

# SPH-QSFP+AOCX

## QSFP+ ACTIVE OPTICAL CABLE



### Features

- Four-channel full-duplex active optical cable
- Transmission data rate up to 11.3Gbit/s per channel
- Reliable VCSEL array technology using multimode fiber
- Available in standard lengths of 3, 5, 10, 15, 20, 30, 50, 100m
- Low power consumption <1.5W
- Operating case temperature 0° C to +70° C
- 3.3V power supply voltage
- RoHS 6 compliant
- Hot Pluggable QSFP form factor

### Applications

- Infiniband transmission at 4ch SDR, DDR and QDR
- Infiniband QDR/DDR/SDR
- Datacenter
- 40G Ethernet
- 4G/8G/10G Fibre Channel

### Description

The QSFP+ active optic cables are a high performance, low power consumption, long reach interconnect solution supporting InfiniBand QDR/DDR/SDR, 12.5G/10G/8G/4G/2G fiber channel, PCIe and SAS. It is compliant with the QSFP MSA and IEEE P802.3ba. SOPTO QSFP AOC is an assembly of 4 full-duplex lanes, where each lane is capable of transmitting data at rates



up to 11.3Gb/s, providing an aggregated rate of 45.2Gb/s.SOPTO QSFP+AOC is one kind of parallel transceiver which provides increased port density and total system cost savings.

## Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

| Parameter                         | Symbol | Min  | Max     | Unit | Note |
|-----------------------------------|--------|------|---------|------|------|
| Storage Temperature               | TST    | -40  | 85      | degC |      |
| Relative Humidity(non-condensing) | RH     | 0    | 85      | %    |      |
| Operating Case Temperature        | TOPC   | 0    | 70      | degC |      |
| Supply Voltage                    | VCC    | -0.3 | 3.6     | V    |      |
| Input Voltage                     | Vin    | -0.3 | Vcc+0.3 | V    |      |

## Recommended Operating Conditions and Supply

| Parameter                    | Symbol | Min  | Typical | Max  | Unit |
|------------------------------|--------|------|---------|------|------|
| Operating Case Temperature   | TOPC   | 0    |         | 70   | degC |
| Power Supply Voltage         | VCC    | 3.13 | 3.3     | 3.47 | V    |
| Power Consumption            |        | -    |         | 1.5  | W    |
| Data Rate                    | DR     | 1    | 10.3    | 11.3 | Gbps |
| Data Speed Tolerance         | ΔDR    | -100 |         | +100 | ppm  |
| Link Distance with OM3 fiber | D      | 0    |         | 100  | m    |

## Electrical Specifications

| Parameter                             | Symbol | Min     | Typical | Max  | Unit  |
|---------------------------------------|--------|---------|---------|------|-------|
| Differential input impedance          | Zin    | 90      | 100     | 110  | ohm   |
| Differential Output impedance         | Zout   | 90      | 100     | 110  | ohm   |
| Differential input voltage amplitude  | ΔVin   | 300     |         | 1100 | mVp-p |
| Differential output voltage amplitude | ΔVout  | 500     |         | 800  | mVp-p |
| Bit Error Rate                        | BR     |         |         | E-12 |       |
| Input Logic Level High                | VIH    | 2.0     |         | VCC  | V     |
| Input Logic Level Low                 | VIL    | 0       |         | 0.8  | V     |
| Output Logic Level High               | VOH    | VCC-0.5 |         | VCC  | V     |
| Output Logic Level Low                | VOL    | 0       |         | 0.4  | V     |

## Pin Descriptions

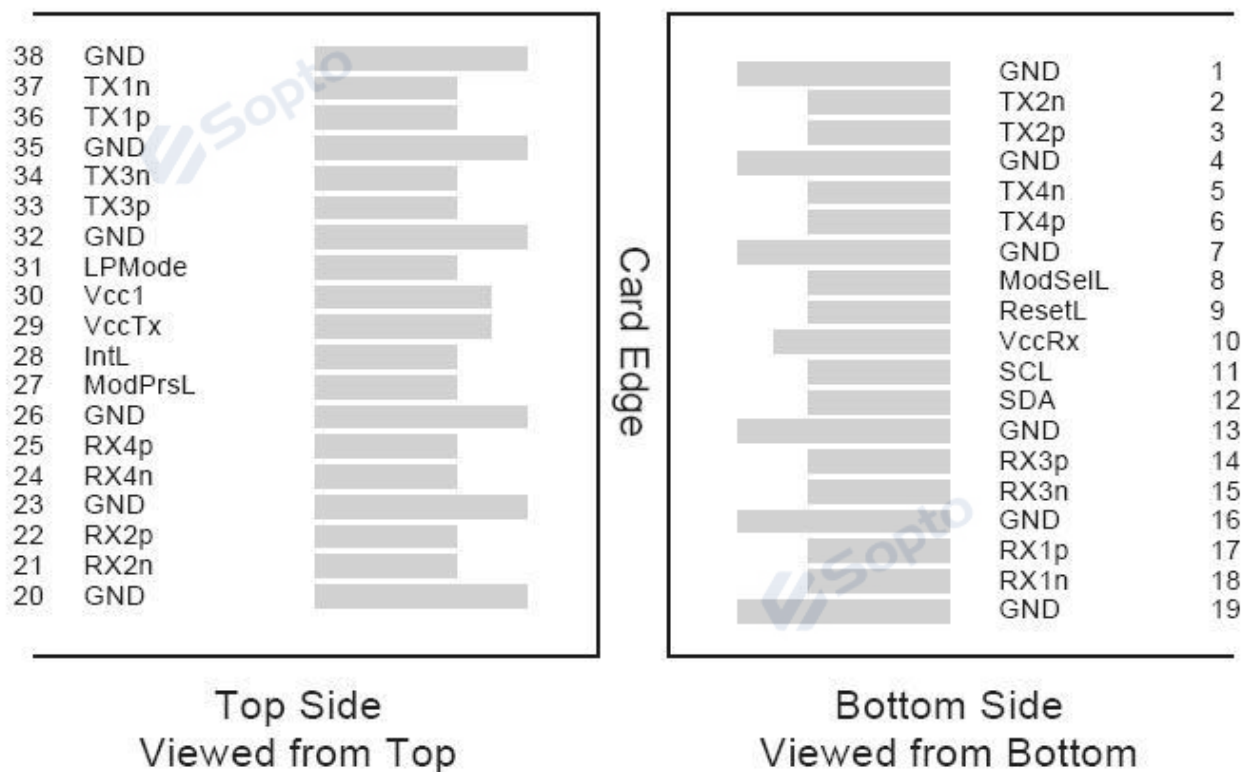
| PIN | Logic | Symbol | Name/Description | Note |
|-----|-------|--------|------------------|------|
| 1   |       | GND    | Ground           | 1    |

|    |             |         |                                      |   |
|----|-------------|---------|--------------------------------------|---|
| 2  | CML-I       | Tx2n    | Transmitter Inverted Data Input      |   |
| 3  | CML-I       | Tx2p    | Transmitter Non-Inverted Data output |   |
| 4  |             | GND     | Ground                               | 1 |
| 5  | CML-I       | Tx4n    | Transmitter Inverted Data Input      |   |
| 6  | CML-I       | Tx4p    | Transmitter Non-Inverted Data output |   |
| 7  |             | GND     | Ground                               | 1 |
| 8  | LVTLL-I     | ModSelL | Module Select                        |   |
| 9  | LVTLL-I     | ResetL  | Module Reset                         |   |
| 10 |             | VccRx   | + 3.3V Power Supply Receiver         | 2 |
| 11 | LVC MOS-I/O | SCL     | 2-Wire Serial Interface Clock        |   |
| 12 | LVC MOS-I/O | SDA     | 2-Wire Serial Interface Data         |   |
| 13 |             | GND     | Ground                               |   |
| 14 | CML-O       | Rx3p    | Receiver Non-Inverted Data Output    |   |
| 15 | CML-O       | Rx3n    | Receiver Inverted Data Output        |   |
| 16 |             | GND     | Ground                               | 1 |
| 17 | CML-O       | Rx1p    | Receiver Non-Inverted Data Output    |   |
| 18 | CML-O       | Rx1n    | Receiver Inverted Data Output        |   |
| 19 |             | GND     | Ground                               | 1 |
| 20 |             | GND     | Ground                               | 1 |
| 21 | CML-O       | Rx2n    | Receiver Inverted Data Output        |   |
| 22 | CML-O       | Rx2p    | Receiver Non-Inverted Data Output    |   |
| 23 |             | GND     | Ground                               | 1 |
| 24 | CML-O       | Rx4n    | Receiver Inverted Data Output        | 1 |
| 25 | CML-O       | Rx4p    | Receiver Non-Inverted Data Output    |   |
| 26 |             | GND     | Ground                               | 1 |
| 27 | LVTTL-O     | ModPrsL | Module Present                       |   |
| 28 | LVTTL-O     | IntL    | Interrupt                            |   |
| 29 |             | VccTx   | +3.3 V Power Supply transmitter      | 2 |
| 30 |             | Vcc1    | +3.3 V Power Supply                  | 2 |
| 31 | LVTTL-I     | LPMode  | Low Power Mode                       |   |
| 32 |             | GND     | Ground                               | 1 |
| 33 | CML-I       | Tx3p    | Transmitter Non-Inverted Data Input  |   |
| 34 | CML-I       | Tx3n    | Transmitter Inverted Data Output     |   |
| 35 |             | GND     | Ground                               | 1 |
| 36 | CML-I       | Tx1p    | Transmitter Non-Inverted Data Input  |   |

|    |       |      |                                  |   |
|----|-------|------|----------------------------------|---|
| 37 | CML-I | Tx1n | Transmitter Inverted Data Output |   |
| 38 |       | GND  | Ground                           | 1 |

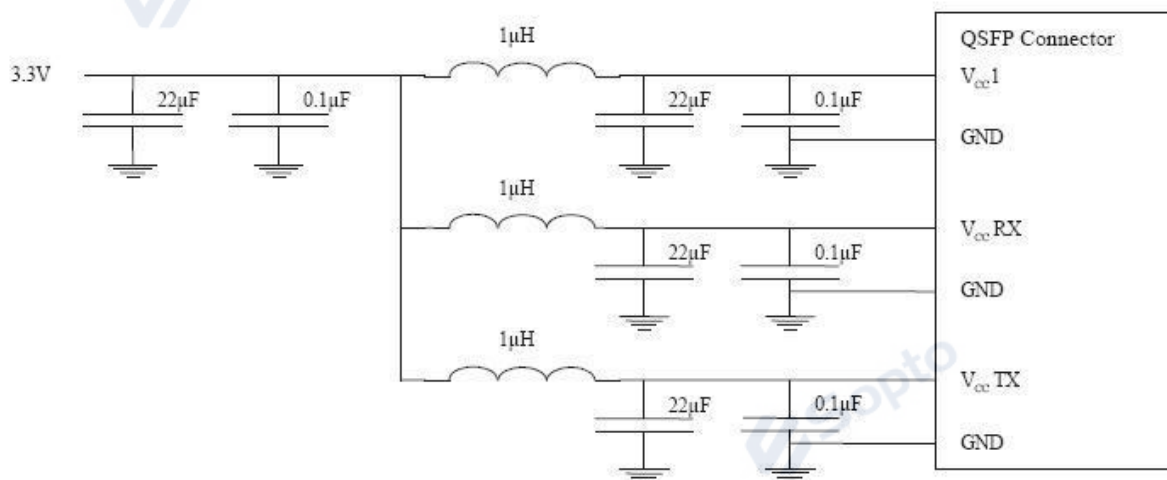
#### Notes:

1. Module circuit ground is isolated from module chassis ground within the module. GND is the symbol for signal and supply (power) common for QSFP modules.
2. The connector pins are each rated for a maximum current of 500mA.



#### Power Supply Filtering

The host board should use the power supply filtering shown in Figure1.



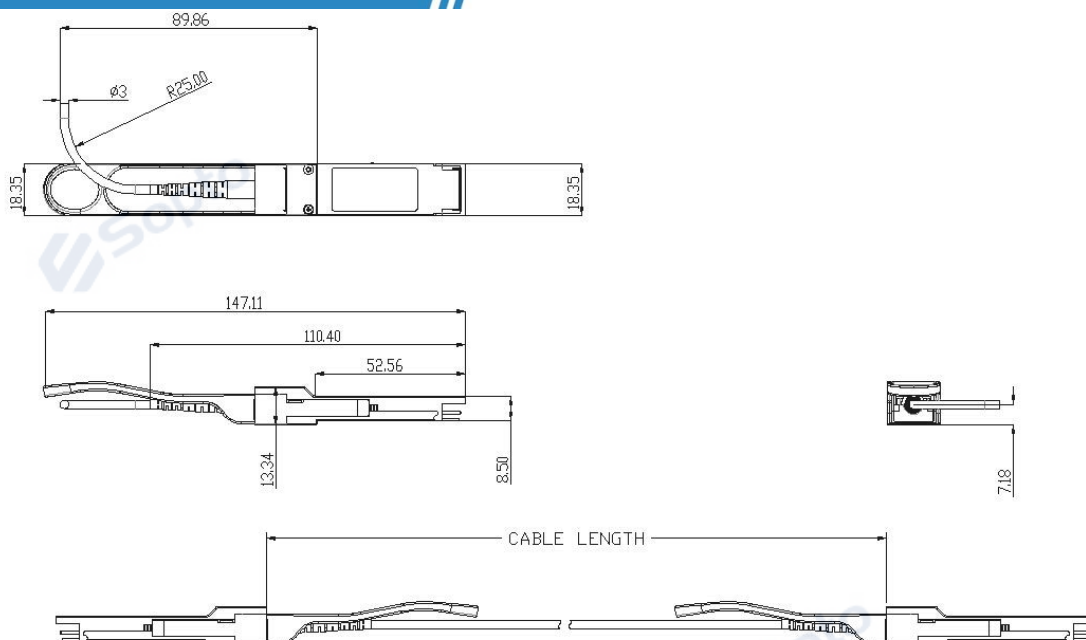
**Figure1. Host Board Power Supply Filtering**
**Pin Assignments and Descriptions**
**Serial ID: Data Fields (Page 00)**

| Address | Size (Bytes) | Name                            | Description of Base ID Field                                             | Optical Module |
|---------|--------------|---------------------------------|--------------------------------------------------------------------------|----------------|
| 128     | 1            | Identifier                      | Identifier Type of serial Module                                         | R              |
| 129     | 1            | Ext. Identifier                 | Extended Identifier of Serial Module                                     | R              |
| 130     | 1            | Connector                       | Code for connector type                                                  | R              |
| 131-138 | 8            | Specification compliance        | Code for electronic compatibility or optical compatibility               | R              |
| 139     | 1            | Encoding                        | Code for serial encoding algorithm                                       | R              |
| 140     | 1            | BR, nominal                     | Nominal bit rate, units of 100 Mbits/s                                   | R              |
| 141     | 1            | Extended Rate select Compliance | Tags for extended rate select compliance                                 | R              |
| 142     | 1            | Length(SMF)                     | Link length supported for SMF fiber in km (note 1)                       | R              |
| 143     | 1            | Length(OM3 50 um)               | Link length supported for EBW 50/125 um fiber(OM3), units of 2m (note 1) | R              |
| 144     | 1            | Length(OM2 50 um)               | Link length supported for 50/125 um fiber (OM2), units of 1m (note 1)    | R              |
| 145     | 1            | Length(OM1 62.5 um)             | Link length supported for 62.5/125 um fiber(OM1), units of 1m (note 1)   | R              |

|         |    |                                               |                                                                                                                                                                                         |   |
|---------|----|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 146     | 1  | Length<br>(Copper)                            | Link length of copper or active cable, units of 1 m<br>(note 1)Link length supported for 50/125 um fiber(OM4), units of 2 m) when Byte 147 declares 850 nm VCSEL as defined in Table 37 | R |
| 147     | 1  | Device tech                                   | Device technology                                                                                                                                                                       | R |
| 148-163 | 16 | Vendor name                                   | QSFP+ vendor name(ASCII)                                                                                                                                                                | R |
| 164     | 1  | Extended<br>Module                            | Extended Module codes for InfiniBand                                                                                                                                                    | R |
| 165-167 | 3  | Vendor OUI                                    | QSFP+ vendor IEEE company ID                                                                                                                                                            | R |
| 168-183 | 16 | Vendor PN                                     | Part number provided by QSFP+ vendor(ASCII)                                                                                                                                             | R |
| 184-185 | 2  | Vendor rev                                    | Revision level for part number provided by vendor(ASCII)                                                                                                                                | R |
| 186-187 | 2  | Wave length or<br>Copper cable<br>Attenuation | Nominal laser wavelength(wavelength=value/20 in nm) or copper cable attenuation in dB at 2.5GHz(Adrs 186) and 5.0GHz (Adrs 187)                                                         | R |
| 188-189 | 2  | Wavelength<br>tolerance                       | Guaranteed range of laser wavelength(+/- value) from nominal wavelength.(wavelength Tol.=value/200 in nm)                                                                               | R |
| 190     | 1  | Max case<br>temp.                             | Maximum case temperature in degrees C                                                                                                                                                   | R |
| 191     | 1  | CC_BASE                                       | Check code for base ID fields (addresses 128-190)                                                                                                                                       | R |
| 192-195 | 4  | Options                                       | Rate Select, TX Disable,TX Fault, LOS, Warning indicators for: Temperature, VCC, RX power, TX Bias                                                                                      | R |

|                                   |    |                            |                                                                                                         |   |
|-----------------------------------|----|----------------------------|---------------------------------------------------------------------------------------------------------|---|
| 196-211                           | 16 | Vendor SN                  | Serial number provided by vendor (ASCII)                                                                | R |
| 212-219                           | 8  | Date Code                  | Vendor's manufacturing date code                                                                        | R |
| 220                               | 1  | Diagnostic Monitoring Type | Indicates which types of diagnostic monitoring are implemented (if any) in the Module. Bit 1,0 Reserved | R |
| 221                               | 1  | Enhanced Options           | Indicates which optional enhanced features are implemented in the Module.                               | R |
| 222                               | 1  | Reserved                   |                                                                                                         |   |
| 223                               | 1  | CC_EXT                     | Check code for the Extended ID Fields(addresses 192-222)                                                | R |
| <b>Vendor Specific ID Fields</b>  |    |                            |                                                                                                         |   |
| 224-255 32 Vendor Specific EEPROM |    |                            |                                                                                                         |   |

## Mechanical Dimensions



Dimensions in Millimeters



## ESD

This transceiver is specified as ESD threshold 1KV for high speed data pins and 2KV for all others electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

## Ordering information

| Part Number   | Product Description                                    |
|---------------|--------------------------------------------------------|
| SPH-QSFP+AOCX | X=different cable lengths on OM3 Multimode Fiber (MMF) |
| 5             | 5=5m                                                   |
| 10            | 10=10m                                                 |
| 20            | 20=20m                                                 |
| 50            | 50=50m                                                 |
| 100           | 100=100m                                               |

Note:

- 1、 Default Jacket Material is PVC.
- 2、 Default operating case temperature is 0 ~ 70°C. If you need -40 ~85°C products, add “T” after Part Number .
- 4、 If you need more customized services, please contact us.

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