



Low E.S.R. For Switching Regulators – Type LER

ALUMINUM ELECTROLYTIC CAPACITORS

- * Broad operating range excellent reliability good performance characteristics.
- * Low leakage current and low D.F.
- * Low impedance at high frequencies.
- * For high frequency filter circuits, data processing, telecommunications, high frequency switching regulators.

Operating temperature range: -55°C~+105°C.

Capacitance and tolerance: Capacitance measurements shall be made by the bridge method at a frequency of 120Hz₋₅⁺¹⁰Hz.

The capacitance shall be within the specified tolerance of ±20%.

Leakage current: Measurement shall be made at rated DC voltage with an application of a steady source of power such as a regulated power supply. A current-limiting resistor of 1,000 ohms shall be connected in series with each capacitor under test. Rated DC voltage shall be applied to the capacitor for 5 minutes before making the leakage current measurements.

The maximum leakage current for the capacitors shall not exceed the value determined from the following equation or 2UA, whichever is greater.

$$I = 0.002CV$$

- Where: I = Leakage Current (UA)
 C = Nominal Capacitance (UF)
 V = Rated DC Voltage (V.DC)

Dissipation factor: Measured at a frequency of 120Hz₋₅⁺¹⁰ Hz, the dissipation factor shall be less than the values in Table 1.

Table 1.

Rated Voltage (V.DC)	Dissipation Factor (%)
6.3	12
10	10
16	8
25	7
35	7
50~100	6

Low-temperature characteristics: The ratio of the impedance of -25°C or -55°C to that of +20°C shall be less than the values listed in table 2.

Table 2.

Rated Voltage (V.DC)	Ratio of Impedance	
	Z @ -25°C Z @ +20°C	Z @ -55°C Z @ +20°C
6.3	3	5
10	2	4
16	2	3
25	2	3
35	2	3
50~100	2	3

Life test: Full-rated voltage shall be applied to the capacitors through a series protective resistor (1,000 ohms) for a period of 2,000 hours ±12 hours while the capacitors are maintained at an ambient temperature of +105°C ±2°C (shielded from direct heat radiation).

The capacitors shall then be removed from the test chamber and stabilized at room temperature and meet each of the values listed in Table 3.

Table 3.

Capacitance	85% or more of initial measurements
Dissipation factor	200% less of value in Table 1.
Leakage current	Same as specified under the values mentioned in Leakage Current Item
Appearance	Free from leakage of electrolyte and/or other noticeable deformation

Shelf life test: Prior to testing, each capacitor in the test group is measured for capacitance, dissipation factor and DC leakage current.

Capacitors are then stored at +105°C ±2°C for 500 hours with no voltage applied. After 500 hours the capacitors shall be removed from the test chamber and allowed to be stabilized to room temperature. Following the shelf test, rated DC voltage will be applied to the capacitor for 30 minutes after which the capacitor will meet each of the requirements as listed in Table 4.

Table 4.

Capacitance	90% or more of initial measurements
Dissipation factor	115% less of value in Table 1.
Leakage current	Same as specified under Leakage Current
Appearance	Free from leakage of electrolyte and/or other noticeable deformation



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RIPPLE CURRENT in mA-RMS (at 100kHz, +85° C) – peak voltage not to exceed rated DC voltage –

Rated Voltage (V) Surge Voltage (V) CAP. (μF)	6.3	10	16	25	35	50	63	100
1								70
2.2								100
3.3						130	130	130
4.7						150	150	160
10					220	220	220	220
22				330	330	340	340	350
33			350	410	410	420	430	450
47		370	420	480	480	510	520	550
100	510	560	630	730	750	780	820	
220	780	850	970	1,100	1,120	1,210		
330	970	1,060	1,210	1,410	1,480			
470	1,170	1,080	1,480	1,650				
1,000	1,670	1,970						

IMPEDANCE in OHMS (Ω) (at 100kHz, +20° C)

Rated Voltage (V) CAP. (μF)	6.3	10	16	25	35	50	63	100
1								30.80
2.2								14.00
3.3						9.30	9.30	9.30
4.7						6.30	6.50	6.50
10					3.20	3.10	3.10	3.10
22				1.45	1.45	1.40	1.40	1.40
33			1.28	0.97	0.97	0.93	0.93	0.93
47		1.12	0.92	0.68	0.68	0.65	0.65	0.65
100	0.67	0.57	0.45	0.34	0.34	0.32	0.32	
220	0.33	0.28	0.23	0.17	0.17	0.16		
330	0.24	0.20	0.16	0.12	0.12			
470	0.17	0.14	0.12	0.09				
1,000	0.09	0.07						



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ESR (Equivalent Series Resistance) in OHMS (Ω) 20°C at 120Hz

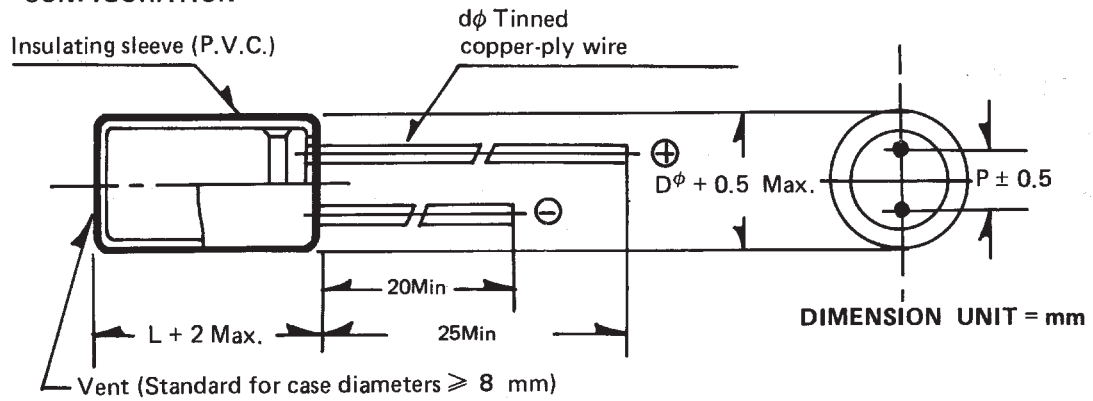
Rated Voltage (V) CAP. (μ F)	6.3	10	16	25	35	50	63	100
1								66.00
2.2								30.00
3.3						20.00	20.00	20.00
4.7						14.00	14.00	14.00
10					8.00	6.60	6.60	6.60
22				3.60	3.60	3.00	3.00	3.00
33			3.20	2.40	2.40	2.00	2.00	2.00
47		2.80	2.30	1.70	1.70	1.40	1.40	1.40
100	1.59	1.33	1.06	0.80	0.80	0.66	0.66	
220	0.72	0.60	0.48	0.36	0.36	0.30		
330	0.48	0.40	0.32	0.24	0.24			
470	0.34	0.28	0.23	0.17				
1,000	0.16	0.13						

ESR (Equivalent Series Resistance) in OHMS (Ω) +20°C –at 1kHz–

Rated Voltage (V) CAP. (μ F)	6.3	10	16	25	35	50	63	100
1								46.00
2.2								21.00
3.3						14.00	14.00	14.00
4.7						9.80	9.80	9.80
10					4.80	4.60	4.60	4.60
22				2.16	2.16	2.10	2.10	2.10
33			1.92	1.44	1.44	1.40	1.40	1.40
47		1.68	1.38	1.02	1.02	0.98	0.98	0.98
100	0.95	0.80	0.63	0.48	0.48	0.46	0.46	
220	0.43	0.36	0.29	0.22	0.22	0.21		
330	0.29	0.24	0.19	0.14	0.14			
470	0.20	0.17	0.14	0.10				
1,000	0.10	0.08						

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• **CONFIGURATION**



Outside Diameter (Dφ)	Lead Spacing (P)	Lead Wire (dφ)
8.0	3.5	0.6
10.0	5.0	0.6
13.0	5.0	0.6

DIMENSIONS: Diameter (Dφ) x Length (L) = mm

Rated Voltage (V)	6.3	10	16	25	35	50	63	100
Surge Voltage (V)	8	13	20	32	44	63	79	125
CAP. (μF)								
1								8 x 11.5
2.2								8 x 11.5
3.3						8 x 11.5	8 x 11.5	8 x 11.5
4.7						8 x 11.5	8 x 11.5	10 x 12.5
10					8 x 11.5	8 x 11.5	8 x 11.5	10 x 16
22				8 x 11.5	10 x 12.5	10 x 12.5	10 x 16	13 x 20
33			8 x 11.5	10 x 12.5	10 x 16	10 x 16	10 x 20	13 x 25
47		8 x 11.5	10 x 12.5	10 x 12.5	10 x 16	10 x 20	13 x 20	13 x 34.5
100	10 x 12.5	10 x 16	10 x 16	10 x 20	13 x 20	13 x 25	13 x 34.5	
220	10 x 20	10 x 20	13 x 20	13 x 20	13 x 25	13 x 34.5		
330	13 x 20	13 x 20	13 x 25	13 x 25	13 x 34.5			
470	13 x 20	13 x 25	13 x 34.5	13 x 34.5				
1,000	13 x 25	13 x 34.5						