NOVASTACK®-B

Part No. Plug: 20712-004E-0* Receptacle:20713-004E-0*

Product Specification

Qualification Test Report No. TR-16098

Rev.	ECN	Date	Prepared by	Checked by	Approved by
3	S22100	March 8, 2022	K.Watanabe	Haji.Takahashi	Y.Hashimoto
2	S21600	November 22, 2021	Haji.Takahashi	S.Suzuki	Y.Hashimoto
1	S16631	September 21, 2016	H.Ikari	-	Y.Shimada
0	S16546	August 17, 2016	H.Ikari	-	Y.Shimada

1. Scope

This Product Specification defines the test conditions and the performances of the NOVASTACK-B Battery Board-to-board (FPC) connector.

2. Product Name and Parts No.

2.1 Product Name

NOVASTACK-B

2.2 Parts No.

Plug:20712-004E-0*
Receptacle: 20713-004E-0*

3. Rating

3.1 Operating Condition

Amperage：Signal contact … 1.0A AC/DC (per contact pin)
Power contact … 6.0A AC/DC (per contact pin)
Voltage ：50V AC (per contact pin)
Operating Temperature：233 to 358K(-40℃ to +85℃) (Containing temperature rise by current)
Operating Humidity：85% max

3.2 Storage Conditions

Storage Temperature：248 to 333K(-25℃ to +60℃)
Storage Humidity：85% max. (Non-condensing)

4. Test and Performance

Test Condition

This initial test is equal to it's at shipping condition and unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202G.
Temperature … 288K to 308K（15℃ to 35℃）
Pressure … 866hPa to 1066hPa（650mmHg to 800mmHg）
Relative Humidity … 45 to 75%R.H.

4.1. Electrical Performance

1. Contact resistance	
Reference standard:	MIL-STD-202G, Method 307
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then measure the contact resistance as shown in Fig.2 by the four terminal methods. Apply the low level condition of 20mV MAX. DC for the open circuit voltage and 10mA MAX. DC for the closed circuit current.
Pass criteria:	Contact Initial：40mΩMAX. After testing：⊿R20mΩ MAX. Power contact Initial：40mΩMAX. After testing：⊿R20mΩ MAX.

2. Insulation resistance	
Reference standard:	MIL-STD-202G, Method 302
Test conditions:	Mate the plug and receptacle connector together, and then apply DC 250 V between the inner contact and the ground contact.
Pass criteria:	Initial ：1,000 MΩ MIN. After testing ：100 MΩ MIN.

3. Dielectric withstanding voltage	
Reference standard:	MIL-STD-202G, Method 301
Test conditions:	Mate the receptacle and plug connector together, then apply AC 200V(rms) between the neighboring contacts for a minute.
Pass criteria:	No abnormalities such as creeping discharge, flashover, insulator breakdown occur.

4. Temperature rising	
Reference standard:	-
Test conditions:	Mate the plug and receptacle connector together, then apply rating current per contact pin.
Pass criteria:	Over ambient ⊿T30 ℃ MAX.

4.2. Mechanical Performance

1. Mating force and Unmating force	
Reference standard:	-
Test conditions:	Solder the plug and receptacle connector to the test board, then place the plug and receptacle on push-on/pull-off machine, measure of initial and mating/un-mating 30 cycles at a speed 25±3mm/min. along the mating axis.
Pass criteria:	Mating Force 40N MAX. Un-mating Force Initial：10N MIN. After test：7N MIN.

2. Durability	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and unmating 30 cycles at a speed 25±3mm/min. along the mating axis.
Pass criteria:	Contact resistance: Shall meet4.1.1

3. Contact retention force	
Reference standard:	-
Test conditions:	Place the connector on the push-on/pull-off machine, then apply force on the contact head and push the contact along the direction opposite to the contact insertion at a speed of 25±3mm/min. Measure the force when the contact dislodges the connector.
Pass criteria:	Receptacle contact retention force: 0.1N MIN.

4. Vibration	
Reference standard:	MIL-STD-202G, Method 201A
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the vibrator. Then apply the following vibration. During the testing, run 100mA DC to check electrical discontinuity. Frequency：10Hz→55Hz→10Hz/approx 1min. Directions：Three mutually perpendicular direction. Total Amplitude：1.52 mm Sweep duration：2 hours for each direction, a total of 6 hours.
Pass criteria:	Contact resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

5. Shock	
Reference standard:	MIL-STD-202G, Method 213B, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the shock machine. The n apply the following shock. MAX.G ：50G Duration ：11 milliseconds Wave Form ：Half Sinusoidal Directions , cycle ：6 mutually perpendicular direction , 3 cycles about each direction
Pass criteria:	Contact resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

1. Thermal shock	
Reference standard:	MIL-STD-202G, Method 107G, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature：218K(-55℃)：30 min.→358K(85℃)：30 min. Transition time：5 min. MAX. No. of cycles ：5 cycles
Pass criteria:	Contact resistance: Shall meet 4.1.1. Insulation resistance: Shall meet 4.1.2. Dielectric withstanding voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

2. High temperature life	
Reference standard:	MIL-STD-202G, Method 108A, Condition B.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature：358±2K (85±2℃) Duration：250 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

3. Humidity(Steady state)	
Reference standard:	MIL-STD-202G, Method 103B, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2℃) Humidity: 90 to 95%RH Duration: 240 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Insulation resistance: Shall meet 4.1.2. Dielectric withstanding voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

4. Humidity(Cycling)	
Reference standard:	MIL-STD-202G, Method 106G.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature：298[263] to 338K (25[-10] to 65℃) Humidity ：90 to 98%RH Duration ：10cycles (240hours)
Pass criteria:	Contact resistance: Shall meet 4.1.1. Insulation resistance: Shall meet 4.1.2. Dielectric withstanding voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

5. Low temperature life	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment . Temperature：233±2K (-40±2℃) Duration：96 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

6. Salt water spray	
Reference standard:	MIL-STD-202G, Method 101E, Condition B.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 308±2K (35±2℃) Salt water density: 5±1% [by weight] Duration: 48 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

7. H_2S gas	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2℃) Relative humidity: 80±5%RH Gas: H2S 3±1ppm Duration: 48 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

4.4. Others

1. Solder ability	
Reference standard:	MIL-STD-202G, Method 208H.
Test conditions:	Dip the solder tine of the contact in the solder bath at 518±5K （245±5℃） for 5±0.5 seconds after immersing the tine in the flux of RMA or R type for 5 to 10 seconds.
Pass criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Soldering heat resistance	
Reference standard:	-
Test conditions:	Reflow temperature as shown in Fig.1. The number of times of Reflow is within 2.
Pass criteria:	No abnormality adversely affecting the performance shall not occur.

3. Soldering iron	
Reference standard:	-
Test conditions:	Operating temperature ：613 to 633K (350℃±10) Application time of soldering iron ：5±1sec. The number of times of application ： 3 times
Pass criteria:	No abnormality adversely affecting the performance shall occur.

4.5 Test Sequence and Sample Quantity

Table 1 Test Sequence and Sample Quantity

Test Item	Group												
	A	B	C	D	E	F	G	H	J	K	L	M	N
Contact Resistance	2,6		1,3,5	1,3	1,3	1,5	1,5,7	1,3	1,3	1,3			
Insulation Resistance						2,6	2,8						
D. W. Voltage						3,7	3,9						
Temperature Rising													1
Mating Force	1,5												
Unmating Force	3,7												
Durability	4						4 (10cycles)						
Contact Retention Force		1,3											
Vibration			2										
Shock			4										
Thermal Shock				2									
High Temperature Life		2			2								
Humidity (Steady State)						4							
Humidity (Cycling)							6						
Cold Temperature Life								2					
Salt Water Spray									2				
Gas (H_2S)										2			
Solder ability											1		
Soldering Heat Resistance												1	
Sample QTY.	5 pcs.	20 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	10 pcs.	10 pcs.	5 pcs.

※Numbers indicate sequence in which tests are performed.

5. Reflow Temperature Profile

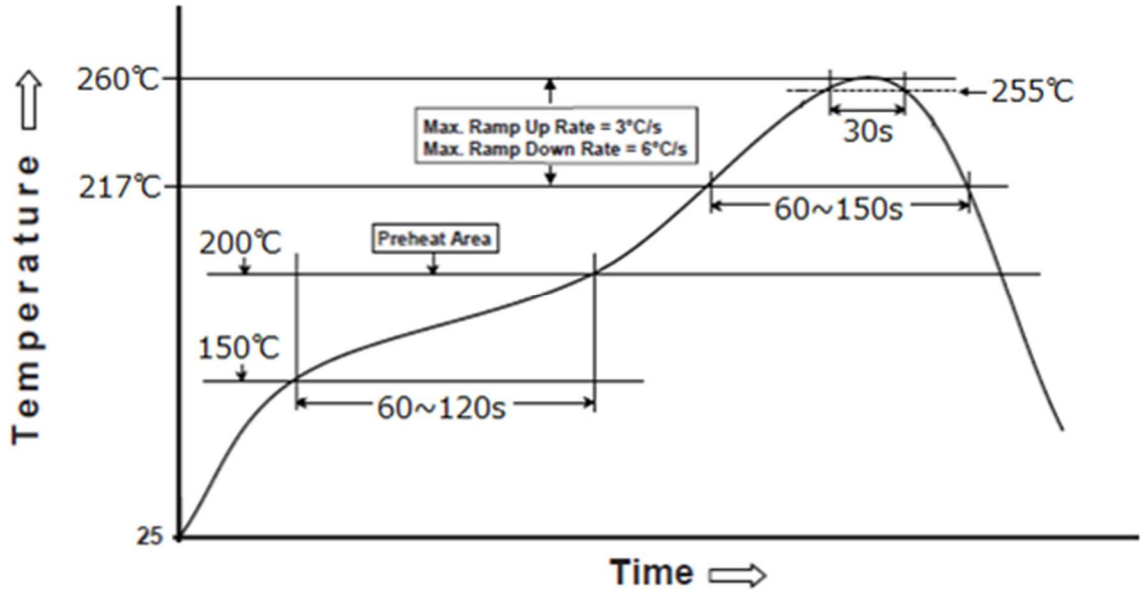


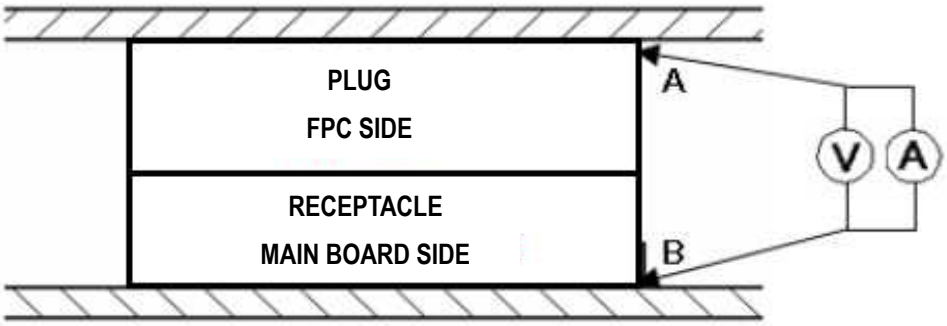
Fig.1 Reflow Temperature Profile

5.1 Recommended Metal Mask

Refer to DWG NO.20712 (Plug), 20713(Receptacle) .

6. Measuring method

6.1 Measuring method of Contact Resistance



Contact Resistance = R_{AB}

Fig.2 Contact Resistance