

## Specification

### Small Form Factor Pluggable

Duplex LC Receptacle – SFP

### Optical Transceivers

1000BASE-SX

1250Mbit/s



## Ordering Information

**T S D - S x C H 1 - C 1 1**



**Category**


SD : DDMI Product



**Voltage / Temperature**

1 : 3.3V / +0°C ~ +70°C

2 : 3.3V / -40 °C ~ +85°C

Model Name	Voltage	Category	Device type	Interface	SD/LOS	Temperature	Distance	Latch Color
TSD-S1CH1-C11	3.3V	With DDMI	VCSEL / PIN	AC / AC Coupling	LVTTTL	+0°C ~ +70°C	550m ( Table 1 )	Black
TSD-S2CH1-C11						-40°C ~ +85°C		

Media	Wavelength	Fiber Core Dimension	Modal Bandwidth	Fiber Type	Distance
Multi-Mode Fiber	850nm	50 μ m	500 MHz*km	OM2	550m
		50 μ m	400 MHz*km		500m
		62.5 μ m	200 MHz*km	OM1	275m
		62.5 μ m	160 MHz*km		220m

Table 1

## Features

- **ROHS Compliant**
- **Standard Small Form Factor Pluggable Package – SFP MSA Compliant**
- **Digital Diagnostic SFF-8472 Rev.10.2 Compliant**
- **Gigabit Ethernet Standard ( IEEE802.3Z 1000BASE-SX ) Compliant**
- **Fibre Channel Standard ( 100-M5-SN-I and 100-M6-SN-I ) Compliant**
- **Laser Class 1 Product – IEC60825-1 Compliant**
- **Standard Duplex LC Receptacle Optical Interface**
- **Single + 3.3 V Power Supply**
- **Differential LVPECL Data Input and Output**
- **LVTTL Loss of Signal**
- **Serial ID through I<sup>2</sup>C Interface**
- **Low Power Consumption**

## Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit
Storage temperature	T <sub>S</sub>	-40	--	85	°C
Supply voltage	V <sub>CC</sub>	0	--	4	V
Operating Relative Humidity	--	5	--	95	%
Input voltage	V <sub>IN</sub>	0	--	V <sub>CC</sub>	V

## Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V <sub>CC</sub>	3.1	3.3	3.5	V
Operating Case temperature ( TSD-S1CH1-C11 )	T <sub>C</sub>	0	--	70	°C
Operating Case temperature ( TSD-S2CH1-C11 )		-40	--	85	
Total Current ( Transmitter + Receiver )	I <sub>CC</sub>	--	--	250	mA

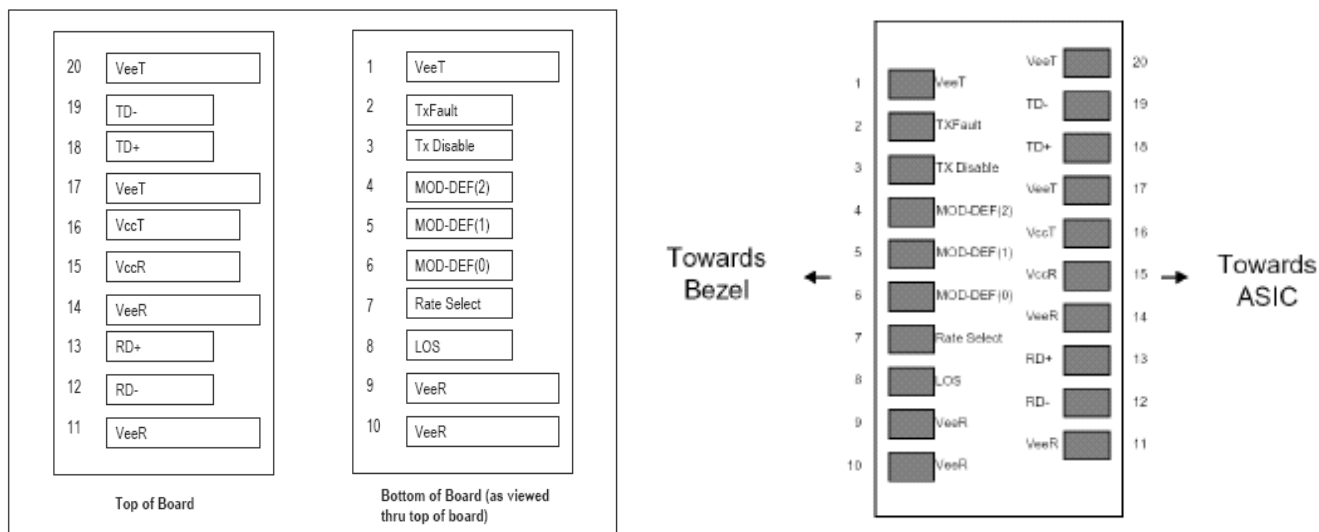
**Transmitter Specifications** (  $V_{CC}=3.1V\sim 3.5V$  ;  $T_C= 0^{\circ}C\sim 70^{\circ}C$  /  $T_C= -40^{\circ}C\sim 85^{\circ}C$  )

Parameter	Symbol	Min	Typ	Max	Unit
<b>Optical Characteristics</b>					
Output Optical Power	$P_{out}$	-9	--	-3	dBm
Extinction Ratio	ER	9	--	--	dB
Center Wavelength	$\lambda_C$	830	--	860	nm
Spectral Width (RMS)	$\sigma$	--	--	0.85	nm
Rise/Fall time (20-80%)	$T_{r,f}$	--	--	260	ps
Relative Intensity Noise	RIN	--	--	-117	dB/Hz
Output Eye	Compliant with IEEE 802.3z				
Max. $P_{out}$ TX-DISABLE Asserted	$P_{OFF}$	--	--	-45	dBm
<b>Electrical Characteristics</b>					
Differential Input Voltage	$V_{DIFF}$	0.4	--	2.0	V
Tx_Disable_Input_High	$V_{DISH}$	2.0	--	$V_{CC}+0.3$	V
Tx_Disable_Input_Low	$V_{DISL}$	0	--	0.8	V
Tx_Fault_Output_High	$V_{FH}$	2.0	--	$V_{CC}+0.3$	V
Tx_Fault_Output_Low	$V_{FL}$	0	--	0.8	V

**Receiver Specifications** (  $V_{CC}=3.1V\sim 3.5V$  ;  $T_C= 0^{\circ}C\sim 70^{\circ}C$  /  $T_C= -40^{\circ}C\sim 85^{\circ}C$  )

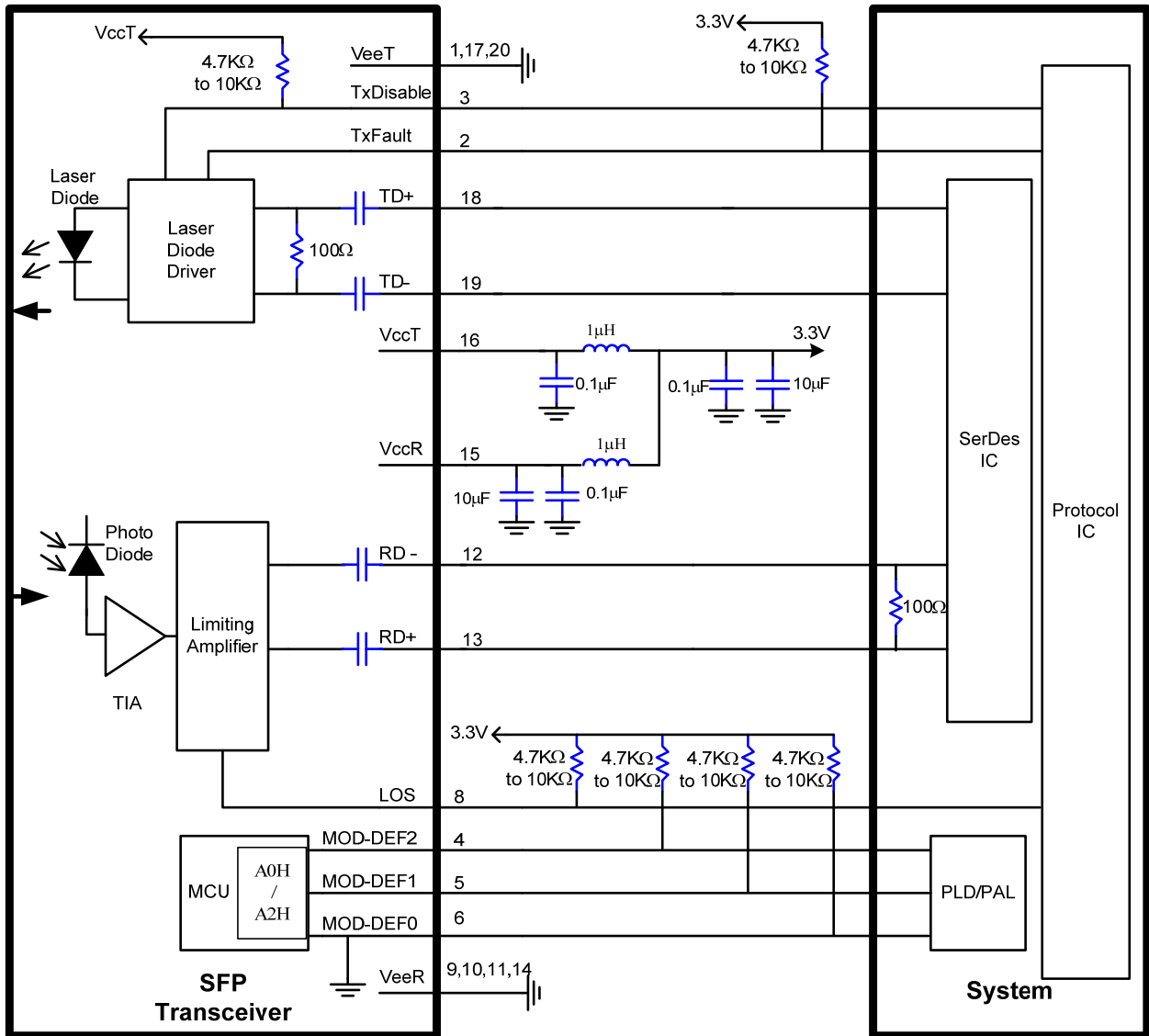
Parameter	Symbol	Min	Typ	Max	Unit
<b>Optical Characteristics</b>					
Optical Input Power-maximum	$P_{SATIN}$	0	--	--	dBm
Receiver Sensitivity ( PRBS= $2^7-1$ ; BER $\leq 10^{-12}$ )	$P_{SEN}$	--	--	-18	dBm
Operating Center Wavelength	$\lambda_C$	770	--	860	nm
Loss of Signal – De-asserted	$P_{LD}$	--	--	-18	dBm
Loss of Signal - Asserted	$P_{LA}$	-35	--	--	dBm
Loss of Signal - Hysteresis	$P_{LH}$	0.5	--	6	dB
<b>Electrical Characteristics</b>					
Differential Output Voltage	$V_{DIFF}$	0.4	--	2.0	V
Receiver Loss of Signal Output Voltage -Low	$V_{LOSL}$	0	--	0.8	V
Receiver Loss of Signal Output Voltage -High	$V_{LOSH}$	2	--	$V_{CC}+0.3$	V

### Pin Definition and Descriptions



Pin	Name	Input/Output Level	Description
1	VeeT	Input	Transmitter ground
2	TXFault	Output/LVTTL	Laser failure indication. High level indicates "laser failure". Externally pulled up
3	TXDisable	Input/LVTTL	Transmitter disable, High signal/open disables TX laser output. Low level enables TX output, internally pulled up.
4	MOD-DEF(2)	Input/output	Module definition 2, SDA, Data line for I2C bus. Externally pulled up
5	MOD-DEF(1)	Input	Module definition 1, SCL, Clock for I2C bus. Externally pulled up
6	MOD-DEF(0)	Output	Module definition 0, Module present. Ground inside module.
7	Rate Select	-	No connection.
8	LOS	Output/LVTTL	Receiver loss of signal indication. Low signal indicates optical signal is present at RX input. Should be Externally pulled up.
9	VeeR	Input	Receiver ground
10	VeeR	Input	Receiver ground
11	VeeR	Input	Receiver ground
12	RD -	Output/CML	Inverted receiver data output (AC coupled)
13	RD +	Output/CML	Non-inverted receiver data output (AC coupled)
14	VeeR	Input	Receiver ground
15	VccR	Input	Receiver power supply
16	VccT	Input	Transmitter power supply
17	VeeT	Input	Transmitter ground
18	TD +	Input/LVPECL	non-inverted transmitter data input (AC coupled)
19	TD -	Input/LVPECL	Inverted transmitter data input (AC coupled)
20	VeeT	Input	Transmitter ground

**Recommended Circuit Diagram**



**Content in 2-Wire Address A0H**

Address	HEX	Name of Field	Description
00	03	Identifier	SFP
01	04	Extended Identifier	SFP
02	07	Connector type	LC
03	00	Infiniband Compliance Codes	Not compliant
04	00	SONET Compliance Codes	Not compliant
05	00	SONET Compliance Codes	Not compliant
06	01	Ethernet Compliance Codes	1000BASE-SX
07	20	Fiber Channel link length	Intermediate distance
08	40	Fiber Channel transmitter technology	Shortwave laser w/o OFC (SN)
09	0C	Fiber Channel transmission media	Multimode M5/M6
10	01	Fiber Channel speed	100 MBytes/sec
11	01	Encoding codes:	8B/10B
12	0D	Nominal Bit Rate (units of 100Mbps)	1300Mbps
13	00	Rate identifier	Unspecified
14	00	Link length supported for 9um fiber	N/A (units of km)
15	00	Link length supported for 9um fiber	N/A (units of 100m)
16	37	Link length supported for 50um,OM2	550m (units of 10m)
17	1B	Link length supported for 62.5um,OM1	275m (units of 10m)
18	00	Link length supported for copper	N/A (units of 1m)
19	00	Link length supported for 50um,OM3	N/A (units of 10m)
20 ~ 35	46,4F,52,4D,45,52,49,43, 41,4F,45,20,20,20,20,20	Vendor Name	FORMERICA OE
36	00	Unallocated	
37 ~ 39	00,00,00	Vendor OUI	Unspecified
40 ~ 55	54,53,44,2D,53,31(32),43,48, 31,2D,43,31,31,20,20,20	Part Number	TSD-S1(2)CH1-C11
56 ~ 59	00,00,00,00	Vendor Revision number	Unspecified
60 ~ 61	03,52	Laser Wavelength	850nm
62	00	Unallocated	
63		CC_BASE:	Check sum of byte 0 ~ 62
64	00	Options	
65	1A	Options	TX-DIS, TX_FAULT, RX-LOS
66	00	Bit Rate, max.	Unspecified
67	00	Bit Rate, min.	Unspecified
68 ~ 83	Serial Number	Serial Number	
84 ~ 89	yy/mm/dd	Date Code	
90 ~ 91	20,20	Vendor specific lot code	Unspecified
92	68	Diagnostic Monitoring Type	Internal calibration
93	B0	Enhanced Options (soft)	All flags, TX_FAULT, RX-LOS
94	03	SFF-8472 Compliance	Rev10.2
95		CC_EXT	Check sum of byte 64 ~ 94
96~127		Vendor specific	

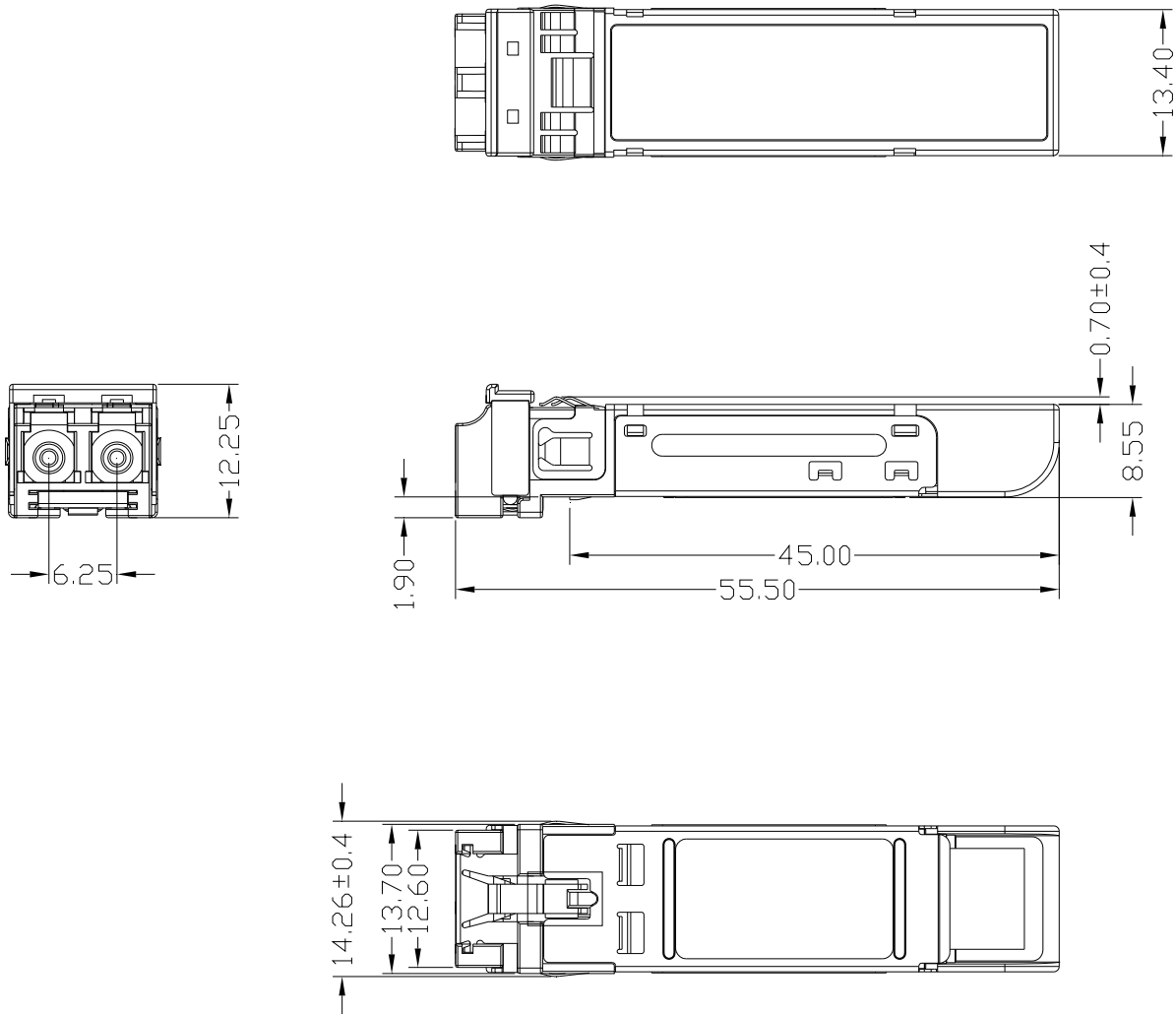
**Content in 2-Wire Address A2H**

Add	Bytes	Name	Hex	Real Value
00-01	2	Temp High Alarm*	6400 (6400)	100°C (100°C)
02-03	2	Temp Low Alarm*	F600 (D800)	-10°C (-40°C)
04-05	2	Temp High Warning*	5F00 (5F00)	95°C (95°C)
06-07	2	Temp Low Warning*	0000 (E200)	0°C (-30°C)
08-09	2	Voltage High Alarm	8CA0	3.6V
10-11	2	Voltage Low Alarm	7530	3.0V
12-13	2	Voltage High Warning	88B8	3.5V
14-15	2	Voltage Low Warning	7918	3.1V
16-17	2	Bias High Alarm	2710	20mA
18-19	2	Bias Low Alarm	0000	0mA
20-21	2	Bias High Warning	2328	18mA
22-23	2	Bias Low Warning	0000	0mA
24-25	2	TX Power High Alarm	1393	-3dBm
26-27	2	TX Power Low Alarm	0630	-8dBm
28-29	2	TX Power High Warning	0F8D	-4dBm
30-31	2	TX Power Low Warning	07CB	-7dBm
32-33	2	RX Power High Alarm	2710	0dBm
34-35	2	RX Power Low Alarm	007E	-19dBm
36-37	2	RX Power High Warning	1F07	-1dBm
38-39	2	RX Power Low Warning	009E	-18dBm
40-55	16	Reserved	00	-
56-59	4	RX_PWR(4)	00000000	0
60-63	4	RX_PWR(3)	00000000	0
64-67	4	RX_PWR(2)	00000000	0
68-71	4	RX_PWR(1)	3F800000	1
72-75	4	RX_PWR(0)	00000000	0
76-77	2	TX_I(Slope)	0100	1
78-79	2	TX_I(Offset)	0000	0
80-81	2	TX_PWR(Slope)	0100	1
82-83	2	TX_PWR(Offset)	0000	0
84-85	2	T(Slope)	0100	1
86-87	2	T(Offset)	0000	0
88-89	2	V(Slope)	0100	1
90-91	2	V(Offset)	0000	0
92-94	3	Reserved	00	-
95	1	Checksum		-

Note \*: ( ) for TSD-S2CH1-C11.

Mechanical Outlines

( Unit : mm)





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