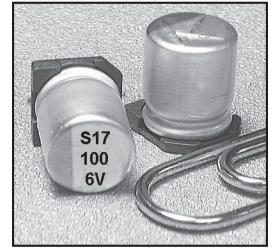


- CYLINDRICAL V-CHIP CONSTRUCTION FOR SURFACE MOUNTING
- EXTENDED LOAD LIFE (3,000 ~ 5,000 HOURS)
- AVAILABLE WITH WIDE TERMINATION & ANTI-VIBRATION SKIRT
- ULTRA LOW ESR, HIGH RIPPLE CURRENT
- CAPACITANCE VALUES UP TO 1000 $\mu$ F
- 6.3x6.3mm ~ 10x10.8mm CASE SIZES
- REFLOW SOLDERING RATED TO +260°C (see reflow specifications)
- MEETS THE REQUIREMENTS OF AEC-Q200\*

\*Contact NIC for supporting test data

**RoHS Compliant**  
includes all homogeneous materials



\*See Part Number System for Details

### CHARACTERISTICS

|                                                                                           |                           |                                            |      |      |
|-------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------|------|------|
| Rated Voltage Range                                                                       | 6.3 ~ 16Vdc               |                                            |      |      |
| Rated Capacitance Range                                                                   | 10 ~ 1000 $\mu$ F         |                                            |      |      |
| Operating Temp. Range                                                                     | -55 ~ +105°C              |                                            |      |      |
| Capacitance Tolerance                                                                     | $\pm$ 20% (M)             |                                            |      |      |
| Max. Leakage Current After 2 Minutes @ 20°C                                               | See Specifications Tables |                                            |      |      |
| Working and Surge Voltage Ratings                                                         | W.V. (Vdc)                | 6.3                                        | 10   | 16   |
|                                                                                           | S.V. (Vdc)                | 8.2                                        | 13   | 20   |
| Tan $\delta$ @ 120Hz/20°C                                                                 |                           | 0.18                                       | 0.16 | 0.14 |
| Impedance Ratio                                                                           | Z -55°C/Z +20°C           | 1 ~ 2.5                                    |      |      |
|                                                                                           | Z +105°C/Z +20°C          | 0.6 ~ 1.0                                  |      |      |
| Load Life Test @ 105°C<br>6.3mm Dia. = 3,000 Hours<br>8mm ~ 10mm Dia. parts = 5,000 Hours | Capacitance Change        | Within $\pm$ 30% of initial measured value |      |      |
|                                                                                           | Tan $\delta$ and ESR      | Less than 200% of specified max. value     |      |      |
|                                                                                           | Leakage Current           | Less than specified max. value             |      |      |

### PART NUMBER SYSTEM

NSPE-S 471 M 6.3V 8x10.8 TR 15 WT Y E

RoHS Compliant, 97% Sn (min.), 3% Bi (max.)

WT = Wide Terminations  
Standard: 15=15" (380mm) Reel Optional: 13=13" (330mm) Reel

Tape & Reel

Size in mm

Working Voltage

Tolerance Code M=20%

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

Series

Optional: Suitable for automotive equipment, sourced to special production and inspection at IATF-16949 certified production site

### STANDARD PRODUCTS AND CASE SIZES D $\phi$ x L (mm)

| PART NUMBER                | Cap.<br>(μF) | Working<br>Voltage | Case Size<br>(D X L) mm | Max. Leakage<br>Current (μA)<br>After 2 minutes* | Max. ESR (mΩ)<br>AT 100kHz/20°C | Max. Ripple Current (mA rms)<br>AT 100kHz/105°C |
|----------------------------|--------------|--------------------|-------------------------|--------------------------------------------------|---------------------------------|-------------------------------------------------|
| NSPE-S101M6.3V6.3X6.3TR15F | 100          | 6.3                | 6.3X6.3                 | 126                                              | 36                              | 1630                                            |
| NSPE-S151M6.3V6.3X6.3TR15F | 150          |                    | 6.3X6.3                 | 189                                              | 36                              | 1630                                            |
| NSPE-S221M6.3V6.3X8TR15F   | 220          |                    | 6.3X8                   | 278                                              | 32                              | 2020                                            |
| NSPE-S221M6.3V8X10.8TR15F  |              |                    | 8X10.8                  | 278                                              | 16                              | 3150                                            |
| NSPE-S331M6.3V8X10.8TR15F  | 330          |                    | 8X10.8                  | 416                                              | 16                              | 3150                                            |
| NSPE-S391M6.3V8X10.8TR15F  | 390          |                    | 8X10.8                  | 492                                              | 16                              | 3150                                            |
| NSPE-S471M6.3V8X10.8TR15F  | 470          |                    | 8X10.8                  | 593                                              | 16                              | 3150                                            |
| NSPE-S561M6.3V8X10.8TR15F  | 560          |                    | 8X10.8                  | 706                                              | 16                              | 3150                                            |
| NSPE-S681M6.3V10X10.8TR15F | 680          |                    | 10X10.8                 | 857                                              | 15                              | 3890                                            |
| NSPE-S821M6.3V10X10.8TR15F | 820          |                    | 10X10.8                 | 1034                                             | 15                              | 3890                                            |
| NSPE-S102M6.3V10X10.8TR15F | 1000         |                    | 10X10.8                 | 1260                                             | 15                              | 3890                                            |

For Automotive Applications See Part Numbering System

\*Please review typical leakage current performance, as shown on NIC load life endurance test report.

### STANDARD PRODUCTS AND CASE SIZES D $\phi$ x L (mm)

| PART NUMBER               | Cap.<br>(μF) | Working<br>Voltage | Case Size<br>(D X L) mm | Max. Leakage<br>Current (μA)<br>After 2 minutes* | Max. ESR (mΩ)<br>AT 100kHz/20°C | Max. Ripple Current (mA rms)<br>AT 100kHz/105°C |
|---------------------------|--------------|--------------------|-------------------------|--------------------------------------------------|---------------------------------|-------------------------------------------------|
| NSPE-S330M10V6.3X6.3TR15F | 33           | 10                 | 6.3X6.3                 | 100                                              | 40                              | 1510                                            |
| NSPE-S470M10V6.3X6.3TR15F | 47           |                    | 6.3X6.3                 | 100                                              | 40                              | 1510                                            |
| NSPE-S680M10V6.3X6.3TR15F | 68           |                    | 6.3X6.3                 | 136                                              | 40                              | 1510                                            |
| NSPE-S101M10V6.3X8TR15F   | 100          |                    | 6.3X8                   | 200                                              | 35                              | 1910                                            |
| NSPE-S101M10V8X10.8TR15F  |              |                    | 8x10.8                  | 200                                              | 18                              | 2800                                            |
| NSPE-S151M10V6.3X8TR15F   | 150          |                    | 6.3x8                   | 300                                              | 35                              | 1910                                            |
| NSPE-S151M10V8X10.8TR15F  |              |                    | 8X10.8                  | 300                                              | 18                              | 2800                                            |
| NSPE-S221M10V8X10.8TR15F  | 220          |                    | 8X10.8                  | 440                                              | 18                              | 2800                                            |
| NSPE-S331M10V8X10.8TR15F  | 330          |                    | 8X10.8                  | 660                                              | 18                              | 2800                                            |
| NSPE-S471M10V10X10.8TR15F | 470          |                    | 10X10.8                 | 940                                              | 16                              | 3650                                            |
| NSPE-S561M10V10X10.8TR15F | 560          |                    | 10X10.8                 | 1120                                             | 16                              | 3650                                            |
| NSPE-S100M16V6.3X6.3TR15F | 10           | 16                 | 6.3X6.3                 | 100                                              | 54                              | 1130                                            |
| NSPE-S220M16V6.3X6.3TR15F | 22           |                    | 6.3X6.3                 | 100                                              | 54                              | 1130                                            |
| NSPE-S330M16V6.3X6.3TR15F | 33           |                    | 6.3X6.3                 | 106                                              | 54                              | 1130                                            |
| NSPE-S470M16V6.3X8TR15F   | 47           |                    | 6.3X8                   | 151                                              | 45                              | 1480                                            |
| NSPE-S470M16V8X10.8TR15F  | 47           |                    | 8X10.8                  | 151                                              | 22                              | 2290                                            |
| NSPE-S680M16V8X10.8TR15F  | 68           |                    | 8X10.8                  | 218                                              | 22                              | 2290                                            |
| NSPE-S101M16V8X10.8TR15F  | 100          |                    | 8X10.8                  | 320                                              | 22                              | 2290                                            |
| NSPE-S151M16V10X10.8TR15F | 150          |                    | 10X10.8                 | 480                                              | 20                              | 2920                                            |

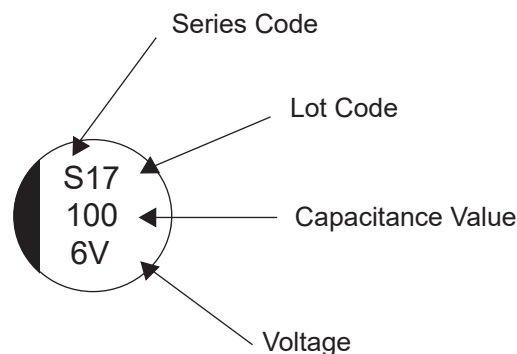
For Automotive Applications See Part Numbering System

\*Please review typical leakage current performance, as shown on NIC load life endurance test report.

### RIPPLE CURRENT FREQUENCY CORRECTION FACTORS

| Cap. $\mu$ F | 100Hz | 1KHz | 10KHz | 100KHz |
|--------------|-------|------|-------|--------|
| C $\leq$ 10  | 0.03  | 0.20 | 0.50  | 1.00   |
| > 10         | 0.05  | 0.20 | 0.50  | 1.00   |

### Part Marking



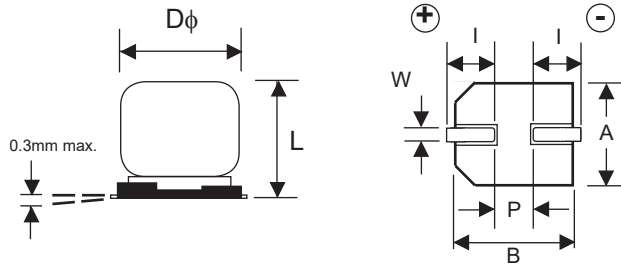
### PRECAUTIONS

Please review the notes on correct use, safety and precautions found at <https://www.niccomp.com/resource/files/aluminum/AlumApplInfoCautions.pdf>  
 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)



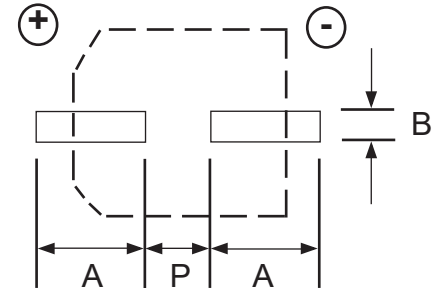
### DIMENSIONS (mm)

| Case Size | $D\phi \pm 0.5$ | L max. | A, B $\pm 0.2$ | W         | $l \pm 0.2$ | $P \pm 0.2$ |
|-----------|-----------------|--------|----------------|-----------|-------------|-------------|
| 6.3x6.3   | 6.3             | 6.3    | 6.6            | 0.5 ~ 0.8 | 2.5         | 2.2         |
| 6.3x8     | 6.3             | 8.0    | 6.6            | 0.5 ~ 0.8 | 2.5         | 2.2         |
| 8x10.8    | 8.0             | 10.8   | 8.3            | 0.7 ~ 1.0 | 2.9         | 3.2         |
| 10x10.8   | 10              | 10.8   | 10.3           | 1.0 ~ 1.4 | 3.2         | 4.6         |



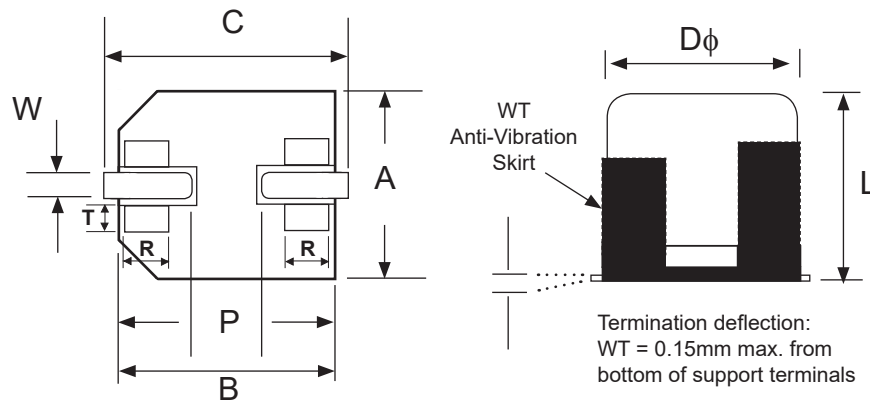
### LAND PATTERN DIM. (mm)

| Case Dia. | A   | B   | P   |
|-----------|-----|-----|-----|
| 6.3       | 3.5 | 1.8 | 2.1 |
| 8         | 4.1 | 2.1 | 2.8 |
| 10        | 4.4 | 2.5 | 4.3 |



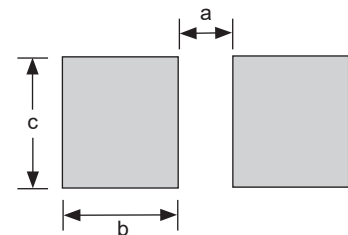
### WIDE TERMINATION DIM. (mm)

| Case Size   | $D\phi \pm 0.5$ | $L \pm 0.5$ | A, B           | $C \pm 0.2$ | P     | W         | R     | T     |
|-------------|-----------------|-------------|----------------|-------------|-------|-----------|-------|-------|
| 6.3x6.3WT   | 6.3             | 6.5         | $6.6 \pm 0.2$  | 7.3         | (2.2) | 0.5 ~ 0.8 | (1.7) | (0.7) |
| 6.3x8WT     | 6.3             | 8.2         | $6.6 \pm 0.2$  | 7.3         | (2.2) | 0.5 ~ 0.8 | (1.7) | (0.7) |
| 8 x 10.8WT  | 8.0             | 10.5        | $8.3 \pm 0.2$  | 9.0         | (3.2) | 0.7 ~ 1.0 | (0.7) | (1.3) |
| 10 x 10.8WT | 10.0            | 10.5        | $10.3 \pm 0.2$ | 11.0        | (4.6) | 1.0 ~ 1.4 | (0.7) | (1.3) |



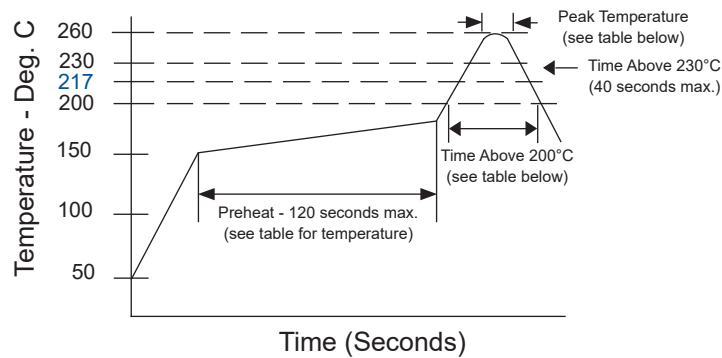
### WIDE TERMINATION LAND PATTERN DIM. (mm)

| Case Size | a   | b   | c   |
|-----------|-----|-----|-----|
| 6.3x6.3   | 1.6 | 4.0 | 3.0 |
| 6.3x8     | 1.6 | 4.0 | 3.0 |
| 8x10.8    | 2.5 | 4.5 | 4.7 |
| 10x10.8   | 3.8 | 4.8 | 4.7 |



| WT (Wide Terminations) Anti-Vibration Test |                                                                                                                                                                                               |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Method                                | Direction: X, Y, Z axis<br>Frequency & Duration: 5 to 2000Hz reciprocation for 20 minutes, 2 hours each direction<br>Peak to Peak Amplitude: 5mm<br>Peak Acceleration: 30G<br>Sweep Type: Log |
| $\Delta$ Capacitance                       | Within $\pm 10\%$ of initial value                                                                                                                                                            |
| Tangent of Loss                            | $\leq$ Specified value                                                                                                                                                                        |
| Leakage Current                            | $\leq$ Specified value                                                                                                                                                                        |

### RECOMMENDED REFLOW SOLDERING PROFILE



### PEAK TEMPERATURES AND DURATIONS

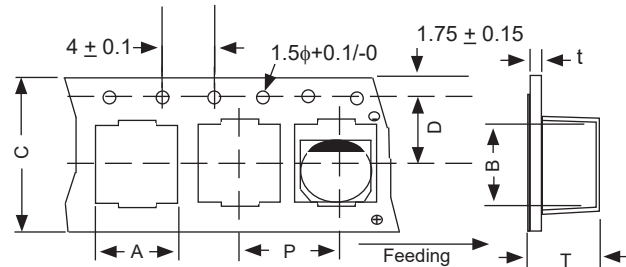
| Diameter   | Preheat<br>(120 sec. max.) | Time above<br>200°C | Time above<br>217°C | Time above<br>230°C | Peak<br>Temperature | Number<br>of Reflow Passes |
|------------|----------------------------|---------------------|---------------------|---------------------|---------------------|----------------------------|
| 6.3 ~ 10mm | 150°C ~ 190°C              | 100 sec. max.       | 80 sec. max.        | 40 sec. max.        | 250°C/5 sec.        | 2x*                        |
|            | 150°C ~ 180°C              | 60 sec. max.        | 50 sec. max.        | 40 sec. max.        | 260°C/instantaneous | 1x                         |

\*Two reflow passes are permissible with a cool down to room temperature required between the first and second pass.

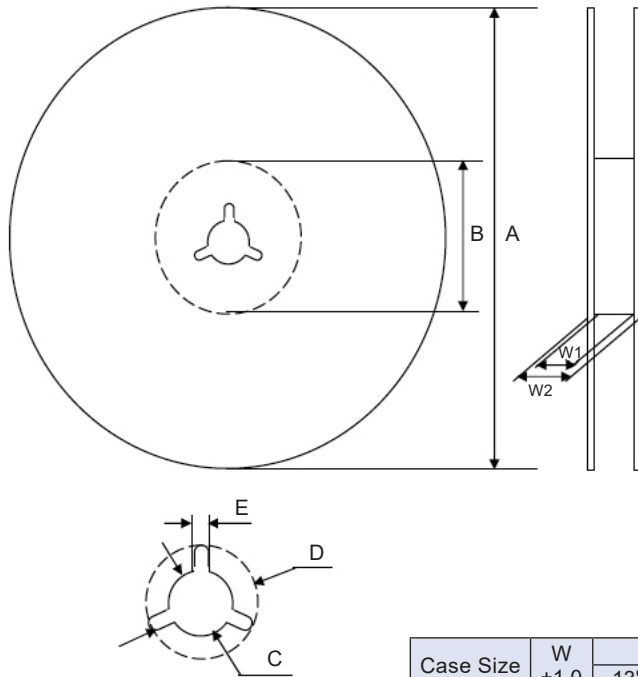
### TAPING SPECIFICATIONS (mm)

- Both Leader and Trailer tape: Minimum 40mm (1.57") empty carrier tape pockets.
- Leader tape: Approximately 20cm of cover tape at leader.
- Connection: Maximum 3 connections (slices) per reel.

| Case Size | A<br>±0.5 | B<br>±0.5 | C<br>±0.3 | D<br>±0.1 | P<br>±0.1 | T<br>±0.2 | t<br>max. |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 6.3x6.3   | 7.0       | 7.0       | 16.0      | 7.5       | 12.0      | 6.5       | 0.4       |
| 6.3x8     | 7.0       | 7.0       | 16.0      | 7.5       | 12.0      | 8.2       | 0.4       |
| 8x10.8    | 8.7       | 8.7       | 24.0      | 11.5      | 16.0      | 11.1      | 0.4       |
| 10x10.8   | 10.7      | 10.7      | 24.0      | 11.5      | 16.0      | 11.2      | 0.4       |



### Preferred V-Chip 15" (380mm) Reels (TR15 suffix)



#### Dimensions (mm)

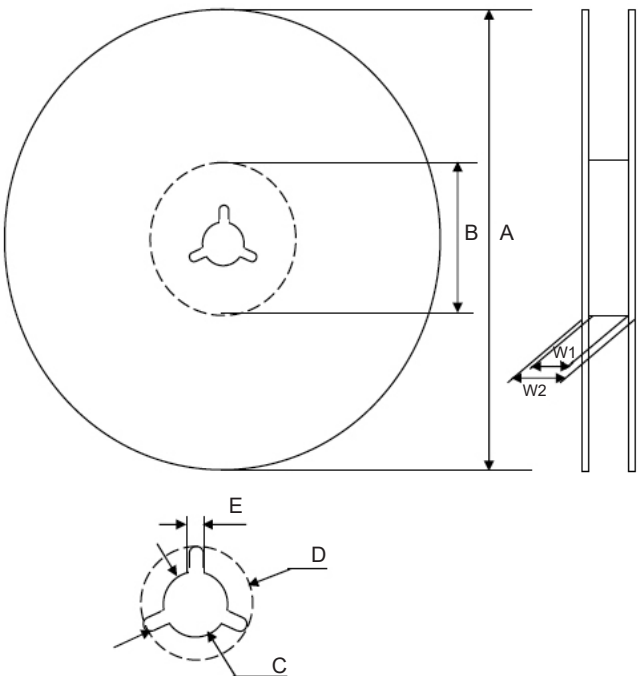
| Case Size       | Tape Width | W1          | W2          |
|-----------------|------------|-------------|-------------|
| 6.3x6.3, 6.3x8  | 16.0       | 16.5 ~ 18.5 | 19.5 ~ 24.0 |
| 8x10.5, 10x10.5 | 24.0       | 24.5 ~ 26.5 | 27.5 ~ 32.0 |

| Case Size       | Tape Width | A                     | B                  | C                      | D                      | E                |
|-----------------|------------|-----------------------|--------------------|------------------------|------------------------|------------------|
| 6.3x6.3, 6.3x8  | 16.0       | $\phi 380$<br>$\pm 2$ | $\phi 80 \sim 105$ | $\phi 13$<br>$\pm 0.5$ | $\phi 21$<br>$\pm 1.0$ | 2.0<br>$\pm 0.5$ |
| 8x10.5, 10x10.5 | 24.0       |                       |                    |                        |                        |                  |

| Color |
|-------|
| Black |

| Case Size | W<br>$\pm 1.0$ | Qty per Reel |             |
|-----------|----------------|--------------|-------------|
|           |                | 13" (330mm)  | 15" (380mm) |
| 6.3x6.3   | 18             | 800          | 1,000       |
| 6.3x8     | 18             | 500          | 900         |
| 8x10.8    | 26             | 300          | 500         |
| 10x10.8   | 26             | 300          | 500         |

### Optional V-Chip 13" (330mm) Reels (TR13 suffix)



#### Dimensions (mm)

| Case Size       | Tape Width | W1          | W2          |
|-----------------|------------|-------------|-------------|
| 6.3x6.3, 6.3x8  | 16.0       | 16.4 ~ 18.5 | 19.5 ~ 24.0 |
| 8x10.5, 10x10.5 | 24.0       | 24.4 ~ 26.5 | 27.5 ~ 32.0 |

| Case Size       | Tape Width | A                       | B                  | C                      | D                      | E                |
|-----------------|------------|-------------------------|--------------------|------------------------|------------------------|------------------|
| 6.3x6.3, 6.3x8  | 16.0       | $\phi 330$<br>$\pm 2.0$ | $\phi 50 \sim 105$ | $\phi 13$<br>$\pm 0.5$ | $\phi 21$<br>$\pm 1.0$ | 2.0<br>$\pm 0.5$ |
| 8x10.5, 10x10.5 | 24.0       |                         |                    |                        |                        |                  |

| Color |
|-------|
| Black |