

MHF® 4 / 4L Connector (AWG#36 ϕ 0.64 Cable)

Part No. MHF 4L Plug: 20572-001R-08 MHF 4 Receptacle: 20449-001E-**

Product Specification

Qualification Test Report No. TR-14078

| | | | | | |
|------|--------|------------------|-------------|------------|--------------|
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| 8 | S22253 | June 16, 2022 | H. Lu | Y. Shimizu | M. Takemoto |
| 7 | S22220 | June 1, 2022 | K. Watanabe | K. Yufu | Y. Hashimoto |
| 6 | S21512 | October 22, 2021 | K. Ikeshita | | M. Takemoto |
| Rev. | ECN | Date | Prepared by | Checked by | Approved by |

1. Scope

This product specification defines the test conditions and the performances of the MHF 4 / 4L Connector

2. Product Name and Parts No.**2.1 Product Name**

MHF 4 / 4L Connector

2.2 Parts No.

MHF 4L Plug : 20572-001R-08

MHF 4 Receptacle : 20449-001E-**

3. Rating**3.1 Applicable Cable**

(1) Description

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

Dielectric core : Fluoro-plastics, diameter 0.44(\pm 0.02)mm

Outer conductor : Spiral of 0.05mm, diameter 0.54(\pm 0.02)mm, tin-copper alloy

Jacket : Fluoro-plastics, diameter 0.64(\pm 0.03)mm

(2) Requirements

Characteristic impedance : 50 \pm 5 Ω by TDR method

Nominal capacitance(Reference value) : 96 pF/m

Dielectric withstand voltage : no breakdown at AC 500V for 1 minutes.

3.2 Operating Conditions

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| Rated voltage | AC60Vr.m.s |
| Nominal characteristic impedance | 50 ohm. |
| Frequency | DC~9GHz |
| VSWR | Plug: 1.30 MAX. (0.1~3GHz), 1.45 MAX. (3~6GHz) 1.60 MAX. (6~9GHz), 1.90 MAX. (9~12GHz) Receptacle: 1.30 MAX. (0.1~3GHz), 1.40 MAX. (3~6GHz), 1.55 MAX. (6~9GHz) |
| Service temperature | 233K~363K (-40 $^{\circ}$ C~90 $^{\circ}$ C) |

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**

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 $^{\circ}$ C~35 $^{\circ}$ C)

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

Relative humidity : 45 ~ 75% R.H.

4.1. Electrical Performance

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| 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 of 20mV MAX. DC for the open circuit voltage and 10mA MAX. DC for the closed circuit current. |
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| Fig.1 | |
| Pass criteria : | Inner contact Initial : 20m Ω MAX. After testing : \triangle R 20m Ω MAX. Ground contact Initial : 20m Ω MAX. After testing : \triangle R 20m Ω MAX. |

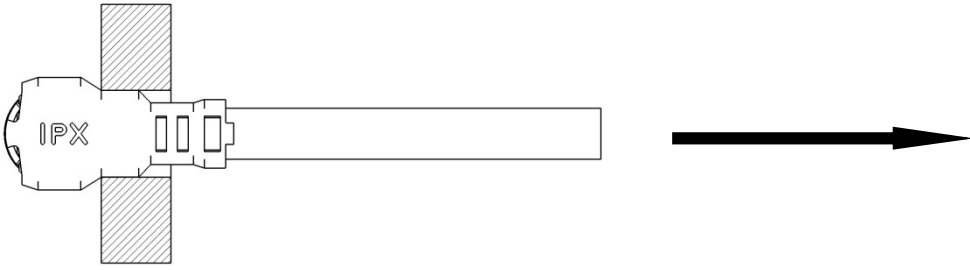
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| 2. Insulation resistance | |
| Reference standard : | MIL-STD-202-302 |
| Test conditions : | Mate the plug and receptacle connector together, and then apply DC 100 V between the inner contact and the ground contact. |
| Pass criteria : | Initial : 500 M Ω MIN. After testing : 100 M Ω MIN. |

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| 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 creeping discharge, flashover, no insulator breakdown shall occur. |

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| 4. VSWR | |
| Reference standard : | - |
| Test conditions : | Measure the VSWR as shown in Fig.2 by the network analyzer. Frequency : 0.1 ~ 12GHz |
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| Fig.2 | |
| Pass criteria : | Plug 1.30 MAX. at 0.1~3GHz, 1.45 MAX. at 3~6GHz, 1.60 MAX. at 6~9GHz, 1.90 MAX. at 9~12GHz Receptacle 1.30 MAX. at 0.1~3GHz, 1.40 MAX. at 3~6GHz, 1.55 MAX. at 6~9GHz |

4.2. Mechanical Performance

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| 1. Mating force and 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 / unmating 30 cycles at a speed 25 ± 3 mm/min. along the mating axis. |
| Pass criteria : | Mating force Initial : 30 N MAX. 30cycles : 30 N MAX. Unmating force Initial : 20 N MAX. 5 N MIN. 30cycles : 20 N MAX. 3 N MIN. |

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| 2. Crimp strength | |
| Reference standard : | - |
| Test conditions : | Pull the cable as shown in Fig.3 at speed of 25 ± 3 mm/minutes by the tensile strength machine and measure the retention force. |
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| Fig.3 | |
| Pass criteria : | 8 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 ± 3 mm/min. along the mating axis. |
| Pass criteria : | Contact resistance : Shall meet 4.1.1. Appearance : No abnormality adversely affecting the performance shall occur. |

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| 4. Vibration | |
| Reference standard: | - |
| 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 15minutes. Half amplitude, Peak value of acceleration : 1.5mm or 59m/s ² (6G) Directions : 3 mutually perpendicular direction, 5 cycles (approx 75minutes.) for each direction. |
| Pass criteria: | Contact resistance : Shall meet 4.1.1. Electrical discontinuity : No electrical discontinuity greater than 1 μ s shall occur. Appearance : No abnormality adversely affecting the performance shall occur. |

4.2. Mechanical Performance

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| 5. Shock | |
| Reference standard : | - |
| Test conditions : | Apply the following shock to the mating connector. During the testing, run 100mA DC to check electrical discontinuity. Peak value of acceleration : 735m/s ² (75G) Directions, cycle : 6 mutually perpendicular direction Duration : 11msec 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 1 μ s shall occur. Appearance : No abnormality adversely affecting the performance shall occur. |

4.3. Environmental Performance

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| 1. Thermal shock | |
| Reference standard : | MIL-STD-202-107, 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. No. 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. |

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| 2. High temperature life | |
| Reference standard : | - |
| Test conditions : | Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature : 363 \pm 2K (90 \pm 2°C) Duration : 96 hours |
| Pass criteria : | Contact resistance : Shall meet 4.1.1. Appearance : No abnormality adversely affecting the performance shall occur. |

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| 3. Humidity (Steady state) | |
| Reference standard : | MIL-STD-202-103, 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 \pm 2K (40 \pm 2°C) Humidity : 90~95%R.H. 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

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| 4. Saltwater spray | |
| Reference standard : | MIL-STD-202-101, Condition B. |
| Test conditions : | Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature : $308\pm 2K$ ($35\pm 2^{\circ}C$) 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. |

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| 5. H₂S 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 : $313\pm 2K$ ($40\pm 2^{\circ}C$) Relative humidity : $80\pm 5\%$ R.H. Gas : H ₂ S 3 ± 1 ppm Duration : 48 hours |
| Pass criteria : | Contact resistance : Shall meet 4.1.1. Appearance : No abnormality adversely affecting the performance shall occur. |

4.4. Others

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| 1. Solder ability | |
| Reference standard : | MIL-STD-202-208 |
| Test conditions : | Dip the solder tine of the contact in the solder bath at $518\pm 5K$ ($245\pm 5^{\circ}C$) for 5 ± 0.5 seconds after immersing the tine in the flux of RMA or R type for 5 to 10 seconds. |
| Pass criteria : | The surface of the dipped contact must become 95% wet and the non-wetted pinholes must not accumulate in one area but be distributed and must be less than 5% of the contact area to be soldered. |

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| 2. Soldering heat resistance | |
| Reference standard : | - |
| Test conditions : | Reflow temperature as shown in Fig.4. The number of times of Reflow is within 2. |
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| 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 | 1,3 | 1,5 | 1,3 | 1,3 | | | |
| Insulation resistance | | | | | | | | 2,6 | | 2,6 | | | | | |
| Dielectric withstanding voltage | 1 | | | | | | | 3,7 | | 3,7 | | | | | |
| VSWR | | 1 | | | | | | | | | | | | | |
| Mating force / Unmating force | | | 1 | | | | | | | | | | | | |
| Crimp strength | | | | 1 | | | | | | | | | | | |
| Durability | | | | | 2 | | | | | | | | | | |
| Vibration | | | | | | 2 | | | | | | | | | |
| Shock | | | | | | | 2 | | | | | | | | |
| Thermal shock | | | | | | | | 4 | | | | | | | |
| High temperature life | | | | | | | | | 2 | | | | | | |
| Humidity (Steady State) | | | | | | | | | | 4 | | | | | |
| Saltwater spray | | | | | | | | | | | 2 | | | | |
| H ₂ S gas | | | | | | | | | | | | 2 | | | |
| Solder ability | | | | | | | | | | | | | 1 | | |
| Soldering heat resistance | | | | | | | | | | | | | | 1 | |
| Specimen Quantity (pcs.) | 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 | 10 |

※Numbers indicate test sequences.

5. Recommended Metal Mask

Refer to drawing for the recommended metal mask thickness and opening dimension.