SPM-4100G / SPM-4100BG / SPM-4100AG (RoHS Compliant)

3.3V / 850 nm / 8.5 Gbps SFP+ LC Multi-Mode TRANSCEIVER

FEATURES

- Up to 8.5 Gb/s Bi-directional Data Link
- Complaint to SFP+ MSA
- Compliant with 8G FC 800-M5/M6/M5E-LC-I
- Compliant with 4G, 2G Fibre Channel
- Link Distance at 8.5 Gbd
  150 m links with OM3 MMF Cables
  50 m links with OM2 MMF Cables
  21 m links with OM1 MMF Cables
- AC/AC Coupling according to MSA
- Single +3.3 V Power Supply
- RoHS 6/6 Compliant
- 0 to 70°C Operation: SPM-4100G
- -10 to 85°C Operation: SPM-4100BG
- -40 to 85°C Operation: SPM-4100AG
- Class 1 Laser International Safety Standard IEC 60825 Compliant

APPLICATIONS

- Multi-rate 8x/4x/2x Fiber Channel

DESCRIPTION

The SPM-4100G series multi-mode transceivers is SFP+ 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. 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)	FC-PI	Distance (m)	Wavelength (nm)	Package	Temp. (°C)	RoHS Compliant
SPM-4100G	8 / 4 / 2	FC-PI-4	150 / 50 / 21*	850 VCSEL	LC SFP+	0 to 70	Yes
SPM-4100BG	8 / 4 / 2	FC-PI-4	150 / 50 / 21*	850 VCSEL	LC SFP+	-10 to 85	Yes
SPM-4100AG	8 / 4 / 2	FC-PI-4	150 / 50 / 21*	850 VCSEL	LC SFP+	-40 to 85	Yes

*: 150m for OM3 MMF, 50m for OM2 MMF, and 21 m for OM1 MMF. All tested at 8.5Gb/s.

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Case Temperature	Topr	0	70	°C	SPM-4100G
		-10	85		SPM-4100BG
		-40	85		SPM-4100AG
Operating Relative Humidity	RH	5	95	%	Non condensing
Power Supply Voltage	Vcc	0	4	V	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	Vcc	3.14	3.3	3.46	V
Operating Case Temperature	Topr	0		70	°C / SPM-4100G
		-10		85	°C / SPM-4100BG
		-40		85	°C / SPM-4100AG
Power Supply Current	$I_{CC\ (TX+RX)}$		135	180	mA
Data Rate		1	8.5		Gb/s

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Transmitter Optical Specifications (0^oC < Topr < 70^oC, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Average Launch Power	$Po_{,Avg}$	-8.2		-1	dBm	1
Optical Modulation Amplitude	$Po_{,OMA}$	0.302			mW	
Output Center Wavelength	λc	840	850	860	nm	
Output Spectrum Width	σ_λ			0.6	nm	RMS (σ)
Relative Intensity Noise	RIN			-128	dB/Hz	

1. Output power is power coupled into a 50/125 μm multi-mode fiber.

Receiver Optical Specifications (0^oC < Topr < 70^oC, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Unstressed Sensitivity at 8.5 Gb/s	Sens			0.076	mWp-p	2, OMA
				-12.5	dBm	3, Average Power
Stress Sensitivity at 8.5 Gb/s	Sens		---	0.155	mWp-p	2, OMA
Receiver Overload	P_{MAX}	0.5	---		dBm	
LOS -- Deasserted	LOS_D	---	---	-14	dBm	Transition: low to high
LOS -- Asserted	LOS_A	-25	---	---	dBm	Transition: high to low
Wavelength of Operation	λc	840		860	nm	
Optical Return Loss	ORL			-12	dB	

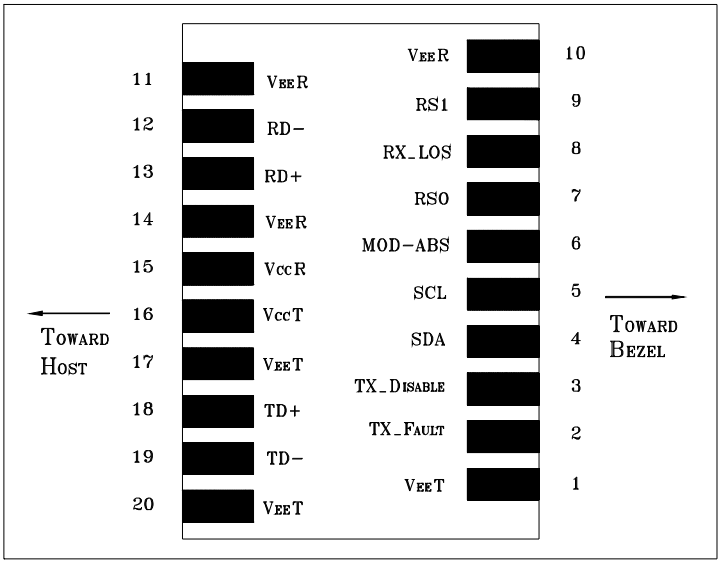
2. Measured with worst ER; BER < 10^{-12} and PRBS 2^7-1.
3. Represents sensitivity based on OMA spec, as corrected to incoming Extinction Ratio of 7 dB. For example, an OMA of 0.076 mW is approximately equal to an average power of -12.5 dBm, average with an Extinction ratio of 7 dB.

Electrical Characteristics						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
High-Speed Signal (CML) Interface Specification						
Input Data Rate		1	8.5		Gb/s	
Differential Input Impedance	Rin		100		Ω	
Differential Data Input Amplitude		150		700	mVpp	Internally AC coupled
Output Data Rate		1	8.5		Gb/s	
Differential Output Impedance	Rout		100		Ω	
Differential Data Output Amplitude		350	600	700	mVpp	Internally AC coupled
Low-Speed Signal (LVTTL) Interface Specification						
Input High Voltage		2.0		Vcc+0.3	V	
Input Low Voltage		GND		0.8	V	
Output High Voltage		2.4		Vcc	V	
Output Low Voltage		GND		0.5	V	

LINK LENGTH

Data Rate / Standard	Fiber Type	Model Bandwidth @ 850nm (MHz-km)	Distance Range (m)
8.5 GBd	62.5/125 μm MMF (OM1)	200	0.5 to 21
	50 / 125 μm MMF (OM2)	500	0.5 to 50
	50 / 125 μm MMF	900	0.5 to 90
	50 / 125 μm MMF	1500	0.5 to 120
	50 / 125 μm MMF (OM3)	2000	0.5 to 150

CONNECTION DIAGRAM



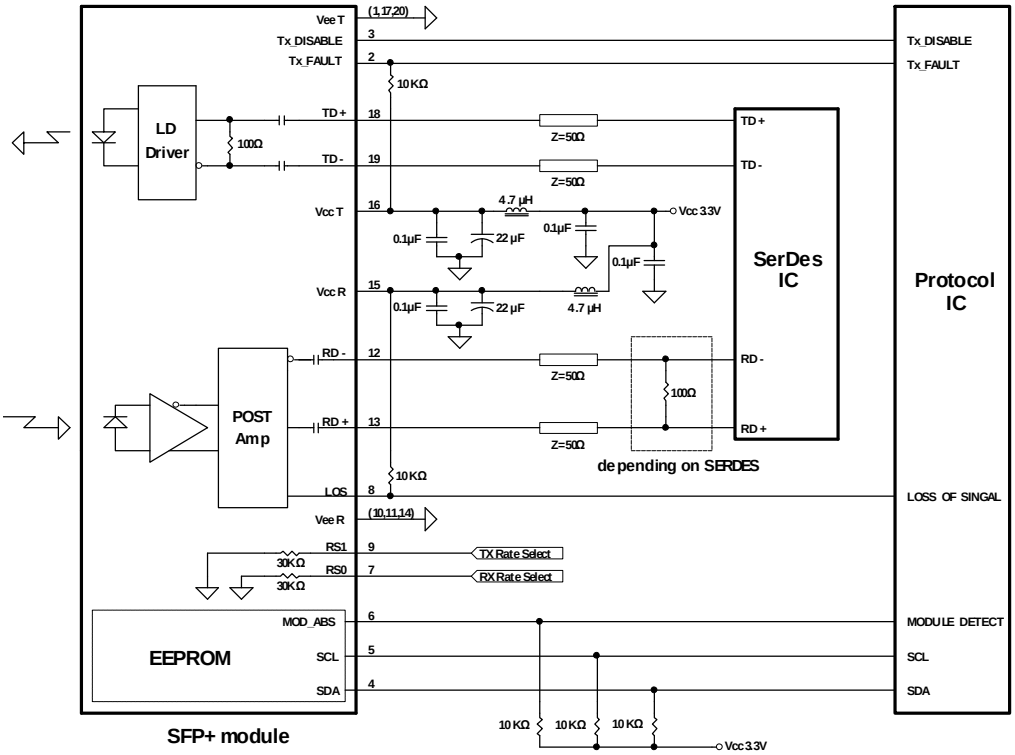
PIN	Signal Name	Description	PIN	Signal Name	Description
1	$V_{EE}T$	Transmitter Signal Ground	11	$V_{EE}R$	Receiver Signal Ground
2	TX_Fault	Transmitter Fault Indication. Logic "1" Output = Laser Fault. Logic "0" Output = Normal Operation	12	RD-	Inverse Receiver Data Out
3	TX_Disable	Logic "1" Input (or no connection) = TX off, Logic "0" = TX on.	13	RD+	Receiver Data Out
4	SDA	Modulation Definition 2 – Two wires serial ID Interface	14	$V_{EE}R$	Receiver Signal Ground
5	SDL	Modulation Definition 1 – Two wires serial ID Interface	15	$V_{CC}R$	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Absent, connected to $V_{EE}T$ or $V_{EE}R$ in the module.	16	$V_{CC}T$	Transmitter Power – 3.3V±5%
7	RS0	RX Rate Select (LVTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	17	$V_{EE}T$	Transmitter Signal Ground
8	RX_LOS	Loss of Signal Out (OC).	18	TD+	Transmitter Data In
9	RS1	TX Rate Select (LVTTL). 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	$V_{EE}R$	Receiver Signal Ground	20	$V_{EE}T$	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

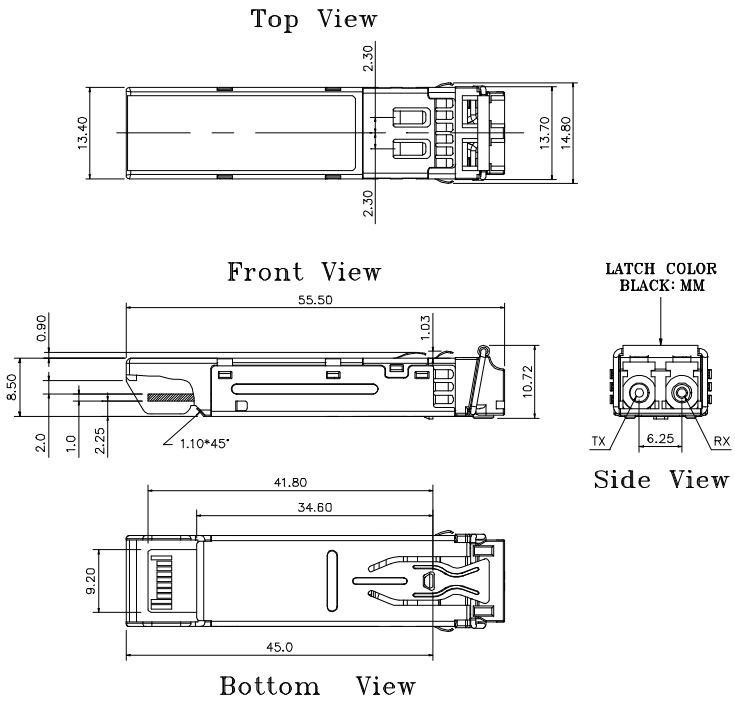
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SDA and SDL appear as no connector (NC) and MOD-ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E^2PROM protocol of the 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	2007/7/1
2.0	Add SPM-4100BG, -10 to 85°C.	2007/12/1
3.0	Add SPM-4100AG, -40 to 85°C.	2008/2/1