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To: DIGI-KEY

Issue No. : CE-VTK4-CE-0-4

Date of Issue : May 27, 2008

Classification : New , Changed

## PRODUCT SPECIFICATION FOR APPROVAL

Product Description : Aluminum Electrolytic Capacitor  
Customer Part Number :

Product Part Number : V type TK series (High.temp.Pb free reflow type)  
Country of Origin : Japan, China (Printed on the packaging label)  
Applications : It has the intention of being used for a general electronic circuit given in a notice matter (limitation of a use).  
On the occasion of application other than the above, even person in charge of our company needs to inform in advance.

※ If you approve this specification, please fill in and sign the below and return 1copy to us.

Approval No	:	
Approval Date	:	
Executed by	:	
		(signature)
Title	:	
Dept.	:	



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# Panasonic



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Notice matter

## ◆ Law and regulation which are applied

- This product complies with the RoHS Directive (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (DIRECTIVE 2002/95/EC).
- No Ozone Depleting Chemicals(ODC's), controlled under the Montreal Protocol Agreement, are used in producing this product.
- We do not PBBs or PBDEs as brominated flame retardants.
- All the materials that are used for this product are registered as "Known Chemicals" in the Japanese act "Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances".
- Export procedure which followed export related regulations, such as foreign exchange and a foreign trade method, on the occasion of export of this product Thank you for your consideration.

## ◆ Limitation of a use

- This capacitor is designed to be used for electronics circuits such as audio/visual equipment, home appliances, computers and other office equipment, optical equipment, measuring equipment and industrial robots.  
High reliability and safety are required [ be / a possibility that incorrect operation of this product may do harm to a human life or property ] more. When use is considered by the use, the delivery specifications which suited the use separately need to be exchanged.

## ◆ Unless otherwise specified, the product shall conform to JIS 5101-18-2

## ◆ Country of origin : JAPAN, CHINA

◆ Manufacturing factory : Panasonic Electronic Devices Japan Co.,Ltd.  
1285, Sakutaguchi, Asada,Yamaguchi City, Yamaguchi  
753-8536 Japan

Panasonic Manufacturing Xiamen Co., Ltd.  
No. 17 Chuang Xin Road, Xiamen Torch Hi-Tech Industrial Development Zone,  
Xiamen, Fujian, China 361000

V type TK series

1. Scope

Fixed capacitors for use in electronic equipment, Surface Mount Type Aluminum electrolytic capacitors with non-solid electrolyte.

2. Parts number

<u>EEE</u>	<u>TK</u>	<u>OO</u>	<u>OOO</u>	<u>△</u>	<u>□</u>
2-1	2-2	2-3	2-4	2-5	2-6
<u>EEE</u>	<u>TK</u>	<u>OO</u>	<u>OOO</u>	<u>△A</u>	<u>□</u>
2-1	2-2	2-3	2-4	2-5	2-6

- 2-1 Surface Mount Type Aluminum Electrolytic Capacitor (Lead-Free Products.)
- 2-2 TK series
- 2-3 Rated Voltage Code

Voltage code	1A	1C	1E	1V	1H	1J	1K	2A
Rated voltage(V.DC)	10	16	25	35	50	63	80	100

- 2-4 Capacitance Code: Indicate capacitance In  $\mu\text{F}$  by 3 letters. The first 2 figures are actual values and the third denotes the number of zeros.  
 "R" denotes the decimal point and all figures are the actual number with "R".  
 ex.  $0.1\mu\text{F} \rightarrow \text{R10}$  ,  $1\mu\text{F} \rightarrow \text{1R0}$  ,  $10\mu\text{F} \rightarrow \text{100}$
- 2-5 U : Miniaturization product type  
 A : High temperature reflow type (Size code : H~K)  
 UA : High temperature reflow type miniaturization product (Size code : H~K)

\* Due to the method used by our company to express taping part numbers, we have eliminated "1" from the taping part numbers.

ex EEETK1A152UAQ  $\rightarrow$  EEETKA152UAQ , EEETK1A332UAM  $\rightarrow$  EEETKA332UAM

- \* Products with the case size of  $\phi 4 \sim \phi 10$  (Size code B ~ G) are produced only in Japan.
- \* Products with the case size of  $\phi 12.5 \sim \phi 18$  (Size code H ~ K) are produced only in China.

- 2-6 Suffix Code for Appearance: Taping Code

P	24.0mm width (Size code "F~G")
Q	32mm width (Size code "H")
M	44mm width (Size code "J~K")

See the drawing in item 11 for the polarity alignment.

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## V type TK series

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## Parts lists

Size Code	Taping Part No.	R.V. [V.DC]	Cap. [ $\mu$ F] (120Hz) (20°C)	Tangent of Loss Angle ( $\tan\delta$ ) max. (120Hz) (20°C)	Leakage Current [ $\mu$ A] max.	ESR [ $\Omega$ ] max. (100kHz)		Rated Ripple Current [mA rms] (100kHz) (125°C) max.
						+20°C	-40°C	
F	EEETK1A221P	10	220	0.30	22.0	0.30	5.0	197
F	EEETK1A331UP	10	330	0.30	33.0	0.30	5.0	197
G	EEETK1A331P	10	330	0.30	33.0	0.20	3.0	270
G	EEETK1A471UP	10	470	0.30	47.0	0.20	3.0	270
H13	EEETK1A102AQ	10	1000	0.30	100.0	0.12	1.80	800
H13	EEETKA152UAQ	10	1500	0.30	150.0	0.12	1.80	800
J16	EEETK1A222AM	10	2200	0.32	220.0	0.08	1.20	1100
J16	EEETKA332UAM	10	3300	0.34	330.0	0.08	1.20	1100
K16	EEETK1A332AM	10	3300	0.36	330.0	0.075	1.10	1300
J16	EEETKA472UAM	10	4700	0.36	470.0	0.08	1.20	1100
K16	EEETK1A472AM	10	4700	0.38	470.0	0.075	1.10	1300
F	EEETK1C101P	16	100	0.23	16.0	0.30	5.0	197
F	EEETK1C221UP	16	220	0.23	35.2	0.30	5.0	197
G	EEETK1C221P	16	220	0.23	35.2	0.20	3.0	270
G	EEETK1C331UP	16	330	0.23	52.8	0.20	3.0	270
H13	EEETK1C331AQ	16	330	0.23	52.8	0.12	1.80	800
H13	EEETK1C471AQ	16	470	0.23	75.2	0.12	1.80	800
H13	EEETK1C681AQ	16	680	0.23	108.8	0.12	1.80	800
H13	EEETKC102UAQ	16	1000	0.23	160.0	0.12	1.80	800
J16	EEETK1C102AM	16	1000	0.25	160.0	0.08	1.20	1100
J16	EEETKC222UAM	16	2200	0.27	352.0	0.08	1.20	1100
K16	EEETK1C222AM	16	2200	0.27	352.0	0.075	1.10	1300
K16	EEETK1C332AM	16	3300	0.29	528.0	0.075	1.10	1300
F	EEETK1E101P	25	100	0.18	25.0	0.30	5.0	197
F	EEETK1E221UP	25	220	0.18	55.0	0.30	5.0	197
G	EEETK1E221P	25	220	0.18	55.0	0.20	3.0	270
G	EEETK1E331UP	25	330	0.18	82.5	0.20	3.0	270
H13	EEETK1E331AQ	25	330	0.18	82.5	0.12	1.80	800
H13	EEETK1E471AQ	25	470	0.18	117.5	0.12	1.80	800
H13	EEETKE681UAQ	25	680	0.18	170.0	0.12	1.80	800
J16	EEETK1E681AM	25	680	0.18	170.0	0.08	1.20	1100
J16	EEETKE102UAM	25	1000	0.18	300.0	0.08	1.20	1100
K16	EEETK1E102AM	25	1000	0.18	300.0	0.075	1.10	1300
K16	EEETK1E222AM	25	2200	0.20	550.0	0.075	1.10	1300

\* Due to the method used by our company to express taping part numbers,  
we have eliminated "1" from the taping part numbers.

\*Products with the case size code B ~ G are produced only in Japan.

\*Products with the case size code H ~ K are produced only in China.

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## V type TK series

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Size Code	Taping Part No.	R.V. [V.DC]	Cap. [ $\mu$ F] (120Hz) (20°C)	Tangent of Loss Angle ( $\tan\delta$ ) max. (120Hz) (20°C)	Leakage Current [ $\mu$ A] max.	ESR [ $\Omega$ ] max. (100kHz)		Rated Ripple Current [mA rms] (100kHz) (125°C) max.
						+20°C	-40°C	
F	EEETK1V470P	35	47	0.16	16.4	0.30	5.0	197
F	EEETK1V101UP	35	100	0.16	35.0	0.30	5.0	197
G	EEETK1V101P	35	100	0.16	35.0	0.20	3.0	270
G	EEETK1V221UP	35	220	0.16	77.0	0.20	3.0	270
H13	EEETK1V331AQ	35	330	0.16	115.5	0.12	1.80	800
H13	EEETKV471UAQ	35	470	0.16	164.5	0.12	1.80	800
J16	EEETK1V471AM	35	470	0.16	164.5	0.08	1.20	1100
J16	EEETKV681UAM	35	680	0.16	238.0	0.08	1.20	1100
K16	EEETK1V681AM	35	680	0.16	238.0	0.075	1.10	1300
K16	EEETK1V102AM	35	1000	0.16	350.0	0.075	1.10	1300
H13	EEETK1H221AQ	50	220	0.14	110.0	0.23	3.40	600
H13	EEETK1H331AQ	50	330	0.14	165.0	0.23	3.40	600
J16	EEETK1H471AM	50	470	0.14	235.0	0.15	2.20	900
J16	EEETKH681UAM	50	680	0.14	340.0	0.15	2.20	900
K16	EEETK1H681AM	50	680	0.14	340.0	0.14	2.10	950
K16	EEETK1H102AM	50	1000	0.14	500.0	0.14	2.10	950
H13	EEETK1J101AQ	63	100	0.12	63.0	0.26	5.20	350
H13	EEETK1J221AQ	63	220	0.12	138.6	0.26	5.20	350
J16	EEETK1J331AM	63	330	0.12	207.9	0.18	3.60	500
J16	EEETK1J471AM	63	470	0.12	296.1	0.18	3.60	500

\* Due to the method used by our company to express taping part numbers, we have eliminated "1" from the taping part numbers.

\*Products with the case size code B ~ G are produced only in Japan.

\*Products with the case size code H ~ K are produced only in China.

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V type TK series

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Size Code	Taping Part No.	R.V. [V.DC]	Cap. [ $\mu$ F] (120Hz) (20°C)	Tangent of Loss Angle ( $\tan\delta$ ) max. (120Hz) (20°C)	Leakage Current [ $\mu$ A] max.	ESR [ $\Omega$ ] max. (100kHz)		Rated Ripple Current [mA rms] (100kHz) (125°C) max.
						+20°C	-40°C	
H13	EEETK1K470AQ	80	47	0.12	37.6	0.42	8.40	250
H13	EEETKK101UAQ	80	100	0.12	80.0	0.42	8.40	250
J16	EEETK1K101AM	80	100	0.12	80.0	0.30	6.00	350
J16	EEETKK221UAM	80	220	0.12	176.0	0.30	6.00	350
K16	EEETK1K221AM	80	220	0.12	176.0	0.28	5.60	400
J16	EEETKK331UAM	80	330	0.12	264.0	0.30	6.00	350
K16	EEETK1K331AM	80	330	0.12	264.0	0.28	5.60	400
K16	EEETK1K471AM	80	470	0.12	376.0	0.28	5.60	400
H13	EEETK2A470AQ	100	47	0.10	47.0	0.42	8.40	250
J16	EEETK2A101AM	100	100	0.10	10.0	0.30	6.00	350
K16	EEETK2A221AM	100	220	0.10	220.0	0.28	5.60	400
K16	EEETK2A331AM	100	330	0.10	330.0	0.28	5.60	400

\* Due to the method used by our company to express taping part numbers, we have eliminated "1" from the taping part numbers.

\*Products with the case size code H ~ K are produced only in China.

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Can Size [Size code] (Standard type)

V.DC Cap.( $\mu$ F)	10	16	25	35	50	63	80	100
47				F			H13	H13
100		F	F	(F),G		H13	(H13),J16	J16
220	F	(F),G	(F),G	(G)	H13	H13	(J16),K16	K16
330	(F),G	(G),H13	(G),H13	H13	H13	J16	(J16),K16	K16
470	(G)	H13	H13	(H13),J16	J16	J16	K16	
680		H13	(H13),J16	(J16),K16	(J16),K16			
1000	H13	(H13),J16	(J16),K16	K16	K16			
1500	(H13)							
2200	J16	(J16),K16	K16					
3300	(J16),K16	K16						
4700	(J16),K16							

( ) Miniaturization Product type

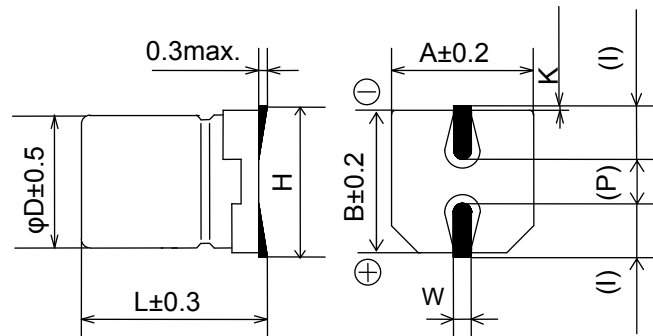
[mm]  
 Size code F :  $\phi$ 8×10.2L  
 G :  $\phi$ 10×10.2L  
 H13:  $\phi$ 12.5×13.5L  
 J16:  $\phi$ 16×16.5L  
 K18:  $\phi$ 18×16.5L

V type TK series

3. Dimensions

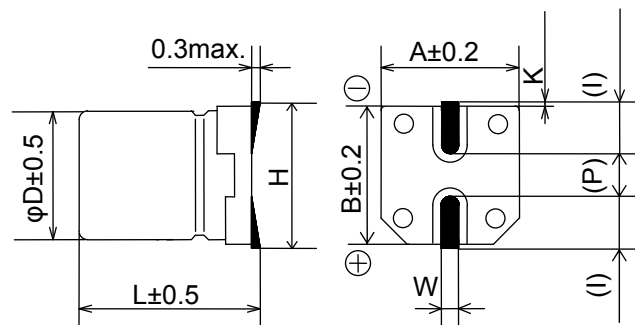
Size code "F~G"

[mm]



( ) Reference size

Size code "H~K"



( ) Reference size

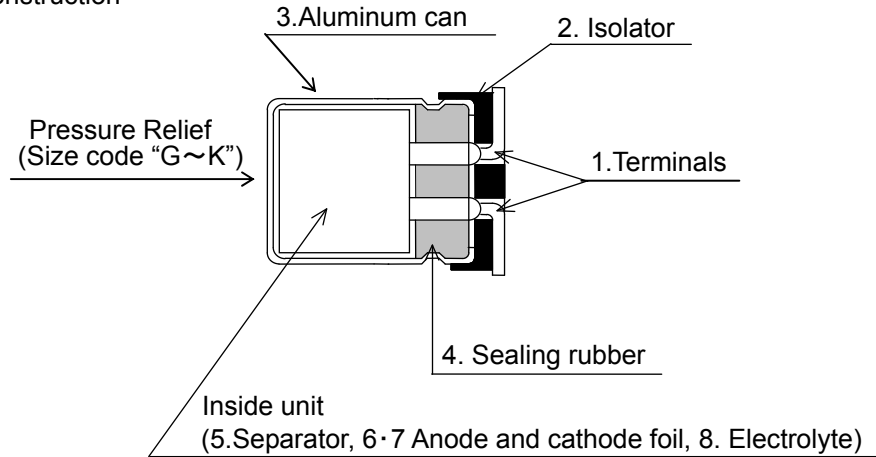
[mm]

Size Code	D	L	A,B	H	I	W	P	K
F	8.0	10.2	8.3	10.0max	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2	10.3	12.0max	3.5	0.90±0.2	4.6	0.70±0.2
H13	12.5	13.5	13.5	15.0max	4.7	0.90±0.3	4.4	0.70±0.3
J16	16	16.5	17.0	19.0max	5.5	1.2±0.3	6.7	0.70±0.3
K16	18	16.5	19.0	21.0max	6.7	1.2±0.3	6.7	0.70±0.3

V type TK series

4. Constructions

4-1 Inside Construction



4-2 Construction parts

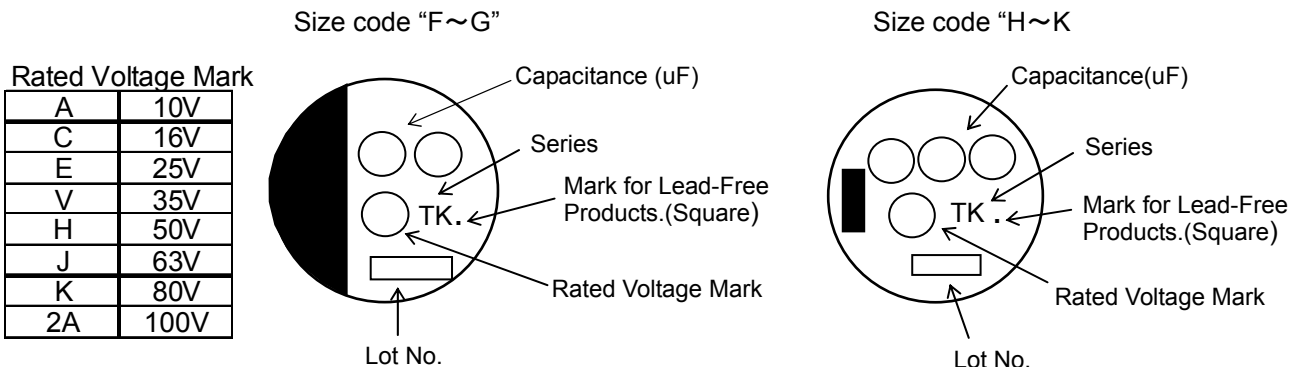
Parts	Materials	Parts	Materials
1 Terminal	Bi contained tin plated Tinned Copper-Clad Steel wire ( $\leq \phi 10$ )	5 Separator	Cellulose
	Tinned Copper-Clad Steel wire ( $\geq \phi 12.5$ )	6 Anode Foil	High Purity Aluminum Foil
2 Isolator	Thermo-plastic Resin	7 Cathode Foil	Aluminum Foil
3 Aluminum Can	Aluminum	8 Electrolyte	Organic Solvent , Organic Acid (No Quaternary Salt)
4 Sealing Rubber	Synthetic rubber (IIR)		

5. Marking

Marking Color : BLACK

Following items shall be marked on the body of Capacitor.

- a ) Rated Voltage Mark
- b ) Capacitance
- c ) Negative Polarity
- d ) Series Mark
- e ) Lot No. (It indicates to Lot No. System)
- f ) Mark for Lead-Free Products.



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LOT No. SYSTEM

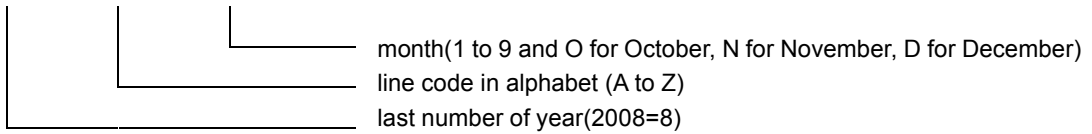
A lot No. shall be given on the bottom of a case in the following way.

Size Code (F~G)

Marking with 3 digits



Indicating that the product was produced in Aug. 2008, under a line A .



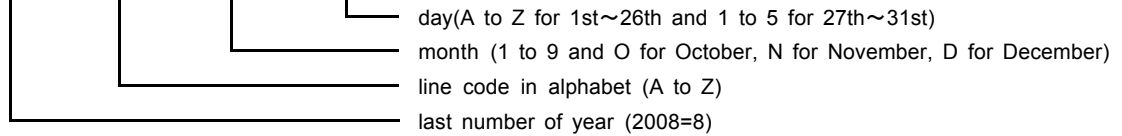
For those made in CHINA (Chip Type)

Size Code (H13~K16)

Marking with 4 digits



Indicating that the product was produced in 1, Aug. 2008, under a line J



production year	production month		production date	
8:2008	1:January	7:July	A=1 date	1=27 date
9:2009	2:February	8:August	B=2	2=28
10:2010	3:March	9:September	C=3	3=29
Indicating with the last digit of a year.	4:April	O:October	~	4=30
	5:May	N:November	Y=25	5=31
	6:June	D:December	Z=26	

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6. Standard rating

No	Item	Ratings								
1	Category Temperature Range	-40°C ~ +125°C								
2	Rated Voltage Range	10 V.DC ~ 100 V.DC								
3	Capacitance Range	47 μF ~ 4700 μF (120Hz 20°C)								
4	Capacitance Tolerance	±20% (120Hz 20°C)								
5	Surge Voltage (V.DC)	R.V.	10	16	25	35	50	63	80	100
		S.V.	13	20	32	44	63	79	100	125
6	Rated Ripple Current	Part lists and Table 2								

V type TK series

7. Performance Characteristics

No	Item	Performance Characteristics	Test																		
1	Leakage Current	$\leq I=0.01CV$ or $3\mu A$ whichever is the greater. [ I:Leakage current C:Capacitance ] [ V:Rated voltage ]	Series Resistor : $1000\Omega\pm 10\Omega$ Applied Voltage : Rated voltage Measuring : After 2 minutes																		
2	Capacitance	Within the specified capacitance tolerance.	Measuring Frequency : $120\text{Hz}\pm 20\%$ Measuring Circuit : Equivalent series circuit Measuring Voltage : $+1.5\text{ V.DC} \sim +2\text{ V.DC}$ ( $\leq 0.5\text{ V}$ for A.C.)																		
3	Tangent of Loss Angle (tanδ)	Part lists.	Measuring Frequency : $120\text{Hz}\pm 20\%$ Measuring Circuit : Equivalent series circuit Measuring Voltage : $+1.5\text{ V.DC} \sim +2\text{ V.DC}$ ( $\leq 0.5\text{ V}$ for A.C.)																		
4	Characteristics at High and Low Temperature	Step 2 Impedance Ratio: Less than the table 1 value of item 8 ratio against step 1.	<table border="1"> <thead> <tr> <th>Step</th> <th>Test Temperature(°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>20\pm 2</math></td> <td>—</td> </tr> <tr> <td>2</td> <td><math>-25\pm 3, -40\pm 3</math></td> <td>30 min</td> </tr> <tr> <td>3</td> <td><math>20\pm 2</math></td> <td>10 min~15 min</td> </tr> <tr> <td>4</td> <td><math>125\pm 2</math></td> <td>30 min</td> </tr> <tr> <td>5</td> <td><math>20\pm 2</math></td> <td>10 min~15 min</td> </tr> </tbody> </table> Impedance should be measured $120\text{Hz}\pm 10\%$ .	Step	Test Temperature(°C)	Time	1	$20\pm 2$	—	2	$-25\pm 3, -40\pm 3$	30 min	3	$20\pm 2$	10 min~15 min	4	$125\pm 2$	30 min	5	$20\pm 2$	10 min~15 min
		Step		Test Temperature(°C)	Time																
1	$20\pm 2$	—																			
2	$-25\pm 3, -40\pm 3$	30 min																			
3	$20\pm 2$	10 min~15 min																			
4	$125\pm 2$	30 min																			
5	$20\pm 2$	10 min~15 min																			
Step 4 Leakage Current: $\leq 800\%$ of the value of item 7.1. Capacitance Change: Within $\pm 25\%$ of the value in step 1. Tangent of Loss Angle (tanδ): $\leq$ the value of item 7.3.																					
5	Surge	Leakage Current: $\leq$ the value of item 7.1. Capacitance Change: Within $\pm 15\%$ of initial measured value. Tangent of Loss Angle (tanδ): $\leq$ the value of item 7.3. Appearance: No significant change can be observed.	Test temperature : $15^\circ\text{C} \sim 35^\circ\text{C}$ Series Protective Resistance : $R = \frac{100 \pm 50}{C}$ [ R: Protective resistance(kΩ) ] [ C: Capacitance(μF) ] Test voltage : Surge voltage item 6.5 Applied voltage 1000 cycles of $30\text{s}\pm 5\text{s}$ "ON" and 5 min 30 s "OFF".																		
6	Robustness of Termination (Tensile)	There is no damage or breakage after test.	After fixing the capacitors, the terminals are pulled in a vertical direction. Load is gradually increased until it reached the value specified below and held for 10 seconds. <table border="1"> <tr> <td>Pull Strength</td> <td>10N</td> </tr> <tr> <td>Keep time</td> <td><math>10\text{s}\pm 1\text{s}</math></td> </tr> </table>	Pull Strength	10N	Keep time	$10\text{s}\pm 1\text{s}$														
Pull Strength	10N																				
Keep time	$10\text{s}\pm 1\text{s}$																				

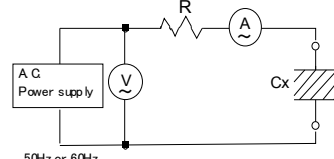
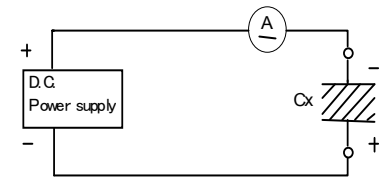
## Product Specification

CE-VTK4-CE-0-4

## V type TK series

12

No	Item	Performance Characteristics	Test
7	Vibration	Capacitance : During test, measured value shall be stabilized. (Measured several times within 30 min. before completion of test) Appearance : No significant change can be observed. Capacitance Change : Within $\pm 5\%$ of initial measured value.	Frequency : 10Hz~55Hz (1 minute per cycle.) Total amplitudes : 1.5 mm Direction and duration of vibration : It is done in the X,Y,Z axis direction for 2 hours each, with a total of 6 hours.
8	Solderability	More than 95% of the terminal surface shall be covered with new solder. ( Exclude the cross-section of cutting lead edge. )	Solder Type : H60A,H60S,or H63A(JIS Z3282) Solder Temperature : $235^{\circ}\text{C}\pm 5^{\circ}\text{C}$ Immersing Time : $2\text{s}\pm 0.5\text{s}$ Immersing Depth : Dip the terminals for Approx. 0.5mm~1mm thick Flux : Approx 25% rosin(JIS K5902) in Ethanol(JIS K8101)
9	Resistance to Soldering heat	Leakage Current : $\leq$ the value of item 7.1. Capacitance Change : Within $\pm 10\%$ of initial measured value. Tangent of Loss Angle ( $\tan\delta$ ) : $\leq$ the value of item 7.3. Appearance : No significant change can be observed.	After reflow soldering (item 9) The capacitor shall be left at room temperature for before measurement.
10	Solvent Resistance of the Marking	There shall be no damage and legibly marked. Marking can be deciphered easily.	Class of Reagent : Isopropyl Alcohol Test Temperature : $20^{\circ}\text{C}\sim 25^{\circ}\text{C}$ Immersing time : $30\text{s}\pm 5\text{s}$
11	Damp Heat (steady state)	Leakage Current : $\leq$ the value of item 7.1. Capacitance Change : Within $\pm 15\%$ of initial measured value. Tangent of Loss Angle ( $\tan\delta$ ) : $\leq 120\%$ the value of item 7.3. Appearance : No significant change can be observed.	Test Temperature : $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Relative Humidity : 90%~95% Test Duration : 240hours $\pm 8$ hours After subjected to the test, the capacitors shall be left for 2 hours at room temperature and room humidity prior to the measurement.

No	Item	Performance Characteristics	Test																				
12	Pressure Relief (Size code "G~K")	Pressure relief shall be operated without any hazardous expulsion or emission of flame. No emission of gas after 30 minutes of the voltage application also meets the specification.	<p>• A.C. Current Method</p>  <p>50Hz or 60Hz</p> <p>(A) :A.C. ammeter    R :Series resistor (V) :A.C. voltmeter    Cx :Tested capacitor</p> <p>Applied Voltage : A.C. voltage equals to R.V. x 0.7 or 250 V(rms) whichever is smaller.</p> <table border="1"> <thead> <tr> <th>Capacitance (μF)</th> <th>D.C. resistance(Ω)</th> </tr> </thead> <tbody> <tr> <td>≤1</td> <td>1000±100</td> </tr> <tr> <td>&gt;1    ≤10</td> <td>100±10</td> </tr> <tr> <td>&gt;10    ≤100</td> <td>10±1</td> </tr> <tr> <td>&gt;100    ≤1000</td> <td>1±0.1</td> </tr> <tr> <td>&gt;1000    ≤10000</td> <td>0.1±0.01</td> </tr> <tr> <td>&gt;10000</td> <td>※</td> </tr> </tbody> </table> <p>* When capacitance is over 10000μF, the value of series resistance equals to the half of the tested capacitor's impedance.</p> <p>• Reverse Voltage Method</p>  <p>(A) D.C. ammeter    Cx :Tested capacitor</p> <table border="1"> <thead> <tr> <th>Nominal Diameter (mm)</th> <th>D.C. Current(A)</th> </tr> </thead> <tbody> <tr> <td>≤ 22.4</td> <td>1 (const)</td> </tr> <tr> <td>&gt; 22.4</td> <td>10 (const)</td> </tr> </tbody> </table>	Capacitance (μF)	D.C. resistance(Ω)	≤1	1000±100	>1    ≤10	100±10	>10    ≤100	10±1	>100    ≤1000	1±0.1	>1000    ≤10000	0.1±0.01	>10000	※	Nominal Diameter (mm)	D.C. Current(A)	≤ 22.4	1 (const)	> 22.4	10 (const)
Capacitance (μF)	D.C. resistance(Ω)																						
≤1	1000±100																						
>1    ≤10	100±10																						
>10    ≤100	10±1																						
>100    ≤1000	1±0.1																						
>1000    ≤10000	0.1±0.01																						
>10000	※																						
Nominal Diameter (mm)	D.C. Current(A)																						
≤ 22.4	1 (const)																						
> 22.4	10 (const)																						

V type TK series

No	Item	Performance characteristics	Test		
13	Endurance	Leakage Current : $\leq$ the value of item 7.1. Capacitance change : Within $\pm 30\%$ of initial measured value. ( $\phi 8 \sim \phi 10$ : code "U" and ( $\phi 12.5 \sim \phi 18$ : miniaturization Product type $\pm 35\%$ ) Tangent of Loss Angle ( $\tan \delta$ ): $\leq 300\%$ of the value of item 7.3. ( $\phi 8 \sim \phi 10$ : code "U" and ( $\phi 12.5 \sim \phi 18$ : miniaturization Product type $\leq 350\%$ ) E.S.R. ( $\phi 8 \sim \phi 10$ Only ) After 1000 hours 20°C: $\leq 150\%$ of the initially specified value. -40°C: $\leq 200\%$ of the initially specified value. After 2000 hours 20°C: $\leq 300\%$ of the initially specified value. -40°C: $\leq 400\%$ of the initially specified value. After 3000 hours 20°C: $\leq 1000\%$ of the initially specified value. -40°C: $\leq 1500\%$ of the initially specified value. Appearance : No significant change can be observed.	Test Temperature : 125 °C $\pm 2$ °C Test Duration 3000 <sup>+72</sup> <sub>0</sub> hours ( $\phi 8 \sim \phi 10$ ) 2000 <sup>+72</sup> <sub>0</sub> hours ( $\phi 12.5 \sim \phi 18$ ) Applied Voltage : Rated voltage After subjected to the test, the capacitors shall be left at room temperature and room humidity for 2 hours prior to the measurement.		
14	Shelf Life	Leakage Current : $\leq$ the value of item 7.1. Capacitance Change : Within $\pm 30\%$ of initial measured value. ( $\phi 8 \sim \phi 10$ : code "U" and ( $\phi 12.5 \sim \phi 18$ : miniaturization Product type $\pm 35\%$ ) Tangent of Loss Angle ( $\tan \delta$ ) : $\leq 300\%$ of the value of item 7.3. ( $\phi 8 \sim \phi 10$ : code "U" and ( $\phi 12.5 \sim \phi 18$ : miniaturization Product type $\leq 350\%$ ) Appearance : No significant change can be observed.	Test Temperature : 125 °C $\pm 2$ °C Test Duration : 1000 <sup>+48</sup> <sub>0</sub> hours After subjected to the test, D.C. rated voltage shall be applied to the capacitors for 30 minutes as post-test treatment after left at the room temperature and humidity for 2 hours prior to the measurement.		
15	Rapid change of temperature	Leakage Current : $\leq$ the value of item 7.1. Capacitance change : Within $\pm 30\%$ of initial measured value. Tangent of Loss Angle ( $\tan \delta$ ): $\leq 300\%$ of the value of item 7.3. Appearance : No significant change can be observed.	Step	Temperature	Leaving time
			1	-40°C $\pm 3$ °C	30min $\pm 3$ min
			2	R.T	3 min $\leq$
			3	+125°C $\pm 2$ °C	30min $\pm 3$ min
			4	R.T	3 min $\geq$
			After 1000 cycles of step 1 to 4, It should be kept at R.T for 1hours ~2 hours before measurement.		

\* Voltage treatment : The rated voltage shall be applied to the capacitors, which are connected to series protective resistors (1000 $\Omega \pm 10\Omega$ ), for 30 minutes as a posttest treatment (performing discharge).

## 8. Other Characteristics

■ Table 1. Characteristics at low temperature Impedance ratio (at 120Hz)

Size Code	R.D(V.DC)	10	16	25	35	50	63	80	100
F~G	Z(-25°C)/Z(20°C)	3	2	2	2	—	—	—	—
	Z(-40°C)/Z(20°C)	4	3	3	3	—	—	—	—
H~K	Z(-25°C)/Z(20°C)	3	2	2	2	2	2	2	2
	Z(-40°C)/Z(20°C)	6	4	4	3	3	3	3	3

■ Table 2. Frequency Correction Factor of Rated Ripple Current

Size Code	Frequenvy(Hz)	120	1k	10k	100k~
F~G	coefficient	0.65	0.85	0.95	1.00
H~K		0.75	0.90	0.95	1.00

V type TK series

9. Reflow Soldering Temperature Profile

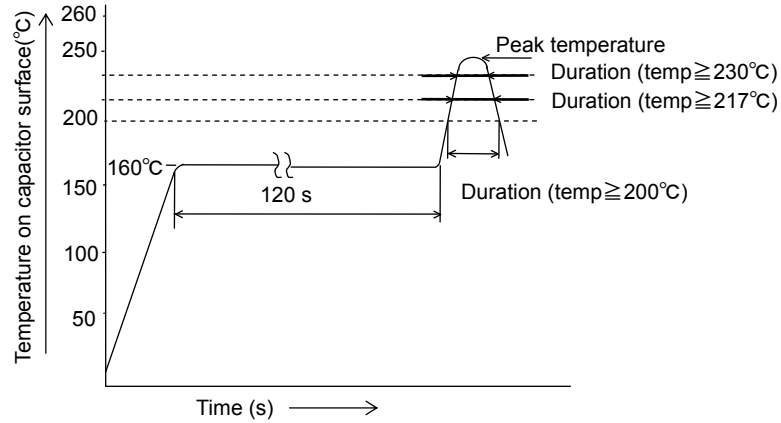
After the capacitor is subjected to the specified reflow soldering, (see the temperature profile below), it shall Meet the condition stated in the item 7, No.9.

<Reflow soldering condition>

The temperature shall be measured with thermal couple (type K,  $\phi 0.1\text{mm}$ ) which shall be placed and fixed on the top of capacitor body.

Maximum Permissible Reflow Soldering Temperature Profile

$\phi 8 \sim \phi 10$

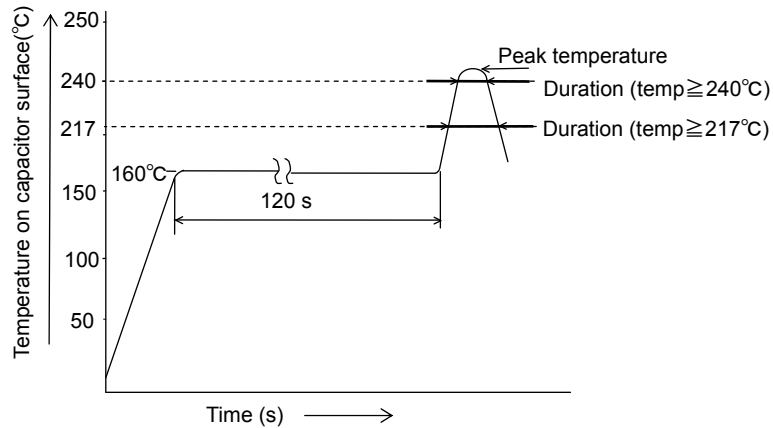


Peak temperature	Duration (temp $\geq 250^\circ\text{C}$ )	Duration (temp $\geq 230^\circ\text{C}$ )	Duration (temp $\geq 217^\circ\text{C}$ )	Duration (temp $\geq 200^\circ\text{C}$ )	Reflow frequency
260°C (255°C)	20 s (30s)	30 s (40 s)	65 s	70 s (90 s)	2

\*Recommended reflow condition is either of following two conditions.

- (1) Peak temperature 260°C, 20s (temp.  $\geq 250^\circ\text{C}$ )
- (2) Peak temperature 255°C, 30s (temp.  $\geq 250^\circ\text{C}$ )

$\phi 12.5 \sim \phi 18$



Can Size (SiZe code)	R.D [V.DC]	Peak temperature	Duration (temp $\geq 240^\circ\text{C}$ )	Duration (temp $\geq 217^\circ\text{C}$ )	Reflow frequency
$\phi 12.5 \sim \phi 18$ (H,J,K)	6.3V ~ 35V	245°C	30 s	90 s	2
	50V ~ 63V		5 s	30 s	2
	80V ~ 100V		5 s	30 s	1

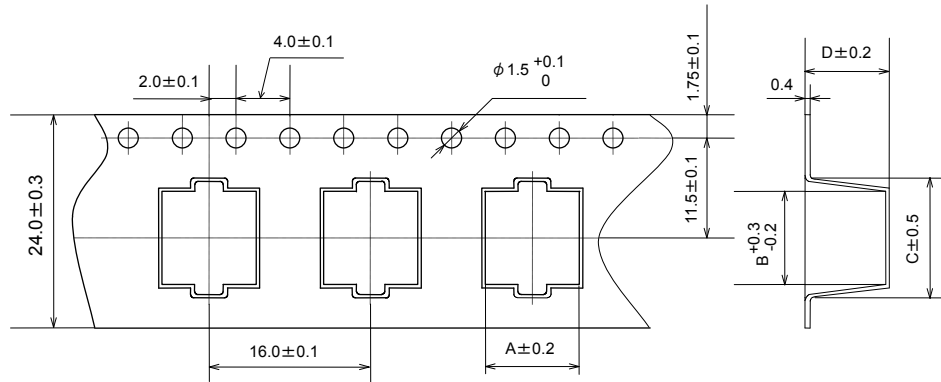
\* Two times of reflow

(The 2nd reflow must be done when the capacitor becomes normal condition regarding temperature.)

\* Soldering Method : I.R. or I.R. + heated air.  
(VPS Method is not Available.)

10. Taping  
10-1 Carrier Tape

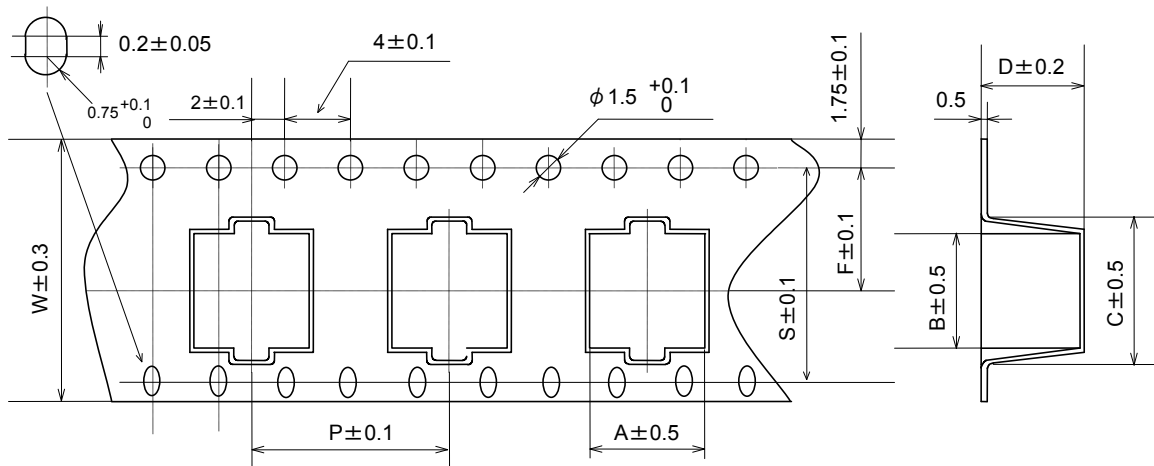
Size code "F~G"



Size Code	A	B	C	D
F	8.7	8.7	12.5	11.0
G	10.7	10.7	14.5	11.0

\* Dimensions of A and B are measured at the bottom of the embossed part.

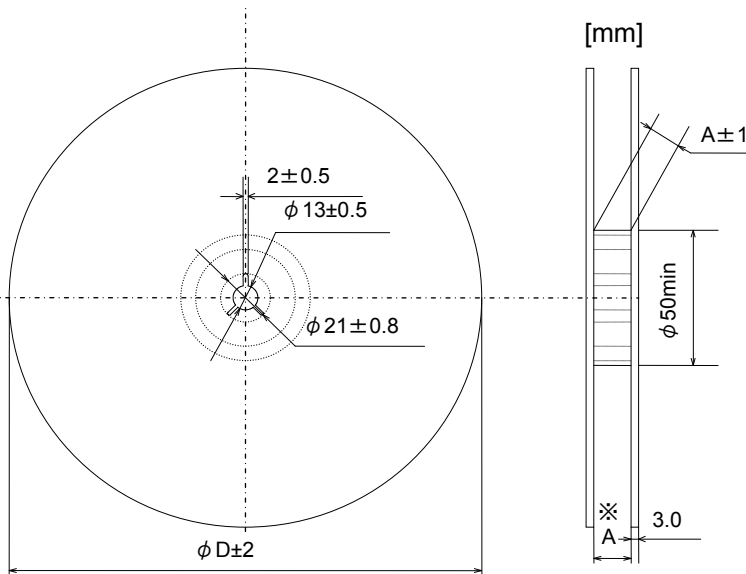
Size code "H~K"



Size Code	Taping Dimension [mm]							
	A	B	C	D	F	P	S	W
H13	14.0	14.0	18.0	14.5	14.2	24.0	28.4	32.0
J16	17.5	17.5	23.0	17.5	20.2	28.0	40.4	44.0
K16	19.5	19.5	26.0	17.5	20.2	32.0	40.4	44.0

\* Dimensions of A and B are measured at the bottom of the embossed part.

10-2 Reel

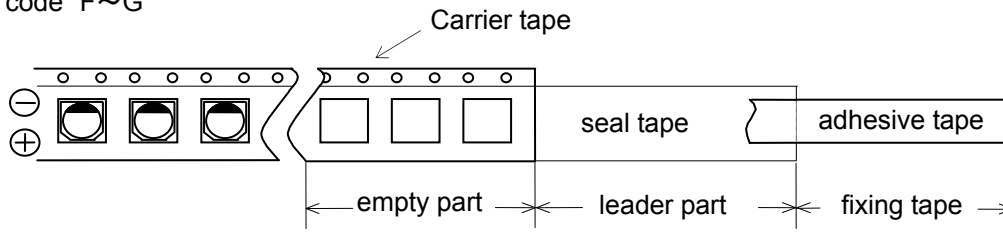


Size Code	Reel Width(A)	$\phi D$
F	26	380
G	26	380
H	34	330
J,K	46	330

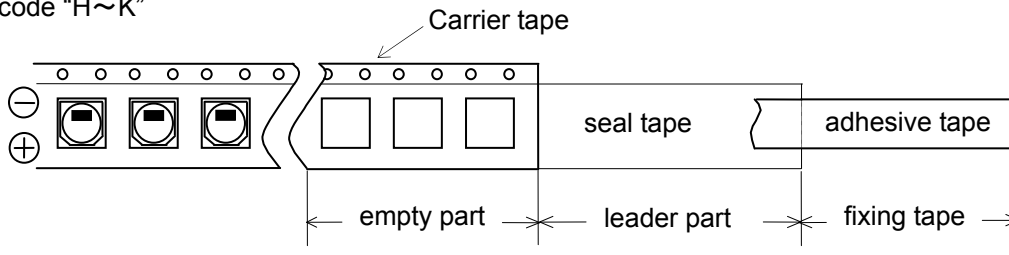
※ The A dimension at the edge of flange shall be less than 1.5 times of the specified value.

11. Details of Carrier Tape

Size code "F~G"



Size code "H~K"

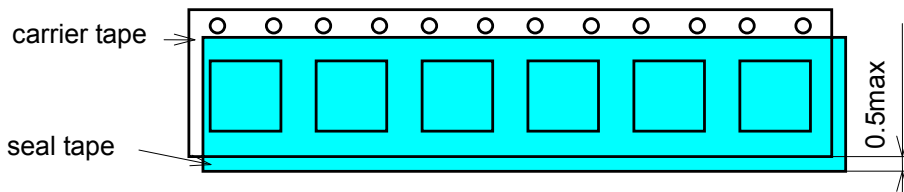


(1)

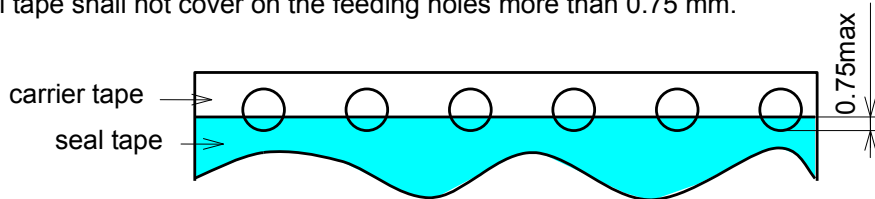
- a. Last reeling empty part of carrier tape shall be more than 10 cm.
- b. Leader part of seal tape shall be more than 20 cm.
- c. First reeling Empty part of carrier tape shall be more than 10 cm.
- d. Adhesive tape fixing the end of the leader part shall be approx, 10 cm.

(2) Deviation between carrier tape and seal tape.

- a. Deviation between carrier tape and seal tape shall be less than 0.5 mm.



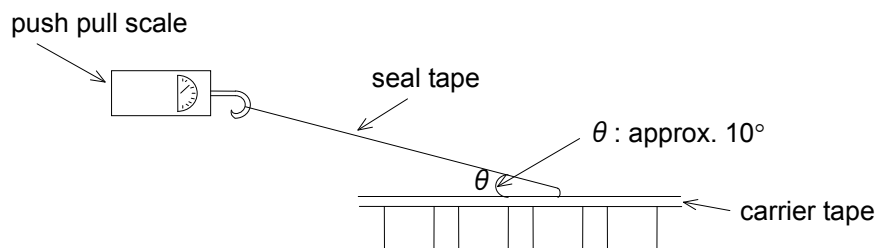
- b. Seal tape shall not cover on the feeding holes more than 0.75 mm.



12. Adhesion Test

Reasonable pulling strength: 0.1N~0.7 N

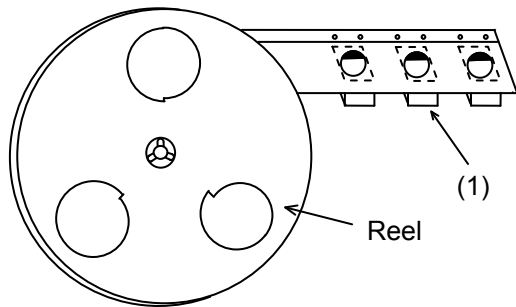
Pulling speed: 300 mm / min



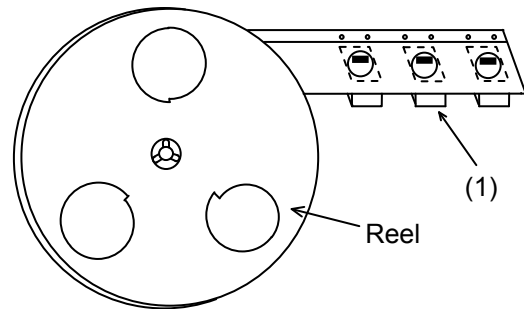
13. Packing Style

- (1) Carrier tape shall be reeled inside. (seal tape shall be outside)
- (2) End of the tape shall be inside to the reel physically as shown in the below figure and leader part of seal tape shall not be attached.

Size code "F~G"

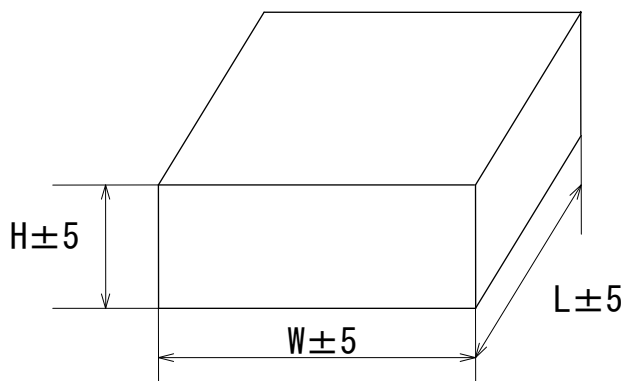


Size code "H~K"



14. Dimensions of Outer Carton Box

Dimensions of outer carton box are subject to change without Notice for adjustment to Reel Size.



[mm]		
Size Code	H	W,L
F	220	395
G	220	395
H	210	350
J,K	230	350

15. Packaging quantity

Size Code	One reel (pcs.)	One outer carton box (reel)	Total quantity (pcs.)
F	500	6	3000
G	500	6	3000
H13	200	5	1000
J16	125	4	500
K16	125	4	500

\* Let an order unit be 1 reel unit.

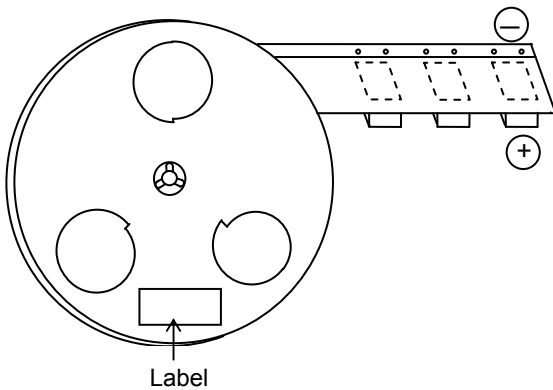
16.Package Label Example

Label information on the Packaging Box

The label has following information in English

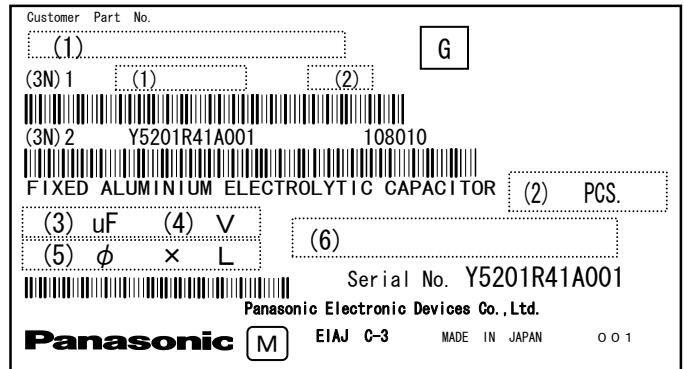
- a) Rated Voltage, Capacitance
- b) Manufacturer's Trademark
- c) Part Number
- d) Packing Quantity
- e) Serial No.
- f) Manufacturer's Name
- g) Country of Origin

16-1 A display to a reel

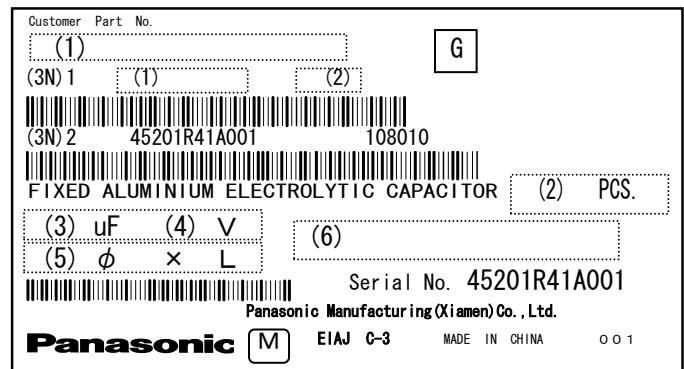


\*The example of a label

<JAPAN PRODUCTS> (Size code "F~G")



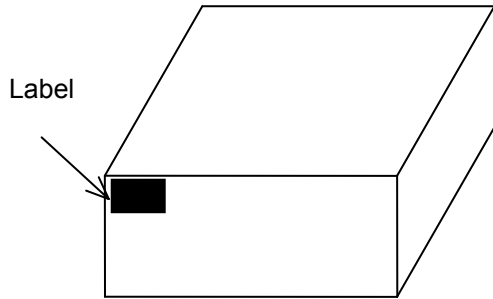
<CHINA PRODUCTS> (Size code "H~K")



Contents of label description

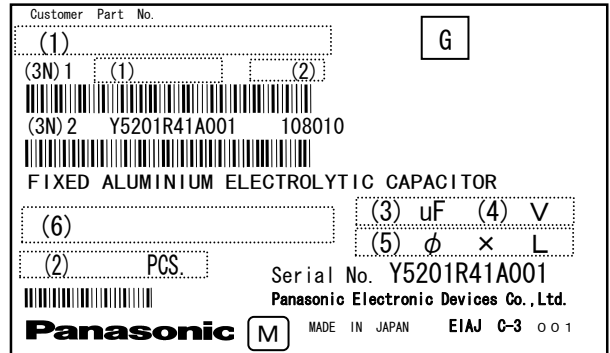
- (1) Customer Part No.
- (2) Quantity
- (3) Rated Capacitance
- (4) Voltage
- (5) Can Size
- (6) Product Part No.

16-2 Outer Box

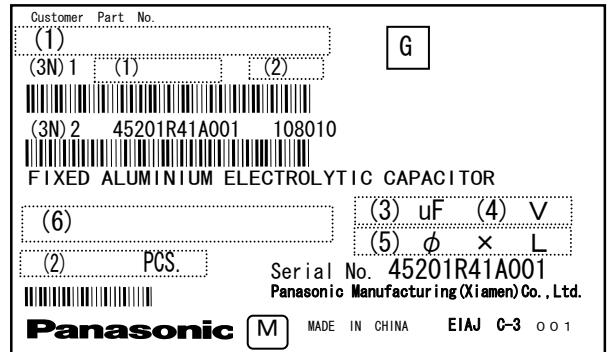


\*The example of a label

<JAPAN PRODUCTS> (Size code "F~G")



<CHINA PRODUCTS> (Size code "H~K")



Contents of label description

- (1) Customer Part No.
- (2) Quantity
- (3) Rated Capacitance
- (4) Voltage
- (5) Can Size
- (6) Product Part No.