

## SPS-4380WG

**(RoHS Compliant)**

### 8.5 Gb/s /80 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 80 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

#### APPLICATIONS

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

#### DESCRIPTION

The SPS-4380WG 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.

#### 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-4380WG	8 / 4 / 2	FC-PI-4	80	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 Optical Power	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	450	mA
Data Rate		2.125	8.5		Gb/s
Total Power Dissipation				1.5	W / 1

Note 1: The inrush current is TBD.

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<b>Transmitter Optical Specifications (0°C &lt; Topr &lt; 70°C, 3.13V &lt; Vcc &lt; 3.47V)</b>						
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 and Dispersion Penalty	TDP			3	dB	
Average Launch Power of OFF Transmitter				-30	dBm	

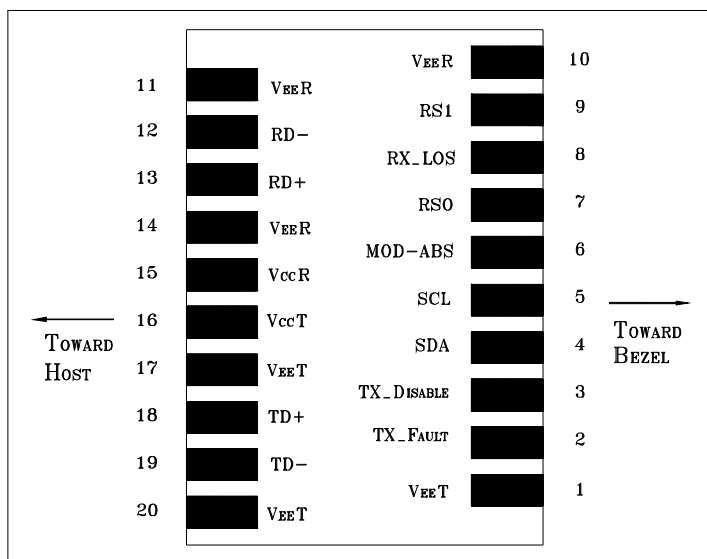
2. Output power is power coupled into a 9/125 μm single-mode fiber.

<b>Receiver Optical Specifications (0°C &lt; Topr &lt; 70°C, 3.13V &lt; Vcc &lt; 3.47V)</b>						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Sensitivity in Average Power	Sen1			-23	dBm	3
Receiver Overload	P <sub>MAX</sub>	-7	---		dBm	
LOS -- Deasserted	LOS <sub>D</sub>	---	---	-23	dBm	Transition: low to high
LOS -- Asserted	LOS <sub>A</sub>	-32	---	---	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>71</sup>-1 at 8.5 Gb/s..

<b>Electrical Characteristics</b>						
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



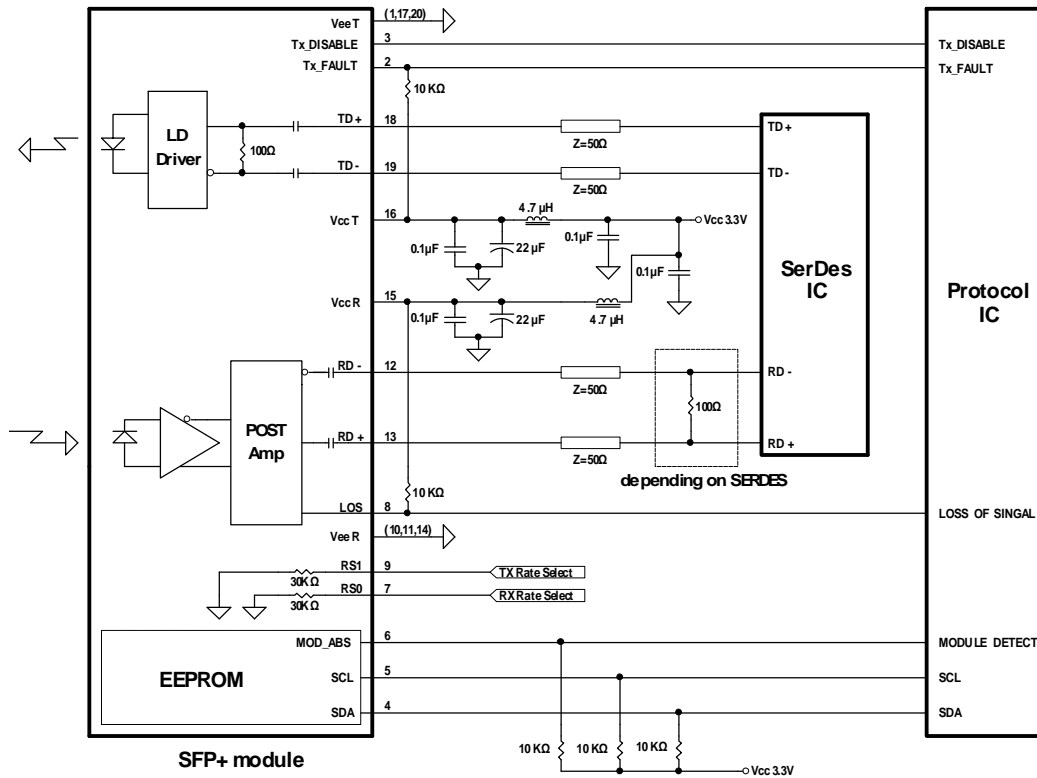
PIN	Signal Name	Description	PIN	Signal Name	Description
1	V <sub>EE</sub> T	Transmitter Signal Ground	11	V <sub>EE</sub> R	Receiver Signal Ground
2	TX_Fault	Transmitter Fault Indication. Logic “1” Output = Laser Fault. Logic “0” Output = Normal Operation	12	RD-	Inverse Receiver Data Out
3	TX_Disable	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

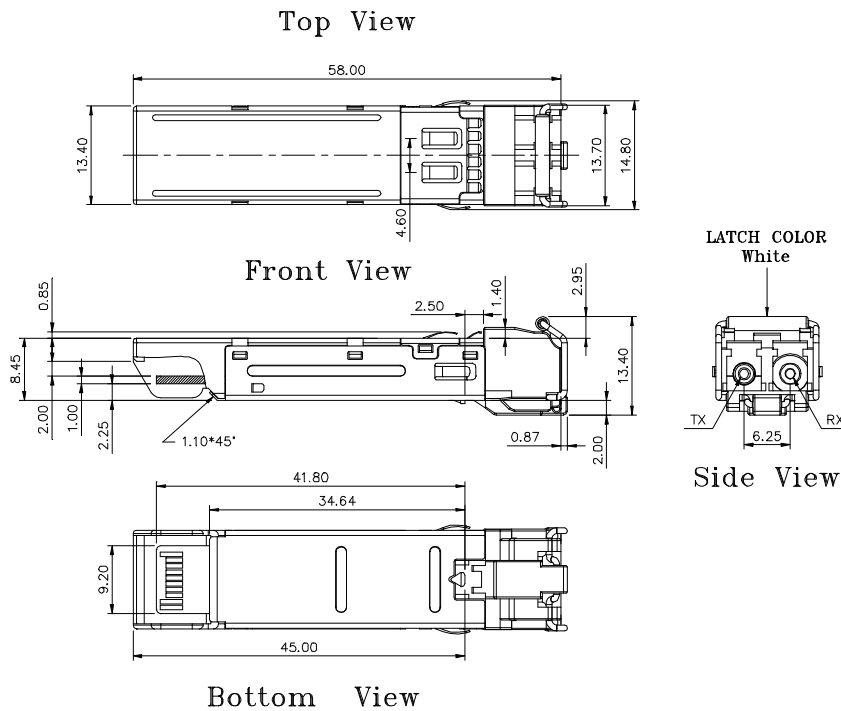
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SDA and SDL appear as no connector (NC) and MOD-ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol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

## RECOMMENDED CIRCUIT SCHEMATIC



## PACKAGE DIAGRAM

Units in mm



**Note:** Specifications subject to change without notice.

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REVISION HISTORY

Version	Subject	Release Date
1.0	Initial datasheet	2010/4/1