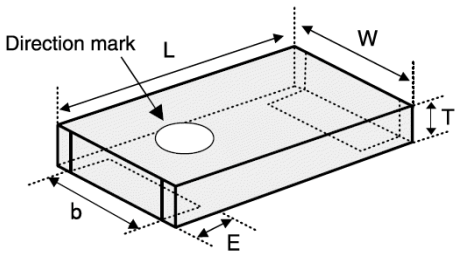
Spec Sheet

Chip Antennas(Multilayer)

AH316M245001-T



Features

- Item Summary

  MonoPole, 3.2x1.6x0.5mm,

  for Bluetooth/W-LAN/ZigBee
- Lifecycle Stage

  New PN available
- Standard packaging quantity (minimum)

  Taping Embossed 3000pcs

Products characteristics table

System	Bluetooth/W-LAN/ZigBee
Frequency Band Width	2400 to 2500 MHz
Center Frequency	2450 MHz
Gain1 (Peak Gain)(typ)	+1.6 dBi
Gain2 (Ave. Gain at OMNI plane)	-0.1 dBi
Efficiency (typ)	-1.4 dB (72 %)
VSWR (typ)	3
Type	MonoPole
Operating Temp. Range	-40 to +85 ℃
RoHS Compliance (10 subst.)	Yes
REACH Compliance (223 subst.)	Yes
Halogen Free	Yes
Soldering	Reflow

External Dimensions

Dimension L	3.2 ±0.15 mm
Dimension W	1.6 ±0.15 mm
Dimension T	0.5 ±0.1 mm
Dimension E	0.5 ±0.2 mm
Dimension b	Min 1.0 mm

2022.06.09

■Notice for TAIYO YUDEN Products

Please read this notice before using the TAIYO YUDEN products.

REMINDERS

- Please conduct validation and verification of our products in actual condition of mounting and operating environment before using our products.
- The product listed in this spec sheet is intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC). Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment, disaster prevention equipment, medical equipment classified as Class I, II or III by IMDRF, highly public information network equipment including, without limitation, telephone exchange, and base station).
  Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment, medical equipment classified as Class IV by IMDRF, nuclear control equipment, undersea equipment, military equipment).
  When our products are used even for high safety and/or reliability-required devices or circuits of general electronic equipment, it is strongly recommended to perform a thorough safety evaluation prior to use of our products and to install a protection circuit as necessary.
  Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the product listed in this spec sheet for any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.
- Information contained in this spec sheet is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.
- Please note that the scope of warranty for our products is limited to the delivered our products themselves and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a fault or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement.
- The contents of this spec sheet are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter “TAIYO YUDEN’s official sales channel”). Please note that the contents of this spec sheet are not applicable to our products purchased from any seller other than TAIYO YUDEN’s official sales channel.
- Caution for Export
  The product listed in this spec sheet may require specific procedures for export according to “U.S. Export Administration Regulations”, “Foreign Exchange and Foreign Trade Control Law” of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

Notice for TAIYO YUDEN Products

Please read this notice before using the TAIYO YUDEN products.

⚠ REMINDERS

Product Information in this Catalog

Product information in this catalog is as of October 2021. All of the contents specified herein and production status of the products listed in this catalog are subject to change without notice due to technical improvement of our products, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual product specification sheets.

Approval of Product Specifications

Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available. When using our products, please be sure to approve our product specifications or make a written agreement on the product specification with TAIYO YUDEN in advance.

Pre-Evaluation in the Actual Equipment and Conditions

Please conduct validation and verification of our products in actual conditions of mounting and operating environment before using our products.

Safety Design

When using our products for high safety and/or reliability-required equipment or circuits, please fully perform safety and/or reliability evaluation. In addition, please install (i) systems equipped with a protection circuit and a protection device and/or (ii) systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault for a failsafe design to ensure safety.

Intellectual Property Rights

Information contained in this catalog is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.

Limited Warranty

Please note that the scope of warranty for our products is limited to the delivered our products themselves conforming to the product specifications specified in the individual product specification sheets, and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a failure or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement, provided, however, that our products shall be used for general-purpose and standard use in the equipment specified in this catalog or the individual product specification sheets.

TAIYO YUDEN's Official Sales Channel

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Caution for Export

Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

Limited Application

1. Equipment Intended for Use

The products listed in this catalog are intended for general-purpose and standard use in general electronic equipment for consumer (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets, or the equipment approved separately by TAIYO YUDEN.
TAIYO YUDEN has the product series intended for use in the following equipment. Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

Application	Product Series		Quality Grade *3
	Equipment *1	Category (Part Number Code *2)	
Automotive	Automotive Electronic Equipment (POWERTRAIN, SAFETY)	A	1
	Automotive Electronic Equipment (BODY & CHASSIS, INFOTAINMENT)	C	2
Industrial	Telecommunications Infrastructure and Industrial Equipment	B	2
Medical	Medical Devices classified as GHTF Class C (Japan Class III)	M	2
	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	L	3
Consumer	General Electronic Equipment	S	3

*Notes: 1. Based on the general specifications required for electronic components for such equipment, which are recognized by TAIYO YUDEN, the use of each product series for the equipment is recommended. Please be sure to contact TAIYO YUDEN before using our products for equipment other than those covered by the product series.
2. On each of our part number, the 2nd code from the left is a code indicating the “Category” as shown in the above table. For details, please check the explanatory materials regarding the part numbering system of each of our products.
3. Each product series is assigned a “Quality Grade” from 1 to 3 in order of higher quality. Please do not incorporate a product into any equipment with a higher Quality Grade than the Quality Grade of such product without the prior written consent of TAIYO YUDEN.

2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

(1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
(2) Traffic signal equipment
(3) Disaster prevention equipment, crime prevention equipment
(4) Medical devices classified as GHTF Class C (Japan Class III)
(5) Highly public information network equipment, data-processing equipment (telephone exchange, and base station, etc.)
(6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

(1) Aerospace equipment (artificial satellite, rocket, etc.)
(2) Aviation equipment *1
(3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices *2
(4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
(5) Undersea equipment (submarine repeating equipment, etc.)
(6) Military equipment
(7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

*Notes: 1. There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.
2. Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

Chip Antennas for General Electronic Equipment for Consumer

REFLOW

■PART NUMBER

T S A 5	N	A 2	K	2 G 4 5	N	S 0 0 1	T	
①	②	③	④	⑤	⑥	⑦	⑧	⑨

①Series

Code (1)(2)(3)(4)	
TSA3	Chip antenna for General Electronic Equipment for Consumer, Dual type
TSA5	Chip antenna for General Electronic Equipment for Consumer, Monopole type
TSA6	Chip antenna for General Electronic Equipment for Consumer, Inverted F type

(1) Product Group

Code	
T	Ceramic RF Device

(2) Category

Code	Recommended equipment	Quality Grade
S	General Electronic Equipment for Consumer	3

(3) Type

Code	
A	Antenna

(4) Features, Characteristics

Code	
3	Dual type
5	Monopole type
6	Inverted F type

②Series name

Code	Series name
N	Standard

③Dimensions(case size)

Code	Dimensions(case size)[mm]
18	1.6×0.8
A2	3.2×1.6
A4	10.0×4.0
A6	8.0×6.0

④Thickness

Code	Thickness[mm]
D	0.65max
K	0.5±0.1
L	1.0±0.3

⑤Frequency

Code (example)	Frequency[MHz]
1G57	1574.397～1576.443
2G45	2400～2500
5G55	3100～8000

1.Describe Center Frequency
2.Lower Frequency for Dual band

⑥Electrode type

Code	Electrode type
N	External electrode

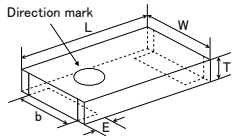
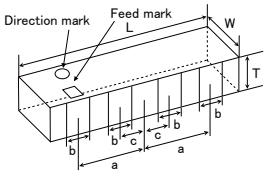
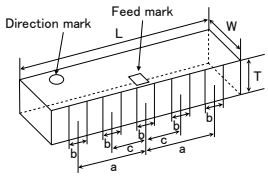
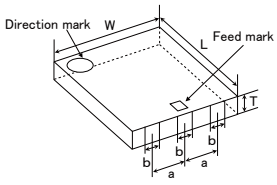
⑦Internal Code

⑧Packaging

Code	Packaging
T	Taping

⑨Internal Code

■EXTERNAL DIMENSIONS / STANDARD QUANTITY

TSA5N18D type, TSA5NA2K type	TSA6NA3L type	TSA3NA4L type	TSA5NA6L type
			

Type	L	W	T	E	a	b	c	Standard quantity[pcs]
TSA5N18D	1.6±0.1	0.8±0.1	0.65max	0.3±0.1	–	0.6±0.1	–	5000
TSA5NA2K	3.2±0.15	1.6±0.15	0.5±0.1	0.5±0.2	–	1.0min.	–	3000
TSA6NA4L	10.0±0.3	4.0±0.3	1.0±0.3	–	2.5±0.3	1.0±0.3	1.0±0.3	2000
TSA3NA4L	10.0±0.3	4.0±0.3	1.0±0.3	–	3.0±0.3	0.8±0.3	1.5±0.3	2000
TSA5NA6L	8.0±0.3	6.0±0.3	1.0±0.3	–	1.8±0.2	1.0±0.3	–	1000

Unit : mm

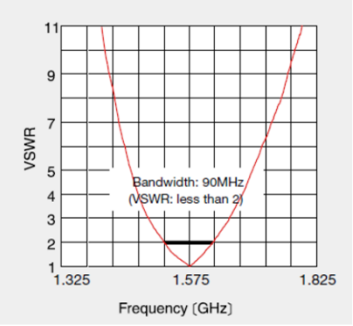
■PART NUMBER

Applications	New part number	Old part number (for reference)	External dimensions (L×W×T) [mm]	Center frequency [MHz]
GPS	TSA5NA2K1G57NS001T	AH 316M157501-T	3.2×1.6×0.5	1575
W-LAN (2.4GHz)	TSA5N18D2G45NV001T	AH 168M245001-T	1.68×0.8×0.65max.	2450
Bluetooth®	TSA5NA2K2G45NS001T	AH 316M245001-T	3.2×1.6×0.5	2450
ZigBee	TSA6NA4L2G45NS0S1T	AH 104F2450S1-T	10.0×4.0×1.0	2450
W-LAN (2.4GHz/5GHz)	TSA3NA4L2G45NS0D1T	AH 104N2450D1-T	10.0×4.0×1.0	2450/5400
UWB & WiMAX (3.5GHz)	TSA5NA6L5G55NS003T	AH 086M555003-T	8.0×6.0×1.0	5550

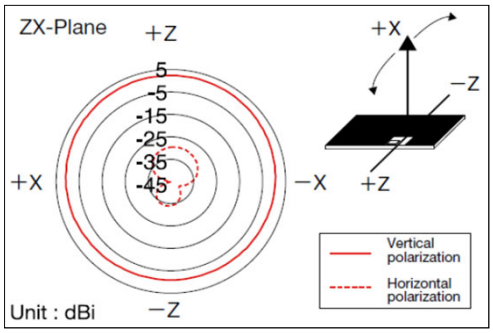
■ELECTRICAL CHARACTERISTICS / TYPICAL CHARACTERISTICS

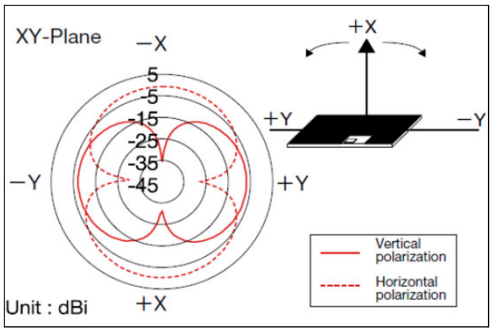
Typical characteristics on TAIYO YUDEN evaluation board

●TSA5NA2K1G57NS001T



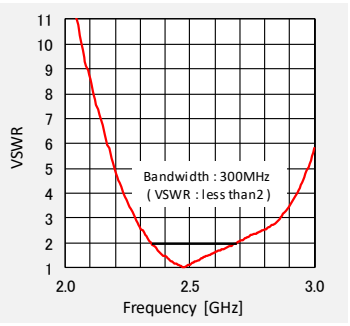
Typical characteristics of VSWR



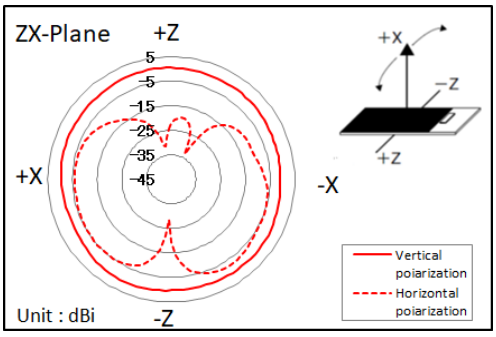


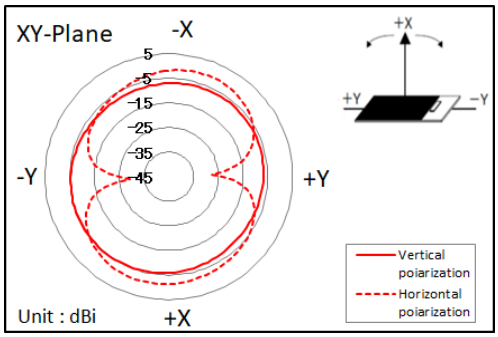
Typical characteristics of radiation pattern (@1.575GHz)

●TSA5N18D2G45NV001T



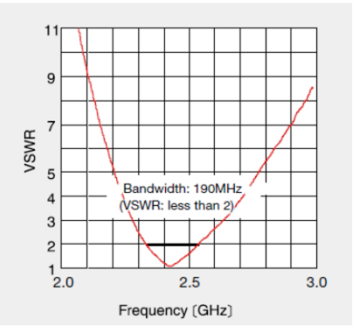
Typical characteristics of VSWR



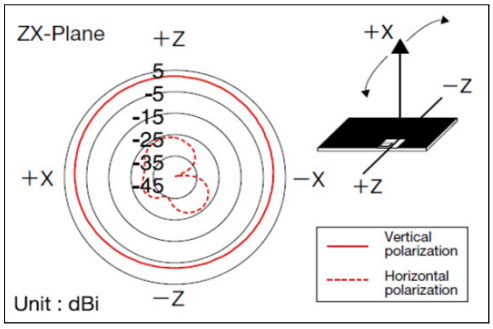


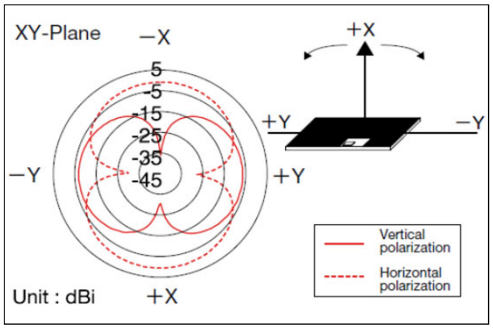
Typical characteristics of radiation pattern (@2.45GHz)

●TSA5NA2K2G45NS001T



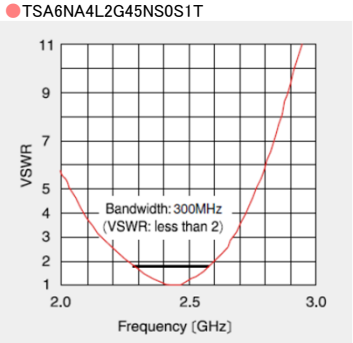
Typical characteristics of VSWR



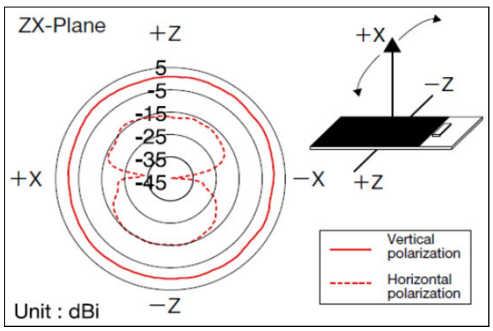


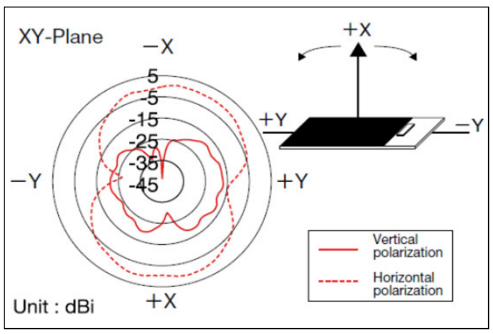
Typical characteristics of radiation pattern (@2.45GHz)

●TSA6NA4L2G45NS0S1T



Typical characteristics of VSWR



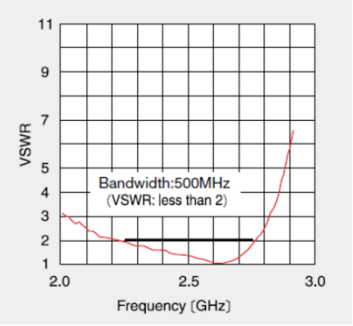


Typical characteristics of radiation pattern (@2.45GHz)

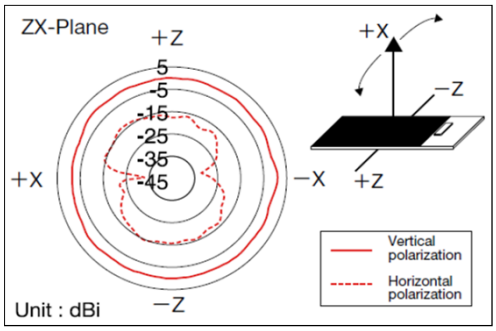
■ELECTRICAL CHARACTERISTICS / TYPICAL CHARACTERISTICS

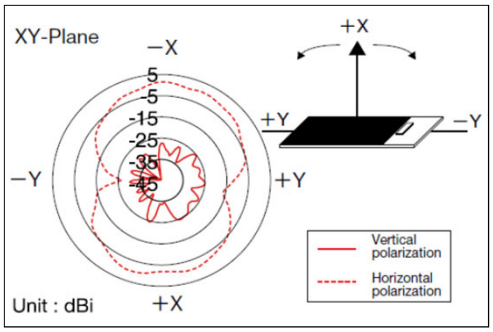
Typical characteristics on TAIYO YUDEN evaluation board

●TSA3NA4L2G45NS0D1T

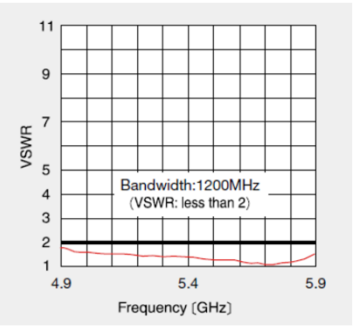


Typical characteristics of VSWR(2GHz band)

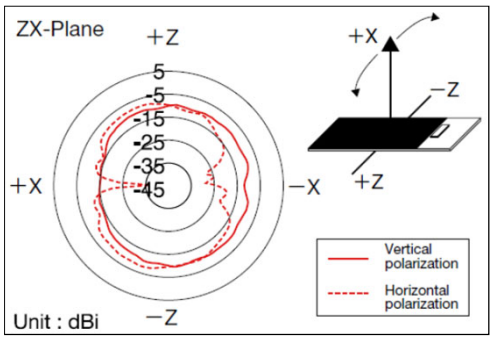


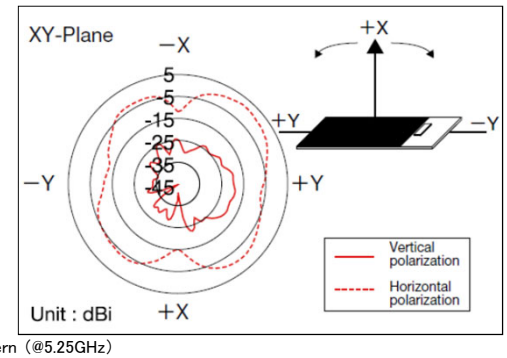


Typical characteristics of radiation pattern (@2.45GHz)



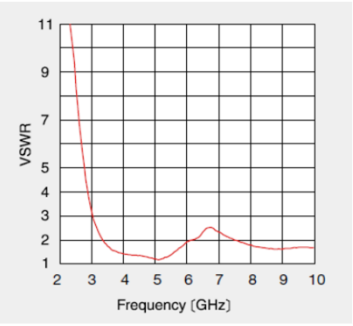
Typical characteristics of VSWR(5GHz band)



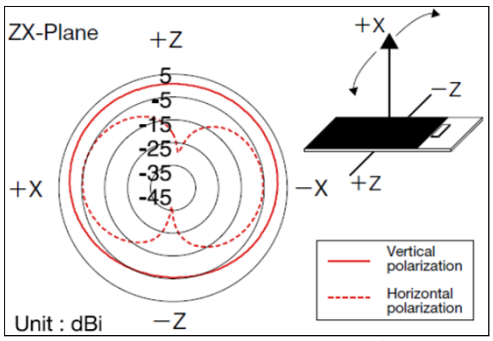


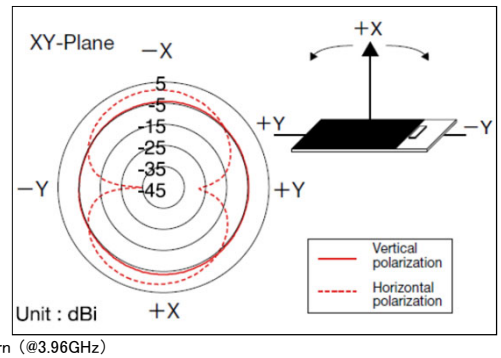
Typical characteristics of radiation pattern (@5.25GHz)

●TSA5NA6L5G55NS003T



Typical characteristics of VSWR





Typical characteristics of radiation pattern (@3.96GHz)

Chip Antennas

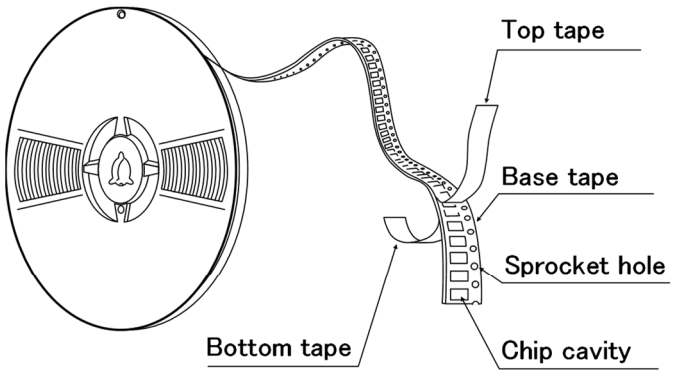
■PACKAGING

①Minimum Quantity

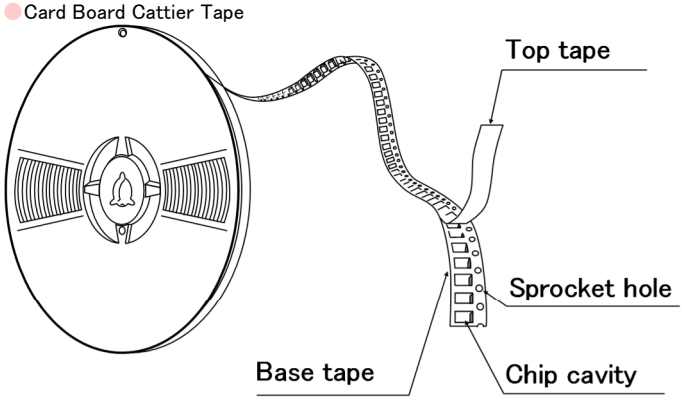
Type	Standard Quantity (pcs) Embossed Tape
A4	2000
A2	3000
A6	1000
18	5000

②Tape Material

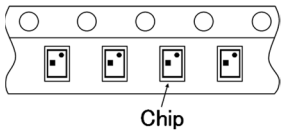
●Embossed Tape



●Card Board Cattier Tape



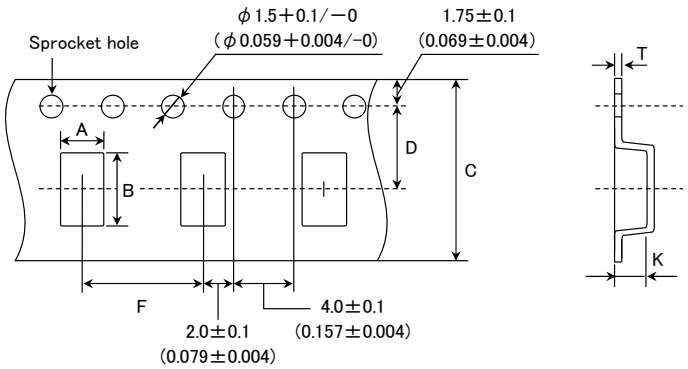
Chip Filled



③Taping Dimensions

●Embossed Tape

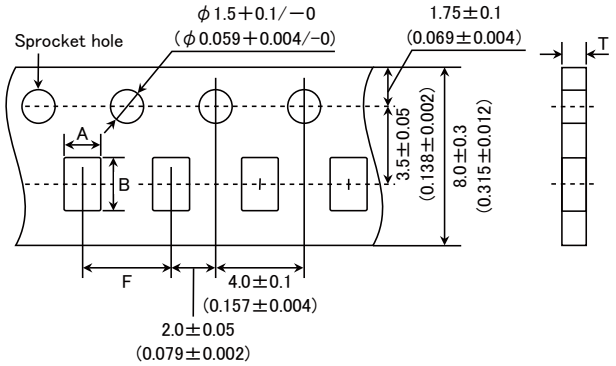
Unit:mm(inch)



Type	Chip Cavity		Tape Width		Insertion Pitch	Tape Thickness max.	
	A	B	C	D	F	K	T
A2	1.9±0.2 (0.075±0.008)	3.5±0.2 (0.138±0.008)	8±0.2 (0.315±0.008)	3.5±0.1 (0.138±0.004)	4±0.1 (0.157±0.004)	0.85 (0.033)	0.3 (0.012)
A4	4.35±0.2 (0.171±0.008)	10.35±0.2 (0.407±0.008)	24±0.3 (0.945±0.012)	11.5±0.1 (0.435±0.004)	8±0.1 (0.315±0.004)	1.45 (0.061)	0.3 (0.012)
A6	6.25±0.2 (0.246±0.008)	8.26±0.2 (0.325±0.008)	16±0.3 (0.630±0.012)	7.5±0.1 (0.296±0.004)	12±0.1 (0.473±0.004)	1.3 (0.051)	0.3 (0.012)

Unit:mm (inch)

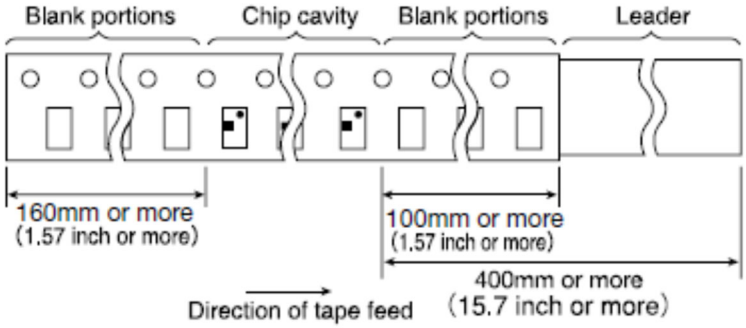
Paper tape 0.315 inches wide　　Unit:mm(inch)



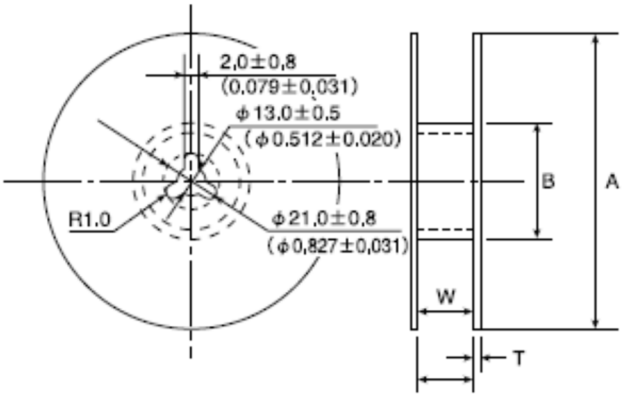
Type	Chip cavity		Insertion Pitch	Tape Thickness max.
	A	B	F	T
18	0.95±0.05 (0.037±0.002)	1.80±0.05 (0.071±0.002)	4.0±0.1 (0.157±0.004)	0.80 (0.031)

Unit:mm(inch)

④Leader and Blank Portion



⑤Reel size

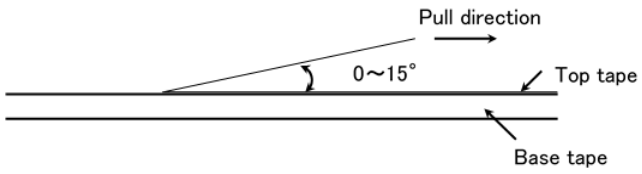


Type	A	B	W	T
18, A2	178±2.0 (7.0±0.08)	50 min. (2.0 min.)	10.0±1.5 (0.394±0.06)	3.0 max. (0.12 max.)
A4	330±2.0 (13.0±0.08)	100±1.0 (3.94±0.04)	25.5±1.0 (1.0±0.04)	3.0 max. (0.12 max.)
A6	330±2.0 (13.0±0.08)	100±1.0 (3.94±0.04)	17.0±1.0 (0.67±0.04)	2.5 max. (0.1 max.)

Unit:mm(inch)

⑥Top Tape Strength

The top tape requires a peel-off force of 0.1～0.7N in the direction of the arrow as illustrated below.



■RELIABILITY DATA

1. Operating Temperature Range	
Specified Value	−40～＋85℃

2. Storage Temperature Range	
Specified Value	−40～＋85℃
Test Methods and Remarks	※with being taped, −20～＋40℃

3. Solderability	
Specified Value	At least 75% of immersed terminal surface is covered by new solder.
Test Methods and Remarks	Solder temperature : 240±5℃ Duration : 3±1 sec. Preconditioning : Preheating at 150℃ after immersion into flux.

4. Thermal Shock	
Specified Value	Shall satisfy required VSWR value of individual specifications for each item.
Test Methods and Remarks	1 hour of recovery after 10 times of 30min.immersion alternately at −40℃ and 85℃ of temperature, followed by evaluating electrical characteristics.

5. High Temperature Storage Test	
Specified Value	Shall satisfy required VSWR value of individual specifications for each item.
Test Methods and Remarks	1 hour of recovery under standard condition after 96 hours recovery with 85℃ of temperature, followed by evaluating electrical characteristics.

6. Low Temperature Storage Test	
Specified Value	Shall satisfy required VSWR value of individual specifications for each item.
Test Methods and Remarks	1 hour of recovery under standard condition after 96 hours recovery with −40℃ of temperature, followed by evaluating electrical characteristics.

7. Humidity Storage Test	
Specified Value	Shall satisfy required VSWR value of individual specifications for each item.
Test Methods and Remarks	1 hour of recovery under standard condition after 96 hours recovery with 60℃ of temperature, 90～95% relative humidity followed by evaluating electrical characteristics.

8. Resistance to Reflow	
Specified Value	Shall satisfy required VSWR value of individual specifications for each item.
Test Methods and Remarks	Two times of reflow soldering by recommended profile attached, followed by evaluating electrical characteristics.

■PRECAUTIONS

1. PCB Design

Precautions

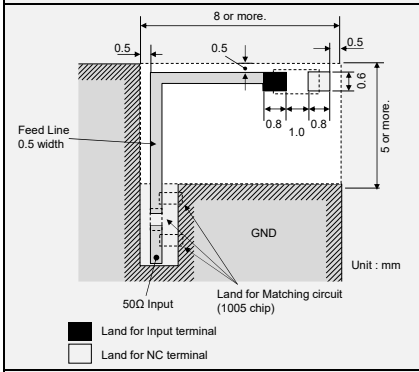
◆Land pattern design

Please do not arrange the surface and inside layer pattern near the antenna mounting area.

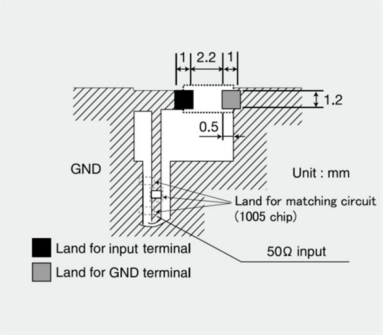
Technical Considerations

◆Land pattern design (Land pattern dimension examples and recommended antenna land pattern)

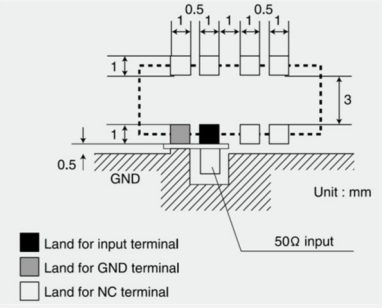
TSA5N18D



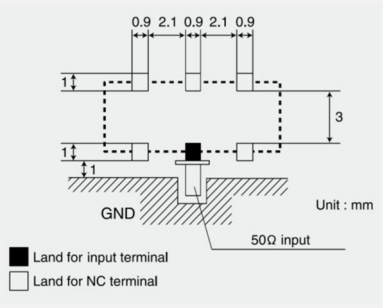
TSA5NA2K



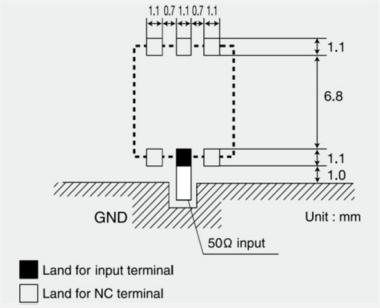
TSA6NA4L



TSA3NA4L



TSA5NA6L

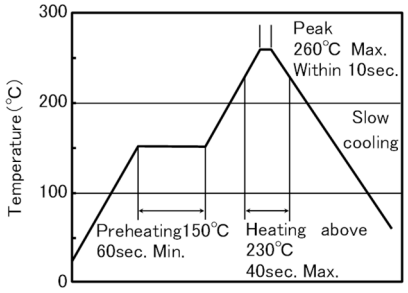


2. Soldering

Technical Considerations

◆Conditions of Reflow soldering (for reference)

・ Pb Free Reflow Profile



※ Components should be preheated to within 100 to 130°C from soldering temperature.

※ Assured to be reflow soldering for 2 times.

Note : The above profiles are the maximum allowable soldering condition, therefore these profiles are not always recommended.

3. Storage Conditions	
Precautions	◆Storage conditions 1. The Products must not be used in the following environments : ・ exposure to special gases such as (C12, NH3, SOx, NOx) ・ exposure to volatile gas or inflammable gas ・ exposure to a lot of dust ・ exposure to water or condensation ・ exposure to direct sunlight or freezing 2. The Products should be kept in the following conditions : ・ Temperature : －10～＋40℃ ・ Humidity : 15～85%RH max. 3. The products should be used within 6 months after delivery. In case of storage over 6 months, solderability shall be checked before actual usage.

■ Please contact our offices for further details of specifications.
All of the standard values listed here are subject to change without notice due to technical improvements.
Therefore, please check the specifications carefully before use.