

寰波科技股份有限公司
SmartAnt Telecom Co., Ltd.
6F, No. 12, Li-shing Road.,
Science-based Industrial Park
300 Hsin-chu, Taiwan R.O.C
Tel. (03) 578-3188 Fax. (03) 578-3189

Documents For Approval

Customer : Alpha Networkc Inc.

1. SmartAnt Product Name: **Dual Band Omni-Directional Antenna**
2. Part No: ALP05-220170
3. Document No: _____
4. Date: 2005.5.26
5. Customer approved Product Number: _____

Customer Evaluations:

- ☐ **Approved** (Date: _____)
- ☐ **Rejected** (Date: _____)
- ☐ **Limited** (Date: _____)
- ☐ **Conditional Approved** (Date: _____)
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- ◎ SmartAnt Telecom Approved By: Dallas Wu Date:05. 26. 2005
- ◎ SmartAnt Telecom Prepared By: Michael Chen Date:05. 26. 2005

Approval contents

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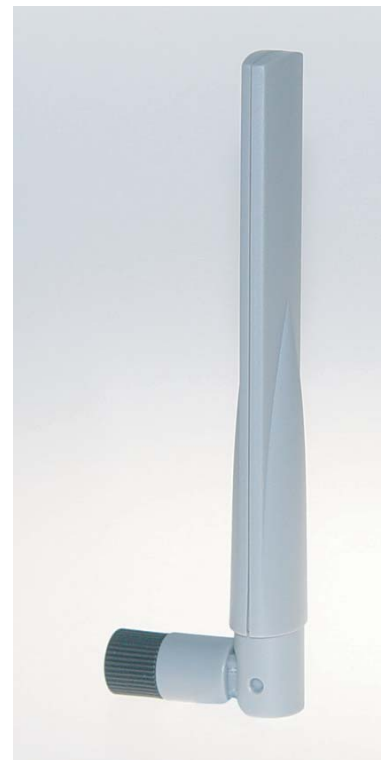
Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

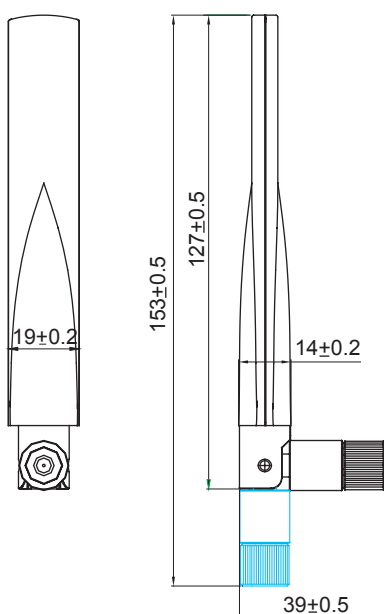
Electrical Specification

Frequency range	2400 MHz - 2500 MHz	4900 MHz - 5875 MHz
Peak Gain	2.5 dBi	5.5 dBi
Average Gain	1.5 dBi	3 dBi
VSWR	2.0 : 1 Max.	2.0 : 1 Max.
Polarization	Linear, vertical	Linear, vertical
HPBW / horizontal	360°	360°
HPBW / vertical	50°	25°
Power handling	2 W (cw)	2 W (cw)
Impedance	50 Ohms	50 Ohms
Connector	RP SMA Plug	

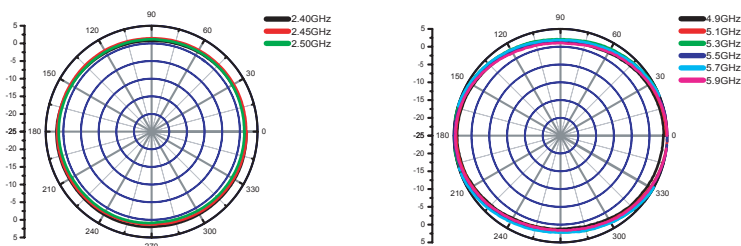


Environmental & Mechanical Characteristics

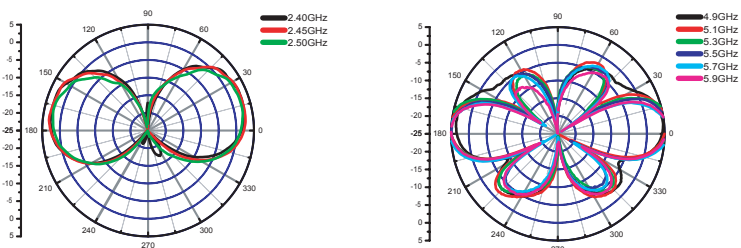
Temperature	- 10°C to + 55°C
Humidity	95% @ 25°C
Radome color	Gray
Radome material	PC ABS
Weight	21 g
Dimensions	19 x 42 x 156 mm



H-plane Co-polarization Pattern



V-plane Co-polarization Pattern



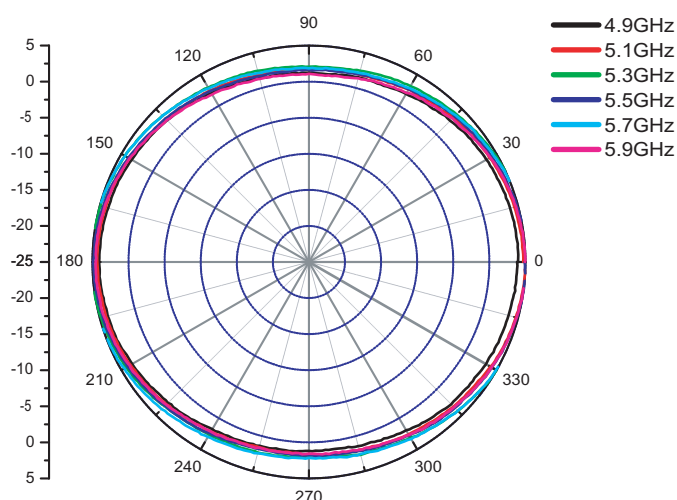
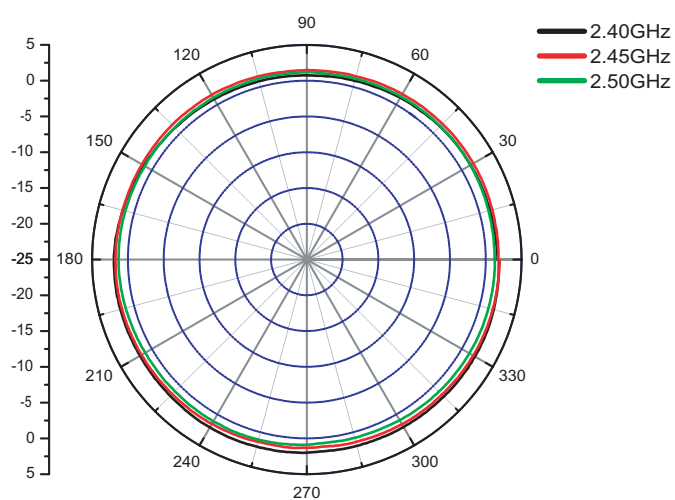
Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

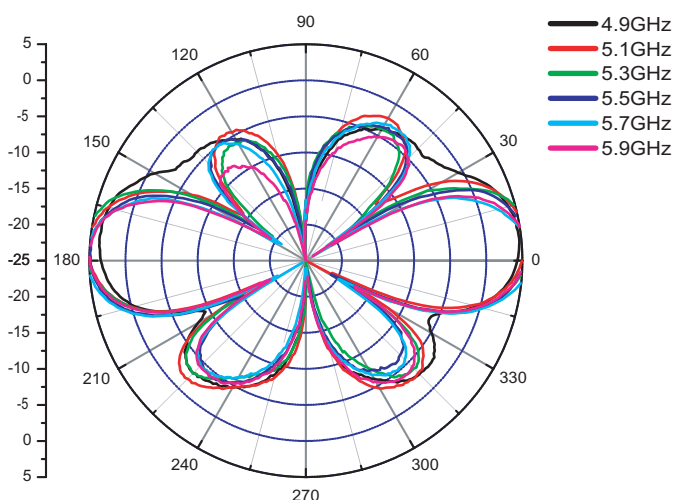
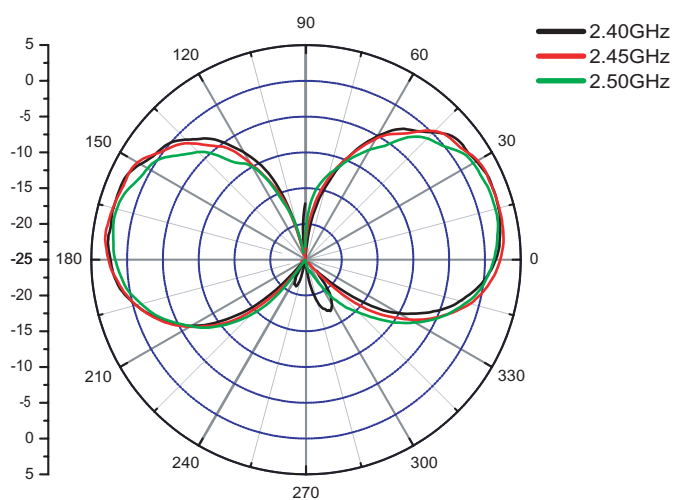
ALP05-220170

Radiation Pattern

H-plane Co-polarization Pattern



V-plane Co-polarization Pattern

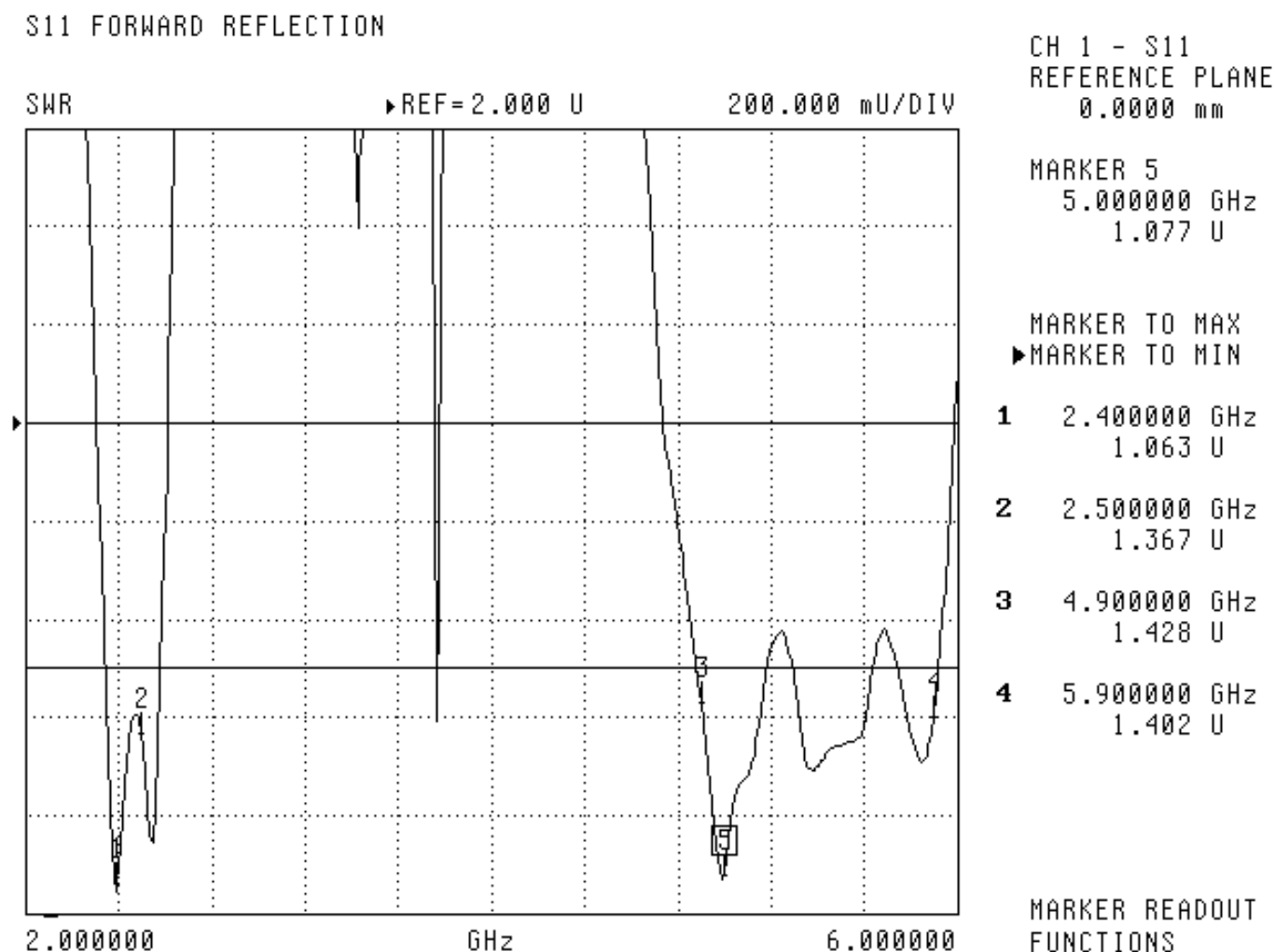


Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

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VSWR

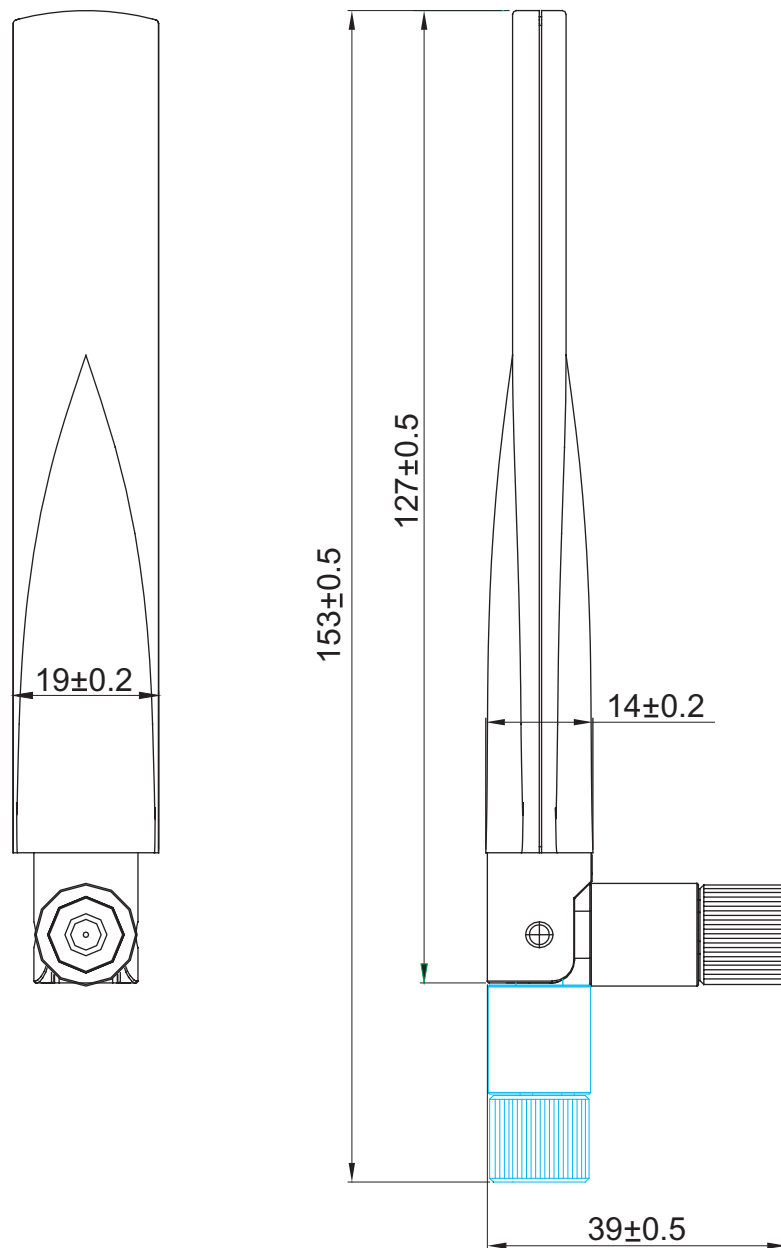


Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

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Product Drawing



Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 1

ALP05-220170

Material Approval - PCB

ROGERS
CORPORATION

Advanced Circuit Materials

Advanced Circuit Materials Division
100 S. Roosevelt Avenue
Chandler, AZ 85226
Tel: 480-961-1382, Fax: 480-961-4533
www.rogerscorporation.com

Data Sheet
RO1.4000

RO4000® Series High Frequency Circuit Materials

PROPERTY	TYPICAL VALUE		DIRECTION	UNITS	CONDITION	TEST METHOD
	RO4003C	RO4350B ⁽¹⁾				
Dielectric Constant, ϵ_r	3.38±0.05	3.48±0.05 ⁽²⁾	Z	--	10 GHz/23°C 2.5 GHz/23°C	IPC-TM-650 2.5.5.5
Dissipation Factor tan, δ	0.0027 0.0021	0.0037 0.0031	Z	--	10 GHz/23°C 2.5 GHz/23°C	IPC-TM-650 2.5.5.5
Thermal Coefficient of ϵ_r	+40	+50	Z	ppm/°C	-100°C to 250°C	IPC-TM-650 2.5.5.5
Volume Resistivity	1.7 X 10 ¹⁰	1.2 X 10 ¹⁰		MΩ•cm	COND A	IPC-TM-650 2.5.17.1
Surface Resistivity	4.2 X 10 ⁹	5.7 X 10 ⁹		MΩ	COND A	IPC-TM-650 2.5.17.1
Electrical Strength	31.2 (780)	31.2 (780)	Z	KV/mm (V/mil)	0.51mm (0.020")	IPC-TM-650 2.5.6.2
Tensile Modulus	26,889 (3900)	11,473 (1664)	Y	MPa (kpsi)	RT	ASTM D638
Tensile Strength	141 (20.4)	175 (25.4)	Y	MPa (kpsi)	RT	ASTM D638
Flexural Strength	276 (40)	255 (37)	-	MPa (kpsi)		IPC-TM-650 2.4.4
Dimensional Stability	<0.3	<0.5	X,Y	mm/m (mils/inch)	after etch +E2/150°	IPC-TM-650 2.4.39A
Coefficient of Thermal Expansion	11	14	X	ppm/°C	-55 to 288°C	IPC-TM-650 2.1.41
	14	16	Y			
	46	50	Z			
Tg	>280	>280	-	°C	A	IPC-TM-650 2.4.24
Thermal Conductivity	0.64	0.62	-	W/m²K	100°C	ASTM F433
Moisture Absorption	0.04 .	0.04	-	%	48 hrs immersion 0.060" sample Temperature 50°C	ASTM D570
Density	1.79	1.86	-	gm/cm³	23°C	ASTM D792
Copper Peel Strength	1.05 (6.0)	0.88 (5.0)		N/mm (pli)	after solder float 1 oz. EDC Foil	IPC-TM-650 2.4.8
Flammability	N/A	94V-0				UL

STANDARD THICKNESS:	STANDARD PANEL SIZE:	STANDARD COPPER CLADDING:
RO4003C®: 0.008" (0.203mm), 0.020" (0.508mm) 0.032" (0.813mm), 0.060" (1.524mm)	12" X 18" (305 X 457 mm) 24" X 18" (610 X 457 mm) 24" X 36" (610 X 915 mm) 48" X 36" (1.224 m X 915 mm)	½ oz. (17µm), 1 oz. (34µm) and 2 oz. (70µm) electrodeposited copper foil.
RO4350B: 0.004" (0.101mm), 0.0066" (0.168mm) 0.010" (0.254mm), 0.020" (0.508mm) 0.030" (0.762mm), 0.060" (1.524mm)		

(1) Dielectric constant and loss tangent are reported based on IPC-TM-2.5.5.5 @ GHz (stripline resonator). Departure from this test method or frequency may yield different values. It has been reported that in some microstrip applications, a Delta (Δ) of 0.2 in dielectric constant has been observed for both RO4003C and RO4350B based on actual circuit measurement and circuit modeling comparisons. It is up to the user to determine which value best fits the application and modeling software used during the design process while Rogers ensures the repeatability of the product received.

(2) Dielectric constant typical value does not apply to 0.004 (0.101mm) laminates. Dielectric constant specification value for 0.004 RO4350B material is 3.36 ± 0.05.

Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Connector(1/2)

REV:1

SPECIFICATIONS									
VOLTAGE WITHSTANDING	AC500V		REMARK						
CURRENT RATING	1A								
IMPEDANCE	50 Ω								
FREQUENCY RANGE	6 GHz								
CABLE TYPE	RG 178								
WEIGHT									
STANDARD SPEC									
NO	ITEM	CONDITION	SPEC.				CHECK(1)		
			MAX	MIN	UNIT	TIME	A	B	
1	THREAD	USE GO -NO GO GAUGE TEST					-	○	
2	INSULATION RESISTANCE	DC 500V, >5000 M Ω		5000	M Ω		-	○	
3	VSWR	6 GHz, ≤ 1.5	1.5				-	○	
4	Salt Spray	Min. 48 Hours		48	hrs		-	○	
5	TEMPERATURE RANGE	-20 $^{\circ}$ C~85 $^{\circ}$ C							
6									
PART NAME			CONTROL NO.		RECORD		CHECK		APPROVED
RP SSMA-BBL									
DWG. NO.			ASS'Y DWG. NO.		Lily		Irven		John
					11/12-03'		11/12-03'		11/12-03'

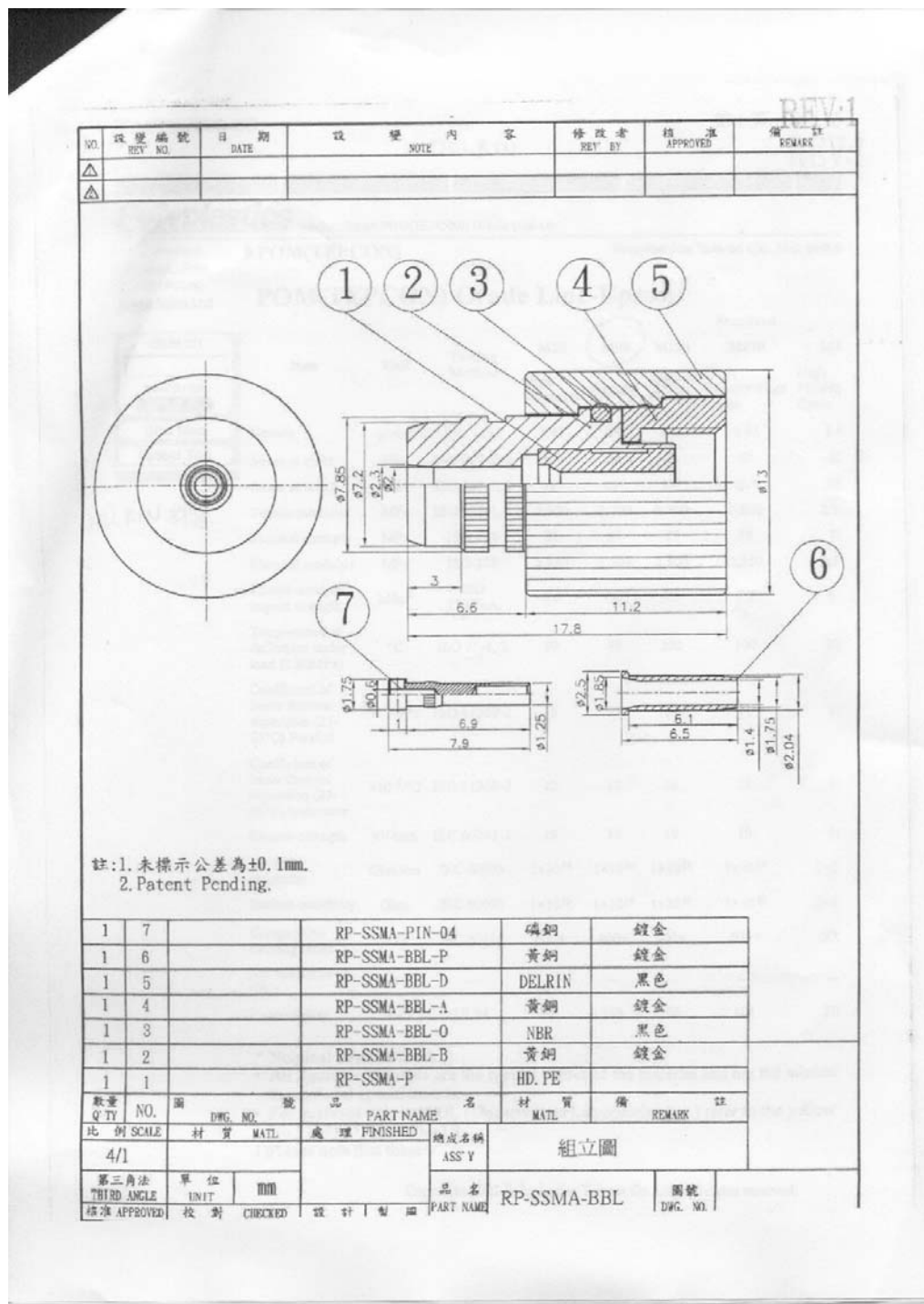
(1) A : OFTEN CHECK B : REGULAR CHECK

Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Connector(2/2)



Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Radome(1/5)

ABS Characteristics

POLYLAC

6001-0018 Rev. 1

特性 Typical Properties	試驗法 ASTM Test	單位 Units	一般級 (General Purpose)					
			PA-707	PA-757	PA-717C	PA-727	PA-747	PA-709
引張強度 Tensile Strength	D-638	kg/cm ² (lb/in ²)	500 (7090)	480 (6800)	450 (6380)	485 (6870)	385 (5470)	400 (5670)
延伸率 Tensile Elongation	D-638	%	15	20	25	20	30	40
彎曲彈性率 Flexural Modulus	D-790	10 ⁴ kg/cm ² (10 ⁵ lb/in ²)	2.9 (4.1)	2.7 (3.8)	2.5 (3.5)	2.7 (3.8)	2.2 (3.1)	2.3 (3.2)
彎曲強度 Flexural Strength	D-790	kg/cm ² (lb/in ²)	860 (12200)	790 (11200)	720 (10200)	780 (11000)	620 (8800)	640 (9070)
洛氏硬度 Rockwell- Hardness	D-785		R-116	R-116	R-115	R-110	R-108	R-102
IZOD 衝擊強度 (NOTCHED) IZOD Impact Strength	D-256	1/8" kg-cm/cm (ft-lb/in)	14 (2.6)	20 (3.7)	28 (5.2)	26 (4.8)	41 (7.5)	45 (8.4)
		1/4" kg-cm/cm (ft-lb/in)	14 (2.6)	18 (3.3)	25 (4.6)	23 (4.2)	36 (6.6)	40 (7.4)
軟化點 Vicat Softening Temp.	D-1525	°C (°F)	105 (221)	105 (221)	104 (219)	105 (221)	103 (217)	105 (221)
熱變形溫度 H.D.T. (annealed) (unannealed)	D-648 (annealed) (unannealed)	°C (°F)	99(210) 88(190)	99(210) 88(190)	98(208) 87(189)	99(210) 88(190)	97(206) 86(187)	98(208) 88(190)
比重 Specific Gravity	D-792	23/23 °C	1.06	1.05	1.04	1.04	1.03	1.03
流動係數 Melt Flow Index	D-1238	200 °C X 5kg g/10min(Cond.G)	1.9	1.8	1.2	1.8	1.2	0.5
	ISO-1133	220 °C X 10kg g/10min	20	22	12	19	13	5
燃燒率 Flammability	File No. E56070 UL & C-UL		1/16"HB	1/16"HB	1/16"HB	1/16"HB	1/16"HB	1/16"HB
產品特性			高光澤性 高剛性	高剛性 高光澤性	一般射出 成型用	電鍍用	超高強度 射出成型用	超高衝擊 性管片
Product Description			High Gloss High Rigid	High Gloss Medium Impact	Medium Impact	Electro- Plating	High Impact	Super Impact

以上所列數據係根據 ASTM 試驗方法所測得，僅供參考用。* ISO 試驗方法

Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Radome(2/5)

防火級 (Flame Retardant)						耐熱級 (High Heat)		
PA-766	PA-765	PA-765A	PA-765B	PA-764	PA-764B	PA-777B	PA-777D	PA-777E
380 (400)	390 (5,530)	400 (5,670)	400 (5,670)	370 (5,250)	430 (6,100)	430 (6,100)	440 (6,240)	440 (6,240)
30	15	15	25	15	20	15	15	10
2.0 (2.8)	2.1 (3.0)	2.3 (3.2)	2.4 (3.4)	2.0 (2.8)	2.3 (3.2)	2.4 (3.4)	2.5 (3.5)	2.5 (3.5)
690 (360)	620 (8,800)	640 (9,070)	650 (9,200)	590 (8,360)	660 (9,370)	700 (9,920)	750 (10,630)	750 (10,630)
R-95	R-100	R-100	R-102	R-96	R-102	R-112	R-115	R-115
13 (.3)	22 (4.0)	24 (4.4)	26 (4.8)	14 (2.6)	20 (3.7)	23 (4.3)	17 (3.2)	12 (2.2)
11 (.9)	18 (3.3)	20 (3.7)	22 (4.0)	12 (2.2)	15 (2.8)	20 (3.7)	14 (2.6)	11 (2.0)
18 (14)	90 (194)	92 (197)	95 (203)	97 (208)	101 (214)	115 (239)	125 (257)	129 (264)
192 (178)	83(181) 73(165)	85(185) 76(179)	86(187) 79(174)	92(198) 79(174)	96(205) 81(178)	107(225) 97(206)	115(239) 105(221)	120(248) 109(228)
20	1.19	1.17	1.16	1.19	1.16	1.03	1.06	1.07
3	5.2	4.8	4.2	3.3	2.8	—	—	—
5	60	48	42	33	28	6.7	6.0	5.0
1/16"V-O 1/10"5VA	1/12"V-O 1/10"5VA	1/10"V-O 1/16"V-2 1/8"5VA	1/16"V-O 1/10"5VA	1/10"V-O 1/8"5VA	1/16"V-O 1/10"5VA	1/16"HB	1/16"HB	1/16"HB
耐熱性 耐光性	耐熱性 耐光性	耐熱性 耐光性	耐熱性 耐光性	耐熱性 耐光性	耐熱性 耐光性	耐熱性	超耐熱性	超耐熱性
Flum act	E.R. High Flow	E.R. High Flow	E.R. Medium Impact	E.R. Weather Resistant	E.R. Weather Resistant	High Heat High Impact	Super High Heat	Super High Heat

1-0 9708 x2000

Dual-Band Omni-Directional Antenna

for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Radome(3/5)

日本帝人化成聚碳酸酯樹脂 POLYCARBONATE RESIN "TEIJIN PANLITE"

品名	規格	特 性	比 重	透 光 率	電 阻 率	電 導 率	熱 膨 脹 係 數	熱 收 縮 係 數	防火等級
			g/cm ³	3.0mm厚 %	Ω·cm	10 ⁻¹⁴ S/cm	1/100℃	3mm厚 %	
高粘度級 PANLITE	KV-2300Y (K-1300Y)	押出吹出射出高粘度 冰色	1.2	89	22,300	85	138℃	0.5 ~ 0.7	V-2
	KV-2300 (K-1300)	押出吹出射出標準型	1.2	89	22,300	85	138℃	0.5 ~ 0.7	V-2
	KV-2300Z (K-1300Z)	押出吹出射出耐熱性 冰色	1.2	88	22,800	90	131℃	0.5 ~ 0.7	V-2
	K-1300W	粉狀押出標準型	1.2	半透明	22,300	90	-	-	V-2
中高粘度級 PANLITE	KV-2285 K-1285	標準押出・射出級	1.2	89	22,400	85	138℃	0.5 ~ 0.7	V-2
	KV-2285ZC (K-1285ZC)	高粘度押出射出耐熱級	1.2	89	22,400	85	138℃	0.5 ~ 0.7	V-2
中粘度級 PANLITE	LV-2250 (L-1250)	標準色射出級	1.2	89	22,700	90	133℃	0.5 ~ 0.7	V-2
	LV-2250R (L-1250R)	易成型射出級	1.2	89	22,700	90	133℃	0.5 ~ 0.7	V-2
	LV-2250Y (L-1250Y)	易成型射出冰色	1.2	88	22,700	90	133℃	0.5 ~ 0.7	V-2
	LV-2250Z (L-1250Z)	易成型冰色耐熱性	1.2	88	22,700	90	133℃	0.5 ~ 0.7	V-2
	L-1250J	易成型耐熱水型	1.2	89	22,700	90	133℃	0.5 ~ 0.7	V-2
	L-1250T	易成型耐熱水、冰色	1.2	88	22,700	90	133℃	0.5 ~ 0.7	V-2
	L-1250W	射出・旋轉成型粉狀	1.2	-	-	-	-	-	-
低粘度級 PANLITE	LV-2225 (L-1225)	標準型射出級	1.2	89	23,000	85	132℃	0.5 ~ 0.7	V-2
	LV-2225R (L-1225R)	射出成型標準型	1.2	89	23,000	85	132℃	0.5 ~ 0.7	V-2
	LV-2225Y (L-1225Y)	射出・吹出標準型、 冰色	1.2	88	23,000	85	132℃	0.5 ~ 0.7	V-2
	L-1225J	射出・耐熱水	1.2	88	23,500	85	132℃	0.5 ~ 0.7	V-2
	L-1225T	射出・吹出・耐熱型、 耐熱水、冰色	1.2	88	23,000	85	132℃	0.5 ~ 0.7	V-2
	L-1225W	射出・旋轉成型粉狀	1.2	-	-	-	-	-	-
超低粘度級 PANLITE	LV-2225L (L-1225L)	射出標準型、冰色	1.2	88	23,300	80	131℃	0.5 ~ 0.7	V-2
	L-1225 ZL-100	射出標準型、耐熱、 冰色	1.2	88	23,800	55	128℃	0.5 ~ 0.7	V-2
	LV-2225Z (L-1225Z)	射出耐熱木質標準級	1.2	90	23,100	80	132℃	0.5 ~ 0.7	
	AD-5303	高機械強度力強	1.2	90	24,000	5	128℃	0.5 ~ 0.7	

◎ 以上表所列數值 僅供參考用

94-V1

JUL 11 2003 01:22PM

PHONE NO. : 886 2 2683252

FROM : JI GIN ENTERPRISE CO

Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Radome(4/5)

QMFZ2.E50075 - Test Results - Certification

 Online Certifications Directory

QMFZ2.E50075

TELJIN CHEMICALS LTD
HIBIYA DAIBIRU BLDG
2-2 UCHISAIWAI-CHO 1-CHOME
CHIYODA-KU
TOKYO 100-0011, JAPAN

E50075

Material Dsg	Color	Min. mm	Flame Class	H		RTI		H		D		
				W	A	Elec	Mech	T	9	C		
				I	I			Imp	Str	R	S	I
Acrylic/Polycarbonate (A/PC), designated "Metamarble" furnished as pellets.												
PW-1000N	ALL	1.5	V-1	2	0	50	50	50	—	—	—	—
		3.0	V-0	2	0	50	50	50	4	7	0	0
		6.0	V-0	1	1	50	50	50	—	—	—	—
Acrylonitrile Butadiene Styrene/Polycarbonate (ABS/PC), carbon fiber and glass reinforced, designated "Panlite" furnished as pellets.												
BN-32(cc)N#	BK	0.75	V-0	—	—	60	60	60	—	—	—	—
BN-33(cc)N#	BK	0.75	V-0	—	—	60	60	60	—	—	—	—
Acrylonitrile Butadiene Styrene/Polycarbonate (ABS/PC), carbon fiber reinforced, designated "Panlite" furnished as pellets.												
BN-31(k)N#	ALL	0.75	V-0	—	—	60	60	60	—	—	—	—
Polybutylene Naphthalate (PBN), furnished as pellets.												
C10(zz)(++)	ALL	0.75	HB	4	3	50	50	50	—	—	—	—
		1.5	HB	3	3	50	50	50	—	—	—	—
		3.0	HB	3	3	50	50	50	2	5	3	3
C1000(++)	ALL	0.75	HB	4	2	50	50	50	—	—	—	—

FROM : JI GIN ENTERPRISE CO
PHONE NO. : 886 2 2693252
JUL 11 2003 03:24P

Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 0.1

ALP05-220170

Material Approval - Radome(5/5)

QMFZ2.E50075 - Plastic - Component											
3.0	V-2	2	0	125	115	125	2	5	2		
6.0	V-0	1	0	125	115	125					
KV-2300#(Z), KV-2300U#, KV-2300V#, KV-2300Z#											
ALL	0.38	V-2	4	4	80	80	80				
	1.5	V-2	2	0	125	115	125				
	3.0	V-2	2	0	125	115	125	2	5	2	
	6.0	V-0	0	0	125	115	125				
L-1225#(Z), L-1225U#, L-1225V#, L-1225Z#(F1)											
ALL	0.40	V-2	4	3	80	80	80	2			
	0.75	V-2	3	1	80	80	80	2			
	1.5	V-2	3	1	125	115	125	3			
	1.9	HB	3	1	125	115	125	3			
	3.0	HB	2	1	125	115	125	3	5	2	
	6.0	HB	1	1	125	115	125	4			
L-1225LL	ALL	0.40	V-2	4	3	80	80	80			
	0.75	V-2	3	1	80	80	80				
	1.5	V-2	3	1	125	115	125				
	3.0	V-2	2	1	125	115	125	2	5	2	
	3.3	HB	2	1	125	115	125				
	6.0	HB	1	1	125	115	125				
L-1225LM, L-1225ZL											
ALL	0.40	V-2	4	3	80	80	80				
	0.75	V-2	3	1	80	80	80				
	1.5	V-2	3	1	125	115	125				
	2.1	HB	3	1	125	115	125				
	3.0	HB	2	1	125	115	125	2	5	2	
	6.0	HB	1	1	125	115	125				
L-1250#(Z), L-1250U#, L-1250V#, L-1250Z#(F1)											
ALL	0.40	V-2	4	3	80	80	80	2			
	0.84	V-2	4	3	80	80	80	4			
	1.5	HB	4	0	125	115	125	3			
	3.0	HB	1	0	125	115	125	3	5	2	
	6.0	HB	1	0	125	115	125	4			
LD-1000#	WT	0.44	V-2	4	0	80	80	80			