

NUMBER GS-29-010	TYPE PRODUCT QUALIFICATION SUMMARY		
TITLE FCI BergStak® Connector & TE Free Height* Connector Inter-Mating * Free Height™ is a trademark of Tyco Electronics, Inc., All rights reserved.		PAGE 1 of 10	REVISION A
		AUTHORIZED BY Matthew Cheong	DATE 27 th Oct 09
		CLASSIFICATION UNRESTRICTED	

1.0 OBJECTIVE

This document summarizes qualification test results and inter-mating performance of BergStak® connectors and Tyco Free Height Connectors based on the requirements of the FCI BergStak® Product Specification.

These tests were completed by an independent test laboratory contracted by FCI.

2.0 SCOPE

This summary includes results of qualification testing for each FCI/Tyco inter-mating combination. Connectors in the test plan represent commercially available products. 40 position and 120 position connectors were used. All connectors mated with a PCB stack height of 5mm. FCI BergStak® Receptacle and Plug contact interfaces were plated with 30 μ" GXT, while Tyco Receptacle and Plug were plated with 30 μ" Au.

An inter-mating study was performed using the following sequence per revision B of Product Specification GS-12-547:

- Group 2, Vibration and Mechanical Shock Sequence
 - o FCI Plug mated to Tyco Receptacle (Section 6.1.1)
 - o Tyco Plug mated to FCI Receptacle (Section 6.1.2)
- Group 3, Mating/Un-mating force with Durability Sequence
 - o FCI Plug mated to Tyco Receptacle (Section 6.2.1)
 - o Tyco Plug mated to FCI Receptacle (Section 6.2.2)
- Group 7, Thermal Shock, Cyclic Humidity & Temperature Sequence
 - o FCI Plug mated to Tyco Receptacle (Section 6.3.1)
 - o Tyco Plug mated to FCI Receptacle (Section 6.3.2)
- Group 8, Temperature Life Sequence
 - o FCI Plug mated to Tyco Receptacle (Section 6.4.1)
 - o Tyco Plug mated to FCI Receptacle (Section 6.4.2)

3.0 CONCLUSION

The test results indicate that FCI to Tyco inter-mating performance meets the requirement of FCI product specification, applicable to the full test sequence scope specified in section 2.0.

4.0 DEFINITIONS

EIA: Electronic Industries Alliance
LLCR: Low Level Contact Resistance

5.0 REFERENCE DOCUMENTS

- 5.1 Product Specification GS-12-547, Revision B
- 5.2 EIA 364 series test procedures

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6.0 QUALIFICATION SUMMARY

6.1 Qualification results for Test Group 2, Vibration & Mechanical sequence, are summarized below:

6.1.1 Test Group 2 – FCI Plug & Tyco Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 9.4mΩ max	Pass 9.1mΩ max
Durability Pre-conditioning EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 25 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.3mΩ max	Pass 9.7mΩ max
Temp Life, Pre-conditioning EIA-364-17 Per GS-12-547 section 6.1.16	Condition: 105±5°C, 120 hrs Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#3 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.7mΩ max	Pass 10.2mΩ max
Vibration EIA-364-28, Cond V, Letter D Per GS-12-547 section 6.1.6	Condition: Cond. V, Letter D, 90min each axis Criteria: No Damage & No Discontinuity >0.1μsec	Pass No Damage No Discontinuity	Pass No Damage No Discontinuity
LLCR#4 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.7mΩ max	Pass 11.6mΩ max
Mechanical Shock EIA-364-27 Per GS-12-547 section 6.1.7	Condition: Cond. A, 50G half- sine, 3 shock each direction and axis (18 total) Criteria: No Damage & No Discontinuity >0.1μsec	Pass No Damage No Discontinuity	Pass No Damage No Discontinuity
LLCR#5 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.9mΩ max	Pass 12.1mΩ max

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6.1.2 Test Group 2 – Tyco Plug & FCI Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 9.5mΩ max	Pass 9.2mΩ max
Durability Pre-conditioning EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 25 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 9.9mΩ max	Pass 9.1mΩ max
Temp Life, Pre-conditioning EIA-364-17 Per GS-12-547 section 6.1.16	Condition: 105±5°C, 120 hrs Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#3 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.2mΩ max	Pass 9.6mΩ max
Vibration EIA-364-28, Cond V, Letter D Per GS-12-547 section 6.1.6	Condition: Cond. V, Letter D, 90min each axis Criteria: No Damage & No Discontinuity >0.1μsec	Pass No Damage No Discontinuity	Pass No Damage No Discontinuity
LLCR#4 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.4mΩ max	Pass 10.8mΩ max
Mechanical Shock EIA-364-27 Per GS-12-547 section 6.1.7	Condition: Cond. A, 50G half- sine, 3 shock each direction and axis (18 total) Criteria: No Damage & No Discontinuity >0.1μsec	Pass No Damage No Discontinuity	Pass No Damage No Discontinuity
LLCR#5 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.4mΩ max	Pass 13.5mΩ max

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6.2 Qualification results for Test Group 3, Mating/Un-mating with high durability, are summarized below:

6.2.1 Test Group 3— FCI Plug & Tyco Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
Mating Force#1 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.9N/pin max, 36N max(40Pos) 108N max(120Pos)	Pass 28.8N max	Pass 75.7N max
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 9.7mΩ max	Pass 9.0mΩ max
Un-mating Force#1 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.1N/pin min, 4N min(40Pos) 12N min(120Pos)	Pass 9.0N min	Pass 14.5N min
Mating Force#2 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.9N/pin max, 36N max(40Pos) 108N max(120Pos)	Pass 33.0N max	Pass 72.3N max
Un-mating Force#2 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.1N/pin min, 4N min(40Pos) 12N min(120Pos)	Pass 9.5N min	Pass 18.8N min
Durability EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 100 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
Mating Force#3 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.9N/pin max, 36N max(40Pos) 108N max(120Pos)	Pass 24.4N max	Pass 73.6N max
Un-mating Force#3 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.1N/pin min, 4N min(40Pos) 12N min(120Pos)	Pass 15.0N min	Pass 27.2N min
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 12.2mΩ max	Pass 9.9mΩ max

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6.2.2 Test Group 3 – Tyco Plug & FCI Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
Mating Force#1 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.9N/pin max, 36N max(40Pos) 108N max(120Pos)	Pass 28.8N max	Pass 77.6N max
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 9.7mΩ max	Pass 8.9mΩ max
Un-mating Force#1 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.1N/pin min, 4N min(40Pos) 12N min(120Pos)	Pass 9.8N min	Pass 21.6N min
Mating Force#2 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.9N/pin max, 36N max(40Pos) 108N max(120Pos)	Pass 21.7N max	Pass 72.2N max
Un-mating Force#2 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.1N/pin min, 4N min(40Pos) 12N min(120Pos)	Pass 7.7N min	Pass 19.3N min
Durability EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 100 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
Mating Force#3 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.9N/pin max, 36N max(40Pos) 108N max(120Pos)	Pass 25.0N max	Pass 75.3N max
Un-mating Force#3 EIA-364-13 Per GS-12-547 section 6.1.8	Condition: 1"/min Criteria: 0.1N/pin min, 4N min(40Pos) 12N min(120Pos)	Pass 12.6N min	Pass 25.4N min
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 9.9mΩ max	Pass 8.7mΩ max

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6.3 Qualification results for Test Group 7, Thermal Shock, Cyclic Humidity & Temperature sequence, are summarized below:

6.3.1 Test Group 7 – FCI Plug & Tyco Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 11.0mΩ max	Pass 8.7mΩ max
Durability Pre-conditioning EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 25 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 12.0mΩ max	Pass 10.6mΩ max
Thermal Shock EIA-364-32, method A Per GS-12-547 section 6.1.15	Condition: -40°C~125°C, 10 cycles Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#3 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 15.4mΩ max	Pass 12.2mΩ max
Cyclic Humidity & Temp EIA-364-31, method III Per GS-12-547 section 6.1.17	Condition: EIA-364-31, Method III (omit step 7b) Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#4 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 15.6mΩ max	Pass 15.1mΩ max
Reseating Per GS-12-547 section 6.1.14	Condition: 3 cycles un-mating & mating Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#5 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 16.2mΩ max	Pass 12.8mΩ max

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6.3.2 Test Group 7 – Tyco Plug & FCI Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 13.7mΩ max	Pass 9.5mΩ max
Durability Pre-conditioning EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 25 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 11.0mΩ max	Pass 13.8mΩ max
Thermal Shock EIA-364-32, method A Per GS-12-547 section 6.1.15	Condition: -40°C~125°C, 10 cycles Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#3 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.7mΩ max	Pass 13.8mΩ max
Cyclic Humidity & Temp EIA-364-31, method III Per GS-12-547 section 6.1.17	Condition: EIA-364-31, Method III (omit step 7b) Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#4 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 12.0mΩ max	Pass 12.8mΩ max
Reseating Per GS-12-547 section 6.1.14	Condition: 3 cycles manual un-mating & mating Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#5 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 11.4mΩ max	Pass 12.8mΩ max

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6.4 Qualification results for Test Group 8, Temperature Life Sequence, are summarized below:

6.4.1 Test Group 8 – FCI Plug & Tyco Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 12.7mΩ max	Pass 10.0mΩ max
Durability Pre-conditioning EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 25 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 10.8mΩ max	Pass 13.5mΩ max
Temp Life, Pre-conditioning EIA-364-17 Per GS-12-547 section 6.1.16	Condition: 105±5°C, 120 hrs Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR @ 250 hrs Temp Life EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA @250 hours Criteria: 50mΩ max	Pass 13.2mΩ max	Pass 14.1mΩ max
LLCR @ 1000 hrs Temp Life EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA @1000 hours Temp Life Criteria: 50mΩ max	Pass 17.5mΩ max	Pass 13.7mΩ max
Reseating Per GS-12-547 section 6.1.14	Condition: 3 cycles manual un-mating & mating Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#5 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 20.9mΩ max	Pass 13.5mΩ max

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6.4.2 Test Group 8 – Tyco Plug & FCI Receptacle (40 & 120 positions)

TEST	SPECIFICATION CRITERION	RESULTS (40 positions)	RESULTS (120 positions)
LLCR#1 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 30mΩ max	Pass 16.1mΩ max	Pass 11.1mΩ max
Durability Pre-conditioning EIA-364-09 Per GS-12-547 section 6.1.10	Condition: 25 cycles, 1"/min Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#2 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 12.1mΩ max	Pass 9.7mΩ max
Temp Life, Pre-conditioning EIA-364-17 Per GS-12-547 section 6.1.16	Condition: 105±5°C, 120 hrs Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR @ 250 hrs Temp Life EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA @250 hours Criteria: 50mΩ max	Pass 10.8mΩ max	Pass 14.6mΩ max
LLCR @ 1000 hrs Temp Life EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA @1000 hours Temp Life Criteria: 50mΩ max	Pass 11.0mΩ max	Pass 18.0mΩ max
Reseating Per GS-12-547 section 6.1.14	Condition: 3 cycles manual un-mating & mating Criteria: No Damage	Pass No Damage	Pass No Damage
LLCR#5 EIA-364-23 Per GS-12-547 section 6.1.2	Condition: 20mV, 100mA Criteria: 50mΩ max	Pass 17.6mΩ max	Pass 15.1mΩ max

7.0 NOTES

Not Applicable

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REVISION RECORD

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