

# MHF<sup>®</sup>-TI Connector

Part No. Plug:20589-001R-0\* Receptacle:20860-001E-0\*

## Product Specification

Qualification Test Report No. TR-20007

5	S25057	January 29, 2025	T. Takuno	-	K. Yufu
4	S23137	May 9, 2023	K. Tanaka	K. Yufu	Y. Hashimoto
3	S21293	June 24, 2021	S. Taguchi	-	M. Takemoto
2	S20333	July 7, 2020	K. Tanaka	Y. Fukumoto	T. Yamauchi
Rev.	ECN	Date	Prepared by	Checked by	Approved by

## 1. Scope

This product specification defines the test conditions and the performances of the MHF-TI Connector

## 2. Product Name and Parts No.

### 2.1 Product Name

MHF-TI Connector

### 2.2 Parts No.

Plug: 20859-001R-0\*

Receptacle: 20860-001E-0\*

## 3. Rating

### 3.1 Applicable Cable

AWG#25~26 coaxial cable (jacket diameter 2.80~3.00mm)

### 3.2 Operating Conditions

Amperage: 100mAAC/DC

Operating temperature: 233 to 358K(-40°C to 105°C) (Containing temperature rise by current)

Operating humidity: 85% max

### 3.3 Storage Conditions

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

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

Keeping the production in the above conditions, we asked to use them within 1 year after delivery.

## 4. Test and Performance

### Test Condition

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

Temperature: 288K to 308K(15°C to 35°C)

Pressure: 866hPa to 1066hPa (650mmHg to 800mmHg)

Relative humidity: 45 to 75% R.H.

4.1. Electrical Performance

1. Contact resistance	
Reference standard:	MIL-STD-202-307
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then apply 20mV MAX. DC open circuit voltage and 10mA MAX. DC closed circuit current. Measure the contact resistance of Signal and Ground contact at the section shown in Fig.1 by the four terminal methods.
Fig.1	
Pass criteria:	Signal Contact Initial: 20 mΩ MAX. After testing: 30 mΩ MAX. Ground Contact Initial: 15 mΩ MAX. After testing: 25 mΩ MAX.

2. Insulation resistance	
Reference standard:	MIL-STD-202-302, Test condition A
Test conditions:	Mate the plug and receptacle connector together, and then apply DC 100 V between the inner contact and the ground contact.
Pass criteria:	Initial: 500 MΩ MIN. After testing: 100 MΩ MIN.

3. Dielectric withstanding voltage	
Reference standard:	MIL-STD-202-301
Test conditions:	Mate the receptacle and plug connector together, then apply AC 200V(rms) between the inner contact and the ground contact for a minute.
Pass criteria:	No abnormalities such as creeping discharge, flashover, insulator breakdown occur.

4.1. Electrical Performance

4. VSWR

Reference standard: -

Test conditions: Measure the VSWR as shown in Fig.2 by the network analyzer.  
Frequency : 100MHz ~ 6.0GHz

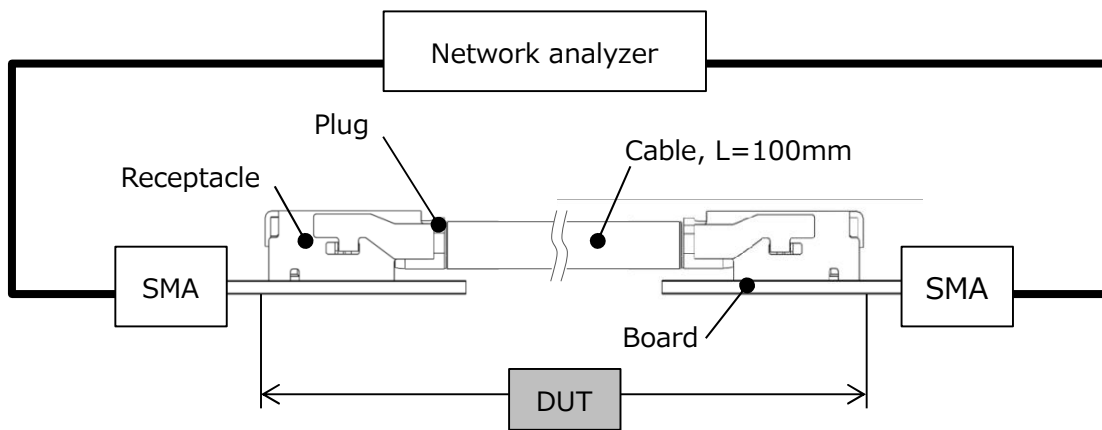


Fig.2

Pass criteria: VSWR  
0.1~6.0GHz: 1.5 Max

**4.2. Mechanical Performance**

1. Mating force	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine. Repeat mating/unmating 30 cycles at a speed $25\pm 3$ mm/min. along the mating axis. Measure the mating and unmating force at the initial and after 30cycles.
Pass criteria:	Mating force 45 N MAX.

2. Durability	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and unmating 30cycles at a speed $25\pm 3$ mm/min. along the mating axis.
Pass criteria:	Contact resistance: Shall meet 4.1.1

3. Mating lock strength	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine. Then Measure the load when the plug is pulled out at a speed of $25 \pm 3$ mm along the mating axis
Pass criteria:	Mating lock strength: 110N MIN.

4. Cable retention force	
Reference standard:	-
Test conditions:	Place the plug connector on the push-on/pull-off machine and pull the cable along the cable axis at a speed $25\pm 3$ mm/min. Measure the force when the discontinuity occurs.
Pass criteria:	Cable retention force: 90 N MIN.

5. Vibration	
Reference standard:	MIL-STD-202-201
Test conditions:	Solder the 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: 10-2000Hz Sweep speed: 1oct/min Power spectral density: $49\text{m/s}^2(5\text{G})$ Directions, Duration: 3 mutually perpendicular direction 8 hours about each direction.
Pass criteria:	Contact resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than $1\mu\text{s}$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

6. Shock	
Reference standard:	MIL-STD-202-213, Test condition A.
Test conditions:	Solder the 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: 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 $1\mu\text{s}$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

**4.3. Environmental Performance****1. High temperature life**

Reference standard: JIS C 60068-2-2

Test conditions: Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.  
 Temperature:  $378\pm 2\text{K}$  ( $105\pm 2^\circ\text{C}$ )  
 Duration: 1000 hours

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

**2. Low temperature life**

Reference standard: JIS C 60068-2-1

Test conditions: Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.  
 Temperature:  $233\pm 2\text{K}$  ( $-40\pm 2^\circ\text{C}$ )  
 Duration: 1000 hours

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

**3. Humidity (Steady state)**

Reference standard: -

Test conditions: Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.  
 Temperature:  $333\pm 2\text{K}$  ( $60\pm 2^\circ\text{C}$ )  
 Humidity: 90~95%RH  
 Duration: 96 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. Thermal shock**

Reference standard: -

Test conditions: Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.  
 Temperature:  $233\text{K}(-40^\circ\text{C}), 30\text{min.} \rightarrow 378\text{K}(105^\circ\text{C}), 30\text{min.}$   
 Transition time: 5min. MAX.  
 No. of cycles: 1000 cycles

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

5. Temperature and humidity cycling	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Duration: 10cycles (240hours)
	<p>Fig.3</p>
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. SO <sub>2</sub> gas	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2°C) Relative humidity: 80±5%RH Gas: SO <sub>2</sub> 25±1ppm Duration: 500 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

6. Sn whisker	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 303±3K (30±3°C) Relative humidity: 60±5%RH Duration: 4000 hours
Pass criteria:	Sn whisker 50µm MAX. (Use microscope with magnification of X100 MIN.)

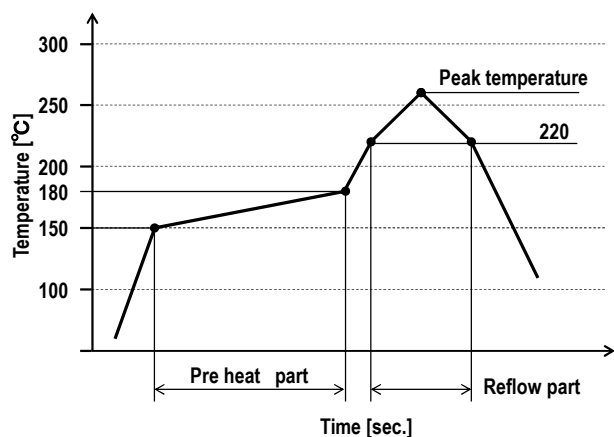
4.4. Others

1. Solderability

Reference standard:	-
Test conditions:	Immerse the contact soldering part to flux of RMA or R type for 5 to 10 seconds, then dip the part into the solder bath of 518±5K (245±5°C) for 5±0.5seconds.
Pass criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Resistance to soldering heat

Reference standard:	-
Test conditions:	Reflow temperature: See Fig.4. Cycle: 2



	Reflow condition
Pre heat part (150~180°C)	110s MIN.
Reflow part (220°C MIN.)	60s MIN.
Peak temperature	260°C MIN.

Fig.4

Pass criteria:	No deformation nor defect adversely affecting the performance occur.
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## 4.5 Test Sequence and Specimen Quantity

Details of the Testing Groups A to Q are indicated in test report.

**Table.1 Test Sequence and Sample Quantity**

No.	Test Item	Testing Groups															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q
4.1 Electrical Performance	1			1,3			1,3	1,3	1,3	1,3	1,5	1,5	1,5	1,3			
	2										2,6	2,6	2,6				
	3										3,7	3,7	3,7				
	4	1															
4.2 Mechanical Performance	1		1														
	2			2													
	3				1												
	4					1											
	5						2										
	6							2									
4.3 Environmental Performance	1								2								
	2									2							
	3										4						
	4											4					
	5												4				
	6														2		
	7															1	
4.4 Others	1																1
	2																
Specimen quantity		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

※Numbers indicate test sequences.

## 5. Recommended Metal Mask

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