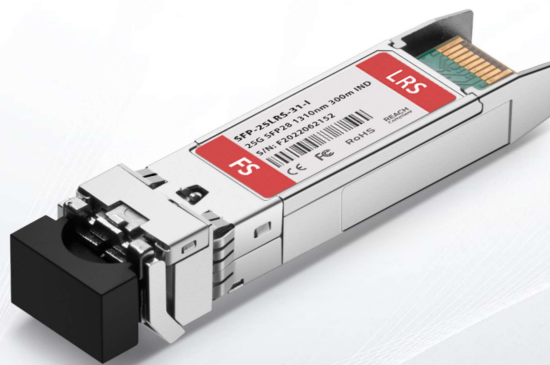


25G SFP28 1310nm 300 DOM Industrial Transceiver

SFP-25GLRS-31-I



Application

- 25GBASE-LR-S
- 25G Ethernet/ Data Center

Features

- Built-in Macom Chip, Max. Power Consumption 1W
- Certified and Tested in Targeted Switch for Superior Performance, Quality, and Reliability
- High-speed Connectivity Compliant to IEEE 802.3 by and IEEE 802.3cc
- Interoperable with Other IEEE-compliant 25G Interfaces for Seamless Integration
- FS BOX - Support Real-time Configuration
- Hot Pluggable SFP28 MSA Compliant
- Class 1 FDA Laser Safety and RoHS Compliant

I. Description

SFP-25GLRS-31-I is a 1310nm DFB laser based 25Gb/s SFP28 transceiver. It is designed to transmit and receive optical data up to 300m over single mode fiber. The transceiver is compliant with SFF-8472, SFF-8402, SFF-8432 and applicable portions of SFF-8431. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

II. Specification

Product Specifications

Specifications									
Part Number	Form Factor	Data Rate (Gb/s)	Laser	Optical Power (dBm)	Detector	Receiver Sensitivity (OMA) (dBm)	Temp (°C)	Reach (km)	DDM
SFP-25GLRS-31-I	SFP28	25.78125	1310 nmDFB	-5~2	PIN	<-8.5	-40~85	0.3	Y

III. Absolute Maximum Ratings

Recommended Storage conditions

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	T _s	-45	85	°C
Relative Humidity	RH	0	95	%
Supply Voltage	V _{CC}	-0.3	4.0	V

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature Range	T _{OPR}	0		70	°C
Power Supply Voltage	V _{CC}	3.14	3.3	3.46	V
Bit Rate	BR		25.78		Gb/s
Max Supported Link Length	L	0.3			km

IV. Electrical Ports Definition

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Supply Voltage	V_{CC}	V	3.14	3.3	3.46	
Supply Current	I_{CC}	mA		300		
Transmitter						
Input Differential Impedance	R_{IN}	Ω		100		
Single Ended Data Input Swing	V_{IN}	mVp-p	90		450	
Transmit Disable Voltage	V_{DIS}	V	2		V_{CCHOST}	
Transmit Enable Voltage	V_{EN}	V	V_{EE}		$V_{EE}+0.8$	
Transmit Fault Assert Voltage	V_{FA}	V	2.2		V_{CCHOST}	
Transmit Fault De-Assert Voltage	V_{FDA}	V	V_{EE}		$V_{EE}+0.4$	
Receiver						
Single Ended Data Output Swing	V_{OD}	mVp-p	225		375	
LOS Fault	V_{LOSFT}	V	2.2		V_{CCHOST}	
LOS Normal	V_{LOSNR}	V	V_{EE}		$V_{EE}+0.4$	

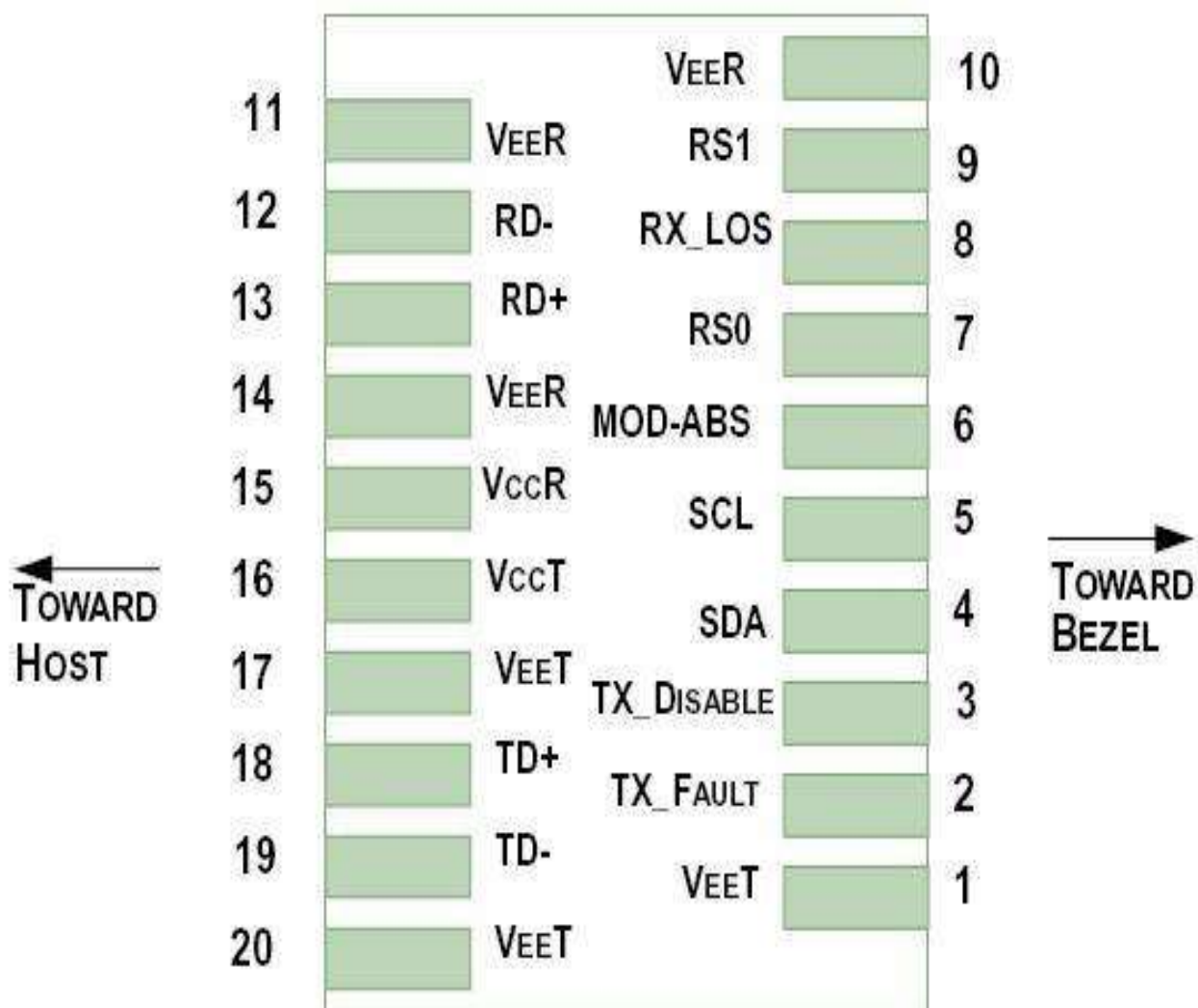
V. Optical Ports Definition

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Transmitter						
Center Wavelength	λ	nm	1260	1310	1360	
Spectral Width	SMSR	dB	30			
Optical Modulation Amplitude	P_{OMA}	dBm	-4		2.2	
Optical Output Power	P_{av}	dBm	-5		2	
Extinction Ratio	ER	dB	3			
Transmitterand Dispersion Penalty	TDP	dB			1	
Average Launch Power of OFF Transmitter	P_{OFF}	dBm			-30	
Receiver						
Center Wavelength	λ	nm	1260		1360	
Overload		dBm	2			
Receiver Power (OMA)	P_{OMA}	dBm			-8.5	1
Assert LOS	LOS_A	dBm	-30			
De-Assert LOS	LOS_D	dBm			-16	
LOS Hysteresis		dB	0.5			

Notes:

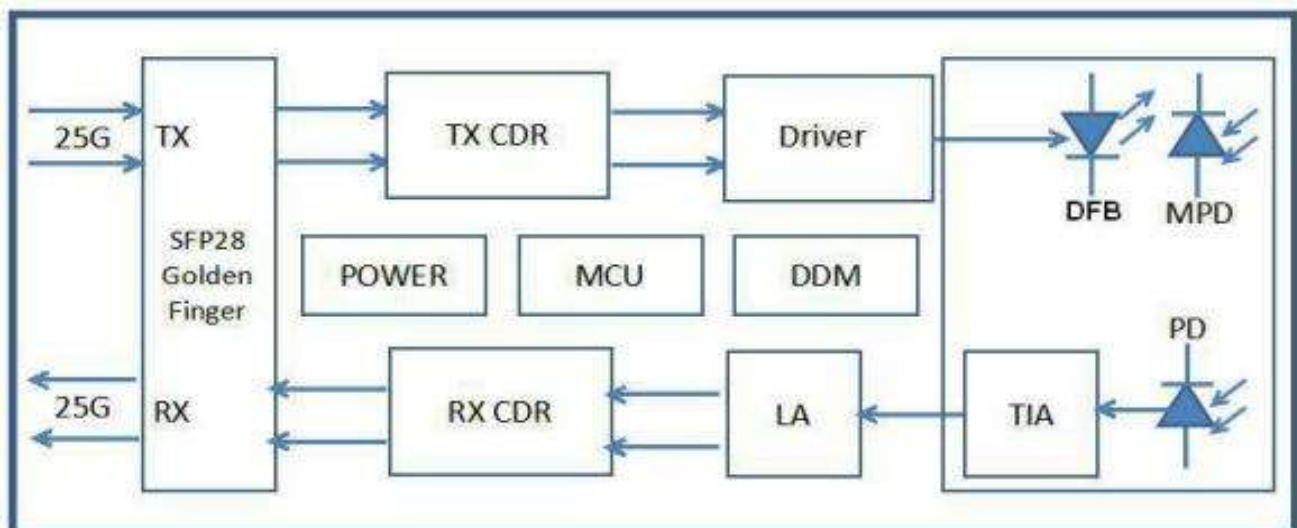
1.Measured with 25.78125Gb/s, PRBS 231-1, NRZ, ER>4dB, BER<5E-5

VI. Pin Function Definitions



Pin No.	Symbol	Logic	Description
1,17,20	VeeT		Connected to signal ground on the host board
2	TX Fault	LVTTL Output	Module transmitter fault output
3	TX Disable	LVTTL Input	Module transmitter disable control
4	SDA	LVTTL Input/Output	2-wire serial interface data
5	SCL	LVTTL Input/Output	2-wire serial interface clock
6	MOD-ABS		Module absent (connected to Module ground)
7	RS0	LVTTL Input	Rate select 0 (Rx): Low=CDR Bypass; High=CDR Select
8	LOS	LVTTL Output	Receiver loss of signal
9	RS1	LVTTL Input	Rate select 1 (Tx): Low=CDR Bypass; High=CDR Select
10,11,14	VeeR		Connected to signal ground on the host board
12	RD-	CML Output	Receiver inverted data output, internally AC coupled and terminated
13	RD+	CML Output	Receiver non-inverted data output, internally AC coupled and terminated
15	VccR		Receiver Power 3.3V Supply
16	VccT		Transmitter Power 3.3V Supply
18	TD+	CML Input	Transmitter non-inverted data input, internally AC coupled and terminated
19	TD-	CML Input	Transmitter inverted data Input, internally AC coupled and terminated

VII. Principle Diagram



VIII. Firmware Characters

CDR control (Volatile parameter. Reset to default value on boot)

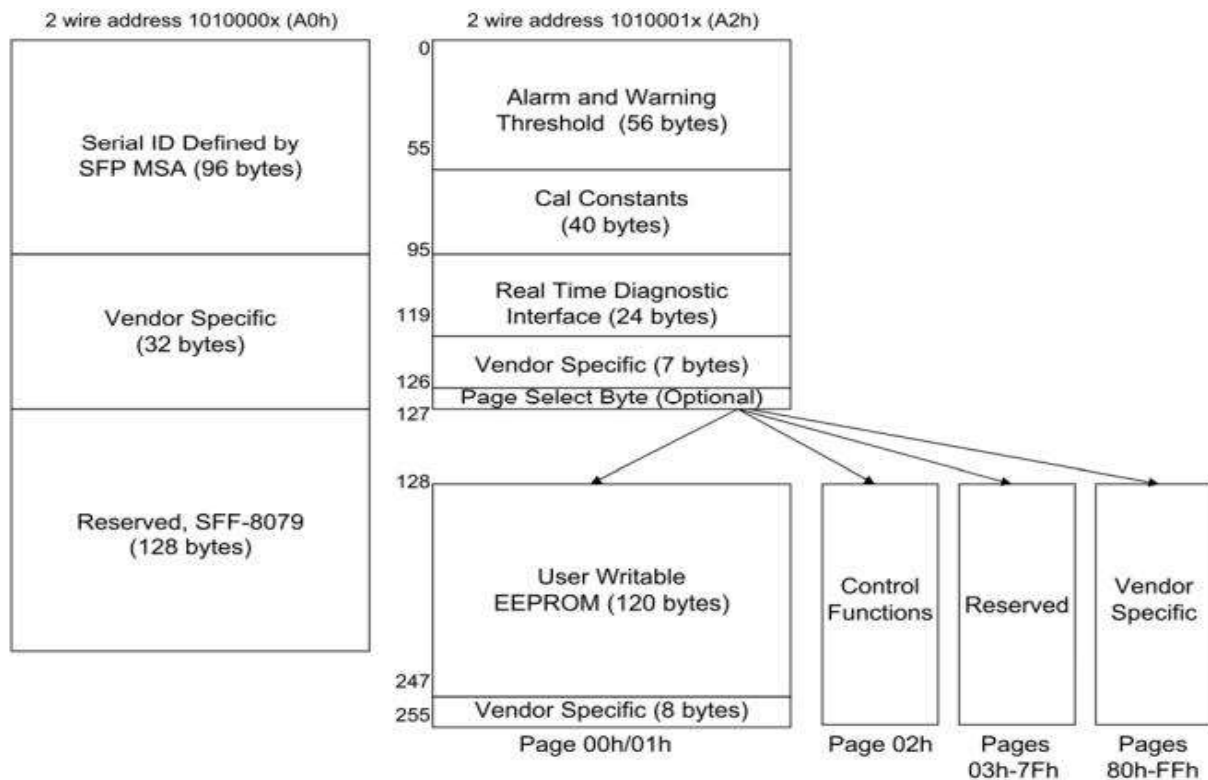
	Hard: Pin #7	Soft: A2h, Byte 110d bit 3	Mode of Operation	Rates	Note
RS0	0	0	RxCDR bypass	Rx: 9.8304Gb/s, 10.1376Gb/s or 10.3125Gb/s	
	0	1	RxCDR select	Rx: 24.33024Gb/s or 25.78125Gb/s. Module auto detect data rate and CDR lock accordingly.	Default
	1	0	RxCDR select		
	1	1	RxCDR select		
	Hard: Pin #9	Soft: A2h, Byte 118d bit 3	Mode of Operation	Rates	Note
RS1	0	0	TxCDR bypass	Tx: 9.8304Gb/s, 10.1376Gb/s or 10.3125Gb/s	
	0	1	TxCDR select	Tx: 24.33024Gb/s or 25.78125Gb/s. Module auto detect data rate and CDR lock accordingly.	Default
	1	0	TxCDR select		
	1	1	TxCDR select		

ADDRESS A2H BYTE 114d				ADDRESS A2H BYTE 115d			
Code	Transmitter Input Equalization			Code			
	Nominal	Units	Note		Nominal	Units	Note
11xx	Reserved	dB					
1011	Reserved	dB		1xxx	Vendor Specific		
1010	10	dB		0111	7	dB	
1001	9	dB		0110	6	dB	
1000	8	dB		0101	5	dB	
0111	7	dB		0100	4	dB	
0110	6	dB		0011	3	dB	
0101	5	dB		0010	2	dB	
0100	4	dB		0001	1	dB	default
0011	3	dB		0000	0	No Emphasis	
0010	2	dB	default				
0001	1	dB					
0000	0	NO EQ					

Input EQ and Output Emphasis (Volatile parameter. Reset to default value onboot)

A2H,114d	7-4	Tx input equalization @ TxCDR select	Input equalization level control
	3-0	Tx input equalization @ TxCDR bypass	Input equalization level control
A2H,115ds	7-4	RX Output emphasis @ RxCDR select	Output emphasis level control
	3-0	RX output emphasis @ RxCDR bypass	Output emphasis level control

Serial Identification



EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2-wire address 1010000X (A0). Memory Contents of Serial ID are shown in Table 1.

Table 1 Serial ID Memory Contents

Data Address	Field Size	Name of Field	Values (Hex)	Remark
BASE ID FIELDS				
0	1	Identifier	03	SFP28
1	1	Ext. Identifie	04	SFP function is defined by two wire interface ID
2	1	Connector	07	LC
3~10	8	Transceiver Compliance Code	00 00 00 00 00 00 00 00	Transceiver Compliance Code
11	1	Encoding	03	NRZ
12	1	BR, Nominal	FF	25500Mbps

Data Address	Field Size	Name of Field	Values (Hex)	Remark
BASE ID FIELDS				
13	1	Rate Identifier	00	Unspecified
14	1	Length (9μm) km	00	0km
15	1	Length (9μm) 100m	03	300m
16	1	Length (50μm,OM2)	00	Not support OM2 fiber
17	1	Length(62.5μm,OM1)	00	Not support OM1 fiber
18	1	Length (OM4 or copper cable)	00	Not support OM4 fiber
19	1	Length(50um,OM3)	00	Not support OM3 fiber
20-35	16	Vendor name	57 54 44 20 20 20 20 20 20 20 20 20 20 20 20 20	"WTD" (ASCII)
36	1	Transceiver	03	fixed value
37-39	3	Vendor OUI	00 1C AD	IEEE ID
40-55	16	Vendor PN	52 54 58 4D 33 33 30 2D 32 30 35 20 20 20 20 20	"RTXM330-205" (ASCII)
56-59	4	Vendor rev	32 2E 36 20	"2.6"(ASCII)
60-61	2	Wavelength	05 1E	1310nm
62	1	Reserved	00	Reserved
63	1	CC_BASE	Variable	Check sum for Base ID Fields (addresses 0 to 62)

Data Address	Field Size	Name of Field	Values (Hex)	Remark
--------------	------------	---------------	--------------	--------

EXTENDED ID FIELDS

64	1	Options	18	CDR
65	1	Options	3A	TX_DISABLE, TX_FAULT and Rx LOS
66	1	BR, max	67	Upper bit rate margin, units of %
67	1	BR, min	00	Lower bit rate margin, units of %
68-83	16	Vendor SN	Variable	Serial Number of transceiver (ASCII)
84-89	6	Date code	Variable	Vendor's manufacturing date code (ASCII)
90-91	2	Diagnostic Monitoring Type	Variable	Provided by vendor
92	1	Enhanced Options	68	Digital diagnostic monitoring, "internally calibrated" is implemented, RX measurement type is "Average Power"
93	1	Enhanced Options	F8	Optional Alarm/Warning flags implemented for all monitored quantities, Optional soft TX_Disable control implemented, Optional Soft TX_FAULT monitoring implemented, Optional Soft RX_LOS monitoring implemented.
94	1	SFF_8472 Compliance	08	Includes functionality described in Rev12.0 SFF-8472
95	1	CC_EXT	Variable	Check sum for Extended ID Field (addresses 64 to 94)

VENDOR SPECIFIC ID FIELDS

96-127	32	Vendor Specific	Read only	Depends on customer information Byte96~byte111 write space reserved for Huawei reserved anti-counterfeit code, currently write-protected.
--------	----	-----------------	-----------	---

Reserved, SFF-8079

128-255	128	Reserved	Filled by "00"	Reserved
---------	-----	----------	----------------	----------

Diagnostic Monitor Functions

Diagnostic Monitor Functions interface uses the 2-wire address 1010001X (A2).

Memory contents of Diagnostic Monitor Functions are shown in Table 2.

Table 2 Memory contents of Diagnostic Monitor Function

Data Address	Field Size (bytes)	Name	Contents and Description
Alarm and Warning Thresholds			
00-01	2	Temperature High Alarm	Set to 75°C
02-03	2	Temperature Low Alarm	Set to -5°C
04-05	2	Temperature High Warning	Set to 70°C
06-07	2	Temperature Low Warning	Set to 0°C
08-09	2	Vcc High Alarm	Set to 3.63V
10-11	2	Vcc Low Alarm	Set to 2.97V
12-13	2	Vcc High Warning	Set to 3.465V
14-15	2	Vcc Low Warning	Set to 3.135V
16-17	2	Bias High Alarm	Set to 100mA
18-19	2	Bias Low Alarm	Set to 10mA
20-21	2	Bias High Warning	Set to 80mA
22-23	2	Bias Low Warning	Set to 20mA
24-25	2	TX Power High Alarm	Set to 5dBm
26-27	2	TX Power Low Alarm	Set to -10dBm
28-29	2	TX Power High Warning	Set to 2dBm

Data Address	Field Size (bytes)	Name	Contents and Description
--------------	--------------------	------	--------------------------

Alarm and Warning Thresholds

30-31	2	TX Power Low Warning	Set to -7dBm
32-33	2	RX Power High Alarm	Set to 5dBm
34-35	2	RX Power Low Alarm	Set to -13.5dBm
36-37	2	RX Power High Warning	Set to 2dBm
38-39	2	RX Power Low Warning	Set to -10.5dBm
40-55	16	Reserved	Filled by "00"

Calibration Constants

Data Address	Field Size (bytes)	Name	value	Description
56-59	4	RX Power Calibration Data4	00 00 00 00	Single precision floating-point calibration data for received power Byte 56 is MSB. Byte 59 is LSB.
60-63	4	RX Power Calibration Data3	00 00 00 00	Single precision floating-point calibration data for received power Byte 60 is MSB. Byte 63 is LSB.
64-67	4	RX Power Calibration Data2	00 00 00 00	Single precision floating-point calibration data for received power Byte 64 is MSB. Byte 67 is LSB.
68-71	4	RX Power Calibration Data1	3F 80 00 00	Single precision floating-point calibration data for received power Byte 68 is MSB. Byte 71 is LSB.
72-75	4	RX Power Calibration Data0	00 00 00 00	Single precision floating-point calibration data for received power Byte 72 is MSB. Byte 75 is LSB.

Data Address	Field Size (bytes)	Name	value	Description
76-77	2	Bias Calibration Data1	0100	Unsigned fixed-point calibration data for laser bias current. Byte 76 is MSB. Byte 77 is LSB
78-79	2	Bias Calibration Data0	00 00	16-bit signed 2's complement calibration data for laser bias current. Byte 78 is MSB. Byte 79 is LSB.
80-81	2	TX Power Calibration Data1	0100	Unsigned fixed-point calibration data for laser output power. Byte 80 is MSB. Byte 81 is LSB
82-83	2	TX Power Calibration Data0	00 00	16-bit signed 2's complement calibration data for laser output power. Byte 82 is MSB. Byte 83 is LSB.
84-85	2	Temperature Calibration Data1	0100	Unsigned fixed-point calibration data for transceiver temperature. Byte 84 is MSB. Byte 85 is LSB
86-87	2	Temperature Calibration Data0	00 00	16-bit signed 2's complement calibration data for transceiver temperature. Byte 86 is MSB. Byte 87 is LSB.
88-89	2	Vcc Calibration Data1	0100	Unsigned fixed-point calibration data for supply voltage. Byte 88 is MSB. Byte 89 is LSB
90-91	2	Vcc Calibration Data0	00 00	16-bit signed 2's complement calibration data for supply voltage. Byte 90 is MSB. Byte 91 is LSB.
92-94	3	Reserved	Filled by "00"	Reserved
95	1	Check Sum	Variable	Checksum of bytes 0-94

Data Address	Field Size (bytes)	Name	value	Description
--------------	--------------------	------	-------	-------------

Real Time Diagnostic Monitor Interface

96	1	Temperature MSB	Variable	Internally measured module temperature
97	1	Temperature LSB	Variable	
98	1	VccMSB	Variable	Internally measured supply voltage in transceiver
99	1	VccLSB	Variable	
100	1	TX BiasMSB	Variable	Internally measured TX Bias Current
101	1	TX BiasLSB	Variable	
102	1	TX Power MSB	Variable	Measured TX output power
103	1	TX Power LSB	Variable	
104	1	RX Power MSB	Variable	Measured RX input power
105	1	RX Power LSB	Variable	
106-107	2	Reserved	00 00	Reserved
108-109	2	Reserved	00 00	Reserved

Optional Status/Control Bits

110	1	Logic Status	Variable	See Table 4
111	1	Reserved	00	
112-113	2	Alarm and Warning Flags	Variable	See Table 5
114	1	Tx Input equalization Control	Variable	
115	1	Rx Output emphasis Control	Variable	

Data Address	Field Size (bytes)	Name	value	Description
--------------	--------------------	------	-------	-------------

Real Time Diagnostic Monitor Interface

116-117	2	Alarm and Warning Flags	Variable	See Table 5
118	1	Extended Module Control/Status Byte	Variable	See Table 6
119	1	Tx/Rx CDR unlocked	Variable	
120-127	8	Vendor Specific	Vendor Specific	Vendor specific memory

User Writable EEPROM

128~247	120	User Writable EEPROM	Filled by "00"	User Writable EEPROM
248~255	8	Vendor Specific	Filled by "00"	Vendor Specific

Table 3 Logic Status and AD Conversion Updates

Byte	Bit	Name	Description
110	7	Tx Disable State	Optional digital State of the Tx Disable input pin.
110	6	Soft Tx Disable Control	Read/write bit that allows software disable of laser. Writing '1' disables laser requirements. This bit is "OR"d with the hard TX_DISABLE pin value. Note, per SFP MSA TX_DISABLE pin is default enabled unless pulled low by hardware. If Soft TX Disable is not implemented, the transceiver ignores the value of this bit. Default power up value is zero/low. The register that does not require password protection and can be overwritten directly.
110	5	RS(1) State	Digital state of SFP input pin AS(1) per SFF-8079 or RS(1) per SFF-8431. Updated within 100ms of change on pin. See A2h Byte 118, Bit 3 for Soft.RS(1) Select control information
110	4	RS(0)State	Digital state of the SFP Rate Select Input Pin. Updated within 100ms of change on pin. Note: This pin is also known as AS(0) in SFF-8079 and RS(0) in SFF-8431.
110	3	Soft Rate Select Control	Read/write bit that allows software rate select control. Writing '1' selects full bandwidth operation. This bit is "OR'd with the hard Rate_Select, AS(0) or RS(0) pin value. See Table 8-7 for timing requirements. Default at power up is logic zero/low, unless specifically redefined by value selected in Table 5-6. If Soft Rate Select is not implemented, the transceiver ignores the value of this bit. Note: Specific transceiver behaviors of this bit are identified in Table 5-6 and referenced documents. See Table 10-1, byte 118, bit 3 for Soft RS(1) Select.
110	2	Tx Fault	Optional digital state of the Tx Fault output pin.
110	1	LOS	Optional digital state of the LOS output pin.
110	0	Data Ready Bar	Indicates transceiver has achieved power up and data is ready. Bit remains high until data is ready to be read at which time the device sets the bit low.
111	7~0	Reserved	Set to 0.

Alarm and Warning Flags

Bytes 112–117 contain an optional set of alarm and warning flags.

Table 4 Alarm and Warning Flags

Byte	Bit(s)	Name	Description
112	7	Temperature High Alarm	Set when temperature monitor value exceeds high alarm level.
112	6	Temperature Low Alarm	Set when temperature monitor value exceeds low alarm level.
112	5	Vcc High Alarm	Set when Vcc monitor value exceeds high alarm level.
112	4	Vcc Low Alarm	Set when Vcc monitor value exceeds Low alarm level.
112	3	Laser Bias High Alarm	Set when laser bias monitor value exceeds high alarm level.
112	2	Laser Bias Low Alarm	Set when laser bias monitor value exceeds low alarm level.
112	1	Tx Power High Alarm	Set when Tx power monitor value exceeds high alarm level
112	0	Tx Power Low Alarm	Set when Tx power monitor value exceeds low alarm level.
113	7	Rx Power High Alarm	Set when Rx power monitor value exceeds high alarm level
113	6	Rx Power Low Alarm	Set when Rx power monitor value exceeds low alarm level
113	5	Optional Laser Temp High Alarm	Not Supported (Set to 0)
113	4	Optional Laser Temp Low Alarm	
113	3	Optional TEC currentHigh Alarm	Not supported (set to 0)
113	2	Optional TEC currentLow Alarm	
113	1~0	Reserved	

Byte	Bit(s)	Name	Description
114	7-4	Tx input equalization control RATE = HIGH	Input equalization level control
114	3~0	Tx input equalization control RATE = Low	Input equalization level control
115	7-4	RX output emphasis control RATE = HIGH	Output emphasis level control
115	3~0	RX output emphasis control RATE = Low	Output emphasis level control
116	7	Temperature High warning	Set when temperature monitor value exceeds high warning level.
116	6	Temperature Low warning	Set when temperature monitor value exceeds low warning level.
116	5	Vcc High warning	Set when Vcc monitor value exceeds high warning level.
116	4	Vcc Low warning	Set when Vcc monitor value exceeds Low warning level.
116	3	Laser Bias High warning	Set when laser bias monitor value exceeds high warning level.
116	2	Laser Bias Low warning	Set when laser bias monitor value exceeds low warning level.
116	1	Tx Power High warning	Set when Tx power monitor value exceeds high warning level
116	0	Tx Power Low warning	Set when Tx power monitor value exceeds low warning level.
117	7	Rx Power High warning	Set when Rx power monitor value exceeds high warning level
117	6	Rx Power Low warning	Set when Rx power monitor value exceeds low warning level
117	5	Optional Laser Temp High Warning	Not Supported (Set to 0)
117	4	Optional Laser Temp Low Warning	
117	3	Optional TEC currentHigh Warning	
117	2	Optional TEC currentLow Warning	
117	1~0	Reserved	Not supported (set to 0).

Extended Information

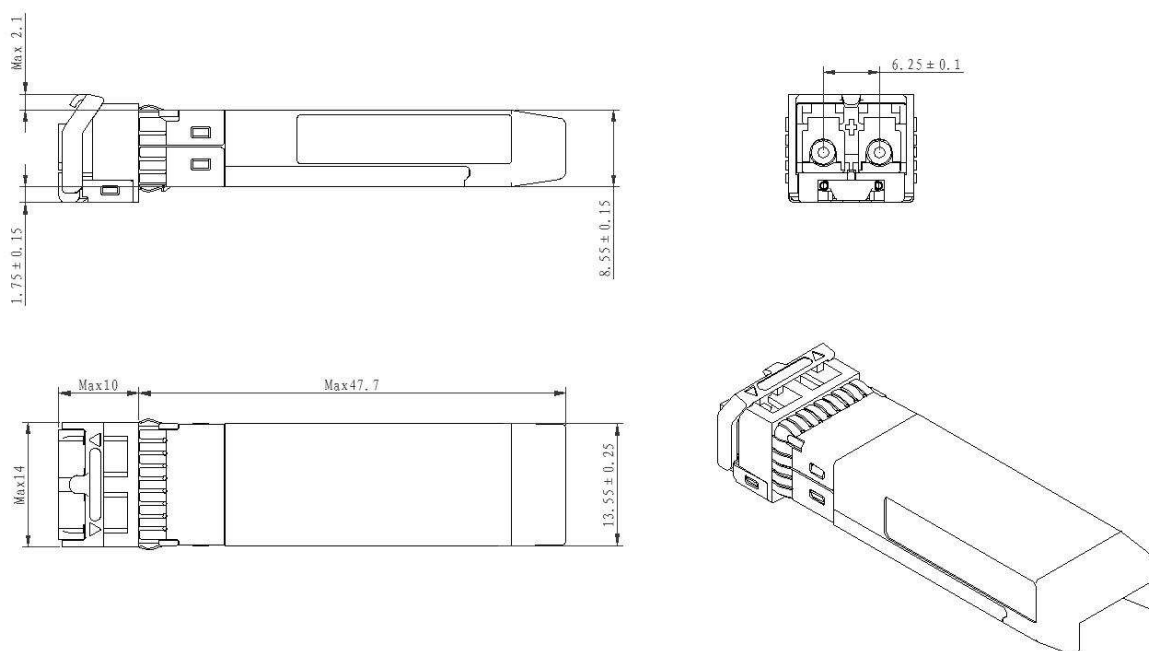
Addresses 118–119 are defined for extended module control and status functions.

Table 5 Extended Module Control/Status Bytes

Byte	Bit(s)	Name	Description
Byte	Bit	Name	Description
118	7~4	Reserved	Set to 0
118	3	Soft RS(1) Select	Read/write bit that allows software Tx rate control. Writing '1' selects full speed Tx operation. This bit is "OR'd with the hard RS(1) pin value. See Table 8-7 for timing requirements. Default at power up is logic zero/low, unless specifically redefined by value selected in Table 5-6. If Soft RS(1) is not implemented, the transceiver ignores the value of this bit. Note: Specific transceiver behaviors of this bit are identified in Table 5-6 and referenced documents. See Table 9-11, byte 110, bit 3 for Soft RS(0) Select.
118	2	Reserved	Set to 0
118	1	Power Level OperationState	Power Level 1 operation (1.0 Watt max. set to 0)
118	0	Power Level Select	Power Level 1 Only(set to 0).
119	7~2	Unallocated	Set to 0
119	1	Optional Tx CDR unlocked	Used when bit 64.3(A0H) is set to 1, if the Tx side CDR is enabled, a value of 0 indicates that the CDR is locked, whereas a value of 1 indicates loss of lock of CDR
119	0	Optional Rx CDR unlocked	Used when bit 64.3(A0H) is set to 1, if the Rx side CDR is enabled, a value of 0 indicates that the CDR is locked, whereas a value of 1 indicates loss of lock of CDR

IX. Mechanical Drawings

Mechanical Structure (unit: cm)



X. Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015.7	Class 1 (> 1500 Volts)
Electrostatic Discharge (ESD) Immunity	Variation of IEC61000-4-2	LV 4 (Air discharge : 15KV; Contact discharge: 8 KV)
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class BFCC Class B	Compliant with standards
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.