

Low ESR High Reliability Electrolytic Capacitors ESRL Series

■ FEATURES

- Very low ESR
- High permissible ripple current
- Wide operating temperature range
- Long life and high reliability
- Suited for switching power supplies
- Satisfies characteristic W of JIS-C-5141 standard
- RoHS Compliant



■ CHARACTERISTICS

Item	Characteristic								
Operating Temperature Range	-55°C ~ +105°C								
Capacitance Tolerance	±20% at +20°C, 120Hz								
Leakage Current	I = 0.01CWV or 3μA whichever is greater after 2 minutes of applied rated DC working voltage at 20°C								
	Where: C = rated capacitance in μF; WV = rated DC working voltage								
Dissipation Factor (Tan, at +20°C 120Hz)	Working voltage (WV)	6.3	10	16	25	35	50	63	100
	Tan	0.22	0.19	0.16	0.14	0.12	0.10	0.08	0.05
	For capacitors whose capacitance exceeds 1,000μF, the specification of tan is increased by 0.02 for every addition of 1,000μF.								
Surge Voltage	Working voltage (WV)	6.3	10	16	25	35	50	63	100
	Surge voltage (SV)	8	13	20	32	44	63	79	125
Low Temperature Characteristics	Working voltage (WV)	6.3	10	16	25	35	50	63	100
	Impedance ratio, Z-55°C/Z-20°C	3	2	2	2	2	2	2	2
Life Test	When returned to +20°C after 2,000 hours application of working voltage at +105°C, the capacitor will meet the following limits: Capacitance change is ±20% of initial value; tan is < 200% of initial specified value; leakage current is ≤ initial specified value								
Shelf Test	When returned to +20°C after 1,000 hours +105°C with no voltage applied, the capacitor will meet the following limits: Capacitance change is ±20% of initial value; tan is < 200% of initial specified value; leakage current is ≤ initial specified value								

■ PART NUMBERING SYSTEM

1	4	0	-	E	S	R	L	5	0	V	1	0	0	-	R	C
Prefix				Series				Voltage			Capacitance (μF)			Suffix (RoHS Compliant)		

■ RIPPLE CURRENT AND FREQUENCY MULTIPLIERS

Working Voltage (WV)	Frequency (Hz)				
	60 (50)	120	500	1K	≥10K
6.3~16	0.55	0.70	0.85	0.95	1.00
25~35	0.45	0.60	0.75	0.90	1.00
50~100	0.40	0.55	0.70	0.85	1.00

■ RIPPLE CURRENT AND TEMPERATURE MULTIPLIERS

Temperature (°C)	<50	70	85	105
Multiplier	2.40	2.05	1.7	1.0

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■ RIPPLE CURRENT (mA RMS @ 105°C, 120Hz)

Value (μF)	Working Voltage (WV)							
	6.3	10	16	25	35	50	63	100
1						43	N/A	36
2.2						48	N/A	40
3.3						52	N/A	43
4.7						55	N/A	100
6.8						55	N/A	100
10						68	100	168
22					108	143	100	168
33			108	108	182	143	170	210
39			108	182	182	182	170	350
47		78	182	182	182	320	170	435
56		85	182	182	182	320	265	435
68		108	182	182	182	320	265	530
100	108	182	182	320	320	445	435	625
220	182	280	320	360	445	825	570	1010
330	280	280	360	445	600	825	770	1255
390	320	410	510	775	930	1085	770	1650
470	410	410	510	775	1000	1085	1420	
560	410	510	775	930	1000	1085	1625	
680	510	510	775	1000	1085	1415	1625	
1000	690	690	1000	1080	1085	1595	1790	
1200	775	930	1125	1200	1200	1830		
2200	1125	1200	1200	1595	2065	2465		
3300	1200	1200	1830	2065	2465			
4700	1595	1830	2065	2465				

■ RIPPLE CURRENT (mA RMS @ 105°C, 100Hz)

Value (μF)	Working Voltage (WV)							
	6.3	10	16	25	35	50	63	100
1						78	N/A	66
2.2						88	N/A	72
3.3						94	N/A	78
4.7						100	N/A	180
6.8						100	N/A	180
10						124	180	305
22					154	260	180	308
33			154	154	260	260	305	380
39			154	260	260	260	305	500
47		111	260	260	260	400	305	620
56		121	260	260	260	400	380	620
68		154	260	260	260	400	380	760
100	154	260	260	400	400	635	620	890
220	260	400	400	510	635	1030	820	1440
330	400	400	510	635	860	1250	1100	1790
390	400	510	635	635	1030	1355	1100	2065
470	510	510	635	635	1250	1355	1770	
560	510	635	860	1030	1250	1355	2030	
680	635	635	860	1250	1355	1770	2030	
1000	860	860	1250	1355	1355	1770	2240	
1200	860	1030	1250	1355	1355	2030		
2200	1250	1355	1355	1770	2295	2740		
3300	1535	1355	2030	2295	2740			
4700	1770	2030	2295	2740				

■ IMPEDANCE (Ω@-10°C, 100KHz)

Value (μF)	Working Voltage (WV)							
	6.3	10	16	25	35	50	63	100
1						15.0	N/A	25.0
2.2						12.0	N/A	21.0
3.3						11.0	N/A	18.0
4.7						9.00	N/A	4.20
6.8						9.00	N/A	4.20
10						6.00	4.20	2.00
22					3.90	1.80	4.20	2.00
33			3.90	3.90	1.80	1.80	2.00	1.80
39			3.90	1.80	1.80	1.80	2.00	1.10
47		5.50	1.80	1.80	1.80	0.99	2.00	0.95
56		4.80	1.80	1.80	1.80	0.99	1.80	0.95
68		3.90	1.80	1.80	1.80	0.99	1.80	0.63
100	3.90	1.80	1.80	0.99	0.99	0.57	0.95	0.56
220	1.80	0.99	0.99	0.75	0.57	0.30	0.24	0.32
330	0.88	0.99	0.75	0.57	0.42	0.26	0.21	0.17
390	0.88	0.75	0.57	0.42	0.30	0.21	0.21	0.14
470	0.75	0.75	0.57	0.42	0.26	0.21	0.18	
560	0.75	0.57	0.42	0.30	0.26	0.21	0.14	
680	0.57	0.57	0.42	0.26	0.21	0.18	0.14	
1000	0.42	0.37	0.26	0.23	0.21	0.18	0.11	
1200	0.42	0.30	0.26	0.21	0.21	0.14		
2200	0.26	0.21	0.21	0.18	0.13	0.10		
3300	0.21	0.21	0.14	0.13	0.10			
4700	0.18	0.14	0.13	0.10				

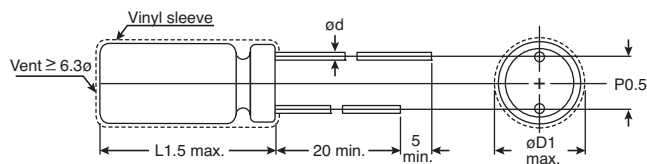
■ IMPEDANCE (Ω@20°C, 100KHz)

Value (μF)	Working Voltage (WV)							
	6.3	10	16	25	35	50	63	100
1						5.00	N/A	7.00
2.2						4.00	N/A	6.00
3.3						3.50	N/A	5.00
4.7						3.00	N/A	1.20
6.8						3.00	N/A	1.20
10						2.00	1.20	0.56
22					1.30	0.60	1.20	0.56
33			1.30	1.30	0.60	0.60	0.56	0.50
39			1.30	0.60	0.60	0.60	0.56	0.32
47		2.10	0.60	0.60	0.60	0.33	0.56	0.27
56		1.90	0.60	0.60	0.60	0.33	0.50	0.27
68		1.30	0.60	0.60	0.60	0.33	0.50	0.21
100	1.30	0.60	0.60	0.33	0.33	0.19	0.27	0.16
220	0.60	0.33	0.33	0.25	0.19	0.12	0.094	0.090
330	0.33	0.33	0.25	0.19	0.12	0.085	0.073	0.060
390	0.33	0.27	0.19	0.14	0.12	0.070	0.073	0.056
470	0.25	0.25	0.19	0.14	0.085	0.070	0.060	
560	0.25	0.19	0.14	0.12	0.085	0.070	0.048	
680	0.19	0.19	0.14	0.085	0.070	0.060	0.048	
1000	0.14	0.14	0.085	0.070	0.070	0.060	0.041	
1200	0.14	0.12	0.085	0.070	0.070	0.048		
2200	0.085	0.070	0.070	0.060	0.044	0.037		
3300	0.070	0.070	0.048	0.044	0.037			
4700	0.060	0.048	0.044	0.037				

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■ DIMENSIONS



Lead Spacing and Diameter (mm)

φD	5	6.3	8	10	13	16	18
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5
φd	0.5	0.5	0.6	0.6	0.6	0.8	0.8
B	0.5	0.5	0.5	0.5	0.5	0.5	0.5
a	1.0			1.5			

Value (μF)	Working Voltage (WV); Dimensions: φD x L (mm)							
	6.3	10	16	25	35	50	63	100
1						5 x 11		5 x 11
2.2						5 x 11		5 x 11
3.3						5 x 11		5 x 11
4.7						5 x 11		6.3 x 11
6.8						5 x 11		6.3 x 11
10						5 x 11	6.3 x 11	8 x 11.5
22					5 x 11	6.3 x 11	6.3 x 11	8 x 11.5
33			5 x 11	5 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 12.5
39			5 x 11	6.3 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 16
47		5 x 11	6.3 x 11	6.3 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 20
56		5 x 11	6.3 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 12.5	10 x 20
68		5 x 11	6.3 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 12.5	10 x 25
100	5 x 11	6.3 x 11	6.3 x 11	8 x 11.5	8 x 11.5	10 x 16	10 x 20	13 x 20
220	6.3 x 11	8 x 11.5	8 x 11.5	10 x 12.5	10 x 16	10 x 25	12.5 x 20	16 x 25
330	8 x 11.5	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 31.5
390	8 x 11.5	10 x 12.5	10 x 16	10 x 16	10 x 25	12.5 x 25	12.5 x 25	16 x 35.5
470	10 x 12.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 25	
560	10 x 12.5	10 x 16	10 x 20	10 x 20	12.5 x 20	12.5 x 25	16 x 31.5	
680	10 x 16	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	
1000	10 x 20	10 x 20	12.5 x 20	12.5 x 25	12.5 x 25	16 x 31.5	16 x 35.5	
1200	10 x 20	10 x 25	12.5 x 20	12.5 x 25	12.5 x 25	16 x 35.5		
2200	12.5 x 20	12.5 x 25	12.5 x 25	16 x 25	16 x 35.5	18 x 40		
3300	12.5 x 25	12.5 x 25	16 x 31.5	16 x 35.5	18 x 40			
4700	16 x 25	16 x 31.5	16 x 35.5	18 x 40				

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