

MHF[®] 4 Connector

Part No. Plug: 20611-001R Receptacle: 20449-001E-**

Product Specification

Qualification Test Report No. TR-18086

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Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Scope

This Product Specification defines the test conditions and the performances of the MHF 4 Connector.

2. Product Name and Parts No.

2.1 Product Name

MHF 4 PLUG (Ni Top)
MHF 4 RECEPTACLE (Pd-Ni)

2.2 Parts No.

Plug : 20611-001R
Receptacle : 20449-001E-**

3. Rating

3.1 Applicable Cable

(1) Description

Inner conductor: AWG#36(7/0.05), silver plating annealed copper wire
Dielectric core: Fluoro-plastics, diameter 0.4(+0.04, -0.02) mm, nominal thickness 0.125 mm
Outer conductor: Nominal diameter 0.65mm, silver plating annealed copper wire or tin plating annealed copper wire
Jacket: Fluoro-plastics, diameter 0.81(+0.04, -0.02) mm, nominal thickness 0.08 mm

(2) Requirements

Characteristic impedance: 50(+3,-3) ohm by TDR method
Nominal capacitance (Reference value): 96pF/m
Conductor resistance of inner conductor at 293K (20°C): 1400 ohm/km MAX.
Insulation resistance: 1000 mega-ohm·km MIN.
Dielectric withstand voltage: No breakdown at AC1000V for 1 minute.

3.2 Operating Conditions

Voltage: 60V AC (per a contact)
Operating temperature: 233K~363K(-40°C~+90°C)
(Containing temperature rise by current)
Nominal characteristic impedance : 50Ω
Frequency: DC~9GHz
VSWR: PLUG: 1.30 MAX at 0.1~3GHz. 1.50 MAX at 3~6GHz. 2.00 MAX at 6~9GHz.
RECEPTACLE: 1.30 MAX at 0.1~3GHz. 1.4 0MAX at 3~6GHz. 1.55 MAX at 6~9GHz.

3.3 Storage Conditions

Storage temperature: 248 to 333K(-25°C to 60°C)
Storage humidity: 85% max. (Non-condensing)

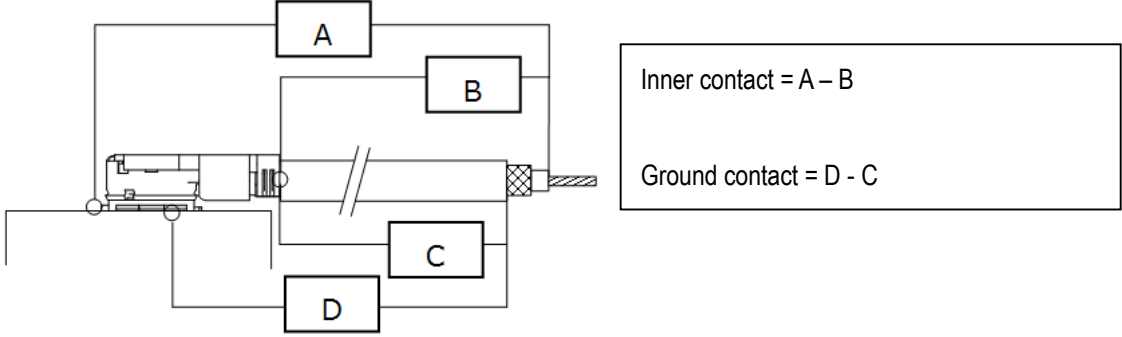
4. Test and Performance

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.

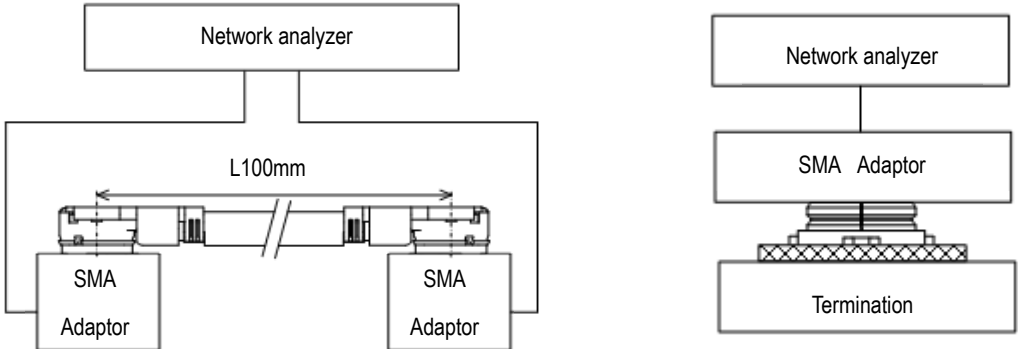
4.1. Electrical Performance

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, measure the contact resistance as shown in Fig. 1 by the four terminal method. Apply the low level condition. Open circuit voltage : 20mV MAX. Circuit current : 10mA MAX.
	
Fig. 1	
Pass criteria :	Inner contact Initial : 20mΩ MAX. After testing : Δ R 20mΩ MAX. Ground contact Initial : 20mΩ MAX. After testing : Δ R 100mΩ MAX.

2. Insulation resistance	
Reference standard :	MIL-STD-202-302
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.

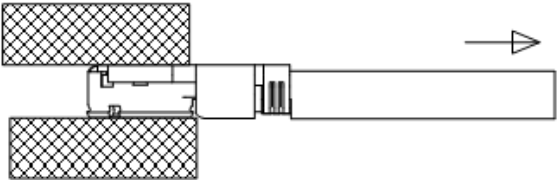
3. Dielectric withstanding voltage	
Reference standard :	MIL-STD-202-301
Test conditions :	Mate the plug and receptacle connector together, then, apply AC 200 V rms between the inner contact and the ground contact for a minute.
Pass criteria :	No creeping discharge, no flashover, and no insulator breakdown.

4.1. Electrical Performance

4. VSWR	
Reference standard :	-
Test conditions :	Measure the VSWR as shown in Fig. 2 by the network analyzer. Frequency : 0.1~9GHz
	
Fig. 2	
Pass criteria :	Plug: 1.30 MAX.at 0.1~3GHz, 1.50 MAX.at 3~6GHz, 2.00 MAX.at 6~9GHz Receptacle: 1.30 MAX.at 0.1~3GHz, 1.40 MAX.at 3~6GHz, 1.55 MAX.at 6~9GHz

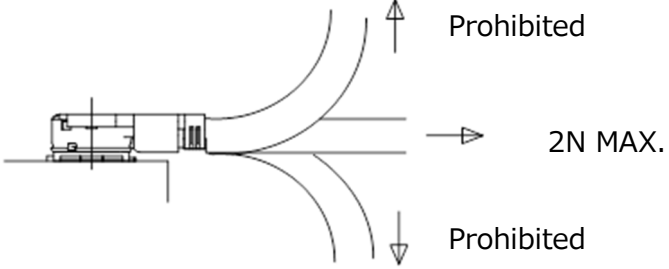
4.2. Mechanical Performance

1. Unmating force	
Reference standard :	-
Test conditions :	Solder the receptacle connector to the test board and mate the plug connector together then, measure the unmating force at speed of 25 ± 3 mm/minutes in parallel with the mating axis by the push-pull machine.
Pass criteria :	Unmating force Initial : 4 N MIN. After 30 cycles : 2 N MIN.

2. Crimp strength	
Reference standard :	-
Test conditions :	Pull the cable as shown in Fig. 3 at speed of 25 ± 3 mm/minutes by the tensile strength machine and measure the retention force.
	
Fig. 3	
Pass criteria :	5N MIN.

4.2. Mechanical Performance

3. Durability	
Reference standard :	-
Test conditions :	Mate and unmate the receptacle connector(soldered to the test board) and plug connector 30cycles at speed of $25\pm 3\text{mm/minutes}$ in parallel with the mating axis by the push-pull machine.
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Contact resistance : Shall meet 4.1.1.

4. Cable retention force	
Reference standard :	-
Test conditions :	Apply force to cable as shown in Fig. 4. During the testing, run 100mA DC to check electrical discontinuity.
 <p style="text-align: center;">Fig. 4</p>	
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Electrical discontinuity : No electrical discontinuity greater than $1\mu\text{s}$ shall occur.

5. Vibration	
Reference standard :	MIL-STD-202-201
Test conditions :	Apply the following vibration to the mating connector. During the testing, run 100mA DC to check electrical discontinuity. Frequency : $10\text{Hz} \rightarrow 100\text{Hz} \rightarrow 10\text{Hz}$ / approx. 20minutes. Half amplitude, Peak value of acceleration : 1.5mm or 59m/s^2 (6G) Directions , cycle : 3 mutually perpendicular direction, 3 cycles for each direction.
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Contact resistance : Shall meet 4.1.1. Electrical discontinuity : No electrical discontinuity greater than $1\mu\text{s}$ shall occur.

6. Shock	
Reference standard :	MIL-STD-202-213
Test conditions :	Apply the following shock to the mating connector. During the testing, run 100mA DC to check electrical discontinuity. Peak value of acceleration : 735m/s^2 (75G) Duration : 11msec. Wave Form : Half sinusoidal Directions, cycle : 6 mutually perpendicular direction, 3 cycles for each direction
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Contact resistance : Shall meet 4.1.1. Electrical discontinuity : No electrical discontinuity greater than $1\mu\text{s}$ shall occur.

4.3. Environmental Performance

1. Humidity(Steady state)	
Reference standard :	MIL-STD-202-103, Condition B
Test conditions :	Apply the following environment to the mating connector. Temperature : 313±2K (40±2°C) Humidity : 90~95%RH Duration : 96 hours
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Contact resistance : Shall meet 4.1.1. Insulation resistance : Shall meet 4.1.2. Dielectric withstanding voltage : Shall meet 4.1.3.

2. Thermal shock	
Reference standard :	MIL-STD-202-107 Condition A
Test conditions :	Apply the following environment to the mating connector. Temperature : 218K(-55°C) : 30min. ↔ 358K(85) : 30min. Transition time : 5min. MAX. No. of cycles : 5 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 adversely affecting the performance shall occur.

3. High temperature life	
Reference standard :	-
Test conditions :	Apply the following environment to the mating connector. Temperature: 363±2K (90±2°C) Duration: 96 hours
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Contact resistance : Shall meet 4.1.1.

4. H ₂ S gas	
Reference standard :	-
Test conditions :	Apply the following environment to the mating connector. Temperature : 313±2K (40±2°C) Relative humidity : 80±5%RH Gas : H ₂ S 3±1ppm Duration : 96 hours
Pass criteria :	Contact resistance : Shall meet 4.1.1. Appearance : No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

5. Saltwater spray	
Reference standard :	MIL-STD-202-101, Condition B
Test conditions :	Apply the following environment to the mating connector. Temperature : $308 \pm 2\text{K}$ ($35 \pm 2^\circ\text{C}$) Salt water density : $5 \pm 1\%$ [by weight] Duration : 48 hours
Pass criteria :	Appearance : No abnormality adversely affecting the performance shall occur. Contact resistance : Shall meet 4.1.1.

4.4. Others

1. Solder ability	
Reference standard :	MIL-STD-202-208
Test conditions :	Dip the soldering point of the contacts in the solder bath at $518 \pm 5\text{K}$ ($245 \pm 5^\circ\text{C}$) for 5 ± 0.5 seconds after immersing the tine in the flux of RMA 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 profile. : Fig. 5 The number of reflow is 2 times.
<p>Fig. 5</p> <p>The graph shows a temperature profile with two reflow cycles. The first cycle starts with a ramp up to a plateau at 403-443 K (130-170°C), which lasts for 60-120 seconds. This is followed by a second ramp up to a higher peak at 553 K (260°C), which lasts for 10±5 seconds. The temperature then ramps down after each peak.</p>	
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	J	K	L	M	N	P	Q	
Contact Resistance					1, 3		1, 3	1, 3	1, 5	1, 5	1, 3	1, 3	1, 3			
Insulation Resistance									2, 6	2, 6						
D. W. Voltage	1								3, 7	3, 7						
VSWR		1														
Unmating Force			1													
Crimp strength				1												
Durability					2											
Cable Retention Force						1										
Vibration							2									
Shock								2								
Humidity (Steady State)									4							
Thermal Shock										4						
High Temperature Life											2					
H2S Gas												2				
Salt Water Spray													2			
Solder ability														1		
Soldering Heat Resistance															1	
Sample Quantity (pcs.)	Plug	10	10	10	10	10	10	10	10	10	10	10	10	10	-	-
	Receptacle		5		-										10	10

※Numbers indicate sequence in which tests are performed.

5. Recommended Metal Mask

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