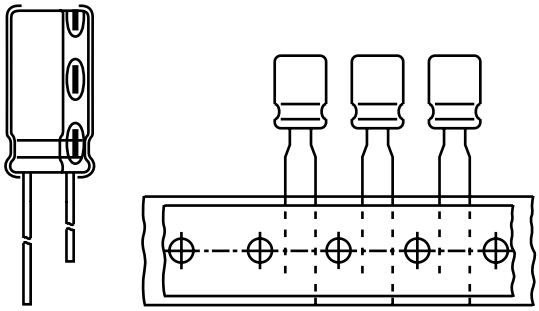
Aluminum Capacitors
Radial Style



Component outlines

FEATURES

- Polarized aluminum electrolytic capacitor
- Small dimensions
- Ultra low impedance
- High ripple current
- Long lifetime

Pb-free
RoHS COMPLIANT

APPLICATIONS

- Industrial electronics, telecommunication systems, data processing
- Professional switching power supply units
- DC/DC converters
- Smoothing, filtering

QUICK REFERENCE DATA

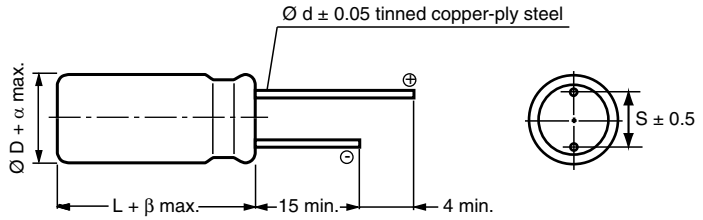
DESCRIPTION	UNIT	VALUE
Nominal case size (Ø D x L)	mm	5 x 11 to 18 x 40
Rated capacitance range C_R	µF	0.47 to 15 000
Capacitance tolerance	%	± 20
Rated voltage range	V	6.3 to 100
Category temperature range	°C	- 40 to + 105
Load life	h	up to 5000
Based on sectional specification		IEC 60384-4/EN 130300
Climatic category IEC 68		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	63	100
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	6.3 x 11	10 x 12.5
47	→	→	→	5 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	10 x16	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	-	-	-	-
10 000	16 x 31.5	18 x 35.5	-	-	-	-	-	-
15 000	18 x 35.5	-	-	-	-	-	-	-

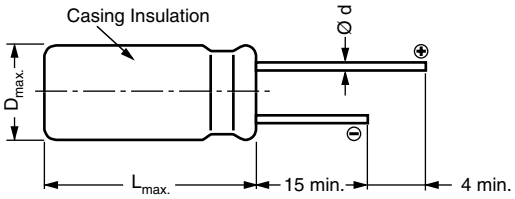
Note
10 % capacitance tolerance on request

RADIAL STYLE: DIMENSIONS in millimeters

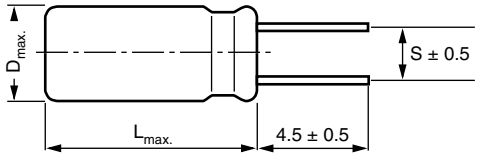


Ø D	5	6.3	8	10	12.5	16	18	22	25
S	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
Ø d	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0	1.0
β	1.5			2.0					
α	0.5							1.0	

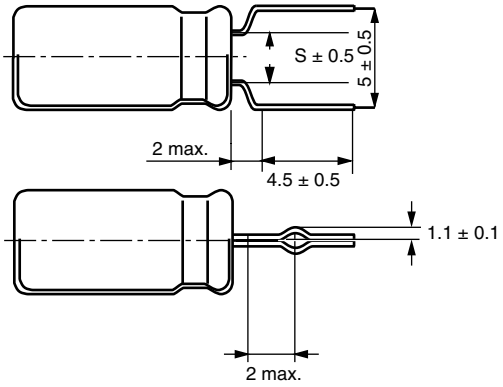
DIMENSIONS in millimeters AND AVAILABLE FORMS



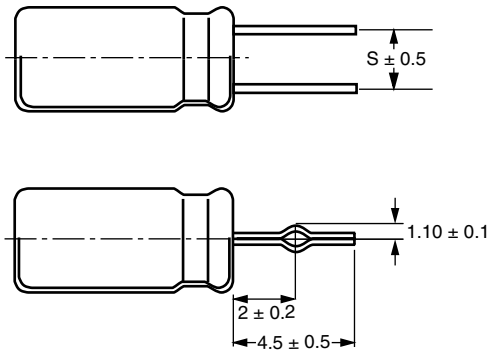
Ø D ≤ 18 long leads MALREKX00...



Ø D ≤ 18 shortened leads MALREKX05...
(S = 2/2.5/3.5/5/7.7.5 mm)



Ø D ≤ 8 leads shortened and formed MALREKX09...
(S = 2.0/2.5/3.5 mm)



10 ≤ Ø D ≤ 18 leads shortened and formed MALREKX06...
(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 δ	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 °C, P = 80 to 120 kPa, RH = 45 to 75 %

ORDERING EXAMPLE

EKX 3300 µF/25 V, ± 20 %, size: 16 x 31.5 mm
Leads: Long
Ordering code: MALREKX00JS433E00K

Leads: Short
Ordering code: MALREKX05...

For 5 ≤ Ø D ≤ 8 mm
Leads: Bent open, shortened and formed
Ordering code: MALREKX09...

For 10 ≤ Ø D ≤ 18 mm
Leads: Shortened and formed
Ordering code: MALREKX06 ...

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/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	0.15	405	0.67	MALREKX00BA333B00K
	1000	10 x 12.5	0.22	0.053	1030	1.90	MALREKX00DC410B00K
	3300	12.5 x 20	0.28	0.025	2360	4.00	MALREKX00FE433B00K
	10 000	16 x 31.5	0.40	0.015	3680	9.00	MALREKX00JS510B00K
	15 000	18 x 35.5	0.50	0.014	3800	11.5	MALREKX00KL515B00K
10	100	5 x 11	0.19	0.30	250	0.42	MALREKX00AA310C00K
	220	6.3 x 11	0.19	0.15	405	0.67	MALREKX00BA322C00K
	470	8 x 11.5	0.19	0.072	760	1.10	MALREKX00PB347C00K
	1000	10 x 16	0.19	0.038	1430	2.50	MALREKX00DD410C00K
	1500	10 x 20	0.21	0.027	1820	3.10	MALREKX00DE415C00K
	2200	12.5 x 20	0.23	0.025	2360	4.00	MALREKX00FE422C00K
	3300	12.5 x 25	0.25	0.018	2770	5.20	MALREKX00FG433C00K
	4700	16 x 25	0.27	0.015	3460	7.70	MALREKX00JG447C00K
	10 000	18 x 35.5	0.39	0.014	3800	11.5	MALREKX00KL510C00K
16	150	6.3 x 11	0.16	0.15	405	0.67	MALREKX00BA315D00K
	330	8 x 11.5	0.16	0.072	760	1.10	MALREKX00PB333D00K
	470	10 x 12.5	0.16	0.053	1030	1.90	MALREKX00DC347D00K
	1000	10 x 20	0.16	0.027	1820	3.10	MALREKX00DE410D00K
	1500	12.5 x 20	0.18	0.025	2360	4.00	MALREKX00FE415D00K
	2200	12.5 x 25	0.20	0.018	2770	5.20	MALREKX00FG422D00K
	3300	16 x 25	0.22	0.015	3460	7.70	MALREKX00JG433D00K
	4700	16 x 31.5	0.24	0.015	3680	9.00	MALREKX00JS447D00K
25	47	5 x 11	0.14	0.30	250	0.42	MALREKX00AA247E00K
	100	6.3 x 11	0.14	0.15	405	0.67	MALREKX00BA310E00K
	220	8 x 11.5	0.14	0.072	760	1.10	MALREKX00PB322E00K
	330	10 x 12.5	0.14	0.053	1030	1.90	MALREKX00DC333E00K
	470	10 x 16	0.14	0.038	1430	2.50	MALREKX00DD347E00K
	1000	12.5 x 20	0.14	0.025	2360	4.00	MALREKX00FE410E00K
	1500	16 x 20	0.16	0.015	3460	6.10	MALREKX00JE415E00K
	2200	16 x 25	0.18	0.015	3460	7.70	MALREKX00JG422E00K
	3300	16 x 31.5	0.20	0.015	3680	9.00	MALREKX00JS433E00K
	4700	18 x 35.5	0.22	0.014	3800	11.5	MALREKX00KL447E00K

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/20 °C (Ω)	I_R 100 kHz/105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
35	4.7	5 x 11	0.12	0.35	250	0.42	MALREKX00AA147F00K
	10	5 x 11	0.12	0.35	250	0.42	MALREKX00AA210F00K
	22	5 x 11	0.12	0.35	250	0.42	MALREKX00AA222F00K
	33	5 x 11	0.12	0.30	250	0.42	MALREKX00AA233F00K
	150	8 x 11.5	0.12	0.072	760	1.10	MALREKX00PB315F00K
	220	10 x 12.5	0.12	0.053	1030	1.90	MALREKX00DC322F00K
	330	10 x 16	0.12	0.038	1430	2.50	MALREKX00DD333F00K
	470	10 x 20	0.12	0.027	1820	3.10	MALREKX00DE347F00K
	1000	12.5 x 25	0.12	0.018	2770	5.20	MALREKX00FG410F00K
	1500	16 x 25	0.14	0.015	3460	7.70	MALREKX00JG415F00K
	2200	16 x 31.5	0.16	0.015	3680	9.00	MALREKX00JS422F00K
	3300	18 x 35.5	0.18	0.014	3680	11.5	MALREKX00KL433F00K
50	0.47	5 x 11	0.10	2.0	250	0.42	MALREKX00AA047H00K
	1.0	5 x 11	0.10	2.0	250	0.42	MALREKX00AA110H00K
	2.2	5 x 11	0.10	2.0	250	0.42	MALREKX00AA122H00K
	3.3	5 x 11	0.10	1.0	250	0.42	MALREKX00AA133H00K
	4.7	5 x 11	0.10	1.0	250	0.42	MALREKX00AA147H00K
	10	5 x 11	0.10	0.50	250	0.42	MALREKX00AA210H00K
	22	5 x 11	0.10	0.26	250	0.42	MALREKX00AA222H00K
	33	6.3 x 11	0.10	0.17	405	0.67	MALREKX00BA233H00K
	47	6.3 x 11	0.10	0.14	405	0.67	MALREKX00BA247H00K
	100	8 x 11.5	0.10	0.072	760	1.10	MALREKX00PB310H00K
	150	10 x 12.5	0.10	0.061	1030	1.90	MALREKX00DC315H00K
	220	10 x 16	0.10	0.038	1430	2.50	MALREKX00DD322H00K
	330	10 x 20	0.10	0.032	1820	3.10	MALREKX00DE333H00K
	470	12.5 x 20	0.10	0.025	2360	4.00	MALREKX00FE347H00K
	1000	16 x 25	0.10	0.018	3460	7.70	MALREKX00JG410H00K
	1500	16 x 31.5	0.12	0.015	3680	9.00	MALREKX00JS415H00K
	2200	18 x 35.5	0.14	0.014	3800	11.5	MALREKX00KL422H00K
63	3.3	5 x 11	0.09	2.0	165	0.42	MALREKX00AA133J00K
	4.7	5 x 11	0.09	2.0	165	0.42	MALREKX00AA147J00K
	10	5 x 11	0.09	0.45	165	0.42	MALREKX00AA210J00K
	22	6.3 x 11	0.09	0.30	265	0.67	MALREKX00BA222J00K
	33	6.3 x 11	0.09	0.30	265	0.67	MALREKX00BA233J00K
	47	8 x 11.5	0.09	0.20	500	1.10	MALREKX00PB247J00K
	100	10 x 16	0.09	0.10	945	2.50	MALREKX00DD310J00K
	150	10 x 20	0.09	0.08	1100	3.10	MALREKX00DE315J00K
	220	10 x 25	0.09	0.07	1300	2.40	MALREKX00DG322J00K
	330	12.5 x 20	0.09	0.04	1495	4.00	MALREKX00FE333J00K
	470	16 x 20	0.09	0.035	1990	6.10	MALREKX00JE347J00K
	1000	16 x 35.5	0.09	0.020	2835	11.0	MALREKX00JL410J00K
100	2.2	5 x 11	0.08	2.0	125	0.42	MALREKX00AA122L00K
	3.3	5 x 11	0.08	2.0	125	0.42	MALREKX00AA133L00K
	4.7	5 x 11	0.08	2.0	125	0.42	MALREKX00AA147L00K
	10	6.3 x 11	0.08	0.50	205	0.67	MALREKX00BA210L00K
	22	8 x 11.5	0.08	0.30	355	1.10	MALREKX00PB222L00K
	33	10 x 12.5	0.08	0.25	450	1.90	MALREKX00DC233L00K
	47	10 x 16	0.08	0.20	580	2.50	MALREKX00DD247L00K
	100	12.5 x 20	0.08	0.10	1045	4.00	MALREKX00FE310L00K
	150	12.5 x 25	0.08	0.070	1195	5.20	MALREKX00FG315L00K
	220	16 x 25	0.08	0.060	1600	7.70	MALREKX00JG322L00K
	330	16 x 31.5	0.08	0.040	1750	9.00	MALREKX00JS333L00K
	470	18 x 40	0.08	0.030	2060	15.0	MALREKX00KK347L00K

LOW TEMPERATURE BEHAVIOR (at 120 Hz)				
IMPEDANCE RATIO Z (T2)/Z (T1)	RATED VOLTAGE (V)			
T2/T1	6.3	10	16	25 ~ 100
- 25 °C/+ 20 °C	2	2	2	2
- 40 °C/+ 20 °C	3	3	3	3

ADDITIONAL ELECTRICAL DATA			
PARAMETER	CONDITIONS	VALUE	
Current			
Leakage current	After 1 minute at U_R	$I_{L1} \leq 0.03 \times C_R \times U_R$	or 4 µA (whichever is greater)
(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 (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				
	~ 33 µF	47 ~ 220 µF	330 ~ 680 µF	1000 ~ 1500 µF	2200 ~ 15 000 µF
120	0.42	0.50	0.55	0.60	0.70
1000	0.70	0.73	0.77	0.80	0.85
10 000	0.90	0.92	0.94	0.96	0.98
≥ 100 000	1.00	1.00	1.00	1.00	1.00

TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE (quick reference)	REQUIREMENTS
Load life	T_{amb} = 105 °C U_R and I_R applied After 2000 hours Ø 5, Ø 6.3 After 3000 hours Ø 8 mm After 4000 hours Ø 10 mm After 5000 hours > Ø 10 mm	Δ C/C: ± 25 % of initial value $I_L \leq$ spec. limit tan $\delta \leq 2$ x 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	Δ C/C: ± 25 % of initial value $I_L \leq$ spec.limit tan $\delta \leq 2$ x spec. limit

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

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