

## SPS-43100WG

**(RoHS Compliant)**

### 8.5 Gb/s / 100 km / 1550 nm Digital Diagnostic SFP+ LC SM TRANSCEIVER for 8G FC

#### FEATURES

- | Data rate up to 8.5 Gb/s
- | Compliant with SFP+ MSA
- | Compliance with Fibre Channel FC-PI-4 800-SM-LC-L
- | Compliant with 4G and 2G Fibre Channel
- | SFF-8472 Digital Diagnostic Function
- | **Temperature-stabilized 1550 nm EML Transmitter**
- | **Distance up to 100 km at SM Fiber**
- | AC/AC Coupling according to MSA
- | Single +3.3 V Power Supply
- | **Low Power consumption**
- | RoHS 6/6 Compliant
- | 0 to 70°C Operating
- | Class 1 Laser International Safety Standard IEC-60825 Compliant

#### DESCRIPTION

The SPS-43100WG series single mode transceiver is small form factor pluggable module for bi-directional serial optical data communications such as 8x/4x/2x/1x Fibre Channel. 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. This module is designed for single mode fiber and operates at a nominal wavelength of 1550 nm. The transmitter section uses a temperature-stabilized 1550 nm electrical-modulated laser (EML) 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.

#### APPLICATIONS

- | Multi-rate 8x / 4x / 2x Fibre Channel

#### 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.       | Bit Rate (Gb/s) | FC-PI   | Distance (km) | Wavelength (nm) | Package       | Temp. (°C) | RoHS Compliant |
|-------------|-----------------|---------|---------------|-----------------|---------------|------------|----------------|
| SPS-43100WG | 8 / 4 / 2       | FC-PI-4 | 100           | 1550 EML        | SFP+ with DMI | 0 to 70    | Yes            |

| Absolute Maximum Ratings   |        |      |     |       |                |  |
|----------------------------|--------|------|-----|-------|----------------|--|
| Parameter                  | Symbol | Min  | Max | Units | Notes          |  |
| Storage Temperature        | Tstg   | -40  | 85  | °C    |                |  |
| Relative Humidity          | RH     | 5    | 85  | %     | Non-condensing |  |
| Operating Case Temperature | Topr   | 0    | 70  | °C    |                |  |
| Power Supply Voltage       | Vcc    | -0.5 | 3.6 | V     |                |  |
| Receiver Input for Damage  | Mip    | -3   |     | dBm   | Average Power  |  |

| Recommended Operating Conditions |                         |       |     |       |                |  |
|----------------------------------|-------------------------|-------|-----|-------|----------------|--|
| Parameter                        | Symbol                  | Min   | Typ | Max   | Units / Notes  |  |
| Power Supply Voltage             | Vcc                     | 3.135 | 3.3 | 3.465 | V              |  |
| Operating Case Temperature       | Topr                    | 0     |     | 70    | °C             |  |
| Relative Humidity                | RH                      | 5     | 85  | %     | Non-condensing |  |
| Power Supply Current             | I <sub>CC (TX+RX)</sub> |       | 350 | 500   | mA             |  |
| Data Rate                        |                         | 2.125 | 8.5 |       | Gb/s           |  |

| Transmitter Optical Specifications (0°C < T <sub>opr</sub> < 70°C, 3.13V < V <sub>cc</sub> < 3.47V) |                     |      |     |      |       |              |
|---|---------------------|------|-----|------|-------|--------------|
| Parameter   | Symbol              | Min  | Typ | Max  | Units | Notes        |
| Average Launch Power  | P <sub>O, Avg</sub> | +1   |     | +4.0 | dBm   | 2            |
| Output Center Wavelength  | λ <sub>c</sub>      | 1530 |     | 1565 | nm    |              |
| Output Spectrum Width   | σ <sub>λ</sub>      |      |     | 1    | nm    | -20 dB width |
| Side Mode Suppression Ratio   | SMSR                | 30   |     |      | dB    |              |
| Extinction Ratio  | ER                  | 3.0  |     |      |       |              |
| Relative Intensity Noise  | RIN                 |      |     | -128 | dB/Hz |              |
| Transmitter Dispersion Penalty  | TDP                 |      |     | 3    | dB    |              |
| Average Launch Power of OFF Transmitter   |                     |      |     | -30  | dBm   |              |

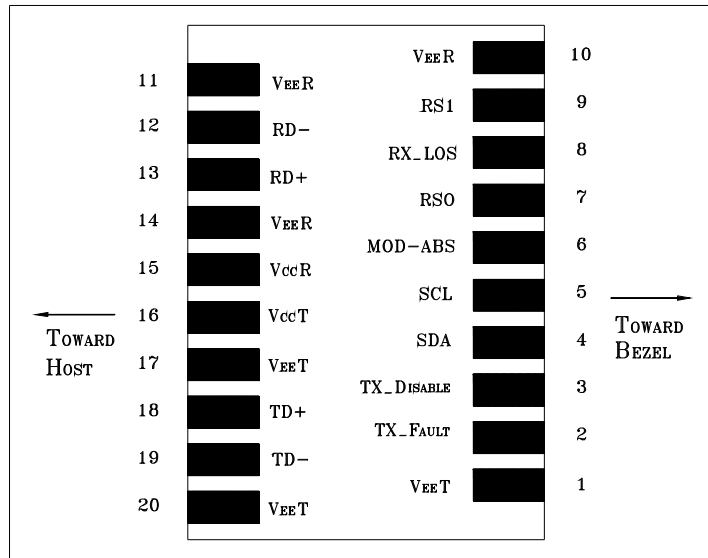
2. Output power is power coupled into a 9/125 μm single-mode fiber.

| Receiver Optical Specifications (0°C < T <sub>opr</sub> < 70°C, 3.13V < V <sub>cc</sub> < 3.47V) |                  |      |     |      |       |                         |
|--|------------------|------|-----|------|-------|-------------------------|
| Parameter  | Symbol           | Min  | Typ | Max  | Units | Notes                   |
| Sensitivity in Average Power   | Sen1             |      |     | -24  | dBm   | 3                       |
| Receiver Overload  | P <sub>MAX</sub> | -7   | --- |      | dBm   |                         |
| LOS -- Deasserted  | LOS <sub>D</sub> | ---  | --- | -27  | dBm   | Transition: low to high |
| LOS -- Asserted  | LOS <sub>A</sub> | -35  | --- | ---  | dBm   | Transition: high to low |
| Wavelength of Operation  | λ <sub>c</sub>   | 1530 |     | 1565 | nm    |                         |

3. Measured with worst ER; BER < 10<sup>-12</sup> and PRBS 2<sup>7</sup>-1 at 8.5 Gb/s..

| Electrical Characteristics                               |                  |       |     |                      |                  |                       |
|--|------------------|-------|-----|----------------------|------------------|-----------------------|
| Parameter  | Symbol           | Min   | Typ | Max                  | Units            | Notes                 |
| <b>High-Speed Signal (CML) Interface Specification</b>   |                  |       |     |                      |                  |                       |
| Input Data Rate  |                  | 2.125 | 8.5 |                      | Gb/s             |                       |
| Differential Input Impedance                             | R <sub>in</sub>  |       | 100 |                      | Ω                |                       |
| Differential Data Input Amplitude                        |                  | 120   |     | 820                  | mV <sub>pp</sub> | Internally AC coupled |
| Output Data Rate   |                  | 2.125 | 8.5 |                      | Gb/s             |                       |
| Differential Output Impedance                            | R <sub>out</sub> |       | 100 |                      | Ω                |                       |
| Differential Data Output Amplitude                       |                  | 340   |     | 850                  | mV <sub>pp</sub> | Internally AC coupled |
| <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



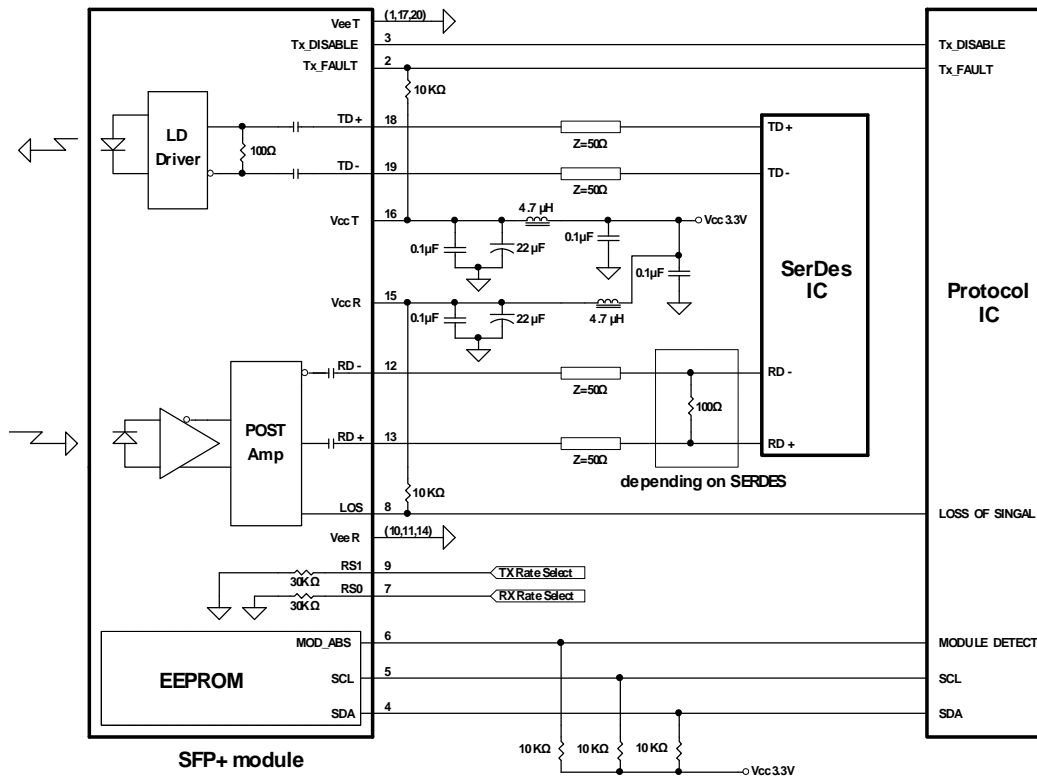
| PIN | Signal Name       | Description  | PIN | Signal Name       | Description                 |
|-----|-------------------|--|-----|-------------------|-----------------------------|
| 1   | V <sub>EE</sub> T | Transmitter Signal Ground  | 11  | V <sub>EE</sub> R | Receiver Signal Ground      |
| 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  | V <sub>EE</sub> R | Receiver Signal Ground      |
| 5   | SDL               | Modulation Definition 1 – Two wires serial ID Interface  | 15  | V <sub>CC</sub> R | Receiver Power – 3.3V±5%    |
| 6   | MOD-ABS           | Modulation Definition 0 – Ground in Module   | 16  | V <sub>CC</sub> T | Transmitter Power – 3.3V±5% |
| 7   | RS0               | RX Rate Select (LVTTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 17  | V <sub>EE</sub> T | Transmitter Signal Ground   |
| 8   | RX_LOS            | Loss of Signal Out (OC).   | 18  | TD+               | Transmitter Data In         |
| 9   | RS1               | TX Rate Select (LVTTTL). 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  | V <sub>EE</sub> R | Receiver Signal Ground   | 20  | V <sub>EE</sub> T | Transmitter Signal Ground   |

MODULE DEFINITION

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

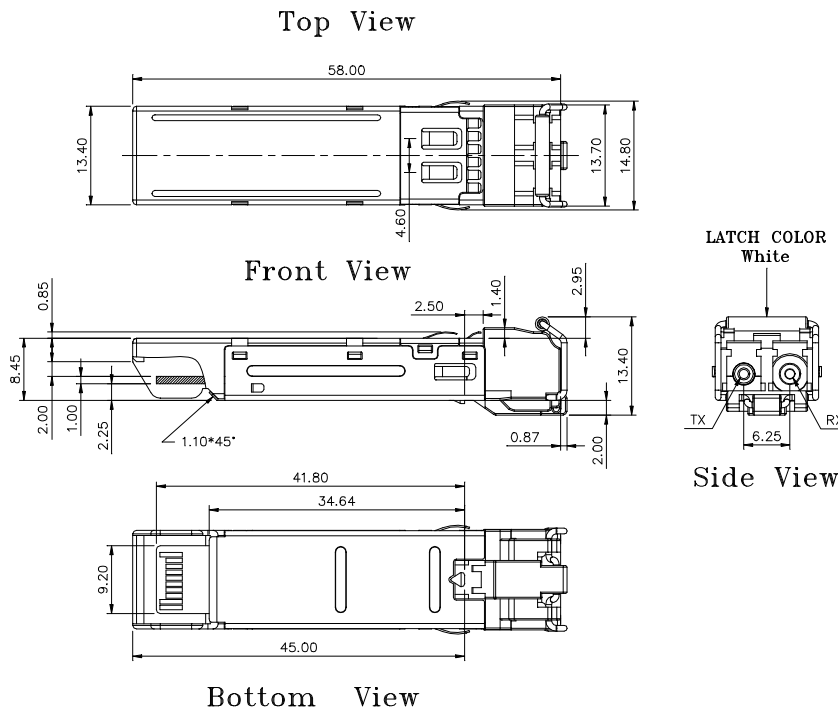
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SDA and SDL appear as no connector (NC) and MOD-ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol 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 | 2010/8/1     |
|         |                   |              |
|         |                   |              |
|         |                   |              |
|         |                   |              |