



MKP-X2-X SERIES

AEC-Q200 ▲ X2 ▲ RFI CAPACITOR

METALLIZED POLYPROPYLENE CAPACITOR ▲ THT type

In accordance with UL, CUL ENEC, CQC safety regulations

Flame retardant plastic case, epoxy resin sealed, UL 94V-0

Self-healing property

Radio Frequency Interference RFI capacitor ▲ Safety class X2

Automotive ▲ **AEC-200 qualified**




SPECIFICATION

Item		Characteristics		
Related Documents		UL 60384–14:2014, CAN/CAS-E60384-14:2014 IEC60384–14:2013, EN60384–14:2013, GB/T 6346.14–2015, AEC-Q200		
Rated Temperature Range		-40°C to +110°C		
Capacitance Range	C _R	0.1μF to 2.2μF		
Capacitance Tolerance	ΔC	±10% ▲ ±20%		
Rated Voltage	V _{R AC}	250V _{AC} to 310V _{AC}		
Insulation Resistance	R _{INS}	Terminal to Terminal	Terminal to Enclosure	
		≥ 15GΩ at 100V _{DC} (C _R ≤ 0.33μF)	≥ 30GΩ at 100V _{DC}	
		≥ 5GΩ × μF at 100V _{DC} (C _R > 0.33μF)	≥ 0.5GΩ at 500V _{DC}	
Dissipation Factor ^{Note 1}	tan δ	0.1% or less		
Permissible DC Voltage	V _{DC}	630V _{DC}		
Withstand Voltage	V _W	Between Terminal	1800V _{DC} for 3 sec	
		Between Terminal and Enclosure	2110V _{AC} for 1 min	
		Nothing abnormal shall be found		
Maximum Pulse Rise Slope dV/dt	Pitch (mm)	15.0mm	22.5mm	27.5mm
	630V _{DC}	300V/μs	180V/μs	120V/μs

Note:

1: Measured at 1kHz, 20±5°C

APPLICATIONS

Automotive	Across the Line Filter	Antenna Coupling	Interference Suppressors
			

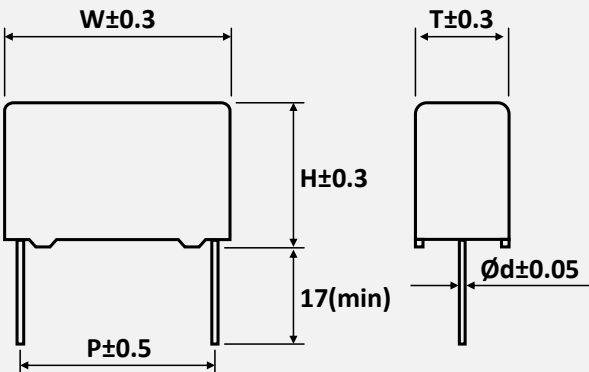
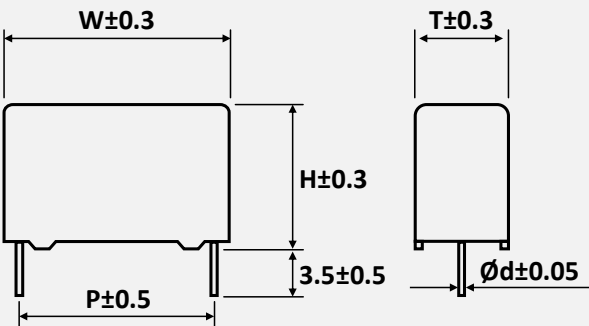
ELECTRICAL CHARACTERISTICS

V_{RAC}	C_R (μF)	Dimensions (mm)					$\tan\delta$ (%) ^{Note 1}	Part Number ^{Note 2}
		W	H	T	P	ϕd		
305V _{AC}	0.1	18	12	6	15.0	0.8	0.10	MKP-104□0305AB115□-X
	0.12	18	12	6	15.0	0.8	0.10	MKP-124□0305AB115□-X
	0.15	18	13.5	7.5	15.0	0.8	0.10	MKP-154□0305AB115□-X
	0.18	18	13.5	7.5	15.0	0.8	0.10	MKP-184□0305AB115□-X
	0.22	18	14	8	15.0	0.8	0.10	MKP-224□0305AB115□-X
	0.27	18	15	9	15.0	0.8	0.10	MKP-274□0305AB115□-X
	0.33	18	16	10	15.0	0.8	0.10	MKP-334□0305AB115□-X
	0.39	18	19	10	15.0	0.8	0.10	MKP-394□0305AB115□-X
	0.47	18	19	11	15.0	0.8	0.10	MKP-474□0305AB115□-X
	0.56	18	21	12	15.0	0.8	0.10	MKP-564□0305AB115□-X
	0.15	26	14.5	6	22.5	0.8	0.10	MKP-154□0305AB122□-X
	0.18	26	14.5	6	22.5	0.8	0.10	MKP-184□0305AB122□-X
	0.22	26	14.5	6	22.5	0.8	0.10	MKP-224□0305AB122□-X
	0.27	26	16.5	7	22.5	0.8	0.10	MKP-274□0305AB122□-X
	0.33	26	17	8.5	22.5	0.8	0.10	MKP-334□0305AB122□-X
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	0.47	26	19	10	22.5	0.8	0.10	MKP-474□0305AB122□-X
	0.56	26	19	10	22.5	0.8	0.10	MKP-564□0305AB122□-X
	0.68	26	18.5	10	22.5	0.8	0.10	MKP-684□0305AB122□-X
	0.82	26	20	11	22.5	0.8	0.10	MKP-824□0305AB122□-X
	1	26	22	12	22.5	0.8	0.10	MKP-105□0305AB122□-X
	0.47	31	18	9	27.5	0.8	0.10	MKP-474□0305AB127□-X
	0.56	31	20	10	27.5	0.8	0.10	MKP-564□0305AB127□-X
	0.68	31	20	10	27.5	0.8	0.10	MKP-684□0305AB127□-X
	0.82	31	20	11	27.5	0.8	0.10	MKP-824□0305AB127□-X
	1	31	20	11	27.5	0.8	0.10	MKP-105□0305AB127□-X
	1.5	31	23.5	14	27.5	0.8	0.10	MKP-155□0305AB127□-X
	2.2	31	26	18	27.5	0.8	0.10	MKP-225□0305AB127□-X

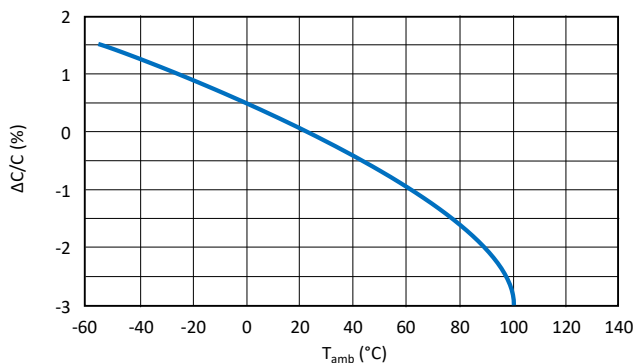
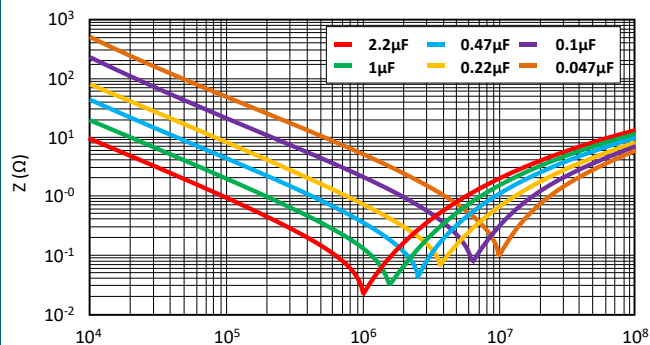
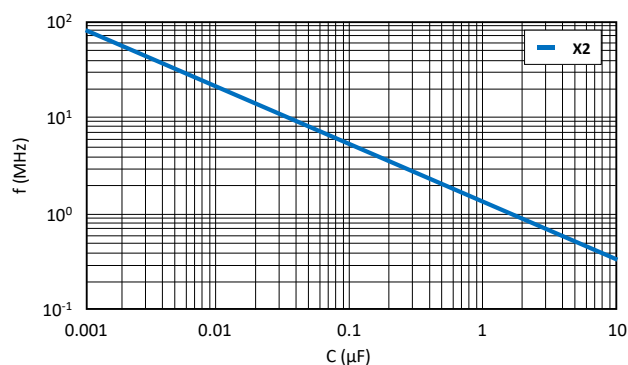
Notes

- 1 Measured at 1kHz, 20°C
- 2 Enter the appropriate tolerance and lead length code □ from the product code table

PACKAGE OUTLINE ▲ All dimensions in mm

Long Leads	Short Leads
 <p>Diagram showing dimensions for Long Leads package: W±0.3, H±0.3, T±0.3, P±0.5, and 17(min) for lead length. Hole diameter is $\phi d \pm 0.05$.</p>	 <p>Diagram showing dimensions for Short Leads package: W±0.3, H±0.3, T±0.3, P±0.5, and 3.5±0.5 for lead length. Hole diameter is $\phi d \pm 0.05$.</p>

REFERENCE DATA

Fig. 1 • Capacitance Drift vs. Ambient Temperature

Fig. 2 • Impedance vs. Frequency • $V_{RAC} = 310V$

Fig. 3 • Resonant Frequency vs. Capacitance


PRODUCT CODE

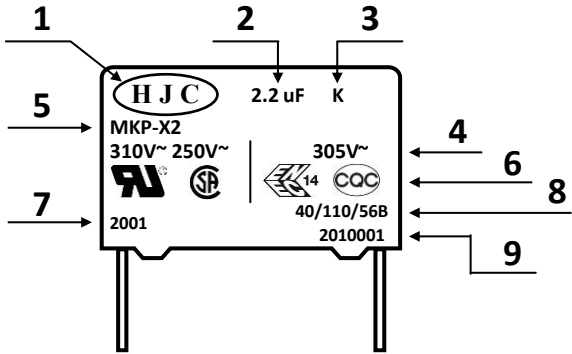
Example: MKP-X2-X (AEC-Q200) series ▲ 0.47 μF ▲ 305V_{AC} ▲ $\pm 10\%$ ▲ P=22.5mm ▲ Bulk ▲ Straight leads ▲ 17mm lead length

MKP-		474		K		0305		A		B		1		22		1		-X	
Series		Capacitance Code ^{Note 1} (pF)		Capacitance Tolerance (%)		Rated Voltage (V _{AC})		Voltage Type		Packaging Type		Lead Configuration ^{Note 2}		Pitch (mm)		Lead Length (mm) ^{Note 3}		Special Remark ^{Note 4}	
Code	Series	Code	μF	Code	Tol.	Code	VAC	Code	Type	Code	Type	Code	Style	Code	mm	Code	mm	Code	Type
MKP	MKP	104	0.1	K	±10	0305	305	A	AC	B	Bulk	1	SL	15	15.0	1	17.0	-X	See Note 4
		224	0.22	M	±20									22	22.5	2	3.5		
		105	1.0											27	27.5				
		155	1.5																
		225	2.2																

Notes:

- Capacitance code expressed in pF. The first two digits represent significant figures. The last digit specifies the total number of zeros to be added.
- SL = Straight leads, for other lead configuration consult MGT please.
- For other lead length consult MGT please.
- X = Automotive, AEC-Q200 qualified version

PRODUCT MARKING

Marking	Details
	No.
	Description
	1 Manufacturer Logo
	2 Nominal capacitance in μF
	3 Capacitance tolerance
	4 AC rated voltage
	5 Series name
	6 Safety standard approvals
	7 Date code
	8 Application category
	9 Lot number

DATE CODE & APPLICATION CATEGORY

Example:

Date code

2001: 2001 = 1st week of 2020

Application category

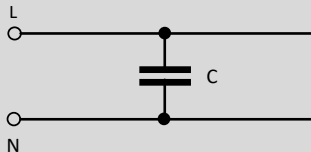
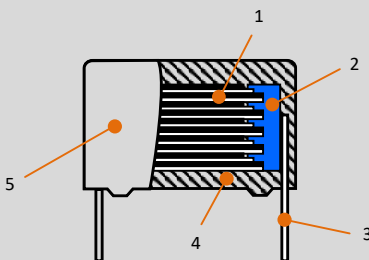
40/110/56B: 40 = Minimum temperature (-40°C)
110 = Maximum temperature ($+110^{\circ}\text{C}$)
56 = Days of damp heat test
B = Category of passive flammability

Lot number

2010001: 20 = Year, here 2020
1 = Month, here January
0001 to XXXX = Serial number

20		01	
Year		Week	
19	2019	01	1 st
20	2020	02	2 nd
21	2021	03	3 rd
22	2022	04	4 th
23	2023	05	5 th
...
30	2030	53	53 rd

TECHNICAL SPECIFICATION

No.	Category	Specification										
1	Scope	<p>This specification covers the requirement for metallized polypropylene dielectric fixed capacitor.</p> <p>Typical applications: Interference suppression and << across-the-line >> applications</p> <p>Reference standards: AEC-Q200</p> 										
2	Product Name	Metallized polypropylene film capacitor, Type MKP										
3	Product Range	<table><tr><td>Operating temperature range:</td><td>-40°C to +110°C (including temperature rise on unit surface)</td></tr><tr><td>Rated AC voltage (50/60Hz)</td><td>250V_{AC} to 310V_{AC} (630V_{DC} max.)</td></tr><tr><td>Capacitance range:</td><td>Refer to the individual drawing</td></tr><tr><td>Capacitance tolerance:</td><td>Refer to the individual drawing</td></tr></table>	Operating temperature range:	-40°C to +110°C (including temperature rise on unit surface)	Rated AC voltage (50/60Hz)	250V _{AC} to 310V _{AC} (630V _{DC} max.)	Capacitance range:	Refer to the individual drawing	Capacitance tolerance:	Refer to the individual drawing		
Operating temperature range:	-40°C to +110°C (including temperature rise on unit surface)											
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Capacitance range:	Refer to the individual drawing											
Capacitance tolerance:	Refer to the individual drawing											
4	Appearance	<table><tr><td>1. Marking shall be legible in the right place.</td></tr><tr><td>2. Plating of lead wire shall be perfect without rust.</td></tr><tr><td>3. Coating shall be without any crack, rent, pinhole etc.</td></tr></table>	1. Marking shall be legible in the right place.	2. Plating of lead wire shall be perfect without rust.	3. Coating shall be without any crack, rent, pinhole etc.							
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2. Plating of lead wire shall be perfect without rust.												
3. Coating shall be without any crack, rent, pinhole etc.												
5	Construction	<p>The capacitor has a non-inductive construction, wound with metallized polypropylene film dielectric. The capacitor is enclosed in flame retardation plastic case, filled with flame retardation filling resin, and has two leads.</p>  <table><tr><td>1 = Element</td><td>Metallized Polypropylene film</td></tr><tr><td>2 = Metal spray</td><td>Special solder. (Lead Free) compliant to RoHS directive</td></tr><tr><td>3 = Lead wire</td><td>Tinned wire. (Lead Free) compliant to RoHS directive</td></tr><tr><td>4 = Inner coating</td><td>Epoxy resin filled. (UL-94V-0 Standard)</td></tr><tr><td>5 = Outer coating</td><td>Plastic case. (UL-94V-0 Standard)</td></tr></table>	1 = Element	Metallized Polypropylene film	2 = Metal spray	Special solder. (Lead Free) compliant to RoHS directive	3 = Lead wire	Tinned wire. (Lead Free) compliant to RoHS directive	4 = Inner coating	Epoxy resin filled. (UL-94V-0 Standard)	5 = Outer coating	Plastic case. (UL-94V-0 Standard)
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5 = Outer coating	Plastic case. (UL-94V-0 Standard)											
6	Dimensions	As specified in the individual drawing.										
7	Conditional Standard Test	<p>The test shall be conducted at a temperature of from 15°C to 35°C, a humidity of from 45% to 75%.</p> <p>However, the test shall be conducted at a temperature of 20±5°C, a humidity of 65±5% when doubt is entertained about judgment.</p>										

TECHNICAL SPECIFICATION

No.	Category	Specification			
8	Character	Test Item	Conditions		Performance
		Voltage proof (IEC60384-14, 4.2.1)	Between terminals		Nothing abnormal shall be found.
			Applied voltage	1800V _{DC} for 3sec	
			Cut-off current	10mA DC	
			Ramp / rise time	C ≤ 2.2μF: 5sec	
				2.2 < C ≤ 10μF: 10sec	
			Between terminals and enclosure		
			Applied voltage	2110V _{AC} for 1min	
			The capacitor shall be applied the voltage through a resistor of 2kΩ or more when charge and discharge.		
		Insulation resistance (IEC60384-14, 4.2.5)	Between terminals		Within the limits stated under conditions.
			15GΩ or more	When C ≤ 0.33μF at 100V _{DC}	
			5GΩ × μF or more	When C > 0.33μF at 100V _{DC}	
			2GΩ × μF or more	When C > 0.33μF at 500V _{DC}	
			Between terminals and enclosure		
			30GΩ or more	at 100V _{DC}	
			0.5GΩ or more	at 500V _{DC}	
When the reading of measuring instrument becomes steady at a value after a voltage of 100±15V _{DC} or 500±50V _{DC} is applied for 1 minute ±5 seconds. Ambient temperature at 20°C.					
Capacitance (IEC60384-14, 4.2.2)	Measured at a frequency of 1 ± 0.2kHz, at 20 °C, 1V _{RMS} .		Within a range of specified value		
Dissipation factor (IEC60384-14, 4.2.3)	Measured at a frequency of 1 ± 0.2kHz, at 20 °C, 1V _{RMS} .		0.1% or less.		

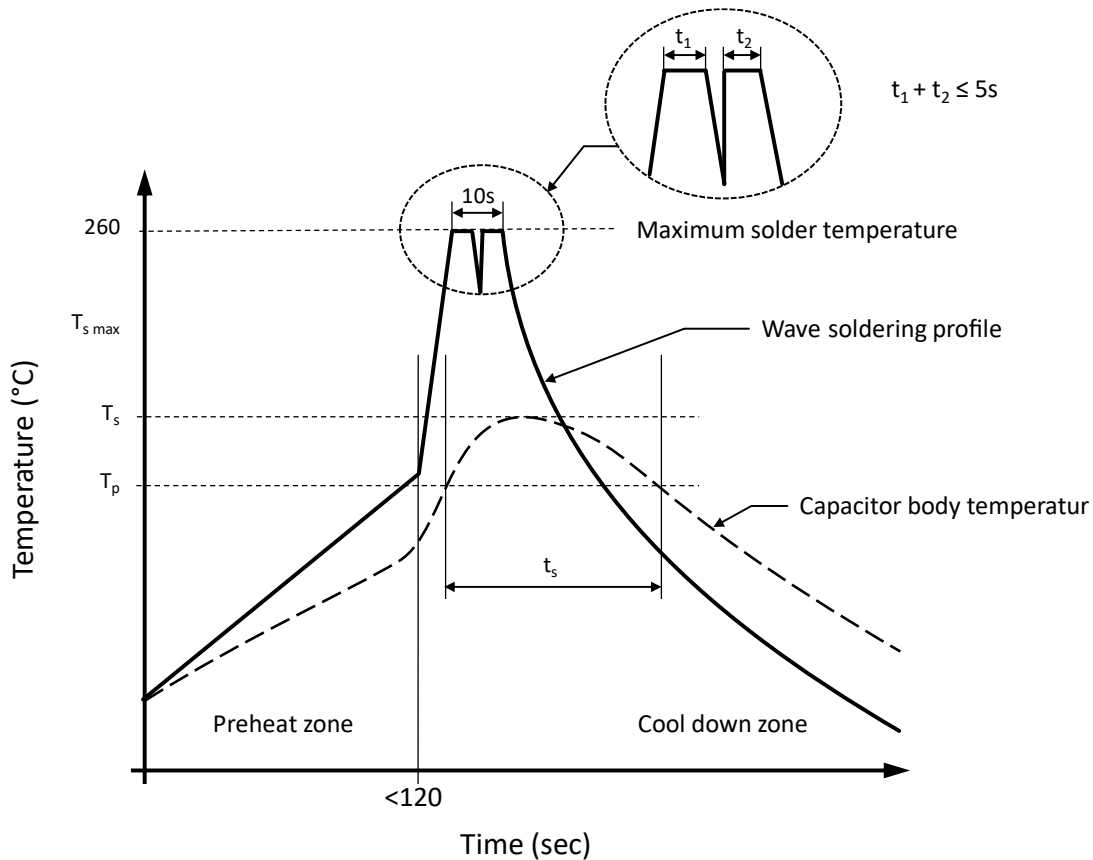
TECHNICAL SPECIFICATION

No.	Category	Specification		
9	Endurance Characteristics	Test Item	Conditions	Performance
		Temperature Cycling (JESD22 Method JA-104)	1000 cycles (- 55°C to 110°C) Note: If 85°C or 125°C part the 1000 cycles will be at that temperature rating measurement at 24±2 hours after test conclusion. 30min. maximum dwell time at each temperature extreme. 1min. maximum transition time	$\Delta C/C \leq 10\%$ $\Delta DF \leq 50 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Biased Humidity (MIL-STD-202 Method 103)	1000 hours; 40°C/93%RH. Rated Voltage Measurement at 24±2 hours after test conclusion.	$\Delta C/C \leq 10\%$ $\Delta DF \leq 80 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Mechanical Shock (MIL-STD-202 Method 213)	Figure 1 of Method 213. Condition C (100g PK Sawtooth)	No deformation, cracks, or other Abnormalities. Capacitor pin cannot be interrupted
		High Temperature Exposure (Storage) (MIL-STD-202 Method 108)	1000 hrs at rated operating temperature (e.g., 85°C. part can be stored for 1000 hrs at 85°C. Same applies for 100°C & 125°C parts.). Unpowered. Measurement at 24±4 hours after test conclusion.	$\Delta C/C \leq 10\%$ $\Delta DF \leq 50 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Moisture Resistance (MIL-STD-202 Method 106)	t = 24 hours/cycle. Note: Steps 7a & 7b not required. Unpowered. Measurement at 24±2 hours after test conclusion.	$\Delta C/C \leq 5\%$ $\Delta DF \leq 50 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Operational Life (MIL-STD-202 Method 108)	1000 hours $T_A=85^\circ\text{C}$, Note: Condition D (1000 hrs) If 100°C or 125°C the 1000 hours will be at that temperature. Metallized Film: 125% of rated voltage at 85°C. 100% of rated voltage above 85°C. Measurement at 24±2 hours after test conclusion.	$\Delta C/C \leq 10\%$ $\Delta DF \leq 50 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Terminal Strength (Leaded) (MIL-STD-202 Method 211)	Test leaded device lead integrity only. Conditions: A (2.27 kg)	No remarkable change Capacitor pin cannot be interrupted
		Resistance to Solvents (MIL-STD-202 Method 215)	Note: Also, aqueous wash chemical - OKEM clean or	No remarkable change
		Vibration (MIL-STD-202 Method 204)	5g's for 20 minutes, 12 cycles each of 3 orientations Use 8"X5" PCB, .031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test, from 10-2000 Hz	$\Delta C/C \leq 5\%$ $\Delta DF \leq 50 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Resistance to Soldering Heat (MIL-STD-202 Method 210)	Solder bath: 260 °C ± 5 °C Immersion time: 10±0.5sec	$\Delta C/C \leq 3\%$ $\Delta DF \leq 50 \times 10^{-4}$ at 1KDF $IR \geq 50\%$ of limit value
		Solderability (J-STD-002)	Solder bath: 245 °C ± 5 °C Immersion time: 2±0.5sec Visual examination	At least 95% of the circumferential face of lead wire up to immersed level shall be covered with new solder
		Flammability (UL-94)	V-0 or V-1 are acceptable. Electrical Test not required	V-0

TECHNICAL SPECIFICATION

No.	Category	Specification			
10	Approved Standard	Agency	Country	Conditions	File Number
		UL	USA	UL60384-14:2014; CAN/CSA E60384-1/14:2014 MKP 0.0047~10.0μF 310V _{AC} , 40/110/56/B	E149075-20170803
		CSA	Canada	CAN/CSA-E 60384-14 MKP 0.0047~10.0μF 310V _{AC} , 40/110/56/B	2294211
		ENEC	Semko	IEC 60384-14 MKP 0.0047~10.0μF 310V _{AC} , 40/110/56/B	SE-ENEC-2002895
		CB	Semko	EN 60384-14 MKP 0.0047~10.0μF 310V _{AC} , 40/110/56/B	SE-103415
		CQC	China	GB/T6346.14-2015 MKP 0.0047~10.0μF 310V _{AC} , 40/110/56/B	CQC09001029854
		The ENEC mark was accepted in all European countries			
11	Rated Voltage Pulse Slope dV/dt at 630V _{DC}	Pitch	15mm	22.5mm	27.5mm
		dV/dt	300V/μs	180V/μs	120V/μs
12	Storage Conditions	It should be noted that the solderability of the terminals may be deteriorated when stored barely in an atmosphere for a long period.			
		It should not be in particularly high temperature and high humidity, it must submit to the following conditions (Keeping in the original package) Temperature: 5°C to 35°C Relative humidity: ≤ 70% Storage period: ≤ 12 months (Following the manufacturing date marked on the label in package bag)			
		Avoid wetting the capacitor by water, oil, salt and/or poisonous gas.			
		If used the capacitor that overdue the storage time, it should be test, the characteristics of the capacitor or contact with our technical engineer.			

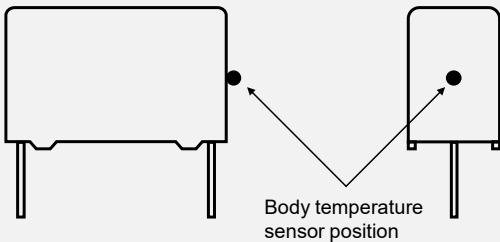
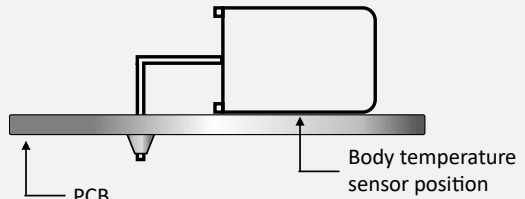
RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



Capacitor body temperature should follow the description below:

Profile Features		Polypropylene Film Capacitor	Polyester Film Capacitor
Capacitor body maximum temperature at preheating	T_p	$\leq 110^\circ\text{C} / 120 \text{ seconds}$	$\leq 125^\circ\text{C} / 120 \text{ seconds}$
Capacitor body maximum temperature at wave soldering	T_s	$\leq 120^\circ\text{C} / t_s \leq 45 \text{ seconds}$	$\leq 150^\circ\text{C} / t_s \leq 45 \text{ seconds}$

DETERMINING THE CAPACITOR BODY TEMPERATURE

Vertical Mounting	Horizontal Mounting
 <p>Body temperature sensor position</p> <p>The body temperature sensor position is defined as the highest temperature point around the capacitor body.</p>	 <p>PCB</p> <p>Body temperature sensor position</p> <p>If there is 90 degree bending product, the sensor position shall between product and PCB</p>

SOLDERING SUGGESTIONS

When solder a capacitor, heat in soldering is conducted to the element of the capacitor from wire lead and an enclosure, and hence it should be noted that soldering under high temperature and a long period may cause deterioration of breakdown of capacitors. Be sure to solder within the recommended temperature condition range.

HAND SOLDERING

- a.) Soldering iron top temperature: $\leq 350^{\circ}\text{C}$
- b.) Soldering time: $\leq 3\text{sec}$

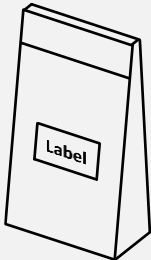
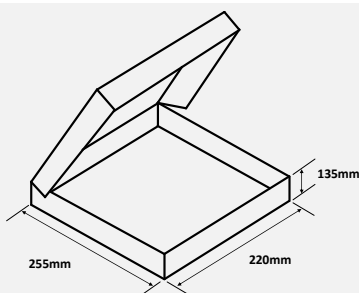
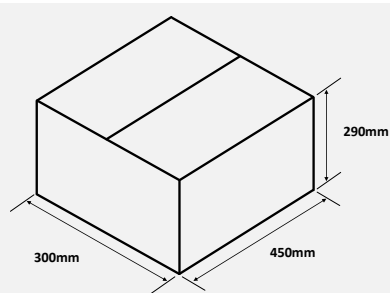
If re-work or dipping twice in necessary, it should be done after the capacitor returned to the normal temperature. Suggestion time is 24 hours.

THT film capacitors are not suitable for reflow soldering.

When SMD components are used together with film capacitor, the film capacitor should not pass into the SMD adhesive curing oven. The film capacitor should be assembled after the SMD process.

To ensure proper conditions for manual or selective soldering, the body (surface) temperature of the film capacitor (T_s) must be $\leq 120^{\circ}\text{C}$.

PACKAGING

Bag	Container	Carton
		
<p>Label with</p> <ol style="list-style-type: none"> 1. Manufacturer name 2. Capacitor type 3. Part number 4. Quantity 5. Package 	<p>4 containers per carton</p>	<p>Outside details of the carton</p> <ol style="list-style-type: none"> 1. Customer name 2. Capacitor type 3. Capacitor specification 4. Part number 5. Quantity

REVISION TABLE

Revision	Date	Status	Notes
001	01/10/2021	Initial release	Initial publication

DISCLAIMER

Except for the written expressed warranties, MGT does not implicitly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any MGT product.

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It is subject to the user's duty of care to design and validate his products in such a way that appropriate measures are taken, such as protective circuits or redundant systems to ensure the safety standards required in the application.

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