

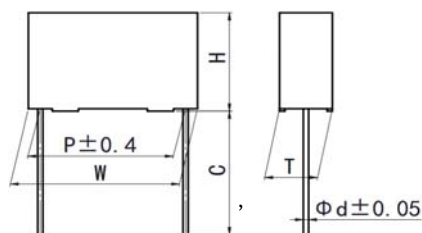


Version history

Current version	Date	Author	Change description

Metallized polypropylene film interference suppression capacitor(Class Y1, 440Vac/500Vac)




■ Outline Drawing



■ Features

- AEC-Q200 qualified
- Metallized polypropylene structure
- Withstanding overvoltage stressing
- Excellent active and passive flame resistant abilities
- Widely used in line to ground, line-by-pass, antenna Coupling interference suppression circuit, etc.

■ Safety Approvals

●		CQC	IEC 60384-14: 2013+AMD1:2016, Y1, 440Vac/500Vac/1500Vdc, 0.00047μF~0.022μF, 40/110/56/B Certificate No.: CQC10001044432
●		ENEC-SEMCO	EN IEC 60384-14: 2023, Y1, 440Vac/500Vac/1500Vdc, 0.00047μF~0.10μF, 40/110/56/B Certificate No.: SE-ENEC-2400830
●		UL/CUL	UL 60384-14:2016, CSA E60384-14:14, Y1, 440Vac/500Vac/1500Vdc, 0.00047μF~0.022μF, 40/110/56/B File No.: E186600, CCN: FOWX2/8

■ Specifications

Class	Class Y1	
Climatic Category/Passive Flammability Category	40/110/56/B	
Operating Temperature Range	-40℃ ~ +110℃	
Rated Voltage	440Vac/500Vac, 50/60Hz	
Rated DC voltage	1 500Vdc	
Capacitance Range	0.00047μF~0.10μF	
Capacitance Tolerance	±10%(K), ±20%(M)	
Voltage Proof	Between Terminals:	4 000Vac (2s)
	Between Terminals To Case:	4 000Vac (1min)
Insulation Resistance	R≥15 000MΩ (20℃, 100V, 1min)	
Dissipation Factor	≤10×10 ⁻⁴ (1kHz, 20℃)	≤20×10 ⁻⁴ (10kHz, 20℃)



■ 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

D	4	7												
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Digit 1 to 3 Series code

D47=MKP67 (Automotive grade parts)

Digit 4 to 5 A.C. rated voltage

S1=440V H2=500V

Digit 6 to 8 Rated capacitance value

For example : 103=10×10³ pF= 0.01 μF

Digit 9 Capacitance tolerance

K=±10%, M=±20%

Digit 10 Pitch

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

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	4 6	F=10.0mm F=15.0mm	0	straight	1	each cap. among two consecutive holes P3=12.7mm, H=18.5mm (For pitch=7.5mm)
						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
		32	lead length 3.2mm				
		35	lead length 3.5mm				
		38	lead length 3.8mm				
		40	lead length 4.0mm				
		45	lead length 4.5mm				
Note: Recommend short lead due to long lead could deform easily.							



■ Dimensions (mm)

440Vac/500Vac [#]						
C _N	W	H	T	P	d	Part number
470 pF	17.5	11.0	5.0	15.0	0.6	D47S1471-60****
560 pF	17.5	11.0	5.0	15.0	0.6	D47S1561-60****
680 pF	17.5	11.0	5.0	15.0	0.6	D47S1681-60****
820 pF	17.5	11.0	5.0	15.0	0.6	D47S1821-60****
0.0010 μF	17.5	11.0	5.0	15.0	0.6	D47S1102-60****
0.0012 μF	17.5	11.0	5.0	15.0	0.6	D47S1122-60****
0.0015 μF	17.5	11.0	5.0	15.0	0.6	D47S1152-60****
0.0018 μF	17.5	12.0	6.0	15.0	0.6	D47S1182-60****
0.0020 μF	17.5	12.0	6.0	15.0	0.6	D47S1202-60****
0.0022 μF	17.5	12.0	6.0	15.0	0.6	D47S1222-60****
0.0025 μF	17.5	12.0	6.0	15.0	0.6	D47S1252-60****
0.0027 μF	17.5	13.5	7.5	15.0	0.6	D47S1272-60****
0.0028 μF	17.5	13.5	7.5	15.0	0.6	D47S1282-60****
0.0033 μF	17.5	13.5	7.5	15.0	0.6	D47S1332-60****
0.0039 μF	17.5	13.5	7.5	15.0	0.6	D47S1392-60****
0.0040 μF	17.5	13.5	7.5	15.0	0.6	D47S1402-60****
0.0047 μF	17.5	14.0	8.0	15.0	0.6	D47S1472-60****
0.0050 μF	17.5	14.5	8.5	15.0	0.6	D47S1502-60****
0.0056 μF	17.5	14.5	8.5	15.0	0.6	D47S1562-60****
0.0068 μF	17.5	16.0	10.0	15.0	0.8	D47S1682-60****
0.0082 μF	17.5	19.0	11.0	15.0	0.8	D47S1822-60****
0.010 μF	17.5	19.0	11.0	15.0	0.8	D47S1103-60****
0.0056 μF	26.5	15.0	6.0	22.5	0.8	D47S1562-90****
0.0068 μF	26.5	16.0	7.0	22.5	0.8	D47S1682-90****
0.0082 μF	26.5	17.0	8.5	22.5	0.8	D47S1822-90****
0.010 μF	26.5	17.0	8.5	22.5	0.8	D47S1103-90****
0.012 μF	26.5	18.5	10.0	22.5	0.8	D47S1123-90****
0.015 μF	26.5	18.5	10.0	22.5	0.8	D47S1153-90****
0.018 μF	26.5	20.0	11.0	22.5	0.8	D47S1183-90****
0.022 μF	26.5	22.0	12.0	22.5	0.8	D47S1223-90****
▲0.022 μF	32.0	20.0	11.0	27.5	0.8	D47S1223-B0****
▲0.033 μF	32.0	22.0	13.0	27.5	0.8	D47S1333-B0****
▲0.047 μF	32.0	28.0	14.0	27.5	0.8	D47S1473-B0****
▲0.068 μF	32.0	33.0	18.0	27.5	0.8	D47S1683-B0****
▲0.10 μF	32.0	37.0	22.0	27.5	0.8	D47S1104-B0****

- Note: 1. “-” =capacitance tolerance code, M=±20%, K=±10%
 2. “****” =lead form and packaging mode code (refer to table 1)
 3. “#” when the rated voltage is 500Vac, the digit 4~5 is H2.
 4. “▲” indicates no CQC & UL approval

■ Maximum permissible voltage change per unit of time

Rated Voltage (Vac)	dV/dt (V/us) at 630 Vdc		
	P=15mm	P=22.5mm	P=27.5mm
440	3 000	1 000	500

- Note: 1. Rated voltage pulse slope (dV/dt)_R at rated voltage.
 2. If the working voltage (U) is lower than the rated voltage (U_R), the capacitor can be worked at a higher dV/dt. In this case, the maximum allowed dV/dt is obtain by multiplying the right value with U_R/U.



■ 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 Voltage proof between terminals: 4000V (a.c.) IR. test voltage: 500Vd.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 measure ment	4.1Visual examination	Dimensions: gauging by vernier caliper Measuring frequency: Capacitance: 1kHz Tangent of loss angle: C _N ≤1μF: 10kHz	No visible damage & legible marking
		4.1Dimensions (Gau ging)		Fit detail specification
		4.2.2Capacitanc e		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	No visible damage Cap. : ΔC /C≤5% Tangent of loss angle: CN≤1μF: ≤0.008 (10kHz)

Group	Item		Conditions of test	Performance requirements
C1B	Initial measurement	4.1 Visual examination	Dimensions: gauging by vernier caliper Measuring frequency: Capacitance: 1kHz Tangent of loss angle: $C_N \leq 1\mu\text{F}$: 10kHz	No visible damage & legible marking
		4.1 Dimensions (Gauging)		Fit detail specification
		4.2.2 Capacitance		Within specified tolerance
		4.2.3 Tangent of loss angle		
	4.5 Solderability		Methods: Groove welding Ta, Method 1 Solder temperature: $245^\circ\text{C} \pm 5^\circ\text{C}$ Immersion time: $2.0\text{s} \pm 0.5\text{s}$	Good quality of tinning
	4.20 Solvent resistance of the marking		Solvent: Industrial isopropanol. Solvent temperature: $23^\circ\text{C} \pm 5^\circ\text{C}$ Dipping time: $5\text{min} \pm 0.5\text{min}$ Condition: scrub Scrub material: absorbent cotton Reverting time: No	The marking shall be legible
	4.6 Rapid change of temperature		$T = -40^\circ\text{C}$, $T = +110^\circ\text{C}$ 5 cycles, Duration: $t = 30\text{min}$	No visible damage
	4.7 Vibration (straight lead) (when capacitor weight > 3g, the capacitor body needs to be fixed)		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) (when capacitor weight > 3g, the capacitor body needs to be fixed)		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.: $ \Delta C /C \leq 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	$+110^\circ\text{C}$, 16h	No visible damage & legible marking
		Damp heat, Cyclic	Test Db, Severity: b, the first cycle Temperature: $+55^\circ\text{C}$, 24h each cycle, Method 2	
		Cold	-40°C , 2h	
		Damp heat, Cyclic	Test Db, Severity b, the other cycles Temperature: $+55^\circ\text{C}$, 24h each cycle, Method 2	
		Final measurement	Measuring frequency: Capacitance: 1kHz Tangent of loss angle: $C_N \leq 1\mu\text{F}$: 10kHz; Voltage proof between terminals: 4000V(a.c.), 1min Voltage proof between terminal and housing: 4000V(a.c.), 1min Insulation resistance test voltage: 500Vd.c.	Cap.: $ \Delta C /C \leq 5\%$ Increase of $\text{tg}\delta$: $C_N \leq 1\mu\text{F}$: ≤ 0.008 (10kHz) No permanent breakdown or flashover I.R.: $\geq 50\%$ of the rated value





Group	Item	Conditions of test	Performance requirements
C2	4.12 Damp heat, steady state	Temperature: 40°C ±2°C 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) No permanent breakdown or flashover I.R.: ≥50% of the rated value
	Final measurement	Tangent of loss angle: C _N ≤1μF: 10kHz Voltage proof between terminals: 4000V(a.c.), 1min Voltage proof between terminal and housing: 4000V(a.c.), 1min	
C3	Initial measurement	Measuring frequency capacitance: 1kHz Tangent of loss angle: C _N ≤1μF: 10kHz Insulation resistance test voltage: 500Vd.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: 8.0kV (suitable for C _N ≤1μF)	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°C Duration : 1000h Voltage: at 1.7 U _R except that once every hour the voltage shall be increased to 1000Vrms for 0.1s; and each capacitor individually through a resistor of 47.0Ω ±5 %.	No visible damage & legible marking Cap.: ΔC /C≤10% Increase of tgδ: C _N ≤1μF: ≤0.008 (10kHz) No permanent breakdown or flashover I.R.: ≥50% of the rated value
	Final measurement	Tangent of loss angle: C _N ≤1μF: 10kHz Voltage proof between terminals: 4000V(a.c.), 1min Voltage proof between terminal and housing: 4000V(a.c.), 1min	

Group	Item	Conditions of test	Performance requirements
C4	4.15 Charging and discharging	<p>Times: 10 000 Duration of charging: 0.5s Duration of discharging: 0.5s</p> <p>Charging voltage: $\sqrt{2}U_R$ Vd.c. Charging resistance: $220/C_N(\Omega)$ or the current $\leq 1.0A$ (whichever is the minor) Discharging resistance:</p> $R = \frac{\sqrt{2}U_R}{C_N \times \frac{dU}{dt}} (\Omega)$ <p>C_N: Capacitance (μF) dU/dt (V/us) : 100V/μs</p>	<p>Cap. : $\Delta C /C \leq 10\%$ Increase of $tg\delta$: $C_N \leq 1\mu F$: ≤ 0.008 (10kHz) $C_N > 1\mu F$: ≤ 0.005 (1kHz) I.R. : $\geq 50\%$ of the rated value</p>
C6	4.17 Passive flammability	<p>Needle flame test The category of flammability: B Expose time: 1 time Capacitor Volume Exposing time $250 < V(mm^3) \leq 500$ 20s $500 < V(mm^3) \leq 1750$ 30s $V(mm^3) > 1750$ 60s</p>	<p>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.</p>

■ Marking (For example)

 MKP67 500~ Y1
 103K 40/110/56/B
 
 and 103 K 500~
 DP10001

Marking Introduction:

Sign	explain	Sign	explain
	Brand	40/110/56/B	Climate category / Passive Flammability Class
MKP67	Type		CQC Approval
Y1	Class		ENEC-SEMKO Approval
500~	Rated voltage		UL & CUL Approval
103K	Rated capacitance and tolerance	DP10001	Product traceability information

Taping specification for box-type capacitors

Outline Drawing

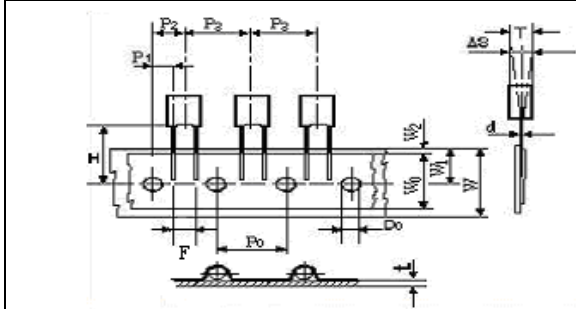


Fig. 1 P=5.0, 7.5mm

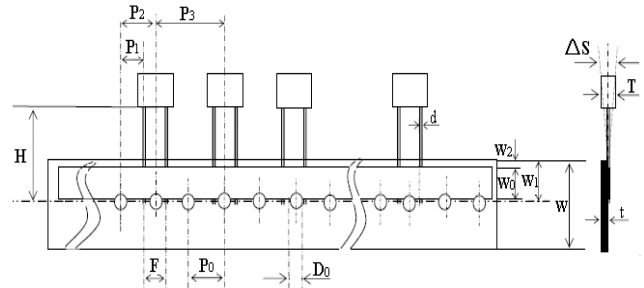


Fig. 2 P=10.0, 15.0mm

Taping Dimensions (mm)

Technology index title	Code	Dimensions				Tolerance
		P=5.0	P=7.5	P=10.0	P=15.0	
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	ΔS	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 position	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

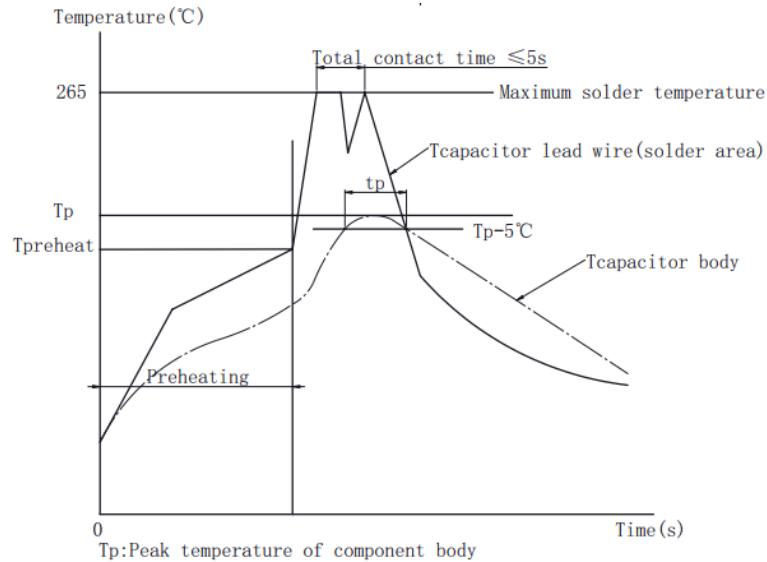
Note: * P₀=15mm is also available;
**F can be other lead spacing;
***H=16.5mm is available;

■ Soldering suggestions

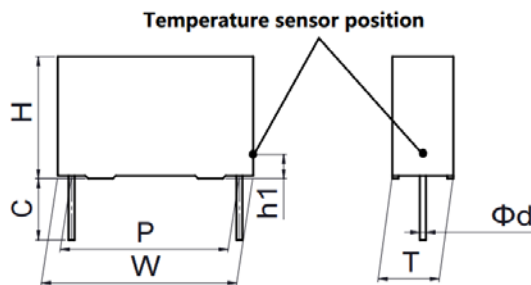
- ▲ Manual soldering
Max. temperature: 350°C, time: 3s
- ▲ Wave soldering

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.

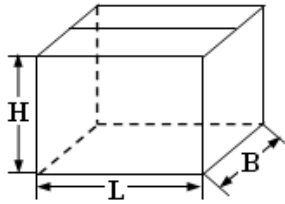


Note: If re-working or dipping twice is necessary, it should be done after the capacitor returns to the normal temperature.

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 (°C)	OPP film P≤15mm	OPP film P>15mm	PET film
	115	120	125
Maximum capacitor lead wire temperature (°C)	265	265	265
Maximum capacitor body heating time tp=Tp-5°C	30s		

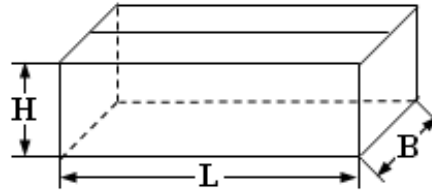
■ Packing box sizes(mm) (example)

1. Out packing box for bulk



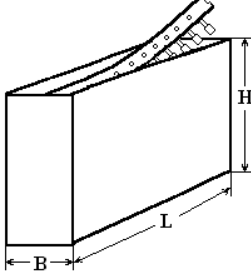
L:375±5
B:375±5
H:265±5

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 ° C to 35 ° C

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