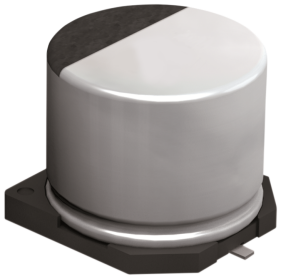
Aluminium Electrolytic Capacitors

RND components

Features

- Temperature up to +105 ℃ with load life of 2000 hours
- Large Capacitance: 1 µF to 1000 µF
- Low impedance
- Surface mount lead terminals
- Suited for high quality and high reliability applications
- RoHS compliant



Applications

Designed for surface mounting on high density PC board
Typical applications include coupling, decoupling, bypass and filtering

PART NUMBER

Example: RND 150VVT006M101DA1L

RND 150VVT	006	M	101	D	A1	L
Series	Rated Voltage	Tolerance	Capacitance	Diameter	Length of Al Case	Packaging
	006=6.3 V 6R3=6.3 V 010=10 V 016=16 V 035=35 V 050=50 V 063=63 V 100=100 V	J= ±5% K= ±10% M=±20% A= -0%~+20% D= -5%~+20% V=-10%~+20% Q=-10%~+30% T=-10%~+50% E=-15%~+20% I= -30%~+20% B= +10%~+30% N= +10%~+25%	0R1=0.1uF 1R0=1uF 100=10uF 101=100uF 102=1000uF 103=10000uF 223=22000uF	B= 3 mm C=4 mm D=5 mm E=6.3 mm F=8 mm G=10 mm H=12 mm X=12.5 mm I=13 mm J=16 mm K=18 mm L=20 mm M=22 mm N=25 mm O=30 mm P=35 mm X=40 mm R=51 mm S=64 mm T=76 mm U=90 mm V=100 mm	A1= 5.4 mm A2=5.8 mm A3=6.2 mm A4=6.7 mm A5=7.5 mm A6=7.7 mm B1=10.2 mm B2=10.4 mm B3=10.5 mm B4=12.2 mm B5=12.5 mm B6=13.5 mm B7=16.5 mm B8=21.5 mm	R-Taping(Reel Pack) C-Lead Cut D-Lead Cut and Crimp F-Lead Forming Cut H-Lead Forming Cut and Crimp B-Forming Only S-Long Lead L-Bended lead of 90^0 Y-Snap in Terminal W-Screw Terminal

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Specifications

Operating Temperature Range	-55～+105℃
Voltage Range	4～100V
Capacitance Range	0.1～6800μF
Capacitance Tolerance	±20% at 120 Hz, 20℃
Leakage Current	For Φ4～Φ10, after 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3(μA), whichever is greater. For Φ12.5～Φ16, after 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4(μA), whichever is greater.

Tan δ

Measurement frequency: 120Hz, Temperature: 20℃

Rated voltage (V.DC)		4	6.3	10	16	25	35	50	63	100
Tanδ (max)	Φ4～Φ10	0.35	0.26	0.20	0.16	0.14	0.12	0.12	0.12	0.12
	Φ12.5～Φ16	0.42	0.38	0.34	0.30	0.26	0.22	0.18	0.14	0.12

Stability at Low Temperature

Measurement frequency: 120Hz

Rated voltage (V.DC)			4	6.3	10	16	25	35	50	63	100
Impedance ratio ZT/Z20 (max)	Φ4～Φ10	Z(-25℃)/Z(20℃)	7	4	3	2	2	2	2	2	3
		Z(-55℃)/Z(20℃)	15	8	6	4	4	3	3	3	4
	Φ12.5～Φ16	Z(-25℃)/Z(20℃)	7	5	4	3	2	2	2	2	2
		Z(-55℃)/Z(20℃)	17	12	10	8	5	4	3	3	3

Load Life

After 2000 hours' application of rated voltage at 105℃, capacitors meet the characteristics requirements listed at right .

Capacitance Change	Within ±20% of the initial value for capacitors of 10V or more, and within ±30% of the initial value for capacitors of 4V & 6.3V
Tanδ	200% or less of the initial specified value
Leakage Current	Initial specified value or less

Shelf Life

After leaving capacitors under no load at 105℃ for 1000 hours, they meet the specified value for load life characteristics listed above.

Resistance to Soldering Heat

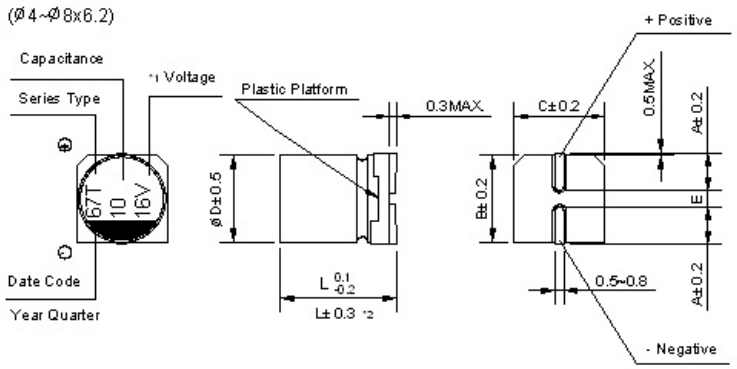
After reflow soldering and restored at room temperature, they meet the characteristics requirements listed at right.

Capacitance Change	Within ±10% of the initial value
Tanδ	Initial specified value or less
Leakage Current	Initial specified value or less

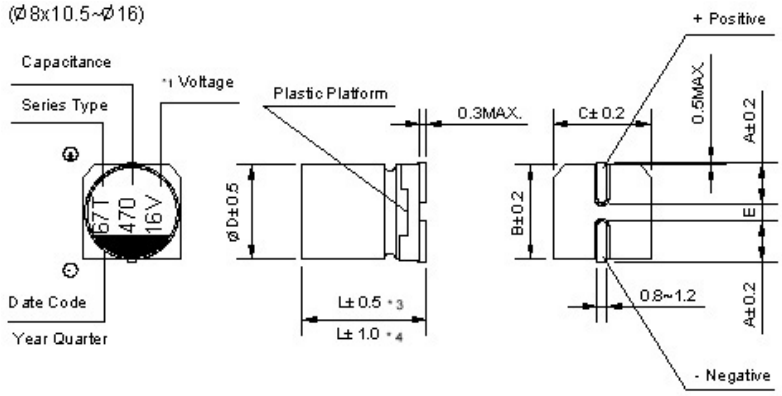
Applicable Standards

JIS C-5141 and JIS C-5102

Dimensions & Marking



Aluminium Electrolytic Capacitors



1 Voltage mark [6V] represents 6.3V for Φ4～Φ10; *2 [L±0.3] is applicable to Φ6.3×7.7 and Φ8×6.2;

3 [L±0.5] is applicable to Φ8×10.5～Φ10; *4 [L±1.0] is applicable to Φ12.5～Φ16.

Re: Date code and series type — 1st digit for Year; 2nd digit for Quarter, 4 quarter codes in one year are 1, 4, 7, O;
3rd character for Series; HT Series = T

(mm)

D×L	Φ4×5.4	Φ5×5.4	Φ6.3×5.4	Φ6.3×7.7	Φ8×6.2	Φ8×10.5	Φ10×10.5	Φ10×13.5	Φ12.5×13.5	Φ12.5×16	Φ16×16.5
A	1.8	2.1	2.4	2.4	3.3	2.9	3.2	3.2	4.7	4.7	5.5
B	4.3	5.3	6.6	6.6	8.3	8.3	10.3	10.3	12.8	12.8	16.3
C	4.3	5.3	6.6	6.6	8.3	8.3	10.3	10.3	12.8	12.8	16.3
E ± 0.2	1.0	1.3	2.2	2.2	2.2	3.1	4.4	4.4	4.4	4.4	6.7
L	5.4	5.4	5.4	7.7	6.2	10.5	10.5	13.5	13.5	16.0	16.5

Standard size & Maximum permissible ripple current

WV		4		6.3		10		16		25	
Cap.(μF)		0G		0J		1A		1C		1E	
4.7	4R7									4×5.4	13
10	100							4×5.4	18	5×5.4 (4×5.4)	20 (14)
22	220			4×5.4	22	5×5.4 (4×5.4)	25 (20)	5×5.4 (4×5.4)	27 (20)	6.3×5.4 (5×5.4)	36 (25)
33	330	5×5.4 (4×5.4)	30 (18)	5×5.4 (4×5.4)	27 (22)	5×5.4 (4×5.4)	30 (22)	6.3×5.4 (5×5.4)	40 (28)	6.3×5.4 (5×5.4)	44 (29)
47	470	(4×5.4) (5x5.4)	36 (24)	5×5.4 (4×5.4)	33 (25)	6.3×5.4 (5×5.4)	41 (30)	6.3×5.4 (5×5.4)	48 (31)	6.3×5.4 (8×6.2)	48 (91)
100	101	6.3×5.4 (5×5.4)	60 (43)	6.3×5.4 (5×5.4)	50 (39)	6.3×5.4 (8×6.2)	53 (110)	6.3×5.4 (8×6.2)	60 (120)	6.3×7.7	91
150	151	6.3×5.4	52	6.3×5.4	55	6.3×5.4	62	6.3×7.7	95	8×10.5 (6.3×7.7)	140 (100)
220	221	6.3×5.4	57	6.3×7.7 (6.3×5.4)	105 (67)	6.3×7.7 (8×6.2)	105 (105)	8×10.5 (6.3×7.7) (8×6.2)	150 (105) (85)	8×10.5	175
330	331	6.3×7.7	100	6.3×7.7	105	8×10.5	196	8×10.5	195	10×10.5 (8×10.5)	240 (220)
470	471	6.3×7.7	105	8×10.5 (6.3x7.7)	210 (120)	10×10.5 (8×10.5)	260 (210)	10×10.5 (8×10.5)	295 (230)	10×10.5	280
680	681	8×10.5	210	8×10.5	210	10×10.5	270	10×10.5	315	10×13.5	400
1000	102	8×10.5	230	10×10.5 (8×10.5)	300 (230)	10×10.5	315	12.5×13.5 (10×13.5) (10×10.5)	500 (390) (340)	12.5×13.5	580
1500	152	10×10.5	315	10×13.5 (10×10.5)	450 (315)	10×13.5	460	12.5×13.5	550	12.5×16	850
2200	222	10×13.5 (10×10.5)	440 (**340**)	12.5×13.5 (10×13.5)	620 (500)	12.5×13.5	680	16×16.5 (12.5×16)	950 (750)	16×16.5	1050
3300	332	10×13.5	490	12.5×16 (12.5×13.5)	700 (660)	16×16.5	1000	16×16.5	1000		
4700	472	12.5×13.5	600	16×16.5	1000						
6800	682	16×16.5 (12.5×16)	950 (**650**)							Case Size	Ripple Current

Ripple Current (mA rms) at 105℃ 120 Hz

Aluminium Electrolytic Capacitors

RND components

Standard size & Maximum permissible ripple current

WV		35		50		63		100	
Cap.(μF)		1V		1H		1J		2A	
0.1	0R1			4×5.4	0.7	4×5.4	0.7		
0.22	R22			4×5.4	1.6	4×5.4	1.6		
0.33	R33			4×5.4	2.5	4×5.4	2.5		
0.47	R47			4×5.4	3.5	4×5.4	3.5		
1	010			4×5.4	7	4×5.4	7	4×5.4	7
2.2	2R2			4×5.4	11	4×5.4	11	6.3×5.4	14
3.3	3R3	4×5.4	13	4×5.4	13	5×5.4	13	6.3×7.7 (6.3×5.4) (8×6.2)	32 (20) (30)
4.7	4R7	4×5.4	14	5×5.4 (4×5.4)	16 (13)	5×5.4	16	6.3×7.7 (6.3×5.4)	35 (21)
10	100	5×5.4 (4×5.4)	21 (14)	6.3×5.4	24	6.3×7.7 (6.3×5.4) (8×6.2)	39 (24) (25)	8×10.5 (6.3×7.7)	77 (35)
22	220	**6.3×5.4 (5×5.4)**	**38 (18)**	6.3×7.7 (6.3×5.4) (8×6.2)	51 (42) (70)	8x10.5 (6.3x7.7)	8 (4)	**10×10.5** (8x10.5)	126 (84)
33	330	6.3×5.4 (8×6.2)	42 (84)	6.3×7.7	60	8×10.5	112	10×10.5	133
47	470	6.3×7.7 (6.3×5.4)	70 (50)	8×10.5 (6.3×7.7)	120 (63)	10×10.5 (8×10.5)	160 (119)	12.5×13.5 (10×13.5) (10×10.5)	250 (160) (140)
68	680	**6.3*7.7**	**80**			**8*10.5**	**170**	12.5x13.5 (10x13.5)	300 (180)
100	101	8×10.5 (6.3×7.7)	120 (84)	10×10.5 (8×10.5)	170 (140)	12.5×13.5 (10×13.5) (10×10.5)	270 (210) (196)	16×16.5 (12.5x13.5)	450 (380)
150	151	8×10.5	155	10×10.5	170	10×13.5	225		
220	221	10×10.5 (8×10.5)	220 (190)	10×13.5 (10×10.5)	280 (220)	16×16.5 (12.5×13.5) (10x13.5)	560 (470) (235)	16×16.5	550
330	331	10×10.5	245	16×16.5 (12.5×13.5) (10x13.5)	600 (420) (295)	16×16.5 (12.5×16)	700 (510)		
470	471	12.5×13.5 (10×13.5) (10×10.5)	520 (375) (280)	16×16.5 (12.5×16)	700 (520)	16×16.5	750		
680	681	12.5×13.5 (10×13.5)	530 (395)	16×16.5	750				
1000	102	16×16.5 (12.5×16)	750 (600)					Case Size	Ripple Current

Ripple Current (mA rms) at 105℃ 120Hz

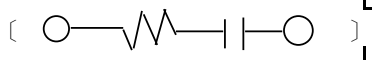
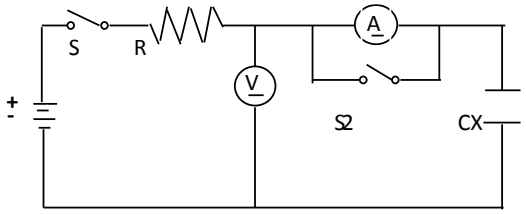
Frequency Correction Factor of Rated Ripple Current

Frequency		50Hz	120Hz	300Hz	1kHz	10kHz~
Capacitance (μF)						
Φ4～Φ10	0.1～68	0.70	1.00	1.17	1.36	1.50
	100～3300	0.85	1.00	1.08	1.20	1.30
Φ12.5～Φ16	～68	0.75	1.00	1.35	1.57	2.00
	100～680	0.80	1.00	1.23	1.34	1.50
	1000～6800	0.85	1.00	1.10	1.13	1.15

Aluminium Electrolytic Capacitors

RND components

Electrical Characteristics

<table>
<tr><th>NO.</th><th>ITEM</th><th>TEST METHOD</th><th>SPECIFICATION</th></tr>
<tr><td>2.1</td><td></td><td></td><td rowspan="2">Voltage range、capacitance range, see specification of this series.</td></tr>
<tr><td>2.2</td><td>Capacitance</td><td>1. Measuring frequency : 120 ± 12Hz
2. Measuring voltage : ≦0.5Vrms + 0.5 ~ 2.0VDC</td></tr>
<tr><td>2.3</td><td>Dissipation factor</td><td>3. Measurement circuit  </td><td rowspan="2">Dissipation factor、leakage current, see specification of this series.</td></tr>
<tr><td>2.4</td><td>Leakage current</td><td>DC leakage current shall be measured after 1~2 minutes application of the DC rated working voltage through the 1000 Ω resistor at 20℃.
 

R : 1000 ± 100Ω A : DC current meter
V : DC voltage meter
S1 : Swich
S2 : Swich for protect of current meter
CX : Testing capacitor</td></tr>
<tr><td>2.5</td><td>Temperature characteristics</td><td>
<table>
<tr><th>STEP</th><th>TEMPERATURE</th><th>STORAGE TIME</th></tr>
<tr><td>1</td><td>20 ± 2 ℃</td><td>30 minutes</td></tr>
<tr><td>2</td><td>-40 ± 3 ℃</td><td>2 hours</td></tr>
<tr><td>3</td><td>20 ± 2 ℃</td><td>15 minutes</td></tr>
<tr><td>4</td><td>105 ± 2℃</td><td>2 hours</td></tr>
</table>
Step 1. Measure the capacitance and impedance.(Z_{r0}) .
(|Z｜, 20℃, 120Hz ± 10%)
Step 2. Measure the impedance at thermal balance after 2 hours.
(Zr) .(|Z｜, -40℃, 120Hz ± 10%)
Step 4. Measure the capacitance and leakage current at thermal balance after 2 hours.
</td><td>Step 2.
Impedance ratio (Zr / Z_{r0}) less than specified value.

Step 4
Capacitance change :
within ± 20% of the initial measured value.
Leakage current :
Less than 10 times of initial specified value .</td></tr>
</table>

Aluminium Electrolytic Capacitors

RND components

NO.	ITEM	TEST METHOD	SPECIFICATION
2.6	Surge test	Rated surge voltage shall be applied (swich on) for 30 ± 5 seconds and then shall be applied (swich off) with discharge for 5 ± 0.5 min at room temperature . This cycle shall be repeated for 1000 cycles	Capacitance change : within ± 20% of the initial specified value. Dissipation factor : lessthan 200% of the initial specified value.
2.7	APPLICABLE RIPPLE CURRENT	The maximum A.C.current having frequency of 100K Hz which can be applied to the capacitor at 105±2℃ continuously.Peak voltage not to exceed rated D.C.voltage.	Leakage current : within initial specified value.

3. Mechanical characteristics:

NO.	ITEM	TEST METHOD	SPECIFICATION
3.1	Lead strength	(A) Tensile strength: wire lead terminal: d (mm) ≦0.45 | 0.5 ~ 0.8 | 0.8＜d≦1.25 load (Kg) 0.51 | 1.0 | 2.0 snap-in terminal: d (mm) snap-in terminal load (Kg) 2.0 The capacitor shall withstand the constant tensile force specified between the body and each lead for 10 seconds without damage either mechanical or electrical.	When the capacitance is measured, there shall be no intermittent contacts, or open- or short- circuiting.
		(B) Bending strength: wire lead terminal: d (mm) ≦0.45 | 0.5 ~ 0.8 | 0.8＜d≦1.25 load (Kg) 0.25 | 0.51 | 1.0 snap-in terminal: cross section area of terminal (mm²) | force (Kg) 0.5＜S≦1 | 1.0 S＞1 | 2.5 With the capacitor in a vertical position appliy the load specified axially to each lead . The capacitor shall be rotated slowly from the vertical to the horizontal position , back to the vertical position . The 90° in the opposite direction and back the original position . Performance of capacitor shall not have changed and leads shall be undamaged .	There shall be no such mechanical damage as terminal damage etc.

NO.	ITEM	TEST METHOD	SPECIFICATION
3.2	Vibration resistance	The frequancy of the vibration shall vary uniformly within the range 10 to 55 Hz with the amplitude of 1.5 mm , completing the cycle in the internal of one minute . The capacitor shall be securely mounted by its leads with hold the body of capacitor . The capacitor shall be vibrated in three mutually perpendicular directions for a period of 2 hours in each direction .	Capacitance : no unsteady . Appearance : no abnormal . Capacitance change : within ± 5% of initial measured value .
3.3	Solderability	The leads are dipped in the solder bath of Sn at 260 ± 5 ℃ for 2 ± 0.5 seconds . The dipping depth should be set at 1.5 ~ 2.0 mm .	The solder alloy shall cover the 95% or more of the dipped lead's area .

4. Reliability

NO.	ITEM	TEST METHOD	SPECIFICATION
4.1	Soldering heat resistance	The leads immerse in the solder bath of Sn at 260 ± 5 ℃ for 10 ± 1 seconds until a distance of 1.5 ~ 2mm from the case .	No damage or leakage of electrolyte . Capacitance change : within ± 10% of the initial measured value . Tan δ : less than specified value . Leakage current : less than specified value .
4.2	Damp heat (steady state)	Subject the capacitors to 40 ± 2 ℃ and 90% to 95% relative humidity for 240 ± 8 hours .	Capacitance change : within ± 10% of the initial measured value . Tan δ : less than specified value . Leakage current : less than specified value .

Aluminium Electrolytic Capacitors

RND components

NO.	ITEM	TEST METHOD	SPECIFICATION 規格
4.3	Load life	After X hours continuous application of DC rated working voltage at 105 ± 2 ℃ , the measurements shall meet the following limits . Measurements shall be performed after 2 hours exposed at room temperature .	Standard of judgement is according to requirement of this series .
4.4	Shelf life	After storage for Y hours at 105 ± 2 ℃ without voltage application , the measurements shall meet the following limits . Measurements shall be performed after exposed for 1 to 2 hrs at room temperature after application of DC rated voltage to the capacitor for Z minutes .	
4.5	Storage at low temperature	The capacitor shall be stored at temperature of -40 ± 3 ℃ for 240 ± 8 hours , during which time no voltage shall be applied . And then the capacitor shall be subjected to standard atmosph-eric conditions for 16 hours or more , after which measurements shall be made .	Capacitance change : within ± 10% of the initial value . Tan δ : less than specified value . Leakage current : less than specified value . Appearance : no abnormal .

Storage Conditions and Control for Aluminum Electrolytic Capacitor

1.Store the capacitor at a temperature of 5℃ to 35℃ and at a relative humidity of less than 75%
2.Store the capacitor in low temperature places free from direct sun shine.
3.Store the capacitor in places free from oil vapor、salt water vapor.
4.Store the capacitor in places far from toxic gases (chlorine、ammonium、hydrogen sulfide、sulphurous acid、nitric acid , etc) .
5.Store the capacitor in place free from Ozone、ultraviolet ray or radiation .

Detergent needing attention:

Hydrogen carbide liquid and halogen liquid can cause Aluminium Electrolytic Capacitor to corrode. Some of Safe and Unsafe detergent are as follows

Safe	**Unsafe**
Dimethybenxene Methanol Ethanol Propanol Butanol Detergent	1.1.2- arichloroethane Tetrachloroethylene Chloroform(colorless volatilizable liquid) Dichloromethane Trichlorelethylene