

**S P E C I F I C A T I O N**  
**O F**  
**ALUMINIUM ELECTROLYTIC CAPACITORS**

HE Series

	sheet 1 of 23	APPROVED	<i>T. Kuro</i>			
DWG. No.	<b>H010423F1</b>	CHECKED	<i>T. Kuro</i>			
REV. LET.		DESIGNED	<i>J. Yamashita</i>			
LET.	REVISIONS	DATE	DR.	CK.	AP.	

**1. SCOPE**

This specification covers "HE series" miniature single-ended aluminum electrolytic capacitors.

**2. APPLICABLE SPECIFICATION**

Japanese Industrial Standard JIS C-5141 Characteristics W and JIS C-5102 except as specified in this specification.

**3. OPERATING TEMPERATURE RANGE**

Operating temperature range is the range of ambient temperature at which the capacitor can be operated continuously at rated voltage.  
-40~+105°C

**4. CHARACTERISTICS**

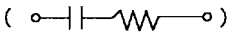
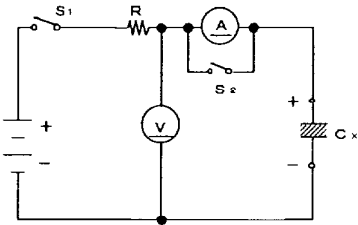
Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests are as follows :



- Ambient temperature : 5 to 35°C
- Relative humidity : 45 to 85%
- Air pressure : 86kPa to 106kPa

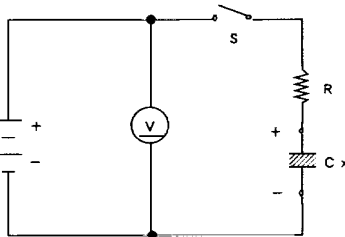
If there may be doubt on the results, measurements shall be made within the following limits,

- Ambient temperature : 20±2°C
- Relative humidity : 60 to 70%
- Air pressure : 86kPa to 106kPa

**4.1 ELECTRICAL CHARACTERISTICS**

No.	Item	Test method	Performance
4.1.1	RATED VOLTAGE		DC 6.3~100 V
4.1.2	CAPACITANCE	Measuring frequency 120Hz ±20 % Measuring circuit : Series equivalent circuit (  ) Measuring voltage : 0.5Vrms or less +1.5 to 2.0 VDC	6.8~18000 μF  Capacitance tolerance: ±20%
4.1.3	Tan δ	Measuring frequency, measuring circuit and measuring voltage are the same those for capacitance.	Not more than the value given in table 1.
4.1.4	LEAKAGE CURRENT	The rated voltage shall be applied across the capacitor and its protective resistor which shall be 1000±100Ω. The leakage current shall then be measured after an electrification period of 1 min.  Measurement circuit 	After 2 min; not more than I=0.01CV(μA) or 3(μA) whichever is greater. After 2min :  I : Leakage current (μA) C : Capacitance (μF) V : Rated voltage (V)

- R : Protective resistor (1000±100Ω)
-  : DC ammeter
-  : DC voltmeter
- S<sub>1</sub> : switch
- S<sub>2</sub> : Protective switch for an ammeter
- C<sub>x</sub> : Test Capacitor

No.	Item	Test method	Performance															
4. 1. 5	MAXIMUM APPLICABLE RIPPLE CURRENT	The maximum A. C. current having frequency of 100kHz which can be applied to the capacitor at $105 \pm 2^\circ\text{C}$ continuously. Peak voltage not to exceed rated D. C. voltage.	Not more then the value sheet 19, 20.															
4. 1. 6	TEMPERATURE CHARACTERISTIC	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>20 \pm 2^\circ\text{C}</math></td> <td>-----</td> </tr> <tr> <td>2</td> <td><math>-40 \pm 2^\circ\text{C}</math></td> <td>2h.</td> </tr> <tr> <td>3</td> <td><math>20 \pm 2^\circ\text{C}</math></td> <td>15min.</td> </tr> <tr> <td>4</td> <td><math>105 \pm 2^\circ\text{C}</math></td> <td>2h.</td> </tr> </tbody> </table> <p>Step1 : Capacitance and impedance shall be measured. (<math> Z </math> <math>20^\circ\text{C}</math> 120Hz <math>\pm 20\%</math>)</p> <p>Step2 : After the capacitor being stored for 2 hours, Impedance shall be made at thermal stability. (<math> Z </math> <math>-40^\circ\text{C}</math> 120Hz <math>\pm 20\%</math>)</p> <p>Step4 : After the capacitor being stored for 2 hours, capacitance shall be measured. The measurement shall be made</p>	Step	Temperature	Time	1	$20 \pm 2^\circ\text{C}$	-----	2	$-40 \pm 2^\circ\text{C}$	2h.	3	$20 \pm 2^\circ\text{C}$	15min.	4	$105 \pm 2^\circ\text{C}$	2h.	<p>Impedance ratio Ratio to the value at step 1 shall be not more than the value given Table-1.</p> <p>Step 4 : Variation of capacitance Within <math>\pm 20\%</math> of the value at Step 1.</p>
Step	Temperature	Time																
1	$20 \pm 2^\circ\text{C}$	-----																
2	$-40 \pm 2^\circ\text{C}$	2h.																
3	$20 \pm 2^\circ\text{C}$	15min.																
4	$105 \pm 2^\circ\text{C}$	2h.																
4. 1. 7	SURGE TEST	<p>Voltage application : 1000 times of charging for <math>30 \pm 5</math> sec., with a period of <math>6 \pm 0.5</math> min. Test temperature : <math>15^\circ\text{C} \sim 35^\circ\text{C}</math> And the capacitor shall be stored under standard atmospheric conditions to obtain thermal stability, after which measurements shall be made.</p> <p>Test circuit</p>  <p style="margin-left: 20px;">             R : Protective series resistor (1000<math>\Omega</math>)              V : DC voltmeter              S : Switch              C<sub>x</sub> : Test capacitor         </p> <p>Note : This requirement is applicable only to instantaneous overvoltage which may be applied to the terminals of capacitor, therefore, not applicable to such overvoltages as often applied.</p>	<p>Capacitance Not less than 80 % of the value before test.</p> <p>Dissipation factor Not more than 200 % of the specified value in Table 1.</p> <p>Leakage current To satisfy No. 4. 1. 4.</p>															
SPECIFICATION		DWG. No.	H010423F1 sheet 2															

# nichicon

4.2 MECHANICAL PERFORMANCE																																				
No.	Item	Test method	Performance																																	
4.2.1	TERMINAL STRENGTH	<p>Tensile strength of termination: A static load of ※<sub>1</sub>N shall be applied to the terminal in the axial direction and acting in a direction away from the body for 10 sec.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">φ d</td> <td style="padding: 2px;">0.5</td> <td style="padding: 2px;">0.6</td> <td style="padding: 2px;">0.8</td> </tr> <tr> <td style="padding: 2px;">dia. of wire φ</td> <td style="padding: 2px;">0.5</td> <td style="padding: 2px;">0.6</td> <td style="padding: 2px;">0.8</td> </tr> <tr> <td style="padding: 2px;">※<sub>1</sub></td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">10</td> </tr> <tr> <td style="padding: 2px;">Tensile force N</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">10</td> </tr> </table> <p>Bending strength of termination: Hang the specified dead weight of ※<sub>2</sub>N, then bent the body through 90°, return to the original position. Next bend it in opposite direction through 90° with the same speed, again return to the original position. Carry out this operation in about 5 sec.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">φ d</td> <td style="padding: 2px;">0.5</td> <td style="padding: 2px;">0.6</td> <td style="padding: 2px;">0.8</td> </tr> <tr> <td style="padding: 2px;">dia. of wire φ</td> <td style="padding: 2px;">0.5</td> <td style="padding: 2px;">0.6</td> <td style="padding: 2px;">0.8</td> </tr> <tr> <td style="padding: 2px;">※<sub>2</sub></td> <td style="padding: 2px;">2.5</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">5</td> </tr> <tr> <td style="padding: 2px;">Bending force N</td> <td style="padding: 2px;">2.5</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">5</td> </tr> </table>	φ d	0.5	0.6	0.8	dia. of wire φ	0.5	0.6	0.8	※ <sub>1</sub>	5	10	10	Tensile force N	5	10	10	φ d	0.5	0.6	0.8	dia. of wire φ	0.5	0.6	0.8	※ <sub>2</sub>	2.5	5	5	Bending force N	2.5	5	5	<p>When the capacitance is measured, there shall be no intermittent contacts, or open or short-circuiting. There shall be no such mechanical damage.</p>	
φ d	0.5	0.6	0.8																																	
dia. of wire φ	0.5	0.6	0.8																																	
※ <sub>1</sub>	5	10	10																																	
Tensile force N	5	10	10																																	
φ d	0.5	0.6	0.8																																	
dia. of wire φ	0.5	0.6	0.8																																	
※ <sub>2</sub>	2.5	5	5																																	
Bending force N	2.5	5	5																																	
4.2.2	RESISTANCE TO VIBRATION	<p>To comply with JIS C-5102 8.2. and JIS C-5025. Direction and duration of vibration: 3 orthogonal directions mutually each for 2h. Total 6h.</p>	<p>When the capacitance is measured, there shall be no intermittent contacts, or open or short-circuiting. There shall be no such mechanical damage.</p>																																	
4.2.3	SOLDERABILITY	<p>To comply with JIS C-0050 Temperature or solder : 230±5°C Dipping time : 2±0.5sec. This specification shall be met after the capacitors are stored under standard atmospheric conditions for 6 months.</p>	<p>At least 3/4 of circumferential surface of the dipping portion of termination shall be covered with new solder.</p>																																	

4.3 ENDURANCE PERFORMANCE			
No.	Item	Test method	Performance
4.3.1	RESISTANCE TO SOLDERING HEAT	Solder bath method Solder temperature : 260±5°C Immersion time : 10±1 sec. Printed wiring board : 1.6mm  Soldering iron method Bit temperature : 350±10°C Application time of soldering iron : 3 ¼ 秒  For other procedures then those specified, refer to JIS C-0050. Test Method 1 (Solder bath at 260 °C) and Method 2 (Soldering iron at 350 °C)	Variation of capacitance : Within ±10% of the value before test.  Tan δ : To satisfy Table 1  Leakage current : To satisfy No. 4.1.4  Appearance : No remarkable abnormality.
4.3.2	RESISTANCE TO DAMP HEAT (STEADY STATE)	To comply with JIS C-5023 Test temperature : 40±2°C Test time : 240±8h Relative humidity : 90~95% After completion of test, the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurements shall be made.	Variation of capacitance : Within ±15% of the value before test.  Tan δ : To satisfy Table 1  Leakage current : To satisfy No. 4.1.4  Appearance : No remarkable abnormality.
4.3.3	LIFE TEST	Applied voltage D. C. bias with rated ripple current through protective resistance of 1000 Ω, so that its peak voltage shall not exceed the rated D. C. voltage. The capacitors shall be removed from the test chamber and stabilized at room temperature for 2 h.  Test temperature 105 ±2°C Test time ※3 (6.3~10V) Φ D ≤ 6.3 : 4000 <sup>+72</sup> / <sub>-0</sub> h Φ D = 8, 10 : 6000 <sup>+72</sup> / <sub>-0</sub> h Φ D ≥ 12.5 : 8000 <sup>+72</sup> / <sub>-0</sub> h (16~100V) Φ D ≤ 6.3 : 5000 <sup>+72</sup> / <sub>-0</sub> h Φ D = 8, 10 : 7000 <sup>+72</sup> / <sub>-0</sub> h Φ D ≥ 12.5 : 10000 <sup>+72</sup> / <sub>-0</sub> h	Variation of capacitance : Within 20% of the value before test.  Tan δ : Not more than 200% of the specified value in Table 1.  Leakage current : To satisfy No. 4.1.4  Appearance : No remarkable abnormality.
SPECIFICATION		DWG. No.	H010423F1 sheet 4

No.	Item	Test method	Performance										
4.3.4	SAFETY VENT	<p>A.C. Application Test</p> <p>The capacitor shall be subjected to an A.C. voltage(50 or 60Hz) with r.m.s.value equal to 0.7 times the rated D.C. voltage through a series resistor.</p> <p>The series resistor as follows.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Cap. (<math>\mu</math>F)</th> <th style="text-align: center;">R(<math>\Omega</math>)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>C \leq 10</math></td> <td style="text-align: center;">100</td> </tr> <tr> <td style="text-align: center;"><math>10 &lt; C \leq 100</math></td> <td style="text-align: center;">10</td> </tr> <tr> <td style="text-align: center;"><math>100 &lt; C \leq 1000</math></td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;"><math>1000 &lt; C</math></td> <td style="text-align: center;">0.1</td> </tr> </tbody> </table> <p>D.C. Application Test</p> <p>The capacitor Shall be subjected to a reverse D.C. voltage equal to the rated D.C. voltage. The current flowing through the capacitor shall be limited to 1A.</p>	Cap. ( $\mu$ F)	R( $\Omega$ )	$C \leq 10$	100	$10 < C \leq 100$	10	$100 < C \leq 1000$	1	$1000 < C$	0.1	<p>The vent device is actuated under the test conditions, thereby preventing terminals, metal pieces, etc, of the capacitor from scattering due to burst, the case from separating from the seal packing, or the capacitor from producing flame.</p>
Cap. ( $\mu$ F)	R( $\Omega$ )												
$C \leq 10$	100												
$10 < C \leq 100$	10												
$100 < C \leq 1000$	1												
$1000 < C$	0.1												
<p>Note : The test is terminated if the vent device is not actuated when 30min. has elapsed from the start of the test conducted under the conditions.</p>													

Table - 1 Electrical Characteristics

Rated voltage (V)	Surge voltage (V)	Tan $\delta$		
			$\frac{ Z _{-25^{\circ}\text{C}}}{ Z _{+20^{\circ}\text{C}}}$	$\frac{ Z _{-40^{\circ}\text{C}}}{ Z _{+20^{\circ}\text{C}}}$
6.3	8	0.22	4	8
10	13	0.19	3	6
16	20	0.16	2	4
25	32	0.14	2	3
35	44	0.12	2	3
50	63	0.10	2	3
63	79	0.09	2	3
100	125	0.08	2	3

5. MARKING

5.1 The following items shall be marked indelibly on the capacitor.

- (1) Manufacture's name (abbreviated manufacture's name permitted) or trade mark. : nichicon
- (2) Month and year of production or cord (including Lot No.)
- (3) Rated voltage
- (4) Capacitance
- (5) Polarity of the terminals
- (6) Capacitance tolerance code : (M)
- (7) Maximum operating temperature : 105°C
- (8) Series identification : HE

<MARKING>

**nichicon**  
100  $\mu$ F 50V



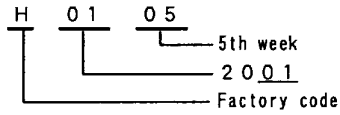
HE (M)  
105°C  
Lot No.

5.2 Marking color

Sleeve color : Black  
 Print color : White

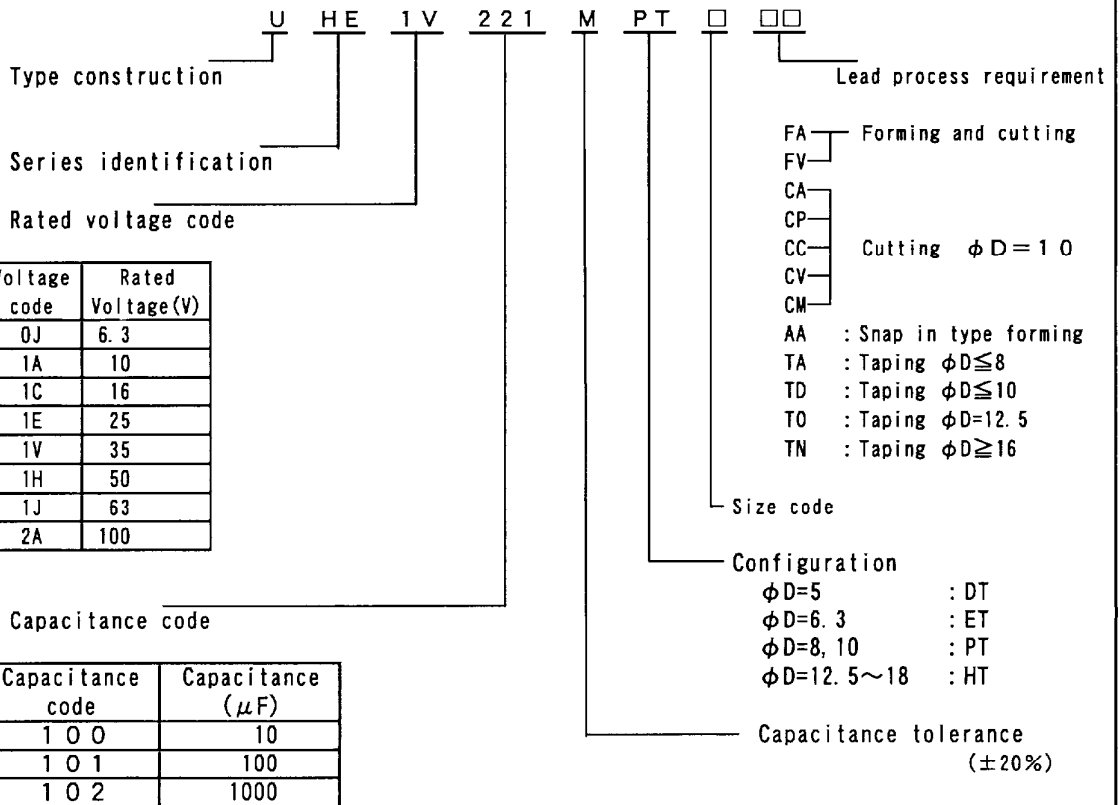
5.3 Lot No

<Example>



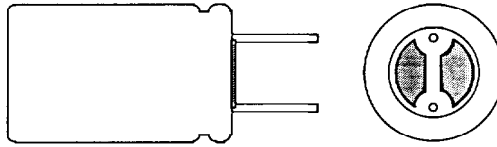
5th week  
 2 0 0 1  
 Factory code  
 H:OHNO Factory  
 A:ASAHI ELECTRIC INDUSTRIES CO.,LTD.  
 N:Nichicon Iwate Co.,LTD.  
 M:Nichicon Singapore PTE.LTD.  
 B:Nichicon Malaysia SDN.BHD.

6. TYPE NUMBERING SYSTEM

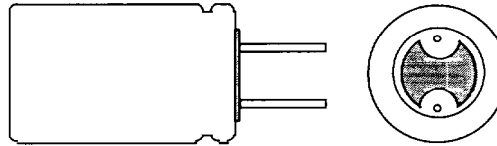


"GAS ESCAPE" END SEAL TYPE

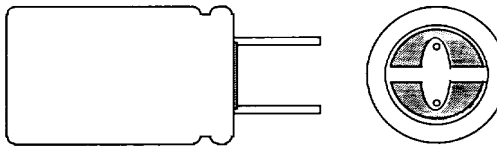
FORM A



FORM B



FORM C



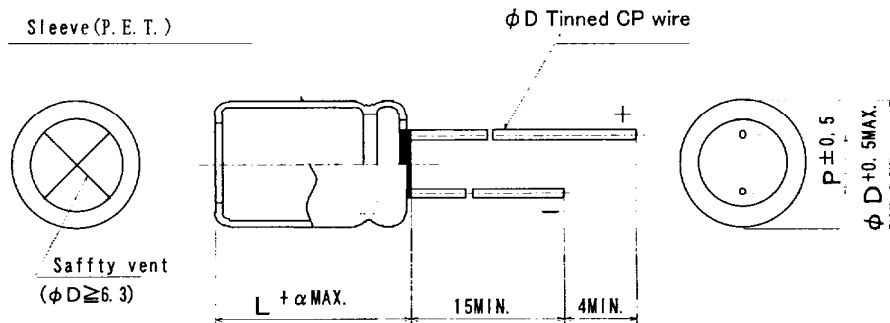
• SCOPE

FORM	$\phi D$
A	$\phi 5$ , $\phi 6.3$
B	$\phi 8$ , $\phi 10$
C	$\phi 12.5 \sim 18$

7. SHAPE AND DIMENSIONS

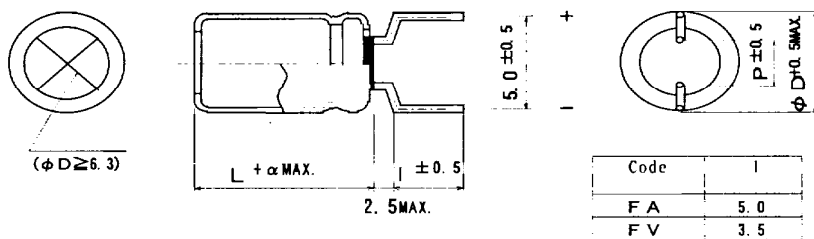
A : LONG READ

$$\alpha \begin{cases} L < 20 : 1.5 \\ L \geq 20 : 2.0 \end{cases}$$





B:FORMING CUT(formed lead code:FA, FV)

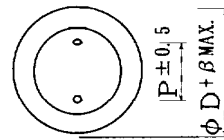
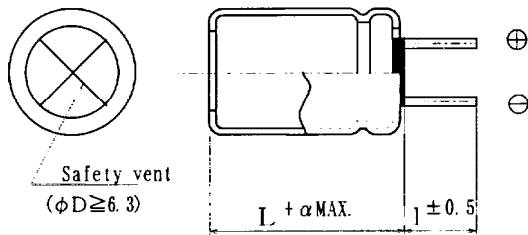


(mm)

$\phi D$	5	6.3	8	10	12.5	16	18
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5
$\phi d$	0.5	0.5	0.6	0.6	0.6 ※0.8	0.8	0.8

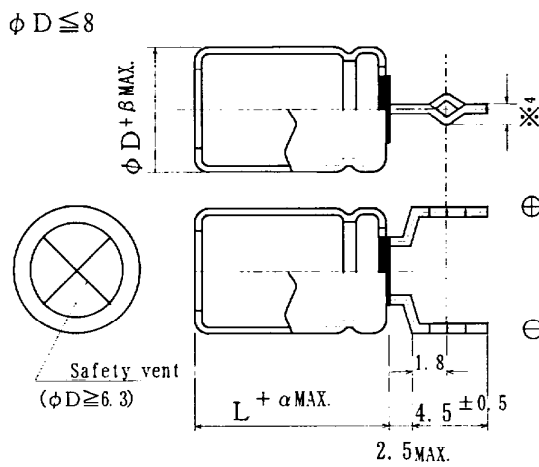
※In case  $L > 25$  for  $\phi 12.5(D)$  case size, lead diameter  $\phi 0.8(d)$  will be applied.

C : STRAIGHT CUT TYPE LEAD (Formed lead code : CA, CP, CC, CV, CM)

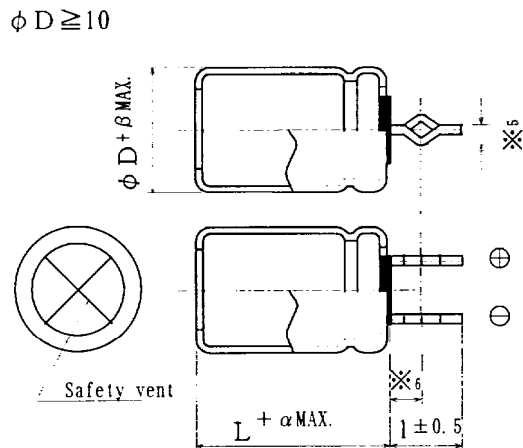
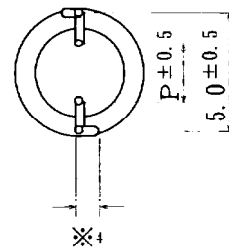


Formed lead code	l	Formed lead code	l
CA	5.0	CV	3.5
CP	4.5	CM	3.0
CC	4.0		

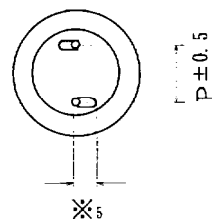
D : SNAP-IN TYPE LEAD (Formed lead code : AA)



※<sub>4</sub> { φ4, φ5, φ6.3 : 1.1  
φ8 : 1.3



※<sub>5</sub> { φ10 ~ φ18 : 1.3  
φ20 ~ φ25 : 1.8  
※<sub>6</sub> { φ10 ~ φ18 : 1.8  
φ20 ~ φ25 : 2.0  
l { φ10 ~ φ18 : 4.5  
φ20 ~ φ25 : 5.0



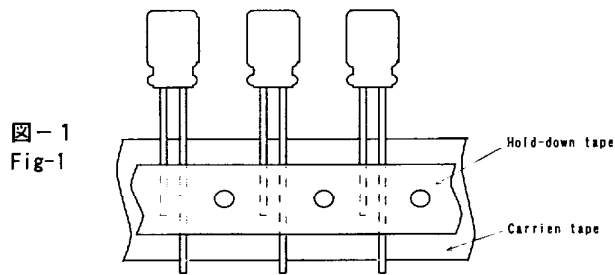
8. Application

This specification applied to the single-  
 . ( $L \leq 25$ )

9. Taping method

9.1 Leads of capacitor shall be fixed between  
 on the hold-down tape and carrier tape  
 as shown Fig-1.

All capacitors shall be orientated in one  
 direction such that the positive lead comes  
 right side of the capacitor when seeing  
 from hold-down tape up.

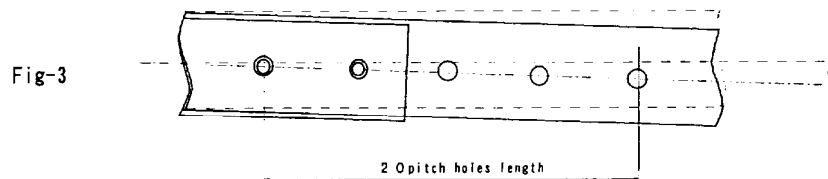
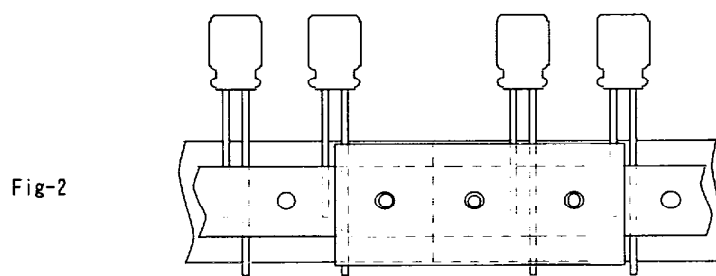


9.2 leader length and trailer length shall be  
 3 feeding hold unless otherwise requested.

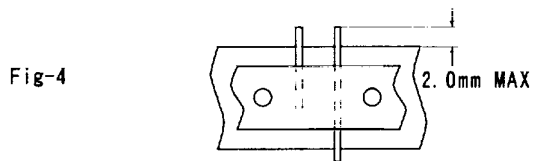
9.3 There shall be no three successive missing  
 product on tape.

9.4 Joint of carrier tape

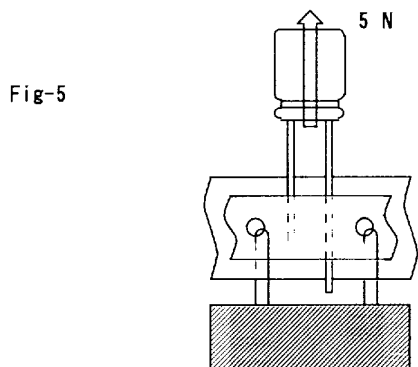
For joint of carrier tape, two carrier  
 tape shall be joined together by winding  
 adhesive tape around carrier tape.  
 Divergence of feed hold center shall not  
 be exceed 1 mm at 20 feed holes length.



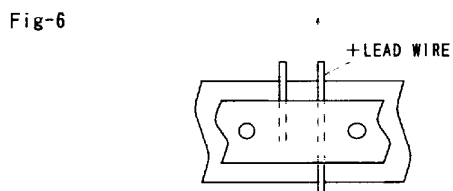
9.5 When leads are snipped to remove a capacitor, lead protrusion above the carrier tape shall be 2mm MAX.



9.6 Pull strength  
Capacitors shall be withstand 5N pull test without being removed from tape.



9.7 Lead pull strength  
Lead pull strength after taped shall be listed in the table below (+lead only).  
+ lead shall be pulled vertically as show Fig-6 until the lead is completely removed from the tape by using pull tester.



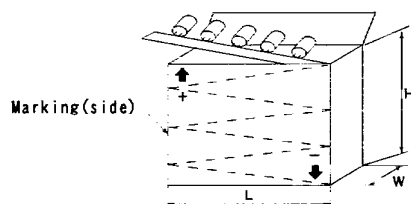
Case dia.	Lead dia.	Pull strength
φ5, φ6.3	0.5	3N MIN
φ8, φ10, φ12.5	0.6	3N MIN
φ16、φ18	0.8	3N MIN

## 10 Packing

10.1 Taped capacitors are packed into carton case in zigzag each folding will have following units.

Diameter	Quantity
5, 6.3, 8	25
10	24
12.5	20
16	10

## 10.2 Package dimensions



$\Phi D$	L MAX.	H MAX.	W MAX.
5 x 11	340	260	54
6.3 x 11	340	300	54
6.3 x 15	340	300	54
8 x 11.5	340	260	54
8 x 15	340	260	54
8 x 20	340	260	62
10 x 12.5	340	200	54
10 x 15	340	200	54
10 x 20	340	200	62
10 x 25	340	200	65
12.5 x 20	330	290	65
12.5 x 25	330	290	65
16 x 15	320	230	65
16 x 20	320	230	65
16 x 25	320	230	65
18 x 15	330	290	65
18 x 20	330	290	65
18 x 25	330	290	65

## 10.3 Marking(Each box shall be marked)

### 1) Polarity

The indication which shows the + side and - side drawer that it agreed with the product polarity like 10.2 clauses drawer is put.

### 2) Rated voltage

### 3) Type No. (When requested)

### 4) Quantity

### 5) Produced lot number

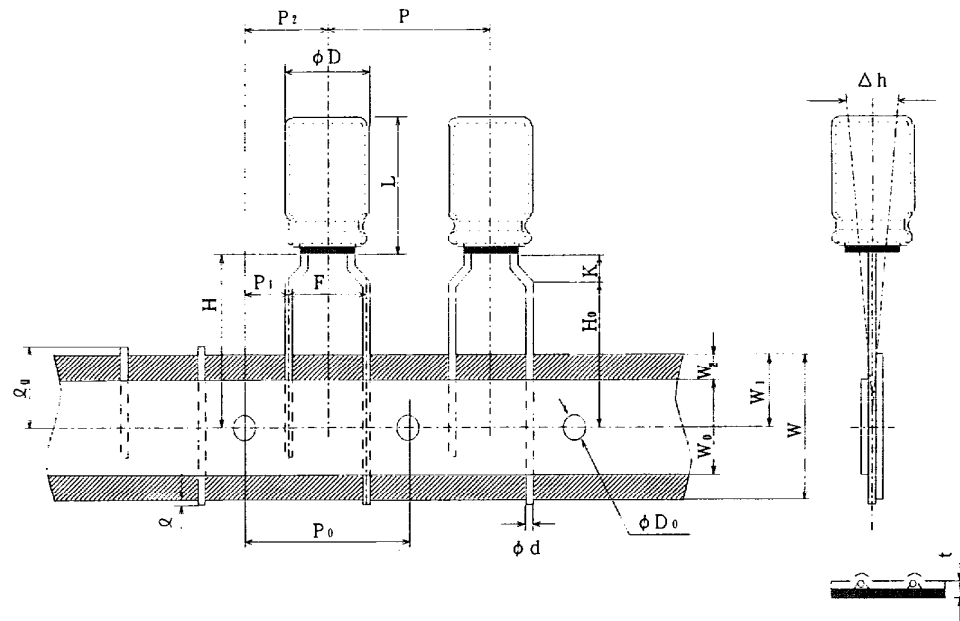
## 10.4 Quantity in box

Case diameter	Quantity in box
4, 5, 6.3	2000
8	1000
10, 12.5	500
16, 18	250

## 10.5 Taping form and dimension.

A figure shows it in P13~P18.

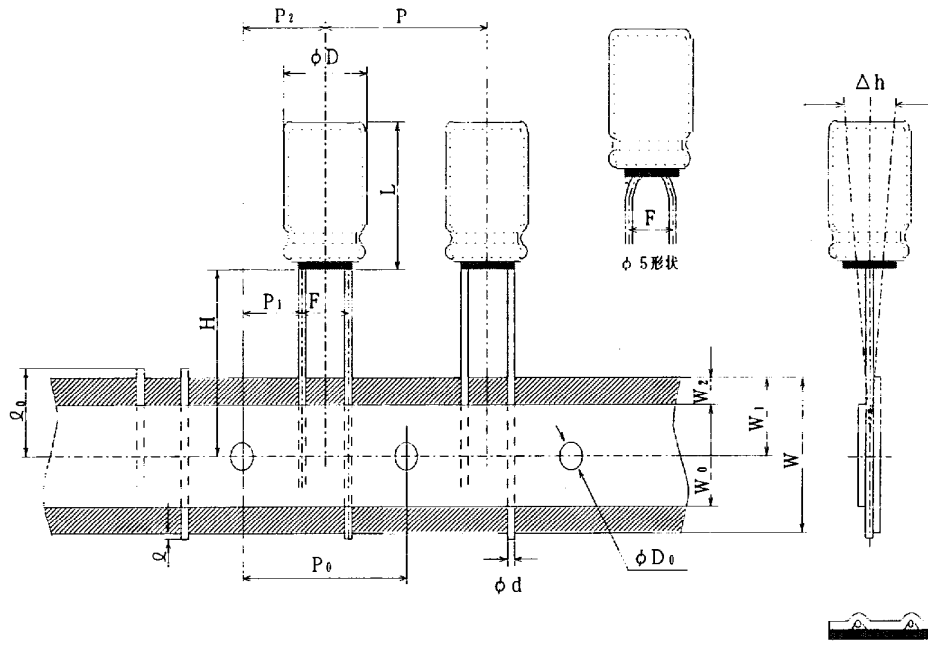
## Taping Configuration (Taping code: TA)



(mm)

Item	Symbol	Value	Tolerance	Remarks
BODY Diameter	$\phi D$	5, 6, 3, 8	$\pm 0.5$ MAX	
Body height	L	L		To comply with series specification.
Lead-Wire diameter	$\phi d$	0.5	$\pm 0.05$	$\phi 8 : 0.6$
Pitch of component	P	12.7	$\pm 1.0$	
Feed hole pitch	P0	12.7	$\pm 0.2$	
Hole center to lead	P1	3.85	$\pm 0.5$	
Free hole center to component center	P2	6.35	$\pm 1.0$	
Lead to lead distance	F	5.0	$^{+0.1}$ $^{-0.2}$	
Clinch Height	K	2.5	MAX	$\phi 8 : 4.0$ MAX.
Component alignment .F-R	$\Delta h$	0	$\pm 1.0$	
Tape width	W	18.0	$\pm 0.5$	
Hold-down tape width	W0	7.0	MIN	The hold down tape shall not protrude beyond the carrier tape.
Hold position	W1	9.0	$\pm 0.5$	
Hold-down tape width	W2	3.0	MAX	
Height of component from tape center	H	18.5	$^{-0.75}$ $^{-0.5}$	$\phi 8 : 20.0$
Lead-wire clinch height	H0	16.0	$\pm 0.5$	
Lead-wire protrusion	$\alpha$	1.0	MAX	
Feed hole diameter	$\phi D0$	4.0	$\pm 0.2$	
Total tape thickness	t	0.6	$\pm 0.2$	
Length of snapped lead	$\lambda 0$	11.0	MAX	

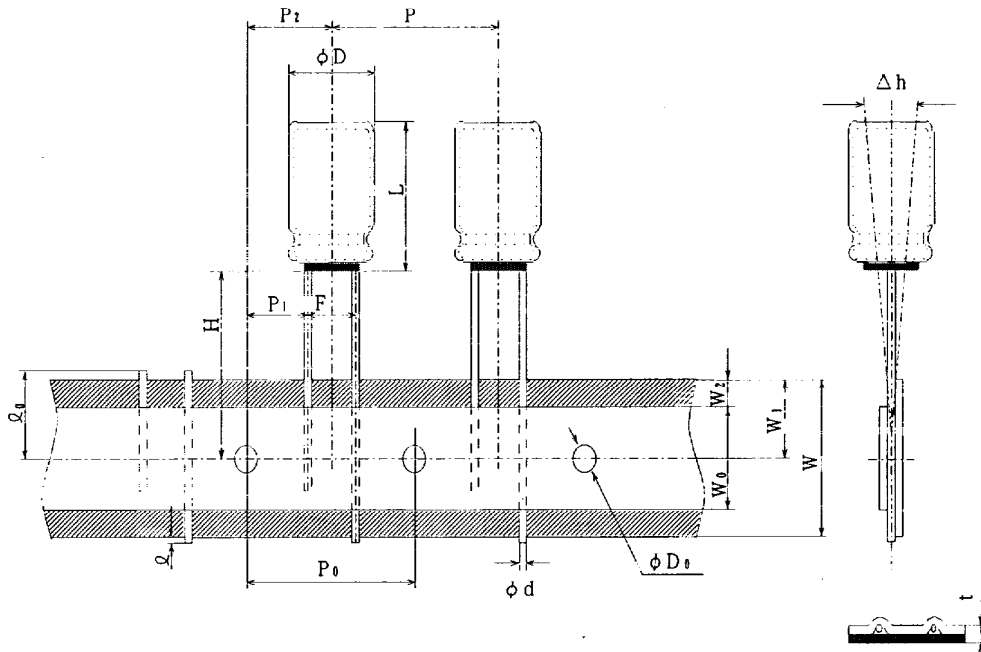
## Taping Configuration (Taping code: TD)



(mm)

Item	Symbol	Value	Tolerance	Remarks
BODY Diameter	$\phi D$	5.6.3	$\pm 0.5 \text{ MAX}$	
Body height	L	L		To comply with series specification.
Lead-Wire diameter	$\phi d$	0.5	$\pm 0.05$	
Pitch of component	P	12.7	$\pm 1.0$	
Feed hole pitch	P0	12.7	$\pm 0.2$	
Hole center to lead	P1	5.1	$\pm 0.5$	
Free hole center to component center	P2	6.35	$\pm 1.0$	
Lead to lead distance	F	2.5	$^{+0.2}$ $_{-0.2}$	
Component alignment F-R	$\Delta h$	0	$\pm 1.0$	
Tape width	W	18.0	$\pm 0.5$	
Hold-down tape width	W0	7.0	MIN	The hold down tape shall not protrude beyond the carrier tape.
Hold position	W1	9.0	$\pm 0.5$	
Hold-down tape width	W2	3.0	MAX	
Height of component from tape center	H	18.5	$^{+0.75}$ $_{-0.5}$	
Lead-wire protrusion	$\lambda$	1.0	MAX	
Feed hole diameter	$\phi D0$	4.0	$\pm 0.2$	
Total tape thickness	t	0.6	$\pm 0.2$	
Length of snapped lead	$\lambda 0$	11.0	MAX	

Taping Configuration (Taping code: TD)

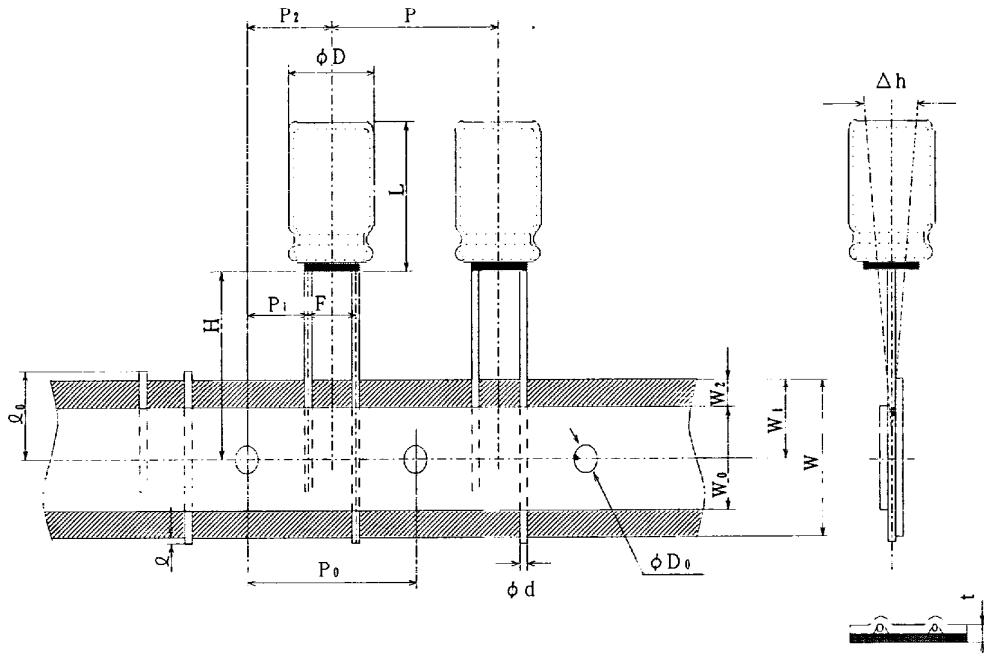


(mm)

Item	Symbol	Value	Tolerance	Remarks
BODY Diameter	$\phi D$	8	+0.5MAX	
Body height	L	L		To comply with series specification.
Lead-Wire diameter	$\phi d$	0.6	$\pm 0.05$	
Pitch of component	P	12.7	$\pm 1.0$	
Feed hole pitch	P0	12.7	$\pm 0.2$	
Hole center to lead	P1	4.6	$\pm 0.5$	
Free hole center to component center	P2	6.35	$\pm 1.0$	
Lead to lead distance	F	3.5	$^{+0.8}$ $_{-0.2}$	
Component alignment F-R	$\Delta h$	0	$\pm 1.0$	
Tape width	W	18.0	$\pm 0.5$	
Hold-down tape width	W0	7.0	MIN	The hold down tape shall not protrude beyond the carrier tape.
Hold position	W1	9.0	$\pm 0.5$	
Hold-down tape width	W2	3.0	MAX	
Height of component from tape center	H	18.5	$^{+0.75}$ $_{-0.5}$	
Lead-wire protrusion	$\alpha$	1.0	MAX	
Feed hole diameter	$\phi D0$	4.0	$\pm 0.2$	
Total tape thickness	t	0.6	$\pm 0.2$	
Length of snapped lead	$\lambda 0$	11.0	MAX	



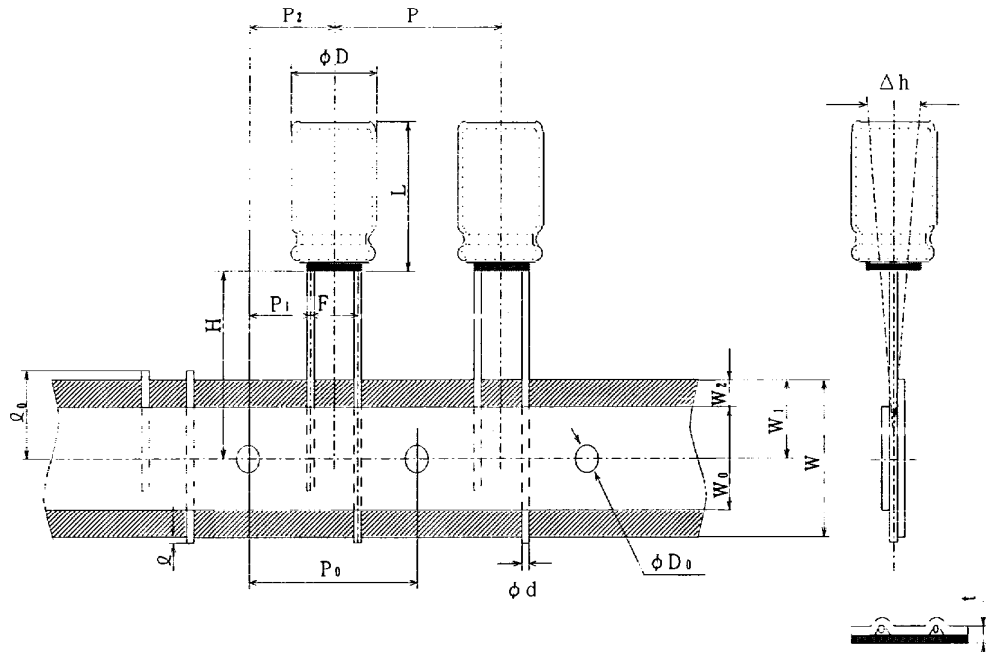
## Taping Configuration (Taping code:TD)



(mm)

Item	Symbol	Value	Tolerance	Remarks
BODY Diameter	$\phi D$	10	$\pm 0.5 \text{ MAX}$	
Body height	L	L		To comply with series specification.
Lead-Wire diameter	$\phi d$	0.6	$\pm 0.05$	
Pitch of component	P	12.7	$\pm 1.0$	
Feed hole pitch	P0	12.7	$\pm 0.2$	
Hole center to lead	P1	3.85	$\pm 0.5$	
Free hole center to component center	P2	6.35	$\pm 1.0$	
Lead to lead distance	F	5.0	$^{+0.8}$ $_{-0.2}$	
Component alignment .F-R	$\Delta h$	0	$\pm 1.0$	
Tape width	W	18.0	$\pm 0.5$	
Hold-down tape width	W0	7.0	MIN	The hold down tape shall not protrude beyond the carrier tape.
Hold position	W1	9.0	$\pm 0.5$	
Hold-down tape width	W2	3.0	MAX	
Height of component from tape center	H	18.5	$^{+0.75}$ $_{-0.5}$	
Lead-wire protrusion	$\lambda$	1.0	MAX	
Feed hole diameter	$\phi D0$	4.0	$\pm 0.2$	
Total tape thickness	t	0.6	$\pm 0.2$	
Length of snipped lead	$\lambda 0$	11.0	MAX	

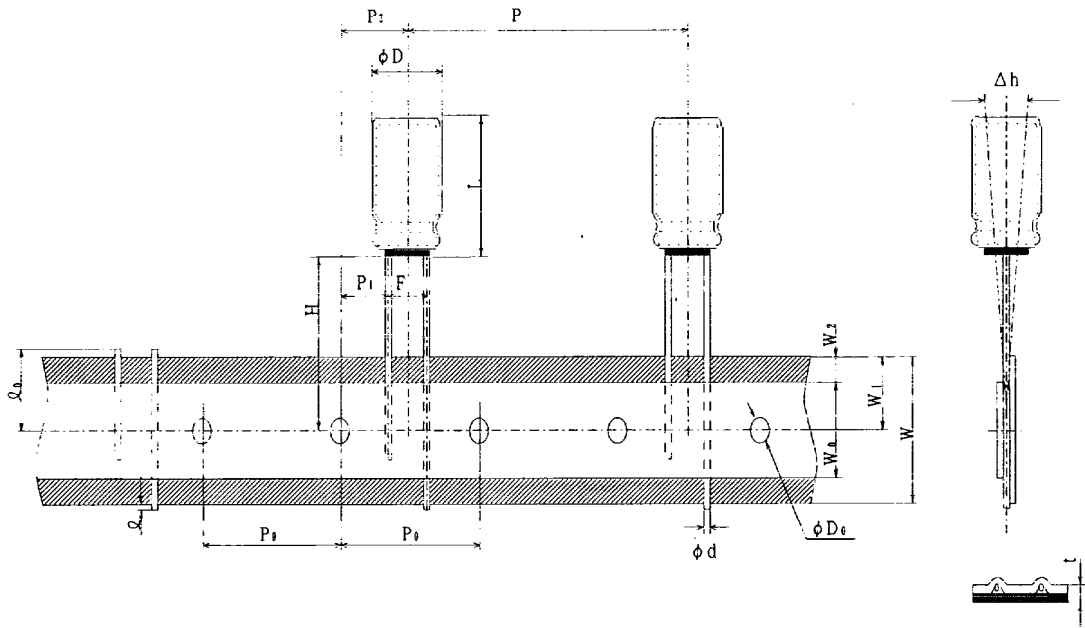
## Taping Configuration (Taping code: T0)



(mm)

Item	Symbol	Value	Tolerance	Remarks
BODY Diameter	$\phi D$	12.5	+0.5MAX	
Body height	L	L		To comply with series specification.
Lead-Wire diameter	$\phi d$	0.6	$\pm 0.05$	
Pitch of component	P	15.0	$\pm 1.0$	
Feed hole pitch	P0	15.0	$\pm 0.2$	
Hole center to lead	P1	5.0	$\pm 0.5$	
Free hole center to component center	P2	7.5	$\pm 1.0$	
Lead to lead distance	F	5.0	$^{+0.8}$ $^{-0.2}$	
Component alignment .F-R	$\Delta h$	0	$\pm 1.0$	
Tape width	W	18.0	$\pm 0.5$	
Hold-down tape width	W0	12.5	MIN	The hold down tape shall not protrude beyond the carrier tape.
Hold position	W1	9.0	$\pm 0.5$	
Hold-down tape width	W2	3.0	MAX	
Height of component from tape center	H	18.5	$^{+0.75}$ $^{-0.5}$	
Lead-wire protrusion	$\lambda$	1.0	MAX	
Feed hole diameter	$\phi D0$	4.0	$\pm 0.2$	
Total tape thickness	t	0.6	$\pm 0.2$	
Length of snapped lead	$\lambda 0$	11.0	MAX	

## Taping Configuration (Taping code: TN)



(mm)

Item	Symbol	Value	Tolerance	Remarks
BODY Diameter	$\phi D$	16.18	$\pm 0.5 \text{ MAX}$	
Body height	L	25		To comply with series specification.
Lead-Wire diameter	$\phi d$	0.8	$\pm 0.05$	
Pitch of component	P	30.0	$\pm 1.0$	
Feed hole pitch	P0	15.0	$\pm 0.2$	
Hole center to lead	P1	3.75	$\pm 0.5$	
Free hole center to component center	P2	7.5	$\pm 1.0$	
Lead to lead distance	F	7.5	$\pm 0.8$	
Component alignment .F-R	$\Delta h$	0	$\pm 1.0$	
Tape width	W	18.0	$\pm 0.5$	
Hold-down tape width	W0	12.5	MIN	The hold down tape shall not protrude beyond the carrier tape.
Hold position	W1	9.0	$\pm 0.5$	
Hold-down tape width	W2	3.0	MAX	
Height of component from tape center	H	18.5	$^{+0.75}$ $_{-0.5}$	
Lead-wire protrusion	$\lambda$	1.0	MAX	
Feed hole diameter	$\phi D0$	4.0	$\pm 0.2$	
Total tape thickness	t	0.6	$\pm 0.2$	
Length of snapped lead	$\lambda 0$	11.0	MAX	

■ Standard ratings

V Cap. code		6.3(0J)				10(1A)			
		Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz	Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz
100	101				5 × 11	0.58	2.3	210	
150	151	5 × 11	0.58	2.3	210				
220	221				6.3 × 11	0.22	0.87	340	
330	331	6.3 × 11	0.22	0.87	340				
470	471				8 × 11.5	0.13	0.52	640	
680	681	8 × 11.5	0.13	0.52	640	8 × 15	0.087	0.35	
680	681				▲ 10 × 12.5	0.08	0.32	865	
820	821	10 × 12.5	0.08	0.32	865				
1000	102	8 × 15	0.087	0.35	840	8 × 20	0.069	0.27	
1000	102				▲ 10 × 16	0.06	0.24	1210	
1200	122	8 × 20	0.069	0.27	1050	10 × 20	0.046	0.18	
1200	122	▲ 10 × 16	0.06	0.24	1210				
1500	152	10 × 20	0.046	0.18	1400	10 × 25	0.042	0.17	
1500	152				▲ 12.5 × 15	0.049	0.16	1450	
1800	182	12.5 × 15	0.049	0.16	1450				
2200	222	10 × 25	0.042	0.17	1650	10 × 31.5	0.031	0.12	
2200	222				▲ 12.5 × 20	0.035	0.12	1900	
2200	222				● 16 × 15	0.042	0.12	1940	
2700	272	▲ 10 × 31.5	0.031	0.12	1910	18 × 15	0.043	0.11	
2700	272	16 × 15	0.042	0.12	1940				
3300	332	12.5 × 20	0.035	0.12	1900	12.5 × 25	0.027	0.089	
3900	392	12.5 × 25	0.027	0.089	2230	12.5 × 31.5	0.024	0.078	
3900	392	▲ 18 × 15	0.043	0.11	2210	▲ 16 × 20	0.027	0.078	
4700	472	12.5 × 31.5	0.024	0.078	2650	12.5 × 35.5	0.02	0.065	
5600	562	12.5 × 35.5	0.02	0.065	2880	12.5 × 40	0.017	0.056	
5600	562	▲ 16 × 20	0.027	0.078	2530	▲ 16 × 25	0.021	0.06	
5600	562				● 18 × 20	0.026	0.067	2860	
6800	682	12.5 × 40	0.017	0.056	3350	16 × 31.5	0.017	0.05	
6800	682	▲ 16 × 25	0.021	0.06	2930	▲ 18 × 25	0.019	0.049	
6800	682	● 18 × 20	0.026	0.067	2860				
8200	822	16 × 31.5	0.017	0.05	3450	16 × 35.5	0.015	0.044	
8200	822				▲ 18 × 31.5	0.015	0.04	4170	
10000	103	16 × 35.5	0.015	0.044	3610	16 × 40	0.013	0.038	
10000	103	▲ 18 × 25	0.019	0.049	3140	▲ 18 × 35.5	0.0	0.038	
12000	123	16 × 40	0.013	0.038	4080	18 × 40	0.012	0.032	
12000	123	▲ 18 × 31.5	0.015	0.04	4170				
15000	153	18 × 35.5	0.014	0.038	4220				
18000	183	18 × 40	0.012	0.032	4280				

V Cap. code		16(1C)				25(1E)			
		Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz	Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz
47	470				5 × 11	0.58	2.3	210	
56	560	5 × 11	0.58	2.3	210				
100	101				6.3 × 11	0.22	0.87	340	
120	121	6.3 × 11	0.22	0.87	340				
220	221				8 × 11.5	0.13	0.52	640	
330	331	8 × 11.5	0.13	0.52	640	8 × 15	0.087	0.35	
330	331				▲ 10 × 12.5	0.08	0.32	865	
470	471	8 × 15	0.087	0.35	840	8 × 20	0.069	0.27	
470	471	▲ 10 × 12.5	0.08	0.32	865	▲ 10 × 16	0.06	0.24	
680	681	8 × 20	0.069	0.27	1050	10 × 20	0.046	0.18	
680	681	▲ 10 × 16	0.06	0.24	1210	▲ 12.5 × 15	0.049	0.16	
820	821				10 × 25	0.042	0.17	1450	
1000	102	10 × 20	0.046	0.18	1400	10 × 31.5	0.031	0.12	
1000	102	▲ 12.5 × 15	0.049	0.16	1450	▲ 12.5 × 20	0.035	0.12	
1000	102				● 16 × 15	0.042	0.12	1940	
1200	122	10 × 25	0.042	0.17	1650	18 × 15	0.043	0.11	
1500	152	10 × 31.5	0.031	0.12	1910	12.5 × 25	0.027	0.089	
1500	152	▲ 12.5 × 20	0.035	0.12	1900				
1500	152	● 16 × 15	0.042	0.12	1940				
1800	182				12.5 × 31.5	0.024	0.078	2650	
1800	182				▲ 16 × 20	0.027	0.078	2530	
2200	222	12.5 × 25	0.027	0.089	2230	12.5 × 35.5	0.02	0.065	
2200	222	▲ 18 × 15	0.043	0.11	2210	▲ 18 × 20	0.026	0.067	
2700	272	12.5 × 31.5	0.024	0.078	2650	12.5 × 40	0.017	0.056	
2700	272	▲ 16 × 20	0.027	0.078	2530	▲ 16 × 25	0.021	0.06	
3300	332	12.5 × 35.5	0.02	0.065	2880	16 × 31.5	0.017	0.05	
3300	332				▲ 18 × 25	0.019	0.049	3140	
3900	392	12.5 × 40	0.017	0.056	3350	16 × 35.5	0.015	0.044	
3900	392	▲ 16 × 25	0.021	0.06	2930	▲ 18 × 31.5	0.015	0.04	
3900	392	● 16 × 20	0.026	0.067	2860				
4700	472	16 × 31.5	0.017	0.05	3450	16 × 40	0.013	0.038	
4700	472	▲ 18 × 25	0.019	0.049	3140	▲ 18 × 35.5	0.014	0.038	
5600	562	16 × 35.5	0.015	0.044	36	18 × 40	0.012	0.032	
5600	562	▲ 18 × 31.5	0.015	0.04	4170				
6800	682	16 × 40	0.013	0.038	4080				
8200	822	18 × 35.5	0.014	0.038	4220				
10000	103	18 × 40	0.012	0.032	4280				

In this case, 6 will be put at 12th digit of type numbering system, "▲"

In this case, 3 will be put at 12th digit of type numbering system, "●"

V Cap. code		35(1V)				50(1H)			
		Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz	Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz
22	220								
33	330	5 × 11	0.58	2.3	210				
47	470								
56	560	6.3 × 11	0.22	0.87	340	6.3 × 11	0.3	1.2	295
100	101					8 × 11.5	0.17	0.68	555
120	121					8 × 15	0.12	0.48	730
150	151	8 × 11.5	0.13	0.52	640	10 × 12.5	0.12	0.48	760
180	181					8 × 20	0.091	0.36	910
220	221	8 × 15	0.087	0.35	840	10 × 16	0.084	0.34	1050
220	221	▲ 10 × 12.5	0.08	0.32	865				
270	271	8 × 20	0.069	0.27	1050	10 × 20	0.06	0.24	1220
270	271					▲ 12.5 × 15	0.061	0.2	1260
330	331	10 × 16	0.06	0.24	1210	10 × 25	0.055	0.22	1440
470	471	10 × 20	0.046	0.18	1400	10 × 31.5	0.043	0.17	1690
470	471	▲ 12.5 × 15	0.049	0.16	1450	▲ 12.5 × 20	0.045	0.15	1660
470	471					● 16 × 15	0.055	0.17	1690
560	561	10 × 25	0.042	0.17	1650	12.5 × 25	0.034	0.11	1950
560	561					▲ 18 × 15	0.054	0.15	1930
680	681	10 × 31.5	0.031	0.12	1910	12.5 × 31.5	0.03	0.1	2310
680	681	▲ 12.5 × 20	0.035	0.12	1900				
680	681	● 16 × 15	0.042	0.12	1940				
820	821					12.5 × 35.5	0.025	0.083	2510
820	821					▲ 16 × 20	0.034	0.1	2210
1000	102	12.5 × 25	0.027	0.089	2230	12.5 × 40	0.021	0.069	2920
1000	102	▲ 18 × 15	0.043	0.11	2210	▲ 16 × 25	0.025	0.075	2555
1000	102					● 18 × 20	0.036	0.097	2490
1200	122	12.5 × 31.5	0.024	0.078	2650	16 × 31.5	0.022	0.066	3010
1200	122	▲ 16 × 20	0.027	0.078	2530	▲ 18 × 25	0.026	0.07	2740
1500	152	12.5 × 35.5	0.02	0.065	2880	16 × 35.5	0.019	0.057	3150
1800	182	12.5 × 40	0.017	0.056	3350	16 × 40	0.016	0.048	3710
1800	182	▲ 16 × 25	0.021	0.06	2930	▲ 18 × 31.5	0.021	0.057	3635
1800	182	● 18 × 20	0.026	0.067	2860				
2200	222	16 × 31.5	0.017	0.05	3450	▲ 18 × 35.5	0.017	0.046	3680
2200	222	▲ 18 × 25	0.019	0.049	3140				
2700	272	16 × 35.5	0.0	0.044	3610	18 × 40	0.014	0.038	3800
2700	272	▲ 18 × 31.5	0.015	0.04	4170				
3300	332	16 × 40	0.013	0.038	4080				
3300	332	▲ 18 × 35.5	0.014	0.038	4220				
3900	392	18 × 40	0.012	0.032	4280				

V Cap. code		63(1J)				100(2A)			
		Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz	Case size φ D × L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Impedance (Ω)MAX. -10°C 100kHz	Rated rip (mA rms) 105°C 100kHz
6.8	6R8								
15	150	5 × 11	2.3	9.3	55	5 × 11	2.3	9.3	55
27	270					6.3 × 11	1.2	5	115
33	330	6.3 × 11	1.2	5	115	8 × 11.5	0.63	2.8	232
39	390					8 × 15	0.45	2.1	300
47	470					10 × 12.5	0.43	1.8	288
56	560	8 × 11.5	0.63	2.8	232	8 × 20	0.33	1.6	362
68	680					10 × 16	0.31	1.5	357
82	820	8 × 15	0.45	2.1	300	10 × 20	0.21	0.94	466
82	820	▲ 10 × 12.5	0.43	1.8	288	▲ 12.5 × 15	0.23	1.1	466
100	101					10 × 25	0.2	0.84	531
120	121	8 × 20	0.33	1.6	362	10 × 31.5	0.15	0.71	663
120	121	▲ 10 × 16	0.31	1.5	357	▲ 12.5 × 20	0.16	0.64	690
150	151					16 × 15	0.14	0.66	795
180	181	10 × 20	0.21	0.94	466	12.5 × 25	0.12	0.45	784
180	181	▲ 12.5 × 15	0.23	1.1	466	▲ 18 × 15	0.12	0.5	920
220	221	10 × 25	0.2	0.84	531	12.5 × 31.5	0.1	0.42	905
220	221					▲ 16 × 20	0.091	0.38	1040
270	271	10 × 31.5	0.15	0.71	663	12.5 × 35.5	0.083	0.35	1050
270	271	▲ 12.5 × 20	0.16	0.64	690	▲ 16 × 25	0.073	0.27	1250
270	271	● 16 × 15	0.14	0.66	795				
330	331	12.5 × 25	0.12	0.45	784	12.5 × 40	0.071	0.3	1180
330	331					▲ 18 × 20	0.08	0.3	1240
390	391	18 × 15	0.12	0.5	920	16 × 31.5	0.054	0.2	1570
390	391					▲ 18 × 25	0.057	0.21	1490
470	471	12.5 × 31.5	0.1	0.42	905	16 × 35.5	0.045	0.17	1790
470	471	▲ 16 × 20	0.091	0.38	1040	▲ 18 × 31.5	0.047	0.17	1630
560	561	12.5 × 35.5	0.083	0.35	1050	16 × 40	0.04	0.15	2020
560	561	16 × 25	0.073	0.27	1250				
680	681	12.5 × 40	0.071	0.3	1180	18 × 35.5	0.04	0.15	1790
680	681	▲ 18 × 20	0.08	0.3	1240				
820	821	16 × 31.5	0.054	0.2	1570	18 × 40	0.036	0.13	2330
820	821	▲ 18 × 25	0.0	0.21	1490				
1000	102	16 × 35.5	0.045	0.17	1790				
1000	102	▲ 18 × 31.5	0.047	0.17	1630				
1200	122	16 × 40	0.04	0.15	2020				
1200	122	▲ 18 × 35.5	0.04	0.15	1790				
1500	152	18 × 40	0.036	0.13	2330				

In this case, 6 will be put at 12th digit of type numbering system, "▲"

In this case, 3 will be put at 12th digit of type numbering system, "●"

## 1 1. Resistance to cleaning agent

### (1) Applicable cleaning agents

Pine Alpha ST-100S, Clean Through 750H/750L/710M, Sanelek b-12, Aqua Cleaner 210SEP, Techno Care FRW14~17, Iso-propyl Alcohol

### (2) Cleaning condition

Total cleaning time shall be within 5 minutes by immersion, ultrasonic or other method. (Temperature of the cleaning agent shall be 60 °C or lower)

## 1 2. APPLICATION NOTICE

- (1) Application of reverse voltage would lead the short-circuited circuitry and may further result in an explosion if the unit is kept energized.
- (2) Do not apply any overvoltage exceeding the rated voltage (surge voltage for short period) to the capacitor.
- (3) Do not use for a circuit where abrupt discharges are repeated frequently.
- (4) Do not allow any higher ripple currents than rated to flow through a capacitor.
- (5) Whenever you use a capacitor that has been long stored, make sure to gradually increase the voltage to the rated value.
- (6) The characteristics of capacitor will be adversely affected if leads are dipped in solder too long or if the solder temperature is too high.
- (7) Be careful not to subject the lead wires of capacitors to excessive force.

## 1 3. OTHERS

- Export Trading Control Ordinance  
The products specified in this specification are not the articles which are listed in Export Trading Control Ordinance.
- Ozon Depletion Substance  
Ozon depletion substances are not used in our production process and at our suppliers.
- Brominated Flame Retardants  
The restricted brominated flame retardants are not used.

Material of Aluminum Electrolytic Capacitors  
**HE Series**

No.	ITEM	MATERIALS
①	Anode foil	High-purity Aluminum foil (purity:99.97%), thick:90~100 $\mu$ m
②	Cathode foil	High-purity Aluminum foil (purity:99.92%), thick:40~50 $\mu$ m
③	Separator	Manira paper, thick:40~50 $\mu$ m
④	Lead wire	Tinned CP wire (d: $\phi$ 0.5~ $\phi$ 0.8)
⑤	Aluminum led tab	(Purity:99.92%, hard, Dia: $\phi$ 1.2~ $\phi$ 2.2)
⑥	Rubber end seal	Synthetic Rubber
⑦	Aluminum case	(Purity:99.20%, for built-in safety vent $\phi$ 6.3 up)
⑧	Sleeve	P. E. T. sleeve (thick:50 $\mu$ m)
⑨	Tape or binder	Tape : Polypropylene, thick:30 $\mu$ m Binder : Pobarl
⑩	Paste	Etylen giycol and carboxylate with anti-solvent additive