

850nm SFP+ Multi-Mode Transceiver

AXS85-192-M3 / AXS85-192-M3+

Features

- Operating data rate up to 11.3Gbps
- 850nm VCSEL Transmitter
- Distance up to 300m @50 / 125 um MMF
- Single 3.3V Power supply and TTL Logic Interface
- Duplex LC Connector Interface, Hot Pluggable
- Compliant with MSA SFP+ Specification SFF-8431
- Compliant with IEEE 802.3ae 10GBASE-SR/SW
- Power Dissipation < 1.0W
- Dispersion tolerance up to 40ps/nm over G.651
- Operating Case Temperature Standard: 0°C~+70°C
Industrial:-40°C~85°C



Applications

- 10GBASE-SW at 9.953Gbps
- 10GBASE-SR at 10.3125Gbps
- OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- CPRI rates 10.138Gb/s ,9.830 Gb/s,7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- Other Optical Link

Product Description

The AXS85-192-M3/AXS85-192-M3+ series multi-mode transceiver is SFP+ module for duplex optical data communications such as 10GBASE-SR and 10GBASE-SW. It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. This module is designed for multi-mode fiber and operates at a nominal wavelength of 850 nm.

The transmitter section uses a Vertical Cavity Surface Emitted Laser (VCSEL) and is a Class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated GaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|---------------------|--------|------|------|------|
| Storage Temperature | Ts | -40 | +85 | °C |
| Supply Voltage | Vcc | -0.5 | 3.6 | V |
| Input Voltage | Vin | -0.5 | Vcc | V |
| Output Current | Io | - | 50 | mA |

Recommended Operating Conditions

| Parameter | Symbol | | Min. | Typical | Max. | Unit |
|----------------------------|--------|---------------|------|---------|------|------|
| Operating Case Temperature | Tc | AXS85-192-M3 | 0 | | 70 | °C |
| | | AXS85-192-M3+ | -40 | | 85 | |
| Power Supply Voltage | Vcc | | 3.15 | 3.3 | 3.45 | V |
| Power Supply Current | Icc | | | | 300 | mA |
| Surge Current | ISurge | | | | +30 | mA |
| Baud Rate | | | 0.6 | | 11.3 | Gbps |

Performance Specifications – Electrical

| Parameter | Symbol | Min. | Typ. | Max | Unit | Notes |
|--------------------------------|--------|------|------|---------|------|---------------------|
| Transmitter | | | | | | |
| CML Inputs(Differential) | Vin | 150 | | 1200 | mVpp | AC coupled inputs |
| Input Impedance(Differential) | Zin | 85 | 100 | 115 | ohms | Rin > 100 kohms@ DC |
| Tx_DISABLE InputVoltage – High | | 2 | | Vcc+0.3 | V | |
| Tx_DISABLE InputVoltage – Low | | 0 | | 0.8 | V | |

| | | | | | | |
|-----------------------------------|------|-----|-----|---------|------|------------------------|
| Tx_FAULT OutputVoltage – High | | 2 | | Vcc+0.3 | V | Io = 400µA; HostVcc |
| Tx_FAULT OutputVoltage – Low | | 0 | | 0.8 | V | Io = -4.0mA |
| Receiver | | | | | | |
| CML Outputs(Differential) | Vout | 350 | | 700 | mVpp | AC coupledoutputs |
| Output Impedance(Differential) | Zout | 85 | 100 | 115 | ohms | |
| Rx_LOS OutputVoltage – High | | 2 | | Vcc+0.3 | V | Io = 400µA; HostVcc |
| Rx_LOS OutputVoltage – Low | | 0 | | 0.8 | V | Io = -4.0mA |
| MOD_DEF (2:0) | VoH | 2.5 | | | V | With Serial ID |
| | VoL | 0 | | 0.5 | V | |

Optical and Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|--|--------------------|---------------------------|---------|-------|---------|
| 50 / 125 um MMF | | | 300 | | m |
| Data Rate | | 0.6 | | 11.3 | Gbps |
| Transmitter | | | | | |
| Centre Wavelength | λ_c | 840 | 850 | 860 | nm |
| Spectral Width (RMS) | $\Delta\lambda$ | | | 0.45 | nm |
| Average Output Power | P _{out} | -6 | | -1 | dBm |
| Extinction Ratio | ER | 3.0 | 5.0 | | dB |
| Output Optical Eye | | IEEE 802.3-2005 Compliant | | | |
| Transmitter Dispersion Penalty | TDP | | | 3.9 | dB |
| TX_Disable Assert Time | t _{off} | | | 10 | us |
| TX_DISABLE Negate Time | t _{on} | - | - | 1 | ms |
| TX_BISABLE time to start reset | t _{reset} | 10 | - | - | us |
| Time to initialize, include reset of TX_FAULT | t _{init} | - | - | 300 | ms |
| TX_FAULT from fault to assertion | t _{fault} | - | - | 100 | us |
| Total Jitter | TJ | - | - | 0.28 | UI(p-p) |
| Data Dependant Jitter | DDJ | - | - | 0.1 | UI(p-p) |
| Uncorrelated Jitter | UJ | - | - | 0.023 | RMS |

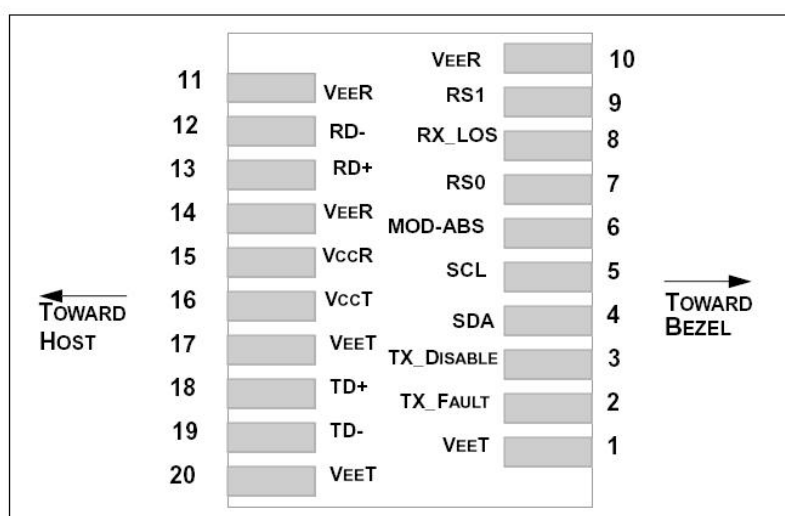
| Receiver | | | | | |
|-------------------------|------------------|-----|-----|-------|-----|
| Centre Wavelength | λ_c | 840 | 850 | 860 | nm |
| Receiver Sensitivity | Pmin | | | -11.1 | dBm |
| Receiver Overload*Note2 | Pmax | -1 | | | dBm |
| Optical Return Loss | ORL | | | -12 | dB |
| LOS De-Assert | LOS _D | | | -12.5 | dBm |
| LOS Assert | LOS _A | -25 | | | dBm |
| LOS Hysteresis | | 0.5 | | | dB |

Note 2: Measured with a PRBS 2³¹ -1 test pattern @ 10.3125Gbps, BER ≤ 10⁻¹²

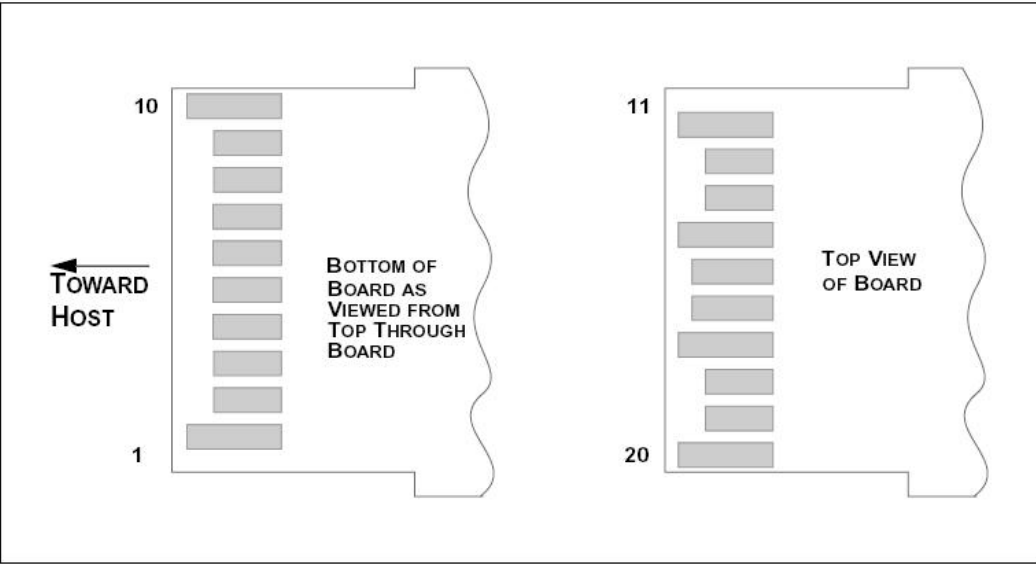
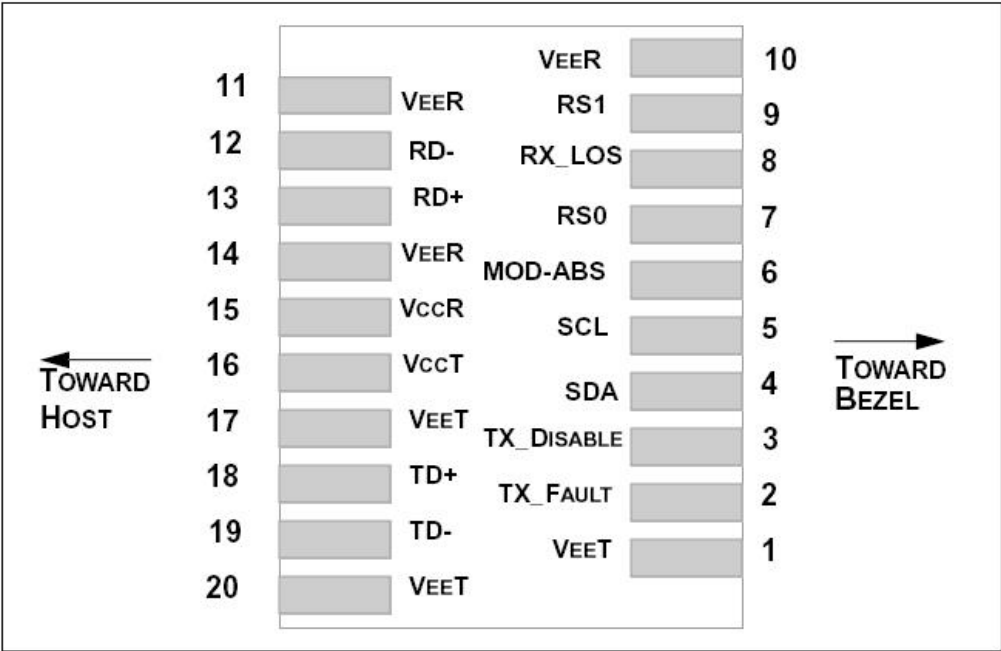
Regulatory Compliance*Note1

| Product Certificate | Certificate Number | Applicable Standard |
|---------------------|--------------------|-------------------------------|
| TUV | R50135086 | EN 60950-1:2006+A11+A1+A12+A2 |
| | | EN 60825-1:2014 |
| | | EN 60825-2:2004+A1+A2 |
| UL | E317337 | UL 60950-1 |
| | | CSA C22.2 No. 60950-1-07 |
| EMC CE | AE 50285865 0001 | EN 55022:2010 |
| | | EN 55024:2010 |
| FCC | WTF14F0514417E | 47 CFR PART 15 OCT., 2013 |
| FDA | / | CDRH 1040.10 |
| ROHS | / | 2011/65/EU |

Note1: The above certificate number updated to June 2014, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with 10Gtek



SFP+ Transceiver Electrical Pad Layout



Pin Function Definitions

| Pin Num. | Name | Function | Plug Seq. | Notes |
|----------|-----------|-----------------------------|-----------|---|
| 1 | VeeT | TransmitterGround | 1 | |
| 2 | TX Fault | Transmitter FaultIndication | 3 | Note 1 |
| 3 | TXDisable | TransmitterDisable | 3 | Note 2, Module disables on high or open |
| 4 | SDA | Module Definition 2 | 3 | 2-wire Serial Interface Data Line. |
| 5 | SCL | Module Definition 1 | 3 | 2-wire Serial Interface Clock. |
| 6 | MOD-ABS | Module Definition 0 | 3 | Note 3 |
| 7 | RS0 | RX Rate Select (LVTTL). | 3 | Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low toVeeT with a >30K resistor.. |
| 8 | LOS | Loss of Signal | 3 | Note 4 |
| 9 | RS1 | TX Rate Select (LVTTL). | 1 | Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low toVeeT with a >30K resistor. |
| 10 | VeeR | Receiver Ground | 1 | Note 5 |
| 11 | VeeR | Receiver Ground | 1 | Note 5 |
| 12 | RD- | Inv. Received DataOut | 3 | Note 6 |
| 13 | RD+ | Received Data Out | 3 | Note 6 |
| 14 | VeeR | Receiver Ground | 1 | Note 5 |
| 15 | VccR | Receiver Power | 2 | 3.3V \pm 5%, Note 7 |
| 16 | VccT | Transmitter Power | 2 | 3.3V \pm 5%, Note 7 |
| 17 | VeeT | TransmitterGround | 1 | Note 5 |
| 18 | TD+ | Transmit Data In | 3 | Note 8 |
| 19 | TD- | Inv. Transmit DataIn | 3 | Note 8 |
| 20 | VeeT | TransmitterGround | 1 | Note 5 |

Note:

- 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K Ω resistor on the host board. Pull up voltage between 2.0V and VccT/R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K~10 K Ω resistor. Its states are:
Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined

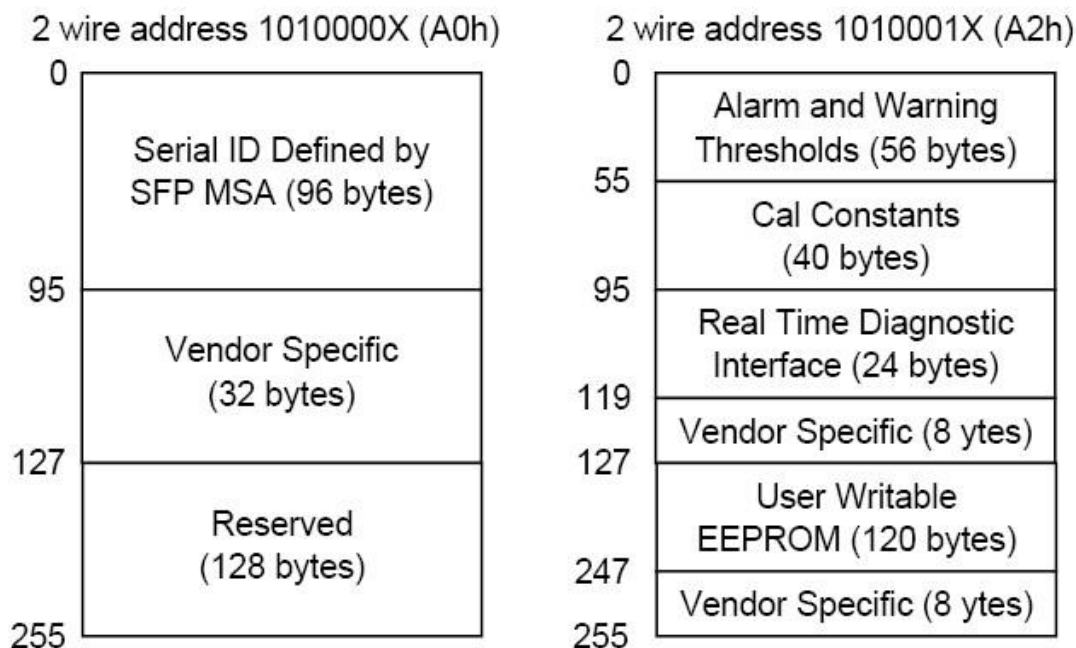
High (2.0 – 3.465V): Transmitter Disabled
Open: Transmitter Disabled

- 3) Module Absent, connected to VeeT or VeeR in the module.
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K Ω resistor. Pull up voltage between 2.0V and VccT/R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 5) The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
- 6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 700 mV differential (185 –350 mV single ended) when properly terminated.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V \pm 5% at the SFP+ connector pin. Maximum supply current is 300 mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30Ma greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.
- 8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 150 – 1200 mV (75–600mV single-ended), though it is recommended that values between 150 and 1200 mV differential (75 – 600mV single-ended) be used for best EMI performance.

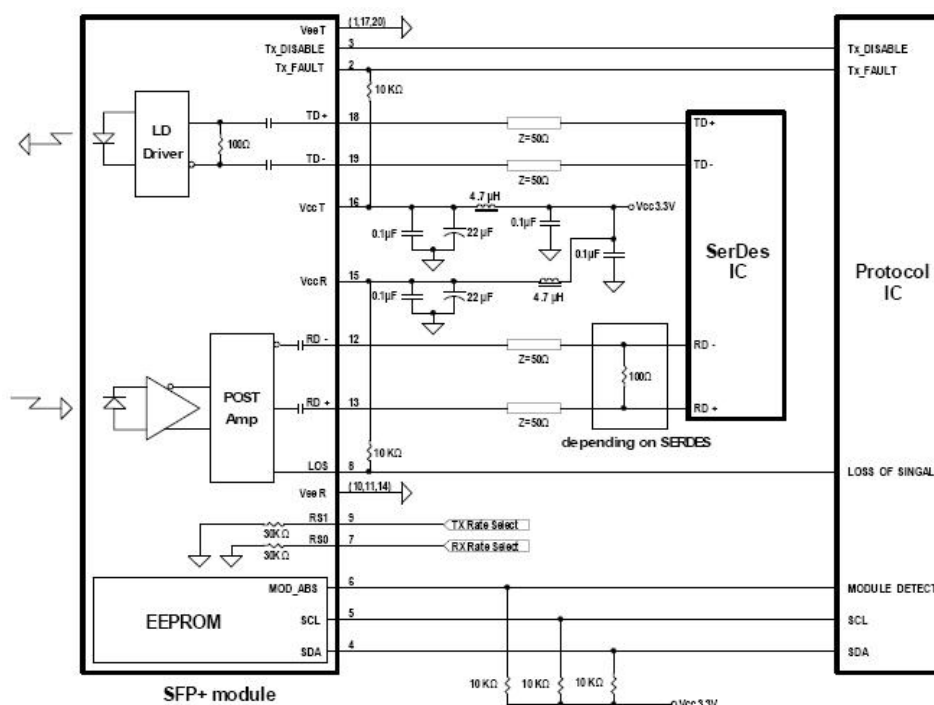
EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) 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.

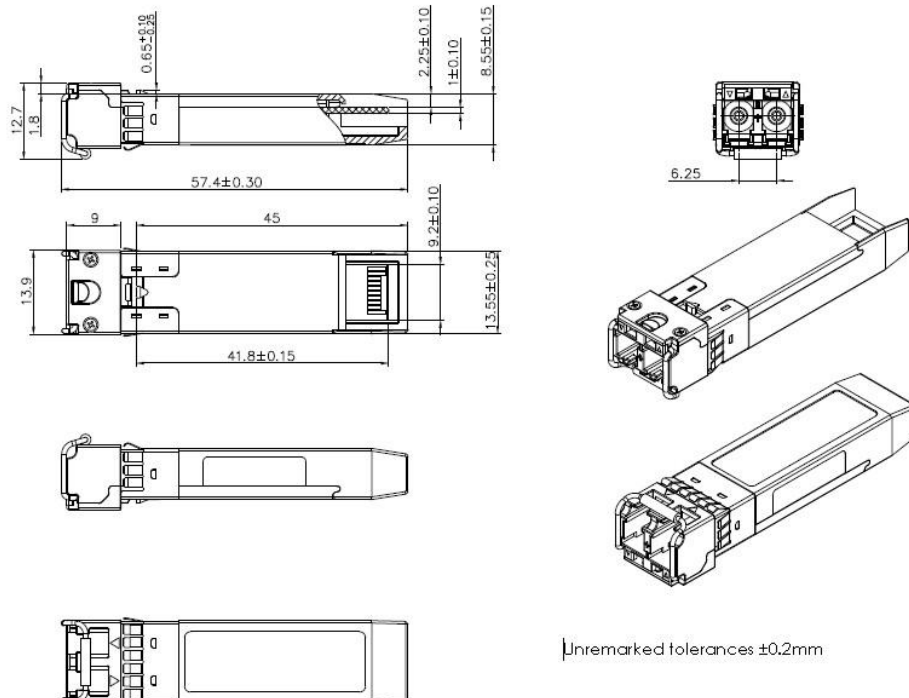
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2H. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 10.3.



Recommend Circuit Schematic



Mechanical Specifications



*This 2D drawing only for reference, please check with 10Gtek before ordering

Eye Safety

This transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

Notice:

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Ordering information

| Part No. | Data Rate | Laser | Fiber Type | Distance | Temp. | DDMI |
|---------------|--------------------|----------------|------------|----------|------------|------|
| AXS85-192-M3 | 0.6Gbpsto 11.3Gbps | 850nmV CSEL | MMF | 300m | Standard | YES |
| AXS85-192-M3+ | 0.6Gbpsto 11.3Gbps | 850nmV CSEL | MMF | 300m | Industrial | YES |

*The product image only for reference purpose.

Revision History

| Revision | Initiated | Approved | content | Release Date |
|----------|-----------|----------|----------|--------------|
| Ver1.0 | HT.HUANG | Nicky | Released | Sep/2017 |