Preliminary Data Sheet

10GBASE-BR40 SFP+ 1270nm / 1330nm BIDI 40km Transceiver P/N: WST-SFP+BX4E-xx

Features:

- Support data rate up to 11.3Gb/s.
- Distance up to 40 km for G.652 SMF
- Hot-pluggable SFP footprint
- Simplex LC Connector
- 1270nm / 1330nm DFB Transmitter
- 1330nm / 1270nm APD Receiver
- Low power consumption
  Max. 1.5W for WST-SFP+BX4E-xC
  Max. 1.8W for WST-SFP+BX4E-xI
- Operating temperature range:
  0 to 70 °C Operation: WST-SFP+BX4E-xC
  -40 to 85 °C Operation: WST-SFP+BX4E-xI

Applications:

- 10G Ethernet
- OTU2/2e
- Other Optical Links

Standards:

- Complaint with IEEE 802.3cp
- Complaint with SFF-8431/8432/8472 SFP+ MSA
- Complaint with ITU-G652 SMF
- Class 1 Laser International Safety Standard
  IEC-60825 Compliant
- RoHS 2.0 Compliant

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Relative Humidity	RH		95	%	
Power Supply Voltage	Vcc	-0.5	3.6	V	
Receiver Input Optical Power	Mip		-4.6	dBm	1

Notes:

1. It is in average power. Please add at least 12/9/6dB attenuators for short/10km/20km connections to avoid Rx APD damage.

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	WST-SFP+BX4E-xC
		-40		85	WST-SFP+BX4E-xI
Data Rate	BR		10.3125	11.3	Gb/s
Transmission Distance	TD			40	km
Coupled fiber	Single mode fiber				9/125um SMF

Electrical Characteristics(TOP = Tc, Vcc = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Power Consumption	P			1.5	W	WST-SFP+BX4E-xC
				1.8		WST-SFP+BX4E-xI
Supply Current	Icc			450	mA	WST-SFP+BX4E-xC
				540		WST-SFP+BX4E-xI
Transmitter Section						
Differential Data Input Amplitude	Vin	150		1200	mVpp	Internally AC coupled
Differential Input Impedance		85	100	115	Ω	
TX Clock Tolerance		-100		+100	ppm	
TX_DIS Disable	VIH	2		Vcc+0.3	V	
TX_DIS Enable	VIL	0		0.8	V	
Receiver Section						
Differential Data Output Amplitude	Vout	350		700	mVpp	Internally AC coupled
Differential Output Impedance		85	100	115	Ω	
RX Clock Tolerance		-100		+100	ppm	
RX_LOS LOS	VoH	2			V	1
RX_LOS Normal	VoL	0		0.4	V	1

Notes:

1. Loss Of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Transmitter Optical Specifications (Operating Temperature Range, 3.135V < Vcc < 3.465V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Output Center Wavelength	λc	1260	1270	1280	nm	WST-SFP+BX4E-Ux
		1320	1330	1340	nm	WST-SFP+BX4E-Dx
Average Launch Power	Po, AVG	-3		+3	dBm	1
Output Spectrum Width	Dl			1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Modulation Amplitude	OMA	0			dBm	2
OMA minus TDP		-1			dBm	
Transmitter and Dispersion Penalty				2.6	dB	
Extinction Ratio	ER	5.5			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	3
Average Launch Power of OFF Transmitter	Po, off			-30	dBm	
Output Eye Mask	Compliant with IEEE 802.3cp					

Notes:

1. Output power is power coupled into a 9/125 μm single-mode fiber.
2. The OMA(min) requirements holds even if TDP < 1dB
3. 12dB reflection.

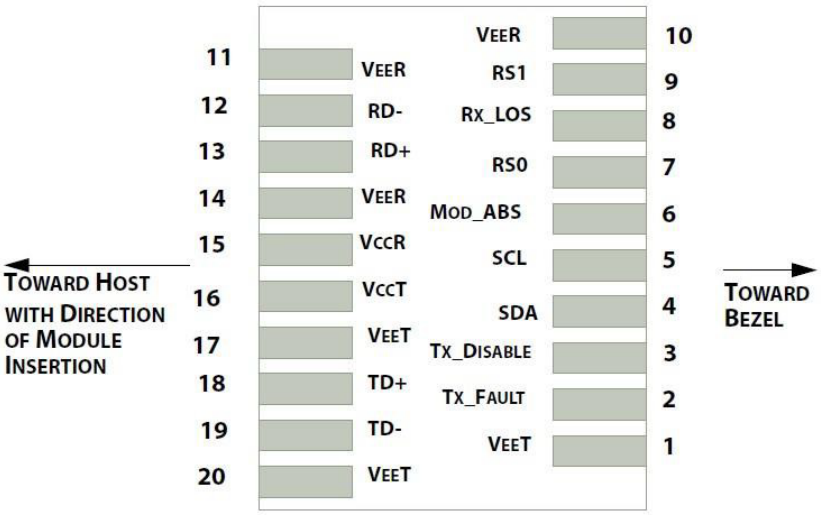
Receiver Optical Specifications (Operating Temperature Range, 3.135V < Vcc < 3.465V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Wavelength of Operation	λc	1320	1330	1340	nm	WST-SFP+BX4E-Ux
		1260	1270	1280	nm	WST-SFP+BX4E-Dx
Average receive power	P_R	-21.2		-7	dBm	
Sensitivity in OMA	R_{R-O}			-19	dBm	1
Receiver Overload	P_{R-OL}	-7			dBm	1
LOS – Asserted	LOS_A	-30			dBm	Transition: high to low
LOS – Deasserted	LOS_D			-21	dBm	Transition: low to high
LOS – Hysteresis	LOS_H	0.5		6	dB	LOS_D - LOS_A

Notes:

1. Measured with worst ER, BER less than 1E-12 and PRBS 2^31-1 at 10.3125Gbps

Pin Definition



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: 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: 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

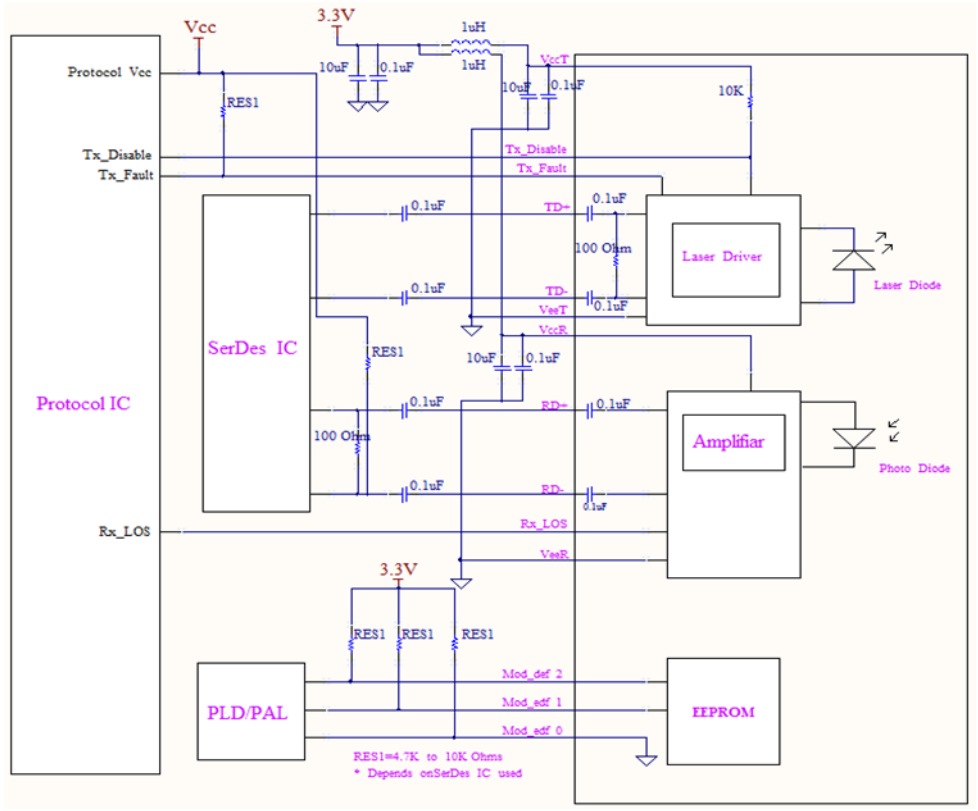
Notes:

1. Circuit ground is internally isolated from chassis ground
2. Tx FAULT is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V.A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm

thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.

3. Laser output disabled on Tx DIS >2.0V or open, enabled on Tx DIS <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal

Recommended Circuit Schematic



EEPROM Series ID Memory Contents (Address A0h)

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h.

The memory is mapped in Table 1.

And the DDM specification at address A2h.

For more details of the memory map and byte definitions, please refer to the SFF-8472, "Digital Diagnostic Monitoring Interface for Optical Transceivers". The DDM parameters have been internally calibrated

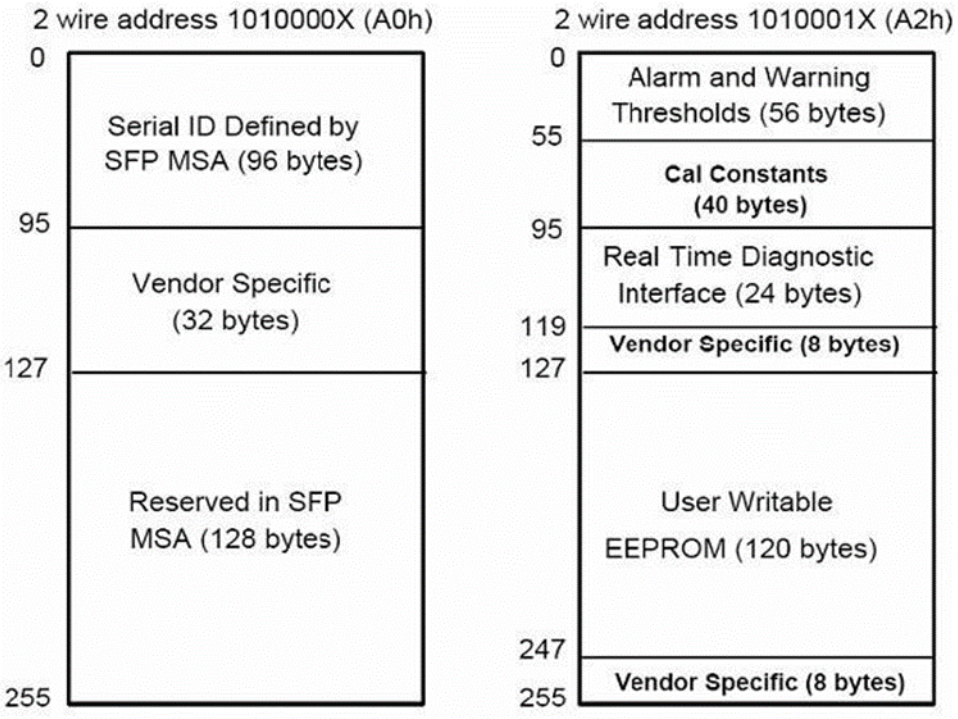


Table 1- Digital Diagnostic Memory Map (Specific Data Field Descriptions)

Digital Diagnostic Specifications

Parameter	Range	Units	Accuracy	Callbration
Transceiver Case temperature (Commercial)	0 to +70	ºC	±3ºC	Internal / External
Transceiver Case temperature (Industrial)	-40 to +85	ºC	±3ºC	Internal / External
Transceiver supply voltage	3.0 to 3.6	V	±3%	Internal / External
Transmitter bias current	10 to 100	mA	±10%	Internal / External
Transmitter output power	0 to +5	dBm	±3dB	Internal / External
Receiver average input power	-20 to -6	dBm	±3dB	Internal / External

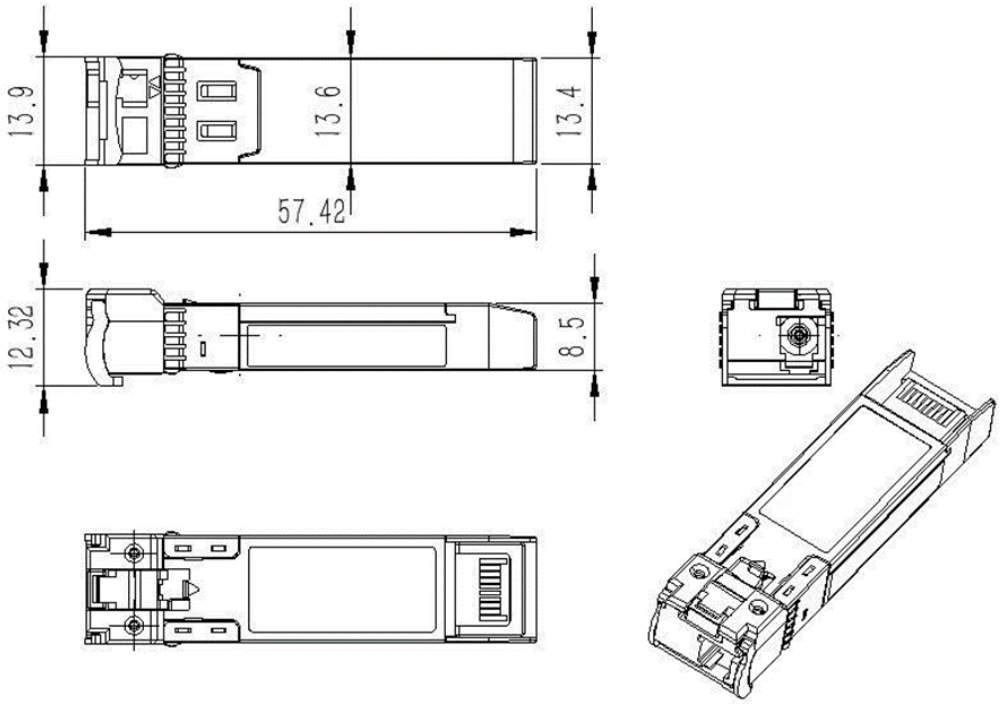
Notes:

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
TX_Disable Assert Time	t_off			100	us
TX_Disable Negate Time	t_on			2	ms
Time to Initialize Include Reset of TX_FAULT	t_int			300	ms
TX_FAULT from Fault to Assertion	t_fault			100	us
TX_Disable Time to Start Reset	t_reset	10			us
Receiver Loss of Signal Assert Time	TA,RX_LOS			100	us
Receiver Loss of Signal Deassert Time	Td,RX_LOS			100	us
Rate-Select Chage Time	t_ratesel			10	us
Serial ID Clock Time	t_serial-clock			100	kHz

Mechanical drawing



Units in mm

Note: ALL DIMENSIONS ARE ±0.1mm. Specifications subject to change without notice.

Ordering Information

P/N	Package	Data rate	Laser Wavelength (nm)	Tx OMA (dBm)	Detector	Rx OMA Sensitivity (dBm)	Case Temp (℃)	Distance (km)	Media	Power Dissipation (W)
WST-SFP+BX4E-UC	SFP+	10.3125 Gb/s	1270 TX/1330 RX	> 0	APD	-19	0 to 70	40	RoHS DDM	10GBASE-BR40
WST-SFP+BX4E-DC	SFP+	10.3125 Gb/s	1330 TX/1270 RX	> 0	APD	-19	0 to 70	40	RoHS DDM	10GBASE-BR40
WST-SFP+BX4E-UI	SFP+	10.3125 Gb/s	1270 TX/1330 RX	> 0	APD	-19	-40 to 85	40	RoHS DDM	10GBASE-BR40
WST-SFP+BX4E-DI	SFP+	10.3125 Gb/s	1330 TX/1270 RX	> 0	APD	-19	-40 to 85	40	RoHS DDM	10GBASE-BR40

Modification History

Revision	Date	Description	Originator	Review	Approved
V0.1	18-Oct-2023	New Issue	Joanne Ni	Ken Cheng	Wayne Liao

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