

### FEATURES

- CYLINDRICAL V-CHIP CONSTRUCTION
- LOW LEAKAGE CURRENT (0.5μA TO 2.0μA max.)
- LOW COST TANTALUM REPLACEMENT
- DESIGNED FOR REFLOW SOLDERING

**RoHS  
Compliant**

includes all homogeneous materials

\*See Part Number System for Details



### CHARACTERISTICS

|                                                        |                                        |                                       |                                                                                     |      |      |      |      |
|--------------------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------|------|------|------|------|
| Rated Voltage Rating                                   | 6.3 ~ 50Vdc                            |                                       |  |      |      |      |      |
| Rated Capacitance Range                                | 0.1 ~ 100μF                            |                                       |                                                                                     |      |      |      |      |
| Operating Temperature Range                            | -40° ~ +85°C                           |                                       |                                                                                     |      |      |      |      |
| Capacitance Tolerance                                  | ±20%(M)                                |                                       |                                                                                     |      |      |      |      |
| Max. Leakage Current After 2 Minutes at 20°C           | 0.002CV or 0.5μA, whichever is greater |                                       |                                                                                     |      |      |      |      |
| Surge Voltage & Max. Tanδ                              | W.V. (Vdc)                             | 6.3                                   | 10                                                                                  | 16   | 25   | 35   | 50   |
|                                                        | S.V. (Vdc)                             | 8.0                                   | 13                                                                                  | 20   | 32   | 44   | 63   |
|                                                        | Tanδ @ 120Hz/20°C                      | 0.24                                  | 0.20                                                                                | 0.18 | 0.14 | 0.12 | 0.10 |
| Low Temperature Stability<br>(Impedance Ratio @ 120Hz) | W.V. (Vdc)                             | 6.3                                   | 10                                                                                  | 16   | 25   | 35   | 50   |
|                                                        | Z-40°C/Z +20°C                         | 4                                     | 3                                                                                   | 2    | 2    | 2    | 2    |
|                                                        | Z-55°C/Z +20°C                         | 8                                     | 8                                                                                   | 4    | 4    | 4    | 4    |
| Load Life Test<br>at Rated W.V.<br>85°C 2,000 Hours    | Capacitance Change                     | Within ±25% of initial measured value |                                                                                     |      |      |      |      |
|                                                        | Tanδ                                   | Less than 200% of specified value     |                                                                                     |      |      |      |      |
|                                                        | Leakage Current                        | Less than specified value             |                                                                                     |      |      |      |      |

### MAXIMUM PERMISSIBLE RIPPLE CURRENT (mA rms AT 120Hz AND 85°C)

| Cap.<br>(μF) | Working Voltage (Vdc) |    |    |    |    |     |
|--------------|-----------------------|----|----|----|----|-----|
|              | 6.3                   | 10 | 16 | 25 | 35 | 50  |
| 0.1          | -                     | -  | -  | -  | -  | 1.0 |
| 0.22         | -                     | -  | -  | -  | -  | 2.3 |
| 0.33         | -                     | -  | -  | -  | -  | 3.5 |
| 0.47         | -                     | -  | -  | -  | -  | 5   |
| 1.0          | -                     | -  | -  | -  | -  | 10  |
| 2.2          | -                     | -  | -  | -  | -  | 15  |
| 3.3          | -                     | -  | -  | -  | -  | 18  |
| 4.7          | -                     | -  | -  | 18 | 20 | 23  |
| 10           | -                     | -  | 25 | 28 | 30 | 34  |
| 22           | 31                    | 35 | 39 | 52 | 54 | -   |
| 33           | 39                    | 43 | 57 | 63 | -  | -   |
| 47           | 47                    | 59 | 68 | -  | -  | -   |
| 100          | 71                    | 76 | -  | -  | -  | -   |

### MAXIMUM ESR (Ω AT 120Hz AND 20°C)

| Cap.<br>(μF) | Working Voltage (Vdc) |      |      |      |      |      |
|--------------|-----------------------|------|------|------|------|------|
|              | 6.3                   | 10   | 16   | 25   | 35   | 50   |
| 0.1          | -                     | -    | -    | -    | -    | 1660 |
| 0.22         | -                     | -    | -    | -    | -    | 754  |
| 0.33         | -                     | -    | -    | -    | -    | 503  |
| 0.47         | -                     | -    | -    | -    | -    | 353  |
| 1.0          | -                     | -    | -    | -    | -    | 166  |
| 2.2          | -                     | -    | -    | -    | -    | 75.4 |
| 3.3          | -                     | -    | -    | -    | -    | 50.3 |
| 4.7          | -                     | -    | -    | 49.5 | 42.3 | 35.3 |
| 10           | -                     | -    | 26.5 | 23.2 | 19.9 | 16.6 |
| 22           | 18.1                  | 15.1 | 12.1 | 10.6 | 9.05 | -    |
| 33           | 12.6                  | 10.1 | 8.04 | 7.04 | -    | -    |
| 47           | 8.47                  | 7.06 | 5.65 | -    | -    | -    |
| 100          | 3.98                  | 3.32 | -    | -    | -    | -    |

### RIPPLE CURRENT FREQUENCY CORRECTION FACTOR

| Frequency         | 50Hz ≤ f < 100Hz | 100Hz ≤ f < 1KHz | 1KHz ≤ f < 10KHz | f ≥ 10KHz |
|-------------------|------------------|------------------|------------------|-----------|
| Correction Factor | 0.8              | 1.0              | 1.3              | 1.5       |

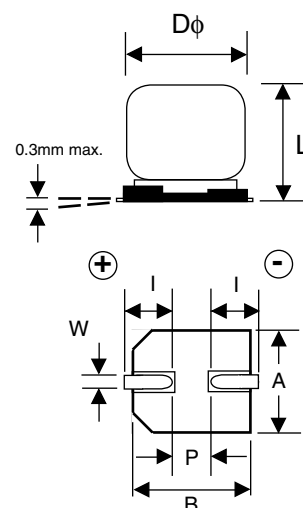
### PRECAUTIONS

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)



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

| Cap.<br>( $\mu$ F) | Code | Working Voltage (Vdc) |         |         |         |         |         |
|--------------------|------|-----------------------|---------|---------|---------|---------|---------|
|                    |      | 6.3                   | 10      | 16      | 25      | 35      | 50      |
| 0.1                | R10  | -                     | -       | -       | -       | -       | 4x5.5   |
| 0.22               | R22  | -                     | -       | -       | -       | -       | 4x5.5   |
| 0.33               | R33  | -                     | -       | -       | -       | -       | 4x5.5   |
| 0.47               | R47  | -                     | -       | -       | -       | -       | 4x5.5   |
| 1.0                | 1R0  | -                     | -       | -       | -       | -       | 4x5.5   |
| 2.2                | 2R2  | -                     | -       | -       | -       | -       | 4x5.5   |
| 3.3                | 3R3  | -                     | -       | -       | -       | -       | 4x5.5   |
| 4.7                | 4R7  | -                     | -       | -       | 4x5.5   | 4x5.5   | 5x5.5   |
| 10                 | 100  | -                     | -       | 4x5.5   | 5x5.5   | 5x5.5   | 6.3x5.5 |
| 22                 | 220  | 4x5.5                 | 5x5.5   | 5x5.5   | 6.3x5.5 | 6.3x5.5 | -       |
| 33                 | 330  | 5x5.5                 | 5x5.5   | 6.3x5.5 | 6.3x5.5 | -       | -       |
| 47                 | 470  | 5x5.5                 | 6.3x5.5 | 6.3x5.5 | -       | -       | -       |
| 100                | 101  | 5x5.5                 | 6.3x5.5 | -       | -       | -       | -       |



### DIMENSIONS (mm)

| Case Size | D $\phi$ ±0.5 | L max. | A/B±0.2 | I ± 0.2 | W         | P±0.2 |
|-----------|---------------|--------|---------|---------|-----------|-------|
| 4x5.5     | 4.0           | 5.5    | 4.3     | 1.8     | 0.5 ~ 0.8 | 1.0   |
| 5x5.5     | 5.0           | 5.5    | 5.3     | 2.1     | 0.5 ~ 0.8 | 1.4   |
| 6.3x5.5   | 6.3           | 5.5    | 6.6     | 2.5     | 0.5 ~ 0.8 | 2.2   |

### PART NUMBER SYSTEM

**NACL** **100** **M** **35V** **4.5x5.5** **TR** **13** **F**  
 Series    Capacitance Code in  $\mu$ F, first 2 digits are significant  
 Third digit is no. of zeros, "R" indicates decimal for values under 10 $\mu$ F  
 Tolerance Code M=20%, K=10%  
 Working Voltage  
 Size in mm  
 Tape & Reel  
 330mm (13") Reel  
 97% Sn (min.), 3% Bi (max.)  
 RoHS Compliant