

# NOVASTACK® 35-HDN Connector

Part No. Plug: 20864-0\*\*E-0# Receptacle: 20865-0\*\*E-0#

## Product Specification

Qualification Test Report No. TR-19055

3	S21553	November 1, 2021	H. Higuchi	S. Suzuki	Y. Hashimoto
2	S19573	September 25, 2019	R. Shioya	A. Kagoshima	Y. Shimada
1	S19505	September 4, 2019	Y. Baba	T. Yayoshi	Y. Shimada
0	S19411	June 28, 2019	R. Shioya	T. Yayoshi	Y. Shimada
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-HDN Connector, a board-to-board connector of 0.35 mm contact pitch.

## 2. Product Name and Parts No.

### 2.1 Product Name

NOVASTACK 35-HDN

### 2.2 Parts No.

Plug: 20864-0\*\*E-0#

Receptacle: 20865-0\*\*E-0#

## 3. Rating

### 3.1 Operating Conditions

Amperage: Signal contact ...10P : 1.0A MAX. AC/DC x pin counts = 10.0A AC/DC (Total)  
12P and over : 12.0A AC/DC (Total)

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

Operating temperature: 233~358K(-40°C~+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~308K (+15°C~+35°C)

Pressure... 866hPa~1,066hPa (650mmHg~800mmHg)

Relative humidity... 45~75%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 DC for the closed circuit current.						
<p style="text-align: center;">Fig.1</p>							
Pass criteria:	<table border="0"> <tr> <td><u>Signal contact</u></td> <td>Initial: 40 mΩ max.</td> <td>After testing: <math>\triangle R</math> 40 mΩ max.</td> </tr> <tr> <td><u>Ground</u></td> <td>Initial: 20 mΩ max.</td> <td>After testing: <math>\triangle R</math> 20 mΩ max.</td> </tr> </table>	<u>Signal contact</u>	Initial: 40 mΩ max.	After testing: $\triangle R$ 40 mΩ max.	<u>Ground</u>	Initial: 20 mΩ max.	After testing: $\triangle R$ 20 mΩ max.
<u>Signal contact</u>	Initial: 40 mΩ max.	After testing: $\triangle R$ 40 mΩ max.					
<u>Ground</u>	Initial: 20 mΩ max.	After testing: $\triangle R$ 20 mΩ max.					

## 4.1. Electrical Performance

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 neighboring contacts and contact to the shell. Refer to Fig. 2 for the measurement points.
Pass criteria:	Initial: 1,000 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, then apply AC 250V(rms) between the neighboring contacts and contact to the shell for a minute. Refer to Fig. 2 for the measurement points.
Pass criteria:	No abnormalities such as creeping discharge, flashover, insulator breakdown occur.

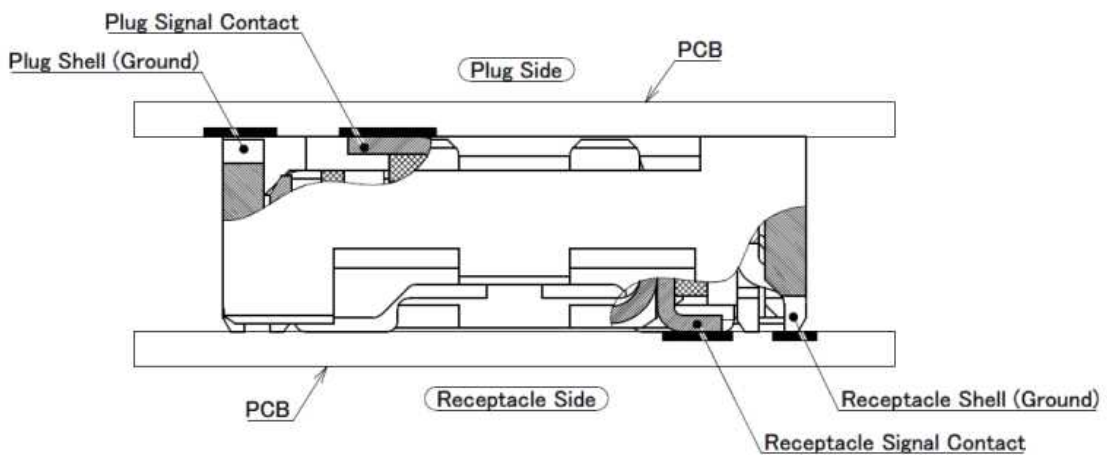


Fig.2

4. Temperature Rising	
Reference standard:	-
Test conditions:	Mate the plug and receptacle connector together and then apply rating current per contact.
Pass criteria:	Over ambient $\Delta T30$ °C max.

**4.2. Mechanical Performance**

<b>1. Mating Force and Unmating Force</b>	
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 10 cycles at a speed $25\pm 3$ mm/min. along the mating axis.
Pass criteria:	Mating force Initial 2.0 N/Pin MAX. Unmating force 10cycle 0.15 N/Pin MIN.

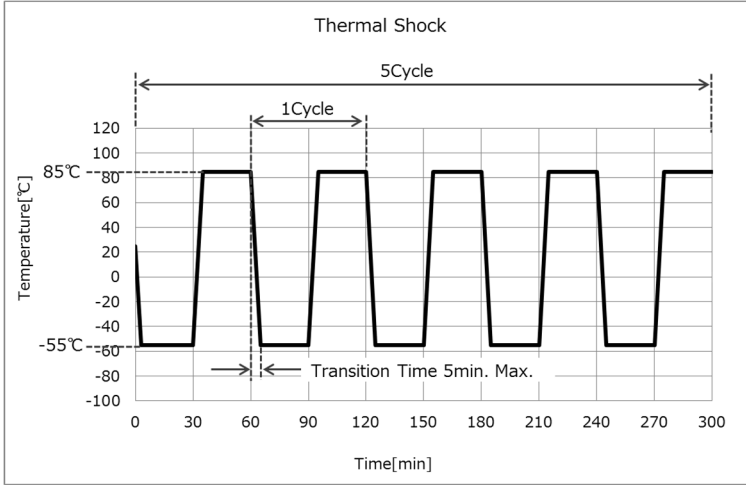
<b>2. Durability</b>	
Reference standard:	-
Test conditions:	Solder the plug and receptacle connector to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and unmating 10 cycles at a speed $25\pm 3$ mm/min. along the mating axis.
Pass criteria:	Contact resistance: Shall meet 4.1.1

<b>3. Contact Retention Force</b>	
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 $25\pm 3$ mm/min. Measure the force when the contact dislodges the connector.
Pass criteria:	Receptacle contact retention force: 0.1N min.

<b>4. Vibration</b>	
Reference standard:	MIL-STD-202G, Method 201A
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 $1\mu s$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

<b>5. Shock</b>	
Reference standard:	MIL-STD-202G, Method 213B, 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
Pass criteria:	Contact resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than $1\mu s$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

4.3.Environmental Performance

1. Thermal Shock	
Reference standard:	MIL-STD-202G, Method 107G, 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: 218K (-55°C), 30 minutes→358K (85°C), 30 minutes Transition time: 5 minutes max. No. of cycles: 5 cycles Refer to Fig.3 for sequence.
 <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 representing 5 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 '1 Cycle' interval is marked from 60 to 120 minutes, and a '5 Cycle' interval is marked from 0 to 300 minutes. A note indicates 'Transition Time 5min. Max.'.</p>	
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.

2. High Temperature Life	
Reference standard:	MIL-STD-202G, Method 108A, 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: 358±2K (85±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. Humidity(Steady State)	
Reference standard:	MIL-STD-202G, Method 103B, 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: 90~95%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.

4.3.Environmental Performance

4. Humidity(Cycling)	
Reference standard:	MIL-STD-202G, Method 106G.
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]~338K (25[-10]~65°C) Humidity: 90~98%RH Duration: 10 cycles (240 hours) Refer to Fig.4 for sequence.
	Fig.4
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. Salt Water Spray	
Reference standard:	MIL-STD-202G, Method 101E, 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±2K (35±2°C) 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.

6. H <sub>2</sub> S 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±2K (40±2°C) Relative humidity: 80±5%RH Gas: H <sub>2</sub> S 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 $518 \pm 5K$ ( $245 \pm 5^\circ C$ ) for $5 \pm 0.5$ 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:	<p>Reflow temperature is shown in Fig.5.                      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.</p>
<p>The graph shows a reflow temperature profile. The y-axis is labeled 'Temperature' with an upward arrow, ranging from 25 to 260°C. The x-axis is labeled 'Time' with a rightward arrow. The curve starts at 25°C, rises to 150°C (with a 60~120s interval), then to 200°C (labeled 'Preheat Area'). It continues to rise to 217°C, then to a peak of 255°C (with a 30s interval at the peak), and finally reaches 260°C. Ramp rates are specified as Max. Ramp Up Rate = 3°C/s and Max. Ramp Down Rate = 6°C/s. A 60~150s interval is also marked between 217°C and 255°C.</p>	
Fig.5	
Pass criteria:	No abnormality adversely affecting the performance shall not occur.

3. Soldering Iron	
Reference standard:	-
Test conditions:	<p>Operating temperature : <math>613 \sim 633K</math> (<math>350^\circ C \pm 10</math>)                      Application time of soldering iron : <math>5 \pm 1sec</math>.                      The number of times of application : 3times</p>
Pass criteria:	No abnormality adversely affecting the performance shall not 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
Contact Resistance		2,6		1,3,5	1,5	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											
Unmating Force		3,7											
Durability		4											
Contact Retention Force			1										
Vibration				2									
Shock				4									
Thermal Shock					4								
High 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 QTY.	5 pcs.	5 pcs.	20 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	10 pcs.	10 pcs.	10 pcs.

※Numbers indicate sequence in which tests are performed.

## 5. Recommended Metal Mask

Numbers indicate sequence in which tests are performed.