SPB-2970LWG / SPB-2970BLWG / SPB-2970ALWG (RoHS Compliant)

10.3 Gbps / 70 km / 1330 nm TX / 1270 nm RX Digital Diagnostic 1-Fiber SM LC SFP+ Transceiver

FEATURES

- 1-Fiber Bi-Directional SFP Optical Transceiver
- Up to 10.3 Gbps Bi-directional Data Links
- Compliant with SFP+ MSA
- Compliant to IEEE 802.3ae 10GBASE-BX
- SFF-8472 Digital Diagnostic Function
- Simplex LC Connector
- 1330 nm DFB LD Transmitter
- 1270 nm Receiver
- Distance Up to 70 km
- AC/AC Coupling according to MSA
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70ºC Operating: SPB-2970LWG
- -10 to 85ºC Operating: SPB-2970BLWG
- -40 to 85ºC Operating: SPB-2970ALWG
- Class 1 Laser International Safety Standard IEC 60825 Compliant

APPLICATIONS

- 10G Ethernet Links

DESCRIPTION

The SPB-2970LWG series single mode transceiver is small form factor pluggable module for bi-directional serial optical data communications such as IEEE 802.3ae 10GBASE-BX by using 1330 nm transmitter and 1270 nm receiver. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I^2C series bus specified in the SFP MSA SFF-8472. The transmitter section uses a multiple quantum well 1330 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated 1270 nm 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)	10GBASE	Distance (km)	TX (nm)	RX (nm)	Package	Temp (ºC)	RoHS Compliant
SPB-2970LWG	10.3	BX	70	1330 DFB	1270	LC SFP+ with DMI	0 to 70	Yes
SPB-2970BLWG	10.3	BX	70	1330 DFB	1270	LC SFP+ with DMI	-10 to 85	Yes
SPB-2970ALWG	10.3	BX	70	1330 DFB	1270	LC SFP+ with DMI	-40 to 85	Yes

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	ºC	
Operating Case Temperature	Topr	0 -10 -40	70 85 85	ºC	SPB-2970LWG SPB-2970BLWG SPB-2970ALWG
Relative Humidity	RH	0	85	%	Non condensing
Power Supply Voltage	Vcc	0	3.6	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	
Receiver Damage Threshold			4	dBm	

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Recommended Operating Conditions					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units / Notes**
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Power Supply Current	$I_{CC\ (TX+RX)}$		280	350	mA / SPB-2970LWG
			280	450	mA / SPB-2970BLWG mA / SPB-2970ALWG
Operating Case Temperature	Topr	0 -10 -40		70 85 85	°C / SPB-2970LWG °C / SPB-2970BLWG °C / SPB-2970ALWG
Data Rate			10.3125		Gb/s

Transmitter Optical Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Average Launch Power	$P_{o,\ Avg}$	6		9	dBm	1
Output Center Wavelength	λ_C	1320	1330	1340	nm	
Output Spectrum Width	σ_λ			1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Average Launch Power of OFF Transmitter				-30	dBm	

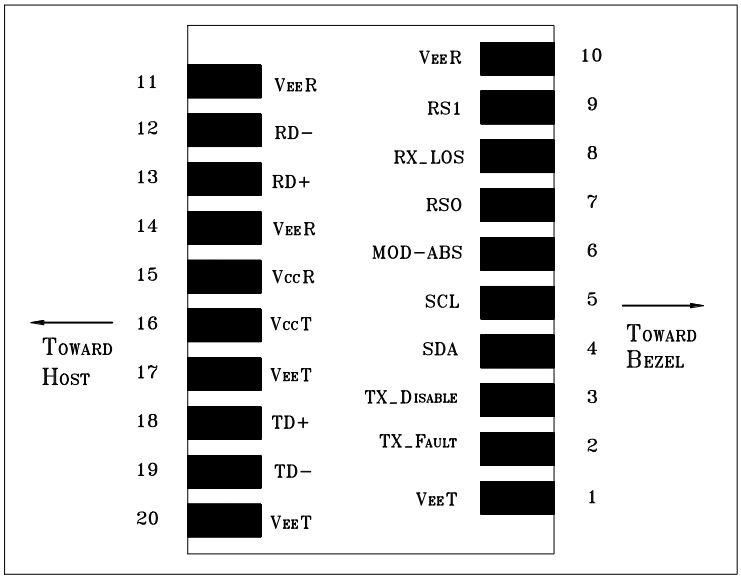
1. Output power is power coupled into a 9/125 μm single-mode fiber.

Receiver Optical Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Sensitivity at 10.3 Gb/s				-22	dBm	2, Average Power
Receiver Overload	P_{MAX}	-5	---		dBm	2, Average Power
LOS -- Deasserted	LOS_D	---	---	-25	dBm	Transition: low to high
LOS -- Asserted	LOS_A	-36	---	---	dBm	Transition: high to low
LOS -- Hysteresis		0.5	---	3.0	dB	
Wavelength of Operation	λ_C	1260		1280	nm	3

2. Measured with average power; BER < 10^{-12} and PRBS 2^{31}-1.
3. At least 32 dB optical isolation for the wavelength 1320 to 1340 nm.

Electrical Characteristics						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
High-Speed Signal (CML) Interface Specification						
Input Data Rate			10.3125		Gb/s	
Differential Input Impedance	Rin		100		Ω	
Differential Data Input Amplitude		150		1200	mVpp	Internally AC coupled
Output Data Rate			10.3125		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	

CONNECTION DIAGRAM



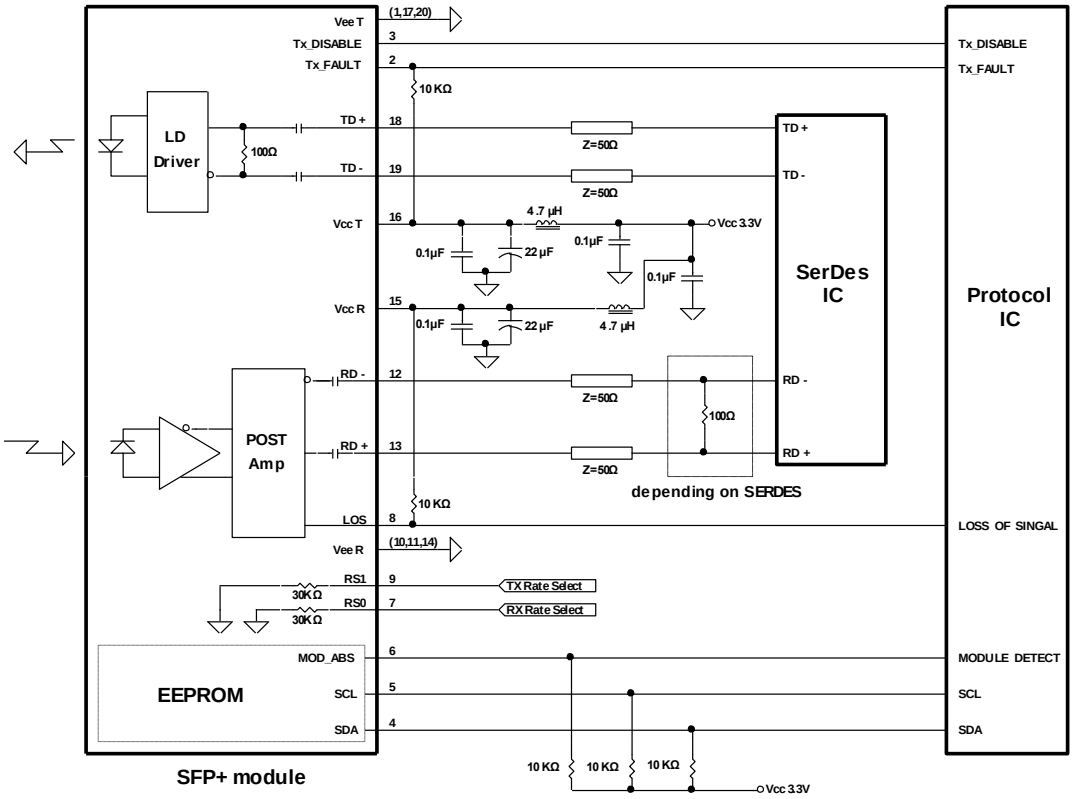
PIN	Signal Name	Description	PIN	Signal Name	Description
1	$V_{EE}T$	Transmitter Signal Ground	11	$V_{EE}R$	Receiver Signal Ground
2	TX_Fault	Transmitter Fault Indication. Logic “1” Output = Laser Fault. Logic “0” Output = Normal Operation	12	RD-	Inverse Receiver Data Out
3	TX_Disable	Logic “1” Input (or no connection) = Laser off, Logic “0” = Laser on.	13	RD+	Receiver Data Out
4	SDA	Modulation Definition 2 – Two wires serial ID Interface	14	$V_{EE}R$	Receiver Signal Ground
5	SCL	Modulation Definition 1 – Two wires serial ID Interface	15	$V_{CC}R$	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Definition 0 – Ground in 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

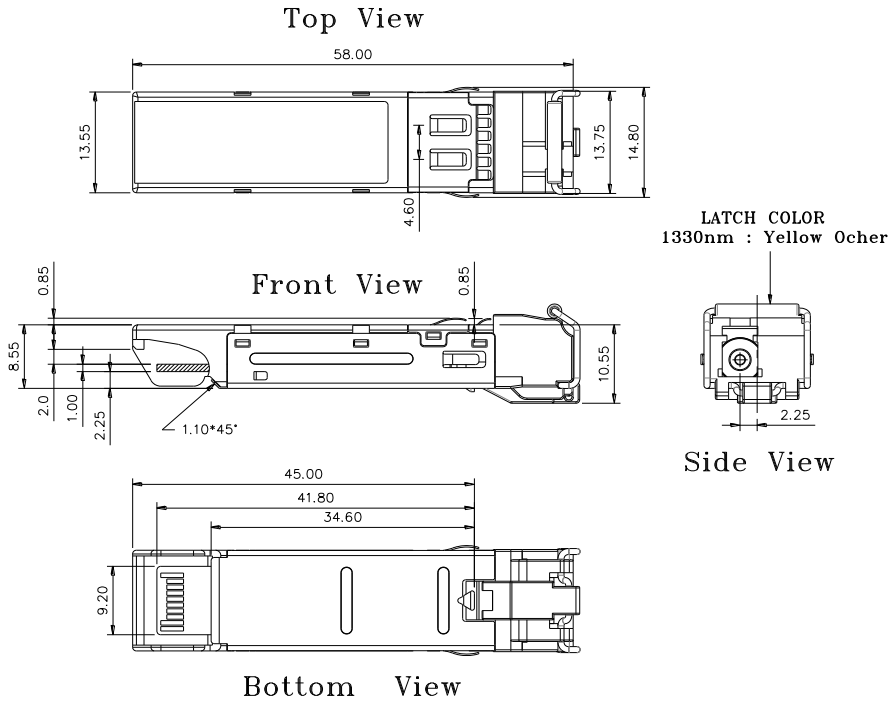
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SDA and SCL appear as no connection (NC) and MOD-ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E^2PROM protocol of 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	2013/1/1
1.1	Update the maximum LOS Deasserted level to -25 dBm	2013/5/21
2.0	Update the minimum LOS Asserted level to -36 dBm	2013/8/15
3.0	Change package diagram	2015/12/1
4.0	Add SPB-2970BLWG & SPB-2970ALWG	2024/5/21
5.0	Update the Icc of the I-Temp & E-Temp Models to a maximum of 450mA.	2024/9/20