



SFP28 Pluggable Passive Copper Cable Assemblies

TABLE OF CONTENTS

Introduction	2
Description	2
Features and Benefits	2
Product Applications.....	2
Industry Standards	2
Technical Documents.....	2
Part Numbers.....	3
Table 1. Part Number Selection Guide.....	3
Product Specifications	3
Table 2. Material Specifications	3
Table 3. Electrical/Mechanical Specifications	3
Table 4. Environmental Specifications	3
Table 5. Bulk Cable Specifications.....	4
Table 6. Operating Specifications	4
Pin Configurations.....	5
SFP28 Straight Cable Assembly.....	5
QSFP28 to 4x SFP28 Breakout Assembly.....	6
ASHREA	6
Guidelines	6
Plot	7
SFP28 Cable Assembly Mechanical Schematics	8
SFP28 to SFP28	8
QSFP28 to 4x QSFP28	8
EEPROM Memory Map	8
Signal Integrity Performance.....	8
Table 7. SFP28 to SFP28 DAC Channel Operating Margin (COM) per IEEE 802.3by CA-25G-L	8
Table 8. SFP28 to SFP28 DAC Types CA-N (no FEC), CA-S (short) and CA-L (long)	9
SFP28 to SFP28 DAC Signal Integrity Performance Plots	9

SFP28 Pluggable Passive Copper Cable Assemblies

INTRODUCTION

Description

TE Connectivity's (TE) SFP28 passive copper cable assembly features two differential copper pairs, providing one data transmission channel at speeds up to 28Gbps per channel, and meets 25G Ethernet requirements.

Offered in a broad range of wire gages – from 26AWG through 33AWG – this 25G copper cable assembly features low insertion loss and low cross talk.

Designed for applications in the data center, networking and telecommunications markets that require a high speed, reliable cable assembly, this next generation product shares the same mating interface with SFP+ form factor, making it backward compatible with existing SFP ports. SFP28 can be used with current 10G applications with substantial signal integrity margin.

TE also offers break out assemblies with a 100G QSFP28 module on one end breaking out to four 25G SFP28 modules on the opposite end of the assembly.

Features and Benefits

- Compatible with IEEE 802.3by and Fibre Channel industry standards
- Supports single lane data rate up to 28Gbps
- Optimized construction to minimize insertion loss and cross talk
- Customized cable braid termination limits EMI radiation
- Backward compatible with existing SFP+ form factor connectors and cages
- Pull-to-release latch pin design
- 26AWG through 33AWG cable
- Straight and breakout assembly configurations available
- Customizable EEPROM mapping for cable signature
- RoHS compliant

Product Applications

- Switches, servers and routers
- Data Center networks
- Storage area networks
- High performance computing
- Telecommunication and wireless infrastructure
- Test and measurement equipment

Industry Standards

- 25G Ethernet (IEEE 802.3by)
- Fibre Channel
- SFF-8402 SFP+ 1X 28Gb/s Pluggable Transceiver Solution (SFP28)
- SFF-8665 QSFP+ 28G 4X Pluggable Transceiver Solution (QSFP28)

Technical Documents

Product Specification

- 108-2364 Single Port and Ganged SFP+ Cages, zSFP+ Single Port and Ganged Cages, and SFP+ Copper Direct Attach Cable Assemblies
- 108-32081 QSFP28 Copper Module Direct Attach Cable Assembly

SFP28 Pluggable Passive Copper Cable Assemblies

PART NUMBERS

Table 1. Part Number Selection Guide

TEPN	Description	AWG	Cable Assembly Length (meters)						
			0.5	1	1.5	2	3	4	5
2821262	SFP28 to SFP28 Straight Assembly	33	-1	-2	-3	-4			
2821222		30	-5	-3		-2	-1		
2821223		28				-2	-1	-3	
2821224		26					-1	-2	-3
2821033	QSFP28 to 4x SFP28 Breakout Assembly	33		-8					
		30		-1		-10	-2		
		28					-4		
		26					-12	-5	-3

Contact TE for customized lengths.

PRODUCT SPECIFICATIONS

Table 2. Material Specifications

PCB	Halogen Free low loss laminate
	IPC Class 3
Contact	30µin min hard Gold plated contact pads
Backshell	Nickel plated zinc diecast
Latch Pin	Nickel plated brass
Pull Tab	Molded polypropylene
Bulk Cable	Silver plated copper conductor
	Flexible PVC jacket
	Metallic tape pair shield

Table 3. Electrical/Mechanical Specifications

Impedance	100Ω
Data Rate	28Gbps per channel
Durability	250 cycles
Mating Force	40N maximum

Table 4. Environmental Specifications

Operating Temp	-10°C to 55°C
Storage Temp	-10°C to 55°C
Safety Certifications	RoHS compliant
	UL Type CL2
	CSA Certified

SFP28 Pluggable Passive Copper Cable Assemblies

Table 5. Bulk Cable Specifications

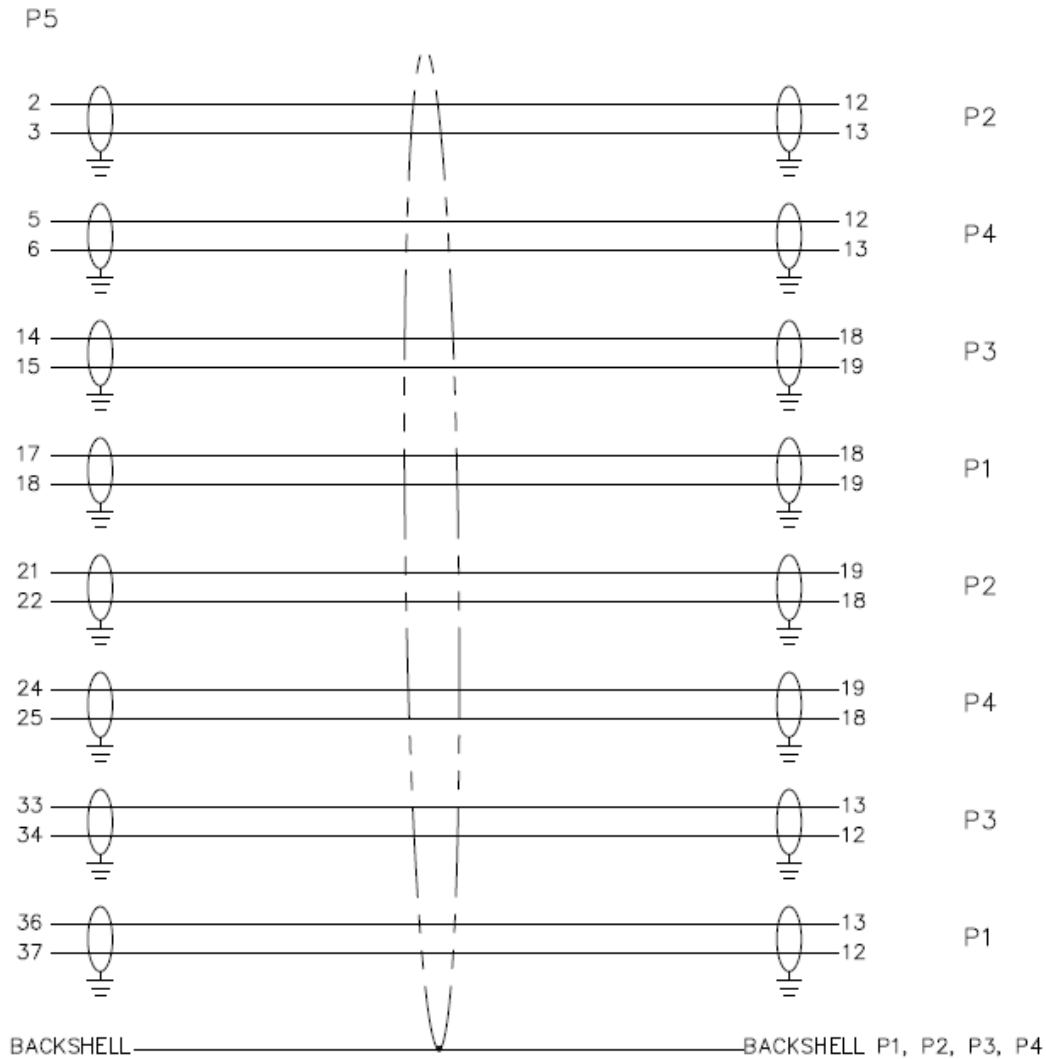
Bend Radius	7x OD Dynamic
2 pair Cable OD	33AWG= 2.92 mm
	30AWG= 4.19 mm
	28AWG= 4.83 mm
	26AWG= 5.59 mm
Attenuation at 12.89 GH	33AWG= 8.3 dB/m
	30AWG= 4.5 dB/m
	28AWG= 3.7 dB/m
	26AWG=2.8 dB/m

Table 6. Operating Specifications

Parameter	Min	Nominal	Max	Unit
Operating Voltage	3.13	3.3	3.46	V
Two-Wire SCL Frequency			400	kHz
Passive QSFP28 Power (per connector)	2.5	6.1	14.4	mW
Passive SFP28 Power (per connector)	4.9	9.6	16.4	mW
Operating Data Rate	0.01		28	Gbps

SFP28 Pluggable Passive Copper Cable Assemblies

QSFP28 to 4x SFP28 Breakout Assembly



ASHREA

Guidelines

ASHRAE stands for the American Society of Heating, Refrigerating, and Air-Conditioning Engineers. Founded in 1894, it is a global society advancing human well-being through sustainable technology for the built environment. ASHRAE focuses on building systems, energy efficiency, indoor air quality, refrigeration and sustainability.

ASHRAE publishes a well-recognized series of standards and guidelines relating to HVAC systems and issues. These standards are often referenced in building codes, and are considered useful standards for use by consulting engineers, mechanical contractors, architects, and government agencies. These building codes are commonly accepted standards for architects and engineers.

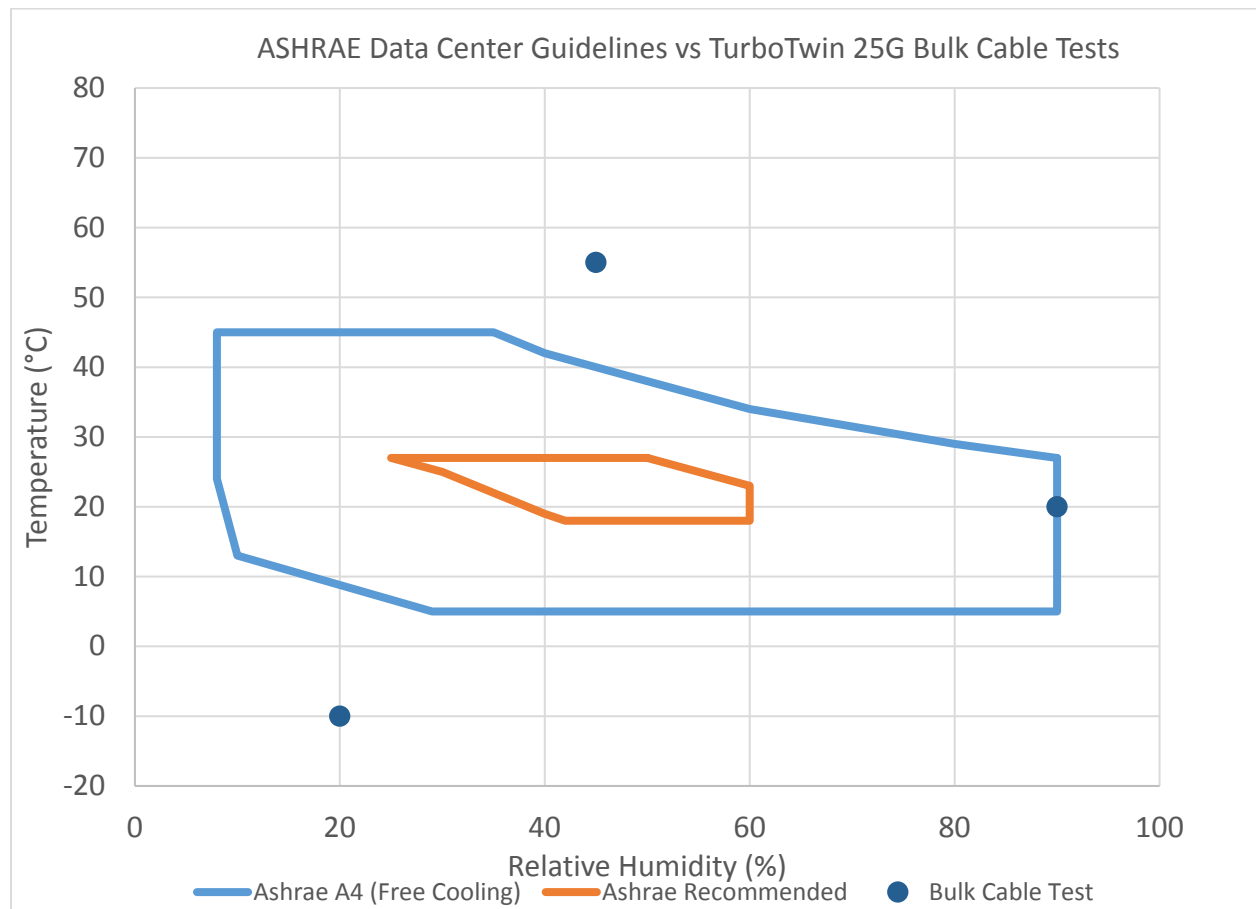
SFP28 Pluggable Passive Copper Cable Assemblies

ASHRAE Technical Committee 9.9, Mission Critical Facilities, Technology Spaces and Electronic Equipment, brings together the interests of the data center industry in the area of data center cooling technologies. ASHRAE developed the Thermal Guidelines for Data Processing Environments that establishes a framework for cooling requirements in the data center. These Guidelines define four classes of data center equipment (A1 through A4) based on the equipment's operating temperature and relative humidity requirements.

The ASHRAE recommended A1 range defines the range where the most reliable and power efficient operation of the data center can be achieved based on ITE manufacturers' input. The ASHRAE A4 range (free cooling) is the broadest range in terms of temperature and relative humidity extremes.

TE tested 25G bulk cable at max and min recommended operating temperatures and plotted the results versus ASHRAE A1 and A4 classes. At both extreme temperatures, TE bulk cable exceeds ASHRAE recommended guidelines at the free cooling A4 range.

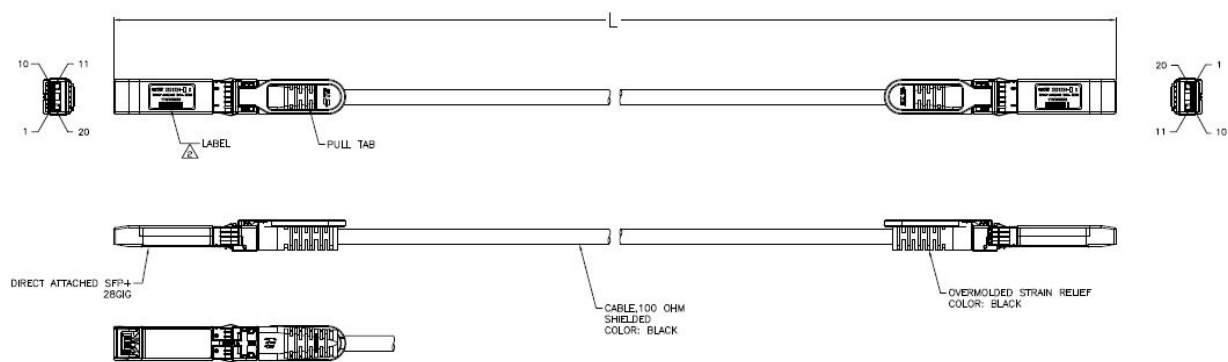
Plot



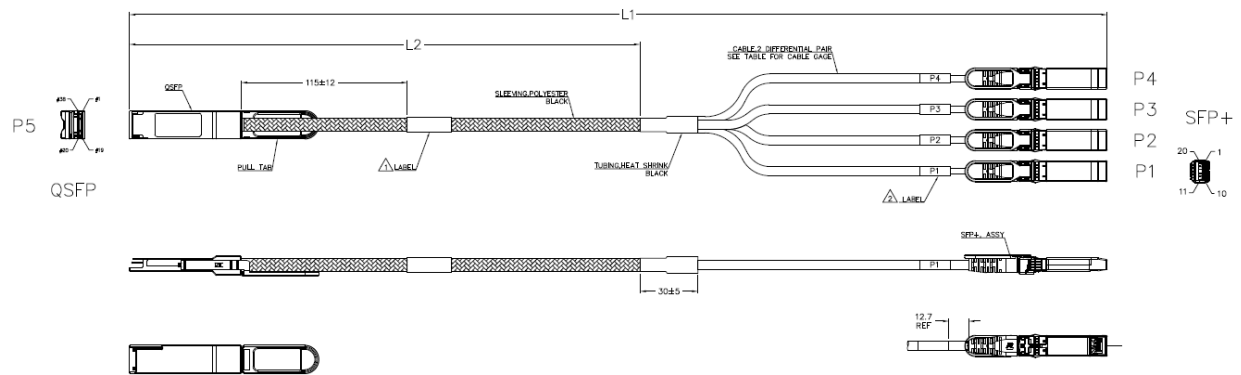
SFP28 Pluggable Passive Copper Cable Assemblies

SFP28 CABLE ASSEMBLY MECHANICAL SCHEMATICS

SFP28 to SFP28



QSFP28 to 4x QSFP28



EEPROM MEMORY MAP

To access detailed EEPROM memory mapping for these cable assemblies, please click on the following hyperlinks:

- [EEPROM Map SFP28 Straight Assembly](#)
- [EEPROM Map SFP28 Breakout Assembly](#)

SIGNAL INTEGRITY PERFORMANCE

Table 7. SFP28 to SFP28 DAC Channel Operating Margin (COM) per IEEE 802.3by CA-25G-L

Assembly Length	Wire Gauge	Case 1	Case 2
3 meter	30 AWG	6.21	5.11
5 meter	26 AWG	5.56	4.42

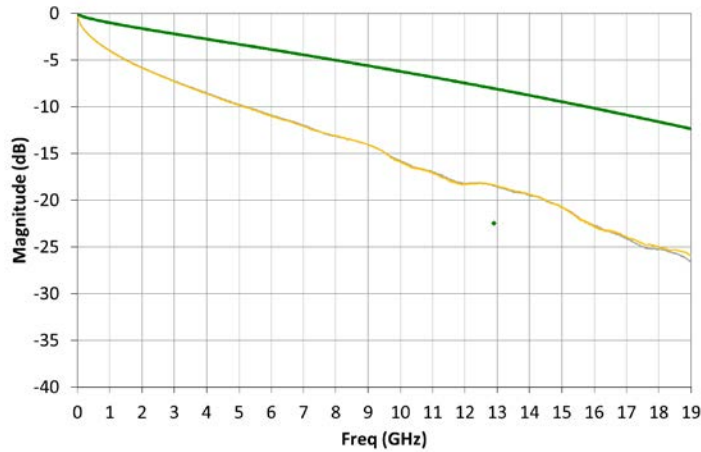
SFP28 Pluggable Passive Copper Cable Assemblies

Table 8. SFP28 to SFP28 DAC Types CA-N (no FEC), CA-S (short) and CA-L (long)

TE Part Number	Configuration	IEEE 802.3by
2821262-1	0.5m 33AWG	CA-N
2821262-2	1m 33AWG	CA-N
2821262-3	1.5m 33AWG	CA-L
2821262-4	2m 33AWG	CA-L
2821222-1	3m 30AWG	CA-L
2821222-2	2m 30AWG	CA-S
2821222-3	1m 30AWG	CA-N
2821222-5	0.5m 30AWG	CA-N
2821223-1	3m 28AWG	CA-L
2821223-2	2m 28AWG	CA-N
2821223-3	4m 28AWG	CA-L
2821224-1	3m 26AWG	CA-S
2821224-2	4m 26AWG	CA-L
2821224-3	5m 26AWG	CA-L

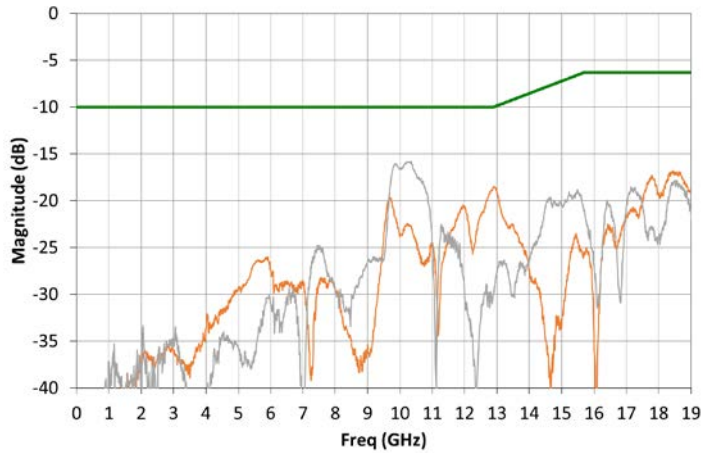
SFP28 to SFP28 DAC Signal Integrity Performance Plots

Insertion Loss (SDD21) of 3m 30AWG SFP28

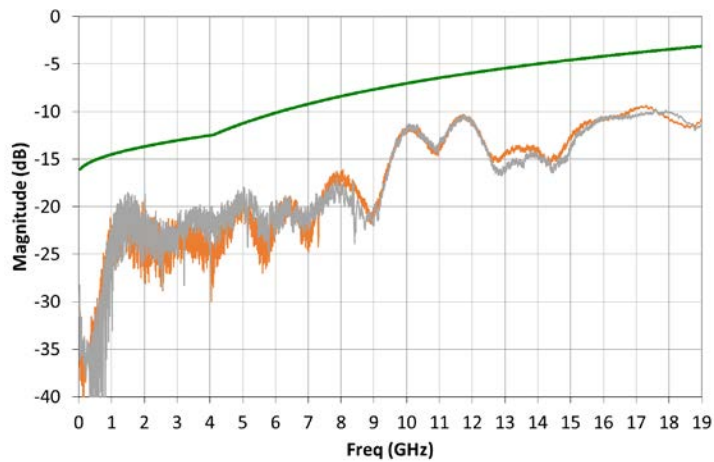


SFP28 Pluggable Passive Copper Cable Assemblies

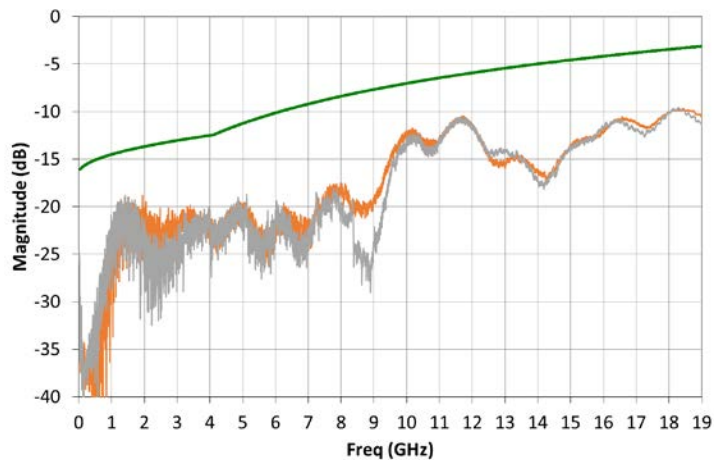
Mode Conversion (SCD21) of 3m 30AWG SFP28



Return Loss (SDD11) of 3m 30AWG SFP28

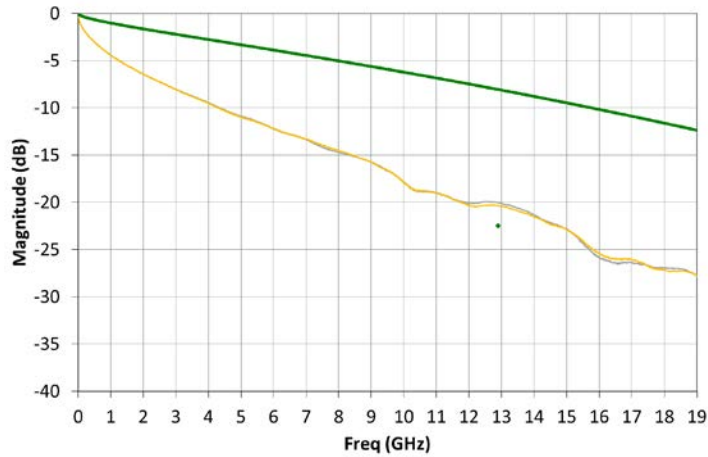


Return Loss (SDD22) of 3m 30AWG SFP28



SFP28 Pluggable Passive Copper Cable Assemblies

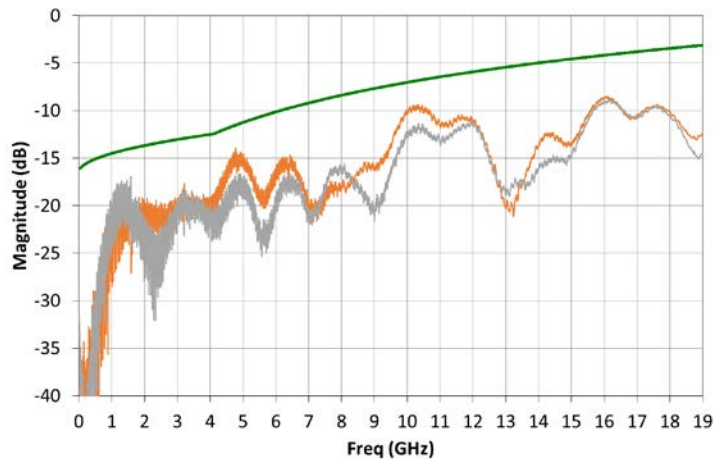
Insertion Loss (SDD21) of 4m 28AWG SFP28



Conversion Mode (SCD21) of 4m 28AWG SFP28

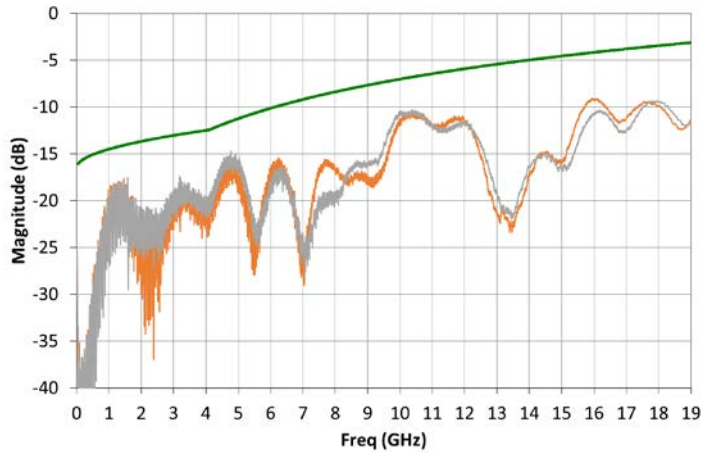


Return Loss (SDD11) of 4m 28AWG SFP28

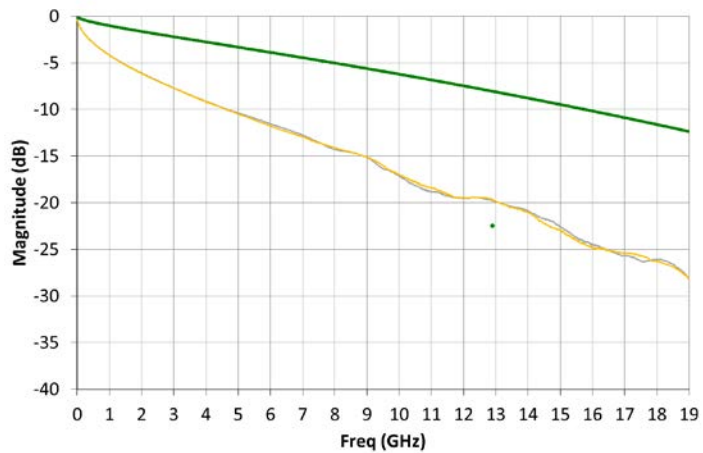


SFP28 Pluggable Passive Copper Cable Assemblies

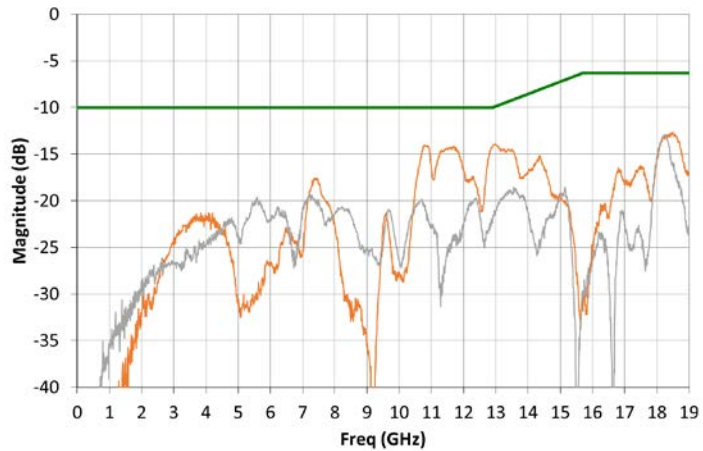
Return Loss (SDD22) of 4m 28AWG SFP28



Insertion Loss (SDD21) of 5m 26AWG SFP28

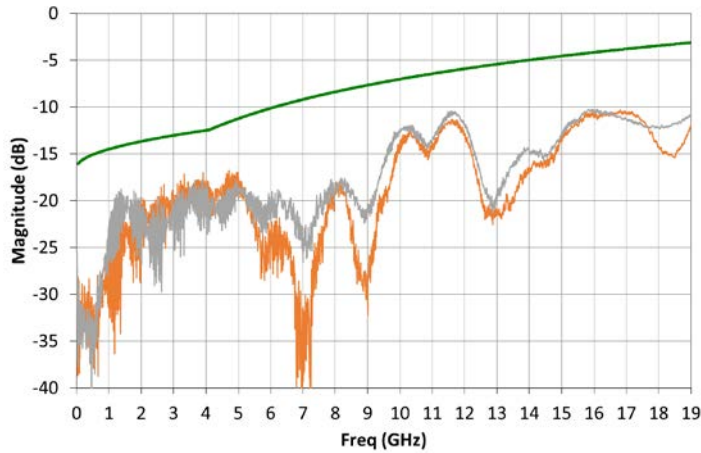


Conversion Mode (SCD21) of 5m 26AWG SFP28

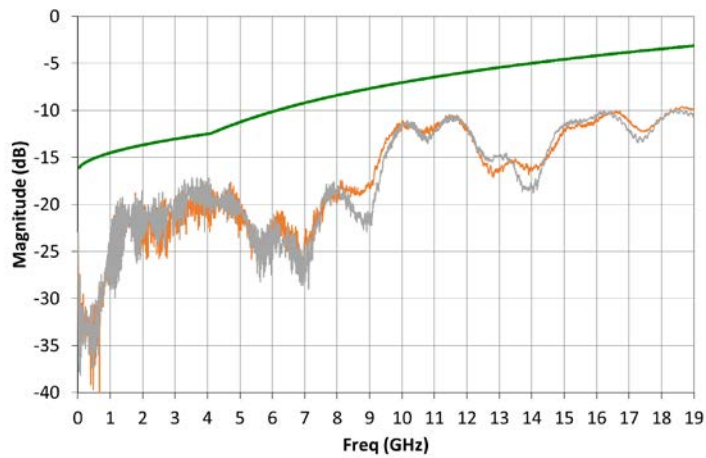


SFP28 Pluggable Passive Copper Cable Assemblies

Return Loss (SDD11) of 5m 26AWG SFP28



Return Loss (SDD22) of 5m 26AWG SFP28



While TE has made every reasonable effort to ensure the accuracy of the information in this document, TE does not guarantee that it is error-free, nor does TE make any other representation, warranty or guarantee that the information is accurate, correct, reliable or current. TE reserves the right to make any adjustments to the information contained herein at any time without notice. TE EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES REGARDING THE INFORMATION CONTAINED HEREIN, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event will TE be liable for any direct, indirect, incidental, special or consequential damages arising from or related to recipient's use of the information. It is the sole responsibility of recipient of this information to verify the results of this information using their engineering and product environment. Recipient assumes any and all risks associated with the use of the information.