MHF® 5 Plug Ass'y Selective Ni Type (AWG#38φ0.48 Cable)

Part No. Plug:20615-002R-48 Receptacle:20566-001E-01

Product Specification

Qualification Test Report No. TR-15029

Rev.	ECN	Date	Prepared by	Checked by	Approved by
3	S22262	June 20, 2022	K.Watanabe	K.Yufu	Y.Hashimoto
2	S21518	October 26, 2021	K.Ikeshita		M. Takemoto
1	S15169	April 17, 2015	H.T		Tom
0	S14428	October 20, 2014	Y.Hashimoto	T.Tagawa	T.Takano

1. Scope

This product specification defines the test conditions and the performances of the MHF5 Connector (Plug Ass'y Selective Ni Type).

2. Product Name and Parts No.

2.1 Product Name

MHF5 Connector (Plug Ass'y Selective Ni Type)

2.2 Parts No.

Plug: 20615-002R-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

Rated voltage	AC60Vr.m.s
Nominal characteristic impedance	50 ohm.
Frequency	DC～6GHz
VSWR	Plug : 1.30 MAX. (0.1～3HGz), 1.50 MAX.(3～6GHz) 1.60 MAX. (6～12GHz) Receptacle : 1.30 MAX. (0.1～3HGz) , 1.40 MAX. (3～6GHz), 1.50 MAX. (6～12GHz) , 1.65 MAX. (12～15GHz)
Service Temperature	233K～363K (-40℃～90℃)

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. Apply the low level condition. Open circuit voltage: 20mV MAX. Circuit current: 10mA MAX.

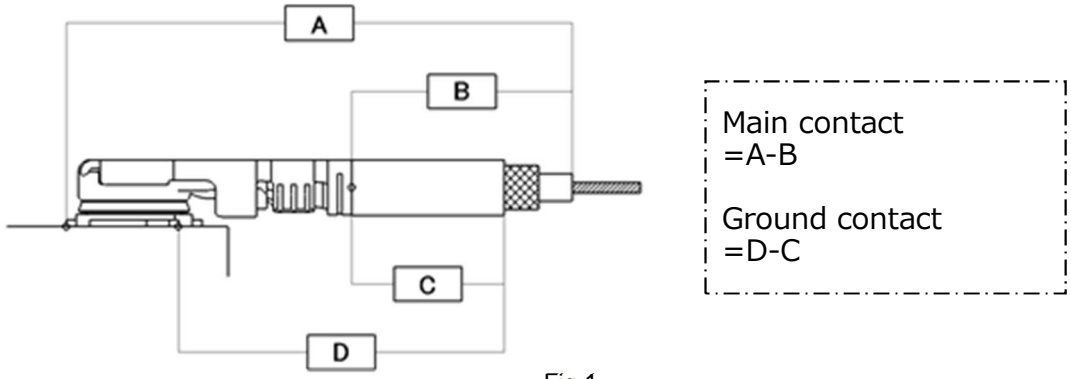


Fig.1

Pass criteria:	Inner contact Initial： 20mΩ MAX. After testing： ⊿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 inner contact and the ground contact.
Pass criteria:	Initial: 500 MΩ MIN. After testing: 100 MΩ MIN.

3. D. W. 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 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~6GHz

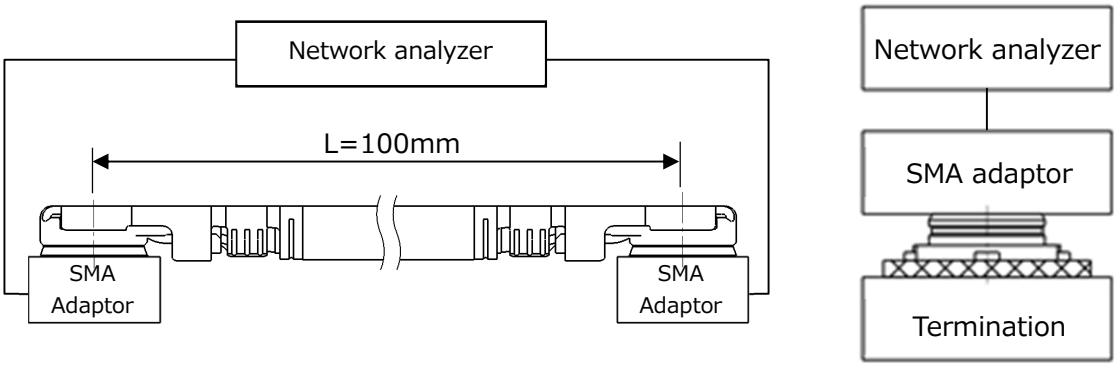


Fig. 2

Pass criteria:		
	PLUG:	1.30 MAX. at 0.1~3GHz, 1.5 MAX. at 3~6GHz 1.60 MAX. at 6~12GHz
	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 of initial and un-mating 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 un-mating 30cycles 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.

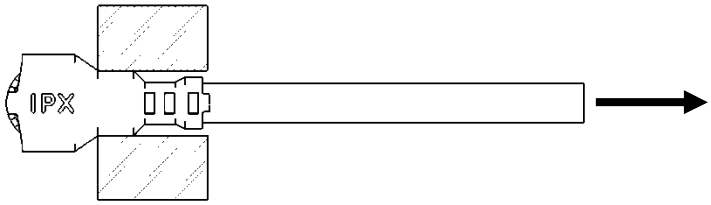
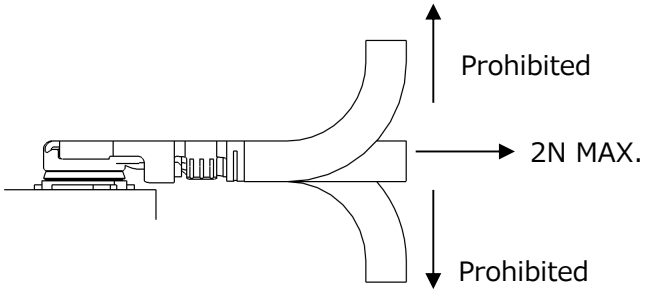


Fig. 3

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: Looseness between the parts, chipping, breakage or other abnormality shall not 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 5 cycles (approx. 75min) 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

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.

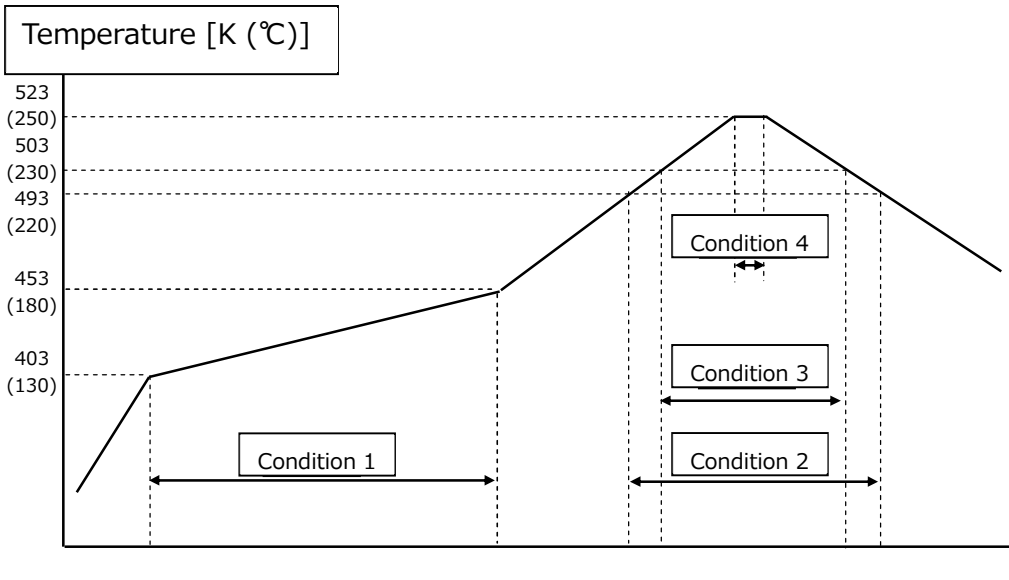
4.3. Environmental Performance

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. 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 or R 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	503L (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