

# MHF III Connector

Part No. Plug:20367-001R Receptacle:20369-001E

## Product Specification

Qualification Test Report No. TR-04044

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9	S12152	April 2, 2012	H.M		E.K
8	S12020	January 19, 2012	H.M		Tom
7	S10218	September 8, 2010	H.M		E.K
Rev.	ECN	Date	Prepared by	Checked by	Approved by

## 1. Scope

This product specification defines the test conditions and the performances of the MHF III Connector.

## 2. Product Name and Parts No.

### 2.1 Product Name

MHF III Connector.

### 2.2 Parts No.

Plug: 20367-001R

Receptacle: 20369-001E

## 3. Rating

### 3.1 Applicable Cable

#### (1) Description

Inner conductor : AWG#36(7/0.05) ,Silver plating annealed copper wire

Dielectric core : Fluoro-plastics ,diameter 0.4(+0.04,-0.02)mm , nominal thickness 0.125mm

Outer conductor : 8/5/0.05 , nominal diameter 0.65mm , silver plating annealed copper wire or tin plating annealed copper wire

Jacket : Fluoro-plastics , diameter 0.81(+0.04,-0.02)mm , nominal thickness 0.08mm

#### (2) Requirements

Characteristic impedance : 50(+2,-2) $\Omega$ . by TDR method

Nominal capacitance ( Reference value ) : 96 pF/m

Conductor resistance of inner conductor at 293K (20 $^{\circ}$ C) : 1400 $\Omega$ /km MAX.

Insulation resistance : 1000 M $\Omega$ ·km MIN.

Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

### 3.2 Operating Conditions

Voltage: 60V AC (per contact)

Nominal characteristic impedance: 50 $\Omega$

Frequency: DC~9GHz

VSWR: Plug 1.30 MAX. at 0.1~3GHz, 1.50 MAX. at 3~6GHz, 1.70 MAX. at 6~9GHz

Receptacle 1.30 MAX. at 0.1~3GHz, 1.40 MAX. at 3~6GHz, 1.60 MAX. at 6~9GHz

Operating temperature: 233 to 363K(-40 $^{\circ}$ C to 90 $^{\circ}$ C) (Containing temperature rise by current)

### 3.3 Storage Conditions

Storage temperature: 248 to 333K(-25 $^{\circ}$ C to 60 $^{\circ}$ C)

Storage humidity: 85% max. (Non-condensing)

## 4. Test and Performance

### Test Condition

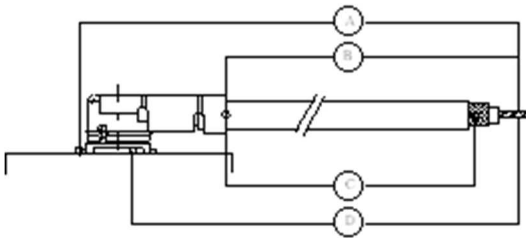
Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202.

Temperature: 288K to 308K(15 $^{\circ}$ C to 35 $^{\circ}$ C)

Pressure: 866hPa to 1066hPa(650mmHg to 800mmHg)

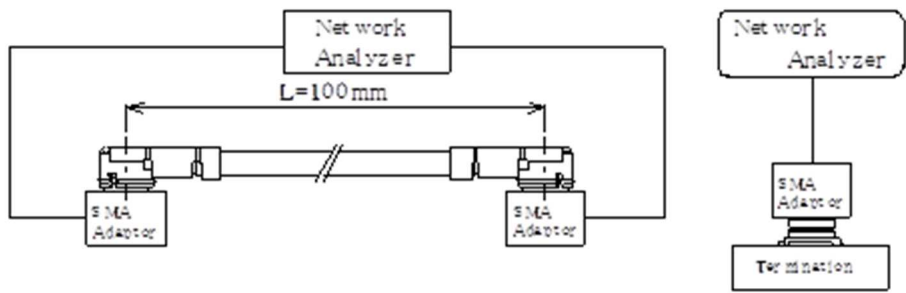
Relative humidity: 45 to 75% R.H.

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 apply 20mV MAX. DC open circuit voltage and 10mA MAX. DC closed circuit current. Measure the contact resistance of signal and GROUND at the section shown in Fig.1 by the four terminal methods. Open circuit voltage: 20mV MAX. Circuit current: 10mA MAX.
	
<div style="border: 1px dashed black; padding: 5px; width: fit-content;"> <p>Inner contact = A - B</p> <p>Ground contact = D - C</p> </div>	
Fig.1	
Pass criteria:	Signal Contact Initial: 20 mΩ MAX. After testing: $\Delta R$ 20 mΩ MAX. GROUND Initial: 20 mΩ MAX. After testing: $\Delta R$ 20 mΩ MAX.

2. Insulation resistance	
Reference standard:	MIL-STD-202-302, Test condition
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 receptacle and plug connector together, then apply AC 200V(rms) between the neighboring contacts for a minute.
Pass criteria:	No abnormalities such as creeping discharge, flashover, insulator breakdown occur.

4. VSWR	
Reference standard:	-
Test conditions:	Measure the VSWR as shown in Fig.-2 by the network analyzer. Frequency : 100M ~ 9GHz
	
Fig.2	
Pass criteria:	Plug: 1.30 MAX. at 0.1~3GHz, 1.50 MAX. at 3~6GHz, 1.70 MAX. at 6~9GHz Receptacle: 1.30 MAX. at 0.1~3GHz, 1.40 MAX. at 3~6GHz, 1.60 MAX. at 6~9GHz

**4.2. Mechanical Performance**

1. Un-mating 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. Repeat unmating 30 cycles at a speed $25\pm 3\text{mm/min}$ . along the mating axis. Measure the unmating force at the initial and after 30cycles.
Pass criteria:	Total un-mating force Initial: 4 N MIN. 30cycles: 2 N MIN.

2. Crimp strength	
Reference standard:	-
Test conditions:	Pull the cable as shown in Fig.-3 at speed $25\pm 3\text{mm/minutes}$ by tensile strength machine.

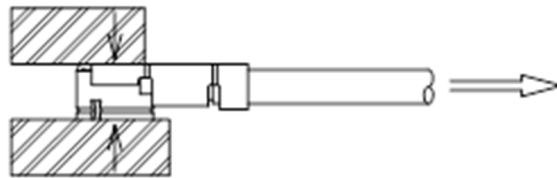


Fig.3

Pass criteria:	7 N MIN.
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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 unmating 30cycles at a speed $25\pm 3\text{mm/min}$ . along the mating axis.
Pass criteria:	Contact resistance: Shall meet 4.1.1

4. Contact resistance with force on the cable	
Reference standard:	-
Test conditions:	Apply force on the cable as shown in Fig.-4. During the testing, run 100mA DC to check electrical discontinuity.

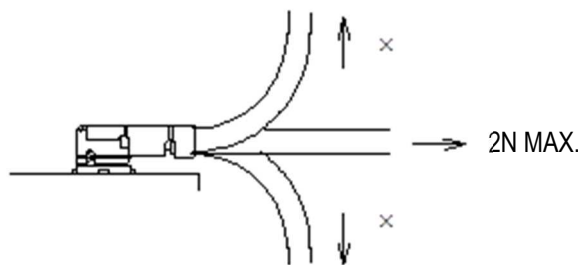


Fig.4

Pass criteria:	Contact resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than $1\mu\text{s}$ shall occur. Appearance: No abnormality adversely affecting the performance shall occur.
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<b>5. Vibration</b>	
Reference standard:	MIL-STD-202-201
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the vibrator. Then apply the following vibration. During the testing, run 100mA DC to check electrical discontinuity. Frequency: 10Hz→100Hz→10Hz/approx. 20min. Half amplitude, Peak value of acceleration: 1.5mm or 59m/s <sup>2</sup> (6G) Directions, cycle: 3 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.

<b>6. Shock</b>	
Reference standard:	MIL-STD-202-213, Test 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: 735m/s <sup>2</sup> (75G) Duration: 11msec Wave Form: Half Sinusoidal Directions: 6 mutually perpendicular direction Cycle: 3 cycles 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

<b>1. Humidity (Steady state)</b>	
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°C) 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.

<b>2. Thermal shock</b>	
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°C), 30min. → 358K(85°C), 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: MIL-STD-202-108, 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:  $363\pm 2\text{K}$  ( $90\pm 2^\circ\text{C}$ )  
 Duration: 96 hours

Pass criteria: Contact resistance: Shall meet 4.1.1.  
 Contact retention force: Shall meet 4.2.3.  
 Appearance: No abnormality adversely affecting the performance shall occur.

4. H<sub>2</sub>S gas

Reference standard: -

Test conditions: Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.  
 Temperature:  $313\pm 2\text{K}$  ( $40\pm 2^\circ\text{C}$ )  
 Relative humidity:  $80\pm 5\%RH$   
 Gas: H<sub>2</sub>S  $3\pm 1\text{ppm}$   
 Duration: 96 hours

Pass criteria: Contact resistance: Shall meet 4.1.1.  
 Appearance: No abnormality adversely affecting the performance shall occur.

## 5. Saltwater 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:  $308\pm 2\text{K}$  ( $35\pm 2^\circ\text{C}$ )  
 Relative Humidity :  $95\sim 98\%RH$   
 Saltwater density:  $5\pm 1\%$  [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. Solderability	
Reference standard:	-
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°C) for 5±0.5seconds.
Pass criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Resistance to soldering heat	
Reference standard:	-
Test conditions:	<p>(1) Reflow Part: 533+0/-5K (260+0/-5°C) Peak 498K MIN. (225°C MIN.) 70sec. MIN.</p> <p>(2) Pre-heat Part: 433~443K (160~170°C) 80~100sec.</p> <p>Reflow temperature: See Fig.2.</p> <p>Cycle: 2</p>
<p>Fig.5</p>	
<p>【Recommended metal mask thickness】 t=0.12mm</p> <p>【Recommended aperture ratio】 100%</p>	
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	1,3	1,5	1,5	1,3	1,3	1,3			
Insulation resistance								2,6	2,6						
Dielectric withstanding voltage								3,7	3,7						
VSWR	1														
Un-mating force		1													
Crimp strength			1												
Durability				2											
Contact resistance with force on the cable					2										
Vibration						2									
Shock							2								
Humidity (Steady State)								4							
Thermal shock									4						
High temperature life										2					
H <sub>2</sub> S gas											2				
Saltwater spray												2			
Solder ability													1		
Soldering heat resistance														1	
Specimen quantity.	Plug	10	10	10	10	10	10	10	10	10	10	10	10	-	-
	Receptacle	5		-										10	10

※Numbers indicate test sequences.