

# Miniature Aluminum Electrolytic Capacitors

NRE-FL Series

HIGH TEMPERATURE, EXTENDED LOAD LIFE, RADIAL LEADS, POLARIZED

## FEATURES

- HIGH VOLTAGE (6.3 ~ 250V)
- LOW IMPEDANCE AT 100KHz
- LONG LIFE AT HIGH TEMPERATURE (UP TO 10,000 HOURS)

**RoHS Compliant**  
includes all homogeneous materials

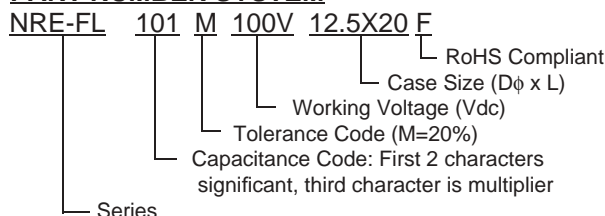
\*See Part Number System for Details



## CHARACTERISTICS

Rated Voltage Range		6.3 ~ 250VDC												
Capacitance Range		0.47 ~ 15,000 $\mu$ F												
Operating Temperature Range		-40°C ~ +105°C												
Capacitance Tolerance		$\pm$ 20% (M)												
Maximum Leakage Current		0.01CV or 3 $\mu$ A whichever is greater after 2 minutes										0.04CV+100 $\mu$ A (After 1 minute)		
												0.02CV+25 $\mu$ A (After 5 minutes)		
Max. Tan $\delta$ at 120Hz/20°C	W.V. (Vdc)	6.3	10	16	25	35	50	63	100	160	200	250		
	S.V. (Vdc)	8	13	20	32	44	63	79	125	200	250	300		
	C $\leq$ 1,000 $\mu$ F	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.12	0.12	0.12		
	C = 2,200 $\mu$ F	0.24	0.21	0.18	0.16	0.14	0.12	-	-	-	-	-		
	C = 3,300 $\mu$ F	0.26	0.23	0.20	0.18	0.16	-	-	-	-	-	-		
	C = 4,700 $\mu$ F	0.28	0.25	0.22	0.20	-	-	-	-	-	-	-		
	C = 6,800 $\mu$ F	0.32	0.29	0.26	-	-	-	-	-	-	-	-		
	C = 10,000 $\mu$ F	0.40	0.37	-	-	-	-	-	-	-	-	-		
Low Temperature Stability Impedance Ratio @ 120Hz	Z-20°C/Z+20°C	4	3	2	2	2	2	2	2	3	3	3		
	Z-40°C/Z+20°C	8	6	4	3	3	3	3	3	4	4	4		
Case Size & Voltage	Hours	Load Life Test @ 105°C and Rated Voltage												
D $\phi$ $\leq$ 6.3mm, 6.3~10V	4000	Change in Characteristics	$\Delta$ Capacitance	Within $\pm$ 25% of initial measured value ( $\pm$ 20% for 160 ~ 250Vdc parts)										
D $\phi$ $\leq$ 6.3mm, 16~100V	5000			$\Delta$ Tan $\delta$	Less than 200% of specified value									
D $\phi$ 8mm, 6.3~10V	6000				$\Delta$ LC	Less than specified value								
D $\phi$ 8mm, 16~100V	7000													
D $\phi$ 10mm, 6.3~10V	6000													
D $\phi$ 10mm, 16~100V	7000													
D $\phi$ 10mm, 160~250V	2000													
D $\phi$ $\geq$ 12.5mm, 6.3~10V	8000													
D $\phi$ $\geq$ 12.5mm, 16~100V	10000													
D $\phi$ $\geq$ 12.5mm, 160~250V	2000													

## PART NUMBER SYSTEM



## PRECAUTIONS

Please review the notes on correct use, safety and precautions found on pages T10 & T11 of NIC's Electrolytic Capacitor catalog.  
Also found at [www.niccomp.com/precautions](http://www.niccomp.com/precautions)  
If in doubt or uncertainty, please review your specific application - process details with NIC's technical support personnel: [tpmg@niccomp.com](mailto:tpmg@niccomp.com)



### MAXIMUM PERMISSIBLE RIPPLE CURRENT (mA AT 100KHz AND 105°C)

Cap. ( $\mu$ F)	Working Voltage (Vdc)										
	6.3	10	16	25	35	50	63	100	160	200	250
0.47	-	-	-	-	-	17	-	15	-	-	-
1.0	-	-	-	-	-	30	-	20	-	-	-
2.2	-	-	-	-	-	43	-	30	-	-	-
3.3	-	-	-	-	-	53	-	40	-	-	-
4.7	-	-	-	-	-	88	-	65	-	-	-
10	-	-	-	-	-	100	87	140	-	-	-
22	-	-	-	-	-	150	140	160	350	350	300
33	-	-	-	150	150	250	140	230	450	550	450
47	-	-	150	150	250	250	210	290	600	600	850
68	-	-	-	-	-	-	-	-	600	950	1050
100	150	150	250	250	400	400	300	430	950	1200	1200
150	-	-	-	-	-	-	-	-	1200	1280	-
220	250	250	400	400	580	770	520	900	1400	1400	-
330	250	400	400	580	770	1050	660	900	-	-	-
470	400	400	580	770	1050	1300	750	-	-	-	-
1000	580	770	1050	1300	1650	1850	1390	-	-	-	-
2200	1300	1300	1650	1850	2000	2200	-	-	-	-	-
3300	1300	1650	1850	2000	2200	-	-	-	-	-	-
4700	1850	1850	2000	2200	-	-	-	-	-	-	-
6800	1850	2000	2200	-	-	-	-	-	-	-	-
10000	2000	2200	-	-	-	-	-	-	-	-	-
15000	2200	-	-	-	-	-	-	-	-	-	-

### RIPPLE CURRENT FREQUENCY CORRECTION FACTOR

Frequency (Hz)	120	1K	10K	$\leq$ 100K
0.47 ~ 10 $\mu$ F	0.42	0.60	0.80	1.00
22 ~ 33 $\mu$ F	0.55	0.75	0.90	1.00
47 ~ 330 $\mu$ F	0.70	0.85	0.95	1.00
470 ~ 1000 $\mu$ F	0.75	0.90	0.98	1.00
2200 ~ 15000 $\mu$ F	0.80	0.95	1.00	1.00

All 160 ~ 250V Parts					
Frequency (Hz)	60(50)	120	1K	10K	$\leq$ 100K
Coefficient	0.40	0.50	0.75	0.90	1.00

### MAXIMUM IMPEDENCE ( $\Omega$ AT 100KHz AND 20°C)

Cap. ( $\mu$ F)	Working Voltage (Vdc)										
	6.3	10	16	25	35	50	63	100	160	200	250
0.47	-	-	-	-	-	5.5	-	6.0	-	-	-
1.0	-	-	-	-	-	4.0	-	4.5	-	-	-
2.2	-	-	-	-	-	2.5	-	3.0	-	-	-
3.3	-	-	-	-	-	2.2	-	2.7	-	-	-
4.7	-	-	-	-	-	1.9	-	2.5	-	-	-
10	-	-	-	-	-	1.5	2.3	1.2	-	-	-
22	-	-	-	-	-	0.90	1.3	0.63	1.0	1.0	1.4
33	-	-	-	0.90	0.90	0.40	1.2	0.43	0.70	0.55	0.70
47	-	-	0.90	0.90	0.40	0.40	0.63	0.31	0.45	0.44	0.31
68	-	-	-	-	-	-	-	-	0.45	0.24	0.22
100	0.90	0.90	0.40	0.40	0.25	0.25	0.43	0.16	0.24	0.17	0.18
150	-	-	-	-	-	-	-	-	0.17	0.16	-
220	0.40	0.40	0.25	0.25	0.16	0.12	0.21	0.073	0.14	0.14	-
330	0.40	0.25	0.25	0.16	0.12	0.078	0.16	0.073	-	-	-
470	0.25	0.25	0.16	0.12	0.078	0.062	0.12	-	-	-	-
1000	0.16	0.12	0.078	0.062	0.048	0.034	0.054	-	-	-	-
2200	0.062	0.062	0.048	0.034	0.029	0.025	-	-	-	-	-
3300	0.062	0.048	0.034	0.029	0.025	-	-	-	-	-	-
4700	0.034	0.034	0.029	0.025	-	-	-	-	-	-	-
6800	0.034	0.029	0.025	-	-	-	-	-	-	-	-
10000	0.029	0.025	-	-	-	-	-	-	-	-	-
15000	0.025	-	-	-	-	-	-	-	-	-	-

### STANDARD PRODUCT AND CASE SIZE TABLE D $\phi$ x L (mm)

Cap. ( $\mu$ F)	Code	Working Voltage (Vdc)										
		6.3	10	16	25	35	50	63	100	160	200	250
0.47	R47	-	-	-	-	-	5x11	-	5x11	-	-	-
1.0	1R0	-	-	-	-	-	5x11	-	5x11	-	-	-
2.2	2R2	-	-	-	-	-	5x11	-	5x11	-	-	-
3.3	3R3	-	-	-	-	-	5x11	-	5x11	-	-	-
4.7	4R7	-	-	-	-	-	5x11	-	5x11	-	-	-
10	100	-	-	-	-	-	5x11	5x11	6.3x11	-	-	-
22	220	-	-	-	-	-	5x11	6.3x11	8x11.5	10x20	10x20	10x20
33	330	-	-	-	5x11	5x11	6.3x11	6.3x11	10x12.5	12.5x20	12.5x25	12.5x25
47	470	-	-	5x11	5x11	6.3x11	6.3x11	8x11.5	10x16	12.5x25	12.5x25	16x25
68	680	-	-	-	-	-	-	-	-	12.5x25	16x25	16x31.5
100	101	5x11	5x11	6.3x11	6.3x11	8x11.5	8x11.5	10x12.5	12.5x20	16x25	16x31.5	16x35.5
150	151	-	-	-	-	-	-	-	-	16x31.5	16x35.5	-
220	221	6.3x11	6.3x11	8x11.5	8x11.5	10x12.5	10x16	10x20	16x25	18x35.5	18x35.5	-
330	331	6.3x11	8x11.5	8x11.5	10x12.5	10x16	10x20	12.5x20	16x25	-	-	-
470	471	8x11.5	8x11.5	10x12.5	10x16	10x20	12.5x20	12.5x25	-	-	-	-
1000	102	10x12.5	10x16	10x20	12.5x20	12.5x25	16x25	16x31.5	-	-	-	-
2200	222	12.5x20	12.5x20	12.5x25	16x25	16x31.5	18x35.5	-	-	-	-	-
3300	332	12.5x20	12.5x25	16x25	16x31.5	18x35.5	-	-	-	-	-	-
4700	472	16x25	16x25	16x31.5	18x35.5	-	-	-	-	-	-	-
6800	682	16x25	16x31.5	18x35.5	-	-	-	-	-	-	-	-
10000	103	16x31.5	18x35.5	-	-	-	-	-	-	-	-	-
15000	153	18x35.5	-	-	-	-	-	-	-	-	-	-

### LEAD SPACING AND DIAMETER (mm)

Case Dia. (D $\phi$ )	5	6.3	8	10	12.5	16	18
Lead Dia. (D $\phi$ )	0.5	0.5	0.6	0.6	0.6	0.8	0.8
Lead Spacing (F)	2.0	2.5	3.5	5.0	5.0	7.5	7.5
Dim. $\alpha$	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Dim. $\beta$	L < 16mm: 1.5mm, L > 20mm: 2.0mm						

