MINIFLEX® 5-BFN II LK (03) Connector

Part No. 20600-0**E-01#

Product Specification

Qualification Test Report No. TR-14132

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4	S21619	November 30, 2021	S.Shigekoshi	M.Muro	H.Ikari
3	S19591	September 26, 2019	S.Shigekoshi	M.Muro	H.Ikari
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1	S15577	November 27, 2015	H.A		Y.S

1. Scope

This Product Specification defines the test conditions and the performances of the MINIFLEX 5-BFN II LK (03) Connector , a FPC-to-board connector of 0.5mm contact pitch.

2. Product Name and Parts No.

2.1 Product Name

MINIFLEX 5-BFN II LK (03)

2.2 Parts No.

20600-0**E-01#

3. Rating

3.1 Operating Conditions

Amperage ・・・・・・・・・・・・・ 0.5A DC (per contact)
7.0A DC (per connector)

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

Operating Temperature ・・・・ 233～398K (-40℃～+125℃)
Containing temperature rise by current

Operating Humidity ・・・・・・ 20～80%RH

3.2 Storage Conditions

Storage Temperature ・・・・ After soldering : 233～398K (-40℃～+85℃)
Before soldering : 233～328K (-40℃～+55℃)

Storage Humidity ・・・・・・・ Connector & Emboss Packing : 20～85%RH

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

3.3 Applicable Lead Thickness

t=0.30±0.03 (FPC)
Thermosetting adhesive

4. Test 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 ・・・・・・・・・・・ 288～308K (15～35℃)

Humidity ・・・・・・・・・・・・・ 45～75%

Atmospheric Pressure ・・・・ 650～800 mmHg

4.2 Test and Performance

4.2.1 Electrical Performance

(1) Contact Resistance

A. Test Method ・・・・ Solder the connector to the test board and connect the applicable Lead, then, measure the contact resistance as shown in Fig.2 by the four terminals method. 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.

B. Requirements ・・・ Contact resistance shall meet the values in Table 1.

Table.1 Contact Resistance

Initial	40mΩ MAX.
After Test	ΔR= 20mΩ MAX.

(2) Dielectric Withstanding Voltage

A. Test Method ・・・・ Solder the connector to the test board and connect the applicable Lead, then, apply AC 200V (rms) between the neighboring contacts for one minute in accordance with MIL-STD-202G, Method 301.

B. Requirements ・・・ No creeping discharge, flashover, nor insulator breakdown shall occur.

(3) Insulation Resistance

A. Test Method ・・・・ Solder the connector to the test board and connect the applicable Lead, then, apply DC500V between the neighboring contacts in accordance with MIL-STD-202G, Method 302.

B. Requirements ・・・ Insulation resistance shall not be less than 100MΩ.

(4) Temperature rising

A. 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 connector. (The total current for connector: 7.0A MAX.)

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

4.2.2 Mechanical Performance

(1) Actuator operating force

A. Test Method ・・・・ Solder the connector to the test board and insert FPC to the connector, then, lock and unlock the actuator.

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

Table.2 Actuator operating Force

n : Pos.	Locking Force	Unlocking Force
Initial	0.6 N (61gf) ×(n+2) MAX.	0.05 N (5gf) ×(n+2) MIN.
20th cycles	0.6 N (61gf) ×(n+2) MAX.	0.05 N (5gf) ×(n+2) MIN.

※ "n" is the number of pin

(2) FPC Retention Force

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

B. 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	0.15 N (15gf) ×n + 2.0N MIN.
After Test	0.15 N (15gf) ×n + 2.0N MIN.

※ "n" is the number of pin

(3) Durability

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

B. Requirement ・・・ 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 Retention Force

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

B. Requirements ・・・ Contact retention force shall not be less than 0.5N (51gf).

(5) LOCK Retention Force

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

B. Requirements ・・・ Lock retention force shall not be less than 0.5N (51gf).

(6) Hold Down Retention Force

A. 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.

B. Requirement ・・・ Hold Down retention force shall not be less than 0.5N (51gf).

(7) Vibration

A. Test Method ・・・・ Solder the connector to the test board and connect the applicable Lead, then, put them on the vibrator. 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 1min.
Directions ・・・・・・・・・ Three mutually perpendicular direction.
Total Amplitude ・・・・・ 1.5mm
Sweep duration ・・・・・ 2 hours for each direction, a total of 6 hours.

B. Requirement ・・・ Contact resistance before and after test shall meet the values in Table 1.
During the test, no electrical discontinuity greater than 1μsec. shall occur.
After test, no abnormality adversely affecting the performance shall occur.

(8) Shock

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

MAX. G ・・・・・・・・・・・ 50 G
Duration ・・・・・・・・・・・ 11msec.
Wave Form ・・・・・・・・・ Half Sinusoidal
Number of times ・・・・・・ 3 times for each direction, a total of 18 times.

B. Requirement ・・・ Contact resistance before and after test shall meet the values in Table 1. During the test, no electrical discontinuity greater than 1μsec. shall occur. After test, no abnormality adversely affecting the performance shall occur.

(9) Fretting corrosion

A. Test Method ・・・・ Solder the connector to the test board and connect the applicable Lead, then, put them on the fretting corrosion machine. Apply the following shock. During the test, apply the current of 1mA DC to check electrical discontinuity.

MAX. G ・・・・・・・・・・・ 100 G
Cycles ・・・・・・・・・・・ 20,000 cycles (50～60 Cycles/min.)

B. Requirement ・・・ Contact resistance before and after test shall meet the values in Table 1.
During the test, no electrical discontinuity greater than 1μsec. shall occur.
After test, no abnormality adversely affecting the performance shall occur.

4.2.3 Environmental Performance

(1) Thermal Shock

A. 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 (+125℃):30 min.

No. of cycles ····· 100 cycles

B. Requirement ··· 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

A. Test Method ···· Solder the connector to the test board and connect the applicable Lead, them to the following environment.

Temperature ····· 358±2 K (125±2℃)

Duration ····· 1000 hours

B. Requirement ··· 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

A. Test Method ···· Solder the connector to the test board and connect the applicable Lead, then, apply the rating current continuously in the following environment.

Temperature ····· 333 K (60℃)

Humidity ····· 90%RH

Duration ····· 1000 hours

B. Requirement ··· 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

A. 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

B. Requirement ··· 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

A. 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

B. Requirement ··· 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

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

Chamber temperature ··· 313 K (40℃)
Gas ····· H_2S 3ppm
Humidity ····· 80%RH
Duration ····· 96 hours

B. Requirement ··· 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

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

Chamber temperature ··· 313 K (40℃)
Gas ····· SO_2 25ppm
Humidity ····· 80%RH
Duration ····· 96 hours

B. Requirement ··· 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

A. 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

B. Requirement ··· 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

A. Test Method ・・・ Expose the connector to the following condition for pretreatment. Dip the solder tine of the contact in the solder bath at 528±2 K (255±2℃) in accordance with EIAJ-ET7404 (The wetting balance method). Use the solder paste M705-221MB (SENJU METAL INDUSTRY Co.,Ltd.)

Condition of Pretreatment : PCT

Temperature ・・・・・・・ 378K (105℃)

Humidity ・・・・・・・・・・ 100%RH

Duration ・・・・・・・・・・ 4 hours

B. Requirement ・・・ 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.

Reflow shall be within twice.

Condition of Pretreatment : 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 sec.

Heating times ・・・・ twice

B. Requirement ・・・ There is no abnormality adversely affecting the performance.

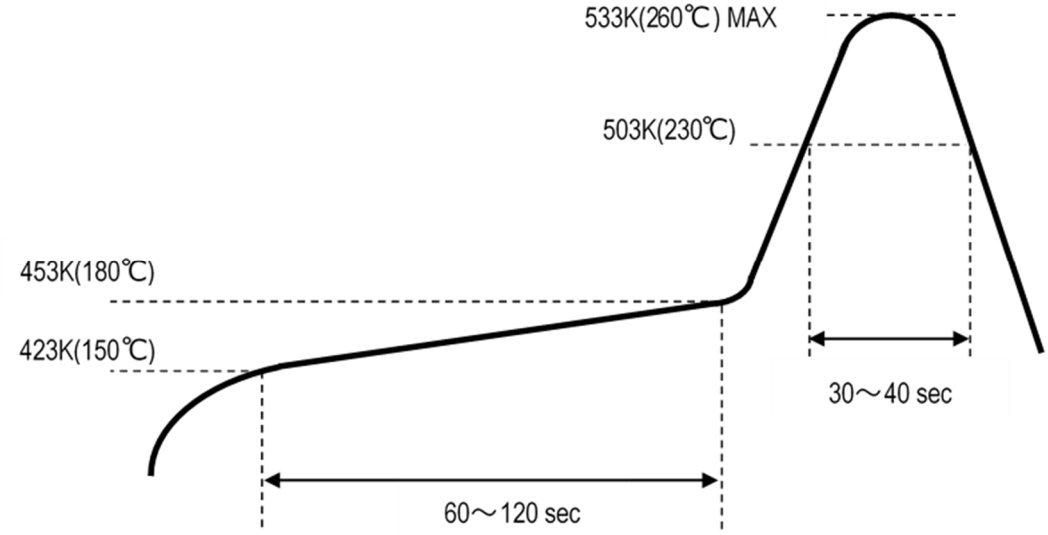


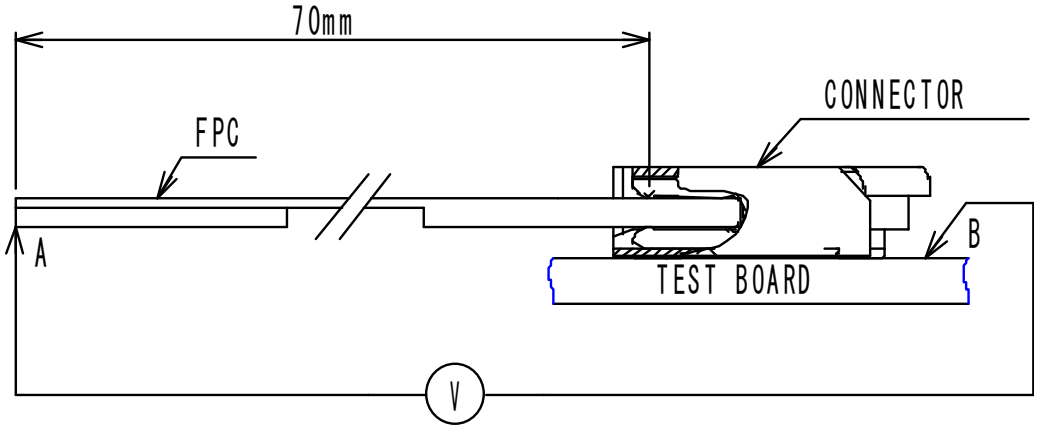
Fig. 1 Reflow Temperature Profile

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 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.	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs	10 pcs

The number in “group” means the test sequence.



Contact Resistance = R_{AB} − Resistance of a 70mm length of FPC cable.

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-12019 for the handling of MINIFLEX 5-BFN II