# QSFP28 -4\*SFP28 Active optical cabel

**(AOC)**



|  |  |  |  |
| --- | --- | --- | --- |
| Document NO. | Draft by | Review by | Approved by |
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# Description:

QSFP28-4SFP28-AOC active optical cable, integrated four data channels, the total bandwidth of 100Gbps. 4 transmission channels, each channel can run at 25.3125 Gbps. QSFP + to 4x SFP + AOC cables are 100GBase QSFP + hybrid cables. One end is a QSFP + optical connector and the other end is a 4 SFP + optical connector. Transmission distance of not more than 100 meters. The fiber optic cable is a high-performance module for short-range multi-channel data communications and interconnect applications.

# Features

* Support 4x25GBASE-SR application
* Compliant to QSFP28 MSA SFF-8636 and SFP28 MSA SFF-8431 and SFF- 8472
* Multi rate of up to 25.78125Gbps per lane
* Transmission distance up to 50m

 +3.3V single power supply

* Low power consumption
* UL certification cables (optional)
* Operating temp Commercial: 0°C to +70 °C
* RoHS compliant

# Applications

* 4x25Gbe-SR
* Other optical links

**Absolute Maximum Ratings**

**Table1- Absolute Maximum Ratings**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Symbol** | **Min.** | **Typical** | **Max.** | **Unit** | **Notes** |
| Supply Voltage | Vcc3 | -0.5 | - | +3.6 | V |  |
| Storage Temperature | Ts | -10 | - | +70 | °C |  |
| Operating Humidity | RH | +5 | - | +85 | % | 1 |

**Note: 1 No condensation**

**Recommended Operating Conditions**

**Table 2- Recommended operating Conditions**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Symbol** | **Min.** | **Typical** | **Max.** | **Unit** | **Notes** |
| Operating Temperature | TC | 0 | - | +70 | °C |  |
| Power Supply Voltage | Vcc | 3.14 | 3.3 | 3.47 | V |  |
| Power Dissipation per QSFP28 | Pd | - | - | 2.5 | W |  |
| Power Dissipation per SFP28 | Pd | - | - | 1.0 | W | 1 |
| Bit Rate per Lane | BR | 10.3125 | 25.78125 | - | Gbps |  |

**Note: 1 Per terminal**

**Electrical Characteristics**

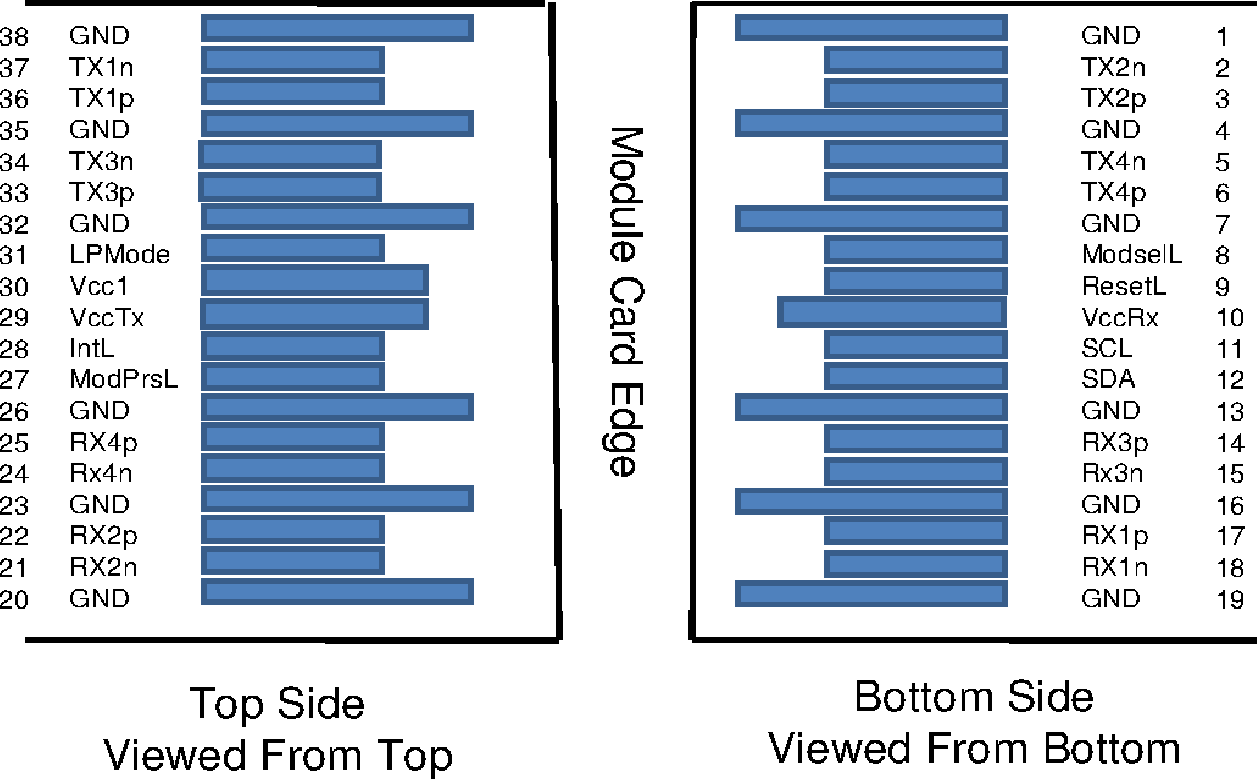
**Table 3- Electrical Characteristics for QSFP28**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Symbol** | **Min.** | **Typ.** | **Max.** | **Units** | **Notes** |
| ModSelL | Module Select | VOL | 0 | - | 0.8 | V |  |
| Module Unselect | VOH | 2.5 | - | VCC | V |  |
| LPMode | Low Power Mode | VIL | 0 | - | 0.8 | V |  |
| Normal Operation | VIH | 2.5 | - | VCC+0.3 | V |  |
| ResetL | Reset | VIL | 0 | - | 0.8 | V |  |
| Normal Operation | VIH | 2.5 | - | VCC+0.3 | V |  |
| ModPrsL | Normal Operation | VOL | 0 | - | 0.4 | V |  |
| IntL | Interrupt | VOL | 0 | - | 0.4 | V |  |
| Normal Operation | VoH | 2.4 | - | VCC | V |  |
| **Electrical Transmitter Characteristics** | | | | | | | |
| Differential Date Input Swing | | Vin,P-P | 200 | - | 1600 | mV |  |
| Output Differential Impedance | | ZIN | 90 | 100 | 110 | Ω |  |
| **Electrical Receiver Characteristics** | | | | | | | |
| Differential Data Output Swing | | Vout | 200 | - | 800 | mVPP |  |
| Bit Error Rate | | BER |  |  | E-12 |  | 1 |
| Input Differential Impedance | | ZD | 90 | 100 | 110 | Ω |  |

**Note: 1 PRBS2[^3](mailto:31-1@25.78125Gbps)1[-1@25.78125Gbps](mailto:31-1@25.78125Gbps)**

**Table 4- Electrical Characteristics for SFP28**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Symbol** | | **Min.** | **Typ.** | **Max.** | **Units** | | **Notes** |
| **Electrical Transmitter Characteristics** | | | | | | | | | | |
| Differential Data Input Swing | | | Vin,P-P | | 200 | - | 1600 | | mVPP |  |
| Input Differential Impedance | | | ZIN | | 90 | 100 | 110 | | Ω |  |
| Tx\_Fault | Normal Operation | | VOL | | 0 | - | 0.8 | | V |  |
| Transmitter Fault | | VOH | | 2.0 | - | VCC | | V |  |
| Tx\_Disable | Normal Operation | | VIL | | 0 | - | 0.8 | | V |  |
| Laser Disable | | VIH | | 2.0 | - | VCC+0.3 | | V |  |
| **Electrical Receiver Characteristics** | | | | | | | | | | |
| Differential Date Output | | | | Vout | 400 | - | 800 | mV | |  |
| Bit Error Rate | | | | BER | - | - | E-12 | - | |  |
| Output Differential Impedance | | | | ZD | 90 | 100 | 110 | Ω | |  |
| Rx\_LOS | | Normal Operation | | VOL | 0 | - | 0.8 | V | |  |
| Lose Signal | | VoH | 2.0 | - | VCC | V | |  |

**Pin arrangement**

**Figure 1, Pin View for QSFP28**

**Table 5- Pin Function Definitions for QSFP28**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pin** | **Symbol** | **Name/Description** | **Notes** |
| 1 | GND | Ground | 1 |
| 2 | Tx2n | Transmitter Inverted Data Input |  |
| 3 | Tx2p | Transmitter Non-Inverted Data Input |  |
| 4 | GND | Ground | 1 |
| 5 | Tx4n | Transmitter Inverted Data Input |  |
| 6 | Tx4p | Transmitter Non-Inverted Data Input |  |
| 7 | GND | Ground | 1 |
| 8 | ModSelL | Module Select |  |
| 9 | ResetL | Module Reset |  |
| 10 | Vcc Rx | +3.3V Power Supply Receiver |  |
| 11 | SCL | 2-wire serial interface clock |  |
| 12 | SDA | 2-wire serial interface data |  |
| 13 | GND | Ground | 1 |
| 14 | Rx3p | Receiver Non-Inverted Data Output |  |
| 15 | Rx3n | Receiver Inverted Data Output |  |
| 16 | GND | Ground | 1 |
| 17 | Rx1p | Receiver Non-Inverted Data Output |  |
| 18 | Rx1n | Receiver Inverted Data Output |  |
| 19 | GND | Ground | 1 |
| 20 | GND | Ground | 1 |
| 21 | Rx2n | Receiver Inverted Data Output |  |
| 22 | Rx2p | Receiver Non-Inverted Data Output |  |
| 23 | GND | Ground | 1 |
| 24 | Rx4n | Receiver Inverted Data Output |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Pin** | **Symbol** | **Name/Description** | **Notes** |
| 25 | Rx4p | Receiver Non-Inverted Data Output |  |
| 26 | GND | Ground | 1 |
| 27 | ModPrsL | Module Present |  |
| 28 | IntL | Interrupt |  |
| 29 | Vcc Tx | +3.3V Power supply transmitter |  |
| 30 | Vcc1 | +3.3V Power supply |  |
| 31 | LPMode | Low Power Mode |  |
| 32 | GND | Ground | 1 |
| 33 | Tx3p | Transmitter Non-Inverted Data Input |  |
| 34 | Tx3n | Transmitter Inverted Data Input |  |
| 35 | GND | Ground | 1 |
| 36 | Tx1p | Transmitter Non-Inverted Data Input |  |
| 37 | Tx1n | Transmitter Inverted Data Input |  |
| 38 | GND | Ground | 1 |

**Note: 1. Circuit ground is internally isolated from chassis ground.**



**Table 6-Pin Function Definitions**

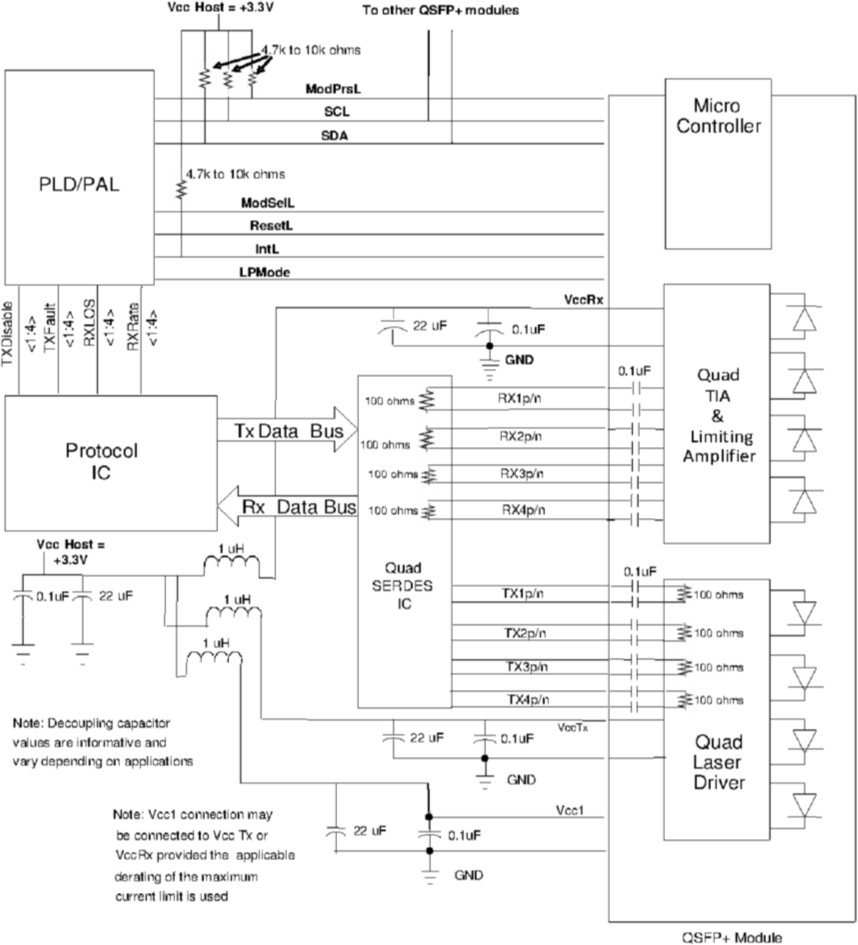
**Figure 2, Pin View for SFP28**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pin** | **Symbol** | **Name/Description** | **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 | SDA | 2-Wire Serial Interface Data Line (MOD-DEF2) |  |
| 5 | SCL | 2-Wire Serial Interface Clock (MOD-DEF1) |  |
| 6 | MOD\_ABS | Module Absent, connected to VEET or VEER in the module | 2 |
| 7 | RS0 | Rate Select 0, optionally controls SFP+ module receiver | 4 |
| 8 | RX\_LOS | Receiver Loss of Signal Indication (In FC designated as Rx\_LOS and in Ethernet designated as NOT Signal Detect) | 2 |
| 9 | RS1 | Rate Select 1, optionally controls SFP+ module transmitter | 4 |

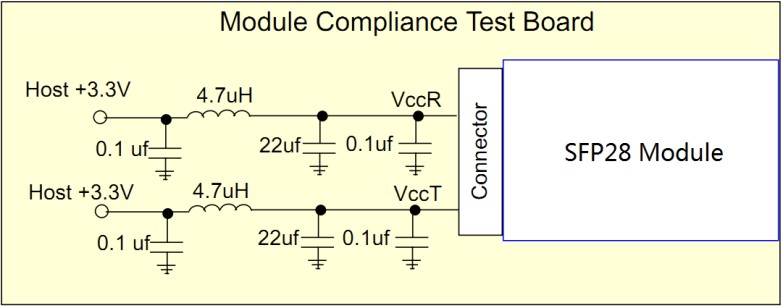
|  |  |  |  |
| --- | --- | --- | --- |
| **Pin** | **Symbol** | **Name/Description** | **Notes** |
| 10 | VEER | Module Receiver Ground | 1 |
| 11 | VEER | Module Receiver Ground | 1 |
| 12 | RD- | Receiver Inverted Data Output |  |
| 13 | RD+ | Receiver Non-Inverted Data Output |  |
| 14 | VEER | Module Receiver Ground | 1 |
| 15 | VCCR | Module Receiver 3.3 V Supply |  |
| 16 | VCCT | Module Transmitter 3.3 V Supply |  |
| 17 | VEET | Module Transmitter Ground | 1 |
| 18 | TD+ | Transmitter Non-Inverted Data Input |  |
| 19 | TD- | Transmitter Inverted Data Input |  |
| 20 | VEET | Module Transmitter Ground | 1 |

**Note:**

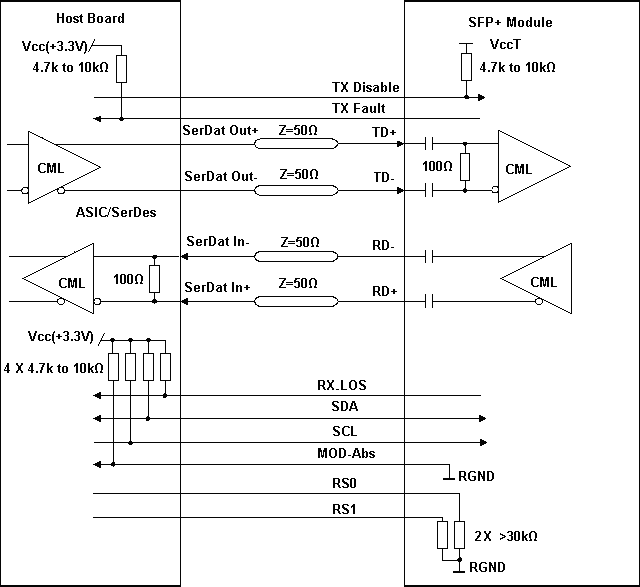
1. **The module ground pins are isolated from the module case.**
2. **The pins shall be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.46V on host board.**
3. **The pin is pulled up to VCCT with a 4.7K-10KΩ resistor in the module.**
4. **See SFF-8472 Rev12.2 Table 10-2.**

**Recommended Circuit**

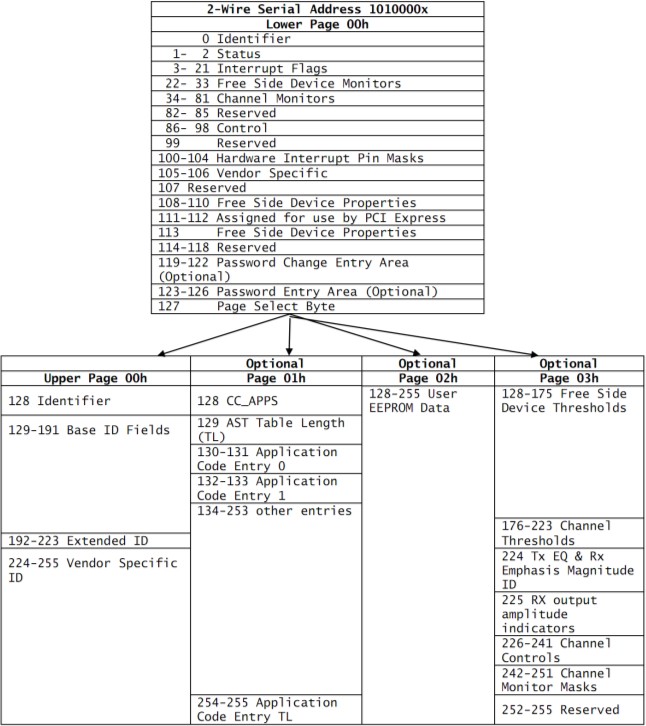
**Figure 3, Recommended Interface Circuit for QSFP28**



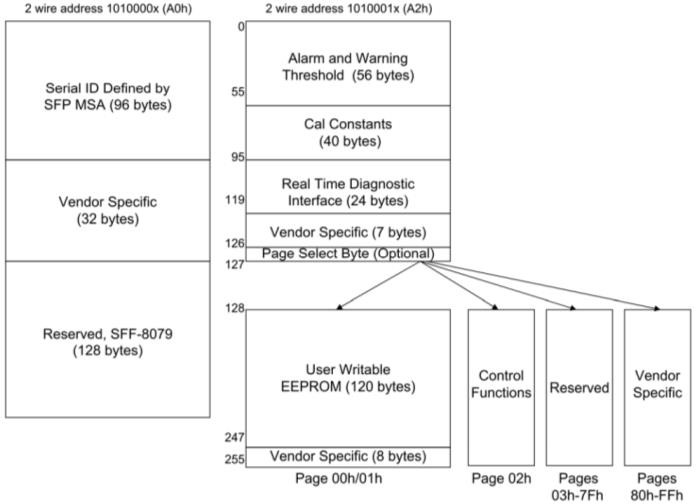
**Figure 4, Recommended Host Board Power Supply Circuit for SFP28**



**Figure 5, Recommended Interface Circuit for SFP28**

**Monitoring Specification**

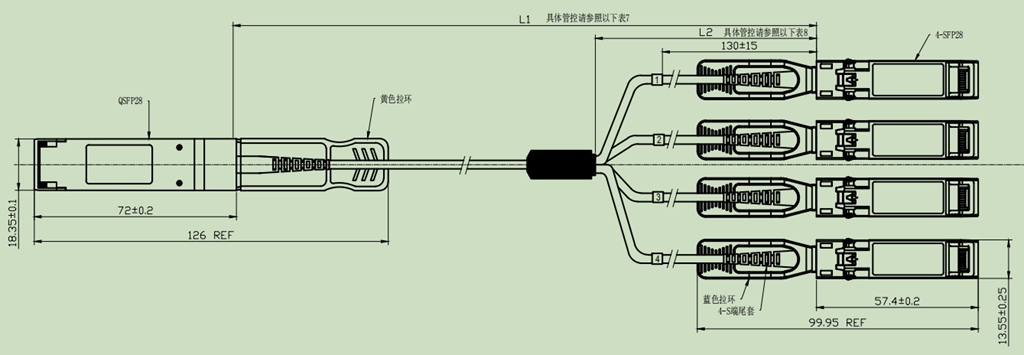
**Figure 6, Memory Map for QSFP28**



**Figure 7, Memory Map for SFP28**

**Mechanical**

**Unit mm**

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**Figure 8, Mechanical Diagram**

**Table 7- Cable Length**

|  |  |
| --- | --- |
| **Cable Length L1（Unit: m）** | **Tolerant（Unit: cm）** |
| ≤1.0 | +5/-0 |
| 1.0＜L≤4.5 | +15/-0 |
| 4.5＜L≤14.5 | +30/-0 |
| ＞14.5 | +2%/-0 |

**Table 8- Breakout Cable Nominal Length**

|  |  |
| --- | --- |
| **Total Length**  **L1 (Unit: m)** | **Breakout Point Measured from SFP**  **L2(Unit: m)** |
| 1 | 0.7 |
| 2 | 1.4 |
| 3 | 2 |
| ≥5 | 3 |

**Warnings**

**Handling Precautions:** This device is susceptible to damage as a result of electrostatic discharge (ESD).

A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

**Laser Safety:** Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.