# Miniature Aluminum Electrolytic Capacitors

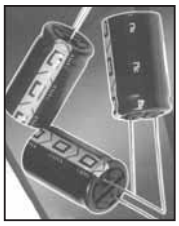
NRWP Series

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

EXTENDED TEMPERATURE
NRWS ➡ NRWP
(today's standard) (reduced sizes)

RoHS Compliant
includes all homogeneous materials

*See Part Number System for Details



## CHARACTERISTICS

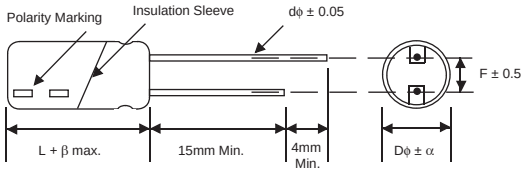
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Rated Voltage Range | | 6.3 ~ 100VDC | | | | | | | |
| Capacitance Range | | 33 ~ 33,000µF | | | | | | | |
| Operating Temperature Range | | -55°C ~ +105°C | | | | | | | |
| Capacitance Tolerance | | ±20% (M) | | | | | | | |
| Maximum Leakage Current After 2 minutes | | 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 | 0.12 | - |
| | 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 | 0.38 | 0.34 | 0.30 | 0.26 | 0.24 | - | - | - |
| | C = 10,000µF | 0.46 | 0.42 | 0.38 | 0.34 | - | - | - | - |
| | C = 15,000µF | 0.56 | 0.52 | 0.48 | - | - | - | - | - |
| | C = 22,000µF | 0.70 | 0.66 | - | - | - | - | - | - |
| | C = 33,000µF | 0.92 | - | - | - | - | - | - | - |
| Low Temperature Stability Impedance Ratio @ 120Hz | Z-40°C/Z+20°C | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 |
| | Z-55°C/Z+20°C | 10 | 8 | 6 | 4 | 3 | 3 | 3 | 3 |
| Load Life Test @ 105°C | Duration | φ D ≤ 8: 1,000 hours, φ D ≥ 10: 2,000 hours | | | | | | | |
| | Δ Capacitance | Within ±25% of initial measured value | | | | | | | |
| | Δ Tan δ | Less than 200% of specified value | | | | | | | |
| | Δ LC | Less than specified value | | | | | | | |

## STANDARD PRODUCT AND CASE SIZE TABLE Dφ x L (mm)

| Capacitance (µF) | Code | Working Voltage (Vdc) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 |
| 33 | 330 | - | - | - | - | - | - | - | 8 x 11.5 |
| 47 | 470 | - | - | - | - | - | - | - | 8 x 11.5 |
| 100 | 101 | - | - | - | - | - | 8 x 11.5 | 8 x 11.5 | 10 x 16 |
| 220 | 221 | - | - | - | 6.3 x 11 | 8 x 11.5 | 10 x 12.5 | 10 x 16 | 12.5 x 20 |
| 330 | 331 | - | - | 6.3 x 11 | 8 x 11.5 | 10 x 12.5 | 10 x 16 | 10 x 20 | 12.5 x 25 |
| 470 | 471 | - | 6.3 x 11 | 8 x 11.5 | 8 x 11.5 | 10 x 12.5 | 10 x 20 | 12.5 x 20 | 16 x 25 |
| 680 | 681 | 6.3 x 11 | 8 x 11.5 | 8 x 11.5 | 10 x 12.5 | 10 x 16 | 12.5 x 20 | 12.5 x 25 | 16 x 31.5 |
| 1,000 | 102 | 8 x 11.5 | 8 x 11.5 | 10 x 12.5 | 10 x 16 | 10 x 20 | 12.5 x 25 | 16 x 25 | 18 x 35.5 |
| 2,200 | 222 | 10 x 16 | 10 x 16 | 10 x 20 | 12.5 x 20 | 16 x 25 | 16 x 31.5 | 18 x 31.5 | - |
| 3,300 | 332 | 10 x 20 | 10 x 20 | 12.5 x 20 | 16 x 25 | 16 x 25 | 18 x 35.5 | - | - |
| 4,700 | 472 | 12.5 x 20 | 12.5 x 20 | 12.5 x 25 | 16 x 25 | 16 x 35.5 | - | - | - |
| 6,800 | 682 | 12.5 x 25 | 16 x 25 | 16 x 25 | 16 x 35.5 | 18 x 35.5 | - | - | - |
| 10,000 | 103 | 16 x 25 | 16 x 25 | 16 x 31.5 | 18 x 35.5 | - | - | - | - |
| 15,000 | 153 | 16 x 31.5 | 16 x 35.5 | 18 x 35.5 | - | - | - | - | - |
| 22,000 | 223 | 18 x 31.5 | 18 x 35.5 | - | - | - | - | - | - |
| 33,000 | 333 | 18 x 40 | - | - | - | - | - | - | - |

## 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 = D < 16mm = 1.5mm, L ≥ 16mm = 2.0mm

## 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 |
|---|---|---|---|---|---|---|
| NRWP681M6.3V6.3 x 11F | 680 | 6.3 | 0.28 | 285 | 0.68 | 1,000 |
| NRWP102M6.3V8 x 11.5F | 1,000 | | 0.28 | 460 | 0.46 | 1,000 |
| NRWP222M6.3V10 x 16F | 2,200 | | 0.30 | 775 | 0.23 | 2,000 |
| NRWP332M6.3V10 x 20F | 3,300 | | 0.32 | 985 | 0.16 | 2,000 |
| NRWP472M6.3V12.5 x 20F | 4,700 | | 0.34 | 1150 | 0.12 | 2,000 |
| NRWP682M6.3V12.5 x 25F | 6,800 | | 0.38 | 1480 | 0.09 | 2,000 |
| NRWP103M6.3V16 x 25F | 10,000 | | 0.46 | 1700 | 0.08 | 2,000 |
| NRWP153M6.3V16 x 31.5F | 15,000 | | 0.56 | 2090 | 0.06 | 2,000 |
| NRWP223M6.3V18 x 31.5F | 22,000 | | 0.70 | 2280 | 0.05 | 2,000 |
| NRWP333M6.3V18 x 40F | 33,000 | | 0.92 | 2350 | 0.05 | 2,000 |
| NRWP471M10V6.3 x 11F | 470 | 10 | 0.24 | 295 | 0.85 | 1,000 |
| NRWP681M10V8 x 11.5F | 680 | | 0.24 | 430 | 0.59 | 1,000 |
| NRWP102M10V8 x 11.5F | 1,000 | | 0.24 | 500 | 0.40 | 1,000 |
| NRWP222M10V10 x 16F | 2,200 | | 0.26 | 860 | 0.20 | 2,000 |
| NRWP332M10V10 x 20F | 3,300 | | 0.28 | 1100 | 0.14 | 2,000 |
| NRWP472M10V12.5 x 20F | 4,700 | | 0.30 | 1350 | 0.11 | 2,000 |
| NRWP682M10V16 x 25F | 6,800 | | 0.34 | 1700 | 0.08 | 2,000 |
| NRWP103M10V16 x 25F | 10,000 | | 0.42 | 1950 | 0.07 | 2,000 |
| NRWP153M10V16 x 35.5F | 15,000 | | 0.52 | 2090 | 0.06 | 2,000 |
| NRWP223M10V18 x 35.5F | 22,000 | | 0.66 | 2180 | 0.05 | 2,000 |
| NRWP331M16V6.3 x 11F | 330 | 16 | 0.20 | 270 | 1.01 | 1,000 |
| NRWP471M16V8 x 11.5F | 470 | | 0.20 | 375 | 0.71 | 1,000 |
| NRWP681M16V8 x 11.5F | 680 | | 0.20 | 480 | 0.49 | 1,000 |
| NRWP102M16V10 x 12.5F | 1,000 | | 0.20 | 640 | 0.33 | 2,000 |
| NRWP222M16V10 x 20F | 2,200 | | 0.22 | 1050 | 0.17 | 2,000 |
| NRWP332M16V12.5 x 20F | 3,300 | | 0.24 | 1300 | 0.12 | 2,000 |
| NRWP472M16V12.5 x 25F | 4,700 | | 0.26 | 1650 | 0.09 | 2,000 |
| NRWP682M16V16 x 25F | 6,800 | | 0.30 | 1900 | 0.07 | 2,000 |
| NRWP103M16V16 x 31.5F | 10,000 | | 0.38 | 1950 | 0.06 | 2,000 |
| NRWP153M16V18 x 35.5F | 15,000 | | 0.48 | 2070 | 0.05 | 2,000 |
| NRWP221M25V6.3 x 11F | 220 | 25 | 0.16 | 240 | 1.21 | 1,000 |
| NRWP221M25V8 x 11.5F | 330 | | 0.16 | 335 | 0.80 | 1,000 |
| NRWP221M25V8 x 11.5F | 470 | | 0.16 | 440 | 0.56 | 1,000 |
| NRWP221M25V10 x 12.5F | 680 | | 0.16 | 630 | 0.39 | 2,000 |
| NRWP102M25V10 x 16F | 1,000 | | 0.16 | 740 | 0.27 | 2,000 |
| NRWP222M25V12.5 x 20F | 2,200 | | 0.18 | 1090 | 0.14 | 2,000 |
| NRWP332M25V16 x 25F | 3,300 | | 0.20 | 1500 | 0.10 | 2,000 |
| NRWP472M25V16 x 25F | 4,700 | | 0.22 | 1800 | 0.08 | 2,000 |
| NRWP682M25V16 x 35.5F | 6,800 | | 0.26 | 1910 | 0.06 | 2,000 |
| NRWP103M25V18 x 35.5F | 10,000 | | 0.34 | 2050 | 0.06 | 2,000 |
| NRWP221M35V8 x 11.5F | 220 | 35 | 0.14 | 300 | 1.06 | 2,000 |
| NRWP331M35V10 x 12.5F | 330 | | 0.14 | 400 | 0.70 | 1,000 |
| NRWP471M35V10 x 12.5F | 470 | | 0.14 | 525 | 0.49 | 2,000 |
| NRWP681M35V10 x 16F | 680 | | 0.14 | 760 | 0.34 | 2,000 |
| NRWP102M35V10 x 20F | 1,000 | | 0.14 | 865 | 0.23 | 2,000 |
| NRWP222M35V16 x 25F | 2,200 | | 0.16 | 1370 | 0.12 | 2,000 |
| NRWP332M35V16 x 25F | 3,300 | | 0.18 | 1680 | 0.09 | 2,000 |
| NRWP472M35V16 x 35.5F | 4,700 | | 0.20 | 1870 | 0.07 | 2,000 |
| NRWP682M35V18 x 35.5F | 6,800 | | 0.24 | 1920 | 0.06 | 2,000 |
| NRWP101M50V8 x 11.5F | 100 | 50 | 0.12 | 200 | 1.99 | 2,000 |
| NRWP221M50V10 x 12.5F | 220 | | 0.12 | 360 | 0.90 | 1,000 |
| NRWP331M50V10 x 16F | 330 | | 0.12 | 470 | 0.60 | 2,000 |
| NRWP471M50V10 x 20F | 470 | | 0.12 | 600 | 0.42 | 2,000 |
| NRWP681M50V12.5 x 20F | 680 | | 0.12 | 980 | 0.29 | 2,000 |
| NRWP102M50V12.5 x 25F | 1,000 | | 0.12 | 1060 | 0.20 | 2,000 |
| NRWP222M50V16 x 31.5F | 2,200 | | 0.14 | 1600 | 0.11 | 2,000 |
| NRWP332M50V18 x 35.5F | 3,300 | | 0.16 | 1780 | 0.08 | 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 |
|---|---|---|---|---|---|---|
| NRWP101M63V8 x 11.5F | 100 | 63 | 0.10 | 230 | 1.66 | 1,000 |
| NRWP221M63V10 x 16F | 220 | | 0.10 | 390 | 0.75 | 2,000 |
| NRWP331M63V10 x 20F | 330 | | 0.10 | 540 | 0.50 | 2,000 |
| NRWP471M63V12.5 x 20F | 470 | | 0.10 | 700 | 0.35 | 2,000 |
| NRWP681M63V12.5 x 25F | 680 | | 0.10 | 800 | 0.24 | 2,000 |
| NRWP102M63V16 x 25F | 1,000 | | 0.10 | 1200 | 0.17 | 2,000 |
| NRWP222M63V18 x 31.5F | 2,200 | | 0.12 | 1400 | 0.09 | 2,000 |
| NRWP330M100V8 x 11.5F | 33 | 100 | 0.08 | 140 | 4.02 | 1,000 |
| NRWP470M100V8 x 11.5F | 47 | | 0.08 | 185 | 2.82 | 1,000 |
| NRWP101M100V10 x 16F | 100 | | 0.08 | 290 | 1.33 | 2,000 |
| NRWP221M100V12.5 x 20F | 220 | | 0.08 | 560 | 0.60 | 2,000 |
| NRWP331M100V12.5 x 25F | 330 | | 0.08 | 690 | 0.40 | 2,000 |
| NRWP471M100V16 x 25F | 470 | | 0.08 | 880 | 0.28 | 2,000 |
| NRWP681M100V16 x 31.5F | 680 | | 0.08 | 900 | 0.20 | 2,000 |
| NRWP102M100V18 x 35.5F | 1,000 | | 0.08 | 985 | 0.13 | 2,000 |

## RIPPLE CURRENT FREQUENCY CORRECTION FACTOR

| Cap. (µF) | 60Hz | 120Hz | 500Hz | 1KHz | 10KHz ~ up |
|---|---|---|---|---|---|
| 33 ~ 47 | 0.80 | 1.00 | 1.20 | 1.30 | 1.50 |
| 100 ~ 1,000 | 0.80 | 1.00 | 1.10 | 1.10 | 1.20 |
| 2,200 ~ 33,000 | 0.80 | 1.00 | 1.05 | 1.10 | 1.15 |

## PART NUMBER SYSTEM

NRWP 221 M 25V 6.3X11 F

- F — RoHS Compliant
- 6.3X11 — Case Size (Dϕ x L)
- 25V — Working Voltage (Vdc)
- M — Tolerance Code (M=20%)
- 221 — Capacitance Code: First 2 characters significant, third character is multiplier
- NRWP — Series

**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
If in doubt or uncertainty, please review your specific application - process details with NIC's technical support personnel: tpmg@niccomp.com