MHF® 5L Connector (φ1.13 Cable)

Part No. Plug:20668-001R-13 Receptacle:20566-001E-01

Product Specification

Qualification Test Report No. TR-16003

Rev.	ECN	Date	Prepared by	Checked by	Approved by
4	S21523	October 28, 2021	K. Ikeshita		M. Takemoto
3	S19176	July 26, 2019	K. Tanaka	T. Yamauchi	Y.Shimada
2	S17446	June 14, 2017	Y. Imaji	Y. Hashimoto	K. Yotsutani
1	S17436	June 9, 2017	Y. Imaji	Y. Hashimoto	K. Yotsutani

1. Scope

This product specification defines the test conditions and the performances of the MHF 5L Connector AWG#32 φ1.13 Cable.

2. Product Name and Parts No.

2.1 Product Name

MHF 5L PLUG
MHF 5 RECEPTACLE

2.2 Parts No.

Plug: 20668-001R-13
Receptacle: 20566-001E-01

3. Rating

3.1 Applicable Cable

(1) Description

Inner conductor: AWG#32(7/0.08) , Silver plating copper wire
Dielectric core: Fluoro-plastics, diameter 0.7(±0.03) mm
Outer conductor: Nominal diameter 0.92 mm, silver plating copper wire or tin plating copper wire
Jacket: Fluoro-plastics, diameter 1.131.13(±0.05) mm

(2) Requirements

Characteristic impedance ： 50 (+2, -2) ohm by TDR method
Nominal capacitance (Reference value)： 98 pF/m
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～12GHz
VSWR	Plug: 1.3 MAX. (DC～3GHz), 1.4 MAX. (3～6GHz) 1.5 MAX.(6~12GHz) Receptacle: 1.3 MAX. (DC～3GHz), 1.4 MAX. (3～6GHz) 1.5 MAX.(6~12GHz)
Service Temperature	233K～363K（-40℃～90℃）

3.3 Storage Conditions

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

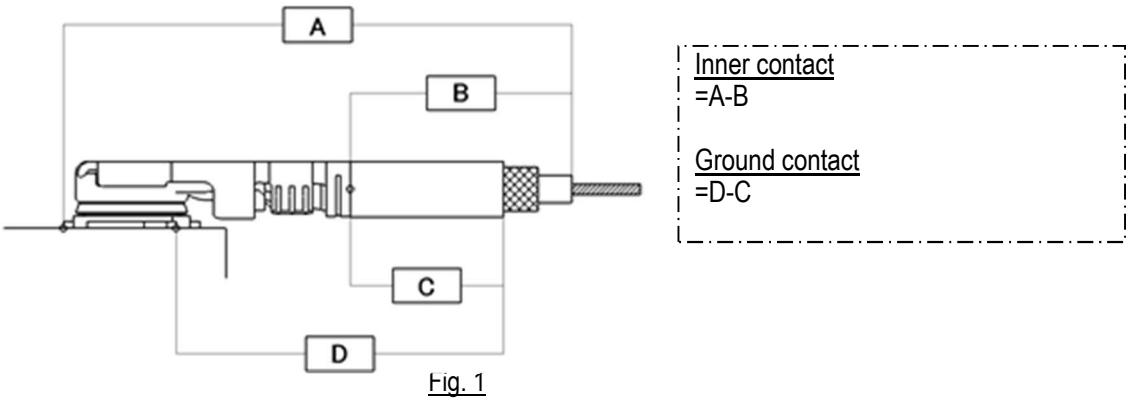
4. Test and Performance

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: ⊿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 ～ 12GHz

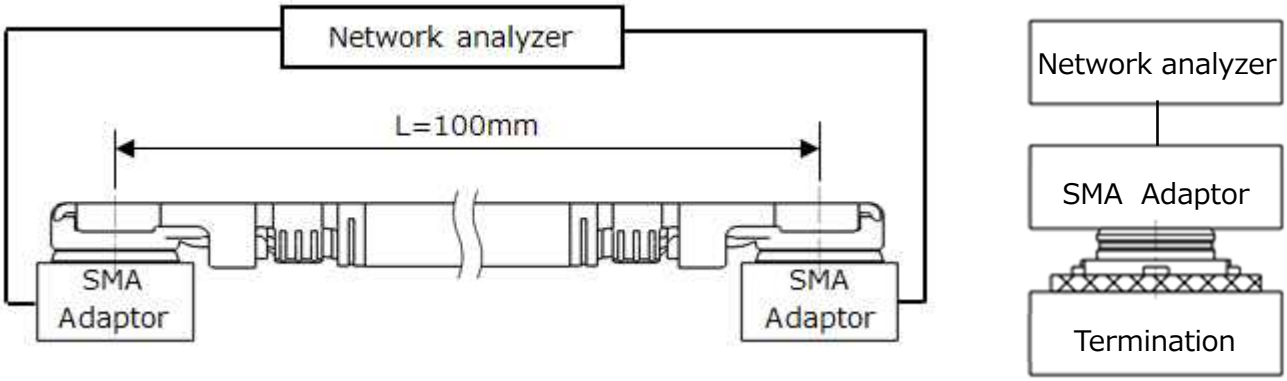


Fig. 2

Pass criteria:	Plug 1.3MAX.at 0.1～3GHz 1.4MAX.at 3～6GHz 1.5MAX.at 6~12GHz Receptacle 1.3MAX.at 0.1～3GHz 1.4MAX.at 3～6GHz 1.5MAX.at 6~12GHz

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.

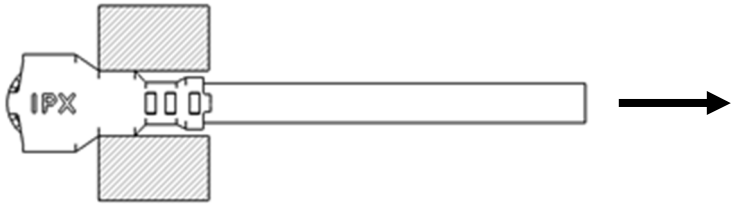
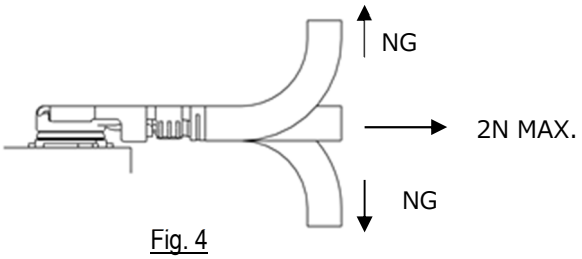


Fig. 3

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/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. [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　　Directions: 6 mutually perpendicular direction Duration: 11msec.　　Cycle: 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. 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℃) 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.

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℃):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℃) Duration: 96 hours
Pass criteria:	[Contact resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

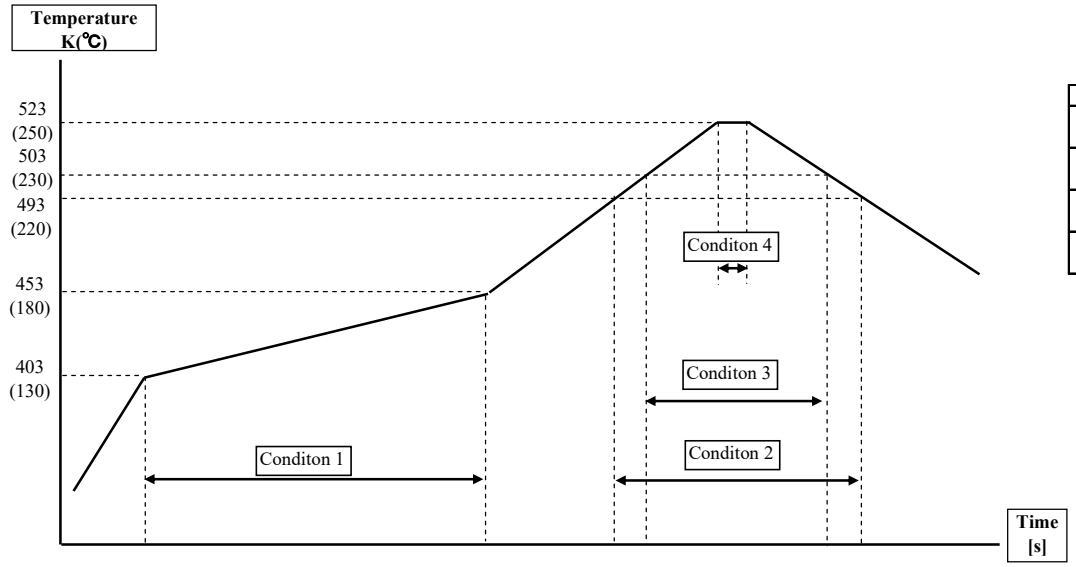
4. H_2S Gas	
Reference standard:	-
Test conditions:	Apply the following environment to the mating connector. Temperature: 313±2K (40±2℃) Relative Humidity: 80±5%RH Gas: H_2S 3±1ppm Duration: 96 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting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

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

Fig. 5

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	1,5	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				
H_2S Gas											2			
Salt Water Spray												2		
Solder ability													1	
Soldering Heat Resistance														1
Specimen Quantity.	10	10	10	10	10	10	10	10	10	10	10	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.