MHF® 5 Connector

(AWG#38φ0.48 Cable)

Part No. Plug: 20615-001R-48 Receptacle: 20566-001E-01

Product Specification

Qualification Test Report No. TR-14026

Rev.	ECN	Date	Prepared by	Checked by	Approved by
5	S22244	June 20, 2022	K.Watanabe	K.Yufu	Y.Hashimoto
4	S21511	October 22, 2021	K.Ikeshita		M.Takemoto
3	S21149	March 31, 2021	N.Miyashiro	K.Ikeshita	M.Takemoto
2	S17288	April 17, 2017	M.N		Ken

1. Scope

This product specification defines the test conditions and the performances of the MHF 5 Connector AWG#38φ0.48 Cable.

2. Product Name and Parts No.

2.1 Product Name

MHF 5 Connector

2.2 Parts No.

Plug: 20615-001R-48
Receptacle: 20566-001E-01

3. Rating

3.1 Applicable Cable

(1) Description

Inner conductor: AWG#38(7/0.04), Silver plating annealed copper wire
Dielectric core: Fluoro-plastics, diameter 0.32(+0.02,-0.02) mm, nominal thickness 0.10mm
Outer conductor: Nominal diameter 0.42mm, silver plating annealed copper wire or tin plating annealed copper wire
Jacket: Fluoro-plastics, diameter 0.48(+0.04) mm, nominal thickness 0.04mm

(2)Requirements

Characteristic impedance: 50(+5,-5) ohm by TDR method
Nominal capacitance (Reference value): 102 pF/m
Conductor resistance of inner conductor at 293K (20℃): 2080 ohm/km MAX.
Insulation resistance: 1000 mega-ohm・km MIN.
Dielectric withstand voltage: no breakdown at AC1500 V for 1 minutes.

3.2 Operating Conditions

Voltage: 60 Vr.m.s AC
Operating Temperature: 233～363K(-40℃～+90℃)
(Containing temperature rise by current)
Nominal characteristic impedance: 50Ω
Frequency: DC~12 GHz
VSWR: [Plug] 1.30 MAX at 0.1~3 GHz
1.50 MAX at 3~6 GHz
1.60 MAX at 6~9 GHz
1.60 MAX at 9~12 GHz
[Receptacle] 1.30 MAX at 0.1~3 GHz
1.40 MAX at 3~6 GHz
1.50 MAX at 6~12 GHz
1.65 MAX at 12~15 GHz

3.3 Storage Conditions

Storage temperature: 248 to 333K(-25℃ to 60℃)
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℃ to 35℃)
Pressure: 866hPa to 1066hPa(650mmHg to 800mmHg)
Relative humidity: 45 to75% 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. Open circuit voltage : 20mV MAX. Circuit current : 10mA MAX.

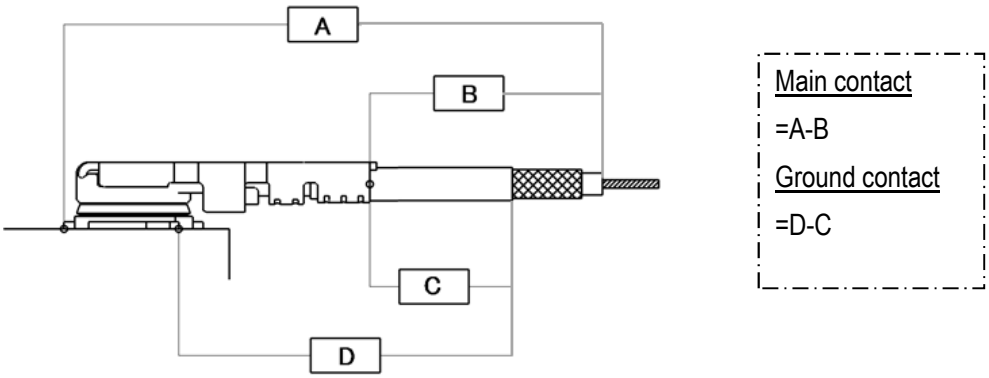


Fig.1

Pass criteria:	Main contact Initial： 20mΩ MAX. After testing： ⊿R20mΩ MAX. Ground contact Initial： 20mΩ MAX. After testing： ⊿R20mΩ 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 main 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 main 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~12GHz

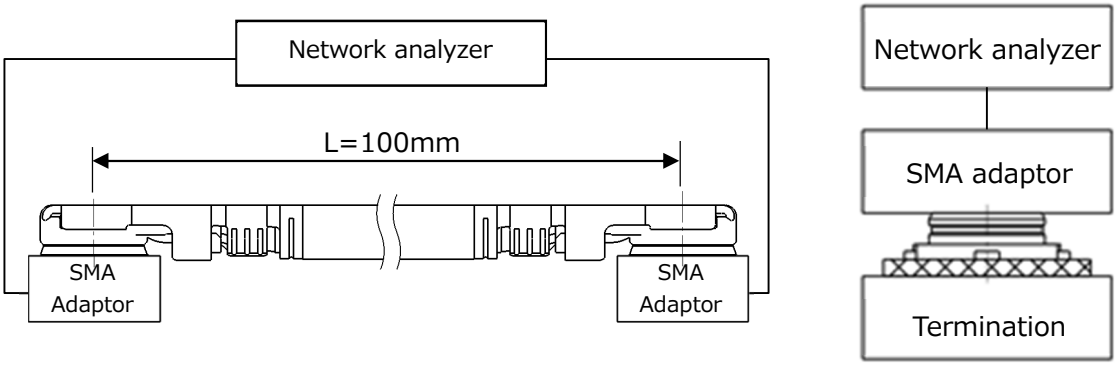


Fig. 2

Pass criteria:	Plug:	1.30 MAX. at 0.1~3GHz, 1.50 MAX. at 3~6GHz 1.60 MAX. at 6~9GHz, 1.60 MAX. at 9~12GHz
	Receptacle:	1.30 MAX. at 0.1~3GHz, 1.40 MAX. at 3~6GHz 1.50 MAX. at 6~12GHz, 1.65 MAX. at 12~15GHz

4.2. Mechanical Performance

1. 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 the unmating force at the initial and after 30 cycles at a speed 25±3mm/min. along the mating axis.
Pass criteria:	Initial: 4 N MIN. After 30cycles: 2 N MIN.

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±3mm/min. along the mating axis.
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

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.

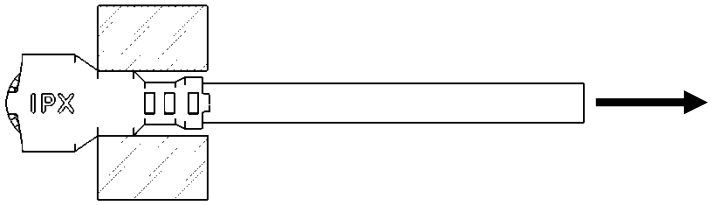
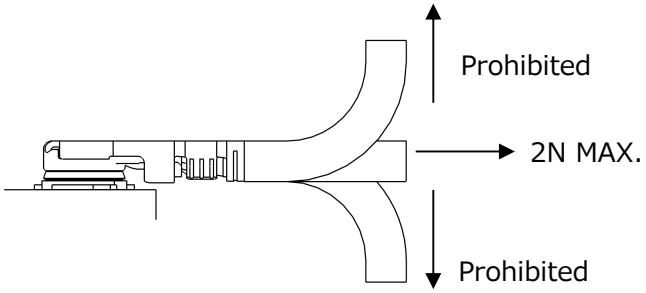


Fig. 3

Pass criteria:	7N 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:	Electrical discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

5. Vibration	
Reference standard:	-
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. 15 minutes. 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:	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

6. Shock	
Reference standard:	MIL-STD-202-213, Test condition B.
Test conditions:	Apply the following vibration to the mating connector. During the testing, run 100mA DC to check electrical discontinuity. Peak value of acceleration : 735m/s2 (75G) Duration: 11msec Wave Form: half sinusoidal Directions, cycle: 6 mutually perpendicular direction, 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-202-103, Test 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℃) 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

2. Thermal Shock	
Reference standard:	MIL-STD-202-107, Test 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℃),30min.→358K(85℃),30min. Transition time: 5min. MAX. Cycle: 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℃) Duration : 96 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur

4. H_2S Gas	
Reference standard:	-
Test conditions:	Apply the following environment to the mating connector. Temperature: 313±2K (40±2℃) Relative Humidity: 80±5%RH Gas: H2S 3±1ppm Duration: 96 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur

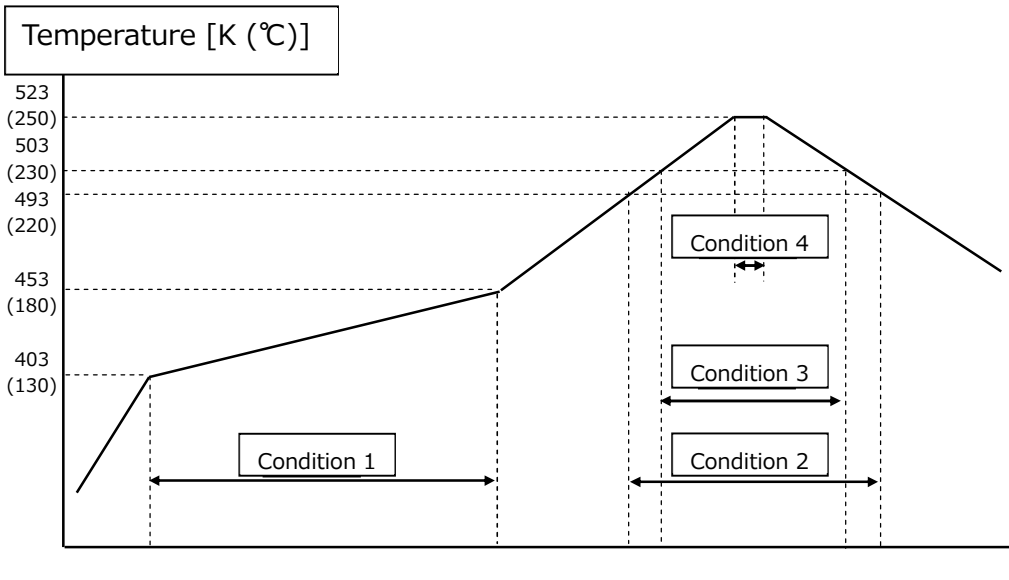
4.3. Environmental Performance

5. Salt Water Spray	
Reference standard:	MIL-STD-202-101, Test 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℃) 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

4.4. Others

1. Solder ability	
Reference standard:	MIL-STD-202-208
Test conditions:	Immerse the contact soldering part to flux of RMA type for 5 to 10 seconds, then dip the part into the solder bath of 518±5K （245±5℃） for 5±0.5seconds.
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: Fig. 5 The number of reflow is 2 times.



	Temperature	Time [s]
Condition 1	403~453K (130~180℃)	120MAX.
Condition 2	493K (220℃)	60MAX.
Condition 3	503K (230℃)	50MAX.
Condition 4	523K 250℃	10

Fig. 5

Pass criteria:	No deformation nor defect adversely affecting the performance 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, 5	1, 3	1, 3	1, 3		
Insulation Resistance									2, 6	2, 6					
D. W. Voltage									3, 7	3, 7					
VSWR		1													
Unmating force			1												
Durability				2											
Crimp Strength					1										
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
Specimen quantity (pcs.)	Plug	10	10	10	-	10	10	10	10	10	10	10	10	-	-
	Receptacle	5			10									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