

# Miniature Aluminum Electrolytic Capacitors

NRWA Series

RADIAL LEADS, POLARIZED, STANDARD SIZE, EXTENDED TEMPERATURE

## FEATURES

- REDUCED CASE SIZING
- -55°C ~ +105°C OPERATING TEMPERATURE
- HIGH STABILITY OVER LONG LIFE

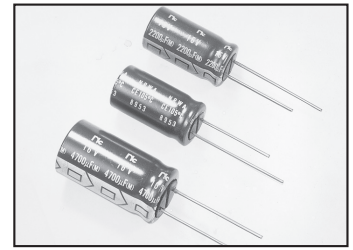
EXTENDED TEMPERATURE

**NRWA** → **NRWS**  
(today's standard) (reduced sizes)

**RoHS  
Compliant**

includes all homogeneous materials

\*See Part Number System for Details



## CHARACTERISTICS

|  |                        |  |      |      |      |      |      |      |      |
|--|------------------------|--|------|------|------|------|------|------|------|
| Rated Voltage Range  |                        | 6.3 ~ 100VDC                               |      |      |      |      |      |      |      |
| Capacitance Range  |                        | 2.2 ~ 10,000 $\mu$ F                       |      |      |      |      |      |      |      |
| Operating Temperature Range  |                        | -55°C ~ +105°C                             |      |      |      |      |      |      |      |
| Capacitance Tolerance  |                        | $\pm$ 20% (M)                              |      |      |      |      |      |      |      |
| Maximum Leakage Current @ +20°C  | After 1 min.           | 0.03CV or 4 $\mu$ A whichever is greater   |      |      |      |      |      |      |      |
|  | After 2 min.           | 0.01CV or 3 $\mu$ A whichever is greater   |      |      |      |      |      |      |      |
| Max. Tan $\delta$ at 120Hz/20°C  | W.V. (Vdc)             | 6.3  | 10   | 16   | 25   | 35   | 50   | 63   | 100  |
|  | S.V. (Vdc)             | 8  | 13   | 20   | 32   | 44   | 63   | 79   | 125  |
|  | C $\leq$ 1,000 $\mu$ F | 0.22                                       | 0.19 | 0.16 | 0.14 | 0.12 | 0.10 | 0.09 | 0.08 |
|  | 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 | -    | -    | -    | -    | -    |
| Low Temperature Stability Impedance Ratio @ 120Hz                                    | Z-25°C/Z+20°C          | 4  | 3    | 2    | 2    | 2    | 2    | 2    | 2    |
|  | Z-40°C/Z+20°C          | 8  | 6    | 4    | 3    | 3    | 3    | 3    | 3    |
| Load Life Test at Rated W.V +105°C 1,000 Hours: 5~12.5 $\phi$ 2,000 Hours: 16 $\phi$ | $\Delta$ Capacitance   | Within $\pm$ 20% of initial measured value |      |      |      |      |      |      |      |
|  | $\Delta$ Tan $\delta$  | Less than 200% of specified value          |      |      |      |      |      |      |      |
|  | $\Delta$ LC            | Less than specified value                  |      |      |      |      |      |      |      |
| Shelf Life Test +105°C 1,000 Hours No Load   | $\Delta$ Capacitance   | Within $\pm$ 20% of initial measured value |      |      |      |      |      |      |      |
|  | $\Delta$ Tan $\delta$  | Less than 200% of specified value          |      |      |      |      |      |      |      |
|  | $\Delta$ LC            | Less than specified value                  |      |      |      |      |      |      |      |

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

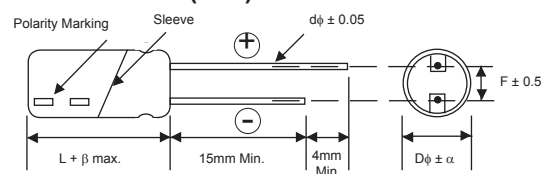
| Cap. ( $\mu$ F) | Code | Working Voltage (Vdc) |         |         |         |         |         |         |         |
|-----------------|------|-----------------------|---------|---------|---------|---------|---------|---------|---------|
|                 |      | 6.3                   | 10      | 16      | 25      | 35      | 50      | 63      | 100     |
| 2.2             | 2R2  | -                     | -       | -       | -       | -       | 5x11    | -       | 5x11    |
| 3.3             | 3R3  | -                     | -       | -       | -       | -       | 5x11    | 5x11    | 5x11    |
| 4.7             | 4R7  | -                     | -       | -       | 5x11    | 5x11    | 5x11    | 5x11    | 5x11    |
| 10              | 100  | -                     | -       | 5x11    | 5x11    | 5x11    | 5x11    | 5x11    | 6.3x11  |
| 22              | 220  | -                     | 5x11    | 5x11    | 5x11    | 5x11    | 5x11    | 6.3x11  | 8x11.5  |
| 33              | 330  | 5x11                  | 5x11    | 5x11    | 5x11    | 5x11    | 6.3x11  | 6.3x11  | 10x12.5 |
| 47              | 470  | 5x11                  | 5x11    | 5x11    | 5x11    | 6.3x11  | 6.3x11  | 8x11.5  | 10x16   |
| 100             | 101  | 5x11                  | 5x11    | 6.3x11  | 6.3x11  | 8x11.5  | 8x11.5  | 10x12.5 | 12.5x20 |
| 220             | 221  | -                     | 6.3x11  | 8x11.5  | 8x11.5  | 10x12.5 | 10x16   | 10x20   | 16x25   |
| 330             | 331  | 6.3x11                | -       | 8x11.5  | 10x12.5 | 10x16   | 10x20   | 12.5x20 | 16x25   |
| 470             | 471  | 8x11.5                | 8x11.5  | 10x12.5 | 10x16   | 10x20   | 12.5x20 | 12.5x25 | 16x31.5 |
| 1,000           | 102  | 10x12.5               | 10x16   | 10x20   | 12.5x20 | 12.5x25 | 16x25   | 16x31.5 | -       |
| 2,200           | 222  | 12.5x20               | 12.5x20 | 12.5x25 | 16x25   | 16x31   | 18x36   | -       | -       |
| 3,300           | 332  | 12.5x20               | 12.5x25 | 16x25   | 16x31   | 18x35.5 | -       | -       | -       |
| 4,700           | 472  | 16x25                 | 16x25   | 16x31.5 | 18x35.5 | -       | -       | -       | -       |
| 6,800           | 682  | 16x25                 | 16x31   | 18x35.5 | -       | -       | -       | -       | -       |
| 10,000          | 103  | 16x31                 | 18x36   | -       | -       | -       | -       | -       | -       |

## 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 |

Drawing is representative of parts as supplied in bulk or straight lead format, please see taping specification for details on taped format packaging.

## DIMENSIONS (mm)



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



## STANDARD VALUES, SPECIFICATIONS AND CASE SIZES (mm)

| Part Number          | Cap. (μF) | W.V. (Vdc) | Dissipation Factor +20°C/120Hz | Ripple Current Rating (mA) +105°C/120Hz | Max. ESR (Ω) +20°C/120Hz | Load Life Hours @+105°C |
|----------------------|-----------|------------|--------------------------------|---|--------------------------|-------------------------|
| NRWA330M6.3V5x11F    | 33        | 6.3        | 0.22                           | 47                                      | 11.1                     | 1,000                   |
| NRWA470M6.3V5x11F    | 47        |            | 0.22                           | 57                                      | 7.8                      | 1,000                   |
| NRWA101M6.3V5x11F    | 100       |            | 0.22                           | 82                                      | 3.7                      | 1,000                   |
| NRWA331M6.3V6.3x11F  | 330       |            | 0.22                           | 170                                     | 1.11                     | 1,000                   |
| NRWA471M6.3V8x11.5F  | 470       |            | 0.22                           | 230                                     | 0.78                     | 1,000                   |
| NRWA102M6.3V10x12.5F | 1,000     |            | 0.22                           | 400                                     | 0.36                     | 1,000                   |
| NRWA222M6.3V12.5x20F | 2,200     |            | 0.24                           | 760                                     | 0.181                    | 1,000                   |
| NRWA332M6.3V12.5x20F | 3,300     |            | 0.26                           | 890                                     | 0.131                    | 1,000                   |
| NRWA472M6.3V16x25F   | 4,700     |            | 0.28                           | 1230                                    | 0.099                    | 2,000                   |
| NRWA682M6.3V16x25F   | 6,800     |            | 0.32                           | 1340                                    | 0.078                    | 2,000                   |
| NRWA103M6.3V16x31F   | 10,000    |            | 0.40                           | 1610                                    | 0.063                    | 2,000                   |
| NRWA220M10V5x11F     | 22        |            | 10                             | 0.19                                    | 42                       | 14.3                    |
| NRWA330M10V5x11F     | 33        | 0.19       |                                | 51                                      | 9.6                      | 1,000                   |
| NRWA470M10V5x11F     | 47        | 0.19       |                                | 61                                      | 6.7                      | 1,000                   |
| NRWA101M10V5x11F     | 100       | 0.19       |                                | 89                                      | 3.2                      | 1,000                   |
| NRWA221M10V6.3x11F   | 220       | 0.19       |                                | 150                                     | 1.43                     | 1,000                   |
| NRWA471M10V8x11.5F   | 470       | 0.19       |                                | 250                                     | 0.67                     | 1,000                   |
| NRWA102M10V10x16F    | 1,000     | 0.19       |                                | 470                                     | 0.32                     | 1,000                   |
| NRWA222M10V12.5x20F  | 2,200     | 0.21       |                                | 790                                     | 0.158                    | 1,000                   |
| NRWA332M10V12.5x25F  | 3,300     | 0.23       |                                | 1000                                    | 0.166                    | 1,000                   |
| NRWA472M10V16x25F    | 4,700     | 0.25       |                                | 1270                                    | 0.088                    | 2,000                   |
| NRWA682M10V16x31F    | 6,800     | 0.29       |                                | 1540                                    | 0.071                    | 2,000                   |
| NRWA103M10V18x36F    | 10,000    | 0.37       |                                | 1770                                    | 0.058                    | 2,000                   |
| NRWA100M16V5x11F     | 10        | 16         | 0.16                           | 31                                      | 26.5                     | 1,000                   |
| NRWA220M16V5x11F     | 22        |            | 0.16                           | 45                                      | 12.1                     | 1,000                   |
| NRWA330M16V5x11F     | 33        |            | 0.16                           | 55                                      | 8.0                      | 1,000                   |
| NRWA470M16V5x11F     | 47        |            | 0.16                           | 68                                      | 5.8                      | 1,000                   |
| NRWA101M16V6.3x11F   | 100       |            | 0.16                           | 110                                     | 2.7                      | 1,000                   |
| NRWA221M16V8x11.5F   | 220       |            | 0.16                           | 190                                     | 1.21                     | 1,000                   |
| NRWA331M16V8x11.5F   | 330       |            | 0.16                           | 230                                     | 0.80                     | 1,000                   |
| NRWA471M16V10x12.5F  | 470       |            | 0.16                           | 320                                     | 0.66                     | 1,000                   |
| NRWA102M16V10x20F    | 1,000     |            | 0.16                           | 560                                     | 0.27                     | 1,000                   |
| NRWA222M16V12.5x25F  | 2,200     |            | 0.18                           | 950                                     | 0.136                    | 1,000                   |
| NRWA332M16V16x25F    | 3,300     |            | 0.20                           | 1220                                    | 0.101                    | 2,000                   |
| NRWA472M16V16x31.5F  | 4,700     |            | 0.22                           | 1490                                    | 0.078                    | 2,000                   |
| NRWA682M16V18x35.5F  | 6,800     | 0.26       | 1770                           | 0.063                                   | 2,000                    |                         |
| NRWA4R7M25V5x11F     | 4.7       | 25         | 0.14                           | 22                                      | 49                       | 1,000                   |
| NRWA100M25V5x11F     | 10        |            | 0.14                           | 33                                      | 23                       | 1,000                   |
| NRWA220M25V5x11F     | 22        |            | 0.14                           | 49                                      | 10.8                     | 1,000                   |
| NRWA330M25V5x11F     | 33        |            | 0.14                           | 59                                      | 7.0                      | 1,000                   |
| NRWA470M25V5x11F     | 47        |            | 0.14                           | 71                                      | 4.9                      | 1,000                   |
| NRWA101M25V6.3x11F   | 100       |            | 0.14                           | 120                                     | 2.3                      | 1,000                   |
| NRWA221M25V8x11.5F   | 220       |            | 0.14                           | 200                                     | 1.1                      | 1,000                   |
| NRWA331M25V10x12.5F  | 330       |            | 0.14                           | 290                                     | 0.70                     | 1,000                   |
| NRWA471M25V10x16F    | 470       |            | 0.14                           | 380                                     | 0.49                     | 1,000                   |
| NRWA102M25V12.5x20F  | 1,000     |            | 0.14                           | 670                                     | 0.23                     | 1,000                   |
| NRWA222M25V16x25F    | 2,200     |            | 0.16                           | 1110                                    | 0.121                    | 2,000                   |
| NRWA332M25V16x31F    | 3,300     |            | 0.18                           | 1380                                    | 0.090                    | 2,000                   |
| NRWA472M25V18x35.5F  | 4,700     | 0.20       | 1670                           | 0.071                                   | 2,000                    |                         |
| NRWA4R7M35V5x11F     | 4.7       | 35         | 0.12                           | 24                                      | 42                       | 1,000                   |
| NRWA100M35V5x11F     | 10        |            | 0.12                           | 35                                      | 19.9                     | 1,000                   |
| NRWA220M35V5x11F     | 22        |            | 0.12                           | 52                                      | 9.0                      | 1,000                   |
| NRWA330M35V5x11F     | 33        |            | 0.12                           | 64                                      | 6.0                      | 1,000                   |
| NRWA470M35V6.3x11F   | 47        |            | 0.12                           | 87                                      | 4.2                      | 1,000                   |
| NRWA101M35V8x11.5F   | 100       |            | 0.12                           | 150                                     | 2.0                      | 1,000                   |
| NRWA221M35V10x12.5F  | 220       |            | 0.12                           | 260                                     | 0.90                     | 1,000                   |
| NRWA331M35V10x16F    | 330       |            | 0.12                           | 350                                     | 0.60                     | 1,000                   |
| NRWA471M35V10x20F    | 470       |            | 0.12                           | 450                                     | 0.42                     | 1,000                   |
| NRWA102M35V12.5x25F  | 1,000     |            | 0.12                           | 780                                     | 0.20                     | 1,000                   |
| NRWA222M35V16x31F    | 2,200     |            | 0.14                           | 1280                                    | 0.106                    | 2,000                   |
| NRWA332M35V18x35.5F  | 3,300     |            | 0.16                           | 1570                                    | 0.081                    | 2,000                   |



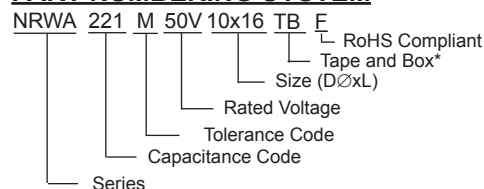
## STANDARD VALUES, SPECIFICATIONS AND CASE SIZES (mm)

| Part Number          | Cap. (μF) | W.V. (Vdc) | Dissipation Factor +20°C/120Hz | Ripple Current Rating (mA) +105°C/120Hz | Max. ESR (Ω) +20°C/120Hz | Load Life Hours @+105°C |       |
|----------------------|-----------|------------|--------------------------------|---|--------------------------|-------------------------|-------|
| NRWA2R2M50V5x11F     | 2.2       | 50         | 0.10                           | 18                                      | 75                       | 1,000                   |       |
| NRWA3R3M50V5x11F     | 3.3       |            | 0.10                           | 22                                      | 50                       | 1,000                   |       |
| NRWA4R7M50V5x11F     | 4.7       |            | 0.10                           | 26                                      | 35                       | 1,000                   |       |
| NRWA100M50V5x11F     | 10        |            | 0.10                           | 38                                      | 16.6                     | 1,000                   |       |
| NRWA220M50V5x11F     | 22        |            | 0.10                           | 57                                      | 7.5                      | 1,000                   |       |
| NRWA330M50V6.3x11F   | 33        |            | 0.10                           | 80                                      | 5.0                      | 1,000                   |       |
| NRWA470M50V6.3x11F   | 47        |            | 0.10                           | 96                                      | 3.5                      | 1,000                   |       |
| NRWA101M50V8x11.5F   | 100       |            | 0.10                           | 160                                     | 1.66                     | 1,000                   |       |
| NRWA221M50V10x16F    | 220       |            | 0.10                           | 310                                     | 0.75                     | 1,000                   |       |
| NRWA331M50V10x20F    | 330       |            | 0.10                           | 410                                     | 0.50                     | 1,000                   |       |
| NRWA471M50V12.5x20F  | 470       |            | 0.10                           | 540                                     | 0.35                     | 1,000                   |       |
| NRWA102M50V16x25F    | 1,000     |            | 0.10                           | 950                                     | 0.166                    | 2,000                   |       |
| NRWA222M50V18x36F    | 2,200     |            | 0.12                           | 1480                                    | 0.091                    | 2,000                   |       |
| NRWA3R3M63V5x11F     | 3.3       | 63         | 0.09                           | 23                                      | 40                       | 1,000                   |       |
| NRWA4R7M63V5x11F     | 4.7       |            | 0.09                           | 28                                      | 32                       | 1,000                   |       |
| NRWA100M63V5x11F     | 10        |            | 0.09                           | 41                                      | 15.0                     | 1,000                   |       |
| NRWA220M63V6.3x11F   | 22        |            | 0.09                           | 69                                      | 6.8                      | 1,000                   |       |
| NRWA330M63V6.3x11F   | 33        |            | 0.09                           | 85                                      | 4.5                      | 1,000                   |       |
| NRWA470M63V8x11.5F   | 47        |            | 0.09                           | 120                                     | 3.2                      | 1,000                   |       |
| NRWA101M63V10x12.5F  | 100       |            | 0.09                           | 200                                     | 1.49                     | 1,000                   |       |
| NRWA221M63V10x20F    | 220       |            | 0.09                           | 350                                     | 0.68                     | 1,000                   |       |
| NRWA331M63V12.5x20F  | 330       |            | 0.09                           | 480                                     | 0.45                     | 1,000                   |       |
| NRWA471M63V12.5x25F  | 470       |            | 0.09                           | 620                                     | 0.32                     | 1,000                   |       |
| NRWA102M63V16x31.5F  | 1,000     |            | 0.09                           | 1080                                    | 0.149                    | 2,000                   |       |
| NRWA2R2M100V5x11F    | 2.2       |            | 100                            | 0.08                                    | 19                       | 60                      | 1,000 |
| NRWA3R3M100V5x11F    | 3.3       |            |                                | 0.08                                    | 23                       | 40                      | 1,000 |
| NRWA4R7M100V5x11F    | 4.7       | 0.08       |                                | 30                                      | 28                       | 1,000                   |       |
| NRWA100M100V6.3x11F  | 10        | 0.08       |                                | 49                                      | 13.3                     | 1,000                   |       |
| NRWA220M100V8x11.5F  | 22        | 0.08       |                                | 84                                      | 6.0                      | 1,000                   |       |
| NRWA330M100V10x12.5F | 33        | 0.08       |                                | 120                                     | 4.0                      | 1,000                   |       |
| NRWA470M100V10x16F   | 47        | 0.08       |                                | 160                                     | 2.8                      | 1,000                   |       |
| NRWA101M100V12.5x20F | 100       | 0.08       |                                | 280                                     | 1.33                     | 1,000                   |       |
| NRWA221M100V16x25F   | 220       | 0.08       |                                | 500                                     | 0.60                     | 2,000                   |       |
| NRWA331M100V16x25F   | 330       | 0.08       |                                | 610                                     | 0.40                     | 2,000                   |       |
| NRWA471M100V16x31.5F | 470       | 0.08       |                                | 780                                     | 0.28                     | 2,000                   |       |

### RIPPLE CURRENT FREQUENCY CORRECTION FACTOR

| Frequency (Hz) | 50   | 120  | 300  | 1K   | 10K  | 100K |
|----------------|------|------|------|------|------|------|
| 0.47 ~ 3.3μF   | 0.65 | 1.00 | 1.35 | 1.75 | 2.30 | 2.50 |
| 4.7 ~ 33μF     | 0.75 | 1.00 | 1.25 | 1.50 | 1.75 | 1.80 |
| 47 ~ 1000μF    | 0.80 | 1.00 | 1.15 | 1.30 | 1.40 | 1.50 |
| 2200 ~ 10000μF | 0.85 | 1.00 | 1.03 | 1.05 | 1.08 | 1.08 |

### PART NUMBERING SYSTEM



\*see tape specification for details

### PRECAUTIONS

Please review the notes on correct use, safety and precautions 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)

