

Component outlines

FEATURES

- Polarized aluminum electrolytic capacitor
- Long lifetime
- High temperature range up to 125 °C
- Low impedance
- High reliability



RoHS
COMPLIANT

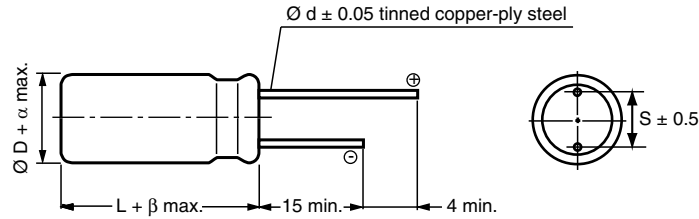
APPLICATIONS

- Industrial electronics, automotive electronics, data processing electronics, telecommunication systems
- Smoothing, filtering

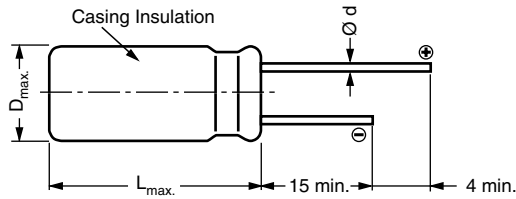
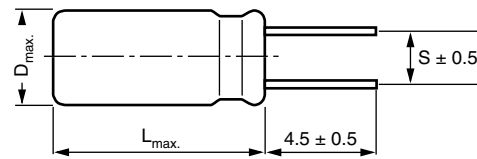
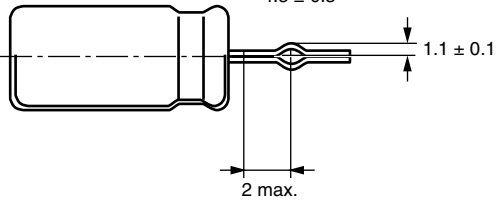
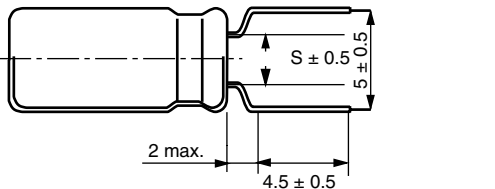
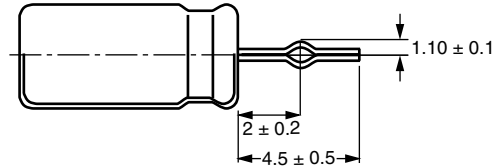
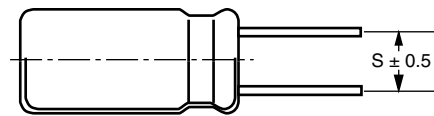
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QUICK REFERENCE DATA			
DESCRIPTION	UNIT	VALUE	
Nominal case size (Ø D x L)	mm	5 x 11 to 18 x 40	
Rated capacitance range C _R	µF	0.47 to 10 000	
Capacitance tolerance	%	± 20	
Rated voltage range	V	10 to 50	63 to 250
Category temperature range	°C	- 55 to + 125	- 40 to + 125
Load life	h	up to 2000	
Based on sectional specification		IEC 60384-4 / EN 130 300	
Climatic category IEC 60068		55/125/56	40/125/56

SELECTION CHART FOR C _R , U _R AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)										
C _R (µF)	RATED VOLTAGE [V]									
	10	16	25	35	50	63	100	160	200	250
0.47	→	→	→	→	→	→	8 x 11.5	10 x 12.5	→	10 x 12.5
1.0	→	→	→	→	5 x 11	→	8 x 11.5	10 x 12.5	→	10 x 12.5
1.5	→	→	→	→	5 x 11	→	→	→	→	→
2.2	→	→	→	→	5 x 11	8 x 11.5	10 x 12.5	10 x 16	→	10 x 16
3.3	→	→	→	→	5 x 11	8 x 11.5	10 x 16	10 x 16	→	10 x 20
4.7	→	→	→	→	5 x 11	8 x 11.5	10 x 16	10 x 20	10 x 20	12.5 x 20
6.8	→	→	→	→	5 x 11	→	→	→	→	→
10	→	→	→	→	5 x 11	8 x 11.5	10 x 20	12.5 x 20	12.5 x 20	16 x 25
15	→	→	→	→	5 x 11	-	-	-	-	-
22	→	→	→	5 x 11	6.3 x 11	10 x 16	12.5 x 25	16 x 25	16 x 31.5	-
33	→	→	5 x 11	→	6.3 x 11	10 x 20	16 x 25	16 x 31.5	-	-
47	→	5 x 11	→	6.3 x 11	8 x 11.5	12.5 x 20	16 x 31.5	-	-	-
68	5 x 11	→	6.3 x 11	→	8 x 11.5	-	-	-	-	-
100	→	6.3 x 11	→	8 x 11.5	10 x 16	12.5 x 25	-	-	-	-
150	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 20	-	-	-	-	-
220	→	8 x 11.5	10 x 12.5	10 x 16	10 x 25	-	-	-	-	-
330	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	-	-	-	-	-
470	10 x 12.5	10 x 16	10 x 20	12.5 x 20	12.5 x 25	-	-	-	-	-
680	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 20	-	-	-	-	-
1000	10 x 20	12.5 x 20	12.5 x 25	16 x 20	16 x 31.5	-	-	-	-	-
1500	12.5 x 20	12.5 x 25	16 x 20	16 x 31.5	16 x 40	-	-	-	-	-
2200	12.5 x 25	16 x 20	16 x 25	16 x 35.5	18 x 40	-	-	-	-	-
3300	16 x 20	16 x 25	16 x 35.5	18 x 40	-	-	-	-	-	-
4700	16 x 31.5	16 x 35.5	18 x 40	-	-	-	-	-	-	-
6800	16 x 35.5	18 x 35.5	-	-	-	-	-	-	-	-
10 000	18 x 40	-	-	-	-	-	-	-	-	-

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 MALREKL00...

 $\varnothing D \leq 18$ shortened leads MALREKL05...
 (S = 2/2.5/3.5/5/7.5 mm)

 $\varnothing D \leq 8$ leads shortened and formed MALREKL09...
 (S = 2.0/2.5/3.5 mm)

 $10 \leq \varnothing D \leq 18$ leads shortened and formed MALREKL06...
 (S = 5/7.5 mm)

GENERAL NOTE

- For Standard Packaging Quantity (SPQ) 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
Z	max. impedance at 100 kHz
I_R	rated alternating current (rms) at 100 kHz and upper category temperature

Note

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

ORDERING EXAMPLE

EKL 100 $\mu\text{F}/50\text{ V}$, $\pm 20\%$, size: 10 x 16 mm
Leads: Long
Ordering code: MALREKL00DD310H00K

Leads: Short
Ordering code: MALREKL05...

For $5 \leq \varnothing D \leq 8$ mm

Leads: Bent open, shortened and formed
Ordering code: MALREKL09...

For $10 \leq \varnothing D \leq 18$ mm

Leads: Shortened and formed
Ordering code: MALREKL06 ...

ELECTRICAL DATA AND ORDERING INFORMATION							
U_R (V)	C_R 120 Hz (μF)	DIMENSIONS $\varnothing D \times L$ (mm)	$\tan \delta$ 120 Hz	Z 100 kHz/ 120 °C (Ω)	I_R 100 kHz/ 125 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
10	68	5 x 11	0.19	1.00	124	0.50	MALREKL00AA268C00K
	150	6.3 x 11	0.19	0.45	212	0.70	MALREKL00BA315C00K
	330	8 x 11.5	0.19	0.21	368	1.10	MALREKL00PB333C00K
	470	10 x 12.5	0.19	0.17	480	1.60	MALREKL00DC347C00K
	680	10 x 16	0.19	0.12	616	2.30	MALREKL00DD368C00K
	1000	10 x 20	0.19	0.078	848	2.50	MALREKL00DE410C00K
	1500	12.5 x 20	0.21	0.059	1134	3.80	MALREKL00FE415C00K
	2200	12.5 x 25	0.23	0.044	1368	4.50	MALREKL00FG422C00K
	3300	16 x 20	0.25	0.040	1480	5.80	MALREKL00JE433C00K
	4700	16 x 31.5	0.27	0.030	1936	9.00	MALREKL00JS447C00K
	6800	16 x 35.5	0.31	0.026	2144	11.0	MALREKL00JL468C00K
10000	18 x 40	0.37	0.022	2432	16.0	MALREKL00KK510C00K	
16	47	5 x 11	0.16	1.00	124	0.50	MALREKL00AA247D00K
	100	6.3 x 11	0.16	0.45	212	0.70	MALREKL00BA310D00K
	220	8 x 11.5	0.16	0.21	368	1.10	MALREKL00PB322D00K
	330	10 x 12.5	0.16	0.16	500	1.60	MALREKL00DC333D00K
	470	10 x 16	0.16	0.12	616	2.30	MALREKL00DD347D00K
	680	10 x 20	0.16	0.085	816	2.50	MALREKL00DE368D00K
	1000	12.5 x 20	0.16	0.061	1129	3.80	MALREKL00FE410D00K
	1500	12.5 x 25	0.18	0.047	1328	4.50	MALREKL00FG415D00K
	2200	16 x 20	0.20	0.043	1440	5.80	MALREKL00JE422D00K
	3300	16 x 25	0.22	0.035	1676	7.50	MALREKL00JG433D00K
	4700	16 x 35.5	0.24	0.026	2144	11.0	MALREKL00JL447D00K
6800	18 x 35.5	0.28	0.023	2320	13.0	MALREKL00KL468D00K	
25	33	5 x 11	0.14	1.00	124	0.50	MALREKL00AA233E00K
	68	6.3 x 11	0.14	0.47	208	0.70	MALREKL00BA268E00K
	150	8 x 11.5	0.14	0.21	368	1.10	MALREKL00PB315E00K
	220	10 x 12.5	0.14	0.17	480	1.60	MALREKL00DC322E00K
	330	10 x 16	0.14	0.12	600	2.30	MALREKL00DD333E00K
	470	10 x 20	0.14	0.084	816	2.50	MALREKL00DE347E00K
	680	12.5 x 20	0.14	0.060	1114	3.80	MALREKL00FE368E00K
	1000	12.5 x 25	0.14	0.047	1328	4.50	MALREKL00FG410E00K
	1500	16 x 20	0.16	0.044	1416	5.80	MALREKL00JE415E00K
	2200	16 x 25	0.18	0.036	1641	7.50	MALREKL00JG422E00K
	3300	16 x 35.5	0.20	0.026	2144	11.0	MALREKL00JL433E00K
4700	18 x 40	0.22	0.023	2368	16.0	MALREKL00KK447E00K	



Aluminum Capacitors
Radial Style 125 °C

Vishay Roederstein

ELECTRICAL DATA AND ORDERING INFORMATION							
U _R (V)	C _R 120 Hz (µF)	DIMENSIONS Ø D x L (mm)	tan δ 120 Hz	Z 100 kHz/ 120 °C (Ω)	I _R 100 kHz/ 125 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
35	22	5 x 11	0.12	0.97	128	0.50	MALREKL00AA222F00K
	47	6.3 x 11	0.12	0.44	216	0.70	MALREKL00BA247F00K
	100	8 x 11.5	0.12	0.21	368	1.10	MALREKL00PB310F00K
	150	10 x 12.5	0.12	0.16	500	1.60	MALREKL00DC315F00K
	220	10 x 16	0.12	0.12	616	2.30	MALREKL00DD322F00K
	330	10 x 20	0.12	0.078	848	2.50	MALREKL00DE333F00K
	470	12.5 x 20	0.12	0.060	1121	3.80	MALREKL00FE347F00K
	680	12.5 x 25	0.12	0.047	1328	4.50	MALREKL00FG368F00K
	1000	16 x 20	0.12	0.044	1416	5.80	MALREKL00JE410F00K
	1500	16 x 31.5	0.14	0.036	1908	9.00	MALREKL00JS415F00K
	2200	16 x 35.5	0.16	0.026	2144	11.0	MALREKL00JL422F00K
	3300	18 x 40	0.18	0.022	2432	16.0	MALREKL00KK433F00K
50	1.0	5 x 11	0.10	5.20	29	0.50	MALREKL00AA110H00K
	1.5	5 x 11	0.10	4.90	36	0.50	MALREKL00AA115H00K
	2.2	5 x 11	0.10	4.50	43	0.50	MALREKL00AA122H00K
	3.3	5 x 11	0.10	3.90	53	0.50	MALREKL00AA133H00K
	4.7	5 x 11	0.10	2.90	65	0.50	MALREKL00AA147H00K
	6.8	5 x 11	0.10	2.30	73	0.50	MALREKL00AA168H00K
	10	5 x 11	0.10	1.80	92	0.50	MALREKL00AA210H00K
	15	5 x 11	0.10	1.20	116	0.50	MALREKL00AA215H00K
	22	6.3 x 11	0.10	0.84	156	0.70	MALREKL00BA222H00K
	33	6.3 x 11	0.10	0.56	192	0.70	MALREKL00BA233H00K
	47	8 x 11.5	0.10	0.39	275	1.10	MALREKL00PB247H00K
	68	8 x 11.5	0.10	0.26	328	1.10	MALREKL00PB268H00K
	100	10 x 16	0.10	0.21	465	2.30	MALREKL00DD310H00K
	150	10 x 20	0.10	0.13	656	2.50	MALREKL00DE315H00K
	220	10 x 25	0.10	0.098	832	3.00	MALREKL00DG322H00K
	330	12.5 x 20	0.10	0.072	1025	3.80	MALREKL00FE333H00K
	470	12.5 x 25	0.10	0.057	1200	4.50	MALREKL00FG347H00K
	680	16 x 20	0.10	0.052	1304	5.80	MALREKL00JE368H00K
1000	16 x 31.5	0.10	0.039	1696	9.00	MALREKL00JS410H00K	
1500	16 x 40	0.12	0.034	1928	13.0	MALREKL00JK415H00K	
2200	18 x 40	0.14	0.031	2048	16.0	MALREKL00KK422H00K	
63	2.2	8 x 11.5	0.08	4.00	28	1.10	MALREKL00PB122J00K
	3.3	8 x 11.5	0.08	3.50	34	1.10	MALREKL00PB133J00K
	4.7	8 x 11.5	0.08	2.60	41	1.10	MALREKL00PB147J00K
	10	8 x 11.5	0.08	2.20	60	1.10	MALREKL00PB210J00K
	22	10 x 16	0.08	1.00	113	2.30	MALREKL00DD222J00K
	33	10 x 20	0.08	0.70	151	2.50	MALREKL00DE233J00K
	47	12.5 x 20	0.08	0.60	211	3.80	MALREKL00FE247J00K
	100	12.5 x 25	0.08	0.20	336	4.50	MALREKL00FG310J00K
100	0.47	8 x 11.5	0.08	6.00	13	1.10	MALREKL00PB047L00K
	1.0	8 x 11.5	0.08	5.00	19	1.10	MALREKL00PB110L00K
	2.2	10 x 12.5	0.08	3.80	33	1.60	MALREKL00DC122L00K
	3.3	10 x 16	0.08	3.30	44	2.30	MALREKL00DD133L00K
	4.7	10 x 16	0.08	2.50	52	2.30	MALREKL00DD147L00K
	10	10 x 20	0.08	2.00	83	2.50	MALREKL00DE210L00K
	22	12.5 x 25	0.08	1.00	157	4.50	MALREKL00FG222L00K
	33	16 x 25	0.08	0.70	214	7.50	MALREKL00JG233L00K
	47	16 x 31.5	0.08	0.60	279	9.00	MALREKL00JS247L00K

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 120 Hz (μ F)	DIMENSIONS \varnothing D x L (mm)	$\tan \delta$ 120 Hz	Z 100 kHz/ 120 °C (Ω)	I_R 100 kHz/ 125 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
160	0.47	10 x 12.5	0.15	6.00	10	1.60	MALREKL00DC047M00K
	1.0	10 x 12.5	0.15	5.00	15	1.60	MALREKL00DC110M00K
	2.2	10 x 16	0.15	3.80	24	2.30	MALREKL00DD122M00K
	3.3	10 x 16	0.15	3.50	32	2.30	MALREKL00DD133M00K
	4.7	10 x 20	0.15	2.50	38	2.50	MALREKL00DE147M00K
	10	12.5 x 20	0.15	2.00	66	3.80	MALREKL00FE210M00K
	22	16 x 25	0.15	1.20	118	7.50	MALREKL00JG222M00K
	33	16 x 31.5	0.15	1.00	158	9.00	MALREKL00JS233M00K
200	4.7	10 x 20	0.15	2.80	38	2.50	MALREKL00DE147S00K
	10	12.5 x 20	0.15	2.50	72	3.80	MALREKL00FE210S00K
	22	16 x 31.5	0.15	2.00	129	9.00	MALREKL00JS222S00K
250	0.47	10 x 12.5	0.15	8.00	10	1.60	MALREKL00DC047N00K
	1.0	10 x 12.5	0.15	7.00	14	1.60	MALREKL00DC110N00K
	2.2	10 x 16	0.15	5.50	24	2.30	MALREKL00DD122N00K
	3.3	10 x 20	0.15	4.50	32	2.50	MALREKL00DE133N00K
	4.7	12.5 x 20	0.15	4.10	45	3.80	MALREKL00FE147N00K
	10	16 x 25	0.15	3.90	79	7.50	MALREKL00JG210N00K

LOW TEMPERATURE BEHAVIOR (AT 120 Hz)

IMPEDANCE RATIO $Z(T2)/Z(T1)$	RATED VOLTAGE (V)	
$T2/T1$	10	16 - 250
- 25/- 20 °C	3	2
- 40/+ 20 °C	5	4

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 μ A for $U_R \leq 50$ V (whichever is greater)
	After 5 minutes at U_R	$I_{L5} \leq 0.03 \times C_R \times U_R$ + 10 μ A for $U_R \geq 63$ V
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 $U_R \leq 50$ V					
	$C_R \leq 33 \mu$ F	$C_R = 47$ to 100 μ F	$C_R = 150$ to 220 μ F	$C_R = 330$ to 680 μ F	$C_R = 1000$ to 1500 μ F	$C_R \geq 2200 \mu$ F
120	0.20	0.25	0.35	0.45	0.50	0.55
1000	0.50	0.60	0.70	0.75	0.80	0.85
10 000	0.80	0.90	0.92	0.95	0.96	0.98
100 000	1.00	1.00	1.00	1.00	1.00	1.00



MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY	
FREQUENCY (Hz)	I_R MULTIPLIER FOR $U_R \geq 63$ V
120	0.56
1000	0.78
10 000	0.89
100 000	1.00

TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE (quick reference)	REQUIREMENTS
Load life	$T_{amb} = 125$ °C U_R and I_R applied After 2000 hours After 1000 hours $\varnothing 5$, $\varnothing 6.3$ and $U_R \geq 100$ V	$\Delta C/C: \pm 20$ % of initial value $I_L \leq$ spec. limit $\tan \delta \leq 3 \times$ spec. limit
Shelf life	No voltage applied After 1000 hours After test: U_R to be applied for 30 minutes 24 to 48 hours before measurement	$\Delta C/C: \pm 20$ % of initial value $I_L \leq$ spec. limit $\tan \delta \leq 2 \times$ spec. limit



Disclaimer

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