

MHF® 5 / 5L Connector (φ0.84 Cable)

Part No. MHF 5L Plug: 20714-001R-81 MHF 5 Receptacle: 20566-001E-01

Product Specification

Qualification Test Report No. TR-16049

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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 5 / 5L Connector AWG#33 φ0.84 Cable.

2. Product Name and Parts No.

2.1 Product Name

MHF 5L Plug
MHF 5 Receptacle

2.2 Parts No.

Plug: 20714-001R-81
Receptacle: 20566-001E-01

3. Rating

3.1 Applicable Cable

(1) Description

Inner conductor: AWG#33(7/0.071), Silver plating annealed copper wire
Dielectric core: Fluoro-plastics, diameter 0.62 mm
Outer conductor: Nominal diameter 0.72 mm, silver plating annealed copper wire or tin plating annealed copper wire
Jacket: Fluoro-plastics, diameter 0.84 mm

(2) Requirements

Characteristic impedance : 50 (+3, -3) ohm by TDR method
Nominal capacitance (Reference value) : 95 pF/m
Conductor resistance of inner conductor at 293K (20°C): 700 ohm/km MAX.
Insulation resistance: 1000 mega-ohm • km MIN.
Dielectric withstand voltage: no breakdown at 1000V AC for 1 minutes.

3.2 Operating Conditions

Rated voltage	AC60Vr.m.s
Nominal characteristic impedance	50 ohm.
Frequency	DC to 15GHz
VSWR	Plug: 1.3 MAX. (0.1-3GHz), 1.4 MAX. (3-6GHz), 1.5 MAX. (6-12GHz), 1.6 MAX. (12-15GHz) Receptacle: 1.3 MAX. (0.1-3GHz), 1.4 MAX. (3-6GHz), 1.5 MAX. (6-12GHz), 1.65 MAX. (12-15GHz)
Service Temperature	233K to 363K (-40°C to 90°C)

3.3 Storage Conditions

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

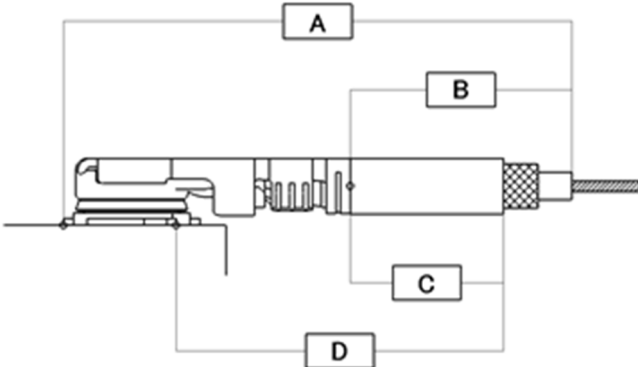
4. Test and Performance

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. Open circuit voltage: 20mV MAX. Circuit current: 10mA MAX.		
	 <u>Inner contact</u> =A-B <u>Ground contact</u> =D-C Fig. 1		
Pass criteria:	Inner Contact	Initial: 20mΩ MAX.	After testing: $\triangle$ R20mΩ MAX.
	Ground contact	Initial: 20mΩ MAX.	After testing: $\triangle$ R100mΩ MAX.

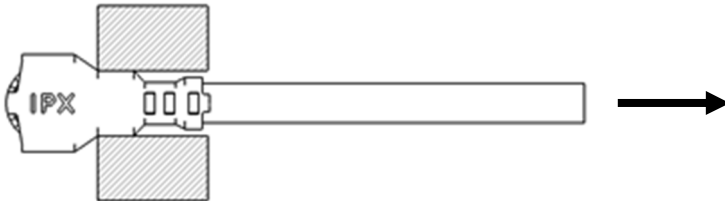
2. Insulation resistance			
Reference standard:	MIL-STD-202-302		
Test conditions:	Mate the plug and receptacle connector together, and then apply DC 100 V between the inner contact and the ground contact.		
Pass criteria:	Initial: 500 MΩ MIN. After testing: 100 MΩ MIN.		

3. Dielectric withstanding voltage			
Reference standard:	MIL-STD-202-301		
Test conditions:	Mate the plug and receptacle connector together, then apply AC 200V(rms) between the inner contact and the ground contact 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 to 15GHz				
Network analyzer SMA Adaptor L=100mm SMA Adaptor Network analyzer SMA Adaptor Termination Fig. 2						
Pass criteria:	Plug	1.3MAX.at 0.1-3GHz	1.4MAX.at 3-6GHz	1.5MAX.at 6-12GHz	1.6MAX.at 12-15GHz	
	Receptacle	1.3MAX.at 0.1-3GHz	1.4MAX.at 3-6GHz	1.5MAX.at 6-12GHz	1.65MAX.at 12-15GHz	

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 un-mating force at speed 25±3mm/minutes in parallel with the mating axis by the push-pull machine.		
Pass criteria:	Initial	: 5N MIN.	After 30cycles : 3N MIN.
2. Durability			
Reference standard:	-		
Test conditions:	Mate and un-mate the receptacle connector (Soldered to the test board) and plug connector 30 cycles at speed of 25±3mm/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.		
3. Crimp strength			
Reference standard:	-		
Test conditions:	Pull the cable as shown in Fig. 3 at speed of 25±3mm/minutes by the tensile strength machine and measure the retention force.		
			
Fig. 3			
Pass criteria:	10N MIN		

4.2. Mechanical Performance**4. Cable retention force**

Reference standard: -

Test conditions: Apply force to the cable as shown in Fig. 4. During the testing, run 100mA DC to check electrical discontinuity.

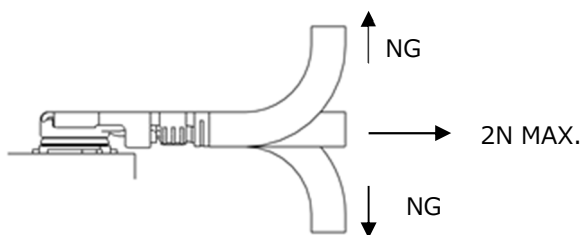


Fig. 4

Pass criteria: [Appearance] No abnormality adversely affecting the performance shall occur.
 [Electrical discontinuity] No electrical discontinuity greater than 1μs 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: 10Hz → 100Hz → 10Hz / approx. 20minutes.
 Half amplitude, Peak value of acceleration: 1.5mm or 59m/s² (6G)
 Directions, cycle: 3 mutually perpendicular direction, 3 cycles for each direction.

Pass criteria: [Appearance] No abnormality adversely affecting the performance shall occur.
 [Electrical discontinuity] No electrical discontinuity greater than 1μs shall occur.

6. Shock

Reference standard: MIL-STD-202-213B, 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 1μs shall occur.
 [Appearance] No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance**1. Humidity (Steady State)**

Reference standard: MIL-STD-202-103B, Condition B.

Test conditions: Apply the following environment to the mating connector in accordance with
 Temperature: 313±2K (40±2°C)
 Humidity: 90 to 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.

4.3. Environmental Performance**2. Thermal Shock**

Reference standard:	MIL-STD-202-107G, 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):30min. Transition time: 5min. MAX. Number 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:	[Contact resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

4. H₂S 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.

5. Salt Water Spray

Reference standard:	MIL-STD-202-101E, 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) Salt water 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.

4.4. Others

1. Solder ability	
Reference standard:	MIL-STD-202-208H.
Test conditions:	Dip the soldering point of the contacts in the solder bath at 4.18±5K (245±5℃) for 5±0.5seconds after immersing the tine in the flux of RMA type for 5 to 10 seconds.
Pass criteria:	More than 95% of the dipped surface becomes wet and the pinhole that should not gather at one point is less than 5%.

2. Soldering heat resistance

Reference standard: -

Test conditions:

Reflow temperature profile: See Fig. 5

The number of reflow is 2 times.

Temperature
K(°C)

523
(250)

503
(230)

493
(220)

453
(180)

403
(130)

Conditon 1

523
(250)

503
(230)

493
(220)

453
(180)

403
(130)

Conditon 4

Conditon 3

Conditon 2

Time
[s]

	Temperature	Time[s]
Conditon 1	403~453K 130~180°C	120 MAX.
Conditon 2	493K 220°C	60 MAX.
Conditon 3	503K 230°C	50 MAX.
Conditon 4	523K 250°C	10

Fig. 5

Pass criteria:

No abnormality adversely affecting the performance shall not occur.

4.5 Test Sequence and Specimen Quantity

Details of the Testing Groups A to P 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	J	K	L	M	N	P
4.1 Electrical Performance	1	Contact Resistance			1,3			1,3	1,3	1,5	1,5	1,3	1,3	1,3		
	2	Insulation Resistance								2,6	2,6					
	3	D. W. Voltage								3,7	3,7					
	4	VSWR	1													
4.2 Mechanical Performance	1	Unmating Force		1												
	2	Durability			2											
	3	Crimp Strength				1										
	4	Cable Retention Force					1									
	5	Vibration						2								
	6	Shock							2							
4.3 Environmental Performance	1	Humidity (Steady State)								4						
	2	Thermal Shock									4					
	3	High Temperature Life										2				
	4	H ₂ S Gas											2			
	5	Salt Water Spray												2		
4.4 Others	1	Solder ability													1	
	2	Soldering Heat Resistance														1
Specimen quantity (pcs.)	Plug		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.