

**SPM-7100G**

**(RoHS Compliant)**

**3.3V / 850 nm / 1.25 Gbps LC SFP MULTI-MODE TRANSCEIVER**

**FEATURES**

- | Hot-Pluggable SFP Footprint LC Optical Transceiver
- | Small Form-Factor Pluggable (SFP) MSA compatible
- | Compliant with IEEE 802.3z Gigabit Ethernet 1000BASE-SX
- | Compliant with Fiber Channel FC-PH-2 for 100-M5-SN-1 and 100-M6-SN-1
- | 300 m links with 62.5/125 μm MMF Cables
- | 550 m links with 50/125 μm MMF Cables
- | AC/AC Coupling according to MSA
- | Single +3.3 V Power Supply
- | RoHS Compliant
- | -10 to 85°C Operation
- | Class 1 Laser International Safety Standard IEC 60825 Compliant

**APPLICATIONS**

- | Gigabit Ethernet Switches and Routers
- | Fiber Channel Switch Infrastructure
- | XDSL Applications
- | Metro Edge Switching

**DESCRIPTION**

The SPM-7100G series multi-mode transceivers is small form factor pluggable module for bi-directional serial optical data communications such as Gigabit Ethernet 1000BASE-SX and Fiber Channel FC-PH-2 for 100-M5-SN-1 and 100-M6-SN-1. It is with the SFP 20-pin connector to allow hot plug capability. 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.

**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.     | Bit Rate (Gb/s) | Distance (m) | Wavelength (nm) | Package | Temp. (°C) | TX Power (dBm) | RX Sens. (dBm) | RoHS Compliant |
|-----------|-----------------|--------------|-----------------|---------|------------|----------------|----------------|----------------|
| SPM-7100G | 1.25            | 300 / 550*   | 850             | LC SFP  | -10 to 85  | -4 to -9       | -17            | Yes            |

\*: 300 meter for 62.5/125 μm MM fiber; 550 meter for 50/125 μm MM Fiber.

| Absolute Maximum Ratings   |                  |      |     |       |       |
|----------------------------|------------------|------|-----|-------|-------|
| Parameter                  | Symbol           | Min  | Max | Units | Notes |
| Storage Temperature        | T <sub>stg</sub> | -40  | 85  | °C    |       |
| Operating Case Temperature | T <sub>opr</sub> | -10  | 85  | °C    |       |
| Power Supply Voltage       | V <sub>cc</sub>  | -0.5 | 3.6 | V     |       |

| Recommended Operating Conditions |                         |      |      |     |               |
|----------------------------------|-------------------------|------|------|-----|---------------|
| Parameter                        | Symbol                  | Min  | Typ  | Max | Units / Notes |
| Power Supply Voltage             | V <sub>cc</sub>         | 3.1  | 3.3  | 3.5 | V             |
| Operating Case Temperature       | T <sub>opr</sub>        | -10  |      | 85  | °C            |
| Power Supply Current             | I <sub>CC (TX+RX)</sub> |      |      | 250 | mA            |
| Data Rate                        |                         | 1063 | 1250 |     | Mb/s          |

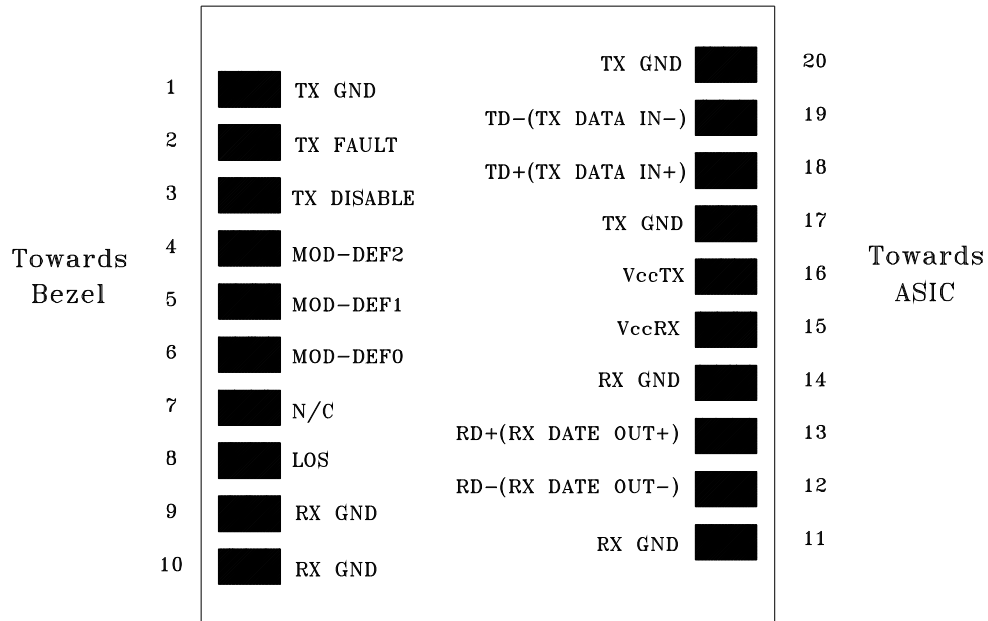
| Transmitter Specifications (-10°C < Topr < 85°C, 3.1V < Vcc < 3.5V) |                                   |      |     |                      |       |                    |
|---|-----------------------------------|------|-----|----------------------|-------|--------------------|
| Parameter   | Symbol                            | Min  | Typ | Max                  | Units | Notes              |
| <b>Optical</b>  |                                   |      |     |                      |       |                    |
| Optical Transmit Power  | P <sub>o</sub>                    | -9   | --- | -4                   | dBm   | 1                  |
| Output Center Wavelength  | λ                                 | 830  |     | 860                  | nm    |                    |
| Output Spectrum Width   | Δλ                                | ---  | --- | 0.85                 | nm    | RMS (σ)            |
| Extinction Ratio  | E <sub>R</sub>                    | 9    | --- | ---                  | dB    |                    |
| Optical Rise Time   | t <sub>r</sub>                    |      |     | 260                  | ps    | 20 % to 80% Values |
| Optical Fall Time   | t <sub>f</sub>                    |      |     | 260                  | ps    | 20 % to 80% Values |
| Relative Intensity Noise  | RIN                               |      |     | -117                 | dB/Hz |                    |
| <b>Electrical</b>   |                                   |      |     |                      |       |                    |
| Data Input Current – Low  | I <sub>IL</sub>                   | -350 |     |                      | μA    |                    |
| Data Input Current – High   | I <sub>IH</sub>                   |      |     | 350                  | μA    |                    |
| Differential Input Voltage  | V <sub>IH</sub> - V <sub>IL</sub> | 0.5  |     | 2.4                  | V     | Peak-to-Peak       |
| TX Disable Input Voltage – Low                                      | T <sub>DIS,L</sub>                | 0    |     | 0.5                  | V     | 2                  |
| TX Disable Input Voltage – High                                     | T <sub>DIS,H</sub>                | 2.0  |     | V <sub>cc</sub>      | V     | 2                  |
| TX Disable Assert Time  | T <sub>ASSERT</sub>               |      |     | 10                   | μs    |                    |
| TX Disable Deassert Time  | T <sub>DEASSERT</sub>             |      |     | 1                    | ms    |                    |
| TX Fault Output Voltage -- Low                                      | T <sub>FaultL</sub>               | 0    |     | 0.5                  | V     | 3                  |
| TX Fault Output Voltage -- High                                     | T <sub>FaultH</sub>               | 2.0  |     | V <sub>cc</sub> +0.3 | V     | 3                  |

1. Output power is power coupled into a 62.5/125 μm MM fiber.
2. There is an internal 4.7K to 10K ohm pull-up resistor to VccTX.
3. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

| Receiver Specifications (-10°C < Topr < 85°C, 3.1V < Vcc < 3.5V) |                                   |     |     |                      |       |                         |
|--|-----------------------------------|-----|-----|----------------------|-------|-------------------------|
| Parameter  | Symbol                            | Min | Typ | Max                  | Units | Notes                   |
| <b>Optical</b>   |                                   |     |     |                      |       |                         |
| Sensitivity  | Sens                              |     |     | -17                  | dBm   | 4                       |
| Maximum Input Power  | P <sub>in</sub>                   | -3  | 0   |                      | dBm   | 4                       |
| Signal Detect -- Asserted  | P <sub>a</sub>                    | --- |     | -17                  | dBm   | Transition: low to high |
| Signal Detect -- Deasserted                                      | P <sub>d</sub>                    | -30 | --- | ---                  | dBm   | Transition: high to low |
| Signal detect -- Hysteresis                                      |                                   | 1.0 | --- |                      | dB    |                         |
| Wavelength of Operation  |                                   | 700 | --- | 900                  | nm    |                         |
| <b>Electrical</b>  |                                   |     |     |                      |       |                         |
| Differential Output Voltage                                      | V <sub>OH</sub> - V <sub>OL</sub> | 0.6 |     | 2.0                  | V     |                         |
| Output LOS Voltage -- Low  | V <sub>OL</sub>                   | 0   |     | 0.5                  | V     | 5                       |
| Output LOS Voltage -- High                                       | V <sub>OH</sub>                   | 2.0 |     | V <sub>cc</sub> +0.3 | V     | 5                       |

4. Measured at 2<sup>7</sup>-1 PRBS at BER 1E-12.
5. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

CONNECTION DIAGRAM



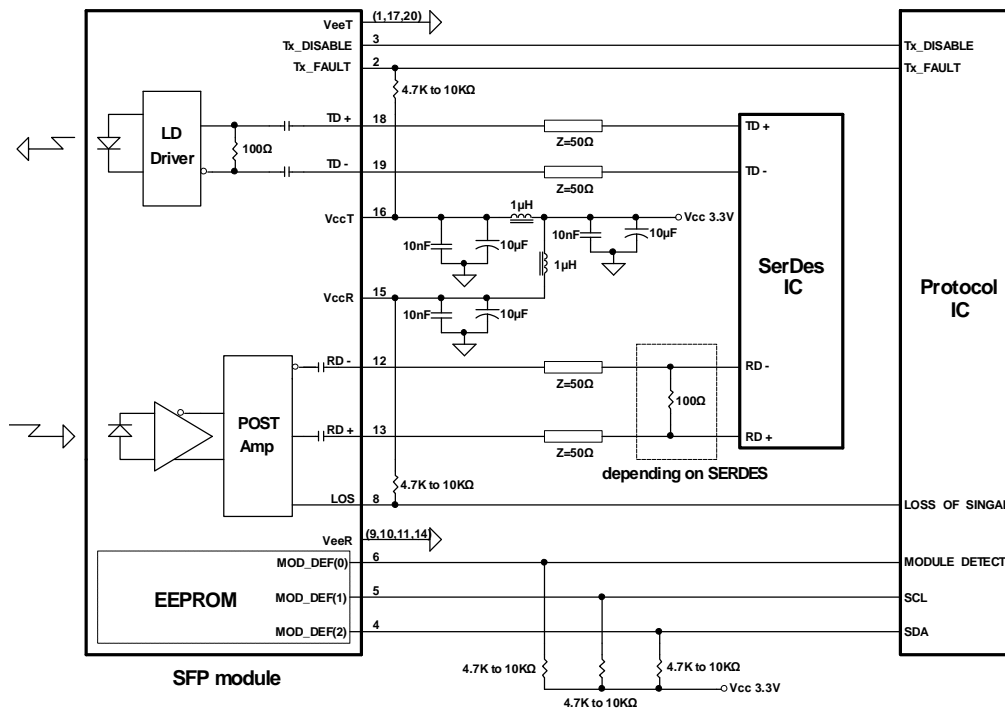
| PIN | Signal Name | Description   | PIN | Signal Name  | Description                 |
|-----|-------------|---|-----|--------------|-----------------------------|
| 1   | TX GND      | Transmitter Ground                                      | 11  | RX GND       | Receiver Ground             |
| 2   | 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 |

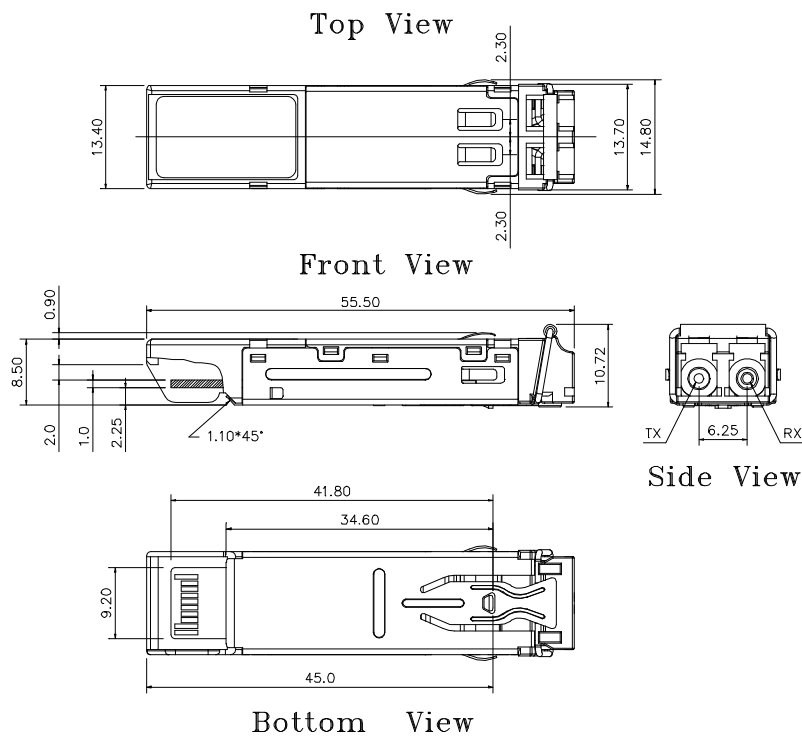
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM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

## RECOMMENDED CIRCUIT SCHEMATIC



## PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.

## Revision History

| Version | Subject  | Release Date |
|---------|--|--------------|
| 1.0     | Initial datasheet                                | 2005/12/1    |
| 2.0     | Revise package diagram for high port density use | 2008/1/1     |
|         |  |              |
|         |  |              |
|         |  |              |