

# Miniature Aluminum Electrolytic Capacitors

NRE-HW Series

HIGH VOLTAGE, RADIAL, POLARIZED, EXTENDED TEMPERATURE

## FEATURES

- HIGH VOLTAGE/TEMPERATURE (UP TO 450VDC/+105°C)
- NEW REDUCED SIZES

## CHARACTERISTICS

Rated Voltage Range	160 ~ 450VDC						
Capacitance Range	0.47 ~ 330 $\mu$ F						
Operating Temperature Range	-40°C ~ +105°C (160 ~ 400V) or -25°C ~ +105°C (450V)						
Capacitance Tolerance	$\pm$ 20% (M)						
Maximum Leakage Current @ 20°C	CV $\leq$ 1000 $\mu$ F 0.03CV +15 $\mu$ A, CV > 1000 $\mu$ F 0.02 +25 $\mu$ A (after 2 minutes)						
Max. Tan $\delta$ @ 120Hz/20°C	W.V.	160	200	250	350	400	450
	S.V.	200	250	300	400	450	500
	Tan $\delta$	0.20	0.20	0.20	0.25	0.25	0.25
Low Temperature Stability Impedance Ratio @ 120Hz	Z-25°C/Z+20°C	3	3	3	4	6	6
	Z-40°C/Z+20°C	6	6	6	8	10	-
Load Life Test at Rated W.V. +105°C 2,000 Hours: 10 $\phi$ & Up +105°C 1,000 Hours: 8 $\phi$	Capacitance Change	Within $\pm$ 25% of initial measured value					
	Tan $\delta$	Less than 200% of specified maximum value					
	Leakage Current	Less than specified maximum value					
Shelf Life Test +85°C 1,000 Hours with no load	Shall meet same requirements as in load life test						

**RoHS Compliant**  
includes all homogeneous materials  
\*See Part Number System for Details



## E.S.R.

( $\Omega$  AT 120Hz AND 20°C)

Cap ( $\mu$ F)	W.V. (Vdc)	
	160~250	350~450
0.47	706	882
1.0	332	415
2.2	151	188
3.3	101	126
4.7	70.6	86.2
10	33.2	41.5
22	15.1	18.8
33	10.1	12.6
47	7.06	8.82
68	4.88	6.10
100	3.32	4.15
150	2.21	-
220	1.51	-
330	1.01	-

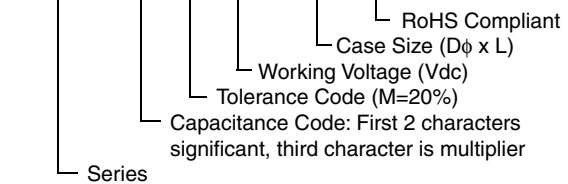
## MAXIMUM PERMISSIBLE RIPPLE CURRENT

(mA rms AT 120Hz AND 105°C)

Cap ( $\mu$ F)	Working Voltage (Vdc)					
	160	200	250	350	400	450
0.47	7	8	8	10	10	-
1.0	15	16	18	20	20	18
2.2	22	24	25	28	28	28
3.3	28	32	34	36	36	36
4.7	39	40	41	47	47	47
10	63	64	66	70	70	70
22	107	112	119	123	126	125
33	137	147	154	158	161	154
47	172	175	182	182	189	172
68	217	228	235	242	249	189
100	287	301	302	308	-	-
150	385	403	412	-	-	-
220	522	532	-	-	-	-
330	560	-	-	-	-	-

## PART NUMBER SYSTEM

NREHW 100 M 350V 10X20 F



## RIPPLE CURRENT FREQUENCY CORRECTION FACTOR

Cap. Value	Frequency (Hz)		
	100 ~ 500	1K ~ 5K	10K ~ 100K
<100 $\mu$ F	1.00	1.30	1.50
100 ~ 1000 $\mu$ F	1.00	1.20	1.30

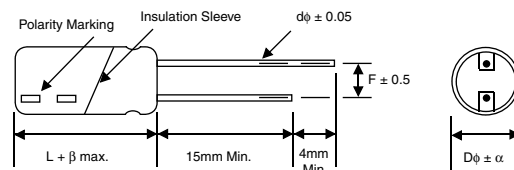
## STANDARD PRODUCT AND CASE SIZE D $\phi$ x L (mm)

Cap ( $\mu$ F)	Code	Working Voltage (Vdc)					
		160	200	250	350	400	450
0.47	R47	5x11	5x11	5x11	6.3x11	6.3x11	-
1.0	1R0	5x11	5x11	5x11	6.3x11	8x11.5	8x12.5
2.2	2R2	6.3x11	6.3x11	6.3x11	8x11.5	8x11.5	10x16
3.3	3R3	6.3x11	6.3x11	8x11.5	8x12.5	10x12.5	10x20
4.7	4R7	6.3x11	8x11.5	8x11.5	10x12.5	10x16	12.5x20
10	100	8x11.5	8x12.5	10x12.5	10x20	10x20	12.5x25
22	220	10x12.5	10x16	10x20	12.5x25	12.5x25	16x25
33	330	10x20	10x20	12.5x20	16x25	16x25	16x31
47	470	12.5x20	12.5x20	12.5x25	16x31	16x31	18x36
68	680	12.5x20	12.5x25	16x25	16x36	18x36	18x41
100	101	12.5x25	16x25	16x36	18x41	-	-
150	151	16x31	16x36	18x36	-	-	-
220	221	16x36	18x36	-	-	-	-
330	331	18x41	-	-	-	-	-

## 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

$\beta = L < 20\text{mm} = 1.5\text{mm}$ ,  $L > 20\text{mm} = 2.0\text{mm}$



## 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)

