

NOVASTACK®4

Part No. Plug: 20641 Receptacle: 20642

Product Specification

Qualification Test Report No. TR-14088

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7	S21582	November 5, 2021	Y.Kuribayashi	S.Suzuki	Y.Hashimoto
6	S18081	January 25, 2018	K.Tanaka	-	M.Takemoto
5	S17654	August 30, 2017	K.Tanaka	-	M.Takemoto
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Scope

This Product Specification defines the test conditions and the performances of the NOVASTACK® 4 Connector, a board-to-board connector of 0.4mm contact pitch.

2. Product Name and Parts No.

2.1 Product Name

NOVASTACK® 4

2.2 Parts No.

Plug: 20641-0**E

Receptacle: 20642-0**E

3. Rating

3.1 Operating Condition

Amperage : 0.3A AC/DC (per contact pin)

Voltage : 60V AC (per contact pin)

Operating Temperature : 233 to 358K(-40°C to +85°C)
(Containing temperature rise by current)

Operating Humidity : 85% max

3.2 Storage Conditions

Storage Temperature : 248 to 333K(-25°C to 60°C)

Storage Humidity : 85% max.

(Non-condensing)

4. Test and Performance

Test Condition

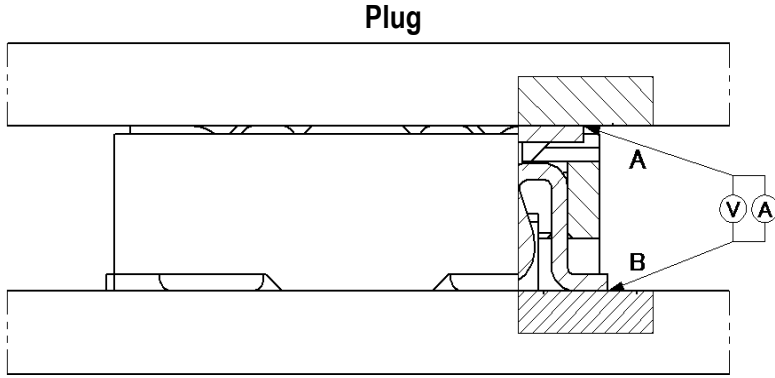
This initial test is equal to it's at shipping condition and unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202G.

Temperature ... 288K to 308K (15°C to 35°C)

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.1 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.
 <p style="text-align: center;">Plug</p> <p style="text-align: center;">Receptacle</p> <p style="text-align: center;">Fig.1 Contact Resistance</p>	
Pass criteria:	Contact Initial: 80 mΩ MAX. After testing: ΔR 20 mΩ 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: 1500 MΩ MIN. After testing: 500 MΩ MIN.

3. Dielectric withstanding voltage	
Reference standard:	MIL-STD-202G, Method 301
Test conditions:	Mate the receptacle and plug connector together, and then apply AC 250V (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 and then apply rating current per contact pin.
Pass criteria:	Over ambient ΔT 30 °C MAX.

4.2. Mechanical Performance

1. Mating force and Un-mating force	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine, measure of initial and mating/unmating 30 cycles at a speed 25 ± 3 mm/min. along the mating axis.
Pass criteria:	<p>Mating force</p> <p>Initial</p> <p>6 P: 10.0 N MAX.</p> <p>10 P: 12.0 N MAX.</p> <p>24 P: 28.8 N MAX.</p> <p>30 P: 36.0 N MAX.</p> <p>34 P: 40.8 N MAX.</p> <p>40 P: 48.0 N MAX.</p> <p>Unmating force</p> <p>30cycles</p> <p>6 P: 1.2 N MIN.</p> <p>10 P: 2.0 N MIN.</p> <p>24 P: 4.8 N MIN.</p> <p>30 P: 6.0 N MIN.</p> <p>34 P: 6.8 N MIN.</p> <p>40 P: 8.0 N MIN.</p>

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 30cycles at a speed 25 ± 3 mm/min. along the mating axis.
Pass criteria:	Contact resistance: Shall meet 4.1.1

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 ± 3 mm/min. Measure the force when the contact dislodges the connector.
Pass criteria:	<p>Plug contact retention force: 0.1N MIN.</p> <p>Receptacle contact retention force: 0.1N MIN.</p>

4. Vibration	
Reference standard:	MIL-STD-202G, Method 201
Test conditions:	<p>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.</p> <p>Frequency: 10Hz→55Hz→10Hz/approx. 1min.</p> <p>Directions: 3 mutually perpendicular directions.</p> <p>Total Amplitude: 1.52mm</p> <p>Sweep duration: 2 hours for each direction, a total of 6 hours.</p>
Pass criteria:	<p>Contact resistance: Shall meet 4.1.1.</p> <p>Electrical discontinuity: No electrical discontinuity greater than $1\mu\text{s}$ shall occur.</p> <p>Appearance: No abnormality adversely affecting the performance shall occur.</p>

4.2. Mechanical Performance

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

4.3. Environmental Performance

1. Thermal shock	
Reference standard:	MIL-STD-202G, Method 107, 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°C),30min.→358K(85°C),30min. Transition time: 5min. 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 108, 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 \pm 2K (85 \pm 2°C) Duration: 250 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Contact retention force: Shall meet 4.2.3. Appearance: No abnormality adversely affecting the performance shall occur.

3. 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: 228 \pm 2K (-45 \pm 2°C) Duration: 96 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Contact retention force: Shall meet 4.2.3. Appearance: No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

4. Humidity(Steady state)	
Reference standard:	MIL-STD-202G, Method 103, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: $313\pm 2K$ ($40\pm 2^{\circ}C$) 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.

5. Humidity(Cycling)	
Reference standard:	MIL-STD-202G, Method 106.
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°C) 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

6. Salt water spray	
Reference standard:	MIL-STD-202G, Method 101, Condition B
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: $308 \pm 2\text{K}$ ($35 \pm 2^\circ\text{C}$) Salt water density: $5 \pm 1\%$ [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 ₂ S 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: $313 \pm 2\text{K}$ ($40 \pm 2^\circ\text{C}$) Relative humidity: $80 \pm 5\%$ RH Gas: H ₂ S $3 \pm 1\text{ppm}$ 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 208
Test conditions:	Dip the solder tine of the contact in the solder bath at $518 \pm 5K$ ($245 \pm 5^{\circ}C$) 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.2. The number of times of Reflow is within 3.

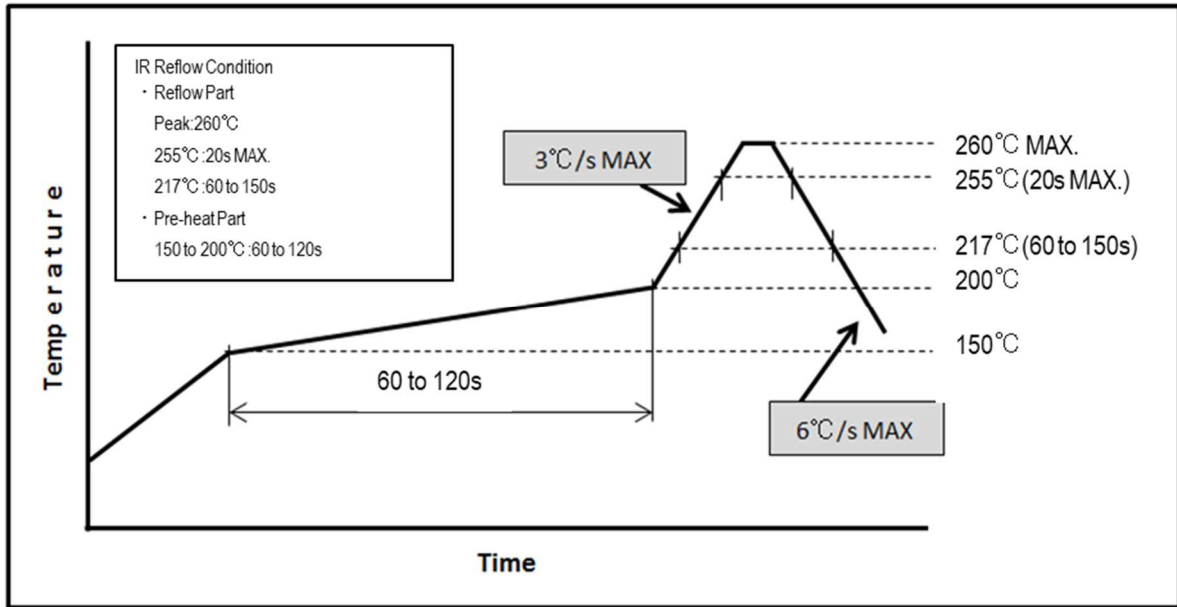


Fig.2

Pass criteria:	No abnormality adversely affecting the performance shall not occur.
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3. Soldering iron	
Reference standard:	-
Test conditions:	Operating temperature : 613 to $633K$ ($350^{\circ}C \pm 10$) Application time of soldering iron : 5 ± 1 sec. The number of times of application : 3times
Pass criteria:	No abnormality adversely affecting the performance shall occur.

4.5 Test Sequence and Specimen Quantity

Table 1 Test Sequence and Sample Quantity

Test Item	Group													
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Contact Resistance	2,6		1,3,5	1,5	1,3	1,3	1,5	1,5	1,3	1,3				
Insulation Resistance				2,6			2,6	2,6						
D. W. Voltage				3,7			3,7	3,7						
Temperature Rising														1
Mating Force	1,5													
Un-mating Force	3,7													
Durability	4													
Contact Retention Force		1,3												
Vibration			2											
Shock			4											
Thermal Shock				4										
High Temperature Life		2			2									
Low Temperature Life						2								
Humidity (Steady State)							4							
Humidity (Cycling)								4						
Salt Water Spray									2					
H2S Gas										2				
Solder Ability											1			
Soldering Heat Resistance												1		
Soldering Iron													1	
Sample q'ty	5 pcs.	20 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	10 pcs.	10 pcs.	10 pcs.	5 pcs.

※Numbers indicate sequence in which tests are performed.

5. Recommended Metal Mask

Recommended thickness of METAL MASK : t=0.12

※The pattern dimensions and opening rate refer to a drawing