25Gb/s SFP28 Tunable DWDM 15km Transceiver HXSH-FLTS1x

Features

- Up to 25.78125Gb/s data links
- Monolithically integrated full C-band tunable transmitter and APD receiver
- 50 GHz ITU channel spacing with integrated wavelength locker
- Up to 15km on 9/125μm SMF
- Smart Features: Self-Negotiation, Remote DDM, Remote WL Locking
- Hot-pluggable SFP+ footprint
- Duplex LC/UPC type pluggable optical interface
- RoHS-10 compliant and lead-free
- Support Digital Monitoring interface
- Single +3.3V power supply
- Compliant with SFF+MSA and SFF-8472, SFF-8431, SFF-8690 and G.698.1
- Metal enclosure, for lower EMI
- Meet ESD requirements, resist 8KV direct contact voltage
- Case operating temperature
  Commercial: 0 ~ +70ºC
  Extended: -20 ~ +85ºC
  Industrial: -40 ~ +85ºC

Applications

- CPRI 9.8304Gb/s, 10.1376Gb/s, 24.33024Gb/s
- Ethernet 10.3125Gb/s, 25.78125Gb/s

Part Number Ordering Information

Part Number	Data Rate (Gb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (ºC) (Operating Case)
HXSH-FLTS1C	25.78125	Refer to wavelength selection	15	0~70 commercial
HXSH-FLTS1E	25.78125		15	-20~85 extended
HXSH-FLTS1I	25.78125		15	-40~80 Industrial

Wavelength Selection: C-band λc Wavelength Guide Pin Descriptions

Channel (xx)	Wavelength (nm)	Frequency (THZ)	Channel (xx)	Wavelength (nm)	Frequency (THZ)
13	1567.13	191.30	37	1547.72	193.70
H3	1566.72	191.35	J7	1547.32	193.75
14	1566.31	191.40	38	1546.92	193.80
H4	1565.90	191.45	J8	1546.52	193.85
15	1565.50	191.50	39	1546.12	193.90
H5	1565.09	191.55	J9	1545.72	193.95
16	1564.68	191.60	40	1545.32	194.00
H6	1564.27	191.65	K0	1544.92	194.05
17	1563.86	191.70	41	1544.53	194.10
H7	1563.45	191.75	K1	1544.13	194.15
18	1563.05	191.80	42	1543.73	194.20
H8	1562.64	191.85	K2	1543.33	194.25
19	1562.23	191.90	43	1542.94	194.30
H9	1561.83	191.95	K3	1542.54	194.35
20	1561.42	192.00	44	1542.14	194.40
I0	1561.01	192.05	K4	1541.75	194.45
21	1560.61	192.10	45	1541.35	194.50
I1	1560.20	192.15	K5	1540.95	194.55
22	1559.79	192.20	46	1540.56	194.60
I2	1559.39	192.25	K6	1540.16	194.65
23	1558.98	192.30	47	1539.77	194.70
I3	1558.58	192.35	K7	1539.37	194.75
24	1558.17	192.40	48	1538.98	194.80
I4	1557.77	192.45	K8	1538.58	194.85

25	1557.36	192.50	49	1538.19	194.90
I5	1556.96	192.55	K9	1537.79	194.95
26	1556.55	192.60	50	1537.40	195.00
I6	1556.15	192.65	L0	1537.00	195.05
27	1555.75	192.70	51	1536.61	195.10
I7	1555.34	192.75	L1	1536.22	195.15
28	1554.94	192.80	52	1535.82	195.20
I8	1554.54	192.85	L2	1535.43	195.25
29	1554.13	192.90	53	1535.04	195.30
I9	1553.73	192.95	L3	1534.64	195.35
30	1553.33	193.00	54	1534.25	195.40
J0	1552.93	193.05	L4	1533.86	195.45
31	1552.52	193.10	55	1533.47	195.50
J1	1552.12	193.15	L5	1533.07	195.55
32	1551.72	193.20	56	1532.68	195.60
J2	1551.32	193.25	L6	1532.29	195.65
33	1550.92	193.30	57	1531.90	195.70
J3	1550.52	193.35	L7	1531.51	195.75
34	1550.12	193.40	58	1531.12	195.80
J4	1549.72	193.45	L8	1530.72	195.85
35	1549.32	193.50	59	1530.33	195.90
J5	1548.91	193.55	L9	1529.94	195.95
36	1548.51	193.60	60	1529.55	196.00
J6	1548.11	193.65	M0	1529.16	196.05
Non-ITU	Peak wavelength between 1529.16nm-1567.13nm				

I. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T_S	-40	85	ºC	
Power Supply Voltage (no damaged)	V_{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH_d	0		dBm	

II. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T_{OP}	0		70	ºC	commercial
		-20		85		extended
		-40		85		Industrial
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Data Rate		9.8304		25.78125	Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			15	km	9/125um

III. General Description

Walsun 25G tunable transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at signaling rates from 9.8304 Gb/s to 25.78125 Gb/s. The module complies with the Enhanced Small Form Factor Pluggable （SFP+） multisource agreement-MSA（SFF-8431） and SFF-8432，SFF-8690，SFF-8472. It complies with the ITU-T G.698.1 standard with 100 GHz channel spacing for CPRI and Ethernet applications.

The transceiver integrates the receiver and transmitter path on one module. The transceiver contains a C-band-tunable integrated Mach-Zehnder (MZ) laser, enabling data transmission over single-mode fiber through an industry-standard LC connector. On the receiver side, the 25 G/bps data stream is recovered from a trans-impedance amplifier, and passed to an output driver. This module features a hot-pluggable electrical interface.

the transceiver provides a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP+ MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.
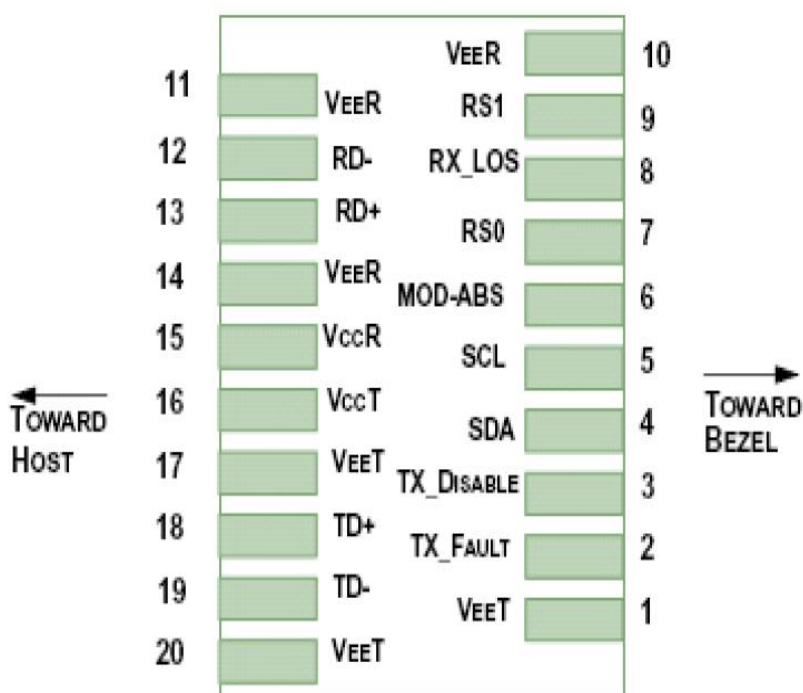
IV. Pin Assignment and Pin Description

Figure1. Diagram of host board connector block pin numbers and names

Pin	Symbol	Name/Description	Notes
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4
5	SCL	2-wire Serial Interface Clock Line	4

6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	Rate Select 0	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	No connection required	
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.

2. TFAULT is an open collector/drain output, which should be pulled up with a 4.7kΩ-10kΩ 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 TDIS >2.0V or open, enabled on TDIS <0.8V.

4. Should be pulled up with 4.7kΩ-10kΩ on 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.

V. Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Power Consumption	p			2.8	W	
Supply Current	Icc			892	mA	
Transmitter						
Single-ended Input Voltage Tolerance	Vcc	-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	
Differential Input Voltage Swing	Vin,pp	120		820	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee		Vee +0.8	V	2
Receiver						
Differential Output Voltage Swing	Vout,pp	350		850	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	28			ps	4
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	5
LOS De-assert Voltage	VlosL	Vee		Vee +0.8	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.

2. Or open circuit.

3. Input 100 ohms differential termination.

4. These are unfiltered 20-80% values.

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

6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

VI. Optical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Wavelength range (ITU Grid)	Λ	1529.16		1567.13	nm	
Center Wavelength Spacing			50		GHz	1
Optical Spectral Width	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	P_{AVG}	0		5	dBm	2
Optical Extinction Ratio	ER	6.0			dB	
Transmitter and Dispersion Penalty	TDP			3	dB	
Transmitter OFF Output Power	POff			-30	dBm	
Frequency stability (BOL)		-1.5		1.5	GHz	
Frequency stability (EOL)		-2.5		2.5	GHz	
Transmitter Eye Mask		Compliant with IEEE802.3ae				
Receiver						
Center Wavelength	λ_C	1270		1610	nm	
Receiver Sensitivity (Average Power, BtoB)	Sen.			-16	dBm	3
Receiver Sensitivity (EOL, 15km Fiber)	Sen.			-16	dBm	3
Input Saturation Power (overload)	Psat	0			dBm	
LOS Assert	LOSA	-27			dBm	
LOS De-assert	LOSD			-18	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver reflectance	dB			-26	dB	

Notes:

1. λc refer to wavelength selection, and corresponds to approximately 0.4 nm.

2. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.

3. Measured with Light source 1529.16~1567.13nm, Data rate 25.78125Gb/s, ER>6dB; BER≤5E-5 @PRBS=2^{31} -1 NRZ.

VII. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

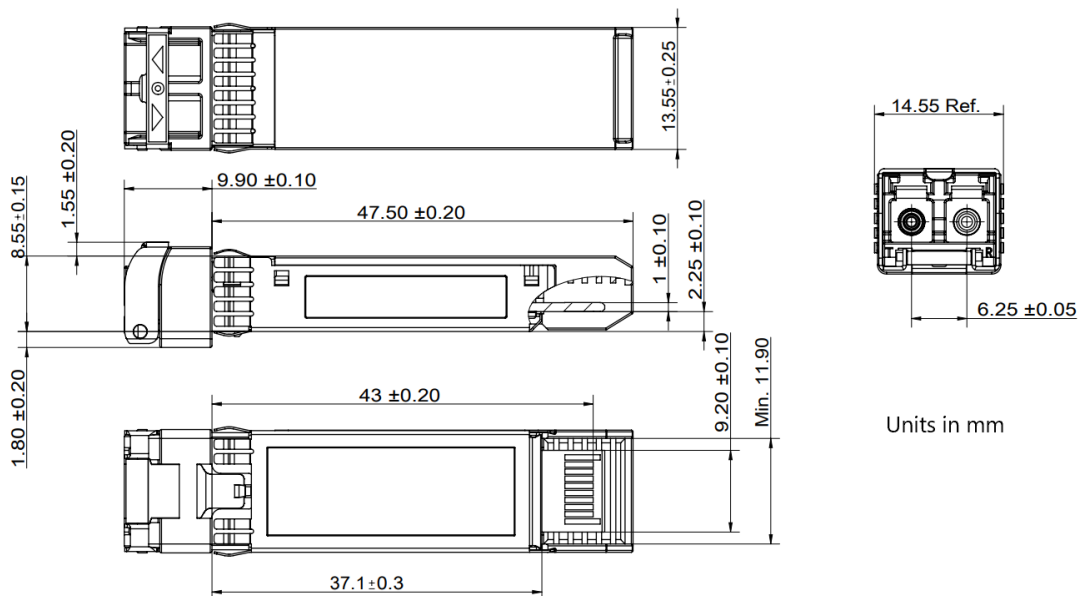| Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_ Temp	-3	3	°C	Over operating temp
Supply voltage monitor absolute error	DMI _VCC	-3	3	%	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_ bias	-10	10	%	
TX power monitor absolute error	DMI_TX	-3	3	dB	

VIII. Mechanical Dimensions

Figure2. Mechanical Outline

IX. Wavelength Self-Negotiation

The tunable transceiver with the Self-negotiation function can automatically tune wavelengths within 5 minutes. It eliminates manual tuning tasks. Each transceiver can self-tune based only on its physical fiber connection. No input from host system or technician is needed. Integrated firmware in the transceivers determines the proper wavelengths to connect each port.

Wavelength self-negotiation specification

Parameters	Max time	Note
Wavelength switching completion time	3.5s	These times refer to the time from command issuance to wavelength availability
Wavelength self -tuning requirements	576s/96 channels	Two modules are docked and the laser is turned on without configuring the operating frequency.
When the BBU side DWDM optical module wavelength self-negotiation is successful, if Tx is turned off and then Tx is turned on, it is necessary to re-enter the wavelength self-negotiation: Self-negotiation starts from the wavelength that was successfully negotiated last time; If the previous wavelength negotiation is not successful, start the negotiation from the first wave.	NA	
After the wavelength negotiation of the DWDM module is successful, the successfully negotiated wavelength will be retained. After the next power outage and startup, wavelength self-negotiation will be prioritized starting from the successfully negotiated wavelength.	NA	
The optical module will perform normal detection during self-negotiation and wavelength retention, such as LOS…	NA	

X. Revision History

Version No.	Initiated	Revised contents	Release Date
1.0	Andy Zhang	Preliminary datasheet	2012-06-11

XI. Contact us

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