

**SPS-2347VMW-CXX0G / SPS-2347AVMW-CXX0G**

**(RoHS Compliant)**

**12 Gb/s / 40 km / CWDM Medium Power SM Video Digital Diagnostic SFP+ Transceiver**

**FEATURES**

- SMPTE 2082, SMPTE 424M, SMPTE 292M, SMPTE 259M, and DVB-ASI Compatible
- Hot-Pluggable SFP Footprint LC Optical Transceiver
- Small Form-Factor Pluggable (SFP) MSA compatible
- Speed up to 12 Gb/s
- Distance up to 40 km for 12G-SDI
- Rx Reclocker built-in
- Support Full Video Pathological Patterns for HD-SDI, 3G-SDI, 6G-SDI, and 12G-SDI
- 4-CH CWDM: 1270 nm to 1330 nm
- SFF-8472 Digital Diagnostic Function
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70°C Operation: SPS-2347VMW-CXX0G
- -40 to 85°C Operation: SPS-2347AVMW-CXX0G
- Class 1 Laser International Safety Standard IEC-60825 Compliant

**APPLICATIONS**

- SMPTE 2082 Compliant Electrical-to-Optical Interfaces
- High-density Video Routers

**DESCRIPTION**

The SPS-2347VMW-CXX0G series is a single mode transceiver module designed to transmit/receive optical serial digital signals as defined in SMPTE 2082, SMPTE 424M, SMPTE 292M, SMPTE 259M, and DVB-ASI. It supports up to 12Gbps and is specifically designed to transmit the pathological patterns for HD-SDI, 3G-SDI, 6G-SDI, and 12G-SDI. It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I<sup>2</sup>C. The transmitter section uses a CWDM DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A maximum distance of 40 km is achievable with 12Gbps pathological signals.

**LASER SAFETY**

This single mode 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.

**ORDER INFORMATION**

| P/No.              | Type        | Bit Rate (Gb/s) | TX     |             | RX        |            | Package          | Temp (°C) | RoHS Compliant |
|--------------------|-------------|-----------------|--------|-------------|-----------|------------|------------------|-----------|----------------|
|                    |             |                 | λ (nm) | Power (dBm) | λ (nm)    | Sen. (dBm) |                  |           |                |
| SPS-2347VMW-CXX0G  | Transceiver | Up to 12        | CWDM*  | 8 to 4      | 1260/1620 | -1 to -11  | LC SFP+ with DMI | 0 to 70   | Yes            |
| SPS-2347AVMW-CXX0G | Transceiver | Up to 12        | CWDM*  | 8 to 4      | 1260/1620 | -1 to -11  | LC SFP+ with DMI | -40 to 85 | Yes            |

**CWDM\* Wavelength**

| Central Wavelength | Min. (nm) | Typ. (nm) | Max. (nm) | Clasp Color Code | Central Wavelength | Min. (nm) | Typ. (nm) | Max. (nm) | Clasp Color Code |
|--------------------|-----------|-----------|-----------|------------------|--------------------|-----------|-----------|-----------|------------------|
| -C270              | 1264.5    | 1270      | 1277.5    | Light Purple     | -C310              | 1304.5    | 1310      | 1317.5    | Yellow Green     |
| -C290              | 1284.5    | 1290      | 1297.5    | Sky Blue         | -C330              | 1324.5    | 1330      | 1337.5    | Yellow Ocher     |

CWDM\*: 4 Wavelengths from 1270 nm to 1330 nm, each step 20 nm.

| Absolute Maximum Ratings   |        |          |          |       |   |
|----------------------------|--------|----------|----------|-------|---|
| Parameter                  | Symbol | Min      | Max      | Units | Notes                                   |
| Storage Temperature        | Tstg   | -40      | 85       | °C    |   |
| Operating Case Temperature | Topr   | 0<br>-40 | 70<br>85 | °C    | SPS-2347VMW-CXX0G<br>SPS-2347AVMW-CXX0G |
| Power Supply Voltage       | Vcc    | -0.5     | 3.6      | V     |   |

| Recommended Operating Conditions |                         |          |            |            |   |
|----------------------------------|-------------------------|----------|------------|------------|---|
| Parameter                        | Symbol                  | Min      | Typ        | Max        | Units / Notes                                     |
| Power Supply Voltage             | Vcc                     | 3.13     | 3.3        | 3.47       | V   |
| Operating Case Temperature       | Topr                    | 0<br>-40 |            | 70<br>85   | °C / SPS-2347VMW-CXX0G<br>°C / SPS-2347AVMW-CXX0G |
| Power Supply Current             | I <sub>CC (TX+RX)</sub> |          | 350<br>430 | 430<br>580 | mA / SPS-2347VMW-CXX0G<br>mA / SPS-2347AVMW-CXX0G |
| Data Rate                        |                         |          | 11.88      |            | Gb/s  |

| Transmitter Optical Specifications (3.13V < Vcc < 3.47V) |                     |                     |                |                     |       |              |
|--|---------------------|---------------------|----------------|---------------------|-------|--------------|
| Parameter  | Symbol              | Min                 | Typ            | Max                 | Units | Notes        |
| Average Launch Power                                     | P <sub>O, Avg</sub> | 4                   |                | 8                   | dBm   | 1            |
| Output Center Wavelength                                 | λ                   | λ <sub>c</sub> -5.5 | λ <sub>c</sub> | λ <sub>c</sub> +7.5 | nm    | 2            |
| Output Spectrum Width                                    | σ <sub>λ</sub>      |                     |                | 1                   | nm    | -20 dB width |
| Side Mode Suppression Ratio                              | SMSR                | 30                  |                |                     | dB    |              |
| Extinction Ratio   | ER                  | 3.5                 |                |                     |       |              |
| Relative Intensity Noise                                 | RIN                 |                     |                | -128                | dB/Hz |              |
| Average Launch Power of OFF Transmitter                  |                     |                     |                | -30                 | dBm   |              |

- Output power is power coupled into a 9/125 μm single-mode fiber.
- ITU-T G.694.2 CWDM wavelength from 1270 nm to 1330 nm, each step 20 nm.

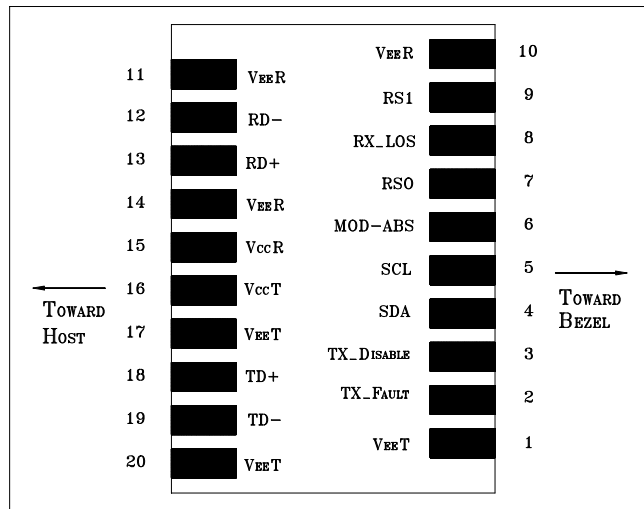
| Receiver Optical Specifications (3.13V < Vcc < 3.47V) |                  |      |     |      |       |                         |
|---|------------------|------|-----|------|-------|-------------------------|
| Parameter   | Symbol           | Min  | Typ | Max  | Units | Notes                   |
| Sensitivity@11.88Gb/s                                 | Sen              |      |     | -11  | dBm   | 2                       |
| Sensitivity@6Gb/s                                     | Sen              |      |     | -12  | dBm   | 2                       |
| Sensitivity@2.97Gb/s                                  | Sen              |      |     | -12  | dBm   | 2                       |
| Sensitivity@1.485Gb/s                                 | Sen              |      |     | -12  | dBm   | 2                       |
| Receiver Overload                                     | P <sub>MAX</sub> | -1   | --- |      | dBm   |                         |
| LOS -- Deasserted                                     | LOS <sub>D</sub> | ---  | --- | -12  | dBm   | Transition: low to high |
| LOS -- Asserted                                       | LOS <sub>A</sub> | -30  | --- | ---  | dBm   | Transition: high to low |
| LOS Hysteresis  | Hys              | 0.5  | 2   |      | dB    |                         |
| Wavelength of Operation                               | λ <sub>c</sub>   | 1260 |     | 1620 | nm    |                         |

- Measured with pathological pattern; BER < 10<sup>-12</sup>.

| Electrical Characteristics                               |                  |     |       |                      |       |       |
|--|------------------|-----|-------|----------------------|-------|-------|
| Parameter  | Symbol           | Min | Typ   | Max                  | Units | Notes |
| <b>High-Speed Signal (CML) Interface Specification</b>   |                  |     |       |                      |       |       |
| Input Data Rate  |                  |     | 11.88 |                      | Gb/s  |       |
| Differential Input Impedance                             | R <sub>in</sub>  |     | 100   |                      | Ω     |       |
| Output Data Rate   |                  |     | 11.88 |                      | Gb/s  |       |
| Differential Output Impedance                            | R <sub>out</sub> |     | 100   |                      | Ω     |       |
| <b>Low-Speed Signal (LVTTTL) Interface Specification</b> |                  |     |       |                      |       |       |
| Input High Voltage                                       |                  | 2.0 |       | V <sub>cc</sub> +0.3 | V     |       |
| Input Low Voltage  |                  | GND |       | 0.8                  | V     |       |
| Output High Voltage                                      |                  | 2.4 |       | V <sub>cc</sub>      | V     |       |

|                    |  |     |  |     |   |  |
|--------------------|--|-----|--|-----|---|--|
| Output Low Voltage |  | GND |  | 0.5 | V |  |
|--------------------|--|-----|--|-----|---|--|

## CONNECTION DIAGRAM



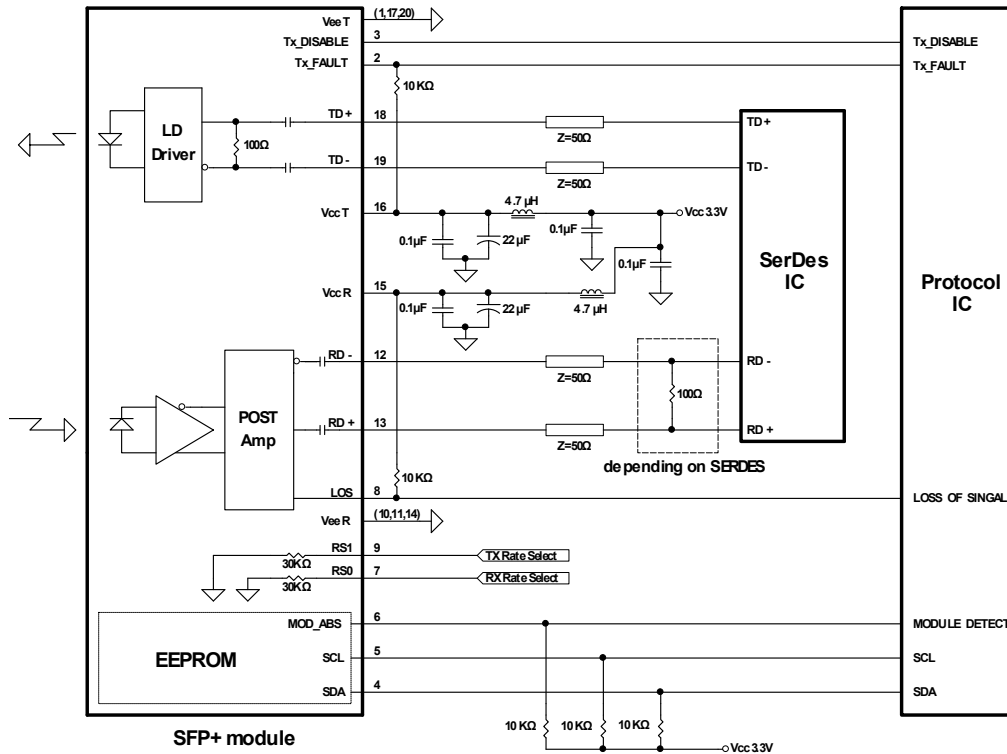
| PIN | Signal Name | Description  | PIN | Signal Name | Description                 |
|-----|-------------|--|-----|-------------|-----------------------------|
| 1   | VEE T       | Transmitter Signal Ground  | 11  | VEE R       | Receiver Signal Ground      |
| 2   | TX_Fault    | Transmitter Fault Indication. Logic "1" Output = Laser Fault. Logic "0" Output = Normal Operation                            | 12  | RD-         | Inverse Receiver Data Out   |
| 3   | TX_Disable  | Logic "1" Input (or no connection) = Laser off, Logic "0" = Laser on.  | 13  | RD+         | Receiver Data Out           |
| 4   | SDA         | Modulation Definition 2 – Two wires serial ID Interface  | 14  | VEE R       | Receiver Signal Ground      |
| 5   | SCL         | Modulation Definition 1 – Two wires serial ID Interface  | 15  | Vcc R       | Receiver Power – 3.3V±5%    |
| 6   | MOD-ABS     | Modulation Definition 0 – Ground in Module   | 16  | Vcc T       | Transmitter Power – 3.3V±5% |
| 7   | RS0         | RX Rate Select:<br>This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 17  | VEE T       | Transmitter Signal Ground   |
| 8   | RX_LOS      | Loss of Signal Out (OC).   | 18  | TD+         | Transmitter Data In         |
| 9   | RS1         | TX Rate Select:<br>This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 19  | TD-         | Inverse Transmitter Data In |
| 10  | VEE R       | Receiver Signal Ground   | 20  | VEE T       | Transmitter Signal Ground   |

### Module Definition

| Module Definition | MOD-DEF2<br>PIN 4 | MOD-DEF1<br>PIN 5 | MOD-DEF0<br>PIN 6 | Interpretation by Host            |
|-------------------|-------------------|-------------------|-------------------|-----------------------------------|
| 4                 | SDA               | SCL               | LV-TTL Low        | Serial module definition protocol |

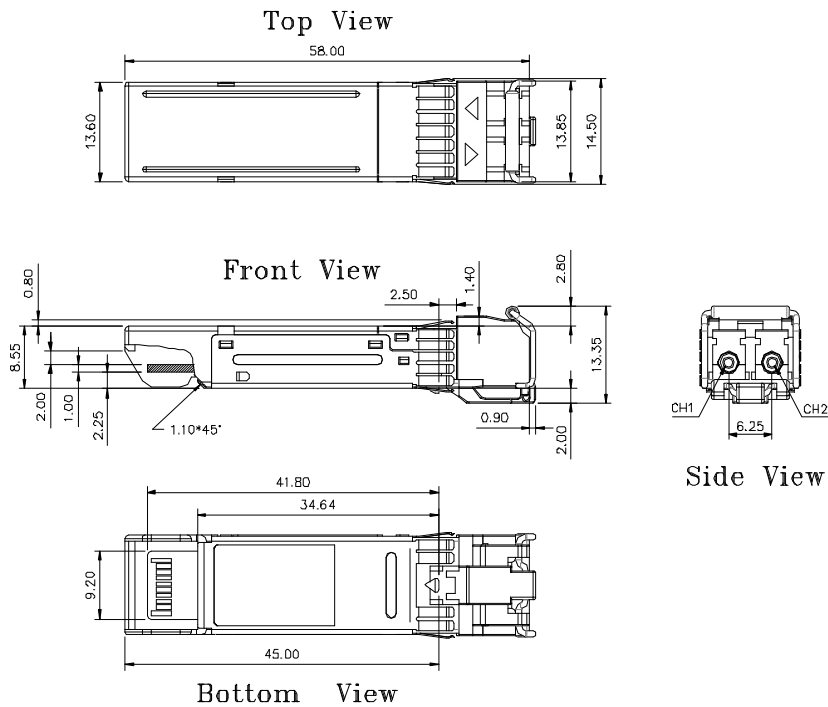
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol of the ATMEL AT24C01A/02/04 family of components.

## RECOMMENDED CIRCUIT SCHEMATIC



## PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.

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**REVISION HISTORY**

| Version | Subject           | Release Date |
|---------|-------------------|--------------|
| 1.0     | Initial datasheet | 2023/2/16    |
| 2.0     | Add I-Temp models | 2023/9/12    |
|         |                   |              |
|         |                   |              |