MHF® I Connector (Plug: 2.00 Type)

Part No. Plug: 20767-001R-20 Receptacle: 20279-001E-0* / 20431-001E-01 / 20441-001E-01

Product Specification

Qualification Test Report No. TR-18041

Rev.	ECN	Date	Prepared by	Checked by	Approved by
3	S23452	December 22, 2023	M.Toida	K. Yufu	Y. Hashimoto
2	S23420	November 28, 2023	K.Tanaka	K. Yufu	Y. Hashimoto
1	S22233	June 3, 2022	S. Tsuboki	K. Yufu	Y. Hashimoto
0	S18391	June 26, 2018	M. Nomoto	K. Motomura	K. Yotsutani

1. Scope

This Product Specification defines the test conditions and the performances of the MHF I Connector, a wire-to-board connector for AWG#26 coaxial cable.

2. Product Name and Parts No.

2.1 Product Name

MHF I Connector

2.2 Parts No.

Plug: 20767-001R-20
Receptacle: 20279-001E-0* / 20431-001E-01 / 20441-001E-01

3. Rating

3.1 Applicable Cable

(1) Description

Inner conductor: AWG#26 (7/0.16), Silver plating annealed copper wire
Dielectric core: diameter 1.50 (±0.10) mm, Fluor-plastics
Outer conductor: nominal diameter 1.70mm, 16/7/0.05, Tin plating annealed copper wire
Jacket: diameter 2.00 (±0.10) mm, Fluor-plastics

(2) Requirements

Characteristic impedance : 50±5Ω by TDR method
Insulation resistance : 1,000 MΩ・km MIN.
Dielectric withstand voltage: no breakdown at AC 500V for 1 minutes.

3.2 Operating Conditions

Voltage: 60V AC (per contact pin)
Nominal characteristic impedance: 50Ω
VSWR: Plug: 1.30 Max at 0.1~3GHz, 1.50 Max at 3~6GHz, 1.60 Max at 6~9GHz
Receptacle: 1.30 Max at 0.1~3GHz, 1.40 Max at 3~6GHz, 1.80 Max at 6~9GHz
Operating temperature: 233K～363K（-40℃～90℃）
(Containing temperature rise by current)

3.3 Storage Conditions

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

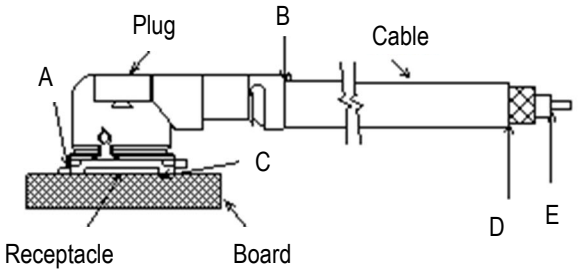
4. Test and Performance

Test Condition

This initial test is equal to it's at shipping condition and unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202 G.

Temperature… 288K～308K（15℃～35℃）
Relative humidity… 45～75%R.H.

4.1. Electrical Performance

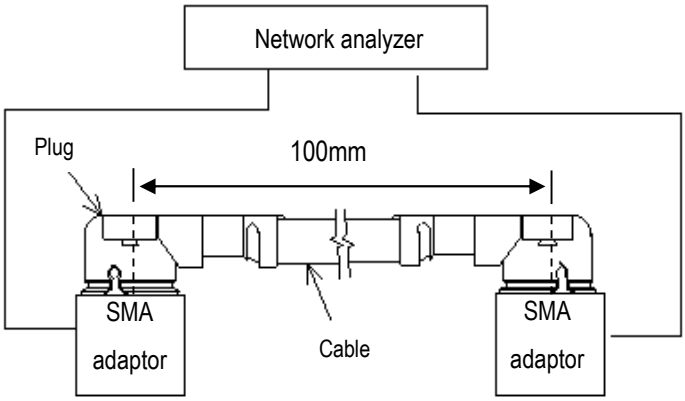
1. Contact resistance	
Reference standard:	MIL-STD-202, Method 307
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then measure the contact resistance as shown in Fig. 1 by the four terminal methods. Apply the low level condition of 20mV MAX. DC for the open circuit voltage and 10mA MAX. (DC or AC1kHz) for the closed circuit current. <Contact resistance of inner contact> = <resistance of A-E> - <resistance of B-E> <Contact resistance of ground contact> = <resistance of C-D> - <resistance of B-D>
	 Fig. 1
Pass criteria:	Inner contact Initial： 20mΩ MAX. After testing： ⊿R 20mΩ MAX. Ground contact Initial： 20mΩ MAX. After testing： ⊿R 100mΩ MAX.

2. Insulation resistance	
Reference standard:	MIL-STD-202, Method 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, Method 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.

4.1. Electrical Performance

4. VSWR	
Reference standard:	-
Test conditions:	Measure the VSWR as shown in Fig. 2 by the network analyzer. Frequency : 100MHz~9GHz



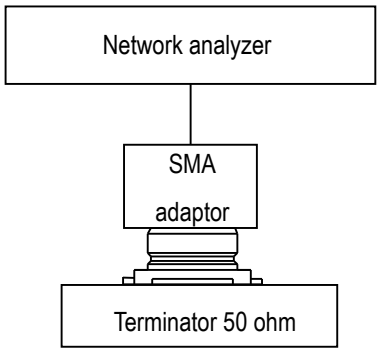
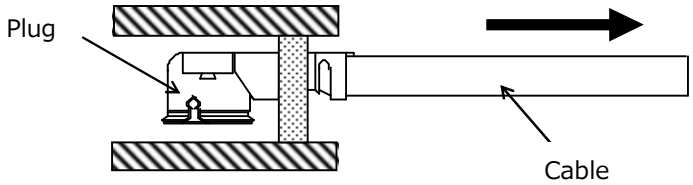


Fig. 2

Pass criteria:	Plug 1.30 MAX. at 0.1~3GHz, 1.50 MAX. at 3~6GHz, 1.60 MAX. at 6~9GHz Receptacle 1.30 MAX. at 0.1~3GHz, 1.40 MAX. at 3~6GHz, 1.80 MAX. at 6~9GHz

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 mating/un-mating 30 cycles at a speed 25±3mm/min. along the mating axis.
Pass criteria:	Initial: 5 N MIN. After 30cycles: 3 N MIN.

2. Crimp strength	
Reference standard:	-
Test conditions:	Pull the cable as shown in Fig.3 at a speed 25±3mm/minutes by tensile strength machine.
	 Fig. 3
Pass criteria:	15N 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 un-mating 30cycles at a speed 25±3mm/min. along the mating axis.
Pass criteria:	[Contact Resistance] Shall meet 4.1.1.

4.2. Mechanical Performance

4. 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/s^2 (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.

5. Shock	
Reference standard:	MIL-STD-202, Method 213, 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/s^2 (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. Thermal Shock	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment in accordance. Temperature: 233K/30minutes (-40℃) → 278~308K/5 minutes MAX. (5～35℃) → 363K/30minutes (90℃) → 278~308K/5 minutes MAX. (5～35℃) Number of cycles: 5 cycles
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Insulation Resistance] Shall meet 4.1.2. [Appearance] No abnormality adversely affecting the performance shall occur.

2. Contact resistance with force on the cable	
Reference standard:	MIL-STD-202, Method 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±2 K (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. [Appearance] No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

3. Salt Water Spray	
Reference standard:	MIL-STD-202, Method 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℃) Salt water density: 5±1% [by weight] Duration: 48 hours
Pass criteria:	[Appearance] No abnormality adversely affecting the performance shall occur.

4. 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.

4.4. Others

1. Solder ability	
Reference standard:	MIL-STD-202, Method 208
Test conditions:	Dip the solder tine of the contact in the solder bath at 518±5K （245±5℃） for 5±0.5seconds after immersing the tine in the flux of RMA or R type for 5 to 10 seconds.
Pass criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Soldering Heat Resistance	
Reference standard:	-
Test conditions:	Put on the receptacle connector to PCB, apply the heat 2 cycles as shown in Fig. 5.

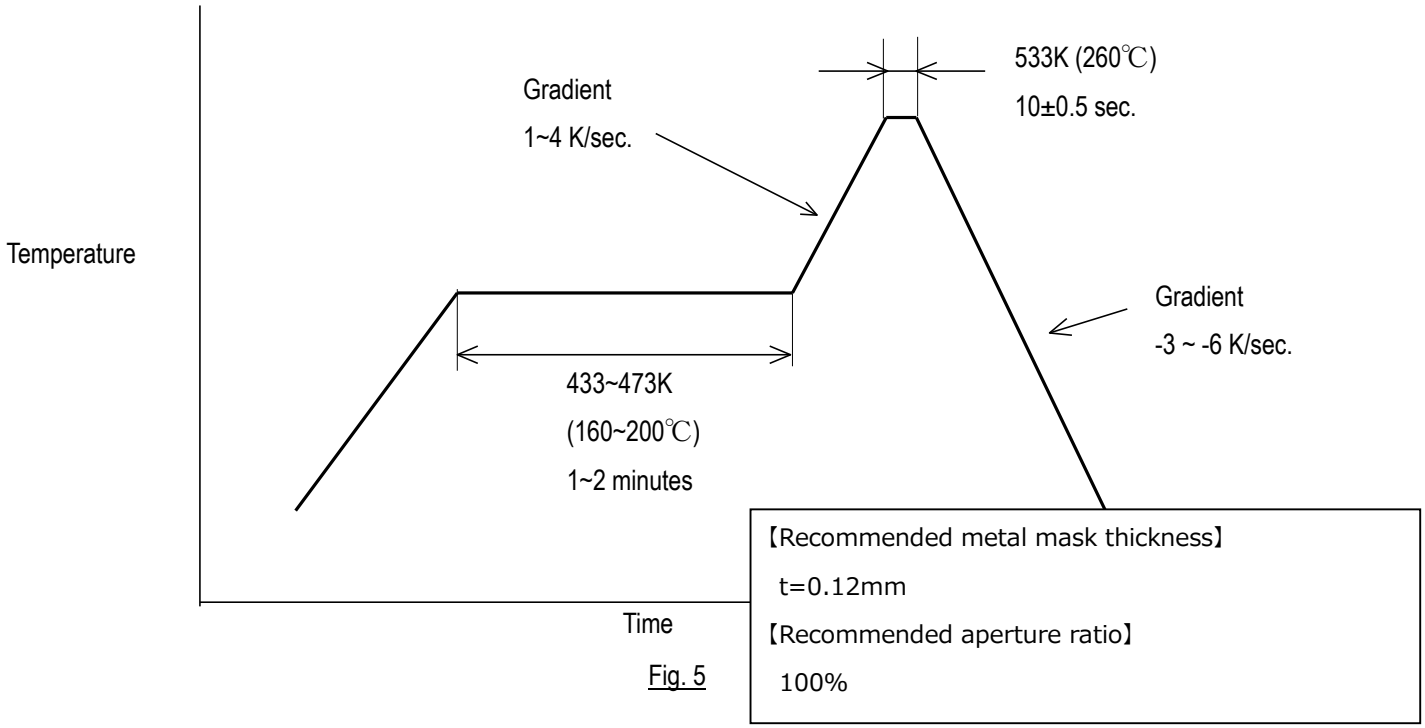


Fig. 5

【Recommended metal mask thickness】
t=0.12mm
【Recommended aperture ratio】
100%

Pass criteria:	[Appearance] No abnormality adversely affecting the performance shall occur.

4.5 Test Sequence and Sample Quantity

Table 1 Test Sequence and Sample Quantity

Test Item		Group												
		A	B	C	D	E	F	G	H	J	K	L	M	N
Contact resistance						1,3	1,3	1,3	1,4	1,4		1.3		
Insulation resistance									2,5	2,5				
D. W. Voltage		1												
VSWR			1											
Unmating force				1										
Crimp strength					1									
Durability						2								
Vibration							2							
Shock								2						
Thermal shock									3					
Humidity (Steady state)										3				
Salt water spray											1			
High temperature life												2		
Solder ability													1	
Soldering heat resistance														1
Sample Quantity	Plug	10	10	10	10	10	10	10	10	10	10	10	-	-
	Receptacle	10	5	10	-	10	10	10	10	10	10	10	10	10
Test board (pcs.)		10	5	10	-	10	10	10	10	10	10	10	-	10

※Numbers indicate sequence in which tests are performed.