

# 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                                                       |                                           | <div>includes all homogeneous materials</div> <div>*See Part Number System for Details</div> |      |      |      |      |  |
| Capacitance Range                                                                      | 0.47 ~ 330μF                                                       |                                           |                                                                                              |      |      |      |      |  |
| Operating Temperature Range                                                            | -40°C ~ +105°C (160 ~ 400V)<br>or -25°C ~ +105°C (450V)            |                                           |                                                                                              |      |      |      |      |  |
| Capacitance Tolerance                                                                  | ±20% (M)                                                           |                                           |                                                                                              |      |      |      |      |  |
| Maximum Leakage Current @ 20°C                                                         | CV ≤ 1000μF 0.03CV +15μA, CV > 1000μF 0.02 +25μA (after 2 minutes) |                                           |                                                                                              |      |      |      |      |  |
| Max. Tan δ @ 120Hz/20°C                                                                | W.V.                                                               | 160                                       | 200                                                                                          | 250  | 350  | 400  | 450  |  |
|                                                                                        | S.V.                                                               | 200                                       | 250                                                                                          | 300  | 400  | 450  | 500  |  |
|                                                                                        | Tan δ                                                              | 0.20                                      | 0.20                                                                                         | 0.20 | 0.25 | 0.25 | 0.25 |  |
| Low Temperature Stability<br>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.<br>+105°C 2,000 Hours: 10φ & Up<br>+105°C 1,000 Hours: 8φ | Capacitance Change                                                 | Within ±25% of initial measured value     |                                                                                              |      |      |      |      |  |
|                                                                                        | Tan δ                                                              | Less than 200% of specified maximum value |                                                                                              |      |      |      |      |  |
|                                                                                        | Leakage Current                                                    | Less than specified maximum value         |                                                                                              |      |      |      |      |  |
| Shelf Life Test<br>+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.

(Ω AT 120Hz AND 20°C)

| Cap (μF) | 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 (μF) | 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

Series  
Capacitance Code: First 2 characters significant, third character is multiplier  
Tolerance Code (M=20%)  
Working Voltage (Vdc)  
Case Size (Dφ x L)  
RoHS Compliant

## RIPPLE CURRENT FREQUENCY CORRECTION FACTOR

| Cap. Value   | Frequency (Hz) |         |            |
|--------------|----------------|---------|------------|
|              | 100 ~ 500      | 1K ~ 5K | 10K ~ 100K |
| <100μF       | 1.00           | 1.30    | 1.50       |
| 100 ~ 1000μF | 1.00           | 1.20    | 1.30       |

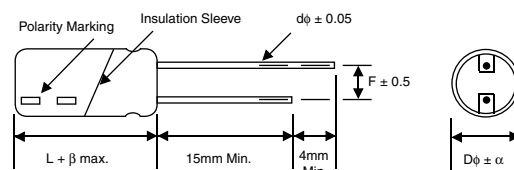
## STANDARD PRODUCT AND CASE SIZE D φ x L (mm)

| Cap (μF) | 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. (Dφ)   | 5   | 6.3 | 8   | 10  | 12.5 | 16  | 18  |
|------------------|-----|-----|-----|-----|------|-----|-----|
| Lead Dia. (dφ)   | 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 α            | 0.5 | 0.5 | 0.5 | 0.5 | 0.5  | 0.5 | 0.5 |

β = L < 20mm = 1.5mm, L > 20mm = 2.0mm



## 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)

