

Technical Datasheet

AA1403170-E6-C

Avaya Nortel® Compatible 10GBase-BX-D SFP+ BiDi Transceiver

Hot Pluggable, +3.3V, Tx1330nm/ Rx1270nm, SMF, LC 10km, DOM, Industrial
Temperature

FEATURES

- Supports 9.95 to 11.3Gb/s bit rates
- Hot-Pluggable
- Single LC for Bi-directional Transmission
- Built-in 1330/1270 WDM Filter
- Uncooled 1330nm or 1270nm CWDM DFB Laser.
- SMF links up to 10km
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface
- Power Supply:+3.3V
- Power consumption<1.5W
- Industrial operating temperature range: -40~85°C
- RoHS compliant, Lead free

APPLICATIONS

- 10GBASE-LR/LW Ethernet
- SONET OC-192 / SDH
- 10G Fibre Channel

DESCRIPTION

ATGBICS AA1403170-E6-C is a very compact 10Gb/s optical transceiver module for serial optical communication applications at 10Gb/s. The AA1403170-E6-C converts a 10Gb/s serial electrical data stream to 10Gb/s optical output signal and a 10Gb/s optical input signal to 10Gb/s serial electrical data streams. The high speed 10Gb/s electrical interface is fully compliant with SFI specification.

The high performance Tx1330nm/Rx1270 DFB transmitter and high sensitivity PIN receiver provide superior performance for Ethernet applications at up to 10km links. The SFP+ Module IS compliant with SFF-8431, SFF-8432 and IEEE 802.3ae 10GBASE-LR. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. The fully SFP compliant form factor provides hot pluggability, easy optical port upgrades and low EMI emission.

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Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---------------------|--------------|------|---------|------|------|
| Storage Temperature | T_S | -40 | | +85 | °C |
| Supply Voltage | $V_{CC,T,R}$ | -0.5 | | 4 | V |
| Relative Humidity | RH | 0 | | 85 | % |

Recommended Operating Environment:

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|--------------|--------|---------|--------|------|
| Case operating Temperature | T_S | -40 | | +85 | °C |
| Supply Voltage | $V_{CC,T,R}$ | +3.135 | | +3.465 | V |
| Supply Current | I_{CC} | | | 350 | mA |
| Power Dissipation | P_D | | | 1.5 | W |

Electrical Characteristics ($T_O = 0$ to 70 °C, $V_{CC} = 3.135$ to 3.465 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Note | |
|-----------------------------------|----------|----------|-----|-----|--------------|------|---|
| Transmitter: | | | | | | | |
| Differential input voltage swing | | 180 | | 700 | mVpp | 1 | |
| Transmit Disable Input | H | V_{IH} | 2.0 | | $V_{CC}+0.3$ | V | |
| | L | V_{IL} | 0 | | 0.8 | V | |
| Transmit Enable Output | H | V_{OH} | 2.4 | | $V_{CC}+0.3$ | V | |
| | L | V_{OL} | 0 | | 0.4 | V | 2 |
| Input Differential Impedance | Z_{in} | 80 | 100 | 120 | Ω | | |
| Receiver | | | | | | | |
| Differential output voltage swing | | 300 | | 850 | mVpp | 3 | |
| LOS Output | H | V_{OH} | 2.4 | | $V_{CC}+0.3$ | V | 2 |
| | L | V_{OL} | 0 | | 0.4 | V | |
| Output Differential Impedance | Z_{on} | 80 | 100 | 120 | Ω | | |

Notes:

- 1) TD+/- are internally AC coupled with 100Ω differential termination inside the module.
- 2) Tx Fault and Rx LOS are open collector outputs, which should be pulled up with $4.7k$ to $10k\Omega$ resistors on the host board. Pull up voltage between $2.0V$ and $V_{CC}+0.3V$.
- 3) RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user

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SERDES.

Optical Parameters ($T_o = 0$ to 70°C , $V_{CC} = 3.135$ to 3.465 Volts)

| Parameter | | Symbol | Min | Typ | Max | Unit | Ref. | |
|-----------------------------|----------------|-----------------|----------------------------|------|------|------|------|--|
| Transmitter | | | | | | | | |
| Bit Rate | | BR | 9.9 | | 11.3 | Gb/s | | |
| Optical Wavelength | AA1403170-E6-C | λ | 1260 | 1270 | 1280 | nm | | |
| | AA1403170-E6-C | | 1320 | 1330 | 1340 | | | |
| Average output power | | P_o | -6 | | 0 | dBm | | |
| Optical Extinction Ratio | | ER | 3.5 | | | dB | | |
| Spectral width | | $\Delta\lambda$ | | | 1 | nm | | |
| Side Mode Suppression Ratio | | SMSR | 30 | | | dB | | |
| Optical Eye Mask | | | Compliant with IEEE802.3ae | | | | | |
| Receiver | | | | | | | | |
| Bit Rate | | BR | 9.9 | | 11.3 | Gb/s | | |
| Optical Wavelength | AA1403170-E6-C | λ | 1320 | 1330 | 1340 | nm | | |
| | AA1403170-E6-C | | 1260 | 1270 | 1280 | | | |
| Receiver Sensitivity | | Sen | | | -15 | dBm | 1 | |
| Maximum Input Power | | P_{MAX} | 0 | | | dBm | | |
| LOS De-Assert | | LOS_D | | | -15 | dBm | | |
| LOS Assert | | LOS_A | -25 | | | dBm | | |
| LOS Hysteresis | | LOS_H | 0.5 | | 4 | dB | | |

Notes:

1) Measured with a PRBS of $2^{31}-1$ at 1×10^{-12} BER and 3.5 dB extinction ratio.

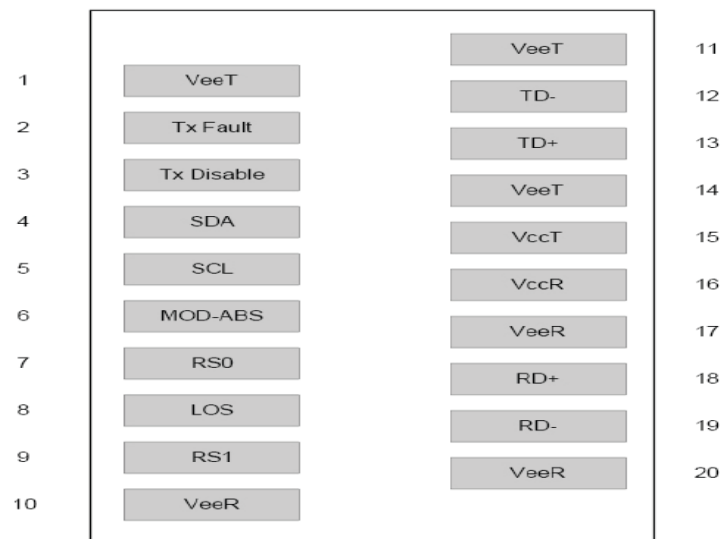
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Timing Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---|-----------------------|------|---------|------|------|
| TX_Disable Assert Time | t_off | | | 10 | us |
| TX_Disable Negate Time | t_on | | | 1 | ms |
| Time to Initialize Include Reset of TX_FAULT | t_int | | | 300 | ms |
| TX_FAULT from Fault to Assertion | t_fault | | | 100 | us |
| TX_Disable Time to Start Reset | t_reset | 10 | | | us |
| Receiver Loss of Signal Assert Time | T _{A,RX_LOS} | | | 100 | us |
| Receiver Loss of Signal Deassert Time | T _{d,RX_LOS} | | | 100 | us |
| Rate-Select Change Time | t_ratesel | | | 10 | us |
| Serial ID Clock Time | t_serial-clock | | | 100 | kHz |

Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name



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Pin Function Definitions

| PIN # | Name | Function | Notes |
|-------|------------|---|-------|
| 1 | VeeT | Module transmitter ground | 1 |
| 2 | Tx Fault | Module transmitter fault | 2 |
| 3 | Tx Disable | Transmitter Disable; Turns off transmitter laser output | 3 |
| 4 | SDL | 2 wire serial interface data input/output (SDA) | |
| 5 | SCL | 2 wire serial interface clock input (SCL) | |
| 6 | MOD-ABS | Module Absent, connect to VeeR or VeeT in the module | 2 |
| 7 | RS0 | Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s | |
| 8 | LOS | Receiver Loss of Signal Indication | 4 |
| 9 | RS1 | Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s | |
| 10 | VeeR | Module receiver ground | 1 |
| 11 | VeeR | Module receiver ground | 1 |
| 12 | RD- | Receiver inverted data out put | |
| 13 | RD+ | Receiver non-inverted data out put | |
| 14 | VeeR | Module receiver ground | 1 |
| 15 | VccR | Module receiver 3.3V supply | |
| 16 | VccT | Module transmitter 3.3V supply | |
| 17 | VeeT | Module transmitter ground | 1 |
| 18 | TD+ | Transmitter inverted data out put | |
| 19 | TD- | Transmitter non-inverted data out put | |
| 20 | VeeT | Module transmitter ground | 1 |

Notes

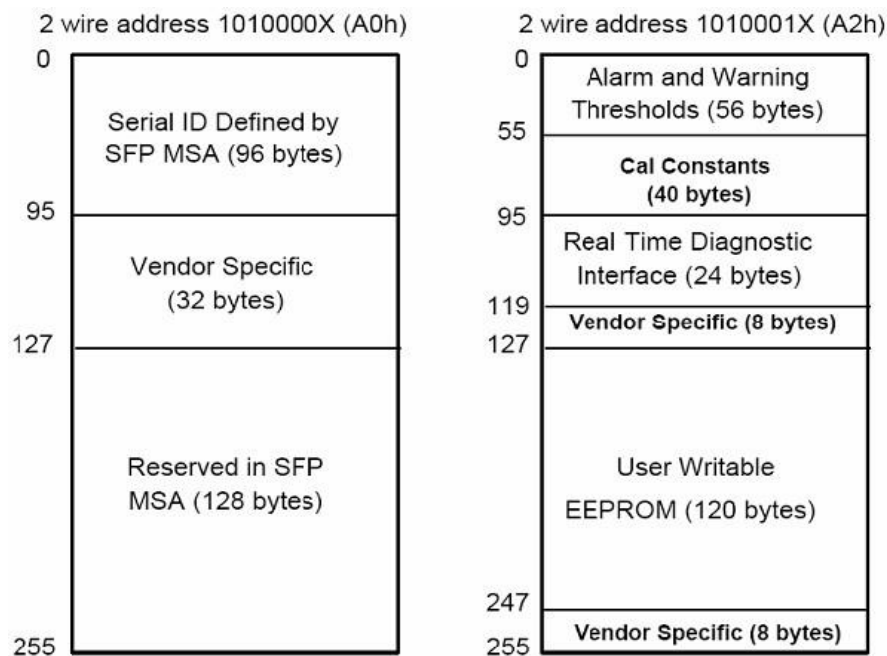
- 1) The module ground pins shall be isolated from the module case.
- 2) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.
- 3) This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.
- 4) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

SFP Module EEPROM Information and Management

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The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I²C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information (A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)



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Table 2 - EEPROM Serial ID Memory Contents (A0h)

| Data Address | Length (Byte) | Name of Length | Description and Contents |
|----------------------------------|---------------|----------------|---|
| Base ID Fields | | | |
| 0 | 1 | Identifier | Type of Serial transceiver (03h=SFP) |
| 1 | 1 | Reserved | Extended identifier of type serial transceiver (04h) |
| 2 | 1 | Connector | Code of optical connector type (07=LC) |
| 3-10 | 8 | Transceiver | 10G Base-LR |
| 11 | 1 | Encoding | 64B/66B |
| 12 | 1 | BR, Nominal | Nominal baud rate, unit of 100Mbps |
| 13-14 | 2 | Reserved | (0000h) |
| 15 | 1 | Length(9um) | Link length supported for 9/125um fiber, units of 100m |
| 16 | 1 | Length(50um) | Link length supported for 50/125um fiber, units of 10m |
| 17 | 1 | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m |
| 18 | 1 | Length(Copper) | Link length supported for copper, units of meters |
| 19 | 1 | Reserved | |
| 20-35 | 16 | Vendor Name | SFP vendor name: ATGBICS |
| 36 | 1 | Reserved | |
| 37-39 | 3 | Vendor OUI | SFP transceiver vendor OUI ID |
| 40-55 | 16 | Vendor PN | Part Number: AA1403170-E6-C |
| 56-59 | 4 | Vendor rev | Revision level for part number |
| 60-62 | 3 | Reserved | |
| 63 | 1 | CCID | Least significant byte of sum of data in address 0-62 |
| Extended ID Fields | | | |
| 64-65 | 2 | Option | Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |
| 66 | 1 | BR, max | Upper bit rate margin, units of % |
| 67 | 1 | BR, min | Lower bit rate margin, units of % |
| 68-83 | 16 | Vendor SN | Serial number (ASCII) |
| 84-91 | 8 | Date code | ATGBICS Manufacturing date code |
| 92-94 | 3 | Reserved | |
| 95 | 1 | CCEX | Check code for the extended ID Fields (addresses 64 to 94) |
| Vendor Specific ID Fields | | | |
| 96-127 | 32 | Readable | ATGBICS specific date, read only |
| 128-255 | 128 | Reserved | Reserved for SFF-8079 |

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Digital Diagnostic Monitor Characteristics

| Data Address | Parameter | Accuracy | Unit |
|--------------|----------------------------------|----------|------|
| 96-97 | Transceiver Internal Temperature | ±3.0 | °C |
| 100-101 | Laser Bias Current | ±10 | % |
| 100-101 | Tx Output Power | ±3.0 | dBm |
| 100-101 | Rx Input Power | ±3.0 | dBm |
| 100-101 | VCC3 Internal Supply Voltage | ±3.0 | % |

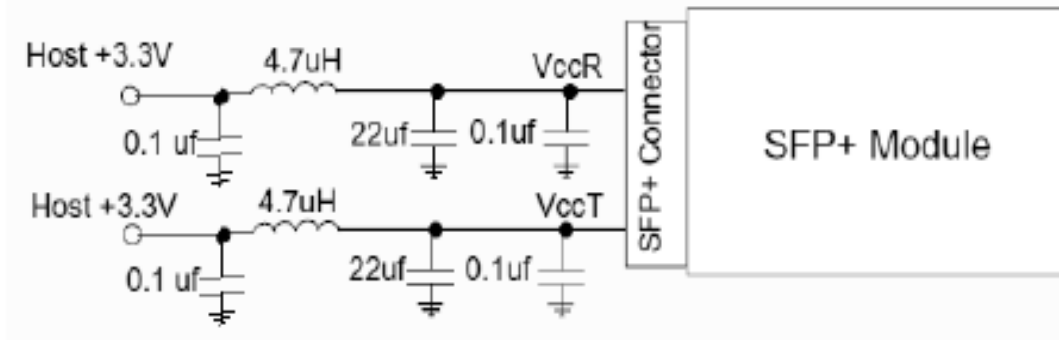
Regulatory Compliance

The WPP-B23192-DL10D /WPP-B32192-DL10D complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

| | | |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>1000 V) |
| Electrostatic Discharge (ESD) to the Single LC Receptacle | IEC 61000-4-2 GR-1089-CORE | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class 1 laser product. |

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Recommended Circuit



Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit

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Mechanical Dimensions (units: mm)

