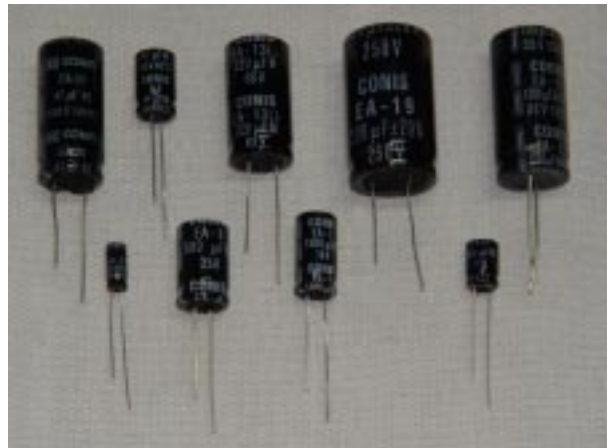


**CONIS COMPANY Ltd.**  
**CAPACITORS**  
**EMI and RFI FILTERS**

# **RADIAL ALUMINIUM ELECTROLYTIC CAPACITORS**



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**Head office and factory address:**

**342 "Tzar Osvoboditel", 2500 Kyustendil, Bulgaria**

**Tel.: +359 78/26030 - General manager      Fax: +359 78/51312**

**+359 78/26326 - External sales      +359 78/51373 - Internal sales**

**E-mail: [info@conis-bg.com](mailto:info@conis-bg.com)**

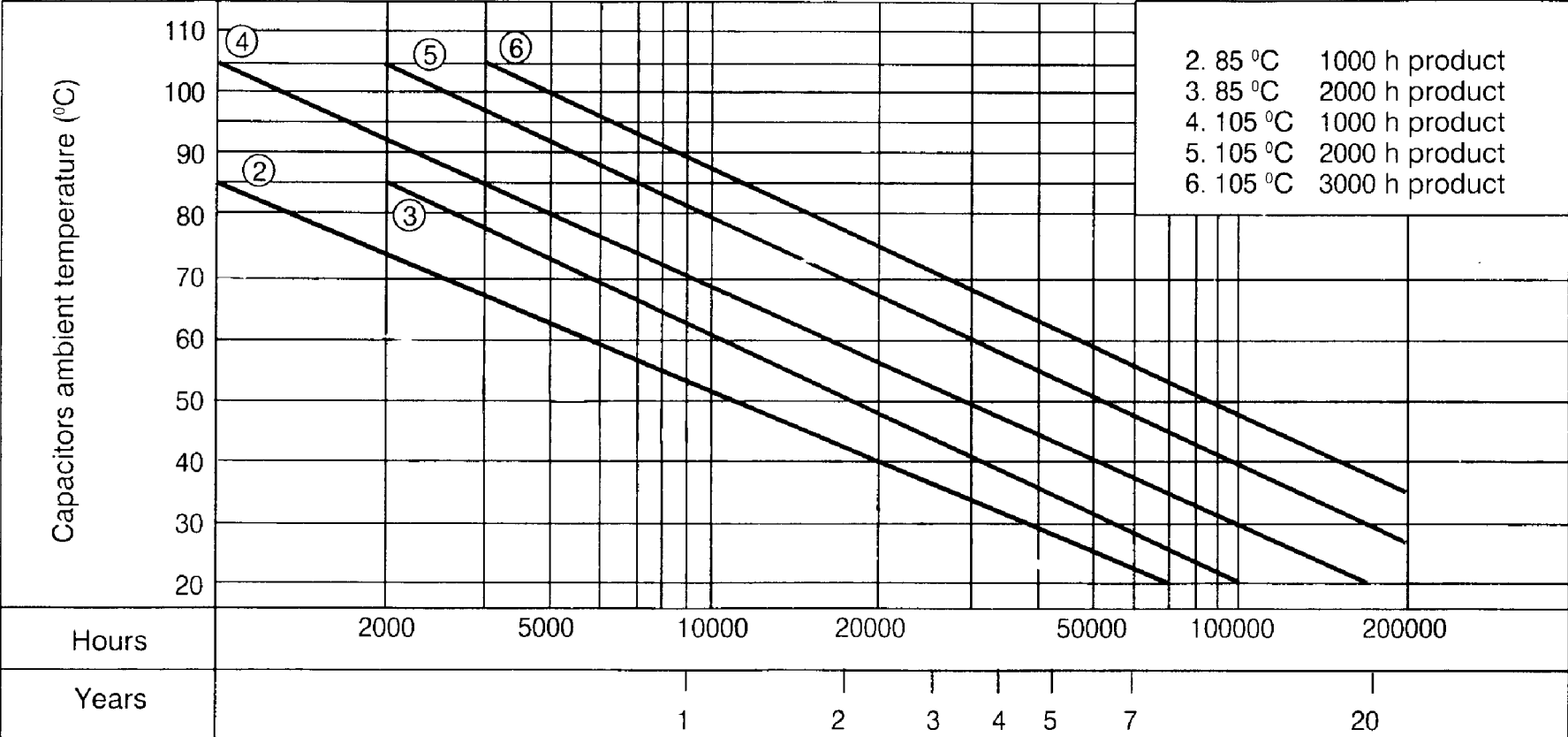
**web site: [www.conis-bg.com](http://www.conis-bg.com)**

# Radial Aluminium Electrolytic Capacitors

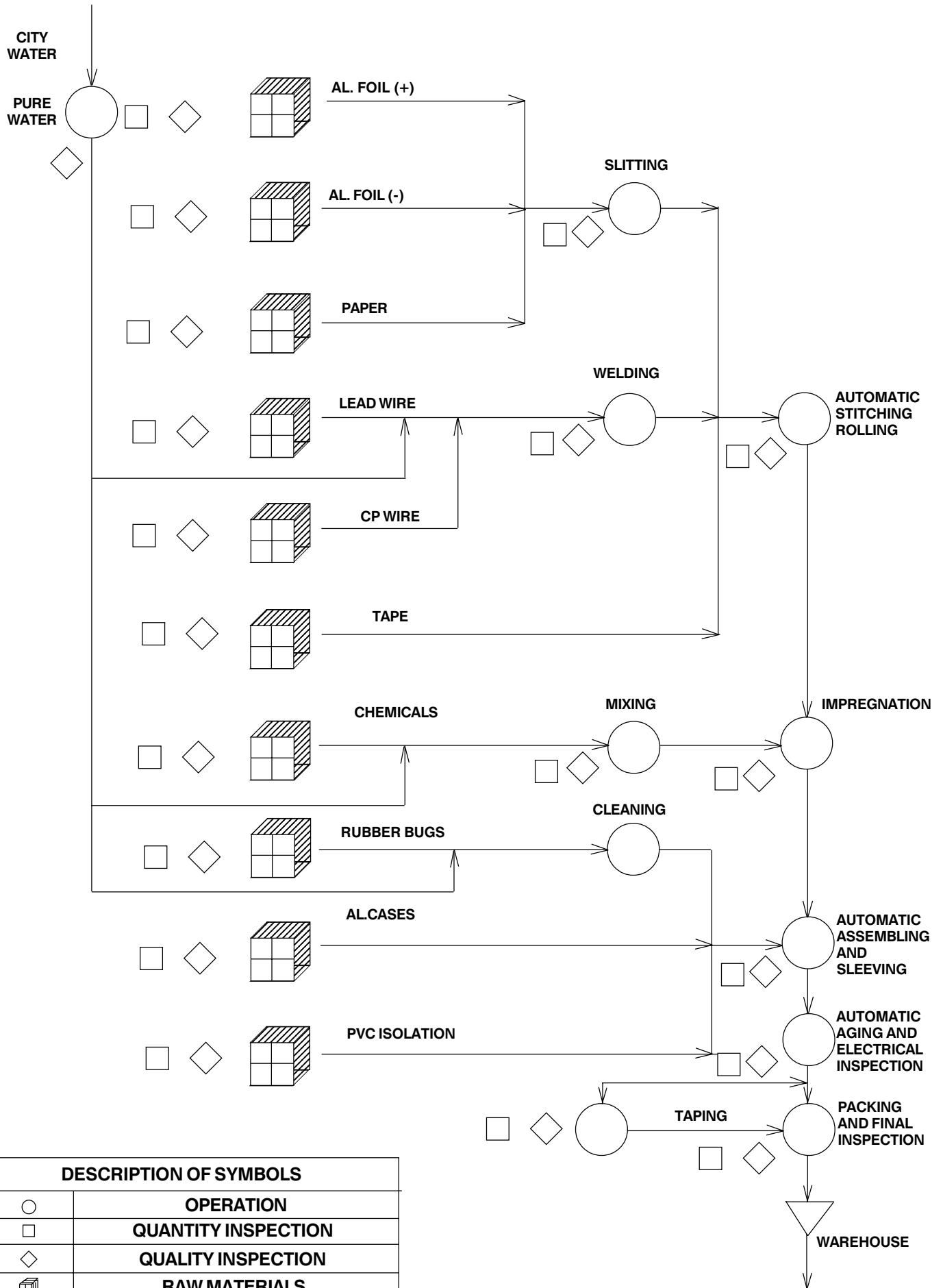
## List of Products

<b>Series</b>	<b>Features</b>	<b>Operating Temperature Range /°C/</b>	<b>Voltage Range /VDC/</b>	<b>Capacitance Range /µF/</b>	<b>Load Life Time /hours/</b>	<b>Page</b>
EA - 7	For General Purpose	-40 to +85	6.3 to 100	0.1 to 10000	85°C - 2000	6
EA - 8	Wide Temp. Range. Standard	-55 to +105	6.3 to 100	0.47 to 10000	105°C - 2000	9
EA - 9	Wide Temp. Range. Standard Low ESR. High Reliability	-55 to +105	6.3 to 63	0.47 to 4700	105°C - 2000	12
EA - 13	Low ESR. Low Z. Long life	-55 to +105	10 to 63	33 to 4700	105°C - 3000	15
EA - 19	Standard	-40 to +85	160 to 450	1 to 470	85 °C - 2000	18
EA - 20	Wide Temp. Range. Standard	-25 to +105	160 to 450	1 to 470	105 °C - 2000	22
NP	Non Polarized	-40 to +85	6.3 to 100	0.1 to 4700	85 °C - 1000	26
BP	Bi - Polarized	-40 to +85	35 to 63	1 to 100	85 °C - 2000	28

# Expected Life Chart



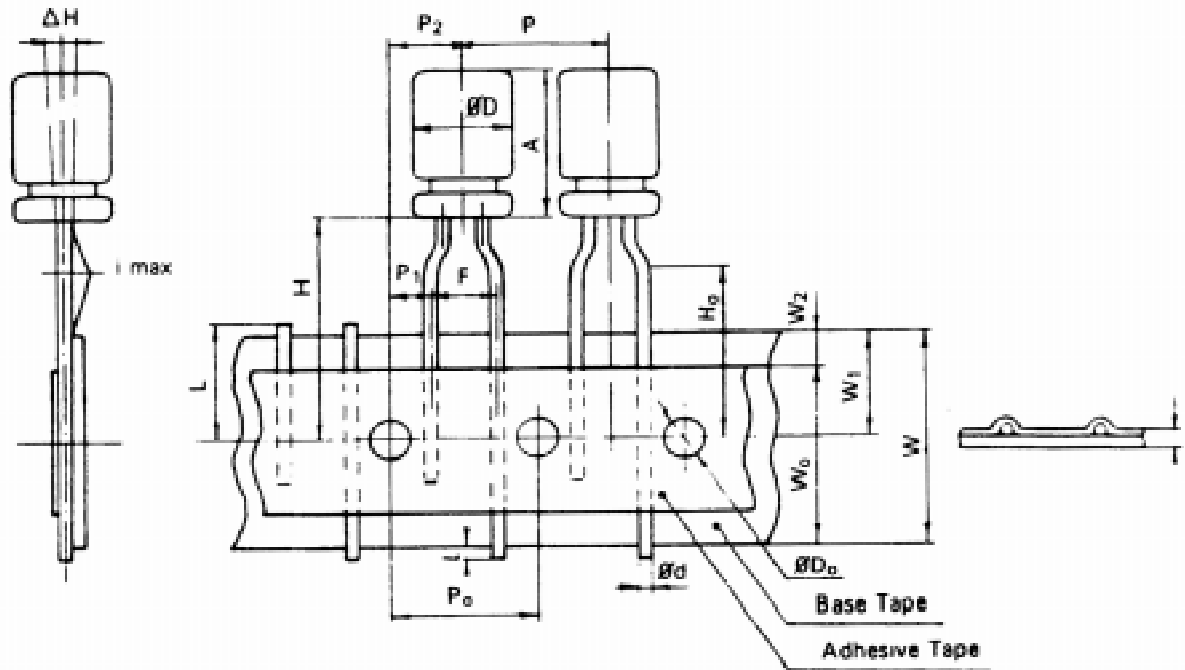
# MANUFACTURE FLOW CHART



DESCRIPTION OF SYMBOLS	
○	OPERATION
□	QUANTITY INSPECTION
◇	QUALITY INSPECTION
▣	RAW MATERIALS

For series: EA-7; EA-8; EA-9; EA-13; EA-19; EA-20; NP; BP

TAPING SHAPE AND DIMENSIONS FOR  $\phi D=5; 6,3; 8\text{mm}$



SYMBOL	NOMINAL VALUE	TOLERANCE	REMARKS
$\phi D$	5, 6.3, 8	$\pm 0.5$	CP wire Cumulative pitch error: $\pm 1\text{mm}/20$ pitches To be measured at bottom of clinch
A	$\phi 5, \phi 6.3, : 12.5 \text{ max}; \phi 8 : 14 \text{ max}$	-	
$\phi d$	$\phi 5 : 0.5$ $\phi 6.3, \phi 8 : 0.65$	$\pm 0.05$	
P	12.7	$\pm 1.0$	
Po	12.7	+ 0.2	
P1	3.85	$\pm 0.7$	
P2	6.35	$\pm 1.0$	
F	5.0	+ 0.8 - 0.2	
$\Delta H$	0	$\pm 2.0$	
W	18.0	$\pm 0.5$	
W0	12.5 min	-	
W1	9.0	$\pm 0.5$	
W2	1.5 max	-	
H	$\phi 5, \phi 6.3 : 18.5$ $\phi 8 : 20.0$	$\pm 0.75$	
Ho	16.0	$\pm 0.5$	
l	1.0 max	-	
Do	4.0	$\pm 0.2$	
t	0.7	$\pm 0.2$	
L	11.0 max	-	

**Packing**

Ammo pack:

$\phi 5, \phi 6.3$  - 2000 pcs/box  
 $\phi 8$  - 1000 pcs/box

Reel pack:

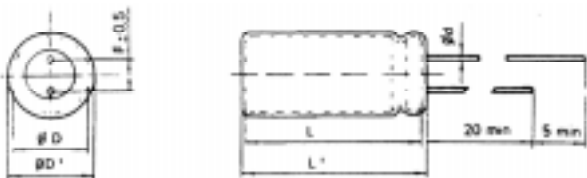
$\phi 5$  - 1500 pcs/box  
 $\phi 6.3$  - 1000 pcs/box

# 1. Miniature Aluminium Electrolytic Capacitors - Radial

## EA - 7 SERIES For General Purpose

- \*Standard series for General Purpose
- \* Load life of 2000 hours at 85 °C
- \* Single ended

Item	Characteristics																																		
Operating temperature range	- 40 ÷ + 85 °C																																		
Rated working voltage range Ur	6.3 ÷ 100 VDC																																		
Nominal capacitance range Cn	0.1 ÷ 10000 µF /at 20 °C, 120 Hz/																																		
Capacitance tolerance	≤ 0.68 µF + 100% - 10%	1 ÷ 2.2 µF + 50% - 10%	≥ 3.3 µF ± 20%																																
Leakage current max.	≤ 35 V, CnUr ≤ 1000 0.05 CnUr or 5µA /after 5 min/	≥ 50 V, CnUr ≤ 1000 0.05 CnUr + 3µA /after 5 min/	6.3 ÷ 100 V, CnUr > 1000 0.03 CnUr + 3µA /after 5 min/																																
Dissipation factor max.	<table border="1"> <thead> <tr> <th>Rated voltage (VDC)</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Dissipation factor</td> <td colspan="2">0.25</td> <td colspan="2">0.20</td> <td colspan="3">0.15</td> <td>0.10</td> </tr> </tbody> </table>								Rated voltage (VDC)	6.3	10	16	25	35	50	63	100	Dissipation factor	0.25		0.20		0.15			0.10									
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Low temperature characteristics (impedance ratio at 100 Hz)	<table border="1"> <thead> <tr> <th>VDC</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Z - 25°C/Z + 20°C</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z - 40°C/Z + 20°C</td> <td>8</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> </tbody> </table>								VDC	6.3	10	16	25	35	50	63	100	Z - 25°C/Z + 20°C	4	3	2	2	2	2	2	2	Z - 40°C/Z + 20°C	8	8	6	4	3	3	3	3
	VDC	6.3	10	16	25	35	50	63	100																										
	Z - 25°C/Z + 20°C	4	3	2	2	2	2	2	2																										
Z - 40°C/Z + 20°C	8	8	6	4	3	3	3	3																											
Load life (after application of the rated voltage for 2000 hours at 85°C)	<table border="1"> <tbody> <tr> <td>Leakage current</td> <td colspan="8">Less than specified value</td> </tr> <tr> <td>Capacitance change</td> <td colspan="8">± 20%</td> </tr> <tr> <td>tg δ</td> <td colspan="8">Less than 150% specified value</td> </tr> </tbody> </table>								Leakage current	Less than specified value								Capacitance change	± 20%								tg δ	Less than 150% specified value							
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Shelf life (at 85°C)	After 1000 hours no load test, leakage current, capacitance and tg δ are the same as load life values.																																		



φD	5	6.3	8	10	12.5	16	18	22
φd	0.5			0.65			0.8	08
F	2	2.5	3.5	5		7.5		10
φD'	D+0.5			D+0.6		D+0.6		
L'	L+1.5					L+2		

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency µF	50Hz	120Hz	300Hz	1kHz	10kHz
≤ 47	0.75	1	1.35	1.55	2.0
68 - 680	0.80	1	1.25	1.34	1.5
≥ 1000	0.85	1	1.10	1.13	1.15

Temp. °C	40	60	70	85
Coefficient	2.0	1.5	1.3	1.0

# EA - 7 SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 85°C**

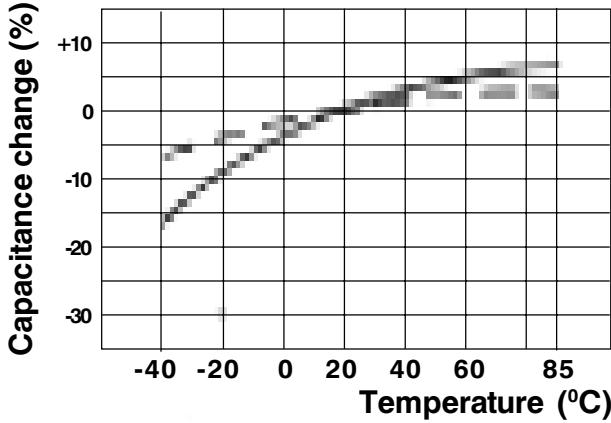
VDC μF	6.3		10		16		25		35		50		63		100	
0.1	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7
0.15	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7.1
0.22	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7.1	5x11	7.1
0.33	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7.2	5x11	7.2	5x11	7.5
0.47	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7.2	5x11	7.5	5x11	7.8
0.68	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7	5x11	7.4	5x11	7.8	5x11	8.0
1.0	5x11	10	5x11	10	5x11	10	5x11	10	5x11	12	5x11	12	5x11	12	5x11	12
1.5	5x11	12	5x11	12	5x11	13	5x11	13	5x11	15	5x11	16	5x11	18	5x11	20
2.2	5x11	18	5x11	18	5x11	18	5x11	21	5x11	21	5x11	21	5x11	21	5x11	24
3.3	5x11	22	5x11	22	5x11	22	5x11	28	5x11	28	5x11	28	5x11	28	5x11	35
4.7	5x11	30	5x11	30	5x11	30	5x11	35	5x11	35	5x11	35	5x11	35	5x11	45
6.8	5x11	33	5x11	33	5x11	33	5x11	43	5x11	43	5x11	50	5x11	50	5x11	62
10	5x11	36	5x11	36	5x11	36	5x11	52	5x11	52	5x11	61	5x11	61	6.3x11	80
15	5x11	44	5x11	44	5x11	44	5x11	72	5x11	72	5x11	85	5x11	85	6.3x11	113
22	5x11	54	5x11	54	5x11	70	5x11	96	5x11	96	5x11	110	6.3x11	120	8x11.5	138
33	5x11	66	5x11	66	5x11	84	5x11	115	5x11	150	6.3x11	150	6.3x11	165	8x14	195
47	5x11	77	5x11	83	5x11	110	5x11	145	6.3x11	170	6.3x11	190	8x11.5	235	10x16.5	250
68	5x11	100	5x11	118	5x11	155	5x11	220	6.3x11	245	8x11.5	265	8x11.5	295	10x16.5	350
100	5x11	125	5x11	146	5x11	200	6.3x11	270	8x11.5	300	8x11.5	330	10x16.5	340	12.5x20.5	420
150	5x11	185	5x11	199	6.3x11	255	8x11.5	355	8x11.5	365	10x16.5	450	10x16.5	480	12.5x24.5	520
220	6.3x11	240	6.3x11	260	6.3x11	325	8x11.5	440	8x14	480	10x16.5	545	10x20.5	570	16x25	640
330	6.3x11	320	6.3x11	340	8x11.5	405	8x14	560	10x16.5	600	10x20.5	640	12.5x20.5	760	16x31.5	920
470	8x11.5	410	8x11.5	435	8x11	515	10x16.5	725	10x20.5	740	12.5x20.5	760	12.5x24.5	1020	16x35.5	1130
680	8x14	510	8x14	580	10x16.5	620	10x20.5	920	12.5x20.5	950	12.5x24.5	1150	16x25	1280	18x37.5	1550
1000	10x16.5	585	10x16.5	680	10x16.5	790	12.5x20.5	1050	12.5x24.5	1095	16x25	1300	16x31.5	1550	18x42	2200
1500	10x20.5	750	10x20.5	780	12.5x20.5	950	12.5x24.5	1150	16x25	1550	16x31.5	1800	18x37.5	2100		
2200	12.5x20.5	870	12.5x20.5	970	12.5x24.5	1050	16x25	1550	16x31.5	1900	18x37.5	2050	18x42	2500		
3300	12.5x24.5	1000	12.5x24.5	1150	16x25	1400	16x25	1750	18x37.5	2050	18x42	2100	22x42	2800		
4700	16x25	1350	16x25	1500	16x31.5	2050	16x35.5	2850	18x37.5	2800	22x42	2500				
6800	16x25	1650	16x25	1950	16x35.5	2250	18x42	3200	22x42	3300						
10000	16x31.5	2050	16x35.5	2800	18x37.5	2990	22x42	3600								

# EA - 7 SERIES

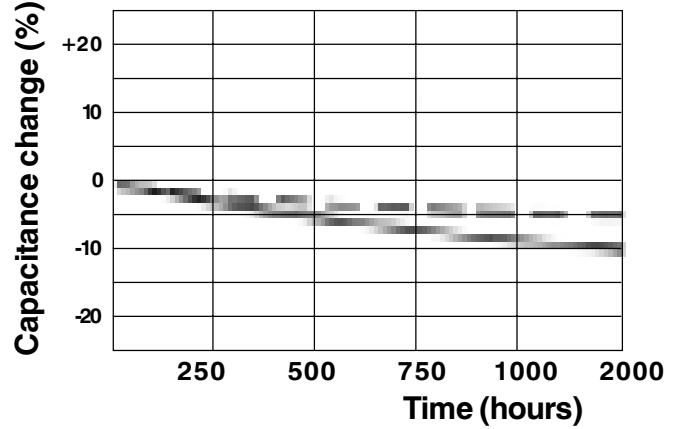
## Typical Performance

———— 330  $\mu\text{F}$  / 16 V  
- - - - 1500  $\mu\text{F}$  / 63 V

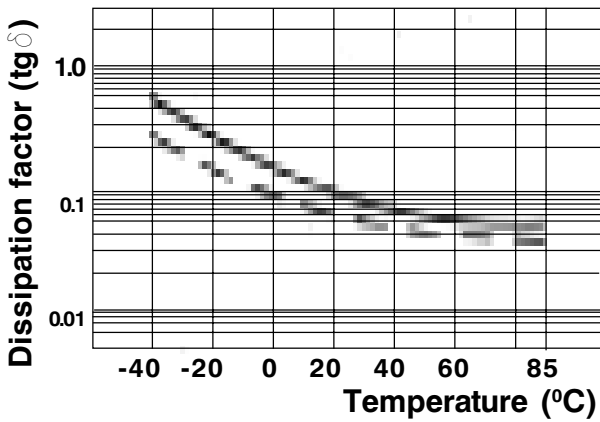
### Temperature characteristics Capacitance change vs. temperature



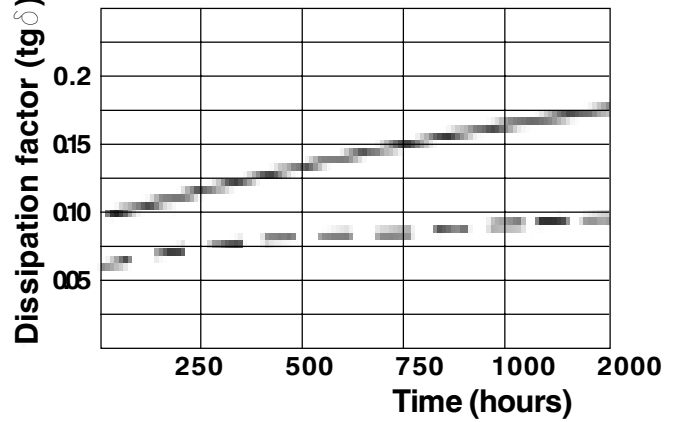
### Load Life ( at +85 °C ) Capacitance change vs. time



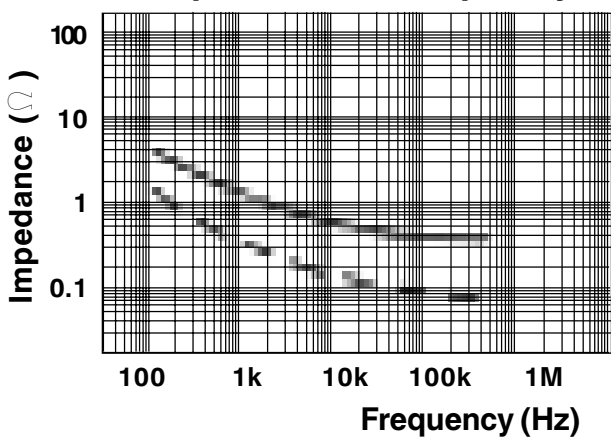
### Dissipation factor vs. temperature



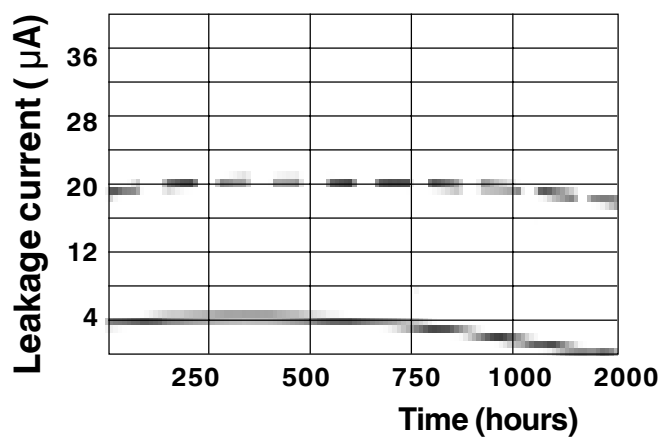
### Dissipation factor vs. time



### Frequency characteristics Impedance vs. frequency



### Leakage current vs. time



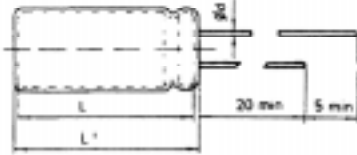
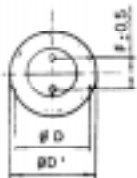


# EA - 8 SERIES

## Wide Temperature Range

- \*Wide operating temperature range of - 55 ÷ +105°C
- \* Standard series for General Purpose
- \* Load life of 2000 hours at 105 °C
- \* Single ended

Item	Characteristics																																			
Operating temperature range	- 55 ÷ +105 °C																																			
Rated working voltage range Ur	6.3 ÷ 100 VDC																																			
Nominal capacitance range Cn	0.47 ÷ 10000 µF /at 20 °C, 120 Hz/																																			
Capacitance tolerance	$\leq 0.68 \mu\text{F} \begin{matrix} + 100\% \\ - 10\% \end{matrix}$	$1 \div 2.2 \mu\text{F} \begin{matrix} + 50\% \\ - 10\% \end{matrix}$	$\geq 3.3 \mu\text{F} \pm 20\%$																																	
Leakage current max.	$\leq 35 \text{ V, CnUr} \leq 1000$	$\geq 50 \text{ V, CnUr} \leq 1000$	$6.3 \div 100 \text{ V, CnUr} > 1000$																																	
	$0.03 \text{ CnUr} \text{ or } 5\mu\text{A}$ /after 5 min/	$0.03 \text{ CnUr} + 3\mu\text{A}$ /after 5 min/																																		
Dissipation factor max.	<table border="1"> <thead> <tr> <th>Rated voltage (VDC)</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Dissipation factor</td> <td colspan="2">0.25</td> <td>0.18</td> <td>0.16</td> <td>0.13</td> <td colspan="2">0.10</td> <td>0.09</td> </tr> </tbody> </table>									Rated voltage (VDC)	6.3	10	16	25	35	50	63	100	Dissipation factor	0.25		0.18	0.16	0.13	0.10		0.09									
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	VDC	6.3	10	16	25	35	50	63	100																											
	Z - 25°C/Z + 20°C	4	3	2	2	2	2	2	2																											
Z - 55°C/Z + 20°C	8	8	6	4	3	3	3	3																												
Load life (after application of the rated voltage for 2000 hours at 105°C)	Leakage current	Less than specified value																																		
	Capacitance change	± 20%																																		
	tg δ	Less than 200% specified value																																		
Shelf life (at 105°C)	After 1000 hours no load test, leakage current, capacitance and tg δ are the same as load life values.																																			



φD	5	6.3	8	10	12.5	16	18	22
φd	0.5			0.65			0.8	0.8
F	2	2.5	3.5	5		7.5		10
φD'	D+0.5			D+0.6		D+0.6		
L'	L+1.5					L+2		

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency µF	50Hz	120Hz	300Hz	1kHz	10kHz
≤ 47	0.75	1	1.35	1.55	2.0
68 - 680	0.80	1	1.25	1.34	1.5
≥ 1000	0.85	1	1.10	1.13	1.15

Temp. °C	40	60	70	85	105
Coefficient	2.4	2.1	1.78	1.65	1

# EA - 8 SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 105°C**

VDC μF	6.3		10		16		25		35		50		63		100	
	<b>0.47</b>	5x11	5.5	5x11	5.5	5x11	5.5	5x11	5.5	5x11	5.7	5x11	6	5x11	6	5x11
<b>0.68</b>	5x11	5.5	5x11	5.5	5x11	5.5	5x11	5.8	5x11	5.8	5x11	6.2	5x11	7.2	5x11	7.5
<b>1.0</b>	5x11	7.5	5x11	7.5	5x11	7.5	5x11	7.8	5x11	9	5x11	9.2	5x11	9.4	5x11	10
<b>1.5</b>	5x11	9	5x11	9	5x11	9.75	5x11	9.75	5x11	11.25	5x11	11.5	5x11	13.5	5x11	15
<b>2.2</b>	5x11	13.5	5x11	13.5	5x11	13.5	5x11	15.75	5x11	15.75	5x11	16	5x11	16	5x11	18
<b>3.3</b>	5x11	16.5	5x11	16.5	5x11	16.5	5x11	21	5x11	21	5x11	21.5	5x11	22.5	5x11	26.5
<b>4.7</b>	5x11	22.5	5x11	22	5x11	22	5x11	27	5x11	27	5x11	27	5x11	28	5x11	34
<b>6.8</b>	5x11	25	5x11	25	5x11	25	5x11	33	5x11	33	5x11	33	5x11	38	5x11	47
<b>10</b>	5x11	27	5x11	27	5x11	27	5x11	39	5x11	39	5x11	46	5x11	46	6.3x11	60
<b>15</b>	5x11	33	5x11	33	5x11	33	5x11	54	5x11	54	5x11	64	5x11	64	6.3x11	85
<b>22</b>	5x11	41	5x11	41	5x11	53	5x11	72	5x11	72	5x11	83	6.3x11	90	8x11.5	104
<b>33</b>	5x11	50	5x11	50	5x11	63	5x11	87	5x11	113	6.3x11	113	6.3x11	124	8x14	147
<b>47</b>	5x11	58	5x11	63	5x11	83	5x11	109	6.3x11	128	6.3x11	143	8x11.5	177	10x16.5	188
<b>68</b>	5x11	75	5x11	89	5x11	117	5x11	165	6.3x11	184	8x11.5	199	8x11.5	222	10x16.5	263
<b>100</b>	5x11	94	5x11	110	5x11	150	6.3x11	203	8x11.5	225	8x11.5	250	10x16.5	255	12.5x20.5	315
<b>150</b>	5x11	140	5x11	150	6.3x11	192	8x11.5	267	8x11.5	274	10x16.5	338	10x16.5	360	12.5x24.5	390
<b>220</b>	6.3x11	180	6.3x11	195	8x11.5	244	8x11.5	330	8x14	360	10x16.5	410	10.5x20.5	428	16x25	490
<b>330</b>	6.3x11	240	6.3x11	255	8x11.5	304	8x14	420	10x16.5	450	10x20.5	480	12.5x20.5	570	16x31.5	690
<b>470</b>	8x11.5	310	8x11.5	330	8x14	390	10x16.5	545	10x20.5	555	12.5x20.5	570	12.5x24.5	770	16x35.5	850
<b>680</b>	8x14	385	8x14	435	10x16.5	465	10x20.5	690	12.5x20.5	715	12.5x24.5	865	16x25	960	18x37.5	1165
<b>1000</b>	10x16.5	440	10x16.5	510	10x20.5	595	12.5x20.5	790	12.5x24.5	820	16x25	975	16x31.5	1160	18x42	2200
<b>1500</b>	10x20.5	565	10x20.5	585	12.5x20.5	715	12.5x24.5	865	16x25	1165	16x31.5	1350	18x37.5	1600		
<b>2200</b>	12.5x20.5	655	12.5x20.5	730	12.5x24.5	790	16x25	1165	16x31.5	1430	18x37.5	1580	18x42	2500		
<b>3300</b>	12.5x24.5	750	12.5x24.5	865	16x25	1050	16x25	1315	18x37.5	1580	18x37.5	2100				
<b>4700</b>	16x25	1015	16x25	1125	16x31.5	1580	16x35.5	2150	18x37.5	2800	22x42	2500				
<b>6800</b>	16x25	1240	16x25	1470	16x35.5	1580										
<b>10000</b>	16x31.5	1580	16x35.5	2100	18x37.5	2250										

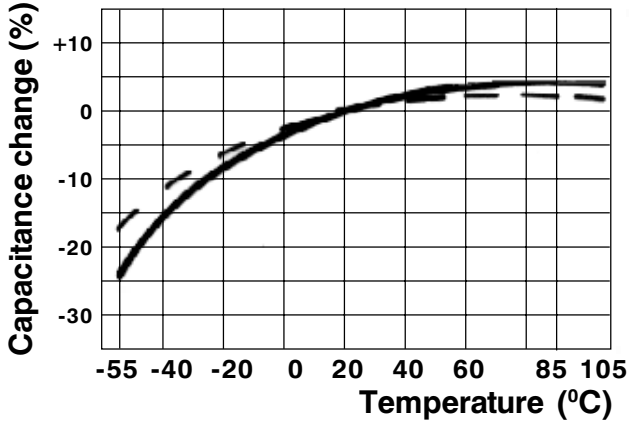
# EA - 8 SERIES

## Typical Performance

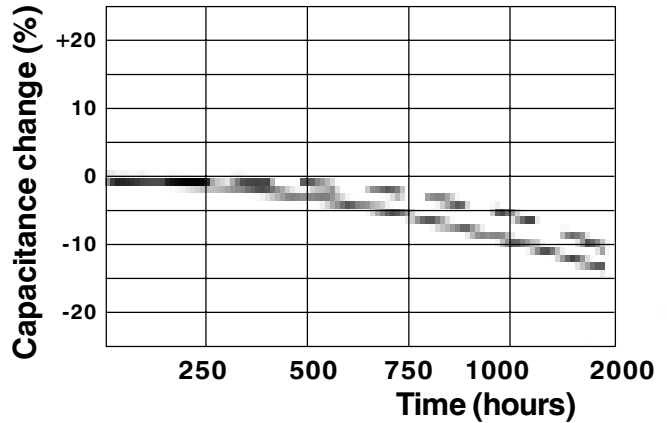
———— 330  $\mu\text{F}$  / 16 V

- - - - 1500  $\mu\text{F}$  / 63 V

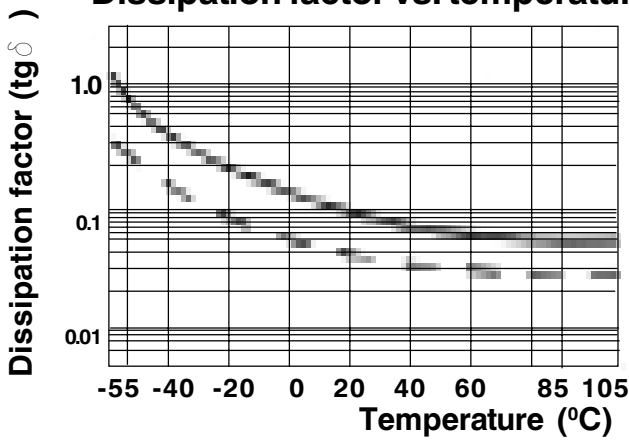
**Temperature characteristics**  
Capacitance change vs. temperature



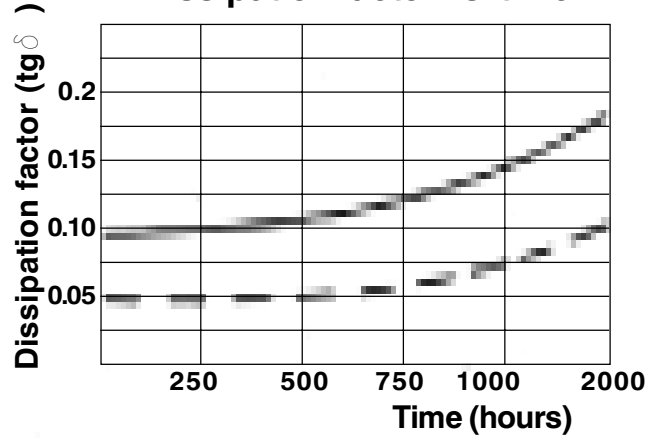
**Load Life ( at +105 °C )**  
Capacitance change vs. time



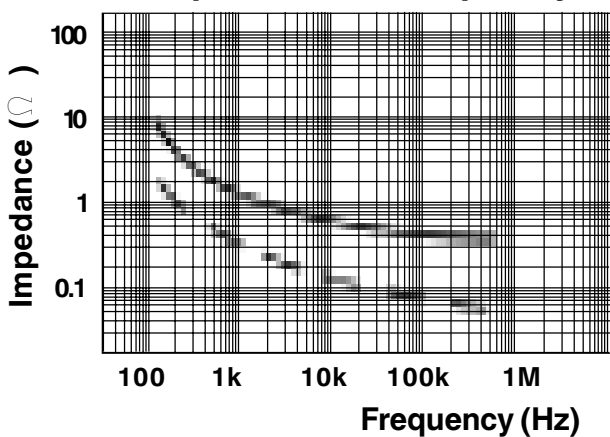
**Dissipation factor vs. temperature**



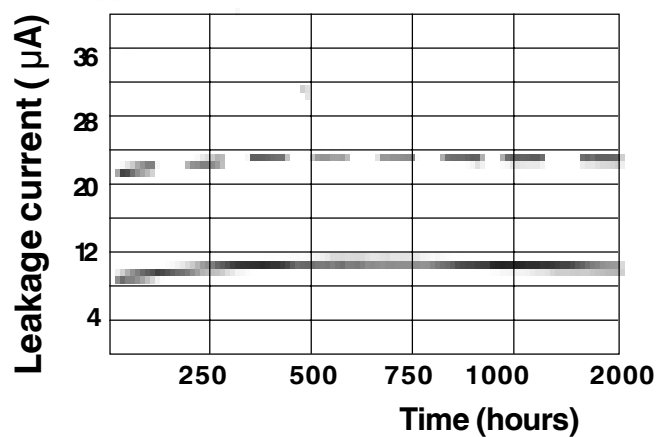
**Dissipation factor vs. time**



**Frequency characteristics**  
Impedance vs. frequency



**Leakage current vs. time**

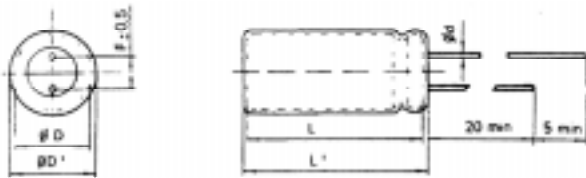


# EA - 9 SERIES

## Wide Temperature Range

- \*Wide operating temperature range of - 55 ÷ +105°C
- \* High performance and excellent temperature characteristics
- \* Low ESR. High Reliability
- \* Load life of 2000 hours at 105 °C
- \* Single ended

Item	Characteristics							
Operating temperature range	- 55 ÷ +105 °C							
Rated working voltage range Ur	6.3 ÷ 63 VDC							
Nominal capacitance range Cn	0.47 ÷ 4700 µF /at 20 °C, 120 Hz/							
Capacitance tolerance	≤ 0.68 µF <sup>+ 100%</sup> - 10%		1 ÷ 2.2 µF <sup>+ 50%</sup> - 10%			≥ 3.3 µF ± 20%		
Leakage current max.	≤ 35 V, CnUr ≤ 1000		50 ÷ 63 V, CnUr ≤ 1000			6.3 ÷ 63 V, CnUr > 1000		
	0.02 CnUr or 5µA /after 5 min/		0.02 CnUr + 3µA /after 5 min/					
Dissipation factor max.	Rated voltage (VDC)	6.3	10	16	25	35	50	63
	Dissipation factor	0.25	0.20	0.15	0.12	0.10	0.08	0.08
Note: The Dissipation factor for capacitors with Cn ≥ 4700 µF will not exceed 0.25 (at 20°C, 120 Hz)								
Low temperature characteristics (impedance ratio at 100 Hz)	VDC	6.3	10	16	25	35	50	63
	Z - 25°C/Z + 20°C	4	3	2	2	2	1.5	1.5
	Z - 55°C/Z + 20°C	6	4	3	2	2	2	2
Load life (after application of the rated voltage for 2000 hours at 105°C)	Leakage current	Less than specified value						
	Capacitance change	± 20%						
	tg δ	Less than 200% specified value						
Shelf life (at 105°C)	After 1000 hours no load test, leakage current, capacitance and tg δ are the same as load life values.							



φD	5	6.3	8	10	12.5	16	18	22
φd	0.5			0.65			0.8	0.8
F	2	2.5	3.5	5		7.5		10
φD'	D+0.5			D+0.6		D+0.6		
L'	L+1.5					L+2		

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency µF	50Hz	120Hz	300Hz	1kHz	10kHz
≤ 47	0.75	1	1.35	1.55	2.0
68 - 680	0.80	1	1.25	1.34	1.5
≥ 1000	0.85	1	1.10	1.13	1.15

Temp. °C	40	60	70	85	105
Coefficient	2.4	2.1	1.78	1.65	1

# EA - 9 SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 105°C**

VDC μF	6.3		10		16		25		35		50		63	
	0.47	5x11	6.2	5x11	6.2	5x11	6.2	5x11	6.2	5x11	6.2	5x11	6.2	5x11
0.68	5x11	7.5	5x11	7.5	5x11	7.5	5x11	7.5	5x11	7.5	5x11	7.5	5x11	7.5
1.0	5x11	9.0	5x11	9.0	5x11	9.0	5x11	9.0	5x11	9.0	5x11	10.0	5x11	10
1.5	5x11	13	5x11	13	5x11	13	5x11	13	5x11	14	5x11	15	5x11	15
2.2	5x11	18	5x11	18	5x11	18	5x11	18	5x11	19	5x11	19	5x11	18
3.3	5x11	22	5x11	22	5x11	22	5x11	24	5x11	25	5x11	27	5x11	27
4.7	5x11	30	5x11	30	5x11	30	5x11	33	5x11	35	5x11	36	5x11	35
6.8	5x11	35	5x11	38	5x11	40	5x11	43	5x11	45	5x11	49	5x11	48
10	5x11	36	5x11	40	5x11	45	5x11	53	5x11	57	5x11	61	6.3x11	61
15	5x11	44	5x11	55	5x11	60	5x11	70	5x11	80	6.3x11	87	6.3x11	87
22	5x11	54	5x11	60	5x11	70	5x11	80	6.3x11	85	8x11.5	93	8x11.5	104
33	5x11	58	5x11	70	5x11	90	6.3x11	100	8x11.5	120	8x11.5	126	10x16.5	147
47	5x11	63	5x11	80	6.3x11	110	8x11.5	140	8x11.5	160	8x14	180	10x16.5	188
68	5x11	78	6.3x11	100	8x11.5	130	8x11.5	180	8x14	200	10x16.5	220	10x16.5	263
100	5x11	103	6.3x11	130	8x11.5	163	8x14	210	10x16.5	235	10x16.5	265	12.5x20.5	315
150	8x11.5	153	8x11.5	180	8x11.5	215	10x16.5	274	10x20.5	290	10x20.5	380	12.5x24.5	390
220	8x11.5	203	8x11.5	242	8x14	293	10x16.5	340	10x20.5	395	12.5x20.5	438	16x25	490
330	8x14	290	10x16.5	331	10x16.5	375	10x20.5	445	12.5x20.5	493	12.5x24.5	570	16x31.5	690
470	10x16.5	380	10x16.5	415	10x20.5	490	10x20.5	565	12.5x20.5	610	16x25	765	16x35.5	650
680	10x20.5	435	10x20.5	495	10x20.5	590	12.5x20.5	715	12.5x24.5	860	16x25	983	18x37.5	1165
1000	10x20.5	595	10x20.5	654	12.5x20.5	785	12.5x24.5	825	16x25	975	16x35.5	1200	18x42	2200
1500	12.5x20.5	620	12.5x20.5	712	12.5x24.5	900	16x25	1160	16x35.5	1350	18x37.5	1600	22x42	2800
2200	12.5x20.5	755	12.5x24.5	900	16x25	1005	16x31.5	1600	18x37.5	2010	18x42	2200		
3300	12.5x24.5	880	16x25	1050	16x31.5	1550	18x37.5	2010	18x42	2200	22x42	2800		
4700	16x25	1250	16x31.5	1550	18x37.5	2050	18x42	2200	22x42	2800				

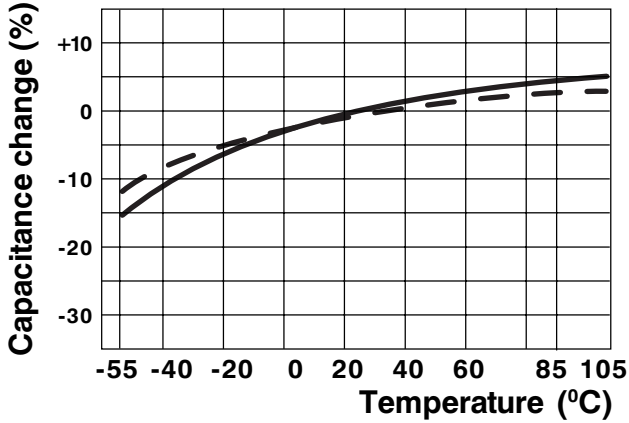
# EA - 9 SERIES

## Typical Performance

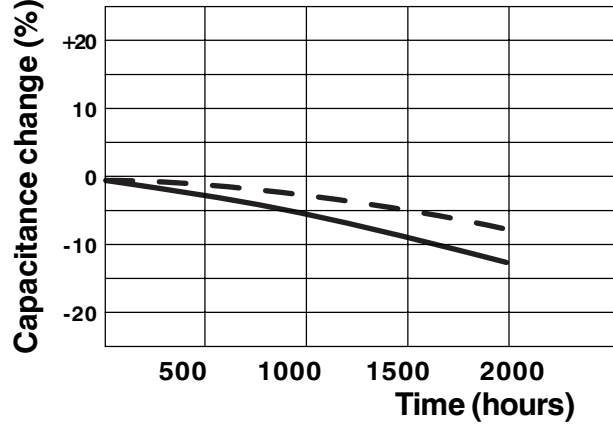
———— 330  $\mu\text{F}$  / 16 V

- - - - 1500  $\mu\text{F}$  / 50 V

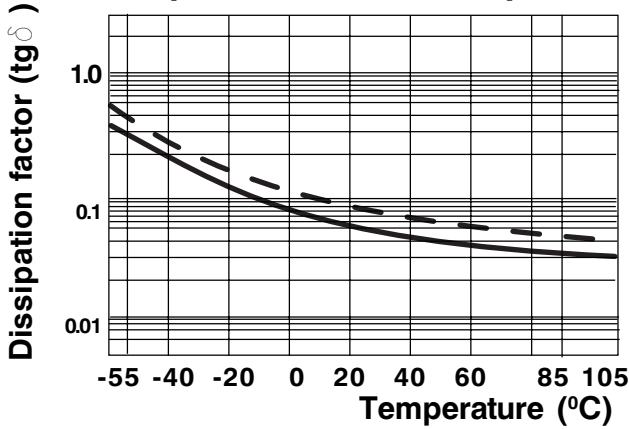
**Temperature characteristics**  
Capacitance change vs. temperature



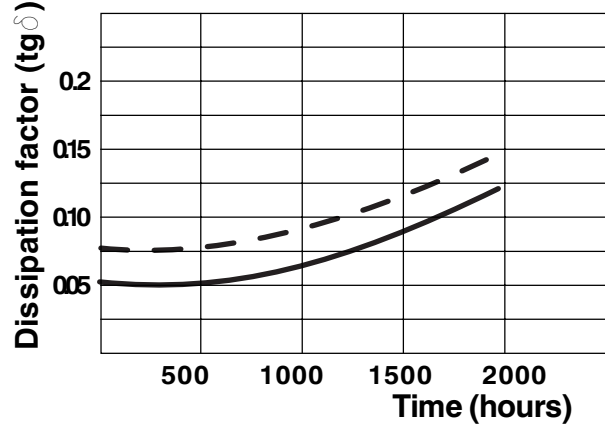
**Load Life ( at +105 °C )**  
Capacitance change vs. time



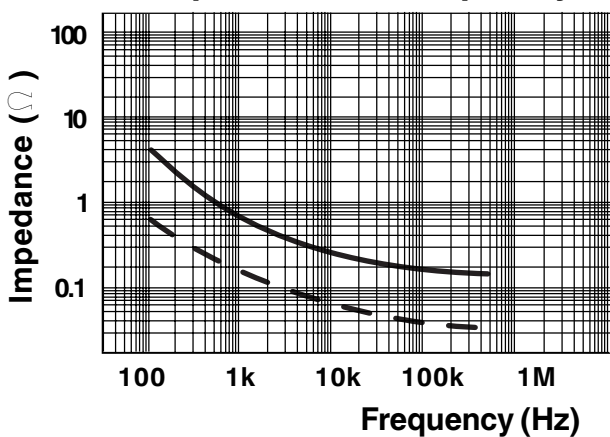
**Dissipation factor vs. temperature**



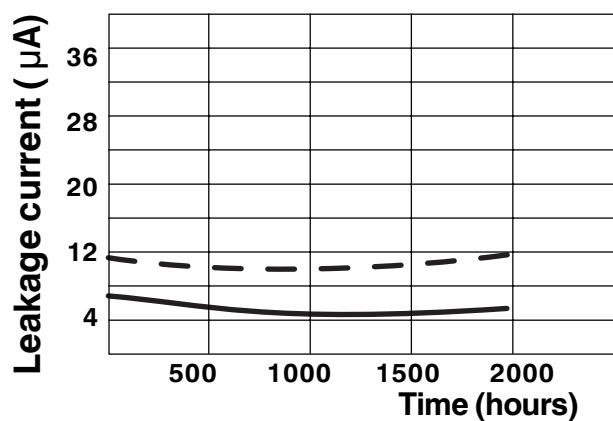
**Dissipation factor vs. time**



**Frequency characteristics**  
Impedance vs. frequency



**Leakage current vs. time**



# EA - 13 SERIES

## Long Life, High Reliability

- \*Low ESR and impedance at high frequency
- \* Ideally suited for use of switching power supplies
- \* Wide operating temperature range of  $-55 \div +105^{\circ}\text{C}$
- \* Load life of 3000 hours at  $105^{\circ}\text{C}$
- \* Single ended

Item	Characteristics														
Operating temperature range	$-55 \div +105^{\circ}\text{C}$														
Rated working voltage range $U_r$	$10 \div 63\text{ VDC}$														
Nominal capacitance range $C_n$	$33 \div 4700\ \mu\text{F}$ /at $20^{\circ}\text{C}$ , 120 Hz/														
Capacitance tolerance	$\pm 20\%$														
Leakage current max.	$0.01 C_n U_r$ or $5\ \mu\text{A}$ /after 5 min/														
Dissipation factor max.	<table border="1"> <thead> <tr> <th>Rated voltage (VDC)</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> </tr> </thead> <tbody> <tr> <td>Dissipation factor</td> <td>0.19</td> <td>0.14</td> <td>0.11</td> <td>0.09</td> <td>0.08</td> <td>0.08</td> </tr> </tbody> </table> <p>Note: The Dissipation factor for capacitors with <math>C_n = 4700\ \mu\text{F}</math> will not exceed 0.25 (at <math>20^{\circ}\text{C}</math>, 120 Hz)</p>	Rated voltage (VDC)	10	16	25	35	50	63	Dissipation factor	0.19	0.14	0.11	0.09	0.08	0.08
Rated voltage (VDC)	10	16	25	35	50	63									
Dissipation factor	0.19	0.14	0.11	0.09	0.08	0.08									
Low temperature characteristics (impedance ratio at 100 Hz)	<table border="1"> <thead> <tr> <th>VDC</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> </tr> </thead> <tbody> <tr> <td><math>Z_{-55^{\circ}\text{C}}/Z_{+20^{\circ}\text{C}}</math></td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> </tbody> </table>	VDC	10	16	25	35	50	63	$Z_{-55^{\circ}\text{C}}/Z_{+20^{\circ}\text{C}}$	3	2	2	2	2	2
VDC	10	16	25	35	50	63									
$Z_{-55^{\circ}\text{C}}/Z_{+20^{\circ}\text{C}}$	3	2	2	2	2	2									
Load life (after application of the rated voltage for 3000 hours at $105^{\circ}\text{C}$ )	<table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Less than specified value</td> </tr> <tr> <td>Capacitance change</td> <td><math>\pm 20\%</math></td> </tr> <tr> <td><math>\text{tg } \delta</math></td> <td>Less than 200% specified value</td> </tr> </tbody> </table>	Leakage current	Less than specified value	Capacitance change	$\pm 20\%$	$\text{tg } \delta$	Less than 200% specified value								
Leakage current	Less than specified value														
Capacitance change	$\pm 20\%$														
$\text{tg } \delta$	Less than 200% specified value														
Shelf life (at $105^{\circ}\text{C}$ )	After 1000 hours no load test, leakage current, capacitance and $\text{tg } \delta$ are the same as load life values.														



$\phi D$	5	6.3	8	10	12.5	16	18	22
$\phi d$	0.5			0.65		0.8		08
F	2	2.5	3.5	5		7.5		10
$\phi D'$	D+0.5			D+0.6		D+0.6		
L'	L+1.5					L+2		

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency $\mu\text{F}$	50Hz	120Hz	300Hz	1kHz	10kHz
$\leq 47$	0.75	1	1.35	1.55	2.0
68 - 680	0.80	1	1.25	1.34	1.5
$\geq 1000$	0.85	1	1.10	1.13	1.15

Temp. $^{\circ}\text{C}$	40	60	70	85	105
Coefficient	2.4	2.1	1.78	1.65	1

# EA - 13 SERIES

\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 105°C & R<sub>ESR</sub> & Z max

Capacitance [μF]	Working voltage [V]	Dimensions φDxL [mm]	R <sub>ESR</sub> max [Ω] 120Hz 20°C	Z max [Ω] 100kHz 20°C	Max Ripple Current mA[rms]
150	10	10x16.5	1.600	0.500	210
220		10x16.5	1.100	0.400	280
330		10x20.5	0.610	0.300	370
470		10x25	0.350	0.190	460
680		10x35	0.210	0.150	580
1000		12.5x35	0.160	0.100	780
1500		12.5x35	0.100	0.080	995
2200		16x35	0.075	0.060	1280
3300		18x37.5	0.050	0.040	1560
4700		18x37.5	0.045	0.035	1890
100	16	10x16.5	1.600	0.500	210
150		10x16.5	1.000	0.400	285
220		10x20.5	0.700	0.300	380
330		10x25.0	0.510	0.200	480
470		12.5x25	0.280	0.150	570
680		12.5x35	0.200	0.110	790
1000		12.5x35	0.145	0.100	1000
1500		16x35	0.097	0.080	1250
2200		18x37.5	0.066	0.060	1600
3300		18x37.5	0.044	0.040	1750
4700	18x37.5	0.037	0.037	2100	
68	25	10x16.5	1.600	0.500	185
100		10x16.5	1.300	0.350	240
150		10x20.5	0.900	0.230	330
220		10x25.0	0.500	0.160	430
330		10x35.0	0.350	0.120	565
470		12.5x25.0	0.205	0.100	740
680		12.5x35.0	0.180	0.080	930
1000		16x35	0.120	0.060	1260
1500		18x37.5	0.085	0.050	1530
2200		18x37.5	0.055	0.045	1750
3300	18x42	0.041	0.034	1800	
47	35	10x16.5	2.290	0.500	160
68		10x16.5	1.390	0.400	210
100		10x20.5	0.900	0.230	280
150		10x25.0	0.650	0.160	380
220		10x35.0	0.420	0.110	495
330		12.5x25.0	0.290	0.080	660
470		12.5x35.0	0.180	0.060	870
680		16x35.5	0.165	0.050	1150
1000		18x37.5	0.110	0.040	1560
2200		18x37.5	0.09	0.035	1880
1500	18x37.5	0.065	0.035	1850	
33	50	10x16.5	2.950	0.600	150
47		10x16.5	1.900	0.430	200
68		10x16.5	1.200	0.320	250
100		12.5x20.5	0.700	0.230	340
150		12.5x20.5	0.600	0.160	480
220		12.5x35	0.370	0.100	580
330		16x35	0.250	0.080	800
470		16x35	0.150	0.060	1100
680		16x35.5	0.120	0.050	1380
1000		18x37.5	0.090	0.040	1600
33	63	10x16.5	2.600	0.500	150
47		10x16.5	1.600	0.400	190
68		10x16.5	1.100	0.300	240
100		12.5x20.5	0.550	0.230	360
150		12.5x20.5	0.510	0.160	580
220		12.5x35.0	0.320	0.100	610
330		16x31.5	0.200	0.080	960
470		16x35.5	0.130	0.060	1300
680		18x37.5	0.107	0.050	1500
1000		18x37.5	0.085	0.040	1650

The value shown for R<sub>ESR</sub> and Z are the maximum permitted. The typical value of the different parameters shown are from 15 to 50% of the maximum ones.

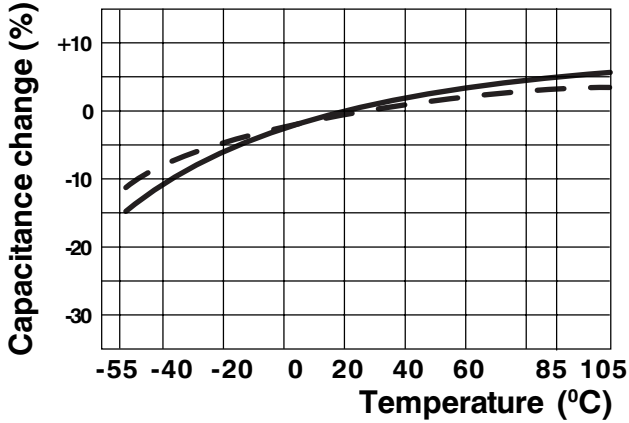


# EA - 13 SERIES

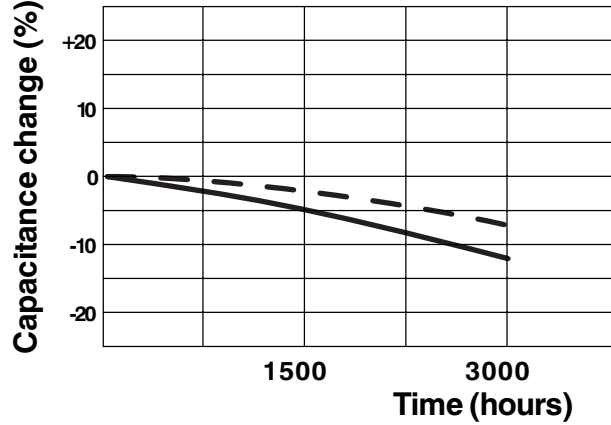
## Typical Performance

———— 330  $\mu\text{F}$  / 16 V  
 - - - - 1000  $\mu\text{F}$  / 35 V

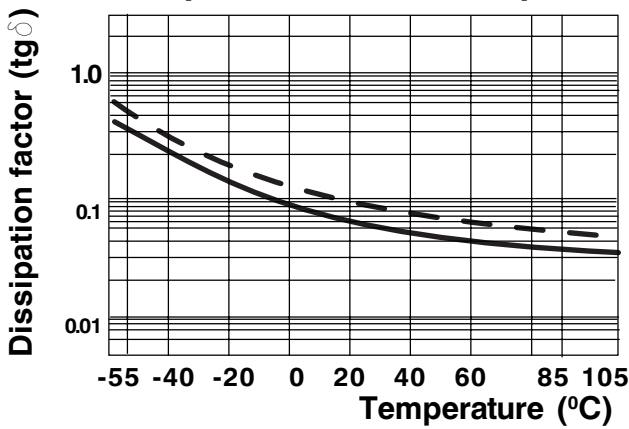
**Temperature characteristics**  
**Capacitance change vs. temperature**



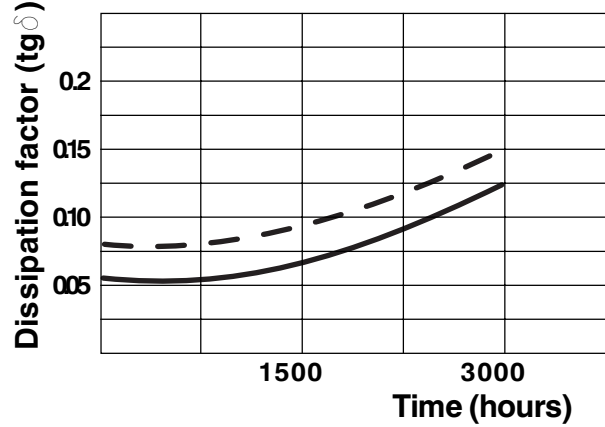
**Load Life ( at +105 °C )**  
**Capacitance change vs. time**



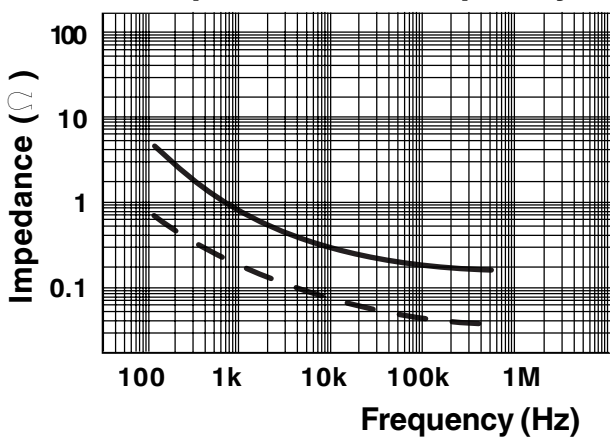
**Dissipation factor vs. temperature**



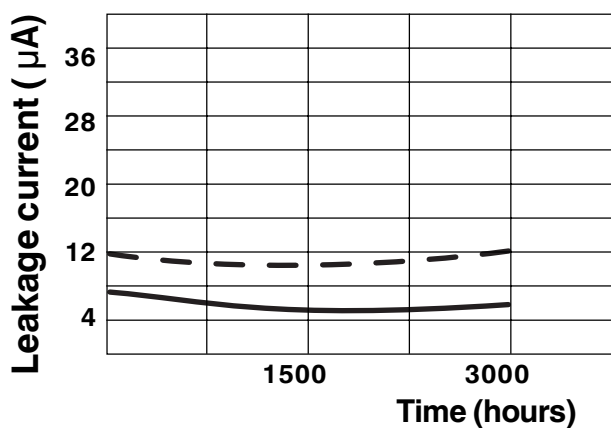
**Dissipation factor vs. time**



**Frequency characteristics**  
**Impedance vs. frequency**



**Leakage current vs. time**

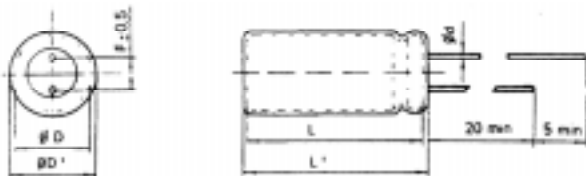


# EA - 19 SERIES

## For General Purpose

- \*Standard series for General Purpose
- \* Load life of 2000 hours at 85 °C
- \* Single ended

Item	Characteristics							
Operating temperature range	- 40 ÷ + 85 °C							
Rated working voltage range Ur	160 ÷ 400 VDC							
Nominal capacitance range Cn	1 ÷ 470 µF /at 20 °C, 120 Hz/							
Capacitance tolerance	± 20 %							
Leakage current max.	0.02 CnUr + 5 µA /after 5 min/							
Dissipation factor max.	Rated voltage (VDC)	160	200	250	350	385	400	450
	Dissipation factor	0.15	0.15	0.15	0.17	0.20	0.20	0.22
Low temperature characteristics (impedance ratio at 100 Hz)	VDC	160	200	250	350	385	400	450
	Z - 25°C/Z + 20°C	6	6	6	8	8	8	8
	Z - 40°C/Z + 20°C	8	8	8	10	12	12	12
Load life (after application of the rated voltage for 2000 hours at 85°C)	Leakage current	Less than specified value						
	Capacitance change	±20%						
	tg δ	Less than 200% specified value						
Shelf life (at 85°C)	After 1000 hours no load test, leakage current, capacitance and tg δ are the same as load life values.							



φD	5	6.3	8	10	12.5	16	18	22
φd	0.5			0.65			0.8	
F	2	2.5	3.5	5		7.5		10
φD'	D+0.5			D+0.6		D+0.6		
L'	L+1.5					L+2		

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency µF	50Hz	120Hz	300Hz	1kHz	10kHz
≤47	0.75	1	1.35	1.55	2.0
68 - 470	0.80	1	1.25	1.34	1.5

Temp. °C	40	60	70	85
Coefficient	2.0	1.5	1.3	1

# EA - 19 SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 85°C & R<sub>ESR</sub> & Z<sub>MAX</sub>**

Capacitance [ μF ]	Working voltage [ V ]	Dimensions φDxL [ mm ]	R <sub>ESR</sub> max [ Ω ] 120Hz 20°C	Z max [ Ω ] 10kHz 20°C	Max Ripple Current mA[rms]
1.0	160	5x11	238.00	37.30	17
2.2		5x11	105.00	31.60	25
3.3		6.3x11	72.00	23.00	37
4.7		6.3x11	49.50	16.50	45
6.8		8x11.5	35.50	11.50	62
10.0		8x11.5	23.00	9.15	78
22.0		10x16.5	8.50	6.18	135
33.0		10x20.5	7.00	3.60	195
47.0		12.5x20.5	4.95	2.75	235
68.0		12.5x24.5	3.31	2.12	310
100.0		16x25	2.21	1.10	410
220.0		18x37.5	0.85	0.43	750
330.0		18x42	0.80	0.40	700
470.0		22x42	0.80	0.40	700
1.0	200	5x11	230.00	36.50	17
2.2		6.3x11	103.50	30.60	27
3.3		6.3x11	71.50	22.20	39
4.7		8x11.5	49.00	16.00	52
6.8		8x11.5	35.00	11.00	72
10.0		8x14	22.50	8.80	85
22.0		10x20.5	8.10	7.80	138
33.0		12.5x20.5	6.80	3.15	195
47.0		12.5x24.5	4.55	2.50	255
68.0		16x25	3.00	2.00	375
100.0		16x31.5	2.00	1.00	410
220.0		18x37.5	0.81	0.40	800
330.0		22x42	0.80	0.40	700
1.0		250	5x11	228.50	35.60
2.2	6.3x11		101.50	29.90	30
3.3	6.3x11		71.00	21.80	42
4.7	8x11.5		48.50	15.20	51
6.8	8x14		34.50	10.30	70
10.0	10x16.5		22.00	7.90	83
22.0	10x20.5		7.85	5.00	160
33.0	12.5x20.5		6.55	2.95	210
47.0	16x25		4.25	2.10	255
68.0	16x25		2.85	1.85	340
100.0	16x31.5		1.95	0.90	450
220.0	22x42		1.90	0.85	440

The values shown for R<sub>ESR</sub> and Z are the maximum permitted. The typical value of the different parameters shown are from 15 to 50% of the maximum ones.

# EA - 19 SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 85°C & R<sub>ESR</sub> & Z<sub>MAX</sub>**

Capacitance [ $\mu$ F ]	Working voltage [ V ]	Dimensions $\phi$ DxL [ mm ]	R <sub>ESR</sub> max [ $\Omega$ ] 120Hz 20°C	Z max [ $\Omega$ ] 10kHz 20°C	Max Ripple Current mA[rms]
1.0	350	5x11	226.00	33.90	19
2.2		6.3x11	100.00	29.00	33
3.3		8x11.5	70.60	21.00	39
4.7		8x14	48.20	14.80	47
6.8		10x16.5	34.30	10.00	70
10.0		10x20.5	21.60	7.00	98
22.0		12.5x24.5	7.55	4.50	160
33.0		16x25	6.25	2.75	188
47.0		16x31.5	4.00	1.95	250
68.0		16x31.5	2.65	1.75	340
100.0		18x37.5	1.95	0.85	470
1.0		400	6.3x11	223.00	33.00
2.2	8x11.5		98.00	28.50	33
3.3	8x14		70.00	20.50	39
4.7	10x16.5		48.00	14.20	52
6.8	10x16.5		34.00	9.80	70
10.0	12.5x20.5		21.20	6.80	98
22.0	12.5x24.5		7.25	4.25	165
33.0	16x25		6.00	2.55	210
47.0	16x31.5		2.85	1.85	280
68.0	18x37.5		2.50	1.65	370
100.0	18x42		2.40	1.60	350
1	450		6,3x11	223	33
2.2		8x11	98	28.5	33
3.3		10x16.5	70	20.5	39
4.7		10x16.5	48	14.2	54
6.8		10x20.5	34	9.8	70
10		125x20.5	21	6.8	98
22		16x25	7.25	4.25	165
33		16x31.5	6.0	2.55	210
47		16x35.5	2.85	1.85	280
68		18x37	2.5	1.65	370
100		22x40	2.4	1.6	350

The values shown for R<sub>ESR</sub> and Z are the maximum permitted. The typical value of the different parameters shown are from 15 to 50% of the maximum ones.

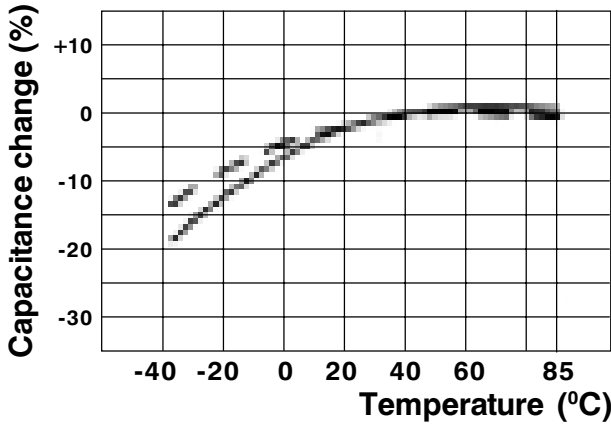
# EA - 19 SERIES

## Typical Performance

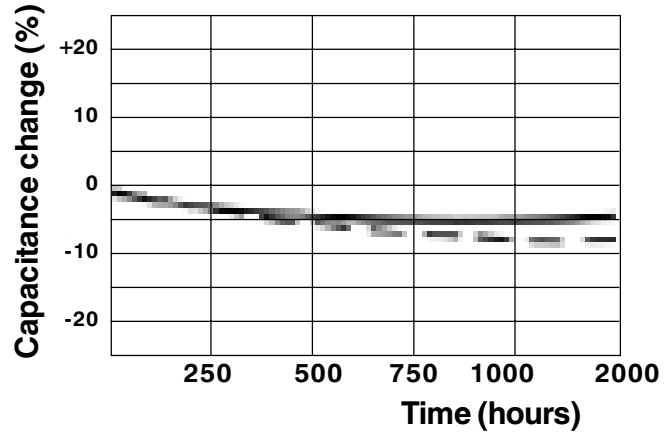
———— 47  $\mu\text{F}$  / 160 V

- - - 15  $\mu\text{F}$  / 350 V

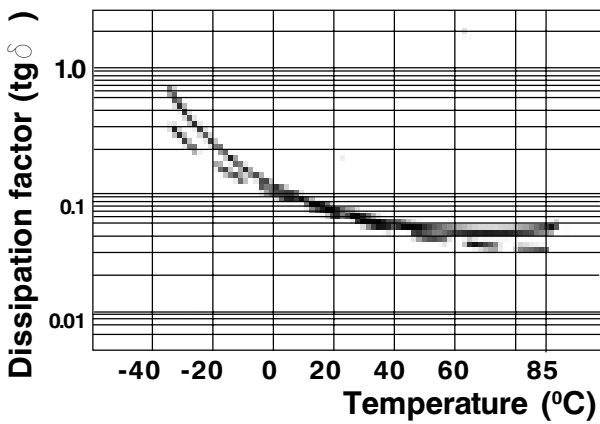
**Temperature characteristics**  
Capacitance change vs. temperature



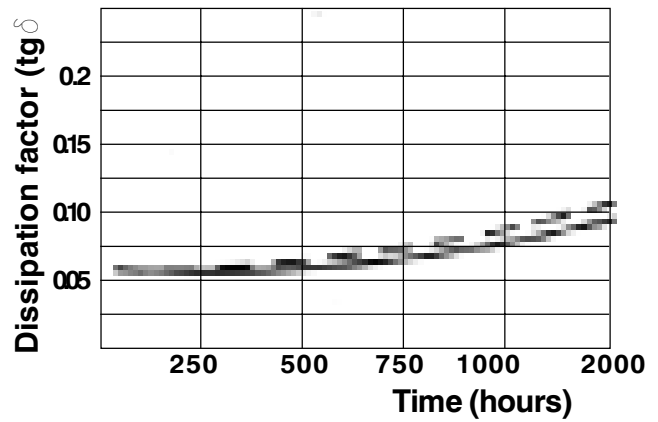
**Load Life ( at +85 °C )**  
Capacitance change vs. time



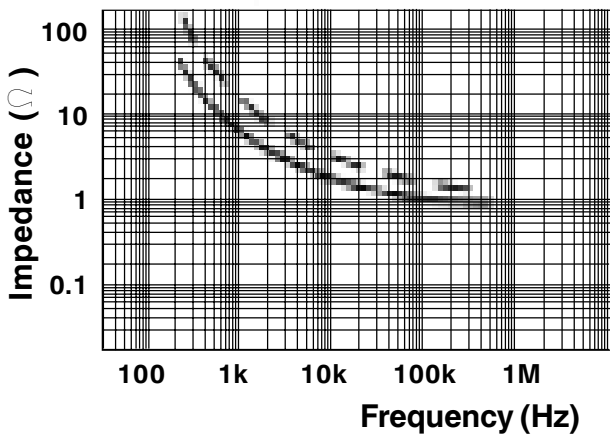
**Dissipation factor vs. temperature**



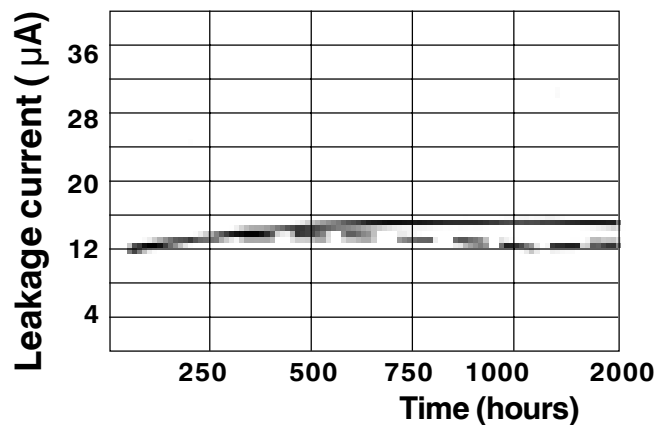
**Dissipation factor vs. time**



**Frequency characteristics**  
Impedance vs. frequency



**Leakage current vs. time**



# EA - 20 SERIES

## Wide Temperature Range

- \*Wide operating temperature range of  $-40 \div +105^{\circ}\text{C}$
- \* High performance and excellent temperature characteristics
- \* Load life of 2000 hours at  $105^{\circ}\text{C}$
- \* Single ended

Item	Characteristics							
Operating temperature range	$-40 \div +105^{\circ}\text{C}$							
Rated working voltage range $U_r$	$160 \div 450\text{ VDC}$							
Nominal capacitance range $C_n$	$1 \div 470\ \mu\text{F}$ / at $20^{\circ}\text{C}$ , 120 Hz/							
Capacitance tolerance	$\pm 20\%$							
Leakage current max.	$0.02 C_n U_r + 5\ \mu\text{A}$ /after 5 min/							
Dissipation factor max.	Rated voltage (VDC)	160	200	250	350	385	400	450
	Dissipation factor	0.15	0.15	0.15	0.17	0.20	0.20	0.22
Low temperature characteristics (impedance ratio at 100 Hz)	VDC	160	200	250	350	385	400	450
	Z - $25^{\circ}\text{C}$ /Z + $20^{\circ}\text{C}$	6	6	6	8	8	8	8
Load life (after application of the rated voltage for 2000 hours at $105^{\circ}\text{C}$ )	Leakage current	Less than specified value						
	Capacitance change	$\pm 20\%$						
	$\text{tg } \delta$	Less than 200% specified value						
Shelf life (at $105^{\circ}\text{C}$ )	After 1000 hours no load test, leakage current, capacitance and $\text{tg } \delta$ are the same as load life values.							



$\phi D$	5	6.3	8	10	12.5	16	18	22
$\phi d$	0.5			0.65			0.8	
F	2	2.5	3.5	5		7.5		10
$\phi D'$	D+0.5			D+0.6		D+0.6		
L'	L+1.5					L+2		

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency $\mu\text{F}$	50Hz	120Hz	300Hz	1kHz	10kHz
$\leq 47$	0.75	1	1.35	1.55	2.0
68 - 470	0.80	1	1.25	1.34	1.5

Temp. $^{\circ}\text{C}$	40	60	70	85	105
Coefficient	2.4	2.1	1.75	1.65	1

# EA - 20 SERIES

\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 105°C & R<sub>ESR</sub> & Z<sub>MAX</sub>

Capacitance [ μF ]	Working voltage [ V ]	Dimensions φDxL [ mm ]	R <sub>ESR</sub> max [ Ω ] 120Hz 20°C	Z max [ Ω ] 10kHz 20°C	Max Ripple Current mA[rms]
1.0	160	5x11	238.00	37.30	15
2.2		5x11	105.00	31.60	20
3.3		6.3x11	72.00	23.00	31
4.7		6.3x11	49.50	16.50	38
6.8		8x11.5	35.50	11.50	62
10.0		8x11.5	23.00	9.15	70
22.0		10x16.5	8.50	6.18	115
33.0		10x20.5	7.00	3.60	160
47.0		12.5x20.5	4.95	2.75	190
68.0		12.5x24.5	3.31	2.12	250
100.0		16x25	2.21	1.10	335
220.0		18x37.5	0.85	0.43	590
330.0		18x42	0.80	0.42	740
470.0		22x42	0.80	0.40	700
1.0	200	5x11	230.00	36.50	15
2.2		6.3x11	103.50	30.60	23
3.3		6.3x11	71.50	22.20	32
4.7		8x11.5	49.00	16.00	42
6.8		8x11.5	35.00	11.00	62
10.0		8x14	22.50	8.80	71
22.0		10x20.5	8.10	7.80	123
33.0		12.5x20.5	6.80	3.15	165
47.0		12.5x24.5	4.55	2.50	205
68.0		16x25	3.00	2.00	270
100.0		16x31.5	2.00	1.00	365
220.0		18x37.5	0.81	0.40	625
330.0		22x42	0.80	0.40	800
1.0		250	5x11	228.50	35.60
2.2	6.3x11		101.50	29.90	25
3.3	6.3x11		71.00	21.80	36
4.7	8x11.5		48.50	15.20	47
6.8	8x14		34.50	10.3	63
10.0	10x16.5		22.00	7.90	71
22.0	10x20.5		7.85	5.00	123
33.0	12.5x20.5		6.55	2.95	165
47.0	16x25		4.25	2.10	201
68.0	16x25		2.85	1.85	295
100.0	16x31.5		1.95	0.90	380
220.0	22x42		0.80	0.90	380

The values shown for R<sub>ESR</sub> and Z are the maximum permitted. The typical value of the different parameters shown are from 15 to 50% of the maximum ones.

# EA - 20 SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA(rms) at 120 Hz, 105°C & R<sub>ESR</sub> & Z<sub>MAX</sub>**

Capacitance [ $\mu$ F ]	Working voltage [ V ]	Dimensions $\phi$ DxL [ mm ]	R <sub>ESR</sub> max [ $\Omega$ ] 120Hz 20°C	Z max [ $\Omega$ ] 10kHz 20°C	Max Ripple Current mA[rms]
1.0	350	5x11	226.00	33.90	15
2.2		6.3x11	100.00	29.00	25
3.3		8x11.5	70.60	21.00	36
4.7		8x14	48.20	14.80	63
6.8		10x16.5	48.00	14.00	73
10.0		10x20.5	21.60	7.00	85
22.0		12.5x24.5	7.55	4.50	123
33.0		16x25	6.25	2.75	165
47.0		16x31.5	4.00	1.95	210
68.0		18x37.5	2.65	1.75	300
100.0		18x37.5	1.95	0.85	390
1.0	385	6.3x11	223.00	33.00	16
2.2		8x11.5	98.00	28.50	26
3.3		8x14	70.00	20.50	36
4.7		10x16.5	48.00	14.20	48
6.8		10x16.5	34.00	9.80	66
10.0		12.5x20.5	21.20	6.80	74
22.0		12.5x24.5	7.25	4.25	123
33.0		16x25	6.00	2.55	165
47.0		16x31.5	3.85	1.85	215
68.0		18x37.5	2.50	1.65	310
100.0		18x42	1.90	0.80	400
1.0	400	6.3x11	223.00	33.00	17
2.2		8x11.5	98.00	28.50	26
3.3		8x14	70.00	20.50	37
4.7		10x16.5	48.00	14.20	68
6.8		10x16.5	34.00	9.80	75
10.0		12.5x20.5	21.20	6.80	85
22.0		12.5x24.5	7.25	4.25	123
33.0		16x25	6.00	2.55	165
47.0		16x35.5	3.85	1.85	215
68.0		18x37.5	2.50	1.65	315
100.0		18x42	1.85	0.80	400
1	450	6.3x11	223	33	17
2.2		8x11.5	98	28.5	27
3.3		10x16.5	70	20.5	37
4.7		10x16.5	48	14.2	50
6.8		10x20.5	34	9.8	70
10		12.5x20.5	21	6.8	76
22		16x25	7	4.25	124
33		16x31.5	6	2.55	165
47		16x35.5	3.85	1.85	215
68		18x37	2.5	1.65	320
100		22x40	1.85	0.80	400

The values shown for R<sub>ESR</sub> and Z are the maximum permitted. The typical values of the different parameters shown are from 15 to 50% of the maximum ones.

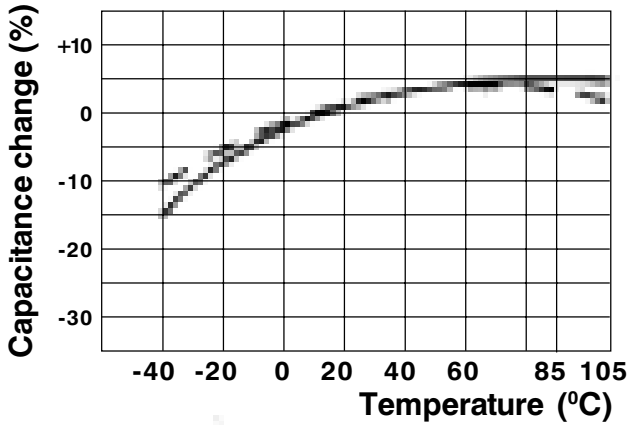


# EA - 20 SERIES

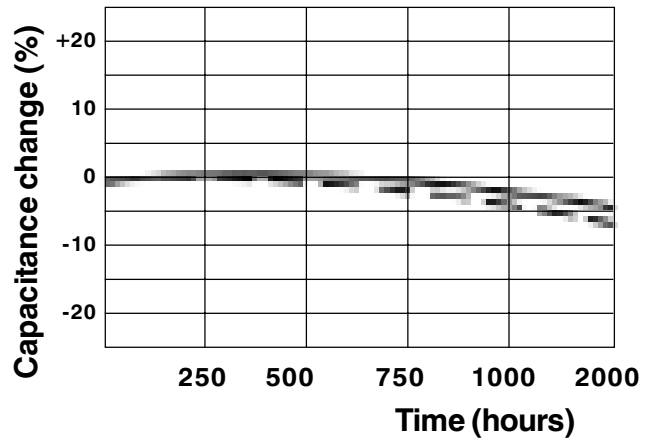
## Typical Performance

—— 47  $\mu\text{F}$  / 160 V  
 - - - 15  $\mu\text{F}$  / 350 V

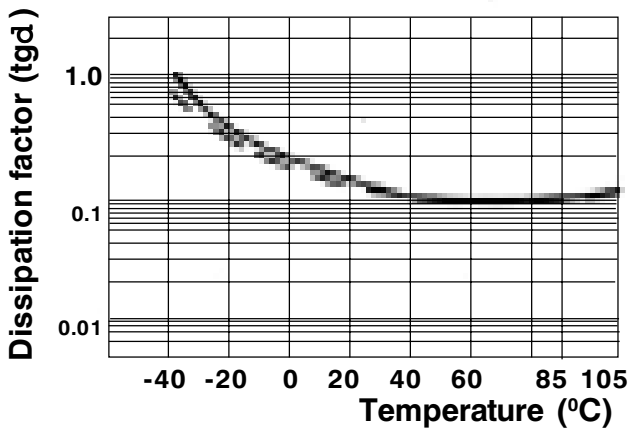
**Temperature characteristics**  
**Capacitance change vs. temperature**



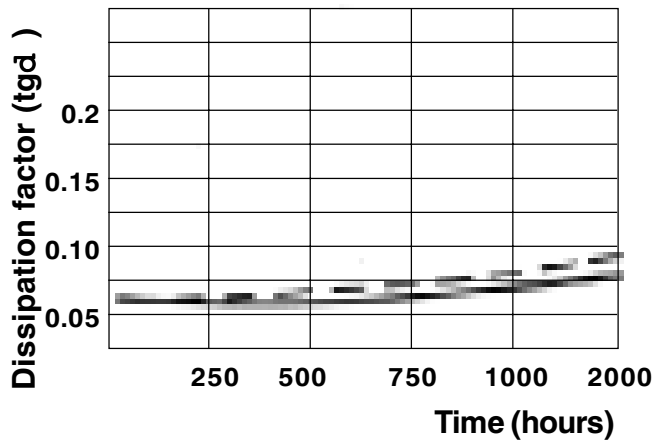
**Load Life ( at +105 °C)**  
**Capacitance change vs. time**



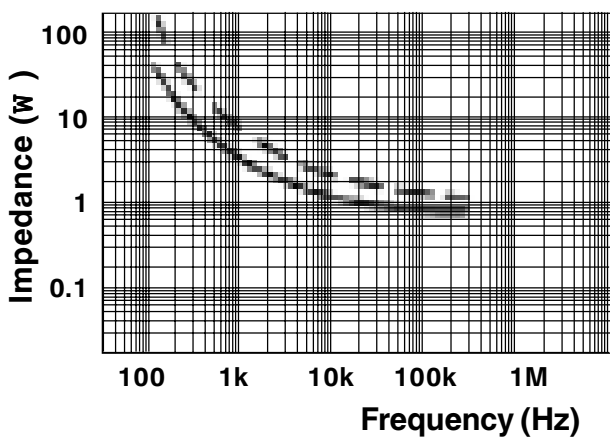
**Dissipation factor vs. temperature**



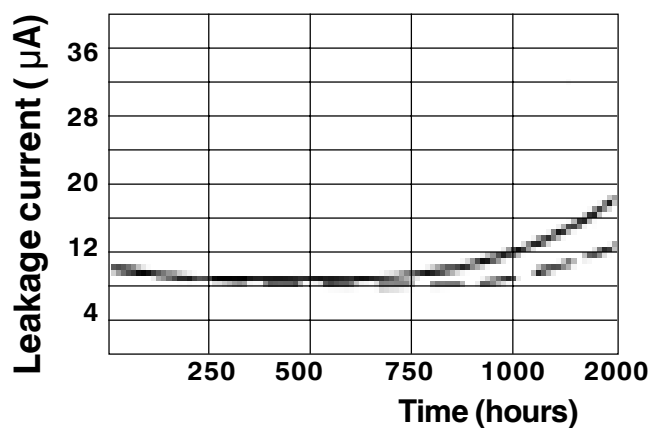
**Dissipation factor vs. time**



**Frequency characteristics**  
**Impedance vs. frequency**



**Leakage current vs. time**

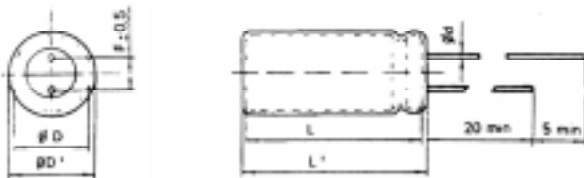


# NP SERIES

## Non Polarized

- \*Standard non-polarized series
- \* Designed for use in circuits with reversing polarity
- \* Load life of 1000 hours at 85°C
- \* Single ended

Item	Characteristics																																			
Operating temperature range	- 40 ÷ +85 °C																																			
Rated working voltage range Ur	6.3 ÷ 100 VDC																																			
Nominal capacitance range Cn	0.1 ÷ 4700 µF /at 20 °C, 120 Hz/																																			
Capacitance tolerance	≤ 0.68 µF + 100% - 10%	1 ÷ 2.2 µF + 50% - 10%	≥ 3.3 µF ± 20%																																	
Leakage current max.	0.03 CnUr + 3µA /after 5 min/																																			
Dissipation factor max.	<table border="1"> <thead> <tr> <th>Rated voltage (VDC)</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Dissipation factor</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> </tr> </tbody> </table>								Rated voltage (VDC)	6.3	10	16	25	35	50	63	100	Dissipation factor	0.24	0.20	0.16	0.16	0.14	0.12	0.10	0.09										
	Rated voltage (VDC)	6.3	10	16	25	35	50	63	100																											
Dissipation factor	0.24	0.20	0.16	0.16	0.14	0.12	0.10	0.09																												
Note: The Dissipation factor for capacitors with Cn = 4700 µF will not exceed 0.25 (at 20°C, 120 Hz)																																				
Low temperature characteristics (impedance ratio at 100 Hz)	<table border="1"> <thead> <tr> <th>VDC</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Z - 25°C/Z + 20°C</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z - 40°C/Z + 20°C</td> <td>8</td> <td>6</td> <td>6</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>3</td> </tr> </tbody> </table>									VDC	6.3	10	16	25	35	50	63	100	Z - 25°C/Z + 20°C	4	3	2	2	2	2	2	2	Z - 40°C/Z + 20°C	8	6	6	4	4	4	4	3
	VDC	6.3	10	16	25	35	50	63	100																											
	Z - 25°C/Z + 20°C	4	3	2	2	2	2	2	2																											
Z - 40°C/Z + 20°C	8	6	6	4	4	4	4	3																												
Load life (after application of the rated voltage for 1000 hours at 85°C)	Leakage current	Less than specified value																																		
	Capacitance change	± 20%																																		
	tgδ	Less than 200% specified value																																		
	Test method	Polarity revers each 250 hours																																		
Shelf life (at 85°C)	After 1000 hours no load test, leakage current, capacitance and tgδ are the same as load life values.																																			



$\phi D$	5	6.3	8	10	12.5	16	18
$\phi d$	0.5			0.65		0.8	
F	2	2.5	3.5	5		7.5	
$\phi D'$	D+0.5			D+0.6		D+0.6	
L'	L+1.5					L+2	

### \* PERMISSIBLE RIPPLE CURRENT MULTIPLIERS

Frequency µF	50Hz	120Hz	300Hz	1kHz	10kHz
≤ 47	0.75	1	1.35	1.55	2.0
68 - 680	0.80	1	1.25	1.34	1.5
≥ 1000	0.85	1	1.10	1.13	1.15

Temp. °C	40	60	70	85
Coefficient	2.0	1.5	1.3	1.0

# NP SERIES

**\*DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT A(rms) at 120 Hz, 85°C**

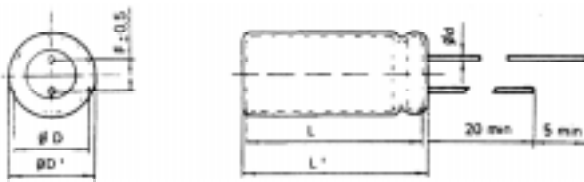
VDC μF	6.3		10		16		25		35		50		63		100	
0.1	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01
0.15	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01
0.22	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01
0.33	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01
0.47	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01
0.68	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.01
1.0	5x11	0.01	5x11	0.01	5x11	0.01	5x11	0.012	5x11	0.015	5x11	0.02	5x11	0.02	6.3x11	0.02
1.5	5x11	0.01	5x11	0.01	5x11	0.012	5x11	0.015	5x11	0.02	5x11	0.02	5x11	0.02	6.3x11	0.02
2.2	5x11	0.011	5x11	0.015	5x11	0.015	5x11	0.02	5x11	0.02	5x11	0.03	5x11	0.03	6.3x11	0.03
3.3	5x11	0.015	5x11	0.02	5x11	0.02	5x11	0.025	5x11	0.03	5x11	0.03	6.3x11	0.03	6.3x11	0.04
4.7	5x11	0.02	5x11	0.025	5x11	0.03	5x11	0.03	5x11	0.03	6.3x11	0.04	6.3x11	0.04	8x11.5	0.05
6.8	5x11	0.03	5x11	0.035	5x11	0.04	5x11	0.04	6.3x11	0.04	6.3x11	0.05	6.3x11	0.05	8x11.5	0.06
10	5x11	0.04	5x11	0.04	5x11	0.04	6.3x11	0.05	6.3x11	0.05	6.3x11	0.06	8x11.5	0.07	10x16.5	0.08
15	5x11	0.05	5x11	0.05	6.3x11	0.06	6.3x11	0.07	6.3x11	0.07	8x11.5	0.09	8x11.5	0.09	10x16.5	0.11
22	5x11	0.06	5x11	0.06	6.3x11	0.07	6.3x11	0.08	8x11.5	0.09	8x11.5	0.11	10x16.5	0.13	10x16.5	0.14
33	5x11	0.07	6.3x11	0.08	6.3x11	0.09	8x11.5	0.12	8x11.5	0.13	10x16.5	0.16	10x16.5	0.18	10x20.5	0.20
47	5x11	0.09	6.3x11	0.10	8x11.5	0.12	8x11.5	0.15	10x16.5	0.17	10x16.5	0.20	10x20.5	0.23	12.5x20.5	0.27
68	6.3x11	0.11	8x11.5	0.15	8x11.5	0.16	10x16.5	0.21	10x16.5	0.23	10x20.5	0.27	12.5x20.5	0.31	12.5x24.5	0.35
100	8x11.5	0.17	8x11.5	0.18	10x16.5	0.22	10x16.5	0.27	10x20.5	0.29	12.5x20.5	0.38	12.5x20.5	0.39	16x25	0.46
150	8x11.5	0.20	10x16.5	0.25	10x16.5	0.29	10x20.5	0.36	12.5x20.5	0.43	12.5x20.5	0.47	12.5x24.5	0.52	16x35.5	0.66
220	10x16.5	0.23	10x16.5	0.33	10x20.5	0.37	12.5x20.5	0.52	12.5x20.5	0.52	12.5x24.5	0.62	16x25	0.69	18x37.5	0.88
330	10x16.5	0.33	10x20.5	0.43	12.5x20.5	0.54	12.5x20.5	0.64	12.5x24.5	0.69	16x31.5	0.92	16x35.5	0.96		
470	10x20.5	0.49	12.5x20.5	0.60	12.5x20.5	0.66	12.5x24.5	0.81	16x25	0.90	16x35.5	1.10	18x37.5	1.30		
680	12.5x20.5	0.70	12.5x20.5	0.73	12.5x24.5	0.86	16x25	1.00	16x35.5	1.20	18x37.5	1.50				
1000	12.5x24.5	0.92	12.5x24.5	0.96	16x25	1.20	16x35.5	1.60	18x37.5	1.80						
1500	12.5x24.5	1.00	16x25	1.21	16x35.5	1.55	18x37.5	2.00								
2200	16x25	1.45	16x35.5	1.65	18x37.5	2.10										
3300	16x35.5	1.95	18x37.5	2.25												
4700	18x37.5	2.50														

# BP SERIES

## For Speaker Networks

- \* Non-polarized series for crossover networks in Hi-Fi sound systems
- \* Excellent frequency characteristics
- \* Close capacitance tolerance
- \* Load life of 2000 hours at 85 °C
- \* BP series have voltage range of 35V, 50V, 63V

Item	Characteristics	
Operating temperature range	- 40 ÷ +85 °C	
Rated working voltage range $U_r$	35V, 50V, 63 V	
Nominal capacitance range $C_n$	1 ÷ 100 $\mu$ F / at 20 °C, 120 Hz/	
Capacitance tolerance	$\pm 10 \%$ , $\pm 20 \%$ at 1kHz 20 °C	
Leakage current max.	0.03 $C_n U_r$ or 5 $\mu$ A /after 5 min/	
Dissipation factor max.	0.12 1kHz 20 °C; 0.3 5kHz 20 °C	
Load life (after application of the rated voltage for 2000 hours at 85°C)	Leakage current	Less than specified value
	Capacitance change	$\pm 20\%$
	$\text{tg } \delta$	Less than 200% specified value
	Test method	Polarity revers each 250 hours
Shelf life (at 85°C)	After 1000 hours no load test, leakage current, capacitance and $\text{tg } \delta$ are the same as load life values.	



$\phi D$	10	12.5	16	18
$\phi d$	0.65			0.8
$F$	5		7.5	
$\phi D'$	D+0.6		D+0.6	
$L'$	L+1.5		L+2	

\* DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT mA (rms) at 1 kHz

VDC	$\mu$ F													
	1.0	1.5	2.2	3.3	4.7	6.8	10	15	22	33	47	68	100	
35	10x16.5 90	10x16.5 115	10x16.5 140	10x16.5 170	10x16.5 215	10x20.5 260	12.5x20.5 345	12.5x20.5 405	12.5x20.5 500	12.5x24.5 615	16x31.5 770	16x31.5 930	16x35.5 1150	
50	10x16.5 100	10x16.5 130	10x16.5 150	10x16.5 190	10x16.5 230	10x20.5 280	12.5x20.5 340	12.5x20.5 430	12.5x20.5 510	12.5x24.5 635	16x31.5 795	16x31.5 960	18x37.5 1170	
63	10x16.5 100	10x16.5 130	10x16.5 155	10x20.5 190	10x20.5 230	10x20.5 285	12.5x20.5 350	12.5x24.5 440	12.5x24.5 580	16x25 780	16x31.5 810	16x35.5 1010	18x37.5 1350	