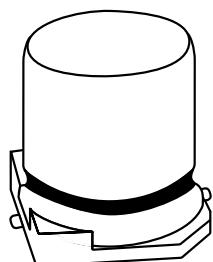


Aluminum Capacitors



FEATURES

- Polarized aluminum electrolytic capacitors, non solid electrolyte
- Extra low impedance, high ripple current
- Temperature up to 105 °C
- RoHS compliant


RoHS
COMPLIANT

APPLICATIONS

- SMD technology, for high mounting density
- Industrial and professional applications
- General industrial, consumer
- Smoothing, filtering, buffering

PACKAGING

- Supplied in blister tape

QUICK REFERENCE DATA

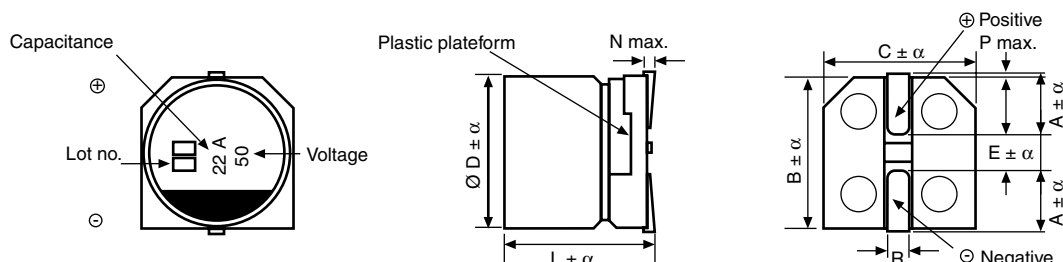
DESCRIPTION	UNIT	VALUE
Nominal case size (Ø D x L)	mm	6 x 5.8 to 12.5 x 13.5
Rated capacitance range C _R	µF	10 to 1500
Capacitance tolerance	%	± 20
Rated voltage range	V	6.3 to 100
Category temperature range	°C	- 40 to 105
Load life	h	2000
Based on sectional specification		IEC 60384-4/ EN 130300
Climatic category IEC 60068		40/105/56

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
10	→	→	→	→	→	6.3 x 5.8
22	→	→	→	→	→	6.3 x 5.8
33	→	→	→	→	6.3 x 5.8	8 x 6.2
47	→	→	→	→	6.3 x 5.8	8 x 6.2
68	→	→	→	6.3 x 5.8	8 x 6.2	8 x 10
100	→	→	6.3 x 5.8	8 x 6.2	8 x 10	10 x 10
220	6.3 x 5.8	6.3 x 7.7	8 x 6.2	8 x 10	10 x 10	-
330	8 x 6.2	→	8 x 10	-	-	-
470	→	8 x 10	10 x 10	-	-	-
680	→	10 x 10	-	-	-	-
1000	10 x 10	-	-	-	-	-
1500	10 x 10	-	-	-	-	-

DIMENSIONS in millimeters

CASE SIZE CODE	$D \pm \alpha$	$L \pm \alpha$	$A \pm \alpha$	$B \pm \alpha$	$C \pm \alpha$	$E \pm \alpha$	R	N	P
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	$0.5 \sim 0.8$	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	$0.5 \sim 0.8$	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	$0.5 \sim 0.8$	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	$0.8 \sim 1.1$	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	$0.8 \sim 1.1$	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	$1.1 \sim 1.4$	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
Z	max. impedance at 100 kHz

Note

Unless otherwise specified, all electrical values apply at
 $T_{amb} = 20^\circ\text{C}$, $P = 86$ to 100 kPa, $RH = 45$ to 75% .

ORDERING EXAMPLE

ECL $22 \mu\text{F}/50 \text{ V}$, $\pm 20\%$, size $6.3 \times 5.8 \text{ mm}$

Ordering code: MALSECL00AD222HARK

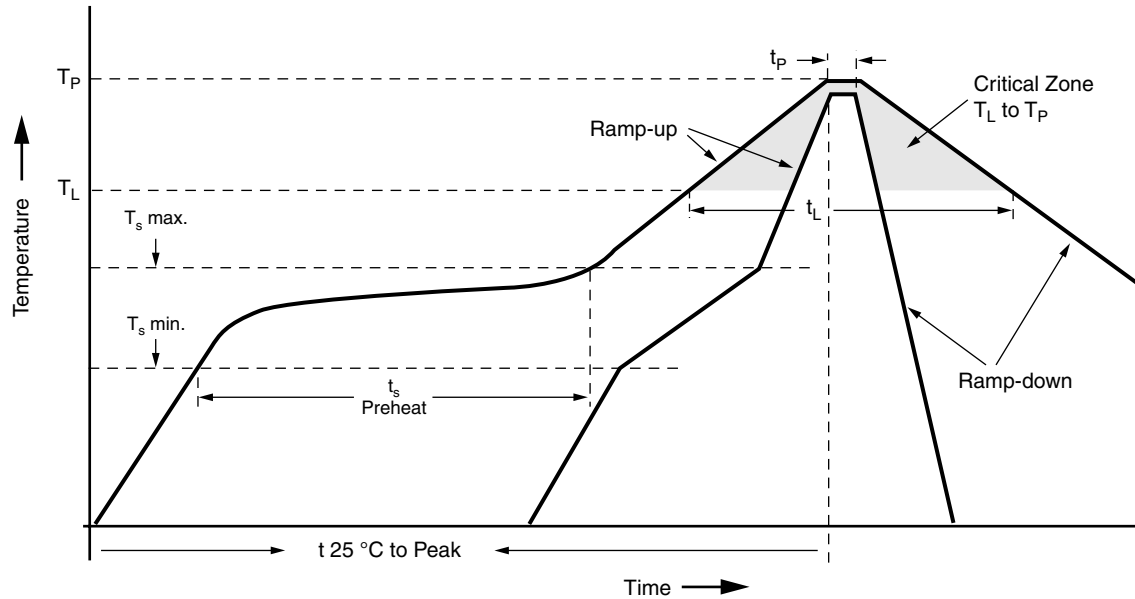
For Standard Packaging Quantity (SPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service.

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μF)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	Z 100 kHz/ 20 °C (Ω)	I_R 100 kHz/ 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER
6.3	220	6.3 x 5.8	0.24	0.44	230	0.30	MALSECL00AD322BARK
	330	8 x 6.2	0.24	0.26	300	0.55	MALSECL00AE333BARK
	1000	10 x 10	0.24	0.09	670	1.21	MALSECL00AG410BARK
	1500	10 x 10	0.24	0.09	670	1.21	MALSECL00AG415BARK
10	220	6.3 x 7.7	0.19	0.34	280	0.40	MALSECL00BM322CARK
	470	8 x 10	0.19	0.17	450	1.00	MALSECL00AF347CARK
	680	10 x 10	0.19	0.09	670	1.21	MALSECL00AG368CARK
16	100	6.3 x 5.8	0.16	0.44	230	0.30	MALSECL00AD310DARK
	220	8 x 6.2	0.16	0.26	300	0.55	MALSECL00AE322DARK
	330	8 x 10	0.16	0.17	450	1.00	MALSECL00AF333DARK
	470	10 x 10	0.16	0.09	670	1.21	MALSECL00AG347DARK
25	68	6.3 x 5.8	0.14	0.44	230	0.30	MALSECL00AD268EARK
	100	8 x 6.2	0.14	0.26	300	0.55	MALSECL00AE310EARK
	220	8 x 10	0.14	0.17	450	1.00	MALSECL00AF322EARK

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μ F)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	Z 100 kHz/ 20 °C (Ω)	I_R 100 kHz/ 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER
35	33	6.3 x 5.8	0.12	0.44	230	0.30	MALSECL00AD233FARK
	47	6.3 x 5.8	0.12	0.44	230	0.30	MALSECL00AD247FARK
	68	8 x 6.2	0.12	0.26	300	0.55	MALSECL00AE268FARK
	100	8 x 10	0.12	0.17	450	1.00	MALSECL00AF310FARK
	220	10 x 10	0.12	0.09	670	1.21	MALSECL00AG322FARK
50	10	6.3 x 5.8	0.12	0.88	165	0.30	MALSECL00AD210HARK
	22	6.3 x 5.8	0.12	0.88	165	0.30	MALSECL00AD222HARK
	33	8 x 6.2	0.12	0.63	300	0.55	MALSECL00AE233HARK
	47	8 x 6.2	0.12	0.63	300	0.55	MALSECL00AE247HARK
	68	8 x 10	0.12	0.34	450	1.00	MALSECL00AF268HARK
	100	10 x 10	0.12	0.18	670	1.21	MALSECL00AG310HARK

REFLOW SOLDERING CONDITIONS FOR SMD ALUMINUM ELECTROLYTIC CAPACITORS

PROFILE FEATURE

	SOLDERING CONDITION		
	$\varnothing 4 \sim \varnothing 10$	$\varnothing 12.5$	$\varnothing 16$
Average ramp-up rate (T_L to T_P)	3 °C/s max.	3 °C/s max.	
Preheat			
Temperature min. ($T_s \text{ min.}$)	150 °C	150 °C	
Temperature max. ($T_s \text{ max.}$)	200 °C	200 °C	
Time ($T_s \text{ min.}$ to $T_s \text{ max.}$)	60 ~ 150 s	40 ~ 120 s	40 ~ 100 s
$T_s \text{ max.}$ 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	

PROFILE FEATURE

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 $\pm 10\%$ of initial value
$\tan \delta$	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	2	2	2	2	2	2	3	3
- 40 °C/+ 20 °C	3	3	3	3	3	3	4	4

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

FREQUENCY (Hz)	I_R MULTIPLIER
50	0.41
120	0.59
300	0.69
1000	0.80
10 000	0.88
100 000	1.00

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 $\tan \delta_{max.}$	$ESR = \tan \delta / 2 \pi f C_R$

TEST PROCEDURES AND REQUIREMENTS

TEST	PROCEDURE (QUICK REFERENCE)	REQUIREMENTS
Load life	$T_{amb} = 105\text{ °C}$ U_R and I_R applied After 2000 h	$\Delta C/C: \pm 25\%$ 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	$\Delta C/C: \pm 25\%$ of initial value $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$



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