

Aluminum Capacitors Radial Style



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case
- Miniaturized, high CV-product per unit volume
- Low impedance
- Long lifetime
- Temperature range up to 105 °C
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

APPLICATIONS

- General purpose, industrial, telecommunications, power supplies and audio-video
- Coupling, decoupling, timing, smoothing, filtering and buffering
- Portable and mobile units

QUICK REFERENCE DATA

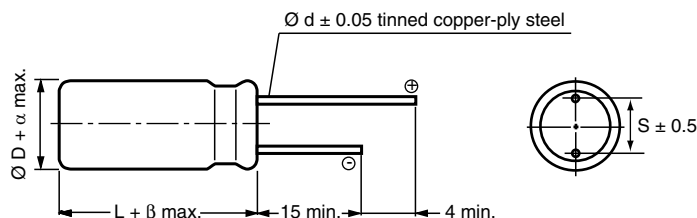
DESCRIPTION	UNIT	VALUE		
Nominal case size (Ø D x L)	mm	5 x 11 to 18 x 40		
Rated capacitance range C _R	µF	0.22 to 15 000		
Capacitance tolerance	%	± 20		
Rated voltage range	V	6.3 to 450		
Category temperature range	°C	6.3 V to 350 V - 40 to + 105		
Load Life	h	400 V to 450 V - 25 to + 105		
U _R ≤ 100 V		5 x 11 to 6.3 x 11	8 x 11.5	10 x 12.5 to 18 x 40
U _R > 100 V		2000	3000	5000
		2000		
Based on sectional specification		IEC 60384-4/EN 130300		
Climatic category IEC 60068		40/105/56		25/105/56

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

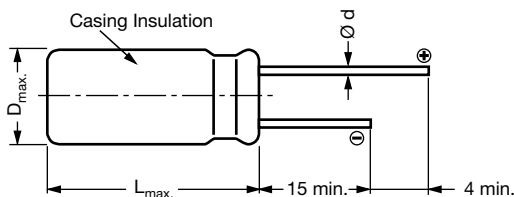
C _R (µF)	RATED VOLTAGE (V) (continuation see next page)							
	6.3	10	16	25	35	50	63	100
0.22	→	→	→	→	→	5 x 11	-	-
0.47	→	→	→	→	→	5 x 11	-	-
1.0	→	→	→	→	→	5 x 11	-	-
2.2	→	→	→	→	→	5 x 11	-	5 x 11
3.3	→	→	→	→	→	5 x 11	5 x 11	5 x 11
4.7	→	→	→	→	5 x 11	5 x 11	5 x 11	5 x 11
10	→	→	→	→	5 x 11	5 x 11	5 x 11	6.3 x 11
22	→	→	→	→	5 x 11	5 x 11	6.3 x 11	8 x 11.5
33	→	→	→	→	5 x 11	→	6.3 x 11	10 x 12.5
47	→	→	→	5 x 11	6.3 x 11	6.3 x 11	8 x 11.5	10 x 16
100	→	5 x 11	→	6.3 x 11	8 x 11.5	8 x 11.5	10 x 16	12.5 x 20
150	→	→	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 20	12.5 x 25
220	→	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16	10 x 25	16 x 25
330	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	16 x 31.5
470	→	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	16 x 20	18 x 40
1000	10 x 12.5	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 25	16 x 35.5	-
1500	→	10 x 20	12.5 x 20	16 x 20	16 x 25	16 x 31.5	-	-
2200	→	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	18 x 35.5	-	-
3300	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	18 x 35.5	-	-	-
4700	→	16 x 25	16 x 31.5	18 x 35.5	-	-	-	-
6800	16 x 25	16 x 31.5	18 x 35.5	-	-	-	-	-
10 000	16 x 31.5	18 x 35.5	-	-	-	-	-	-
15 000	18 x 35.5	-	-	-	-	-	-	-

SELECTION CHART FOR C_R , U_R , AND RELEVANT NOMINAL CASE SIZES ($\varnothing D \times L$ in mm)

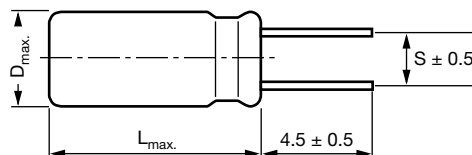
C_R (μF)	RATED VOLTAGE (V)				
	160	200	250	400	450
3.3	→	→	→	→	10 x 20
4.7	→	→	→	→	12.5 x 20
10	→	→	10 x 20	10 x 20	12.5 x 25
22	→	10 x 20	12.5 x 20	12.5 x 25	16 x 25
33	10 x 20	12.5 x 20	12.5 x 25	16 x 20	16 x 31.5
47	→	12.5 x 20	12.5 x 25	16 x 25	18 x 31.5
100	→	16 x 25	16 x 31.5	18 x 40	-
150	16 x 31.5	18 x 25	18 x 31.5	-	-
220	16 x 31.5	18 x 31.5	18 x 40	-	-
330	18 x 31.5	-	-	-	-

RADIAL STYLE: DIMENSIONS in millimeters


$\varnothing D$	5	6.3	8	10	12.5	16	18	22	25
S	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
$\varnothing d$	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0	1.0
β	1.5			2.0					
α	0.5							1.0	

DIMENSIONS in millimeters AND AVAILABLE FORMS


$\varnothing D \leq 18$ long leads MALREKE00...



$\varnothing D \leq 18$ shortened leads MALREKE05...
(S = 2 mm/2.5 mm/3.5 mm/5 mm/7.5 mm)

GENERAL NOTE

- For Minimum Package Quantity (MPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service.
- For other packaging forms please refer to Vishay Roederstein General Information.



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}	Calculated equivalent series resistance at 120 Hz
I_R	Rated ripple current (RMS)
Z	Max. impedance

Note

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

ORDERING EXAMPLEEKE 470 $\mu\text{F}/35\text{ V}$, $\pm 20\%$, size: 10 mm x 20 mm

Leads: Long

Ordering code: MALREKE00DE347F00K

Leads: Short

Ordering code: MALREKE05...

ELECTRICAL DATA AND ORDERING INFORMATION								
U_R (V)	C_R 120 Hz (μF)	DIMENSIONS $\varnothing D \times L$ (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz/ 20°C (Ω)	Z 100 kHz/ 20°C (Ω)	I_R 100 kHz/ 105°C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
6.3	330	6.3 x 11	0.22	0.884	0.30	280	0.43	MALREKE00BA333B00K
	1000	10 x 12.5	0.22	0.292	0.10	660	1.90	MALREKE00DC410B00K
	3300	12.5 x 20	0.28	0.113	0.050	1400	4.50	MALREKE00FE433B00K
	6800	16 x 25	0.34	0.066	0.030	2100	6.60	MALREKE00JG468B00K
	10 000	16 x 31.5	0.40	0.053	0.025	2600	9.00	MALREKE00JS510B00K
	15 000	18 x 35.5	0.50	0.044	0.022	3000	11.5	MALREKE00KL515B00K
10	100	5 x 11	0.19	2.520	0.65	180	0.42	MALREKE00AA310C00K
	220	6.3 x 11	0.19	1.145	0.30	280	0.43	MALREKE00BA322C00K
	470	8 x 11.5	0.19	0.536	0.14	450	1.05	MALREKE00PB347C00K
	1000	10 x 16	0.19	0.252	0.080	850	2.40	MALREKE00DD410C00K
	1500	10 x 20	0.21	0.186	0.054	1100	3.00	MALREKE00DE415C00K
	2200	12.5 x 20	0.23	0.139	0.050	1400	4.50	MALREKE00FE422C00K
	3300	12.5 x 25	0.25	0.100	0.038	1700	4.70	MALREKE00FG433C00K
	4700	16 x 25	0.27	0.076	0.030	2100	6.60	MALREKE00JG447C00K
	6800	16 x 31.5	0.31	0.060	0.025	2600	9.00	MALREKE00JS468C00K
	10 000	18 x 35.5	0.37	0.049	0.022	3000	11.5	MALREKE00KL510C00K
16	150	6.3 x 11	0.16	1.415	0.30	280	0.43	MALREKE00BA315D00K
	330	8 x 11.5	0.16	0.643	0.14	450	1.05	MALREKE00PB333D00K
	470	10 x 12.5	0.16	0.452	0.10	660	1.90	MALREKE00DC347D00K
	1000	10 x 20	0.16	0.212	0.054	1100	3.00	MALREKE00DE410D00K
	1500	12.5 x 20	0.18	0.159	0.050	1400	4.50	MALREKE00FE415D00K
	2200	12.5 x 25	0.20	0.121	0.038	1700	4.70	MALREKE00FG422D00K
	3300	16 x 25	0.22	0.088	0.030	2100	6.60	MALREKE00JG433D00K
	4700	16 x 31.5	0.24	0.068	0.025	2600	9.00	MALREKE00JS447D00K
	6800	18 x 35.5	0.28	0.055	0.022	3000	11.5	MALREKE00KL468D00K
25	47	5 x 11	0.14	3.951	0.65	180	0.42	MALREKE00AA247E00K
	100	6.3 x 11	0.14	1.857	0.30	280	0.43	MALREKE00BA310E00K
	220	8 x 11.5	0.14	0.844	0.14	450	1.05	MALREKE00PB322E00K
	330	10 x 12.5	0.14	0.563	0.10	660	1.90	MALREKE00DC333E00K
	470	10 x 16	0.14	0.395	0.080	850	2.40	MALREKE00DD347E00K
	1000	12.5 x 20	0.14	0.186	0.050	1400	4.50	MALREKE00FE410E00K
	1500	16 x 20	0.16	0.141	0.030	2100	5.80	MALREKE00JE415E00K
	2200	16 x 25	0.18	0.109	0.030	2100	6.60	MALREKE00JG422E00K
	3300	16 x 31.5	0.20	0.080	0.025	2600	9.00	MALREKE00JS433E00K
	4700	18 x 35.5	0.22	0.062	0.022	3000	11.5	MALREKE00KL447E00K

**ELECTRICAL DATA AND ORDERING INFORMATION**

U_R (V)	C_R 120 Hz (μ F)	DIMENSIONS $\varnothing D \times L$ (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz/ 20 °C (Ω)	Z 100 kHz/ 20 °C (Ω)	I_R 100 kHz/ 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
35	4.7	5 x 11	0.12	33.86	0.70	180	0.42	MALREKE00AA147F00K
	10	5 x 11	0.12	15.92	0.70	180	0.42	MALREKE00AA210F00K
	22	5 x 11	0.12	7.235	0.70	180	0.42	MALREKE00AA222F00K
	33	5 x 11	0.12	4.823	0.65	180	0.42	MALREKE00AA233F00K
	47	6.3 x 11	0.12	3.386	0.30	280	0.43	MALREKE00BA247F00K
	100	8 x 11.5	0.12	1.592	0.14	450	1.05	MALREKE00PB310F00K
	150	8 x 11.5	0.12	1.061	0.14	450	1.05	MALREKE00PB315F00K
	220	10 x 12.5	0.12	0.723	0.10	660	1.90	MALREKE00DC322F00K
	330	10 x 16	0.12	0.482	0.080	850	2.40	MALREKE00DD333F00K
	470	10 x 20	0.12	0.339	0.054	1100	3.00	MALREKE00DE347F00K
	1000	12.5 x 25	0.12	0.159	0.038	1700	4.70	MALREKE00FG410F00K
	1500	16 x 25	0.14	0.124	0.030	2100	6.60	MALREKE00JG415F00K
	2200	16 x 31.5	0.16	0.096	0.025	2600	9.00	MALREKE00JS422F00K
	3300	18 x 35.5	0.18	0.072	0.022	3000	11.5	MALREKE00KL433F00K
50	0.22	5 x 11	0.10	602.9	8.00	18	0.42	MALREKE00AA022H00K
	0.47	5 x 11	0.10	282.2	5.00	25	0.42	MALREKE00AA047H00K
	1.0	5 x 11	0.10	132.6	3.50	40	0.42	MALREKE00AA110H00K
	2.2	5 x 11	0.10	60.29	3.00	55	0.42	MALREKE00AA122H00K
	3.3	5 x 11	0.10	40.19	2.60	65	0.42	MALREKE00AA133H00K
	4.7	5 x 11	0.10	28.22	2.30	90	0.42	MALREKE00AA147H00K
	10	5 x 11	0.10	13.26	1.40	120	0.42	MALREKE00AA210H00K
	22	5 x 11	0.10	6.029	1.20	150	0.42	MALREKE00AA222H00K
	47	6.3 x 11	0.10	2.822	0.43	250	0.43	MALREKE00BA247H00K
	100	8 x 11.5	0.10	1.326	0.24	340	1.05	MALREKE00PB310H00K
	150	10 x 12.5	0.10	0.884	0.17	490	1.90	MALREKE00DC315H00K
	220	10 x 16	0.10	0.603	0.12	650	2.40	MALREKE00DD322H00K
	330	10 x 20	0.10	0.402	0.10	810	3.00	MALREKE00DE333H00K
	470	12.5 x 20	0.10	0.282	0.085	1100	4.50	MALREKE00FE347H00K
	1000	16 x 25	0.10	0.133	0.043	1600	6.60	MALREKE00JG410H00K
	1500	16 x 31.5	0.12	0.106	0.038	2000	9.00	MALREKE00JS415H00K
	2200	18 x 35.5	0.14	0.084	0.034	2300	11.5	MALREKE00KL422H00K
63	3.3	5 x 11	0.09	36.17	2.00	64	0.42	MALREKE00AA133J00K
	4.7	5 x 11	0.09	25.40	2.00	76	0.42	MALREKE00AA147J00K
	10	5 x 11	0.09	11.94	2.00	111	0.42	MALREKE00AA210J00K
	22	6.3 x 11	0.09	5.426	0.60	190	0.43	MALREKE00BA222J00K
	33	6.3 x 11	0.09	3.617	0.60	233	0.43	MALREKE00BA233J00K
	47	8 x 11.5	0.09	2.540	0.50	328	1.05	MALREKE00PB247J00K
	100	10 x 16	0.09	1.194	0.12	456	2.40	MALREKE00DD310J00K
	150	10 x 20	0.09	0.796	0.10	610	3.00	MALREKE00DE315J00K
	220	10 x 25	0.09	0.543	0.090	809	3.20	MALREKE00DG322J00K
	330	12.5 x 20	0.09	0.362	0.085	1036	4.50	MALREKE00FE333J00K
	470	16 x 20	0.09	0.254	0.050	1411	5.80	MALREKE00JE347J00K
	1000	16 x 35.5	0.09	0.119	0.025	1967	10.0	MALREKE00JL410J00K

**ELECTRICAL DATA AND ORDERING INFORMATION**

U_R (V)	C_R 120 Hz (μ F)	DIMENSIONS $\varnothing D \times L$ (mm)	$\tan \delta$ 120 Hz	R_{ESR} 120 Hz/ 20 °C (Ω)	Z 100 kHz/ 20 °C (Ω)	I_R 100 kHz/ 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
100	2.2	5 x 11	0.08	48.23	2.50	52	0.42	MALREKE00AA122L00K
	3.3	5 x 11	0.08	32.15	2.50	64	0.42	MALREKE00AA133L00K
	4.7	5 x 11	0.08	22.58	2.50	76	0.42	MALREKE00AA147L00K
	10	6.3 x 11	0.08	10.61	1.00	128	0.43	MALREKE00BA210L00K
	22	8 x 11.5	0.08	4.823	0.60	224	1.05	MALREKE00PB222L00K
	33	10 x 12.5	0.08	3.215	0.40	319	1.90	MALREKE00DC233L00K
	47	10 x 16	0.08	2.258	0.30	417	2.40	MALREKE00DD247L00K
	100	12.5 x 20	0.08	1.061	0.15	570	4.50	MALREKE00FE310L00K
	150	12.5 x 25	0.08	0.707	0.12	762	4.70	MALREKE00FG315L00K
	220	16 x 25	0.08	0.482	0.070	1250	6.60	MALREKE00JG322L00K
	330	16 x 31.5	0.08	0.322	0.050	1404	9.00	MALREKE00JS333L00K
	470	18 x 40	0.08	0.226	0.030	1980	15.0	MALREKE00KK347L00K
160	33	10 x 20	0.15	6.029	1.30	565	3.00	MALREKE00DE233M00K
	150	16 x 31.5	0.15	1.326	0.22	1300	9.00	MALREKE00JS315M00K
	220	16 x 31.5	0.15	0.904	0.22	1300	9.00	MALREKE00JS322M00K
	330	18 x 31.5	0.15	0.603	0.22	1700	11.0	MALREKE00KS333M00K
200	22	10 x 20	0.15	9.043	1.50	440	3.00	MALREKE00DE222S00K
	33	12.5 x 20	0.15	6.029	0.91	590	4.50	MALREKE00FE233S00K
	47	12.5 x 20	0.15	4.233	0.91	780	4.50	MALREKE00FE247S00K
	100	16 x 25	0.15	1.989	0.27	1280	6.60	MALREKE00JG310S00K
	150	18 x 25	0.15	1.326	0.27	1500	9.00	MALREKE00KG315S00K
	220	18 x 31.5	0.15	0.904	0.22	1700	11.0	MALREKE00KS322S00K
250	10	10 x 20	0.15	19.89	3.50	300	3.00	MALREKE00DE210N00K
	22	12.5 x 20	0.15	9.043	2.30	480	4.50	MALREKE00FE222N00K
	33	12.5 x 25	0.15	6.029	1.70	630	4.70	MALREKE00FG233N00K
	47	12.5 x 25	0.15	4.233	1.70	630	4.70	MALREKE00FG247N00K
	100	16 x 31.5	0.15	1.989	0.63	1400	9.00	MALREKE00JS310N00K
	150	18 x 31.5	0.15	1.326	0.42	1450	11.0	MALREKE00KS315N00K
	220	18 x 40	0.15	0.904	0.35	1485	15.0	MALREKE00KK322N00K
400	10	10 x 20	0.20	26.53	2.90	180	3.00	MALREKE00DE210X00K
	22	12.5 x 25	0.20	12.06	1.30	300	4.70	MALREKE00FG222X00K
	33	16 x 20	0.20	8.038	0.91	600	5.80	MALREKE00JE233X00K
	47	16 x 25	0.20	5.644	0.73	700	6.60	MALREKE00JG247X00K
	100	18 x 40	0.20	2.653	0.34	1250	15.0	MALREKE00KK310X00K
450	3.3	10 x 20	0.20	80.38	6.50	150	3.00	MALREKE00DE133P00K
	4.7	12.5 x 20	0.20	56.44	3.60	200	4.50	MALREKE00FE147P00K
	10	12.5 x 25	0.20	26.53	2.50	315	4.70	MALREKE00FG210P00K
	22	16 x 25	0.20	12.06	1.70	570	6.60	MALREKE00JG222P00K
	33	16 x 31.5	0.20	8.038	1.10	620	9.00	MALREKE00JS233P00K
	47	18 x 31.5	0.20	5.644	0.93	900	11.0	MALREKE00KS247P00K

LOW TEMPERATURE BEHAVIOR (at 120 Hz)

IMPEDANCE RATIO $Z(T_2)/Z(T_1)$	RATED VOLTAGE (V)					
T_2/T_1	6.3	10	16	25 ~ 100	160 ~ 250	350 ~ 450
- 25 °C/+ 20 °C	4	3	2	2	3	8
- 40 °C/+ 20 °C	8	6	4	3	4	-

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Current		
Leakage current (test conditions: U_R , 20 °C)	After 1 min at U_R	$I_{L1} \leq 0.03 \times C_R \times U_R$ or 4 μA for $U_R \leq 100 V$ (whichever is greater)
	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)
	After 5 min at U_R	$I_{L5} \leq 0.02 \times C_R \times U_R$ + 15 μA for $U_R > 100 V$
Resistance		
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max.}$ and C_R	$ESR = \tan \delta / 2 \pi f C_R$

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY			
FREQUENCY (Hz)	I_R MULTIPLIER FOR $U_R \leq 100 V$		
	$C_R \leq 47 \mu F$	$C_R = 68 \mu F$ to 680 μF	$C_R \geq 1000 \mu F$
50	0.34	0.47	0.65
120	0.45	0.59	0.77
300	0.61	0.74	0.85
1000	0.70	0.79	0.88
10 000	0.91	0.88	0.88
100 000	1.00	1.00	1.00

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY		
FREQUENCY (Hz)	I_R MULTIPLIER FOR $U_R > 100 V$	
	$C_R = 0.47 \mu F$ to 220 μF	$C_R \geq 330 \mu F$
50	0.44	0.69
120	0.56	0.77
300	0.69	0.87
1000	0.78	0.87
10 000	0.89	0.88
100 000	1.00	1.00

TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE (quick reference)	REQUIREMENTS
Load life	$T_{amb} = 105 \text{ }^\circ C$ U_R and I_R applied After specified hours	$\Delta C/C: \pm 25 \%$ of initial value $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$
Shelf life	$T_{amb} = 105 \text{ }^\circ C$ No voltage applied After 1000 h After test: U_R to be applied for 30 min 24 h 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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