

NOVASTACK® 35-HDH Connector

Part No. Plug:21003-0**E Receptacle:21004-0**E

Product Specification

Qualification Test Report No. TR-22021

2	S24181	May 16, 2024	Y. Baba	-	S. Suzuki
1	S23377	October 23, 2023	W. Lau	Y. Shimizu	M. Takemoto
0	S22310	July 8, 2022	M. Hidaka	S. Suzuki	Y. Hashimoto
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Scope

This Product Specification defines the test conditions and the performances of the NOVASTACK 35-HDH Connector, a board-to-board connector of 0.35 mm contact pitch.

2. Product Name and Parts No.

2.1 Product Name

NOVASTACK 35-HDH

2.2 Parts No.

Plug: 21003-0**E

Receptacle: 21004-0**E

3. Rating

3.1 Operating Conditions

Amperage: Signal contact ... 0.5A AC/DC (Per Contact Pin)
12.0A MAX. (Total)

Voltage: 60V AC(r.m.s)/DC (per contact pin)

Operating temperature: 233 to 358K(-40°C to +85°C)

(Containing temperature rise by current)

Operating humidity: 85%R.H. max.

3.2 Storage Conditions

Storage temperature: 248 - 333K(-25°C - +60°C)

Storage humidity: 85%R.H. 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-202.

Temperature: 288K to 308K (+15°C to +35°C)

Atmospheric Pressure: 866hPa to 1,066hPa (650mmHg to 800mmHg)

Relative Humidity: 45 to 75%R.H.

4.1. Electrical Performance

1. Contact Resistance	
Reference Standard:	MIL-STD-202-307
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 DC for the closed circuit current.
Fig.1	
Pass Criteria:	Contact Initial: 50 mΩ max. After testing: ΔR 50 mΩ max. Ground Initial: 20 mΩ max. After testing: ΔR 20 mΩ max.

2. Insulation Resistance	
Reference Standard:	MIL-STD-202-302
Test Conditions:	Mate the plug and receptacle connector together, and then apply DC 250 V between the neighboring contacts and contact to the shell.
Pass Criteria:	Initial: 1,000 MΩ min. After testing: 500 MΩ min.

3. Dielectric withstanding voltage	
Reference standard:	MIL-STD-202-301
Test conditions:	Mate the receptacle and plug connector together, then apply AC 250V(rms) between the neighboring contacts and contact to the shell 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. Contact ··· 0.5A/pin. Total ··· 12A MAX.
Pass criteria:	Over ambient ΔT 30 °C 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/unmating 20 cycles at a speed 25 ± 3 mm/min. along the mating axis.
Pass criteria:	Mating force 60P: Initial 60 N MAX. 70P: Initial 70 N MAX. Unmating force 60P: 20cycle 6.0 N MIN. 70P: 20cycle 7.0 N MIN.

2. Durability

Reference standard:	-
Test conditions:	Solder the plug and receptacle connector to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and unmating 20 cycles 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:	Receptacle contact retention force: 0.1N MIN.

4. Vibration

Reference standard:	MIL-STD-202-201
Test conditions:	Solder the plug and 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. 1 minute Directions: 3 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 $1\mu\text{s}$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

5. Shock

Reference standard:	MIL-STD-202-213, Test condition A.
Test conditions:	Solder the plug and 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: 11 msec 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 $1\mu\text{s}$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

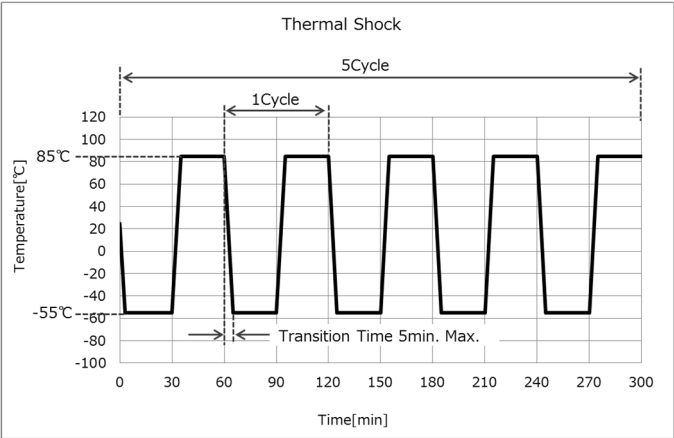
1. Thermal shock	
Reference standard:	MIL-STD-202-107, Test condition A.
Test conditions:	<p>Solder the plug and receptacle connector to the test board, then mate plug and receptacle connector, and expose them to the following environment.</p> <p>Temperature: 218K (-55°C), 30 minutes→358K (85°C), 30 minutes</p> <p>Transition time: 5 minutes max.</p> <p>No. of cycles: 5 cycles</p> <p>Refer to Fig. 2 for sequence.</p>
 <p>The graph, titled 'Thermal Shock', plots Temperature [°C] on the y-axis (ranging from -100 to 120) against Time [min] on the x-axis (ranging from 0 to 300). It shows a square wave pattern with five cycles. Each cycle consists of a 30-minute dwell at 85°C, a 5-minute transition to -55°C, a 30-minute dwell at -55°C, and another 5-minute transition back to 85°C. A horizontal double-headed arrow labeled '5Cycle' spans the entire duration from 0 to 300 minutes. A smaller horizontal double-headed arrow labeled '1Cycle' spans one full cycle from 60 to 120 minutes. A horizontal double-headed arrow labeled 'Transition Time 5min. Max.' indicates the duration of the temperature transitions between the 85°C and -55°C levels.</p>	
Pass criteria:	<p>Contact resistance: Shall meet 4.1.1.</p> <p>Insulation resistance: Shall meet 4.1.2.</p> <p>Dielectric withstanding voltage: Shall meet 4.1.3.</p> <p>Appearance: No abnormality adversely affecting the performance shall occur.</p>

Fig.2

2. High temperature life	
Reference standard:	MIL-STD-202-108, Test condition B.
Test conditions:	<p>Solder the plug and receptacle connector to the test board, then mate plug and receptacle connector, and expose them to the following environment.</p> <p>Temperature: 358±2K (85±2°C)</p> <p>Duration: 250 hours</p>
Pass criteria:	<p>Contact resistance: Shall meet 4.1.1.</p> <p>Contact retention force: Shall meet 4.2.3.</p> <p>Appearance: No abnormality adversely affecting the performance shall occur.</p>

4.3. Environmental Performance

3. Humidity (Steady state)	
Reference standard:	MIL-STD-202-103, Test condition A.
Test conditions:	Solder the plug and receptacle connector to the test board, then mate plug and receptacle connector, and expose them to the following environment. Temperature: 313±2K (40±2°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.

4. Humidity (Cycling)	
Reference standard:	MIL-STD-202-106.
Test conditions:	Solder the plug and receptacle connector to the test board, then mate plug and receptacle connector, and expose them to the following environment. Temperature: 298[263] to 338K (25[-10] to 65°C) Humidity: 90 to 98%RH Duration: 10 cycles (240 hours) Refer to Fig. 3 for sequence.

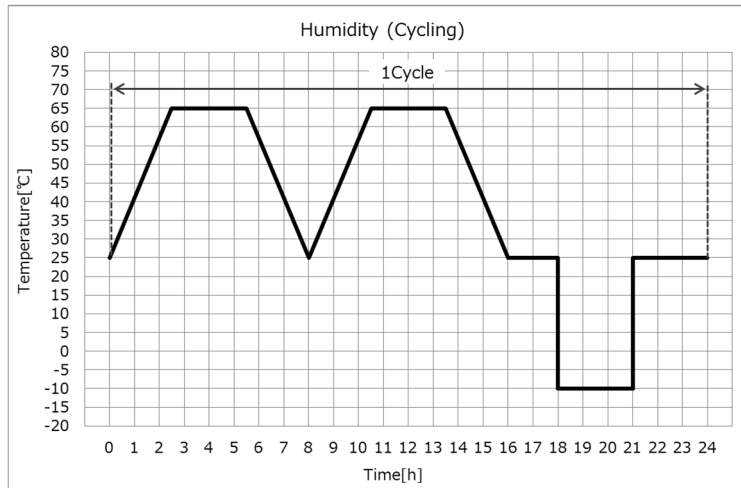


Fig. 3

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.
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4.3. Environmental Performance**5. Salt spray**

Reference standard: MIL-STD-202-101, Test condition B.

Test conditions: Solder the plug and receptacle connector to the test board, then mate plug and receptacle 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.

6. H₂S gas

Reference standard: -

Test conditions: Solder the plug and receptacle connector to the test board, then mate plug and receptacle 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: H₂S 3 ± 1 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. Solderability	
Reference standard:	MIL-STD-202G-208H
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. Resistance to soldering heat

Reference standard:	-
Test conditions:	Reflow temperature is shown in Fig.4. The number of Reflow time is within 2. In the case of nitrogen reflow, the oxygen concentration shall be 1,000 ppm or more. If oxygen concentration is lower than 1,000ppm, contact your I-PEX sales for details.

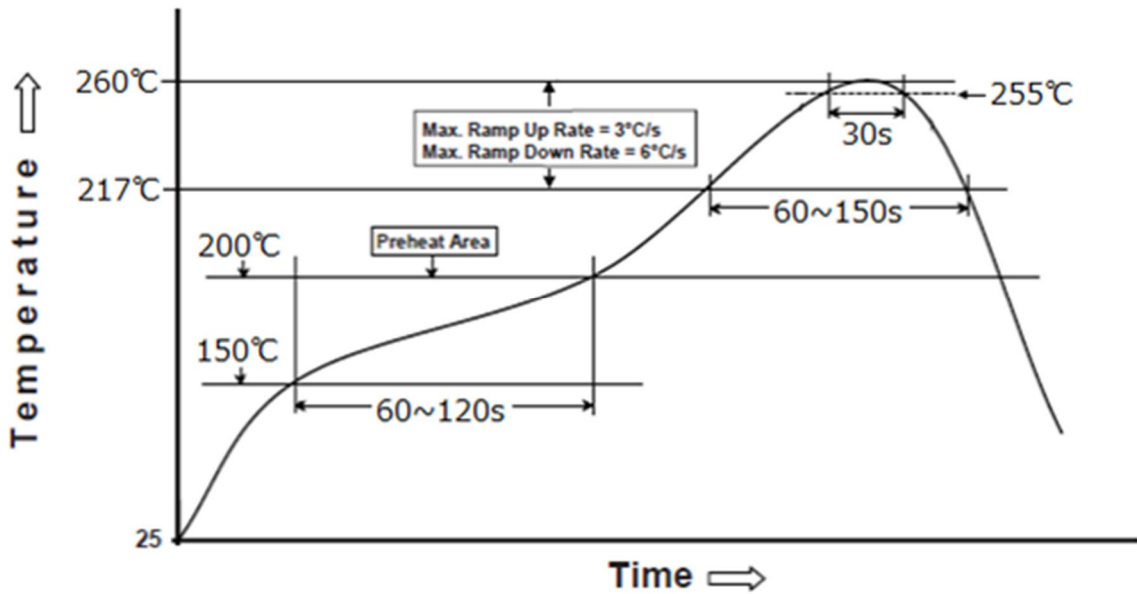


Fig. 4

Pass criteria:	No deformation nor defect adversely affecting the performance 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 deformation nor defect adversely affecting the performance occur.

4.5 Test Sequence and Specimen Quantity

Table 1 Test Sequence and Sample Quantity

No.	Test Item	Testing Groups													
		A	B	C	D	E	F	G	H	J	K	L	M	N	
4.1 Electrical Performance	1	Contact resistance		2,6		1,3,5	1,5	1,3	1,5	1,5	1,3	1,3			
	2	Insulation resistance				2,6		2,6	2,6						
	3	Dielectric withstanding voltage				3,7		3,7	3,7						
	4	Temperature rising	1												
4.2 Mechanical Performance	1	Mating force		1,5											
		Unmating force		3,7											
	2	Durability		4											
	3	Contact retention force			1										
	4	Vibration				2									
	5	Shock				4									
4.3 Environmental Performance	1	Thermal shock				4									
	2	High temperature life					2								
	3	Humidity (Steady State)						4							
	4	Humidity (Cycling)							4						
	5	Saltwater spray								2					
	6	H ₂ S gas									2				
4.4 Others	1	Solder ability											1		
	2	Soldering heat resistance												1	
	3	Soldering iron													1
Specimen quantity			5	5	20	5	5	5	5	5	5	5	10	10	10
			pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.	pcs.

※Numbers indicate sequence in which tests are performed.

5. Recommended Metal Mask

Refer to drawing for the recommended metal mask thickness and opening dimension.