

## TTD4580-35-PI-AO

Arris® TTD4580-35-PI Compatible TAA 10GBase-DWDM SFP+ Transceiver (SMF, 1549.32nm, 80km, LC, DOM, -40 to 95C)

### Features

- Cooled DWDM EML Transmitter with TEC
- Supports 9.95Gbps to 11.3Gbps Bit Rates
- APD Receiver
- LC/UPC Duplex Optical Connector Interface
- Power Consumption: 2.8W
- Maximum Link Length of 80km
- Compliant to SFF-8431 for Electrical Interface; SFF-8432 for Mechanical Interface
- Single 3.3V Power Supply
- Operating Temperature: -40 to 95 Celsius
- Hot-Pluggable
- RoHS Compliant and Lead-Free



### Applications

- 8x/10x Fibre Channel
- 10x Gigabit Ethernet over DWDM
- Access, Metro and Enterprise

### Product Description

This Arris® TTD4580-35-PI compatible SFP+ transceiver provides 10GBase-DWDM throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1549.32nm via an LC connector. It can operate at temperatures between -40 and 95C. It is guaranteed to be 100% compatible with the equivalent Arris® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

AddOn's transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S.-made or designated country end products.")



**Wavelength Guide (100GHz ITU-T Channels)**

| ITU Channel # | Frequency (THz) | Center Wavelength (nm) |
|---------------|-----------------|------------------------|
| 17            | 191.7           | 1563.86                |
| 18            | 191.8           | 1563.05                |
| 19            | 191.9           | 1562.23                |
| 20            | 192.0           | 1561.42                |
| 21            | 192.1           | 1560.61                |
| 22            | 192.2           | 1559.79                |
| 23            | 192.3           | 1558.98                |
| 24            | 192.4           | 1558.17                |
| 25            | 192.5           | 1557.36                |
| 26            | 192.6           | 1556.55                |
| 27            | 192.7           | 1555.75                |
| 28            | 192.8           | 1554.94                |
| 29            | 192.9           | 1554.13                |
| 30            | 193.0           | 1553.33                |
| 31            | 193.1           | 1552.52                |
| 32            | 193.2           | 1551.72                |
| 33            | 193.3           | 1550.92                |
| 34            | 193.4           | 1550.12                |
| 35            | 193.5           | 1549.32                |
| 36            | 193.6           | 1548.51                |
| 37            | 193.7           | 1547.72                |
| 38            | 193.8           | 1546.92                |
| 39            | 193.9           | 1546.12                |
| 40            | 194.0           | 1545.32                |
| 41            | 194.1           | 1544.53                |
| 42            | 194.2           | 1543.73                |
| 43            | 194.3           | 1542.94                |
| 44            | 194.4           | 1542.14                |
| 45            | 194.5           | 1541.35                |
| 46            | 194.6           | 1540.56                |
| 47            | 194.7           | 1539.77                |
| 48            | 194.8           | 1538.98                |
| 49            | 194.9           | 1538.19                |
| 50            | 195.0           | 1537.40                |
| 51            | 195.1           | 1536.61                |
| 52            | 195.2           | 1535.82                |
| 53            | 195.3           | 1535.04                |

|    |       |         |
|----|-------|---------|
| 54 | 195.4 | 1534.25 |
| 55 | 195.5 | 1533.47 |
| 56 | 195.6 | 1532.68 |
| 57 | 195.7 | 1531.90 |
| 58 | 195.8 | 1531.12 |
| 59 | 195.9 | 1530.33 |
| 60 | 196.0 | 1529.55 |

#### Absolute Maximum Ratings

| Parameter                   | Symbol     | Min. | Typ.    | Max. | Unit | Notes |
|-----------------------------|------------|------|---------|------|------|-------|
| Data Rate                   | DR         |      | 10.3125 |      | Gbps | 1     |
| Storage Temperature         | Tstg       | -40  |         | 95   | °C   |       |
| Operating Relative Humidity | RH         | 0    |         | 85   | %    | 2     |
| Operating Temperature       | Tc         | -40  |         | 95   |      | 3     |
| Maximum Supply Voltage      | VccT, VccR | -0.5 |         | 4.0  | V    |       |

#### Notes:

1. Distances are calculated for worst-case fiber and transceiver characteristics based on the optical and electrical specifications shown in this document using techniques specified in IEEE 802.3. These distances are consistent with those specified for 10GBASE-ZR and 10GBASE-ZW.
2. Non-condensing.
3. With airflows.

## Electrical Characteristics

| Parameter                                     | Symbol      | Min.   | Typ. | Max.       | Unit  | Notes |
|-----------------------------------------------|-------------|--------|------|------------|-------|-------|
| Transmitter Differential Input Voltage        | Vp          | 2.5    |      |            | V     |       |
| Module Supply Voltage                         | VccT, VccR  | +3.135 |      | -3.465     | V     |       |
| Total Power Consumption                       | PC          |        |      | 2.8        | W     | 1     |
| Power Supply Noise Tolerance                  | PSNT        |        |      | 66         | mVp-p | 2     |
| Low-Speed Signal Electrical Characteristics   |             |        |      |            |       |       |
| Tx_Fault, Rx_LOS                              | VOL         | -0.3   |      | 0.4        | V     | 3     |
|                                               | VOH         | -50    |      | 37.5       | μA    | 4     |
| Tx_Disable, RS0, RS1                          | VIL         | -0.3   |      | 0.8        | V     | 5     |
|                                               | VIH         | 2.0    |      | VccT + 0.3 | V     | 5     |
| Low-Speed Signals Timing Specifications       |             |        |      |            |       |       |
| Tx_Disable Assert Time                        | t_off       |        |      | 100        | μs    | 6     |
| Tx_Disable Negate Time                        | t_on        |        |      | 2          | ms    | 7     |
| Time to Initialize (Cold and Warm Start Time) | t_start_up  |        |      | 90         | s     | 8, 9  |
| Rx_LOS Assert Delay                           | t_los_on    |        |      | 100        | μs    | 10    |
| Rx_LOS Negate Delay                           | t_los_off   |        |      | 100        | μs    | 11    |
| Tx_Fault Assert                               | tx_fault_on |        |      | 1          | ms    | 12    |
| Tx_Fault Reset                                | t_reset     | 10     |      |            | μs    | 13    |

### Notes:

1. With airflows.
2. 10Hz to 10MHz.
3. At 0.7mA.
4. Measured with a 4.7kΩ load pull up to the Host\_Vcc.
5. Tx\_Disable has an internal 4.7kΩ to 10kΩ pull up to the VccT.
6. Rising edge of Tx\_Disable to fall of output signal below 10% of nominal.
7. Falling edge of Tx\_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery.
8. Time from power on or falling edge of Tx\_Disable to when the modulated optical output rises above 90% of nominal and the 2-wire interface is available.
9. Cooled type.
10. From occurrence of loss of signal to assertion of Rx\_LOS.
11. From occurrence of presence of signals to negation of Rx\_LOS.
12. From occurrence of fault to assertion of Tx\_Fault.
13. Time Tx\_Disable must be held high to reset the Tx\_Fault.

## High-Speed Signal Electrical Characteristics

| Parameter                                                | Symbol      | Min. | Typ. | Max.   | Unit     | Notes |
|----------------------------------------------------------|-------------|------|------|--------|----------|-------|
| Module Transmitter Input Electrical Specifications at B' |             |      |      |        |          |       |
| Tx Input Differential Voltage                            | VI          | 190  |      | 700    | mV       | 1     |
| Differential Input Resistance                            | RI          | 95   | 100  | 105    | $\Omega$ |       |
| Differential Input S-Parameter (Note 2)                  | SDD11       |      |      | Note 3 | dB       | 3     |
|                                                          |             |      |      | Note 4 | dB       | 4     |
| Reflected Differential to Common-Mode Conversion         | SCD11       |      |      | -10    | dB       | 5     |
| Module Receiver Output Electrical Specifications at C'   |             |      |      |        |          |       |
| Rx Output Differential Voltage                           | VO          | 300  |      | 850    | mV       | 1     |
| Termination Mismatch at 1MHz                             | $\Delta ZM$ |      |      | 5      | %        |       |
| Single-Ended Output Voltage Tolerance                    |             | -0.3 |      | 4.0    | V        |       |
| Output AC Common-Mode Voltage                            |             |      |      | 7.5    | mV       | 6     |
| Differential Output S-Parameter                          | SDD22       |      |      | Note 6 | dB       | 7     |
|                                                          |             |      |      | Note 7 | dB       | 8     |
| Common-Mode Output Reflection Coefficient                | SCC22       |      |      | Note 8 | dB       | 9     |
|                                                          |             |      |      | -3     | dB       | 10    |
| Rx Output Rise/Fall Time                                 | Tr/Tf       | 28   |      |        | ps       | 11    |
| Rx Output Total Jitter                                   | TJ          |      |      | 0.70   | Ulp-p    |       |
| Rx Output Deterministic Jitter                           | DJ          |      |      | 0.42   | Ulp-p    |       |

### Notes:

1. Voltage swing for 1G operation is equivalent to voltage swing in 10G operation.
2. Measured at B'' with Host Compliance Board and Module Compliance Board pair.
3. Reflection Coefficient given by equation SDD11 (dB) < -12 + 2 × SQRT (f), with f in GHz. 0.01 to 4.1GHz.
4. Reflection Coefficient given by equation SDD11 (dB) < -6.3 + 13 × log10 (f/5.5), with f in GHz. 4.1 to 11.1GHz.
5. 0.01 to 11.1GHz.
6. The RMS value is measured by calculating the standard deviation of the histogram for one UI of the common mode signal.
7. Reflection Coefficient given by equation SDD22 (dB) < -12 + 2 × SQRT (f), with f in GHz. 0.01 to 4.1GHz.
8. Reflection Coefficient given by equation SDD22 (dB) < -6.3 + 13 × log10 (f/5.5), with f in GHz. 4.1 to 11.1GHz.
9. Reflection Coefficient given by equation SCC22 (dB) < -7 + 1.6 × f, with f in GHz. 0.01 to 2.5GHz.
10. 2.5 to 11.1GHz.
11. 20-80%.

## Optical Characteristics

| Parameter                           | Symbol                        | Min.                        | Typ. | Max.              | Unit  | Notes |
|-------------------------------------|-------------------------------|-----------------------------|------|-------------------|-------|-------|
| Transmitter                         |                               |                             |      |                   |       |       |
| Peak Wavelength                     | $\lambda_P$                   | ITU-T 694.1 Grid Wavelength |      |                   | nm    | 1     |
| Center Wavelength Spacing           |                               | 100                         |      |                   | GHz   |       |
| Spectral Width at -20dB             | $\Delta\lambda$ -20dB         |                             |      | 0.30              | nm    | 2     |
| Side-Mode Suppression Ratio         | SMSR                          | 30.0                        |      |                   | dB    |       |
| Average Optical Power               | PAVE                          | 0                           |      | +5.0              | dBm   |       |
| Extinction Ratio                    | ER                            | 8.2                         |      |                   | dB    | 3     |
| Transmitter and Dispersion Penalty  | TDP                           |                             |      | 3.5               | dB    |       |
| Laser Off Power                     | Poff                          |                             |      | -30.0             | dBm   |       |
| Relative Intensity Noise            | RIN <sub>12</sub> OMA         |                             |      | -128.0            | dB/Hz |       |
| Wavelength Stability After Start-Up |                               | $\lambda_P$ - 100           |      | $\lambda_P$ + 100 | pm    |       |
| Transmitter Output Eye Mask         | IEEE 802.3-2012 Clause 52.9.7 |                             |      |                   |       | 7     |
| Receiver                            |                               |                             |      |                   |       |       |
| Operating Wavelength                | $\lambda_O$                   | 1260                        |      | 1600              | nm    |       |
| Receiver Sensitivity (Average)      | S                             |                             |      | -23.0             | dBm   | 4     |
| Receiver Power (Pave) Overload      | OL                            | -6.0                        |      |                   | dBm   | 4     |
| Sensitivity (OMA)                   | SOMA                          |                             |      | -21.9             | dBm   | 4     |
| Receiver Reflectance                | RR                            |                             |      | -27.0             | dB    | 5     |
| Loss of Signal - Asserted           | LOSA                          | -37.0                       |      |                   | dBm   | 6     |
| Loss of Signal - De-Asserted        | LOSD                          |                             |      | -24.0             | dBm   | 6     |
| Loss of Signal Hysteresis           | LOSH                          | 0.5                         | 2.5  | 5.0               | dB    |       |

### Notes:

1. See 100GHz ITU-T Channels Wavelength Guide.
2. At -20dB.
3. At 10.3Gbps, PRBS 2<sup>31</sup>-1.
4. Measured with at 10.3125Gbps, ER>8.2dB, PRBS 2<sup>31</sup>-1, and BER<1x10<sup>-12</sup>.
5. At  $\lambda_O$ .
6. Loss of Signal (LOS) detection responds only to OMA and the indicator will respond unpredictably with the application of un-modulated optical.
7. See Eye Mask Diagram below.



## 2-Wire Interface Electrical Specifications

| Parameter                                 | Symbol | Min.     | Typ. | Max.     | Unit    | Notes |
|-------------------------------------------|--------|----------|------|----------|---------|-------|
| Host 2-Wire Vcc                           | VccH   | 3.14     |      | 3.46     | V       | 1     |
| SCL and SDA                               | VOL    | 0.0      |      | 0.8      | V       | 2     |
|                                           | VOH    | Vcch-0.5 |      | Vcch+0.3 | V       |       |
| SCL and SDA                               | VIL    | -0.3     |      | VccT*0.3 | V       | 3     |
|                                           | VIH    | VccT*0.7 |      | VccT+0.5 | V       |       |
| Input Current on the SCL and SDA Contacts | li     | -10      |      | 10       | $\mu$ A |       |
| Capacitance on SCL and SDA Contacts       | Ci     |          |      | 14       | pF      | 4     |
| Total Bus Capacitance for SCL and SDA     | Cb     |          |      | 100      | pF      | 5, 6  |
|                                           |        |          |      | 290      | pF      | 5, 7  |

### Notes:

1. The host 2-wire Vcc is the voltage used for resistive pull-ups for the 2-wire interface.
2. RP pulled to VccT/R. Rp is the pull-up resistor. Active bus termination may be used by the host in place of a pull up resistor. Pull-ups can be connected to any one of several power supplies; however, the host board design shall ensure that no module contact has voltage exceeding module VccT/R+0.5V nor requires the module to sink more than 3.0mA current.
3. These voltages are measured on the other side of the connector to the device under test.
4. Ci is the capacitance looking into the module SCL and SDA contacts.
5. Cb is the total bus capacitance on the SCL or SDA bus.
6. At 400kHz, 3.0k $\Omega$  Rp, max. At 100kHz, 8.0k $\Omega$  Rp, max.
7. At 400kHz, 1.1k $\Omega$  Rp, max. At 100kHz, 2.75k $\Omega$  Rp, max.

## 2-Wire Timing Specifications

| Parameter                                         | Symbol       | Min. | Typ. | Max. | Unit | Notes |
|---------------------------------------------------|--------------|------|------|------|------|-------|
| Clock Frequency                                   | fSCL         | 0    |      | 400  | kHz  | 1     |
| Clock Pulse Width Low                             | tLOW         | 1.3  |      |      | μs   |       |
| Clock Pulse Width High                            | tHIGH        | 0.6  |      |      | μs   |       |
| Stop to Start Time                                | tBUF         | 20   |      |      | μs   | 2     |
| Start Hold Time                                   | tHD,STA      | 0.6  |      |      | μs   |       |
| Start Set-Up Time                                 | tSU,STA      | 0.6  |      |      | μs   |       |
| Data In Hold Time                                 | tHD,DAT      | 0    |      |      | μs   |       |
| Data In Set-Up Time                               | tSU,DAT      | 0.1  |      |      | μs   |       |
| Input Rise Time (100kHz)                          | tR,100       |      |      | 1000 | ns   | 3     |
| Input Rise Time (400kHz)                          | tR,400       |      |      | 300  | ns   | 3     |
| Input Fall Time (100kHz)                          | tF,100       |      |      | 300  | ns   | 4     |
| Input Fall Time (400kHz)                          | tF,400       |      |      | 300  | ns   | 4     |
| Stop Set-Up Time                                  | tSU,STO      | 0.6  |      |      | μs   |       |
| Serial Interface Clock Holdoff "Clock Stretching" | t_clock_hold |      |      | 500  | μs   | 5     |

### Notes:

1. Module shall operate with fSCL up to 100kHz without requiring clock stretching. The module may clock stretch with fSCL greater than 100kHz and up to 400kHz.
2. Between STOP and START and between ACK and restart.
3. From (VIL, MAX. - 0.15) to (VIH, MIN. + 0.15).
4. From (VIH, MIN. + 0.15) to (VIL, MAX. - 0.15).
5. Maximum time the module may hold the SCL line low before continuing with a read or write operation.

## 2-Wire Bus Timing Diagram



## Pin Descriptions

| Pin | Symbol     | Name/Description                                                                 | Plug Seq.       | Notes |
|-----|------------|----------------------------------------------------------------------------------|-----------------|-------|
| 1   | VeeT       | Transmitter Signal Ground.                                                       | 1 <sup>st</sup> |       |
| 2   | Tx_Fault   | Transmitter Fault (LVTTL-O) – High indicates a fault condition.                  | 3 <sup>rd</sup> | 1     |
| 3   | Tx_Disable | Transmitter Disable (LVTTL-I) – High or open disables the transmitter.           | 3 <sup>rd</sup> | 2     |
| 4   | SDA        | 2-Wire Serial Interface Data Line (LVCMOS – I/O). Same as MOD-DEF2 in INF-8074.  | 3 <sup>rd</sup> | 3     |
| 5   | SCL        | 2-Wire Serial Interface Clock Line (LVCMOS – I/O). Same as MOD-DEF1 in INF-8074. | 3 <sup>rd</sup> | 3     |
| 6   | MOD_ABS    | Module Absent. Controlled by the module.                                         | 3 <sup>rd</sup> | 4     |
| 7   | RS0        | Receiver Rate Select 0. Not Used. Internally pulled down, 51kΩ.                  | 3 <sup>rd</sup> |       |
| 8   | RX_LOS     | Receiver Loss of Signal Indication (LVTTL-O).                                    | 3 <sup>rd</sup> | 1     |
| 9   | RS1        | Transmitter Rate Select 1. Not Used. Internally pulled down, 51kΩ.               | 3 <sup>rd</sup> |       |
| 10  | VeeR       | Receiver Signal Ground.                                                          | 1 <sup>st</sup> |       |
| 11  | VeeR       | Receiver Signal Ground.                                                          | 1 <sup>st</sup> |       |
| 12  | RD-        | Receiver Data Output, Inverted (CML-O).                                          | 3 <sup>rd</sup> |       |
| 13  | RD+        | Receiver Data Output, Non-Inverted (CML-O).                                      | 3 <sup>rd</sup> |       |
| 14  | VeeR       | Receiver Signal Ground.                                                          | 1 <sup>st</sup> |       |
| 15  | VccR       | Receiver Power +3.3V.                                                            | 2 <sup>nd</sup> |       |
| 16  | VccT       | Transmitter Power +3.3V.                                                         | 2 <sup>nd</sup> |       |
| 17  | VeeT       | Transmitter Signal Ground.                                                       | 1 <sup>st</sup> |       |
| 18  | TD+        | Transmitter Data Input, Non-Inverted (CML-I).                                    | 3 <sup>rd</sup> |       |
| 19  | TD-        | Transmitter Data Input, Inverted (CML-I).                                        | 3 <sup>rd</sup> |       |
| 20  | VeeT       | Transmitter Signal Ground.                                                       | 1 <sup>st</sup> |       |

### Notes:

1. This is an open drain output that, on the host board, requires a 4.7kΩ to 10kΩ pull-up resistor to the Host\_Vcc.
2. This input is internally biased high with a 4.7kΩ to 10kΩ pull-up resistor to the VccT.
3. 2-wire serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
4. They must be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. MOD\_ABS is grounded by the module to indicate that the module is present.

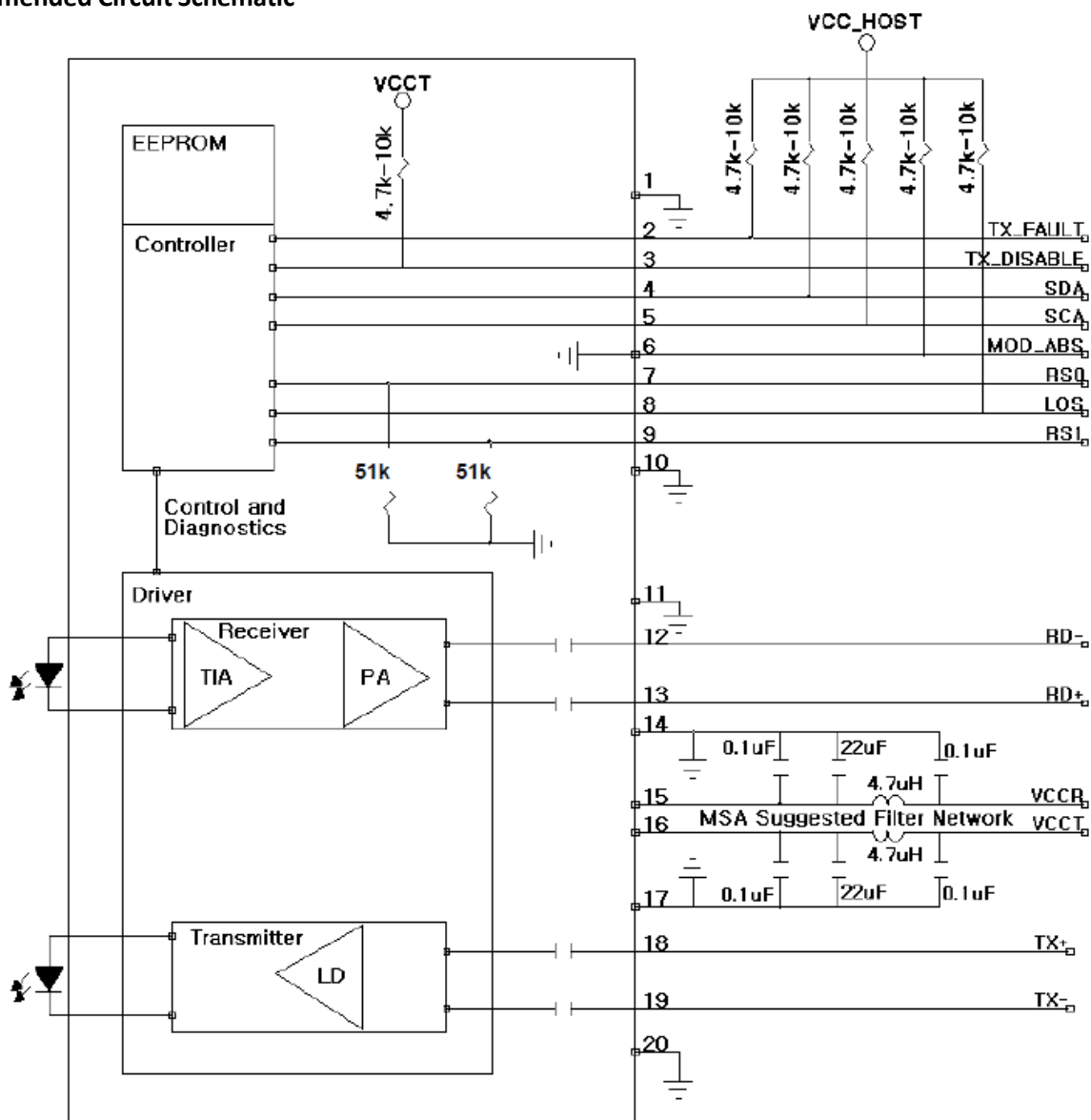
Electrical Pad Layout



Host Board



### Recommended Circuit Schematic



Mechanical Specifications



## About AddOn Networks

In 1999, AddOn Networks entered the market with a single product. Our founders fulfilled a severe shortage for compatible, cost-effective optical transceivers that compete at the same performance levels as leading OEM manufacturers. Adhering to the idea of redefining service and product quality not previously had in the fiber optic networking industry, AddOn invested resources in solution design, production, fulfillment, and global support.

Combining one of the most extensive and stringent testing processes in the industry, an exceptional free tech support center, and a consistent roll-out of innovative technologies, AddOn has continually set industry standards of quality and reliability throughout its history.

Reliability is the cornerstone of any optical fiber network and is ingrained in AddOn's DNA. It has played a key role in nurturing the long-term relationships developed over the years with customers. AddOn remains committed to exceeding industry standards with certifications from ranging from NEBS Level 3 to ISO 9001:2005 with every new development while maintaining the signature reliability of its products.



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