

# MHF<sup>®</sup> 4L Connector (AWG#34φ0.83 Cable)

Part No. Plug:20565-001R-83 Receptacle:20449-001E-\*\*

## Product Specification

Qualification Test Report No. TR-15011

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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 4L Connector.

**2. Product Name and Parts No.****2.1 Product Name**

MHF 4L connector

**2.2 Parts No.**

Plug: 20565-001R-83

Receptacle: 20449-001E-\*\*

**3. Rating****3.1 Applicable Cable**

## (1) Description

Inner conductor : AWG#34(7/0.062)0.186±0.006mm, Silver plating annealed copper wire

Dielectric core : Fluoro-plastics , diameter 0.53(±0.02)mm , nominal thickness 0.17mm

Outer conductor : 16/5/0.04, nominal diameter 0.71mm, Copper-Polyester tape + Sn plating annealed copper wire

Jacket : Fluoro-plastics , diameter 0.83(+0.02 / -0.04)mm

## (2) Requirements

Characteristic impedance : 50±3Ω by TDR method

Nominal capacitance(Reference value): 96 pF/m

Conductor resistance of inner conductor at 293K (20°C)(Reference value) : 925Ω/km

Insulation resistance : 1,000 MΩ·km MIN.

Dielectric withstand voltage : no breakdown at AC 1,500V for 1 minutes.

**3.2 Operating Conditions**

Rated voltage	AC60Vr.m.s
Nominal characteristic impedance	50 ohm.
Frequency	DC~6GHz
VSWR	Plug : 1.3 MAX. (DC~3HGz) , 1.45 MAX. (3~6GHz) Receptacle : 1.3 MAX. (DC~3HGz) , 1.4 MAX. (3~6GHz)
Service temperature	233K~363K (-40°C~90°C)

**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 methods. Apply the low level condition of 20mV MAX. DC for the open circuit voltage and 10mA MAX. DC for the closed circuit current.
Fig.1	
Pass criteria :	Inner contact Initial : 20mΩ MAX. After testing : $\triangle R$ 20mΩ MAX. Ground contact Initial : 20mΩ MAX. After testing : $\triangle R$ 20mΩ MAX.

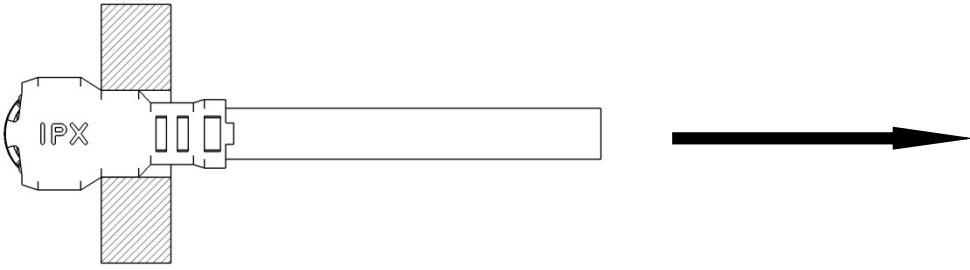
2. Insulation resistance	
Reference standard :	MIL-STD-202-302
Test conditions :	Mate the plug and receptacle connector together, and then apply DC 100 V between the inner contact and the ground contact.
Pass criteria :	Initial : 500 MΩ MIN. After testing : 100 MΩ MIN.

3. Dielectric withstanding voltage	
Reference standard :	MIL-STD-202-301
Test conditions :	Mate the 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. VSWR	
Reference standard :	-
Test conditions :	Measure the VSWR as shown in Fig.2 by the network analyzer. Frequency : 0.1 ~ 12GHz
Fig.2	
Pass criteria :	Plug 1.3 MAX. at 0.1~3GHz, 1.45 MAX. at 3~6GHz Receptacle 1.3 MAX. at 0.1~3GHz, 1.4 MAX at 3~6GHz

4.2. Mechanical Performance

1. Mating force and Unmating 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 of initial and mating / unmating 30 cycles at a speed $25\pm 3$ mm/min. along the mating axis.
Pass criteria :	Mating force Initial : 30 N MAX. 30cycles : 30 N MAX. Unmating force Initial : 20 N MAX. 5 N MIN. 30cycles : 20 N MAX. 3 N MIN.

2. Crimp strength	
Reference standard :	-
Test conditions :	Pull the cable as shown in Fig.3 at speed of $25\pm 3$ mm/minutes by the tensile strength machine and measure the retention force.
	
Pass criteria :	8 N MIN.

3. 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. Appearance : No abnormality adversely affecting the performance shall occur.

4. Vibration	
Reference standard:	-
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 : 10Hz→100Hz→10Hz / approx 15minutes. Half amplitude, Peak value of acceleration : 1.5mm or 59m/s <sup>2</sup> (6G) Directions : 3 mutually perpendicular direction, 5 cycles (approx 75minutes.) for each direction.
Pass criteria:	Contact resistance : Shall meet 4.1.1. Electrical discontinuity : No electrical discontinuity greater than 1μs shall occur. Appearance : No abnormality adversely affecting the performance shall occur.

#### 4.2. Mechanical Performance

5. Shock	
Reference standard :	-
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 <sup>2</sup> (75G)      Directions, cycle : 6 mutually perpendicular direction Duration : 11msec      3 cycles about each direction Wave Form : Half Sinusoidal
Pass criteria :	Contact resistance : Shall meet 4.1.1. Electrical discontinuity : No electrical discontinuity greater than 1μs shall occur. Appearance : No abnormality adversely affecting the performance shall occur.

#### 4.3. Environmental Performance

1. Thermal shock	
Reference standard :	MIL-STD-202-107, Condition A.
Test conditions :	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature : 218K(-55°C) : 30min. → 358K(85°C) : 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.

2. High temperature life	
Reference standard :	-
Test conditions :	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature : 363±2K (90±2°C) Duration : 96 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 :	MIL-STD-202-103, Condition B.
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) Humidity : 90~95%R.H. 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.

**4.3. Environmental Performance**

<b>4. Saltwater spray</b>	
Reference standard :	MIL-STD-202-101, Condition B.
Test conditions :	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature : 308±2K (35±2°C) Saltwater 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.

<b>5. H<sub>2</sub>S gas</b>	
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%R.H. Gas : H <sub>2</sub> S 3±1ppm Duration : 48 hours
Pass criteria :	Contact resistance : Shall meet 4.1.1. Appearance : No abnormality adversely affecting the performance shall occur.

**4.4. Others**

<b>1. Solder ability</b>	
Reference standard :	MIL-STD-202-208
Test conditions :	Dip the solder tine of the contact in the solder bath at 518±5K (245±5°C) for 5±0.5seconds after immersing the tine in the flux of RMA or R type for 5 to 10 seconds.
Pass criteria :	The surface of the dipped contact must become 95% wet and the non-wetted pinholes must not accumulate in one area but be distributed and must be less than 5% of the contact area to be soldered.

<b>2. Soldering heat resistance</b>	
Reference standard :	-
Test conditions :	Reflow temperature as shown in Fig.4. 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 Item	Group													
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Contact resistance					1,3	1,3	1,3	1,5	1,3	1,5	1,3	1,3		
Insulation resistance								2,6		2,6				
Dielectric withstanding voltage	1							3,7		3,7				
VSWR		1												
Mating force / Unmating force			1											
Crimp strength				1										
Durability					2									
Vibration						2								
Shock							2							
Thermal shock								4						
High temperature life									2					
Humidity (Steady State)										4				
Saltwater spray											2			
H <sub>2</sub> S gas												2		
Solder ability													1	
Soldering heat resistance														1
Specimen quantity.	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.

※Numbers indicate test sequences.

## 5. Recommended Metal Mask

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