### SPECIFICATION OF METALLIZED POLYESTER FILM CAPACITOR

( MPP TYPE )

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TEMPERATURE RANGE</td>
<td>-40°C ~ +85°C</td>
</tr>
<tr>
<td>2. RATED CAPACITANCE</td>
<td>0.0047 uF ~ 4.7 uF</td>
</tr>
<tr>
<td>3. CAPACITANCE TOLERANCE</td>
<td>J = ±5%, K = ±10%, M = ±20%</td>
</tr>
<tr>
<td>4. RATED VOLTAGE</td>
<td>100V, 250V, 400V, 630VDC</td>
</tr>
<tr>
<td>5. DIELECTRIC STRENGTH</td>
<td>R.V × 1.6 1 MINUTE</td>
</tr>
<tr>
<td>6. DISSIPATION FACTOR</td>
<td>0.1% MAX. AT 25°C, 1 KHZ</td>
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<tr>
<td>7. HIGH TEMPERATURE</td>
<td>85°C, NO VOLTAGE APPLIED</td>
</tr>
</tbody>
</table>
|                                      | \[
| \frac{\Delta C}{C} = -5\% \text{ MAX.}, DF < 0.2\% |
| 8. LOW TEMPERATURE                  | -40°C, NO VOLTAGE APPLIED |
|                                      | \[
| \frac{\Delta C}{C} = +5\% \text{ MAX.}, DF < 0.2\% |
| 9. HIGH TEMPERATURE LOADING        | 85°C, R.V. × 1.5, 1000 HRS. |
|                                      | \[
| \frac{\Delta C}{C} = -5\% \text{ MAX.}, DF < 0.2\% |
|                                      | IR > 30% OF INITIAL VALUE |
| 10. HUMIDITY                       | 40°C +2°C, 90 ~ 95% R.H. 96+ 4 HRS. |
|                                      | \[
| \frac{\Delta C}{C} = -3\% \text{ MAX. OF INITIAL VALUE} |
|                                      | IR > 30% OF INITIAL VALUE |
| 11. INSULATION RESISTANCE          | CHARGING RATED VOLTAGE OR LESS THAN 500VDC |
|                                      | (1) LESS THAN 0.1UF > 30,000MΩ |
|                                      | (2) MORE THAN 0.1UF > 10,000MΩ*UF |
1  GENERAL INFORMATION

1.1 APPLICATIONS:
THE TYPE MPP (METALLIZED POLYPROPYLENE) CAPACITORS, DUE TO
THEIR EXCELLENT CHARACTERISTICS HAVE A WIDE RANGE OF APPLICATIONS,
ESPECIALLY AT HIGH FREQUENCIES FOR RESONANT CIRCUITS, SWITCHING MODE
POWER SUPPLIES, LINE DEFLECTION SYSTEM, TEMPERATURE – STABILIZED
OSCILLATOR CIRCUITS.

1.2 OPERATING TEMPERATURE RANGE: -40°C ~ +85°C

1.3 STANDARD TESTING CONDITION:
TEMPERATURE: 25°C
HUMIDITY: 60 – 65% R.H.

2  CONSTRUCTIONS: (SHOWN AS FIG 1)

2.1 DIELECTRIC MATERIAL: POLYPROPYLENE FILM
2.2 ELECTRODE MATERIAL: VACUUM EVAPORATED ALUMINUM LAYER
2.3 OUTER COATING MATERIAL: EPOXY RESIN, FIRE RETARDANT ON REQUEST
2.4 TERMINAL MATERIAL: SOLDER-PLATED COPPER-CLAD STEEL WIRE
2.5 TERMINAL CONTACT: ELECTRICALLY WELDED
2.6 NON-INDUCTIVE WOUND

- TWO LAYERS OF METAL ARE SPRAYED ON EACH END TO ENSURE GOOD, LASTING CONTACT TO EVERY LAYER.
- LEAD CAREFULLY SPOT-WELDED TO END PLATE FOR STABILITY AND LOW INDUCTANCE
- ALUMINIUM ELECTRODES
- PLASTIC FILM
- EPOXY RESIN COATING UL FILE NO.E154421
- LEAD WIRE
3 EXPLANATION OF IMPORTANT TERMINOLOGY
3.1 RATED CAPACITANCE
THE RATED CAPACITANCE VALUE IN PICOFARADS IS EXPRESSED BY A THREE DIGIT NUMBER. THE FIRST TWO DIGITS ARE SIGNIFICANT FIGURES AND THE LAST DIGIT SPECIFIES THE NUMBER OF ZEROS TO FOLLOW.

EXAMPLE: 473 INDICATED 47000 PF OR 0.047 UF
154 INDICATED 150000 PF OR 0.15 UF
105 INDICATED 1000000 PF OR 1.0 UF

3.2 CAPACITANCE TOLERANCE
THE TOLERANCE IS THE PERMISSIBLE ACTUAL, CAPACITANCE RELATIVE TO THE RATED CAPACITANCE AND IT IS DEFINED IN PERCENT. SYMBOL OF TOLERANCE SHOWN AS TABLE II.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>TOLERANCE</th>
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<tbody>
<tr>
<td>F</td>
<td>± 1%</td>
</tr>
<tr>
<td>J</td>
<td>± 5%</td>
</tr>
<tr>
<td>M</td>
<td>± 20%</td>
</tr>
<tr>
<td>G</td>
<td>± 2%</td>
</tr>
<tr>
<td>K</td>
<td>± 10%</td>
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3.3 RATED VOLTAGE
EACH CAPACITOR IS DESIGNED FOR A SPECIFIED RATED VOLTAGE WHICH IT HAS TO STAND IN CONTINUOUS OPERATION WITHOUT DAMAGE. THIS IS USUALLY ONLY VALID FOR AMBIENT TEMPERATURES OF \( \leq +85^\circ C \). IN THE CASE OF HIGHER TEMPERATURES A DERATING FACTOR MUST BE APPLIED TO THE RATED VOLTAGE AT 85^\circ C.

3.4 DISSIPATION FACTOR:
THE DISSIPATION FACTOR \( \tan \delta \) IS THE QUOTIENT OF THE RESISTIVE AND REACTIVE PARTS OF THE IMPEDANCE. THE a.c. DIELECTRIC LOSSES ARE ILLUSTRATED BY \( R \) IN THE EQUIVALENT CIRCUIT DIAGRAM. THE INSULATION RESISTANCE \( R_{is} \) IS IN PARALLEL WITH \( R \), AND AFFECTS THE \( \tan \delta \) ONLY AT VERY LOW FREQUENCIES. THE DISSIPATION FACTOR IS ALSO AFFECTED BY THE RESISTANCE OF BOTH ELECTRODES AND OF THE TERMINATION ELECTRODE INTERFACE. THIS IS REPRESENTED BY THE SERIES RESISTANCE \( r \).

EQUIVALENT CIRCUIT SHOWN AS FIG II.
3.5 Insulation Resistance / Time Constant
The insulation resistance is normally expressed in MΩ and is measured at a specified voltage after 1 minute.
The time constant defines the time in seconds, in which the voltage across the capacitor self-discharges to 37% of the fully charged state and it is expressed as $\tau = IR \times C$.
The insulation resistance or time constant value denotes the quality of the dielectric insulation.

3.6 Self-healing
All metallized plastic film capacitor manufacture by self-healing the electric arc, which occurs with voltage breakdown of the dielectric, evaporates the metallization the area of the breakdown without impairing the dielectric, this result in effectively isolating the region of the failure.
The time necessary for the self-healing process is less than 10 µsec since only fraction of the energy stored in the capacitor are dissipated in the self-healing process, the potential drop remains accordingly low. The capacitor design ensure that self-healing processes occur only occasionally, even when the parameters of continuous maximum voltage and maximum limit temperature apply.
The self-healing characteristics is independent of maintaining the specified limit condition, and can even be effective at low voltage rating where electrochemical action takes precedence.

4 Electrical Testing Methods:
4.1 Capacitance:
Testing Frequency: 1 KHz ± 200Hz
Testing Voltage: 1 ~ 5 VRMS

4.2 Dissipation Factor: Same as 4.1, DF shall be less than 0.1 %

4.3 Dielectric Strength at 25 °C
Tested at 160 % of rated voltage for 60 seconds through a limiting resistor of at least 1 ohm per volt.

4.4 Insulation Resistance (I.R.) at 25 °C
I.R. shall be measured at rated voltage or less than 500VDC with a charging time of 60 seconds.
And at 25 °C. The result shall be meet the requirement table I.
5 MECHANICAL TESTING METHODS:

5.1 LEAD TENSILE STRENGTH:
WITHSTANDS 2.2 LBS. OF STEADY PULL APPLIED RADIALY TO THE LEAD WIRE FOR 5 SECS.

5.2 LEAD BENDING STRENGTH:
1.1 LBS. LOAD IS APPLIED TO THE LEADS. THE BODY OF CAPACITOR IS BENT 90 DEGREES AND RETURNED TO ITS ORIGINAL POSITION. AFTER THE TEST NO LOOSENING OR BREAKING OF THE TERMINAL SHOULD BE FOUND.

5.3 SOLDERABILITY:
THE LEAD WIRE IS IMMERSED UP TO 0.155” ± 0.030” FROM THE ROOT OF THE TERMINAL INTO THE SOLDER BATH AT 230 ± 5°C FOR 2 ± 0.5 SEC. SOLDER SHOULD COVER AT LEAST 75% OF THE CIRCUMFERENCE OF THE LEAD. THE DIPPING SPEED INTO, AND RAISING SPEED FROM THE MOLTEN SOLDER SHALL BE 25 ± 6 MM/SEC. (SHOWN AS FIG III)

![Diagram of solderability test](attachment:image)

5.4 HEAT SHOCK:
THE LEAD OF CAPACITOR IS IMMERSED INTO THE SOLDER BATH AT 260 ± 5°C FOR 5 ± 5 SEC. THE DIPPING SPEED INTO, AND RAISING SPEED FROM THE MOLTEN SOLDER SHALL BE 25 ± 6 MM/SEC. (SHOWN AS FIG III)

5.5 VIBRATION (SHOWN AS FIG IV)
WHEN THE CAPACITOR IS SUBJECTED TO THE VIBRATION TEST SPECIFIED BY THE VARIABLE FREQUENCY CYCLE, 1 MINUTE PER CYCLE FROM 10 HZ TO 55 HZ AND THEN 10 HZ WITH AN AMPLITUDE OF 1.5MM IN THREE DIRECTIONS (VERTICAL, HORIZONTAL AND LATERAL) FOR 2 HOURS EACH WITH A TOTAL OF 6 HOURS. AFTER THIS, INSPECT SHALL SATISFY THE INITIAL REQUIREMENT.
THE CAPACITOR SHALL BE MOUNTED BY THE FOLLOWING METHODS:
THE CAPACITOR LEAD WIRES SHALL BE INSERTED VERTICALLY AS DEEP AS THEIR ROOT INTO A COPPER-FOILED LAMINATED BOARD FOR PRINTED CIRCUIT BOARD SHOWN AS FIG 1, AND THE LEAD WIRE SHALL BE SOLDERED TO THE COPPER FOIL. THEN, THE COPPER FOILED LAMINATED BOARD WITH THE CAPACITOR SHALL BE RICIDLY FIXED TO THE VIBRATION TEST PLATE.

6 WEATHERABILITY TESTING METHODS

6.1 HIGH TEMPERATURE
PLACE THE CAPACITOR IN A THERMOSTATIC OVEN KEPT AT 85°C, AFTER REACHING THE THERMAL STABILITY, THE RESULT OF MEASUREMENT SHALL SATISFY THE REQUIREMENT GIVEN IN FOLLOWING ITEM:
6.1.1 CAPACITANCE DRIFT: THE RATE - 5% OF INITIAL VALUE.
6.1.2 DISSIPATION FACTOR: LESS THAN 0.2% AT 1 KHZ.

6.2 LOW TEMPERATURE
PLACE THE CAPACITOR IN A THERMOSTATIC OVEN KEPT AT -40°C, AFTER REACHING THE THERMAL STABILITY, THE RESULT OF MEASUREMENT SHALL SATISFY THE REQUIREMENT GIVEN IN FOLLOWING ITEM:
6.2.1 CAPACITANCE DRIFT: +5% MAX. OF INITIAL VALUE.
6.2.2 DISSIPATION FACTOR: LESS THAN 0.2% AT 1 KHZ.

6.3 HIGH TEMPERATURE LOADING
PLACE THE CAPACITOR IN A THERMOSTATIC OVEN KEPT AT +85°C FOR 1 HOUR, AND THEN APPLIED 150% OF THE RATED VOLTAGE FOR 1000 HOUR. AFTER THIS, TAKE OUT THE CAPACITOR FROM THE THERMOSTATIC OVEN FOR 1 TO 2 HOURS. THE RESULT OF MEASUREMENT SHALL SATISFY THE REQUIREMENT GIVEN IN FOLLOWING ITEM:
6.3.1 CAPACITANCE DRIFT: +5% MAX. OF INITIAL VALUE.
   i. DISSIPATION FACTOR: LESS THAN 0.2% AT 1 KHZ.
   ii. INSULATION RESISTANCE: OVER THAN 30% OF INITIAL VALUE.
6.4 HUMIDITY
PLACE THE CAPACITOR IN A THERMOSTATIC OVEN KEPT AT TEMPERATURE 40 ± 2 °C AND HUMIDITY 95 ± 2 % FOR 96 ± 4 HRS. AFTER THIS, TAKE OUT THE CAPACITOR FROM THE THERMOSTATIC OVEN FOR 16 HRS. THE RESULT OF MEASUREMENT SHALL SATISFY THE REQUIREMENT GIVEN IN FOLLOWING ITEM:
6.4.1 CAPACITANCE DRIFT: ± 3 % MAX. OF INITIAL VALUE.
6.4.2 INSULATION RESISTANCE: OVER THAN 30 % OF INITIAL VALUE.
6.4.3 DISSIPATION FACTOR: LESS THAN 0.2%

7 MARKING
7.1 MARKING ON INDIVIDUAL CAPACITOR INCLUDES: (SHOWN AS FIG. V)
7.1.1 RATED CAPACITANCE: SUCH AS 223, 154 OR 105 IN PF OR UF
7.1.2 RATED VOLTAGE: SUCH AS 100V, 250V, 630V IN DC
7.1.3 CAPACITANCE TOLERANCE: SUCH AS J, K OR M
7.1.4 MANUFACTURER’S SYMBOL:

7.2 MARKING ON PACKAGE
EACH PACKAGE UNIT SHALL CARRY THE TYPE, RATING, QUANTITY AND DATE OF MANUFACTURE, LOCATION OF MANUFACTURE, AND THE MANUFACTURER’S NAME.

RATED CAPACITANCE  
\[224 \text{ K} \]
\[400 \text{ V} \]
CAPACITANCE TOLERANCE
RATED VOLTAGE

8 PACKING
THE CAPACITOR SHALL BE CAREFULLY PACKED TO PREVENT DAMAGE OWING TO MOISTURE ABSORPTION, VIBRATION OR IMPACT DURING STORAGE

9 ACCEPTABLE QUALITY LEVEL
THE ACCEPTABLE QUALITY LEVEL IS SPECIFIED AS FOLLOWING:
9.1 APPEARANCE AQL: 4.0
9.2 DIMENSION AQL: 1.5
9.3 MECHANICAL CHARACTERISTICS AQL: 1.5
9.4 ELECTRICAL CHARACTERISTICS INCLUDES C, IR, WV, DF AND ECT. AQL: 1.0
10 DIMENSION
TYPE: MPP

METALLIZED POLYPROPYLENE FILM CAPACITOR (COATING)

■ OUTLINE DRAWING

![Diagram showing the dimensions of the capacitor]

尺寸 DIMENSION:

<table>
<thead>
<tr>
<th>CAPACITANCE</th>
<th>250VDC</th>
<th>400VDC</th>
<th>630VDC</th>
</tr>
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<tbody>
<tr>
<td>SYMBO</td>
<td>uF</td>
<td>W</td>
<td>H</td>
</tr>
<tr>
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<tr>
<td>274</td>
<td>0.27</td>
<td>31.0</td>
<td>20.0</td>
</tr>
</tbody>
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可依需求制作特殊规格（SPECIAL SIZE OR ITEMS ON REQUEST）