# MINIFLEX® 3-BFN L-LK-HD TYPE

Part No. 20655-0**E-01#

## Product Specification

Qualification Test Report No. TR-15027

| | | | | | |
|---|---|---|---|---|---|
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| 1 | S19581 | September 26, 2019 | S.Shigekoshi | M.Muro | H.Ikari |
| 0 | S15163 | April 14, 2015 | S.A | Y.S | E.K |
| Rev. | ECN | Date | Prepared by | Checked by | Approved by |

## 1. Scope

This Product Specification defines the test conditions and the performances of the MINIFLEX 3-BFN L-LK-HD TYPE Connector , a FPC-to-board connector of 0.3mm contact pitch.

## 2. Product Name and Parts No.

### 2.1 Product Name

MINIFLEX 3-BFN L-LK-HD TYPE

### 2.2 Parts No.

20655-0**E-01#

## 3. Ratings

### 3.1 Operating Conditions

Amperage ・・・・・・・・・・・・・・・ 0.3A DC（per contact）

Voltage ・・・・・・・・・・・・・・・・・ 50V AC（per contact）

Operating Temperature ・・・・・・ 233～358K (-40℃～+85℃)
(Containing temperature rise by current)

Operating Humidity ・・・・・・・・・ 20～80%RH

### 3.2 Storage Conditions

Storage Temperature ・・・・・・・・ Connector : 233～358K (-40℃～+85℃)
Emboss Packing : 233～328K (-40℃～+55℃)

Storage Humidity ・・・・・・・・・・・ Connector & Emboss Packing : 20～85%RH. (Non-condensing)

Storage period ・・・・・・・・・・・・・ Maximum storage period: Within one year from delivery date, under sealed condition.

### 3.3 Applicable Lead Thickness

t=0.20±0.03 (FPC)
Thermosetting adhesive

## 4. Test Methods and Performance：

### 4.1 Test Condition

Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202G.

Temperature… 288K～308K（15℃～35℃）

Pressure… 866hPa～1066hPa（650mmHg～800mmHg）

Relative humidity… 45～75%R.H.

**4.2 Test and Performance**

4.2.1 Electrical Performance

(1) Contact Resistance

(Test Method) Solder the connector to the test board and connect the applicable Lead. Apply the open circuit voltage of 20mV MAX. DC and the closed circuit current of 10mA MAX. DC in accordance with MIL-STD-202G Method 307 and measure the contact resistance as shown in Fig.2 by the four terminals method.
The conductor resistance of test board and FPC is excluded.

(Requirements) Contact resistance shall meet the values in Table 1.

Table 1 Contact Resistance

| | |
|---|---|
| Initial | 60mΩ MAX. |
| After Test | ΔR= 40mΩ MAX. |

(2) Dielectric Withstanding Voltage

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, apply AC 250V (rms) between the neighboring contacts for 1 minute in accordance with MIL-STD-202G, Method 301.

(Requirements) No creeping discharge, flashover, nor insulator breakdown shall occur.

(3) Insulation Resistance

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, apply DC250V between the neighboring contacts in accordance with MIL-STD-202G, Method 302.

(Requirements) Insulation resistance shall not be less than 100MΩ.

(4) Temperature rise

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, apply the rating current to each contact and measure temperature rise around the connector.

(Requirement) Temperature rise ΔT: 30K (30℃) MAX.

4.2.2 Mechanical Performance

(1) Actuator operating force

(Test Method) Solder the connector to the test board and insert FPC to the connector, then, lock & unlock the actuator.

(Requirements) Actuator operating force before and after test shall meet the values in Table 2.

Table 2 Operating Force

| n : Pos. | Locking Force | Unlocking Force |
|---|---|---|
| Initial | 0.21 N (21gf) ×(n+2) MAX. | 0.014N (1.4gf) ×(n+2) MIN. |
| 20th cycles | 0.21 N (21gf) ×(n+2) MAX. | 0.014N (1.4gf) ×(n+2) MIN. |

※ "n" is the number of pin

(2) FPC Retention Force

(Test Method) Insert the applicable Lead into the connector, place them on the push-on/pull-off machine, then, un-mate applicable Lead at the speed of 25±3mm/min. along the mating axis.

(Requirements) FPC Retention force before and after test shall meet the values in Table 3.

Table 3 FPC Retention Force

| n : Pos. | FPC Retention Force |
|---|---|
| Initial | 0.13 N (13gf) ×n +1.0N MIN. |
| After Test | 0.10 N (10gf) ×n +1.0N MIN. |

※ "n" is the number of pin

(3) Durability

(Test Method) Solder the connector to the test board, insert FPC to the connector, then, operate the actuator 20cycles repeatedly.

(Requirements) Contact resistance before and after test shall meet the values in Table.1.
Actuator operating force before and after test shall meet the values in Table.2.
FPC retention force before and after test shall meet the values in Table.3.

(4) Contact and Lock Retention Force

(Test Method) Set the connector on the push-on/pull-off machine and apply force to the contact and lock in the direction opposite to the insertion at the speed of 25±3mm/min.
Measure the force when the contact and lock came off from the connector.

(Requirements) Contact and lock retention force shall not be less than 0.3N (30.6gf).

(5) Hold Down Retention Force

(Test Method) Place the connector on the push-on/pull-off machine and apply force to the hold down in the direction opposite to insertion at the speed of 25±3mm/min.
Measure the force when the hold down came off from the connector.

(Requirements) Hold Down retention force shall not be less than 0.3N (30.6gf).

(6) Vibration

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, put them on the vibrator and apply the following vibration in accordance with MIL-STD-202G Method 201A.
During the test, apply the current of 1mA DC to check electrical discontinuity.

Frequency ・・・・・・・・・・・ 10Hz→55Hz→10Hz/ approx 1 min.

Directions ・・・・・・・・・・・ Three mutually perpendicular direction.

Total Amplitude ・・・・・・・ 1.52mm

Sweep duration ・・・・・・・ 2 hours for each direction, a total of 6 hours.)

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
During test, no electrical discontinuity greater than 1μsec. shall occur.
After test, No abnormality adversely affecting the performance shall occur between parts, no chipping, no breakage or other abnormality.

(7) Shock

(Test Method) Solder the connector to the test board, connect the applicable Lead, and place them on the shock machine. Then, apply the following shock in accordance with MIL-STD-202G, Method 213B, Condition A.
During test, apply the current of 1mA DC to check electrical discontinuity.

MAX. G ・・・・・・・・・・・・ 50 G

Duration ・・・・・・・・・・・・ 11msec.

Wave Form ・・・・・・・・・・ Half Sinusoidal

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
During test, no electrical discontinuity greater than 1μsec. shall occur.
After test, No abnormality adversely affecting the performance shall occur between parts, no chipping, no breakage or other abnormality.

(8) Fretting corrosion

(Test Method) Solder the connector to the test board, connect the applicable Lead, place them on the fretting corrosion machine and apply the following shock.
During test, apply the current of 1mA DC to check electrical discontinuity.

MAX. G ・・・・・・・・・・・・ 100 G

Cycles ・・・・・・・・・・・・ 20,000 cycles (50～60Cycles/min.)

(Requirement) Contact resistance before and after test shall meet the values in Table 1.
During test, no electrical discontinuity greater than 1μsec. shall occur.
After test, No abnormality adversely affecting the performance shall occur between parts, no chipping, no breakage or other abnormality.

4.2.3 Environmental Performance

(1) Thermal Shock

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.

Temperature ····· 233K(-40℃):30 min. → 358K (+85℃):30 min.

No. of cycles ····· 200 cycles

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
No abnormality adversely affecting the performance shall occur.

(2) High Temperature Life

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment in accordance with MIL-STD-202G, Method 108A, Condition D.

Temperature ····· 358±2 K (85±2℃)

Duration ····· 1000 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
No abnormality adversely affecting the performance shall occur.

(3) High Temperature & High humidity energizing

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, apply the rated voltage in the following environment.

Temperature ····· 333 K (60℃)

Humidity ····· 90%RH

Duration ····· 1000 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1,
Dielectric withstanding voltage shall meet 5.2.1. (2) and insulation resistance shall meet 5.2.1.(3).
No abnormality adversely affecting the performance shall occur.

(4) High Temperature & High Humidity Life

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.

Temperature ····· 333 K (60℃)

Humidity ····· 90%RH

Duration ····· 1000 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1,
Dielectric withstanding voltage shall meet 5.2.1. (2) and insulation resistance shall meet 5.2.1.(3).
No abnormality adversely affecting the performance shall occur.

(5) Cold Temperature Life

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.

Temperature ····· 233 K (-40℃)

Duration ····· 1000 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
No abnormality adversely affecting the performance shall occur.

(6) Gas : $H_2S$

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.

Chamber temperature ‥ 317 K (40℃)
Gas ‥‥‥‥‥‥‥‥‥‥‥‥‥‥ $H_2S$ 3ppm
Humidity ‥‥‥‥‥‥‥‥‥‥‥‥ 80%RH
Duration ‥‥‥‥‥‥‥‥‥‥‥‥ 96 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
No abnormality adversely affecting the performance shall occur.

(7) Gas : $SO_2$

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.

Chamber temperature ‥ 317 K (40℃)
Gas ‥‥‥‥‥‥‥‥‥‥‥‥‥‥ $SO_2$ 25ppm
Humidity ‥‥‥‥‥‥‥‥‥‥‥‥ 80%RH
Duration ‥‥‥‥‥‥‥‥‥‥‥‥ 96 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
No abnormality adversely affecting the performance shall occur.

(8) Salt Water Spray

(Test Method) Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment in accordance with MIL-STD-202G, Method 101E, Condition B.

Temperature ‥‥‥‥‥‥‥‥ 308±2 K (35±2℃)
Salt water density ‥‥‥‥ 5±1% by weight
Duration ‥‥‥‥‥‥‥‥‥‥‥‥ 48 hours

(Requirements) Contact resistance before and after test shall meet the values in Table 1.
No abnormality adversely affecting the performance shall occur.

4.2.4 Others

(1) Solderability

(Test Method) Expose the connector to the following environment for preparation and dip the soldering area of the contact into the solder bath at 523±2 K (255±2℃) in accordance with EIAJ-ET7404 (Quick heating method).

Condition of Preparation : PCT

Temperature) ・・・・・・・・・ 378K (105℃)

Humidity ・・・・・・・・・・・・ 100%RH

Duration ・・・・・・・・・・・・ 4 hours

(Requirements) Zero cross time is 3 second MAX. More than 95% of the dipped surface shall be evenly wet.

(2) Soldering Heat Resistance

A. Test Method ・・・・

<Reflow>

① Reflow part

533K (260℃) Peak

503K (230℃)MIN. 30～40 sec.

② Pre-heat part

423～453K (150～180℃) 60～120 sec.

The number of times of Reflow is within Twice.

Condition of Preparation : PCT

Temperature ・・・・・・・・・ 358K (85℃)

Humidity ・・・・・・・・・・・・ 85%RH

Duration ・・・・・・・・・・・・ 24 hours

<Soldering iron>

Temperature of soldering iron ・・ 663±10K (390±10℃)

heating time ・・・・・・・・・・・・・ 3.0±0.5 秒 (sec.)

heating times ・・・・・・・・・・・・ 2 回 (times)

(Requirements) No abnormality adversely affecting the performance shall occur.

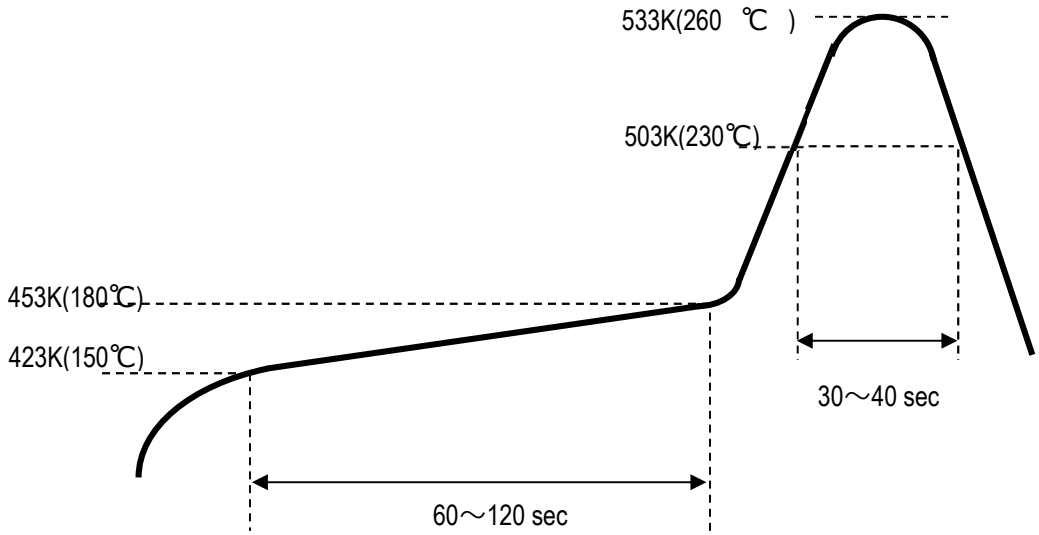


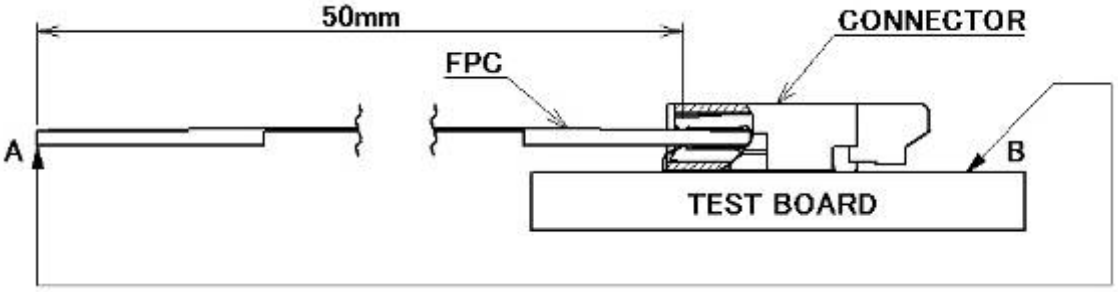

Fig. 1 Reflow Temperature Profile

4.2.5 Test Sequence and Sample Quantity

Table 4 Test Sequence and Sample Quantity

| Test Items | Group | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R |
| C/T Resistance | 2,7 | | | 1,3, 5 | 1,3 | 1,3 | 1,3 | 1,5 | 1,5 | 1,3 | 1,3 | 1,3 | 1,3 | | | |
| D.W.Voltage | | | | | | | | 2,6 | 2,6 | | | | | | | |
| Insulation Resistance | | | | | | | | 3,7 | 3,7 | | | | | | | |
| Temp. rise | | | | | | | | | | | | | | | | 1 |
| Act Locking Force | 1,5 | | | | | | | | | | | | | | | |
| Act Un-locking Force | 3,6 | | | | | | | | | | | | | | | |
| FPC Retention Force | | 1,3 | | | | | | | | | | | | | | |
| Durability | 4 | 2 | | | | | | | | | | | | | | |
| C/T and Lock Retention Force | | | 1 | | | | | | | | | | | | | |
| H/D Retention Force | | | 2 | | | | | | | | | | | | | |
| Vibration | | | | 2 | | | | | | | | | | | | |
| Shock | | | | 4 | | | | | | | | | | | | |
| Fretting corrosion | | | | | 2 | | | | | | | | | | | |
| Thermal Shock | | | | | | 2 | | | | | | | | | | |
| High Temp. Life | | | | | | | 2 | | | | | | | | | |
| High Temp & High Hum energizing | | | | | | | | 2 | | | | | | | | |
| High Temp & High Hum Life | | | | | | | | | 2 | | | | | | | |
| Cold Temp. Life | | | | | | | | | | 2 | | | | | | |
| Gas ($H_2S$) | | | | | | | | | | | 2 | | | | | |
| Gas ($SO_2$) | | | | | | | | | | | | 2 | | | | |
| Salt Water Spray | | | | | | | | | | | | | 2 | | | |
| Solderability | | | | | | | | | | | | | | 1 | | |
| Soldering Heat Resist. | | | | | | | | | | | | | | | 1 | |
| Sample QTY. | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs | 5 pcs |

The number in group means the test sequence.




Contact Resistance = $R_{AB}$ − Resistance of a 50mm length of FPC cable − Resistance of Test Board .

Fig. 2 Contact Resistance

5. Recommended Metal Mask

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

6. Precautions for Handling Cable Connectors

Refer to instruction manual HIM-12007 for the handling of MINIFLEX 3-BFN.