

### PRODUCT FEATURES

- Twinax Direct-Attach Cable, Passive
- SFP28 to SFP28 Connectors
- Length: 50cm to 5 Meters
- Up to 25Gb/s data rate SFF-8402 Compliant
- Operating case temperature of 0-70 °C
- Single 3.3V supply voltage
- BER better than 10<sup>-15</sup>
- Hot pluggable
- Compliant with SFF-8432
- Compliant with IEEE 802.3by
- Compliant with RoHS



### APPLICATIONS

- 25G Ethernet

## Recommended Operation Condition

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Topc	0	70	degC
Storage Temperature	Tst	-40	125	degC
Relative Humidity (non-condensation)	RS	-	85	%
Supply Voltage	VCC3	3.135	3.465	V
Voltage on LVTTTL Input	Vilvttl	-0.3	VCC3 +0.2	V
Power Supply Current	ICC3	0.001	-	mA
Total Power Consumption	Pd	-	0.003	W

### Notes:

Stress or conditions exceed the above range may cause permanent damage to the device.

This is a stress rating only and functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not applied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## Frequency Domain

Item	Test Parameter	IEEE802.3by Specification
1	Differential Insertion Loss (SDD21)	Maximum insertion loss at 12.8906Ghz -22.48dB Minimum insertion loss at 12.8906Ghz -8dB
2	Differential Insertion Loss (SDD21)	Maximum insertion loss at 12.8906Ghz -22.48dB Minimum insertion loss at 12.8906Ghz -8dB
3	Differential Return Loss (SDD22)	-16.5+2xSQRT(f) @ 0.01 to 4.1GHz -10.66+14xLog10(f/5.5) @4.1 to 19GHz
4	Differential Return Loss (SDD11)	-16.5+2xSQRT(f) @ 0.01 to 4.1GHz -10.66+14xLog10(f/5.5) @4.1 to 19GHz
5	Common Mode Reflection (SCC22)	-2dB @ 0.01 to 19GHz
6	Common Mode Reflection (SCC11)	-2dB @ 0.01 to 19GHz
7	Common Mode Conversion (SCD22)	-22+(20/25.78)*(f) @ 0.01 to 12.89GHz -15+(6/25.78)*(f) @ 12.9 to 19GHz
8	Common Mode Conversion (SCD11)	-22+(20/25.78)*(f) @ 0.01 to 12.89GHz -15+(6/25.78)*(f) @ 12.9 to 19GHz
9	Differential to Common Mode Conversion Loss (SCD12)	-10dB @ 0.01 to 12.89GHz -27+(29/22)*(f) @ 12.9 to 15.7GHz -6.3dB @ 15.71 to 19GHz
10	Differential to Common Mode Conversion Loss (SCD21)	-10dB @ 0.01 to 12.89GHz -27+(29/22)*(f) @ 12.9 to 15.7GHz -6.3dB @ 15.71 to 19GHz

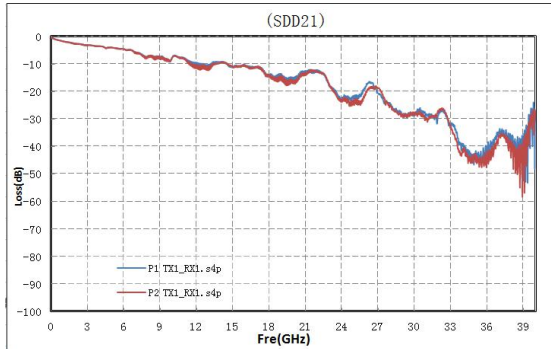
## Time Domain

Item	Test Parameter	Specification (Proposal )
1	Intra-Skew* 1M 1.5M~2M 2.5M~3M	20ps Max 25ps Max 30ps Max
2	Differential Impedance Rise time: 14ps (20%~80%)	100 +/- 10 Ohm
3	Insertion Loss* (SDD21) for 1M	a) 0.6GHz : -2.11 dB Max b) 1.25GHz : -2.88 dB Max c) 2.50GHz : -3.78 dB Max d) 3.25GHz : -4.95 dB Max e) 5.0GHz : -5.82 dB Max
	Insertion Loss* (SDD21) for 1.5M	a) 0.6GHz : -2.13 dB Max b) 1.25GHz : -3.24 dB Max c) 2.50GHz : -4.44 dB Max d) 3.25GHz : -5.99 dB Max e) 5.0GHz : -6.90 dB Max
	Insertion Loss* (SDD21) for 2M	a) 0.6GHz : -2.32 dB Max b) 1.25GHz : -3.76 dB Max c) 2.50GHz : -5.26 dB Max d) 3.25GHz : -7.20dB Max e) 5.0GHz : -8.14 dB Max
	Insertion Loss* (SDD21) for 2.5M	a) 0.6GHz : -2.58 dB Max b) 1.25GHz : -3.74 dB Max c) 2.50GHz : -5.27 dB Max d) 3.25GHz : -6.15dB Max e) 5.0GHz : -8.38 dB Max
	Insertion Loss* (SDD21) for 3M	a) 0.6GHz : -2.86 dB Max b) 1.25GHz : -4.24 dB Max c) 2.50GHz : -6.02 dB Max d) 3.25GHz : -6.99 dB Max e) 5.0GHz : -9.5 dB Max
	Insertion Loss* (SDD21) for 4M	a) 0.6GHz : -3.85 dB Max b) 1.25GHz : -5.45 dB Max c) 2.50GHz : -8 dB Max d) 3.25GHz : -9.45 dB Max e) 5.0GHz : -12.7 dB Max
	Insertion Loss* (SDD21) for 5M	a) 0.6GHz : -3.85 dB Max b) 1.25GHz : -5.45 dB Max c) 2.50GHz : -8 dB Max d) 3.25GHz : -9.45 dB Max e) 5.0GHz : -12.7 dB Max

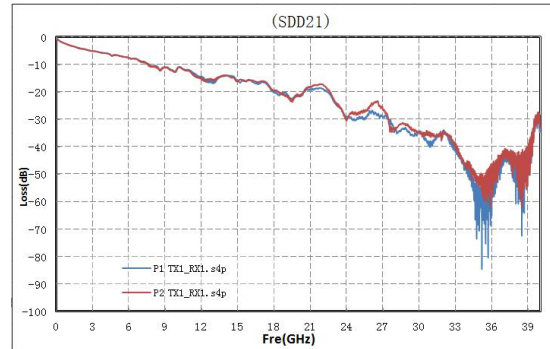
**\* Notes:**

The item 1and 3, Different diameter and length requirements, Different specification

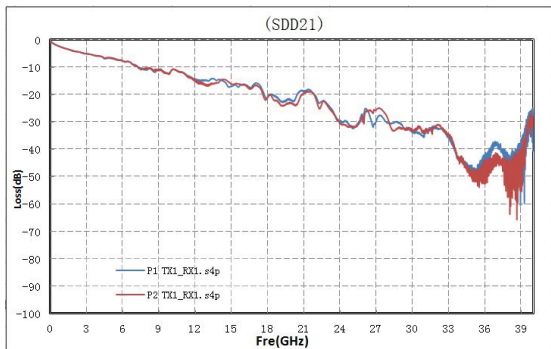
## Typical Operation Characteristics



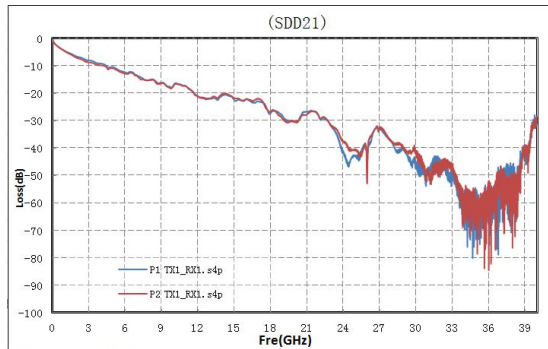
SFP28 30AWG 1M



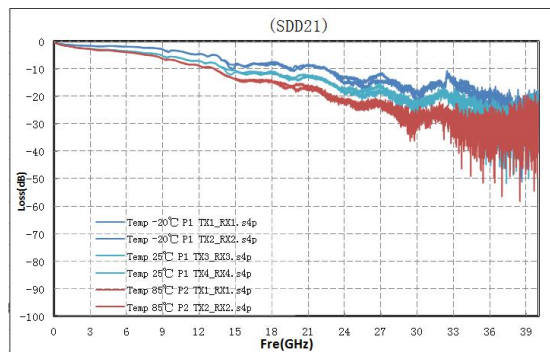
SFP28 30AWG 2M



SFP28 26AWG 3M



SFP28 26AWG 5M



Temperature test data (26AWG 3M)

## Host board Connector Pinout for SFP28

Figure 1 : MSA Compliant Connector

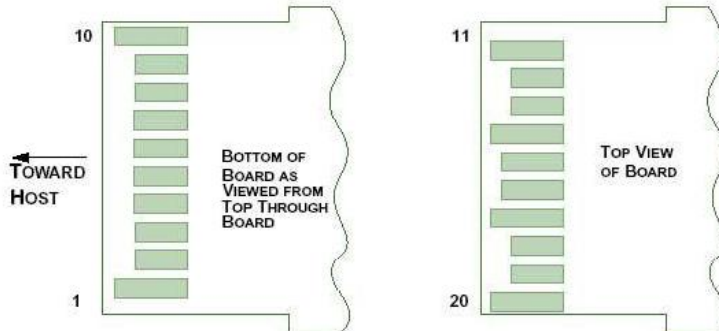


Figure 2: Pin Definitions.

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	Tx_Fault	Transmitter Fault	2
3	LVTTL-I	Tx_Disable	Transmitter Disable	3
4	LVTTL-I/O	SDA	MOD-DEF2 2-wire serial interface data line	4
5	LVTTL-I/O	SCL	MOD-DEF1 2-wire serial interface clock line	4
6		Mod_Abs	Module Absent	5
7	LVTTL-I	RS0	Rate Select Zero	
8	LVTTL-O	Rx_LOS	Module Receiver Loss of Signal	2
9	LVTTL-I	RS1	Rate Select One	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3V Supply	
16		VccT	Module Transmitter 3.3V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

**Notes:**

1. The module signal grounds, VeeR and VeeT, shall be isolated from the module case.
2. This is an open collector/drain output and shall be pulled up with 4.7-10k to Vcc\_Host on the host board. Pull ups can be

connected to multiple power supplies, however the host board design shall ensure that no module has voltage exceeding module  $V_{ccT/R} + 0.5 V$ .

3. This is an open collector/drain input and shall be pulled up with 4.7-10k to  $V_{ccT}$  in the module.
4. See 2-wire electrical specification.
5. This shall be pulled up with 4.7-10k to  $V_{cc\_Host}$  on the host board.

## 2 Wire Interface EEPROM

The EEPROM on the SFP28 passive cable assembly is designed for 256 addresses. The information for addresses 0 to 127 is listed below. This information can be tailored to any customer request. Any address can be altered to display customer specific information and more memory can be added if more addresses are needed. Addresses 128 to 255 can be reserved for customer specific information that is in addition to the SFF 8431 specification.

EEPROM Map			
Device 0xA0			
Address (Dec)	Value (Hex)	Name of Field (as per SFF-8431)	Description of data code
0	3	Identifier	03h = SFP/SFP+/SFP28
1	4	Extended identifier	04h = Serial ID defined
2	21	Code for Connector type	21h = Copper pigtail
3	0	Transceiver application supported	00h = Not specified
4	0	Escon compliance code	00h = Not specified
5	0	Sonnet compliance code	00h = Not specified
6	0	Ethernet compliance code	00h = Not specified
7	0	Fiber channel link length	00h = Not specified
8	4	Fiber channel Technology	04h = SFP+ Passive copper cable
9	0	Fiber channel Transmission media	00h = Not specified
10	0	Fiber channel speed	00h = Not specified
11	0	Code for high speed serial Encoding	00h = Not specified
12	FF	Nominal bit rate (unit: 100M bps)	FF = 255*100Mb or 25Gb
13	0	Reserved	00h = Not specified
14-17	0	Link length supported for Various type of fiber	00h = Not specified
18	1	Link length supported for copper or direct attach cable units of m	Note 1: use 01h for length < 1m Note 2: Fractional length are rounded up to the nearest integer
19	0	Link length supported for 50um OM3 fiber units of 10m	00h = Not specified

20-35	31 30 47 74 65 6B 20 20 20 20 ...	SFP28 Vendor name	
36	0	Code for electronic or optical compatibility	00h = Reserved
37	0	SFP28 Vendor IEEE company ID	
38	0		
39	0		
40	43		
41	41	Manufacture's P/N	
42	42		
43	5A		
44	53		
45	50		
46	2F		
47	5A		
48	53		
49	50		
50	2D		
51	50		
52	31		
53	4D		
54	20		
55	20		
56	30	Revision lever for part number provided by Vendor (ASCII)	1
57	31		
58	20		
59	20		
60	1	Laser Wavelength (Passive /Active Cable Specification compliance)	01h = Passive Cable
61	0		00h = Not specified
62	0	Reserved	
63	1E	Checksum	addresses 0 to 62
64	0	Indicates which options Transceiver signals are Implemented	00h = Copper passive (not used)
65	0		00h = Copper passive (not used)
66	0	Maximum bit rate margin	00h = Not specified
67	0	Minimum bit rate margin	00h = Not specified
68	41	Serial number Provided by Vendor (ASCII)	Fill in Manufacture's serial number "A1234560001" Extra Bytes are filled with space (20h)
69	31		
70	32		
71	33		
72	34		
73	35		
74	36		
75	30		
76	30		
77	30		
78	31		

79	20		
80	20		
81	20		
82	20		
83	20		
84	31	Vendor's manufacturing data code	ASCII code, Two low order digits of year.(00 = 2000) ASCII code, digits of month.(01= Jan through 12 = Dec) ASCII code, day of month.(01~31)
85	35		
86	31		
87	31		
88	32		
89	32		
90	20	Lot number	ASCII code, vendor specific lot code
91	20		
92	0	DD monitoring type	00h = Not specified
93	0	Enhanced software options	00h = Not specified
94	0	SFF-8472 compliance	00h = Digital diagnostic functionality not included or undefined
95	43	Check sum	addresses 64 to94
96-127	0	Vendor Specific ID Fields	0
128-255	FF	Reserved for SFF-8079 (address 128 to 255)	Not used

## Mechanical Specifications

Mechanical				
Parameter	Minimum	Typical	Maximum	Unit
Cable Diameter (26 AWG)		0.220		Inches
Bend Radius (26 AWG)	1.102			Inches
Cable Diameter (30 AWG)		0.181		Inches
Bend Radius (30 AWG)	0.905			Inches
Within Pair Skew			60	ps/5m
Cable Insertion Loss		24.06	28.90	dB/5m
Bulk Cable Time Delay			5.2	ns/m
Bulk Cable Impedance	95	100	105	Ohms
Insertion Force	/		20	N
Withdrawal Force	/		12.5	N
Retention Force	90		/	N
Durability	50 cycles		/	/



## Mechanical Dimensions

