=0^{\circ}C\sim 70^{\circ}C$ / $T_C=-40^{\circ}C\sim 85^{\circ}C$)

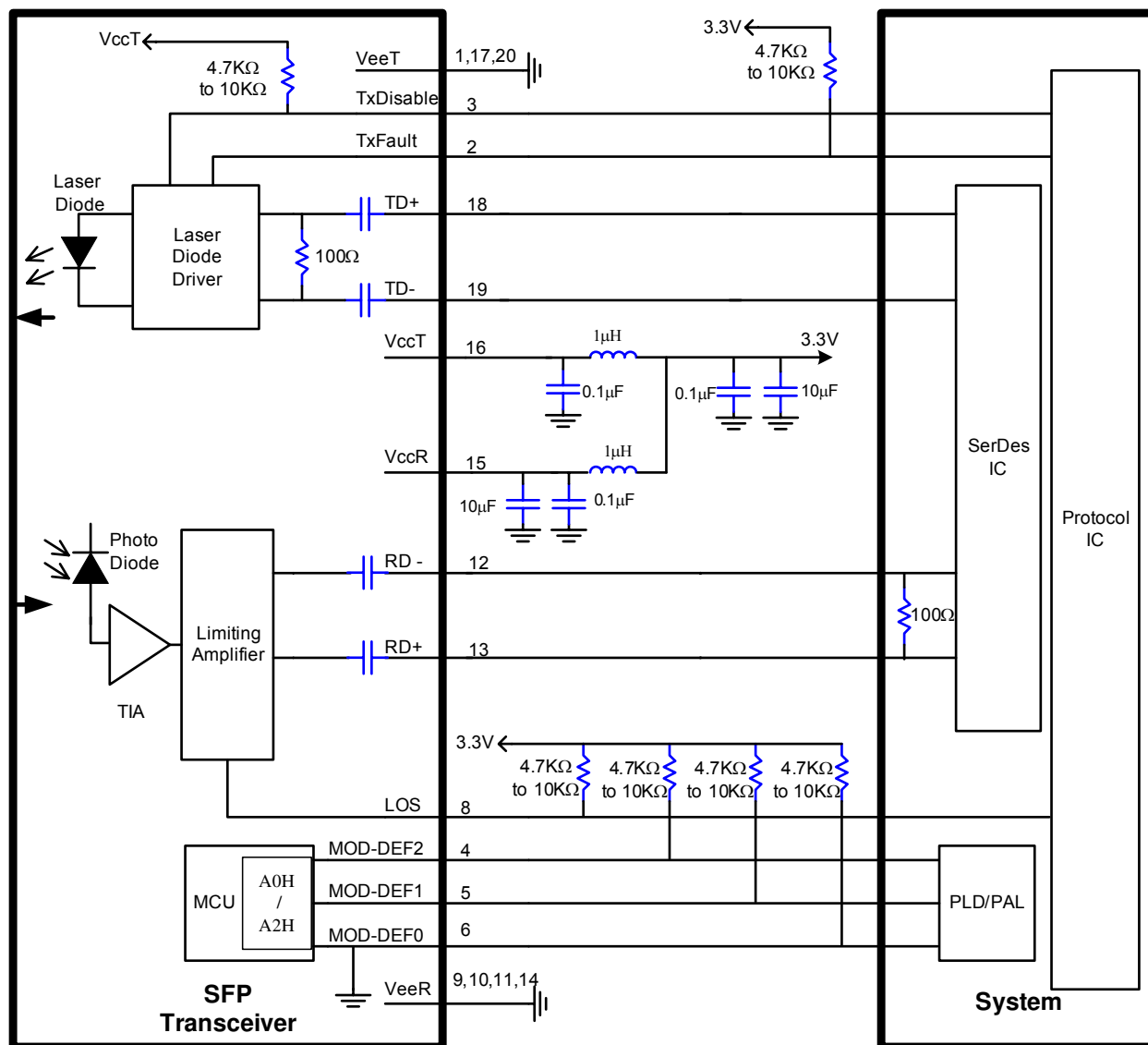
| Parameter | Symbol | Min | Typ | Max | Unit |
|---|-------------|------|-----|--------------|------|
| Optical Characteristics | | | | | |
| Optical Input Power-maximum | P_{SATIN} | -3 | -- | -- | dBm |
| Receiver Sensitivity ($PRBS=2^7-1$; $BER \leq 10^{-12}$) | P_{SEN} | -- | -- | -23 | dBm |
| Operating Center Wavelength | λ_C | 1260 | | 1610 | nm |
| Optical Return Loss | ORL | 12 | -- | -- | dB |
| Loss of Signal – De-asserted | P_{LD} | -- | -- | -23 | dBm |
| Loss of Signal - Asserted | P_{LA} | -45 | -- | -- | dBm |
| Loss of Signal - Hysteresis | P_{LH} | 0.5 | | 6 | dB |
| Electrical Characteristics | | | | | |
| Differential Output Voltage | V_{DIFF} | 0.4 | -- | 2.0 | V |
| Receiver Loss of Signal Output Voltage -Low | V_{LOSH} | 0 | -- | 0.8 | V |
| Receiver Loss of Signal Output Voltage -High | V_{LOSL} | 2 | -- | $V_{CC}+0.3$ | V |

Pin Definition and Descriptions



| Pin | Name | Input/Output Level | Description |
|-----|-------------|--------------------|---|
| 1 | VeeT | Input | Transmitter ground |
| 2 | TXFault | Output/LVTTL | Laser failure indication. High level indicates "laser failure". Externally pulled up |
| 3 | TXDisable | Input/LVTTL | Transmitter disable, High signal/open disables TX laser output. Low level enables TX output, internally pulled up. |
| 4 | MOD-DEF(2) | Input/output | Module definition 2, SDA, Data line for I2C bus. Externally pulled up |
| 5 | MOD-DEF(1) | Input | Module definition 1, SCL, Clock for I2C bus. Externally pulled up |
| 6 | MOD-DEF(0) | Output | Module definition 0, Module present. Ground inside module. |
| 7 | Rate Select | - | No connection. |
| 8 | LOS | Output/LVTTL | Receiver loss of signal indication. Low signal indicates optical signal is present at RX input. Should be Externally pulled up. |
| 9 | VeeR | Input | Receiver ground |
| 10 | VeeR | Input | Receiver ground |
| 11 | VeeR | Input | Receiver ground |
| 12 | RD - | Output/LVPECL | Inverted receiver data output (AC coupled) |
| 13 | RD + | Output/LVTTL | Non-inverted receiver data output (AC coupled) |
| 14 | VeeR | Input | Receiver ground |
| 15 | VccR | Input | Receiver power supply |
| 16 | VccT | Input | Transmitter power supply |
| 17 | VeeT | Input | Transmitter ground |
| 18 | TD + | Input/LVPECL | non-inverted transmitter data input (AC coupled) |
| 19 | TD - | Input/LVPECL | Inverted transmitter data input (AC coupled) |
| 20 | VeeT | Input | Transmitter ground |

Recommended Circuit Diagram





SFP Gigabit Ethernet Transceiver

PRODUCT NUMBER: TSD-SXCA1-G11

Content in 2-Wire Address A0H

| Address | HEX | Name of Field | Description |
|---------|---|--------------------------------------|-----------------------------|
| 00 | 03 | Identifier | SFP |
| 01 | 04 | Extended Identifier | SFP |
| 02 | 07 | Connector type | LC |
| 03 | 00 | Infiniband Compliance Codes | Not compliant |
| 04 | 00 | SONET Compliance Codes | Not compliant |
| 05 | 00 | SONET Compliance Codes | Not compliant |
| 06 | 02 | Ethernet Compliance Codes | 1000BASE-LX |
| 07 | 12 | Fiber Channel link length | LC / Long Distance |
| 08 | 00 | Fiber Channel transmitter technology | N/A |
| 09 | 01 | Fiber Channel transmission media | Single Mode |
| 10 | 01 | Fiber Channel speed | 100 MBytes/sec |
| 11 | 01 | Encoding codes: | 8B/10B |
| 12 | 0D | Nominal Bit Rate (units of 100Mbps) | 1300Mbps |
| 13 | 00 | Rate identifier | Unspecified |
| 14 | 14 | Link length supported for 9um fiber | 20 (units of km) |
| 15 | C8 | Link length supported for 9um fiber | 200 (units of 100m) |
| 16 | 00 | Link length supported for 50um,OM2 | N/A (units of 10m) |
| 17 | 00 | Link length supported for 62.5um,OM1 | N/A(units of 10m) |
| 18 | 00 | Link length supported for copper | N/A (units of 1m) |
| 19 | 00 | Link length supported for 50um,OM3 | N/A (units of 10m) |
| 20 ~ 35 | 46,4F,52,4D,45,52,49,43,41,4F,45,20,20,20,20,20 | Vendor Name | FORMERICA OE |
| 36 | 00 | Unallocated | |
| 37 ~ 39 | 00,00,00 | Vendor OUI | Unspecified |
| 40 ~ 55 | 54,53,44,2D,53,31(32),43,41,31,2D,47,31,31,20,20,20 | Part Number | TSD-S1(2)CA1-G11 |
| 56 ~ 59 | 00,00,00,00 | Vendor Revision number | Unspecified |
| 60 ~ 61 | 05,1E | Laser Wavelength | 1310nm |
| 62 | 00 | Unallocated | |
| 63 | | CC_BASE: | Check sum of byte 0 ~ 62 |
| 64 | 00 | Options | |
| 65 | 1A | Options | TX-DIS, TX_FAULT, RX-LOS |
| 66 | 00 | Bit Rate, max. | Unspecified |
| 67 | 00 | Bit Rate, min. | Unspecified |
| 68 ~ 83 | Serial Number | Serial Number | |
| 84 ~ 89 | yy/mm/dd | Date Code | |
| 90 ~ 91 | 20,20 | Vendor specific lot code | Unspecified |
| 92 | 68 | Diagnostic Monitoring Type | Internal calibration |
| 93 | B0 | Enhanced Options (soft) | All flags, TX_FAULT, RX-LOS |
| 94 | 03 | SFF-8472 Compliance | Rev10.2 |
| 95 | | CC_EXT | Check sum of byte 64 ~ 94 |
| 96~127 | | Vendor specific | |



SFP Gigabit Ethernet Transceiver

PRODUCT NUMBER: TSD-SXCA1-G11

Content in 2-Wire Address A2H

| Add | Bytes | Name | Hex | Real Value |
|-------|-------|-----------------------|-------------|--------------|
| 00-01 | 2 | Temp High Alarm* | 5500 (6400) | 85°C (100°C) |
| 02-03 | 2 | Temp Low Alarm* | 0000 (D800) | 0°C (-40°C) |
| 04-05 | 2 | Temp High Warning* | 5000 (5F00) | 80°C (95°C) |
| 06-07 | 2 | Temp Low Warning* | 0A00 (E200) | 10°C (-30°C) |
| 08-09 | 2 | Voltage High Alarm | 8CA0 | 3.6V |
| 10-11 | 2 | Voltage Low Alarm | 7530 | 3.0V |
| 12-13 | 2 | Voltage High Warning | 88B8 | 3.5V |
| 14-15 | 2 | Voltage Low Warning | 7918 | 3.1V |
| 16-17 | 2 | Bias High Alarm | AFC8 | 90mA |
| 18-19 | 2 | Bias Low Alarm | 09C4 | 5mA |
| 20-21 | 2 | Bias High Warning | 9C40 | 80mA |
| 22-23 | 2 | Bias Low Warning | 0DAC | 7mA |
| 24-25 | 2 | TX Power High Alarm | 4DF1 | 3dBm |
| 26-27 | 2 | TX Power Low Alarm | 0631 | -8dBm |
| 28-29 | 2 | TX Power High Warning | 312D | 1dBm |
| 30-31 | 2 | TX Power Low Warning | 09D0 | -6dBm |
| 32-33 | 2 | RX Power High Alarm | 1F07 | -1dBm |
| 34-35 | 2 | RX Power Low Alarm | 0020 | -25dBm |
| 36-37 | 2 | RX Power High Warning | 1394 | -3dBm |
| 38-39 | 2 | RX Power Low Warning | 0032 | -23dBm |
| 40-55 | 16 | Reserved | 00 | - |
| 56-59 | 4 | RX_PWR(4) | 00000000 | 0 |
| 60-63 | 4 | RX_PWR(3) | 00000000 | 0 |
| 64-67 | 4 | RX_PWR(2) | 00000000 | 0 |
| 68-71 | 4 | RX_PWR(1) | 3F800000 | 1 |
| 72-75 | 4 | RX_PWR(0) | 00000000 | 0 |
| 76-77 | 2 | TX_I(Slope) | 0100 | 1 |
| 78-79 | 2 | TX_I(Offset) | 0000 | 0 |
| 80-81 | 2 | TX_PWR(Slope) | 0100 | 1 |
| 82-83 | 2 | TX_PWR(Offset) | 0000 | 0 |
| 84-85 | 2 | T(Slope) | 0100 | 1 |
| 86-87 | 2 | T(Offset) | 0000 | 0 |
| 88-89 | 2 | V(Slope) | 0100 | 1 |
| 90-91 | 2 | V(Offset) | 0000 | 0 |
| 92-94 | 3 | Reserved | 00 | - |
| 95 | 1 | Checksum | | - |

Note *: () for TSD-S2CA1-G11.

Mechanical Outlines

(Unit : mm)

