

Y2X1 SERIES

Y2/X1 ▲ RFI CAPACITOR

METALLIZED POLYPROPYLENE CAPACITOR ▲ THT type

In accordance with CB, UL, CUL, ENEC, CQC safety regulations

AEC-Q200 on request, contact MGT for more details

Self-healing property

Radio Frequency Interference capacitor ▲ Safety class Y2 or X1

For across the line and line to ground applications






SPECIFICATION

Item		Characteristics		
Related Documents		UL 60384–14, EN60384–14:2013, IEC60384–14		
Rated Temperature Range		-40°C to +110°C		
Capacitance Range	C _R	0.001μF to 0.022μF		
Capacitance Tolerance	ΔC	±10% ▲ ±20%		
Rated Voltage	V _{R AC}	300V _{AC}		
Insulation Resistance	R _{INS}	Terminal to Terminal	Terminal to Enclosure	
		≥ 15GΩ at 100V _{DC} (C _R ≤ 0.33μF)	≥ 10GΩ at 100V _{DC}	
		≥ 5GΩ × μF at 100V _{DC} (C _R > 0.33μF)	≥ 0.5GΩ at 500V _{DC}	
Dissipation Factor ^{Note 1}	tan δ	0.2% or less		
Permissible DC Voltage	V _{DC}	1000V _{DC}		
Withstand Voltage	V _W	Between Terminals	1500V _{AC} for 1 min	
		or	2250V _{DC} for 1 min	
		or	3000V _{DC} for 3 sec	
		Between Terminals and Enclosure	2050V _{AC} for 1 min	
		Nothing abnormal shall be found		
Maximum Pulse Rise Slope dV/dt	Pitch (mm)	10.0mm	15.0mm	22.5mm
	1000V _{DC}	800V/μs	600V/μs	500V/μs

Note:

1: Measured at 1kHz, 20±5°C

APPLICATIONS

Across the Line Filter	Antenna Coupling	Devices with high Voltage Peaks	Line to Ground	Interference Suppressors
				

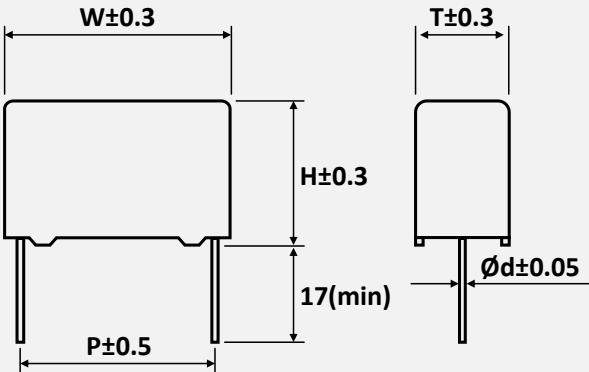
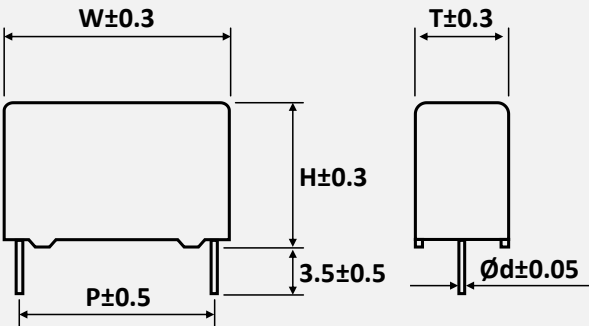
ELECTRICAL CHARACTERISTICS

V_{RAC}	C_R (μF)	Dimensions (mm)					$\tan\delta$ (%) ^{Note 1}	Part Number ^{Note 2}
		W	H	T	P	ϕd		
300V _{AC}	0.001	13	9	4	10	0.6	0.2	Y2X1102□0300AB110□
	0.0015	13	9	4	10	0.6	0.2	Y2X1152□0300AB110□
	0.0022	13	10	5	10	0.6	0.2	Y2X1122□0300AB110□
	0.0033	13	10	5	10	0.6	0.2	Y2X1332□0300AB110□
	0.0047	13	11	5	10	0.6	0.2	Y2X1472□0300AB110□
	0.0068	13	12	6	10	0.6	0.2	Y2X1682□0300AB110□
	0.0082	13	13	7	10	0.6	0.2	Y2X1822□0300AB110□
	0.01	13	14	8	10	0.6	0.2	Y2X1103□0300AB110□
	0.0022	18	11	5	15	0.8	0.2	Y2X1222□0300AB115□
	0.0033	18	11	5	15	0.8	0.2	Y2X1332□0300AB115□
	0.0047	18	11	5	15	0.8	0.2	Y2X1472□0300AB115□
	0.0056	18	11	5	15	0.8	0.2	Y2X1562□0300AB115□
	0.0068	18	11	5	15	0.8	0.2	Y2X1682□0300AB115□
	0.0082	18	11	5	15	0.8	0.2	Y2X1822□0300AB115□
	0.01	18	11	5	15	0.8	0.2	Y2X1103□0300AB115□
	0.015	18	12	6	15	0.8	0.2	Y2X1153□0300AB115□
	0.022	18	13	7	15	0.8	0.2	Y2X1223□0300AB115□
	0.033	18	15	9	15	0.8	0.2	Y2X1333□0300AB115□
	0.047	18	17	10	15	0.8	0.2	Y2X1473□0300AB115□
	0.047	26	16	6	22.5	0.8	0.2	Y2X1473□0300AB122□
	0.068	26	16.5	7.5	22.5	0.8	0.2	Y2X1683□0300AB122□
	0.1	26	18	9	22.5	0.8	0.2	Y2X1104□0300AB122□
	0.15	26	20	11	22.5	0.8	0.2	Y2X1154M0300AB122□
	0.15	26	22	12	22.5	0.8	0.2	Y2X1154K0300AB122□
	0.22	26	24	14	22.5	0.8	0.2	Y2X1224□0300AB122□

Notes

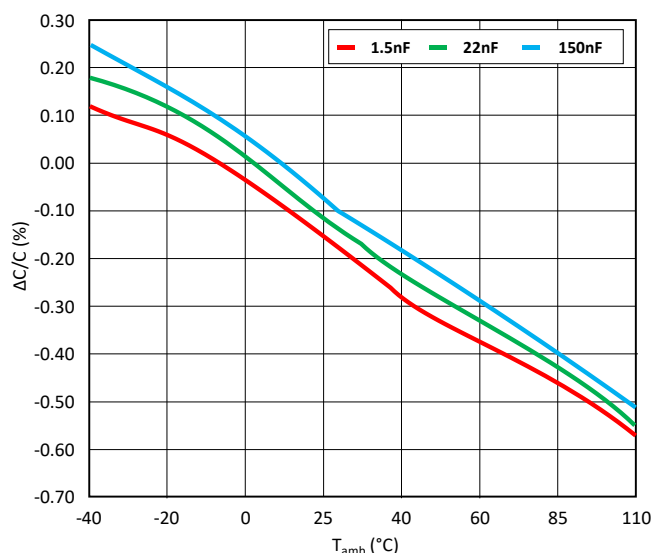
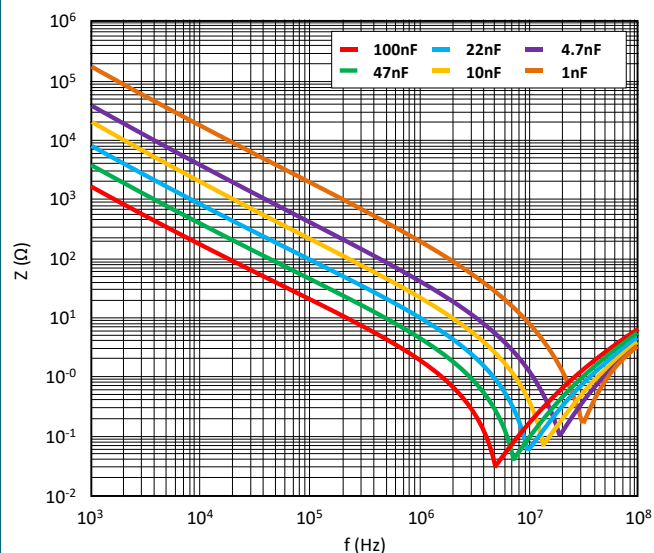
- 1 Measured at 1kHz, 20°C
- 2 Enter the appropriate tolerance and lead length code □ from the product code table

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

REFERENCE DATA

Fig. 1 • Capacitance Drift vs. Ambient Temperature


Fig. 2 • Impedance vs. Frequency • $V_{RAC} = 305V$


PRODUCT CODE

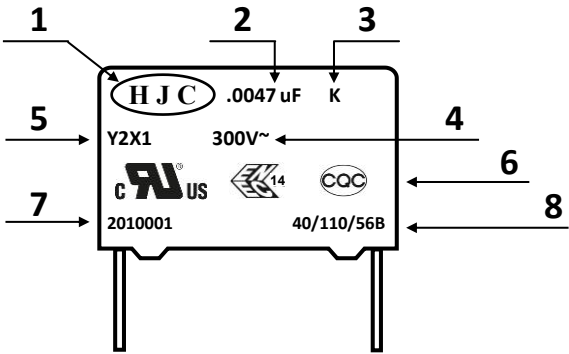
Example: Y2X1 series ▲ 0.033 μ F ▲ 300V_{AC} ▲ $\pm 10\%$ ▲ P=15mm ▲ Bulk ▲ Straight leads ▲ 17mm lead length

Y2X1		333		K		0300		A		B		1		15		1	
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}	
Code	Series	Code	μ F	Code	Tol.	Code	VAC	Code	Type	Code	Type	Code	Style	Code	mm	Code	mm
Y2X1	Y2X1	102	0.001	K	± 10	0300	300	A	AC	B	Bulk	1	SL	10	10.0	1	17.0
		472	0.0047	M	± 20									15	15.0	2	3.5
		153	0.015											22	22.5		
		104	0.1														
		224	0.22														

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.

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

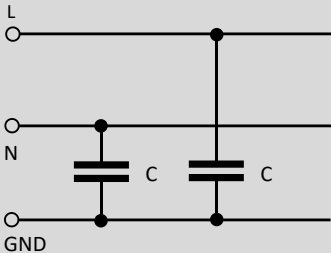
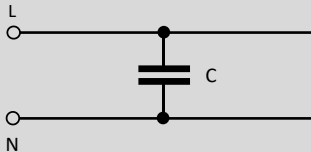
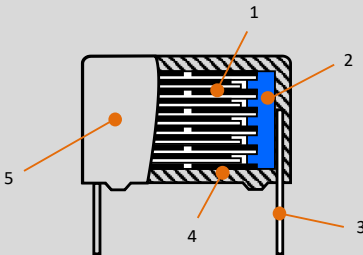
40/110/56B: 40 = Minimum temperature (-40°C)
110 = Maximum temperature ($+110^{\circ}\text{C}$)
56 = Days of damp heat test
B = Category of passive flammability

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	<div><div><p>This specification covers the requirement for metallized polypropylene dielectric fixed capacitor.</p><p>Typical applications: Interference suppression, << across-the-line >> and << line to ground >> applications.</p><p>Reference standards : IEC60384-14</p></div><div></div></div>										
2	Product Name	Metallized polypropylene film capacitor, Type Y2X1										
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>300V_{AC} (1000V_{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)	300V _{AC} (1000V _{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)											
Rated AC voltage (50/60Hz)	300V _{AC} (1000V _{DC} max.)											
Capacitance range:	Refer to the individual drawing											
Capacitance tolerance:	Refer to the individual drawing											
4	Appearance	<div><div>1. Marking shall be legible in the right place.</div><div>2. Plating of lead wire shall be perfect without rust.</div><div>3. Coating shall be without any crack, rent, pinhole etc.</div></div>										
5	Construction	<div><div><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></div><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></div>	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	<div><div>The test shall be conducted at a temperature of from 15°C to 35°C, a humidity of from 45% to 75%.</div><div>However, the test shall be conducted at a temperature of 20±5°C, a humidity of 65±5% when doubt is entertained about judgement.</div></div>										

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	
			or	
			or	
			Between terminals and enclosure	
			Applied voltage	
		Insulation resistance (IEC60384-14, 4.2.5)	The capacitor shall be applied the voltage through a resistor of 2k Ω or more when charge and discharge.	Within the limits stated under conditions.
			Between terminals	
			15G Ω or more	
			5G Ω \times μ F or more	
			Between terminals and enclosure	
			10G Ω or more	
		Capacitance (IEC60384-14, 4.2.2)	0.5G Ω or more	Within a range of specified value
			When the reading of measuring instrument becomes steady at a value after a voltage of 100 \pm 15V _{DC} is applied for 1 minute \pm 5 seconds.	
		Dissipation factor (IEC60384-14, 4.2.3)	Ambient temperature at 25°C.	0.2% or less.
			Measured at a frequency of 1 \pm 0.2kHz, at 20 °C, 1V _{RMS} .	
		Termination strength (IEC60384-14, 4.3)	Measured at a frequency of 1 \pm 0.2kHz, at 20 °C, 1V _{RMS} .	After the test, no breaking or loosening of the terminal shall be found.
			Tensile strength	
			The load specified below shall be applied to the terminal in its draw-out direction gradually up to the specified value and held thus for 10 \pm 1sec.	
			Lead wire diameter:	
			Tensile force:	
			Bending strength	
			While the load specified below is applied to the lead wire, the body of the capacitor shall be bent 90° and returned to the original position. This operation shall be conducted in a few seconds. Then the body shall be bent 90°, at the same speed in the opposite direction and returned to the original position.	
			Lead wire diameter:	
			Bending force:	

TECHNICAL SPECIFICATION

No.	Category	Specification		
		Test Item	Conditions	Performance
8	Character	Vibration proof (IEC60384-14, 4.7)	The frequency shall be varied from 10Hz to 55Hz at 1.5mm amplitude and back to 10Hz in approximately 1 minute, intervals. This motion shall be applied for a period of 2 hours in each of 3 mutually perpendicular directions. During the last 30 min of vibration in each direction, checks shall be made for open or short-circuiting and interruption.	Bending strength: There shall be no open or short-circuiting and the connections must be stabilized. Appearance: There shall be no such mechanical damage as terminal damage etc.
		Solderability (IEC60384-14, 4.5)	The lead wire shall be immersed into soldering bath at 245±5°C for 2.5±0.5sec up to the depth of 1.5±0.5/-0mm from the bottom of the body.	At least 95% of the circumferential face of lead wire up to immersed level shall be covered with new solder.
		Soldering heat resistance (IEC60384-14, 4.4)	The lead wire shall be immersed into soldering bath and its depth of dipping shall be up to 1.5 +0.5/-0mm from the root of terminals by using a heat shielding plate. Temperature and duration of soldering shall be 350±10°C for 3.5±0.5sec or 260±5°C for 10±1sec. After the immersion is finished, the capacitor shall be let alone at ordinary temperature and humidity for 1±0.5hours.	Appearance: No remarkable change. Withstand voltage: Nothing abnormal shall be found, when a voltage specified in item "voltage- proof" is applied for 1 minute. Insulation resistance: Insulation resistance shall conform to Item "insulation resistance". Change rate of capacitance: $\Delta C/C \leq \pm 3\%$ of the value before the test.
		Cold resistance (IEC60384-14, 4.11.4)	The capacitor shall be placed in the testing chamber at -40±3°C for 2+1/-0 hours. After the test, the capacitor shall be let alone at the ordinary condition for 1.5±0.5 hours and shall be satisfied with the performance in the performance column.	Change rate of capacitance: $\Delta C/C \leq \pm 5\%$ of the value before the test.
		Dry heat resistance (IEC60384-14, 4.11.2)	The capacitor shall be placed in the testing oven at +110±2°C for 2+1/-0 hours. After the test, the capacitor shall be let alone at the ordinary condition for 1.5±0.5 hours and shall be satisfied with the performance in the performance column.	Insulation resistance: ≥ 50% of the initial specified value. Change rate of capacitance: $\Delta C/C \leq \pm 5\%$ of the value before the test.

TECHNICAL SPECIFICATION

No.	Category	Specification		
		Test Item	Conditions	Performance
8	Character	Damp heat steady state (IEC60384-14, 4.12)	<p>The capacitor under test shall be put in the testing oven and kept at condition of the temperature $+40\pm 2^{\circ}\text{C}$ and the humidity at 90 to 95% for 56 days and then shall be let alone at ordinary condition for 1.5 ± 0.5 hours.</p> <p>After the test, the capacitor shall be satisfied with the performance in the performance column.</p>	<p>Appearance: No remarkable change.</p> <p>Withstand voltage: [between terminals] Nothing abnormal shall be found when a voltage of $1500V_{AC}$ is applied for 1 minute.</p> <p>Insulation resistance: [between terminals] $\geq 50\%$ of the initial specified value.</p> <p>Change rate of capacitance: $\Delta C/C \leq \pm 5\%$ of the value before the test.</p> <p>Dissipation factor: $\leq 0.15\%$ at 1kHz.</p>
		Rapid change of temperature (IEC60384-14, 4.6)	<p>The capacitor under the test shall be kept in the testing oven and kept at condition of the temperature of $-40\pm 3^{\circ}\text{C}$ for 30 ± 3 minutes.</p> <p>After this, the capacitor shall be let alone at the ordinary temperature for 3 minutes or less.</p> <p>After this, the capacitor under the test shall be kept in the testing oven and kept at condition of the temperature of $+110\pm 2^{\circ}\text{C}$ for 30 ± 3 minutes.</p> <p>Then the capacitor shall be let alone at the ordinary temperature for 3 minutes or less. This operation shall be counted as 1 cycle, and it shall be repeated for 5 cycles successively.</p> <p>After the test, the capacitor shall be let alone at the ordinary condition for 1.5 ± 0.5 hours and shall be satisfied with the performance in the performance column.</p>	<p>Appearance: No remarkable change.</p> <p>Insulation resistance: $\geq 50\%$ of the initial specified value.</p> <p>Change rate of capacitance: $\Delta C/C \leq \pm 10\%$ of the value before the test.</p> <p>Dissipation factor: $\leq 0.12\%$ at 1kHz.</p>

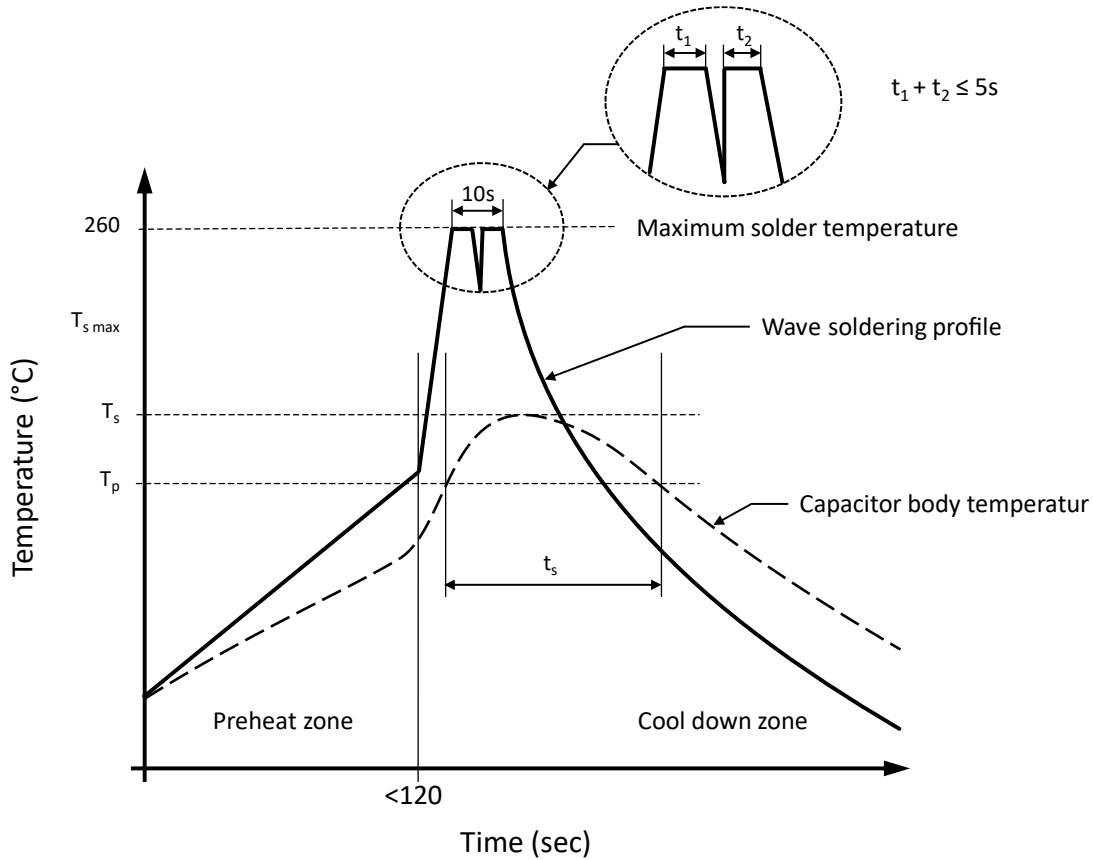
TECHNICAL SPECIFICATION

No.	Category	Specification		
8	Character	Test Item	Conditions	Performance
		Endurance (IEC60384-14, 4.14)	The capacitor shall be submitted to an endurance of 1000h at 110°C at a 170% of rated voltage and that once every hour the voltage shall be increased to 1000V _{RMS} for 0.1 second. After the test, the capacitor shall be satisfied with the following performance.	
		Impulse voltage (IEC60384-14, 4.13)	The capacitor shall be subjected to a maximum of 24 impulses of the same polarity. If any three successive impulses are shown by the monitor to have had a waveform indicating that no self-healing breakdowns have occurred, then the capacitor shall be no more subjected to impulses.	
			Impulse voltage Y2	$V_p = 5kV$
		Active flammability (IEC60384-14, 4.18)	The capacitor shall be wrapped in at least one not more than two complete layers of cheesecloth. The capacitor shall be subjected to 20 discharges from a tank Capacitor, charged to a voltage that, when discharged, places a peak voltage across the capacitor under test.	
			The interval between successive discharges shall be 5 seconds Throughout the test, a rated voltage V_R shall be applied across the capacitor under test and shall be maintained for 2 minutes after the last discharge, unless a blown fuse causes an open circuit.	
			Rated voltage V_R	Peak voltage V_I
			300VAC	5kV _{DC} +7/-0%

TECHNICAL SPECIFICATION

No.	Category	Specification			
9	Approved Standard	Agency	Country	Conditions	File Number
		UL	USA	UL60384-14 Y2X1 0.001~0.22μF 300V _{AC} 40/110/56/B	E149075-20130409
		ENEC	Semko	EN 60384-14 Y2X1 0.001~0.22μF 300V _{AC} 40/110/56/B	SE-ENEC-2100238
		CB	Semko	IEC 60384-14 Y2X1 0.001~0.22μF 300V _{AC} 40/110/56/B	SE-103001
		CQC	China	GB/T6346.14-2015 Y2X1 0.001~0.22μF 300V _{AC} 40/110/56/B	CQC08001028115
		The ENEC mark was accepted in all European countries			
10	Rated Voltage Pulse Slope dV/dt at 1000V _{DC}	Pitch	10mm	15mm	22.5mm
		dV/dt	800V/μs	600V/μs	500V/μs
11	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.			

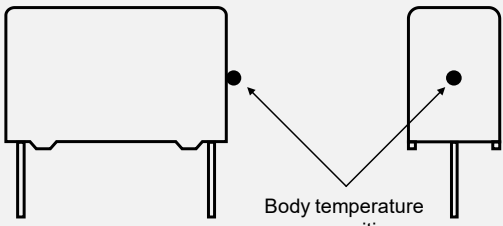
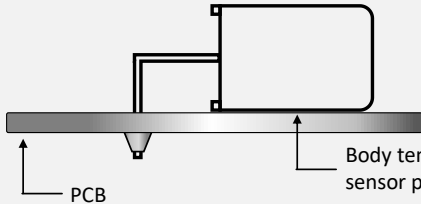
RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



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: $\leq 3\text{sec}$

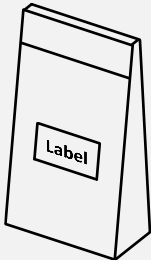
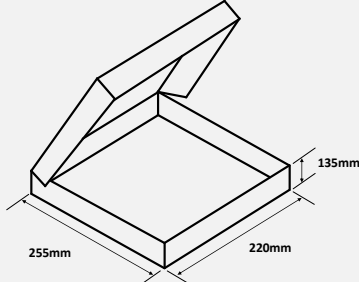
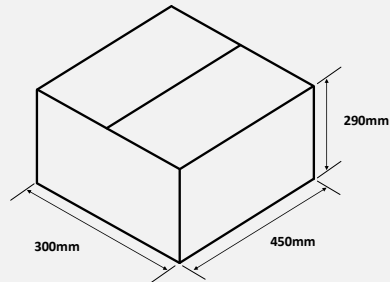
If re-work or dipping twice in necessary, it should be done after the capacitor returned to the normal temperature. Suggestion time is 24 hours.

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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