

MINIFLEX® 4-ST Connector

Part No. 20588-0**E-01#

Product Specification

Qualification Test Report No. TR-13088

8	S23170	June 5, 2023	M. Muro	-	H. Ikari
7	S22102	March 8, 2022	S. Tsuboki	M. Muro	H. Ikari
6	S21562	November 2, 2021	M. Muro	-	H. Ikari
5	S19596	September 27, 2019	S. Shigekoshi	M. Muro	H. Ikari
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Scope

This Product Specification defines the test conditions and the performances of the MINIFLEX 4-ST Connector , a board to FPC connector of 0.4mm contact pitch.

2. Product Name and Parts No.

2.1 Product Name

MINIFLEX 4-ST

2.2 Parts No.

20588-0**E-01#

3. Rating

3.1 Applicable FPC

Applicable Lead Thickness : $t=0.12\pm 0.03$

Thermosetting adhesive

3.2 Operating Condition

Amperage : 0.4 A DC (per contact pin)

6.0A DC (per connector)

Voltage : 50V AC (per contact pin)

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

(Containing temperature rise by current)

Operating Humidity : 20~80%

3.3 Storage Conditions

Storage Temperature : 233~328K(-40°C~55°C) /1year

Storage Humidity : 20~80%

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

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-202G.

Temperature ... 288K~308K (15°C~35°C)

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

Relative Humidity ... 45~75%R.H.

4.1. Electrical Performance

No	Items	Test Conditions	Specifications
1.	Contact Resistance	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.	Initial : 60mΩMAX. After testing : \triangle R 40mΩ MAX.
2.	Dielectric Withstanding Voltage	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.	No creeping discharge, flashover, no insulator breakdown shall occur.
3.	Insulation Resistance	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.	100 MΩ MIN.
4.	Temperature rising	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. (0.4 A MAX per contact pin / 6.0 A MAX per connector.)	Temperature rise ΔT : 30K(°C) MAX.

4.2. Mechanical Performance

No	Items	Test Conditions	Specifications																																				
1.	Actuator operating force	Solder the connector to the test board and insert FPC to the connector, then, close and release the actuator.	<p><u>Closing Force</u> Initial : 0.3 N (30.6gf) ×(n+2) N MAX. 20cycles : 0.3 N (30.6gf) ×(n+2) N MAX.</p> <table border="1"> <thead> <tr> <th>n</th> <th>Initial</th> <th>20cycles</th> </tr> </thead> <tbody> <tr> <td>4P</td> <td>1.8N MAX.</td> <td>1.8N MAX.</td> </tr> <tr> <td>6P</td> <td>2.4N MAX.</td> <td>2.4N MAX.</td> </tr> <tr> <td>8P</td> <td>3.0N MAX.</td> <td>3.0N MAX.</td> </tr> <tr> <td>10P</td> <td>3.6N MAX.</td> <td>3.6N MAX.</td> </tr> <tr> <td>12P</td> <td>4.2N MAX.</td> <td>4.2N MAX.</td> </tr> </tbody> </table> <p><u>Releasing Force</u> Initial : 0.01 N (1.0gf) ×(n+2) MIN. 20cycles : 0.01 N (1.0gf) ×(n+2) MIN. ※“n” is the number of pin</p> <table border="1"> <thead> <tr> <th>n</th> <th>Initial</th> <th>20cycles</th> </tr> </thead> <tbody> <tr> <td>4P</td> <td>0.06N MIN.</td> <td>0.06N MIN.</td> </tr> <tr> <td>6P</td> <td>0.08N MIN.</td> <td>0.08N MIN.</td> </tr> <tr> <td>8P</td> <td>0.10N MIN.</td> <td>0.10N MIN.</td> </tr> <tr> <td>10P</td> <td>0.12N MIN.</td> <td>0.12N MIN.</td> </tr> <tr> <td>12P</td> <td>0.14N MIN.</td> <td>0.14N MIN.</td> </tr> </tbody> </table>	n	Initial	20cycles	4P	1.8N MAX.	1.8N MAX.	6P	2.4N MAX.	2.4N MAX.	8P	3.0N MAX.	3.0N MAX.	10P	3.6N MAX.	3.6N MAX.	12P	4.2N MAX.	4.2N MAX.	n	Initial	20cycles	4P	0.06N MIN.	0.06N MIN.	6P	0.08N MIN.	0.08N MIN.	8P	0.10N MIN.	0.10N MIN.	10P	0.12N MIN.	0.12N MIN.	12P	0.14N MIN.	0.14N MIN.
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2.	FPC Retention Force	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.	<p>Initial : 0.06 N (6.1gf)×n + 2.26N (230.6gf) MIN. 20cycles : 0.06 N (6.1gf)×n + 2.26N (230.6gf) MIN. ※“n” is the number of pin</p> <table border="1"> <thead> <tr> <th>n</th> <th>Initial</th> <th>20cycles</th> </tr> </thead> <tbody> <tr> <td>4P</td> <td>2.50N MIN.</td> <td>2.50N MIN.</td> </tr> <tr> <td>6P</td> <td>2.62N MIN.</td> <td>2.62N MIN.</td> </tr> <tr> <td>8P</td> <td>2.74N MIN.</td> <td>2.74N MIN.</td> </tr> <tr> <td>10P</td> <td>2.86N MIN.</td> <td>2.86N MIN.</td> </tr> <tr> <td>12P</td> <td>2.98N MIN.</td> <td>2.98N MIN.</td> </tr> </tbody> </table>	n	Initial	20cycles	4P	2.50N MIN.	2.50N MIN.	6P	2.62N MIN.	2.62N MIN.	8P	2.74N MIN.	2.74N MIN.	10P	2.86N MIN.	2.86N MIN.	12P	2.98N MIN.	2.98N MIN.																		
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3.	Durability	Solder the connector to the test board, insert FPC to the connector, then, operate actuator 20cycles repeatedly.	[Contact Resistance] Shall meet4.1.1.																																				
4.	Contact /LOCK Retention Force	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.	0.25N(25.5gf).MIN.																																				

4.2. Mechanical Performance

No	Items	Test Conditions	Specifications
5.	Vibration	<p>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.</p> <p>Frequency: 10Hz→55Hz→10Hz/ approx 1 min. Directions: Three mutually perpendicular direction. Total Amplitude: 1.5mm</p> <p>Sweep duration : 2 hours for each direction, a total of 6 hours.</p>	<p>[Contact Resistance] Shall meet 4.1.1.</p> <p>[Electrical discontinuity] No electrical discontinuity grater than 1μs shall occur.</p> <p>[Appearance] No abnormality adversely affecting the performance shall occur.</p>
6.	Shock	<p>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.</p> <p>MAX.G : 50G Duration : 11msec Wave Form : Half Sinusoidal Number of times : 3 times for each direction, a total of 18 times.</p>	<p>[Contact Resistance] Shall meet 4.1.1.</p> <p>[Electrical discontinuity] No electrical discontinuity grater than 1μs shall occur.</p> <p>[Appearance] No abnormality adversely affecting the performance shall occur.</p>
7.	Fretting corrosion	<p>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.</p> <p>MAX. G : 100 G Cycles : 20,000 cycles (50~60Cycles/min.)</p>	<p>[Contact Resistance] Shall meet 4.1.1.</p> <p>[Electrical discontinuity] No electrical discontinuity grater than 1μs shall occur.</p> <p>[Appearance] No abnormality adversely affecting the performance shall occur.</p>

4.3. Environmental Performance

No	Items	Test Conditions	Specifications
1.	Thermal Shock	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Temperature : 233K(-40°C):30 min. → 358K (+85°C):30 min. No. of cycles : 200 cycles	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.
2.	High Temperature Life	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±2K (85±2°C) Duration : 1000 hours	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.
3.	High Temperature & High humidity energizing	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°C) Humidity : 90%RH Duration : 1000hours	[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	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Temperature : 333 K (60°C) Humidity : 90%RH Duration : 1000hours	[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	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Temperature : 233 K (-40°C) Duration : 1000 hours	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.
6.	Gas : H ₂ S	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Chamber temperature : 313 K (40°C) Gas : H ₂ S 3ppm Humidity : 80%RH Duration : 96 hours	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.
7.	Gas : SO ₂	Solder the connector to the test board and connect the applicable Lead, then, expose them to the following environment. Chamber temperature : 313 K (40°C) Gas : SO ₂ 25ppm Humidity : 80%RH Duration : 96 hours	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.
8.	Salt Water Spray	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°C) Salt water density : 5±1% [by weight] Duration : 48 hours	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

4.4.その他 (Others)

No	Items	Test Conditions	Specifications
1.	Solderability	Expose the connector to the following condition for pretreatment. Dip the solder tine of the contact in the solder bath at 528 ± 2 K ($255\pm 2^\circ\text{C}$) 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°C) Humidity : 100%RH Duration : 4 hours	Zero cross time is 3 second MAX. More than 95% of the dipped surface shall be evenly wet.
2.	Soldering Heat Resistance	<Condition of Pretreatment> Temperature : 358K (85°C) Humidity : 85%RH Duration : 24hours <Reflow> ① Reflow part 533K (260°C) Peak 503K (230°C)MIN. 30~40 sec. ② Pre-heat part 423~453K ($150\sim 180^\circ\text{C}$) 60~120sec. Reflow temperature profile Fig1. The number of times of Reflow is within 2. < Soldering iron> Temperature of soldering iron : 663 ± 10 K ($390\pm 10^\circ\text{C}$) Heating time : 3.0 ± 0.5 sec. Heating times : twice	No abnormality adversely affecting the performance shall not occur.

4.5 Test Sequence and Sample Quantity

Table1. 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													
LOCK Retention Force			2													
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 ₂ S)											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 of group is test sequence.

5. Condition of Reflow

Reflow Temperature Profile

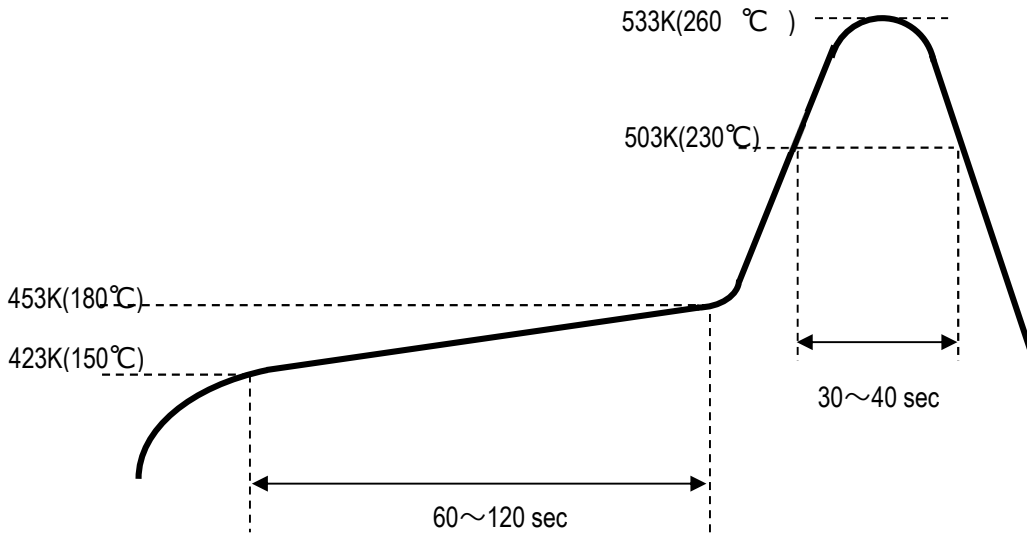
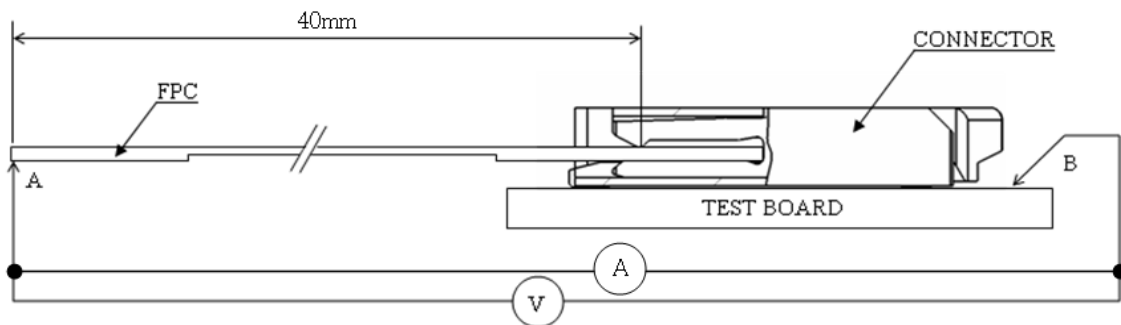


Fig. 1 Reflow Temperature Profile

6. Measuring method of Contact Resistance



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

Fig. 2 Contact Resistance

7. Recommended Metal Mask

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

8. Precautions for Handling Cable Connectors

Refer to instruction manual HIM-14024 for the handling of MINIFLEX 4-ST.