

# MINIFLEX® 2-BF LK TYPE

Part No. 20817-\*\*\*E-01

## Product Specification

Qualification Test Report No. TR-18021

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2	S22045	February 2, 2022	M. Muro	-	H. Ikari
1	S19607	September 27, 2019	S. Shigekoshi	M. Muro	H. Ikari
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## 1. Scope

This Product Specification defines the test conditions and the performances of the MINIFLEX 2-BF LK TYPE Connector, a FPC-to-board connector of 0.2mm contact pitch.

## 2. Product Name and Parts No.

### 2.1 Product Name

MINIFLEX 2-BF LK TYPE

### 2.2 Parts No.

20817-\*\*\*E-01

## 3. Rating

### 3.1 Operating Conditions

Amperage: 0.2A AC/DC (per contact pin)

Voltage: 50V AC (per contact pin)

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

(Containing temperature rise by current)

Operating humidity: 85% max

### 3.2 Storage Conditions

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

Storage humidity: 85% max. (Non-condensing)

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

### 3.3 Applicable FPC

t=0.20±0.03 (FPC)

Thermosetting adhesive

## 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~1066hPa (650mmHg~800mmHg)

Relative humidity... 45~75%RH

## 4.1 Electrical Performance

### 1. Contact resistance

Reference standard: MIL-STD-202, Method 307

Test conditions: 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 1mA MAX. DC in accordance with MIL-STD-202 Method 307 and measure the contact resistance as shown in Fig.1 by the four terminals method. The conductor resistance of test board and FPC is excluded.

$$\text{Contact Resistance} = R_{AB} - \text{Resistance of a 40mm length of FPC cable.}$$

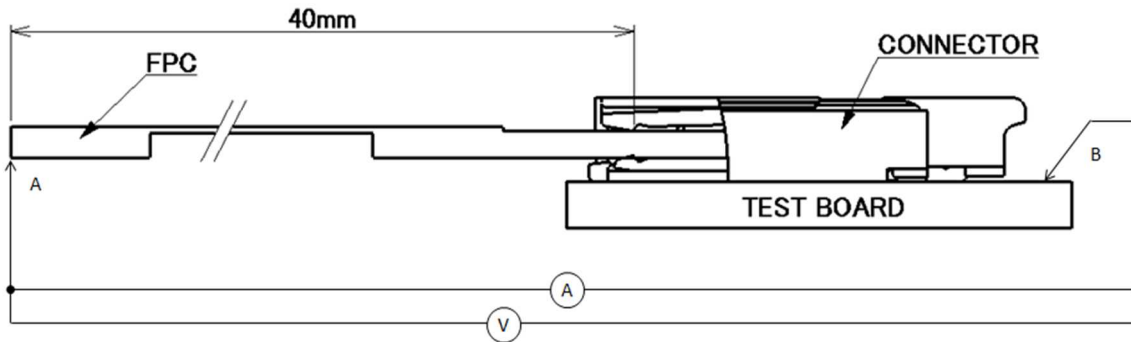


Fig.1

Pass criteria: Contact  
Initial: 100mΩ MAX.  
After testing: ΔR40mΩ MAX.

### 2. Dielectric withstanding voltage

Reference standard: MIL-STD-202, Method 301

Test conditions: Solder the connector to the test board and connect the applicable Lead, then, apply AC 150V (rms) between the neighboring contacts for one minute.

Pass criteria: No abnormalities such as creeping discharge, flashover, insulator breakdown occur.

### 3. Insulation resistance

Reference standard: MIL-STD-202, Method 302

Test conditions: Solder the connector to the test board and connect the applicable Lead, then, apply DC250V between the neighboring contacts.

Pass criteria: Initial: 100 MΩ MIN. After testing: 100 MΩ MIN.

### 4. Temperature rising

Reference standard: -

Test conditions: 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. (0.2A MAX. per contact pin.)

Pass criteria: Over ambient ΔT30 °C MAX.

**4.2 Mechanical Performance**

1. Actuator operating force	
Reference standard:	-
Test conditions:	Solder the connector to the test board and insert FPC to the connector, then, close and release the actuator.
Pass criteria:	<p>Closing force</p> <p>Initial: <math>0.2 \text{ N (20.4gf)} \times n + 0.42\text{N MAX.}</math></p> <p>20cycles: <math>0.2 \text{ N (20.4gf)} \times n + 0.42\text{N MAX.}</math></p> <p>Unlocking force</p> <p>Initial: <math>0.014 \text{ N (1.4gf)} \times n + 0.028\text{N MIN.}</math></p> <p>20cycles: <math>0.014 \text{ N (1.4gf)} \times n + 0.028\text{N MIN.}</math></p> <p>※“n” is the number of pin</p>

2. FPC retention force	
Reference standard:	-
Test conditions:	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 $25 \pm 3\text{mm/min.}$ along the mating axis. (t=0.20mm when using)
Pass criteria:	<p>Initial: <math>0.2 \text{ N (20.4gf)} \times n + 1.0\text{N MIN.}</math></p> <p>20cycles: <math>0.2 \text{ N (20.4gf)} \times n + 1.0\text{N MIN.}</math></p> <p>※“n” is the number of pin</p>

3. Durability	
Reference standard:	-
Test conditions:	Solder the connector to the test board, insert FPC to the connector, and operate actuator 20cycles repeatedly.
Pass criteria:	Contact resistance: Shall meet 4.1.1

4. 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 $25 \pm 3\text{mm/min.}$ Measure the force when the contact dislodges the connector.
Pass criteria:	Contact retention force: 0.1N (10.2gf) MIN.

5. Vibration	
Reference standard:	MIL-STD-202, Method 201A
Test conditions:	<p>Solder the connector to the test board and connect the applicable Lead, then, put them on the vibrator. During the test, apply the current of 1mA DC to check electrical discontinuity.</p> <p>Frequency: 10Hz→55Hz→10Hz/ approx. 1 min.</p> <p>Directions: Three mutually perpendicular directions.</p> <p>Total Amplitude: 1.5mm</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 <math>1\mu\text{s}</math> shall occur.</p> <p>Appearance: No abnormality adversely affecting the performance shall occur.</p>

## 4.2 Mechanical Performance

### 6. Shock

Reference standard: MIL-STD-202, Method 213B, Condition A.

Test conditions: Solder the connector to the test board and connect the applicable Lead, then, put them on the shock machine. During the test, apply the current of 1mA DC to check electrical discontinuity.

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 $\mu$ s shall occur.

Appearance: No abnormality adversely affecting the performance shall occur.

### 7. Fretting Corrosion

Reference standard: -

Test conditions: 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: 100G

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

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:	-
Test conditions:	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Temperature: 233K (-40°C),30min.→358K (85°C),30min. Transition time: 5min. MAX. No. of cycles: 200 cycles
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

2. High temperature life	
Reference standard:	MIL-STD-202, Method 108, Condition D.
Test conditions:	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment in accordance with MIL-STD-202, Method 108, Condition D. Temperature: 358±2K (85±2°C) Duration: 1000 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

3. High Temperature & High humidity energizing	
Reference standard:	-
Test conditions:	Solder the connector to the test board and connect the applicable Lead, then, apply the rating current continuously in the following environment. Temperature: 333K (60°C) Humidity: 90%RH Duration: 1000 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Dielectric Withstanding Voltage: Shall meet 4.1.2. Insulation Resistance: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

4. High Temperature & High humidity Life	
Reference standard:	-
Test conditions:	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Temperature: 333K (60°C) Humidity: 90%RH Duration: 1000 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Dielectric Withstanding Voltage: Shall meet 4.1.2. Insulation Resistance: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

5. Cold Temperature Life	
Reference standard:	-
Test conditions:	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Temperature: 233K (-40°C) Duration: 1000 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

## 4.3 Environmental Performance

### 6. H<sub>2</sub>S gas

Reference standard: -

Test conditions: Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.  
 Chamber temperature: 313K (40°C)  
 Gas: H<sub>2</sub>S 3ppm  
 Humidity: 80%RH  
 Duration: 96 hours

Pass criteria: Contact resistance: Shall meet 4.1.1.  
 Appearance: No abnormality adversely affecting the performance shall occur.

### 7. SO<sub>2</sub> gas

Reference standard: -

Test conditions: Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment.  
 Chamber temperature: 313K (40°C)  
 Gas: SO<sub>2</sub> 25ppm  
 Humidity: 80%RH  
 Duration: 96 hours

Pass criteria: Contact resistance: Shall meet 4.1.1.  
 Appearance: No abnormality adversely affecting the performance shall occur.

### 8. Salt water spray

Reference standard: MIL-STD-202, Method 101E, Condition B

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

## 4.4 Others

### 1. Solder ability

Reference standard: -

Test conditions: Expose the connector to the following condition for pretreatment. Dip the solder tine of the contact in the solder bath at  $528 \pm 2$  K ( $255 \pm 2^\circ\text{C}$ ) in accordance with EIAJ-ET7404 (The wetting balance method). Use the solder paste M705-221MB (SENJU METAL INDUSTRY Co., Ltd.)

<Condition of Pretreatment>  
 Temperature: 378K ( $105^\circ\text{C}$ )  
 Humidity: 100%RH  
 Duration: 4 hours

Pass criteria: Zero cross time is 3 second MAX. More than 95% of the dipped surface shall be evenly wet.

### 2. Soldering heat resistance

Reference standard: -

Test conditions: <Condition of Pretreatment>  
 Temperature: 358K ( $85^\circ\text{C}$ )  
 Humidity: 85%RH  
 Duration: 24hours

<Reflow>

① Reflow part 533K ( $260^\circ\text{C}$ ) Peak 528K ( $255^\circ\text{C}$ ) 30sec. 490K ( $217^\circ\text{C}$ ) MIN. 60~150sec.	< Soldering iron> Temperature of soldering iron: $663 \pm 10$ K ( $390 \pm 10^\circ\text{C}$ ) Heating time: $3.0 \pm 0.5$ sec. Heating times: twice
② Pre-heat part 423~473K ( $150 \sim 200^\circ\text{C}$ ) 60~120sec. Reflow temperature profile Fig.2. The number of times of Reflow is within 2.	

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 Items	Group															
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
C/T Resistance	2,6			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 Closing Force	1,5															
Act Unlocking Force	3,7															
FPC Retention Force		1,3														
Durability	4	2														
C/T Retention Force			1													
Vibration				2												
Shock				4												
Fretting corrosion					2											
Thermal Shock						2										
High Temp. Life							2									
High Temp & High Hum energizing								4								
High Temp & High Hum Life									4							
Cold Temp. Life										2						
Gas (H <sub>2</sub> S)											2					
Gas (SO <sub>2</sub> )												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

※Numbers indicate sequence in which tests are performed.

**5. Condition of Reflow**

**5.1 Reflow Temperature Profile**

※In accordance with IPC/JEDEC J-STD-020D

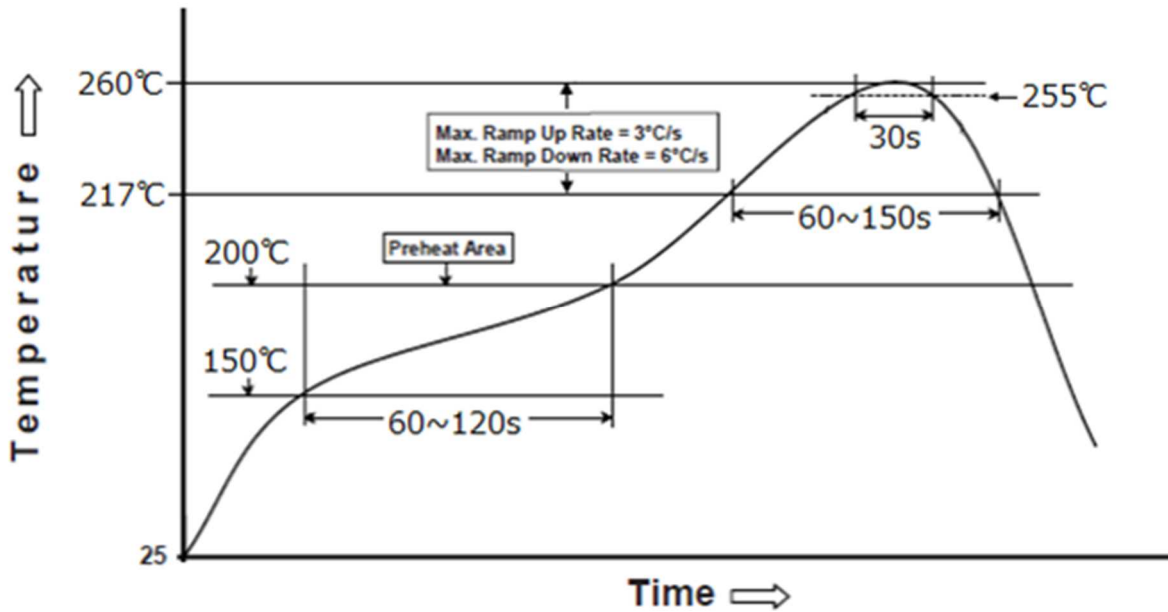


Fig. 2 Reflow Temperature Profile

**6. Recommended Metal Mask**

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

**7. Precautions for Handling Cable Connectors**

Refer to instruction manual HIM-17036 for the handling of MINIFLEX 2-BF.