REQUEST FOR APPROVAL

ITEM	Polymer AL-Cap(SMD)_For Automotive Application
SPEC.	VHHL_ For Automotive Application
DESCRIPTION	SMD Type
PART – NO.	
APPLIED TO	
REFERENCE	INITIAL APPROVAL

Prepare	Review	Approval
J. S. Lee	*M. J. Kim*	*S. G. Ha*
2015.07.10	2015.07.10	2015.07.10
A TERM OF VALIDITY	OVER AT LEAST 15-YEARS FROM ISSUED DATE	

MAKER	ENESOL Co.,Ltd	TEL	82-31-321-2370
ADDRESS	#218, Bongmyeong-Ri, Namsa-Myeon, Yongin-Si, Gyeonggi-Do, Korea		

● Change of history table

No.	Issued Date	Contents	Reason	Page	Remark
1	Mar 27,2015	Original	-	1 to 23	-
2	Jun 18,2015	Dimension 변경, 라벨 추가	고객 승인 제출용	6, 22	-
3	Jul 10,2015	AM63VHHL10MD7 AM63VHHL33MD12추가	고객 승인 제출용	5	

● Contents

1. Scope

This specification shall be specified to aluminum solid electrolytic capacitors with conductive polymer.

2. Part number

(EX) AM25VHHL330ME10

AM	25	VHHL	330	M	E	10
Automotive	Rated Volt. [V]	Series Name	Rated Cap. [㎌]	Cap. Tolerance [%]	Dia. Code [mm]	Length [mm]

16	16.0
20	20.0
25	25.0
35	35.0
50	50.0
63	63.0
80	80.0
100	100.0

K	±10
M	±20

A	4.0
B	5.0
C	6.3
D	8.0
E	10.0

7	6.9
10	9.9
10	10.5
12	11.9
12	12.6

3. Rating

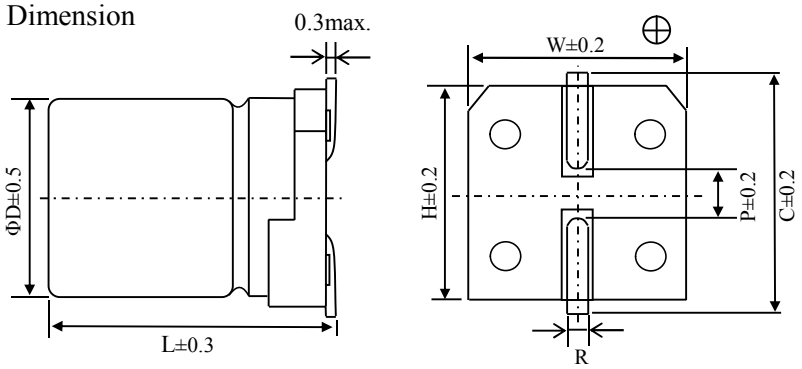
No	Item	Characteristics
1	Operating temperature range	-55 ~ +125℃
2	Rated voltage range	16.0 to 100.0Vdc
3	Capacitance range	10 to 1000㎌
4	Tangent of loss angle (tan δ)	See “Standard ratings” in Item 4
5	Leakage current	See “Leakage current” in Item 7
6	Equivalent series resistance (E.S.R.)	See “Standard ratings” in Item 4
7	Rated ripple current	See “Standard ratings” in Item 4

4. Standard ratings (For Automotive Application)

Rated Voltage [V]	Surge Voltage [V]	Rated Capcitance [μF]	Size ΦD x L[mm]	ESR(20°C, 100kHz) [mΩ] [max]	Rated Ripple Current (125℃ 100kHz)[mArms]	Tangent of Loss Angel [max]	Part Number
16	20	220	8 x 6.9	30	1500	0.12	AM16VHHL220MD7
		470	8 x 9.9	17	3400	0.12	AM16VHHL470MD10
		560	8 x 11.9	16	3800	0.12	AM16VHHL560MD12
		680	10 x10.5	19	3200	0.12	AM16VHHL680ME10
		1000	10 x 12.6	13	4300	0.12	AM16VHHL1000ME12
20	25	150	8 x 6.9	40	1200	0.12	AM20VHHL150MD7
		330	8 x 9.9	20	3300	0.12	AM20VHHL330MD10
		390	8 x 11.9	16	3400	0.12	AM20VHHL390MD12
		470	8 x 11.9	18	3500	0.12	AM20VHHL470MD12
		560	10 x 12.6	14	4000	0.12	AM20VHHL560ME12
		680	10 x 12.6	14	4200	0.12	AM20VHHL680ME12
25	31	100	8 x 6.9	40	1200	0.12	AM25VHHL100MD7
		220	8 x 9.9	20	3200	0.12	AM25VHHL220MD10
		270	8 x 11.9	20	3300	0.12	AM25VHHL270MD12
		330	10 x10.5	14	3000	0.12	AM25VHHL330ME10
		470	10 x 12.6	15	4100	0.12	AM25VHHL470ME12
35	43	68	8 x 6.9	44	1200	0.12	AM35VHHL68MD7
		150	8 x 9.9	22	3100	0.12	AM35VHHL150MD10
		220	8 x 11.9	20	3300	0.12	AM35VHHL220MD12
		270	10 x10.5	20	3100	0.12	AM35VHHL270ME10
		330	10 x 12.6	16	3900	0.12	AM35VHHL330ME12
50	63	10	8 x 6.9	55	1000	0.12	AM50VHHL10MD7
		39	8 x 6.9	45	1300	0.12	AM50VHHL39MD7
		82	8 x 9.9	25	2900	0.12	AM50VHHL82MD10
		120	8 x 11.9	25	2900	0.12	AM50VHHL120MD12
		120	10 x10.5	25	3000	0.12	AM50VHHL120ME10
		180	10 x 12.6	20	3500	0.12	AM50VHHL180ME12
63	79	10	8 x 6.9	50	1000	0.12	AM63VHHL10MD7
		22	8 x 6.9	48	1100	0.12	AM63VHHL22MD7
		33	8 x 11.9	35	2000	0.12	AM63VHHL33MD12
		39	8 x 9.9	28	2700	0.12	AM63VHHL39MD10
		56	8 x 11.9	25	2900	0.12	AM63VHHL56MD12
		68	10 x10.5	28	2800	0.12	AM63VHHL68ME10
		100	10 x 12.6	24	3000	0.12	AM63VHHL100ME12
80	100	27	8 x 9.9	38	1400	0.12	AM80VHHL27MD10
		39	8 x 11.9	35	1600	0.12	AM80VHHL39MD12
		47	10 x10.5	33	1700	0.12	AM80VHHL47ME10
		68	10 x 12.6	28	2100	0.12	AM80VHHL68ME12
100	125	10	8 x 9.9	50	1000	0.12	AM100VHHL10MD10
		22	8 x 11.9	45	1000	0.12	AM100VHHL22MD12
		39	10 x 12.6	35	1400	0.12	AM100VHHL39ME12
		47	10 x 12.6	35	1500	0.12	AM100VHHL47ME12

5. Dimension and construction

5.1 Dimension

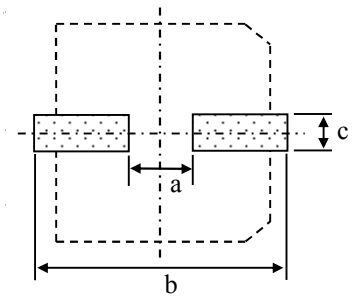


[unit : mm]

Size	ΦD±0.5	L±0.3	W±0.2	H±0.2	C±0.2	R	P±0.2
8Φ×6.9L	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
8Φ×9.9L	8.0	9.9	8.3	8.3	9.0	0.8 to 1.1	3.2
8Φ×11.9L	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
10Φ×10.5L	10.0	10.5	10.3	10.3	11.0	0.8 to 1.1	4.6
10Φ×12.6L	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

Figure 1

Recommended land pattern dimension of PCB

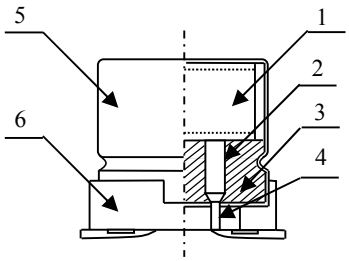


[unit : mm]

Size	a	b	c
8Φ×6.9L	2.8	11.1	1.9
8Φ×9.9L	2.8	11.1	1.9
8Φ×11.9L	2.8	11.1	1.9
10Φ×10.5L	4.3	13.1	1.9
10Φ×12.6L	4.3	13.1	1.9

Figure 2

5.2 Construction



No.	Compositions		Materials
1	Rolled element	Anode foil	Aluminum
		Cathode foil	Aluminum
		Separator	Manila Pulp
		Ending tape	Polyimide film
		Electrolyte	PEDOT
2	Terminal boss		Aluminum
3	Seal		Butyl Rubber
4	Terminal		Ag(Sn)-coated copper covering steel wire Ag(Sn)-coated copper wire
5	Case		Plastic coated aluminum
6	Base plate		Resin

Figure 3

6. Marking

The following items shall be marked on each capacitor.

①Rated voltage ②Nominal capacitance ③Polarity ④Date code.

* Formation of date code. : (EX) 5A4

5	Production Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
		7	8	9	0	1	2	3	4	5	6	
A	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
		A	B	C	D	E	F	G	H	J	K	L	M
4	Week	1st	2nd	3rd	4th	5th						
		1	2	3	4	5						

Figure 4

7. Performance

7.1 Environmental conditions for testing

7.1.1 Ambient temperature : 20±2ºC

7.1.2 Relative humidity : 60 ~ 70%

7.1.3 Air pressure : 86~106kPa

7.2 Electrical performance

7.2.1 Rated voltage

1) Specification : See “Standard ratings” in Item 4

7.2.2 Rated capacitance

1) Conditions

① Measuring frequency : 120Hz±10%

② Tolerance on the rated capacitance : -20% to +20% [M]

2) Specification : See “Standard ratings” in Item 4

7.2.3 Tangent of loss angle (tan δ)

1) Conditions

① Measuring frequency : 120Hz±10%

2) Specification : See “Standard ratings” in Item 4

7.2.4 Equivalent series resistance (E.S.R.)

1) Conditions

① Measuring frequency : 100kHz

② Measurement point : Point of lead wire within 1mm from the body

③ Compensation : Short and open compensation would require

④ Notice : Contact surface of both shorting plate and the electrodes of the test fixture should be polished.

2) Specification : See “Standard ratings” in Item 4.

7.2.5 Leakage current

1) Conditions

① Measuring method : D.C. voltage equal to the rated voltage shall be applied between anode and cathode lead wire of a capacitor through 1kΩ ±10Ω protective resistance. The leakage current shall be measured after an electrification period of 2 minutes.

2) Specification : The greater value of either 0.01CV or 3uA

7.2.6 Maximum permissible ripple current

1) Conditions

① Ripple : Root mean square value of 100kHz sine wave alternative

current

② Caution : The sum of DC voltage and peak voltage shall not exceed the rated voltage

2) Specification : See “Standard ratings” in Item 4

Table 1 Frequency coefficient for ripple current

Frequency	120Hz≤f< 1kHz	1kHz≤f< 10kHz	10kHz≤f< 100kHz	100kHz≤f≤500kHz
Coefficient	0.05	0.3	0.7	1

※ There is not necessary to apply a temperature-compensating coefficient for ripple current within the category temperature range (-55°C to +125°C).

7.2.7 Characteristics at high and low temperature

1) When the capacitors shall be stabilized in regard to temperature in Table 1, characteristics in step 1, 2, 3, 4 and 5 shall meet the following items.

Table 2. Temperature stability

Step	Temperature [℃]	Measurement items
1	+20±2	Capacitance, tanδ, impedance at 100kHz
2	-55±2	Capacitance, impedance at 100kHz
3	+20±2	
4	+125±3	Leakage current, impedance at 100kHz
5	+20±2	Capacitance, tanδ

* The specimen capacitor shall be kept 30~60 minutes in the test temperature.

2) Specifications

① Step 1 : Capacitance and tanδ shall meet the specified value in this document.

② Step 2 : Capacitance change and impedance ration shall meet the following value.

- Capacitance : Within ±10% of the value in step 1
- Impedance ration Z(-55℃)/Z(20℃) = Less than 1.25

③ Step 4 : Leakage current and impedance ratio shall meet the following value.

- Leakage current : Less than 15 times of the specified value in this document.
- Impedance ration Z(+125℃)/Z(20℃) = Less than 1.25

④ Step 5 : Capacitance change and tanδ shall meet the following value.

- Capacitance change : Within ±5% of the value in step 1
- Tanδ : Value shall meet the specified value in this document.

7.3 Environmental performance

7.3.1 Damp heat(Steady state)

1) Conditions

① Temperature : 85±2ºC

② Relative humidity : 85% R.H.

③ Applied voltage : Rated voltage

④ Duration : 1000±24 hrs.

2) Specification

① Appearance : No visible damage

② Capacitance change : Within ±20% of initial value

③ Tanδ : 1.5 times or less than an initial standard

④ ESR: 2.0 times or less than an initial standard

⑤ Leakage current : ≤ initial standard

7.3.2 Endurance

1) Conditions

① Temperature : 125℃

② Applied voltage : Rated voltage

③ Duration : 4,000 $^{+72}_{-0}$ hrs.

* The capacitors shall be stored under standard atmospheric conditions for 1 to 2 hours, then measurement shall be made.

2) Specification

① Appearance : No visible damage

② Capacitance change : Within ±20% of initial value

③ Tanδ : 1.5 times or less than an initial standard

④ ESR: 2.0 times or less than an initial standard

⑤ Leakage current : ≤ initial standard

7.3.3 Surge voltage

1) Conditions

① Applied voltage : See “Standard ratings” in Item 4.

② Duration of charge : 30±5 seconds

③ Duration of discharge : 5 minutes 30 seconds

④ Cycles : 1,000 times

* A protection resistor(1㏀) must be inserted to the circuit during the charge and discharge when measuring the leakage current.

2) Specification

① Appearance : No visible damage

② Capacitance change : Within ±20% of initial value
③ Tanδ : 1.5 times or less than an initial standard
④ ESR: 2.0 times or less than an initial standard
⑤ Leakage current : ≤ initial standard(after voltage treatment)

※ If any doubt arises, measure the leakage current after the following voltage treatment.
Voltage treatment : DC rated voltage is applied to the capacitors for 120minutes at 105℃

7.3.4 Rapid change of temperature

1) Conditions

① Applied voltage : No load
② Cycle number : 100 cycles
③ Test diagram : Figure 4

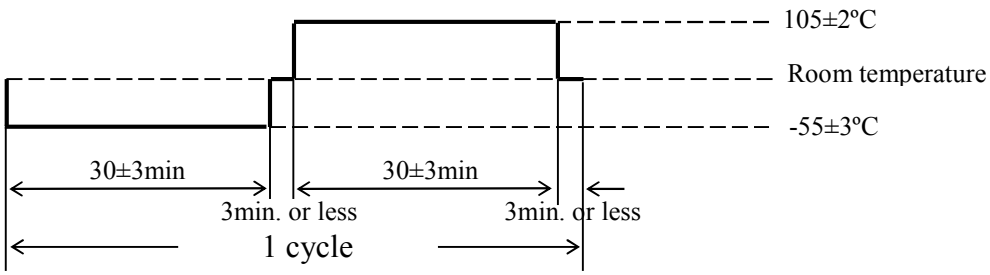


Figure 4

2) Specification

① Appearance : No remarkable abnormality
② Capacitance change : Within ±10% of initial value
③ Tanδ : Less than or equal to the initial specified value
④ Leakage current : Less than or equal to the initial specified value (after voltage treatment)

7.4 Mechanical performance

7.4.1 Vibration

1) Conditions

① Frequency: 10 to 55Hz (1 min. interval / 10→55→10Hz)
② Amplitude: 0.75mm (Total excursion 1.5mm)
③ Direction: X, Y, Z (3 axes)
④ Duration: 2 hours / axis (Total 6 hours)

2) Specification

① Capacitance : Measured capacitance should be settled when it is within 30 min. before the end of the test. Also, after the test, the rate of capacitance change is within ±5%

of the initial value.

7.4.2 Resistance to soldering heat

1) Conditions

Peak Temperature	250℃	260℃
Preheat	150℃ to 180℃ 90±30 sec	
200℃ over time (Max.)	60 sec	60 sec
220℃ over time (Max.)	50 sec	50 sec
230℃ over time (Max.)	40 sec	40 sec
Reflow number	Twice or less	Only 1 time

2) Specification : After reflow test, the capacitors shall meet the following specifications.

① Capacitance change : Within ±10% of initial capacitance

② tanδ : 1.3 times or less than an initial value

③ E.S.R. : 1.3 times or less than an initial value

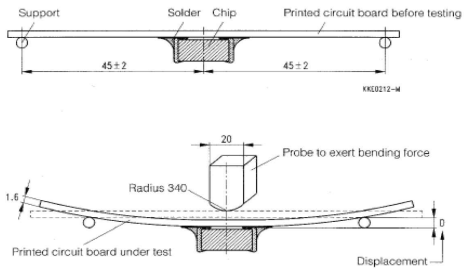
④ Leakage current : Below an initial standard (after voltage treatment)

⑤ Outward appearance : No visible transformation of Al-case or lead Terminal

8. Specification and Test Methods (For Automotive Application)

<table>
<tr><th>No.</th><th>AEC-Q200
Test Item</th><th>Specification</th><th>Test Methods and Conditions</th></tr>
<tr><td>1</td><td>Pre-and Post-Stress Electrical Test</td><td colspan="2">-</td></tr>
<tr><td>2</td><td>High Temperature Exposure (Storage)</td><td>① Appearance : No visible damage
② Capacitance change : Within ±20% of initial value
③ Tanδ : 1.5 times or less than an initial specified value
④ ESR: 1.5 times or less than an initial specified value
⑤ Leakage current : ≤ initial specified value
(after voltage treatment)</td><td>① Temperature : 125±2ºC
② Duration : 1,000±24 hrs. without load
③ Measurement at 24±4 hours after test conclusion.
④ Reference : MIL-STD-202 Method 108</td></tr>
<tr><td>3</td><td>Temperature Cycling</td><td>① Appearance : No remarkable abnormality
② Capacitance change : Within ±10% of initial value
③ Tanδ : Less than or equal to the initial specified value
④ Leakage current : Less than or equal to the initial specified value (after voltage treatment)</td><td>① Applied voltage : No load
② Cycle number : 1,000 cycles
<table>
<tr><td>Step</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Temp.(℃)</td><td>-40+0/-3</td><td>25±2</td><td>125+0/-3</td><td>25±2</td></tr>
<tr><td>Time(min.)</td><td>30±3</td><td>1</td><td>30±3</td><td>1</td></tr>
</table>
③ Measurement at 24±4 hours after test conclusion.
④ Reference : JESD22 Method JA-104</td></tr>
<tr><td>4</td><td>Biased Humidity</td><td>① Appearance : No visible damage
② Capacitance change : Within ±20% of initial value
③ Tanδ : 1.5 times or less than an initial specified value
④ ESR: 1.5 times or less than an initial specified value
⑤ Leakage current : ≤ initial specified value
(after voltage treatment)</td><td>① Applied voltage : Rated Voltage
② Temperature : 85±2ºC
③ Humidity : 85% R.H.
④ Duration : 1,000±24 hrs.
⑤ Reference : MIL-STD-202 Method 103</td></tr>
<tr><td>5</td><td>Operational Life</td><td>① Appearance : No visible damage
② Capacitance change : Within ±20% of initial value
③ Tanδ : 1.5 times or less than an initial specified value
④ ESR: 1.5 times or less than an initial specified value
⑤ Leakage current : ≤ initial specified value</td><td>① Applied voltage : Rated Voltage
② Temperature : 125±2ºC
③ Duration : 1,000±24 hrs.
④ Measurement at 24±4 hours after test conclusion.
⑤ Reference : MIL-STD-202 Method 108</td></tr>
</table>

No.	AEC-Q200 Test Item	Specification	Test Methods and Conditions
6	External Visual	① No defects or abnormalities	① Visual inspection ② Electrical test not required ③ Reference : MIL-STD-883 Method 2009
7	Physical Dimension	① Within the specified dimensions	① Measured with caliper ② Reference : JESD22 Method JB-100
8	Resistance to Solvents	① Appearance : No particular outward appearance abnormality, such as crazing and crack. (Confirmed with magnification x10)	① Reference : MIL-STD-202 Method 215
9	Mechanical Shock	① Appearance : No visible damage ② Capacitance change : Within ±20% of initial value ③ Tanδ : 1.5 times or less than an initial specified value ④ ESR: 1.5 times or less than an initial specified value ⑤ Leakage current : ≤ initial specified value (after voltage treatment)	Three shock in each direction should be applied along 3 mutually perpendicular axes X,Y,Z (total 18 shocks) ① Peak Value : 100G ② Normal Duration : 6ms ③ Velocity Change : 3.75m/s ④ Wave Form : Half-sine ⑤ Reference : MIL-STD-202 Method 213
10	Vibration	① Appearance : No visible damage ② Capacitance change : Within ±20% of initial value ③ Tanδ : 1.5 times or less than an initial specified value ④ ESR: 1.5 times or less than an initial specified value ⑤ Leakage current : ≤ initial specified value (after voltage treatment)	① Acceleration : 5G ② Duration : 20minutes, 12cycles each of 3 orientations(X,Y,Z), ③ Frequency 10Hz – 2000Hz ④ Reference : MIL-STD-202 Method 204
11	Resistance to Soldering Heat	① Capacitance change : Within ±10% of initial capacitance ② tanδ : 1.3 times or less than an initial specified value ③ E.S.R. : 1.3 times or less than an initial specified value ④ Leakage current: Below an initial specified value (after voltage treatment) ⑤ Outward appearance : No visible transformation of Al-case or lead Terminal	① V.P.S (240°C 85s 1times) (V.P.S = Vapor Phase Reflow Soldering) ② Reference : MIL-STD-202 Method 210

No.	AEC-Q200 Test Item	Specification	Test Methods and Conditions
12	ESD	① Appearance : No visible damage ② No defect of electrical characteristics	① Reference : AEC-Q200-002
13	Solderability	At least 95% of surface area of the dipped portion of the terminal shall be covered with new solder.	① Solder temperature : 245±5℃ ② Dip time in solder bath : 2-3s ③ Dip depth in solder bath : 1mm (from root of terminal) ④ Immersion and Emersion speed in solder : 2mm/s
14	Electrical Characterization	See "Standard ratings" in Item 4	Min, Max, Mean and Standard deviation for electrical characteristics(C/ tanδ /E.S.R/LC) should be measured at room temp, -55℃ and 125℃
15	Flammability	V-0 or V-1 Acceptable	① Reference : UL-94
16	Board Flex	① Appearance : No particular outward appearance abnormality, such as crazing and crack. (Confirmed with magnification x10)	① Deflection 2 mm ② Duration 60 sec  ③ Reference : AEC-Q200-005
17	Terminal Strength (SMD)	① Appearance : No particular outward appearance abnormality, such as crazing and crack. (Confirmed with magnification x10)	① Apply a 17.7N(1.8kg) force in the direction parallel to PCB gradually for 60 seconds ② Reference : AEC-Q200-006
18	Surge Voltage	① Appearance : No visible damage ② Capacitance change : Within ±20% of initial value ③ Tanδ : 1.5 times or less than an initial specified value ④ ESR: 1.5 times or less than an initial specified value ⑤ Leakage current : ≤ initial specified value (after voltage treatment)	① Applied voltage : Rated Voltage ② Duration of charge : 30±5 seconds ③ Duration of discharge : 5 minutes 30 seconds ④ Cycles : 1,000 times * A protection resistor(1kΩ) must be inserted to the circuit during the charge and discharge when measuring the leakage current. ② Reference : JIS-C-5101-1

※ If any doubt arises, measure the leakage current after the following voltage treatment.
Voltage treatment : DC rated voltage is applied to the capacitors for 120 minutes at 105℃

9. Pre-cautions on use of EneCAP

9.1 Polarity

EneCAP is a solid aluminum electrolytic capacitor with positive and negative electrodes. Do not reverse the polarity when using. If it is used with the polarities reversed, its life may shorten because of increasing leakage current or short circuit.

9.2 Prohibited circuits

Since problems can be expected due to leakage current increasing during soldering and other processes, EneCAP cannot be used in the following circuits

1) High impedance circuits
2) Coupling circuits
3) Time constant circuits
4) Connection of two or more capacitors in series for higher withstand voltage
5) Circuits to get bad influence by big leakage current

* In addition to the leakage current fluctuation above, the operational conditions such as characteristics at high and low temperature, damp heat and endurance stipulated in the specifications will affect the capacitance. The fluctuation of the capacitance may cause problem if it is used as a time constant capacitor, which is extremely sensitive to the fluctuation of the capacitance. Do not use it as a time constant capacitor. Additionally, please contact ENESOL Co., Ltd. for usage of two or more EneCAP in series for voltage proof.

9.3 Over voltage

Over voltage exceeding the rated voltage may not be applied even for an instant as if may cause a short circuit.

9.4 Sudden charge and discharge

Sudden charge and discharge restricted(for maintenance of high-proof reliability).
A protection circuit is recommended for when a sudden charge or discharge causes excessive rush current because this is a main cause of short circuits and large leakage current. Use protection circuits if the rush current exceeds 10A. The rush current exceeds 10×the maximum allowable ripple current of EneCAP. Be sure to insert a protection resistor of about 1kΩ for charge and discharge when measuring the leakage current.

9.5 Soldering

The soldering conditions are to be within the range prescribed in the specifications. If the specifications are not followed, there is the possibility of the appearance becoming defective and of increase of abnormal leakage current and capacity reduction when

soldering is conducted under conditions that are harsher than those stipulated. Sufficient PCB installation space(PCB means Printed Circuit Board after this.) Sealing resin of EneCAP may have a bulge. The design must give consideration to the standard of height and lead position displacement given in the specifications.

9.6 Use of EneCAP for industrial equipments

To ensure reliability when the EneCAP is used in industrial equipments, design must allow for its capacitance, impedance and other characteristics.

9.7 Use of EneCAP for human life equipments

In case of using in equipments regarding human life(e.g. Space equipment, aeronautic equipment and atomic equipment etc.), be sure to talk over the matter with ENESOL Co., Ltd. Don't use without recognition document of ENESOL Co., Ltd.

9.8 Storage

1) Store EneCAP with the temperature range between 15 to 35℃ and the relative humidity of 75% or less without direct sunshine and store EneCAP in the package states if possible.
2) EneCAP are recommended that you shall open the bag just before use and EneCAP shall be used up.
3) Never store EneCAP in which it is directly exposed to water, brine, oil or in condensation status.
4) Never store EneCAP in any area filled with poisonous gases(including hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and ammonia).
5) Never store EneCAP in any area to which ultraviolet and/or radial rays are radiated.

9.9 Cleaning

Concerning about HCFC, higher alcohol system, petroleum system, terpene system, water system with surface active agent and other solvents the washing way (separateness or combinations) by soak, ultrasonic wave, boil, vapor etc. is confirmed under the maker's recommendation. Please contact us if you require further details.

9.10 Notes on circuit designs for EneCAP

9.10.1 Performance

Use EneCAP within the rating and performance ranges defined in this specifications.

9.10.2 Operating temperature and ripple current

If EneCAP is used at a temperature higher than the upper category temperature(125℃), or excess ripple current flows through EneCAP, there are high possibilities of life cycle reduction or leakage current increasing to cause

EneCAP defective.

9.10.3 Leakage current

The leakage current of EneCAP may increase slightly by soldering conditions. The application of DC voltage enables the capacitors to be repaired by itself and this leads the leakage current to be smaller gradually.

9.10.4 Applied voltage

For the reliability of EneCAP, it is recommended that the voltage applied to EneCAP should be less than 80% of the rated voltage. The peak value of the ripple voltage should be less than the rated voltage.

9.10.5 Failure mode

EneCAP contains a conductive polymer. The life ends mostly due to random failure mode, mainly short circuit. In case of short circuit, EneCAP can be overheated by continuous current flow, then case of EneCAP would be removed by internal pressure increasing.

9.10.6 Insulation

Plastic coated case of EneCAP can't guarantee the insulation. Do not use EneCAP in areas requiring insulation.

10. Advanced consultation for changing

It is conducted under an advance consultation with you if this specification is changed.

11. Taping and packaging

11.1 Deviation of cover tape

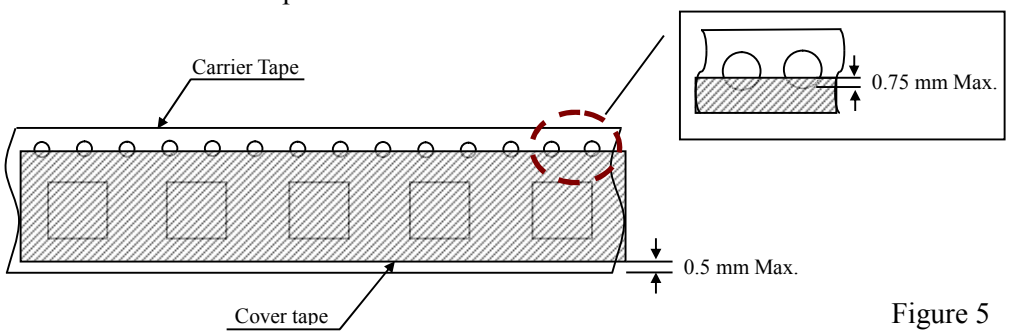


Figure 5

11.2 Trailer

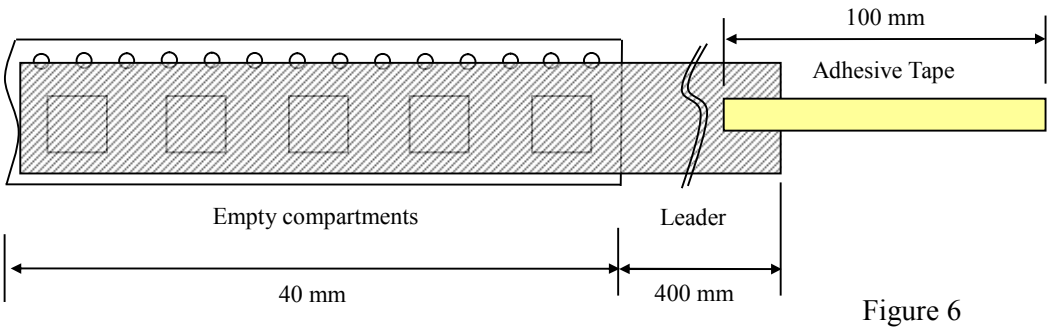


Figure 6

11.3 Reel

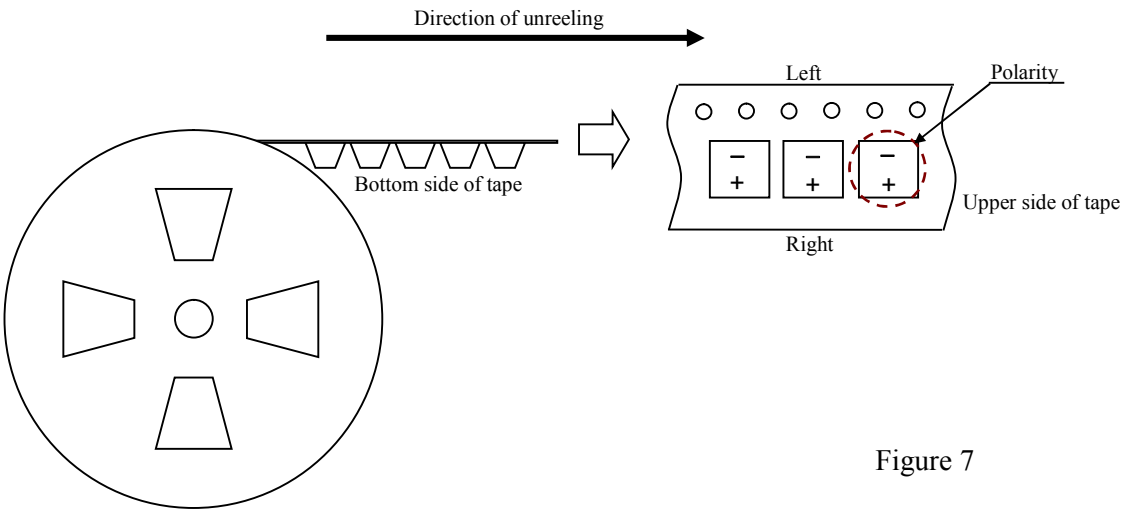
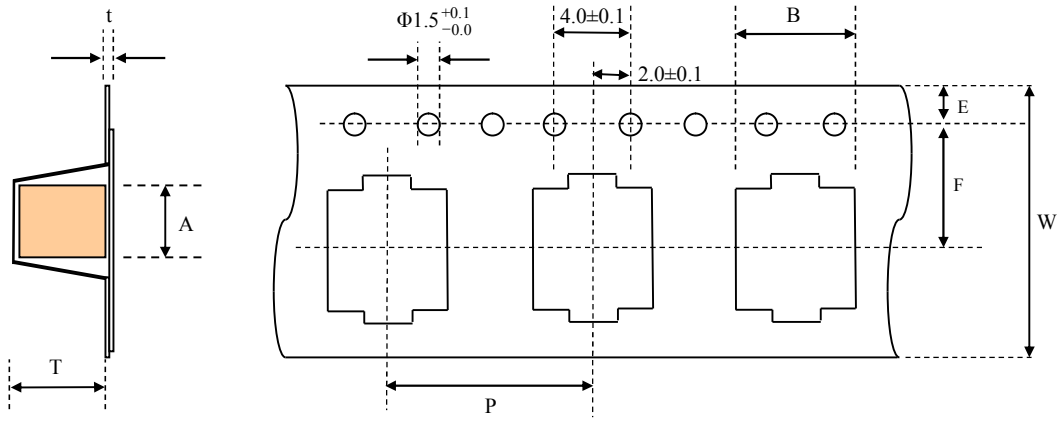


Figure 7

11-4 Carrier tape conditions (unit: mm)

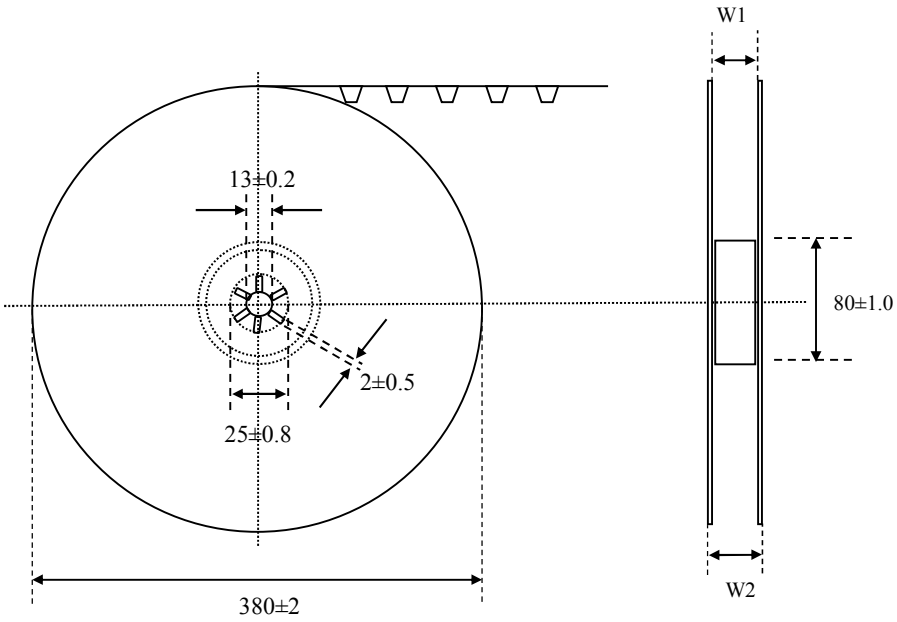


[unit: mm]

Dimensions	A	B	W	F	E	P	t	T
8Φ×6.9L	8.6 ±0.2	8.6 ±0.2	24.0 ±0.3	11.5 ±0.1	1.75 ±0.1	12.0 ±0.1	0.4 ±0.1	7.2 ±0.2
8Φ×9.9L	8.6 ±0.2	8.6 ±0.2	24.0 ±0.3	11.5 ±0.1	1.75 ±0.1	16.0 ±0.1	0.4 ±0.1	10.3 ±0.2
8Φ×11.9L	8.6 ±0.2	8.6 ±0.2	24.0 ±0.3	11.5 ±0.1	1.75 ±0.1	16.0 ±0.1	0.4 ±0.1	12.3 ±0.2
10Φ×10.5L	10.7 ±0.2	10.7 ±0.2	24.0 ±0.3	11.5 ±0.1	1.75 ±0.1	16.0 ±0.1	0.4 ±0.1	10.9 ±0.2
10Φ×12.6L	10.7 ±0.2	10.7 ±0.2	24.0 ±0.3	11.5 ±0.1	1.75 ±0.1	16.0 ±0.1	0.4 ±0.1	13.0 ±0.2

Figure 8

11.5 Carrier reel conditions (unit: mm)



[unit: mm]

Dimensions	W1	W2
8Φ×6.9L	25.5 ± 0.5	29.5 ± 1.0
8Φ×9.9L	25.5 ± 0.5	29.5 ± 1.0
8Φ×11.9L	25.5 ± 0.5	29.5 ± 1.0
10Φ×10.5L	25.5 ± 0.5	29.5 ± 1.0
10Φ×12.6L	25.5 ± 0.5	29.5 ± 1.0

Figure 9

11.6 Peel force of cover tape

Peel force: 0.2~0.7N

Peel speed: 300 mm/min

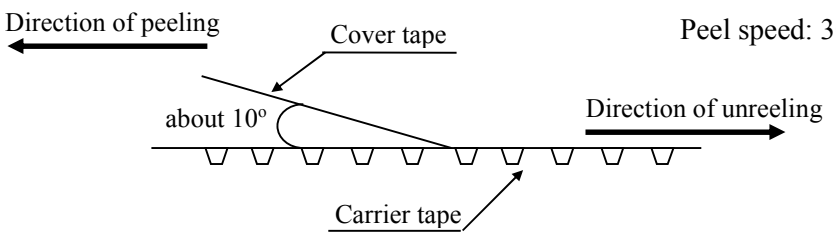


Figure 10

12. Packaging specifications

12.1 Packaging quantity

Table 3. Packing quantities

Size	pcs/reel	pcs/box
8.0Φ×6.9L	1,000	10,000
8.0Φ×9.9L	500	5,000
8.0Φ×11.9L	400	4,000
10.0Φ×10.5L	400	4,000
10.0Φ×12.6L	400	4,000

12.2. Outer carton box

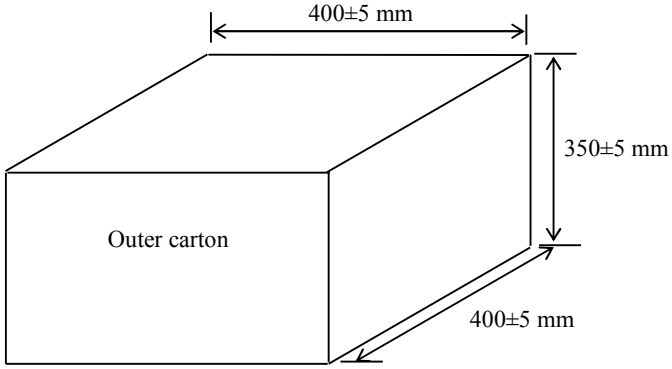


Figure 11

12.3. Label

(Example) - Changeable

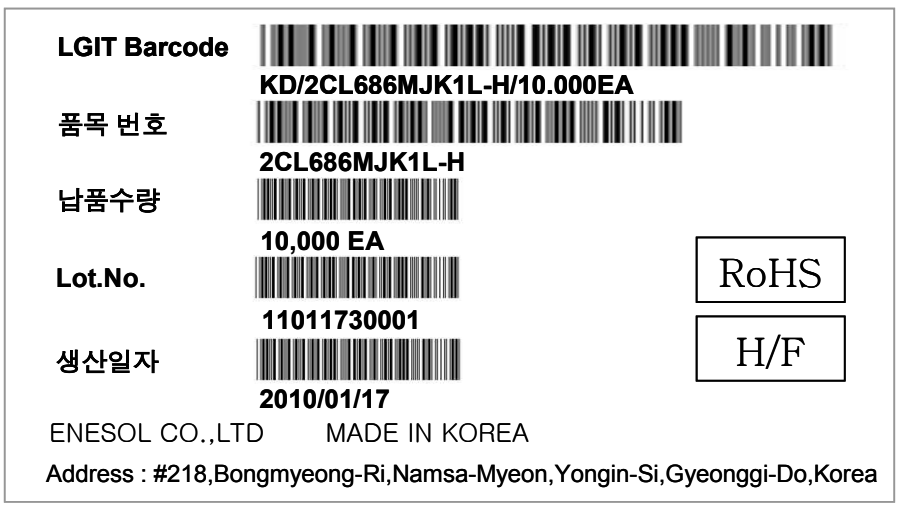


Figure 12

ENESOL CO., LTD.

EneSol Co., Ltd., headquartered in South Korea, is a leading manufacturer in the conductive polymer aluminum solid capacitors for many years that has obtained 7 patents in the aluminum capacitors and is involved in many government projects for the innovation of electronic components and materials. EneSol concerns and make efforts to achieve an environmental system that all its products are RoHS compliant and its plant is ISO-9001 and 14001 certified. EneSol is TS16949 and AEC-Q200 certified.

CONTACT INFORMATION

EneSol

EneSol Co., Ltd.
Manufacturer of the aluminum polymer capacitors (EneCap™)

Headquarter:
#218 Bongmyeong-Ri, Namsa-Myeon, Yongin-Si, Gyunggi-Do, Korea
Phone: +82-31-321-2370 Fax: +82-31-321-2374
Website: http://www.enesol.com Email: enesol@enesol.com

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