

## SPM-9100VWG

**(RoHS Compliant)**

### 850 nm / 3 Gb/s Multi-Mode Digital Diagnostic Video SFP Transceiver

#### FEATURES

- | SMPTE 297-2006 Compatible
- | Hot-Pluggable SFP Footprint LC Optical Transceiver
- | Small Form-Factor Pluggable (SFP) MSA compatible
- | Speed from 50 Mbps to 3Gbps with up to 1000 m Multi-mode Fiber
- | Distance up to 300 m for 3G-SDI
- | **Support Video Pathological Patterns for SD-SDI, HD-SDI and 3G-SDI**
- | SFF-8472 Digital Diagnostic Function
- | Single +3.3 V Power Supply
- | RoHS-6 Compliant
- | 0 to 70°C Operation
- | Hot Pluggable
- | Class 1 Laser International Safety Standard IEC-60825 Compliant

#### APPLICATIONS

- | SMPTE 297-2006 Compliant Electrical-to-Optical Interfaces
- | High-density Video Routers

#### DESCRIPTION

The SPM-9100VWG is a multi-mode transceiver module designed to transmit/receive optical serial digital signals as defined in SMPTE 297-2006. It supports from 50 Mbps to 3 Gbps and is specifically designed for transmitted the SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M SDI pathological patterns. 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. It is with 850 nm VCSEL transmitters. The transmitter can transmit signal from 50 Mbps to 3 Gbps with up to 1000 m of multi-mode fiber. A maximum distance of 300 m is achievable with 3Gbps pathological signals.

#### LASER SAFETY

This multi-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 (Mb/s) | TX     |             | RX     |            | Package         | Temp (°C) | RoHS Compliant |
|--------------------|------|-----------------|--------|-------------|--------|------------|-----------------|-----------|----------------|
|                    |      |                 | λ (nm) | Power (dBm) | λ (nm) | Sen. (dBm) |                 |           |                |
| <b>SPM-9100VWG</b> | TRX  | 50 to 3000      | 850    | -2 to -7    | 850    | 0 to -15   | LC SFP with DMI | 0 to 70   | Yes            |

#### LINK DISTANCE

| SDI    | Bit Rate  | Max. Link Distance (m) |
|--------|-----------|------------------------|
| 3G-SDI | 2.97Gbps  | 300                    |
| HD-SDI | 1.485Gbps | 500                    |
| SD-SDI | 270Mb/s   | 1,000                  |

## Absolute Maximum Ratings

Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| Absolute Maximum Ratings   |        |     |     |        |                |
|----------------------------|--------|-----|-----|--------|----------------|
| Parameter                  | Symbol | Min | Max | Units  | Notes          |
| Storage Temperature        | Tstg   | -40 | 85  | °C     |                |
| Operating Case Temperature | Tc     | 0   | 70  | °C     |                |
| Power Supply Voltage       | Vcc    | 0   | 4   | V      |                |
| ESD Tolerance on all pins  |        |     | 1   | KV HBM |                |
| Relative Humidity          | ---    | 5   | 95  | % RH   | non-condensing |

| Recommended Operating Conditions |        |      |     |      |               |
|----------------------------------|--------|------|-----|------|---------------|
| Parameter                        | Symbol | Min  | Typ | Max  | Units / Notes |
| Power Supply Voltage             | Vcc    | 3.13 | 3.3 | 3.47 | V             |
| Operating Case Temperature       | Tc     | 0    |     | 70   | °C            |
| Baud Rate                        |        | 50   |     | 3000 | Mb/s          |
| Power Supply Current             | Icc    |      | 150 | 200  | mA            |

| Transmitter Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V) |                                   |     |     |         |       |                    |
|---|-----------------------------------|-----|-----|---------|-------|--------------------|
| Parameter   | Symbol                            | Min | Typ | Max     | Units | Notes              |
| <b>Optical</b>  |                                   |     |     |         |       |                    |
| Optical Transmit Power  | Po                                | -7  |     | -2      | dBm   | 1                  |
| Output Center Wavelength  | λ                                 | 830 | 850 | 860     | nm    |                    |
| Output Spectrum Width   | Δλ                                | --- |     | 1       | nm    | RMS (σ)            |
| Extinction Ratio  | ER                                | 5   | 7.5 |         | dB    |                    |
| Relative Intensity Noise  | RIN                               |     |     | -118    | dB/Hz |                    |
| Optical Rise Time / Fall Time                                     | tr / tf                           |     |     | 135     | ps    | 2, SMPTE 424M      |
|   |                                   |     |     | 270     | ps    | 2, SMPTE 292M      |
|   |                                   |     |     | 800     | ps    | 2, SMPTE 344M      |
|   |                                   |     |     | 1.5     | ns    | 2, SMPTE 259M      |
| <b>Electrical</b>   |                                   |     |     |         |       |                    |
| Differential Input Voltage  | V <sub>IH</sub> - V <sub>IL</sub> | 200 |     | 1200    | mVp-p | AC coupled input   |
| Disable Input Voltage -- Low                                      | V <sub>TDIS,L</sub>               | 0   |     | 0.8     | V     | TX Output Enabled  |
| Disable Input Voltage -- High                                     | V <sub>TDIS,H</sub>               | 2.0 |     | Vcc+0.3 | V     | TX Output Disabled |
| SCL, SDA  | V <sub>OH</sub>                   | 2.5 |     | Vcc+0.3 | V     |                    |
|   | V <sub>OL</sub>                   | 0   |     | 0.5     | V     |                    |

- Output power is power coupled into a 9/125 μm single mode fiber.
- 20% to 80%, unfiltered.

| Receiver Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V) |         |     |     |     |       |                                    |
|--|---------|-----|-----|-----|-------|------------------------------------|
| Parameter  | Symbol  | Min | Typ | Max | Units | Notes                              |
| <b>Optical</b>   |         |     |     |     |       |                                    |
| Wavelength of Operation  |         | 780 | --- | 880 | nm    |                                    |
| Sensitivity for SMPTE 424M<br>2.97 Gb/s                        | Sen     | 0   | --- | -15 | dBm   | Pathological                       |
|  |         | 0   | --- | -15 | dBm   | PRBS 2 <sup>23</sup> -1, BER=1E-12 |
| Sensitivity for SMPTE 292M<br>1.485 Gb/s                       | Sen     | 0   | --- | -16 | dBm   | Pathological                       |
|  |         | 0   | --- | -16 | dBm   | PRBS 2 <sup>23</sup> -1, BER=1E-12 |
| Signal Detect -- Asserted                                      | Pa      | --- | --- | -16 | dBm   | Transition: low to high            |
| Signal Detect -- Deasserted                                    | Pd      | -28 | --- | --- | dBm   | Transition: high to low            |
| Signal detect -- Hysteresis                                    |         | 1   |     | 6   | dB    |                                    |
| <b>Electrical</b>  |         |     |     |     |       |                                    |
| CML Output (Differential)                                      |         | 550 | 660 | 850 | mVp-p | AC coupled output                  |
| Optical Rise Time / Fall Time                                  | tr / tf |     |     | 135 | ps    | 3, SMPTE 424M                      |

|                            |                 |     |  |                      |    |  |
|----------------------------|-----------------|-----|--|----------------------|----|--|
|                            |                 |     |  | 270                  | ps | 3, SMPTE 292M                            |
|                            |                 |     |  | 800                  | ps | 3, SMPTE 344M                            |
|                            |                 |     |  | 1.5                  | ns | 3, SMPTE 259M                            |
| Output LOS Voltage -- Low  | V <sub>OL</sub> | 0   |  | 0.5                  | V  | I <sub>OL</sub> =-1.6mA, 1 TTL unit load |
| Output LOS Voltage -- High | V <sub>OH</sub> | 2.5 |  | V <sub>CC</sub> +0.3 | V  | I <sub>OH</sub> =40μA, 1 TTL unit load   |
| SCL, SDA                   | V <sub>OH</sub> | 2.5 |  | V <sub>CC</sub> +0.3 | V  |  |
|                            | V <sub>OL</sub> | 0   |  | 0.5                  | V  |  |

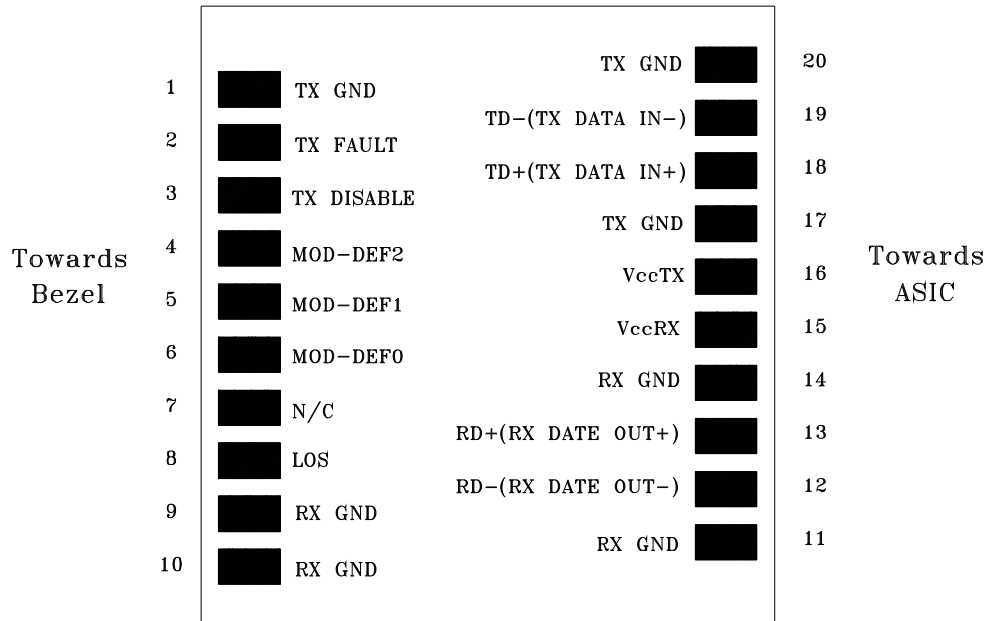
3. 20% to 80%, unfiltered.

## MODULE DEFINITION

| Module Definition | PIN 5 | PIN 6 | Interpretation by Host            |
|-------------------|-------|-------|-----------------------------------|
| 4                 | SCL   | SDA   | Serial module definition protocol |

Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SCL and SDA appear as no connector (NC). 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.

CONNECTION DIAGRAM



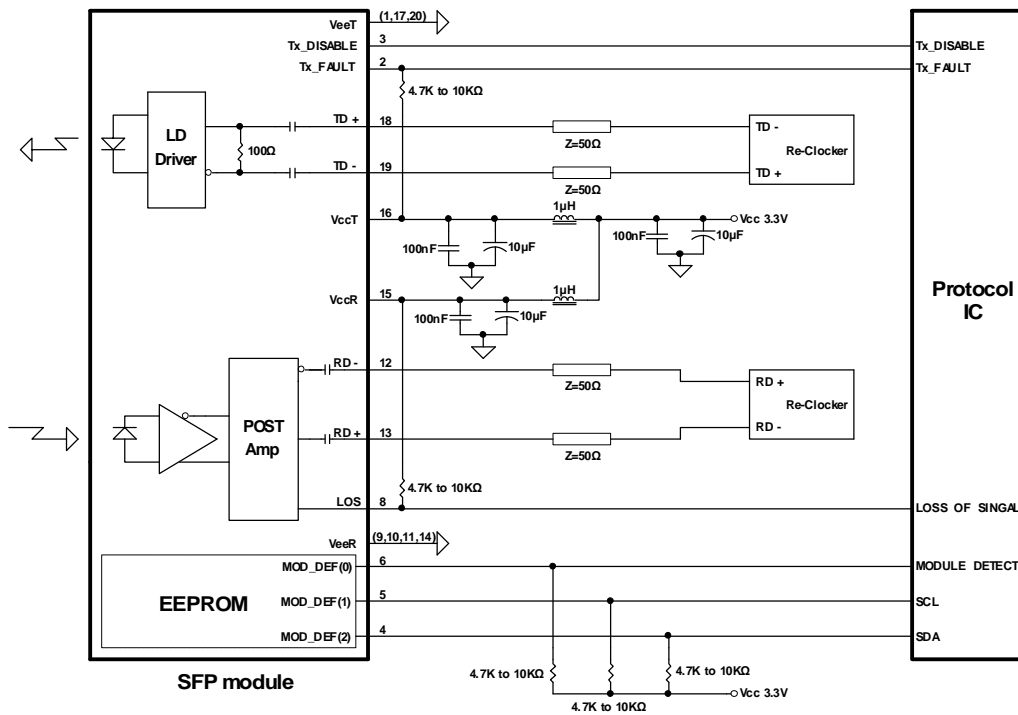
| PIN | Signal Name | Description   | PIN | Signal Name  | Description                 |
|-----|-------------|---|-----|--------------|-----------------------------|
| 1   | TX GND      | Transmitter Ground                                      | 11  | RX GND       | Receiver Ground             |
| 2   | TX Fault    | Transmitter Fault Indication                            | 12  | RX DATA OUT- | Inverse Receiver Data Out   |
| 3   | TX Disable  | Transmitter Disable (Module disables on high or open)   | 13  | RX DATA OUT+ | Receiver Data Out           |
| 4   | MOD-DFE2    | Modulation Definition 2 – Two wires serial ID Interface | 14  | RX GND       | Receiver Ground             |
| 5   | MOD-DEF1    | Modulation Definition 1 – Two wires serial ID Interface | 15  | Vcc RX       | Receiver Power – 3.3V±5%    |
| 6   | MOD-DEF0    | Modulation Definition 0 – Ground in Module              | 16  | Vcc TX       | Transmitter Power – 3.3V±5% |
| 7   | N/C         | Not Connected   | 17  | TX GND       | Transmitter Ground          |
| 8   | LOS         | Loss of Signal  | 18  | TX DATA IN+  | Transmitter Data In         |
| 9   | RX GND      | Receiver Ground   | 19  | TX DATA IN-  | Inverse Transmitter Data In |
| 10  | RX GND      | Receiver Ground   | 20  | TX GND       | Transmitter 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.

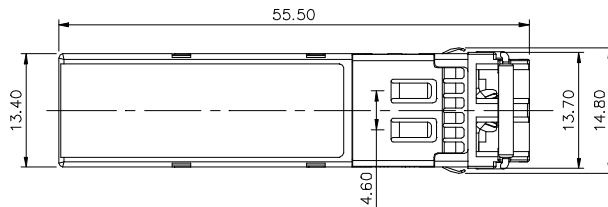
## RECOMMENDED CIRCUIT SCHEMATIC



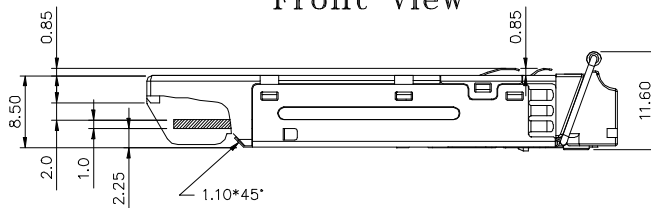
## PACKAGE DIAGRAM

Units in mm

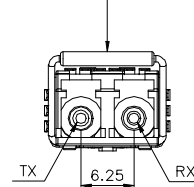
### Top View



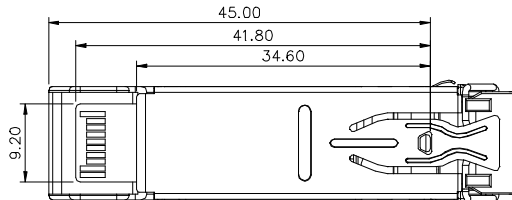
### Front View



LATCH COLOR  
BLACK



### Side View



### Bottom View

Note: Specifications subject to change without notice.

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## REVISION HISTORY

| Version | Subject           | Release Date |
|---------|-------------------|--------------|
| 1.0     | Initial datasheet | 2008/11/1    |
|         |                   |              |
|         |                   |              |
|         |                   |              |

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