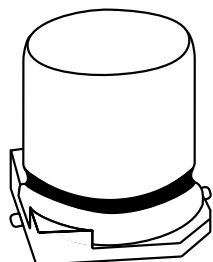


Aluminum Capacitors



FEATURES

- Polarized aluminum electrolytic capacitors
- SMD style
- Miniature dimension
- Extended temperature range: 105 °C
- Reflow soldering
- RoHS compliant


RoHS
COMPLIANT

APPLICATIONS

- Industrial electronics, automotive electronics, telecommunication systems
- Smoothing and filtering
- Miniature power supply units, dc-to-dc converters

PACKAGING

- Supplied in blister tape

QUICK REFERENCE DATA

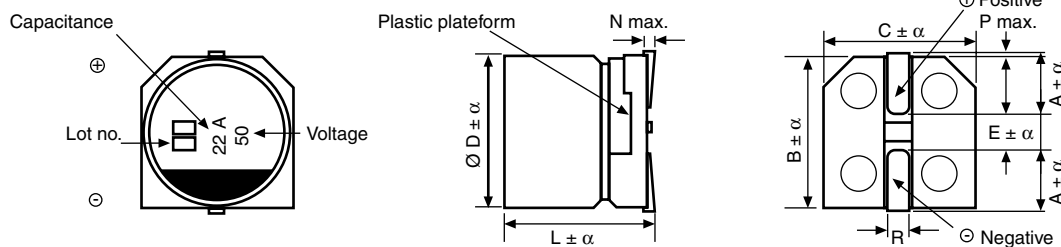
DESCRIPTION	UNIT	VALUE
Nominal case size (Ø D x L)	mm	4 x 5.3 to 12.5 x 13.5
Rated capacitance range C _R	µF	10 to 2200
Capacitance tolerance	%	± 20
Rated voltage range	V	6.3 to 50
Category temperature range	°C	- 40 to 105
Load life	h	2000
Based on sectional specification		IEC 60384-4/ EN130300
Climatic 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	→	→	4 x 5.3	→	5 x 5.3	6.3 x 5.8
22	→	→	→	6.3 x 5.8	6.3 x 5.8	8 x 6.2
33	→	→	6.3 x 5.8	6.3 x 5.8	8 x 6.2	8 x 10
47	5 x 5.3	→	6.3 x 5.8	8 x 6.2	8 x 10	10 x 10
100	→	6.3 x 5.8	→	8 x 10	→	10 x 10
220	→	8 x 10	10 x 10	→	10 x 10	12.5 x 13.5
330	8 x 10	→	10 x 10	10 x 10	12.5 x 13.5	-
470	→	10 x 10	10 x 10	10 x 10	12.5 x 13.5	-
680	→	→	→	12.5 x 13.5	-	-
1000	→	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	$D \pm \alpha$	$L \pm \alpha$	$A \pm \alpha$	$B \pm \alpha$	$C \pm \alpha$	$E \pm \alpha$	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	$0.5 \sim 0.8$	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	$0.5 \sim 0.8$	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	$0.5 \sim 0.8$	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

Note

Unless otherwise specified, all electrical values apply at
 $T_{amb} = 20^\circ\text{C}$, $P = 86$ to 106 kPa, $RH = 45$ to 75% .

ORDERING EXAMPLE

ECV 220 $\mu\text{F}/35$ V, $\pm 20\%$, size 10 x 10 mm

Ordering code: MALSECV00AG322FARK

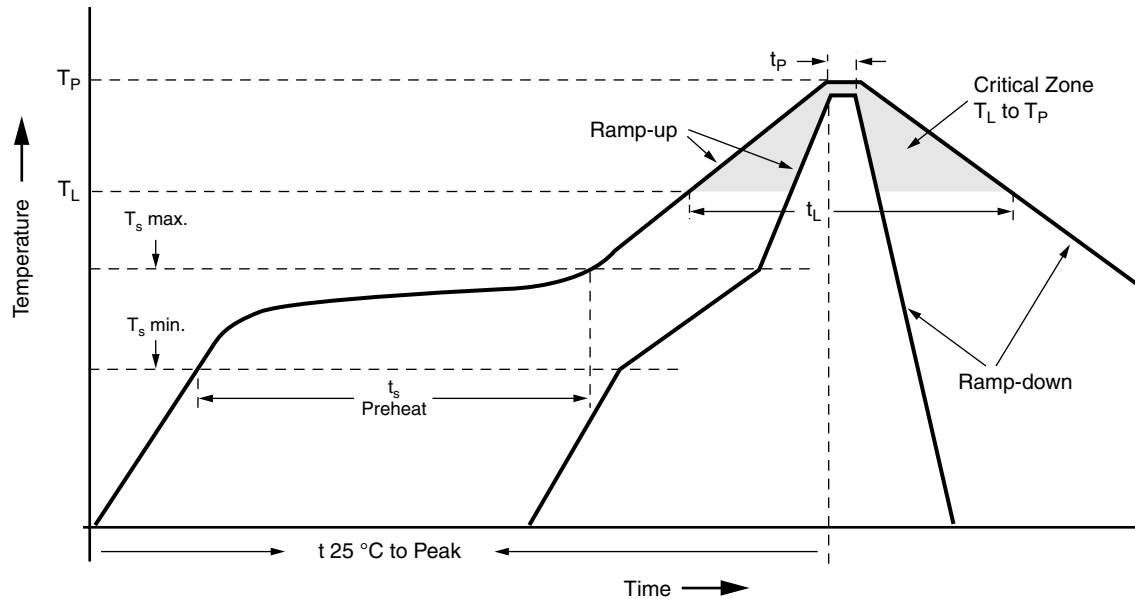
For Standard Packaging Quantity (SPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service.

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μF)	DIMENSIONS $D \times L$ (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz/20 $^\circ\text{C}$ (Ω)	I_R 120 Hz/105 $^\circ\text{C}$ (mA)	WEIGHT (g)	CATALOG NUMBER
6.3	47	5 x 5.3	0.22	6.21	36	0.17	MALSECV00BC247BARK
	330	8 x 10	0.28	1.13	288	1.00	MALSECV00AF333BARK
	1500	10 x 10	0.28	0.25	560	1.21	MALSECV00AG415BARK
	2200	12.5 x 13.5	0.28	0.17	730	2.00	MALSECV00AH422BARK
10	100	6.3 x 5.8	0.19	2.52	60	0.30	MALSECV00AD310CARK
	220	8 x 10	0.24	1.45	173	1.00	MALSECV00AF322CARK
	470	10 x 10	0.24	0.68	351	1.21	MALSECV00AG347CARK
	1000	10 x 10	0.24	0.32	550	1.21	MALSECV00AG410CARK
	1500	12.5 x 13.5	0.24	0.21	650	2.00	MALSECV00AH415CARK
16	10	4 x 5.3	0.16	21.22	17	0.12	MALSECV00BB210DARK
	33	6.3 x 5.8	0.16	6.43	40	0.30	MALSECV00AD233DARK
	47	6.3 x 5.8	0.16	4.52	50	0.30	MALSECV00AD247DARK
	220	10 x 10	0.20	1.21	330	1.21	MALSECV00AG322DARK
	330	10 x 10	0.20	0.80	441	1.21	MALSECV00AG333DARK
	470	10 x 10	0.20	0.56	489	1.21	MALSECV00AG347DARK
	1000	12.5 x 13.5	0.20	0.27	600	2.00	MALSECV00AH410DARK

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μ F)	DIMENSIONS $D \times L$ (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz/20 °C (Ω)	I_R 120 Hz/105 °C (mA)	WEIGHT (g)	CATALOG NUMBER
25	22	6.3 x 5.8	0.14	8.44	38	0.30	MALSECV00AD222EARK
	33	6.3 x 5.8	0.14	5.63	48	0.30	MALSECV00AD233EARK
	47	8 x 6.2	0.16	4.52	79	0.55	MALSECV00AE247EARK
	100	8 x 10	0.16	2.12	181	1.00	MALSECV00AF310EARK
	330	10 x 10	0.16	0.64	372	1.21	MALSECV00AG333EARK
	470	10 x 10	0.16	0.45	450	1.21	MALSECV00AG347EARK
	680	12.5 x 13.5	0.16	0.31	500	2.00	MALSECV00AH368EARK
35	10	5 x 5.3	0.12	15.92	24	0.17	MALSECV00BC210FARK
	22	6.3 x 5.8	0.12	7.23	42	0.30	MALSECV00AD222FARK
	33	8 x 6.2	0.13	5.22	76	0.55	MALSECV00AE233FARK
	47	8 x 10	0.13	3.67	124	1.00	MALSECV00AF247FARK
	220	10 x 10	0.13	0.78	450	1.21	MALSECV00AG322FARK
	330	12.5 x 13.5	0.13	0.52	500	2.00	MALSECV00AH333FARK
	470	12.5 x 13.5	0.13	0.37	600	2.00	MALSECV00AH347FARK
50	10	6.3 x 5.8	0.10	13.26	30	0.30	MALSECV00AD210HARK
	22	8 x 6.2	0.12	7.23	67	0.55	MALSECV00AE222HARK
	33	8 x 10	0.12	4.82	133	1.00	MALSECV00AF233HARK
	47	10 x 10	0.12	3.39	180	1.21	MALSECV00AG247HARK
	100	10 x 10	0.12	1.59	310	1.21	MALSECV00AG310HARK
	220	12.5 x 13.5	0.12	0.72	480	2.00	MALSECV00AH322HARK

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.	

PROFILE FEATURE		
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
$\tan \delta$	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
- 25 °C/+ 20 °C	3	3	2	2	2	2
- 40 °C/+ 20 °C	8	5	4	3	3	3

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Current		
Leakage current (Test conditions: U_R , 20 °C)	After 2 minutes 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	$T_{\text{amb}} = 105$ °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 $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.