

MHF[®]-TI Connector

Part No. Plug: 20859-001R-0* Receptacle: 20860-001E-0*

Product Specification

Qualification Test Report No. TR-20007

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
1	S20092	February 18, 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#24~26 coaxial cable (jacket diameter 2.46~3.0 mm)

3.2 Operating Conditions

Amperage : 100mA AC/DC

Operating Temperature : 233~358K(-40°C~105°C)

(Containing temperature rise by current)

Operating Humidity : 85% max

3.3 Storage Conditions

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

Storage humidity: 85% max. (結露無きこと / 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

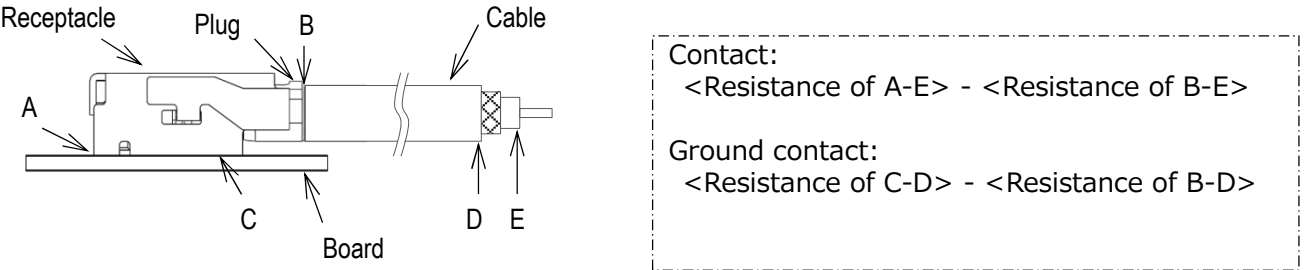
This initial test is equal to it's at shipping condition and unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202.

Temperature... 288K~308K (15°C~35°C)

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

Relative humidity... 45~75%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 measure the contact resistance as shown in Fig.1 by the four terminal methods. Apply the low level condition of 20mV MAX. DC for the open circuit voltage and 10mA MAX. DC for the closed circuit current.
 <p style="text-align: center;">Fig.1</p>	
Pass criteria:	<p>Contact Initial: 20 mΩ MAX. After testing: 30 mΩ MAX.</p> <p>Ground contact Initial: 15 mΩ MAX. After testing: 25 mΩ MAX.</p>

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 neighboring contacts for a minute.
Pass criteria:	No creeping discharge, flashover, no insulator breakdown shall 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
<p>The diagram illustrates the test setup for measuring the Voltage Standing Wave Ratio (VSWR) of the MHF-TI connector. A Network analyzer is connected to two SMA ports. The left SMA port is connected to a Receptacle on a Board. The right SMA port is connected to a Plug on a Board. A Cable, L=100mm, connects the two boards. A DUT (Device Under Test) is connected between the two boards. The distance between the SMA ports is indicated by a double-headed arrow.</p>	
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, measure mating force of initial and mating/unmating 30 cycles at a speed 25 ± 3 mm/min. along the mating axis.
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 30 cycles at a speed 25 ± 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 mate plug connector with fixed cable, and place them on the push-on/pull-off machine. Then Measure the load when the plug is pulled out at a speed of 25 ± 3 mm along the mating axis.
Pass criteria:	Mating lock strength: 110N MIN.

4. Cable retention force	
Reference standard:	-
Test conditions:	Place the fixed plug connector on the push-on/pull-off machine and then apply force on the cable along the direction at a speed 25 ± 3 mm/min. Measure the force when the cable dislodges the plug connector.
Pass criteria:	Cable retention force: 90N MIN.

5. Vibration	
Reference standard:	JIS C 60068-2-6
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the vibrator. 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

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

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±2K (105±2°C) Duration: 1000 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality

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±2K (-40±2°C) Duration: 1000 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality

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±2K (60±2°C) Humidity: 90~95%RH Duration: 1000 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

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: 233K(-40°C),30min.→378K(105°C),30min. 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

4.3. Environmental Performance

5. Temperature and humidity cycling	
Reference standard:	-
Test conditions:	<p>Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.</p> <p>Duration: 10cycles (240hours)</p>
	Fig.3
Pass criteria:	<p>Contact resistance: Shall meet 4.1.1.</p> <p>Insulation resistance: Shall meet 4.1.2.</p> <p>Dielectric withstanding voltage: Shall meet 4.1.3.</p> <p>Appearance: No abnormality</p>

5. SO ₂ gas	
Reference standard:	-
Test conditions:	<p>Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.</p> <p>Temperature: 313±2K (40±2°C)</p> <p>Relative humidity: 80±5%RH</p> <p>Gas: SO₂ 25±1ppm</p> <p>Duration: 500 hours</p>
Pass criteria:	<p>Contact resistance: Shall meet 4.1.1.</p> <p>Appearance: No abnormality adversely affecting the performance shall occur.</p>

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

4.4. Others

1. Solder ability	
Reference standard:	-
Test conditions:	Dip the solder tine of the contact in the solder bath at $518 \pm 5K$ ($245 \pm 5^{\circ}C$) for 5 ± 0.5 seconds after immersing the tine in the flux of RMA or R type for 5 to 10 seconds.
Pass criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Soldering heat resistance									
Reference standard:	-								
Test conditions:	Reflow temperature as shown in Fig.4. The number of times of Reflow is within 2.								
<table border="1" style="margin-left: auto; margin-right: 0;"> <thead> <tr> <th colspan="2">Reflow condition</th> </tr> </thead> <tbody> <tr> <td>Pre heat part (150~180°C)</td> <td>110s MIN.</td> </tr> <tr> <td>Reflow part (220°C MIN.)</td> <td>60s MIN.</td> </tr> <tr> <td>Peak temperature</td> <td>260°C MIN.</td> </tr> </tbody> </table>		Reflow condition		Pre heat part (150~180°C)	110s MIN.	Reflow part (220°C MIN.)	60s MIN.	Peak temperature	260°C MIN.
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 abnormality adversely affecting the performance shall not occur.								

4.5 Test Sequence and Specimen Quantity

Table 1 Test Sequence and Sample Quantity

Test Item	Group														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P
Contact Resistance		2, 4			1,3	1,3	1,3	1,3	1,5	1,5	1,5	1,3			
Insulation Resistance									2,6	2,6	2,6				
D. W. Voltage									3,7	3,7	3,7				
VSWR	1														
Mating Force		1													
Durability		3													
Mating lock strength			1												
Cable Retention Force				3											
Vibration					2										
Shock						2									
High Temperature Life							2								
Low Temperature Life								2							
Humidity (Steady state)									4						
Thermal shock										4					
Temperature and humidity cycling											4				
SO ₂ gas												2			
Sn whisker													1		
Solder ability														1	
Soldering heat resistance															1
Specimen Quantity.	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

※Numbers indicate sequence in which tests are performed.

5. Recommended Metal Mask

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