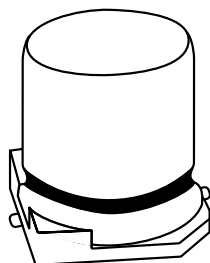


Aluminum Capacitors



FEATURES

- Polarized aluminum electrolytic capacitors
- SMD style
- High CU-product
- Miniature dimension
- Reflow soldering
- RoHS compliant


RoHS
COMPLIANT

QUICK REFERENCE DATA

DESCRIPTION	UNIT	VALUE
Nominal case size (Ø D x L)	mm	4 x 5.3 to 12.5 x 13.5
Rated capacitance range C _R	µF	0.10 to 2200
Capacitance tolerance	%	± 20
Rated voltage range	V	6.3 to 100
Category temperature range	°C	- 40 to + 85
Load life	h	2000
Based on sectional specification		IEC 60384-4/EN 130300
Climatic category IEC 60068		40/105/56

APPLICATIONS

- General use
- Consumer electronics
- Low-headroom, height restricted low mass units
- Filtering, smoothing, coupling

PACKAGING

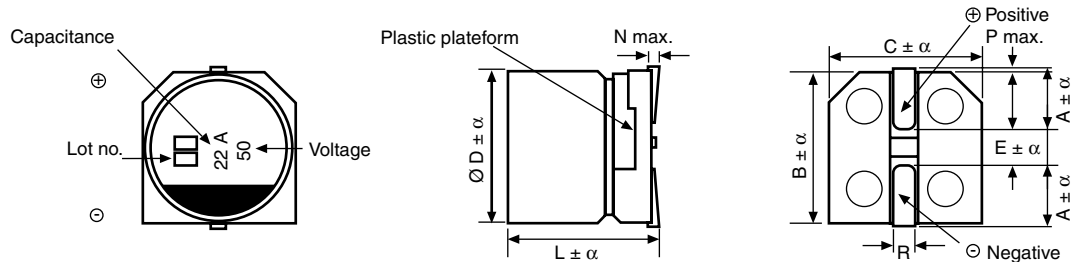
- Supplied in blister tape

SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

C _R (µF)	RATED VOLTAGE (V)							
	6.3	10	16	25	35	50	63	100
0.10	→	→	→	→	→	4 x 5.3	-	-
0.22	→	→	→	→	→	4 x 5.3	-	-
0.33	→	→	→	→	→	4 x 5.3	-	-
0.47	→	→	→	→	→	4 x 5.3	-	-
1.0	→	→	→	→	→	4 x 5.3	-	-
2.2	→	→	→	→	→	4 x 5.3	→	5 x 5.3
3.3	→	→	→	→	→	4 x 5.3	→	6.3 x 5.8
4.7	→	→	→	→	→	5 x 5.3	→	6.3 x 5.8
10	→	→	→	→	4 x 5.3	5 x 5.3	6.3 x 5.8	8 x 10
22	→	→	→	5 x 5.3	→	6.3 x 5.3	8 x 6.2	8 x 10
33	→	→	→	5 x 5.3	6.3 x 5.3	6.3 x 7.7	8 x 10	10 x 10
47	→	→	5 x 5.3	6.3 x 5.3	8 x 6.2	8 x 10	→	10 x 10
68	→	→	→	→	→	→	→	12.5 x 13.5
100	5 x 5.3	→	6.3 x 5.3	8 x 6.2	8 x 10	10 x 10	→	12.5 x 13.5
220	→	8 x 6.2	6.3 x 7.7	8 x 10	→	10 x 10	12.5 x 13.5	-
330	6.3 x 7.7	→	8 x 10	→	10 x 10	12.5 x 13.5	-	-
470	→	8 x 10	→	10 x 10	12.5 x 13.5	-	-	-
1000	8 x 10	10 x 10	→	12.5 x 13.5	-	-	-	-
1500	10 x 10	→	12.5 x 13.5	-	-	-	-	-
2200	→	12.5 x 13.5	-	-	-	-	-	-

DIMENSIONS in millimeters

CASE SIZE CODE	D ± α	L ± α	A ± α	B ± α	C ± α	E ± α	R	N	P
BB	4 ± 0.5	5.3 ± 0.2	1.9 ± 0.2	4.3 ± 0.2	4.3 ± 0.2	1.0 ± 0.2	0.5 ~ 0.8	0.3	0.5
BC	5 ± 0.5	5.3 ± 0.2	2.3 ± 0.2	5.3 ± 0.2	5.3 ± 0.2	1.4 ± 0.2	0.5 ~ 0.8	0.3	0.5
BD	6.3 ± 0.5	5.3 ± 0.3	2.4 ± 0.2	6.6 ± 0.2	6.6 ± 0.2	2.2 ± 0.2	0.5 ~ 0.8	0.3	0.5
AD	6.3 ± 0.5	5.8 ± 0.3	2.4 ± 0.2	6.6 ± 0.2	6.6 ± 0.2	2.2 ± 0.2	0.5 ~ 0.8	0.3	0.5
BM	6.3 ± 0.5	7.7 ± 0.4	2.4 ± 0.2	6.6 ± 0.2	6.6 ± 0.2	2.2 ± 0.2	0.5 ~ 0.8	0.3	0.5
AE	8 ± 0.5	6.2 ± 0.4	3.3 ± 0.2	8.3 ± 0.2	8.3 ± 0.2	2.3 ± 0.2	0.5 ~ 0.8	0.3	0.5
AF	8 ± 0.5	10 ± 0.5	2.9 ± 0.2	8.3 ± 0.2	8.3 ± 0.2	3.1 ± 0.2	0.8 ~ 1.1	0.3	0.5
AG	10 ± 0.5	10 ± 0.5	3.2 ± 0.2	10.3 ± 0.2	10.3 ± 0.2	4.5 ± 0.2	0.8 ~ 1.1	0.3	0.5
AH	12.5 ± 0.5	13.5 ± 0.5	4.6 ± 0.2	12.8 ± 0.2	12.8 ± 0.2	4.5 ± 0.2	1.1 ~ 1.4	0.3	0.5
AK	16 ± 0.5	16.5 ± 0.5	5.6 ± 0.2	16.8 ± 0.2	16.8 ± 0.2	6.5 ± 0.2	1.1 ~ 1.4	0.3	0.5



ELECTRICAL DATA

SYMBOL	DESCRIPTION
U_R	rated voltage
C_R	rated capacitance at 120 Hz
$\tan \delta$	max. dissipation factor at 120 Hz
R_{ESR}	max. equivalent series resistance at 120 Hz
I_R	rated alternating current at 120 Hz and upper category temperature

Note

Unless otherwise specified, all electrical values apply at $T_{amb} = 20^\circ\text{C}$, $P = 80$ to 120 kPa, $RH = 45$ to 75% .

ORDERING EXAMPLE

ECA 33 μF /25 V, $\pm 20\%$, size 5 x 5.3 mm

Ordering code: MALSECA00BC233EARK

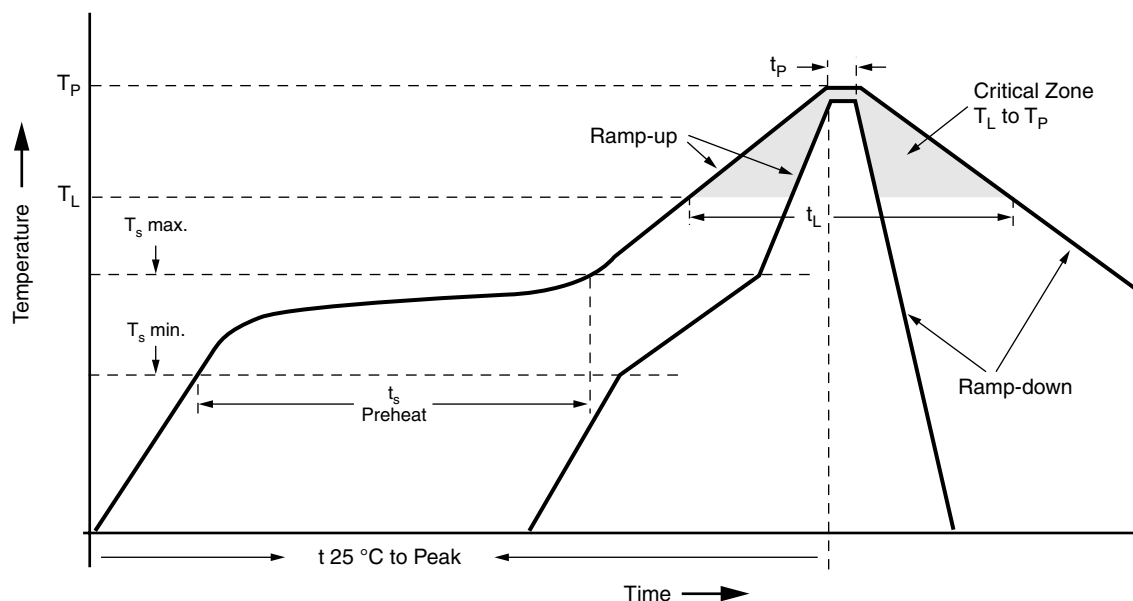
For Standard Packaging Quantity (SPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service.

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μF)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz (Ω)	I_R 120 Hz/85 °C (mA)	WEIGHT (g)	CATALOG NUMBER
6.3	100	5 x 5.3	0.28	3.71	60	0.17	MALSECA00BC310BARK
	330	6.3 x 7.7	0.35	1.41	188	0.40	MALSECA00BM333BARK
	1000	8 x 10	0.35	0.46	370	1.00	MALSECA00AF410BARK
	1500	10 x 10	0.35	0.31	480	1.25	MALSECA00AG415BARK
10	220	8 x 6.2	0.24	1.45	175	0.55	MALSECA00AE322CARK
	470	8 x 10	0.24	0.68	290	1.00	MALSECA00AF347CARK
	1000	10 x 10	0.24	0.32	454	1.25	MALSECA00AG410CARK
	2200	12.5 x 13.5	0.24	0.14	960	2.50	MALSECA00AH422CARK

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μ F)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz (Ω)	I_R 120 Hz/85 °C (mA)	WEIGHT (g)	CATALOG NUMBER
16	47	5 x 5.3	0.20	5.64	52	0.17	MALSECA00BC247DARK
	100	6.3 x 5.3	0.20	2.65	88	0.27	MALSECA00BD310DARK
	220	6.3 x 7.7	0.24	1.45	162	0.40	MALSECA00BM322DARK
	330	8 x 10	0.24	0.96	270	1.00	MALSECA00AF333DARK
	1500	12.5 x 13.5	0.24	0.21	870	2.50	MALSECA00AH415DARK
25	22	5 x 5.3	0.13	7.84	41	0.17	MALSECA00BC222EARK
	33	5 x 5.3	0.13	5.22	50	0.17	MALSECA00BC233EARK
	47	6.3 x 5.3	0.13	3.67	70	0.27	MALSECA00BD247EARK
	100	8 x 6.2	0.16	2.12	145	0.55	MALSECA00AE310EARK
	220	8 x 10	0.16	0.96	232	1.00	MALSECA00AF322EARK
	470	10 x 10	0.16	0.45	400	1.25	MALSECA00AG347EARK
	1000	12.5 x 13.5	0.16	0.21	820	2.50	MALSECA00AH410EARK
35	10	4 x 5.3	0.15	19.9	27	0.12	MALSECA00BB210FARK
	33	6.3 x 5.3	0.15	6.03	65	0.27	MALSECA00BD233FARK
	47	8 x 6.2	0.15	4.23	105	0.55	MALSECA00AE247FARK
	100	8 x 10	0.15	1.99	175	1.00	MALSECA00AF310FARK
	330	10 x 10	0.15	0.60	360	1.25	MALSECA00AG333FARK
	470	12.5 x 13.5	0.15	0.42	600	2.50	MALSECA00AH347FARK
50	0.10	4 x 5.3	0.10	1326	3.2	0.12	MALSECA00BB010HARK
	0.22	4 x 5.3	0.10	602.9	4.7	0.12	MALSECA00BB022HARK
	0.33	4 x 5.3	0.10	401.9	5.7	0.12	MALSECA00BB033HARK
	0.47	4 x 5.3	0.10	282.2	6.8	0.12	MALSECA00BB047HARK
	1.0	4 x 5.3	0.10	132.6	10	0.12	MALSECA00BB110HARK
	2.2	4 x 5.3	0.10	60.3	15	0.12	MALSECA00BB122HARK
	3.3	4 x 5.3	0.10	40.2	18	0.12	MALSECA00BB133HARK
	4.7	5 x 5.3	0.10	28.2	25	0.17	MALSECA00BC147HARK
	10	5 x 5.3	0.10	13.2	41	0.17	MALSECA00BC210HARK
	22	6.3 x 5.3	0.10	6.03	71	0.27	MALSECA00BD222HARK
	33	6.3 x 7.7	0.12	4.82	94	0.40	MALSECA00BM233HARK
	47	8 x 10	0.12	3.39	140	1.00	MALSECA00AF247HARK
	100	10 x 10	0.12	1.59	195	1.25	MALSECA00AG310HARK
	220	10 x 10	0.12	0.72	320	1.25	MALSECA00AG322HARK
	330	12.5 x 13.5	0.12	0.48	600	2.50	MALSECA00AH333HARK
63	10	6.3 x 5.8	0.12	15.9	46	0.30	MALSECA00AD210JARK
	22	8 x 6.2	0.12	7.23	96	0.55	MALSECA00AE222JARK
	33	8 x 10	0.12	4.82	117	1.00	MALSECA00AF233JARK
	220	12.5 x 13.5	0.12	0.72	550	2.50	MALSECA00AH322JARK
100	2.2	5 x 5.3	0.12	72.35	20	0.17	MALSECA00BC122LARK
	3.3	6.3 x 5.8	0.12	48.2	29	0.30	MALSECA00AD133LARK
	4.7	6.3 x 5.8	0.12	33.9	35	0.30	MALSECA00AD147LARK
	10	8 x 10	0.12	15.9	77	1.00	MALSECA00AF210LARK
	22	8 x 10	0.12	7.23	100	1.00	MALSECA00AF222LARK
	33	10 x 10	0.12	4.82	130	1.25	MALSECA00AG233LARK
	47	10 x 10	0.12	3.39	155	1.25	MALSECA00AG247LARK
	68	12.5 x 13.5	0.12	2.34	350	2.50	MALSECA00AH268LARK
	100	12.5 x 13.5	0.12	1.59	420	2.50	MALSECA00AH310LARK

REFLOW SOLDERING CONDITIONS FOR SMD ALUMINUM ELECTROLYTIC CAPACITORS


PROFILE FEATURE			
	SOLDERING CONDITION		
	Ø 4 ~ Ø 10	Ø 12.5	Ø 16
Average ramp-up rate (T _L to T _P)	3 °C/s max.	3 °C/s max.	
Preheat			
Temperature min. (T _s min.)	150 °C	150 °C	
Temperature max. (T _s max.)	200 °C	200 °C	
Time (T _s min. to T _s max.)	60 ~ 150 s	40 ~ 120 s	40 ~ 100 s
T _s max. to T _L			
Ramp-up rate	3 °C/s max.	3 °C/s max.	
Time maintained above			
Temperature (T _L)	217 °C	217 °C	
Time (t _L)	60 ~ 90 s	40 ~ 60 s	
Peak/classification temperature (T _P)	250 °C	240 °C	230 °C
Time within 5 °C of actual peak temperature (T _P)	10 s max.	10 s max.	
Ramp-down rate	3 °C/s max.	3 °C/s max.	
Time 25 °C to peak temperature	8 min max.	8 min max.	

RESISTANCE TO SOLDERING HEAT	
Leakage current	Less than specified value
Capacitance value	Within ± 10 % of initial value
tan δ	Less than specified value

LOW TEMPERATURE BEHAVIOR (at 120 Hz)

IMPEDANCE RATIO (Z) T2/(Z) T1	RATED VOLTAGE (V)							
T2/T1	6.3	10	16	25	35	50	63	100
- 25 °C/+ 20 °C	5	4	3	2	2	2	2	2
- 40 °C/+ 20 °C	10	8	6	4	3	3	3	3

ADDITIONAL ELECTRICAL DATA

PARAMETER	CONDITIONS	VALUE
Current		
Leakage current (Test conditions: U_R , 20 °C)	After 2 min at U_R	$I_{L2} \leq 0.01 \times C_R \times U_R$ or 3 μA for $U_R \leq 100 V$ (whichever is greater)
Resistance		
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max}$.	$ESR = \tan \delta / 2 \pi f C_R$

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY

FREQUENCY (Hz)	I_R MULTIPLIER FOR $U_R \leq 100 V$
50	0.70
120	1.00
300	1.17
1000	1.36
$\geq 10\,000$	1.50

TEST PROCEDURES AND REQUIREMENTS

TEST	PROCEDURE (QUICK REFERENCE)	REQUIREMENTS
Load life	$T_{amb} = 85\,^{\circ}C$ U_R and I_R applied After 2000 h	$\Delta C/C: \pm 20\%$ of initial value $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$
Shelf life	No voltage applied After 1000 h After test: U_R to be applied for 30 min 24 to 48 h before measurement	$\Delta C/C: \pm 20\%$ of initial value $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$



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