1.0 SCOPE

2.0 PRODUCT DESCRIPTION

2.1 Product Name and Series Number(s)
2.2 Dimensions, Materials, Plating and Markings
2.3 Additional General Specifications

3.0 REFERENCE DOCUMENTS

3.1 FCI Documents
3.2 Industrial Documents

4.0 QUALIFICATION

5.0 RATINGS

5.1 Voltage
5.2 Current
5.3 Temperature

6.0 PERFORMANCE

6.1 Electrical Characteristics
6.2 ESD Requirements
6.3 EMI Protection
6.4 QSFP+ Pin Assignment
6.5 2 Wire Interface EEPROM (Lower and Upper Page)
6.6 Mechanical Characteristics
6.7 Environmental Requirements

7.0 QUALITY ASSURANCE PROVISIONS

7.1 Equipment Calibration
7.2 Inspection Conditions
7.3 Sample Quantity and Description
7.4 Acceptance
7.5 Qualification Testing
7.6 Requalification Testing

8.0 SUPPORTING INFORMATION

9.0 REVISION RECORD

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
10G QSFP+ to 4xSFP+ Cable Assembly QSFP End	10114734	
28G QSFP+ to 4xSFP+ Cable Assembly QSFP End	10130795	

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(10/14G) NELCO (28G)
- Overall thickness: 1.0mm ±0.1(over pads)
- Mating interface plating: Hard gold over nickel

Bulk Cable:

- As listed on the cable specification drawings.

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
SI-VG-2012-11-021	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

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: -40ºC to +85ºC

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.

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.

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

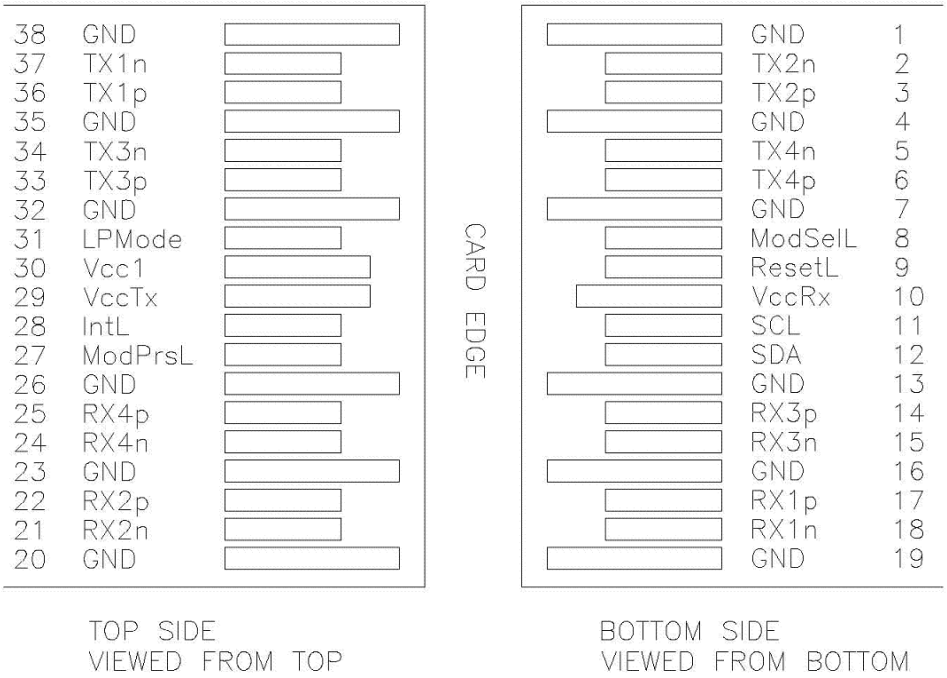

FIGURE 3
QSFP+ Module Contact Definition

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+ (10G)	10093084
FCI STANDARD FDR (14G)	10119329
FCI STANDARD EDR (28G)	10121178

FCIStdEppromTemp_QSFP+_RevC.xlsx					FCI 10G QDR QSFP+ to QSFP+	FCI 14G FDR QSFP+ to QSFP+	FCI 28G EDR QSFP+ to QSFP+	FCI 10G QDR QSFP+ to EYEMAX (QSFP end)	FCI 10G QDR QSFP+ to 4xSFP+ (QSFP end)	FCI 28G EDR QSFP+ to 4xSFP+ (QSFP end)
			Address		10093084-	10119239-	10121178-	10117984-	10114734-	10130795-
Name of Field			Addr (Dec)	Addr (Hex)	Value (Hex)	Value (Hex)	Value (Hex)	Value (Hex)	Value (Hex)	Value (Hex)
ID and status	Identifier		0	0	D	D	D	D	D	D
	Revision Compliance		1	1	7	7	7	7	7	7
	Status	With MCU : 0x00; Without MCU : 0X04 ;	2	2	4	4	4	4	4	4
Interrupt Flags			3	3	0	0	0	0	0	0
			4	4	0	0	0	0	0	0
			5	5	0	0	0	0	0	0
			6	6	0	0	0	0	0	0
			7	7	0	0	0	0	0	0
			8	8	0	0	0	0	0	0
			9	9	0	0	0	0	0	0
			10	A	0	0	0	0	0	0
			11	B	0	0	0	0	0	0
			12	C	0	0	0	0	0	0
			13	D	0	0	0	0	0	0
			14	E	0	0	0	0	0	0
			15	F	0	0	0	0	0	0
			16	10	0	0	0	0	0	0
			17	11	0	0	0	0	0	0
			18	12	0	0	0	0	0	0
			19	13	0	0	0	0	0	0
			20	14	0	0	0	0	0	0
			21	15	0	0	0	0	0	0
Channel Monitors			22	16	0	0	0	0	0	0
			23	17	0	0	0	0	0	0
			24	18	0	0	0	0	0	0
			25	19	0	0	0	0	0	0
			26	1A	0	0	0	0	0	0
			27	1B	0	0	0	0	0	0
			28	1C	0	0	0	0	0	0
			29	1D	0	0	0	0	0	0
			30	1E	0	0	0	0	0	0
			31	1F	0	0	0	0	0	0
			32	20	0	0	0	0	0	0
			33	21	0	0	0	0	0	0
			34	22	0	0	0	0	0	0
			35	23	0	0	0	0	0	0
			36	24	0	0	0	0	0	0
			37	25	0	0	0	0	0	0
			38	26	0	0	0	0	0	0
			39	27	0	0	0	0	0	0
			40	28	0	0	0	0	0	0
			41	29	0	0	0	0	0	0
			42	2A	0	0	0	0	0	0
			43	2B	0	0	0	0	0	0
			44	2C	0	0	0	0	0	0
			45	2D	0	0	0	0	0	0
			46	2E	0	0	0	0	0	0
			47	2F	0	0	0	0	0	0
			48	30	0	0	0	0	0	0
			49	31	0	0	0	0	0	0
			50	32	0	0	0	0	0	0
			51	33	0	0	0	0	0	0
			52	34	0	0	0	0	0	0
			53	35	0	0	0	0	0	0

			54	36	0	0	0	0	0	0
			55	37	0	0	0	0	0	0
			56	38	0	0	0	0	0	0
			57	39	0	0	0	0	0	0
			58	3A	0	0	0	0	0	0
			59	3B	0	0	0	0	0	0
			60	3C	0	0	0	0	0	0
			61	3D	0	0	0	0	0	0
			62	3E	0	0	0	0	0	0
			63	3F	0	0	0	0	0	0
			64	40	0	0	0	0	0	0
			65	41	0	0	0	0	0	0
			66	42	0	0	0	0	0	0
			67	43	0	0	0	0	0	0
			68	44	0	0	0	0	0	0
			69	45	0	0	0	0	0	0
			70	46	0	0	0	0	0	0
			71	47	0	0	0	0	0	0
			72	48	0	0	0	0	0	0
			73	49	0	0	0	0	0	0
			74	4A	0	0	0	0	0	0
			75	4B	0	0	0	0	0	0
			76	4C	0	0	0	0	0	0
			77	4D	0	0	0	0	0	0
			78	4E	0	0	0	0	0	0
			79	4F	0	0	0	0	0	0
			80	50	0	0	0	0	0	0
			81	51	0	0	0	0	0	0
Reserved			82	52	0	0	0	0	0	0
			83	53	0	0	0	0	0	0
			84	54	0	0	0	0	0	0
			85	55	0	0	0	0	0	0
Control			86	56	0	0	0	0	0	0
			87	57	0	0	0	0	0	0
			88	58	0	0	0	0	0	0
			89	59	0	0	0	0	0	0
			90	5A	0	0	0	0	0	0
			91	5B	0	0	0	0	0	0
			92	5C	0	0	0	0	0	0
			93	5D	0	0	0	0	0	0
			94	5E	0	0	0	0	0	0
			95	5F	0	0	0	0	0	0
			96	60	0	0	0	0	0	0
			97	61	0	0	0	0	0	0
Reserved			98	62	0	0	0	0	0	0
			99	63	0	0	0	0	0	0
Free Side Device Indicators and Channel Masks			100	64	0	0	0	0	0	0
			101	65	0	0	0	0	0	0
			102	66	0	0	0	0	0	0
			103	67	0	0	0	0	0	0
			104	68	0	0	0	0	0	0
			105	69	0	0	0	0	0	0
			106	6A	0	0	0	0	0	0
Reserved			107	6B	0	0	0	0	0	0
Free Side Device Properties			108	6C	0	0	0	0	0	0
			109	6D	0	0	0	0	0	0
	Far end complies with SFF 8636: 0x08 ; Far end doesn't complies with SFF 8636: 0x00 ;		110	6E	8	8	8	0	0	0
			111	6F	0	0	0	0	0	0
Reserved			112	70	0	0	0	0	0	0
	connectivity of depopulated or break out cables		113	71	0	0	10	0	40	40
			114	72	0	0	0	0	0	0
			115	73	0	0	0	0	0	0
			116	74	0	0	0	0	0	0
			117	75	0	0	0	0	0	0
			118	76	0	0	0	0	0	0
Password Change Entry Area (Optional)			119	77	0	0	0	0	0	0
			120	78	0	0	0	0	0	0
			121	79	0	0	0	0	0	0
			122	7A	0	0	0	0	0	0
Password Entry Area (Optional)			123	7B	0	0	0	0	0	0
			124	7C	0	0	0	0	0	0
			125	7D	0	0	0	0	0	0
			126	7E	0	0	0	0	0	0
Page Select Byte			127	7F	0	0	0	0	0	0

Base ID Fields

Identifier		128	80	D	D	D	D	D	D
Ext. Identifier		129	81	0	0	0	0	0	0
Connector		130	82	23	23	23	23	23	23
Specification Compliance	10/40G Ethernet Compliance Code	131	83	8	8	88	8	8	88
	SONET Compliance codes	132	84	0	0	0	0	0	0
	SAS/SATA compliance codes	133	85	0	0	0	0	0	0
	Gigabit Ethernet Compliant codes	134	86	0	0	0	0	0	0
	Fibre Channel link length	135	87	0	0	0	0	0	0
	Fibre Channel Transmitter Technology	136	88	0	0	0	0	0	0
	Fibre Channel transmission media	137	89	0	0	0	0	0	0
	Fibre Channel Speed	138	8A	0	0	0	0	0	0
Encoding		139	8B	0	0	5	0	0	5
BR, nominal		140	8C	0	0	FF	0	0	FF
Extended RateSelect		141	8D	0	0	0	0	0	0
Length(SMF)		142	8E	0	0	0	0	0	0
Length(OM3 50 um)		143	8F	0	0	0	0	0	0
Length(OM2 50 um)		144	90	0	0	0	0	0	0
Length(OM1 62.5 um)		145	91	0	0	0	0	0	0
Cable Assembly Length (Passive or active)		146	92	0	0	0	0	0	0
Device tech		147	93	A0	A0	A0	A0	A0	A0
Vendor name		148	94	46	46	46	46	46	46
		149	95	43	43	43	43	43	43
		150	96	49	49	49	49	49	49
		151	97	20	20	20	20	20	20
		152	98	45	45	45	45	45	45
		153	99	6C	6C	6C	6C	6C	6C
		154	9A	65	65	65	65	65	65
		155	9B	63	63	63	63	63	63
		156	9C	74	74	74	74	74	74
		157	9D	72	72	72	72	72	72
		158	9E	6F	6F	6F	6F	6F	6F
		159	9F	6E	6E	6E	6E	6E	6E
		160	A0	69	69	69	69	69	69
		161	A1	63	63	63	63	63	63
		162	A2	73	73	73	73	73	73
		163	A3	20	20	20	20	20	20
Extended Module		164	A4	7	F	1F	7	7	1F
Vendor OUI		165	A5	FC	FC	FC	FC	FC	FC
		166	A6	7C	7C	7C	7C	7C	7C
		167	A7	E7	E7	E7	E7	E7	E7
Vendor PN		168	A8	31	31	31	31	31	31
		169	A9	30	30	30	30	30	30
		170	AA	30	31	31	31	31	31
		171	AB	39	31	32	31	31	33
		172	AC	33	39	31	37	34	30
		173	AD	30	32	31	39	37	37
		174	AE	38	33	37	38	33	39
		175	AF	34	39	38	34	34	35
		176	B0	2D	2D	2D	2D	2D	2D
		177	B1	20	20	20	20	20	20
		178	B2	20	20	20	20	20	20
		179	B3	20	20	20	20	20	20
		180	B4	20	20	20	20	20	20
		181	B5	20	20	20	20	20	20
		182	B6	20	20	20	20	20	20
		183	B7	20	20	20	20	20	20
Vendor Rev		184	B8	20	20	20	20	20	20
		185	B9	20	20	20	20	20	20
Wavelength or Copper Cable	Attenuation @2.5G	186	BA	0	0	0	0	0	0
	Attenuation @5G	187	BB	0	0	0	0	0	0
Wavelength tolerance or Copper Cable Attenuation	the copper cable attenuation at 7.0 GHz	188	BC	0	0	0	0	0	0
	the copper cable attenuation at 12.9 GHz	189	BD	0	0	0	0	0	0
Max case temp.		190	BE	0	0	0	0	0	0
CC_BASE		191	BF	B1	BA	49	B7	AD	4E

Extended ID	Options	Extended Ethernet Compliance Codes	192	C0	0	0	B	0	0	B
		RX output amplitude programming	193	C1	0	0	0	0	0	0
			194	C2	0	0	0	0	0	0
			195	C3	0	0	0	0	0	0
	Vendor SN		196	C4	43	43	43	43	43	43
			197	C5	4E	4E	4E	4E	4E	4E
			198	C6	31	31	31	31	31	31
			199	C7	37	37	37	37	37	37
			200	C8	32	32	32	32	32	32
			201	C9	38	38	38	38	38	38
			202	CA	51	51	51	39	39	39
			203	CB	41	4B	56	4A	41	52
			204	CC	20	20	20	20	20	20
			205	CD	20	20	20	20	20	20
			206	CE	20	20	20	20	20	20
			207	CF	20	20	20	20	20	20
			208	D0	30	30	30	30	30	30
			209	D1	30	30	30	30	30	30
			210	D2	30	30	30	30	30	30
			211	D3	31	31	31	31	31	31
	Date Code		212	D4	31	31	31	31	31	31
			213	D5	37	37	37	37	37	37
			214	D6	30	30	30	30	30	30
			215	D7	37	37	37	37	37	37
			216	D8	31	31	31	31	31	31
			217	D9	34	34	34	34	34	34
			218	DA	20	20	20	20	20	20
			219	DB	20	20	20	20	20	20
	Diagnostic Monitoring Type		220	DC	0	0	0	0	0	0
	Enhanced Options		221	DD	0	0	0	0	0	0
	BR, nominal		222	DE	0	0	67	0	0	67
	CC_EXT		223	DF	AA	B4	31	8B	92	15
Vender Specific ID			224	E0	0	0	0	0	0	0
			225	E1	0	0	0	0	0	0
			226	E2	0	0	0	0	0	0
			227	E3	0	0	0	0	0	0
			228	E4	0	0	0	0	0	0
			229	E5	0	0	0	0	0	0
			230	E6	0	0	0	0	0	0
			231	E7	0	0	0	0	0	0
			232	E8	0	0	0	0	0	0
			233	E9	0	0	0	0	0	0
			234	EA	0	0	0	0	0	0
			235	EB	0	0	0	0	0	0
			236	EC	0	0	0	0	0	0
			237	ED	0	0	0	0	0	0
			238	EE	0	0	0	0	0	0
			239	EF	0	0	0	0	0	0
			240	F0	0	0	0	0	0	0
			241	F1	0	0	0	0	0	0
			242	F2	0	0	0	0	0	0
			243	F3	0	0	0	0	0	0
			244	F4	0	0	0	0	0	0
			245	F5	0	0	0	0	0	0
			246	F6	0	0	0	0	0	0
			247	F7	0	0	0	0	0	0
			248	F8	0	0	0	0	0	0
			249	F9	0	0	0	0	0	0
			250	FA	0	0	0	0	0	0
			251	FB	0	0	0	0	0	0
			252	FC	0	0	0	0	0	0
			253	FD	0	0	0	0	0	0
			254	FE	0	0	0	0	0	0
			255	FF	0	0	0	0	0	0

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 180º - 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.

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 -55ºC to +85ºC. (EIA 364-32C, condition I)	Max. 2**0** milliohm change from initial readings
6.7.2	**Temperature Life**	Cable should be mated and subject 70ºC 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 25ºC and 65ºC at 80% to 100% relative humidity EIA 364-31, Method III excluding steps 7a & 7b	Max. 2**0** 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. 2**0** milliohm change from initial readings
6.7.5	**Thermal Disturbance**	Cables are cycled between 15±3 and 85±3ºC as measured on the part. Ramps at min 2ºC/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

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 durabilty	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.

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

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	

8.0 SUPPORTING INFORMATION

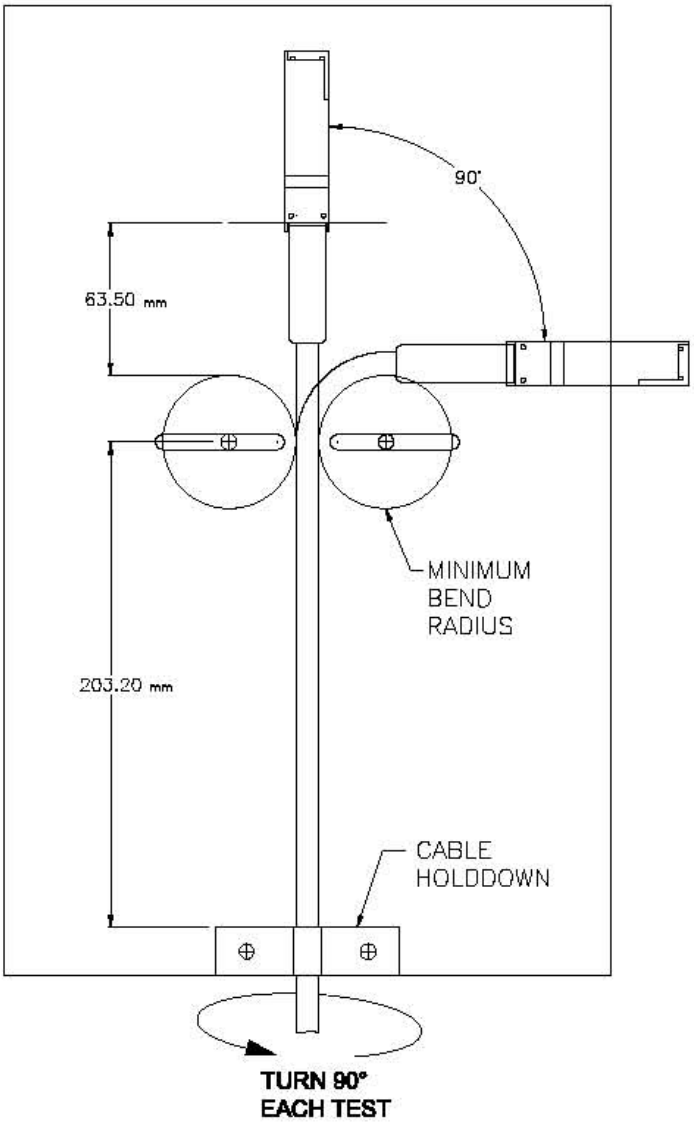

Figure 1 – Single Minimum Bending Radius
(See Mechanical Characteristics 6.1.9 and Table 1)

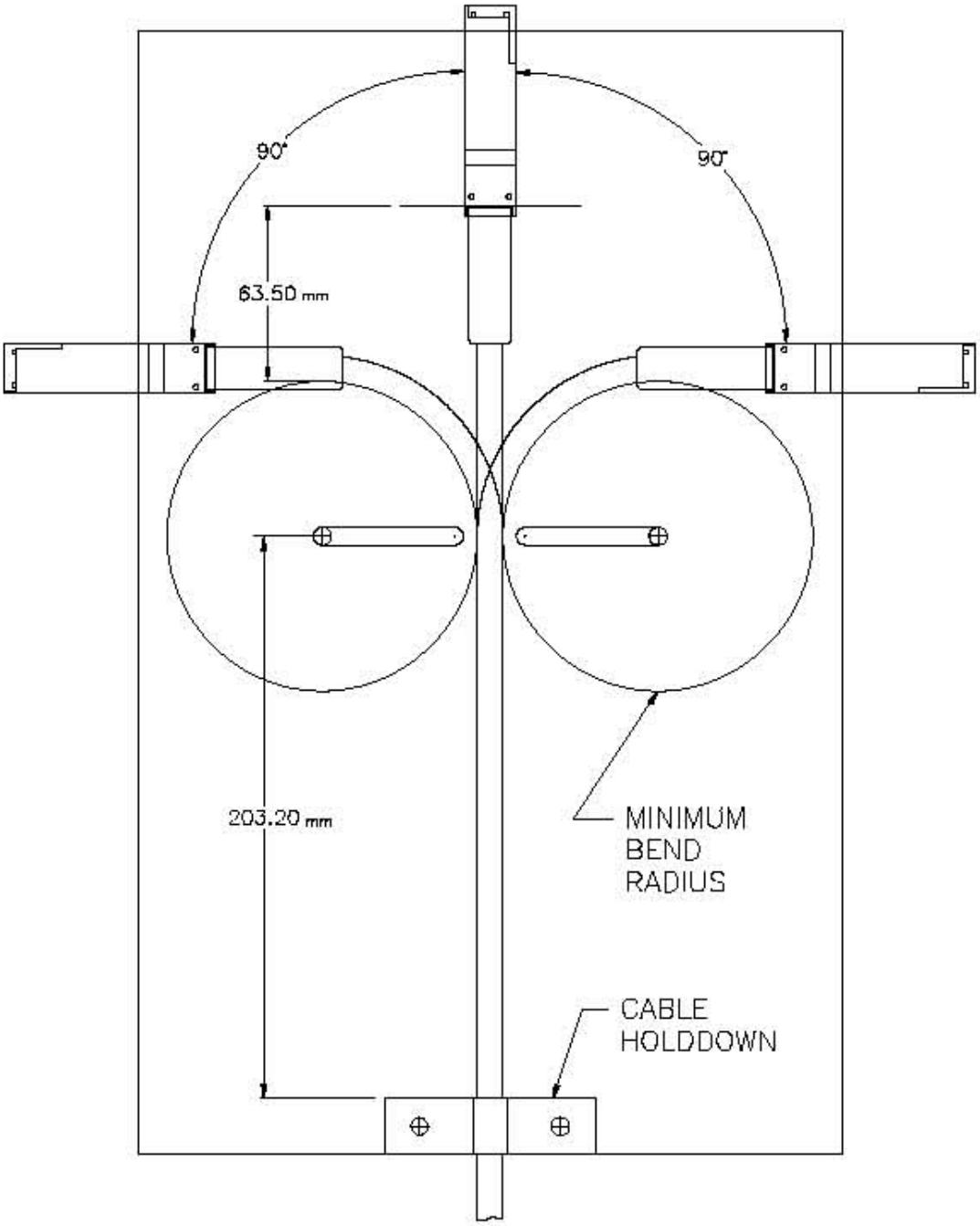

Figure 2 – Repeated Wire Flex Test
(See Mechanical Characteristics 6.1.8 and Table 1)

9.0 REVISION RECORD

REV.	PAGE	DESCRIPTION	ECR	DATE
A	All	Release from Preliminary	V10-0131	2004/5/10
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	2007/7/10
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	3	Added applicable information for 14G QSFP+ Cable Assembly Add EEPROM Section back into Spec	ECR-ELX-V-011521	2005/2/12
F	8	Updated contents of address 131 to comply with the latest rev of SFF-8436	ECR-ELX-V-13361	2011/2/12
G	29	Update Test Plan to remove LLCR Step 11 from Test Group 4	ECN-ELX-V-14334-1	3-25-13
H	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	2007/9/13
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	15	Delete previous EEPROM content and add FCI standard QDR & FDR & EDR EEPROM	ECN-ELX-N-16985-1	2005/6/14
L	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
N	2,8,10	Revise the map content per the latest industrial spec	ECN-ELX-N-21737-1	8-21-15
P	2	Add the QSFP to 4xSFP+ Cable Assembly P/N	ECN-ELX-N-24491-1	7-13-16
R	8,9,10	Revise the EEPROM map content per the latest industrial spec	ECN-ELX-N-27463-1	7-14-17