

## 40 Gb/s QSFP+ SR4 Transceiver with DDM

### QSFP+ Series

- 40 Gbps per module
- Up to 11.1 Gbps data rate per channel
- Maximum link length of 300 m links on OM3 multimode fiber or 400 m links on OM4 multimode fiber
- High reliability 850 nm VCSEL technology
- Electrically hot-pluggable
- Digital diagnostic SFF-8436 compliant
- Standard 12 lane with MPO connector
- Power consumption < 0.7 W



Ascent's QSFP-AQ-MP-85-03 QSFP transceivers are designed for use in 40 Gigabit per second links over multimode fiber. They are compliant with the QSFP+ MSA and IEEE 802.3ba 40GBASE-SR4.

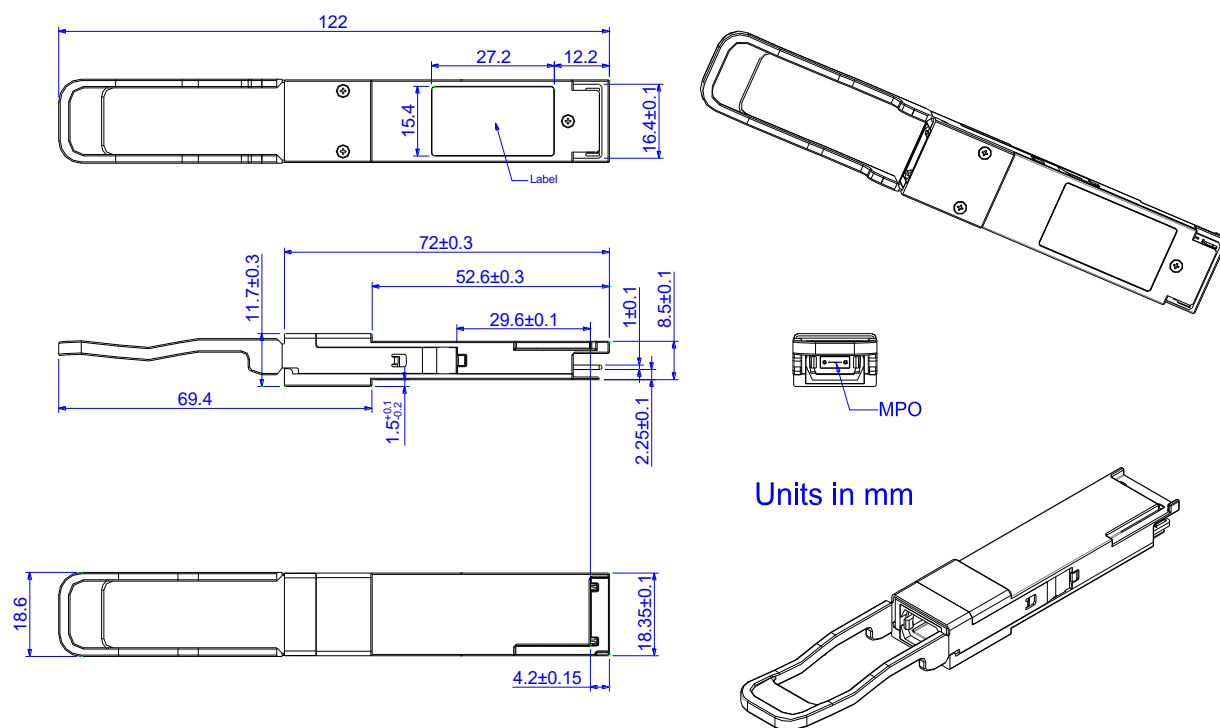
The optical transmitter portion of the transceiver incorporates a 4-channel VCSEL array, a 4-channel input buffer and laser driver, diagnostic monitors, control and bias blocks. For module control, the control interface incorporates a two-wire serial interface of clock and data signals. Diagnostic monitors for VCSEL bias, module temperature, transmitted optical power, received optical power and supply voltage are implemented and results are available through the TWS interface. Alarm and warning thresholds are established for the monitored attributes. Fault detection or channel deactivation through the TWS interface will disable the channel. Status, alarm/warning and fault information are available via the TWS interface.

The optical receiver portion of the transceiver incorporates a 4-channel PIN photodiode array, a 4-channel TIA array, a 4-channel output buffer, diagnostic monitors, and control and bias blocks. Diagnostic monitors for optical input power are implemented and results are available through the TWS interface. Alarm and warning thresholds are established for the monitored attributes.

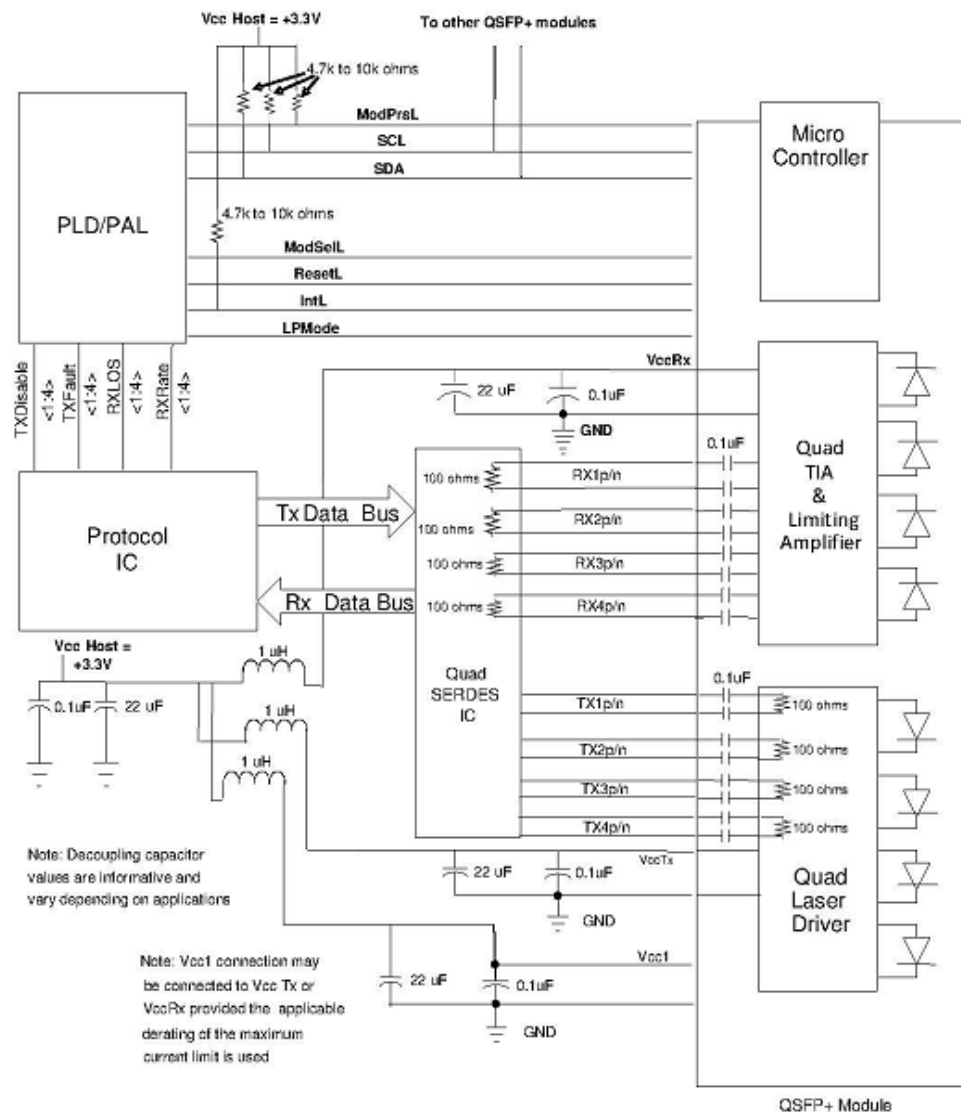
## Key Features

- High channel capacity: 40 Gbps per module
- Up to 11.1 Gbps data rate per channel
- Maximum link length of 300 m links on OM3 multimode fiber or 400 m links on OM4 multimode fiber
- High reliability 850 nm VCSEL technology
- Electrically hot-pluggable
- Digital diagnostic SFF-8436 compliant
- Standard 12 lane with MPO connector
- Case operating temperature range: 0 °C to +70 °C
- Power consumption < 0.7 W

## Outline Dimensions



## Host-Transceiver Interface Block Diagram



## Pin Assignment

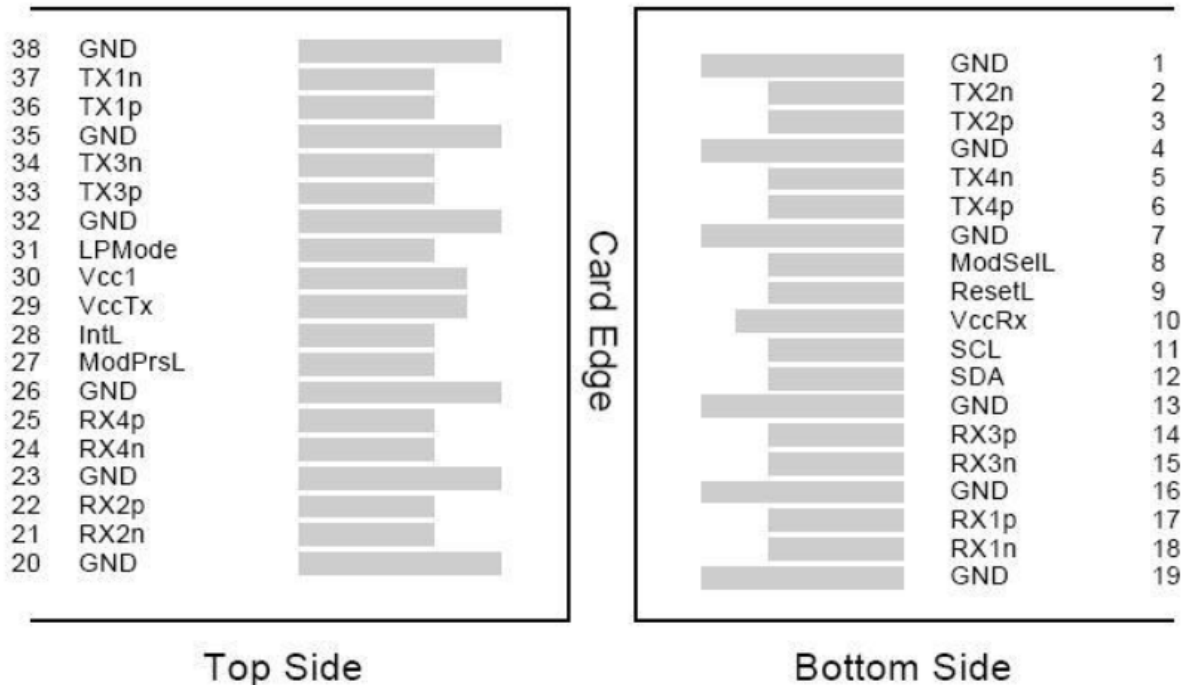


Figure 1 – Pin out of Connector Block on Host Board

| Pin | Symbol  | Name/Description                                 | Note |
|-----|---------|--|------|
| 1   | GND     | Transmitter Ground (Common with Receiver Ground) | 1    |
| 2   | Tx2n    | Transmitter Inverted Data Input                  |      |
| 3   | Tx2p    | Transmitter Non-Inverted Data output             |      |
| 4   | GND     | Transmitter Ground (Common with Receiver Ground) | 1    |
| 5   | Tx4n    | Transmitter Inverted Data Input                  |      |
| 6   | Tx4p    | Transmitter Non-Inverted Data output             |      |
| 7   | GND     | Transmitter Ground (Common with Receiver Ground) | 1    |
| 8   | ModSelL | Module Select                                    |      |
| 9   | ResetL  | Module Reset                                     |      |
| 10  | VccRx   | 3.3V Power Supply Receiver                       | 2    |
| 11  | SCL     | 2-Wire serial Interface Clock                    |      |
| 12  | SDA     | 2-Wire serial Interface Data                     |      |
| 13  | GND     | Transmitter Ground (Common with Receiver Ground) |      |
| 14  | Rx3p    | Receiver Non-Inverted Data Output                |      |
| 15  | Rx3n    | Receiver Inverted Data Output                    |      |
| 16  | GND     | Transmitter Ground (Common with Receiver Ground) | 1    |
| 17  | Rx1p    | Receiver Non-Inverted Data Output                |      |
| 18  | Rx1n    | Receiver Inverted Data Output                    |      |
| 19  | GND     | Transmitter Ground (Common with Receiver Ground) | 1    |

|    |         |  |   |
|----|---------|--|---|
| 20 | GND     | Transmitter Ground (Common with Receiver Ground) | 1 |
| 21 | Rx2n    | Receiver Inverted Data Output                    |   |
| 22 | Rx2p    | Receiver Non-Inverted Data Output                |   |
| 23 | GND     | Transmitter Ground (Common with Receiver Ground) | 1 |
| 24 | Rx4n    | Receiver Inverted Data Output                    | 1 |
| 25 | Rx4p    | Receiver Non-Inverted Data Output                |   |
| 26 | GND     | Transmitter Ground (Common with Receiver Ground) | 1 |
| 27 | ModPrsl | Module Present                                   |   |
| 28 | IntL    | Interrupt  |   |
| 29 | VccTx   | 3.3V power supply transmitter                    | 2 |
| 30 | Vcc1    | 3.3V power supply                                | 2 |
| 31 | LPMODE  | Low Power Mode, not connect                      |   |
| 32 | GND     | Transmitter Ground (Common with Receiver Ground) | 1 |
| 33 | Tx3p    | Transmitter Non-Inverted Data Input              |   |
| 34 | Tx3n    | Transmitter Inverted Data Output                 |   |
| 35 | GND     | Transmitter Ground (Common with Receiver Ground) | 1 |
| 36 | Tx1p    | Transmitter Non-Inverted Data Input              |   |
| 37 | Tx1n    | Transmitter Inverted Data Output                 |   |
| 38 | GND     | Transmitter Ground (Common with Receiver Ground) | 1 |

## Notes:

1. GND is the symbol for signal and supply (power) common for QSFP+ modules. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500 mA.

## Specifications

### Absolute Maximum Ratings

| Parameter            | Symbol | Min.    | Typ. | Max.    | Unit | Note |
|----------------------|--------|---------|------|---------|------|------|
| Storage Temperature  | Ts     | -40     | -    | 85      | °C   |      |
| Relative Humidity    | RH     | 5       | -    | 95      | %    |      |
| Power Supply Voltage | VCC    | -0.3    | -    | 4       | V    |      |
| Signal Input Voltage |        | Vcc-0.3 | -    | Vcc+0.3 | V    |      |
| Damage threshold     |        | 3.4     |      |         | dBm  |      |

### Recommended Operating Conditions

| Parameter                  | Symbol | Min. | Typ.    | Max. | Unit | Note             |
|----------------------------|--------|------|---------|------|------|------------------|
| Case Operating Temperature | Tcase  | 0    | -       | 70   | °C   | Without air flow |
| Power Supply Voltage       | VCC    | 3.14 | 3.3     | 3.46 | V    |                  |
| Power Supply Current       | Icc    | -    |         | 200  | mA   |                  |
| Data Rate                  | BR     |      | 10.3125 |      | Gbps | Each channel     |
| Transmission Distance      | TD     |      | -       | 300  | m    | OM3 MMF          |
|                            |        |      |         | 400  | m    | OM4 MMF          |

### Optical Characteristics

| Parameter                                    | Symbol                      | Min  | Typ. | Max  | Unit | Note |
|--|-----------------------------|------|------|------|------|------|
| Transmitter                                  |                             |      |      |      |      |      |
| Center Wavelength                            | $\lambda_0$                 | 840  |      | 860  | nm   |      |
| Average Launch Power Each Lane               |                             | -7.6 |      | 2.4  | dBm  |      |
| Spectral Width (RMS)                         | $\sigma$                    |      |      | 0.65 | nm   |      |
| Optical Extinction Ratio                     | ER                          | 3    |      |      | dB   |      |
| Average Launch Power Off Each Lane           | Poff                        |      |      | -30  | dBm  |      |
| Transmitter and Dispersion Penalty Each Lane | TDP                         |      |      | 3.5  | dB   |      |
| Optical Return Loss Tolerance                | ORL                         |      |      | 12   | dB   |      |
| Output Eye Mask                              | Compliant with IEEE 802.3ba |      |      |      |      |      |
| Receiver                                     |                             |      |      |      |      |      |
| Receiver Wavelength                          | $\lambda_{in}$              | 840  |      | 860  | nm   |      |
| Rx Sensitivity per Lane                      | RSENS                       |      |      | -9.5 | dBm  | 1    |
| Input Saturation Power (Overload)            | Psat                        | 2.4  |      |      | dBm  |      |
| Receiver Reflectance                         | Rr                          |      |      | -12  | dB   |      |
| LOS De-Assert                                | LOSD                        |      |      | -12  | dBm  |      |
| LOS Assert                                   | LOSA                        | -30  |      |      | dBm  |      |
| LOS Hysteresis                               |                             | 0.5  |      |      | dBm  |      |

### Notes:

1. Measured with a PRBS 2<sup>31</sup>-1 test pattern, @10.325 Gb/s, BER < 10<sup>-12</sup>.

## Electrical Characteristics

| Parameter                            | Symbol   | Min  | Typ. | Max  | Unit     | Note |
|--------------------------------------|----------|------|------|------|----------|------|
| Supply Voltage                       | Vcc      | 3.14 | 3.3  | 3.46 | V        |      |
| Supply Current                       | Icc      |      |      | 200  | mA       |      |
| <b>Transmitter</b>                   |          |      |      |      |          |      |
| Input Differential Impedance         | Rin      |      | 100  |      | $\Omega$ | 1    |
| Differential Data Input Swing        | Vin, pp  | 180  |      | 1000 | mV       |      |
| Single-Ended Input Voltage Tolerance | VinT     | -0.3 |      | 4.0  | V        |      |
| <b>Receiver</b>                      |          |      |      |      |          |      |
| Differential Data Output Swing       | Vout, pp | 300  |      | 850  | mV       | 2    |
| Single-Ended Output Voltage          |          | -0.3 |      | 4.0  | V        |      |

## Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Into 100  $\Omega$  differential termination.

## Digital Diagnostic Functions

Ascent's QSFP-AQ-LP-85-03 supports the 2-wire serial communication protocol as defined in the QSFP+ MSA., which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

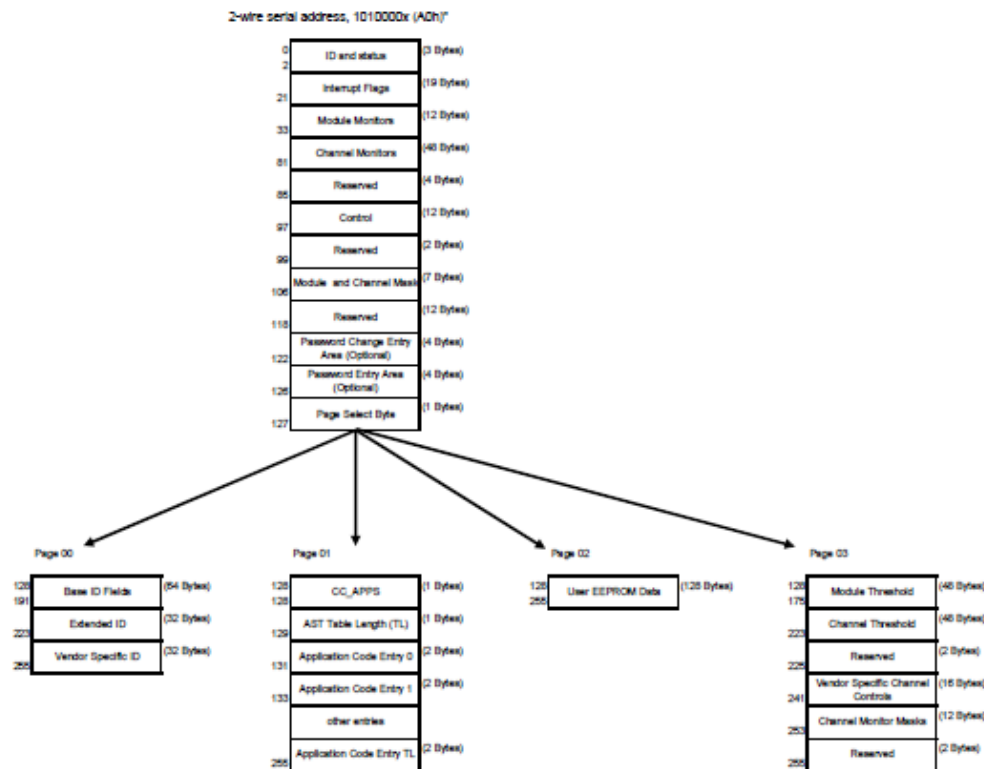
The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the QSFP+ transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the QSFP+ transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8-bit parameters, addressed from 00h to the maximum address of the memory.

This clause defines the Memory Map for QSFP+ transceiver used for serial ID, digital monitoring and certain control functions. The interface is mandatory for all QSFP+ devices. The memory map has been changed in order to accommodate 4 optical channels and limit the required memory space. The structure of the memory is shown in Figure 2 -QSFP+ Memory Map. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to

addresses in the lower page, e.g. Interrupt Flags and Monitors. Less time critical entries, e.g. serial ID information and threshold settings, are available with the Page Select function. The structure also provides address expansion by adding additional upper pages as needed. For example, in Figure 2 upper pages 01 and 02 are optional. Upper page 01 allows implementation of Application Select Table, and upper page 02 provides user read/write space. The lower page and upper pages 00 and 03 are always implemented. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a “one-time-read” for all data related to an interrupt situation. After an Interrupt, IntL, has been asserted, the host can read out the flag field to determine the effected channel and type of flag.

For more detailed information including memory map definitions, please see the QSFP+ MSA Specification.

**Figure 2 – QSFP+ Memory Map**



## Lower Memory Map

The lower 128 bytes of the 2-wire serial bus address space, see Table 1, is used to access a variety of measurements and diagnostic functions, a set of control functions, and a means to select which of the various upper memory map pages are accessed on subsequent reads. This portion of the address space is always directly addressable and thus is chosen for monitoring and control functions that may need to be repeatedly accessed. The definition of identifier field is the same as page 00h Byte 128.

**Table 1 – Lower Memory Map**

| Byte Address | Description                | Type      |
|--------------|----------------------------|-----------|
| 0            | Identifier (1 Byte)        | Read-Only |
| 1-2          | Status (2 Bytes)           | Read-Only |
| 3-21         | Interrupt Flags (19 Bytes) | Read-Only |



|         |   |            |
|---------|---|------------|
| 22-33   | Module Monitors (12 Bytes)                      | Read-Only  |
| 34-81   | Channel Monitors (48 Bytes)                     | Read-Only  |
| 82-85   | Reserved (4 Bytes)                              | Read-Only  |
| 86-97   | Control (12 Bytes)                              | Read/Write |
| 98-99   | Reserved (2 Bytes)                              | Read/Write |
| 100-106 | Module and Channel Masks (7 Bytes)              | Read/Write |
| 107-118 | Reserved (12 Bytes)                             | Read/Write |
| 119-122 | Password Change Entry Area (optional) (4 Bytes) | Read/Write |
| 123-126 | Password Entry Area (optional) (4 Bytes)        | Read/Write |
| 127     | Page Select Byte                                | Read/Write |

## Status Indicator Bits

The Status Indicators are defined in Table 2.

**Table 2 – Status Indicators**

| Byte | Bit | Name           | Description   |
|------|-----|----------------|---|
| 1    | All | Reserved       |   |
| 2    | 7   | Reserved       |   |
|      | 6   | Reserved       |   |
|      | 5   | Reserved       |   |
|      | 4   | Reserved       |   |
|      | 3   | Reserved       |   |
|      | 2   | Reserved       |   |
|      | 1   | IntL           | Digital state of the IntL interrupt output pin.   |
|      | 0   | Data_Not_Ready | Indicates transceiver has not yet achieved power up and monitor data is not ready. Bit remains high until data is ready to be read at which time the device sets the bit low. |

## Interrupt Flags

A portion of the memory map (Bytes 3 through 21), form a flag field. Within this field, the status of LOS and Tx Fault as well as alarms and warnings for the various monitored items is reported. For normal operation and default state, the bits in this field have the value of 0b. For the defined conditions of LOS, Tx Fault, module and channel alarms and warnings, the appropriate bit or bits are set, value = 1b. Once asserted, the bits remained set (latched) until cleared by a read operation that includes the affected bit or reset by the ResetL pin. The Channel Status Interrupt Flags are defined in Table 3.

**Table 3 — Channel Status Interrupt Flags**

| Byte | Bit | Name      | Description                                       |
|------|-----|-----------|---|
| 3    | 7   | L-Tx4 LOS | Latched TX LOS indicator, channel 4 (Not support) |
|      | 6   | L-Tx3 LOS | Latched TX LOS indicator, channel 3 (Not support) |
|      | 5   | L-Tx2 LOS | Latched TX LOS indicator, channel 2 (Not support) |
|      | 4   | L-Tx1 LOS | Latched TX LOS indicator, channel 1 (Not support) |
|      | 3   | L-Rx4 LOS | Latched RX LOS indicator, channel 4               |
|      | 2   | L-Rx3 LOS | Latched RX LOS indicator, channel 3               |

|   |     |             |                                       |
|---|-----|-------------|---------------------------------------|
| 4 | 1   | L-Rx2 LOS   | Latched RX LOS indicator, channel 2   |
|   | 0   | L-Rx1 LOS   | Latched RX LOS indicator, channel 1   |
|   | 7-4 | Reserved    |                                       |
|   | 3   | L-Tx4 Fault | Latched TX fault indicator, channel 4 |
|   | 2   | L-Tx3 Fault | Latched TX fault indicator, channel 3 |
|   | 1   | L-Tx2 Fault | Latched TX fault indicator, channel 2 |
|   | 0   | L-Tx1 Fault | Latched TX fault indicator, channel 1 |
|   | 5   | All         | Reserved                              |

The Module Monitor Interrupt Flags are defined in Table 4.

**Table 4 – Module Monitor Interrupt Flags**

| Byte | Bit | Name                | Description                         |
|------|-----|---------------------|-------------------------------------|
| 6    | 7   | L-Temp High Alarm   | Latched high temperature alarm      |
|      | 6   | L-Temp Low Alarm    | Latched low temperature alarm       |
|      | 5   | L-Temp High Warning | Latched high temperature warning    |
|      | 4   | L-Temp Low Warning  | Latched low temperature warning     |
|      | 3-0 | Reserved            |                                     |
| 7    | 7   | L-Vcc High Alarm    | Latched high supply voltage alarm   |
|      | 6   | L-Vcc Low Alarm     | Latched low supply voltage alarm    |
|      | 5   | L-Vcc High Warning  | Latched high supply voltage warning |
|      | 4   | L-Vcc Low Warning   | Latched low supply voltage warning  |
|      | 3-0 | Reserved            |                                     |
| 8    | All | Reserved            |                                     |

The Channel Monitor Interrupt Flags are defined in Table 5

**Table 5 – Channel Monitor Interrupt Flags**

| Byte | Bit | Name                     | Description                              |
|------|-----|--------------------------|--|
| 9    | 7   | L-Rx1 Power High Alarm   | Latched high RX power alarm, channel 1   |
|      | 6   | L-Rx1 Power Low Alarm    | Latched low RX power alarm, channel 1    |
|      | 5   | L-Rx1 Power High Warning | Latched high RX power warning, channel 1 |
|      | 4   | L-Rx1 Power Low Warning  | Latched low RX power warning, channel 1  |
|      | 3   | L-Rx2 Power High Alarm   | Latched high RX power alarm, channel 2   |
|      | 2   | L-Rx2 Power Low Alarm    | Latched low RX power alarm, channel 2    |
|      | 1   | L-Rx2 Power High Warning | Latched high RX power warning, channel 2 |
|      | 0   | L-Rx2 Power Low Warning  | Latched low RX power warning, channel 2  |
| 10   | 7   | L-Rx3 Power High Alarm   | Latched high RX power alarm, channel 3   |
|      | 6   | L-Rx3 Power Low Alarm    | Latched low RX power alarm, channel 3    |
|      | 5   | L-Rx3 Power High Warning | Latched high RX power warning, channel 3 |
|      | 4   | L-Rx3 Power Low Warning  | Latched low RX power warning, channel 3  |
|      | 3   | L-Rx4 Power High Alarm   | Latched high RX power alarm, channel 4   |
|      | 2   | L-Rx4 Power Low Alarm    | Latched low RX power alarm, channel 4    |
|      | 1   | L-Rx4 Power High Warning | Latched high RX power warning, channel 4 |
|      | 0   | L-Rx4 Power Low Warning  | Latched low RX power warning, channel 4  |
| 11   | 7   | L-Tx1 Bias High Alarm    | Latched high TX bias alarm, channel 1    |

|       |     |                           |  |
|-------|-----|---------------------------|--|
|       | 6   | L-Tx1 Bias Low Alarm      | Latched low TX bias alarm, channel 1     |
|       | 5   | L-Tx1 Bias High Warning   | Latched high TX bias warning, channel 1  |
|       | 4   | L-Tx1 Bias Low Warning    | Latched low TX bias warning, channel 1   |
|       | 3   | L-Tx2 Bias High Alarm     | Latched high TX bias alarm, channel 2    |
|       | 2   | L-Tx2 Bias Low Alarm      | Latched low TX bias alarm, channel 2     |
|       | 1   | L-Tx2 Bias High Warning   | Latched high TX bias warning, channel 2  |
|       | 0   | L-Tx2 Bias Low Warning    | Latched low TX bias warning, channel 2   |
| 12    | 7   | L-Tx3 Bias High Alarm     | Latched high TX bias alarm, channel 3    |
|       | 6   | L-Tx3 Bias Low Alarm      | Latched low TX bias alarm, channel 3     |
|       | 5   | L-Tx3 Bias High Warning   | Latched high TX bias warning, channel 3  |
|       | 4   | L-Tx3 Bias Low Warning    | Latched low TX bias warning, channel 3   |
|       | 3   | L-Tx4 Bias High Alarm     | Latched high TX bias alarm, channel 4    |
|       | 2   | L-Tx4 Bias Low Alarm      | Latched low TX bias alarm, channel 4     |
|       | 1   | L-Tx4 Bias High Warning   | Latched high TX bias warning, channel 4  |
|       | 0   | L-Tx4 Bias Low Warning    | Latched low TX bias warning, channel 4   |
| 13    | 7   | L-Tx1 Power High Alarm    | Latched high TX Power alarm, channel 1   |
|       | 6   | L-Tx1 Power Low Alarm     | Latched low TX Power alarm, channel 1    |
|       | 5   | L-Tx1 Power High Warning  | Latched high TX Power warning, channel 1 |
|       | 4   | L-Tx1 Power Low Warning   | Latched low TX Power warning, channel 1  |
|       | 3   | L-Tx2 Power High Alarm    | Latched high TX Power alarm, channel 2   |
|       | 2   | L-Tx2 Power Low Alarm     | Latched low TX Power alarm, channel 2    |
|       | 1   | L-Tx2 Power High Warning  | Latched high TX Power warning, channel 2 |
|       | 0   | L-Tx2 Power Low Warning   | Latched low TX Power warning, channel 2  |
| 14    | 7   | L-Tx3 Power High Alarm    | Latched high TX Power alarm, channel 3   |
|       | 6   | L-Tx3 Power Low Alarm     | Latched low TX Power alarm, channel 3    |
|       | 5   | L-Tx31 Power High Warning | Latched high TX Power warning, channel 3 |
|       | 4   | L-Tx3 Power Low Warning   | Latched low TX Power warning, channel 3  |
|       | 3   | L-Tx4 Power High Alarm    | Latched high TX Power alarm, channel 4   |
|       | 2   | L-Tx4 Power Low Alarm     | Latched low TX Power alarm, channel 4    |
|       | 1   | L-Tx4 Power High Warning  | Latched high TX Power warning, channel 4 |
|       | 0   | L-Tx4 Power Low Warning   | Latched low TX Power warning, channel 4  |
| 15-16 | All | Reserved                  | Reserved channel monitor flags, set 4    |
| 17-18 | All | Reserved                  | Reserved channel monitor flags, set 5    |
| 19-20 | All | Reserved                  | Reserved channel monitor flags, set 6    |
| 21    | All | Reserved                  |  |

## Module Monitors

Real time monitoring for the QSFP+ module include transceiver temperature, transceiver supply voltage, and monitoring for each transmit and receive channel. Measured parameters are reported in 16-bit data fields, i.e., two concatenated bytes. These are shown in Table 6.

**Table 6 – Module Monitoring Values**

| Byte | Bit | Name | Description |
|------|-----|------|-------------|
|------|-----|------|-------------|

|       |     |                    |   |
|-------|-----|--------------------|---|
| 22    | All | Temperature MSB    | Internally measured module temperature    |
| 23    | All | Temperature LSB    |   |
| 24-25 | All | Reserved           | Internally measured module supply voltage |
| 26    | All | Supply Voltage MSB |   |
| 27    | All | Supply Voltage LSB |   |
| 28-33 | All | Reserved           |   |

## Channel Monitoring

Real time channel monitoring is for each transmit and receive channel and includes optical input power, Tx bias current and Tx output Power. Measurements are calibrated over vendor specified operating temperature and voltage and should be interpreted as defined below. Alarm and warning threshold values should be interpreted in the same manner as real time 16-bit data. Table 7 defines the Channel Monitoring.

**Table 7 – Channel Monitoring Values**

| Byte  | Bit | Name          | Description                                    |
|-------|-----|---------------|--|
| 34    | All | Rx1 Power MSB | Internally measured RX input power, channel 1  |
| 35    | All | Rx1 Power LSB |  |
| 36    | All | Rx2 Power MSB | Internally measured RX input power, channel 2  |
| 37    | All | Rx2 Power LSB |  |
| 38    | All | Rx3 Power MSB | Internally measured RX input power, channel 3  |
| 39    | All | Rx3 Power LSB |  |
| 40    | All | Rx4 Power MSB | Internally measured RX input power, channel 4  |
| 41    | All | Rx4 Power LSB |  |
| 42    | All | Tx1 Bias MSB  | Internally measured TX bias, channel 1         |
| 43    | All | Tx1 Bias LSB  |  |
| 44    | All | Tx2 Bias MSB  | Internally measured TX bias, channel 2         |
| 45    | All | Tx2 Bias LSB  |  |
| 46    | All | Tx3 Bias MSB  | Internally measured TX bias, channel 3         |
| 47    | All | Tx3 Bias LSB  |  |
| 48    | All | Tx4 Bias MSB  | Internally measured TX bias, channel 4         |
| 49    | All | Tx4 Bias LSB  |  |
| 50    | All | Tx1 Power MSB | Internally measured TX output power, channel 1 |
| 51    | All | Tx1 Power LSB |  |
| 52    | All | Tx2 Power MSB | Internally measured TX output power, channel 2 |
| 53    | All | Tx2 Power LSB |  |
| 54    | All | Tx3 Power MSB | Internally measured TX output power, channel 3 |
| 55    | All | Tx3 Power LSB |  |
| 56    | All | Tx4 Power MSB | Internally measured TX output power, channel 4 |
| 57    | All | Tx4 Power LSB |  |
| 58-65 |     |               | Reserved channel monitor set 4                 |
| 66-73 |     |               | Reserved channel monitor set 5                 |
| 74-81 |     |               | Reserved channel monitor set 6                 |

## Control Bytes

Control Bytes are defined in Table 8

**Table 8 – Control Bytes**

| Byte  | Bit | Name                   | Description  |
|-------|-----|------------------------|--|
| 86    | 7-4 | Reserved               |  |
|       | 3   | Tx4_Disable            | Read/write bit that allows software disable of transmitters          |
|       | 2   | Tx3_Disable            | Read/write bit that allows software disable of transmitters          |
|       | 1   | Tx2_Disable            | Read/write bit that allows software disable of transmitters          |
|       | 0   | Tx1_Disable            | Read/write bit that allows software disable of transmitters          |
| 87    | 7   | Rx4_Rate_Select        | Software Rate Select, Rx channel 4 msb                               |
|       | 6   | Rx4_Rate_Select        | Software Rate Select, Rx channel 4 lsb                               |
|       | 5   | Rx3_Rate_Select        | Software Rate Select, Rx channel 3 msb                               |
|       | 4   | Rx3_Rate_Select        | Software Rate Select, Rx channel 3 lsb                               |
|       | 3   | Rx2_Rate_Select        | Software Rate Select, Rx channel 2 msb                               |
|       | 2   | Rx2_Rate_Select        | Software Rate Select, Rx channel 2 lsb                               |
|       | 1   | Rx1_Rate_Select        | Software Rate Select, Rx channel 1 msb                               |
|       | 0   | Rx1_Rate_Select        | Software Rate Select, Rx channel 1 lsb                               |
| 88    | 7   | Tx4_Rate_Select        | Software Rate Select, Tx channel 4 msb (Not support)                 |
|       | 6   | Tx4_Rate_Select        | Software Rate Select, Tx channel 4 lsb (Not support)                 |
|       | 5   | Tx3_Rate_Select        | Software Rate Select, Tx channel 3 msb (Not support)                 |
|       | 4   | Tx3_Rate_Select        | Software Rate Select, Tx channel 3 lsb (Not support)                 |
|       | 3   | Tx2_Rate_Select        | Software Rate Select, Tx channel 2 msb (Not support)                 |
|       | 2   | Tx2_Rate_Select        | Software Rate Select, Tx channel 2 lsb (Not support)                 |
|       | 1   | Tx1_Rate_Select        | Software Rate Select, Tx channel 1 msb (Not support)                 |
|       | 0   | Tx1_Rate_Select        | Software Rate Select, Tx channel 1 lsb (Not support)                 |
| 89    | All | Rx4_Application_Select | Software Application Select per SFF-8079, Rx Channel 4               |
| 90    | All | Rx3_Application_Select | Software Application Select per SFF-8079, Rx Channel 3               |
| 91    | All | Rx2_Application_Select | Software Application Select per SFF-8079, Rx Channel 2               |
| 92    | All | Rx1_Application_Select | Software Application Select per SFF-8079, Rx Channel 1               |
| 93    | 2-7 | Reserved               |  |
|       | 1   | Power_set              | Power set to low power mode. Default 0.                              |
|       | 0   | Power_over-ride        | Override of LPMODE signal setting the power mode with software.      |
| 94    | All | Tx4_Application_Select | Software Application Select per SFF-8079, Tx Channel 4 (Not support) |
| 95    | All | Tx3_Application_Select | Software Application Select per SFF-8079, Tx Channel 3 (Not support) |
| 96    | All | Tx2_Application_Select | Software Application Select per SFF-8079, Tx Channel 2 (Not support) |
| 97    | All | Tx1_Application_Select | Software Application Select per SFF-8079, Tx Channel 1 (Not support) |
| 98-99 | All | Reserved               |  |

## Ordering Information

**Product Name**

QSFP-AQ-MP-85-03

**Product Description**

QSFP+ Plug-in, 40 Gbps, 400 m OM4 fiber, TX/RX 850 nm SR4, with DDM on two multi-mode fibers, MPO connector

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