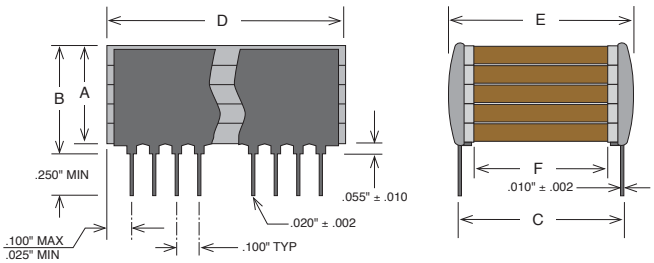
Switch-Mode Ceramic Capacitors

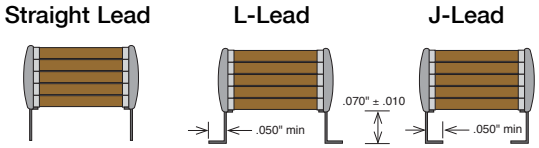
Switch-Mode ceramic capacitors feature large capacitance values and exhibit low ESR (equivalent series resistance) and low ESL (equivalent series inductance) making them well suited for high power and high frequency applications where tantalum or aluminum electrolytic capacitors may not be suitable. 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 Style
- 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
VOLTAGE	CASE SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	LEAD STYLE	MARKING	SPECIAL CODE
Standard Voltages: 500 = 50 V 101 = 100 V 201 = 200 V 501 = 500 V	See Chart	N = NPO B = BX W = X7R	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	J = ± 5% K = ± 10% L = ± 15% M = ± 20% N = ± 30% Z = +80% -20% P = +100% -0%	J = "J" Leads (formed in) K = "J" Leads with reduced height of .045" +/- .010" L = "L" Leads (formed out) M = "L" Leads with reduced height of .045" +/- .010" N = Straight Lead	3 = Specified 4 = Standard Marking	C = Standard Part H = Group A Tested

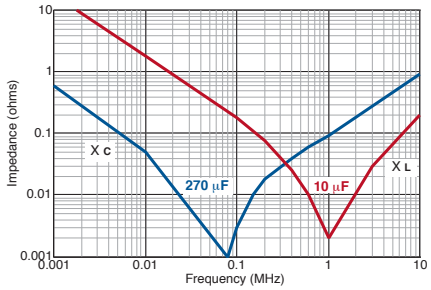
Part number written: 201P03W275KJ4H

15191 Bledsoe Street, Sylmar, California 91342 • (818) 364-9800• FAX (818) 364-6100

Switch-Mode Ceramic Capacitors

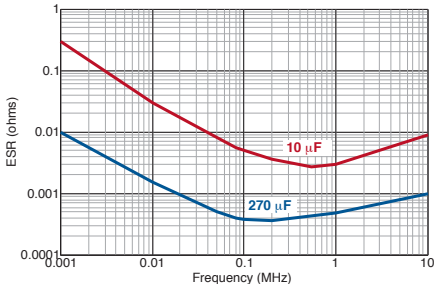
Impedance vs Frequency (Typical)

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.



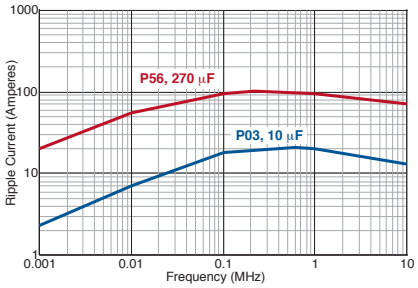
ESR vs Frequency (Typical)

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 Johanson 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.

Electrical Characteristics

Dielectric:	NPO	X7R
Temperature Coefficient:	0 ±30ppm/°C (-55 to +125°C)	±15% (-55 to +125°C)
Dissipation Factor:	0.1% max.	2.5% max.
Aging	None	-2.5% per decade hour
Insulation Resistance (Min. @ 25°C, WVDC)	1000 ΩF or 100 GΩ, whichever is less	500 ΩF or 50 GΩ, whichever is less
Dielectric Strength:	For 500V Ratings: 750VDC, 25ºC, 50mA max For 200V Ratings: 2xWVDC, 25ºC, 50mA max For 25-100V Ratings: 2.5xWVDC, 25ºC, 50mA max	
Test Conditions:	1kHz ±50Hz;1.0±0.2 VRMS	

15191 Bledsoe Street, Sylmar, California 91342 • (818) 364-9800• FAX (818) 364-6100

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)			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
P05	0.07	0.05	0.04	0.02	1.3	0.70	0.37	0.17	3.0	2.2	1.0	0.50
P25	0.14	0.10	0.08	0.04	2.6	1.4	0.74	0.34	6.0	4.4	2.0	1.0
P35	0.21	0.15	0.12	0.06	3.9	2.1	1.1	0.51	9	6.6	3.0	1.5
P45	0.28	0.20	0.16	0.08	5.2	2.8	1.5	0.68	12	8.8	4.0	2.0
P55	0.35	0.25	0.20	0.10	6.5	3.5	1.8	0.85	15	11	5.0	2.5
P04	0.22	0.15	0.12	0.07	4.0	2.0	1.1	0.50	9	6.5	3.0	1.5
P24	0.44	0.30	0.24	0.14	8.0	4.0	2.2	1.0	18	13	6	3.0
P34	0.66	0.45	0.36	0.21	12	6.0	3.3	1.5	27	19	9	4.5
P44	0.88	0.60	0.48	0.28	16	8	4.4	2.0	36	26	12	6.0
P54	1.1	0.75	0.60	0.35	20	10	5.5	2.5	45	32	15	7.5
P03	0.70	0.50	0.39	0.22	10	6.8	3.5	1.5	28	20	9.5	4.7
P23	1.4	1.0	0.78	0.44	20	13	7.0	3.0	56	40	19	9.4
P33	2.1	1.5	1.2	0.66	30	20	10	4.5	84	60	28	14
P43	2.8	2.0	1.5	0.88	40	27	14	6.0	112	80	38	18
P53	3.5	2.5	2.0	1.1	50	34	17	7.5	140	100	47	23
P01	1.4	1.0	0.75	0.44	20	13	7.0	3.0	50	40	19	9.4
P21	2.8	2.0	1.5	0.88	40	27	14	6.0	100	80	38	18
P31	4.2	3.0	2.2	1.3	60	40	21	9.0	150	120	57	27
P41	5.6	4.0	3.0	1.8	80	54	28	12	200	160	76	36
P51	7.0	5.0	3.7	2.2	100	68	35	15	250	200	95	46
P02	2.0	1.4	1.0	0.6	30	19	10	5	75	55	25	14
P22	4.0	2.8	2.0	1.2	60	38	20	9	150	110	50	28
P32	6.0	4.2	3.0	1.8	90	57	30	13	220	160	75	42
P42	8.0	5.6	4.0	2.4	120	76	40	18	300	220	100	56
P52	10	7.0	5.0	3.0	150	95	50	22	370	270	125	70
P06	4.0	2.8	2.2	1.2	69	40	20	9	160	110	50	25
P26	8	5.6	4.4	2.4	130	80	40	18	320	220	100	50
P36	12	8.4	6.6	3.6	200	120	60	27	480	330	150	75
P46	16	11	8.8	4.8	270	160	80	36	640	440	200	100
P56	20	14	11	6	340	200	100	45	800	550	250	125

Dielectric specifications may be found on page 16.
Contact the factory for RoHS products.

15191 Bledsoe Street, Sylmar, California 91342 • (818) 364-9800• FAX (818) 364-6100

Switch-Mode Ceramic Capacitors

P-Series Switch-Mode Mechanical Characteristics

CASE SIZE	A (max")	B (max")	C ±.025"	D (min.")	D (max")	E (max")	F (min.")	Leads per side
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						

15191 Bledsoe Street, Sylmar, California 91342 • (818) 364-9800• FAX (818) 364-6100

Switch-Mode Ceramic Capacitors

E-Series Switch-Mode Capacitance / Voltage Selection

SIZE CODE	NPO Max Capacitance (µF)				BX Max Capacitance (µF)				X7R Max Capacitance (µF)			
	50V	100V	200V	500V	50V	100V	200V	500V	50V	100V	200V	500V
E24	0.13	0.09	0.07	0.045	2.2	1.5	0.8	0.35	5.0	4.0	2.5	1.0
E34	0.26	0.18	0.14	0.09	4.4	3.0	1.6	0.70	10	8.0	5.0	2.0
E44	0.39	0.27	0.21	0.13	6.6	4.5	2.4	1.0	15	12	7.5	3.0
E54	0.52	0.36	0.28	0.18	8.8	6.0	3.2	1.4	20	16	10	4.0
E25	0.22	0.15	0.12	0.08	3.9	2.5	1.4	0.60	9.0	6.5	4.0	1.8
E35	0.44	0.30	0.24	0.16	7.8	5.0	2.8	1.2	18	13	8.0	3.6
E45	0.66	0.45	0.36	0.24	11	7.5	4.2	1.8	27	19	12	5.4
E55	0.88	0.60	0.48	0.32	15	10	5.6	3.0	36	26	16	7.2
E26	0.4	0.30	0.22	0.15	7.0	4.5	2.5	1.0	16	12	7.5	3.3
E36	0.8	0.60	0.44	0.30	14	9.0	5.0	2.0	32	24	15	6.6
E46	1.2	0.90	0.66	0.45	21	13	7.5	3.0	48	36	22	9.9
E56	1.6	1.2	0.9	0.60	28	18	10	4.0	64	48	30	13
E27	0.7	0.5	0.40	0.25	13	8.5	4.5	2.0	30	22	14	6.0
E37	1.4	1.0	0.8	0.5	26	17	9.0	4.0	60	44	28	12
E47	2.1	1.5	1.2	0.8	39	25	13	6.0	90	66	42	18
E57	2.8	2.0	1.6	1.0	52	34	18	8.0	120	88	56	24
E21	0.7	0.5	0.40	0.25	13	8.5	4.5	2.0	30	22	14	6.0
E31	1.4	1.0	0.8	0.5	26	17	9.0	4.0	60	44	28	12
E41	2.1	1.5	1.2	0.8	39	25	13	6.0	90	66	42	18
E51	2.8	2.0	1.6	1.0	52	34	18	8.0	120	88	56	24
E28	0.8	0.6	0.50	0.30	15	10	5.5	2.2	35	25	16	7.0
E38	1.6	1.2	1.0	0.60	30	20	11	4.4	70	50	32	14
E48	2.4	1.8	1.5	0.90	45	30	16	6.6	100	75	48	21
E58	3.2	2.4	2.0	1.2	60	40	22	8.8	140	100	64	28
E22	1.4	1.0	0.75	0.50	24	15	8.5	3.5	50	40	25	11
E32	2.8	2.0	1.5	1.0	48	30	17	7.0	100	80	50	22
E42	3.2	3.0	2.2	2.0	72	45	25	10	150	120	75	33
E52	5.6	4.0	3.0	3.0	96	60	34	14	200	160	100	44
E29	2.0	1.4	1.0	0.70	33	22	12	5.0	75	50	35	16
E39	4.0	2.8	2.0	1.4	66	44	24	10	150	100	70	32
E49	6.0	4.2	3.0	2.1	99	66	36	15	220	150	100	48
E59	8.0	5.6	4.0	2.8	130	88	48	20	300	200	140	64

Dielectric specifications may be found on page 16.
Contact the factory for RoHS products.

15191 Bledsoe Street, Sylmar, California 91342 • (818) 364-9800• FAX (818) 364-6100

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.

15191 Bledsoe Street, Sylmar, California 91342 • (818) 364-9800• FAX (818) 364-6100