

CUSTOMER  
NANJING PANDA ELECTRONICS COMPANY LIMITED

# SHIPMENT SPECIFICATION

TYPE            E/SV-series  
                  MOLDED CHIP TANTALUM CAPACITOR  
QUALITY        STANDARD  
GRADE

NEC TOKIN recommends use of the device with standard quality grade in general electronic equipment like data processing and office equipment, communication equipment (trunk line), test and measurement equipment, audio and video equipment, other consumer products, etc.  
The device is not recommended for use in life support systems, aerospace equipment, submarine cables, nuclear reactor control systems, automotive and transportation equipment, train and traffic control devices, robots, burning control systems, other safety devices, etc., where high reliability is required.  
If the device is to be used in the above equipment, please contact our sales people in advance.

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SOLUTION ENGINEERING DIVISION  
ENERGY DEVICES OPERATIONS UNIT  
NEC TOKIN Corporation

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TITLE	Solid Tantalum Capacitor	CSY - L - 2114	3/29
Type	Molded Chip		

**1. SCOPE**

This specification covers the general requirements for molded tantalum chip capacitors (E/SV series) produced in Japan and in Thailand.

The E/SV series is the Eco-symbol acquisition product which applied an accomplished lead free terminal in the excellent environment consideration.

**2. STRUCTURE**

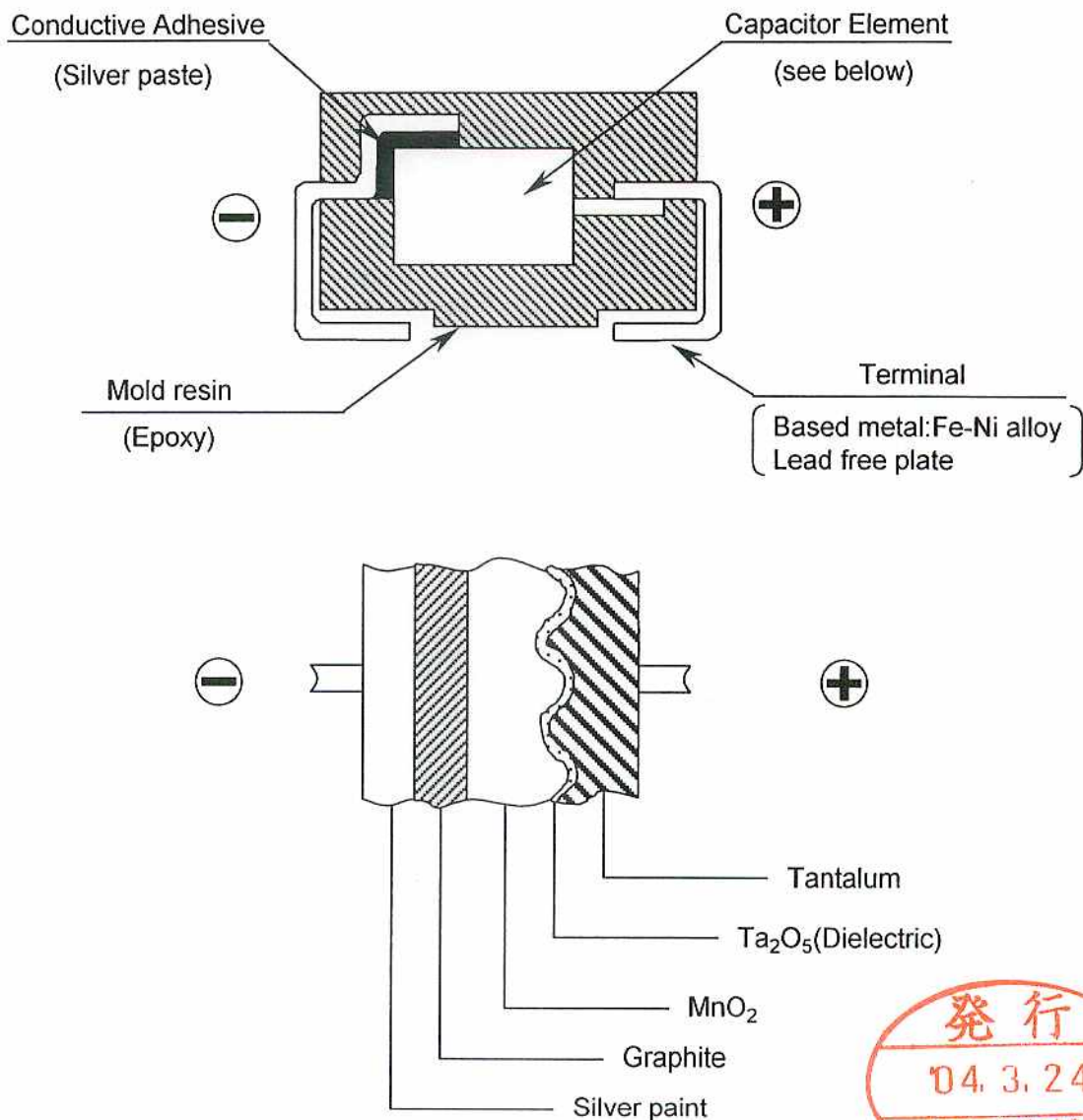


Fig.1 Structure



Revision A	Nov.1.'01	Initial release	REVISION RECORD		
Solution Engineering Division Energy Devices Operations Unit			APPD.	CHK.	DRAW.
			K. Takeuchi	H. Shimoto	K. Niimi

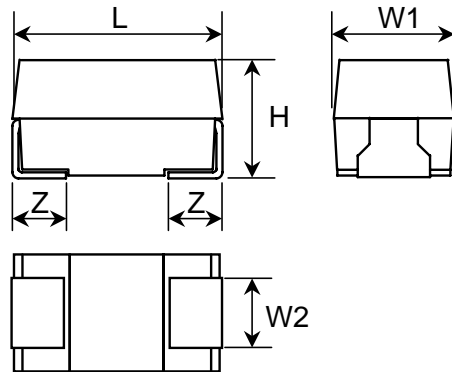
### 3. PRODUCT LINE-UP

Table.1

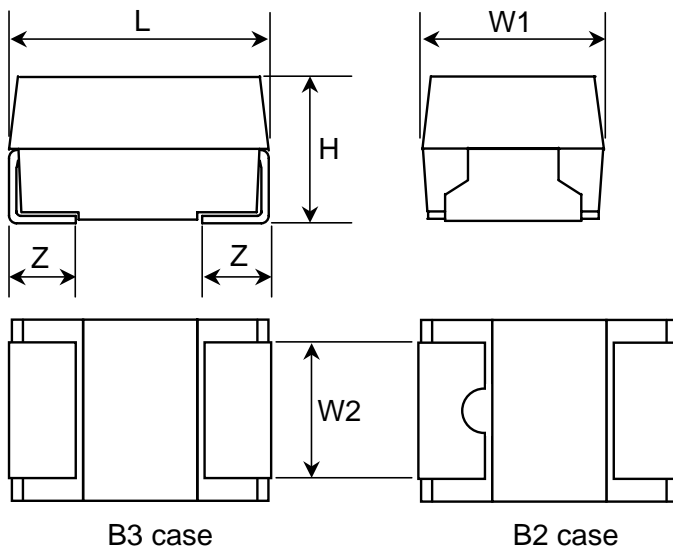
V.DC μF	2.5	4	6.3	10	16	20	25	35
0.47					P	A2	A	A
0.68					P	A2	A	A
1				J P	J P	A2	P A2 A	A2 A
1.5			P	J P	A	A2		A
2.2			J	J P	P A2 A	A2 A	A	A B2
3.3		P	J	PA 2	A2 A	A B3	A B2	B2
4.7			J P A	J P A2 A	A2 A	A B3 B2	B3 B2	C
6.8		J	J P A2	A2 A	A B3	B2		C
10	J	JP	J P A2 A	P A2 A B2	A B3 B2	B2	C	C D
15		P	P A2 A	B3	B2	C	C	D
22	P A2	P A2 A	P A2 A B3 B2	A B3 B2	B2 C D	C2 C D	D	
33	P A2	P A2 A	A B3	B2	C2 C	D	D	
47	P A2 A	A2 A B3	A B3 B2 C	B2 C2 C	C D	D		
68	A	AB 3	B2 C2	B2 C2 C	C D			
100	B3 B2	A B3 B2 C2	B2 C2 C	C V D	D			
150	B2 C2	B2 C2	C	VD				
220	B2 C2	B2 C	C V D	D				
330	C	CV	D					
470	C D	D	D					
680		D						

4. DIMENSION

【 J, P, A2 and A case 】



【 B3 and B2 case 】



【 C2,C,V and D case 】

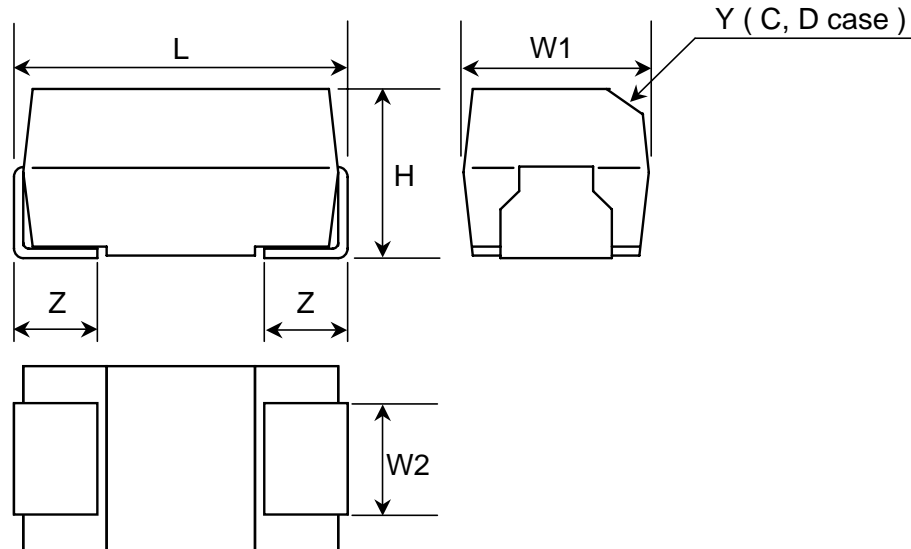


Table.2

(Unit : mm)

Case Code	L	W1	W2	H	Z	Y
J	1.6±0.1	0.8±0.1	0.6±0.1	0.8±0.1	0.3±0.1	-
P	2.0±0.1	1.25±0.1	0.9±0.1	1.1±0.1	0.5±0.1	-
A2	3.2±0.2	1.6±0.2	1.2±0.1	1.1±0.1	0.8±0.2	-
A	3.2±0.2	1.6±0.2	1.2±0.1	1.6±0.1	0.8±0.2	-
B3	3.5±0.2	2.8±0.2	2.2±0.1	1.1±0.1	0.8±0.2	-
B2	3.5±0.2	2.8±0.2	2.2±0.1	1.9±0.2	0.8±0.2	-
C2	6.0±0.2	3.2±0.2	2.2±0.1	1.4±0.1	1.3±0.2	-
C	6.0±0.2	3.2±0.2	2.2±0.1	2.5±0.2	1.3±0.2	0.4C
V	7.3±0.2	4.3±0.2	2.4±0.1	1.9±0.1	1.3±0.2	-
D	7.3±0.2	4.3±0.2	2.4±0.1	2.8±0.2	1.3±0.2	0.4C

5. MARKINGS

【 J case (ex.:6.3V/4.7μF) 】

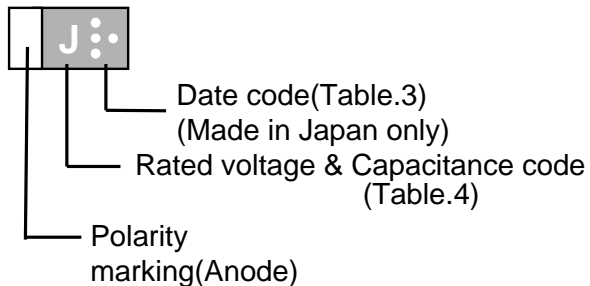


Table.3

2003											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
⋮	⋮⋮	⋮⋮	⋮⋮⋮	⋮⋮⋮	⋮⋮	⋮⋮	⋮⋮	⋮⋮	⋮⋮	⋮⋮	⋮⋮
2004											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
⋮	⋮⋮	⋮	⋮	⋮⋮	⋮⋮	⋮⋮	⋮⋮	⋮	⋮	⋮⋮	⋮

NOTE: Production date code will resume for beginning in 2005.

【 P case 】

(ex.:10V/1μF)

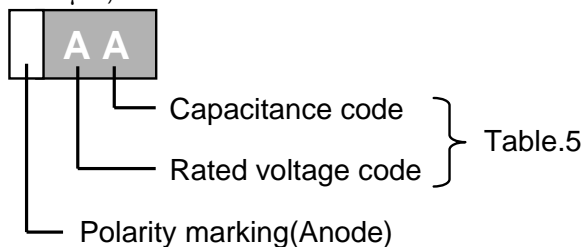


Table.4

UR μF	2.5V	4V	6.3V	10V	16V
1				≧	∩
1.5				∇	
2.2			∩	∠	
3.3			∩		
4.7			J	∇	
6.8		G	∩		
10	e	∩	∩		

(ex.:6.3V/10μF)

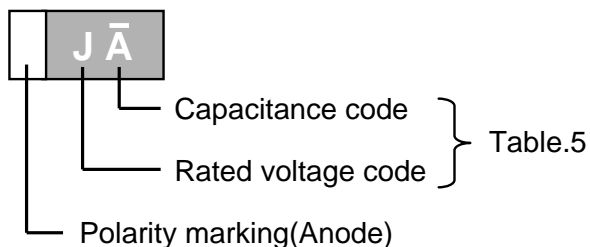
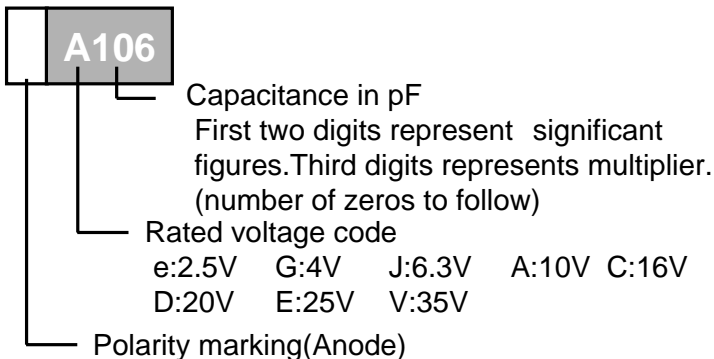


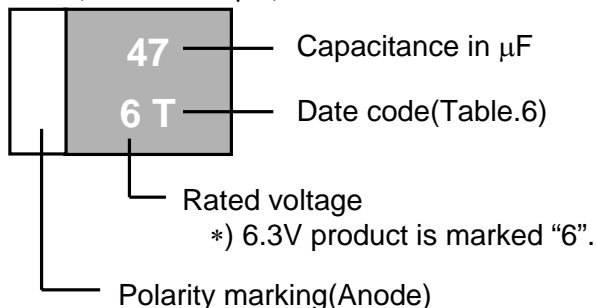
Table.5

UR μF	2.5V	4V	6.3V	10V	16V	25V
0.33						
0.47					CS	
0.68					CW	
1				AA	CA	EA
1.5			JE	AE		
2.2				AJ	CJ	
3.3		GN		AN		
4.7			JS	AS		
6.8			JW			
10		GĀ	JĀ			
15		GĒ	JĒ			
22	eĴ	GĴ	JĴ			
33	eN̄	GN̄				
47	eS̄					

【 A2,A case (ex.:6.3V/10μF) 】



【 B3,B2 case (ex.:6.3V/47μF) 】



【 C2,C,V,D case (ex.:6.3V/220μF) 】

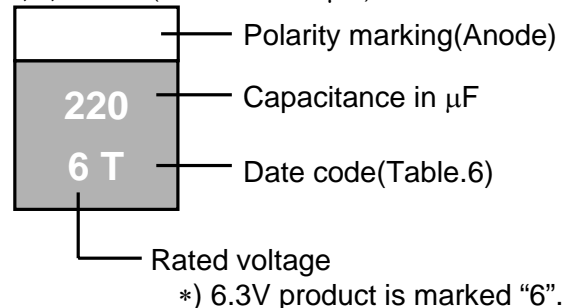


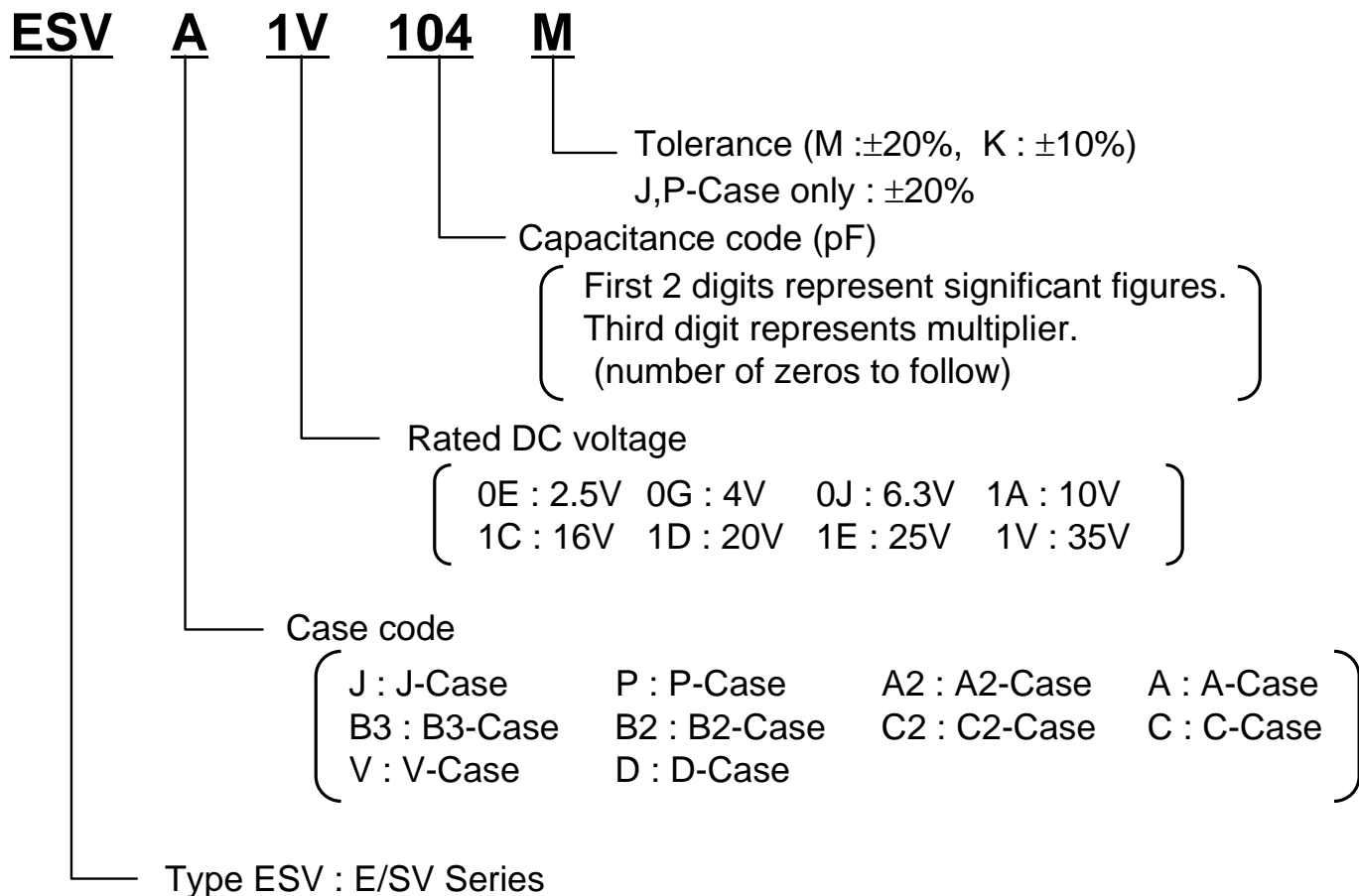
Table.6

Y \ M	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	abc			de		f	g	h	j	k	l	m
2004	n	p	q	r	s	t	u	v	w	x	y	z
2005	A	B	C	D	E	F	G	H	J	K	L	M
2006	N	P	Q	R	S	T	U	V	W	X	Y	Z

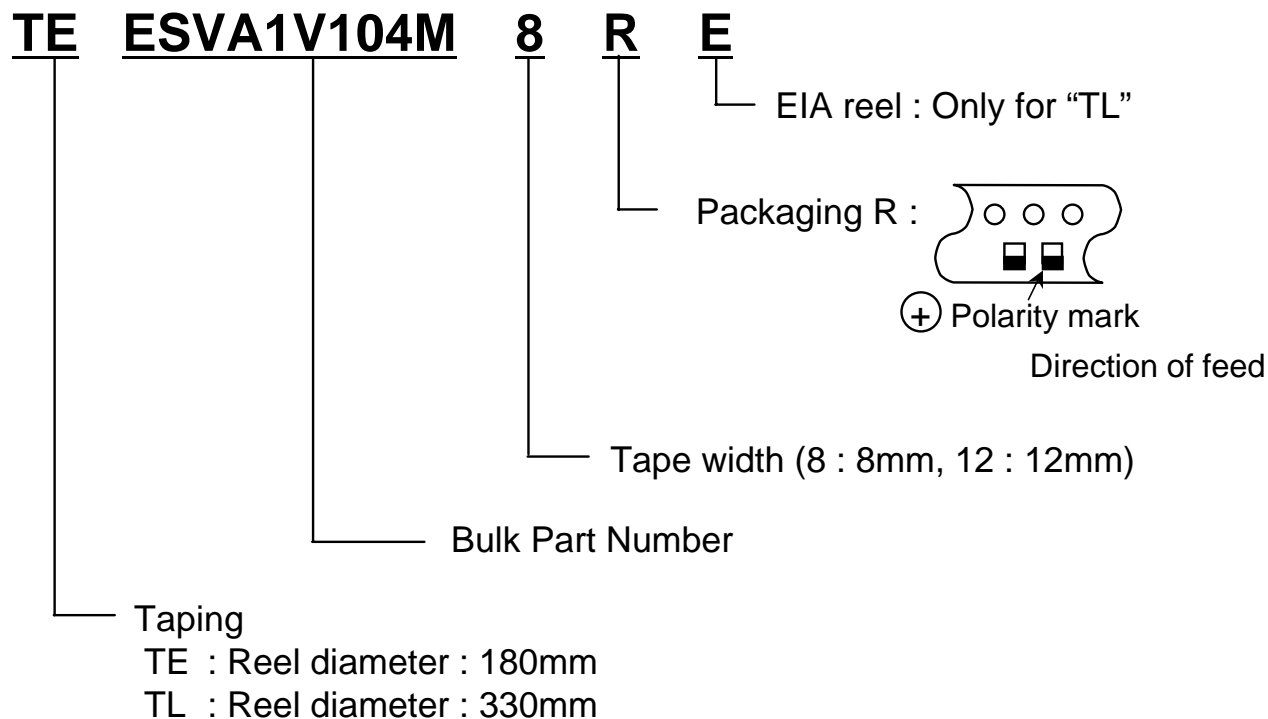
NOTE: Production date code will resume for beginning in 2007.

## 6. PART NUMBERING SYSTEM

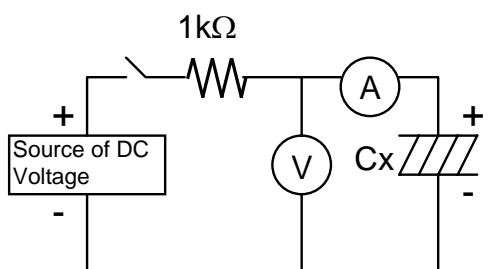
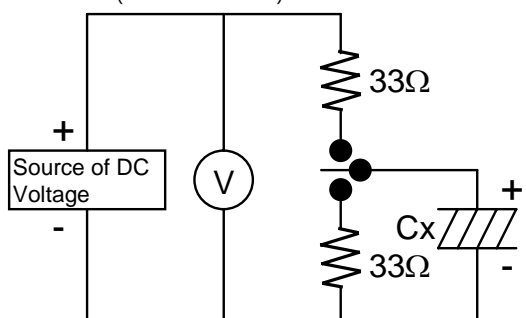
### 6.1 BULK



### 6.2 TAPE and REEL



### 7. PERFORMANCE CHARACTERISTICS

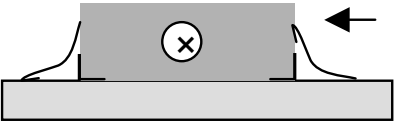
No.	ITEM	PERFORMANCE	TEST CONDITION	
1	Operating Temperature Range	-55 to +125 deg.C		
2	Rated Voltage (V.dc)	2.5 4 6.3 10 16 20 25 35		
3	Derated Voltage (V.dc)	1.6 2.5 4 6.3 10 13 16 22	at 125deg.C	
4	Surge Voltage (V.dc)	3.3 5.2 8 13 20 26 33 46	at 85deg.C	
5	Capacitance (Cap.)	Refer to Standard Ratings. Within tolerance.	Frequency : 120 ±12Hz Voltage : 0.5Vrms+1.5 to 2 V.dc	
6	Dissipation Factor (tanδ)	Refer to Standard Ratings	Rated voltage condition as No.5	
7	Leakage Current (L.C)	0.01CV or 0.5µA whichever is greater	Rated voltage for 5 min 	
8	Dimensions	Mechanical dimensions shall meet the requirement specified in " 4.DIMENSION ".		
9	Resistance to Solvents	Visual	Expose to the following detergent for the duration 30±5sec. a) Isopropyl alcohol b) water	
		ΔC/C		There shall be evidence of mechanical damage. Marking shall be legible.
		D.F. (tanδ)		Within ±2% of initial value
		L.C		Shall not exceed the value in No.6
10	Surge Voltage	ΔC/C	Temperature : 85±2deg.C Applied voltage : No.4 Series resistance : 33Ω Duration of surge : 30±5sec. Time between surge : 5.5min Number of cycle : 1,000  (test circuit) 	
		D.F. (tanδ)		Shall not exceed the value in No.6
		L.C		Shall not exceed the value in No.7
		Visual		There shall be evidence of mechanical damage



No.	ITEM	PERFORMANCE	TEST CONDITION
11	Temperature Stability	$\Delta C/C$ [J,P-case] 0, -20% [Others] 0,-12%	Step 2 Perform preprocessing at 125deg.C for 30 minutes.
		D.F. (tan $\delta$ ) Shall not exceed the value in No.6	
		$\Delta C/C$ [J,P-case] $\pm 5\%$ [Others] $\pm 3\%$	Step 3
		D.F. (tan $\delta$ ) Shall not exceed the value in No.6	
		L.C Shall not exceed the value in No.7	
		$\Delta C/C$ [J,P-case] +20, 0% [Others] +10, 0%	Step 4
		D.F. (tan $\delta$ ) Shall not exceed the value in No.6	
		L.C 0.1CV or 5 $\mu$ A whichever is greater	
		$\Delta C/C$ [J,P-case] +20, 0% [Others] +15, 0%	Step 5
		D.F. (tan $\delta$ ) Shall not exceed the value in No.6	
		L.C 0.125CV or 6.25 $\mu$ A whichever is greater	
		$\Delta C/C$ [J,P-case] $\pm 5\%$ [Others] $\pm 3\%$	Step 6
		D.F. (tan $\delta$ ) Shall not exceed the value in No.6	
		L.C Shall not exceed the value in No.7	
12	Resistance to Soldering Heat	$\Delta C/C$ Refer to Standard Ratings	Temperature : 260 $\pm$ 5deg.C Time(dipped) : 10 $\pm$ 0.5sec. Time(reflowed) : 10 $\pm$ 0.5sec. Reflow soldering : 2 times
		D.F. (tan $\delta$ ) Shall not exceed the value in No.6	
		L.C Shall not exceed the value in No.7	
		Visual There shall be no evidence of mechanical damage	
13	Solderability	Over 95% of the terminal surface shall be covered by a continuous new solder coating after as follows.	The flux shall be a solution containing 25% by weight of water white rosin and 75% by weight of methyl alcohol. Solder temp : 210 $\pm$ 5deg.C Immersion time : 2 $\pm$ 0.5sec.
14	Damp heat	$\Delta C/C$ Refer to Standard Ratings	Temperature : 60 $\pm$ 2deg.C Moisture : 90 to 95% R.H Duration : 21 days
		D.F. (tan $\delta$ ) 150% of initial requirments	
		L.C Shall not exceed the value in No.7	
		Visual There shall be no evidence of mechanical damage	
15	Vibration	Cap. There should be no electrical discontinuity of 0.5 msec or longer Shall be stable for a period of measurment	IEC 68-2-6
		Visual There shall be no evidence of mechanical damage	

Step	Temp
1	20 $\pm$ 2deg.C
2	-55 <sup>0</sup> -3deg.C
3	20 $\pm$ 2deg.C
4	85 <sup>+3</sup> <sub>0</sub> deg.C
5	125 <sup>+3</sup> <sub>0</sub> deg.C
6	20 $\pm$ 2deg.C

Thermal equilibrium :  
Measure C every 5 minutes and there should be no difference between values of any two immediate measurements.

No.	ITEM	PERFORMANCE	TEST CONDITION															
16	Terminal Strength	There shall be no evidence of mechanical damage.	Strength : 4.9N(0.5kgf) Time : 10±0.5sec. (two direction) 															
17	Rapid Change of Temperature	ΔC/C	Part shall be temperature cycle over a temperature range of -55 to +125deg.C, 5times continuously (continuous 5 cycle) as follows. <table border="1" data-bbox="1191 657 1702 864"> <thead> <tr> <th>Step</th> <th>Temp.</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55<sup>0</sup><sub>-3</sub></td> <td>30±3 min.</td> </tr> <tr> <td>2</td> <td>room temp</td> <td>3 min. MAX.</td> </tr> <tr> <td>3</td> <td>125<sup>+3</sup><sub>0</sub></td> <td>30±3 min.</td> </tr> <tr> <td>4</td> <td>room temp</td> <td>3 min. MAX.</td> </tr> </tbody> </table>	Step	Temp.	Time	1	-55 <sup>0</sup> <sub>-3</sub>	30±3 min.	2	room temp	3 min. MAX.	3	125 <sup>+3</sup> <sub>0</sub>	30±3 min.	4	room temp	3 min. MAX.
		Step		Temp.	Time													
		1		-55 <sup>0</sup> <sub>-3</sub>	30±3 min.													
		2		room temp	3 min. MAX.													
3	125 <sup>+3</sup> <sub>0</sub>	30±3 min.																
4	room temp	3 min. MAX.																
D.F. (tanδ)	Shall not exceed the value in No.6																	
L.C	Shall not exceed the value in No.7																	
Visual	There shall be no evidence of mechanical damage																	
18	Shock	ΔC/C	1000m/S <sup>2</sup> (100G) , saw tooth wave															
		D.F. (tanδ)		Shall not exceed the value in No.6														
		L.C		Shall not exceed the value in No.7														
		Visual		There shall be no evidence of mechanical damage														
19	Standard Life Test	ΔC/C	Temperature : 85±2deg.C 125deg.C Duration : 2000 <sup>+72</sup> <sub>0</sub> Hr. Applied voltage : No.2(85deg.C) No.3(125deg.C) Series resistance : 3Ω															
		D.F. (tanδ)		Shall not exceed the value in No.6														
		L.C		Shall not exceed the value in No.7(1000H) [J,P-case] 200% of initial requirements (2000H) [Others] 125% of initial requirements (2000H)														
		Visual		There shall be no evidence of mechanical damage														
20	Failure Rate	1% / 1000H or below	It's the same as No.19															
21	Life	ΔC/C	Temperature : 125±5deg.C Duration : 1000Hr.															
		D.F. (tanδ)		Shall not exceed the value in No.6														
		L.C		Shall not exceed the value in No.7														
22	Reverse Voltage	ΔC/C	Temperature : 85±2deg.C 125±2deg.C Duration : 1000Hr. Applied voltage(85deg.C) : 0.05W.V or 1V whichever is greater Applied voltage(125deg.C):0.03W.V or 0.6V whichever is greater															
		D.F. (tanδ)		Shall not exceed the value in No.6														
		L.C		Shall not exceed the value in No.7														
		Failure Rate		Shall not exceed the value in No.20														

\*1. Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows.  
 Ambient temperature : 5 to 35 deg.C      Relative humidity : 45% to 85%  
 If there may be any doubt on the results, measurements shall be made within the following limits.  
 Ambient temperature : 20 ± 2 deg.C      Relative humidity : 60% to 70%

### 8. TAPE AND REEL SPECIFICATION

#### 8.1 Dimensions

Dimensions of carrier tape and reel is shown in Fig.

#### 8.2 Leader and Trailer

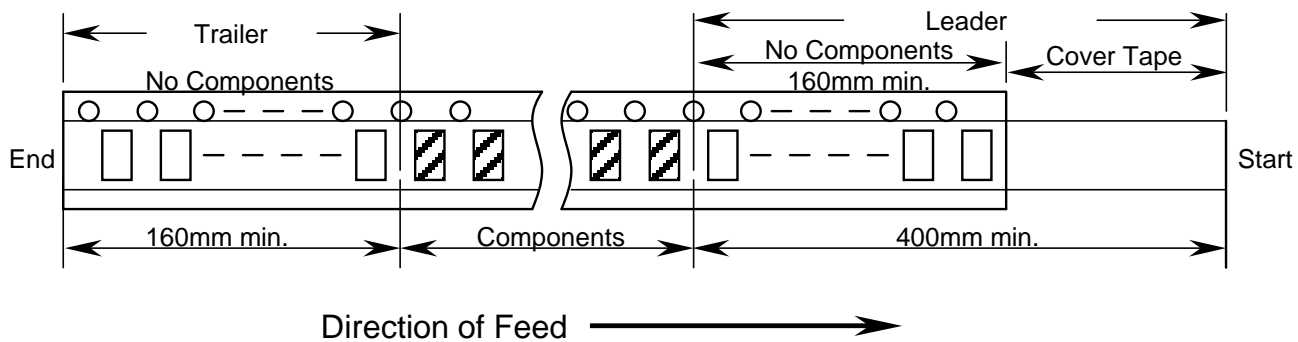


Fig.2 leader and trailer

#### 8.3 Polar Units

All components shall be oriented in one direction.

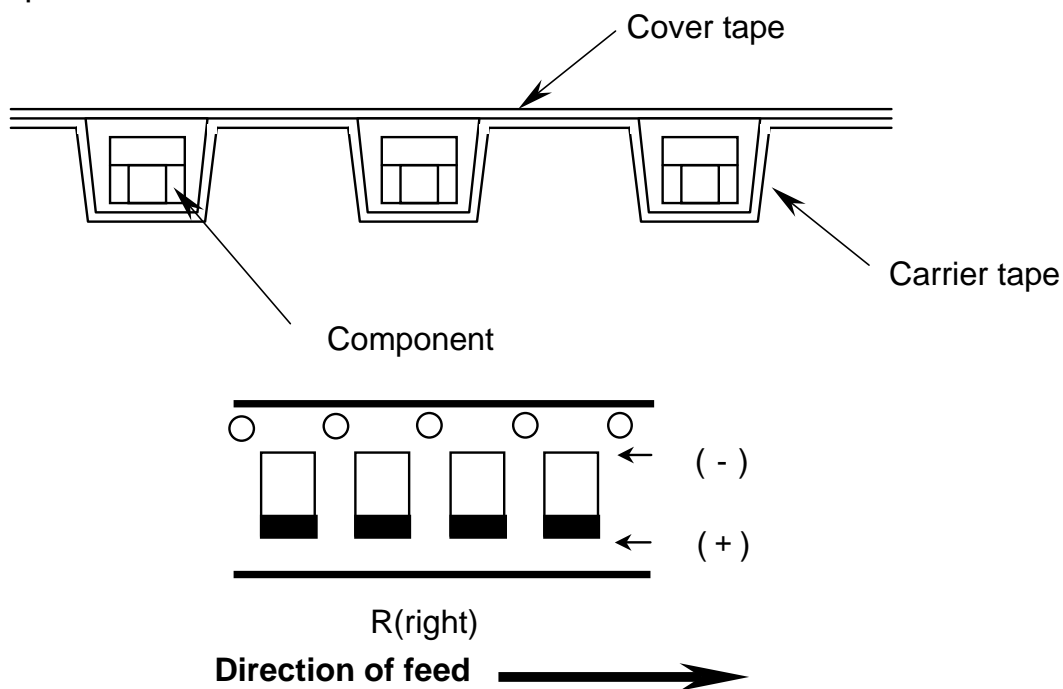


Fig.3 Polar Units

#### 8.4 Peeling strength of Cover tape

Peeling strength ( f ) of Cover tape shall be 0.1 N to 0.6 N .

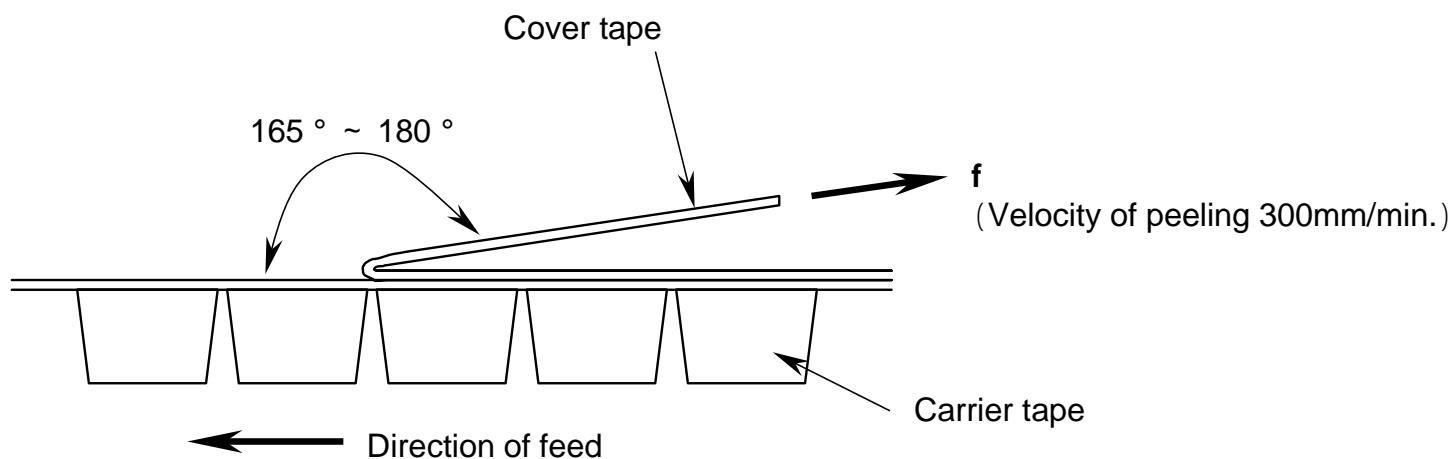


Fig.4 Peeling strength

**8.5 Missing components**

There shall be no missing components within the effective carrier tape.

**8.6 Reel identification data**

Each reel and shipping carton(s) shall be marked as follows.

- (1) Part number
- (2) Quantity
- (3) Lot number
- (4) Manufacturer's name or trademark

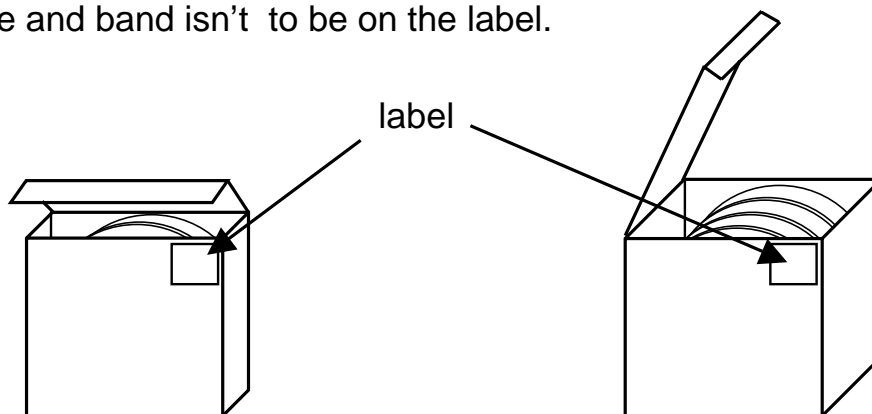
**8.7 Tape and reel specification for inner box**

There shall be same lot number of the product in the packing box. Reels with different lot number shall not be mixed in the same packing box.

Taping products shall be packed using the white surface cardboard packing box.

The stick point of the label is shown in the following figure.

If there is too much space between the packing box and the reel, prevent the reel from moving. The cushioning material shall not be used plastics ( styrene foam, air cap, etc.). After the reels are encased, put the cover and secure it with a sticky tape or a rubber band. Tape and band isn't to be on the label.



Carrier tape width 8 mm :  
max. 1 or 2 reels packing box  
Carrier tape width 12 mm :  
max. 1 reels packing box

Carrier tape width 8 mm :  
max. 3 ~ 5 reels packing box  
Carrier tape width 12 mm :  
max. 2 ~ 6 reels or 11 reels packing box

**9. Country of origin (Attachment - 1)**

- (1) Japan
- (2) Thailand

**10. Manufacturing process chart**

Attachment - 2

• Carrier tape

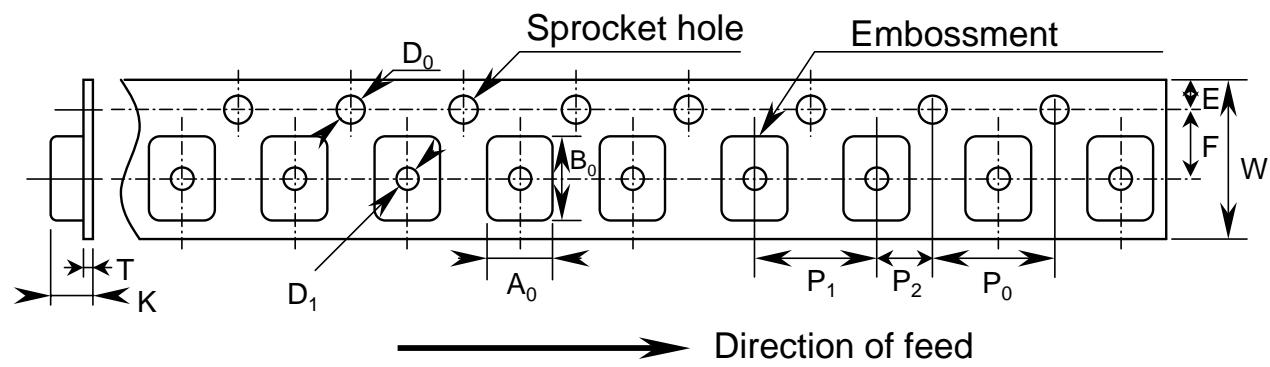


Fig.5 Carrier tape

Table.7 Dimensions

(Unit : mm)

Case code	$A_0 \pm 0.2$	$B_0 \pm 0.2$	$W \pm 0.3$	$F \pm 0.05$	$E \pm 0.1$	$P_1 \pm 0.1$	$P_2 \pm 0.05$
J	1.0	1.8	8.0	3.5	1.75	4.0	2.0
P	1.4	2.2	8.0	3.5	1.75	4.0	2.0
A2	1.9	3.5	8.0	3.5	1.75	4.0	2.0
A	1.9	3.5	8.0	3.5	1.75	4.0	2.0
B3	3.2	3.8	8.0	3.5	1.75	4.0	2.0
B2	3.3	3.8	8.0	3.5	1.75	4.0	2.0
C2	3.7	6.4	12.0	5.5	1.75	8.0	2.0
C	3.7	6.4	12.0	5.5	1.75	8.0	2.0
V	4.6	7.7	12.0	5.5	1.75	8.0	2.0
D	4.8	7.7	12.0	5.5	1.75	8.0	2.0

Case code	$P_0 \pm 0.1$	$D_0 + 0.1 - 0$	$D_1$ min.	$K \pm 0.2$	T	Quantity/reel	
						$\phi 180$ reel	$\phi 330$ reel
J4	.0	$\phi 1.5$	-	1.1	0.2	4000 pcs	-
P4	.0	$\phi 1.5$	-	1.4	0.2	3000 pcs	-
A2	4.0	$\phi 1.5$	$\phi 1.0$	1.4	0.2	3000 pcs	10000 pcs
A4	.0	$\phi 1.5$	$\phi 1.0$	1.9	0.2	2000 pcs	9000 pcs
B3	4.0	$\phi 1.5$	$\phi 1.0$	1.4	0.2	3000 pcs	10000 pcs
B2	4.0	$\phi 1.5$	$\phi 1.0$	2.1	0.2	2000 pcs	5000 pcs
C2	4.0	$\phi 1.5$	$\phi 1.5$	1.7	0.3	1000 pcs	4000 pcs
C4	.0	$\phi 1.5$	$\phi 1.5$	3.0	0.3	500 pcs	2500 pcs
V4	.0	$\phi 1.5$	$\phi 1.5$	2.4	0.4	1000 pcs	3000 pcs
D4	.0	$\phi 1.5$	$\phi 1.5$	3.3	0.3	500 pcs	2500 pcs

• Reel

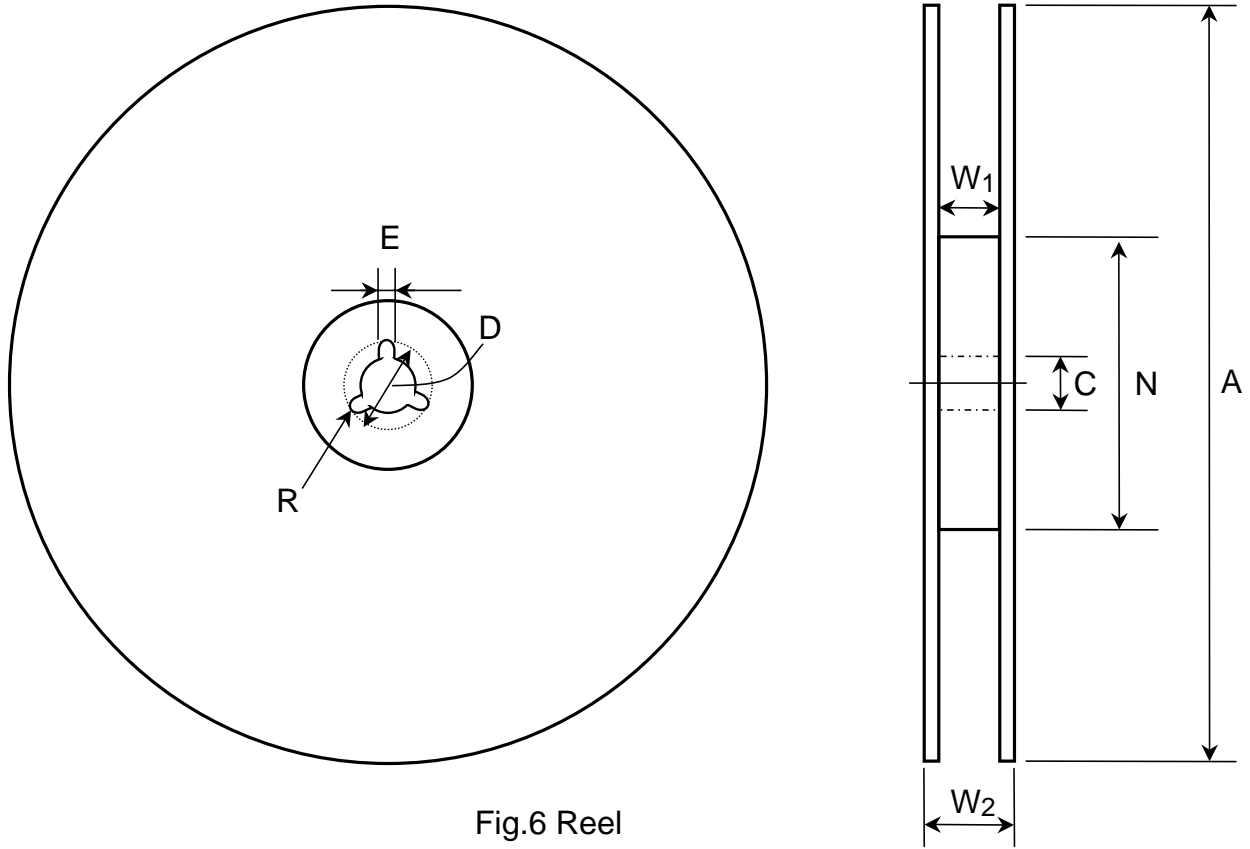


Fig.6 Reel

Table.8 Dimensions

(Unit: mm)

Reel	Tape width	A	N	C	D	E	W1	W <sub>2</sub>	R
180	8	$\phi 180^{+0}_{-3}$	$\phi 50\text{Min.}$	$\phi 13\pm 0.5$	$\phi 21\pm 0.5$	$2.0\pm 0.5$	$9.0\pm 1.0$	$11.4\pm 1.0$	1
	12	$\phi 180^{+0}_{-3}$	$\phi 50\text{Min.}$	$\phi 13\pm 0.5$	$\phi 21\pm 0.5$	$2.0\pm 0.5$	$13.0\pm 0.3$	$15.4\pm 1.0$	1
330	8	$\phi 330\pm 2$	$\phi 80\text{Min.}$	$\phi 13\pm 0.5$	$\phi 21\pm 1.0$	$2.0\pm 0.5$	$9.5\pm 0.5$	14.5Max.	1
	12	$\phi 330\pm 2$	$\phi 80\text{Min.}$	$\phi 13\pm 0.5$	$\phi 21\pm 1.0$	$2.0\pm 0.5$	$13.5\pm 0.5$	18.5Max.	1

### 11. STANDARD RATINGS

#### STANDARD RATINGS

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVJ0E106M8R	2.5	10	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVP0E226M8R	2.5	22	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP0E336M8R	2.5	33	0.20	0.30	0.30	0.8	$\pm$ 20	P
	TEESVP0E476M8R	2.5	47	0.30	0.60	0.40	1.1	$\pm$ 20	P
	TEESVA20E226[ ]8R	2.5	22	0.12	0.20	0.14	0.5	$\pm$ 12	A2
	TEESVA20E336[ ]8R	2.5	33	0.12	0.22	0.14	0.8	$\pm$ 12	A2
	TEESVA20E476[ ]8R	2.5	47	0.12	0.22	0.14	1.1	$\pm$ 12	A2
	TEESVA0E476[ ]8R	2.5	47	0.12	0.22	0.16	1.1	$\pm$ 12	A
	TEESVA0E686[ ]8R	2.5	68	0.18	0.34	0.20	1.7	$\pm$ 12	A
	TEESVB30E107[ ]8R	2.5	100	0.18	0.34	0.20	2.5	$\pm$ 15	B3
	TEESVB20E107[ ]8R	2.5	100	0.08	0.14	0.10	2.5	$\pm$ 12	B2
	TEESVB20E157[ ]8R	2.5	150	0.16	0.30	0.18	3.7	$\pm$ 12	B2
	TEESVB20E227[ ]8R	2.5	220	0.18	0.34	0.20	5.5	$\pm$ 12	B2
	TEESVC20E157[ ]12R	2.5	150	0.12	0.26	0.18	3.7	$\pm$ 12	C2
	TEESVC20E227[ ]12R	2.5	220	0.12	0.26	0.18	5.5	$\pm$ 12	C2
	TEESVC0E337[ ]12R	2.5	330	0.16	0.34	0.18	8.2	$\pm$ 12	C
	TEESVC0E477[ ]12R	2.5	470	0.18	0.34	0.20	11.7	$\pm$ 12	C
	TEESVD0E477[ ]12R	2.5	470	0.14	0.18	0.16	11.7	$\pm$ 12	D

To complete Part number , insert capacitance tolerance ( "M" = $\pm$ 20% , or "K"= $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life","Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".

STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVJ0G685M8R	4	6.8	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVJ0G106M8R	4	10	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVP0G335M8R	4	3.3	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP0G106M8R	4	10	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP0G156M8R	4	15	0.20	0.30	0.30	0.6	$\pm$ 20	P
	TEESVP0G226M8R	4	22	0.20	0.30	0.30	0.8	$\pm$ 20	P
	TEESVP0G336M8R	4	33	0.20	0.30	0.30	1.3	$\pm$ 20	P
	TEESVA20G226[ ]8R	4	22	0.12	0.22	0.16	0.8	$\pm$ 12	A2
	TEESVA20G336[ ]8R	4	33	0.08	0.14	0.10	1.3	$\pm$ 12	A2
	TEESVA20G476[ ]8R	4	47	0.15	0.30	0.20	1.8	$\pm$ 12	A2
	TEESVA0G226[ ]8R	4	22	0.08	0.12	0.10	0.8	$\pm$ 12	A
	TEESVA0G336[ ]8R	4	33	0.10	0.14	0.12	1.3	$\pm$ 12	A
	TEESVA0G476[ ]8R	4	47	0.12	0.22	0.14	1.8	$\pm$ 12	A
	TEESVA0G686[ ]8R	4	68	0.12	0.22	0.14	2.7	$\pm$ 12	A
	TEESVA0G107[ ]8R	4	100	0.30	0.60	0.40	4.0	$\pm$ 20	A
	TEESVB30G476[ ]8R	4	47	0.12	0.18	0.15	1.8	$\pm$ 15	B3
	TEESVB30G686[ ]8R	4	68	0.15	0.28	0.17	2.7	$\pm$ 15	B3
	TEESVB30G107[ ]8R	4	100	0.20	0.38	0.22	4.0	$\pm$ 15	B3
	TEESVB20G107[ ]8R	4	100	0.12	0.22	0.14	4.0	$\pm$ 12	B2
	TEESVB20G157[ ]8R	4	150	0.18	0.34	0.20	6.0	$\pm$ 12	B2
	TEESVB20G227[ ]8R	4	220	0.18	0.34	0.20	8.8	$\pm$ 12	B2
	TEESVC20G107[ ]12R	4	100	0.10	0.18	0.12	4.0	$\pm$ 12	C2
	TEESVC20G157[ ]12R	4	150	0.10	0.18	0.12	6.0	$\pm$ 12	C2
	TEESVC0G227[ ]12R	4	220	0.12	0.22	0.14	8.8	$\pm$ 12	C
	TEESVC0G337[ ]12R	4	330	0.14	0.26	0.16	13.2	$\pm$ 12	C
	TEESVV0G337[ ]12R	4	330	0.12	0.18	0.14	13.2	$\pm$ 12	V
	TEESVD0G477[ ]12R	4	470	0.16	0.30	0.18	18.8	$\pm$ 12	D
	TEESVD0G687[ ]12R	4	680	0.24	0.46	0.26	27.2	$\pm$ 12	D

To complete Part number , insert capacitance tolerance ( "M"  $\pm$ 20% , or "K" $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life","Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".



STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVJ0J225M8R	6.3	2.2	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVJ0J335M8R	6.3	3.3	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVJ0J475M8R	6.3	4.7	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVJ0J685M8R	6.3	6.8	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVJ0J106M8R	6.3	10	0.20	0.38	0.22	0.6	$\pm$ 20	J
	TEESVP0J155M8R	6.3	1.5	0.10	0.15	0.15	0.5	$\pm$ 20	P
	TEESVP0J475M8R	6.3	4.7	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP0J685M8R	6.3	6.8	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP0J106M8R	6.3	10	0.20	0.30	0.30	0.6	$\pm$ 20	P
	TEESVP0J156M8R	6.3	15	0.20	0.30	0.30	0.9	$\pm$ 20	P
	TEESVP0J226M8R	6.3	22	0.20	0.38	0.22	1.3	$\pm$ 20	P
	TEESVA20J685[ ]8R	6.3	6.8	0.08	0.12	0.10	0.5	$\pm$ 12	A2
	TEESVA20J106[ ]8R	6.3	10	0.08	0.12	0.10	0.6	$\pm$ 12	A2
	TEESVA20J156[ ]8R	6.3	15	0.12	0.22	0.14	0.9	$\pm$ 12	A2
	TEESVA20J226[ ]8R	6.3	22	0.12	0.22	0.14	1.3	$\pm$ 12	A2
	TEESVA0J475[ ]8R	6.3	4.7	0.08	0.12	0.10	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA0J106[ ]8R	6.3	10	0.08	0.12	0.10	0.6	$\pm$ 12	A
	TEESVA0J156[ ]8R	6.3	15	0.08	0.12	0.10	0.9	$\pm$ 12	A
	TEESVA0J226[ ]8R	6.3	22	0.10	0.14	0.12	1.3	$\pm$ 12	A
	TEESVA0J336[ ]8R	6.3	33	0.12	0.22	0.14	2.0	$\pm$ 12	A
	TEESVA0J476[ ]8R	6.3	47	0.12	0.22	0.14	2.9	$\pm$ 12	A
	TEESVB30J226[ ]8R	6.3	22	0.08	0.12	0.10	1.3	$\pm$ 15	B3
	TEESVB30J336[ ]8R	6.3	33	0.12	0.18	0.15	2.0	$\pm$ 15	B3
	TEESVB30J476[ ]8R	6.3	47	0.08	0.12	0.10	2.9	$\pm$ 15	B3
	TEESVB20J226[ ]8R	6.3	22	0.08	0.12	0.10	1.3	$\pm$ 5( $\pm$ 10)	B2
	TEESVB20J476[ ]8R	6.3	47	0.08	0.12	0.10	2.9	$\pm$ 5( $\pm$ 10)	B2
	TEESVB20J686[ ]8R	6.3	68	0.10	0.18	0.12	4.2	$\pm$ 12	B2
	TEESVB20J107[ ]8R	6.3	100	0.12	0.22	0.14	6.3	$\pm$ 12	B2
	TEESVC20J686[ ]12R	6.3	68	0.10	0.14	0.12	4.2	$\pm$ 12	C2
	TEESVC20J107[ ]12R	6.3	100	0.10	0.18	0.12	6.3	$\pm$ 12	C2
	TEESVC0J476[ ]12R	6.3	47	0.08	0.12	0.10	2.9	$\pm$ 5( $\pm$ 10)	C
	TEESVC0J107[ ]12R	6.3	100	0.10	0.14	0.12	6.3	$\pm$ 12	C
	TEESVC0J157[ ]12R	6.3	150	0.10	0.18	0.12	9.4	$\pm$ 12	C
	TEESVC0J227[ ]12R	6.3	220	0.14	0.26	0.16	13.8	$\pm$ 12	C
	TEESVV0J227[ ]12R	6.3	220	0.12	0.18	0.14	13.8	$\pm$ 12	V
	TEESVD0J227[ ]12R	6.3	220	0.12	0.18	0.14	13.8	$\pm$ 12	D
	TEESVD0J337[ ]12R	6.3	330	0.14	0.26	0.16	20.7	$\pm$ 12	D
	TEESVD0J477[ ]12R	6.3	470	0.20	0.38	0.22	29.6	$\pm$ 20	D

To complete Part number , insert capacitance tolerance ( "M"  $\pm$ 20% , or "K" $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life", "Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".

STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVJ1A105M8R	10	1	0.10	0.30	0.15	0.5	$\pm$ 20	J
	TEESVJ1A155M8R	10	1.5	0.20	0.30	0.20	0.5	$\pm$ 20	J
	TEESVJ1A225M8R	10	2.2	0.20	0.30	0.20	0.5	$\pm$ 20	J
	TEESVJ1A475M8R	10	4.7	0.20	0.30	0.30	0.5	$\pm$ 20	J
	TEESVP1A105M8R	10	1	0.10	0.15	0.15	0.5	$\pm$ 20	P
	TEESVP1A155M8R	10	1.5	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP1A225M8R	10	2.2	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP1A335M8R	10	3.3	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP1A475M8R	10	4.7	0.20	0.30	0.30	0.5	$\pm$ 20	P
	TEESVP1A106M8R	10	10	0.20	0.30	0.30	1.0	$\pm$ 20	P
	TEESVA21A335[ ]8R	10	3.3	0.08	0.12	0.10	0.5	$\pm$ 12	A2
	TEESVA21A475[ ]8R	10	4.7	0.08	0.12	0.10	0.5	$\pm$ 12	A2
	TEESVA21A685[ ]8R	10	6.8	0.08	0.12	0.10	0.6	$\pm$ 12	A2
	TEESVA21A106[ ]8R	10	10	0.08	0.12	0.10	1.0	$\pm$ 12	A2
	TEESVA1A475[ ]8R	10	4.7	0.08	0.12	0.10	0.5	$\pm$ 12	A
	TEESVA1A685[ ]8R	10	6.8	0.08	0.12	0.10	0.6	$\pm$ 12	A
	TEESVA1A106[ ]8R	10	10	0.08	0.12	0.10	1.0	$\pm$ 12	A
	TEESVA1A226[ ]8R	10	22	0.12	0.22	0.14	2.2	$\pm$ 12	A
	TEESVB31A156[ ]8R	10	15	0.12	0.18	0.15	1.5	$\pm$ 15	B3
	TEESVB31A226[ ]8R	10	22	0.12	0.18	0.15	2.2	$\pm$ 15	B3
	TEESVB21A106[ ]8R	10	10	0.08	0.12	0.10	1.0	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21A226[ ]8R	10	22	0.08	0.12	0.10	2.2	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21A336[ ]8R	10	33	0.08	0.12	0.10	3.3	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21A476[ ]8R	10	47	0.08	0.12	0.10	4.7	$\pm$ 12	B2
	TEESVB21A686[ ]8R	10	68	0.12	0.14	0.14	6.8	$\pm$ 12	B2
	TEESVC21A476[ ]12R	10	47	0.08	0.14	0.10	4.7	$\pm$ 12	C2
	TEESVC21A686[ ]12R	10	68	0.10	0.18	0.14	6.8	$\pm$ 12	C2
	TEESVC1A476[ ]12R	10	47	0.08	0.12	0.10	4.7	$\pm$ 5( $\pm$ 10)	C
	TEESVC1A686[ ]12R	10	68	0.08	0.12	0.10	6.8	$\pm$ 12	C
	TEESVC1A107[ ]12R	10	100	0.10	0.18	0.12	10.0	$\pm$ 12	C
	TEESVV1A107[ ]12R	10	100	0.08	0.18	0.10	10.0	$\pm$ 12	V
	TEESVV1A157[ ]12R	10	150	0.08	0.18	0.10	15.0	$\pm$ 12	V
	TEESVD1A107[ ]12R	10	100	0.08	0.18	0.10	10.0	$\pm$ 5( $\pm$ 10)	D
	TEESVD1A157[ ]12R	10	150	0.10	0.18	0.12	15.0	$\pm$ 12	D
	TEESVD1A227[ ]12R	10	220	0.12	0.22	0.14	22.0	$\pm$ 12	D

To complete Part number , insert capacitance tolerance ( "M" $\pm$ 20% , or "K" $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life","Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".

STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVJ1C105M8R	16	1	0.10	0.30	0.15	0.5	$\pm$ 20	J
	TEESVP1C474M8R	16	0.47	0.10	0.15	0.15	0.5	$\pm$ 20	P
	TEESVP1C684M8R	16	0.68	0.10	0.15	0.15	0.5	$\pm$ 20	P
	TEESVP1C105M8R	16	1	0.10	0.15	0.15	0.5	$\pm$ 20	P
	TEESVP1C225M8R	16	2.2	0.10	0.15	0.15	0.5	$\pm$ 20	P
	TEESVA21C225[ ]8R	16	2.2	0.06	0.10	0.08	0.5	$\pm$ 12	A2
	TEESVA21C335[ ]8R	16	3.3	0.08	0.14	0.10	0.5	$\pm$ 12	A2
	TEESVA21C475[ ]8R	16	4.7	0.08	0.14	0.10	0.7	$\pm$ 12	A2
	TEESVA1C155[ ]8R	16	1.5	0.04	0.08	0.06	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1C225[ ]8R	16	2.2	0.06	0.10	0.08	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1C335[ ]8R	16	3.3	0.06	0.10	0.08	0.5	$\pm$ 12	A
	TEESVA1C475[ ]8R	16	4.7	0.06	0.10	0.08	0.7	$\pm$ 12	A
	TEESVA1C685[ ]8R	16	6.8	0.06	0.10	0.08	1.0	$\pm$ 12	A
	TEESVA1C106[ ]8R	16	10	0.08	0.12	0.10	1.6	$\pm$ 12	A
	TEESVB31C685[ ]8R	16	6.8	0.06	0.10	0.08	1.0	$\pm$ 15	B3
	TEESVB31C106[ ]8R	16	10	0.08	0.14	0.10	1.6	$\pm$ 15	B3
	TEESVB21C106[ ]8R	16	10	0.06	0.10	0.08	1.6	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21C156[ ]8R	16	15	0.06	0.10	0.08	2.4	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21C226[ ]8R	16	22	0.06	0.10	0.08	3.5	$\pm$ 5( $\pm$ 10)	B2
	TEESVC21C336[ ]12R	16	33	0.06	0.10	0.08	5.2	$\pm$ 12	C2
	TEESVC1C226[ ]12R	16	22	0.06	0.10	0.08	3.5	$\pm$ 5( $\pm$ 10)	C
	TEESVC1C336[ ]12R	16	33	0.06	0.10	0.08	5.2	$\pm$ 5( $\pm$ 10)	C
	TEESVC1C476[ ]12R	16	47	0.06	0.10	0.08	7.5	$\pm$ 12	C
	TEESVC1C686[ ]12R	16	68	0.06	0.16	0.10	10.8	$\pm$ 12	C
	TEESVD1C226[ ]12R	16	22	0.06	0.10	0.08	3.5	$\pm$ 5( $\pm$ 10)	D
	TEESVD1C476[ ]12R	16	47	0.06	0.10	0.08	7.5	$\pm$ 5( $\pm$ 10)	D
	TEESVD1C686[ ]12R	16	68	0.06	0.10	0.08	10.8	$\pm$ 5( $\pm$ 10)	D
	TEESVD1C107[ ]12R	16	100	0.10	0.18	0.10	16.0	$\pm$ 12	D

To complete Part number , insert capacitance tolerance ( "M" = $\pm$ 20% , or "K"= $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life","Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".

STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVA21D474[ ]8R	20	0.47	0.06	0.10	0.08	0.5	$\pm 5(\pm 10)$	A2
	TEESVA21D684[ ]8R	20	0.68	0.06	0.10	0.08	0.5	$\pm 5(\pm 10)$	A2
	TEESVA21D105[ ]8R	20	1	0.06	0.10	0.08	0.5	$\pm 12$	A2
	TEESVA21D155[ ]8R	20	1.5	0.06	0.10	0.08	0.5	$\pm 12$	A2
	TEESVA21D225[ ]8R	20	2.2	0.06	0.10	0.08	0.5	$\pm 12$	A2
	TEESVA1D225[ ]8R	20	2.2	0.06	0.10	0.08	0.5	$\pm 12$	A
	TEESVA1D335[ ]8R	20	3.3	0.06	0.10	0.08	0.6	$\pm 12$	A
	TEESVA1D475[ ]8R	20	4.7	0.06	0.10	0.08	0.9	$\pm 12$	A
	TEESVB31D335[ ]8R	20	3.3	0.06	0.10	0.08	0.6	$\pm 15$	B3
	TEESVB31D475[ ]8R	20	4.7	0.06	0.10	0.08	0.9	$\pm 15$	B3
	TEESVB21D475[ ]8R	20	4.7	0.06	0.10	0.08	0.9	$\pm 5(\pm 10)$	B2
	TEESVB21D685[ ]8R	20	6.8	0.06	0.10	0.08	1.3	$\pm 5(\pm 10)$	B2
	TEESVB21D106[ ]8R	20	10	0.06	0.10	0.08	2.0	$\pm 5(\pm 10)$	B2
	TEESVC21D226[ ]12R	20	22	0.06	0.10	0.08	4.4	$\pm 12$	C2
	TEESVC1D156[ ]12R	20	15	0.06	0.10	0.08	3.0	$\pm 5(\pm 10)$	C
	TEESVC1D226[ ]12R	20	22	0.06	0.10	0.08	4.4	$\pm 5(\pm 10)$	C
	TEESVD1D226[ ]12R	20	22	0.06	0.10	0.08	4.4	$\pm 5(\pm 10)$	D
	TEESVD1D336[ ]12R	20	33	0.06	0.10	0.08	6.6	$\pm 5(\pm 10)$	D
	TEESVD1D476[ ]12R	20	47	0.06	0.10	0.08	9.4	$\pm 5(\pm 10)$	D

To complete Part number , insert capacitance tolerance ( "M" = $\pm 20\%$  , or "K"= $\pm 10\%$  ) in blank "[ ]".  
Apply the value in brackets to "Life", "Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm 5\%$ ".

STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVP1E105M8R	25	10	.060	.100	.08	0.5	$\pm$ 20	P
	TEESVA21E105[ ]8R	25	1	0.06	0.10	0.08	0.5	$\pm$ 12	A2
	TEESVA1E474[ ]8R	25	0.47	0.04	0.08	0.06	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1E684[ ]8R	25	0.68	0.06	0.10	0.08	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1E105[ ]8R	25	1	0.06	0.10	0.08	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1E225[ ]8R	25	2.2	0.06	0.10	0.08	0.5	$\pm$ 12	A
	TEESVA1E335[ ]8R	25	3.3	0.06	0.10	0.08	0.8	$\pm$ 12	A
	TEESVB31E475[ ]8R	25	4.7	0.06	0.10	0.08	1.1	$\pm$ 15	B3
	TEESVB21E335[ ]8R	25	3.3	0.06	0.10	0.08	0.8	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21E475[ ]8R	25	4.7	0.06	0.10	0.08	1.1	$\pm$ 5( $\pm$ 10)	B2
	TEESVC1E106[ ]12R	25	10	0.06	0.10	0.08	2.5	$\pm$ 5( $\pm$ 10)	C
	TEESVC1E156[ ]12R	25	15	0.06	0.10	0.08	3.7	$\pm$ 12	C
	TEESVD1E226[ ]12R	25	22	0.06	0.10	0.08	5.5	$\pm$ 5( $\pm$ 10)	D
	TEESVD1E336[ ]12R	25	33	0.06	0.10	0.08	8.2	$\pm$ 5( $\pm$ 10)	D

To complete Part number , insert capacitance tolerance ( "M" = $\pm$ 20% , or "K"= $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life", "Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".

STANDARD RATINGS(Continued)

Part number	NEC TOKIN Part number	Volt. (v.dc)	Cap. ( $\mu$ F)	tan $\delta$			L.C. ( $\mu$ A)	$\Delta$ C/C (%)	Case Code
				+20,+85 deg.C	-55 deg.C	+125 deg.C			
	TEESVA21V105[ ]8R	35	1	0.06	0.10	0.08	0.5	$\pm$ 12	A2
	TEESVA1V474[ ]8R	35	0.47	0.06	0.10	0.08	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1V684[ ]8R	35	0.68	0.06	0.10	0.08	0.5	$\pm$ 5( $\pm$ 10)	A
	TEESVA1V105[ ]8R	35	1	0.06	0.10	0.08	0.5	$\pm$ 12	A
	TEESVA1V155[ ]8R	35	1.5	0.06	0.10	0.08	0.5	$\pm$ 12	A
	TEESVA1V225[ ]8R	35	2.2	0.06	0.10	0.08	0.7	$\pm$ 12	A
	TEESVB21V225[ ]8R	35	2.2	0.06	0.10	0.08	0.7	$\pm$ 5( $\pm$ 10)	B2
	TEESVB21V335[ ]8R	35	3.3	0.06	0.10	0.08	1.1	$\pm$ 5( $\pm$ 10)	B2
	TEESVC1V475[ ]12R	35	4.7	0.06	0.10	0.08	1.6	$\pm$ 5( $\pm$ 10)	C
	TEESVC1V685[ ]12R	35	6.8	0.06	0.10	0.08	2.3	$\pm$ 5( $\pm$ 10)	C
	TEESVC1V106[ ]12R	35	10	0.06	0.10	0.08	3.5	$\pm$ 5( $\pm$ 10)	C
	TEESVD1V106[ ]12R	35	10	0.06	0.10	0.08	3.5	$\pm$ 5( $\pm$ 10)	D
	TEESVD1V156[ ]12R	35	15	0.06	0.10	0.08	5.2	$\pm$ 5( $\pm$ 10)	D

To complete Part number , insert capacitance tolerance ( "M" = $\pm$ 20% , or "K"= $\pm$ 10% ) in blank "[ ]".  
 Apply the value in brackets to "Life", "Standard Life Test" and "Reverse voltage" , in case of  $\Delta$ C/C is " $\pm$ 5%".

## 12. Notes of Using the Solid Tantalum Capacitor

About 90% of the failure mode of the solid tantalum capacitor is short circuits. In the case of short circuit, the tantalum capacitor is heated and may generate fire and be burned.

Please take surplus for the operating condition.

### 12.1 Reliability

The reliability of the solid tantalum capacitor is heavily influenced by environmental conditions such as temperature, humidity, shock, vibration, mechanical stresses, and electric stresses including applied voltage, current, ripple current, transient current and voltage, and frequency. when using solid tantalum capacitors, therefore, provide enough margin to these conditions, so that the reliability of the capacitors is maintained. Voltage and temperature are important parameters when estimating the reliability (field failure rate). The field failure rate of a solid tantalum capacitor can be calculated by the following expression if emphasis is placed only on the voltage and temperature:

The failure rate of solid tantalum capacitors depend on voltage and temperature. Calculate the failure rate for following approximate formula.

$$\lambda = \lambda_0 ( V / V_0 )^{3.2} ( T - T_0 ) / 10$$

$\lambda$  : The approximate failure rate of actual condition

$\lambda_0$  : The basic failure rate of rated voltage [ 1%/1000h ]

T : Temperature of around (deg.C)

V : Working voltage of actual condition ( peak of ripple )

$T_0$  : 85deg.C

$V_0$  : Rated voltage

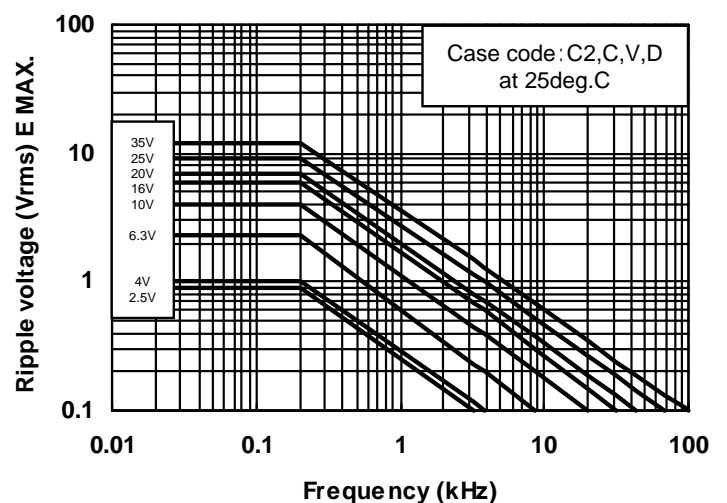
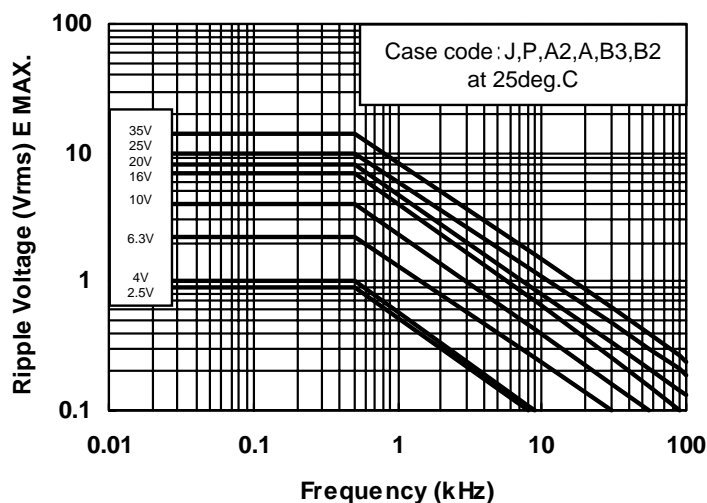
### 12.2 Ripple Voltage

- The sum of DC voltage and peak ripple voltage should not exceed the DC rated voltage of capacitor.
- If you give ripple voltage, you must be lower than the value of following figure. In temperature higher than 85deg.C, permissible ripple voltage shall be derated as follows.

$$E \text{ MAX. (at 50 deg.C) } = 0.7 \times E \text{ MAX. (at 25 deg.C)}$$

$$E \text{ MAX. (at 85 deg.C) } = 0.5 \times E \text{ MAX. (at 25 deg.C)}$$

$$E \text{ MAX. (at 125 deg.C) } = 0.3 \times E \text{ MAX. (at 25 deg.C)}$$



### 12.3 Reverse Voltage

Because the solid tantalum capacitor is of polar type, do not apply a reverse voltage to it. If reverse voltage cannot be avoided, it must be applied for short time and must not exceed the following values:

25deg.C	.....	10% of Rated Voltage or 3 V.dc, whichever is smaller
85deg.C	.....	5% of Rated Voltage
125deg.C	.....	1% of Rated Voltage

### 12.4 Applied Voltage

For general applications, apply 70% or less of the rated voltage to the capacitor. When the capacitor is used in a power line or a low-impedance circuit, keep the applied voltage to within 30% (50% max.) of rated voltage to avoid the adverse influence of inrush current.

### 12.5 When you touch the terminal of the capacitor by tester probe, you should attend to voltage and polarity of tester probe.

### 12.6 Soldering

(1) Soldering condition

- Dip soldering
 

Temperature of solder bath	.....	260deg.C MAX.
Time of dipping	.....	5 sec. MAX.
- Reflow Soldering ( Hot blow soldering, Hot plate soldering )
 

Temperature of solder oven	.....	260deg.C MAX.
Temperature of plate	.....	260deg.C MAX.
Time	.....	10 sec. MAX
- Using soldering iron
 

Temperature of iron	.....	300deg.C MAX
Time	.....	3 sec. MAX

Please adjust soldering condition to connect soldering contact following.

- (2) You should make a soldering temperature profile with smooth temperature rise and down. You should preheat ( at 150deg.C MAX. ) before rising to soldering temperature.
- (3) Use rosin-based flux.
- (4) Be careful about print pattern size. If pattern is too big, the capacitor may move in reflow soldering.
- (5) Please call us if you make many soldering cycle or use special soldering.
- (6) In the case of dip soldering, solderability may be inferior for density of components on the board. You may take generation of flux gas into consideration.

### 12.7 If you use ultrasonic cleaning, be careful to design bath size without capacitors damage by ultrasonic shock.



**Attachment - 1 The difference of a made in Thailand from a made in Japan**

Label

<b>NEC TOKIN CAPACITORS</b>			
PART NO.			
TEESVA20J106M8R			
-----			
TEMSVA20J106M8R			
-----			
NRU106M06R8			
RATING	Cap	Tol	Volt
	10μF	± 20%	6.3 V
LOT NO.	QTY		
4A11T0389	3000		
REMARKS			
PB-FREE			
MADE IN THAILAND			

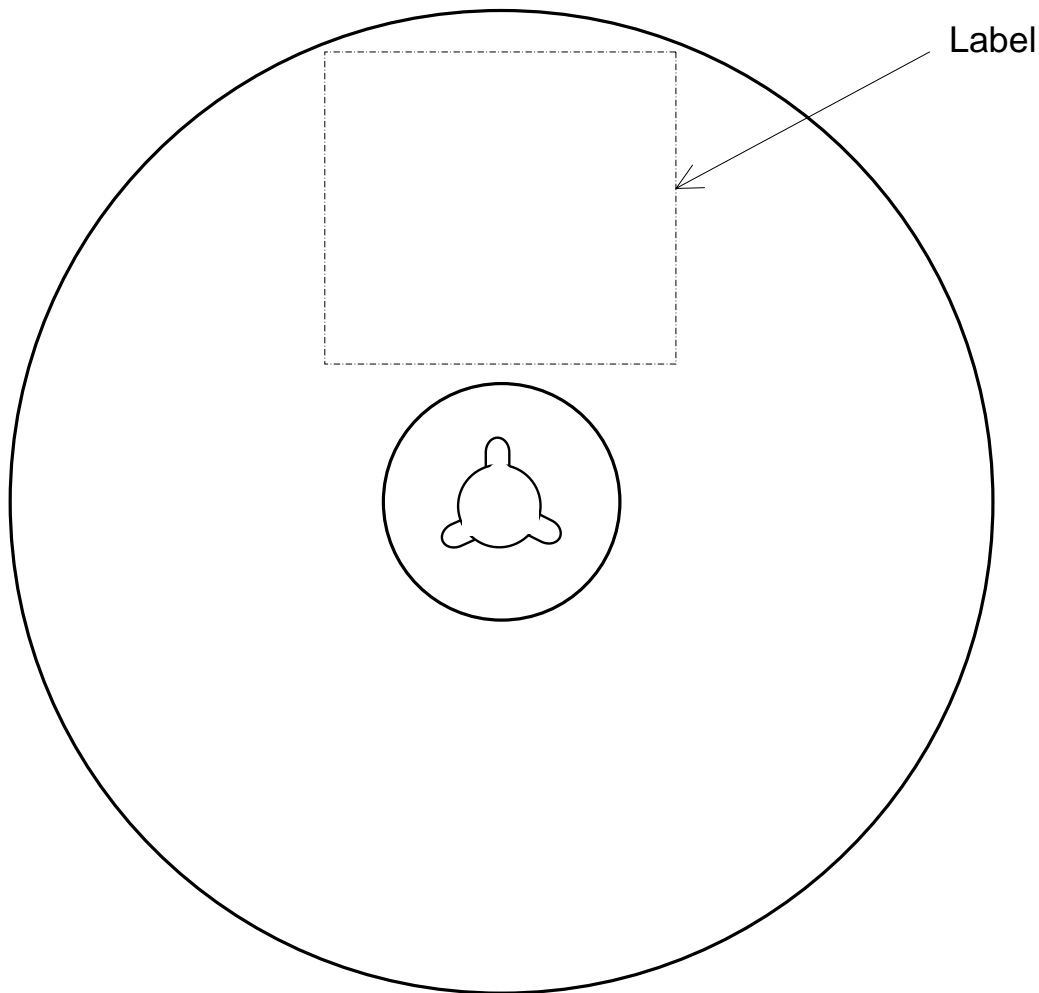
Made in Thailand

<b>NEC TOKIN CAPACITORS</b>			
PART NO.			
TEESVA20J106M8R			
-----			
TEMSVA20J106M8R			
-----			
NRU106M06R8			
RATING	Cap	Tol	Volt
	10μF	± 20%	6.3 V
LOT NO.	QTY		
4A3592	3000		
REMARKS			
PB-FREE			
MADE IN JAPAN			

Made in Japan

They are the same contents as the 1<sup>st</sup> column in case of "J" or "P".

NEC TOKIN Toyama and NEC TOKIN Electronics (Thailand) will add "PB-FREE" of black color ink on the remarks column in the reel label and the Die cut box label.



**Attachment - 2 Manufacturing process chart**

	Japan	Thailand
Powder Mixing	NEC TOKIN Toyama,Ltd.	NEC TOKIN Electronics (Thailand) CO.,Ltd.
Pressing		
Vacuum Sintering		
Pellet Assembly		
Anodization		
MnO <sub>2</sub> Formation		
Graphite Baking		
Conductive Layer Formation		
Anode/Cathode connection		
Molding		
Marking		
Burn-In		
Lead Forming		
Characteristic testing		
Inspection (I)		
Taping		
Inspection (II)		
Stock-In		
Packaging		
Shipping		

**Attachment - 3 REVISION RECORD**  
**REVISION DATE SHEETS AFFECTED CHANGED BY AUTHORITY.**

SYM -BOL	DATE	DESCRIPTION	APPD.	CHK.	DRAW.
B	Jan.28.'02	Add 5 part numbers. A2-case :6.3V/22 $\mu$ F,20V/2.2 $\mu$ F, A-case :4V/100 $\mu$ F, B3-case :20V/3.3 $\mu$ F,4.7 $\mu$ F, Change the name of product base from "NEC Toyama CO.,Ltd." to "NEC TOKIN Toyama,Ltd.".	K.Tsubota	H.Shiromoto	S.Okumura
C	Jan.28.'02	Add 1 part numbers. D-case :16V/22 $\mu$ F Change the carrier tape dimension of "D <sub>1</sub> " from 1.1mm to 1.0mm. (A2,A,B3,B2 case) Change the carrier tape dimension of "D <sub>1</sub> " from 1.6mm to 1.5mm. (C,D case)	M.Yazaki	H.Shiromoto	S.Okumura
D	Apr.8.'02	Change the value of "tan $\delta$ +125deg.C" from 0.03 to 0.3 in Catalog number "TEESVP0E336M8R". Change the value of"LC" from 0.5 to 0.8 in Catalog number "TEESVP0E336M8R". Change the name of product base from "Solution Engineering Department Energy Devices Division" to "Solution Engineering Division Energy Devices Operations Unit". Change the name of product base from "NEC Technologies (Thailand) CO.,Ltd." to "NEC TOKIN Electronics (Thailand) CO.,Ltd.". Change the name of product base from "NEC Sagamihara plant" to "NEC TOKIN Sagamihara plant". Change the carrier tape dimension of "D <sub>1</sub> "f rom "D <sub>1</sub> $\pm$ 0.1" to "D <sub>1</sub> min.". (ALL case) Change the test condition in Section 7.7,7.10. 7.7:Leakage Current 7.10:Surge Voltage Change the Attachment-1. (Label)	N.Hasegawa	H.Shiromoto	S.Okumura
E	Jun.6.'02	Change the test condition in Section 7.9,7.13,7.14,7.17. 7.9:Resistance to Solvents 7.13:Solderability 7.14:Damp heat 7.17:Rapid change of temperature Change the Figure in section 2.	N.Hasegawa	H.Shiromoto	S.Okumura
F	Jul.30.'02	Add the"(Made in Japan only)" in Section No.5.	N.Hasegawa	H.Shiromoto	S.Okumura
G	Aug.29.'02	Add 4 parts number. A2-case:2.5V/47 $\mu$ F,4V/33 $\mu$ F,16V/3.3 $\mu$ F,4.7 $\mu$ F Delete "(Physical)" in the Attachment-1.	N.Hasegawa	H.Shiromoto	S.Okumura
H	Sep.17.'02	Change the manufacturing process chart.	N.Hasegawa	H.Shiromoto	S.Okumura
I	Oct.22.'02	Change the test condition in Section 10. 10:STANDARD RATINGS	K.Takeuchi	H.Shiromoto	S.Okumura
J	Nov.13.'02	Add 1 parts number. J-case:6.3V/10 $\mu$ F	K.Takeuchi	H.Shiromoto	S.Okumura

**Attachment - 3 REVISION RECORD**  
**REVISION DATE SHEETS AFFECTED CHANGED BY AUTHORITY.**

SYM -BOL	DATE	DESCRIPTION	APPD.	CHK.	DRAW.
K	Dec.10.'02	Add 3 parts number. P-case:2.5V/47 $\mu$ F J-case:6.3V/6.8 $\mu$ F A-case:25V/3.3 $\mu$ F Add the "Reflow soldering : 2 times" in section No.7.12. Change the test condition in section 14. 14:Temperature from 40 $\pm$ 2deg.C to 60 $\pm$ 2deg.C	K.Takeuchi	-	K.Niimi
L	Feb.5.'03	Add 6 parts number. P-case:6.3V/22 $\mu$ F A2-case:25V/1 $\mu$ F,35V/1 $\mu$ F B2-case:4V/220 $\mu$ F V-case:4V/330 $\mu$ F,6.3/220 $\mu$ F Change the STRUCTURE from "lead free solder plating" to "lead free plate" in Terminal, and from "Carbon" to "Graphite". Add the "manufacturing process chart." in section No.10. Add the "They are the same contents as the 1st column in case of "J" or "P"." in Attachment -1.	K.Takeuchi	-	K.Niimi
M	Feb.26.'03	Change the "Notes of Using Solid Tantalum Capacitor".	K.Takeuchi	H.Shiromoto	K.Niimi
N	Apr.16.'03	Add 1 parts number. B2-case:25V/3.3 $\mu$ F Add the "[J,P-case] 200% of initial requirements(2000H)" in section No.7.19.(Standard Life Test) Change the value of " $\Delta$ C/C(%)" from $\pm$ 5 to $\pm$ 5( $\pm$ 10) in Catalog number as follows. "TEESVA1E474[ J8R" , "TEESVA1E684[ J8R" , "TEESVA1E105[ J8R" , "TEESVB21E475[ J8R" , "TEESVC1E106[ J12R" , "TEESVD1E226[ J12R" .	K.Takeuchi	H.Shiromoto	S.Okumura
O	May.14.'03	Add 6 parts number. A2-case:2.5V/22 $\mu$ F C2-case:10V/47 $\mu$ F C-case:25V/15 $\mu$ F,35V/10 $\mu$ F D-case:25V/33 $\mu$ F V-case:10V/100 $\mu$ F Change the value of "tan $\delta$ " in part number ESVB31D335M, ESVB31D475M and ESVV0G337M. Change the value of "L.C." in part number ESVV0J227M.	K.Takeuchi	H.Shiromoto	K.Niimi
P	July.14.'03	Change the value of "tan $\delta$ " in part number ESVB20E227M.	K.Takeuchi	H.Shiromoto	K.Niimi
Q	Aug.22.'03	Add 4 part number. A2-case:4V/47 $\mu$ F B2-case:10V/68 $\mu$ F C2-case:6.3V/100 $\mu$ F,16V33 $\mu$ F $\phi$ 330 reel is applied to all the cases except J and P case. Change the Fig.-2 "Leader and Trailer". Change the value of "LC" in part number J0J106M , A20J226M , A0J476M , B20J476M , C0J476M , D0J477M and 1E336M. Change the value of "tan $\delta$ " in part number J1A155M and 225M , J1C105 , A0G107M , B30J476M , C0E337. Change the value of " $\Delta$ C/C" in part number D0E687M.	K.Takeuchi	H.Shiromoto	K.Niimi
R	Oct.16.'03	Add 1 part number. P-case:4V/33 $\mu$ F	K.Takeuchi	H.Shiromoto	S.Okumura

**Attachment - 3 REVISION RECORD**  
**REVISION DATE SHEETS AFFECTED CHANGED BY AUTHORITY.**

SYM -BOL	DATE	DESCRIPTION	APPD.	CHK.	DRAW.
S	Nov.6.'03	Add 1 part number. P-case:6.3V/15 $\mu$ F	K.Takeuchi	H.Shiromoto	K.Niimi
T	Jan.5.'04	Add 16 part number. J-case:10V/1 $\mu$ F,4.7 $\mu$ F P-case:10V/10 $\mu$ F,25V/1 $\mu$ F A2-case:2.5V/33 $\mu$ F,10V/6.8 $\mu$ F A-case:35V/2.2 $\mu$ F B3-case:25V/4.7 $\mu$ F C2-case:2.5V/150 $\mu$ F,220 $\mu$ F, 4V/100 $\mu$ F,150 $\mu$ F, 6.3V/68 $\mu$ F 10V/68 $\mu$ F, 20 $\mu$ F/22 $\mu$ F V-case:10V/150 $\mu$ F Change the value of "tan $\delta$ " in part number B30J476. Change the value of " $\Delta$ C/C" in part number B20J686 and C1D226.	K.Takeuchi	H.Shiromoto	K.Niimi
U	Mar.22.'04	Add 3 part number. P-case:16V/2.2 $\mu$ F A-case:4V/68 $\mu$ F C-case:16V/68 $\mu$ F Change the value of "tan $\delta$ " in part number C20J107 and C21A476.			