

# R76H, 125°C Double Metallized Polypropylene Film, Radial, DC and Pulse Applications (Automotive Grade)

## Overview

The R76H Series is constructed of polypropylene film and double metallized polyester film as electrodes with radial leads of tinned wire. The radial leads are electrically welded to the metal layer on the ends of the capacitor winding. The capacitor is encapsulated in a self-extinguishing solvent resistant plastic case with thermosetting resin material meeting UL 94 V-0 requirements. Two different winding constructions are used depending on voltage parameters. Please see the Performance Characteristics for more information.

Automotive grade devices meet the demanding Automotive Electronics Council's AEC-Q200 qualification requirements.

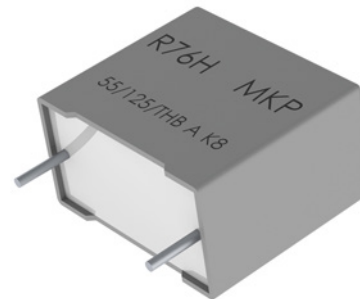
## Applications

Typical applications include resonant circuit, high frequency high current, snubber and silicon-controlled rectifier (SCR and IGBT) and SiC (e.g. MOSFET) commutation circuits as well as applications with high voltage and high current in combination with a high ambient temperature.

Not suitable for across-the-line application (see Suppressor Capacitors).

## Benefits

- Voltage range: 250 – 2,000 VDC
- Capacitance range: 470 pF – 12  $\mu$ F
- Lead Spacing: 10 mm – 37.5 mm
- Capacitance tolerance:  $\pm$ 2.5%,  $\pm$ 5%,  $\pm$ 10%
- Climatic category: 55/125/56 IEC 60068-1
- Operating temperature range of -55°C to +125°C
- Usable in harsh environment at 85°C/85% R.H. up to 1,000 hours
- RoHS compliance and lead-free terminations
- Tape & Reel packaging in accordance with IEC 60286-2
- Self-healing
- Automotive (AEC-Q200) grade



## Part Number System

R76	T	R	3330	SE	30	K	
Series	Rated Voltage (VDC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use		Capacitance Tolerance
Double Metallized Polypropylene	I = 250 M = 400 P = 630 Q = 1,000 T = 1,600 U = 2,000	F = 10 I = 15 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies the total number of zeros to be added.	See Ordering Options Table	H0 H1 H2 H3 H4	H5 H6 H7 H8 HL	H = $\pm$ 2.5% (*) J = $\pm$ 5% K = $\pm$ 10%  (*) = for C $\geq$ 1,000 pF

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## Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10  15  22.5	<b>Standard Lead and Packaging Options</b>		
	Bulk (Bag) – Short Leads	4 +2/-0	SE
	Ammo Pack	H <sub>0</sub> = 18.5±0.5	DQ
	<b>Other Lead and Packaging Options</b>		
	Tape & Reel (Standard Reel Ø 355 mm)	H <sub>0</sub> = 18.5±0.5	GY
	Tape & Reel (Large Reel Ø 500 mm)	H <sub>0</sub> = 18.5±0.5	CK
	Bulk (Bag) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Bag) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag) – Short Leads	10±1	JC
	Bulk (Bag) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
27.5	<b>Standard Lead and Packaging Options</b>		
	Bulk (Tray) – Short Leads	4 +2/-0	SE
	<b>Other Lead and Packaging Options</b>		
	Tape & Reel (Standard Reel Ø 355 mm)	H <sub>0</sub> = 18.5±0.5	GY
	Tape & Reel (Large Reel Ø 500 mm)	H <sub>0</sub> = 18.5±0.5	CK <sup>1</sup>
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
37.5	<b>Standard Lead and Packaging Options</b>		
	Bulk (Tray) – Short Leads	4 +2/-0	SE
	<b>Other Lead and Packaging Options</b>		
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50

<sup>1</sup> = Not for all sizes, see "Packaging Quantities" table.

## Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/-0.5	9.0	+0.1/-0.5	13.0	+0.2/-0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	13.0	+0.2/-0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	13.0	+0.2/-0.5	0.6	±0.05
15.0	±0.4	4.0	+0.2/-0.5	10.0	+0.1/-0.5	18.0	+0.3/-0.5	0.8	±0.05
15.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	18.0	+0.3/-0.5	0.8	±0.05
15.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.3/-0.5	0.8	±0.05
15.0	±0.4	7.5	+0.2/-0.5	13.5	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/-0.5	14.5	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	9.0	+0.2/-0.5	12.5	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	10.0	+0.2/-0.5	16.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/-0.5	19.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/-0.5	15.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/-0.5	16.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05

**Note: See Ordering Options Table for lead length (LL/Ho) options.**

## Dimensions – Millimeters cont.



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
22.5	±0.4	8.5	+0.2/-0.5	17.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/-0.5	18.5	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/-0.5	20.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/-0.5	22.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/-0.7	17.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/-0.7	20.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	22.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	25.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/-0.7	28.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/-0.7	33.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/-0.7	37.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	24.0	+0.2/-0.7	15.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/-0.7	22.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/-0.7	24.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/-0.7	28.5	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/-0.7	32.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/-0.7	40.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/-0.7	44.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/-0.7	15.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/-0.7	19.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	30.0	+0.3/-0.7	45.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05

**Note: See Ordering Options Table for lead length (LL/Ho) options.**

## Performance Characteristics

Dielectric	Polypropylene film						
Plates	Double sided metallized polyester film						
Winding	Non-inductive type						
Leads	Tinned wire						
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.						
Related Documents	IEC 60384-16						
Sections	1			2			
Rated Voltage $V_R$	250 VDC 180 VAC	400 VDC 250 VAC	630 VDC 400 VAC	1,000 VDC 600 VAC	1,600 VDC 650 VAC	2,000 VDC 700 VAC	
Capacitance Range ( $\mu\text{F}$ )	0.027- 12	0.01 - 8.2	0.0039 - 4.7	0.00047 - 2.2	0.0033 - 1.2	0.00056 - 0.56	
Capacitance Values	E12 series (IEC 60063) measured at 1 kHz and +20 $\pm$ 1°C						
Capacitance Tolerance	$\pm$ 2.5%, $\pm$ 5%, $\pm$ 10%						
Operating Temperature Range	-55°C to +125°C						
Rated Temperature $T_R$	+105°C for $V_R$ (DC and AC)						
Voltage Derating	The following decreasing factor has to be applied on the rated voltage: +105°C to 125°C: 1.25% per °C for $V_R$ (DC and AC) = operating voltage $V_{op}$						
Climatic Category	55/125/56 IEC 60068-1						
Storage Conditions	Storage time: $\leq$ 24 months from the date marked on the package label						
	Average relative humidity per year $\leq$ 70%						
	RH $\leq$ 85% for 30 days randomly distributed throughout the year						
	Dew is absent						
	Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)						
Test Voltage	1.6 x $V_R$ VDC for 2 seconds (between terminations) at +25°C $\pm$ 5°C						
Capacitance Drift	Maximum 0.5% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60%						
Maximum Pulse Steepness	dV/dt according to Table 1. For working voltages lower than rated voltage ( $V < V_R$ ), the specified dV/dt can be multiplied by the factor $V_R/V$ .						
Reliability (Reference IEC 61709)	Operational life at $V_{op}$ (DC) > 200,000 hours at 85°C; 6,000 hours at 110°C; 3,000 hours at 125°C						
	Failure rate $\leq$ 1 FIT, $T = +40^\circ\text{C}$ , $V = 0.5 \times V_R$						
	Failure criteria: open or short circuit, capacitance change > 10%, DF 2 times the catalog limits, IR < 0.005 x initial limit						
Temperature Coefficient	-(200 $\pm$ 100) ppm/°C at 1 kHz						
Self-Inductance (Lead Length ~ 2 mm)	Lead Spacing (mm)	7.5	10	15	22.5	27.5	37.5
	L (nH) $\approx$	8	9	10	16	18	20
	Maximum 1 nH per 1 mm lead and capacitor length.						

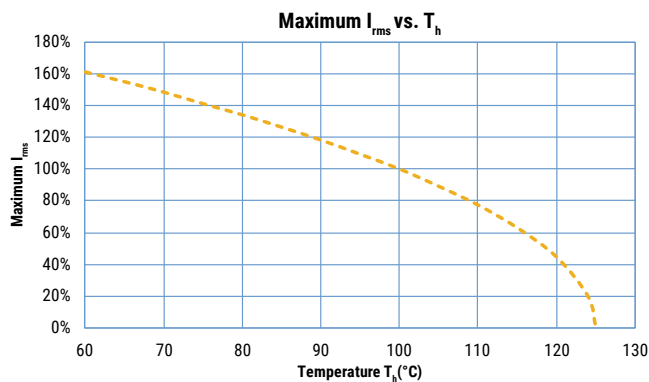
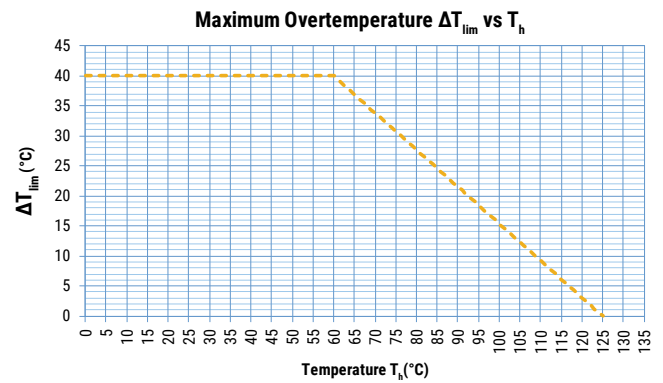
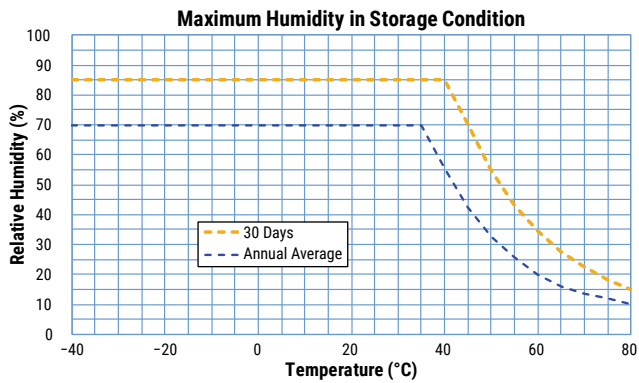
## Performance Characteristics cont.

Dissipation Factor $\tan\delta$	Measured at 25°C ±5°C			
	Frequency	C ≤ 0.1 μF	0.1 μF < C ≤ 1.0 μF	C > 1μF
	1 kHz	≤ 0.03%	≤ 0.03%	≤ 0.04%
	10 kHz	≤ 0.04%	≤ 0.06%	-
100 kHz	≤ 0.10%	-	-	

Insulation Resistance	Measured at +25°C, 100 VDC 60 seconds	
	Minimum Values Between Terminals	
	C ≤ 0.33 μF	C > 0.33 μF
	≥ 100,000 MΩ (≥ 500,000 MΩ)*	≥ 30,000 MΩ · μF (≥ 150,000 MΩ · μF)*

\* Typical value

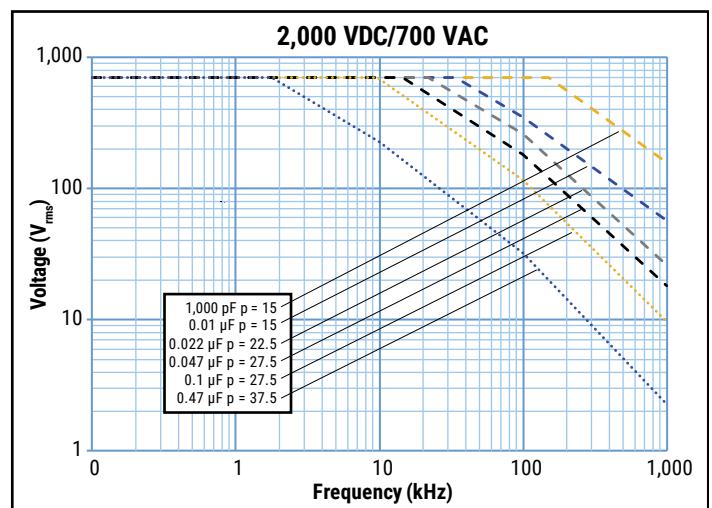
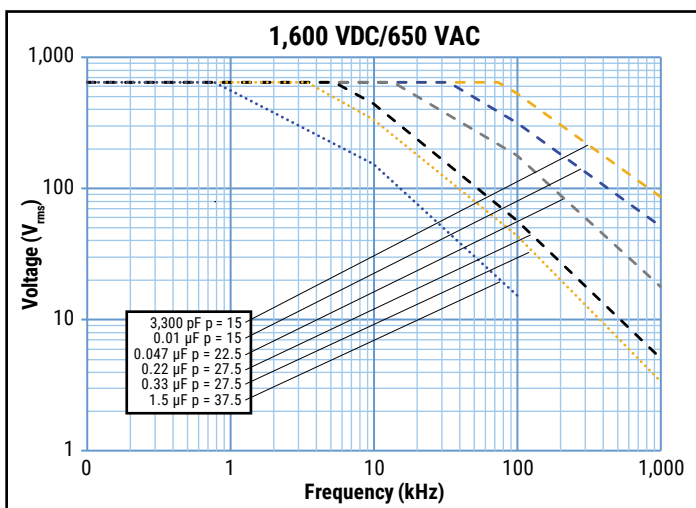
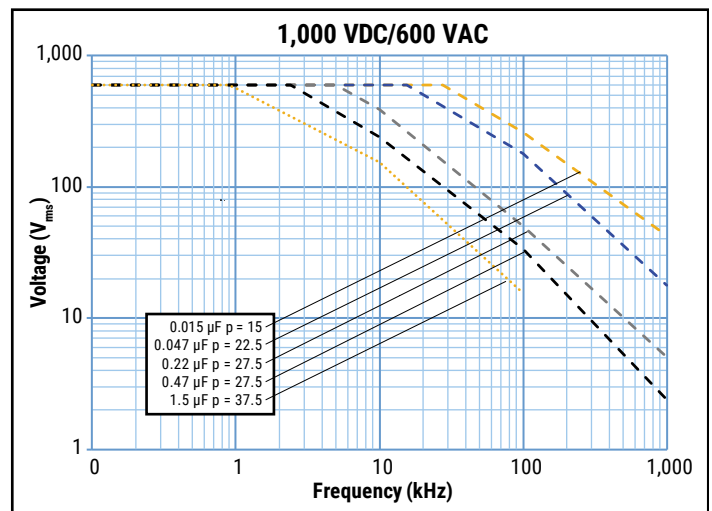
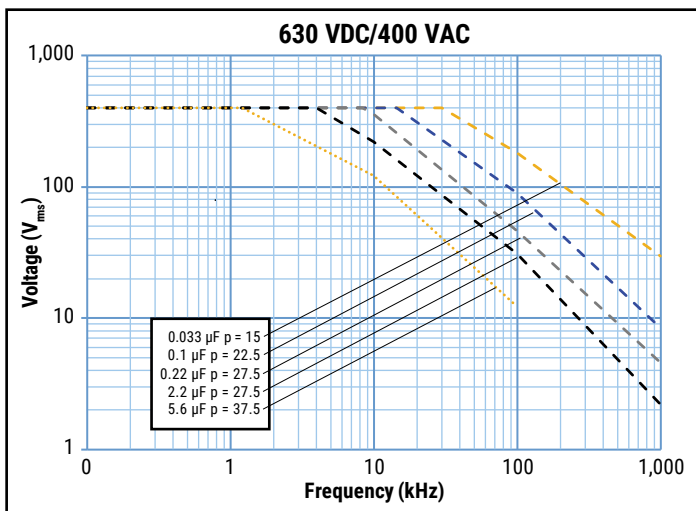
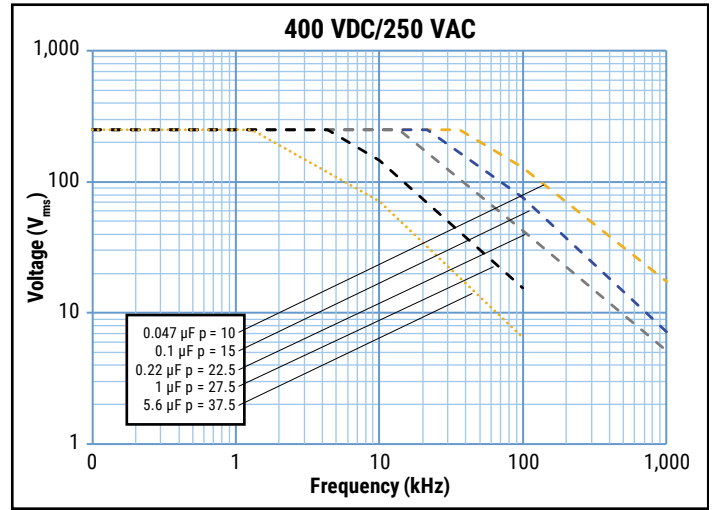
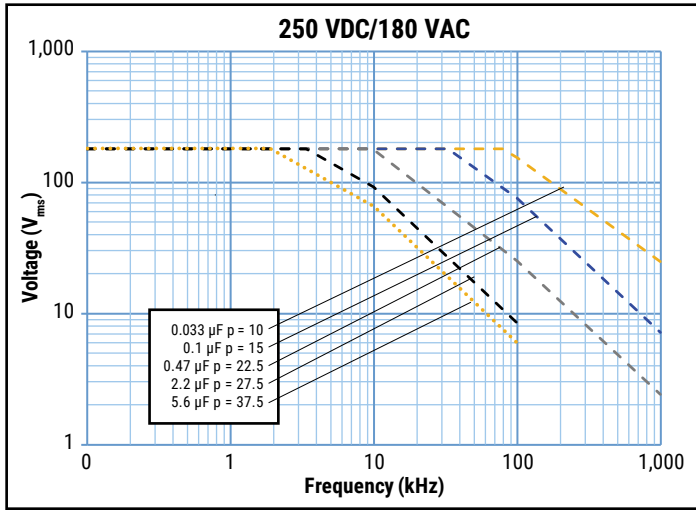


$T_h$  is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

## Qualification

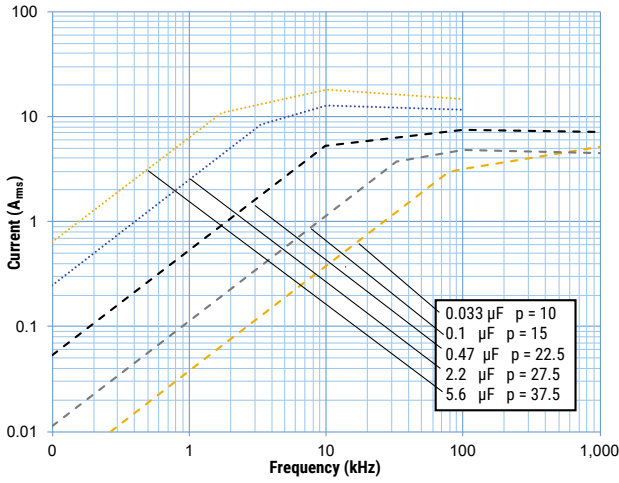
Automotive Grade products meet or exceed the requirements outlined by the Automotive Electronics Council. Details regarding test methods and conditions are referenced in document AEC-Q200, Stress Test Qualification for Passive Components. For additional information regarding the Automotive Electronics Council and AEC-Q200, please visit their website at [www.aecouncil.com](http://www.aecouncil.com).

## Maximum Voltage ( $V_{rms}$ ) Versus Frequency (Sinusoidal Waveform/ $Th \leq 100^\circ C$ )

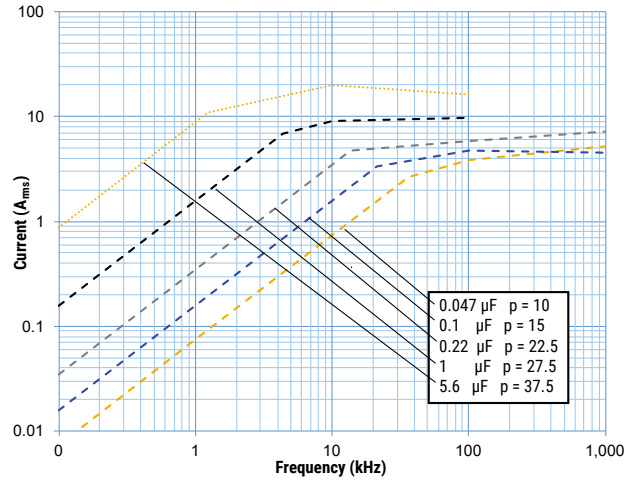


## Maximum Current ( $I_{rms}$ ) Versus Frequency (Sinusoidal Waveform/ $Th \leq 100^\circ C$ )

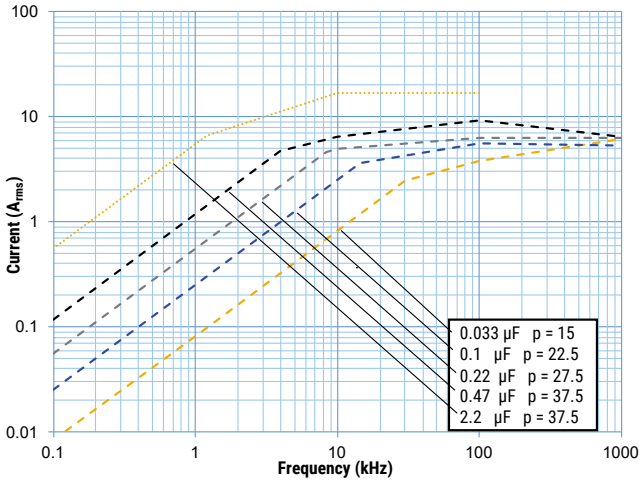
250 Vdc / 180 Vac



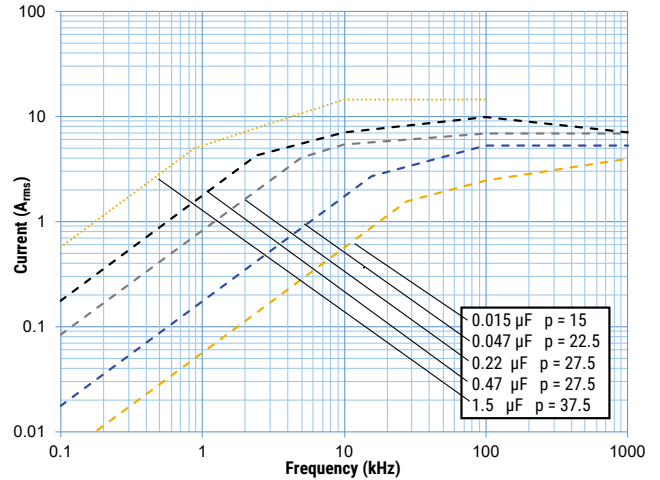
400 Vdc / 250 Vac



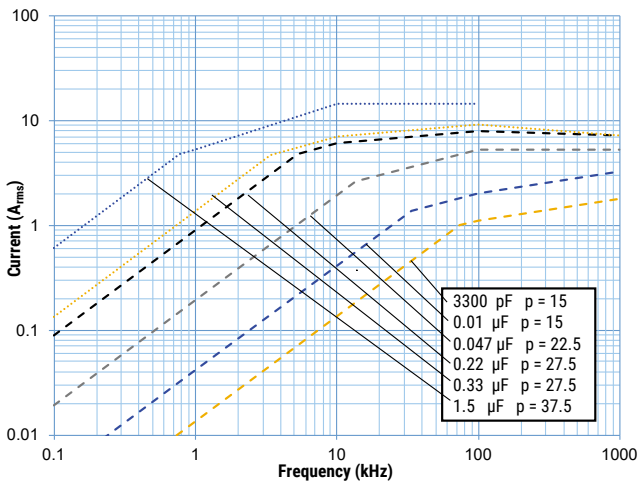
630 VDC/400 VAC



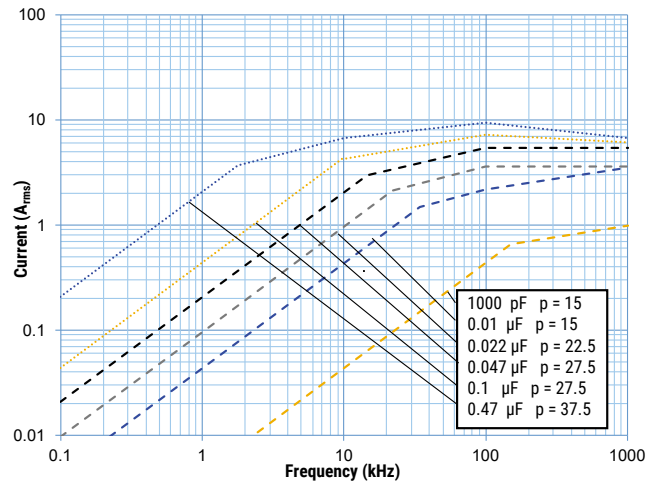
1,000 VDC/600 VAC



1,600 VDC/650 VAC



2,000 VDC/700 VAC





## Environmental Test Data

Damp Heat, Steady State Test	Test Conditions:		Performances
	Temperature: Relative humidity (RH): Test duration:	+40°C ±2°C 93% ±2% 56 days	Δ C/C  ≤ 2%, Δ tanδ ≤ 0.001 at 1 kHz IR after test ≥ 50% of initial limit
Endurance Test	Test Conditions		Performances
	Temperature: Voltage applied: Test duration:	+105°C ±2°C 1.25 x V <sub>R</sub> (DC) 2,000 hours	Δ C/C  ≤ 2%, Δ tanδ ≤ 0.001 at 10 kHz for C ≤ 1 μF Δ tanδ ≤ 0.001 at 1 kHz for C > 1 μF IR after test ≥ 50% of initial limit
	Temperature: Relative humidity (RH): Voltage applied: Test duration:	+85°C ±2°C 85% ±2% 1.0 x VR (AC), 50/60 Hz 1,000 hours	Δ C/C  ≤ 10%, Δ tanδ ≤ 0.001 at 1 kHz IR after test ≥ 50% of initial limit
	Temperature: Relative humidity (RH): Voltage applied: Test duration:	+85°C ±2°C 85% ±2% 1.0 x VR (DC) 1,000 hours	Δ C/C  ≤ 10%, Δ tanδ ≤ 0.001 at 1 kHz IR after test ≥ 50% of initial limit
Resistance to Soldering Heat Test	Test Conditions		Performances
	Solder bath temperature: Dipping time (with heat screen):	260°C ±5°C 10 seconds ±1 second	Δ C/C  ≤ 1%, Δ tanδ ≤ 0.001 at 10 kHz for C ≤ 1 μF Δ tanδ ≤ 0.001 at 1 kHz for C > 1 μF IR after test ≥ initial limit

## Environmental Compliance

All KEMET pulse capacitors are RoHS compliant.





**Table 1 – Ratings & Part Number Reference cont.**

VDC	VAC	Cap Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Max K <sub>0</sub> (V <sup>2</sup> /µs)	I <sub>pk</sub>	ESL	ESR max	I <sub>rms</sub> max (*)	R <sub>th</sub>	KEMET Part Number	Customer Part Number
										Lead Length 2x 4 mm	at 100 kHz	at 100 kHz 100°C			
			T	H	L					A <sub>pk</sub>	nH	mΩ	A <sub>rms</sub>		
250	180	4.7	22.0	37.0	32.0	27.5	200	100,000	940	18	1.4	13.5	21	76IR4470(1)H3(2)	R76IR4470(1)H3(2)
250	180	5.6	22.0	37.0	32.0	27.5	200	100,000	1,120	18	1.1	14.7	21	76IR4560(1)H4(2)	R76IR4560(1)H4(2)
250	180	1.2	11.0	22.0	41.5	37.5	100	50,000	120	20	5.3	10.3	27	76IW4120(1)H3(2)	R76IW4120(1)H3(2)
250	180	1.5	11.0	22.0	41.5	37.5	100	50,000	150	20	4.2	11.6	27	76IW4150(1)H3(2)	R76IW4150(1)H3(2)
250	180	1.5	24.0	15.0	41.5	37.5	100	50,000	150	20	4.2	12.2	24	76IW4150(1)HL(2)	R76IW4150(1)HL(2)
250	180	1.8	11.0	22.0	41.5	37.5	100	50,000	180	20	3.5	10.3	27	76IW4180(1)H3(2)	R76IW4180(1)H3(2)
250	180	1.8	24.0	15.0	41.5	37.5	100	50,000	180	20	3.5	10.9	24	76IW4180(1)HL(2)	R76IW4180(1)HL(2)
250	180	2.2	13.0	24.0	41.5	37.5	100	50,000	220	20	2.9	11.8	25	76IW4220(1)H3(2)	R76IW4220(1)H3(2)
250	180	2.2	24.0	15.0	41.5	37.5	100	50,000	220	20	2.9	12.1	24	76IW4220(1)HL(2)	R76IW4220(1)HL(2)
250	180	2.7	16.0	28.5	41.5	37.5	100	50,000	270	20	2.4	9.8	23	76IW4270(1)H2(2)	R76IW4270(1)H2(2)
250	180	2.7	24.0	19.0	41.5	37.5	100	50,000	270	20	2.4	9.8	23	76IW4270(1)HL(2)	R76IW4270(1)HL(2)
250	180	3.3	16.0	28.5	41.5	37.5	100	50,000	330	20	1.9	10.9	23	76IW4330(1)H3(2)	R76IW4330(1)H3(2)
250	180	3.3	24.0	19.0	41.5	37.5	100	50,000	330	20	1.9	10.8	23	76IW4330(1)HL(2)	R76IW4330(1)HL(2)
250	180	3.9	16.0	28.5	41.5	37.5	100	50,000	390	20	1.6	11.8	23	76IW4390(1)H3(2)	R76IW4390(1)H3(2)
250	180	4.7	19.0	32.0	41.5	37.5	100	50,000	470	20	1.4	13.5	21	76IW4470(1)H3(2)	R76IW4470(1)H3(2)
250	180	5.6	20.0	40.0	41.5	37.5	100	50,000	560	20	1.1	15.5	19	76IW4560(1)H2(2)	R76IW4560(1)H2(2)
250	180	6.8	20.0	40.0	41.5	37.5	100	50,000	680	20	0.9	17.1	19	76IW4680(1)H3(2)	R76IW4680(1)H3(2)
250	180	8.2	24.0	44.0	41.5	37.5	100	50,000	820	20	0.8	19.6	17	76IW4820(1)H2(2)	R76IW4820(1)H2(2)
250	180	10	24.0	44.0	41.5	37.5	100	50,000	1,000	20	0.6	21.6	17	76IW5100(1)H3(2)	R76IW5100(1)H3(2)
250	180	12	30.0	45.0	41.5	37.5	100	50,000	1,200	20	0.5	24.6	16	76IW5120(1)H3(2)	R76IW5120(1)H3(2)
400	250	0.010	4.0	9.0	13.0	10.0	1,500	1,200,000	15	9	64	1.57	79	76MF2100(1)H0(2)	R76MF2100(1)H0(2)
400	250	0.012	4.0	9.0	13.0	10.0	1,500	1,200,000	18	9	53	1.88	79	76MF2120(1)H0(2)	R76MF2120(1)H0(2)
400	250	0.015	4.0	9.0	13.0	10.0	1,500	1,200,000	23	9	42	2.15	79	76MF2150(1)H3(2)	R76MF2150(1)H3(2)
400	250	0.018	4.0	9.0	13.0	10.0	1,500	1,200,000	27	9	35	2.35	79	76MF2180(1)H3(2)	R76MF2180(1)H3(2)
400	250	0.022	4.0	9.0	13.0	10.0	1,500	1,200,000	33	9	29	2.60	79	76MF2220(1)H3(2)	R76MF2220(1)H3(2)
400	250	0.027	5.0	11.0	13.0	10.0	1,500	1,200,000	41	9	24	3.07	69	76MF2270(1)H3(2)	R76MF2270(1)H3(2)
400	250	0.033	5.0	11.0	13.0	10.0	1,500	1,200,000	50	9	19	3.40	69	76MF2330(1)H3(2)	R76MF2330(1)H3(2)
400	250	0.039	6.0	12.0	13.0	10.0	1,500	1,200,000	59	9	16	3.84	64	76MF2390(1)H3(2)	R76MF2390(1)H3(2)
400	250	0.047	6.0	12.0	13.0	10.0	1,500	1,200,000	71	9	14	4.22	64	76MF2470(1)H3(2)	R76MF2470(1)H3(2)
400	250	0.033	5.0	11.0	18.0	15.0	900	720,000	30	10	19	3.6	60	76MI2330(1)H0(2)	R76MI2330(1)H0(2)
400	250	0.039	5.0	11.0	18.0	15.0	900	720,000	35	10	16	4.0	60	76MI2390(1)H3(2)	R76MI2390(1)H3(2)
400	250	0.047	5.0	11.0	18.0	15.0	900	720,000	42	10	14	4.3	60	76MI2470(1)H3(2)	R76MI2470(1)H3(2)
400	250	0.056	5.0	11.0	18.0	15.0	900	720,000	50	10	20	3.6	60	76MI2560(1)H3(2)	R76MI2560(1)H3(2)
400	250	0.068	6.0	12.0	18.0	15.0	900	720,000	61	10	16	4.1	56	76MI2680(1)H3(2)	R76MI2680(1)H3(2)
400	250	0.082	6.0	12.0	18.0	15.0	900	720,000	74	10	14	4.5	56	76MI2820(1)H3(2)	R76MI2820(1)H3(2)
400	250	0.10	7.5	13.5	18.0	15.0	900	720,000	90	10	11	5.2	51	76MI3100(1)H3(2)	R76MI3100(1)H3(2)
400	250	0.10	9.0	12.5	18.0	15.0	900	720,000	90	10	11	5.3	50	76MI3100(1)H7(2)	R76MI3100(1)H7(2)
400	250	0.12	7.5	13.5	18.0	15.0	900	720,000	108	10	13	4.8	51	76MI3120(1)H3(2)	R76MI3120(1)H3(2)
400	250	0.12	9.0	12.5	18.0	15.0	900	720,000	108	10	13	4.8	50	76MI3120(1)H7(2)	R76MI3120(1)H7(2)
400	250	0.15	8.5	14.5	18.0	15.0	900	720,000	135	10	11	5.5	48	76MI3150(1)H3(2)	R76MI3150(1)H3(2)
400	250	0.15	13.0	12.0	18.0	15.0	900	720,000	135	10	11	5.7	45	76MI3150(1)H7(2)	R76MI3150(1)H7(2)
400	250	0.18	10.0	16.0	18.0	15.0	900	720,000	162	10	9	6.3	44	76MI3180(1)H3(2)	R76MI3180(1)H3(2)
400	250	0.18	13.0	12.0	18.0	15.0	900	720,000	162	10	9	6.2	45	76MI3180(1)H7(2)	R76MI3180(1)H7(2)
400	250	0.22	10.0	16.0	18.0	15.0	900	720,000	198	10	7	6.9	44	76MI3220(1)H3(2)	R76MI3220(1)H3(2)
400	250	0.27	11.0	19.0	18.0	15.0	900	720,000	243	10	6	8.1	40	76MI3270(1)H3(2)	R76MI3270(1)H3(2)
VDC	VAC	Cap Value	T	H	L	Lead Spacing (S)	dV/dt (V/µs)	Max K <sub>0</sub> (V <sup>2</sup> /µs)	A <sub>pk</sub>	Lead Length 2x 4 mm	at 100 kHz	at 100 kHz, 100°C	(°C/W)	KEMET Part Number	Customer Part Number
									I <sub>pk</sub>	ESL	ESR max	I <sub>rms</sub> max (*)	R <sub>th</sub>		

(1) Insert lead and packaging code. See Ordering Options Table for available options.

(2) H = 2.5%, J = 5%, K = 10%

(\*) I<sub>rms</sub> value that leads to a ΔT of ≈ 15°C in the hot spot > T<sub>HS</sub> = T<sub>AMB</sub> + ΔT = 100°C + 15°C = 115°C

**Table 1 – Ratings & Part Number Reference cont.**

VDC	VAC	Cap Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Max K <sub>0</sub> (V <sup>2</sup> /µs)	I <sub>pk</sub>	ESL	ESR max	I <sub>rms</sub> max (*)	R <sub>th</sub>	KEMET Part Number	Customer Part Number
			Lead Length 2x 4 mm	at 100 kHz	at 100 kHz 100°C										
											A <sub>pk</sub>	nH	mΩ		
T	H	L													
400	250	0.12	6.0	15.0	26.5	22.5	500	400,000	60	16	20	4.2	43	76MN3120(1)H3(2)	R76MN3120(1)H3(2)
400	250	0.15	6.0	15.0	26.5	22.5	500	400,000	75	16	16	4.7	43	76MN3150(1)H3(2)	R76MN3150(1)H3(2)
400	250	0.18	6.0	15.0	26.5	22.5	500	400,000	90	16	13	5.2	43	76MN3180(1)H3(2)	R76MN3180(1)H3(2)
400	250	0.22	7.0	16.0	26.5	22.5	500	400,000	110	16	11	5.9	41	76MN3220(1)H3(2)	R76MN3220(1)H3(2)
400	250	0.27	8.5	17.0	26.5	22.5	500	400,000	135	16	9	6.7	38	76MN3270(1)H3(2)	R76MN3270(1)H3(2)
400	250	0.33	8.5	17.0	26.5	22.5	500	400,000	165	16	7	7.4	38	76MN3330(1)H3(2)	R76MN3330(1)H3(2)
400	250	0.39	10.0	18.5	26.5	22.5	500	400,000	195	16	8	7.3	36	76MN3390(1)H3(2)	R76MN3390(1)H3(2)
400	250	0.47	10.0	18.5	26.5	22.5	500	400,000	235	16	7	8.0	36	76MN3470(1)H3(2)	R76MN3470(1)H3(2)
400	250	0.56	11.0	20.0	26.5	22.5	500	400,000	280	16	6	8.9	34	76MN3560(1)H3(2)	R76MN3560(1)H3(2)
400	250	0.68	13.0	22.0	26.5	22.5	500	400,000	340	16	4.7	10.2	31	76MN3680(1)H3(2)	R76MN3680(1)H3(2)
400	250	0.39	9.0	17.0	32.0	27.5	300	240,000	117	18	8	7.3	35	76MR3390(1)H3(2)	R76MR3390(1)H3(2)
400	250	0.47	9.0	17.0	32.0	27.5	300	240,000	141	18	7	8.1	35	76MR3470(1)H3(2)	R76MR3470(1)H3(2)
400	250	0.56	11.0	20.0	32.0	27.5	300	240,000	168	18	6	9.3	31	76MR3560(1)H3(2)	R76MR3560(1)H3(2)
400	250	0.68	11.0	20.0	32.0	27.5	300	240,000	204	18	7	8.4	31	76MR3680(1)H3(2)	R76MR3680(1)H3(2)
400	250	0.68	24.0	15.0	32.0	27.5	300	240,000	204	18	7	9.0	27	76MR3680(1)HL(2)	R76MR3680(1)HL(2)
400	250	0.82	13.0	22.0	32.0	27.5	300	240,000	246	18	6	9.5	29	76MR3820(1)H3(2)	R76MR3820(1)H3(2)
400	250	0.82	24.0	15.0	32.0	27.5	300	240,000	246	18	6	9.9	27	76MR3820(1)HL(2)	R76MR3820(1)HL(2)
400	250	1.0	13.0	22.0	32.0	27.5	300	240,000	300	18	6	9.7	29	76MR4100(1)H4(2)	R76MR4100(1)H4(2)
400	250	1.0	24.0	15.0	32.0	27.5	300	240,000	300	18	6	10.1	27	76MR4100(1)HL(2)	R76MR4100(1)HL(2)
400	250	1.2	14.0	28.0	32.0	27.5	300	240,000	360	18	5	10.5	26	76MR4120(1)H4(2)	R76MR4120(1)H4(2)
400	250	1.2	24.0	15.0	32.0	27.5	300	240,000	360	18	5.3	10.3	27	76MR4120(1)HL(2)	R76MR4120(1)HL(2)
400	250	1.5	18.0	33.0	32.0	27.5	300	240,000	450	18	4.2	12.6	23	76MR4150(1)H3(2)	R76MR4150(1)H3(2)
400	250	1.8	18.0	33.0	32.0	27.5	300	240,000	540	18	3.5	11.2	23	76MR4180(1)H3(2)	R76MR4180(1)H3(2)
400	250	2.2	22.0	37.0	32.0	27.5	300	240,000	660	18	2.9	13.1	21	76MR4220(1)H3(2)	R76MR4220(1)H3(2)
400	250	2.7	22.0	37.0	32.0	27.5	300	240,000	810	18	2.4	10.2	21	76MR4270(1)H3(2)	R76MR4270(1)H3(2)
400	250	1.0	11.0	22.0	41.5	37.5	180	144,000	180	20	6	10.1	27	76MW4100(1)H3(2)	R76MW4100(1)H3(2)
400	250	1.0	24.0	15.0	41.5	37.5	180	144,000	180	20	6	10.6	24	76MW4100(1)HL(2)	R76MW4100(1)HL(2)
400	250	1.2	13.0	24.0	41.5	37.5	180	144,000	216	20	5	10.7	25	76MW4120(1)H3(2)	R76MW4120(1)H3(2)
400	250	1.2	24.0	15.0	41.5	37.5	180	144,000	216	20	5	10.9	24	76MW4120(1)HLO2	R76MW4120(1)HLO2
400	250	1.5	13.0	24.0	41.5	37.5	180	144,000	270	20	4	12.0	25	76MW4150(1)H3(2)	R76MW4150(1)H3(2)
400	250	1.5	24.0	15.0	41.5	37.5	180	144,000	270	20	4	12.2	24	76MW4150(1)HL(2)	R76MW4150(1)HL(2)
400	250	1.8	16.0	28.5	41.5	37.5	180	144,000	324	20	4	11.3	23	76MW4180(1)H3(2)	R76MW4180(1)H3(2)
400	250	1.8	24.0	19.0	41.5	37.5	180	144,000	324	20	3.5	11.3	23	76MW4180(1)HL(2)	R76MW4180(1)HL(2)
400	250	2.2	19.0	32.0	41.5	37.5	180	144,000	396	20	2.9	13.1	21	76MW4220(1)H3(2)	R76MW4220(1)H3(2)
400	250	2.2	24.0	19.0	41.5	37.5	180	144,000	396	20	2.9	12.4	23	76MW4220(1)HL(2)	R76MW4220(1)HL(2)
400	250	2.7	19.0	32.0	41.5	37.5	180	144,000	486	20	2.4	10.3	21	76MW4270(1)H3(2)	R76MW4270(1)H3(2)
400	250	3.3	19.0	32.0	41.5	37.5	180	144,000	594	20	1.9	11.3	21	76MW4330(1)H3(2)	R76MW4330(1)H3(2)
400	250	3.9	20.0	40.0	41.5	37.5	180	144,000	702	20	1.6	12.9	19	76MW4390(1)H3(2)	R76MW4390(1)H3(2)
400	250	4.7	20.0	40.0	41.5	37.5	180	144,000	846	20	1.4	14.2	19	76MW4470(1)H3(2)	R76MW4470(1)H3(2)
400	250	5.6	24.0	44.0	41.5	37.5	180	144,000	1,008	20	1.1	16.2	17	76MW4560(1)H3(2)	R76MW4560(1)H3(2)
400	250	6.8	30.0	45.0	41.5	37.5	180	144,000	1,224	20	0.9	18.5	16	76MW4680(1)H3(2)	R76MW4680(1)H3(2)
400	250	8.2	30.0	45.0	41.5	37.5	180	144,000	1,476	20	0.8	20.3	16	76MW4820(1)H3(2)	R76MW4820(1)H3(2)
630	400	0.0039	4.0	9.0	13.0	10.0	4,000	5,040,000	16	9	163	0.98	79	76PF1390(1)H0(2)	R76PF1390(1)H0(2)
630	400	0.0047	4.0	9.0	13.0	10.0	4,000	5,040,000	19	9	135	1.18	79	76PF1470(1)H0(2)	R76PF1470(1)H0(2)
630	400	0.0056	4.0	9.0	13.0	10.0	4,000	5,040,000	22	9	114	1.31	79	76PF1560(1)H0(2)	R76PF1560(1)H0(2)
VDC	VAC	Cap Value	T	H	L	Lead Spacing (S)	dV/dt (V/µs)	Max K <sub>0</sub> (V <sup>2</sup> /µs)	A <sub>pk</sub>	Lead Length 2x 4 mm	at 100 kHz	at 100 kHz, 100°C	(°C/W)	KEMET Part Number	Customer Part Number
									I <sub>pk</sub>	ESL	ESR max	I <sub>rms</sub> max (*)	R <sub>th</sub>		

(1) Insert lead and packaging code. See Ordering Options Table for available options.  
(2) H = 2.5%, J = 5%, K = 10%  
(\*) I<sub>rms</sub> value that leads to a ΔT of ≈ 15°C in the hot spot > T<sub>HS</sub> = T<sub>AMB</sub> + ΔT = 100°C + 15°C = 115°C

















## Soldering Process

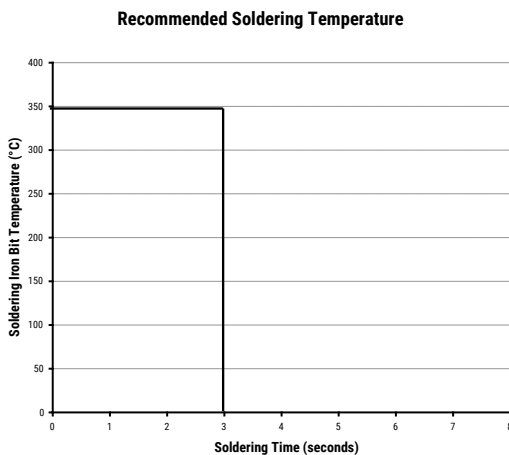
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even 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 recommended limits may result in 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.

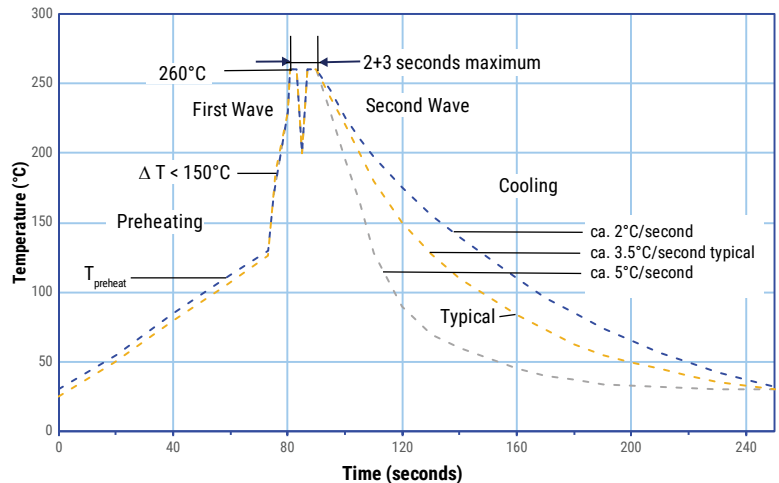
### Manual Soldering Recommendations

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.

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

Figure 1

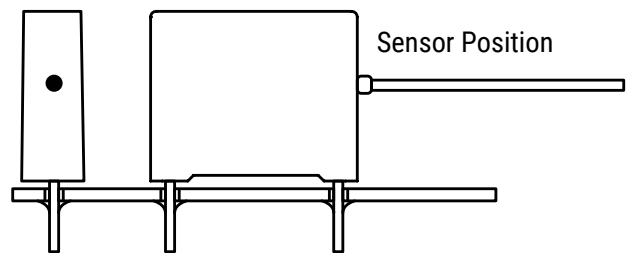
Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Double Metallized Polystyrene and Single Metallized Polypropylene	125°C	130°C	260°C	270°C

2. The maximum temperature measured on the capacitor body:

Set the temperature so that the maximum temperature is below the limit:

Film Material	Maximum Temperature Measured on the Capacitor Body
Double Metallized Polystyrene and Single Metallized Polypropylene	125°C (for series R76H)

Duration: < 60 seconds



### 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.

## Mounting

### Resistance to Vibration and Mechanical Shock

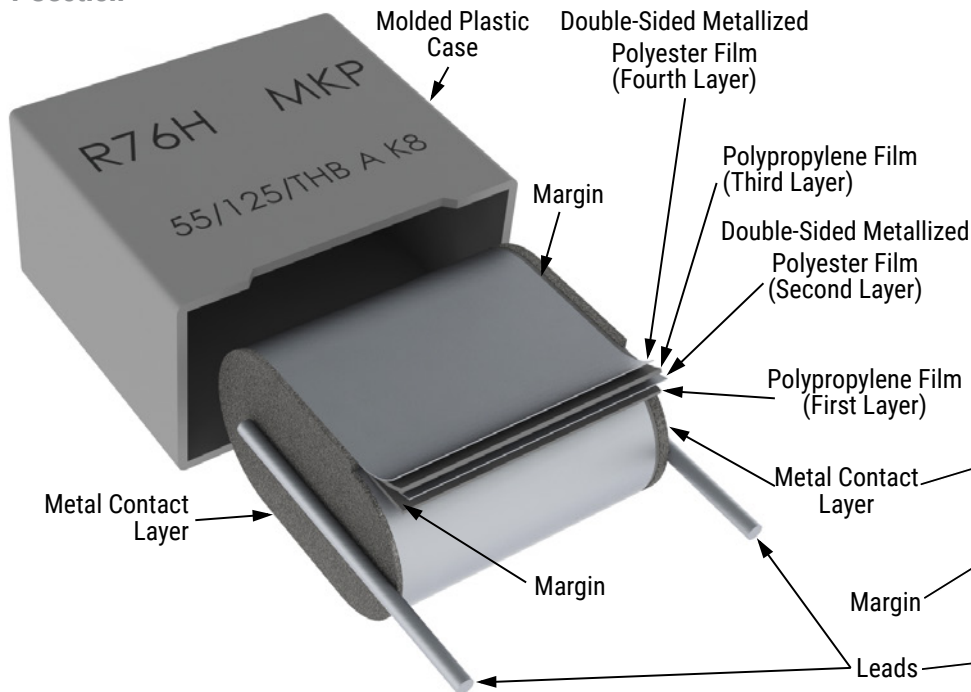
AEC-Q200 Mechanical Stress Tests:

<b>Mechanical Shock</b>	<b>MIL-SDT-202 Method 213</b>	Test condition C Peak value 100 g, duration 6 ms, half-sine-wave (see MIL-HDBK for details)
<b>Vibration</b>	<b>MIL-SDT-202 Method 204</b>	5 g for 20 minutes, 12 cycles each of 3 orientations Use 8"X5" PCB, 0.031" 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 – 2,000 Hz.

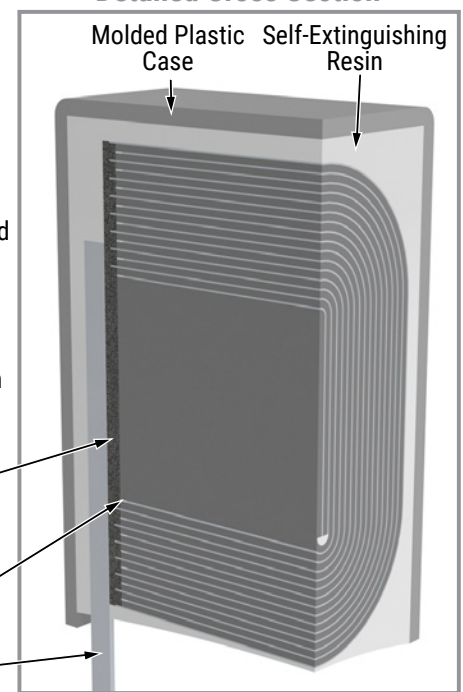
The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitors with pitch  $\leq 22.5$  mm can be mechanically fixed by the leads, for pitch  $> 22.5$  mm, the capacitor body has to be properly fixed (e.g. clamped or glued).

## Construction

### 1 Section

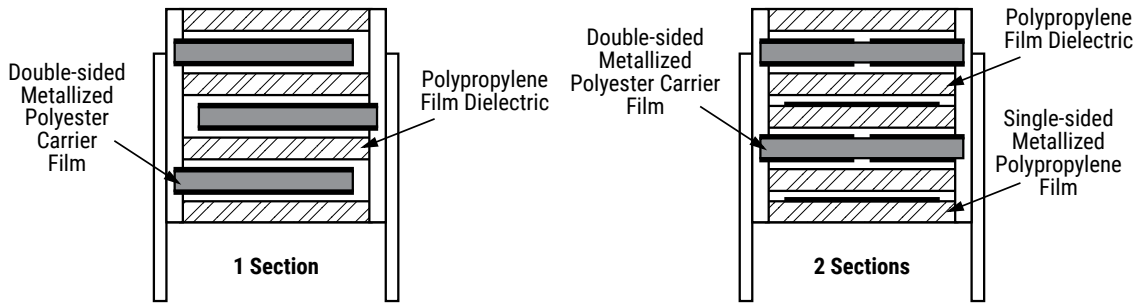


### Detailed Cross Section

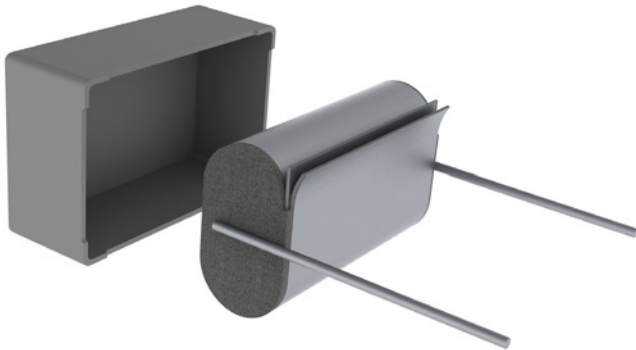


## Construction cont.

### Winding Schemes



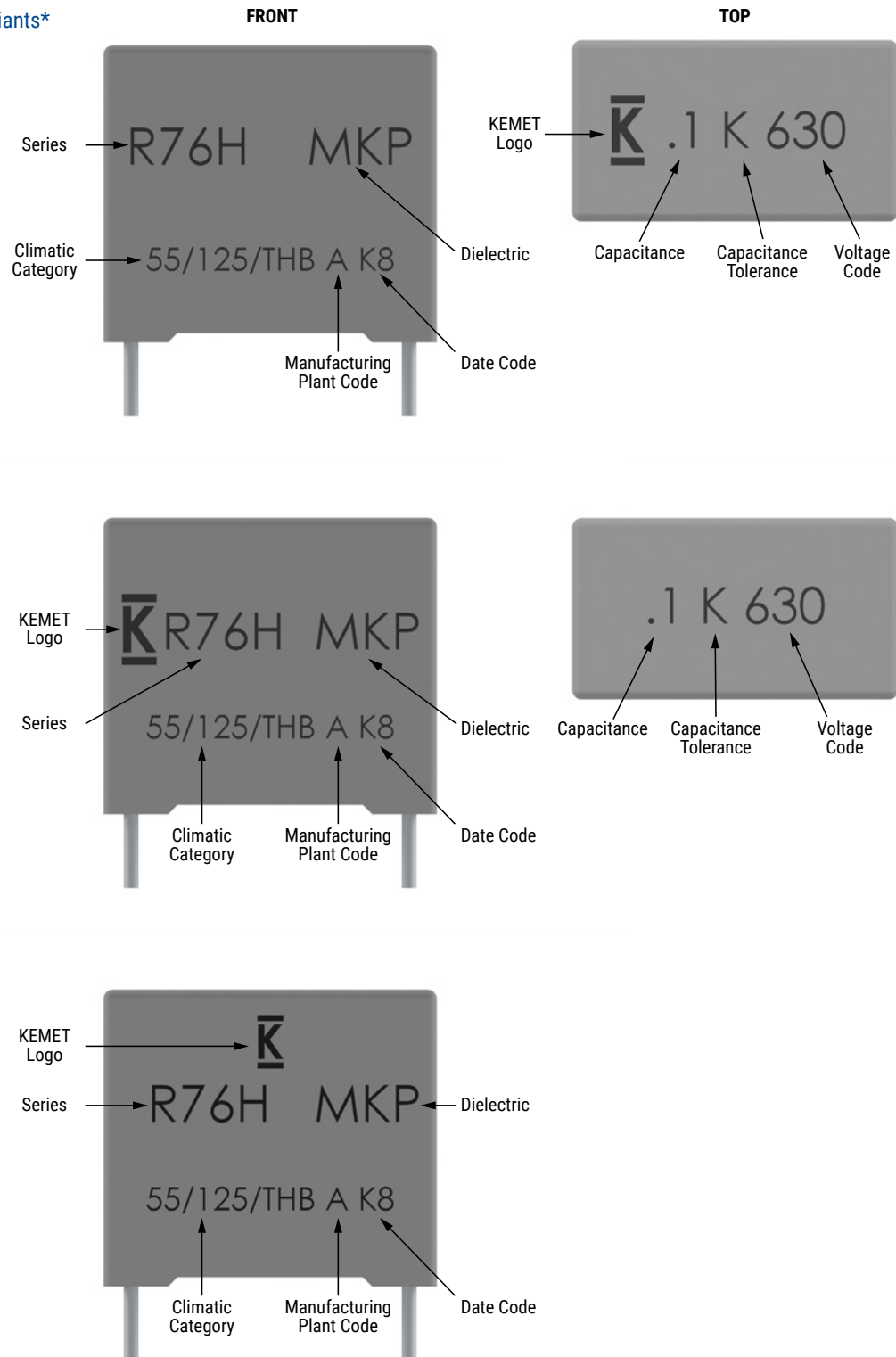
### Low Profile Version



## Marking

Pitch – 10, 15, & 22.5

Marking Variants\*



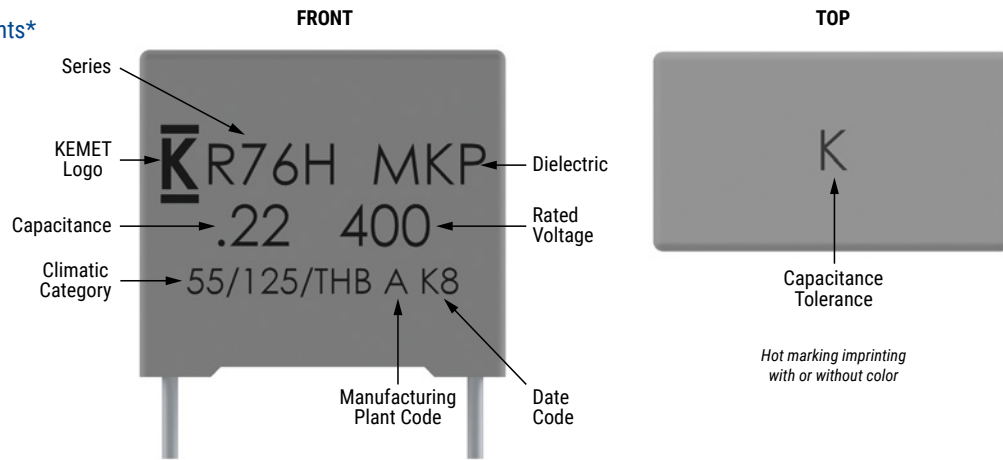
\* Differences are caused by technology (clichee, laser, or ink) and technic (production line)



**Marking cont.**

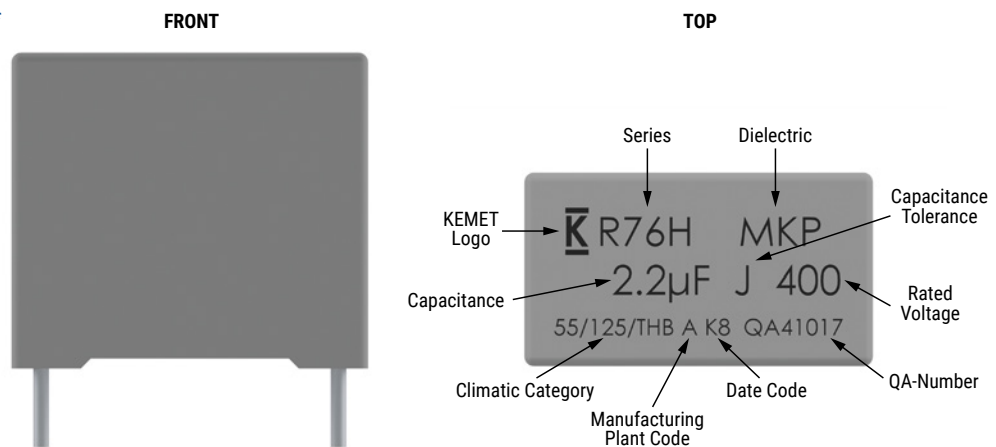
Pitch – 10, 15, 22.5, 27.5, & 37.5

Marking Variants\*



Pitch – 22.5, 27.5, & 37.5

Marking Variants\*



\* Differences are caused by technology (clichee, laser, or ink) and technic (production line)

**Marking cont.**

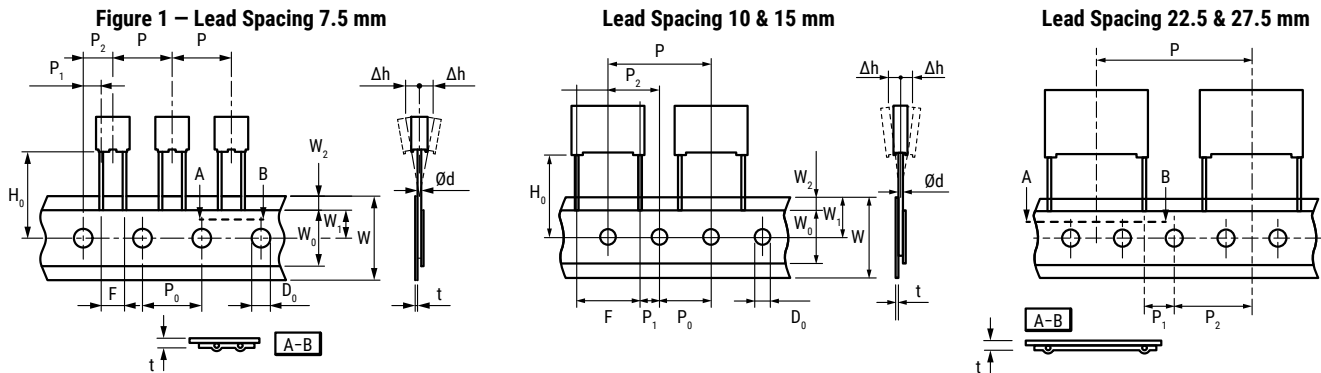
Manufacturing Date Code (IEC-60062)			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	0
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

## Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
	Lead and Packaging Code			JA - JB JE - JH - SE	Z3 - JM <sup>1</sup>	40 - 50	GY - CK	CK	DQ
10	4.0	9.0	13.0	2,000	2,200	1,800	750	1,500	1,000
	5.0	11.0	13.0	1,300	2,000	1,500	600	1,250	800
	6.0	12.0	13.0	1,000	1,800	1,200	500	1,000	680
15	4.0	10.0	18.0	2,500	1,500	1,500	750	1,500	1,000
	5.0	11.0	18.0	2,000	1,250	1,000	600	1,250	800
	6.0	12.0	18.0	1,750	1,000	900	500	1,000	680
	7.5	13.5	18.0	1,000	800	700	350	800	500
	8.5	14.5	18.0	1,000	650	500	300	700	440
	9.0	12.5	18.0	1,000	700	520	270	650	410
	10.0	16.0	18.0	750	550	500	270	600	380
	11.0	19.0	18.0	450	400	350	270	500	340
22.5	6.0	15.0	26.5	805	450	500	300	700	464
	7.0	16.0	26.5	700	450	500	250	550	380
	8.5	17.0	26.5	468	350	300	250	450	280
	10.0	18.5	26.5	396	350	300	160	350	235
	11.0	20.0	26.5	360	200	250	160	350	217
	13.0	22.0	26.5	300	150	200	130	300	-
27.5	9.0	17.0	32.0	816	-	408	230	450	-
	11.0	20.0	32.0	560	-	336	190	350	-
	13.0	12.0	32.0	672	-	288	-	-	-
	13.0	22.0	32.0	480	-	288	150	300	-
	13.0	25.0	32.0	480	-	288	-	300	-
	14.0	28.0	32.0	352	-	176	-	-	-
	18.0	33.0	32.0	256	-	128	-	-	-
	22.0	37.0	32.0	168	-	112	-	-	-
24.0	15.0	32.0	336	144	144	144	-	-	
37.5	11.0	22.0	41.5	420	-	252	-	-	-
	13.0	24.0	41.5	360	-	216	-	-	-
	16.0	28.5	41.5	216	-	108	-	-	-
	19.0	32.0	41.5	192	-	96	-	-	-
	20.0	40.0	41.5	126	-	84	-	-	-
	24.0	15.0	41.5	252	-	108	-	-	-
	24.0	19.0	41.5	216	-	108	-	-	-
	24.0	44.0	41.5	108	-	72	-	-	-
30.0	45.0	41.5	90	-	60	-	-	-	

<sup>1</sup> Only for > 7.5 mm lead spacing.

## Lead Taping & Packaging (IEC 60286-2)



## Taping Specification

Description	Symbol	Dimensions (mm)					Tolerance
		Lead Spacing					
		7.5	10.0	15.0	22.5	27.5	
Lead wire diameter	d	0.5 – 0.6	0.6	0.6 – 0.8	0.8	0.8	±0.05
Taping lead space	P	12.7	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P <sub>0</sub>	12.7	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P <sub>1</sub>	2.6	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P <sub>2</sub>	6.35	12.7	12.7	19.05	19.05	±1.3
Lead spacing ***	F	7.5	10.0	15.0	22.5	27.5	+0.6/-0.1
Component alignment	Δh	0	0	0	0	0	±2
Component deviation	Δp	0	0	0	0	0	±1
Height of component from tape center	H <sub>0</sub> ****	18.5	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	18	+1/-0.5
Hold down tape width	W <sub>0</sub>	6	9	10	10	10	Minimum
Hole position	W <sub>1</sub>	9	9	9	9	9	±0.5
Hold down tape position	W <sub>2</sub>	3	3	3	3	3	Maximum
Feed hole diameter	D <sub>0</sub>	4	4	4	4	4	±0.2
Total Tape thickness	t	0.7	0.7	0.7	0.7	0.7	±0.2

\* Available also 15 mm.

\*\* Maximum 1 mm on 20 lead spacing.

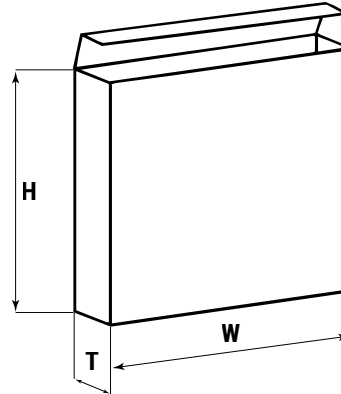
\*\*\* 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.

\*\*\*\* H<sub>0</sub> = 16.5 mm is available upon request.

## Lead Taping & Packaging (IEC 60286-2) cont.

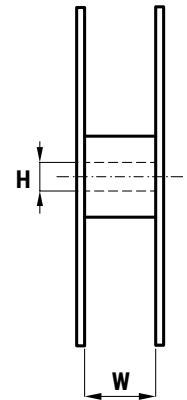
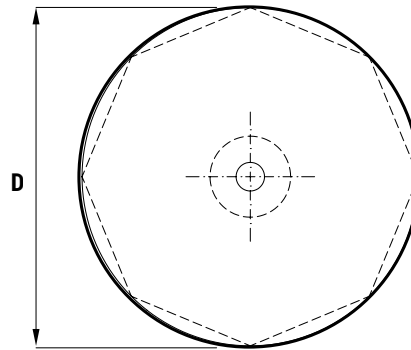
### Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



### Reel Specifications

Dimensions (mm)		
D	H	W
355	30	55 Maximum
500	25	



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