

To \_\_\_\_\_

# PMLCAP®

## Polymer Multi Layer Capacitor

### Specification Sheet

Rubycon PART No.	PMLCAP ST series	
Drawing No.	RPR-0024	
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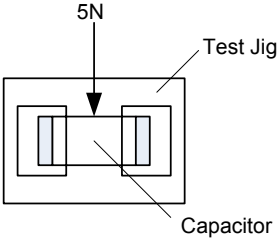
## 7. Dimensions

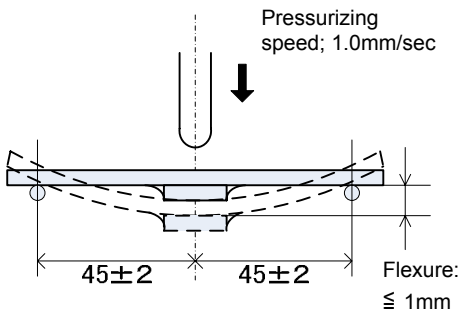
Refer to table-4

## 8. Performance

The test shall be conducted at standard atmospheric conditions (Temperature 15deg C to 35deg C, Relative Humidity 45 to 75%). However the test shall be conducted at a temperature of  $20 \pm 2$ deg C, a relative humidity of 60 to 70%, if a doubt occurred for a judgment.

Table-1 Performance

Items		Conditions	Specifications	
1	Voltage proof	Apply a 150% of rated voltage for 1minute or 175% of rated voltage for 1 second to 5 seconds.	Between terminals	Nothing abnormal shall be found, when applied a specific voltage .
2	Capacitance	Measurement frequency : 1kHz $\pm$ 20% Measurement voltage : 5Vrms or less	Within a range of specified value.	
3	Dissipation factor (Tangent of the loss angle: tan $\delta$ )	Measurement frequency : 1kHz $\pm$ 20% Measurement voltage : 5Vrms or less Measuring Circuit : Series Circuit	1.5% or less	
4	Insulation resistance	When the reading of measuring instrument becomes steady at a value after applying the rated voltage for 1minute $\pm$ 5 seconds.	Between terminals	300M $\Omega$ · $\mu$ F or more
5	Adhesive strength of termination	Pressure : 5N (0.51kg· f)  Holding time : 10 $\pm$ 1 Seconds  Solder the capacitor to the test jig (glass epoxy boards) as shown in below. Then apply 5N force to the longitudinal direction of specimen for 10 $\pm$ 1sec. (JIS C 5101-1 4.34)		
Items		Conditions	Specifications	

6	Bending test	<p>Solder the capacitor to the test jig (glass epoxy boards, <math>t=1.6\text{mm}</math>). Then apply a force in the direction shown in below until the flexure becomes 1mm and maintain for <math>5\pm 1\text{sec}</math>. (JIS C 5101-1 4.35)</p> 	Appearance	No coming off the terminations or other defect should occur.
			Capacitance	Within $\pm 2\%$ of the value before the test
7	Vibration proof	<p>The following vibration shall be applied to the sample (mounted on the PC board)</p> <p>Range of vibration frequency is from 10Hz to 55Hz and total amplitude is 1.5mm, vibration frequency changes from 10Hz to 55Hz and then turns into 10Hz again. This cycle is 1minute. This cycle shall be conducted for 2hours each (total 6hours) in 3 mutually perpendicular directions.</p>	Appearance	No defect or abnormality
			Connection	Stable, no short and no open
8	Solderability	Dip the capacitor in a flux wholly, and then dip it in the solder bath at a temperature of $235\pm 5^\circ\text{C}$ for $2\pm 0.5\text{seconds}$ .	Outer Electrodes	A new uniform coating of solder covers 90% or more of terminal surface.
9	Humidity proof (Steady state)	<p>The capacitor shall be mounted on the PC board. Then the capacitor under test shall be left at 40deg C and the relative humidity at 90 to 95% for <math>500+24/-0</math> hours. Remove and set for 1 to 2 hours at standard atmospheric conditions, then measure.</p> <p>Apply 130% of rated voltage for 1minute, when measured voltage proof.</p>	Appearance	No remarkable change
			Voltage proof	No defect or abnormality
			Capacitance	Within $+20/-5\%$ of the value before the test
			Insulation resistance	$30\text{M}\Omega \cdot \mu\text{F}$ or more
			Dissipation factor: $\tan\delta$	2.25% or less (at 1kHz)
Items		Conditions	Specifications	

10	Humidity load (Damp heat)	The capacitor shall be mounted on the PC board. Then the capacitor under test shall be applied the rated voltage continuously at $40\pm 2$ deg C and the relative humidity at 90 to 95% for $500+24/-0$ hours. Remove and set for 1 to 2 hours at standard atmospheric conditions, then measure. Apply 130% of rated voltage for 1minute, when measured voltage proof.	Appearance	No remarkable change
			Voltage proof	No defect or abnormality
			Capacitance	Within $+20/-5\%$ of the value before the test
			Insulation resistance	$30\text{M}\Omega \cdot \mu\text{F}$ or more
			Dissipation factor: $\tan\delta$	2.25% or less (at 1kHz)
11	High temperature load (Endurance)	The capacitor shall be mounted on the PC board. Then the capacitor under test shall be applied 125% of rated voltage continuously at $125\pm 3$ deg C for $1000+48/-0$ hours through a series-connected resistor of from 200 to 1000 per 1V  Remove and set for 1 to 2 hours at standard atmospheric conditions, then measure.	Appearance	No remarkable change
			Capacitance	Within $+5/-20\%$ of the value before the test
			Insulation resistance	$100\text{M}\Omega \cdot \mu\text{F}$ or more
			Dissipation factor: $\tan\delta$	1.65% or less (at 1kHz)
12	Resistance to Soldering Heat	The capacitor shall be mounted on the PC board using reflow soldering method as shown in Fig-2. (Reflow soldering cycle shall be two)  After the test, set for 1 to 2 hours at standard atmospheric conditions, then measure.  Applying 130% of rated voltage for 1minute, when measured the voltage proof.	Appearance	No remarkable defect or abnormality
			Connection	No remarkable defect or abnormality
			Voltage proof	No defect or abnormality
			Capacitance	Within $+5/-10\%$ of the value before the test
			Insulation resistance	$100\text{M}\Omega \cdot \mu\text{F}$ or more
			Dissipation factor: $\tan\delta$	1.65% or less (at 1kHz)
Items		Conditions	Specifications	

13	Temperature Cycle	<p>The capacitor shall be mounted on the PC board Then the capacitor under test shall be put at -55±3deg C for 30±3minutes. After this, the capacitor under test shall be put at +125±3deg C for 30±3minutes. This operation shall be counted as 1 cycle, and it shall be repeated for 5 cycles successively.</p> <p>Voltage is not applied to the capacitors through the test.</p>	Appearance	No remarkable change
			Capacitance	Within +5/-20% of the value before the test
			Insulation resistance	30MΩ · μ F or more
			Dissipation factor: tanδ	1.65% or less (at 1kHz)

## 9. Notes on use of PMLCAP

## 9-1. Soldering

## (1) Soldering Method

This capacitor shall be used in only reflow method. Don't use in flow, dipping, and VPS soldering method. When the double-stick tape is used by tentative mounting, this product can not be used again

## (2) Recommended reflow soldering conditions

Please confirm your reflow conditions (reflow time and temperature). Fig.2 shows recommended reflow temperature profile

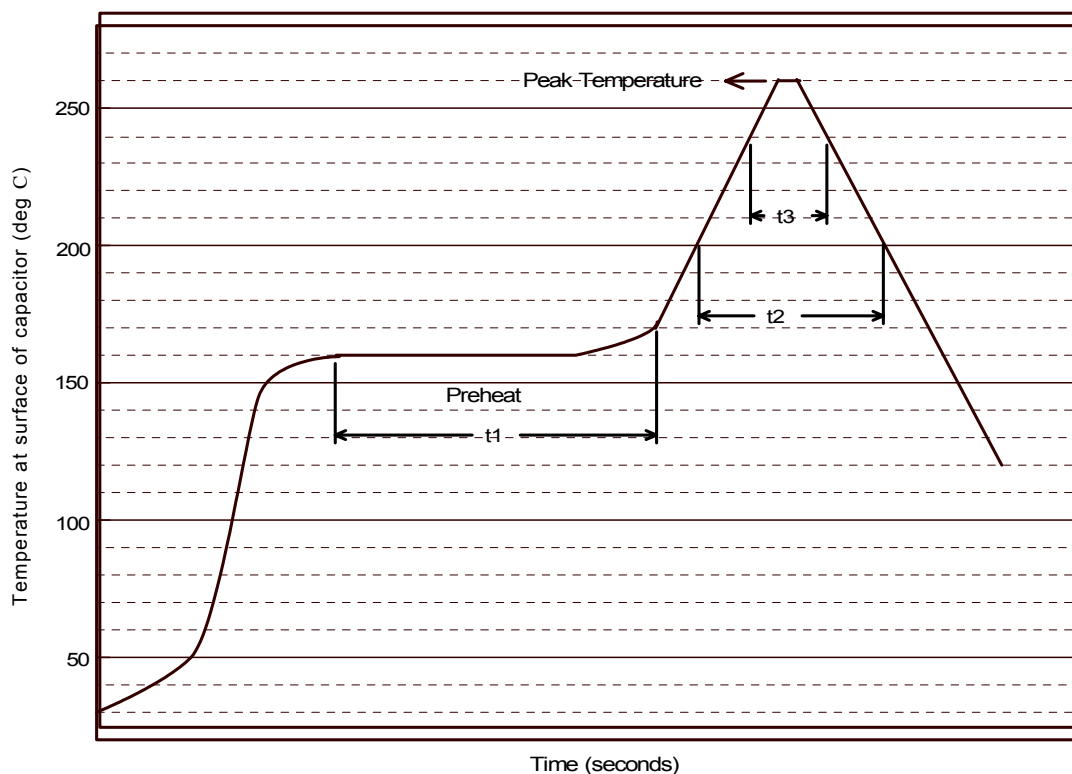


Fig-2 Recommended reflow temperature profile

1. Peak temperature at the surface of capacitor shall not exceed the temperature value as shown in table-2
2. Duration times,  $t_2$  and  $t_3$  shall not exceed the values shown in table-2
3. Holding time at the peak temperature shall be as short as possible.
4. The capacitors shall be preheated at temperature between 150 and 180 deg C, and the preheat time ( $t_1$ ) shall not exceed the value shown in table-2.
5. Maximum reflow soldering cycle shall be two(2) . The second soldering should be carried out after the capacitor itself has returned to normal temperature.

Table-2 Reflow temperature profile

Preheat Temperature	(T) Peak temperature	( $t_1$ ) Period of preheat	( $t_2$ ) Period over 200 °C	( $t_3$ ) Period over 240°C
150°C to 180°C	260°C	180 Sec.	90Sec.	40Sec.

## (3) Soldering conditions when using soldering iron

Reflow soldering is recommended, however use the following conditions when using soldering iron for testing or reworking after reflow soldering.

Conditions when using soldering iron

	Conditions
Temperature of soldering iron	350°C
Time for soldering	4.0 seconds Max
Power of soldering iron	30W Max.
Other	No preheat

**Note**

- Soldering under above condition shall not be repeated for a same part.
- Reworking with soldering iron after reflow soldering shall be performed with above conditions. It shall not be repeated for a same part
- The tip of soldering iron must not touch with capacitors directly.
- Please contact us in advance when require further conditions except for above.

## (4) Recommended land size

For designing land size, refer to the following recommended land size. (Table-3)  
Please contact us if your land design is remarkably different than Table-3

Table-3 Recommended land size

Chip size	Dimensions		
	A	B	C
3216	1.8	3.6	1.4
3225	1.8	3.6	2.3
4532	2.7	5.7	3.0
5750	3.5	7.8	4.5

## (5) Solder paste

A recommended solder paste thickness is between 0.1 mm to 0.2mm.  
The content of halogen in the soldering flux should be 0.1wt% or less.

## (6) Cleaning

Please contact us in advance when cleaning the PC board after mounting. If used not proper cleaning agent, the capacitor may be damaged.

## 9-2. Storage

Due to absorbing or discharging of moisture, the capacitance changes depending on storing conditions.(Fig-3)

The aluminum moisture-proof bag (dry pack) with silica-gel is used in shipping, however the soldering performance may deteriorate due to moisture absorbed which percentage is depended on storing condition after opening the pack.

Dry capacitors at 125 deg C for over 5 hours and then reflow-solder if the capacitors absorb the moisture.

\*\*Fig-3 shows capacitance change at moisture condition.

- Moisture absorbing condition: Temperature 40°C  
Humidity 95%RH  
Time 500hours

- Drying condition : Temperature 125°C  
Time 5hours

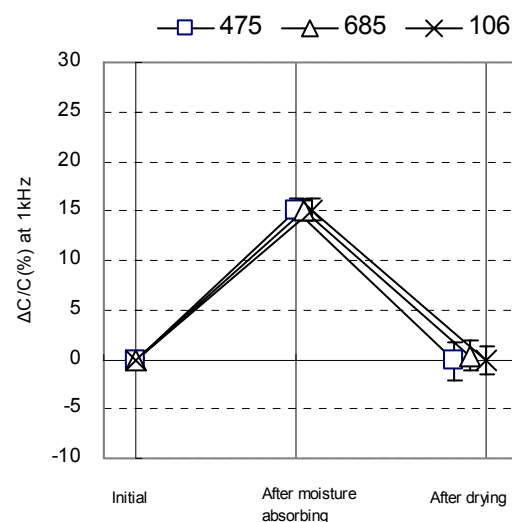


Fig-3 Capacitance change at moisture absorbing condition

## 10. Diagram of dimensions

Refer to Table-4

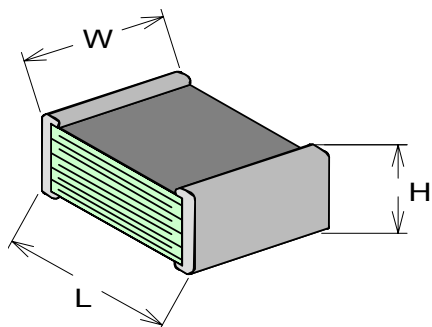


Fig-4 Dimensions of PMLCAP

Table-4 Dimensions in mm ( Tolerance;  $\pm 0.3 \times W \pm 0.3 \times H \pm 0.2$  )

Cap(μF) \ WV(V)	16	25	35	50	63
0.22				3216 (1.0)	3216 (1.4)
0.33				3216 (1.4)	3225 (1.4)
0.47			3216 (1.0)	3225 (1.4)	3225 (1.8)
0.68		3216 (1.4)	3216 (1.4)	3225 (2.0)	4532 (1.4)
1.0	3216 (1.4)	3216 (1.4)	3225 (1.4)	4532 (1.4)	4532 (1.8)
1.5	3216 (1.4)	3225 (2.0)	3225 (2.0)	4532 (1.8)	4532 (2.6)
2.2	3225 (1.8)	3225 (1.8)	4532 (1.4)	4532 (2.6)	5750 (1.8)
3.3	3225 (2.0)	4532 (1.4)	4532 (1.8)	5750 (1.8)	5750 (2.6)
4.7	4532 (1.4)	4532 (1.8)	4532 (2.6)	5750 (2.6)	
6.8	4532 (1.8)	4532 (2.6)	5750 (1.8)		
10	4532 (2.6)	5750 (1.8)	5750 (2.6)		
15	5750 (1.8)	5750 (2.6)			
22	5750 (2.6)				

Example ; 3216 (1.0) → L:3.2×W:1.6×H:1.0

16V

Type	Rating		Size(mm)			Taping code
	WV (DC)	$\mu$ F	L	W	H	
16 ST 105 M A2 3216	16	1.0	3.2	1.6	1.4	A2
16 ST 155 M A2 3216	16	1.5	3.2	1.6	1.4	A2
16 ST 225 M B2 3225	16	2.2	3.2	2.5	1.8	B2
16 ST 335 M B3 3225	16	3.3	3.2	2.5	2.0	B3
16 ST 475 M C1 4532	16	4.7	4.5	3.2	1.4	C1
16 ST 685 M C2 4532	16	6.8	4.5	3.2	1.8	C2
16 ST 106 M C4 4532	16	10	4.5	3.2	2.6	C4
16 ST 156 M D1 5750	16	15	5.7	5.0	1.8	D1
16 ST 226 M D3 5750	16	22	5.7	5.0	2.6	D3

25V

Type	Rating		Size(mm)			Taping code
	WV (DC)	$\mu$ F	L	W	H	
25 ST 684 M A2 3216	25	0.68	3.2	1.6	1.4	A2
25 ST 105 M A2 3216	25	1.0	3.2	1.6	1.4	A2
25 ST 155 M B3 3225	25	1.5	3.2	2.5	2.0	B3
25 ST 225 M B2 3225	25	2.2	3.2	2.5	1.8	B2
25 ST 335 M C1 4532	25	3.3	4.5	3.2	1.4	C1
25 ST 475 M C2 4532	25	4.7	4.5	3.2	1.8	C2
25 ST 685 M C4 4532	25	6.8	4.5	3.2	2.6	C4
25 ST 106 M D1 5750	25	10	5.7	5.0	1.8	D1
25 ST 156 M D3 5750	25	15	5.7	5.0	2.6	D3

35V

Type	Rating		Size(mm)			Taping code
	WV (DC)	$\mu$ F	L	W	H	
35 ST 474 M A1 3216	35	0.47	3.2	1.6	1.0	A1
35 ST 684 M A2 3216	35	0.68	3.2	1.6	1.4	A2
35 ST 105 M B1 3225	35	1.0	3.2	2.5	1.4	B1
35 ST 155 M B3 3225	35	1.5	3.2	2.5	2.0	B3
35 ST 225 M C1 4532	35	2.2	4.5	3.2	1.4	C1
35 ST 335 M C2 4532	35	3.3	4.5	3.2	1.8	C2
35 ST 475 M C4 4532	35	4.7	4.5	3.2	2.6	C4
35 ST 685 M D1 5750	35	6.8	5.7	5.0	1.8	D1
35 ST 106 M D3 5750	35	10	5.7	5.0	2.6	D3

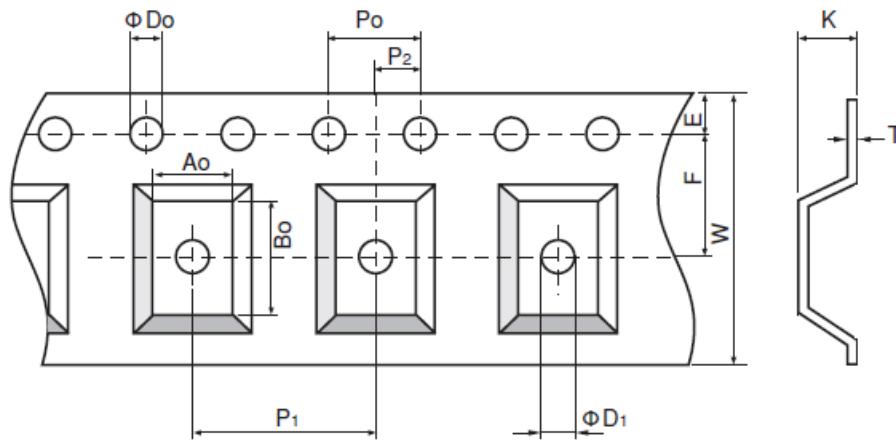
50V

Type	Rating		Size(mm)			Taping code
	WV (DC)	$\mu$ F	L	W	H	
50 ST 224 M A1 3216	50	0.22	3.2	1.6	1.0	A1
50 ST 334 M A2 3216	50	0.33	3.2	1.6	1.4	A2
50 ST 474 M B1 3225	50	0.47	3.2	2.5	1.4	B1
50 ST 684 M B3 3225	50	0.68	3.2	2.5	2.0	B3
50 ST 105 M C1 4532	50	1.0	4.5	3.2	1.4	C1
50 ST 155 M C2 4532	50	1.5	4.5	3.2	1.8	C2
50 ST 225 M C4 4532	50	2.2	4.5	3.2	2.6	C4
50 ST 335 M D1 5750	50	3.3	5.7	5.0	1.8	D1
50 ST 475 M D3 5750	50	4.7	5.7	5.0	2.6	D3

63V

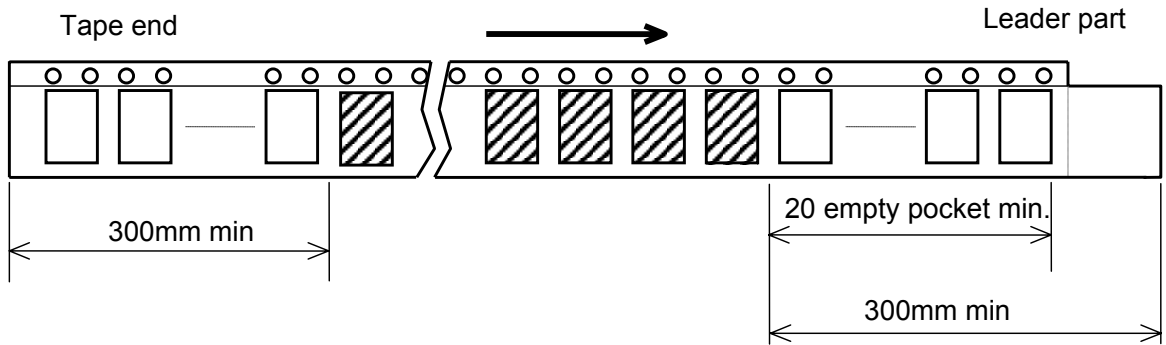
Type	Rating		Size(mm)			Taping code
	WV (DC)	μF	L	W	H	
63 ST 224 M A2 3216	63	0.22	3.2	1.6	1.4	A2
63 ST 334 M B1 3225	63	0.33	3.2	2.5	1.4	B1
63 ST 474 M B2 3225	63	0.47	3.2	2.5	1.8	B2
63 ST 684 M C1 4532	63	0.68	4.5	3.2	1.4	C1
63 ST 105 M C2 4532	63	1.0	4.5	3.2	1.8	C2
63 ST 155 M C4 4532	63	1.5	4.5	3.2	2.6	C4
63 ST 225 M D1 5750	63	2.2	5.7	5.0	1.8	D1
63 ST 335 M D3 5750	63	3.3	5.7	5.0	2.6	D3

- 11. Taping
- 11-1 Embossed taping

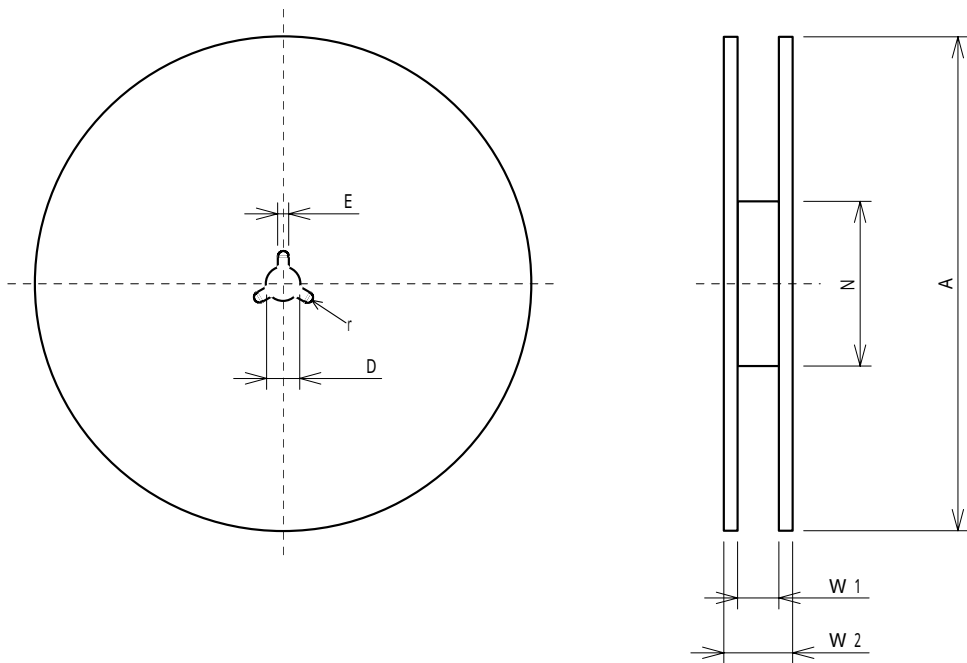


Chip size	Taping code	Dimensions [mm]											
		A0 ±0.1	B0 ±0.1	W ±0.3	F ±0.05	E ±0.1	P1 ±0.1	P2 ±0.04	P0 ±0.1	φD0 ±0.1	φD1 +0.2/-0	K ±0.1	T ±0.05
3216	A1	2.00	3.60	8.0	3.5	1.75	4.0	2.0	4.0	1.5	1.0	1.4	0.20
	A2											1.8	0.25
3225	B1	2.90	3.60	8.0	3.5	1.75	4.0	2.0	4.0	1.5	1.0	1.8	0.25
	B2											2.2	0.25
	B3											2.4	0.25
4532	C1	3.60	4.90	12.0	5.5	1.75	8.0	2.0	4.0	1.5	1.5	1.8	0.25
	C2											2.2	0.25
	C3											2.4	0.25
	C4											3.0	0.25
5750	D1	5.40	6.10	12.0	5.5	1.75	8.0	2.0	4.0	1.5	1.5	2.2	0.25
	D2											2.6	0.25
	D3											3.0	0.25

11-2 Leader part and tape end



11-3 Reel dimension



Chip size	Taping code	Dimension(mm)						
		A ±1.0	N ±1.0	W1 ±1.0	W2 ±1.0	ΦD ±0.2	E ±0.5	r ±0.2
3216	A	180	60	9.5	13.1	13.0	2.0	1.0
3225	B	180	60	9.5	13.1	13.0	2.0	1.0
4532	C	254	100	13.5	18.5	13.0	2.0	1.0
5750	D	254	100	13.5	18.5	13.0	2.0	1.0

11-4 Reel size and quantity

Chip size	Reel size	Quantity
3216	φ180mm	2000pcs/real
3225	φ180mm	2000pcs/real
4532	φ254mm	1500pcs/real
5750	φ254mm	1500pcs/real

12. Packaging

The capacitor shall be put in embossed taping. Then, it shall be put in package with dry silica gel.

13. Use Conditions

Operating temperature range : - 55°C to +125°C

Including temperature-rise on element surface (10°C)  
 Rated voltage derating by category temperature is not necessary.

Rated voltage derating by category temperature

