This device is a PCMCIA card. As such it is classified as portable. Since MPE does not apply to portable devices, this is provided as information only. Also, since the power of this device is lower than 11.4 mW conducted and uses a max 3dBi gain, SAR is not required.

TRC® Since1985
Training Research Co., Ltd.
255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.
TEL: 886-2-26935155 FAX: 886-2-26934440

# *Measurement of MPE*

## 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

| | | |
|---|---|---|
| **EUT** | **:** | Wireless LAN PC Card |
| **Classification** | **:** | Portable Device |
| | | (i) Under normal use condition, the antenna is at least 5cm away from the user; |
| | | (ii) Warning statement for keeping 5cm separation distance and the prohibition of operating next to the person has been printed in the user' s manual |
| **Model No.** | **:** | DB6802-01C |
| **Granted FCC ID** | **:** | NP2-DB-6802-L1 |
| **Frequency Range** | **:** | 2.412 GHz ~ 2.462GHz |
| **Antenna Kit** | **:** | 2 chip antennas |
| **Supported Channel:** | | 11 Channel |
| **Modulation Skill** | **:** | DBPSK, DQPSK, CCK (w/PBCC mode) |
| **Power Type** | **:** | Powered by the PCMCIA slot of the client device |
| **Applicant** | **:** | DBTel Incorporated |
| | | No.29, Tzu Chiang St., Tu-Cheng, Taipei, Taiwan, R.O.C. |

## 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:*** $S = \frac{PG}{4\pi R^2} = \frac{11.4 \times 1.995}{4\pi (5)^2} = 0.724 \times 10^{-1} mW/cm^2$

*Remark:*

*"The safe MPE estimated distance the user must maintain from the antenna is at least 5 cm."*

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 $^{-1}$ (3 / 10) = 1.995

# SPECIFICATION FOR APPROVAL

Customer：大霸電子股份有限公司

Product Description：Chip Antenna

Your Part Number：

ACX Part Number：AT9520-B2R4HAAT

File Number：SF1-250131

Date：May 28, 2002

| | | |
|---|---|---|
| 大霸電子 | Approved | Comments |
| | | |
| ACX | Prepared by | |
| | 張家瑞 | |


璟德電子工業股份有限公司

**Advanced Ceramic X Corporation**

16 Tzu Chiang Road, Hsinchu Industrial District Hsinchu Hsien, Taiwan, 30316

TEL：(03)598-7008

FAX：(03)598-7001

http://www.acxc.com.tw

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Advanced Ceramic X

# AT9520 Series

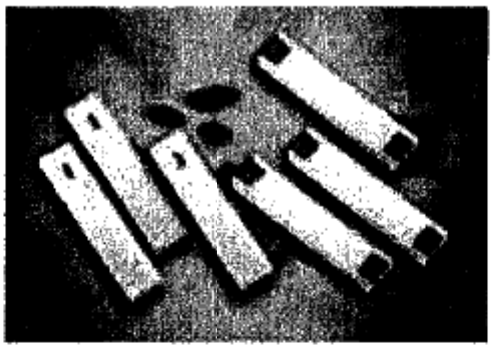
## Multilayer Chip Antenna

### Features

- ❖ Monolithic SMD with small, low-profile and light-weight type.
- ❖ Wide bandwidth

### Applications

- ❖2.4GHz WLAN, Home RF, Bluetooth Modules, etc.



### Specifications

| Part Number | Frequency Range (MHz) | Peak Gain (XZ-V) | Average Gain (XZ-V) | VSWR | Impedance |
|---|---|---|---|---|---|
| AT9520-B2R4HAA_ | 2400~2500 | 3.0 dBi typ. | 1.0 dBi typ. | 2 max. | 50 Ω |

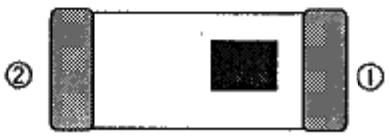
Q'ty/Reel (pcs) : 1000pcs
Operating Temperature Range : -40 ~ +85 °C
Storage Temperature Range : -40 ~ +85 °C
Power Capacity : 3W max.

### Part Number

AT ① 9520 ② - B ③ 2R4 ④ HAA ⑤ □ ⑥

| | | | |
|---|---|---|---|
| ① Type | AT : Antenna | ② Dimensions ( L × W ) | 9.5× 2.0 mm |
| ③ Material Code | B | ④ Frequency Range | 2R4=2400MHz |
| ⑤ Specification Code | HAA | ⑥ Packaging | T: Tape & Reel<br>B: Bulk |

### Terminal Configuration




| No. | Terminal Name | No. | Terminal Name |
|---|---|---|---|
| ① | Feeding Point | ② | NC |

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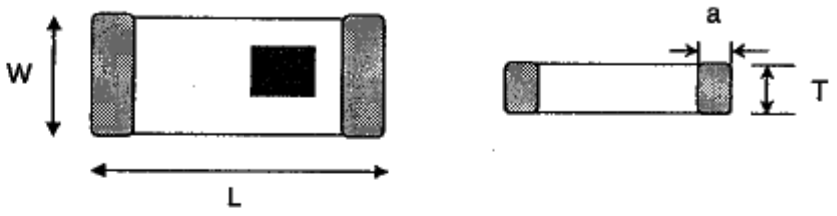
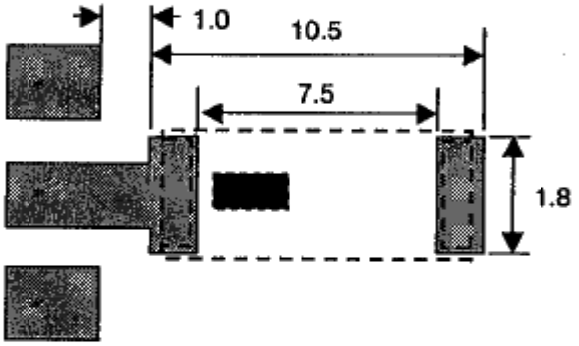
## Dimensions and Recommended PC Board Pattern

Unit : mm

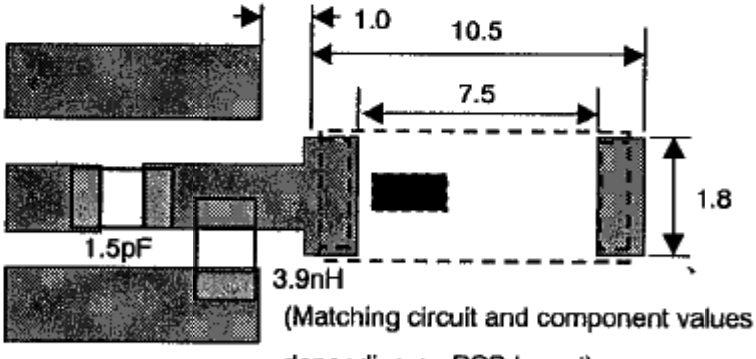



| Mark | L | W | T | a |
|---|---|---|---|---|
| Dimensions | 9.5±0.2 | 2.0±0.2 | 1.2+ 0.1/-0.2 | 0.5±0.3 |

(a) Without Matching Circuits (Moderate Bandwidth)




(b) With Matching Circuits (Wide Bandwidth)




(Matching circuit and component values will be different, depending on PCB layout)

*Line width should be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

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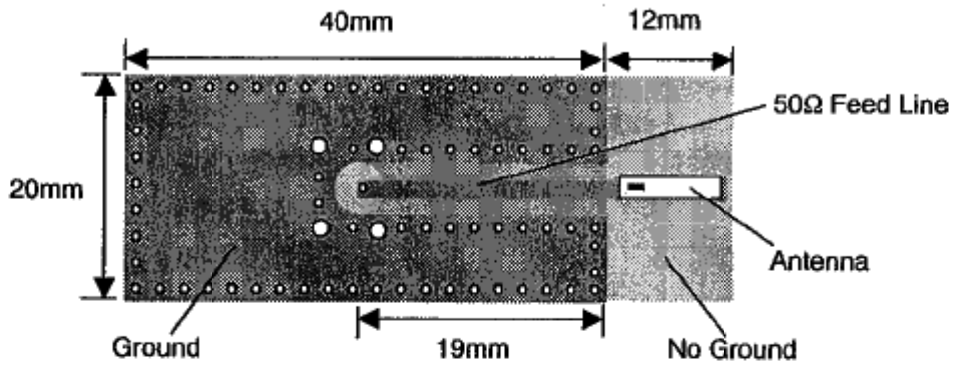
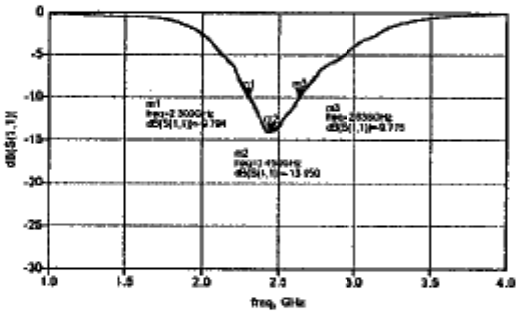
## Typical Electrical Characteristics (T=25°C)

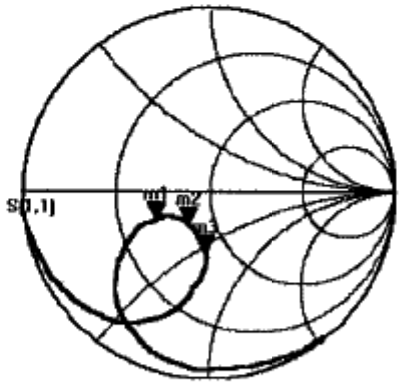
❖Test Board




❖Return Loss

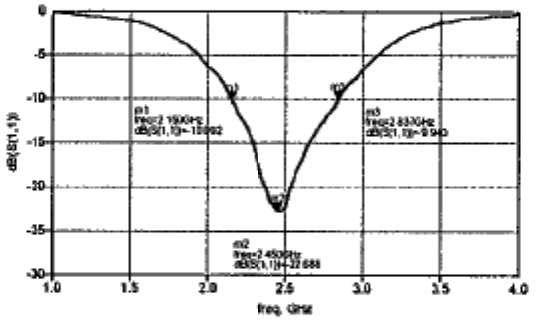
(a) Without Matching Circuits

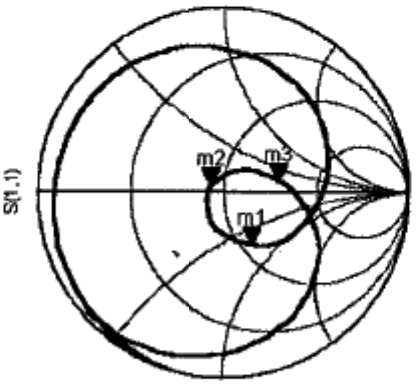



freq (1.000GHz to 4.000GHz)

(b) With Matching Circuits

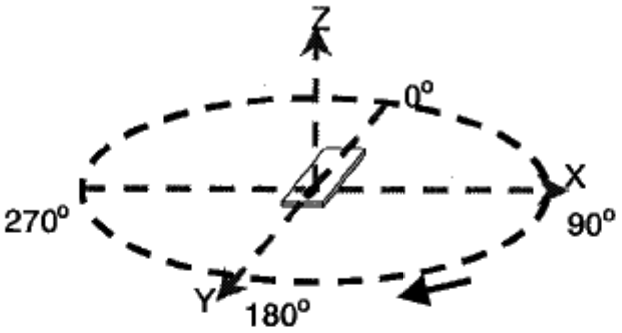


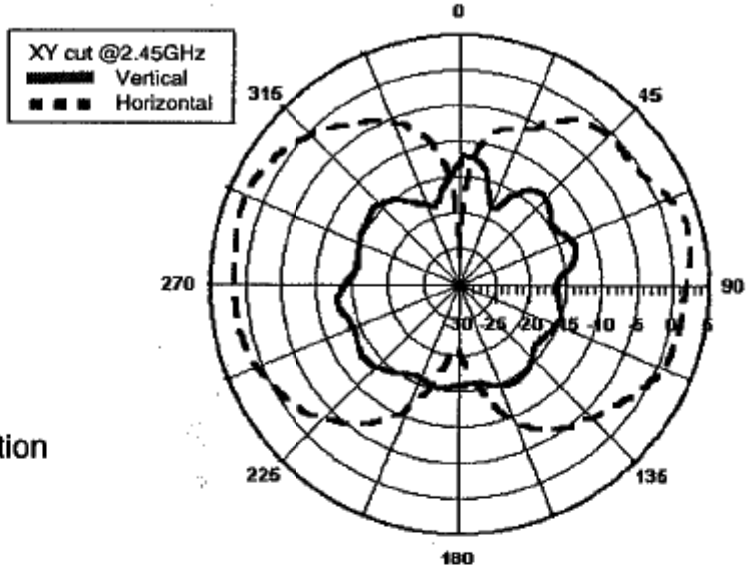

freq (1.000GHz to 4.000GHz)

❖Radiation Patterns

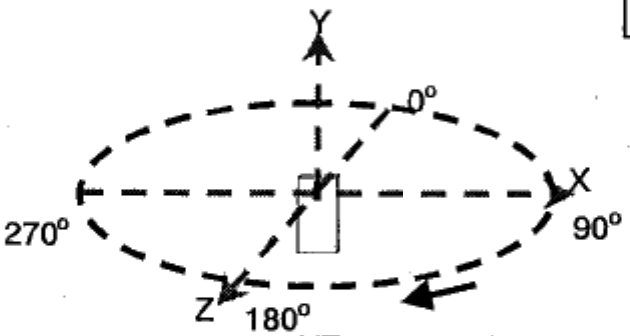
XY-V/XY-H



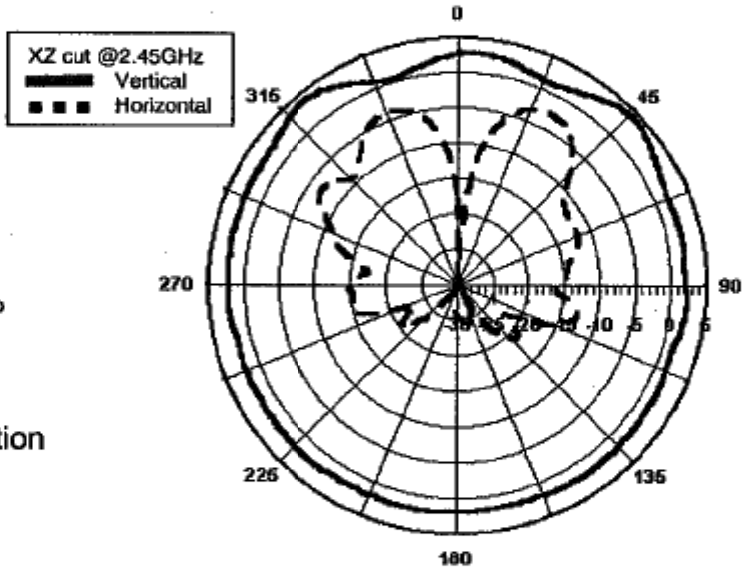

XY-cut scanning direction



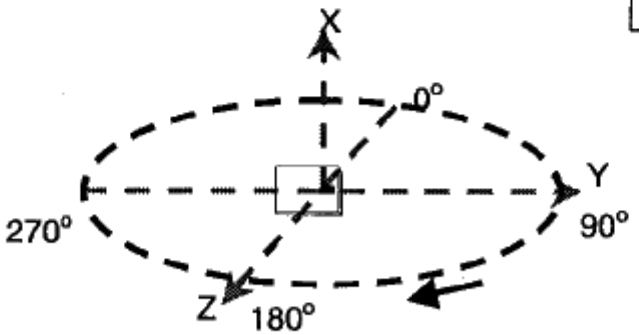

XZ-V/XZ-H



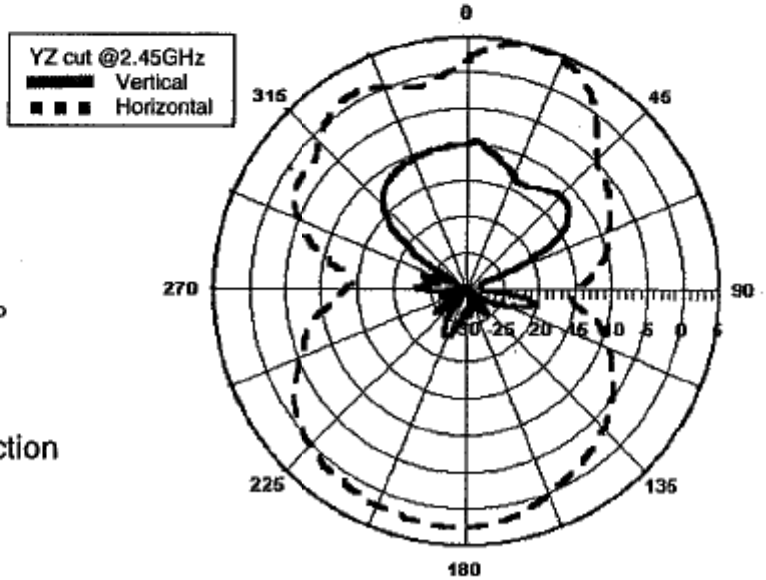

XZ-cut scanning direction




YZ-V/YZ-H




YZ-cut scanning direction

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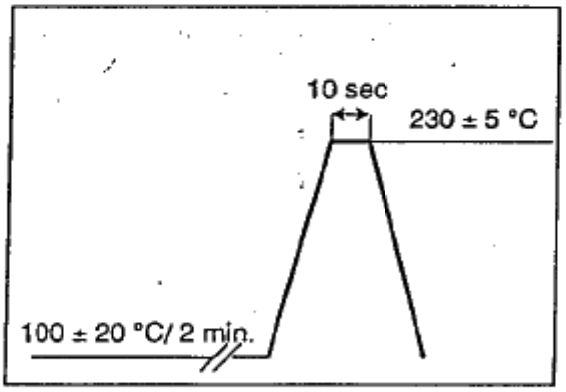
## Mechanical & Environmental Characteristics

| Item | Requirements | Procedure |
|---|---|---|
| Solderability | 1. No apparent damage<br>2. More than 75% of the terminal electrode shall be covered with new solder | 1. Preheat: 120± 5°C<br>2. Solder: 230± 5°C for 5± 1 sec |
| Thermal shock (Temperature Cycle) | 1. No apparent damage<br>2. Fulfill the electrical specification after test | 1. One cycle/ step 1: 85 ± 5°C for 20sec<br>step 2: -40 ± 3°C for 20sec<br>2. Cycle time: 30min<br>3. No. of cycles: 100<br>4. Recovery: 1-2hrs |
| Heat Resistance | 1. No apparent damage<br>2. Fulfill the electrical specification after test | 1. Temperature: 85± 2°C<br>2. Duration: 24±2hrs<br>3. Recovery: 1-2hrs |
| Low Temperature Resistance | 1. No apparent damage<br>2. Fulfill the electrical specification after test | 1. Temperature: -40°± 5°C<br>2. Duration: 24 ±2hrs<br>3. Recovery: 1-2hrs |
| Humidity Resistance | 1. No apparent damage<br>2. Fulfill the electrical specification after test | 1. Temperature: 85± 2°C<br>2. Humidity: 80% ~ 85% RH<br>3. Duration: 1000±48hrs<br>4. Recovery: 1-2hrs |
| Drop Shock | 1. No apparent damage | 1. Dropped onto hard wood from height of 50 cm for 3 times ; each x,y and z direction except terminal direction |

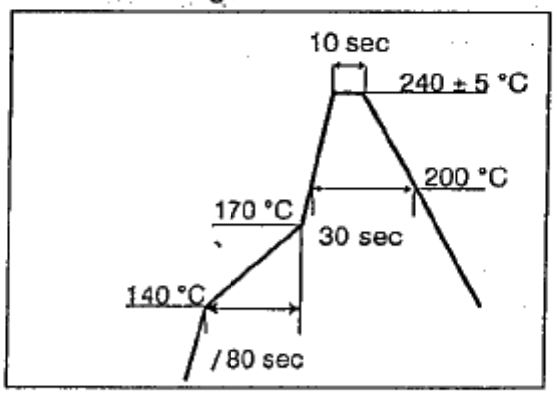
* Operating temperature range: -40℃ ~ + 85℃

## Typical Soldering Profile

Flow Soldering :




Reflow Soldering :




The sample must be pre-heated before soldering .The temperature difference between preheating and soldering must be within 150 ℃.

## Notes

❖The contents of this data sheet are subject to change without notice. Please confirm the specifications and delivery conditions when placing your order.

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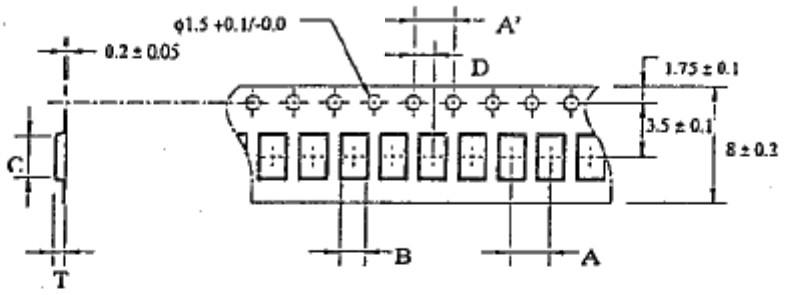
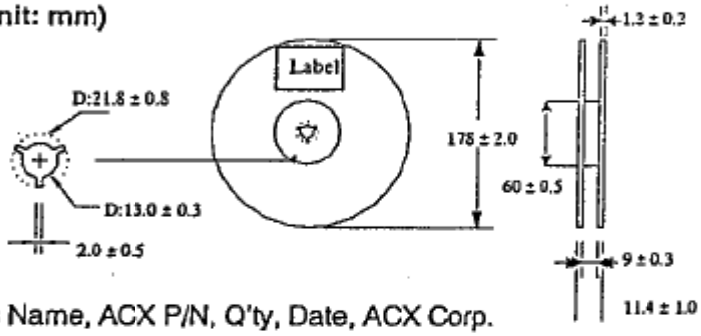
## Taping Specifications

❖Tape Dimensions (Unit: mm)



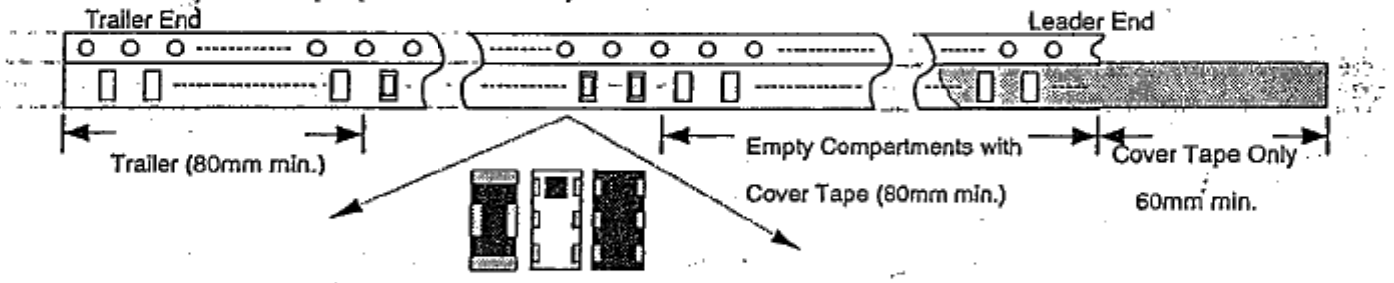

| Type | A | A' | B | C | D | T |
|---|---|---|---|---|---|---|
| 2012 | 4.0± 0.1 | 4.0± 0.1 | 1.6± 0.1 | 2.4± 0.1 | 2.0± 0.1 | Max. 1.3 |
| 3216 | 4.0± 0.1 | 4.0± 0.1 | 1.9± 0.1 | 3.5± 0.1 | 2.0± 0.1 | Max. 1.4 |

❖Reel Dimensions (Unit: mm)

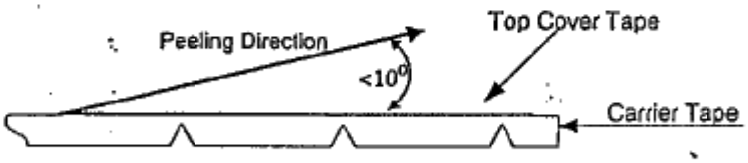



Label: Customer's Name, ACX P/N, Q'ty, Date, ACX Corp.

❖Leader and Trailer Tape (Plastic material)




❖Peel-off Force




Peel-off force should be in the range of 0.1 – 0.6 N at a peel-off speed of 300±10 mm/min .

❖Storage Conditions

To avoid damaging the solderability of the external electrodes, be sure to observe the following points.

(1) Store products at the ambient temperature in the range of 15 ~35℃ and humidity of 45~75% RH. Be noted that the packing materials may be deformed when the temperature exceeds 40℃.
(2) Store products in non-corrosive gas, such as $Cl_2$, $NH_3$, $SO_2$, $NO_x$, etc.
(3) Stored products should be used within 6 months of receipt. Solderability should be verified when exceeding the indicated period.

## Notes

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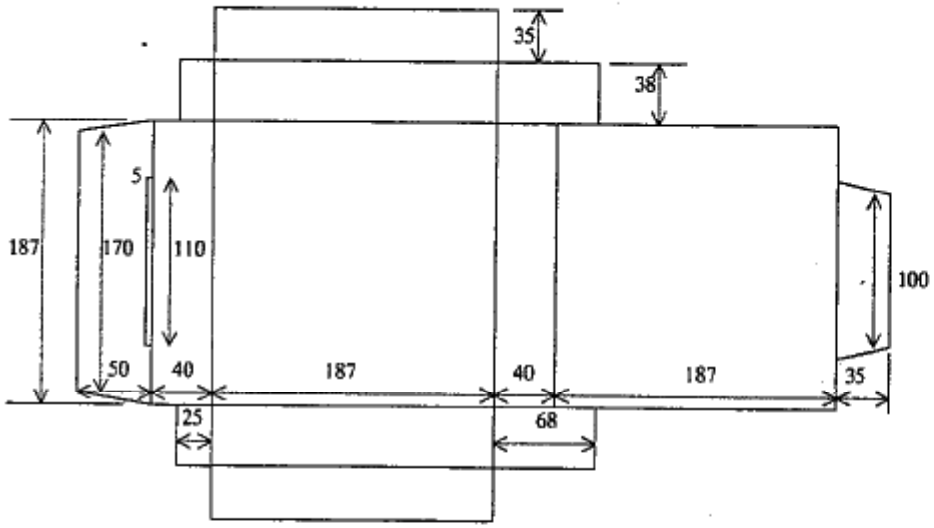
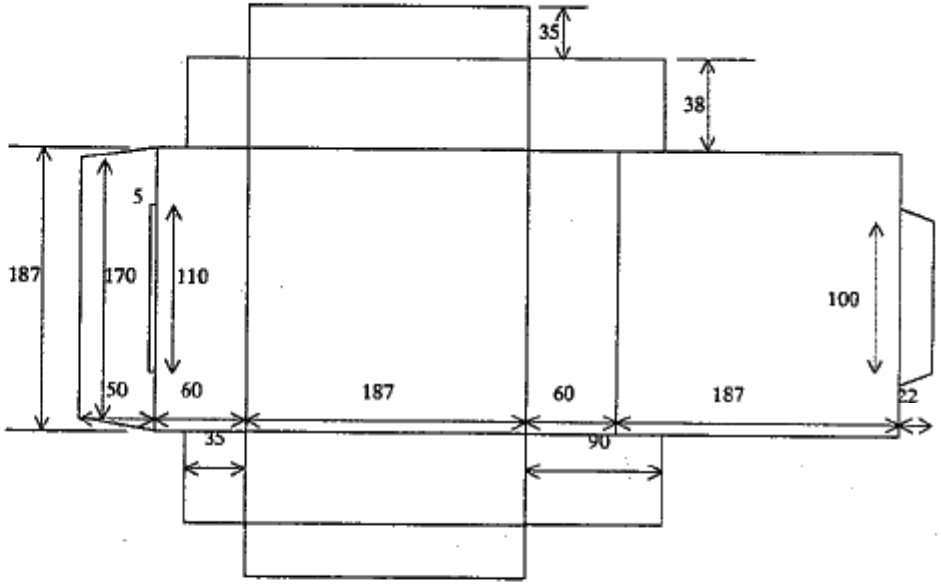
2P

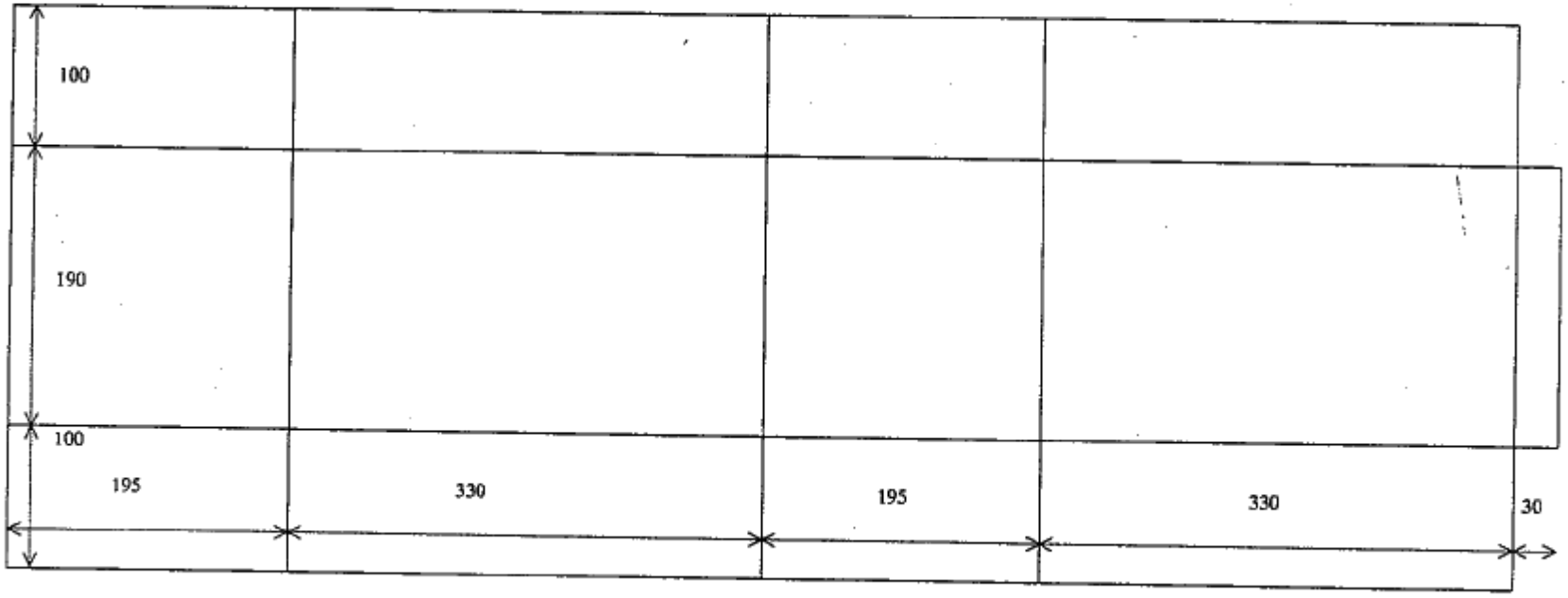



3P




包裝內盒 2 捲裝 3 捲裝展開圖

| ACX Advanced Ceramic X | Product Name | File Name | Date | Sheet |
|---|---|---|---|---|
| | CTN-1P | CTN-1P | 2000/01/14 | 1:5 m/m |
| | Drawn | Check | Approval | ISO NO. |
| | Ray | | | |




包裝外盒 15 捲裝展開圖

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| Product Name | File Name | Date | Sheet |
|---|---|---|---|
| CTN-25P | CTN-25P | 2000/01/14 | 1:5 m/m |
| Drawn | Check | Approval | ISO NO. |
| Ray | | | |