Measurement of Maximum Permissible Exposure

1. Foreword

In adopt with the Human Exposure IEEE C95.1, and according to the FCC 1.1310. The *Maximum Permissible Exposure (MPE)* is obligated to measure in order to prove the safety of radiation harmfulness to the human body.

The *Gain* of the antenna used is measured in an *Anechoic chamber.* The *maximum total power to the antenna* is to be recorded. By adopting the ***Friis Transmission Formula*** and the *power gain of the antenna,* we can find the distance right away from the product, where the limit of the MPE is.

2. Description of EUT

FCC ID	**:**	MSQDPR2325
Product Name	**:**	Wireless Cable Modem
Model Name	**:**	DPR2325
Frequency Range	**:**	2.412GHz ~ 2.462GHz
Channel Spacing	**:**	5MHz
Support Channel	**:**	11 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM

3. Limits for *Maximum Permissible Exposure (MPE)*

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Filed Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	$900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	$180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

[The EUT is tested in transmit and receive modes and in the first, middle and the last channel separately. The following shows only our observation have the greatest emissions.]

According to **OET BULLETIN 56 Fourth Edition/August 1999**, **Equation for Predicting RF Fields:**

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{229.61 \times 1.58}{4\pi (20)^2} = 0.072 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{229.61 \times 1.58}{4\pi}} = 5.373 cm$

Note: "The safe estimated separation that the user must maintain from the antenna is at least 6.5cm"

Where: S = *power density* (in appropriate units, e.g. mW/cm2)

P = *power input* to the antenna (in appropriate units, e.g., mW)

G = *power gain* of the antenna in the direction of interest relative to an isotropic radiator

R = *distance* to the center of radiation of the antenna (appropriate units, e.g., cm)

The *Numeric gain G* of antenna with a gain specified in dB is determined by:

G = Log $^{-1}$ (***dB*** antenna gain / 10)

G = Log $^{-1}$ (2.00 / 10) = 1.58

Appendix

Antenna Specification

WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD. (CHINA)

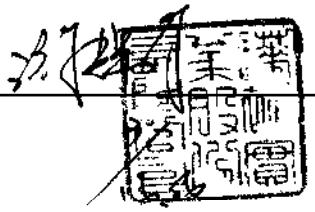
SPECIFICATION FOR APPROVAL

CUSTOMER: *華碩電腦股份有限公司*

PART NAME: ***RF Antenna Assembly***

PART NO.: ***14G150001000*** ***REVISION:***

W. Y. P/NO.: ***C660-510003-A*** ***REV.: X3***

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

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Fax: + 86-21-59741347

SU ZHOU AEON TECH CO., LTD. (CHINA)
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Wujiang City,Jiangsu Province,China
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Fax: + 86-512-63627981

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5. ……	**Connector材質特性** ……	8
6. ……	**SGS測試** ……	9~42

RF Antenna Cable Assembly

Specification

1. Electrical Properties :

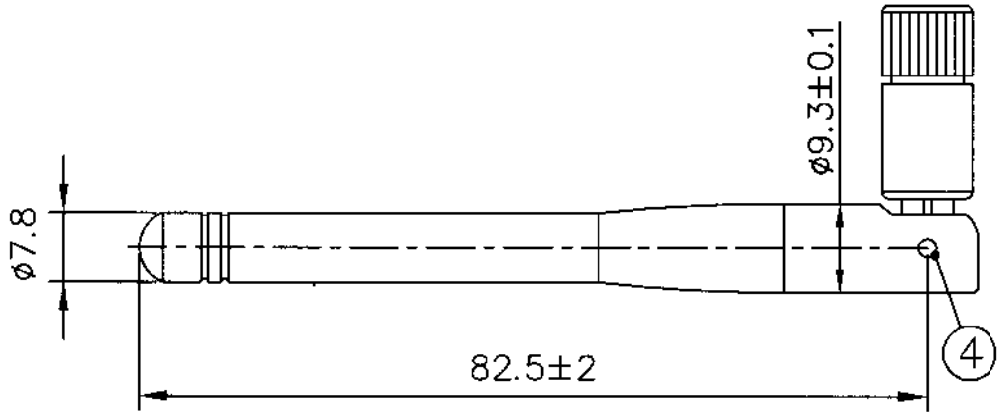
1.1 Frequency Rang.....	2.4GHz ~ 2.5GHz
1.2 Impedance	50Ω Nominal
1.3 VSWR	1.92 Max.
1.4 Return Loss.....	-10dB Maximum
1.5 Electrical Wave.....	1/2 λ Diople
1.6 Gain.....	1.8 dBi
1.7 Admitted Power.....	1W

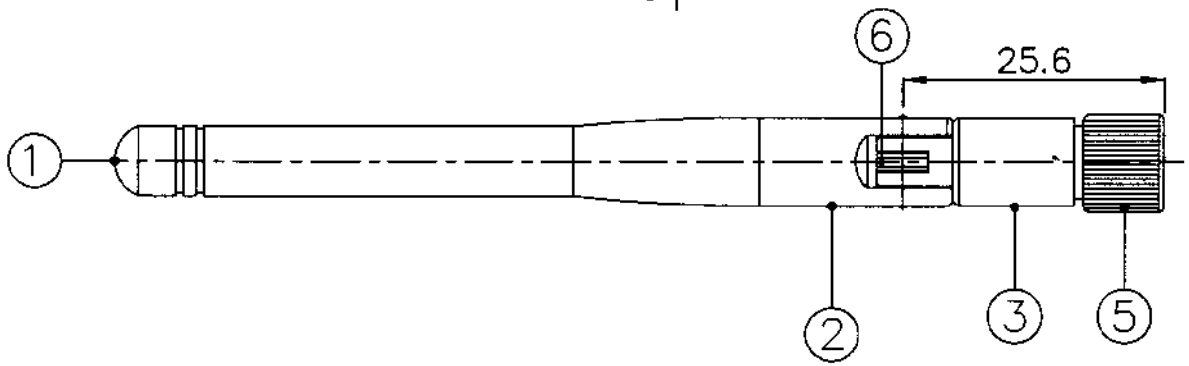
2. Physical Properties :

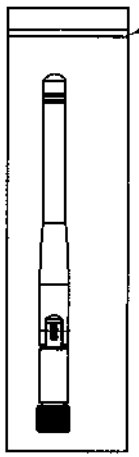
2.1 Cable.....	RG-178 Cable
2.2 Antenna Cover.....	TPE
2.3 Antenna Base.....	PC
2.4 Operating Temp.	-20℃ ~ +65℃
2.5 Storage Temp.	-30℃ ~ +75℃
2.6 Color	Black
2.7 Connector.....	SMA Plug Reverse

CG-

REV	DATE	DESCRIPTION
X1	2/19-2004	New Issue
X2	9/26-2005	Modify material , Add package







Packing : 1pcs/bag

NO	DESCRIPTION		QTY	REMARK
6	Cable	RG-178 , Translucent Brown ; 50 Ω	1	
5	Connector	SMA Straight Plug/Reverse	1	
4	Rivet	Brass , Zn Plated (Black)	2	
X2 3	Antenna Base	PBT ; Color:Black	1	
2	Antenna Base	PC ; Color:Black	1	
1	Antenna Cover	TPE ; Color:Black	1	

CUSTOMER'S SINGATURE

XX.	±1
X.	±1.0
.X	±0.1
.XX	±0.01
.XXX	±0.005

APPROVED
CHECKED
DRAWING 程淑娟

CUSTOMER:	華碩電腦股份有限公司		
PART NO :			
PARTNAME:	RF Antenna Assembly		
W.Y P/NO :	C660-510003-A		
REV	UNIT	FILE :	
X2	m/m	SHEET :	1/1

Wha Yu INDUSTRIAL CO.,LTD.
譁裕實業股份有限公司

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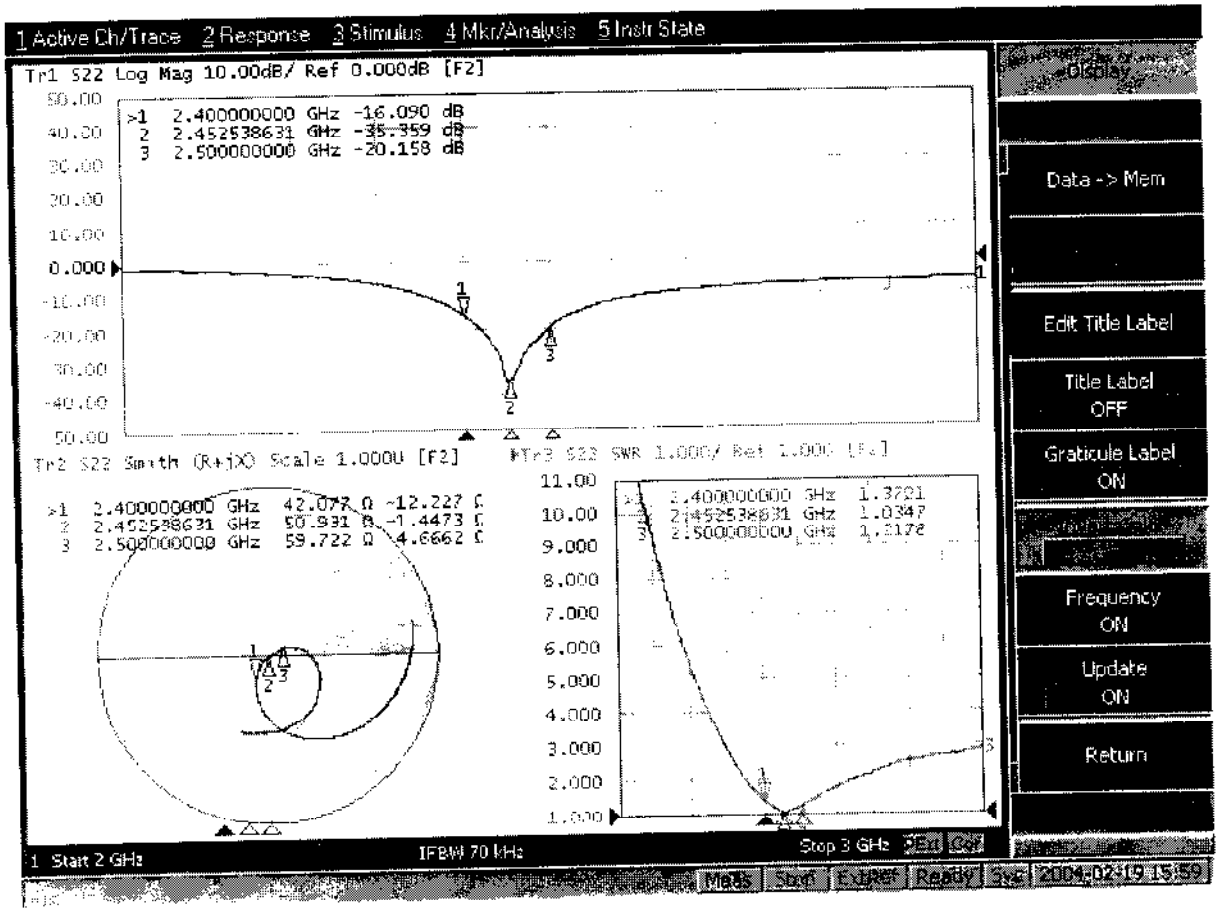
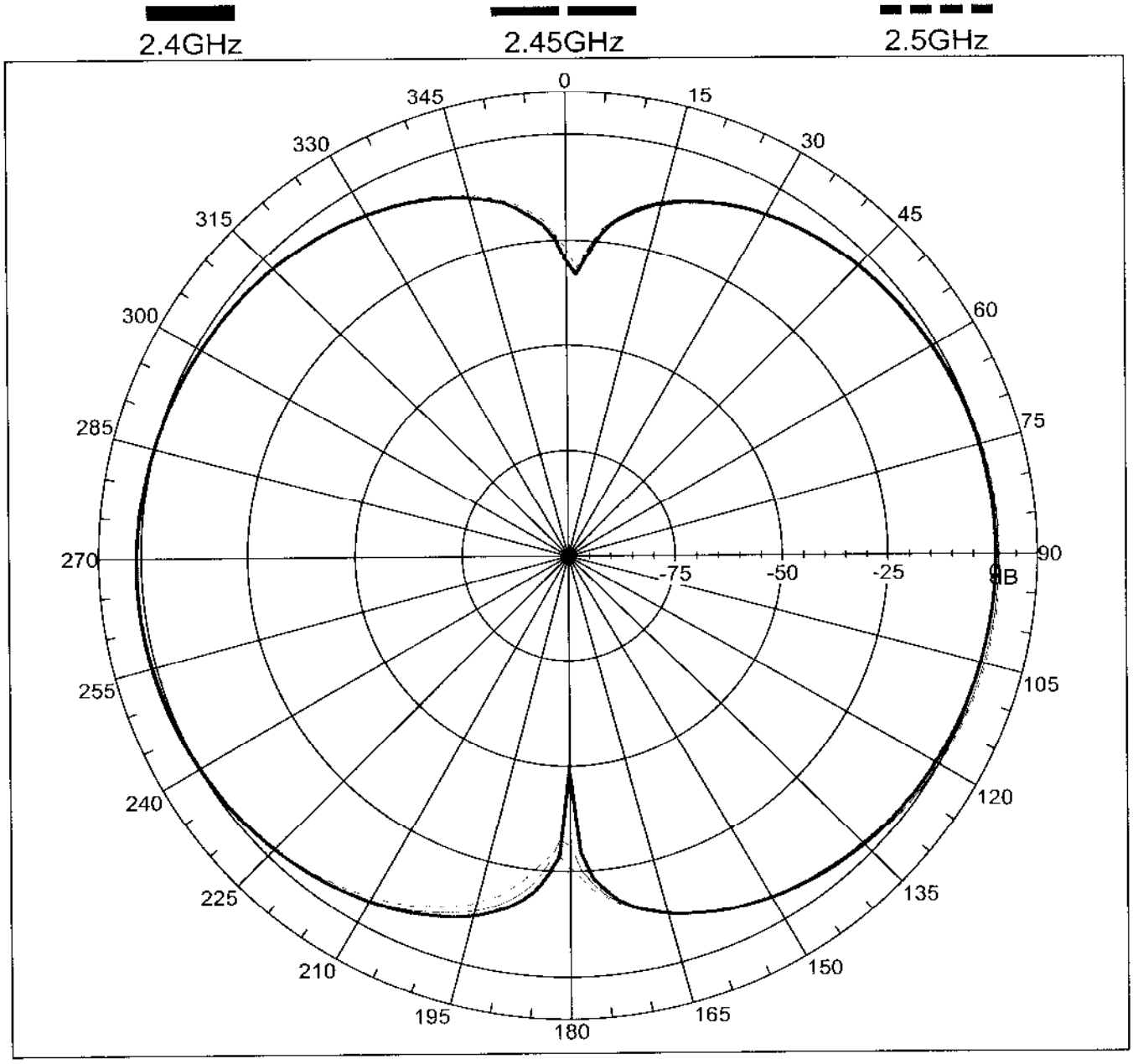
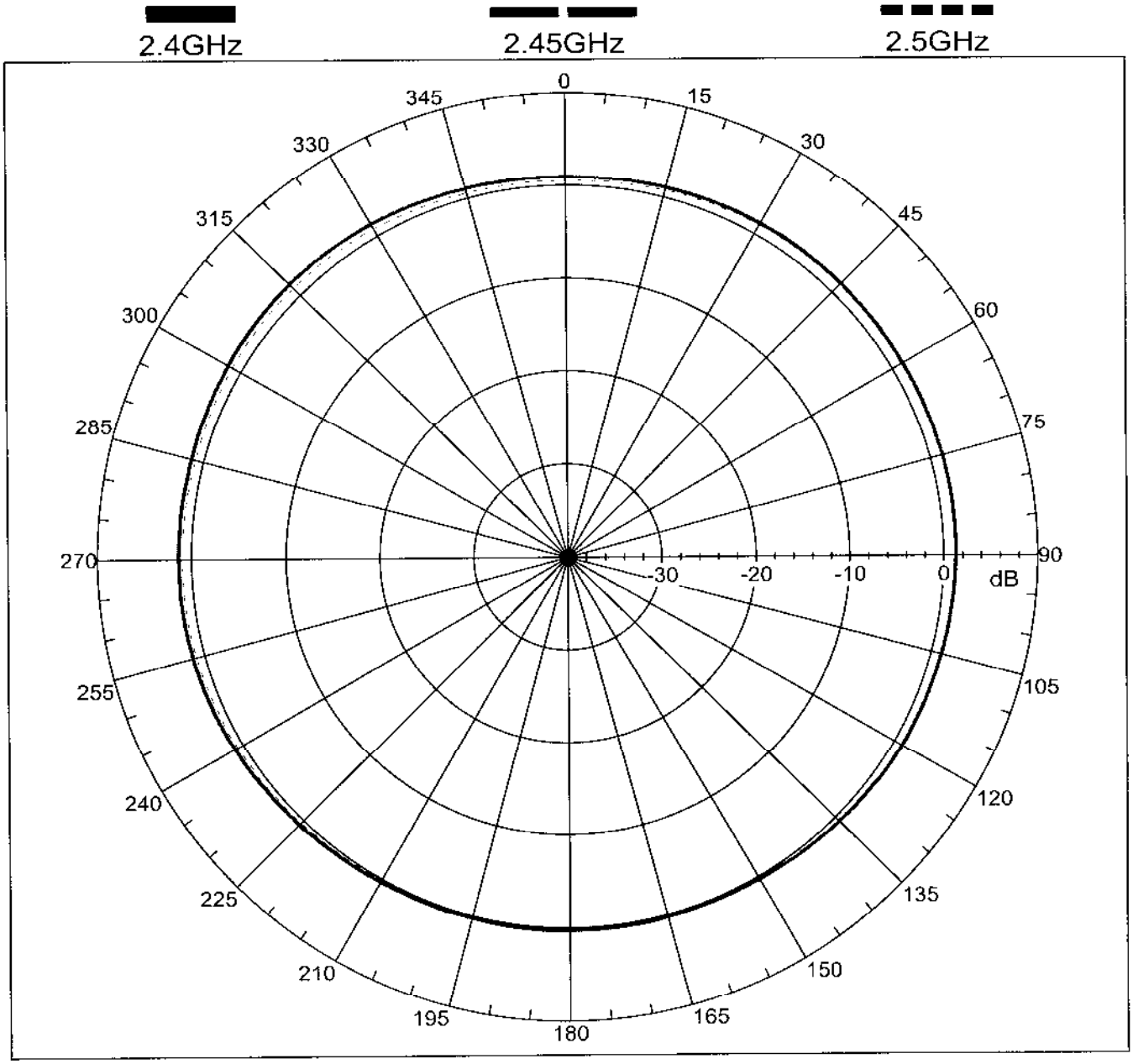

1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Tr1 S22 Log Mag 10.00dB/ Ref 0.000dB [F2]
>1 2.400000000 GHz -16.090 dB
2 2.452538631 GHz -35.359 dB
3 2.500000000 GHz -20.158 dB
50.00
40.00
30.00
20.00
10.00
0.000
-10.00
-20.00
-30.00
-40.00
-50.00
Tr2 S22 Smith (R+jX) Scale 1.000U [F2]
>1 2.400000000 GHz 42.077 Ω -12.227 Ω
2 2.452538631 GHz 50.931 Ω -1.4473 Ω
3 2.500000000 GHz 59.722 Ω 4.6662 Ω
Tr3 S22 SWR 1.000/ Ref 1.000 [F3]
>1 2.400000000 GHz 1.3721
2 2.452538631 GHz 1.0347
3 2.500000000 GHz 1.2176
11.00
10.00
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
Data -> Mem
Edit Title Label
Title Label OFF
Graticule Label ON
Frequency ON
Update ON
Return
1 Start 2 GHz
IFBW 70 kHz
Stop 3 GHz
Meas
Start
Marker
Ready
Sync
2004-02-19 15:59

Far-field amplitude of 2.4GHz small dipole antenna-E-plane.nsi



Far-field amplitude of 2.4GHz small dipole antenna-H-plane.nsi



PRODUCT SPECIFICATION	ISSUED DATE	July.12, 2000	PAGE	1/2
	REVISION		REVISION NO.	

PRODUCT NAME : Coaxial Cable
RATING : -55℃~200℃
ITEM : RG 178 B/U

誠謙

No.	Revised Date	Revised Details	Page	Report

REPORTED BY :

Q.C Engineer HOON LEE

APPROVED BY :

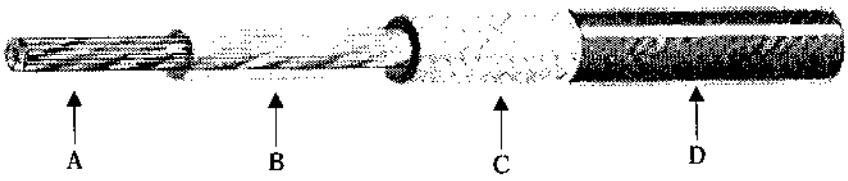
Q.C Manager SOON-MOK SIIIN

PRODUCT SPECIFICATION	ISSUED DATE	July.12, 2000	PAGE	2/2
	REVISION		REVISION NO.	

1. APPLICATIONS

This specification is applies to Coaxial Cable manufactured by the YOUNG CHANG SILICONE CO.,LTD

2. STRUCTURE



A. Conductor: SCCS
B. Insulation : PFA
C. Shield : Silver-Plated Copper
D. Jacket : FEP

3. DIMENSION

Conductor (SCCS)			Insulation		Shield		Jacket	
Structure Q'ty/㎜ϕ	Cross sectional area ㎟(SQ)	Diameter ㎜ϕ	Material	Diameter ㎜ϕ	Material	Diameter ㎜ϕ	Material	Diameter ㎜ϕ
7/0.102	0.06	0.30	PFA	0.84±0.05	SPC	1.25	FEP	1.80±0.10

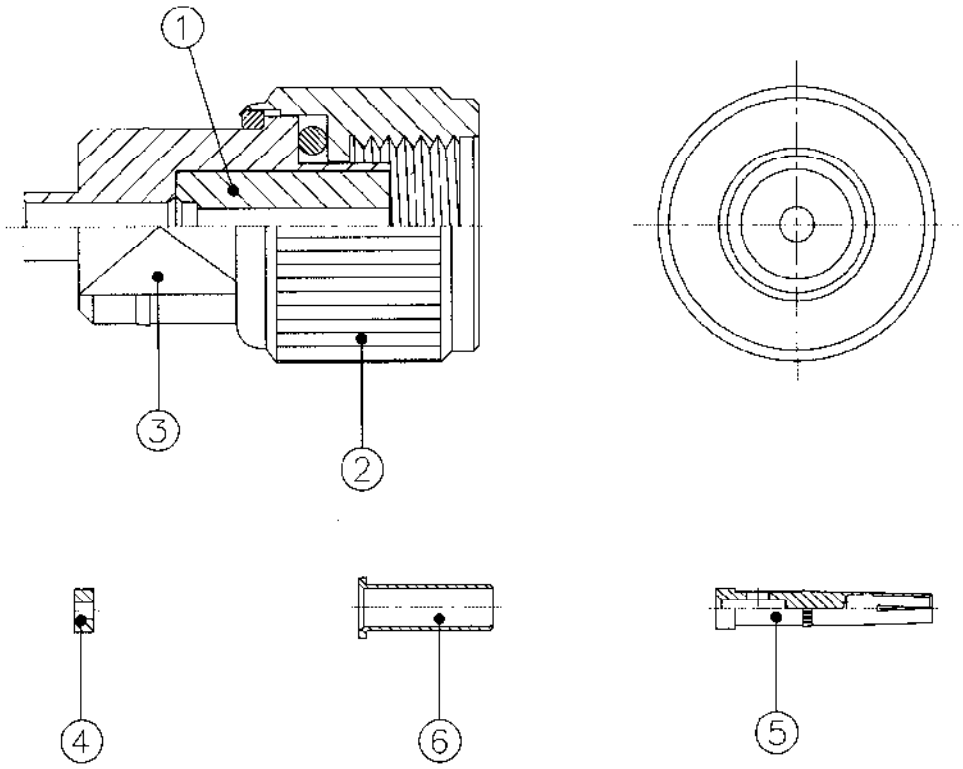
4. ELECTRIC PROPERTIES

Impedance	Capacitance	Maximum Attenuation (dB/100ft)				Dielectric Sterngth
ohms	pF/ft(Max)	100Mhz	400Mhz	1Ghz	3Ghz	V/1min
50 ± 2	32	16.0	33.0	52.0	94.0	2000

譁裕實業股份有限公司
WHA YU INDUSTRIAL CO., LTD
Connector 材質證明書

譁裕料號 Whayu P/N	100-2001150-AZ	產品名稱 Product Name	SMA Plug Reverse Straight For RG-178

結構圖面



材質成份									表面處理
1	絕緣體	Teflon	PTFE						N/A
2	外殼	Brass	Cu	Pb	Fe	Fe+Sn	Zn		電著
3	本體	Brass	Cu	Pb	Fe	Fe+Sn	Zn		鍍鎳
4	絕緣體	Teflon	PTFE						N/A
5	中心針	Phos. Bronze	Cu	Sn	P	Zn	Pb		鍍金
6	尾管	Brass	Cu	Pb	Fe	Fe+Sn	Zn		鍍鎳

Remark：

SGS Test Report

Product：RF Antenna

Contents

No	Description		Report No.	Page
1	Cable	RG-178 Cable	F690501/LF-CTS500034 F690501/LF-CTS500035 F690501/LF-CTSGP06-0418 F690501/LF-CTSGP05-5552	P.10~19
2	Antenna Body	TPE EL-630	GZSCR050640653/LP	P.20~21
3	Antenna Base	PC L-1250Z	GZSCR050640656/LP	P.22~23
4	Antenna Base	PBT	SH533383/CHEM	P.24~25
5	Rivet	Brass , Zn Plated	GZML060201325 SZTYR050305623/LP	P.26~28
6	Connector	SMA Plug Reverse	SH517723/CHEM GZML060201325 GZSCR050421403/LP 2054827/EC 2054838/EC	P.29~40
7	Ground Tube	Brass ; Tin Plated	GZ0602013169/CHEM GZSCR051191692/LP	P.41~43

Result for RoHS：PASS

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SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD. (CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: *ASUS*

PART NAME: *DPR-2320 Antenna Assembly*

PART NO.: *14G151037000* ***REVISION:***

W. Y. P/NO.: *C660-520100-A* ***REV.:*** *X1*

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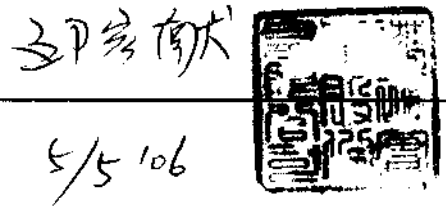
APPROVED BY :		
DATE :	5/5 '06	

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4.	天線本體(PCB板)材質	.....
5.	背膠(3M 467)材質	.....
6.	Cable規格	.....
7.	Connector材質	.....

Antenna Assembly

Specification

1. Electrical Properties：

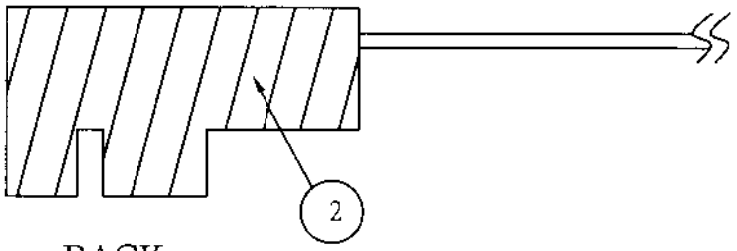
1.1 Frequency Range…….. 2.4~2.5GHz
1.2 Impedance…….. 50Ω
1.3 Return Loss…….. <-10dBi
1.4 VSWR…….. 1.92 Max.
1.5 Peak Gain…….. <2.0dBi@2.40~2.50GHz
1.6 Average Gain……>-3.0dBi@2.40~2.50GHz
1.7 Admitted Power……..1W

2. Physical Properties：

2.1 Operating Temp…….. -10℃ ~ +55℃
2.2 Storage Temp……-30℃ ~ +75℃

CG-1395

REV	DATE	DESCRIPTION
A	2006-05-05	NEW



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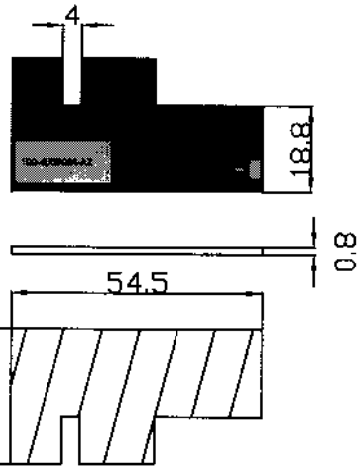

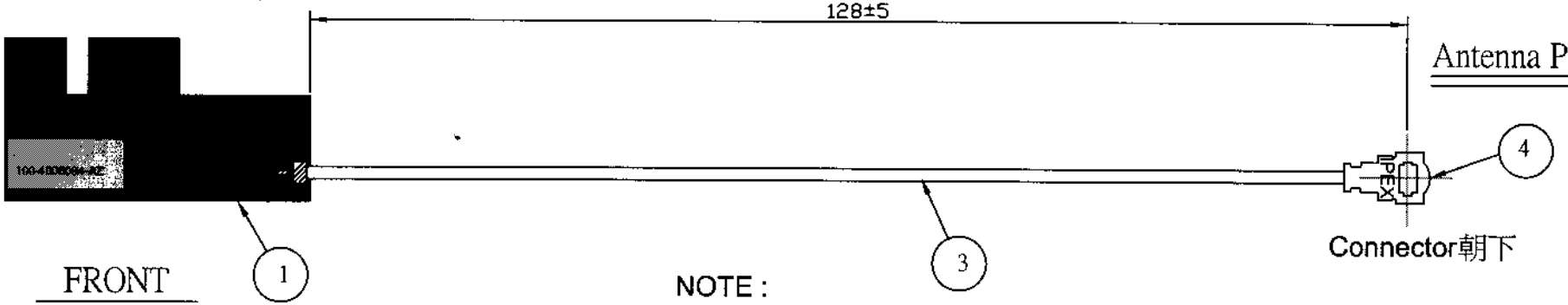

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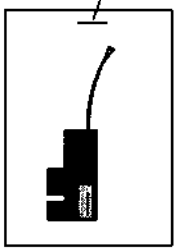

Packing : 1set/bag
每10袋用釘書機訂起來
(以方便客戶點收)

CUSTOMER'S SINGATURE

NOTE :
1. Remove All Burrs.
2. All Angle Within 90° ±3°.
3. All Corners Within R0.2~R0.5.
4. Diamter On Common Center And To Be Concentric Within 0.1mm.
5. [X...]Means Important Dimension.

NO	DESCRIPTION	QTY	REMARK
4	Connector	I-PEX	1	NA
3	Cable Assembly	ø1.13 ; L=132mm	1	Gray
2	Adhesive	3M 467 adhesive	1	NA
1	WLAN Antenna	FR4(T=0.8mm)單面PCB板	1	NA

XX.	±5
X.	±3.0
.X	±1.0
.XX	±0.5
.XXX	±0.1

APPROVED 邱多敏
CHECKED 余哲輝
DRAWING 吳政樺

CUSTOMER: ASUS
PART NO : 14G151037000
PARTNAME: DPR-2320 Antenna
W.Y P/NO : C660-520100-A

REV	UNIT	FILE :
A	m/m	SHEET : 1/1

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WHA YU INDUSTRIAL CO., LTD

ASUS VOIP Model Small Case Test Report

Measurement Time：2006/01/16

Measurement Instrument：

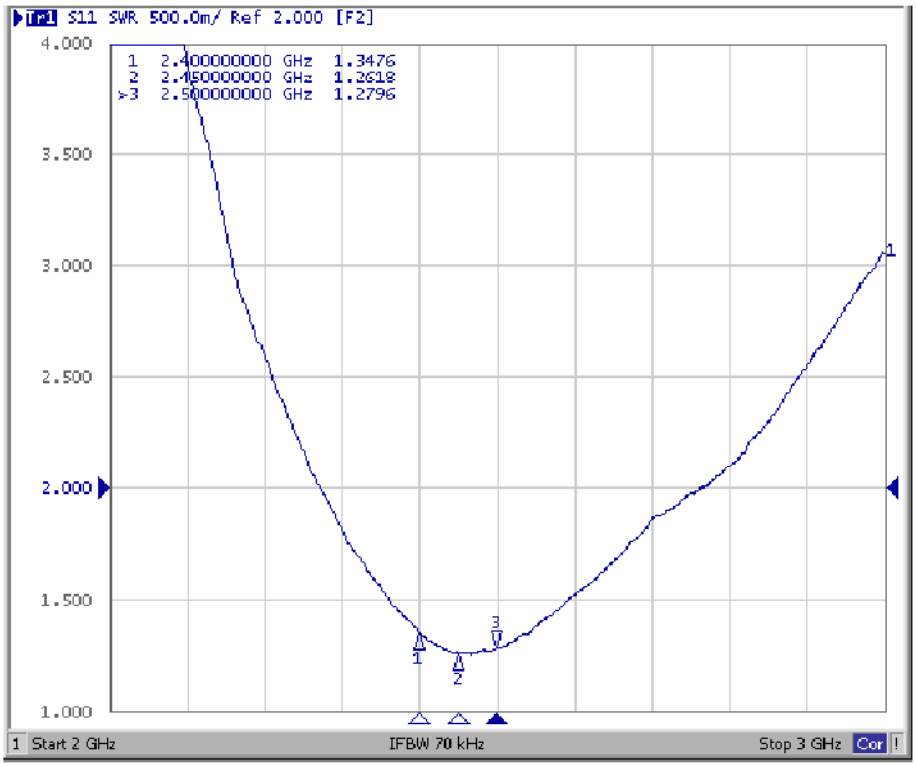
1、Agilent Technologies E5071A 300K~8.5GHz ENASeries Network Analyzer

2、Chamber：3.5m(W) * 3.25m(H) * 7.12m(L)

Gain Horn Antenna：SG-430 1.7~2.6GHz

Measurement Frequency：2.4 GHz ~ 2.5GHz

Antenna VSWR



Antenna	VSWR		
Frequency	2.4GHz	2.45GHz	2.5GHz
Small Case Side	**1.34**	**1.26**	**1.27**

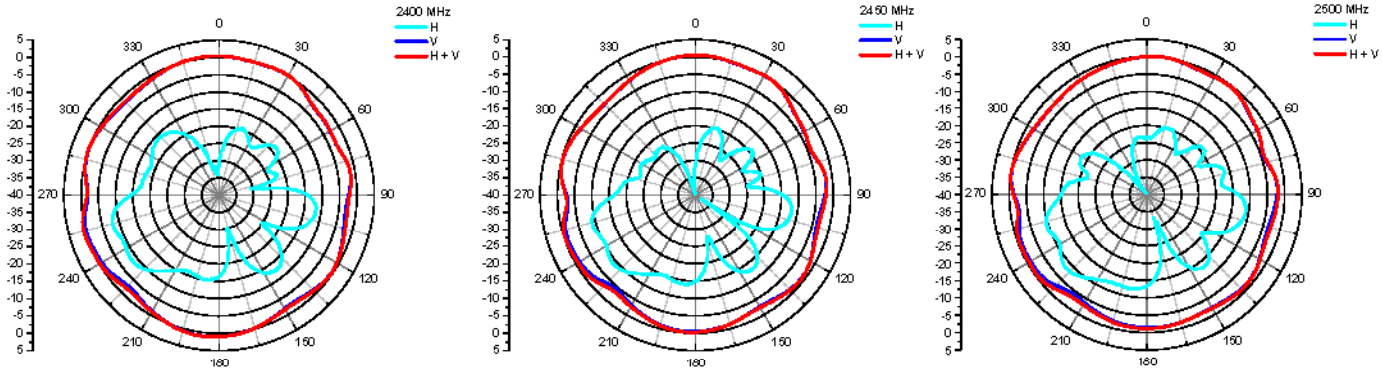
Antenna Peak Gain & Average Gain Test Result

Antenna	Peak Gain (dBi)			Average Gain (dBi)		
Frequency	2.4GHz	2.45GHz	2.5GHz	2.4GHz	2.45GHz	2.5GHz
Small Case Side	**1.08**	**0.54**	**0.15**	**-0.66**	**-1.32**	**-1.45**

Antenna Pattern

Small Case Side

2.4GHz~2.5GHz



NP-150R

Glass cloth base epoxy resin flame retardant copper clad laminate

FEATURES

- High luminance of epoxy contrast with copper for laser type A.O.I.
- UV solder mask may be applied simultaneously to increase yiesIds.
- High performance epoxy blended to achieve higher resistance than that of FR-4-86
- Thickness 0.8mm capability
- Other properties are similartt to NP-140

PERFORMANCE LIST

Characteristics		Unit	Conditioning	Typical Values	SPEC
Volume resistivity		MΩcm	C-96/35/90	$5 \times 10^8 \sim 5 \times 10^9$	10^6 ↑
Surface resistivity		MΩ	C-96/35/90	$5 \times 10^6 \sim 5 \times 10^7$	10^4 ↑
Permittivity 1MHZ		-	C-24/23/50	4.2-4.8	5.4 ↓
Loss Tangent 1MHZ		-	D-24/23/50	0.010-0.016	0.035 ↓
Arc resistance		SEC	D-48/50+D-0.5/23	120 ↑	60 ↑
Dielectric breakdown		KV	D-48/50	60 ↑	40 ↑
Moisture absorption		%	D-24/23	0.05-0.10	0.35 ↓
Flammability		-	C-24/23/50+E-24/125	94V0	94V0
Peel strength 1oz		lb/in	288°C x 10" solder floating	10-14	8 ↑
Thermal stress		SEC	288°C solder dipping	200 ↑	10 ↑
Pressure cooker (2 atm 12°C)	1/2hr	SEC	288°C dipping	230	N/A
	1hr	SEC	288°C dipping	220	N/A
	2hr	SEC	288°C dipping	150	N/A
Flexural strength	LW	psi	A	70000-80000	60000 ↑
	CW	psi	A	60000-65000	50000 ↑
Dimensional stability X-Y axis		%	E-0.5/170	0.005-0.030	0.050 ↓
Coefficient of thermal expansion Z-axis before Tg Z-axis after Tg		in/in/°C in/in/°C	 TMA TMA	 5×10^{-5} 25×10^{-5}	N/A
Glass transition temp		°C	DSC	150 ±5	N/A

Data shown are nominal values for reference only.

NOTE:
The average value in the table refers to samples of .062" 1/1.

PRODUCT SPECIFICATION
製 品 規 格

No. PRS-1176

MHF series micro coaxial connector

Qualification Test Report No. TR-1021

REV.	ECN	BY	DATE	APP.	Prepared by	Reviewed by	Approved by
2	S2031	K.O	May/17/ 02	K.K	K.Ohbayashi JUN / 25 / 01	E,Kawabe Jun / 25 / 01	K.Katabuchi Jun / 29 / 01
1	S1053	K.O	Nov/14/ 01	K.K			
0	S1025	K.O	Jun/25/ 01				
REVISION RECORD							

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1. Scope ／ 序言

MHF series micro coaxial connector is a wire to board connector for AWG#36,32,30 coaxial cable .
MHF series micro coaxial connector は、AWG＃36,32,30同軸ケーブルの基板対ワイヤーコネクタである。

2. Objectives ／ 目的

This specification covers the requirements for product performance and test methods of MHF series microcoaxial connector
本規格は、MHF series micro coaxial connector の性能と試験条件について規定する。

3. Part No. , construction , material and finish ／ 構成、材料及び仕上げ

(1) Part No. Plug : 20278-＊＊＊R-08,-13,-18 , Receptacle : 20279-001E-01

(2) Construction, material and finish of the connector are covered as each drawings.
構成、材料及び仕上げは、各図面に指定されている通りとする。

4. Applicable cable ／ 適合ケーブル

4-1 Part No. 20278-001R-08, 20278-011R-08

(1) Description

Inner conductor : AWG#36(7/0.05)
Silver plating annealed copper wire or silver plating tin-copper alloy
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 anncaled copper wire
Jacket : Fluoro-plastics , diameter 0.81(+0.04,-0.02)mm , nominal thickness 0.08mm

(2) Requirements

Characteristic impedance : 50(+3,-3)ohm by TDR method (raise time 40ps)
Nominal capacitance: 96 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 1400 ohm/km MAX.
Insulation resistance : 1000 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成

中心導体 ： AWG＃36(7／0. 05),銀メッキ軟銅線または銀メッキすず入り銅線
誘電体 ： フッ素樹脂,外径0. 4(＋0. 04,－0. 02),標準厚さ0. 125mm
外部導体 ： 8／5／0. 05,標準外径0. 65mm, 銀メッキ軟銅線
ジャケット ： フッ素樹脂,外径0. 81(＋0. 04,－0. 02)mm, 標準厚さ0. 08mm

(2) 仕様

特性インピーダンス ： 50±3Ω (TDR,ライズタイム40ps)
標準静電容量 ： 96pF／m
293K(20℃)時の中心導体導体抵抗 ： 1400Ω ／km以下
絶縁抵抗 ： 1000MΩ ・km以上
耐電圧 ： AC1000V・1分間にて絶縁破壊の無い事

4-2 Part No. 20278-101R-13, 20278-111R-13

(1) Description

Inner conductor : AWG#32(7/0.08)
Silver plating annealed copper wire or silver plating tin-copper alloy
Dielectric core : Fluoro-plastics , diameter 0.68(+0.04,-0.02)mm , nominal thickness 0.22mm
Outer conductor : 16/4/0.05 , nominal diameter 0.93mm , silver plating annealed copper wire
Jacket : Fluoro-plastics , diameter 1.13(+0.08,-0.05)mm , nominal thickness 0.1mm

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(2) Requirements
Characteristic impedance : 50(+2,-2)ohm by TDR method (raise time 40ps)
Nominal capacitance: 97 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 520 ohm/km MAX.
Insulation resistance : 1500 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成
中心導体 ： AWG＃32(7／0. 08),銀メッキ軟銅線または銀メッキすず入り銅線
誘電体 ： フッ素樹脂,外径0. 68(＋0. 04,－0. 02),標準厚さ0. 22mm
外部導体 ： 16／4／0. 05,標準外径0. 93mm, 銀メッキ軟銅線
ジャケット ： フッ素樹脂,外径1. 13(＋0. 08,－0. 05)mm, 標準厚さ0. 1mm

(2) 仕様
特性インピーダンス ： 50±2Ω (TDR,ライズタイム40ps)
標準静電容量 ： 97pF／m
293K(20℃)時の中心導体導体抵抗 ： 520Ω ／km以下
絶縁抵抗 ： 1500MΩ ・km以上
耐電圧 ： AC1000V・1分間にて絶縁破壊の無い事

4-3 Part No. 20278-001R-32, 20278-011R-32

(1) Description
Inner conductor : AWG#32(7/0.08)
Silver plating annealed copper wire or silver plating tin-copper alloy
Dielectric core : Fluoro-plastics , diameter 0.66(+0.05,-0.05)mm , nominal thickness 0.21mm
First outer conductor : 16/5/0.05, tin plating annealed copper wire
Second outer conductor :16/6/0.05, nominal diameter 1.12mm , tin plating annealed copper wire
Jacket : Fluoro-plastics , diameter 1.32(+0.1,-0.1)mm , nominal thickness 0.1mm

(2) Requirements
Characteristic impedance : 50(+2,-2)ohm by TDR method (raise time 40ps)
Nominal capacitance: 95 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 520 ohm/km MAX.
Insulation resistance : 1500 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成
中心導体 ： AWG＃32(7／0. 08),銀メッキ軟銅線または銀メッキすず入り銅線
誘電体 ： フッ素樹脂,外径0. 66(＋0. 05,－0. 05),標準厚さ0. 21mm
外部導体(内側) ： 16／5／0. 05,すずメッキ軟銅線
外部導体(外側) ： 16／6／0. 05,標準外径1. 12mm, すずメッキ軟銅線
ジャケット ： フッ素樹脂,外径1. 32(＋0. 1,－0. 1)mm, 標準厚さ0. 1mm

(2) 仕様
特性インピーダンス ： 50±2Ω (TDR,ライズタイム40ps)
標準静電容量 ： 95pF／m
293K(20℃)時の中心導体導体抵抗 ： 520Ω ／km以下
絶縁抵抗 ： 1500MΩ ・km以上
耐電圧 ： AC1000V・1分間にて絶縁破壊の無い事

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4-4 Part No. 20278-001R-18, 20278-011R-18
RG178 B/U
(1) Description
Inner conductor : AWG#30(7/0.102) , silver plating copper clad steel wire
Dielectric core : Fluoro-plastics , diameter 0.84(+0.03,-0.03)mm , nominal thickness 0.268mm
Outer conductor : 16/3/0.1 , nominal diameter 1.35mm , silver plating copper wire
Jacket : Fluoro-plastics , diameter 1.8(+0.1,-0.1)mm , nominal thickness 0.23mm
(2) Requirements
Characteristic impedance : 50(+2,-2)ohm by TDR method (raise time 40ps)
Nominal capacitance: 95 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 805 ohm/km MAX.
Insulation resistance : 1500 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC2000V for 1 minutes.
(1) 構成
中心導体 : AWG＃30(7／0. 102),銀メッキ銅被鋼線
誘電体 : フッ素樹脂,外径0. 84(±0. 03),標準厚さ0. 268mm
外部導体 : 16／3／0. 1,標準外径1. 35mm, 銀メッキ軟銅線
ジャケット : フッ素樹脂,外径1. 8(±0. 1)mm, 標準厚さ0. 23mm
(2) 仕様
特性インピーダンス : 50±2Ω (TDR,ライズタイム40ps)
標準静電容量 : 95pF／m
293K(20℃)時の中心導体導体抵抗 : 805Ω ／km以下
絶縁抵抗 : 1500MΩ ・km以上
耐電圧 : AC2000V・1分間にて絶縁破壊の無い事

5. Ratings ／ 定格
(1) Rated voltage / 電圧 : AC60Vrms
(2) Nominal characteristic impedance／公称特性インピーダンス : 50Ω
(3) Frequency / 周波数 : DC～3GHz
(4) VSWR : 1. 3 MAX.
(5) Service Temperature / 使用温度範囲 : 233～363K(－40～＋90℃)

6. Test methods and performance ／ 試験及び性能

6-1 Test condition / 試験条件
Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202
全ての測定と試験は、MIL-STD-202 に基づき以下の条件で行う。.
Temperature / 温度 : 288～308K (15～35℃)
Humidity / 湿度 : 45～75%RH

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6-2 Sample quantity / 試料数

(1) Insulation resistance / 絶縁抵抗 : 10pcs.
(2) Dielectric withstanding voltage / 耐電圧 : 10pcs.
(3) VSWR : 5pcs.
(4) Unmating force / 抜去力 : 10pcs
(5) Durability / 耐久性 : 10pcs.
(6) Cable retention force / ケーブル保持力 : 10pcs.
(7) Vibration / 振動 : 10pcs.
(8) Shock / 衝撃 : 10pcs.
(9) Thermal shock / 温度サイクル : 10pcs.
(10) Humidity / 湿度 : 10pcs.
(11) Salt water spray / 塩水噴霧 : 10pcs.
(12) Solderability / 半田付け性 : 10pcs.
(13) Reflow soldering heat resistance / 半田耐熱性 : 10pcs.

6-3-1 Electrical / 電気的性能
(1) Contact Resistance / 接触抵抗

A.Testing: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 method. Apply the low level condition in accordance with MIL-STD-202, Method 307.
Open circuit voltage : 20mV MAX
Circuit current : 10mA MAX. (DC or AC1kHz)
Contact resistance of inner contact : <resistance of A-E> - <resistance of B-E>
Contact resistance of ground contact : <resistance of A-D> - <resistance of B-D>

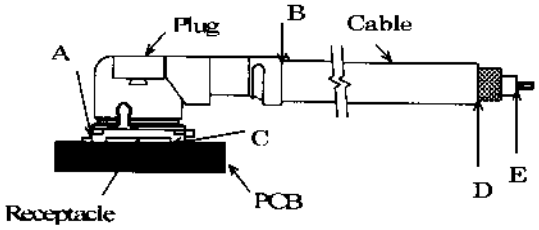

Fig.1

B.Requirements :
Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.
Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:テスト基板にリセプタクルコネクタを半田付けし、プラグコネクタと嵌合させ、Fig. 1のように4端子法にて下記の条件で測定する。 MIL-STD-202 試験法 307 に準拠。
開回路電圧: 20mV以下
試験電流 : 10mA(DCもしくはAC1kHz)
中心導体 : <A－E間の電気抵抗>－<B－E間の電気抵抗>
外部導体 : <A－D間の電気抵抗>－<B－D間の電気抵抗>
B.必要条件: 中心導体 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体 初期 10mΩ 以下, 試験後 15mΩ 以下

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(2) Insulation resistance / 絶縁抵抗

A. Testing : Mate the plug and receptacle connector together, then apply DC 100 V between the inner contact and the ground contact in accordance with MIL-STD-202, Method 302.

B.Requirements : Initial 500 Mohm MIN. after testing 100 Mohm MIN.

A.試験法: リセプタクル及びプラグコネクタを互いに嵌合させ、中心導体と外部導体の間に DC 100Vを印加し、測定する。MIL-STD-202 試験法 302 に準拠。

B.必要条件: 初期 500MΩ 以上 試験後 100MΩ 以上

(3) Dielectric withstanding voltage / 耐電圧

A. Testing : Mate the receptacle and plug connector together, then apply AC 200 Vrms between the inner contact and the ground contact for a minute in accordance with MIL-STD-202, Method 301.

B.Requirements : No creeping discharge, flashover, nor insulator breakdown shall occur.

A.試験法: リセプタクル及びプラグコネクタを互いに嵌合させ、中心導体と外部導体の間にAC200V(実効値)を一分間印加する。 MIL-STD-202 試験法 301 に準拠。

B.必要条件: 沿面放電、空中放電、絶縁破壊等の異常のないこと。

(4) VSWR

A. Testing : Measure the VSWR as shown in Fig.3 by the network analyzer.

Frequency :100M~3GHz

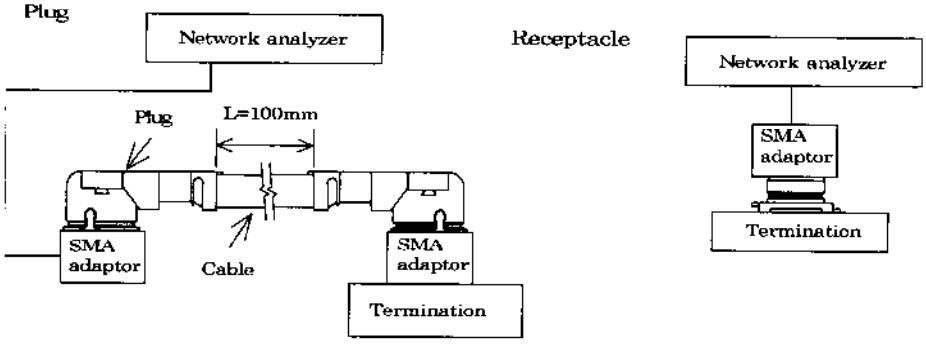

Fig.3

B.Requirements : 1.3 MAX.

A.試験法: ネットワークアナライザーにて Fig.3 のようにVSWRを測定する。
周波数 : 100M～3GHz

B.必要条件: 1. 3以下

6-3-2 Mechanical / 機械的性能

(1) Unmating force / 抜去力

A. Testing : Unmate the receptacle connector (soldered to the test board) and plug at a speed 25±3mm/minutes along the mating by the push-on/pull-off machine .

B.Requirements :

Total unmating force : Initial 5N MIN. after 30 cycles 3N MIN.

Unmating force of inner contact : Initial 0.15N MIN. after 30 cycles 0.1N MIN

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A.試験法:挿抜試験機を用いて、基板に半田付けしたリセプタクルとプラグを嵌合軸と平行に毎分25±3mmの速度で挿抜する。

B.必要条件:

総合抜去力:初回抜去力 5N以上 ,30回後抜去力 3N以上

中心導体 :初回抜去力 0．15N以上 ,30回後抜去力 0．1N以上

(2) Durability / 耐久性

A. Testing : Mate and umate the receptacle connector (soldered to the test board) and plug 30 cycles at a speed 25±3mm/minutes along the mating by the push-on/pull-off machine .

B.Requirements :

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:挿抜試験機を用いて、基板に半田付けしたリセプタクルとプラグを嵌合軸と平行に毎分25±3mmの速度で30回挿抜する。

B.必要条件 中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

(3) Cable retention force / ケーブル保持力

A. Testing : Apply force on the cable as shown in Fig.2.

During the testing, run 100mA DC to check electrical discontinuity.

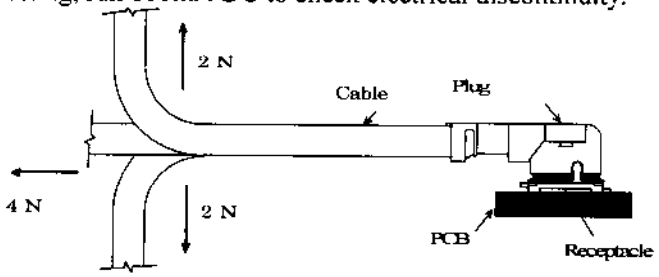

Fig.2

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Electrical discontinuity : No electrical discontinuity grater than 1 micro-sec. shall occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:Fig. 2のようにケーブルに力を加える。尚、試験中にDC100mAの電流を流して電気的瞬断を確認する。

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

電流瞬断 : 試験中、1マイクロ秒を超える電気的瞬断の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

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(4) Vibration / 振動

A. Testing : 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

B.Requirements
Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.
Electrical discontinuity : No electrical discontinuity grater than 1micro-sec. shall occur.
Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.
Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:嵌合状態のコネクタを、下記の振動を加える。尚、試験中にDC100mAの電流を流して電気的瞬断を確認する。
周波数 :10Hz→100Hz→10Hz ／ 約15分間
片振幅,加速度:1．5mm or 59m／s^2 (6G)
方向,サイクル:3つの互いに直角な方向について各5サイクル(約75分)実施

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1マイクロ秒を超える電気的瞬断の無いこと。
中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

(5) Shock / 衝撃

A. Testing : Apply the following vibration to the mating connector in accordance with MIL-STD-202, Method 213, Condition B. 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

B.Requirements
Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.
Electrical discontinuity : No electrical discontinuity grater than 1 micro-sec. shall occur.
Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.
Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:嵌合状態のコネクタを、衝撃試験機に取り付け、下記の衝撃を加える。尚、試験中にDC100mAの電流を流して電気的瞬断を確認する。MIN-STD-202 試験法 213 試験条件 B に準拠。
最大加速度:735m／s^2(75G)
標準持続時間:11msec.
波形: 半波正弦波
方向:直交する6方向、各3回

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1マイクロ秒を超える電気的瞬断の無いこと。
中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

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6-3-3 Environmental / 耐環境性

(1) Thermal shock/ 温度サイクル

A. Testing : Apply the following environment to the mating connector .

Temperature ,duration

:233K/30minutes→278~308K/5minutes MAX.→363K/30minutes→278~308K/5minutes MAX.

(-40℃) (5~35℃) (90℃) (5~35℃)

No. of cycles : 5 cycles

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

Insulation resistance : initial 500 mega-ohm MIN. after testing 100 mega-ohm MIN.

A.試験法:嵌合状態のコネクタを、下記の雰囲気に放置する。

1サイクルの条件

:233K／30分→278～308K／5分以下→363K／30分 ›278～308K／5分以下

（－40℃） (5～35℃) (90℃) (5～35℃)

実施サイクル :5サイクル

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

絶縁抵抗 : 初期 500MΩ 以上 試験後 100MΩ 以上

(2) Humidity / 湿度

A. Testing : Apply the following environment to the mating connector in accordance with MIL-STD-202, Method 103, Condition B .

Temperature : 313±2 K (40±2℃)

Humidity : 90～95%RH

Duration : 96 hours

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

Insulation resistance : initial 500 mega-ohm MIN. after testing 100 mega-ohm MIN.

A.試験法:嵌合状態のコネクタを、下記の雰囲気に放置する。MIL-STD-202 試験法 103 条件 B に準拠。

温度:313±2K (40±2℃)

湿度:90～95%RH

時間:96時間

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

絶縁抵抗 : 初期 500MΩ 以上 試験後 100MΩ 以上

(3) Salt water spray / 塩水噴霧

A. Testing : Apply the following environment to the mating connector in accordance with MIL-STD-202, Method 101, Condition B.

Temperature : 308±2 K (35±2℃)

Salt water density by weight : 5±1%

Duration : 48 hours

B.Requirements : Appearance no abnormality adversely affecting the performance shall occur.

B.Requirements : Appearance no abnormality adversely affecting the performance shall occur.

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

A.試験法：嵌合状態のコネクタを、下記の雰囲気に放置する。
温度　　：308±2K（35±2℃）
塩水濃度：5±1%（重量比）
時間　　：48時間
B.必要条件 ： 外観 著しい腐食の無い事。

6-3-4 Solder / 半田付け関連

(1) Solderability / 半田付け性
A. Testing : Dip the solder tine of the contact in the solder bath at 518±5(245±5℃) for 5±0.5 sec. After immersing the tine in the flux of RMA or R type for 5 to 10 seconds in accordance with MIL-STD-202, Method 208.
B.Requirements : More than 95% of the dipped surface shall be evenly wet.
A.試験法：コンタクトの半田付け部を518±5K（245±5℃）の半田槽内に5±0．5秒浸す。フラックスは、RMA又はR型を使用し5～10秒間浸すものとする。MIL-STD-202，試験法208に準拠。
B.必要条件：浸した面積の95%以上に半田がむらなく付着すること。

(2) Reflow soldering heat resistance / 半田耐熱性
A. Testing : Put on the receptacle connector to PCB , apply the heat 2 cycles as shown in Fig. 4

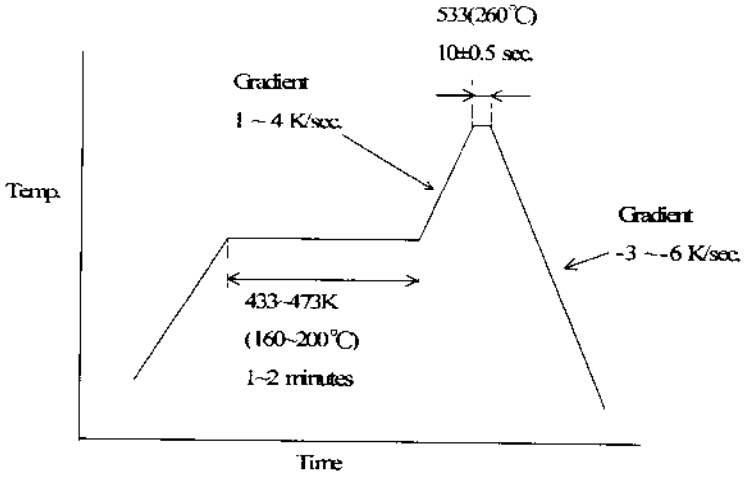

Fig.4

B.Requirements : Appearance　no abnormality adversely affecting the performance shall occur.
A.試験法：基板にリセプタクルコネクタを置き、Fig．4の条件で2回リフローを行う。
B.必要条件：機能を損なう変形及び欠陥の無い事。

WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA
AEON TECH CO., LTD. (CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: *華碩科技股份有限公司*

PART NAME: ***RF Cable Assembly***

PART NO.: ***REVISION:***

W. Y. P/NO.: ***C660-510019-A*** ***REV.:*** ***X1***

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :	Winston	
DATE :	2004/7/6	

HG

TH

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WHA YU INDUSTRIAL CO., LTD.
DCC
2004 7 15
CONTROL DOCUMENT

INDEX

Item	*Content*	*Page*
1.	**Cable Assembly**規格表	1
2.	成品圖	2
3.	測試報告	3
4.	**Cable** 規格	4~9
5.	**Connector**材質特性	10~19

Cable Assembly

Specification

1. Electrical Properties :

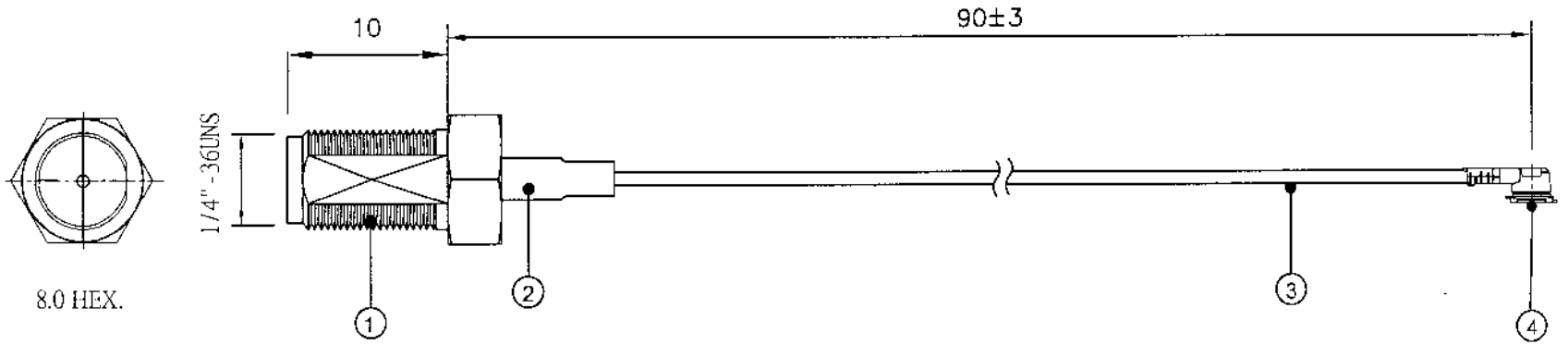
1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
1.2 Impedance ..... 50Ω Nominal
1.3 Insertion Loss..... <1.5 dB

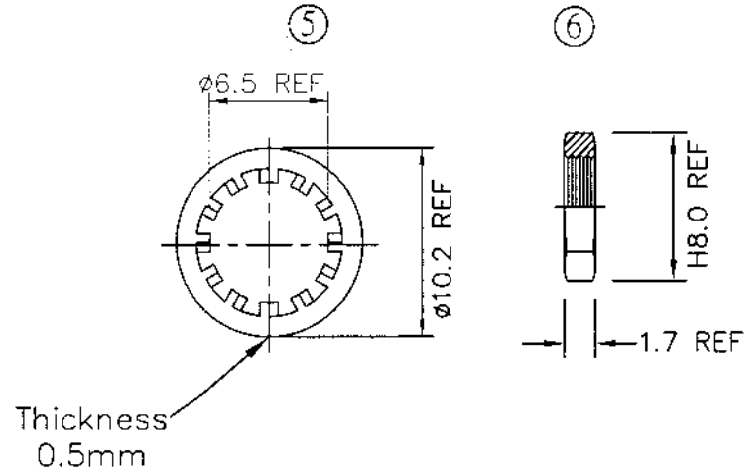
2. Physical Properties :

2.1 Cable..... φ 1.13 Coaxial Cable
2.2 Connector1..... SMA Straight Jack Reverse
Connector2..... MHF Connector
2.3 Operating Temp. .....-20℃ ~ +65℃
2.4 Storage Temp. .....-30℃ ~ +75℃

CG-

REV	DATE	DESCRIPTION
X1	07/06-2004	New Issue





NO	DESCRIPTION	QTY	REMARK
6	Nut	Brass ; Gold Plated	1	
5	Washer	Brass ; Gold Plated	1	
4	Connector	MHF Connector	1	
3	Cable	ø1.13 Cable	1	
2	Tube	Heat Shrink Tube	1	
1	Connector	SMA Straight Jack/Reverse	1	

CUSTOMER'S SINGATURE

XX.	±3.0	APPROVED
X.	±2.0	CHECKED
.X	±1.0	
.XX	±0.5	DRAWING
.XXX	±0.1	

CUSTOMER: 華碩科技股份有限公司

PART NO :

PARTNAME: RF Cable Assembly

W.Y P/NO : C660-510019-A

REV	UNIT	FILE :
X1	mm	SHEET : 1/1

Wha Yu
INDUSTRIAL CO.,LTD.
華裕實業股份有限公司

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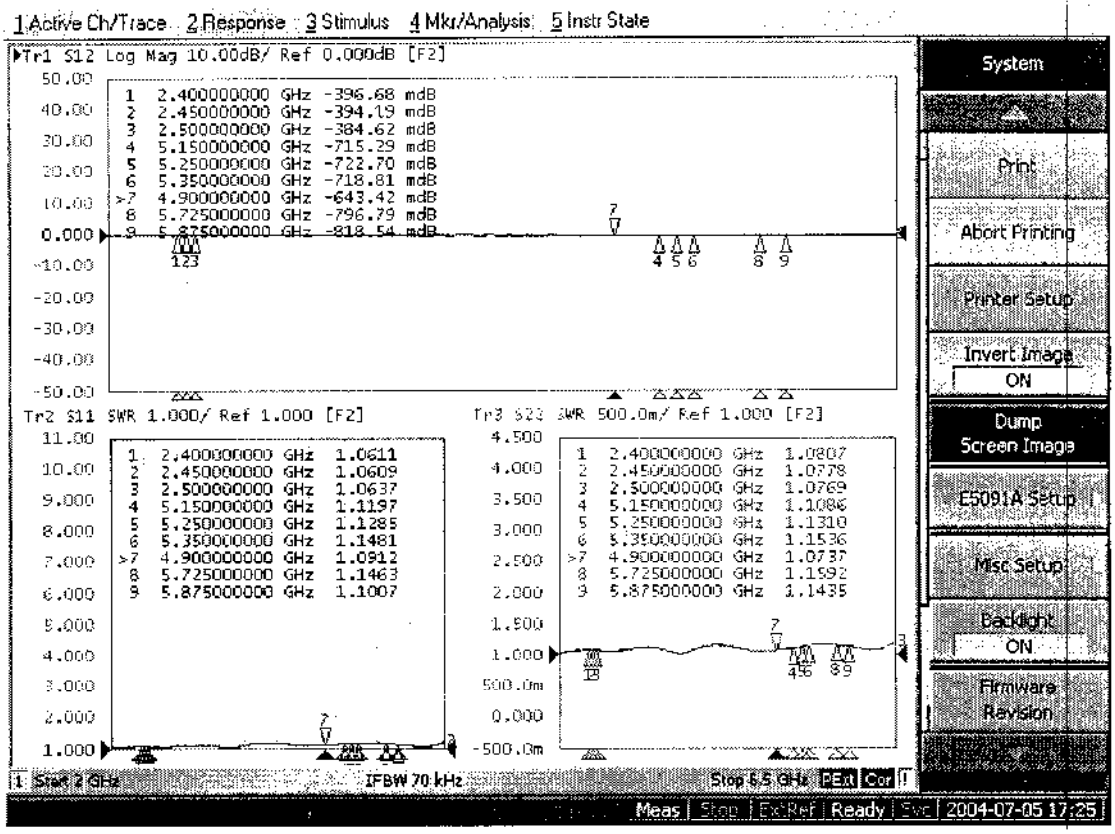
WHA YU INDUSTRIAL CO., LTD

RF Cable Assembly

P/NO : C660-510019-A



Nizing Electric Co., Ltd.
11-15 Santai Rd., Hsinchuang, Taipei Hsien, 242, Taiwan, R.O.C
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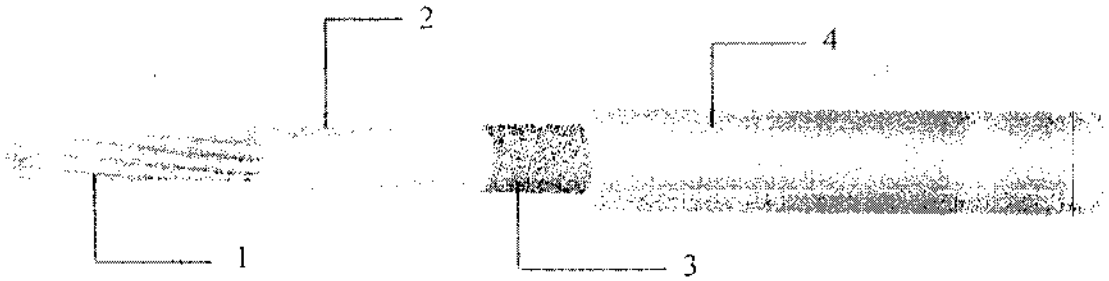
A3132PS001	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE	PAGE	1 / 2
PRODUCT STANDARD		ISSUED	21. Oct. 2003
		REVISED	

I - Scope

This specification presents a FEP insulated high-frequency coaxial cable AWG 32, 1.13 mm O.D. for internal wiring of electronic equipment, such as Computer / Notebook with wireless communication systems.

II - Construction



Item		Unit	Details
1. Inner Conductor	Material	--	Silver coated copper
	Composition	No./mm	AWG 32 or 7 × 0.08
	Dia. (approx.)	mm	0.24
2. Dielectric	Material	---	Extruded FEP
	Thickness	mm	0.22
	Nom. O.D.	mm	0.68 ± 0.02
	Color	---	Natural
3. Outer Conductor	Material	---	Silver coated copper
	Composition	---	Braided (16 / 4 / 0.05)
	Dia. (approx)	mm	0.90 ± 0.03
4. Jacket	Material	---	Extruded FEP
	Thickness	mm	0.10
	Dia.	mm	1.13 + 0.05 / -0.08
	Color		Standard colors are Light Grey, Black, Dark Grey

Note	MADE BY	
	APPROVALS	Shen Bin Chen

Nizing Electric Co., Ltd.
11-15 Santai Rd., Hsinchuang, Taipei Hsien, 242, Taiwan, R.O.C.
Tel: 02-29016164 Fax: 29050644 E-mail: shenbinnizing@yahoo.com.tw

III – Characteristics

Item	Unit	Specified Value	Note
Temperature Rating	℃	200	
Voltage Lasting	V	250	
Dielectric strength	—	Dielectric core: No breakdown at AC 1.5 kV for 0.15 sec.	Spark test
		Jacket: No breakdown at AC 1.5 kV for 0.15 sec.	Spark test
		No breakdown at AC 500V for 1 min.	Outer conductor to inner conductor
Inner conductor resistance	Ω / km	525	at 20℃
Insulation resistance	MΩ / km	Min. 1500	at 20℃
Characteristic Impedance	Ω	50 ± 2	TDR method
Capacitance	pF / m	98	at 1 kHz
Attenuation. (nom.)	dB / m	2.0	1.0 GHz
		2.9	2.0 GHz
		3.6	3.0 GHz
		4.2	4.0 GHz
		4.7	5.0 GHz
		5.2	6.0 GHz
Approx. Weight	g / m	3.15	

Note :

MADE BY

APPROVALS

KURABE INDUSTRIAL CO., LTD

SP3830M-X	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE (FWS 5022)	PAGE	1/4
PRODUCT STANDARD		ISSUED	17-9-2001
		REVISED	

1. SCOPE

This standard covers "FEP insulated High-Frequency coaxial cable".

2. CONSTRUCTION

Construction and dimensions of the cable are shown in Figure.1 and Table 1.

3. PERFORMANCE

Performance of the finished cable is shown in Table 2. The test methods are in accordance with applicable test methods described in JIS C 3005.

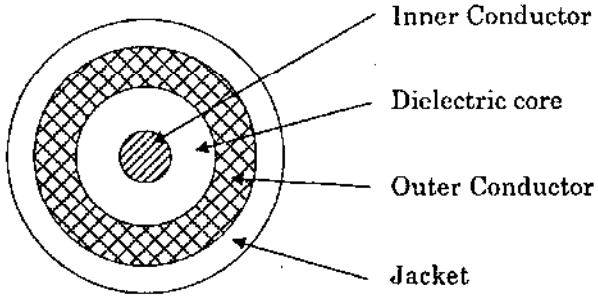


Figure 1.

NOTE :	MADE BY	M. Ohba
	APPROVALS	T. Nagawa

KURABE INDUSTRIAL CO., LTD

SP3830M-X	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE (FWS 5022)	PAGE	2/4
PRODUCT STANDARD		ISSUED	17-9-2001
		REVISED	

Table 1. Construction

Item		Unit	Specified Value
Inner Conductor	Material	—	Silver coated annealed copper wire
	Stranding	No./mm	7/0.08
	Dia.(approx.)		0.24
Dielectric Core	Material	—	FEP
	Thick.(nom.)	mm	0.22
	Dia.	mm	0.68±0.05
	Color	—	Natural
Outer Conductor	Material	—	Silver coated annealed copper wire
	Type	—	Braid (16/4/0.05)
	Dia.(approx)	mm	0.93
Jacket	Material	—	FEP
	Thick.(nom.)	mm	0.10
	Dia.	mm	1.13 +0.10/-0.06
	Color	—	Standard colors are white,black,blue,brown,and gray.

Table 2. Performance

Item	Unit	Specified Value	Note
Appearance	—	Faultless in visible	—
Inner conductor resistance	Ω/km	Max.597	at 20℃
Insulation resistance	MΩ·km	Min.1500	at 20℃
Dielectric strength	—	Dielectric core: No breakdown at AC1.5kV for 0.15sec.	Spark test
		Jacket: No breakdown at AC1.5kV for 0.15sec.	Spark test
		No breakdown at AC500V for 1min.	Outer conductor to inner conductor
Heat resistance for solder	—	Shrink or expansion of dielectric core are not more than 0.5mm	※
Capacitance	pF/m	nom. 98	at 1kHz
Characteristic impedance	Ω	50±2	TDR method
Attenuation (nom.)	dB/m	2.0	1.0GHz
		2.9	2.0GHZ
		3.6	3.0GHz
		4.2	4.0GHz
		4.7	5.0GHz
		5.2	6.0GHz

※ After immersion of dielectric core, 10mm into soldering pot which is 230℃ for 5 seconds, shrinkage or expansion of the dielectric core must not exceed 0.5mm.

NOTE :	MADE BY	M. Ohba
	APPROVALS	T. Kawazoe

SP3830M-X	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE (FWS 5022)	PAGE	3/4
PRODUCT STANDARD		ISSUED	17-9-2001
		REVISED	

4. INSPECTION

An inspection is took place in accordance with applicable test methods. The cable has to pass the specifications described Table 1 and Table 2.

5. TEST METHOD

The test methods are in accordance with applicable test methods described in JIS C 3005 (Test methods for rubber or plastic insulated wires and cables).

6. TEMPERATURE RATING

150 ℃

7. VOLATGE LATING

250 V

8. MARKING ON TAG

Each reel of finished cable is tagged to indicate following information:

(1) Designation of the cable,
(2) Conductor size,
(3) Length,
(4) Date of manufacture or LOT No.,
(5) Specification No., and
(6) Manufacture's name.

9. PACKAGE

The finished cables are cut into a shipping length of 200 meters, reeled to paper bobbin and packed securely to prevent injuries during transportation. Odd length of the finished wires should be accepted for shipping according to the condition of mutual agreement.

In the case no agreement is found, the condition stated in quotation shall prevail.

10. APPLICATION NOTES

10-1. For use other than the use mutually agreed, compatibility should be carefully confirmed in each practical use by user.

10-2. It is recommended to make a trial run for each practical application.

NOTE :	MADE BY	M. Ohba
	APPROVALS	T. Kawasaki

SP3830M-X	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE (FWS 5022)	PAGE	4/4
PRODUCT STANDARD		ISSUED	17-9-2001
		REVISED	

10-3. In case a design for use of cable is changed, please contact our sales department, if necessary. Do not use under extreme mechanical stress such as hard bending, tightening, and twisting. The use under extreme mechanical stress may cause not only shortening the life span of cable but also troubles such as decline of dielectric strength.

10-4. Handling precautions

①Do not hurt the insulation and sheath of the cable by making holes and scratches. And avoid any sharp edge when wiring so as not to injure cables.

②Avoid unnecessary excessive force to cable, such as pulling, twisting, bending or tightening.

10-5. Storage precautions

Avoid continuous exposure to sunlight.

NOTE :	MADE BY	M. Ohba
	APPROVALS	T. Kawasawa

PRODUCT SPECIFICATION
製 品 規 格

No. PRS-1176

MHF series micro coaxial connector

Qualification Test Report No. TR-1021

REV.	ECN	BY	DATE	APP.
2	S2031	K.O	May/17/'02	K.K
1	S1053	K.O	Nov/14/'01	K.K
0	S1025	K.O	Jun/25/'01	
REVISION RECORD				

Prepared by	Reviewed by	Approved by
K.Ohbayashi	E,Kawabe	K.Katabuchi
JUN / 25 / 01	Jun / 25 / 01	Jun / 29 / 01

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

1. Scope ／ 序言

MHF series micro coaxial connector is a wire to board connector for AWG#36,32,30 coaxial cable .
MHF series micro coaxial connector は、AWG＃36,32,30同軸ケーブルの基板対ワイヤーコネクタである。

2. Objectives ／ 目的

This specification covers the requirements for product performance and test methods of MHF series microcoaxial connector
本規格は、MHF series micro coaxial connector の性能と試験条件について規定する。

3. Part No. , construction , material and finish ／ 構成、材料及び仕上げ

(1) Part No. Plug : 20278-＊＊＊R-08,-13,-18 , Receptacle : 20279-001E-01
(2) Construction, material and finish of the connector are covered as each drawings.
構成、材料及び仕上げは、各図面に指定されている通りとする。

4. Applicable cable ／ 適合ケーブル

4-1 Part No. 20278-001R-08, 20278-011R-08

(1) Description

Inner conductor : AWG#36(7/0.05)
Silver plating annealed copper wire or silver plating tin-copper alloy
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
Jacket : Fluoro-plastics , diameter 0.81(+0.04,-0.02)mm , nominal thickness 0.08mm

(2) Requirements

Characteristic impedance : 50(+3,-3)ohm by TDR method (raise time 40ps)
Nominal capacitance: 96 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 1400 ohm/km MAX.
Insulation resistance : 1000 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成

中心導体 ： AWG＃36(7／0. 05),銀メッキ軟銅線または銀メッキナず入り銅線
誘電体 ： フッ素樹脂,外径0. 4(＋0. 04,－0. 02),標準厚さ0. 125mm
外部導体 ： 8／5／0. 05,標準外径0. 65mm, 銀メッキ軟銅線
ジャケット ： フッ素樹脂,外径0. 81(＋0. 04,－0. 02)mm, 標準厚さ0. 08mm

(2) 仕様

特性インピーダンス ： 50±3Ω (TDR,ライズタイム40ps)
標準静電容量 ： 96pF／m
293K(20℃)時の中心導体導体抵抗 ： 1400Ω ／km以下
絶縁抵抗 ： 1000MΩ ・km以上
耐電圧 ： AC1000V・1分間にて絶縁破壊の無い事

4-2 Part No. 20278-101R-13, 20278-111R-13

(1) Description

Inner conductor : AWG#32(7/0.08)
Silver plating annealed copper wire or silver plating tin-copper alloy
Dielectric core : Fluoro-plastics , diameter 0.68(+0.04,-0.02)mm , nominal thickness 0.22mm
Outer conductor : 16/4/0.05 , nominal diameter 0.93mm , silver plating annealed copper wire
Jacket : Fluoro-plastics , diameter 1.13(+0.08,-0.05)mm , nominal thickness 0.1mm

DOCUMENT CLASSIFICATION	TITLE	No.
Product Specification 製品規格	MHF series micro coaxial connector	PRS-1176

(2) Requirements
Characteristic impedance : 50(+2,-2)ohm by TDR method (raise time 40ps)
Nominal capacitance: 97 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 520 ohm/km MAX.
Insulation resistance : 1500 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成
中心導体 : AWG＃32(7／0. 08),銀メッキ軟銅線または銀メッキすず入り銅線
誘電体 : フッ素樹脂,外径0. 68(＋0. 04,－0. 02),標準厚さ0. 22mm
外部導体 : 16／4／0. 05,標準外径0. 93mm, 銀メッキ軟銅線
ジャケット : フッ素樹脂,外径1. 13(＋0. 08,－0. 05)mm, 標準厚さ0. 1mm

(2) 仕様
特性インピーダンス : 50±2Ω (TDR,ライズタイム40ps)
標準静電容量 : 97pF／m
293K(20℃)時の中心導体導体抵抗 : 520Ω ／km以下
絶縁抵抗 : 1500MΩ ・km以上
耐電圧 : AC1000V・1分間にて絶縁破壊の無い事

4-3 Part No. 20278-001R-32, 20278-011R-32

(1) Description
Inner conductor : AWG#32(7/0.08)
Silver plating annealed copper wire or silver plating tin-copper alloy
Dielectric core : Fluoro-plastics , diameter 0.66(+0.05,-0.05)mm , nominal thickness 0.21mm
First outer conductor : 16/5/0.05, tin plating annealed copper wire
Second outer conductor :16/6/0.05, nominal diameter 1.12mm , tin plating annealed copper wire
Jacket : Fluoro-plastics , diameter 1.32(+0.1,-0.1)mm , nominal thickness 0.1mm

(2) Requirements
Characteristic impedance : 50(+2,-2)ohm by TDR method (raise time 40ps)
Nominal capacitance: 95 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 520 ohm/km MAX.
Insulation resistance : 1500 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC1000V for 1 minutes.

(1) 構成
中心導体 : AWG＃32(7／0. 08),銀メッキ軟銅線または銀メッキすず入り銅線
誘電体 : フッ素樹脂,外径0. 66(＋0. 05,－0. 05),標準厚さ0. 21mm
外部導体(内側) : 16／5／0. 05,すずメッキ軟銅線
外部導体(外側) : 16／6／0. 05,標準外径1. 12mm, すずメッキ軟銅線
ジャケット : フッ素樹脂,外径1. 32(＋0. 1, －0. 1)mm, 標準厚さ0. 1mm

(2) 仕様
特性インピーダンス : 50±2Ω (TDR,ライズタイム40ps)
標準静電容量 : 95pF／m
293K(20℃)時の中心導体導体抵抗 : 520Ω ／km以下
絶縁抵抗 : 1500MΩ ・km以上
耐電圧 : AC1000V・1分間にて絶縁破壊の無い事

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4-4 Part No. 20278-001R-18, 20278-011R-18
RG178 B/U
(1) Description
Inner conductor : AWG#30(7/0.102) , silver plating copper clad steel wire
Dielectric core : Fluoro-plastics , diameter 0.84(+0.03,-0.03)mm , nominal thickness 0.268mm
Outer conductor : 16/3/0.1 , nominal diameter 1.35mm , silver plating copper wire
Jacket : Fluoro-plastics , diameter 1.8(+0.1,-0.1)mm , nominal thickness 0.23mm
(2) Requirements
Characteristic impedance : 50(+2,-2)ohm by TDR method (raise time 40ps)
Nominal capacitance: 95 pF/m
Conductor resistance of inner conductor at 293K (20℃) : 805 ohm/km MAX.
Insulation resistance : 1500 mega-ohm.km MIN.
Dielectric withstand voltage : no breakdown at AC2000V for 1 minutes.
(1) 構成
中心導体 ： AWG＃30(7／0．102),銀メッキ銅被鋼線
誘電体 ： フッ素樹脂,外径0．84(±0．03),標準厚さ0．268mm
外部導体 ： 16／3／0．1,標準外径1．35mm, 銀メッキ軟銅線
ジャケット ： フッ素樹脂,外径1．8(±0．1)mm, 標準厚さ0．23mm
(2) 仕様
特性インピーダンス ： 50±2Ω (TDR,ライズタイム40ps)
標準静電容量 ： 95pF／m
293K(20℃)時の中心導体導体抵抗 ： 805Ω ／km以下
絶縁抵抗 ： 1500MΩ ・km以上
耐電圧 ： AC2000V・1分間にて絶縁破壊の無い事

5. Ratings ／ 定格
(1) Rated voltage / 電圧 ： AC60Vrms
(2) Nominal characteristic impedance／公称特性インピーダンス ： 50Ω
(3) Frequency / 周波数 ： DC～3GHz
(4) VSWR ： 1．3 MAX.
(5) Service Temperature / 使用温度範囲 ： 233～363K(－40～＋90℃)

6. Test methods and performance ／ 試験及び性能

6-1 Test condition / 試験条件
Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202
全ての測定と試験は、MIL-STD-202 に基づき以下の条件で行う。.
Temperature / 温度 ： 288～308K (15～35℃)
Humidity / 湿度 ： 45～75%RH

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6-2 Sample quantity / 試料数

(1) Insulation resistance / 絶縁抵抗 : 10pcs.
(2) Dielectric withstanding voltage / 耐電圧 : 10pcs.
(3) VSWR : 5pcs.
(4) Unmating force / 抜去力 : 10pcs
(5) Durability / 耐久性 : 10pcs.
(6) Cable retention force / ケーブル保持力 : 10pcs.
(7) Vibration / 振動 : 10pcs.
(8) Shock / 衝撃 : 10pcs.
(9) Thermal shock / 温度サイクル : 10pcs.
(10) Humidity / 湿度 : 10pcs.
(11) Salt water spray / 塩水噴霧 : 10pcs.
(12) Solderability / 半田付け性 : 10pcs.
(13) Reflow soldering heat resistance / 半田耐熱性 : 10pcs.

6-3-1 Electrical / 電気的性能
(1) Contact Resistance / 接触抵抗

A.Testing: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 method. Apply the low level condition in accordance with MIL-STD-202, Method 307.
Open circuit voltage : 20mV MAX
Circuit current : 10mA MAX. (DC or AC1kHz)
Contact resistance of inner contact : <resistance of A-E> - <resistance of B-E>
Contact resistance of ground contact : <resistance of A-D> - <resistance of B-D>

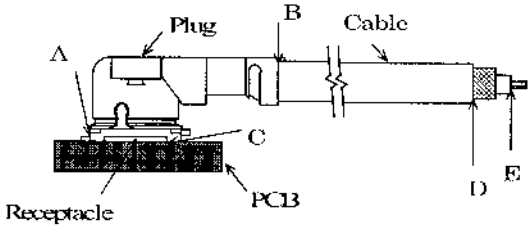

Fig.1

B.Requirements :
Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.
Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-olim MAX.

A.試験法:テスト基板にリセプタクルコネクタを半田付けし、プラグコネクタと嵌合させ、Fig. 1のように4端子法にて下記の条件で測定する。 MIL-STD-202 試験法 307 に準拠。
開回路電圧: 20mV以下
試験電流 : 10mA(DCもしくはAC1kHz)
中心導体 : <A E間の電気抵抗>－<B－E間の電気抵抗>
外部導体 : <A－D間の電気抵抗>－<B－D間の電気抵抗>
B.必要条件: 中心導体 初期 20mΩ 以下、試験後 25mΩ 以下
外部導体 初期 10mΩ 以下, 試験後 15mΩ 以下

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(2) Insulation resistance / 絶縁抵抗

A. Testing : Mate the plug and receptacle connector together, then apply DC 100 V between the inner contact and the ground contact in accordance with MIL-STD-202, Method 302.

B.Requirements : Initial 500 Mohm MIN. after testing 100 Mohm MIN.

A.試験法: リセプタクル及びプラグコネクタを互いに嵌合させ、中心導体と外部導体の間に DC 100Vを印加し、測定する。MIL-STD-202 試験法 302 に準拠。

B.必要条件: 初期 500MΩ 以上 試験後 100MΩ 以上

(3) Dielectric withstanding voltage / 耐電圧

A. Testing : Mate the receptacle and plug connector together, then apply AC 200 Vrms between the inner contact and the ground contact for a minute in accordance with MIL-STD-202, Method 301.

B.Requirements : No creeping discharge, flashover, nor insulator breakdown shall occur.

A.試験法: リセプタクル及びプラグコネクタを互いに嵌合させ、中心導体と外部導体の間にAC200V(実効値)を一分間印加する。 MIL-STD-202 試験法 301 に準拠。

B.必要条件: 沿面放電、空中放電、絶縁破壊等の異常のないこと。

(4) VSWR

A. Testing : Measure the VSWR as shown in Fig.3 by the network analyzer.

Frequency :100M~3GHz

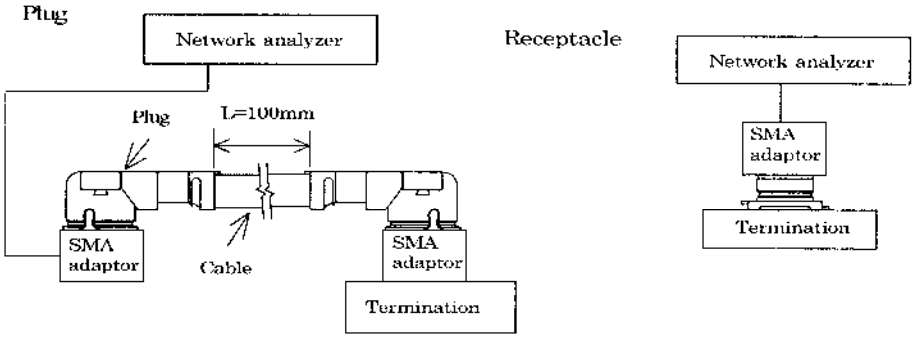

Fig.3

B.Requirements : 1.3 MAX.

A.試験法: ネットワークアナライザーにて Fig.3 のようにVSWRを測定する。
周波数 : 100M～3GHz

B.必要条件: 1．3以下

6-3-2 Mechanical / 機械的性能

(1) Unmating force / 抜去力

A. Testing : Unmate the receptacle connector (soldered to the test board) and plug at a speed 25±3mm/minutes along the mating by the push-on/pull-off machine .

B.Requirements :

Total unmating force : Initial 5N MIN. after 30 cycles 3N MIN.

Unmating force of inner contact : Initial 0.15N MIN. after 30 cycles 0.1N MIN

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A.試験法:挿抜試験機を用いて、基板に半田付けしたリセプタクルとプラグを嵌合軸と平行に毎分25±3mmの速度で挿抜する。

B.必要条件:

総合抜去力:初回抜去力 5N以上 ,30回後抜去力 3N以上

中心導体 :初回抜去力 0.15N以上 ,30回後抜去力 0.1N以上

(2) Durability / 耐久性

A. Testing : Mate and umate the receptacle connector (soldered to the test board) and plug 30 cycles at a speed 25±3mm/minutes along the mating by the push-on/pull-off machine .

B.Requirements :

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:挿抜試験機を用いて、基板に半田付けしたリセプタクルとプラグを嵌合軸と平行に毎分25±3mmの速度で30回挿抜する。

B.必要条件 中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

(3) Cable retention force / ケーブル保持力

A. Testing : Apply force on the cable as shown in Fig.2.

During the testing, run 100mA DC to check electrical discontinuity.

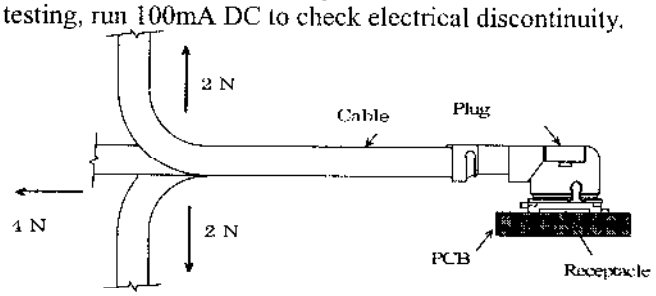

Fig.2

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Electrical discontinuity : No electrical discontinuity grater than 1 micro-sec. shall occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:Fig. 2のようにケーブルに力を加える。尚、試験中にDC100mAの電流を流して電気的瞬断を確認する。

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

電流瞬断 : 試験中、1マイクロ秒を超える電気的瞬断の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

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(4) Vibration / 振動

A. Testing : 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

B.Requirements
Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.
Electrical discontinuity : No electrical discontinuity grater than 1micro-sec. shall occur.
Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.
Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:嵌合状態のコネクタを、下記の振動を加える。尚、試験中にDC100mAの電流を流して電気的瞬断を確認する。
周波数 :10Hz→100Hz→10Hz ／ 約15分間
片振幅,加速度:1．5mm or 59m／s^2 (6G)
方向,サイクル:3つの互いに直角な方向について各5サイクル(約75分)実施

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1マイクロ秒を超える電気的瞬断の無いこと。
中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

(5) Shock / 衝撃

A. Testing : Apply the following vibration to the mating connector in accordance with MIL-STD-202, Method 213, Condition B. 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

B.Requirements
Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.
Electrical discontinuity : No electrical discontinuity grater than 1 micro-sec. shall occur.
Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.
Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

A.試験法:嵌合状態のコネクタを、衝撃試験機に取り付け、下記の衝撃を加える。尚、試験中にDC100mAの電流を流して電気的瞬断を確認する。MIN-STD-202 試験法 213 試験条件 B に準拠,
最大加速度:735m／s^2(75G)
標準持続時間:11msec.
波形: 半波正弦波
方向:直交する6方向、各3回

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。
電流瞬断 : 試験中、1マイクロ秒を超える電気的瞬断の無いこと。
中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下
外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

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6-3-3 Environmental / 耐環境性

(1) Thermal shock/ 温度サイクル

A. Testing : Apply the following environment to the mating connector .

Temperature ,duration

:233K/30minutes→278~308K/5minutes MAX.→363K/30minutes→278~308K/5minutes MAX.

(-40℃) (5~35℃) (90℃) (5~35℃)

No. of cycles : 5 cycles

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

Insulation resistance : initial 500 mega-ohm MIN. after testing 100 mega-ohm MIN.

A.試験法:嵌合状態のコネクタを、下記の雰囲気に放置する。

1サイクルの条件

:233K／30分→278～308K／5分以下→363K／30分→278～308K／5分以下

(－40℃) (5～35℃) (90℃) (5～35℃)

実施サイクル :5サイクル

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

絶縁抵抗 : 初期 500MΩ 以上 試験後 100MΩ 以上

(2) Humidity / 湿度

A. Testing : Apply the following environment to the mating connector in accordance with MIL-STD-202, Method 103, Condition B .

Temperature : 313±2 K (40±2℃)

Humidity : 90～95%RH

Duration : 96 hours

B.Requirements

Appearance : Looseness between the parts, chipping, breakage or other abnormality shall not occur.

Contact resistance of inner contact initial 20 milli-ohm MAX. after testing 25milli-ohm MAX.

Contact resistance of ground contact initial 10 milli-ohm MAX. after testing 15milli-ohm MAX.

Insulation resistance : initial 500 mega-ohm MIN. after testing 100 mega-ohm MIN.

A.試験法:嵌合状態のコネクタを、下記の雰囲気に放置する。MIL-STD-202 試験法 103 条件 B に準拠。

温度:313±2K (40±2℃)

湿度:90～95%RH

時間:96時間

B.必要条件 外観 : 部品のゆるみ、欠け、割れ、その他外観上の異常の無いこと。

中心導体接触抵抗 : 初期 20mΩ 以下, 試験後 25mΩ 以下

外部導体接触抵抗 : 初期 10mΩ 以下, 試験後 15mΩ 以下

絶縁抵抗 : 初期 500MΩ 以上 試験後 100MΩ 以上

(3) Salt water spray / 塩水噴霧

A. Testing : Apply the following environment to the mating connector in accordance with MIL-STD-202, Method 101, Condition B.

Temperature : 308±2 K (35±2℃)

Salt water density by weight : 5±1%

Duration : 48 hours

B.Requirements : Appearance no abnormality adversely affecting the performance shall occur.

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A.試験法:嵌合状態のコネクタを、下記の雰囲気に放置する。
温度 :308±2K (35±2℃)
塩水濃度:5±1%(重量比)
時間 :48時間
B.必要条件 : 外観 著しい腐食の無い事。

6-3-4 Solder / 半田付け関連

(1) Solderability / 半田付け性
A. Testing : Dip the solder tine of the contact in the solder bath at 518±5(245±5℃) for 5±0.5 sec. After immersing the tine in the flux of RMA or R type for 5 to 10 seconds in accordance with MIL-STD-202, Method 208.
B.Requirements : More than 95% of the dipped surface shall be evenly wet.
A.試験法:コンタクトの半田付け部を518±5K(245±5℃)の半田槽内に5±0. 5秒浸す。フラックスは、RMA 又は R 型を使用し 5～10 秒間浸すものとする。MIL-STD-202, 試験法 208 に準拠。
B.必要条件:浸した面積の 95%以上に半田がむらなく付着すること。

(2) Reflow soldering heat resistance / 半田耐熱性
A. Testing : Put on the receptacle connector to PCB , apply the heat 2 cycles as shown in Fig. 4

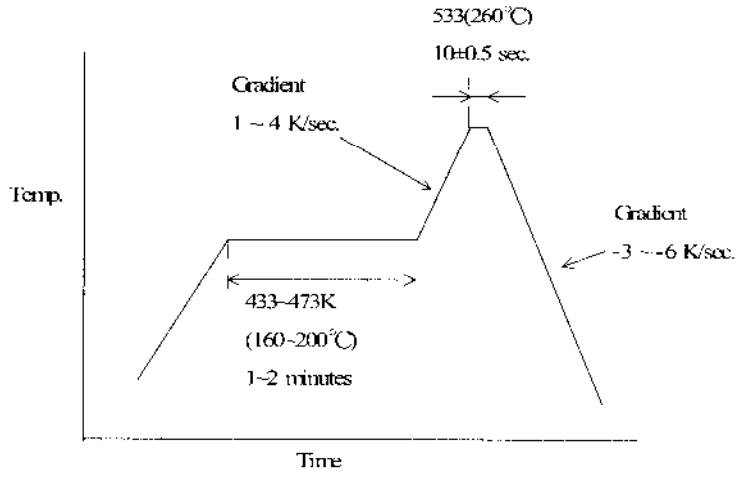

Fig.4

B.Requirements : Appearance no abnormality adversely affecting the performance shall occur.
A.試験法:基板にリセプタクルコネクタを置き、Fig. 4の条件で2回リフローを行う。
B.必要条件:機能を損なう変形及び欠陥の無い事。