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| DOCUMENT NO. | BQP22-L12-B02 |
| SERIAL NO.   | MC3-000083    |
| DATE         | 12/Feb./1998  |

ACCEPTANCE

## Standard Specification

PRODUCT NAME CRYSTAL CLOCK OSCILLATOR

TYPE CMX-309FL C

FREQUENCY 1.000 ~ 30.000MHz

PARTS NO.

|                                                                                 |                     |
|---------------------------------------------------------------------------------|---------------------|
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## NOTICE

- 1.If something that is ambiguously defined or undefined in this specification happened, customer and CITIZEN would discuss and take necessary steps by mutual consent.
- 2.Product test data can't be attached to this specification.
- 3.This product is not authorized for use as critical component in life support devices or systems.

## 1. ABSOLUTE MAXIMUM RATING

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| Parameter                                             | Conditions                                                            | CMX-309FL                | Unit |
|-------------------------------------------------------|-----------------------------------------------------------------------|--------------------------|------|
| Supply Voltage $V_{MAX}$                              |                                                                       | $-0.3 \sim +7.0$         | V    |
| Storage Temperature $T_{STG}$                         | See 8.                                                                | $-55 \sim +125$          | °C   |
| Output Current $I_{OUT}$                              |                                                                       | 25                       | mA   |
| Input Voltage $V_{IN\_M}$                             |                                                                       | $-0.3 \sim V_{DD} + 0.3$ | V    |
| Solder Heat Resistance<br>Of The Outer Lead $T_{SOL}$ | MAX.260 °C × MAX.10 seconds × 2times<br>or MAX.230 °C × MAX.3 minutes |                          |      |

## 2. OPERATING RANGE

| Parameter                       | Conditions | CMX-309FL |      |          | Unit      |
|---------------------------------|------------|-----------|------|----------|-----------|
|                                 |            | Min.      | Typ. | Max.     |           |
| Supply Voltage $V_{DD}$         |            | 4.5       | 5.0  | 5.5      | V         |
| Operating Temperature $T_{OPR}$ |            | $-10$     |      | $+70$    | °C        |
| Input Voltage $V_{IN}$          |            | 0         |      | $V_{DD}$ | V         |
| Output Load<br>$C_L$<br>$TTL$   |            |           |      | 50<br>10 | pF<br>TTL |

## 3. FREQUENCY CHARACTERISTICS

( Load  $\leq 50\text{pF}$  or 10TTL )

| Parameter                           | Conditions                                                                   | CMX-309FL         | Unit         |
|-------------------------------------|------------------------------------------------------------------------------|-------------------|--------------|
| Frequency $f_o$                     | $V_{DD} = 5 \pm 0.5\text{V}$ $T_a = -10 \sim +70\text{ °C}$<br>Load 0 ~ Max. | 1.000 ~<br>30.000 | MHz          |
| Frequency Stability $\Delta f$<br>† | $V_{DD} = 5 \pm 0.5\text{V}$ $T_a = -10 \sim +70\text{ °C}$<br>Load 0 ~ Max  | $\pm 100$         | ppm          |
| Aging $f_a$                         | $V_{DD} = 5\text{V}$ $T_a = +25\text{ °C}$ First year                        | $\pm 5$           | ppm/<br>year |

† includes initial tolerance, temperature characteristics, input voltage characteristics,  
load characteristics, but excludes aging.

#### 4. ELECTRICAL CHARACTERISTICS

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( VDD = 5.0V Ta = 25 °C load=50pF or 10TTL )

| Parameter                     | Conditions                  | CMX-309FL |      |      | Unit |
|-------------------------------|-----------------------------|-----------|------|------|------|
|                               |                             | Min.      | Typ. | Max. |      |
| Start Up Time $t_{osc}$       |                             |           |      | 4    | m s  |
| Power Supply Current $I_{DD}$ | No Load                     |           |      | 2 3  | m A  |
| Disable Current $I_{INH}$     | OE=GND                      |           |      | 1 2  | m A  |
| Rise Time $t_r$               | CMOS load : 20%VDD → 80%VDD |           |      | 8    | n s  |
|                               | TTL load : 0.4V → 2.4V      |           |      | 8    | n s  |
| Fall Time $t_f$               | CMOS load : 80%VDD → 20%VDD |           |      | 8    | n s  |
|                               | TTL load : 2.4V → 0.4V      |           |      | 8    | n s  |
| Duty Cycle DUTY               | CMOS load : 50%VDD          | 4 0       |      | 6 0  | %    |
|                               | TTL load : 1.4V             | 4 5       |      | 5 5  | %    |
| Output HIGH Voltage $V_{OH}$  | $I_{OH} = -400 \mu A$       | VDD-0.4   |      |      | V    |
| Output LOW Voltage $V_{OL}$   | $I_{OL} = 16 \text{ m A}$   |           |      | 0.4  | V    |
| Input HIGH Voltage $V_{IH}$   | OE                          | 2.0       |      |      | V    |
| Input LOW Voltage $V_{IL}$    | OE                          |           |      | 0.8  | V    |
| Output Disable Time $t_{PZX}$ | See 5.                      |           |      | 100  | n s  |
| Output Enable Time $t_{PZX}$  |                             |           |      | 100  | n s  |

#### 5. THREE STATE OUTPUT OPERATION

| OE Input     | Clock Output             |
|--------------|--------------------------|
| HIGH or OPEN | Active : enable          |
| LOW          | High-impedance : disable |

Propagation delay time between

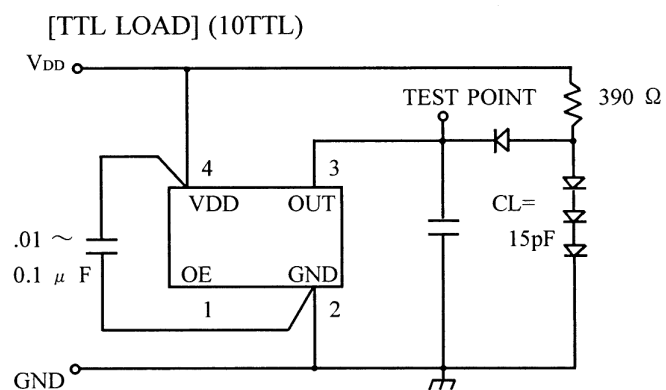
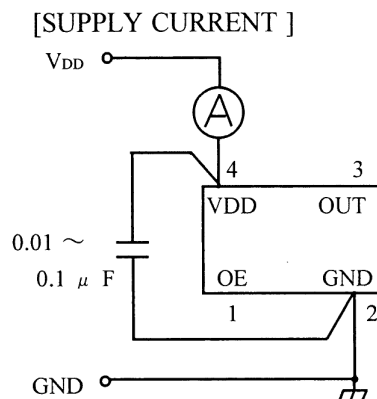
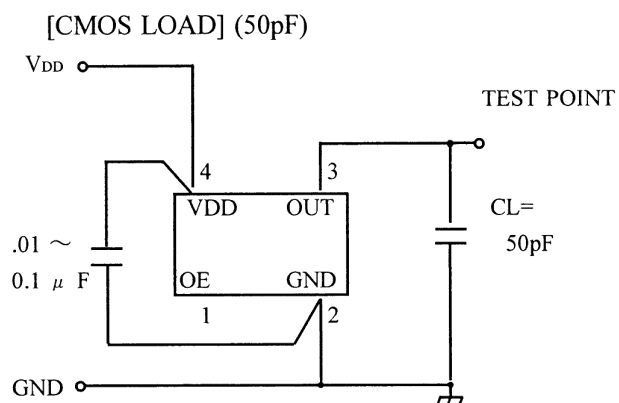
$t_{PZX}$  : OE (HIGH → LOW) and  
OUTPUT(active level  
→ high-impedance)

$t_{PZX}$  : OE (LOW → HIGH) and  
OUTPUT(high-impedance  
→ active level)

NOTE: A disable clock output does not synchronize with OE, because internal quartz oscillator is continuous.

## 6. TEST CIRCUIT

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### [MEASUREMENT CONDITION]

#### 1. Oscilloscope

Impedance: No less than 1M Ω

Capacitance: No more than 15pF

Band width: No less than 400MHz

The length of GND lead of the probe should be as short as possible.

#### 2. The CL includes the probe capacitance.

#### 3. Grounding should be single-point grounding.

#### 4. Supply impedance should be as low as possible.

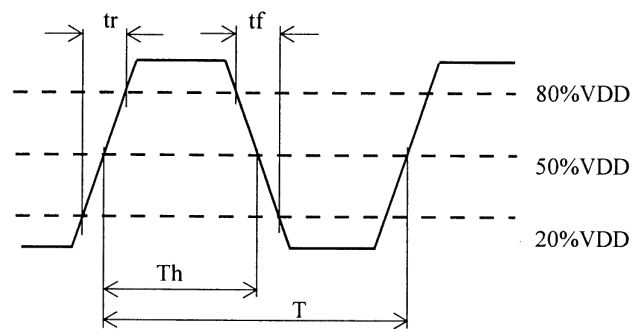
0V → 4.5V rise time is No less than 150 μs

#### 5. Use the ammeter that internal impedance is small.

## 7. OUTPUT WAVEFORM

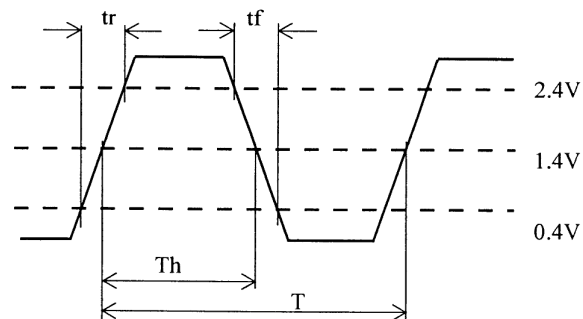
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[ CMOS LOAD] (50pF)



$$\text{DUTY} = T_h / T$$

[ TTL LOAD] (10TTL)



$$\text{DUTY} = T_h / T$$

## 8. ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

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The following are our reliability test conditions.

| Item                         | Test Method                                                                                                   | CMX-309FL                               |                                                |
|------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------|
|                              |                                                                                                               | Frequency *1<br>Shift after Test        | Electrical                                     |
| Temperature Cycle            | -55 ~ 125 °C ( NO BIAS )<br>( 15min. × 100cycles )                                                            | ± 20 ppm                                | Electrical Characteristics satisfy the spec.4. |
| Temperature Humidity Bias    | +85 °C × 85% × 3.6V × 1000hours                                                                               | ± 20 ppm                                |                                                |
| High Temp. Storage           | +125 °C × NO BIAS × 500hours                                                                                  | ± 50 ppm                                |                                                |
| Low Temp. Storage            | -55 °C × NO BIAS × 1000hours                                                                                  | ± 20 ppm                                |                                                |
| Pressure Cooker Test         | +126 °C × 85%RH × 0.203MPa × NO BIAS<br>× 96hours                                                             | ± 40 ppm                                |                                                |
| Vibration                    | 15Hz ~ 500Hz, 1.5mm p-p or 10G<br>15Hz ~ 500Hz ~ 15Hz 15min./cycle<br>3 direction × 2hours for each direction | ± 10 ppm                                |                                                |
| Drop                         | Free drop from 75cm height on a hard wooden board for 3 times                                                 | ± 20 ppm                                |                                                |
| Resistance to Soldering Heat | Into solder bath +260 °C ± 5 °C for 20 sec.                                                                   | ± 10 ppm                                |                                                |
| Solderability                | Dip into solder bath +230 °C for 5 sec.                                                                       | 90% of the dipped terminal is soldered. |                                                |
| Terminal Strength            | Pulling a terminal 500g weight for 10 sec.                                                                    | No defect for lead                      |                                                |

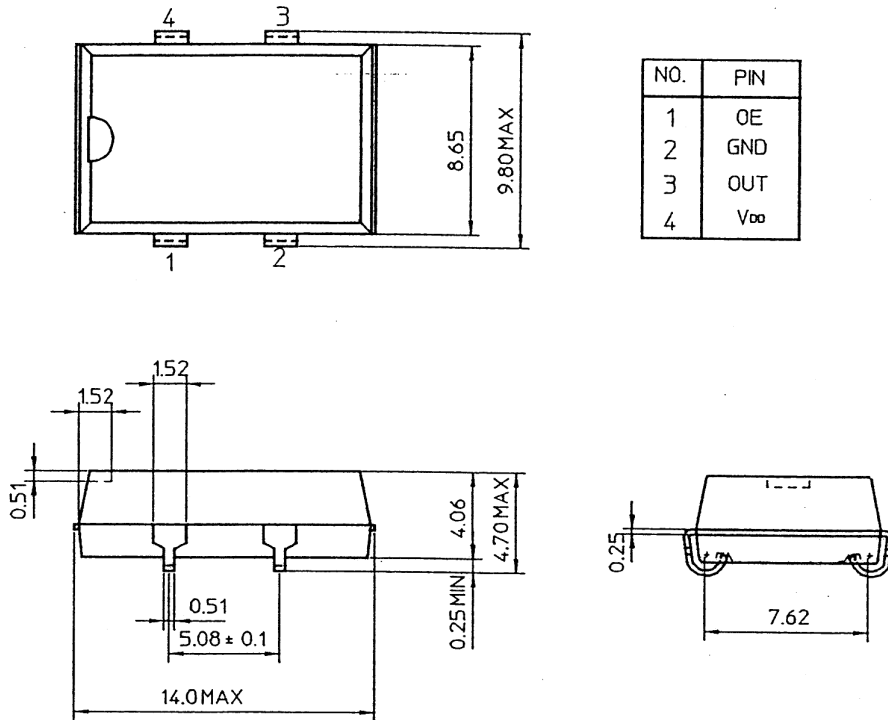
Each test is independently examined.

\*1 The value of after test is measured after putting in room temperature for 2 ~ 24hours.

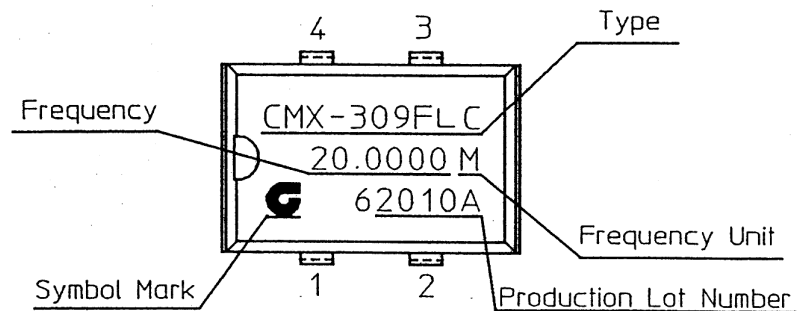
## 9. DIMENSIONS AND MARKING

《 Dimensions 》

(UNIT mm)



《 Marking 》



(Type)

CMX-309FL B

B: ±50ppm(-10~+70℃)  
C: ±100ppm(-10~+70℃)  
F: ±100ppm(-40~+85℃)

FL: 5V(Fundamental) 10TTL(45-55%)/50pF  
FS: 5V(Fundamental) 50pF(45-55%)  
HW: 5V(Overtone) 10TTL(45-55%)/50pF  
HS: 5V(Overtone) 50pF(45-55%)  
FB: 3.3V(Fundamental) 30pF(40-60%)  
FA: 3.3V(Fundamental) 30pF(45-55%)  
HB: 3.3V(Overtone) 30pF(40-60%)  
HA: 3.3V(Overtone) 30pF(45-55%)

## 10. TAPE AND REEL PACKAGING

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Devices under this specification are packaged on 24mm tape in shipping container in accordance with the additional document "TAPE AND REEL PACKAGING SPECIFICATION".

## 11. NOTES

### 1 . HANDLING

#### ( ELECTROSTATIC DISCHARGES )

This device is made with CMOS circuitry. Please take precautions to prevent damage due to electrical static discharge.

#### ( SHOCK RELIABILITY )

This device contains a quartz crystal, so please do not give too much shock or vibration. An automatic inserion is available, however, the internal quartz crystal might be damaged in case that too much shock or vibration is given by machine condition. Be sure to check your machine condition in advance.

#### ( CLEANING )

Since, depending on the cleaning conditions, there is a possibility of damage being caused to the Crystal Osillator, do not fail to test and confirm the results beforehand, using your company's cleaning conditions.

#### ( TEMPERATURE AND HUMIDITY )

We recomend to store and use device under normal temperature and humidity.

When this device is used in high humidity applications, there is a potential problem with condensation.

As with other IC's, please take precautions to prevent condensation.

### 2 . CIRCUIT DESIGNS

#### ( POWER LINES )

We recomend placing a 0.01 to 0.1  $\mu$  F capacitor between  $V_{DD}$  and GND to obtain stable operation and protect against power line ripple .

$V_{DD}$  and GND pattern should be as wide as possible.

#### ( OE INPUT LINE )

When OE pin is not used, please connect it to  $V_{DD}$  .

#### ( OUTPUT LINE )

As a long output line may cause irregular output, please take care to design that output line is as short as possible, and also keep high level signal source away from this device.

# TAPE AND REEL PACKAGING SPECIFICATION

## I .SCOPE

This specification defines the procedure for TAPE AND REEL PACKAGING for CMX-309 Series.

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| { 3 }    | OUTER CARTON       |          |
| { 4 }    | MARKING            | A-5      |
| { 5 }    | QUANTITY           |          |
| { 6 }    | STORAGE ENVIONMENT |          |
| { 7 }    | HANDLING           |          |

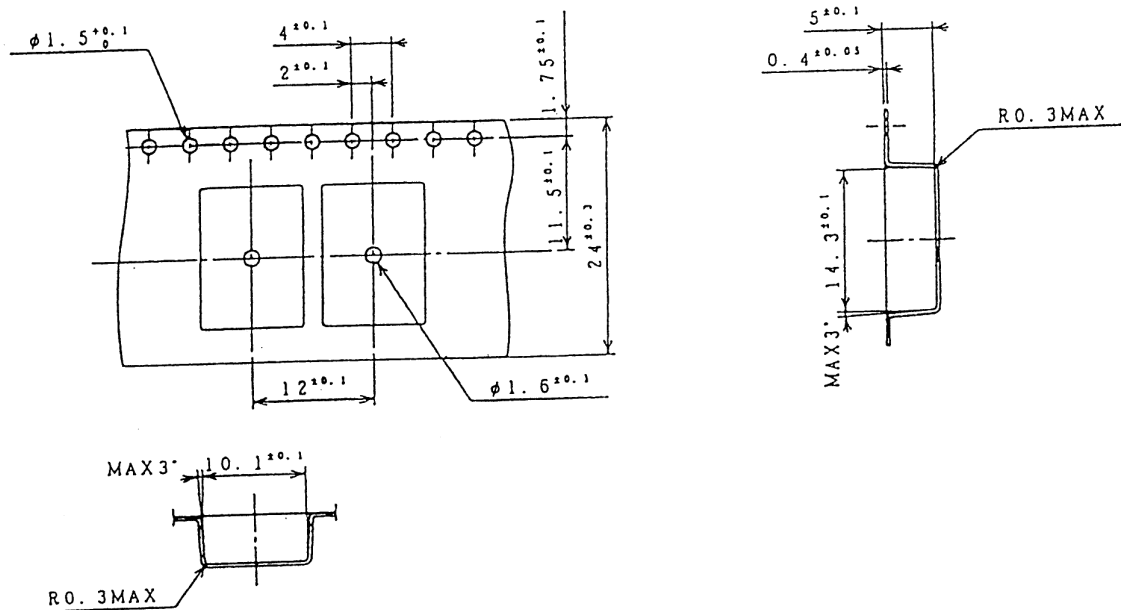
## [ 1 ] TAPING SPECIFICATION

Subject to EIA-481A & JIS C-0806

(1) Tape Dimensions JIS TB-2412

Material of the Carrier Tape : PS conduct

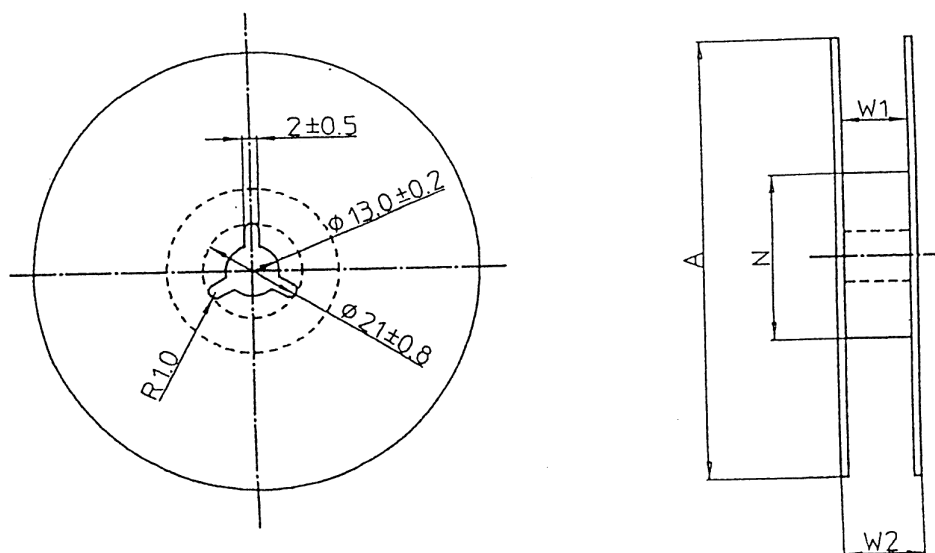
Material of the Cover Tape : PET



## (2) Reel Dimensions

Center material : Corrugated Cardboard

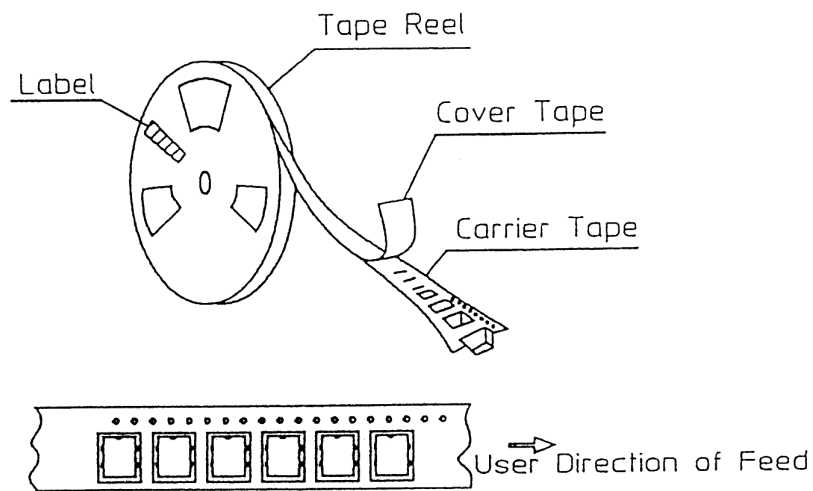
Material of the Reel : Cardboard



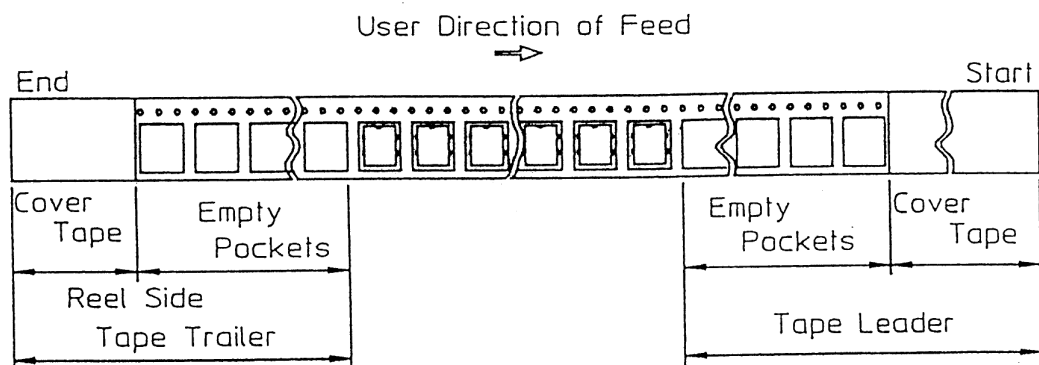
| Symbol        | A                  | N                 | W1             | W2             |
|---------------|--------------------|-------------------|----------------|----------------|
| Dimension(mm) | $\phi 330 \pm 2.0$ | $\phi 80 \pm 1.0$ | $25.5 \pm 1.5$ | $29.5 \pm 2.0$ |

### (3) Packing

#### ① Tape & Reel

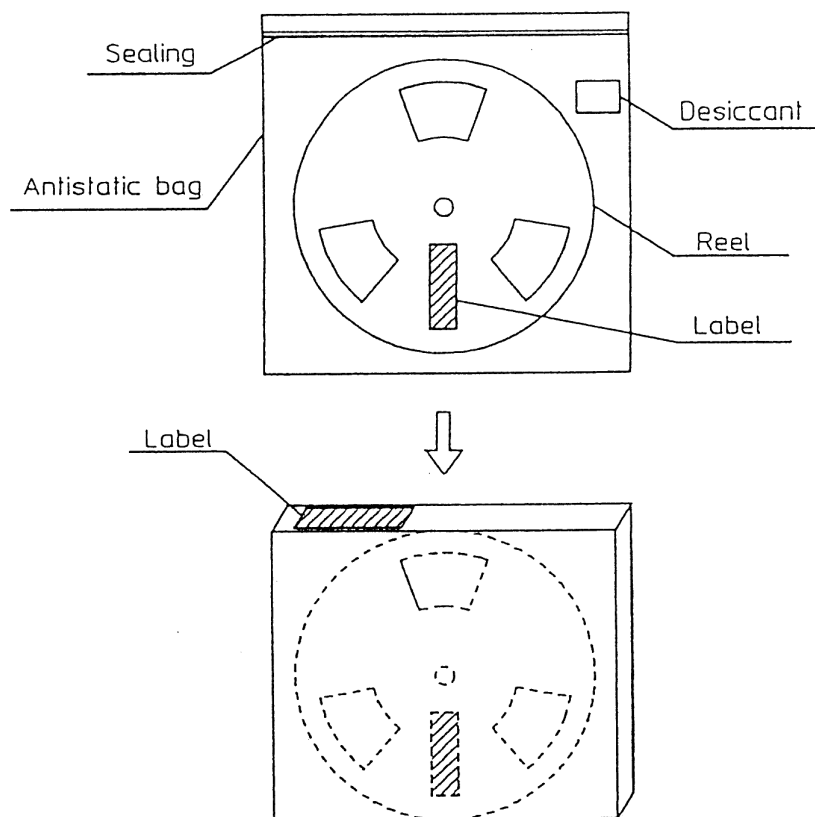


#### ② Start & End Point

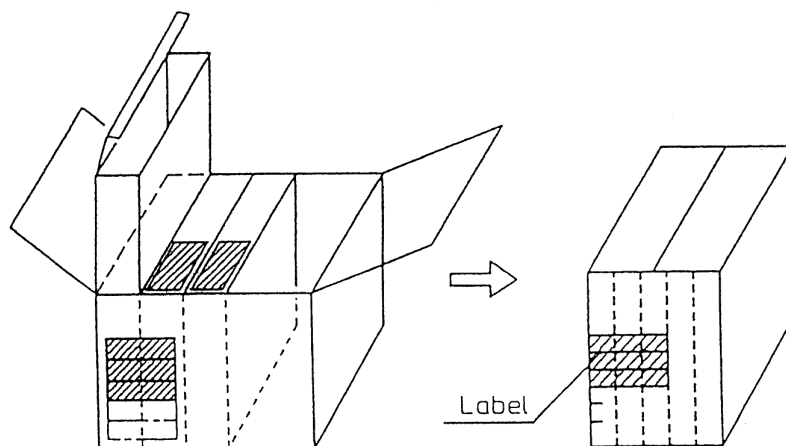


| Item         |              | Empty Space     |
|--------------|--------------|-----------------|
| Tape Leader  | Cover Tape   | Min. 1000 mm    |
|              | Carrier Tape | Min. 10 Pockets |
| Tape Trailer | Cover Tape   | Min. 0 mm       |
|              | Carrier Tape | Min. 10 pockets |

## [ 2 ] INNER CARTON



## [ 3 ] OUTER CARTON



## [ 4 ] MARKING

### (1) Reel Marking

Reel Marking is consist of:

- \* Parts name or type
- \* Frequency
- \* Quantity
- \* Manufacturing Date or symbol
- \* Manufacturer's name or symbol
- \* Others(if necessary)

### (2) Inner Carton Marking

same as Reel Marking

### (3) Outer Carton Marking

same as Reel Marking

## [ 5 ] QUANTITY

1000 pcs/reel

## [ 6 ] STORAGE ENVIRONMENT

- \* Storage the reel at normal temperature and humidity
- \* Open the packing just before using.
- \* Do not expose the sun.
- \* Do not storage with some erosive chemicals.
- \* Nothing is allowed to put on the reel or carton to prevent mechanical damage.

## [ 7 ] HANDLING

- \* Handle with care to prevent the damage of tape, reel and products.