

# Miniature Aluminum Electrolytic Capacitors

NRWS Series

RADIAL LEADS, POLARIZED, NEW FURTHER REDUCED CASE SIZING,  
FROM NRWA WIDE TEMPERATURE RANGE

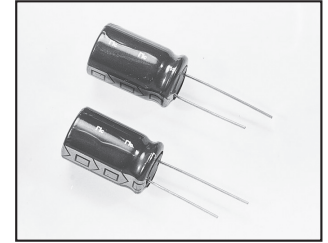
EXTENDED TEMPERATURE  
NRWA → NRWS  
(today's standard) (reduced sizes)

**RoHS**  
**Compliant**  
includes all homogeneous materials

• MEETS THE REQUIREMENTS OF AEC-Q200\*

\*See Part Number System for Details

\*Contact NIC for supporting test data



## CHARACTERISTICS

|                                                                                                   |               |                                       |                                    |      |      |      |      |      |      |  |
|---------------------------------------------------------------------------------------------------|---------------|---------------------------------------|------------------------------------|------|------|------|------|------|------|--|
| Rated Voltage Range                                                                               |               | 6.3 ~ 100VDC                          |                                    |      |      |      |      |      |      |  |
| Capacitance Range                                                                                 |               | 2.2 ~ 15,000μF                        |                                    |      |      |      |      |      |      |  |
| Operating Temperature Range                                                                       |               | -55°C ~ +105°C                        |                                    |      |      |      |      |      |      |  |
| Capacitance Tolerance                                                                             |               | ±20% (M)                              |                                    |      |      |      |      |      |      |  |
| Maximum Leakage Current @ +20°C                                                                   |               | After 1 min.                          | 0.03CV or 4μA whichever is greater |      |      |      |      |      |      |  |
|                                                                                                   |               | After 2 min.                          | 0.01CV or 3μA whichever is greater |      |      |      |      |      |      |  |
| Max. Tan δ 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 ≤ 1,000μF   | 0.28                                  | 0.24                               | 0.20 | 0.16 | 0.14 | 0.12 | 0.10 | 0.08 |  |
|                                                                                                   | C = 2,200μF   | 0.30                                  | 0.26                               | 0.22 | 0.18 | 0.16 | 0.14 | -    | -    |  |
|                                                                                                   | C = 3,300μF   | 0.32                                  | 0.28                               | 0.24 | 0.20 | 0.18 | 0.16 | -    | -    |  |
|                                                                                                   | C = 4,700μF   | 0.34                                  | 0.30                               | 0.26 | 0.22 | 0.20 | -    | -    | -    |  |
|                                                                                                   | C = 6,800μF   | 0.36                                  | 0.32                               | 0.28 | 0.24 | -    | -    | -    | -    |  |
|                                                                                                   | C = 10,000μF  | 0.38                                  | 0.34                               | 0.30 | -    | -    | -    | -    | -    |  |
| Low Temperature Stability Impedance Ratio @ 120Hz                                                 | C = 15,000μF  | 0.56                                  | 0.52                               | -    | -    | -    | -    | -    | -    |  |
|                                                                                                   | Z-25°C/Z+20°C | 5                                     | 4                                  | 3    | 2    | 2    | 2    | 2    | 2    |  |
| Load Life Test at +105°C & Rated W.V<br>2,000 Hours: 16V ~ 100V D≥ 10φ<br>1,000 Hours: All others | Z-40°C/Z+20°C | 12                                    | 10                                 | 8    | 5    | 4    | 4    | 4    | 4    |  |
|                                                                                                   | Δ Capacitance | Within ±20% of initial measured value |                                    |      |      |      |      |      |      |  |
| Shelf Life Test<br>+105°C 1,000 Hours<br>No Load                                                  | Δ Tan δ       | Less than 200% of specified value     |                                    |      |      |      |      |      |      |  |
|                                                                                                   | Δ LC          | Less than specified value             |                                    |      |      |      |      |      |      |  |
|                                                                                                   | Δ Capacitance | Within ±20% of initial measured value |                                    |      |      |      |      |      |      |  |
|                                                                                                   | Δ Tan δ       | Less than 200% of specified value     |                                    |      |      |      |      |      |      |  |
|                                                                                                   | Δ LC          | Less than specified value             |                                    |      |      |      |      |      |      |  |

Note: Capacitors shall conform to JIS-C-5141, unless otherwise specified here.

\*1. Add 0.5 every 1000μF for more than 1000μF \*2. Add 1.0 every 1000μF for more than 1000μF

## STANDARD PRODUCT AND CASE SIZE TABLE DφxL (mm)

| Cap. (μF) | Code | Working Voltage (Vdc) |         |         |         |         |         |         |         |
|-----------|------|-----------------------|---------|---------|---------|---------|---------|---------|---------|
|           |      | 6.3                   | 10      | 16      | 25      | 35      | 50      | 63      | 100     |
| 2.2       | 2R2  | -                     | -       | -       | -       | -       | 5x11    | 5x11    | -       |
| 3.3       | 3R3  | -                     | -       | -       | -       | -       | 5x11    | 5x11    | -       |
| 4.7       | 4R7  | -                     | -       | -       | -       | -       | 5x11    | 5x11    | -       |
| 10        | 100  | -                     | -       | -       | -       | -       | 5x11    | 5x11    | -       |
| 22        | 220  | -                     | -       | -       | -       | -       | 5x11    | 5x11    | 8x11.5  |
| 33        | 330  | -                     | -       | -       | -       | 5x11    | 5x11    | 6.3x11  | 8x12.5  |
| 47        | 470  | -                     | -       | -       | 5x11    | 5x11    | 6.3x11  | 6.3x11  | 10x12.5 |
| 100       | 101  | -                     | 5x11    | 5x11    | 6.3x11  | 6.3x11  | 8x11.5  | 8x12.5  | 10x20   |
| 220       | 221  | 5x11                  | 6.3x11  | 6.3x11  | 8x11.5  | 8x11.5  | 10x12.5 | 10x16   | 12.5x25 |
| 330       | 331  | 6.3x11                | 6.3x11  | 8x11.5  | 8x11.5  | 10x12.5 | 10x16   | 10x20   | 16x25   |
| 470       | 471  | 6.3x11                | 6.3x11  | 8x11.5  | 10x12.5 | 10x16   | 10x20   | 12.5x20 | 16x31   |
| 1,000     | 102  | 8x11.5                | 10x12.5 | 10x16   | 10x20   | 12.5x20 | 12.5x25 | 16x25   | -       |
| 2,200     | 222  | 10x16                 | 10x20   | 12.5x20 | 12.5x25 | 16x25   | 16x31   | -       | -       |
| 3,300     | 332  | 10x20                 | 12.5x20 | 12.5x25 | 16x25   | 16x35   | 18x35.5 | -       | -       |
| 4,700     | 472  | 12.5x20               | 12.5x25 | 16x25   | 16x31   | 18x35.5 | -       | -       | -       |
| 6,800     | 682  | 12.5x25               | 16x25   | 16x31   | 18x35.5 | -       | -       | -       | -       |
| 10,000    | 103  | 16x25                 | 16x31   | 18x35.5 | -       | -       | -       | -       | -       |
| 15,000    | 153  | 16x35.5               | 18x35.5 | -       | -       | -       | -       | -       | -       |

## 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 |



NIC COMPONENTS CORP. www.niccomp.com | www.lowESR.com | www.RFpassives.com | www.SMTmagnetics.com

SPECIFICATIONS ARE SUBJECT TO CHANGE

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

| Part Number          | Cap.<br>( $\mu$ F) | W.V.<br>(Vdc) | Dissipation Factor<br>+20°C/120Hz | Ripple Current Rating (mA)<br>+105°C/100kHz | Max. Impedance ( $\Omega$ )<br>+20°C/100KHz | Load Life Hours<br>@+105°C |
|----------------------|--------------------|---------------|-----------------------------------|---------------------------------------------|---------------------------------------------|----------------------------|
| NRWS221M6.3V5x11F    | 220                | 6.3           | 0.28                              | 160                                         | 1.40                                        | 1,000                      |
| NRWS331M6.3V6.3x11F  | 330                |               | 0.28                              | 240                                         | 0.58                                        | 1,000                      |
| NRWS471M6.3V6.3x11F  | 470                |               | 0.28                              | 250                                         | 0.55                                        | 1,000                      |
| NRWS102M6.3V8x11.5F  | 1,000              |               | 0.28                              | 450                                         | 0.26                                        | 1,000                      |
| NRWS222M6.3V10x16F   | 2,200              |               | 0.30                              | 760                                         | 0.12                                        | 2,000                      |
| NRWS332M6.3V10x20F   | 3,300              |               | 0.32                              | 900                                         | 0.10                                        | 2,000                      |
| NRWS472M6.3V12.5x20F | 4,700              |               | 0.34                              | 1100                                        | 0.072                                       | 2,000                      |
| NRWS682M6.3V12.5x25F | 6,800              |               | 0.36                              | 1420                                        | 0.054                                       | 2,000                      |
| NRWS103M6.3V16x25F   | 10,000             |               | 0.38                              | 1700                                        | 0.043                                       | 2,000                      |
| NRWS153M6.3V16x36F   | 15,000             |               | 0.56                              | 2100                                        | 0.032                                       | 2,000                      |
| NRWS101M10V5x11F     | 100                | 10            | 0.24                              | 150                                         | 1.40                                        | 1,000                      |
| NRWS221M10V6.3x11F   | 220                |               | 0.24                              | 240                                         | 0.58                                        | 1,000                      |
| NRWS331M10V6.3x11F   | 330                |               | 0.24                              | 250                                         | 0.55                                        | 1,000                      |
| NRWS471M10V6.3x11F   | 470                |               | 0.24                              | 370                                         | 0.39                                        | 1,000                      |
| NRWS102M10V10x12.5F  | 1,000              |               | 0.24                              | 560                                         | 0.16                                        | 2,000                      |
| NRWS222M10V10x20F    | 2,200              |               | 0.26                              | 900                                         | 0.10                                        | 2,000                      |
| NRWS332M10V12.5x20F  | 3,300              |               | 0.28                              | 1100                                        | 0.074                                       | 2,000                      |
| NRWS472M10V12.5x25F  | 4,700              |               | 0.30                              | 1420                                        | 0.054                                       | 2,000                      |
| NRWS682M10V16x25F    | 6,800              |               | 0.32                              | 1700                                        | 0.043                                       | 2,000                      |
| NRWS103M10V16x31F    | 10,000             |               | 0.34                              | 1950                                        | 0.035                                       | 2,000                      |
| NRWS153M10V18x36F    | 15,000             |               | 0.52                              | 2400                                        | 0.028                                       | 2,000                      |
| NRWS101M16V5x11F     | 100                | 16            | 0.20                              | 150                                         | 1.40                                        | 1,000                      |
| NRWS221M16V6.3x11F   | 220                |               | 0.20                              | 240                                         | 0.55                                        | 1,000                      |
| NRWS331M16V8x11.5F   | 330                |               | 0.20                              | 370                                         | 0.35                                        | 1,000                      |
| NRWS471M16V8x11.5F   | 470                |               | 0.20                              | 450                                         | 0.28                                        | 1,000                      |
| NRWS102M16V10x16F    | 1,000              |               | 0.20                              | 760                                         | 0.13                                        | 2,000                      |
| NRWS222M16V12.5x20F  | 2,200              |               | 0.22                              | 1100                                        | 0.075                                       | 2,000                      |
| NRWS332M16V12.5x25F  | 3,300              |               | 0.24                              | 1320                                        | 0.054                                       | 2,000                      |
| NRWS472M16V16x25F    | 4,700              |               | 0.26                              | 1600                                        | 0.043                                       | 2,000                      |
| NRWS682M16V16x31F    | 6,800              |               | 0.28                              | 1900                                        | 0.035                                       | 2,000                      |
| NRWS103M16V18x36F    | 10,000             |               | 0.30                              | 2300                                        | 0.028                                       | 2,000                      |
| NRWS470M25V5x11F     | 47                 | 25            | 0.16                              | 150                                         | 1.40                                        | 1,000                      |
| NRWS101M25V6.3x11F   | 100                |               | 0.16                              | 240                                         | 0.60                                        | 1,000                      |
| NRWS221M25V8x11.5F   | 220                |               | 0.16                              | 370                                         | 0.39                                        | 1,000                      |
| NRWS331M25V8x11.5F   | 330                |               | 0.16                              | 400                                         | 0.34                                        | 1,000                      |
| NRWS471M25V10x12.5F  | 470                |               | 0.16                              | 560                                         | 0.17                                        | 2,000                      |
| NRWS102M25V10x20F    | 1,000              |               | 0.16                              | 900                                         | 0.10                                        | 2,000                      |
| NRWS222M25V12.5x25F  | 2,200              |               | 0.18                              | 1320                                        | 0.062                                       | 2,000                      |
| NRWS332M25V16x25F    | 3,300              |               | 0.20                              | 1600                                        | 0.043                                       | 2,000                      |
| NRWS472M25V16x31F    | 4,700              |               | 0.22                              | 1900                                        | 0.035                                       | 2,000                      |
| NRWS682M25V18x36F    | 6,800              |               | 0.24                              | 2200                                        | 0.028                                       | 2,000                      |
| NRWS330M35V5x11F     | 33                 | 35            | 0.14                              | 120                                         | 2.10                                        | 1,000                      |
| NRWS470M35V5x11F     | 47                 |               | 0.14                              | 140                                         | 2.10                                        | 1,000                      |
| NRWS101M35V6.3x11F   | 100                |               | 0.14                              | 180                                         | 1.10                                        | 1,000                      |
| NRWS221M35V8x11.5F   | 220                |               | 0.14                              | 360                                         | 0.46                                        | 1,000                      |
| NRWS331M35V10x12.5F  | 330                |               | 0.14                              | 580                                         | 0.26                                        | 1,000                      |
| NRWS471M35V10x16F    | 470                |               | 0.14                              | 650                                         | 0.18                                        | 1,000                      |
| NRWS102M35V12.5x20F  | 1,000              |               | 0.14                              | 900                                         | 0.11                                        | 2,000                      |
| NRWS222M35V16x25F    | 2,200              |               | 0.16                              | 1400                                        | 0.056                                       | 2,000                      |
| NRWS332M35V16x35F    | 3,300              |               | 0.18                              | 1800                                        | 0.038                                       | 2,000                      |
| NRWS472M35V18x36F    | 4,700              |               | 0.20                              | 2000                                        | 0.035                                       | 2,000                      |
| NRWS2R2M50V5x11F     | 2.2                | 50            | 0.12                              | 40                                          | 5.5                                         | 1,000                      |
| NRWS3R3M50V5x11F     | 3.3                |               | 0.12                              | 50                                          | 4.0                                         | 1,000                      |
| NRWS4R7M50V5x11F     | 4.7                |               | 0.12                              | 80                                          | 2.80                                        | 1,000                      |
| NRWS100M50V5x11F     | 10                 |               | 0.12                              | 90                                          | 2.30                                        | 1,000                      |
| NRWS220M50V5x11F     | 22                 |               | 0.12                              | 110                                         | 2.20                                        | 1,000                      |

For Automotive Applications see part number system



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

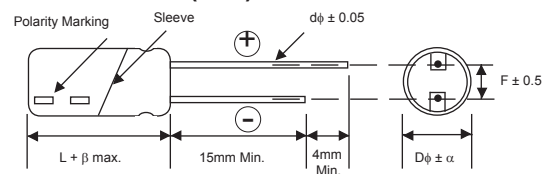
| Part Number          | Cap. (μF) | W.V. (Vdc) | Dissipation Factor +20°C/120Hz | Ripple Current Rating (mA) +105°C/100KHz | Max. Impedance (Ω) +20°C/100KHz | Load Life Hours @+105°C |
|----------------------|-----------|------------|--------------------------------|------------------------------------------|---------------------------------|-------------------------|
| NRWS330M50V5x11F     | 33        | 50         | 0.12                           | 120                                      | 2.10                            | 1,000                   |
| NRWS470M50V6.3x11F   | 47        |            | 0.12                           | 180                                      | 1.10                            | 1,000                   |
| NRWS101M50V8x11.5F   | 100       |            | 0.12                           | 310                                      | 0.55                            | 1,000                   |
| NRWS221M50V10x12.5F  | 220       |            | 0.12                           | 500                                      | 0.30                            | 2,000                   |
| NRWS331M50V10x16F    | 330       |            | 0.12                           | 650                                      | 0.20                            | 2,000                   |
| NRWS471M50V10x20F    | 470       |            | 0.12                           | 800                                      | 0.13                            | 2,000                   |
| NRWS102M50V12.5x25F  | 1,000     |            | 0.12                           | 1100                                     | 0.10                            | 2,000                   |
| NRWS222M50V16x31F    | 2,200     |            | 0.14                           | 1650                                     | 0.055                           | 2,000                   |
| NRWS332M50V18x36F    | 3,300     |            | 0.16                           | 2000                                     | 0.035                           | 2,000                   |
| NRWS2R2M63V5x11F     | 2.2       | 63         | 0.10                           | 42                                       | 8.3                             | 1,000                   |
| NRWS3R3M63V5x11F     | 3.3       |            | 0.10                           | 58                                       | 6.0                             | 1,000                   |
| NRWS4R7M63V5x11F     | 4.7       |            | 0.10                           | 64                                       | 4.20                            | 1,000                   |
| NRWS100M63V5x11F     | 10        |            | 0.10                           | 90                                       | 2.80                            | 1,000                   |
| NRWS220M63V5x11F     | 22        |            | 0.10                           | 140                                      | 2.40                            | 1,000                   |
| NRWS330M63V6.3x11F   | 33        |            | 0.10                           | 200                                      | 1.40                            | 1,000                   |
| NRWS470M63V6.3x11F   | 47        |            | 0.10                           | 240                                      | 1.30                            | 1,000                   |
| NRWS101M63V8x12.5F   | 100       |            | 0.10                           | 300                                      | 0.60                            | 1,000                   |
| NRWS221M63V10x16F    | 220       |            | 0.10                           | 520                                      | 0.22                            | 2,000                   |
| NRWS331M63V10x20F    | 330       |            | 0.10                           | 765                                      | 0.17                            | 2,000                   |
| NRWS471M63V12.5x20F  | 470       |            | 0.10                           | 960                                      | 0.14                            | 2,000                   |
| NRWS102M63V16x25F    | 1,000     |            | 0.10                           | 1100                                     | 0.065                           | 2,000                   |
| NRWS220M100V8x11.5F  | 22        | 100        | 0.08                           | 235                                      | 0.83                            | 1,000                   |
| NRWS330M100V8x12.5F  | 33        |            | 0.08                           | 300                                      | 0.60                            | 1,000                   |
| NRWS470M100V10x12.5F | 47        |            | 0.08                           | 330                                      | 0.39                            | 2,000                   |
| NRWS101M100V10x20F   | 100       |            | 0.08                           | 450                                      | 0.24                            | 2,000                   |
| NRWS221M100V12.5x25F | 220       |            | 0.08                           | 700                                      | 0.15                            | 2,000                   |
| NRWS331M100V16x25F   | 330       |            | 0.08                           | 950                                      | 0.09                            | 2,000                   |
| NRWS471M100V16x31F   | 470       |            | 0.08                           | 1100                                     | 0.085                           | 2,000                   |

For Automotive Applications see part number system

### RIPPLE CURRENT CORRECTION FACTORS

| Cap. (μF)     | Frequency (Hz) |      |       |
|---------------|----------------|------|-------|
|               | 100            | 1K   | 10K ~ |
| ~ 47          | 0.50           | 0.80 | 1.0   |
| > 47 ~ 220    | 0.55           | 0.85 | 1.0   |
| > 220 ~ 1,000 | 0.65           | 0.90 | 1.0   |
| > 1,000       | 0.75           | 0.90 | 1.0   |

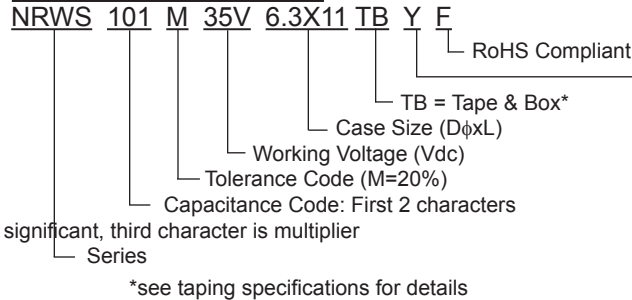
### DIMENSIONS (mm)



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

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

### PART NUMBER SYSTEM



Optional: For automotive equipment, sourced to special production and inspection at TS-16949 certified production site

### 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)

