

DATA SHEET

QSFP28-LR4-C-GEN

100G QSFP28 LR4 Optical Transceiver

QSFP28-LR4-C-GEN Overview

QSFP28-LR4-C-GEN optical transceivers are based on 100G Ethernet IEEE 802.3ba standard. The QSFP28 transceiver converts 4 input channels of 25Gb/s electrical data to 4 LAN-WDM optical signals, and multiplexes them into a single channel for 100Gb/s optical transmission. Conversely, on the receiver side, the module optically de-multiplexes a 100Gb/s input into 4 LAN-WDM channels signals, and converts them to 4 channel output electrical data.

Product Features

- 4x25G LAN-WDM optical architecture upto 103.1Gbps
- QSFP28 MSA compliant
- Duplex LC connector
- Power dissipation < 3.5W
- Built-in digital diagnostic functions
- RoHS compliant
- Operating temperature range: 0°C to 70°C

Applications

- 100GBASE-LR4 100G Ethernet

Ordering Information

| Part Number | Product ID | Description | Color on Clasp |
|---|------------|---|----------------|
| QSFP28-LR4-C-GEN | M359101 | 100G QSFP28 LC Connectors, Up to 10km on SMF, with DOM function. | blue |
| QSFP28-LR4-C-GEN | M359102 | 100G QSFP28 LC Connectors, Up to 13 km on SMF, with DOM function. | blue |
| Note : 1.Product ID is the abbreviated order number of our company's standard model | | | |
| For More Information: SONGXIN TAIPEI TECH SOLUTIONS CO., LTD. Web: www.songxin.com.tw Email: oversea@songxin.com.tw | | | |

General Specifications

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|-----------------------|------------------|------|-----|-------------------|------|---------|
| Bit Error Rate | BER | | | 10 ⁻¹² | | |
| Operating Temperature | T _C | 0 | | 70 | °C | 1 |
| Storage Temperature | T _{STO} | -40 | | 85 | °C | 2 |
| Input Voltage | V _{CC} | 3.14 | 3.3 | 3.46 | V | |
| Maximum Voltage | V _{MAX} | -0.5 | | 3.6 | V | 3 |
| Module total power | P | | | 3.5 | W | |

Notes:

- 1.Case temperature
- 2.Ambient temperature
- 3.For electrical power interface

Optical – Characteristics – Transmitter

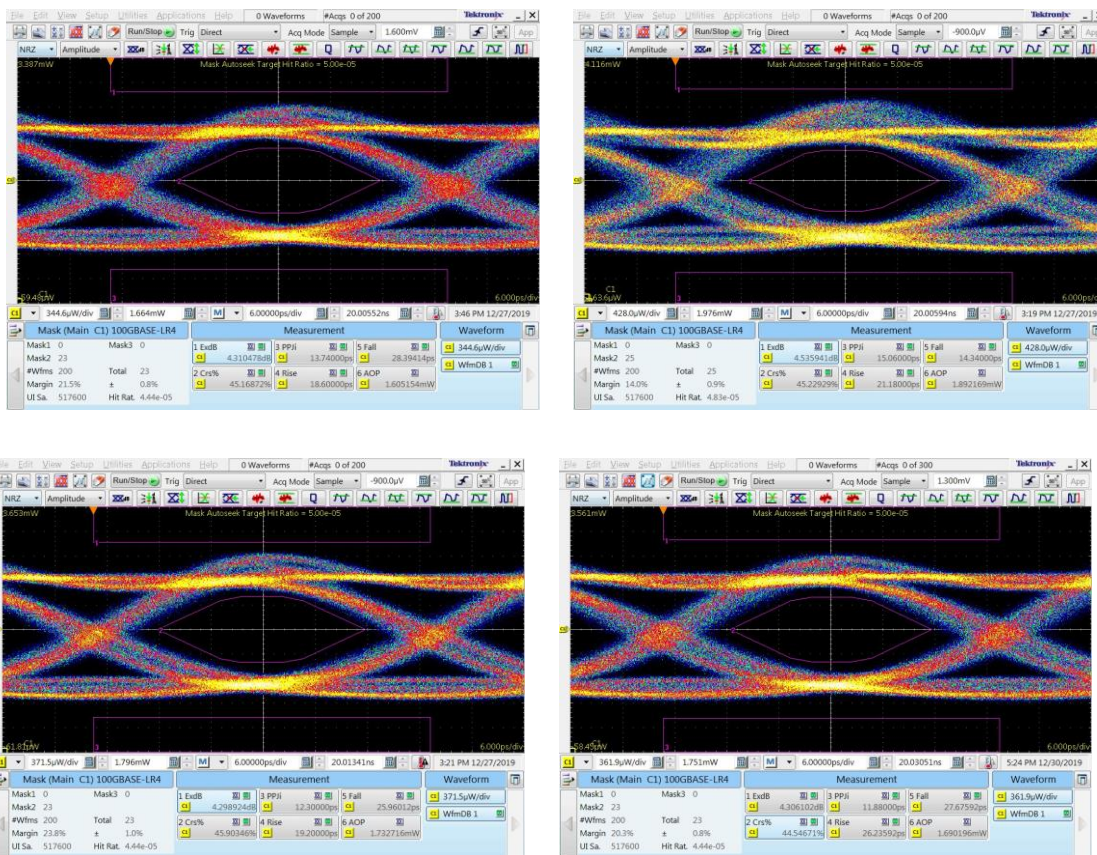
| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|---|-------------|-----------------------------|---------|---------|-------|---------|
| Signaling Speed per lane | | 25.78125±100ppm | | | Gb/s | |
| Total Output Optical Power | P_T | | | 8.3 | dBm | 1 |
| Average Launch Power (Each Lane) | P_{TX} | -4.3 | | 4.5 | dBm | |
| Optical Center Wavelength (L0 Lane) | λ_c | 1294.53 | 1295.56 | 1296.59 | nm | |
| Optical Center Wavelength (L1 Lane) | λ_c | 1299.02 | 1300.06 | 1301.09 | nm | |
| Optical Center Wavelength (L2 Lane) | λ_c | 1303.54 | 1304.59 | 1305.63 | nm | |
| Optical Center Wavelength (L3 Lane) | λ_c | 1308.09 | 1309.14 | 1310.19 | nm | |
| Optical Modulation Amplitude(Each Lane) | OMA | -1.3 | | 4.5 | dB | |
| Extinction Ratio | ER | 4 | | | dB | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Relative Intensity Noise | RIN | | | -130 | dB/Hz | |
| Transmitter Dispersion Penalty | TDP | | | 1.8 | dB | |
| Optical Return Loss Tolerance | | | | 20 | dB | |
| Transmitter Eye Mask | | Compliant with IEEE 802.3ba | | | | |

Notes:

1. Average

TX1-TX4 Typical eye diagram

Test Conditions : 30°C



Optical – Characteristics – Receiver

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|---------------------------------------|---------------|-----------------|---------|---------|------|---------|
| Signaling Speed per lane | | 25.78125±100ppm | | | Gb/s | |
| Optical Center Wavelength (L0 Lane) | λ_c | 1294.53 | 1295.56 | 1296.59 | nm | |
| Optical Center Wavelength (L1 Lane) | λ_c | 1299.02 | 1300.06 | 1301.09 | nm | |
| Optical Center Wavelength (L2 Lane) | λ_c | 1303.54 | 1304.59 | 1305.63 | nm | |
| Optical Center Wavelength (L3 Lane) | λ_c | 1308.09 | 1309.14 | 1310.19 | nm | |
| Optical Input Power, each lane | P_{RX} | -10.6 | | -4.5 | dBm | |
| Receiver Sensitivity (OMA), each Lane | R_{X_SEN1} | | | -8.6 | dBm | |
| LOS Assert | LOS_A | | -18 | | dBm | |
| LOS De-Assert | LOS_D | | -16 | | dBm | |
| LOS Hysteresis | LOS_H | 1.5 | | | dB | |

Electrical – Characteristics – Transmitter

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|-------------------------------|--------------------|----------------------|-----|----------------------|------|---------|
| Signaling Rate per lane | | 25.78125±100ppm | | | Gb/s | |
| Differential data input swing | V _{IN_PP} | | | 900 | mV | |
| Transmit disable voltage | V _D | V _{CC} -1.3 | | V _{CC} | V | |
| Transmit enable voltage | V _{EN} | V _{EE} | | V _{EE} +0.8 | V | |

Electrical – Characteristics – Receiver

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|---------------------------------|---------------------|----------------------|-----|----------------------|------|---------|
| Signaling Rate per lane | | 25.78125±100ppm | | | Gb/s | |
| Differential data output swing | V _{OUT_PP} | 400 | | 800 | mV | |
| Data output rise time (20%-80%) | t _r | | 12 | | ps | |
| Data output fall time (20%-80%) | t _f | | 12 | | ps | |
| LOS Fault | LOS _A | V _{CC} -1.3 | | V _{CC_HOST} | V | |
| LOS Normal | LOS _D | V _{EE} | | V _{EE} +0.5 | V | |

A0 Write Protection

| Security Level 1 Password | | |
|---------------------------|------|-------------|
| Password Entry ADDR | Size | Vaules(hex) |
| Page A0 · 7BH-7EH | 4 | 00 00 10 11 |

This module has the A0 write protection function. The user can enter the security level 1 working state and write the contents of Table 00 and Table 01 of the device address A0H of the module. The method to enter the working state of security level 1 is to write the security level 1 password in order in the 7BH-7EH registers of A0H of the module. After entering security level 1, the user can directly write to the contents of the A0H device address, or modify the contents of the A0H 7F table selection register to write to the contents of Table 00 or Table 01. This version of the module does not support users to modify the password of security level 1. If you need to modify the security level 1 password, you must notify our company to modify it before shipping.

I2C Memory Map(A0,Upper Page 00h)

| Memory Map(2-Wire Serial Address 1010000xb, Upper Page 00h) | | | | | |
|---|------|---------------------------------|---|------|----------------------------|
| IIC Addr | Size | Name | Description | Type | Value (HEX) |
| 128 | 1 | Identifier | QSFP28 | R | 11 |
| 129 | 1 | Ext. Identifier | Extended Identifier | R | DC |
| 130 | 1 | Connector Type | Connector Type=LC | R | 07 |
| 131-138 | 8 | Specification Compliance | Code for electronic or optical compatibility | R | 80 00 00 00 00 00 00 00 |
| 139 | 1 | Encoding | 64B/66B | R | 05 |
| 140 | 1 | Singaling rate,nominal | The nominal bit rate per channel,units of 100 Megabits per second | R | FF |
| 141 | 1 | Extended Rate Select Compliance | Extended Rate Select | R | 00 |
| 142 | 1 | Length (SMF) | Length (Standard SM Fiber) -km | R | 0A |
| 143 | 1 | Length (OM3 50um) | Length (OM3 50um) | R | 00 |
| 144 | 1 | Length (OM2 50um) | Length (OM2 50um) | R | 00 |
| 145 | 1 | Length (OM1 62.5um) | Length (OM1 62.5um) | R | 00 |
| 146 | 1 | Length (OM4 50um) | Length (OM4 50um) | R | 00 |
| 147 | 1 | Device technology | 1.1310nm DFB 2.No wavelength control 3.Uncooled transmitter device 4.Pin detector 5.Transmitter not tunable | R | 40 |
| 148-163 | 16 | Vendor name | SONGXIN | R | ASCII Format |
| 164 | 1 | Extended Module | Extended Module | R | 00 |
| 165-167 | 3 | Vendor OUI | Vendor OUI | R | 000000 |
| 168-183 | 16 | Vendor PN | Vendor PN | R | ASCII Format |
| 184-185 | 2 | Vendor rev | Vendor rev | R | ASCII Format |
| 186-187 | 2 | Wavelength | Wavelength 1310nm , units of 0.05 nm | R | 66 58 |
| 188-189 | 2 | Wavelength tolerance | Wavelength Tolerance , units of 0.005nm | R | 25 1C |
| 190 | 1 | Max case temp. | Maximum Case Temperature in Degrees C. | R | 46 |

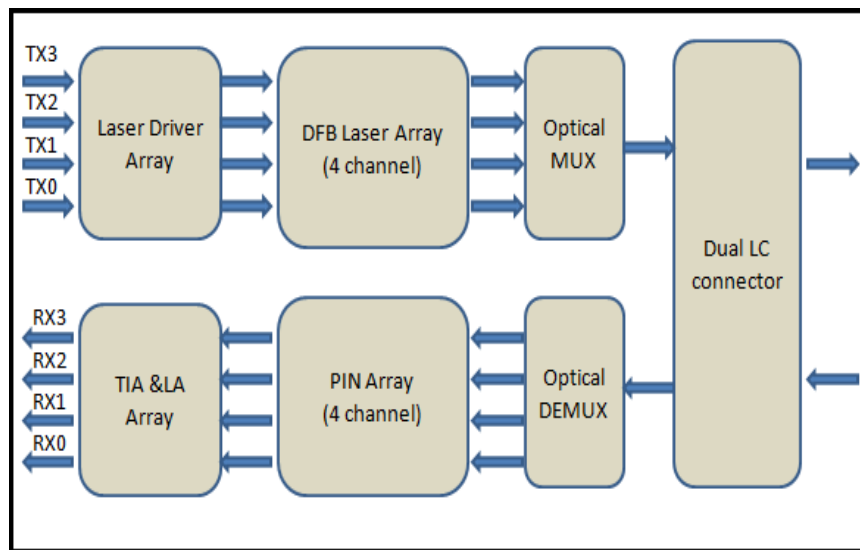
| | | | | | |
|---------|----|----------------------------|---|---|--------------|
| 191 | 1 | CC_BASE | Check sum of bytes 128-190 | R | |
| 192 | 1 | Link codes | Reserve | R | 00 |
| 193-195 | 3 | Options | Options | R | 03 00 3F |
| 196-211 | 16 | Vendor SN | Vendor SN | R | ASCII Format |
| 212-219 | 8 | Date Code | Date Code | R | ASCII Format |
| 220 | 1 | Diagnostic Monitoring Type | Received power measurement type-Average Power | R | 08 |
| 221 | 1 | Enhanced Options | Enhanced Options | R | 00 |
| 222 | 1 | Baud Rate,nominal | Baud Rate,nominal | R | 00 |
| 223 | 1 | CC_EXT | Check sum of bytes 192-222 | R | |
| 224-225 | 32 | Vendor Specific | Vendor Specific | R | |

Digital Diagnostic Functions

QSFP28-LR4-C-GEN supports the 2-wire serial communication protocol, Digital diagnostic information is accessible over the 2-wire interface. Digital diagnostics for QSFP28-LR4-D10 are internally calibrated by default. The internal micro control unit accesses the device operating parameters in real time, such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. The module implements the alarm function, alerts the user when a particular operating parameter exceeds the factory-set normal range.

| Digital Diagnostic Threshold Range | | | | |
|------------------------------------|-----------------|-------------------|------------------|----------------|
| Parameter | High Alarm(hex) | High Warning(hex) | Low Warning(hex) | Low Alarm(hex) |
| Temperature(°C) | 75 (0x4B00) | 70 (0x4600) | 0 (0x0000) | -5 (0xFB00) |
| Voltage(V) | 3.63 (0x8DCC) | 3.46 (0x8728) | 3.13 (0x7A44) | 2.97 (0x7404) |
| Bias Current(mA) | 131 (0xFFDC) | 130 (0xFDE8) | 20 (0x2710) | 15 (0x1D4C) |
| Tx Power(dBm) | 7.5 (0xDBAA) | 4.5 (0x6E18) | -4.3 (0x0E83) | -8.3 (0x05C7) |
| Rx Power(dBm) | 7.5 (0xDBAA) | 4.5 (0x6E18) | -10.6 (0x0367) | -14.6 (0x015B) |

Block-Diagram-of-Transceiver



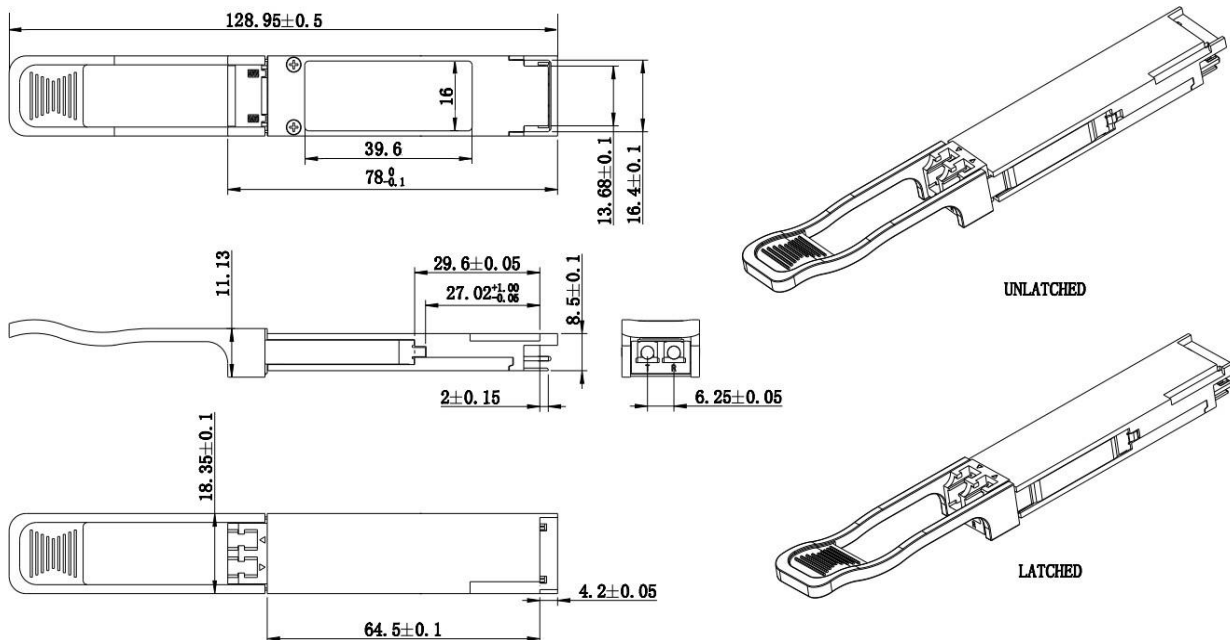
Functions Description

This product converts the 4-channel 25Gb/s electrical input data into LAN WDM optical signals (light), by a driven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX parts as a 100Gb/s data, propagating out of the transmitter module from the SMF. The receiver module accepts the 100Gb/s LAN WDM optical signals input, and de-multiplexes it into 4 individual 25Gb/s channels with different wavelength. Each wavelength light is collected by a discrete photo diode, and then outputted as electric data after amplified by a TIA.

Dimensions

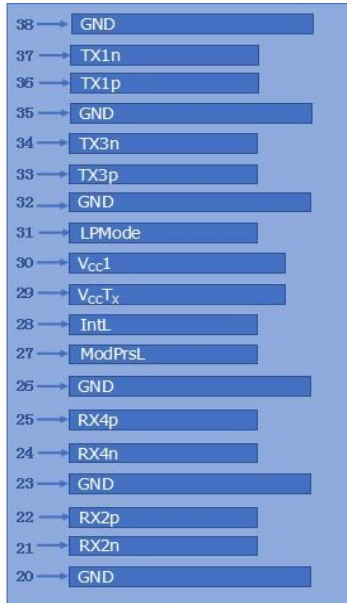
Module Weight: 38g

Dust Cap Weight: 0.95g

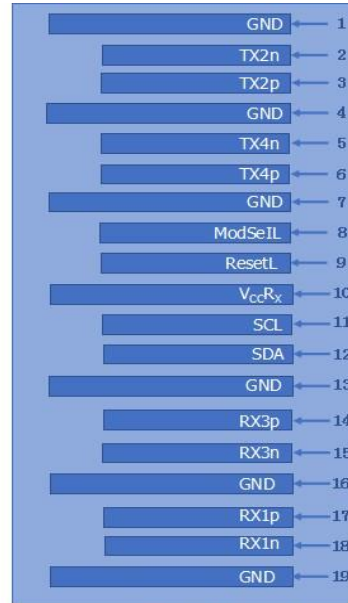


ALL DIMENSIONS (NOT INCLUDING THE LENGTH OF THE CABLE) ARE ±0.2mm
UNLESS OTHERWISE SPECIFIED
UNIT: mm

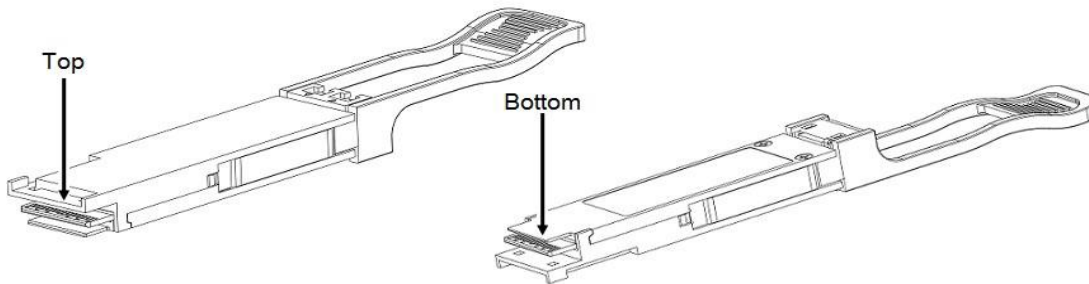
Electrical Pad Layout



Top of Board



Bottom of Board



Pin Assignment

| PIN # | Symbol | Description | Remarks |
|-------|--------------------------------|--|---------|
| 1 | GND | Ground | 5 |
| 2 | Tx2n | Transmitter Inverted Data Input, LAN2 | |
| 3 | Tx2p | Transmitter Non-Inverted Data Input, LAN2 | |
| 4 | GND | Ground | 5 |
| 5 | Tx4n | Transmitter Inverted Data Input, LAN4 | |
| 6 | Tx4p | Transmitter Non-Inverted Data Input, LAN4 | |
| 7 | GND | Ground | 5 |
| 8 | ModSelL | Module select pin, the module responds to two-wire serial communication when low level | 1 |
| 9 | ResetL | Module Reset | 2 |
| 10 | V _{cc} R _X | +3.3V Power Supply Receiver | |
| 11 | SCL | 2-wire serial interface clock | |
| 12 | SDA | 2-wire serial interface data | |
| 13 | GND | Ground | 5 |
| 14 | Rx3p | Receiver Non-Inverted Data Output, LAN3 | |
| 15 | Rx3n | Receiver Inverted Data Output, LAN3 | |
| 16 | GND | Ground | 5 |
| 17 | Rx1p | Receiver Non-Inverted Data Output, LAN1 | |
| 18 | Rx1n | Receiver Inverted Data Output, LAN1 | |
| 19 | GND | Ground | 5 |
| 20 | GND | Ground | 5 |
| 21 | Rx2n | Receiver Inverted Data Output, LAN2 | |
| 22 | Rx2p | Receiver Non-Inverted Data Output, LAN2 | |
| 23 | GND | Ground | 5 |
| 24 | Rx4n | Receiver Inverted Data Output, LAN4 | |
| 25 | Rx4p | Receiver Non-Inverted Data Output, LAN4 | |
| 26 | GND | Ground | 5 |
| 27 | ModPrsL | The module is inserted into the indicate pin and grounded in the module. | 3 |
| 28 | IntL | Interrupt | 4 |
| 29 | V _{cc} T _X | +3.3V Power Supply transmitter | |
| 30 | V _{cc} 1 | +3.3V Power Supply | |
| 31 | LPMODE | Low Power Mode | 5 |
| 32 | GND | Ground | 5 |

| | | | |
|----|------|---|---|
| 33 | Tx3p | Transmitter Non-Inverted Data Input, LAN3 | |
| 34 | Tx3n | Transmitter Inverted Data Input, LAN3 | |
| 35 | GND | Ground | 5 |
| 36 | Tx1p | Transmitter Non-Inverted Data Input, LAN1 | |
| 37 | Tx1n | Transmitter Inverted Data Input, LAN1 | |
| 38 | GND | Ground | 5 |

Notes:

1. ModSelL is the input pin. The module responds to 2-wire serial communication commands when it is held low by the host. ModSelL allows multiple QSFP modules to be used on a single 2-wire interface bus. If ModSelL is High, the module will not respond to any 2-wire interface communication from the host. ModSelL has internal pull-up resistors in the module
2. The module restart pin, when the low level on the ResetL pin lasts longer than the minimum pulse length, resets the module and restores all user modules to their default state. When performing reset device, the host should ignore all status bits. Until the module reset interrupt is completed, please note that during hot plugging, the module will issue this information to complete the reset interrupt without resetting
3. This pin is active high, indicating that the module is running under a low power module.
4. IntL is the output pin, which is the open collector output and must be pulled up to Vcc on the motherboard. When it is low, it indicates that the module may malfunction. The host uses a 2-wire serial interface to identify the interrupt source
5. Circuit ground is internally isolated from chassis ground.

References

1. IEEE standard 802.3ba. IEEE Standard Department.
2. [QSFP28 4X PLUGGABLE TRANSCEIVER – SFF-8665.](#)