OBSOLETE

AC Line EMI Suppression and RC Networks

PHZ9004 Series Metallized Polypropylene Film, 300 VAC 3x X2 with Separate Terminals for Three-Phase Filtering

Overview

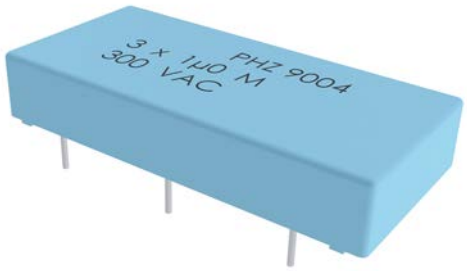
The PHZ9004 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use as an electromagnetic interference suppressor in X2 and across-the-line applications for three phases.

Benefits

- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 3 x 1.0 µF
- Lead spacing: 27.5 mm
- Capacitance tolerance: ±20%, other tolerances on request
- Climatic category: 55/105/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −55°C to +105°C
- 100% screening factory test at 2,200 VDC



Legacy Part Number System

PHZ9004	E	F	7100	M	R06L2
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
Triple Capacitor X2, Metallized Polypropylene	E = 300	F = 27.5	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20%	See Ordering Options Table

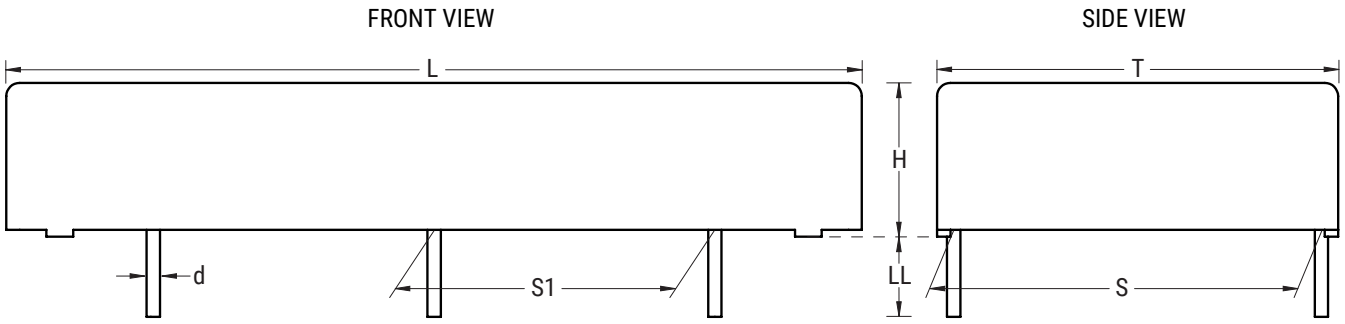
New KEMET Part Number System

9004	AA	105	M	300	C	DECT	V680
Capacitor Class	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging	C-Spec	V-Spec
Triple Capacitor X2, Metallized Polypropylene	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	300 = 300	See Ordering Options Table	Optional additional characters at KEMET's option.	Part Number specific version code

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
27.5	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6+0/−1	C	R06L2

Dimensions – Millimeters



p		p_1		B		H		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
27.5	+/−0.5	21	+/−0.5	30	Maximum	11.5	Maximum	64	Maximum	1	+/−0.05
Note: See Ordering Options Table for lead length (LL) options.											

Performance Characteristics

Rated Voltage	300 VAC 50/60 Hz	
Capacitance Range	3 x 1.0 µF	
Capacitance Tolerance	±20%, other tolerances on request	
Temperature Range	−55°C to +105°C	
Climatic Category	55/105/56	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	0.10%
	10 kHz	0.50%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,200 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable in such case for any failures.	
Insulation Resistance	Minimum Value Between Terminals	
	≥ 10,000 MΩ • µF	
	Minimum Value Between Terminals and Case	
	≥ 100,000 MΩ	

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Humidity	IEC 60068–2–3 Test Ca	+40°C and 90 – 95% RH, 56 days

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

VAC	Cap Value (µF)	Max Dimensions in mm			Lead Spacing (p)	Package Quantity C (R06I2)	dV/dt (V/µs)	New KEMET Part Number	Legacy Part Number
		B	H	L					
300	3 x 1.0	30.0	11.5	64.0	27.5	72	100	9004AA105M300CDECTV680	PHZ9004EF7100MR06L2

Soldering Process

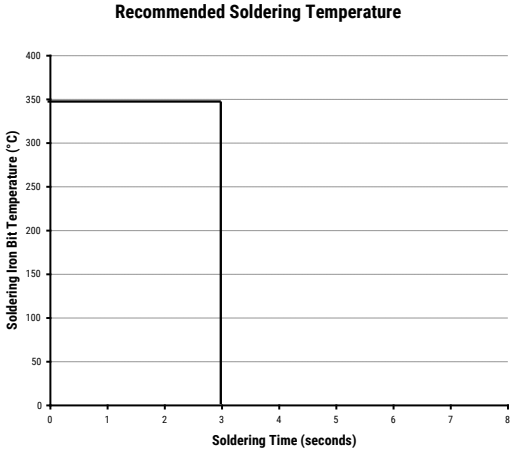
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

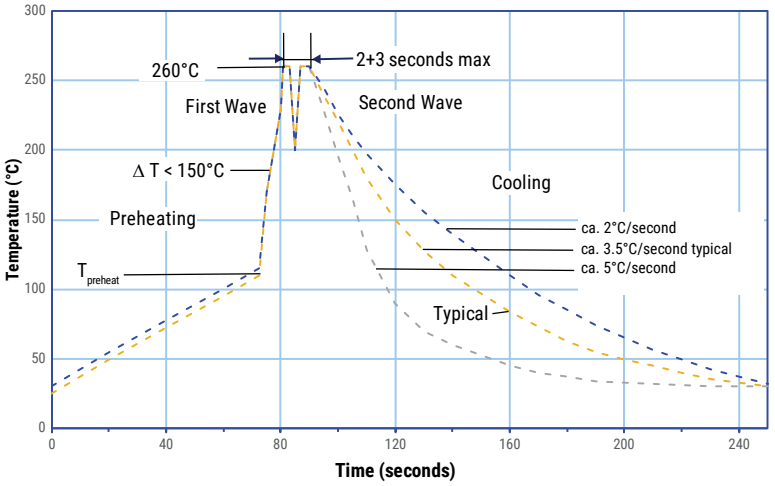
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

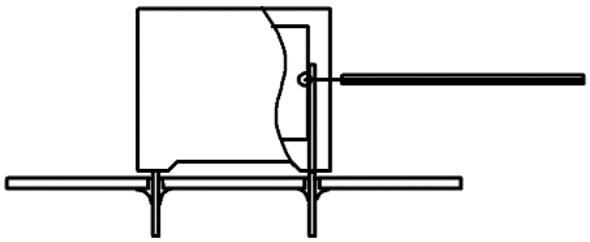
Wave Soldering Recommendations cont'd

1. The table indicates the maximum set-up temperature of the soldering process
Figure 1

Dielectric Film Material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



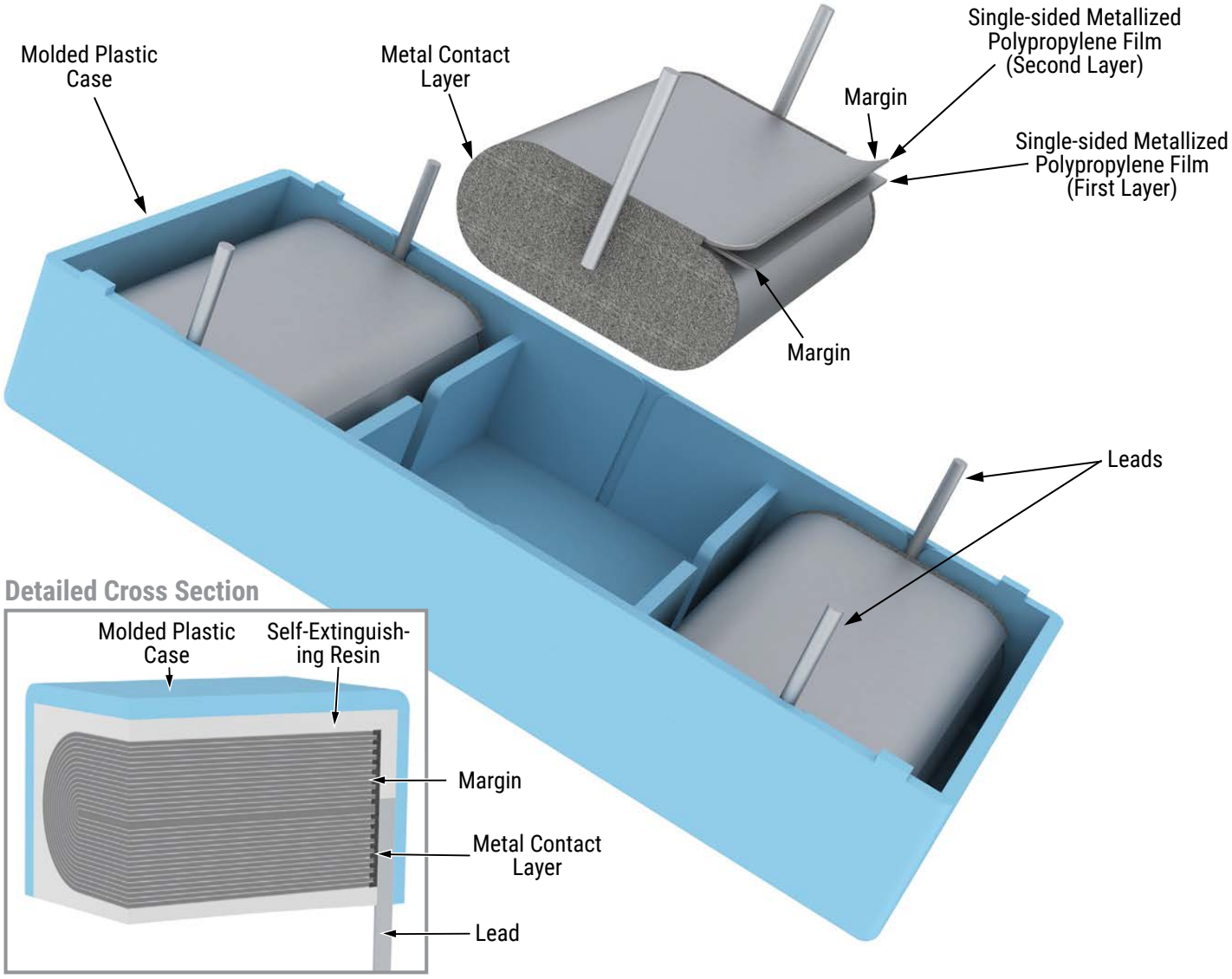
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

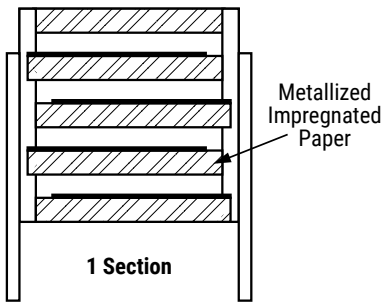
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

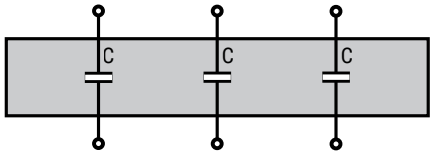


Detailed Cross Section

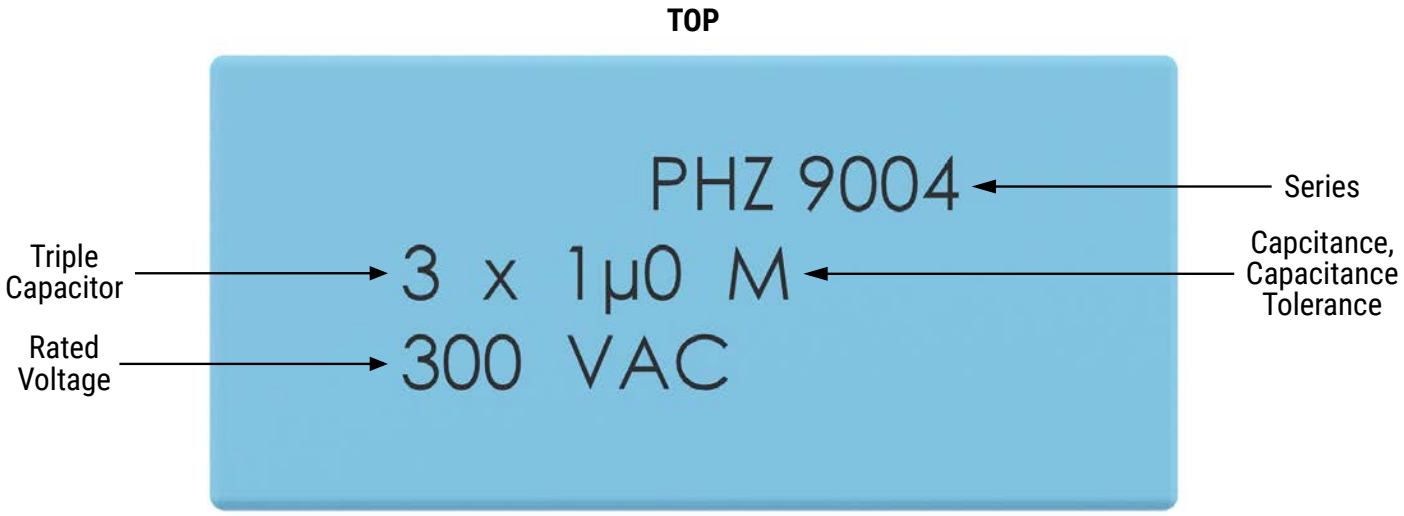
Winding Scheme



Electrical Scheme



Marking



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

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