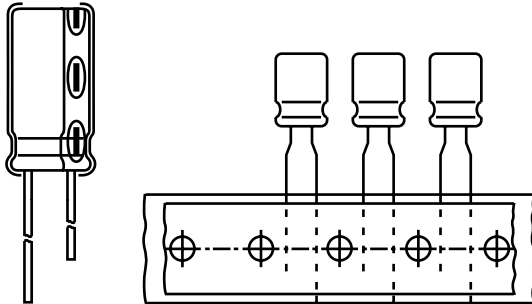


## Aluminum Capacitors Radial Style



Component outlines

**FEATURES**

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


**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 ( $\varnothing$ D x L)	mm	5 x 11 to 18 x 40
Rated capacitance range $C_R$	$\mu$ F	0.47 to 15 000
Capacitance tolerance	%	$\pm$ 20
Rated voltage range	V	6.3 to 100
Category temperature range	$^{\circ}$ 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

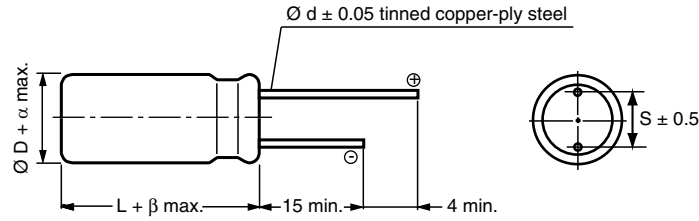
**SELECTION CHART FOR  $C_R$ ,  $U_R$  AND RELEVANT NOMINAL CASE SIZES ( $\varnothing$  D x L in mm)**

$C_R$ ( $\mu$ F)	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 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	-	-	-	-
10 000	16 x 31.5	18 x 35.5	-	-	-	-	-	-
15 000	18 x 35.5	-	-	-	-	-	-	-

**Note**

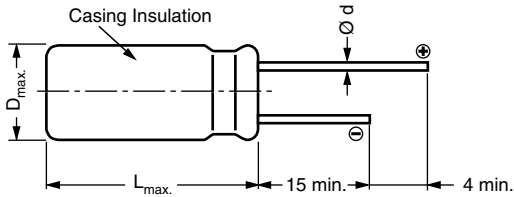
10 % capacitance tolerance on request

**RADIAL STYLE: DIMENSIONS** in millimeters

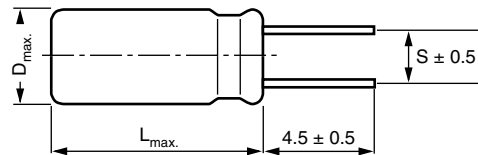


Ø D	5	6.3	8	10	12.5	16	18	22	25
S	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
Ø d	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0	1.0
β	1.5			2.0					
α	0.5							1.0	

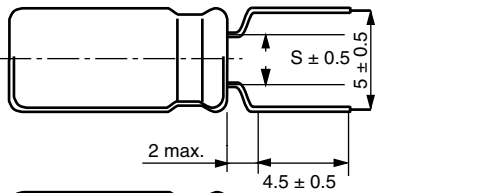
**DIMENSIONS** in millimeters **AND AVAILABLE FORMS**



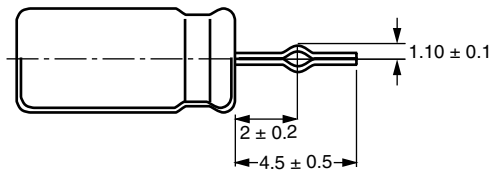
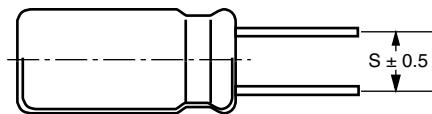
Ø D ≤ 18 long leads MALREKX00...



Ø D ≤ 18 shortened leads MALREKX05...  
(S = 2/2.5/3.5/5/7.5 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

Aluminum Capacitors  
 Radial Style

Vishay Roederstein

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  $T_a = 20\text{ }^\circ\text{C}$ ,  
 $P = 80$  to  $120\text{ kPa}$ ,  $RH = 45$  to  $75\text{ }%$ 
**ORDERING EXAMPLE**

 EKX 3300  $\mu\text{F}/25\text{ V}$ ,  $\pm 20\text{ }%$ , size: 16 x 31.5 mm  
 Leads: Long  
 Ordering code: MALREKX00JS433E00K

 Leads: Short  
 Ordering code: MALREKX05...

**For  $5 \leq \varnothing D \leq 8\text{ mm}$** 

 Leads: Bent open, shortened and formed  
 Ordering code: MALREKX09...

**For  $10 \leq \varnothing D \leq 18\text{ mm}$** 

 Leads: Shortened and formed  
 Ordering code: MALREKX06 ...

ELECTRICAL DATA AND ORDERING INFORMATION							
$U_R$ (V)	$C_R$ 120 Hz ( $\mu\text{F}$ )	DIMENSIONS $\varnothing D \times L$ (mm)	$\tan \delta$ 120 Hz	$Z$ 100 kHz/20 $^\circ\text{C}$ ( $\Omega$ )	$I_R$ 100 kHz/105 $^\circ\text{C}$ (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 ( $\mu$ F)	DIMENSIONS $\varnothing$ D x L (mm)	$\tan \delta$ 120 Hz	Z 100 kHz/20 °C ( $\Omega$ )	$I_R$ 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



Aluminum Capacitors  
Radial Style

Vishay Roederstein

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

<b>ADDITIONAL ELECTRICAL DATA</b>		
PARAMETER	CONDITIONS	VALUE
<b>Current</b>		
Leakage current (Test conditions: $U_R$ , 20 °C)	After 1 minute at $U_R$	$I_{L1} \leq 0.03 \times C_R \times U_R$ or 4 $\mu$ A (whichever is greater)
	After 2 minutes at $U_R$	$I_{L2} \leq 0.01 \times C_R \times U_R$ or 3 $\mu$ A (whichever is greater)
<b>Resistance</b>		
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max}$ .	$ESR = \tan \delta / 2 \pi f C_R$

<b>MULTIPLIER OF RIPPLE CURRENT (<math>I_R</math>) AS A FUNCTION OF FREQUENCY</b>					
FREQUENCY (Hz)	$I_R$ MULTIPLIER FOR $U_R \leq 100$ V				
	~ 33 $\mu$ F	47 ~ 220 $\mu$ F	330 ~ 680 $\mu$ F	1000 ~ 1500 $\mu$ F	2200 ~ 15 000 $\mu$ F
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
$\geq 100\ 000$	1.00	1.00	1.00	1.00	1.00

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