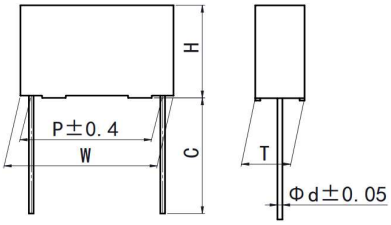
Version history

Current version	Date	Author	Change description

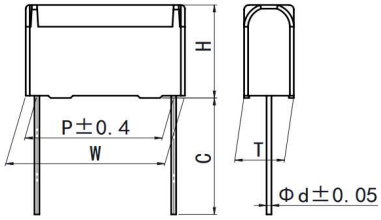
Metallized polypropylene film interference suppression capacitor (Class X2, THB Version) (Temperature Humidity Bias series)

■ Outline Drawing



W±0.4, H±0.4, T±0.4

Square-bottom



W±0.4, H±0.4, T±0.4

Arc-bottom

■ Features

●High stability of capacitance under severe ambient condition, such as high temperature and high humidity

●Good self-healing properties, withstanding surge voltage stressing

●Excellent active and passive flame resistant abilities

■ Applications

●For connection in series with the mains

●For capacitive divider power supply

●Such as power meter, LED driver, and other severe ambient condition applications.

■ Specifications

Reference Standard	GB/T 6346.14 (IEC60384-14)		
Safety Approvals	CQC03001002875; ENEC-VDE:40000358; UL-CUL: E186600, CCN: FOWX2/8		
Class	Class X2		
Climatic Category / Passive Flammability Category	40/110/56/B		
Operating Temperature Range	-40℃ ~ +110℃		
Rated Voltage (U_R)	305Vac/275Vac, 50/60Hz		
Capacitance Range	0.010μF ~ 15μF		
Capacitance Tolerance	±10%(K) , ±20%(M)		
Voltage Proof	Between Terminals:		4.3U_R(dc), 2s
	Between Terminals To Case:		2 120Vac, 1min
Insulation Resistance	R≥15 000MΩ , CN≤0.33μF RCN≥5 000s, CN>0.33μF	(20℃, 100V, 1min)	
Dissipation Factor	CN≤1.0μF	≤10×10^{-4}(1kHz,20℃)	≤20×10^{-4}(10kHz,20℃)
	CN>1.0μF	≤20×10^{-4}(1kHz,20℃)	≤40×10^{-4}(10kHz,20℃)
THB test (Damp heat test with loading)	Temperature: 85℃±2℃; Humidity: 85%RH±2% RH Voltage: 240Vac 50Hz; Duration: 1 000 hours Capacitance change (ΔC/C): ≤10% Dissipation factor change (Δtan δ): ≤0.5% (1kHz)		

	Insulation resistance: ≥50% of the rated value

Note: 1.Recommend for max rated supply mains voltage 250Vac application;
2. If used in application which has ripple current applied, recommend to use AC filter series: C6A etc. If have any questions please contact our technical engineer for more detail.

■ Part number system

The 15 digits part number is formed as follow:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	4	2								W				

Digit 1 to 3 Series code

C42=MKP62

Digit 4 to 5 A.C. rated voltage

Q2=305V P2=275V

Digit 6 to 8 Rated capacitance value

For example : 474=47×10^4 pF=0.47uF

Digit 9 Capacitance tolerance

K=±10% M=±20%

Digit 10 Pitch

6=15.0mm 9=22.5mm B=27.5mm F=37.5mm

Digit 11 Internal use

Digit 12 to 15 Lead form and packaging code

Table 1 Lead form and packaging code

Digit 12		Digit 13		Digit 14		Digit 15	
Code	explanation	Code	explanation	Code	explanation	Code	explanation
A	ammo-pack	6	F=15.0mm	0	straight	5	P3=25.4mm;H=18.5mm (For pitch=10/15mm)
C	straight lead "C" in the figure above	Code	explanation			0	Length tolerance ±0.5mm Or standard length
		00	standard lead length (18mm~26mm)			2	Length tolerance ±0.3mm
		45	lead length 4.5mm				
		35	lead length 3.5mm				
		32	lead length 3.2mm				
Note: Recommend short lead due to long lead could deform easily.							

■ Dimensions(mm)

305Vac/275Vac#						
C_N (μF)	W	H	T	P	d	Part number
0.010	17.5	11.0	5.0	15.0	0.6	C42Q2103-6W****
0.015	17.5	11.0	5.0	15.0	0.6	C42Q2153-6W****
0.022	17.5	11.0	5.0	15.0	0.6	C42Q2223-6W****
0.033	17.5	11.0	5.0	15.0	0.6	C42Q2333-6W****
0.047	17.5	11.0	5.0	15.0	0.6	C42Q2473-6W****
0.068	17.5	11.0	5.0	15.0	0.6	C42Q2683-6W****
0.10	17.5	12.0	6.0	15.0	0.6	C42Q2104-6W****
0.15	17.5	13.5	7.5	15.0	0.6	C42Q2154-6W****
0.22	17.5	14.5	8.5	15.0	0.8	C42Q2224-6W****
0.27	17.5	16.0	10.0	15.0	0.8	C42Q2274-6W****
0.33	17.5	16.0	10.0	15.0	0.8	C42Q2334-6W****
0.39	17.5	19.0	11.0	15.0	0.8	C42Q2394-6W****
0.47	17.5	19.0	11.0	15.0	0.8	C42Q2474-6W****
0.10	26.5	15.0	6.0	22.5	0.6	C42Q2104-9W****
0.15	26.5	15.0	6.0	22.5	0.6	C42Q2154-9W****
0.22	26.5	15.0	6.0	22.5	0.6	C42Q2224-9W****
0.27	26.5	16.0	7.0	22.5	0.6	C42Q2274-9W****
0.33	26.5	16.0	7.0	22.5	0.6	C42Q2334-9W****
0.39	26.5	17.0	8.5	22.5	0.8	C42Q2394-9W****
0.47	26.5	17.0	8.5	22.5	0.8	C42Q2474-9W****
0.56	26.5	18.5	10.0	22.5	0.8	C42Q2564-9W****
0.68	26.5	18.5	10.0	22.5	0.8	C42Q2684-9W****
0.82	26.5	20.0	11.0	22.5	0.8	C42Q2824-9W****
1.0	26.5	22.0	12.0	22.5	0.8	C42Q2105-9W****
1.2	26.5	24.5	15.5	22.5	0.8	C42Q2125-9W****
1.5	26.5	24.5	15.5	22.5	0.8	C42Q2155-9W****

305Vac/275Vac#						
C_N (μF)	W	H	T	P	d	Part number
0.47	32.0	18.0	9.0	27.5	0.8	C42Q2474-BW***
0.56	32.0	18.0	9.0	27.5	0.8	C42Q2564-BW***
0.68	32.0	18.0	9.0	27.5	0.8	C42Q2684-BW***
0.82	32.0	20.0	11.0	27.5	0.8	C42Q2824-BW***
1.0	32.0	20.0	11.0	27.5	0.8	C42Q2105-BW***
1.2	32.0	22.0	13.0	27.5	0.8	C42Q2125-BW***
1.5	32.0	22.0	13.0	27.5	0.8	C42Q2155-BW***
2.2	32.0	28.0	14.0	27.5	0.8	C42Q2225-BW***
2.7	32.0	33.0	18.0	27.5	0.8	C42Q2275-BW***
3.3	32.0	33.0	18.0	27.5	0.8	C42Q2335-BW***
★3.9	32.0	37.0	22.0	27.5	0.8	C42Q2395-BW***
★4.7	32.0	37.0	22.0	27.5	0.8	C42Q2475-BW***
★2.2	41.0	26.0	12.0	37.5	1.0	C42Q2225-FW***
★2.7	41.0	28.0	14.0	37.5	1.0	C42Q2275-FW***
3.3	41.0	30.0	16.0	37.5	1.0	C42Q2335-FW***
★3.9	41.0	32.0	17.0	37.5	1.0	C42Q2395-FW***
4.7	41.0	33.5	18.5	37.5	1.0	C42Q2475-FW***
5.6	41.0	34.0	20.0	37.5	1.0	C42Q2565-FW***
6.8	41.0	37.0	22.0	37.5	1.0	C42Q2685-FW***
8.2	41.0	37.0	26.0	37.5	1.0	C42Q2825-FW***
10M	41.0	41.0	26.0	37.5	1.0	C42Q2106MFW**
★10K	41.0	43.0	28.0	37.5	1.0	C42Q2106KFW***
★12	42.0	45.0	30.0	37.5	1.0	C42Q2126-FW***
★15	42.0	50.0	30.0	37.5	1.0	C42Q2156-FW***

Note: 1. "-" =capacitance tolerance code, K=±10%, M=±20%
2. " ****" =lead form and packing code (refer to table 1)
3. "#" when the rated voltage is 275Vac,the digit 4~5 is P2.
4. If used in the 380Vac, Pls refer to MKP65. Pls contact our technical engineer for more details.
5. "★" = Arc-bottom of the outer shell.

■ Test Method And Performance (IEC 60384-14)

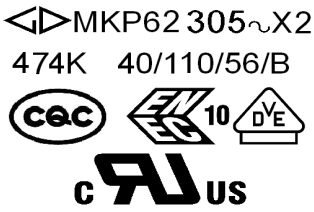
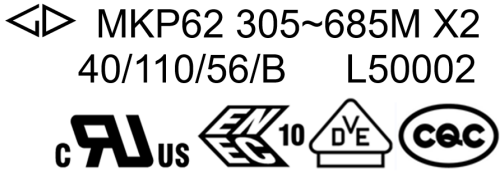
Group	Item		Conditions of test	Performance requirements
A1	4.1 Visual examination		Dimensions: gauging by vernier caliper	No visible damage & legible marking
	4.1Dimensions(Gauging)			Fit detail specification
A2	4.2.2 Capacitance		Measuring frequency: Capacitance: 1kHz Tangent of loss angle: CN≤1μF: 10kHz; CN＞1μF: 1kHz Voltage proof between terminals: 4.3UR(d.c.), 1min IR. test voltage: 100Vd.c.	Within specified tolerance
	4.2.3 Tangent of loss angle			
	4.2.1 Voltage proof			No permanent breakdown or flashover
	4.2.5 Insulation Resistance			I.R.:≥the rated value
B1	4.5 Solderability		Methods: Groove welding Ta, Method 1 Solder temperature: 245℃±5℃ Immersion time: 2.0s±0.5s	Good quality of tinning
C1A	Initial measurement	4.1Visual examination	Dimensions: gauging by vernier caliper Measuring frequency: Capacitance: 1kHz Tangent of loss angle: C_N≤1μF: 10kHz; C_N＞1μF: 1kHz	No visible damage & legible marking
		4.1Dimensions(Gauging)		Fit detail specification
		4.2.2Capacitance		Within specified tolerance
		4.2.3Tangent of loss angle		
	4.1.1 Creepage distances and Clearances		Gauging by vernier caliper	Creepage distances≥4.0mm Clearances≥3.0mm
	4.3 Robustness of Terminations (straight lead)		Tense: 0.50＜d≤0.80, 10N 0.80＜d≤1.25, 20N Ub bending test: Bend: 0.50＜d≤0.80, 5N 0.80＜d≤1.25, 10N The terminals shall be bent 2 times in each direction	No visible damage
	4.4 Resistance to Soldering heat		Capacitors are not pre-dried Groove Method Tb, Method 1A Solder temperature: 260℃±5℃ Immersion time: 10s±1s	No visible damage & legible marking
	4.19 Component solvent resistance		Solvent: industrial isopropyl Solvent temperature:23℃±5℃ Dipping time:5min±0.5min Method 2: (without Sassafras test) Recovery time: 48h	Comply with the specifications in the product size table
	Final measurement		Appearance inspection Cap. measuring frequency: 1kHz Tangent of loss angle: CN≤1μF: 10kHz; CN＞1μF: 1kHz	No visible damage Cap.: |ΔC|/C≤5% Tangent of loss angle: CN≤1μF: ≤0.008 (10kHz) CN＞1μF: ≤0.005 (1kHz)

Group	Item		Conditions of test	Performance requirements
C1B	Initial measurement	4.1Visual examination	Dimensions: gauging by vernier caliper Measuring frequency: Capacitance: 1kHz Tangent of loss angle: $C_N \leqslant 1\mu F$: 10kHz; $C_N > 1\mu F$: 1kHz	No visible damage & legible marking
		4.1Dimensions(Gauging)		Fit detail specification
		4.2.2Capacitance		Within specified tolerance
		4.2.3Tangent of loss angle		
	4.5 Solderability		Methods: Groove welding Ta, Method 1 Solder temperature: 245℃±5℃ Immersion time: 2.0s±0.5s	Good quality of tinning
	4.20 Solvent resistance of the marking		Solvent: Industrial isopropanol. Solvent temperature:23℃±5℃ Dipping time: 5min±0.5min Condition: scrub Scrub material: absorbent cotton Reverting time: No	The marking shall be legible
	4.6 Rapid change of temperature		T_A=-40℃, T_B=+110℃ 5 cycles, Duration: t=30min	No visible damage
	4.7 Vibration (straight lead)		Amplitude 0.75mm or acceleration 98m/s^2 (whichever is the smaller severity), f: 10Hz to 500Hz.Three directions, 2h for each direction, total 6h.	No visible damage
	4.8 Bump (straight lead)		4 000 times, Acceleration: 400m/s^2, Pulse duration, 6ms	No visible damage
	Final measurement		Appearance inspection Cap. measuring frequency: 1kHz	No visible damage Cap.: |ΔC|/C≤5%
C1	4.11 Climatic sequence	Initial measurement	According to the conditions of Group C1A and C1B	According to the requirements of Group C1A and C1B
		Dry heat	+110℃, 16h	No visible damage & legible marking
		Damp heat, Cyclic	Test Db, Severity: b, the first cycle Temperature: +55℃, 24h each cycle, Method 2	
		Cold	-40℃, 2h	
		Damp heat, Cyclic	Test Db, Severity b, the other cycles Temperature: +55℃, 24h each cycle, Method 2	
		Final measurement	Measuring frequency: Capacitance: 1kHz Tangent of loss angle: $C_N \leqslant 1\mu F$: 10kHz; $C_N > 1\mu F$: 1kHz Voltage proof between terminals: $4.3U_R$(d.c.),1min Voltage proof between terminal and housing: 2UR+1500V(a.c.),1min Insulation resistance test voltage: 100Vd.c.	Cap.: |ΔC|/C≤5% Increase of tgδ: $C_N \leqslant 1\mu F$: ≤0.008 (10kHz) $C_N > 1\mu F$: ≤0.005 (1kHz) No permanent breakdown or flashover I.R.:≥50% of the rated value

Group	Item	Conditions of test	Performance requirements
C2	4.12 Damp heat, steady state	Temperature: 40℃ ±2℃ Humidity: 93±3%RH Duration: 56 days	No visible damage & legible marking Cap.: |ΔC|/C≤5% Increase of tgδ: C_N≤1μF: ≤0.008 (10kHz) C_N>1μF: ≤0.005 (1kHz) No permanent breakdown or flashover I.R.:≥50% of the rated value
	Final measurement	Tangent of loss angle: CN≤1μF: 10kHz; CN>1μF: 1kHz Voltage proof between terminals: 4.3UR(d.c.),1min Voltage proof between terminal and housing: 2UR+1500V(a.c.),1min Insulation resistance test voltage: 100Vd.c.	
C3	Initial measurement	Measuring frequency capacitance: 1kHz Tangent of loss angle: CN≤1μF: 10kHz; CN>1μF: 1kHz Insulation resistance test voltage: 100Vd.c.	Within specified tolerance
	4.13 Impulse voltage	Each individual capacitor shall be subjected to 24 impulses of the same polarity, the time between impulses shall not be less than 10S, and the peak value of the voltage impulse: 2.5kV (suitable for C_N ≤1μF; When C_N>1μF, the capacitor can endure pulse voltage value is $2.5/\sqrt{C_N}$ kV)	There are three or more waveforms which indicate that no self-heating breakdown have occurred when it is monitored by the monitor (when any three successive impulses are shown by the monitor to have a wave form indicating that no self-healing breakdown have taken place the impulses can be stopped)
	4.14 Endurance	Temperature : +110℃ Duration : 1000h Voltage: at 1.25 U_R	No visible damage & legible marking Cap.: |ΔC|/C≤10% Increase of tgδ: C_N≤1μF: ≤0.008 (10kHz) C_N>1μF: ≤0.005 (1kHz) No permanent breakdown or flashover I.R.:≥50% of the rated value
	Final measurement	Tangent of loss angle: CN≤1μF: 10kHz; CN>1μF: 1kHz Voltage proof between terminals: 4.3UR(d.c.),1min Voltage proof between terminal and housing: 2UR+1500V(a.c.),1min	

Group	Item	Conditions of test	Performance requirements
C4	4.15 Charging and discharging	Times: 10 000 Duration of charging: 0.5s Duration of discharging: 0.5s Charging voltage: $\sqrt{2}U_R$ Vd.c. Charging resistance: 220/C_N(Ω) or the current ≤1.0A (whichever is the minor) Discharging resistance: $R=\frac{\sqrt{2}U_R}{C_N\times\frac{dU}{dt}}(\Omega)$ C_N: Capacitance (μF) dU/dt(V/us) : 100V/μs	Cap.: |ΔC|/C≤10% Increase of tgδ: C_N≤1μF: ≤0.008 (10kHz) C_N>1μF: ≤0.005 (1kHz) I.R.:≥50% of the rated value
C6	4.17 Passive flammability	Needle flame test The category of flammability: B Expose time: 1 time Capacitor Volume Exposing time 250<V(mm^3)≤500 20s 500<V(mm^3)≤1750 30s V(mm^3)>1750 60s	The flaming time of each capacitor shall not go beyond 10s after it is taken apart from the flame. Drop of each capacitor caused by flame shall not fire the tissue below.
C7	4.18 Active flammability	The specimens shall be individually wrapped in at least 1,but not more than 2,complete layers of cheesecloth, the cheesecloth shall be untreated pure cotton cloth. Each sample shall be subjected to 20 discharged, the interval between successive discharges shall be 5s. U_i=2.5kV$^{+7}_{0}$ % U_R be applied and be maintained for 120$^{+10}_{0}$ s after the last discharge.	The cheese cloth around the capacitor shall not burn with a flame.

■ Marking（For example）

 Fig.1 P≤27.5mm	 Fig.2 P＞27.5mm

Marking Introduction

Sign	explain	Sign	explain
	Brand		ENEC-VDE Approval
MKP62	Type		CQC Approval
305～	Rated voltage		UL,CUL Approval
X2	Class	40/110/56/B	Climate category / Passive Flammability Class
474K 685M	Rated capacitance and tolerance	L50002	Lot No.

■ Taping specification for box-type capacitors

▲ Outline Drawing

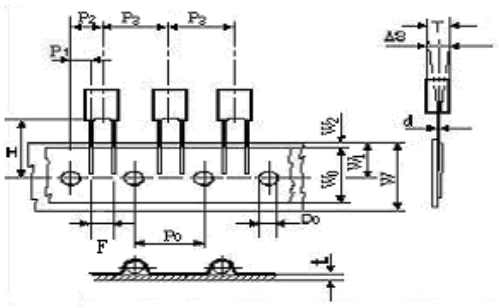


Fig.1 P=5.0, 7.5mm

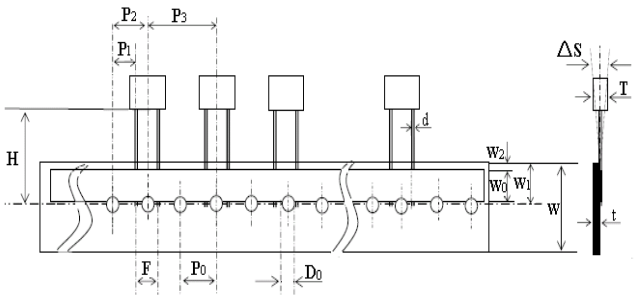


Fig.2 P=10.0, 15.0mm

▲ Taping Dimensions(mm)

Technology index title	Code	Dimensions				
		P=5.0	P=7.5	P=10.0	P=15.0	Tolerance
Taping type	—	Fig 1	Fig 1	Fig2	Fig 2	——
Part number Digit12-15	Ammo-pack	A201	A301	A405	A605	
Taping pitch	P_3	12.7	12.7	25.4	25.4	±1.0
Feed hole pitch	P_0	12.7	12.7	12.7	12.7	±0.3
Center of wire	P_1	3.85	2.6	7.7	5.2	±0.7
Center of body	P_2	6.35	6.35	12.7	12.7	±1.3
Pitch of taping wire	F**	5.0	7.5	10.0	15.0	+0.6 -0.1
Component alignment	△S	0	0	0	0	±2.0
Height of component from tape center	H***	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18.0	18.0	18.0	18.0	+1.0 -0.5
Hold down tape width	W_0	6min	10min	10min	10min	——
Hole position	W_1	9.0	9.0	9.0	9.0	±0.5
Hold down tape sition	W_2	3max	3max	3max	3max	——
Feed hole dia.	D_0	4.0	4.0	4.0	4.0	±0.2
Tape thickness	t	0.7	0.7	0.7	0.7	±0.2

Note: * P_0=15mm is also available;
**F can be other lead spacing;
***H=16.5mm is available;

■ Soldering suggestions

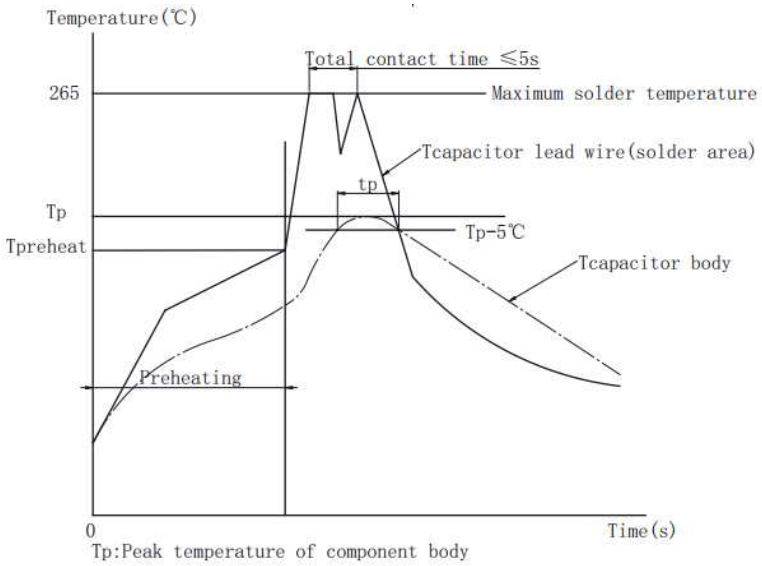
▲ Manual soldering

Max. temperature: 350℃, time: 3s

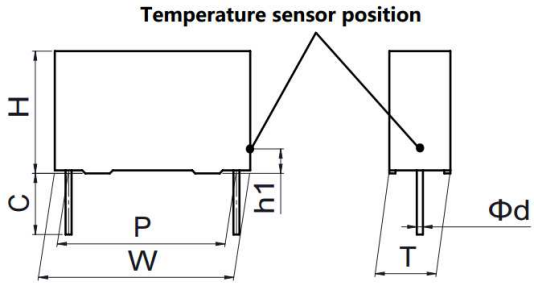
▲ Wave soldering

There are many factors affecting the heating of film capacitor during the wave soldering process, such as: preheating temperature, preheating time, soldering temperature, soldering time, other heat sources influence and so on.

The typical soldering profile is as below:



▲ Because overheating could damage the capacitor, we recommend paying attention to the maximum capacitor temperature and heating time, use temperature sensor to detect the maximum capacitor body temperature.

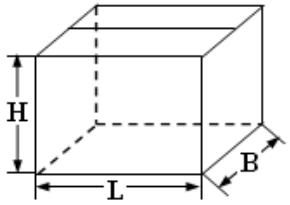


Note: If re-working or dipping twice is necessary, it should be done after the capacitor returns to the normal temperature.

Temperature sensor position (Tcapacitor body)	The capacitor body surface of lead side, capacitor height position from PCB: h1=2～3mm		
Maximum capacitor body temperature Tp(℃)	OPP film P≤15mm	OPP film P>15mm	PET film
	115	120	125
Maximum capacitor lead wire temperature (℃)	265	265	265
Maximum capacitor body heating time tp=Tp-5℃	30s		

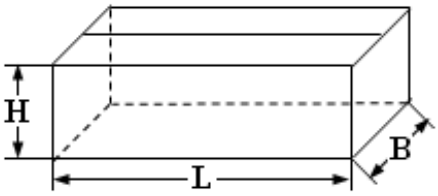
■ Packing box sizes(mm)(example)

1. Out packing box for bulk



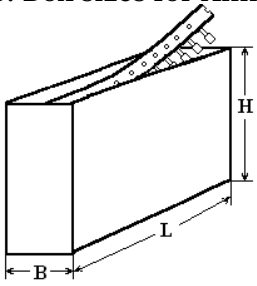
L:375±5
B:375±5
H:265±5

2. Inner packing box for bulk



L:355±3
B:175±3
H:118±3

3. Box sizes for Ammo-pack



L:350±3
B:50±3
H:260±3

■ Storage conditions

▲ It must be noted that the solderability of the terminals may be deteriorated when stored in an atmosphere filled with moisture, dust, or a reactive oxidizing gas.(hydrogen chloride, hydrogen sulfide, sulfuric acid,etc.)

▲ It shouldn’t be located in particularly high temperature and high humidity, it must submit to the following conditions(unchanging primal package):

Temperature：-40 ℃ to 35 ℃

Humidity：Average per year≤70%RH;

For 30 full days randomly distributed throughout the year≤80%RH

Storage time for tinned lead wire:（from the date marked on the capacitor’s body or the label glued to the package）:

Bulk(packed with plastic bag): ≤24 months ;

Taping and line up: ≤12 months

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