


NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 1 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
		CLASSIFICATION UNRESTRICTED	

1.0 OBJECTIVE

This document summarizes qualification test results to demonstrate compliance of FCI QSFP+ cable and connector system to the requirements of the FCI QSFP+ product specification(s) listed in Section 5.0.

2.0 SCOPE

This summary includes results from qualification testing of QSFP+ cable assemblies consisting of 32AWG, 30AWG, 28AWG, 26AWG, & 24AWG wire gages as well as PCB's from both US and China. The connectors were qualified in accordance with FCI product specification GS-12-622.

3.0 CONCLUSION


The results obtained for all tested product configurations successfully met the requirements of FCI product specification GS-12-622.

4.0 DEFINITIONS

MIL-STD: Military Standard
EIA: Electronic Industries Alliance
ANSI: American National Standards Institute
LLCR: Low Level Contact Resistance
CR: Contact Resistance
MFG: Mixed Flowing Gas
IR: Insulation Resistance
DWV: Dielectric Withstanding Voltage

5.0 REFERENCE DOCUMENTS

- 5.1 Product Specification GS-12-622, Rev. A
- 5.2 EIA 364 Series Test Procedures
- 5.3 U.S. Product Test Laboratory Report EL-2010-02-019, Rev. A

NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 2 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
CLASSIFICATION UNRESTRICTED			

6.0 QUALIFICATION SUMMARY


6.1 The qualification testing of the 30 micro-inch gold-plated QSFP+ cable and connector system was performed in 7 test groups, with multiple wire gauge samples represented in each group when applicable.

6.1.1 Test Group 1 – Mechanical with Differential Impedance. 3 each (12 total) cable assemblies 32AWG, 30AWG, 26AWG, & 24AWG. One receptacle test board assembly used for continuity monitoring during the wire flex test.

TEST	SPECIFICATION CRITERION	RESULTS
Differential Impedance EIA-364-108 Per GS-12-622 Sec. 6.1.5	<u>Condition:</u> 70 psec. rise time (20% - 80%) Criterion: 100 Ω +/- 10 Ω	PASS 32AWG – 93Ω min, 107Ω max 30AWG – 92Ω min, 107Ω max 26AWG – 91Ω min, 105Ω max 24AWG – 91Ω min, 105Ω max
Cable Minimum Bend Radius EIA-364-41 Per GS-12-622 Sec. 6.6.8	<u>Condition:</u> 1 cycle in each of 4 perpendicular directions. Criterion: No damage	PASS No damage
Differential Impedance EIA-364-108 Per GS-12-622 Sec. 6.1.5	<u>Condition:</u> 70 psec. Rise time (20% - 80%) Criterion: 100 Ω +/- 10 Ω	PASS 32AWG – 93Ω min, 106Ω max 30AWG – 92Ω min, 107Ω max 26AWG – 91Ω min, 105Ω max 24AWG – 91Ω min, 105Ω max
Wire Flex EIA 364-41E Per FS-12-622 Sec. 6.6.7	<u>Condition:</u> 15 cycles, 180°, 2.5 in. from back of shell to top of roller Criterion: No damage, no discontinuity > 1 μsec.	PASS No damage No discontinuity
Differential Impedance EIA-364-108 Per GS-12-622 Sec. 6.1.5	<u>Condition:</u> 70 psec. rise time (20% - 80%) Criterion: 100 Ω +/- 10 Ω	PASS 32AWG – 92Ω min, 106Ω max 30AWG – 92Ω min, 107Ω max 26AWG – 91Ω min, 105Ω max 24AWG – 91Ω min, 105Ω max
Cable Strain Relief Per GS-12-452 Sec. 6.6.6	<u>Condition:</u> 25 mm/min., 90N min. Criterion: No damage	PASS No damage
Differential Impedance EIA-364-108 Per GS-12-622 Sec. 6.1.5	<u>Condition:</u> 70 psec. rise time (20% - 80%) Criterion: 100 Ω +/- 10 Ω	PASS 32AWG – 93Ω min, 109Ω max 30AWG – 92Ω min, 107Ω max 26AWG – 91Ω min, 105Ω max 24AWG – 91Ω min, 105Ω max

6.1.2 Test Group 2 – Cable Connector Retention to Cage, 3 each (9 total) cable assemblies 32AWG, 30AWG, & 26AWG, and 3 total receptacle test board assemblies.

TEST	SPECIFICATION CRITERION	RESULTS
Cable Connector Retention in Cage Per GS-12-622 Sec. 6.6.9	<u>Condition:</u> 90 N min. axial load, latch engaged Criterion: No damage	PASS No damage

NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 3 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
CLASSIFICATION UNRESTRICTED			


6.1.3 Test Group 3 – Receptacle Cage Mechanical, 3 receptacle cages and 3 receptacle test boards.

TEST	SPECIFICATION CRITERION	RESULTS
Cage Press-Fit Insertion Force EIA-364-09 Per GS-12-622 Sec. 6.6.10	<u>Condition:</u> Axial load on top of cage Criterion: 550 N max.	PASS 222.4 N max
Cage Press-Fit Retention Force EIA-364-09 Per GS-12-622 Sec. 6.6.10	<u>Condition:</u> Axial load on all exposed press-fit tails simultaneously. Criterion: 114 N min.	PASS 133.4 N min.

6.1.4 Test Group 4 – Thermal Shock and Humidity, one each AWG30 and AWG24 cable assembly mated to receptacle test boards for LLCR, two each AWG28 and AWG26 cable assemblies without paddleboard resistors mated to unassembled receptacles (no PCB or cage) for IR/DWV.

TEST	SPECIFICATION CRITERION	RESULTS
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: None (Baseline)	PASS Baseline
IR EIA-364-21 Per GS-12-622 Sec. 6.1.2	<u>Condition:</u> 100 V DC, 60 seconds Criterion: 1 GΩ min	PASS 23 GΩ min
DWV EIA-364-20 Per GS-12-622 Sec. 6.1.3	<u>Condition:</u> 300 V DC, 60 seconds Criterion: No breakdown or arc-over, .5 mA max. leakage current	PASS No breakdown or arc-over, .002 μA max. leakage current
Thermal Shock EIA-364-32 Per GS-12-622 Sec. 6.7.1	<u>Condition:</u> -55C to +85C, 25 1-hour cycles Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max increase	PASS 0.67 mΩ max increase
Humidity EIA-364-31 Per GS-12-622 Sec. 6.7.3	<u>Condition:</u> 10 18-hour cycles, 25C to 65C, exclude 7a and 7b Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max increase	PASS 4.32 mΩ max increase
IR EIA-364-21 Per GS-12-622 Sec. 6.1.2	<u>Condition:</u> 100 V DC, 60 seconds Criterion: 1 GΩ min	PASS 1.59 GΩ min.
DWV EIA-364-20 Per GS-12-622 Sec. 6.1.3	<u>Condition:</u> 300 V DC, 60 seconds Criterion: No breakdown or arc-over, .5 mA max. leakage current	PASS No breakdown or arc-over, 0.57 μA leakage

*Product specification GS-12-622 calls for LLCR to be performed per EIA-364-6. This test was not possible with these assemblies, and EIA-364-23 was used per agreement.

NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 4 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
		CLASSIFICATION UNRESTRICTED	


6.1.5 Test Group 5 – High Temperature Life, one each 30AGW, 28AWG, and 26AWG cable assembly mated to receptacle test board assemblies (3 total) for LLCR measurement.

TEST	SPECIFICATION CRITERION	RESULTS
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: None	PASS Baseline
High Temp. Life EIA-364-17 Per GS-12-622 Sec. 6.7.2	<u>Condition:</u> 500 Hrs. @ 70C Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: None	PASS .03 mΩ max increase

*Product specification GS-12-622 calls for LLCR to be performed per EIA-364-6. This test was not possible with these assemblies, and EIA-364-23 was used per agreement.

6.1.6 Test Group 6 – Mixed Flowing Gas, one 32AWG, 30AWG, and 28AWG cable assembly mated to receptacle test board assemblies for LLCR measurement.

TEST	SPECIFICATION CRITERION	RESULTS
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: None	PASS Baseline
Mating / Unmating Force EIA-364-13 Per GS-12-622 Sec. 6.6.5	<u>Condition:</u> 5 cycles, kick-out springs and latches disengaged Criterion: 40 N max. mating, 30 N max. unmating	PASS 31.36 N max. mating 21.61 N max. unmating
Pre-Condition Durability EIA-364-09 Per GS-12-622 Sec. 6.6.2	<u>Condition:</u> 25 cycles, 10 cyc. Per min. max. Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 1.48 mΩ max. increase
Mixed Flowing Gas 1st Half EIA-364-65 Per GS-12-622 Sec. 6.7.4	<u>Condition:</u> Class IIa, 7 days unmated Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 5.11 mΩ max. increase
Mixed Flowing Gas 2nd Half EIA-364-65 Per GS-12-622 Sec. 6.7.4	<u>Condition:</u> Class IIa, 7 days mated Criterion: No damage	PASS No damage

NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 5 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
		CLASSIFICATION UNRESTRICTED	


6.1.6 Test Group 6 continued

LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 2.88 mΩ max. increase
Thermal Disturbance EIA-364-32 Per GS-12-622 Sec. 6.7.5	<u>Condition:</u> 15C to 85C, 5 min. dwells min., 10 cycles Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 2.41 mΩ max. increase
Mating / Unmating Force EIA-364-13 Per GS-12-622 Sec. 6.6.5	<u>Condition:</u> 5 cycles, kick-out springs and latches disengaged Criterion: 40 N max. mating, 30 N max. unmating	PASS 26.72 N max. mating 17.60 N max. unmating
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 1.32 mΩ max. increase

*Product specification GS-12-622 calls for LLCR to be performed per EIA-364-6. This test was not possible with these assemblies, and EIA-364-23 was used per agreement.

6.1.7 Test Group 7 – Shock and Vibration, three 32AWG, and three 24AWG cable assemblies mated to receptacle test board assemblies (total of six) for LLCR measurement.

TEST	SPECIFICATION CRITERION	RESULTS
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: None	PASS Baseline
Mating / Unmating Force EIA-364-13 Per GS-12-622 Sec. 6.6.5	<u>Condition:</u> 5 cycles, kick-out springs and latches disengaged Criterion: 40 N max. mating, 30 N max. unmating	PASS 27.58 N max. mating 17.79 N max. unmating
Durability EIA-364-09 Per GS-12-622 Sec. 6.6.1	<u>Condition:</u> Cable – 50 cycles, Board – 100 cycles 10 cyc. / min. max. Latches to be disabled. Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 2.44 mΩ max. increase
Mechanical Shock EIA-364-27B Per GS-12-622 Sec. 6.6.3	<u>Condition:</u> ½ sine, 30 G, 11 msec. Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 1.80 mΩ max. increase


NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 6 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
		CLASSIFICATION UNRESTRICTED	

6.1.7 Test Group 7 continued

Vibration EIA-364-28 Per GS-12-622 Sec. 6.6.4	<u>Condition:</u> 20-500 Hz., 15 min. axis Criterion: No damage	PASS No damage
LLCR EIA-364-23 Per Lab Modifications*	<u>Condition:</u> 20mV, 100mA Criterion: 20 mΩ max. increase	PASS 1.02 mΩ max. increase
Mating / Unmating Force EIA-364-13 Per GS-12-622 Sec. 6.6.5	<u>Condition:</u> 5 cycles, kick-out springs and latches disengaged Criterion: 40 N max. mating, 30 N max. unmating	PASS 27.58 N max. mating 14.23 N max. unmating

*Product specification GS-12-622 calls for LLCR to be performed per EIA-364-6. This test was not possible with these assemblies, and EIA-364-23 was used per agreement.

7.0 NOTES

NUMBER GS-29-622	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE QSFP+® Cable and Connector System		PAGE 7 of 7	REVISION A
		AUTHORIZED BY J. Kopec	DATE 04/21/10
CLASSIFICATION UNRESTRICTED			

REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
A	ALL	NEW RELEASE	V10-0174	04/21/10