SPM-9100V-1T1RG (RoHS Compliant)

850 nm / 3 Gb/s Optical Multi-Mode Transmitter/Receiver

FEATURES

- SMPTE 297-2006 Compatible
- Speed from 50 Mbps to 3Gbps with up to 1000 m Multi-mode Fiber
- Distance up to 300 m for 3G-SDI
- Support Video Pathological Patterns for SD-SDI, HD-SDI and 3G-SDI
- Single Transmitter with Simplex LC
- Single Receiver with Simplex LC
- Based on Industry Standard SFP
- TTL Laser Disable Input
- TTL TX_Fault Output
- TTL RX_LOS Output
- Single +3.3 V Power Supply
- RoHS-6 Compliant
- 0 to 70°C Operation
- Hot Pluggable
- Class 1 Laser International Safety Standard IEC-60825 Compliant

APPLICATIONS

- SMPTE 297-2006 Compliant Electrical-to-Optical Interfaces
- High-density Video Routers

DESCRIPTION

The SPM-9100V-1T1RG is a optical multi-mode transmitter/receiver module designed to transmit/receive optical serial digital signals as defined in SMPTE 297-2006. It supports from 50 Mbps to 3 Gbps and is specifically designed for transmitted the SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M SDI pathological patterns. It is with the SFP 20-pin connector to allow hot plug capability. It is with 850 nm VCSEL transmitters. The transmitter can transmit signal from 50 Mbps to 3 Gbps with up to 1000 m of multi-mode fiber. A maximum distance of 300 m is achievable with 3Gbps pathological signals.

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.	Type	Bit Rate (Mb/s)	TX		RX		Package	Temp (°C)	RoHS Compliant
			λ (nm)	Power (dBm)	λ (nm)	Sen. (dBm)			
SPM-9100V-1T1RG	1-TX+1-RX	50 to 3000	850	-2 to -7	850	0 to -15	LC SFP	0 to 70	Yes

LINK DISTANCE

SDI	Bit Rate	Max. Link Distance (m)
3G-SDI	2.97Gbps	300
HD-SDI	1.485Gbps	500
SD-SDI	270Mbos	1,000

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ABSOLUTE MAXIMUM RATINGS

Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Absolute Maximum Ratings					
Parameter	**Symbol**	**Min**	**Max**	**Units**	**Notes**
Storage Temperature	Tstg	-40	85	°C	
Operating Case Temperature	Tc	0	70	°C	
Power Supply Voltage	Vcc	0	4	V	
ESD Tolerance on all pins			1	KV HBM	
Relative Humidity	---	5	95	% RH	non-condensing

Recommended Operating Conditions					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units / Notes**
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Case Temperature	Tc	0		70	°C
Baud Rate		50		3000	Mb/s
Power Supply Current	Icc		140	200	mA

Transmitter Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Optical Transmit Power	Po	-7		-2	dBm	1
Output Center Wavelength	λ	830	850	870	nm	
Output Spectrum Width	Δλ	---		1	nm	RMS (σ)
Extinction Ratio	ER	5	7.5		dB	
Relative Intensity Noise	RIN			-120	dB/Hz	
Optical Rise Time / Fall Time	tr / tf			135	ps	2, SMPTE 424M
				270	ps	2, SMPTE 292M
				800	ps	2, SMPTE 344M
				1.5	ns	2, SMPTE 259M
Electrical						
Differential Input Voltage	V_{IH} - V_{IL}	200		1200	mVp-p	AC coupled input
Disable Input Voltage -- Low	$V_{TDIS,L}$	0		0.8	V	TX Output Enabled
Disable Input Voltage -- High	$V_{TDIS,H}$	2.0		Vcc+0.3	V	TX Ouput Disabled
Output TX_Fault -- Low	V_{OL}	0		0.5	V	
Output TX_Fault -- High	V_{OH}	2.5		Vcc+0.3	V	
SCL, SDA	V_{OH}	2.5		Vcc+0.3	V	
	V_{OL}	0		0.5	V	

1. Output power is power coupled into a 62.5/125 μm multi-mode fiber.
2. 20% to 80%, unfiltered.

Receiver Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Wavelength of Operation		780	850	880	nm	
Sensitivity for SMPTE 424M 2.97 Gb/s	Sen	0	---	-15	dBm	Pathological
		0		-15	dBm	PRBS 2^{23}-1, BER=1E-12
Sensitivity for SMPTE 292M 1.485 Gb/s	Sen	0	---	-16	dBm	Pathological
		0		-16	dBm	PRBS 2^{23}-1, BER=1E-12
Signal Detect -- Asserted	Pa	---	---	-16	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-28	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1		6	dB	
Optical Return Loss			-27		dB	

Electrical						
CML Output (Differential)		550	660	850	mVp-p	AC coupled output
Optical Rise Time / Fall Time	tr / tf			135	ps	3, SMPTE 424M
				270	ps	3, SMPTE 292M
				800	ps	3, SMPTE 344M
				1.5	ns	3, SMPTE 259M
Output LOS Voltage -- Low	V_{OL}	0		0.5	V	I_{OL}=-1.6mA, 1 TTL unit load
Output LOS Voltage -- High	V_{OH}	2.5		Vcc+0.3	V	I_{OH}=40μA, 1 TTL unit load
SCL, SDA	V_{OH}	2.5		Vcc+0.3	V	
	V_{OL}	0		0.5	V	

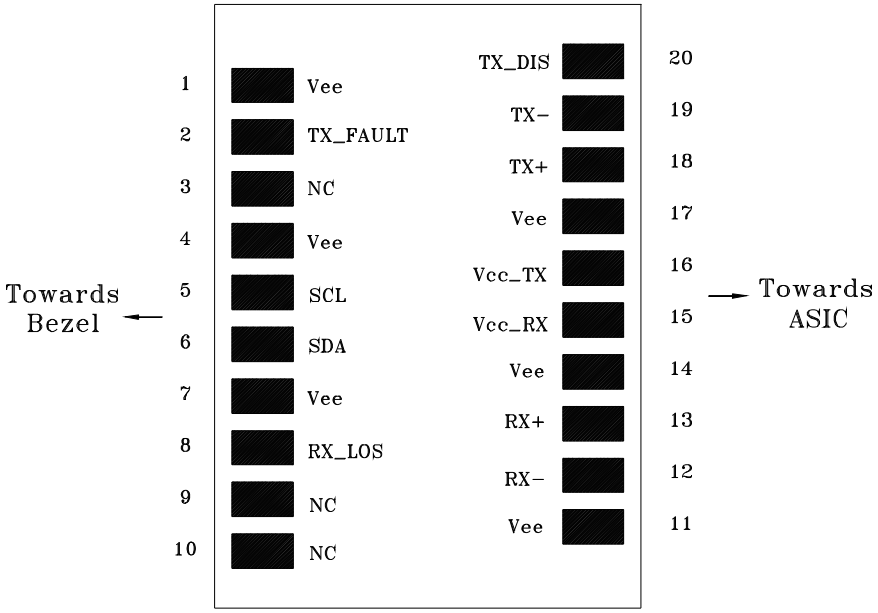
3. 20% to 80%, unfiltered.

MODULE DEFINITION

Module Definition	PIN 5	PIN 6	Interpretation by Host
4	SCL	SDA	Serial module definition protocol

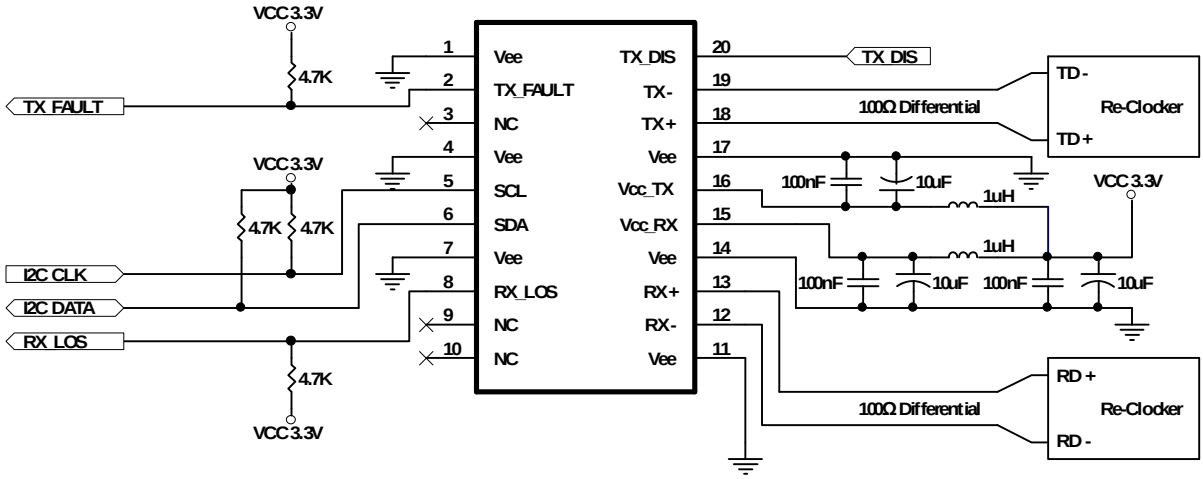
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SCL and SDA appear as no connector (NC). When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E^2PROM protocol of the ATMEL AT24C01A/02/04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

CONNECTION DIAGRAM



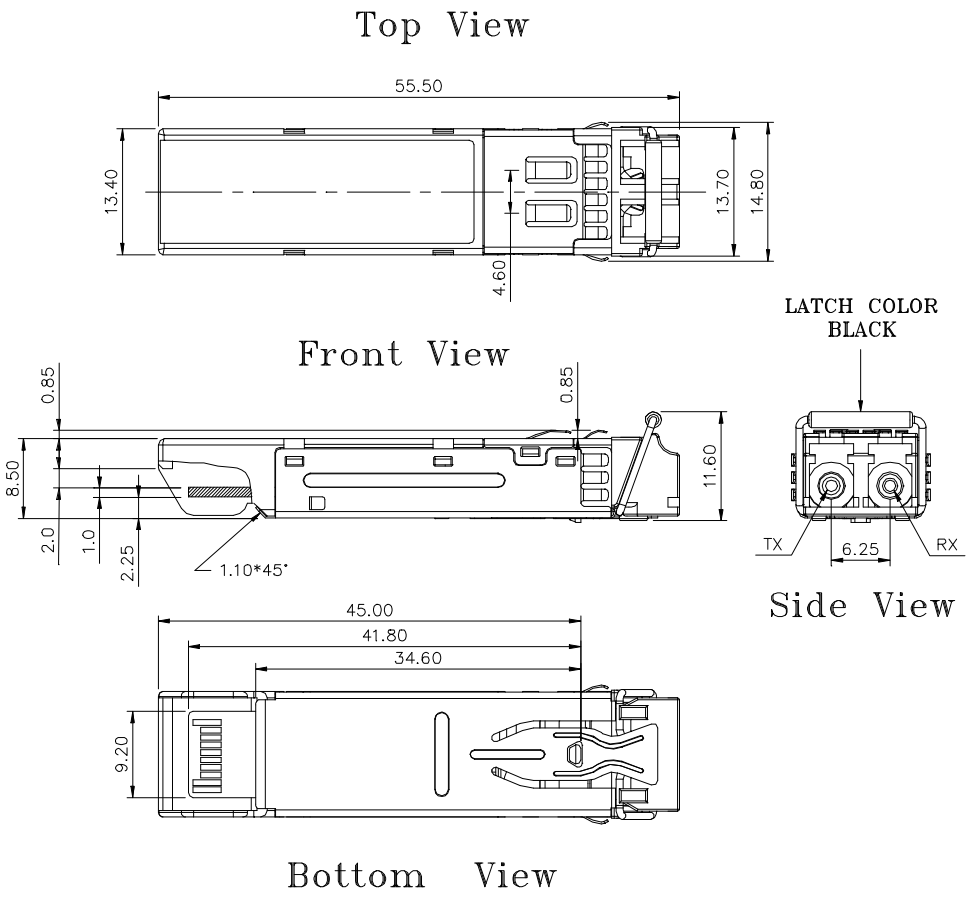
PIN	Name	Function	Notes
1	Vee	Signal Ground	
2	TX_Fault	Transmitter Fault Indicator (Active high, open-drain)	
3	NC	No Connection	
4	Vee	Signal Ground	
5	SCL	Serial I^2C Clock	
6	SDA	Serial I^2C Data	
7	Vee	Signal Ground	
8	RX_LOS	Receiver Loss of Signal Indicator (Active high, open-drain)	
9	NC	No Connection	
10	NC	No Connection	
11	Vee	Signal Ground	
12	RX-	Negative Differential Output	
13	RX+	Positive Differential Output	
14	Vee	Signal Ground	
15	Vcc RX	Power Supply	+3.3V±5%, Internal connected
16	Vcc TX	Power Supply	
17	Vee	Signal Ground	
18	TX+	Positive Transmitter Data In	AC coupled differential lines with 100 ohm differential termination inside the module
19	TX-	Negative Transmitter Data In	
20	TX_DIS	Transmitter Disable	Internal 4.7 kΩ pull-up. The bias current and modulation current are turned off if TX1_DIS = HIGH.

RECOMMENDED CIRCUIT SCHEMATIC



1. Consult the Chipset manufacturer's applications information for biasing required for TX outputs. Some chipset outputs are internally biased and may not need external bias resistor.

PACKAGE DIAGRAM (Units in mm)



Note: Specifications subject to change without notice.

REVISION HISTORY

Version	Subject	Release Date
1.0	Initial datasheet	2008/11/1
2.0	Add TX_Fault and RX_LOS function	2009/3/1