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**FBIS-II (Floating Battery Interconnection System Connector)**

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**1. Introduction**

1.1 Testing was performed on the Floating Battery Interconnection System (FBIS-II) Connector to determine if it meets the requirements of Product Specification, 108-61125 Rev.A

**1.2 Scope**

This report covers the electrical, mechanical and environmental performance requirements of the FBIS-II Connector.

The qualification testing was performed between 25 APR, 2011 and 27 MAY, 2011.

**1.3 Conclusion**

The FBIS-II Connector meets the electrical, mechanical and environmental performance requirements of Product Specification, 108-61125 Rev.A

**Product Description**

This product has been developed for Battery Pack of mobile phone etc.

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Classification : Restricted to Motorola Inc.

1.5 Test Samples

Samples were taken randomly from current production. The following samples were used:

Part Number	Description
1554829-3	FLOATING BATTERY INTERCONNECTION SYSTEMS RECEPTACLE ASSEMBLY
2134167-1	FBIS- II PLUG CONNECTOR 4POS H-TYPE

Fig. 1 (End)

**2. Test Contents**

Para.	Test Items	Requirements	Judgment
2.5.1	Examination of Product	Meets requirements of product drawing	Acceptable
<b>Electrical Requirements</b>			
2.5.2	Low Level Contact Resistance (LLCR)	<ul style="list-style-type: none"> <li>• 30m <math>\Omega</math> Max. (Initial and Final)</li> <li>• <math>\Delta R</math> 10m <math>\Omega</math> Max.(Final)</li> <li>• Subject mated contacts assembled in housing to 20 mV Max. open circuit at 100 mA. As shown in Fig.4</li> </ul>	Acceptable
2.5.3	Dielectric withstanding Voltage (DWV)	<ul style="list-style-type: none"> <li>• There shall be no evidence of arc-over, insulation breakdown or leakage current in excess of 1mA</li> <li>• 500Vrms at 60Hz, for 1minute</li> <li>• Mated connector</li> </ul>	Acceptable
2.5.4	Insulation Resistance (I.R)	<ul style="list-style-type: none"> <li>• The insulation resistance of mated connectors shall not be less than 500M<math>\Omega</math></li> <li>• 100V DC, for 2minute</li> <li>• Mated connector</li> </ul>	Acceptable
2.5.5	Temperature Rising	<ul style="list-style-type: none"> <li>• 30°C Max.</li> <li>• 1.5 Amps RMS continues</li> <li>• 3.5 Amps RMS over any 2 second time period</li> </ul>	Acceptable
<b>Mechanical Requirements</b>			
2.5.6	Mechanical Shock	<ul style="list-style-type: none"> <li>• No electrical discontinuity greater than 25 <math>\mu</math> sec. shall occur</li> <li>• 100g's, 6ms duration, 1/2 sine pulse</li> <li>• 3 shocks in each direction</li> <li>• 3 mutually perpend, planes 18 shocks total</li> </ul>	Acceptable
2.5.7	Vibration	<ul style="list-style-type: none"> <li>• No electrical discontinuity greater than 25 <math>\mu</math> sec. shall occur</li> <li>• Random Vibration</li> <li>• 3 mutually perpend. Planes, 15g peak</li> <li>• 10-2000Hz, 0.4g<sup>2</sup>/Hz, 20min per plane</li> </ul>	Acceptable
2.5.8	Insertion Force (Mating Force)	<ul style="list-style-type: none"> <li>• 1Pos.: 1 N Max.</li> <li>• Operation Speed: 100mm/min.</li> </ul>	Acceptable

Fig. 2 (CONT.)

Para.	Test Items	Requirements	Procedures
2.5.9	Withdrawal Force (Un-mating Force)	<ul style="list-style-type: none"> <li>• 1Pos.: 0.1 N Min.</li> <li>• Operation Speed: 100mm/min.</li> </ul>	Acceptable
2.5.10	Durability (Automatic Operation)	<ul style="list-style-type: none"> <li>• No contact crack allowed</li> <li>• Operation Speed: 600cycles/hour Max.</li> <li>• Number of Cycles: 1000 cycles</li> <li>• As shown in Fig.5-1, 5-2.</li> </ul>	Acceptable
2.5.11	Manual Durability	<ul style="list-style-type: none"> <li>• No contact crack allowed</li> <li>• Number of Cycles: 1000 cycles</li> <li>• As shown in Fig.5-1, 5-2</li> </ul>	Acceptable
<b>Environmental Requirements</b>			
2.5.12	Thermal Shock	<ul style="list-style-type: none"> <li>• No physical damage allowed</li> <li>• Mated connector,</li> <li>• -55°C/30min. 105°C/30min.</li> <li>• 5 cycles.</li> </ul>	Acceptable
2.5.13	Cyclic Humidity	<ul style="list-style-type: none"> <li>• No physical damage allowed</li> <li>Mated connector</li> <li>• 25°C±3°C at 80%±3% RH and</li> <li>65°C±3°C at 50%±3% RH.</li> <li>• 24cycles (dwell time:1h)</li> <li>• Ramp time: 0.5h</li> </ul>	Acceptable
2.5.14	Temperature Life (Heat Aging)	<ul style="list-style-type: none"> <li>• No physical damage allowed</li> <li>• Mated connector</li> <li>• 85°C for 120 hours</li> </ul>	Acceptable
2.5.15	Salt Spray	<ul style="list-style-type: none"> <li>• No corrosion that damages function of connector allowed</li> <li>• Mated connectors with</li> <li>5% , 35°C concentration for 96hours</li> </ul>	Acceptable
2.5.16	Resistance to Reflow Heat	<ul style="list-style-type: none"> <li>• No physical damage allowed</li> <li>• Temperature profile: J-STD-020D</li> </ul>	Acceptable

Fig. 2 (End)

**3. Product Qualification's Test Flow**

Test Examination	Test Group						
	1	2	3	4	5	6	7
	Test Flow (a)						
Examination of Product	1,9	1,14	1,10	1,8	1,6	1,10	1,4
Resistance to Reflow heat	2	2	2		2	2	2
Low Level Contact resistance(LLCR)	3,6	5,9, 11,13	5,7		3,5	5,7	
Dielectric Withstanding Voltage(DWV)				2,6			
Insulation Resistance(I.R)				3,7			
Temperature Rising							3
Mechanical Shock	4						
Vibration	5						
Insertion(Mating) Force	7	3,7	3,8			3,8	
Withdrawal (Un-mating) Force	8	4,8	4,9			4,9	
Durability (Automatic Operation)		6					
Manual Durability			6				
Thermal Shock		10		4			
Cyclic Humidity		12		5			
Temperature Life (Heat Aging)						6	
Salt Spray					4		

**Appendix 1**

(a) Numbers indicate sequence in which the tests are performed.

**4. Test Results**

Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 1	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Resistance to Reflowheat	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Mechanical Shock	5	SET	No discontinuity occurred greater than 25 $\mu$ sec.				Maximum of 25 $\mu$ seconds	Acceptable
	Vibration	5	SET	No discontinuity occurred greater than 25 $\mu$ sec.				Maximum of 25 $\mu$ seconds	Acceptable
	LLCR (Initial)	20	m $\Omega$	20.39	19.41	19.99	0.40	Initial: 30m $\Omega$ Max.	Acceptable
	LLCR (After Mechanical Shock & Vibration)	20	m $\Omega$	21.01	19.79	20.53	0.48	After test: 30m $\Omega$ Max. $\Delta$ R:10m $\Omega$ Max	Acceptable
	Insertion Force(End)	5	N	0.32	0.30	0.31	0.009	1Pos: 1N Max.	Acceptable
	Withdrawal Force(End)	5	N	0.15	0.14	0.146	0.005	1Pos:0.1N Min.	Acceptable

Fig. 3 (CONT.)

Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 2	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Resistance to Reflowheat	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Durability (Automatic operation)	5	SET	Contact crack didn't occur.				No contact crack allowed.	Acceptable
	Thermal shock	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Cyclic Humidity	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Insertion Force (Initial)	5	N	0.34	0.32	0.33	0.008	1Pos: 1N Max.	Acceptable
	Insertion Force (End)	5	N	0.31	0.29	0.30	0.008		Acceptable
	Withdrawal Force(Initial)	5	N	0.18	0.15	0.16	0.013	1Pos: 0.1N Min.	Acceptable
	Withdrawal Force(End)	5	N	0.15	0.14	0.14	0.005		Acceptable
	LLCR (Initial)	20	mΩ	19.76	18.96	19.36	0.29	Initial: 30mΩ Max.	Acceptable
	LLCR (After durability)	20	mΩ	20.12	19.82	19.96	0.11	After test: 30mΩMax. ΔR:10mΩ Max	Acceptable
	LLCR(After thermal shock)	20	mΩ	21.81	20.91	21.32	0.34	After test: 30mΩMax. ΔR:10mΩ Max	Acceptable
	LLCR(After cyclic humidity)	20	mΩ	22.95	21.45	22.25	0.53	After test: 30mΩMax. ΔR:10mΩ Max	Acceptable

Fig. 3 (CONT.)

Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 3	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Resistance to Reflowheat	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Manual durability	5	SET	Contact crack didn't occur.				No contact crack allowed.	Acceptable
	Insertion Force (Initial)	5	N	0.34	0.3	0.32	0.015	1Pos: 1N Max.	Acceptable
	Insertion Force (End)	5	N	0.31	0.28	0.29	0.011		Acceptable
	Withdrawal Force (Initial)	5	N	0.17	0.14	0.16	0.011	1Pos: 0.1N Min.	Acceptable
	Withdrawal Force (End)	5	N	0.15	0.13	0.14	0.008		Acceptable
	LLCR (Initial)	20	mΩ	19.54	18.37	18.97	0.50	Initial: 30mΩ Max.	Acceptable
LLCR (End)	20	mΩ	20.81	19.95	20.39	0.42	After test: 30mΩMax. ΔR:10mΩ Max	Acceptable	

**Fig. 3 (CONT.)**



Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 4	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Thermal Shock	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Cyclic humidity	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	DWV (Initial)	5	SET	Current leakage: 1mA Max.				Current leakage: 1mA Max.	Acceptable
	DWV (End)	5	SET	Current leakage: 1mA Max.				Current leakage: 1mA Max.	Acceptable
	I.R.(Initial)	5	GΩ	9.33	8.74	8.99	-	500MΩ Min.	Acceptable
	I.R.(End)	5	GΩ	9.12	8.35	8.80	-	500MΩ Min.	Acceptable

Fig. 3 (CONT.)

Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 5	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Resistance to Reflowheat	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Salt Spray	5	SET	Corrosion that damages function of connector didn't occur.				No corrosion that damages function of connector allowed.	Acceptable
	LLCR (Initial)	20	mΩ	20.01	18.92	19.51	0.43	Initial: 30mΩ Max.	Acceptable
	LLCR (End)	20	mΩ	22.41	20.17	21.44	0.96	After test: 30mΩMax. ΔR:10mΩ Max	Acceptable

Fig. 3 (CONT.)

Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 6	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Resistance to Reflowheat	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Temperature Life	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Insertion Force (Initial)	5	N	0.38	0.34	0.36	0.016	1 Pos: 1N Max.	Acceptable
	Insertion Force (End)	5	N	0.35	0.32	0.33	0.013		Acceptable
	Withdrawal Force (Initial)	5	N	0.19	0.16	0.17	0.013	1 Pos: 0.1N Min.	Acceptable
	Withdrawal Force (End)	5	N	0.16	0.14	0.15	0.009		Acceptable
	LLCR (Initial)	20	mΩ	20.02	18.94	19.51	0.44	Initial: 30mΩ Max.	Acceptable
LLCR (End)	20	mΩ	21.08	20.69	20.93	0.16	After test: 30mΩMax. ΔR:10mΩ Max	Acceptable	

Fig. 3 (CONT.)

Test Group	Test Items	N	Unit	Test Results				Spec.	Judgement
				Max.	Min.	Ave.	S		
Group 7	Examination of Product (Initial and End)	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Resistance to Reflowheat	5	SET	The physical damage didn't occur.				No physical damage allowed	Acceptable
	Temperature Life	1.5A Continue	5	°C	21.6	-		30°C Max.	Acceptable
3.5A 2seconds		5	°C	24.8	-		Acceptable		

Fig. 3 (End)

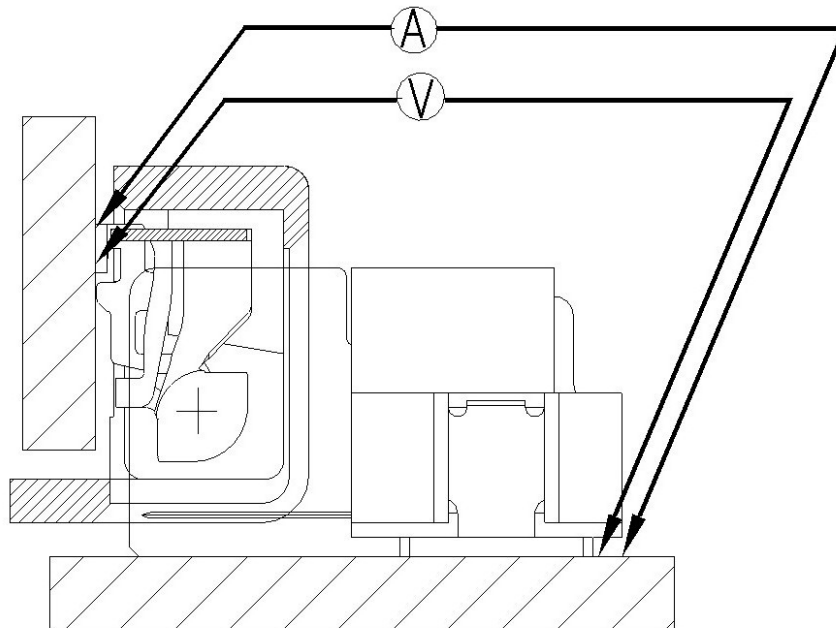


Fig.4 Termination Resistance Measuring Points

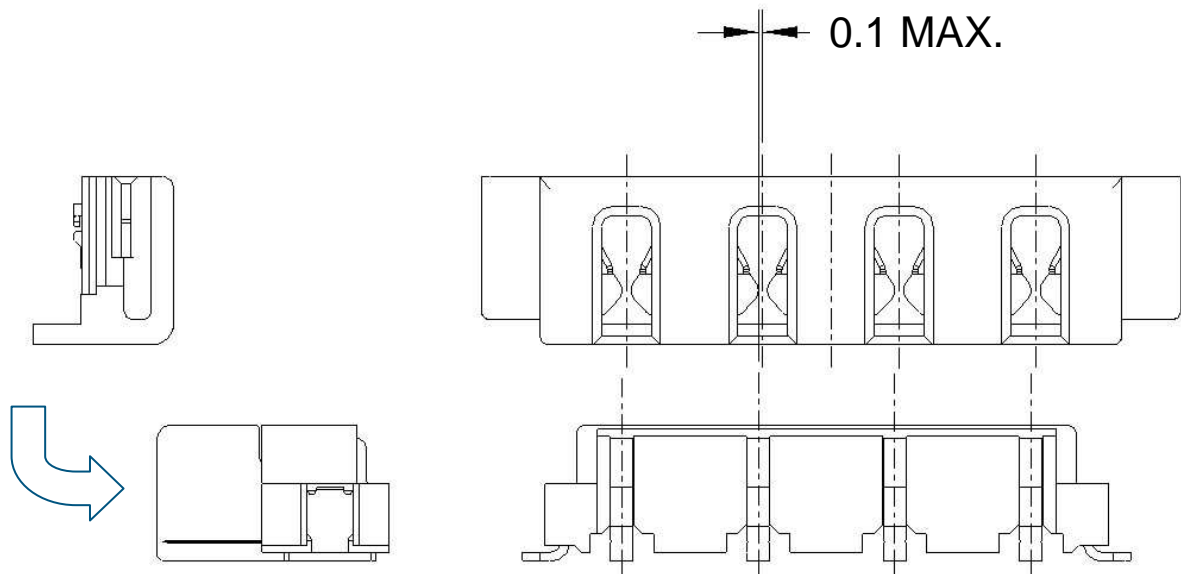


Fig.3-1 Displacement allowance for durability test

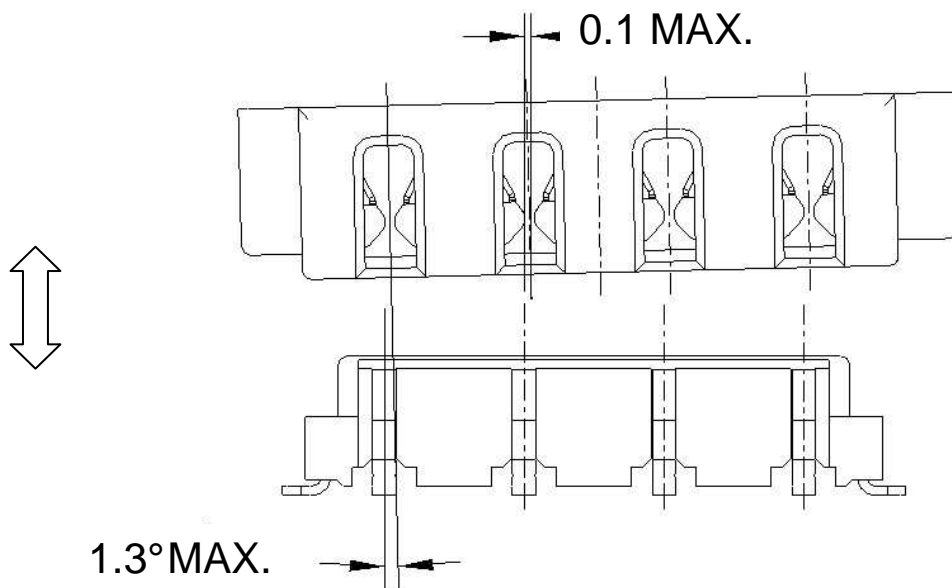


Fig.3-2 Tilt allowance for durability test

The displacement and tilt of the connectors should meet Fig.3-1 and 3-2 .  
Any contacts should not hit PCB of mating side.