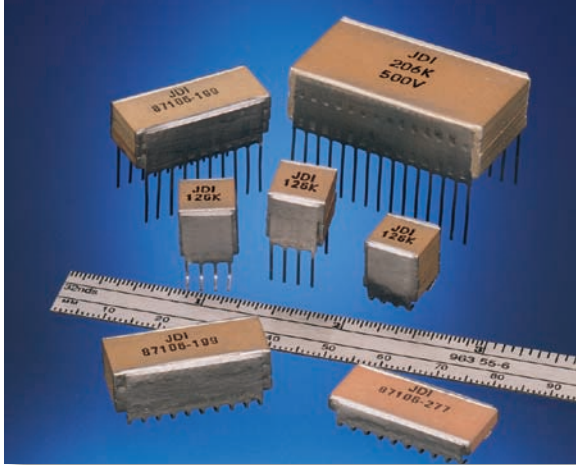




# SWITCH-MODE CERAMIC CAPACITORS

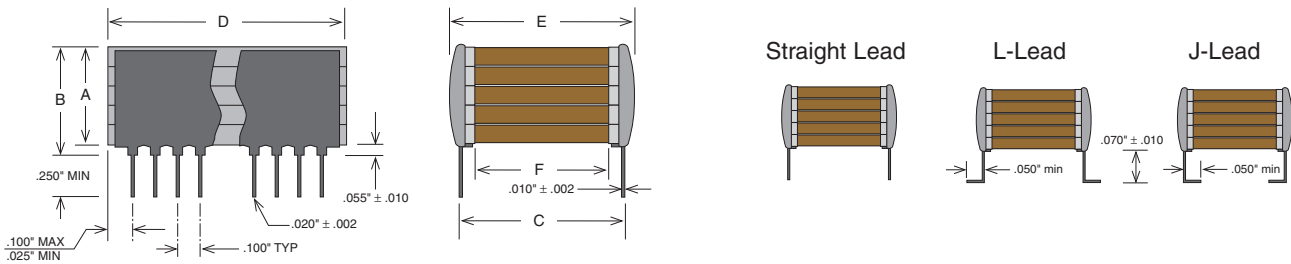


Switch-Mode ceramic capacitors feature large capacitance values and exhibit low ESR (equivalent series resistance) and low ESL (equivalent series inductance) making them well suited for high power and high frequency applications where tantalum or aluminum electrolytic capacitors may not be suitable. AMC offers two series of these devices. The P-Series feature mechanical and pin-out configurations per DSCC 87106 and 88011 drawings while the E-Series feature mechanical and pin-out configurations more common in European design applications.

## KEY FEATURES

- P-Series Approved to DSCC Drawings 87106 & 88011
- E-Series Common European Lead Styles
- NPO & X7R Dielectrics, 50 to 500 VDC Ratings
- Low ESR / Low ESL, Ideal for SMPS Filtering Applications
- Custom Sizes, Voltages, and Values Available

## MECHANICAL CHARACTERISTICS



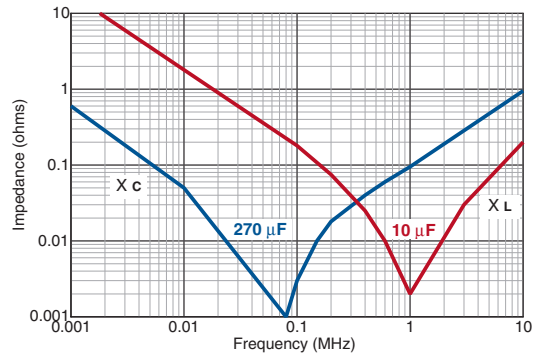
## HOW TO ORDER

201	P03	W	275	K	J	4	H
<b>VOLTAGE</b> Standard Voltages: 500 = 50 V 101 = 100 V 201 = 200 V 501 = 500 V	<b>CASE SIZE</b> See Chart	<b>DIELECTRIC</b> N = NPO B = BX W = X7R	<b>CAPACITANCE</b> 1st two digits are significant; third digit denotes number of zeros. 101 = 100 pF 102 = 1000 pF 103 = 0.01 μF 105 = 1.00 μF	<b>TOLERANCE</b> J = ± 5% K = ± 10% L = ± 15%  M = ± 20% N = ± 30% Z = +80% -20% P = +100% -0%	<b>LEAD STYLE</b> J = "J" Leads (formed in)  L = "L" Leads (formed out) N = Straight Lead	<b>MARKING</b> 3 = Specified 4 = Unmarked	<b>SPECIAL CODE</b> C = Commercial Part H = Group A Tested
Part number written: 201P03W275KJ4H							

# SWITCH-MODE CERAMIC CAPACITORS

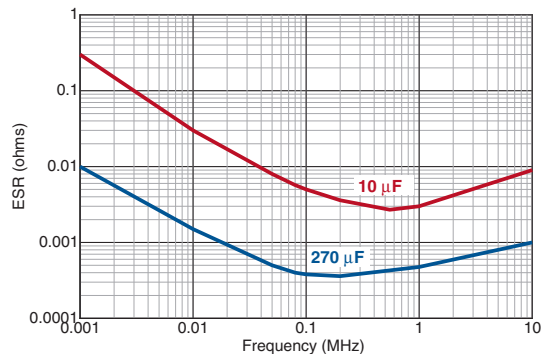
## IMPEDANCE VS FREQUENCY (TYPICAL)

The left-hand portion of the curves represents the capacitive reactance of two typical values. The impedance decreases until series resonance is reached. At this point (the bottom of the V), the only component of the impedance is the ESR. At higher frequencies (the inductive portion) the ESR remains relatively low so that effective filtering is maintained.



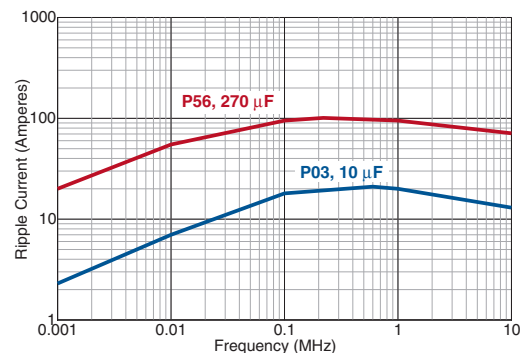
## ESR VS FREQUENCY (TYPICAL)

These curves reflect the very low ESR of two typical values. These ESRs are much lower than Tantalums or Aluminum electrolytics of the same values. The result is the ability to provide filtering (low loss) and to handle high power requirements.



## RIPPLE CURRENT VS FREQUENCY (TYPICAL)

Here are two examples of the ability of Switch-Mode capacitors to handle high values of ripple current (high power) at various frequencies. Refer to the “AC Power Computations” applications note or contact AMC Applications Engineering for more information.



## SOLDERING PRECAUTIONS

The large ceramic mass of Switch-Mode capacitors increases their susceptibility to damage from thermal shock during soldering. Parts should be pre-heated to within 50°C of the peak soldering temperature and the pre-heating cycle’s thermal gradient should be limited to a maximum of 2°C per second.



# SWITCH-MODE CERAMIC CAPACITORS

## P-SERIES SWITCH-MODE CAPACITANCE / VOLTAGE SELECTION

CASE SIZE	NPO Max Capacitance (µF)				BX Max Capacitance (µF)				X7R Max Capacitance (µF)			
	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V
P05	.056	.047	.022	.010	1.20	0.68	0.33	0.15	2.20	1.20	0.68	0.33
P25	0.10	.082	.039	.018	2.20	1.20	0.68	0.27	4.70	2.20	1.50	0.56
P35	0.15	0.12	.068	.027	3.30	1.80	1.00	0.39	6.80	3.30	2.20	0.82
P45	0.22	0.18	.082	.039	4.70	2.70	1.20	0.47	8.20	4.70	2.70	1.00
P55	0.27	0.22	0.10	.047	5.60	3.30	1.50	0.68	12.0	6.80	3.30	1.50
P04	0.12	0.10	.047	.022	2.70	1.50	0.82	0.39	4.70	3.30	1.50	0.82
P24	0.22	0.18	.082	.039	4.70	2.70	1.50	0.68	10.0	4.70	3.30	1.50
P34	0.33	0.27	0.12	.068	8.20	3.90	2.20	1.00	15.0	7.50	4.70	2.20
P44	0.47	0.39	0.18	.082	12.0	5.60	3.30	1.50	22.0	12.0	6.80	3.30
P54	0.56	0.56	0.27	0.12	15.0	8.20	3.90	1.80	27.0	15.0	7.50	4.70
P03	0.47	0.39	0.22	0.10	10.0	5.60	2.70	1.20	22.0	12.0	5.60	2.20
P23	0.82	0.68	0.39	0.18	18.0	10.0	4.70	2.20	33.0	22.0	10.0	4.70
P33	1.20	1.00	0.68	0.27	27.0	15.0	8.20	3.30	56.0	33.0	15.0	6.80
P43	1.80	1.50	0.82	0.39	39.0	22.0	10.0	4.70	75.0	47.0	22.0	10.0
P53	2.20	1.80	1.00	0.47	47.0	27.0	12.0	5.60	100.0	56.0	27.0	12.0
P01	1.00	0.68	0.39	0.18	22.0	12.0	5.60	2.70	39.0	22.0	10.0	5.60
P21	1.80	1.20	0.68	0.33	39.0	22.0	10.0	4.70	75.0	47.0	22.0	10.0
P31	2.70	1.80	1.00	0.47	56.0	33.0	15.0	8.20	120.0	68.0	33.0	15.0
P41	3.90	2.70	1.50	0.68	82.0	47.0	22.0	10.0	150.0	100.0	47.0	22.0
P51	4.70	3.30	1.80	0.82	100.0	56.0	27.0	12.0	180.0	120.0	56.0	27.0
P02	1.20	1.00	0.56	0.22	33.0	18.0	8.20	3.90	56.0	33.0	15.0	8.20
P22	2.20	1.80	1.00	0.39	56.0	33.0	15.0	6.80	100.0	68.0	33.0	15.0
P32	3.30	2.70	1.50	0.68	100.0	56.0	22.0	10.0	150.0	100.0	47.0	22.0
P42	4.70	3.90	2.20	1.00	120.0	68.0	33.0	15.0	220.0	120.0	68.0	33.0
P52	5.60	4.70	2.70	1.20	150.0	82.0	39.0	18.0	270.0	150.0	75.0	39.0
P06	3.30	2.70	1.20	0.47	56.0	39.0	27.0	8.20	100.0	75.0	56.0	15.0
P26	5.60	4.70	2.20	0.82	100.0	68.0	56.0	15.0	180.0	150.0	120.0	33.0
P36	8.20	6.80	3.30	1.20	150.0	100.0	82.0	22.0	270.0	220.0	180.0	47.0
P46	12.0	10.0	4.70	1.80	220.0	150.0	100.0	33.0	390.0	270.0	220.0	68.0
P56	15.0	12.0	5.60	2.20	270.0	180.0	120.0	39.0	470.0	330.0	270.0	82.0

Dielectric specifications may be found on page 16

## SWITCH-MODE CERAMIC CAPACITORS

### P-SERIES SWITCH-MODE MECHANICAL CHARACTERISTICS

CASE SIZE	A	B	C	D	D	E	F	Leads per side
	(max")	(max")	±.025"	(min.)"	(max")	(max")	(min.)"	
P05	.120	.185	.250	0.224	0.275	.300	.080	3
P25	.240	.305						
P35	.360	.425						
P45	.480	.545						
P55	.650	.715						
P04	.120	.185	.400	0.350	0.425	.440	.180	4
P24	.240	.305						
P34	.360	.425						
P44	.480	.545						
P54	.650	.715						
P03	.120	.185	.450	0.950	1.075	.500	.180	10
P23	.240	.305						
P33	.360	.425						
P43	.480	.545						
P53	.650	.715						
P01	.120	.185	.450	1.950	2.075	.500	.180	20
P21	.240	.305						
P31	.360	.425						
P41	.480	.545						
P51	.650	.715						
P02	.120	.185	.800	1.450	1.535	.870	.530	15
P22	.240	.305						
P32	.360	.425						
P42	.480	.545						
P52	.650	.715						
P06	.120	.185	1.250	1.950	2.075	1.350	.980	20
P26	.240	.305						
P36	.360	.425						
P46	.480	.545						
P56	.650	.715						



# SWITCH-MODE CERAMIC CAPACITORS

## E-SERIES SWITCH-MODE CAPACITANCE / VOLTAGE SELECTION

CASE SIZE	NPO Max Capacitance (µF)				BX Max Capacitance (µF)				X7R Max Capacitance (µF)			
	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V
E24	0.15	0.12	0.068	0.027	3.3	1.8	1.0	0.39	6.8	3.3	2.2	0.82
E34	0.22	0.18	0.15	0.039	4.7	2.7	1.5	0.56	10	5.6	3.3	1.2
E44	0.33	0.27	0.22	0.056	6.8	3.9	1.8	0.68	12	8.2	3.9	1.5
E54	0.39	0.33	0.27	0.068	8.2	4.7	2.2	1.0	18	10	4.7	2.2
E25	0.22	0.18	0.1	0.039	4.7	2.7	1.5	0.68	10	4.7	3.3	1.5
E35	0.39	0.27	0.22	0.068	8.2	3.9	2.2	1.0	15	8.2	4.7	2.2
E45	0.56	0.39	0.33	0.082	12	5.6	3.3	1.5	22	12	6.8	3.3
E55	0.68	0.56	0.39	0.12	15	8.2	3.9	1.8	27	15	7.5	4.7
E26	0.39	0.33	0.18	0.068	8.2	4.7	2.2	1.2	15	8.2	5.6	2.2
E36	0.68	0.47	0.39	0.12	12	6.8	3.9	1.5	22	15	6.8	3.3
E46	1.0	0.68	0.56	0.18	18	10	5.6	2.2	33	22	10	5.6
E56	1.2	1.0	0.68	0.22	22	12	6.8	2.7	47	33	12	6.8
E27	0.82	0.68	0.39	0.18	18	10	4.7	2.2	33	22	10	4.7
E37	1.2	1.0	0.68	0.27	27	15	8.2	3.3	56	33	15	6.8
E47	1.8	1.5	1.0	0.39	39	22	10	4.7	75	47	22	10
E57	2.2	1.8	1.2	0.47	47	27	12	5.6	100	56	27	12
E21	0.82	0.68	0.39	0.18	18	10	4.7	2.2	33	22	10	4.7
E31	1.2	1.0	0.68	0.27	27	15	8.2	3.3	56	33	15	6.8
E41	1.8	1.5	1.0	0.39	39	22	10	4.7	75	47	22	10
E51	2.2	1.8	1.2	0.47	47	27	12	5.6	100	56	27	12
E28	1.0	0.82	0.47	0.22	22	12	5.6	2.7	47	27	12	5.6
E38	1.5	1.2	1.0	0.33	33	18	10	3.3	68	39	18	8.2
E48	2.2	1.8	1.5	0.47	47	27	12	5.6	100	56	27	12
E58	2.7	2.2	1.8	0.56	56	33	15	6.8	120	68	33	15
E22	1.8	1.2	0.68	0.33	39	22	10	4.7	75	47	22	10
E32	2.7	1.8	1.5	0.47	68	33	15	8.2	120	68	33	15
E42	3.9	2.7	2.2	0.68	82	47	22	10	150	100	47	22
E52	4.7	3.3	2.7	0.82	100	56	27	12	180	120	56	27
E29	2.7	1.8	1.0	0.47	56	33	15	6.8	120	68	33	15
E39	3.9	2.7	2.2	0.68	100	47	22	12	180	100	47	22
E49	5.6	3.9	3.3	1.0	120	68	33	15	220	150	68	33
E59	6.8	4.7	3.9	1.2	150	82	39	18	270	180	82	39

Dielectric specifications may be found on page 16

# SWITCH-MODE CERAMIC CAPACITORS

## E-SERIES SWITCH-MODE MECHANICAL CHARACTERISTICS

SIZE CODE	A (max.)		C +/- 0.5 mm (.020")		D (max.)		E (max.)		Leads per side
	mm	In.	mm	In.	mm	In.	mm	In.	
E24	3.8	0.150	8.2	0.322	8.7	0.342	9.2	0.362	3
E34	7.4	0.291							
E44	11.1	0.437							
E54	14.8	0.583							
E25	3.8	0.150	10.2	0.400	10.7	0.421	10.7	0.421	4
E35	7.4	0.291							
E45	11.1	0.437							
E55	14.8	0.583							
E26	3.8	0.150	14.0	0.551	13.6	0.535	14.9	0.586	5
E36	7.4	0.291							
E46	11.1	0.437							
E56	14.8	0.583							
E27	3.8	0.150	15.2	0.600	21.6	0.850	16.8	0.661	7
E37	7.4	0.291							
E47	11.1	0.437							
E57	14.8	0.583							
E21	3.8	0.150	20.3*	0.800*	16.6	0.653	21.6	0.850	6
E31	7.4	0.291							
E41	11.1	0.437							
E51	14.8	0.583							
E28	3.8	0.150	10.2	0.400	38.2	1.503	12.0	0.472	14
E38	7.4	0.291							
E48	11.1	0.437							
E58	14.8	0.583							
E22	3.8	0.150	15.2	0.600	38.2	1.503	18.9	0.744	14
E32	7.4	0.291							
E42	11.1	0.437							
E52	14.8	0.583							
E29	3.8	0.150	20.3*	0.800*	40.6	1.598	24.0	0.944	14
E39	7.4	0.291							
E49	11.1	0.437							
E59	14.8	0.583							

\* Lead spacing tolerance +/- 0.8 mm (.031") when 20.3 mm (.800") nominal spacing is specified.

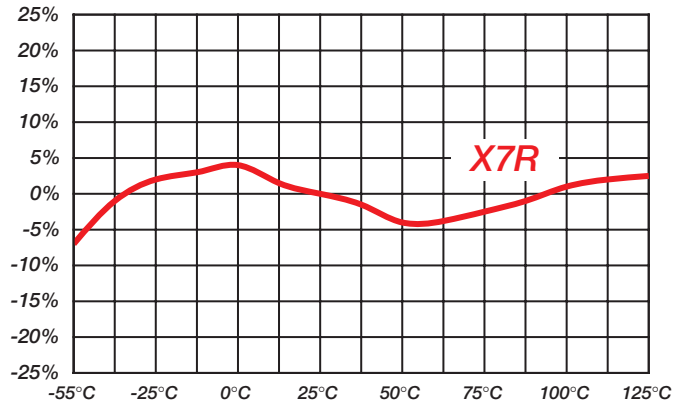
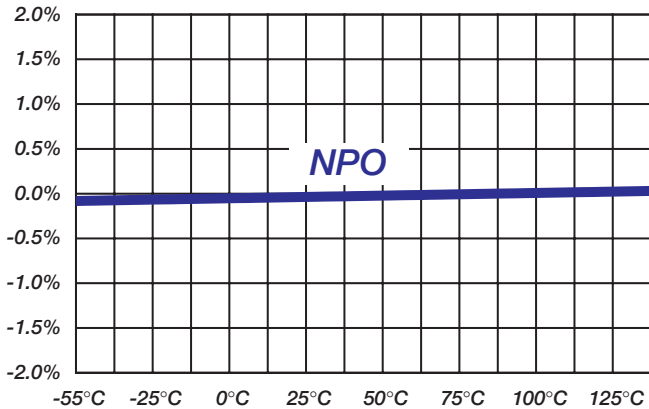


# SWITCH-MODE CERAMIC CAPACITORS

## DIELECTRIC CHARACTERISTICS

	<b>NPO DIELECTRIC</b>	<b>X7R DIELECTRIC</b>
TEMPERATURE COEFFICIENT:	0 ± 30 ppm / °C , -55 to 125°C	0 ± 15% , -55 to 125°C
DISSIPATION FACTOR:	.001 (0.1%) max, 1Khz, 25°C	.025 (2.5%) max, 1KHz, 25°C
AGEING:	None	2.5% / decade hour
INSULATION RESISTANCE:	1000 ΩF or 100 GΩ, whichever is less @ 25°C, WVDC (1KVDC max)	1000 ΩF or 100 GΩ, whichever is less @ 25°C, WVDC (1KVDC max)
DIELECTRIC STRENGTH:		
FOR 1,000 - 5,000 V RATINGS:	1.2 X WVDC, 25°C, 50 mA max	1.2 X WVDC, 25°C, 50 mA max
FOR 500 V RATINGS:	750 VDC, 25°C, 50 mA max	750 VDC, 25°C, 50 mA max
FOR 200 -250 V RATINGS:	2.0 X WVDC, 25°C, 50 mA max	2.0 X WVDC, 25°C, 50 mA max
FOR 50 -100 V RATINGS:	2.5 X WVDC, 25°C, 50 mA max	2.5 X WVDC, 25°C, 50 mA max
TEST PARAMETERS:	1Khz ± 50Hz, 1.0±0.2 VRMS, 25°C	1Khz ± 50Hz, 1.0±0.2 VRMS, 25°C

### TYPICAL CAPACITANCE CHANGE VS TEMPERATURE:



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