

**SPM-5101G / SPM-5101BG / SPM-5101AG**

**(RoHS Compliant)**

**3.3V / 1310 nm / 622 Mbps LC SFP MULTI-MODE TRANSCEIVER**

**FEATURES**

- | Hot-Pluggable SFP Footprint LC Optical Transceiver
- | Small Form-Factor Pluggable (SFP) MSA compatible
- | 1310 nm Transmitter
- | 0 to 1000 m Transmission
- | AC/AC Coupling according to MSA
- | LV-TTL TX Disable Input Signal
- | LV-TTL RX Loss of Signal Output
- | Single +3.3 V Power Supply
- | RoHS Compliant
- | 0 to 70°C Operating : SPM-5101G
- | -10 to 85°C Operating : SPM-5101BG
- | -40 to 85°C Operating : SPM-5101AG
- | Class 1 Laser International Safety Standard IEC 60825 Compliant

**DESCRIPTION**

The SPM-5101G series is small form factor pluggable module for multi-mode fiber Fast Ethernet and OC-12 / STM-4 SONET / SDH fiber communications. It is with the SFP 20-pin connector to allow hot plug capability. The transmitter section uses a multiple quantum well 1310 nm 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.

**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.

**APPLICATIONS**

- | Fast Ethernet Links
- | SONET / SDH Equipment Interconnect
- | Fiber Channel Links

**ORDER INFORMATION**

P/No.	Bit Rate (Mb/s)	Distance (m)	Wavelength (nm)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
<b>SPM-5101G</b>	622	0 to 1000	1310	LC SFP	<b>0 to 70</b>	-12 to -19	-26	Yes
<b>SPM-5101BG</b>	622	0 to 1000	1310	LC SFP	<b>-10 to 85</b>	-12 to -19	-26	Yes
<b>SPM-5101AG</b>	622	0 to 1000	1310	LC SFP	<b>-40 to 85</b>	-12 to -19	-26	Yes

**Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Temperature	Topr	0 -10 -40	70 85 85	°C	SPM-5101G SPM-5101BG SPM-5101AG
Power Supply Voltage	Vcc	0	3.6	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	

**Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	Vcc	3.1	3.3	3.5	V
Power Supply Current	I <sub>CC(TX+RX)</sub>		150	250	mA
Operating Temperature	Topr	0 -10 -40		70 85 85	°C / SPM-5101G °C / SPM-5101BG °C / SPM-5101AG
Data Rate			622	700	Mb/s

Transmitter Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Optical Transmit Power	P <sub>o</sub>	-19	---	-12	dBm	1
Output Center Wavelength	λ	1260	1310	1360	nm	
Output Spectrum Width	Δλ	---	---	10	nm	RMS (σ)
Extinction Ratio	E <sub>R</sub>	8.2	---	---	dB	
Optical Rise Time	t <sub>r</sub>			2	ns	10% to 90% Values
Optical Fall Time	t <sub>f</sub>			2	ns	10% to 90% Values
Relative Intensity Noise	RIN			-116	dB/Hz	
Total Jitter	TJ			1.0	ns	2
<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	3
TX Disable Input Voltage – High	T <sub>DIS,H</sub>	2.0		V <sub>cc</sub>	V	3
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	4
TX Fault Output Voltage -- High	T <sub>FAULTH</sub>	2.0		V <sub>cc</sub> +0.3	V	4

- Notes: 1. Output power is power coupled into a 62.5/125 μm multi-mode fiber.  
 2. Measured with a 2<sup>7</sup>-1 PRBS.  
 3. There is an internal 4.7K to 10K ohm pull-up resistor to VccTX.  
 4. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

Receiver Specifications (0°C < Topr < 70°C, 3.1 V < Vcc < 3.5V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Sensitivity	---	---	---	-26	dBm	5
Maximum Input Power	P <sub>in</sub>	-8	---	---	dBm	
Signal Detect -- Asserted	P <sub>a</sub>	---	---	-26	dBm	Transition: low to high
Signal Detect -- Deasserted	P <sub>d</sub>	-43	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Optical Return Loss	ORL	14			dB	
Wavelength of Operation		1260		1600	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	6
Output LOS Voltage -- High	V <sub>OH</sub>	2.0		V <sub>cc</sub> +0.3	V	6
Signal Detect Assert Time	AS <sub>MAX</sub>			100	μs	OFF to ON
Signal Detect Deassert Time	ANS <sub>MAX</sub>			300	μs	ON to OFF

- Notes: 5. Minimum sensitivity and saturation levels at BER 1E-10 for a 2<sup>23</sup>-1 PRBS.  
 6. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

CONNECTION DIAGRAM



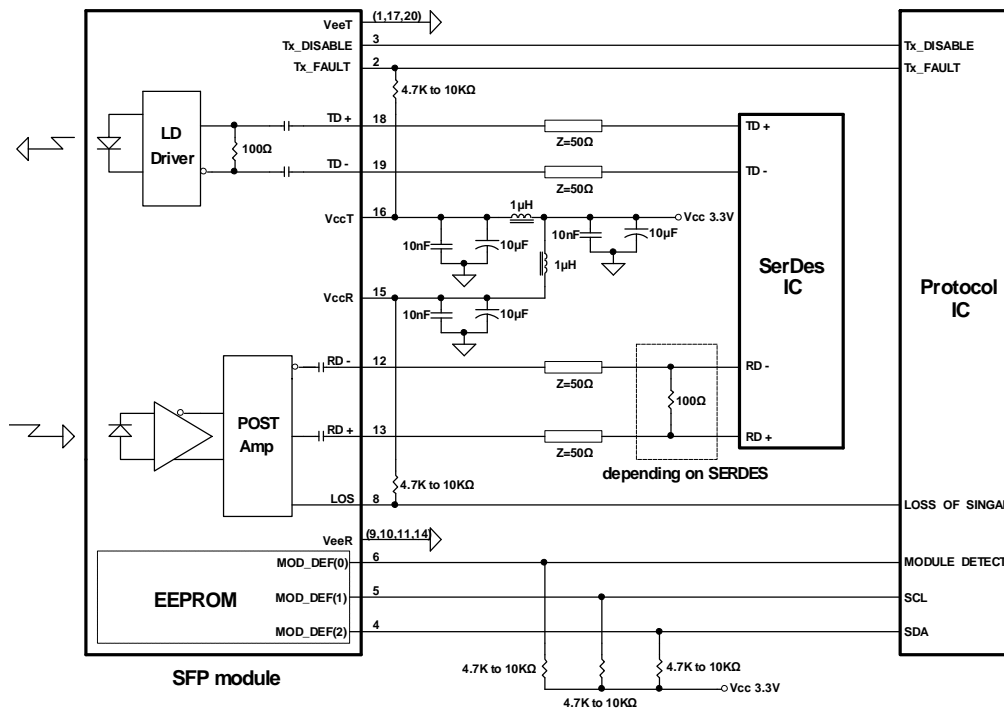
PIN	Signal Name	Description	PIN	Signal Name	Description
1	TX GND	Transmitter Ground	11	RX GND	Receiver Ground
2	TX Fault	Transmitter Fault Indication	12	RX DATA OUT-	Inverse Receiver Data Out
3	TX Disable	Transmitter Disable (Module disables on high or open)	13	RX DATA OUT+	Receiver Data Out
4	MOD-DFE2	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 PIN 4	MOD-DEF1 PIN 5	MOD-DEF0 PIN 6	Interpretation by Host
4	SDA	SCL	LV-TTL Low	Serial module definition protocol

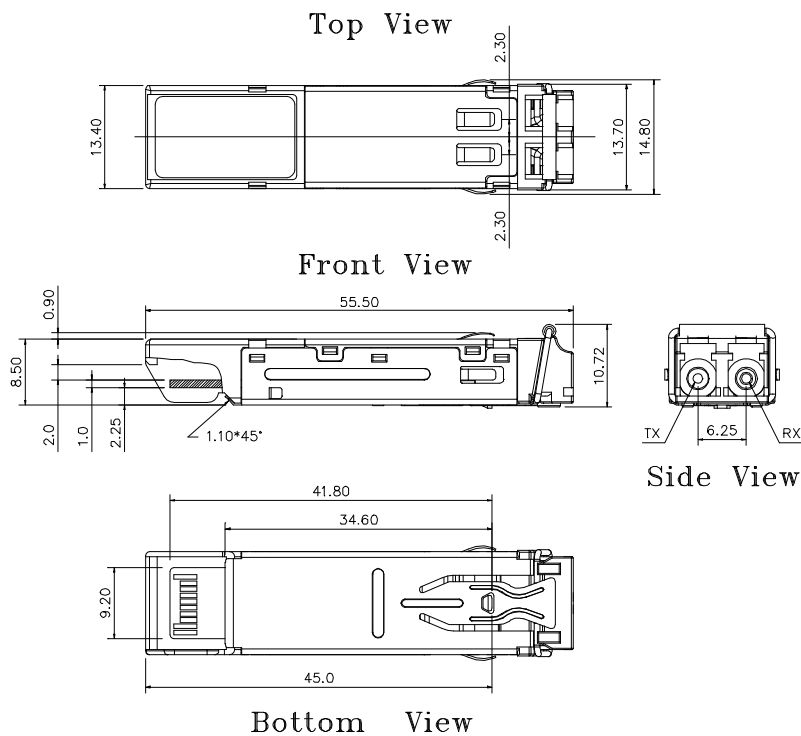
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM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