



## 10.3Gb/s SFP+ BIDI Transceiver

### APSPBxxB33CDL60

#### ■ Product Features

- ✓ Single LC connector
- ✓ Hot-pluggable SFP footprint
- ✓ Uncooled DFB laser
- ✓ RoHS compliant and Lead Free
- ✓ Distance up to 60Km on 9/125um SMF
- ✓ Metal enclosure for lower EMI
- ✓ Power dissipation <1.5W
- ✓ Commercial and industrial operating temperature optional
- ✓ SFP MSA SFF-8472 SFF-8431 SFF-8432 Compliant



#### ■ Applications

- ✓ 10GBASE-LR/LW
- ✓ 10G Fibre Channel

#### ■ General

ATOP's APSPBxxB33CDL60 Small Form Factor Pluggable (SFP+) transceivers are compatible with SFF-8431, SFF-8432 and support 10G Ethernet LR and 10G Fibre Channel. It is designed for use in 10G-Gigabit multi-rate links up to 60km of G.652. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

#### ■ Product Selection

| Part Number     | Wavelength        | Operating Case temperature |
|-----------------|-------------------|----------------------------|
| APSPB23B33CDL60 | Tx-1270 / Rx-1330 | Commercial                 |
| APSPB32B33CDL60 | Tx-1330 / Rx-1270 | Commercial                 |

#### ■ Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883 Method 3015
- ESD to the Duplex LC Receptacle: compatible with IEC 61000-4-2



- Immunity compatible with IEC 61000-4-3
- EMI compatible with FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B
- Laser Eye Safety compatible with FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2
- RoHS compliant with RoHS 2 (2011/65/EU)

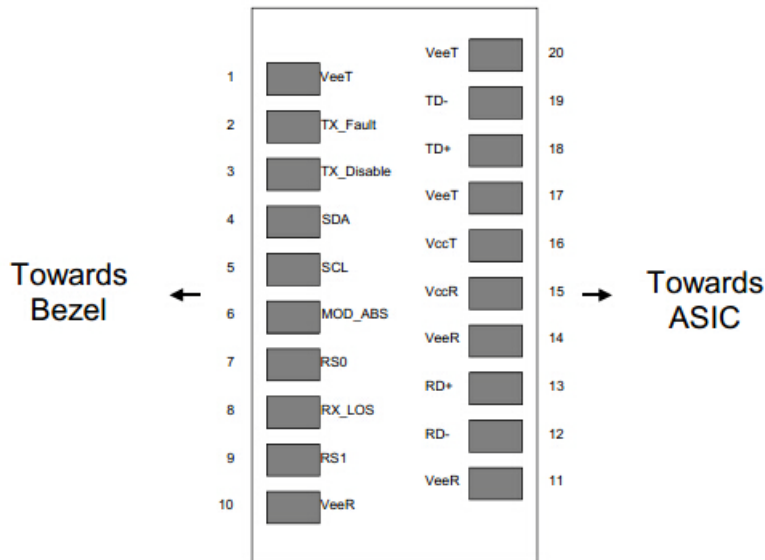
## ■ Pin Descriptions

| Pin | Symbol     | Name/Description  | Ref. |
|-----|------------|---|------|
| 1   | VeeT       | Transmitter Ground (Common with Receiver Ground)                              | 1    |
| 2   | TX Fault   | Transmitter Fault. LVTTTL-O   | 2    |
| 3   | TX Disable | Transmitter Disable. Laser output disabled on high or open.<br>LVTTTL-I       | 3    |
| 4   | SDA        | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O | 2    |
| 5   | SCL        | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I   | 2    |
| 6   | Mod_ABS    | Module Absent, Connect to VeeT or VeeR in Module.                             | 2    |
| 7   | RS0        | Rate Select 0, optionally controls SFP+ module receiver<br>LVTTTL-I           | 4    |
| 8   | LOS        | Loss of Signal indication. Logic 0 indicates normal operation.<br>LVTTTL-O    | 5    |
| 9   | RS1        | Rate Select 1, optionally controls SFP+ module transmitter.<br>LVTTTL-I       | 4    |
| 10  | VeeR       | Receiver Ground (Common with Transmitter Ground)                              | 1    |
| 11  | VeeR       | Receiver Ground (Common with Transmitter Ground)                              | 1    |
| 12  | RD-        | Receiver Inverted DATA out. AC Coupled. CML-O                                 |      |
| 13  | RD+        | Receiver Non-inverted DATA out. AC Coupled. CML-O                             |      |
| 14  | VeeR       | Receiver Ground (Common with Transmitter Ground)                              | 1    |
| 15  | VccR       | Receiver Power Supply   | 6    |
| 16  | VccT       | Transmitter Power Supply  | 6    |
| 17  | VeeT       | Transmitter Ground (Common with Receiver Ground)                              | 1    |

|    |      |  |   |
|----|------|--|---|
| 18 | TD+  | Transmitter Non-Inverted DATA in. AC Coupled. CML- I |   |
| 19 | TD-  | Transmitter Inverted DATA in. AC Coupled. CML- I     |   |
| 20 | VeeT | Transmitter Ground (Common with Receiver Ground)     | 1 |

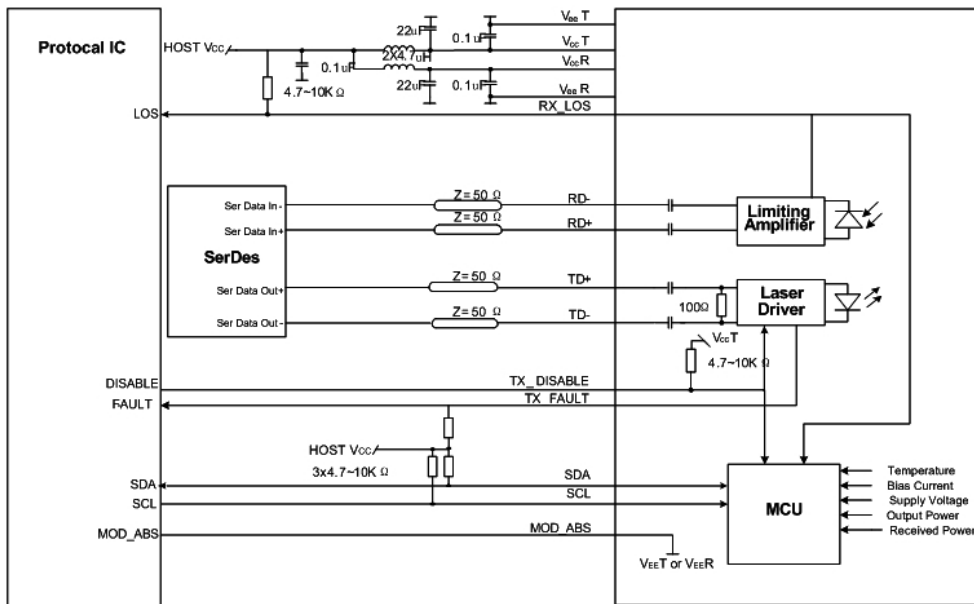
**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. TX Fault is an open collector/drain output .which should be pulled up with a 4.7K – 10K Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc+0.3V.A high output indicates a transmitter fault caused by either the tx bias current or the tx output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on TX Disable >2.0V or open, enabled on TX Disable<0.8V.
4. Internally pulled down per SFF-8431 Rev4.1.
5. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. Internally connected



**Pin-out of Connector Block on Host Board**

■ **Recommend Circuit Schematic**



## Absolute Maximum Ratings

| Parameter              | Symbol | Min  | Typ | Max  | Unit | Ref. |
|------------------------|--------|------|-----|------|------|------|
| Maximum Supply Voltage | Vcc    | -0.5 |     | +4.0 | V    |      |
| Storage Temperature    | TS     | -40  |     | +85  | °C   |      |
| Operating Humidity     | RH     | 0    |     | 85   | %    |      |

## Recommended Operating Conditions

| Parameter                   | Symbol | Min  | Typ  | Max  | Unit | Ref.       |
|-----------------------------|--------|------|------|------|------|------------|
| Power Supply Voltage        | Vcc    | 3.13 | 3.30 | 3.47 | V    |            |
| Power Supply Current        | Icc    |      |      | 350  | mA   | Commercial |
| Case Operating Temperature  | Tc     | 0    |      | +70  | °C   | Commercial |
| Data Rate(Gigabit Ethernet) | BR     |      | 10.3 |      | Gbps |            |
| 9/125um G.652 SMF           | Lmax   |      |      | 60   | km   |            |

## Electrical Characteristics (TOP=25°C, Vcc=3.3Volts)

| Parameter                     | Symbol  | Min       | Typ | Max | Unit | Ref. |
|-------------------------------|---------|-----------|-----|-----|------|------|
| <b>Transmitter</b>            |         |           |     |     |      |      |
| Input differential impedance  | Rin     | 80        | 100 | 120 | Ω    | 1    |
| Differential data input swing | Vin, pp | 120       |     | 850 | mV   |      |
| TX Disable-High               |         | Vcc - 0.8 |     | Vcc | V    |      |



**APSPBxxB33CDL60**

|                                |          |           |  |          |    |   |
|--------------------------------|----------|-----------|--|----------|----|---|
| TX Disable-Low                 |          | Vee       |  | Vee+ 0.8 | V  |   |
| TX Fault-High                  |          | Vcc-0.8   |  | Vcc      | V  |   |
| TX Fault-Low                   |          | Vee       |  | Vee+0.8  | V  |   |
| <b>Receiver</b>                |          |           |  |          |    |   |
| Single ended data output swing | Vout, pp | 300       |  | 850      | mV | 2 |
| Data output rise time          | Tr       | 30        |  |          | ps | 3 |
| Data output fall time          | Tf       | 30        |  |          | ps | 3 |
| LOS-High                       |          | Vcc – 0.8 |  | Vcc      | V  |   |
| LOS-Low                        |          | Vee       |  | Vee+0.8  | V  |   |

**Notes:**

1. AC coupled.
2. Into 100 ohm differential termination.
3. 20 – 80 %

**Optical Characteristics (TOP=25°C, Vcc=3.3 Volts)**

| Parameter                   | Symbol          | Min  | Typ  | Max  | Unit | Ref. |
|-----------------------------|-----------------|------|------|------|------|------|
| <b>Transmitter</b>          |                 |      |      |      |      |      |
| Output Opt. Power           | PO              | +1   |      | +6   | dBm  |      |
| Optical Wavelength          | $\lambda$       | 1260 | 1270 | 1280 | nm   |      |
|                             |                 | 1320 | 1330 | 1340 | nm   |      |
| Side-Mode Suppression Ratio | SMSR            | 30   |      |      | dB   |      |
| Spectral Width(-20dB)       | $\Delta\lambda$ |      |      | 1    | nm   |      |
| Optical Extinction Ratio    | ER              | 4    |      |      | dB   |      |
| <b>Receiver</b>             |                 |      |      |      |      |      |
| RX Sensitivity @10.3Gb/s    | SENS1           |      |      | -20  | dBm  | 1,2  |
| Receiver Overload           |                 | -7   |      |      | dBm  |      |
| Optical Center Wavelength   | $\lambda_C$     | 1320 | 1330 | 1340 | nm   |      |
|                             |                 | 1260 | 1270 | 1280 | nm   |      |
| LOS De-Assert               | LOSD            |      |      | -22  | dBm  |      |
| LOS Assert                  | LOSA            | -40  |      |      | dBm  |      |

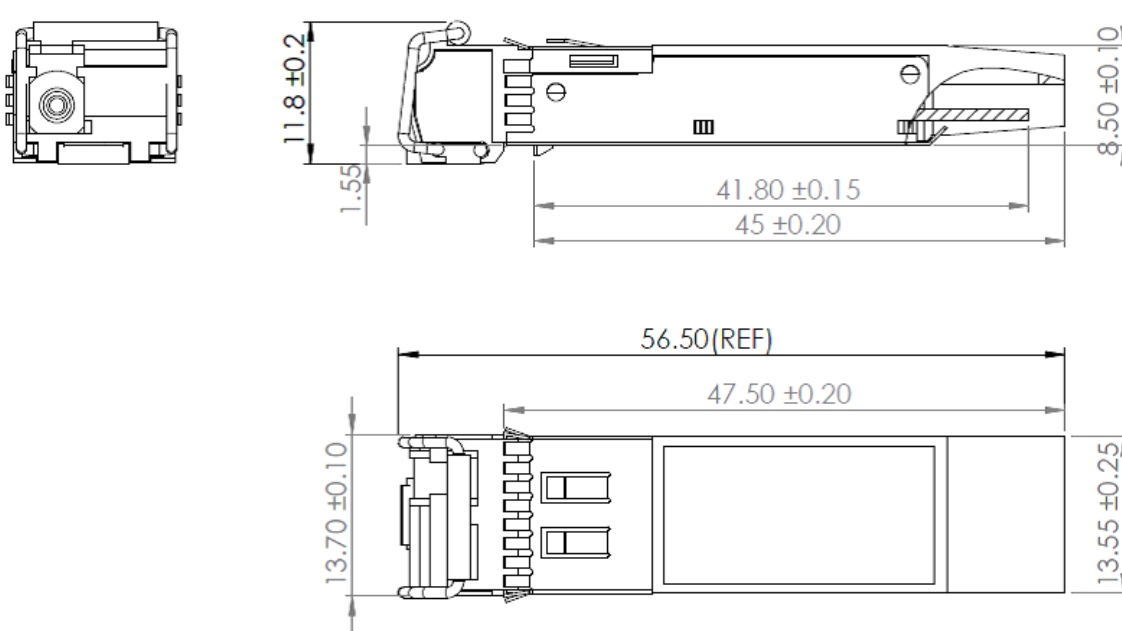
|                |  |     |  |   |    |  |
|----------------|--|-----|--|---|----|--|
| LOS Hysteresis |  | 0.5 |  | 5 | dB |  |
|----------------|--|-----|--|---|----|--|

**Notes:**

1. Measured with conformance signals defined in FC-PI-2 Rev. 10.0 specifications.
2. Measured with PRBS  $2^{31}-1$  at  $10^{-12}$  BER.

**■ Mechanical Specifications**

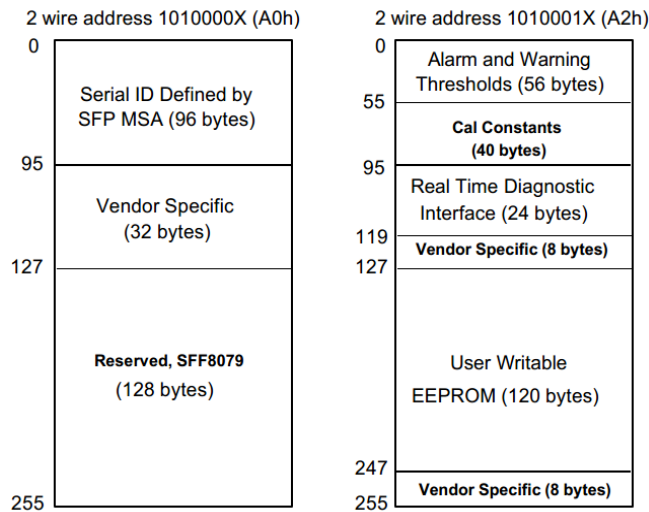
ATOP’s Small Form Factor Pluggable (SFP+) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA), dimensions are in mm.



**APSPBxxB33CDL60**

**■ EEPROM Information**

EEPROM memory map specific data field description is as below:



### ■ Digital Diagnostic Monitoring Interface

Five transceiver parameter values are monitored. The following table defines the monitored parameter's accuracy.

| Parameter    | Range         | Accuracy | Calibration |
|--------------|---------------|----------|-------------|
| Temperature  | 0 to +70°C    | ±3°C     | Internal    |
| Voltage      | 2.97 to 3.63V | ±3%      | Internal    |
| Bias Current | 0 to 100mA    | ±10%     | Internal    |
| TX Power     | +1 to +6dBm   | ±3dB     | Internal    |
| RX Power     | -20 to -7dBm  | ±3dB     | Internal    |

### ■ Revision History

| Revision   | Initiated  | Reviewed | Approved  | DCN           | Release Date  |
|------------|------------|----------|-----------|---------------|---------------|
| Version1.0 | yangpeiyun | sunbin   | dingzheng | New Released. | July 28, 2016 |

### ■ For More Information

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