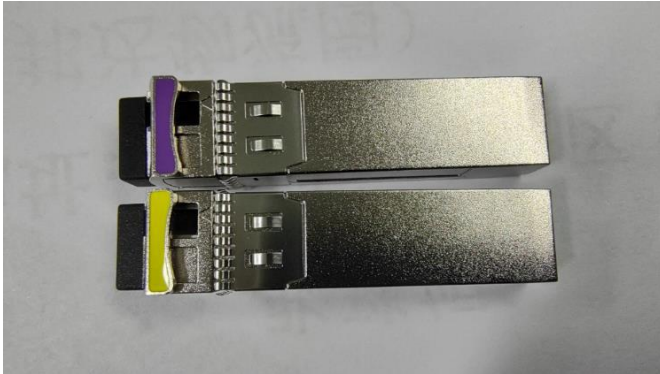


25GBASE-BR40 SFP28 1295nm / 1309nm BIDI 40km

Transceiver

P/N: WST-S28-BX4E-xx



Features:

- 1-Fiber Bi-Directional SFP Optical Transceiver
- Up to 10 Gbps / 25.78 Gbps Bi-directional Data Links
- IEEE 802.3cp 25GBASE-BR40 compliant
- Support CPRI Option 8/10 @ 10.13/ 24.33Gbps
- Built-in dual CDR
- Distance up to 40 km with power budget 20.7dB
- Simplex LC Connector
- 1295nm/1309nm EML Transmitter and APD Receiver
- Single +3.3 V Power Supply
- Low power consumption
 - Max. 1.6W for WST-S28-BX4E-xC
 - Max. 1.8W for WST-S28-BX4E-xI
- Operating temperature range:
 - 0 to 70 °C Operation: WST-S28-BX4E-xC
 - 40 to 85 °C Operation: WST-S28-BX4E-xI

Applications:

- 25GBASE-BR40 Ethernet
- CPRI Option 8/10

Standards:

- IEEE 802.3cp Compliant
- Complaint with SFF-8402 SFP28 MSA
- AC/AC Coupling according to MSA
- SFF-8472 Digital Diagnostic Function
- Class 1 Laser International Safety Standard IEC-60825 Compliant
- RoHS 2.0 Compliant

Description

WST-S28-BX4E-xx series single mode transceiver is a small form factor pluggable module for bi-directional serial optical data communications such as 25GBASE-BR40 Ethernet and CPRI Option 8/10. It is with the SFP28 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. The transmitter section uses a 1295 / 1309 nm EML laser with TEC and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an APD-TIA. The Tx and Rx are with an embedded rate selection clock data recovery (CDR) IC for 25G/10G operation.

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Relative Humidity	RH	5	85	%	
Power Supply Voltage	Vcc	-0.5	3.6	V	
Receiver Input Optical Power	Mip		-3	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-S28-BX4E-xC
		-40		85	WST-S28-BX4E-xI
Relative Humidity	RH	5		85	% / Non-condensing
Data Rate			10 / 25.78		Gb/s

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Notes
Power Consumption	P			1.6	W	WST-S28-BX4E-xC
				1.8		WST-S28-BX4E-xI
Supply Current	Icc			480	mA	WST-S28-BX4E-xC
				540		WST-S28-BX4E-xI

High-Speed Signal (CML) Interface Specification

Input Data Rate			10/25.78		Gb/s	
TX Clock Tolerance		-100		+100	ppm	1
Differential Input Impedance	Rin		100		Ω	
Differential Data Input Amplitude				900	mVpp	Internally AC coupled
Output Data Rate		8.5	25.78		Gb/s	
RX Clock Tolerance		-100		+100	ppm	1
Differential Output Impedance	Rout		100		Ω	
Differential Data Output Amplitude				900	mVpp	Internally AC coupled

Low-Speed Signal (LVTTTL) Interface Specification

Input High Voltage		2.0		Vcc+0.3	V	
Input Low Voltage		-0.3		0.8	V	

Output High Voltage		2		V _{cc}	V	
Output Low Voltage		-0.3		0.4	V	

Notes:

1. Clock tolerance for 24.33Gb/s and 25.78Gb/s

Transmitter Optical Specifications (Operating Temperature Range, 3.135V < V_{cc} < 3.465V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Output Center Wavelength	λ_c	1281	1295	1297	nm	WST-S28-BX4E-Ux
		1306	1309	1322	nm	WST-S28-BX4E-Dx
Average Launch Power	P _{o, AVG}	-3		6	dBm	1
Output Spectrum Width	DI			1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Modulation Amplitude	OMA	0		6	dBm	2
OMA minus TDP	OMA-TDP	-1			dBm	
Transmitter and Dispersion Penalty	TDP			2.7	dB	
Extinction Ratio	ER	4			dB	
Relative Intensity Noise	RIN			-130	dB/Hz	
Average Launch Power of OFF Transmitter	P _{o, off}			-20	dBm	

Notes:

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

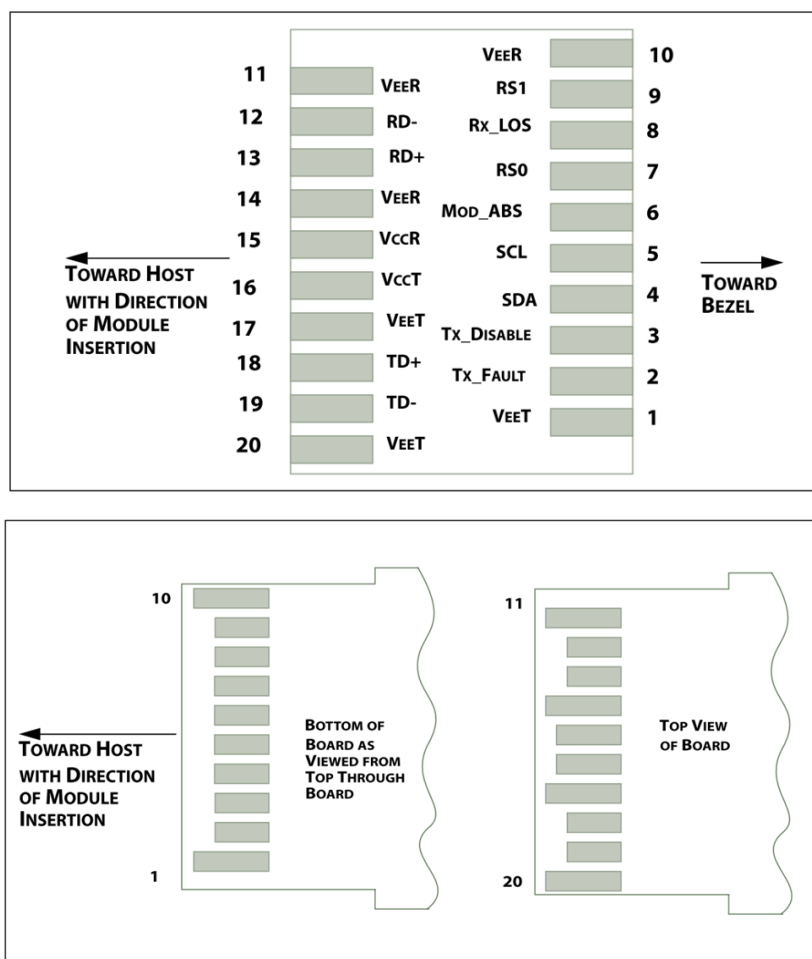
Receiver Optical Specifications (Operating Temperature Range, 3.135V < V_{cc} < 3.465V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Wavelength of Operation	λ_c	1306		1322	nm	WST-S28-BX4E-Ux
		1281		1297	nm	WST-S28-BX4E-Dx
Average receive power	P _R	-21		-4	dBm	
Sensitivity in OMA	R _{R-O}			-19	dBm	1
Receiver Overload	P _{R-OL}	-4			dBm	
LOS – Asserted	LOS _A	-35			dBm	Transition: high to low
LOS – Deasserted	LOS _D			-21	dBm	Transition: low to high
LOS – Hysteresis	LOS _H	0.5		5	dB	LOS _D - LOS _A

Notes:

1. Measured with worst ER; BER < 5×10⁻⁵ @25G; BER < 1×10⁻¹² @10G and PRBS 2³¹-1

Pin Definition



PIN	Signal Name	Description	PIN	Signal Name	Description
1	VEET	Transmitter Signal Ground	11	VEER	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	VEER	Receiver Signal Ground
5	SCL	Modulation Definition 1 – Two wires serial ID Interface	15	VccR	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Definition 0 – Ground in Module	16	VccT	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	VEET	Transmitter Signal Ground
8	RX_LOS	Loss of Signal Out (OC).	18	TD+	Transmitter Data In

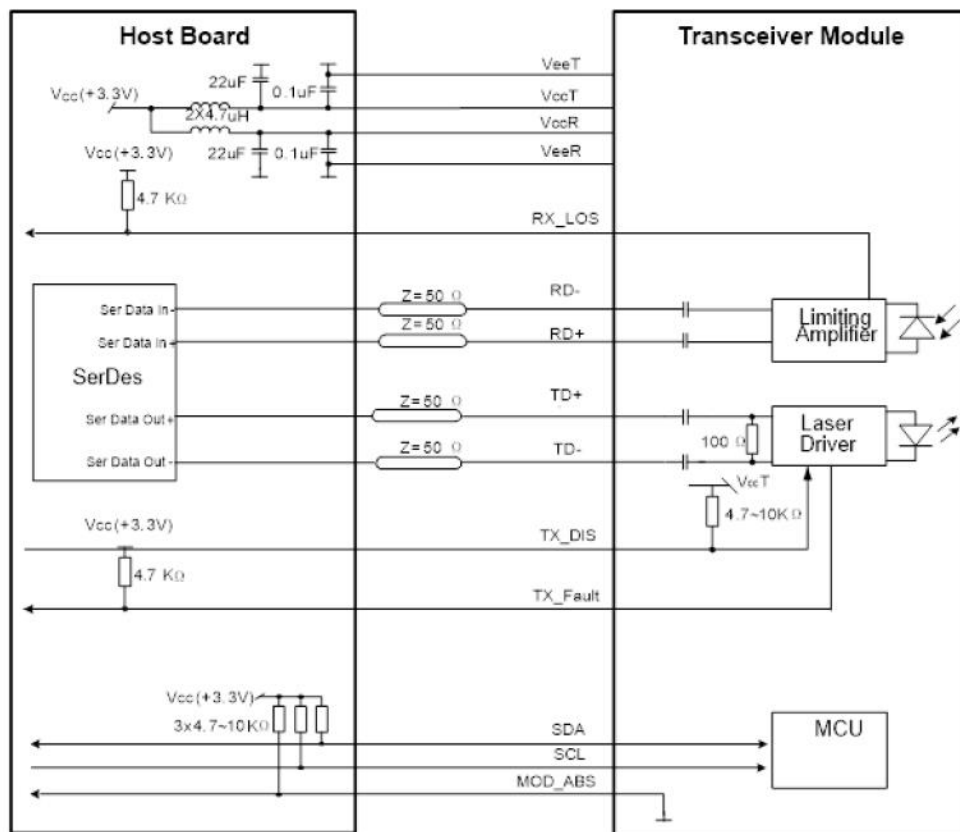
9	RS1	TX Rate Select: This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	19	TD-	Inverse Transmitter Data In
10	V _{EE} R	Receiver Signal Ground	20	V _{EE} T	Transmitter Signal Ground

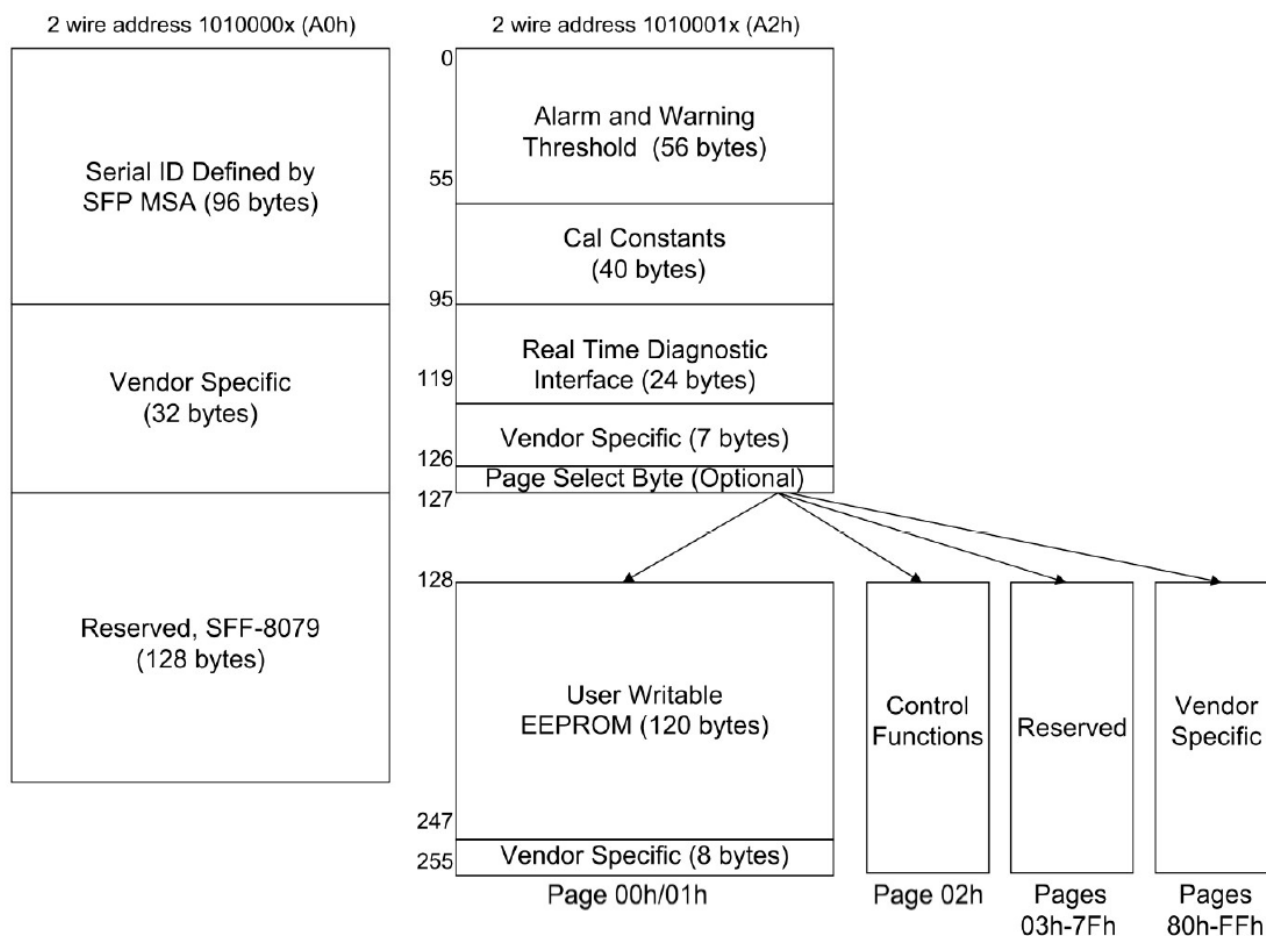
Module Definition

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 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 E²PROM protocol of the ATMEL AT24C01A/02/04 family of components.

Recommended Circuit Schematic



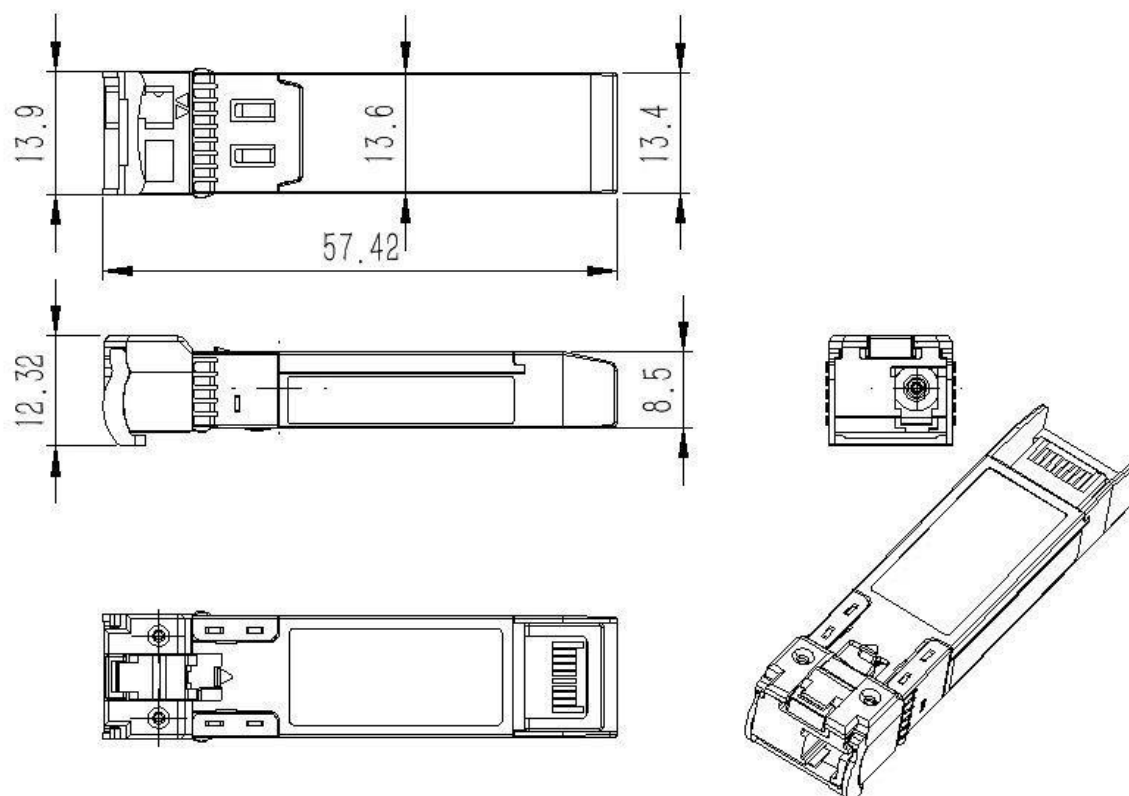
EEPROM Series ID Memory Contents (Address A0h)**Digital Diagnostic Specifications**

WST-S28-BX4E-xx transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics. Below accuracy are based on internal calibration.

Parameter	Symbol	Units	Accuracy	Note
Transceiver Case temperature	DTemp-E	°C	±3°C	1
Transceiver supply voltage	DVoltage	V	±3%	
Transmitter bias current	DBias	mA	±10%	2
Transmitter output power	DTx-Power	dBm	±3dB	
Receiver average input power	DRx-Power	dBm	±3dB	

Notes:

- Internally measured and calibrated with transceiver case temperature
- The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser

Mechanical drawing

Units in mm. All dimensions are $\pm 0.1\text{mm}$ unless otherwise specified.

Note: Specifications subject to change without notice.

Regulatory Compliance

Feature	Reference	Performance
Electrostatic discharge (ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1:2014	Class 1 laser product
Component Recognition	IEC/EN 62368-1, UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

Ordering Information

P/N	Package	Data rate	Laser Wavelength (nm)	Tx OMA (dBm)	Detector	Rx OMA Sensitivity (dBm)	Case Temp (°C)	Distance (km)	others	Application
WST-S28-BX4E-UC	SFP28	10 / 25.78 Gbps	1295 EML	0 ~ +6	APD	-19	0 to 70	40	RoHS DDM	25GBASE-BR40 CPRI 8/10
WST-S28-BX4E-DC	SFP28	10 / 25.78 Gbps	1309 EML	0 ~ +6	APD	-19	0 to 70	40	RoHS DDM	25GBASE-BR40 CPRI 8/10
WST-S28-BX4E-UI	SFP28	10 / 25.78 Gbps	1295 EML	0 ~ +6	APD	-19	-40 to 85	40	RoHS DDM	25GBASE-BR40 CPRI 8/10
WST-S28-BX4E-DI	SFP28	10 / 25.78 Gbps	1309 EML	0 ~ +6	APD	-19	-40 to 85	40	RoHS DDM	25GBASE-BR40 CPRI 8/10

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	8-Sep-2023	New Issue	Ken Cheng	Tom Tang	Wayne Liao

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