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1.0 SCOPE

This specification is applicable to the performance characteristics of QSFP+ cable to board connector system.

2.0 PRODUCT DESCRIPTION

2.1 PRODUCT NAME AND SERIES NUMBER(S)

Product	Series P/N	Test Sections Do Not Apply
10G QSFP Cable Assembly	10093084	
14G QSFP+ Cable Assembly	10119239	
28G QSFP+ Cable Assembly	10121178	
QSFP SMT Board Connector	10099113/10132344	
QSFP Cage	10099114/10128765/10130975	
QSFP Heat Sink	10099115	
QSFP Heat Sink Clip	10099116	
QSFP Cage with Sink and Clip Assembly	10116015/10128764	
Custom QSFP Cable Assembly	10110113	3.2, 6.4, 6.5
Custom QSFP Cable Assembly	10111727	3.2, 6.4, 6.5

2.2 DIMENSIONS, MATERIALS, PLATING AND MARKINGS

Refer to the applicable customer drawing for the related dimensional, material, plating, and marking information.

2.3 ADDITIONAL GENERAL SPECIFICATIONS

Plug PCB:

- Material: FR4
- Overall thickness: 1.05mm $\pm$ 0.1(over pads)
- Mating interface plating: Hard gold over nickel

Bulk Cable:

- As listed on the cable specification drawings.

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3.0 REFERENCE DOCUMENTS

3.1 FCI DOCUMENTS

GS-14-1272	Cable Assembly Packaging Specification
GS-14-1400	Board Connector, Cage, and Heat Sink Packaging Specification
GS-20-126	Board Connector, Cage, and Heat Sink Product Application Specification.
SI-2009-09-004	10G QSFP+ Signal Integrity Performance Report (This Applies Only To Standard Part Number)
SI-VG-2012-04-001	14G QSFP+ Signal Integrity Performance Report (This only applies to the 14G QSFP+ Part Number)
SI-VG-2012-11-013	4x28G QSFP+ Signal Integrity Performance Reports (This applies only to the 28G P/N)
SI-VG-2012-11-021	4x28G QSFP+ Signal Integrity Performance Reports (This applies only to the 28G P/N)
GS-29-622	10G Qualification Test Report Summary
EL-2012-05-033	14G Qualification Test Report
EL-2012-12-023	28G Qualification Test Report

3.2 INDUSTRY DOCUMENTS

FIT, FORM AND FUNCTION

SFF-8436	QSFP+ Copper and Optical Modules
SFF-8661	QSFP+ 28 Gb/s 4X Pluggable Module (Style A)
SFF-8662	QSFP+ 28 Gb/s 4X Connector (Style A) or
SFF-8672	QSFP+ 28 Gb/s 4X Connector (Style B)
SFF-8663	QSFP+ 28 Gb/s 4X Cage (Style A)
IEEE 802.3	Gigabit Ethernet Standard
Infiniband IBTA FDR	(This applies only to the 14G QSFP+ P/N)
InfiniBand IBTA EDR	(This applies only to the 4x28G QSFP+ P/N)
ITU-T G.957	Synchronous Digital Hierarchy Standard
Telcordia Technologies GR-253-CORE	
JEDEC JESD22-A-114B	ESD Specification

TEST SPECIFICATON(S)

EIA 364 Series	Electrical Connector Test Procedures Including Environmental Classifications with Test Procedure
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4.0 QUALIFICATION

Connector and cable assemblies furnished under this specification shall be capable of meeting the qualification test requirements specified herein and shall be uniform in quality, and void of all defects that would adversely affect life or serviceability.

5.0 RATINGS

5.1 VOLTAGE

30 Volts AC per Contact (RMS)/DC Max.

5.2 CURRENT

0.5 Amps Max (per contact)
1.0 Amp Max (per power pin)

5.3 TEMPERATURE

Operating: -40°C to +85°C

6.0 PERFORMANCE

6.1 ELECTRICAL CHARACTERISTICS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.1.1	LLCR	Mate connectors: apply a maximum voltage of 320 mV and a current of 10 mA. (EIA 364-6)	20 milliohm maximum change from initial after environmental exposure
6.1.2	Insulation Resistance	After 100 VDC for 1 minute, measure the insulation resistance between adjacent mated contacts. (EIA 364-21)	1000 mΩ Minimum between adjacent contacts
6.1.3	Dielectric Withstanding Voltage	Apply a voltage of 300 VDC for 1 minute hold between adjacent mated terminals. (EIA 364-20, method B)	No defect between adjacent contacts
6.1.4	Temperature Rise (via Current Cycling)	Mate connectors: measure the temperature rise at the rated current after 96 hours (45 minutes ON and 15 minutes OFF per hour). Testing as required.	Temperature rise: +30°C MAX.

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6.1.5	Differential Impedance	Rise time of 70ps (20% to 80%) (EIA 364-108)	No significant electrical change
6.1.6	Continuity	Verify the continuous electrical path of all expected connections	No unexpected opens, shorts, or high resistance areas.

6.2 ESD Requirements

The module shall meet ESD requirements given in EN61000-4-2, criterion B test specification such that when installed in a properly grounded cage and chassis the units are subjected to 15KV air discharges during operation and 8KV direct contact discharges to the case.

The QSFP+ module and host SFI contacts (High Speed Contacts) shall withstand 1000V electrostatic discharge based on human body model per JEDEC JESD22-A114-B.

The QSFP+ module and host SFI contacts with the exception of the SFI contacts (High Speed Contacts) shall withstand 2kV electrostatic discharge based on human body model per JEDEC JESD22-A114-B.

The QSFP+ module shall meet ESD requirements given in EN61000-4-2, criterion B test specification such that units are subjected to 15kV air discharges during operation and 8kv direct contact discharges to the case.

6.3 EMI Protection

The chassis ground of the QSFP+ module is isolated from the modules circuit ground to provide the equipment designer flexibility regarding connections between external electromagnetic interference shields and circuit ground of the module.

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6.4 QSFP+ Cable Assembly Pin Assignment (Figure 3). See Specification SFF- 8436 section 4. Module mechanicals meet the requirements of specification SFF-8436.

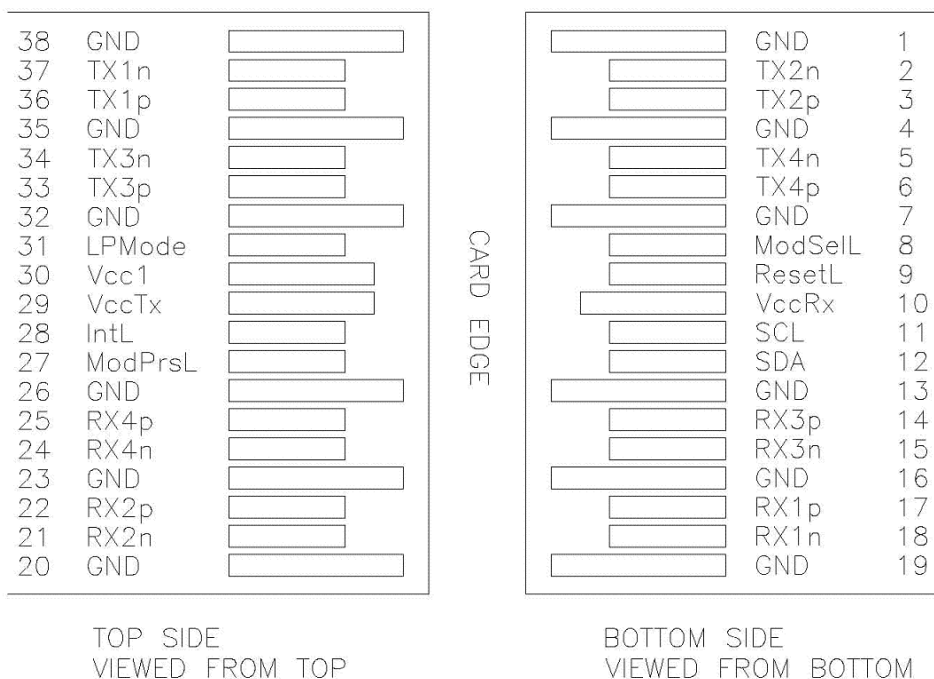


FIGURE 3
QSFP+ Module Contact Definition

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6.5 2 Wire Interface EEPROM

The QSFP+ serial ID provides access to sophisticated identification information that describes the Transceiver's capabilities, standard interfaces, manufacturer, and other information. The EEPROM on the QSFP+ passive cable assembly is designed for 255 addresses.

10G QSFP+ & 14G FDR & 28G EDR EEPROM information and source Refer to below document

TYPE	FCI PN
FCI STANDARD QSFP+	10093084
FCI STANDARD FDR	10119329
FCI STANDARD EDR	10121178

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IBTA Volume2 - v2r1_3_1.140226-Draft and SFF-8636 revision 1.4					FCI 10G QDR QSFP+ to QSFP+	FCI 14G FDR QSFP+ to QSFP+	FCI 28G EDR QSFP+ to QSFP+	FCI 10G QDR QSFP+ to QSFP+	FCI 14G FDR QSFP+ to QSFP+	FCI 28G EDR QSFP+ to QSFP+
			Address		10093084-	10119239-	10121178-	10093084-	10119239-	10121178-
Name of Field			Addr (Dec)	Addr (Hex)	Value (Hex)	Value (Hex)	Value (Hex)	Value (ASCII)	Value (ASCII)	Value (ASCII)
ID and status	Identifier		0	0	D	D	D			
	Revision Compliance		1	1	2	4	4			
	Status	With MCU : 0x02 ; Without MCU : 0x06 ;	2	2	6	6	6			
Interrupt Flags			3	3	0	0	0			
			4	4	0	0	0			
			5	5	0	0	0			
			6	6	0	0	0			
			7	7	0	0	0			
			8	8	0	0	0			
			9	9	0	0	0			
			10	A	0	0	0			
			11	B	0	0	0			
			12	C	0	0	0			
			13	D	0	0	0			
			14	E	0	0	0			
			15	F	0	0	0			
			16	10	0	0	0			
			17	11	0	0	0			
			18	12	0	0	0			
			19	13	0	0	0			
			20	14	0	0	0			
			21	15	0	0	0			
			22	16	0	0	0			
Channel Monitors			23	17	0	0	0			
			24	18	0	0	0			
			25	19	0	0	0			
			26	1A	0	0	0			
			27	1B	0	0	0			
			28	1C	0	0	0			
			29	1D	0	0	0			
			30	1E	0	0	0			
			31	1F	0	0	0			
			32	20	0	0	0			
			33	21	0	0	0			
			34	22	0	0	0			
			35	23	0	0	0			
			36	24	0	0	0			
			37	25	0	0	0			
			38	26	0	0	0			
			39	27	0	0	0			
			40	28	0	0	0			
			41	29	0	0	0			
			42	2A	0	0	0			
			43	2B	0	0	0			
			44	2C	0	0	0			
			45	2D	0	0	0			
			46	2E	0	0	0			
			47	2F	0	0	0			
			48	30	0	0	0			
			49	31	0	0	0			
			50	32	0	0	0			
			51	33	0	0	0			
			52	34	0	0	0			
			53	35	0	0	0			
			54	36	0	0	0			
			55	37	0	0	0			
			56	38	0	0	0			
			57	39	0	0	0			
			58	3A	0	0	0			
			59	3B	0	0	0			
			60	3C	0	0	0			
			61	3D	0	0	0			
			62	3E	0	0	0			
			63	3F	0	0	0			
			64	40	0	0	0			
			65	41	0	0	0			
			66	42	0	0	0			
			67	43	0	0	0			
			68	44	0	0	0			
			69	45	0	0	0			
			70	46	0	0	0			
			71	47	0	0	0			

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			72	48	0	0	0
			73	49	0	0	0
			74	4A	0	0	0
			75	4B	0	0	0
			76	4C	0	0	0
			77	4D	0	0	0
			78	4E	0	0	0
			79	4F	0	0	0
			80	50	0	0	0
			81	51	0	0	0
Reserved			82	52	0	0	0
			83	53	0	0	0
			84	54	0	0	0
			85	55	0	0	0
Control			86	56	0	0	0
			87	57	0	0	0
			88	58	0	0	0
			89	59	0	0	0
			90	5A	0	0	0
			91	5B	0	0	0
			92	5C	0	0	0
			93	5D	0	0	0
			94	5E	0	0	0
			95	5F	0	0	0
Reserved			96	60	0	0	0
			97	61	0	0	0
			98	62	0	0	0
			99	63	0	0	0
Free Side Device Indicators and Channel Masks			100	64	0	0	0
			101	65	0	0	0
			102	66	0	0	0
			103	67	0	0	0
			104	68	0	0	0
			105	69	0	0	0
Reserved			106	6A	0	0	0
			107	6B	0	0	0
			108	6C	0	0	0
			109	6D	0	0	0
Free Side Device Properties			110	6E	8	8	8
			111	6F	0	0	0
Reserved			112	70	0	0	0
			113	71	0	0	0
			114	72	0	0	0
			115	73	0	0	0
			116	74	0	0	0
			117	75	0	0	0
			118	76	0	0	0
Password Change Entry Area (Optional)			119	77	0	0	0
			120	78	0	0	0
			121	79	0	0	0
			122	7A	0	0	0
Password Entry Area (Optional)			123	7B	0	0	0
			124	7C	0	0	0
			125	7D	0	0	0
			126	7E	0	0	0
Page Select Byte			127	7F	0	0	0

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Base ID Fields	Identifier	128	80	D	D	D			
	Ext. Identifier	129	81	0	0	0			
	Connector	130	82	23	23	23			
	10/40G Ethernet Compliance Code	131	83	8	8	8			
	SONET Compliance codes	132	84	0	0	0			
	SAS/SATA compliance codes	133	85	0	0	0			
	Gigabit Ethernet Compliance codes	134	86	C	C	C			
	Fibre Channel link length	135	87	0	0	0			
	Fibre Channel Transmitter Technology	136	88	0	0	0			
	Fibre Channel transmission media	137	89	80	80	80			
Encoding	Fibre Channel Speed	138	8A	C5	C5	C5			
	BR, nominal	139	8B	0	0	0			
	Extended RateSelect	140	8C	0	0	0			
	Length(OM3)	141	8D	0	0	0			
	Length(OM3 50 um)	142	8E	0	0	0			
	Length(OM2 50 um)	143	8F	0	0	0			
	Length(OM2 62.5 um)	144	90	0	0	0			
	Length(OM3 62.5 um)	145	91	0	0	0			
	Cable Assembly	146	92	0	0	0			
	Length (Passive or active)	147	93	A0	A0	A0			
Device tech	148	94	45	45	45	45			
	149	95	43	43	43	43			
	150	96	49	49	49	49			
	151	97	20	20	20	20			
	152	98	45	45	45	45			
	153	99	6C	6C	6C	6C			
	154	9A	65	65	65	65			
	155	9B	63	63	63	63			
	156	9C	74	74	74	74			
	157	9D	72	72	72	72			
Vendor name	158	9E	6F	6F	6F	6F			
	159	9F	6E	6E	6E	6E			
	160	A0	69	69	69	69			
	161	A1	63	63	63	63			
	162	A2	73	73	73	73			
	163	A3	20	20	20	20			
	164	A4	7	7	7	7			
	165	A5	FC	FC	FC	FC			
	166	A6	7C	7C	7C	7C			
	167	A7	E7	E7	E7	E7			
Extended Module	168	A8	31	31	31	31			
	169	A9	30	30	30	30			
	170	AA	20	20	20	20			
	171	AB	31	31	31	31			
	172	AC	39	39	39	39			
	173	AD	30	30	30	30			
	174	AE	38	38	38	38			
	175	AF	34	34	34	34			
	176	B0	20	20	20	20			
	177	B1	20	20	20	20			
Vendor OUI	178	B2	20	20	20	20			
	179	B3	20	20	20	20			
	180	B4	20	20	20	20			
	181	B5	20	20	20	20			
	182	B6	20	20	20	20			
	183	B7	20	20	20	20			
	184	B8	20	20	20	20			
	185	B9	20	20	20	20			
	186	BA	0	0	0	0			
	187	BB	0	0	0	0			
Vendor PN	188	BC	0	0	0	0			
	189	BD	0	0	0	0			
	190	BE	0	0	0	0			
	191	BF	0	0	0	0			
	192	C0	0	0	0	0			
	193	C1	0	0	0	0			
	194	C2	0	0	0	0			
	195	C3	0	0	0	0			
	196	C4	43	43	43	43			
	197	C5	4E	4E	4E	4E			
Vendor Rev	198	C6	31	31	31	31			
	199	C7	34	34	34	34			
	200	C8	31	31	31	31			
	201	C9	39	39	39	39			
	202	CA	51	51	51	51			
	203	CB	41	41	41	41			
	204	CC	20	20	20	20			
	205	CD	20	20	20	20			
	206	CE	20	20	20	20			
	207	CF	20	20	20	20			
Wavelength or Copper Cable	208	D0	30	30	30	30			
	209	D1	30	30	30	30			
	210	D2	30	30	30	30			
	211	D3	31	31	31	31			
	212	D4	30	30	30	30			
	213	D5	30	30	30	30			
	214	D6	30	30	30	30			
	215	D7	30	30	30	30			
	216	D8	30	30	30	30			
	217	D9	30	30	30	30			
Wavelength tolerance or Copper Cable Attenuation	218	DA	0	0	0	0			
	219	DB	0	0	0	0			
	220	DC	0	0	0	0			
	221	DD	0	0	0	0			
	222	DE	0	0	0	0			
	223	DF	0	0	0	0			
	224	DF	0	0	0	0			
	225	DF	0	0	0	0			
	226	DF	0	0	0	0			
	227	DF	0	0	0	0			
Max case temp.	228	DF	0	0	0	0			
	229	DF	0	0	0	0			
	230	DF	0	0	0	0			
	231	DF	0	0	0	0			
	232	DF	0	0	0	0			
	233	DF	0	0	0	0			
	234	DF	0	0	0	0			
	235	DF	0	0	0	0			
	236	DF	0	0	0	0			
	237	DF	0	0	0	0			
CC BASE	238	DF	0	0	0	0			
	239	DF	0	0	0	0			
	240	DF	0	0	0	0			
	241	DF	0	0	0	0			
	242	DF	0	0	0	0			
	243	DF	0	0	0	0			
	244	DF	0	0	0	0			
	245	DF	0	0	0	0			
	246	DF	0	0	0	0			
	247	DF	0	0	0	0			
Options	248	DF	0	0	0	0			
	249	DF	0	0	0	0			
	250	DF	0	0	0	0			
	251	DF	0	0	0	0			
	252	DF	0	0	0	0			
	253	DF	0	0	0	0			
	254	DF	0	0	0	0			
	255	DF	0	0	0	0			
	256	DF	0	0	0	0			
	257	DF	0	0	0	0			
Vendor SN	258	DF	0	0	0	0			
	259	DF	0	0	0	0			
	260	DF	0	0	0	0			
	261	DF	0	0	0	0			
	262	DF	0	0	0	0			
	263	DF	0	0	0	0			
	264	DF	0	0	0	0			
	265	DF	0	0	0	0			
	266	DF	0	0	0	0			
	267	DF	0	0	0	0			

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d ID	Date Code	212	D4	31	31	31	1	1	1
		213	D5	34	34	34	4	4	4
		214	D6	30	30	30	0	0	0
		215	D7	35	35	35	5	5	5
		216	D8	30	30	30	0	0	0
		217	D9	38	38	38	8	8	8
		218	DA	20	20	20			
		219	DB	20	20	20			
	Diagnostic Monitoring Type	220	DC	0	0	0			
	Enhanced Options	221	DD	0	0	0			
	BR, nominal	222	DE	0	0	0			
	CC_EXT	223	DF	AS	AF	BA			
		224	EO	0	0	0			
		225	E1	0	0	0			
		226	E2	0	0	0			
		227	E3	0	0	0			
		228	E4	0	0	0			
		229	E5	0	0	0			
Vendor Specific ID		230	E6	0	0	0			
		231	E7	0	0	0			
		232	E8	0	0	0			
		233	E9	0	0	0			
		234	EA	0	0	0			
		235	EB	0	0	0			
		236	EC	0	0	0			
		237	ED	0	0	0			
		238	EE	0	0	0			
		239	EF	0	0	0			
		240	FO	0	0	0			
		241	F1	0	0	0			
		242	F2	0	0	0			
		243	F3	0	0	0			
		244	F4	0	0	0			
		245	F5	0	0	0			
		246	F6	0	0	0			
		247	F7	0	0	0			
		248	F8	0	0	0			
		249	F9	0	0	0			
		250	FA	0	0	0			
		251	FB	0	0	0			
		252	FC	0	0	0			
		253	FD	0	0	0			
		254	FE	0	0	0			
		255	FF	0	0	0			

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MECHANICAL CHARACTERISTICS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.6.1	Durability	Cable Assembly: 50 Cycles Board Connector: 100 cycles Test Condition: 10 cycles per minute max. Latches to be disabled. (EIA 364-09, 364-23)	1. Max. 20mΩ change from initial readings 2. No visual damage
6.6.2	Pre-conditioning	Mate and un-mate samples 25 times. Test condition: 10 cycles per minute max. (EIA 364-09, 364-23)	No Physical Damage
6.6.3	Mechanical Shock	Mated samples subject to 30G, half-sine shock pulses of 11 milliseconds duration. 3 shocks in each direction applied in 3 mutually perpendicular planes (18 total). EIA 364-27, Method H	No Physical Damage
6.6.4	Random Vibration	Mate samples subjected to 3.10G rms between 20 and 500 Hz for 15 minutes in each of 3 mutually perpendicular planes EIA 364-28, Test Condition: VII	1. Max. 20mΩ change from initial readings 2. No visual damage 3. No discontinuances greater than 1μs
6.6.5	(Insertion & Extraction) Mating & Un-mating Forces	Mate and un-mate samples 5 times. Measure the forces with the kick-out springs and latches disengaged.	1. 40N max mating force 2. 30N max un-mating force
6.6.6	Cable Strain Relief	Place axial load on cable. Test Condition: 25mm/min head speed	1. 90N Minimum 2. No physical damage. 3. Verify continuity 4. No significant electrical change (Diff Impedance)
6.6.7	Wire Flex	Cable flex 180° - 15 Cycles Test Condition : See Table 1 and Figure 2 (EIA 364-41)	1. No physical damage. 2. No loss of continuity during test. 3. No significant electrical change (Diff Impedance)
6.6.8	Cable Minimum Bend Radius	The cable is bent one time over the correct mandrel of size specified in Table 1 in each of 4 perpendicular directions. (Figure 1)	1. No physical damage. 2. Verify continuity 3. No significant electrical change (Diff Impedance)
6.6.9	Latch Strength	Mate connectors and place an axial load on the cable connector.	1. 90N Minimum 2. No physical damage to the module or cage.
6.6.10	Cage Press Fit Insertion & Withdrawal Force	Place axial load on the cage to measure the insertion and withdrawal force of the press-fit sections into and out of the PCB.	1. 550N Max. Insertion per press-fit section. 2. 114N Min. Extraction per press-fit section.

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Raw Cable AWG 8 Pair Standard	Minimum Bending Radius Repeated	Minimum Bending Radius Single
32AWG	2.007" (51mm)	1.004" (25.5mm)
30AWG	2.598" (66mm)	1.299" (33mm)
28AWG	2.952" (75mm)	1.476" (37.5mm)
26AWG	3.385" (86mm)	1.693" (43mm)
24AWG	3.818" (97mm)	1.909" (48.5mm)
Raw Cable AWG 8 Pair 4x28G	Minimum Bending Radius Repeated	Minimum Bending Radius Single
30AWG	2.520" (64mm)	1.260" (32mm)
26AWG	3.189" (81mm)	1.614" (41mm)

- * Minimum Bend Radius for all non standard cables will use the following formula:
Repeated Bending = 10 X Cable Diameter and Single Bending = 5 X Cable Diameter

Table 1 – Cable Minimum Bend Radius (See Figure 1 & 2)

6.6 ENVIRONMENTAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6.7.1	Thermal Shock	Test Condition: 10 cycles -55°C to +85°C. (EIA 364-32C, condition I)	Max. 20 milliohm change from initial readings
6.7.2	Temperature Life	Cable should be mated and subject 70°C for 500 hours EIA 364-17, Method A, Condition 2, Time Condition C	Max. 20 milliohm change from initial readings
6.7.3	Humidity Temperature Cycling	Cables unmated specimens to 10 cycles between 25°C and 65°C at 80% to 100% relative humidity EIA 364-31, Method III excluding steps 7a & 7b	Max. 20 milliohm change from initial readings
6.7.4	Mixed Flowing Gas	Subject the board mounted receptacle to environmental Class IIA for 7 days unmated followed by 7 days mated (14 days total) EIA 364-65, Class IIA	Max. 20 milliohm change from initial readings
6.7.5	Thermal Disturbance	Cables are cycled between 15±3 and 85±3°C as measured on the part. Ramps at min 2°C/minute and dwells ensuring contacts reach extremes for 5 minutes minimum. Humidity not controlled. 10 cycles	Max. 20 milliohm change from initial readings

7.0 QUALITY ASSURANCE PROVISIONS

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7.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with MIL-C-45662.

7.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

- a. Temperature: 25 +/- 5 degrees Celsius
- b. Barometric Pressure: Local ambient

7.3 Sample Quantity And Description

Test Group	Number of Cables	Cable Description	Number of Board Connectors
1	3	Each AWG, double ended, 1 meter min	1
2	3	Any AWG, single ended, 0.5 meter	3
3	1	Any AWG, single ended, 0.5 meter	6 Cages and 3 PCB
4	6	Any AWG, single ended, 0.5 meter	3 Board Connectors and 3 Loose Piece connectors
5	3	Any AWG, single ended, 0.5 meter	3
6	3	Any AWG, single ended, 0.5 meter	3
7	3	Smallest AWG, single ended, 0.5 meter	3
	3	Largest AWG, single ended, 0.5 meter	3
	3 per wire gage tested	Non-terminated cables for board side connector durability	3 Paddle Boards and 1 Cage

For qualification test samples, DC blocking capacitors on the receive channels are to be replaced by 0 ohm resistors so that LLCR measurements can be taken on the receive channels.

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7.4 Acceptance

- 7.4.1 Electrical and mechanical requirements placed on test samples as indicated in section 6.0 shall be established from test data using appropriate statistical techniques. All samples tested in accordance with this product specification shall meet the stated requirements.
- 7.4.2 Failures attributed to equipment, test set-up, or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

7.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequence shall be as shown in Table 2.

7.6 Requalification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix, Table 2.

- A significant design change is made to the existing product, which impacts the product form, fit or function.
- A significant change is made to the manufacturing process, which impacts the product form, fit or function.
- A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

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TABLE 2 - QUALIFICATION TESTING MATRIX

TEST	PARA	TEST GROUP						
		1	2	3	4	5	6	7
		TEST SEQUENCE						
Examination of Product		1,12	1,3	1,4	1,11	1,5	1,14	1,11
LLCR	6.1.1				2,6,8	2,4	2,5,7,9,11,13	2,5,7,9
Insulation Resistance (IR)	6.1.2				3,9			
Dielectric Withstanding Voltage (DWV)	6.1.3				4,10			
Differential Impedance	6.1.5	3,6,8,11						
Continuity	6.1.6	2,5,10						
Durability	6.6.1							4
Pre-conditioning	6.6.2						4	
Mechanical Shock	6.6.3							6
Random Vibration	6.6.4							8
Mating/Un-mating Force	6.6.5						3,12	3,10
Cable Strain Relief	6.6.6	9						
Wire Flex	6.6.7	7						
Minimum Bend Radii	6.6.8	4						
Latch Strength	6.6.9		2					
Cage Press-fit Insertion Force	6.6.10			2				
Cage Press-fit Withdrawal				3				
Thermal Shock	6.7.1				5			
Temperature Life	6.7.2					3		
Humidity Temperate Cycling	6.7.3				7			
Mixed Flowing Gas	6.7.4						6,8	
Thermal Disturbance	6.7.5						10	

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8.0 SUPPORTING INFORMATION

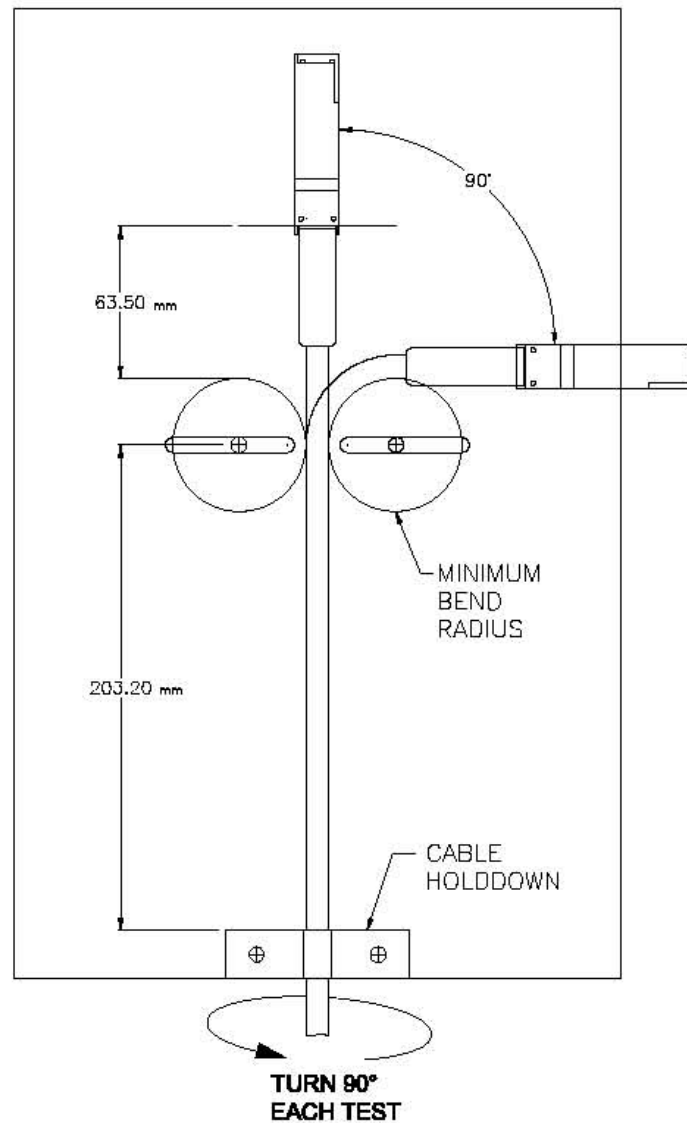


Figure 1 – Single Minimum Bending Radius
(See Mechanical Characteristics 6.1.9 and Table 1)

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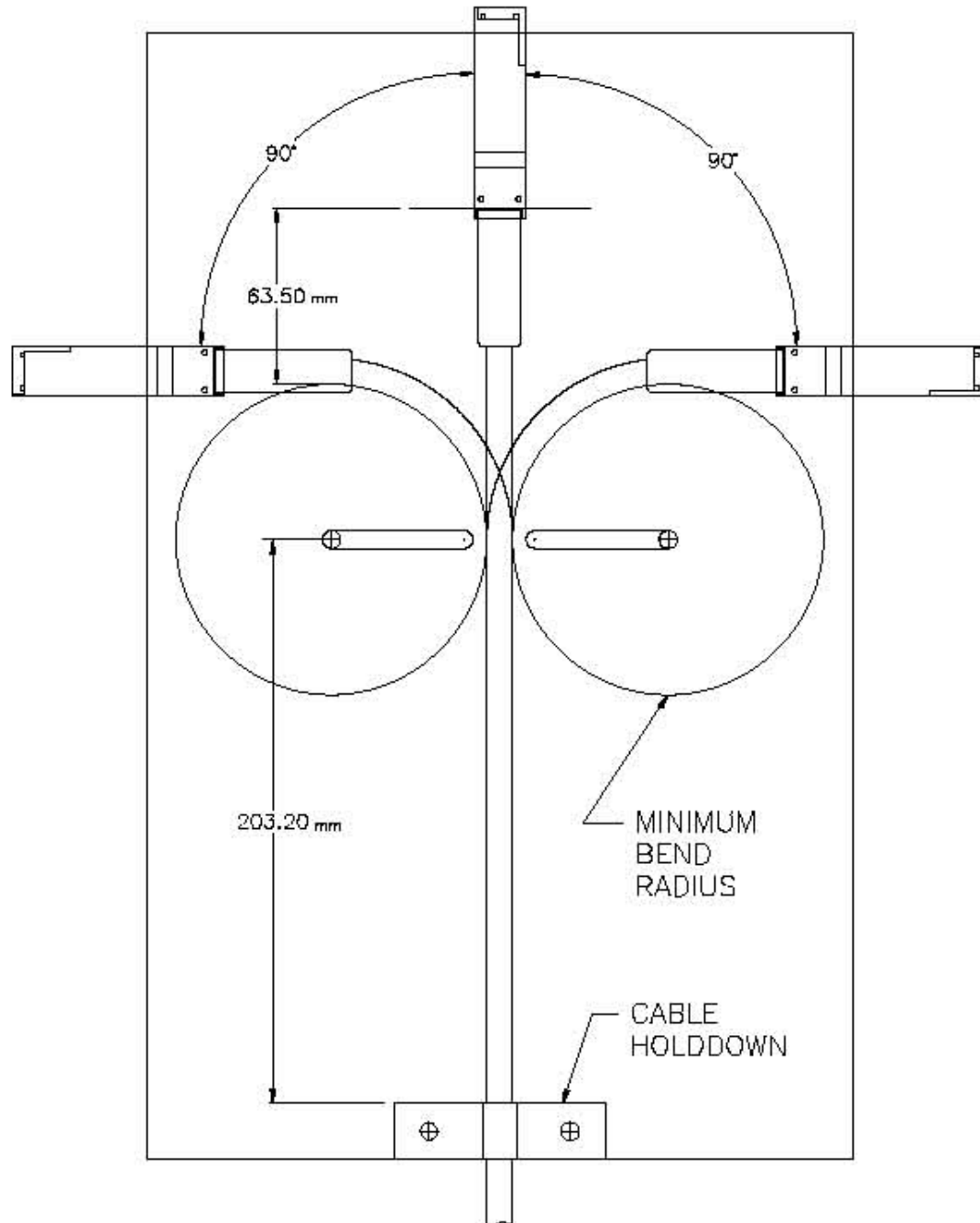


Figure 2 – Repeated Wire Flex Test
(See Mechanical Characteristics 6.1.8 and Table 1)

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9.0 REVISION RECORD

REV.	PAGE	DESCRIPTION	ECR	DATE
A	All	Release from Preliminary	V10-0131	4-05-10
B	All	Rev. A to B, Changed bend radius in Table 1 Repeatable .97 to 2.007, 1.61 to 2.598, 1.69 to 2.952, 1.93 to 3.385, 2.20 to 3.818 and Single, .69 to 1.004, .81 to 1.299, .85 to 1.476, .96 to 1.693, 1.10 to 1.909	V10-0290	7-07-10
C	2	Adding new P/N 10116015	ECN-ELX-N-003201-1	3-14-11
D	All	Removed E-Prom Address from specification.	ECN-ELX-V-010413-1	2-27-12
E	2/3	Added applicable information for 14G QSFP+ Cable Assembly Add EEPROM Section back into Spec	ECR-ELX-V-011521	5-02-12
F	8	Updated contents of address 131 to comply with the latest rev of SFF-8436	ECR-ELX-V-13361	11-02-12
G	29	Update Test Plan to remove LLCRC Step 11 from Test Group 4	ECN-ELX-V-14334-1	3-25-13
H	All, 5, 7, 26, 27	Added applicable information for 28G QSFP+ Cable Assembly Updated Impedance requirement, 6.1.5, 6.6.6, 6.6.7, 6.6.8; Added 6.1.6, Updated memory map, Updated the table in section 7.3, Change repeated bend radius	ECN-ELX-V-15186-1	7-09-13
J	5, 8, 15, 29, 32	Corrected revision change description for Rev H. Changed requirement in section 6.1.5, Corrected dec equivalent on address 131, Corrected Vendor OUI, Updated table 2 to add continuity and update sequence of test group 1	ECN-ELX-N-15503-1	8-27-13
K	7-15	Delete previous EEPROM content and add FCI standard QDR & FDR & EDR EEPROM	ECN-ELX-N-16985-1	5-06-14
L	8-11	Update the QSFP Plus Attenuation table	ECN-ELX-N-17658-1	7-18-14
M	2	Adding new P/N 10132344、10128764、10128765、10130975	ECN-ELX-DG-20036-1	1-21-15

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<u>10119239-4040LF</u>	<u>10119239-2010LF</u>	<u>10119239-4030LF</u>	<u>10119239-6050LF</u>	<u>10099113-102LF</u>	<u>10119239-4010LF</u>
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<u>10121178-4015LF</u>	<u>10121178-4010LF</u>	<u>10121178-4050LF</u>	<u>10119239-4005LF</u>	<u>10117436-001LF</u>	<u>10121178-2030LF</u>
<u>10121178-2025LF</u>	<u>10121178-4030LF</u>	<u>10121178-2010LF</u>	<u>10119239-4020LF</u>	<u>10119239-6030LF</u>	<u>10121178-4045LF</u>
<u>10119239-6040LF</u>	<u>10121178-4040LF</u>	<u>10119239-2025LF</u>	<u>10119239-2015LF</u>	<u>10121178-4025LF</u>	<u>10121178-2020LF</u>
<u>10119239-4035LF</u>	<u>10119239-2005LF</u>	<u>10121178-2005LF</u>			