

Surface Mount Aluminum Electrolytic Capacitors NACZ Series

FEATURES

- CYLINDRICAL V-CHIP CONSTRUCTION FOR SURFACE MOUNTING
- VERY LOW IMPEDANCE & HIGH RIPPLE CURRENT AT 100KHZ
- SUITABLE FOR DC-DC CONVERTER, DC-AC INVERTER, ETC.
- NEW EXPANDED CV RANGE, UP TO 6800μF
- NEW HIGH TEMPERATURE REFLOW "M1" VERSION
- DESIGNED FOR AUTOMATIC MOUNTING AND REFLOW SOLDERING

RoHS Compliant
includes all homogeneous materials

*See Part Number System for Details



CHARACTERISTICS

| | | | | | | | | |
|---|-------------------------------------|--|------|------|------|------|------|------|
| Rated Voltage Rating | 6.3 ~ 50Vdc | | | | | | | |
| Rated Capacitance Range | 4.7 ~ 6800μF | | | | | | | |
| Operating Temp. Range | -55 ~ +105°C | | | | | | | |
| Capacitance Tolerance | ±20% (M) | | | | | | | |
| Max. Leakage Current After 2 Minutes @ 20°C | 0.01CV Or 3μA, whichever is greater | | | | | | | |
| Tan δ @ 120Hz/20°C | W.V. (Vdc) | 6.3 | 10 | 16 | 25 | 35 | 50 | |
| | S.V. (Vdc) | 8.0 | 13 | 20 | 32 | 44 | 63 | |
| | φ4 ~ φ6.3mm Dia. | 0.24 | 0.20 | 0.16 | 0.14 | 0.12 | 0.10 | |
| | φ8 ~ φ16mm Dia. | C ≤ 1000μF | 0.28 | 0.24 | 0.20 | 0.16 | 0.14 | 0.14 |
| | | C = 1500μF | 0.29 | 0.25 | 0.21 | - | 0.14 | - |
| | | C = 2200μF | 0.30 | 0.26 | - | 0.18 | - | - |
| | | C = 3300μF | 0.32 | - | 0.24 | - | - | - |
| C = 4700μF | 0.34 | 0.30 | - | - | - | - | | |
| C = 6800μF | 0.38 | - | - | - | - | - | | |
| Low Temperature Stability Impedance Ratio @ 120Hz | W.V. (Vdc) | 6.3 | 10 | 16 | 25 | 35 | 50 | |
| | Z-40°C/Z+20°C | 3 | 2 | 2 | 2 | 2 | 2 | |
| | Z-55°C/Z+20°C | 5 | 4 | 4 | 3 | 3 | 3 | |
| Load Life Test @ 105°C 4 ~ 6mm Dia. 1,000 hours 8 ~ 12.5mm Dia. 2,000 hours | Capacitance Change | Within ±25% of initial measured value | | | | | | |
| | Tan δ | Less than ±200% of the specified maximum value | | | | | | |
| | Leakage Current | Less than the specified maximum value | | | | | | |

LOW IMPEDANCE AT HIGH FREQUENCY
INDUSTRY STANDARD
STYLE FOR SWITCHERS AND CONVERTERS

LOW ESR COMPONENT
LIQUID ELECTROLYTE
For Performance Data see www.LowESR.com

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

| Cap (μF) | Code | Working Voltage (Vdc) | | | | | |
|----------|------|-----------------------|---------|----------|----------|----------|----------|
| | | 6.3 | 10 | 16 | 25 | 35 | 50 |
| 4.7 | 4R7 | - | - | - | - | 4x6.3 | 4x6.3 |
| 10 | 100 | - | - | - | 4x6.3* | 5x6.3* | 6.3x6.3* |
| 15 | 150 | - | - | 4x6.3 | 6x6.3 | 5x6.3* | - |
| 22 | 220 | - | 4x6.3 | 5x6.3* | 5x6.3 | 5x6.3* | 6.3x6.3* |
| 27 | 270 | 4x6.3* | - | - | - | - | - |
| 33 | 330 | - | 5x6.3 | - | 6.3x6.3 | 6.3x6.3* | 6.3x8* |
| 47 | 470 | 5x6.3 | - | 6.3x6.3 | 6.3x6.3 | 6.3x6.3* | 6.3x8* |
| 56 | 560 | 5x6.3* | - | - | 6.3x6.3 | - | - |
| 68 | 680 | - | 6.3x6.3 | 6.3x6.3* | 6.3x6.3 | 6.3x8* | 8x10.5* |
| 100 | 101 | 6.3x6.3* | - | 6.3x6.3* | 6.3x8* | 8x10.5 | 8x10.5* |
| 120 | 121 | - | 6.3x6.3 | - | - | - | - |
| 150 | 151 | 6.3x6.3 | 6.3x6.3 | 6.3x8* | 8x10.5* | 8x10.5* | 10x10.5* |
| | | | | | | 10x8 | |
| 220 | 221 | 6.3x6.3 | 6.3x8 | 6.3x8* | 8x10.5* | 8x10.5 | 10x10.5 |
| | | | | | 10x8 | | |
| 330 | 331 | 6.3x8* | 8x10.5 | 8x10.5* | 8x10.5 | 10x10.5 | 12.5x14 |
| | | | | 10x8 | | | |
| 390 | 391 | - | - | - | - | - | 12.5x14 |
| 470 | 471 | 8x10.5 | 8x10.5 | 8x10.5 | 10x10.5* | 12.5x14 | 16x17 |
| | | | 10x8 | | | | |
| 680 | 681 | 8x10.5 | - | 10x10.5 | - | 12.5x14 | - |
| | | 10x8* | | | | | |
| 1000 | 102 | 8x10.5* | 10x10.5 | - | 12.5x14 | - | 16x17 |
| 1500 | 152 | 10x10.5* | - | 12.5x14 | - | 16x17 | - |
| 2200 | 222 | - | 12.5x14 | - | 16x17 | - | - |
| 3300 | 332 | 12.5x14 | - | 16x17 | - | - | - |
| 4700 | 472 | - | 16x17 | - | - | - | - |
| 6800 | 682 | 16x17 | - | - | - | - | - |

Denotes New Value



Surface Mount Aluminum Electrolytic Capacitors NACZ Series

STANDARD VALUES, CASE SIZES AND SPECIFICATIONS

| NIC Part Number* | Cap. (µF) | W.V. (Vdc) | Dissipation Factor (Tan δ) | Max. Ripple Current (mA) +105°C, 100KHz | Max. Impedance (Ω) +20°C, 100KHz | Load Life Hours @ +105°C | |
|--------------------------|-----------|------------|----------------------------|---|----------------------------------|--------------------------|-------|
| NACZ270M6.3V4X6.3TR13F | 27 | 6.3 | 0.24 | 80 | 1.80 | 1,000 | |
| NACZ470M6.3V5X6.3TR13F | 47 | | 0.24 | 150 | 0.76 | 1,000 | |
| NACZ560M6.3V5X6.3TR13F | 56 | | 0.24 | 150 | 0.76 | 1,000 | |
| NACZ101M6.3V6.3X6.3TR13F | 100 | | 0.24 | 230 | 0.44 | 1,000 | |
| NACZ151M6.3V6.3X6.3TR13F | 150 | | 0.24 | 230 | 0.44 | 1,000 | |
| NACZ221M6.3V6.3X6.3TR13F | 220 | | 0.24 | 230 | 0.44 | 1,000 | |
| NACZ331M6.3V6.3X8TR13F | 330 | | 0.24 | 280 | 0.34 | 1,000 | |
| NACZ471M6.3V8X10.5TR13F | 470 | | 0.28 | 450 | 0.17 | 2,000 | |
| NACZ681M6.3V8X10.5TR13F | 680 | | 0.28 | 450 | 0.17 | 2,000 | |
| NACZ681M6.3V10X8TR13F | | | | | | | |
| NACZ102M6.3V8X10.5TR13F | 1000 | | 0.28 | 450 | 0.17 | 2,000 | |
| NACZ152M6.3V10X10.5TR13F | 1500 | | 0.29 | 670 | 0.09 | 2,000 | |
| NACZ332M6.3V12.5X14TR15F | 3300 | | 0.32 | 900 | 0.066 | 2,000 | |
| NACZ682M6.3V16X17TR15F | 6800 | | 0.38 | 1250 | 0.052 | 2,000 | |
| NACZ220M10V4X6.3TR13F | 22 | 10 | 0.20 | 80 | 1.80 | 1,000 | |
| NACZ330M10V5X6.3TR13F | 33 | | 0.20 | 150 | 0.76 | 1,000 | |
| NACZ680M10V6.3X6.3TR13F | 68 | | 0.20 | 230 | 0.44 | 1,000 | |
| NACZ121M10V6.3X6.3TR13F | 120 | | 0.20 | 230 | 0.44 | 1,000 | |
| NACZ151M10V6.3X6.3TR13F | 150 | | 0.20 | 230 | 0.44 | 1,000 | |
| NACZ221M10V6.3X8TR13F | 220 | | 0.20 | 280 | 0.34 | 1,000 | |
| NACZ331M10V8X10.5TR13F | 330 | | 0.24 | 450 | 0.17 | 2,000 | |
| NACZ471M10V8X10.5TR13F | 470 | | 0.24 | 450 | 0.17 | 2,000 | |
| NACZ471M10V10X8TR13F | | | | | | | |
| NACZ102M10V10X10.5TR13F | 1000 | | 0.24 | 670 | 0.09 | 2,000 | |
| NACZ222M10V12.5X14TR15F | 2200 | | 0.26 | 900 | 0.066 | 2,000 | |
| NACZ472M10V16X17TR15F | 4700 | | 0.30 | 1250 | 0.052 | 2,000 | |
| NACZ150M16V4X6.3TR13F | 15 | | 16 | 0.16 | 80 | 1.80 | 1,000 |
| NACZ220M16V5X6.3TR13F | 22 | | | 0.16 | 150 | 0.76 | 1,000 |
| NACZ470M16V6.3X6.3TR13F | 47 | 0.16 | | 230 | 0.44 | 1,000 | |
| NACZ680M16V6.3X6.3TR13F | 68 | 0.16 | | 230 | 0.44 | 1,000 | |
| NACZ101M16V6.3X6.3TR13F | 100 | 0.16 | | 230 | 0.44 | 1,000 | |
| NACZ151M16V6.3X8TR13F | 150 | 0.16 | | 280 | 0.34 | 1,000 | |
| NACZ221M16V6.3X8TR13F | 220 | 0.16 | | 280 | 0.34 | 1,000 | |
| NACZ331M16V8X10.5TR13F | 330 | 0.20 | | 450 | 0.17 | 2,000 | |
| NACZ331M16V10X8TR13F | | | | | | | |
| NACZ471M16V8X10.5TR13F | 470 | 0.20 | | 450 | 0.17 | 2,000 | |
| NACZ681M16V10X10.5TR13F | 680 | 0.20 | | 670 | 0.09 | 2,000 | |
| NACZ152M16V12.5X14TR15F | 1500 | 0.21 | | 900 | 0.066 | 2,000 | |
| NACZ332M16V16X17TR15F | 3300 | 0.24 | | 1250 | 0.052 | 2,000 | |
| NACZ100M25V4X6.3TR13F | 10 | 25 | | 0.14 | 80 | 1.80 | 1,000 |
| NACZ150M25V6X6.3TR13F | 15 | | 0.14 | 150 | 0.76 | 1,000 | |
| NACZ220M25V5X6.3TR13F | 22 | | 0.14 | 150 | 0.76 | 1,000 | |
| NACZ330M25V6.3X6.3TR13F | 33 | | 0.14 | 230 | 0.44 | 1,000 | |
| NACZ470M25V6.3X6.3TR13F | 47 | | 0.14 | 230 | 0.44 | 1,000 | |
| NACZ560M25V6.3X6.3TR13F | 56 | | 0.14 | 230 | 0.44 | 1,000 | |
| NACZ680M25V6.3X6.3TR13F | 68 | | 0.14 | 230 | 0.44 | 1,000 | |
| NACZ101M25V6.3X8TR13F | 100 | | 0.14 | 280 | 0.34 | 1,000 | |
| NACZ151M25V8X10.5TR13F | 150 | | 0.16 | 450 | 0.17 | 2,000 | |
| NACZ221M25V8X10.5TR13F | 220 | | 0.16 | 450 | 0.17 | 2,000 | |
| NACZ221M25V10X8TR13F | | | | | | | |
| NACZ331M25V8X10.5TR13F | 330 | | 0.16 | 450 | 0.17 | 2,000 | |
| NACZ471M25V10X10.5TR13F | 470 | | 0.16 | 670 | 0.09 | 2,000 | |
| NACZ102M25V12.5X14TR15F | 1000 | | 0.16 | 900 | 0.066 | 2,000 | |
| NACZ222M25V16X17TR15F | 2200 | 0.18 | 1250 | 0.052 | 2,000 | | |
| NACZ4R7M35V4X6.3TR13F | 4.7 | 35 | 0.12 | 80 | 1.80 | 1,000 | |
| NACZ100M35V5X6.3TR13F | 10 | | 0.12 | 150 | 0.76 | 1,000 | |
| NACZ150M35V5X6.3TR13F | 15 | | 0.12 | 150 | 0.76 | 1,000 | |
| NACZ220M35V5X6.3TR13F | 22 | | 0.12 | 150 | 0.76 | 1,000 | |
| NACZ330M35V6.3X6.3TR13F | 33 | | 0.12 | 230 | 0.44 | 1,000 | |
| NACZ470M35V6.3X6.3TR13F | 47 | | 0.12 | 230 | 0.44 | 1,000 | |

*For Automotive Equipment and high temperature reflow version see part number system



Surface Mount Aluminum Electrolytic Capacitors NACZ Series

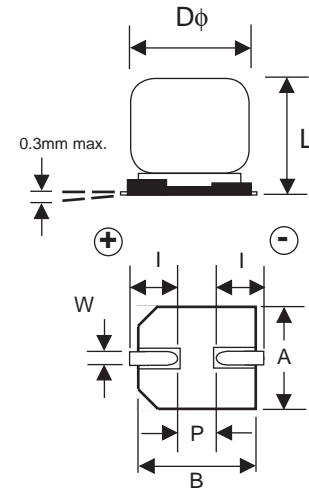
STANDARD VALUES, CASE SIZES AND SPECIFICATIONS

| NIC Part Number* | Cap. (μF) | W.V. (Vdc) | Dissipation Factor (Tan δ) | Max. Ripple Current (mA) +105°C, 100KHz | Max. Impedance (Ω) +20°C, 100KHz | Load Life Hours @ +105°C |
|-------------------------|-----------|------------|----------------------------|---|----------------------------------|--------------------------|
| NACZ680M35V6.3X8TR13F | 68 | 35 | 0.12 | 280 | 0.34 | 1,000 |
| NACZ101M35V8X10.5TR13F | 100 | | 0.14 | 450 | 0.17 | 2,000 |
| NACZ151M35V8X10.5TR13F | 150 | | 0.14 | 450 | 0.17 | 2,000 |
| NACZ151M35V10X8TR13F | | | 0.14 | 450 | 0.17 | 2,000 |
| NACZ221M35V8X10.5TR13F | 220 | | 0.14 | 450 | 0.17 | 2,000 |
| NACZ331M35V10X10.5TR13F | 330 | | 0.14 | 670 | 0.09 | 2,000 |
| NACZ471M35V12.5X14TR15F | 470 | | 0.14 | 900 | 0.066 | 2,000 |
| NACZ681M35V12.5X14TR15F | 680 | | 0.14 | 900 | 0.066 | 2,000 |
| NACZ152M35V16X17TR15F | 1500 | | 0.14 | 1250 | 0.052 | 2,000 |
| NACZ4R7M50V4X6.3TR13F | 4.7 | 50 | 0.10 | 60 | 2.90 | 1,000 |
| NACZ100M50V6.3X6.3TR13F | 10 | | 0.10 | 165 | 0.88 | 1,000 |
| NACZ220M50V6.3X6.3TR13F | 22 | | 0.10 | 165 | 0.88 | 1,000 |
| NACZ330M50V6.3X8TR13F | 33 | | 0.10 | 195 | 0.75 | 1,000 |
| NACZ470M50V6.3X8TR13F | 47 | | 0.10 | 195 | 0.75 | 1,000 |
| NACZ680M50V8X10.5TR13F | 68 | | 0.14 | 300 | 0.40 | 2,000 |
| NACZ101M50V8X10.5TR13F | 100 | | 0.14 | 300 | 0.40 | 2,000 |
| NACZ151M50V10X10.5TR13F | 150 | | 0.14 | 450 | 0.22 | 2,000 |
| NACZ221M50V10X10.5TR13F | 220 | | 0.14 | 450 | 0.22 | 2,000 |
| NACZ331M50V12.5X14TR15F | 330 | | 0.14 | 620 | 0.14 | 2,000 |
| NACZ391M50V12.5X14TR15F | 390 | | 0.14 | 620 | 0.14 | 2,000 |
| NACZ471M50V16X17TR15F | 470 | | 0.14 | 790 | 0.078 | 2,000 |
| NACZ102M50V16X17TR15F | 1000 | | 0.14 | 790 | 0.078 | 2,000 |

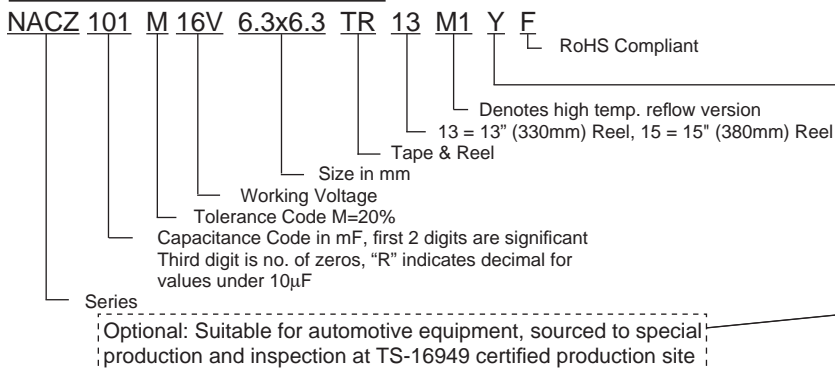
*For Automotive Equipment and high temperature reflow version see part number system

DIMENSIONS (mm)

| Case Size | φD±0.5 | L max. | A±0.2 | B±0.2 | I±0.3 | W | P±0.3 |
|-----------|--------|--------|-------|-------|-------|---------|-------|
| 4x6.3 | 4.0 | 6.3 | 4.3 | 4.3 | 1.8 | 0.5-0.8 | 1.0 |
| 5x6.3 | 5.0 | 6.3 | 5.3 | 5.3 | 2.2 | 0.5-0.8 | 1.4 |
| 6.3x6.3 | 6.3 | 6.3 | 6.6 | 6.6 | 2.5 | 0.5-0.8 | 2.2 |
| 6.3X8 | 6.3 | 8.0 | 6.6 | 6.6 | 2.5 | 0.5-0.8 | 2.2 |
| 8X10.5 | 8.0 | 10.5 | 8.3 | 8.3 | 2.9 | 0.7-1.0 | 3.2 |
| 10X8 | 10.0 | 8.0 | 10.3 | 10.3 | 3.2 | 1.1-1.4 | 4.6 |
| 10X10.5 | 10.0 | 10.5 | 10.3 | 10.3 | 3.2 | 1.1-1.4 | 4.6 |
| 12.5x14 | 12.5 | 14.0 | 12.8 | 12.8 | 4.5 | 1.1-1.4 | 4.6 |
| 16x17 | 16.0 | 17.0 | 16.3 | 16.3 | 5.0 | 1.8-2.1 | 7.0 |



PART NUMBER SYSTEM



| Case Diameter | Termination Material |
|---------------|----------------------|
| 4 ~ 12.5mm φ | 97% Sn, 3% Bi |
| 16mm | 100% Sn |



Surface Mount Aluminum Electrolytic Capacitors NACZ Series

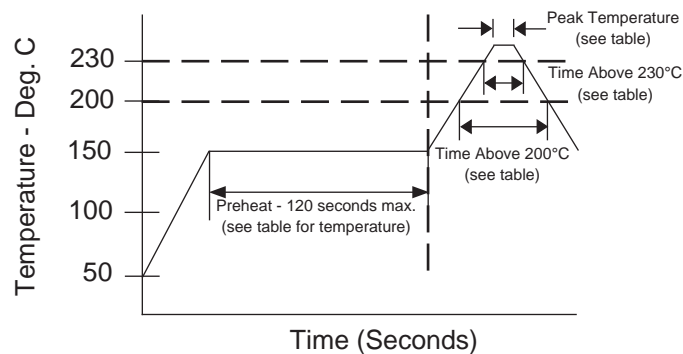
PEAK REFLOW SOLDERING TEMPERATURES AND DURATIONS (STANDARD VERSION)

| Case Size | Preheat: 150°C ~ 180°C | Max. Soldering Temperature | Max. Exposure Time at Max. Soldering Temperature | Max. Exposure Time Above +200°C | Multiple Reflow Exposure |
|-----------|---------------------------|-------------------------------|---|------------------------------------|-----------------------------|
| 4x6.3 | 120 seconds max. | +250°C | 5 seconds | 70 seconds | 2 times max. |
| 5x6.3 | 120 seconds max. | +250°C | 5 seconds | 70 seconds | 2 times max. |
| 6.3x6.3 | 120 seconds max. | +250°C | 5 seconds | 70 seconds | 2 times max. |
| 6.3x8 | 120 seconds max. | +250°C | 5 seconds | 70 seconds | 2 times max. |
| 8x10.5 | 120 seconds max. | +245°C | 5 seconds | 60 seconds | 2 times max. |
| 10x8 | 120 seconds max. | +240°C | 5 seconds | 50 seconds | 2 times max. |
| 10x10.5 | 120 seconds max. | +240°C | 5 seconds | 50 seconds | 2 times max. |
| 12.5x14 | 120 seconds max. | +240°C | 5 seconds | 50 seconds | 2 times max. |
| 16x17 | 120 seconds max. | +230°C | 5 seconds | 30 seconds | 2 times max. |

PEAK REFLOW SOLDERING TEMPERATURES AND DURATIONS (M1 VERSION)

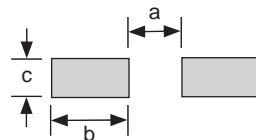
| Case Size | Preheat: 150°C ~ 180°C | Max. Soldering Temperature | Max. Exposure Time at Max. Soldering Temperature | Max. Exposure Time Above +200°C | Max. Exposure Time Above +230°C | Multiple Reflow Exposure |
|-----------|---------------------------|-------------------------------|---|------------------------------------|------------------------------------|-----------------------------|
| 4x6.3 | 120 seconds max. | +255°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |
| 5x6.3 | 120 seconds max. | +255°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |
| 6.3x6.3 | 120 seconds max. | +255°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |
| 6.3x8 | 120 seconds max. | +255°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |
| 8x10.5 | 120 seconds max. | +250°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |
| 10x8 | 120 seconds max. | +250°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |
| 10x10.5 | 120 seconds max. | +250°C | 5 seconds | 60 seconds | 30 seconds | 2 times max. |

RECOMMENDED REFLOW SOLDERING PROFILE



RECOMMENDED LAND PATTERN DIMENSIONS (mm)

| Case Size | a | b | c |
|-----------|-----|-----|-----|
| 4 φ | 1.0 | 2.6 | 1.8 |
| 5 φ | 1.4 | 3.0 | 1.8 |
| 6.3 φ | 2.1 | 3.5 | 1.8 |
| 8 φ | 2.8 | 4.1 | 2.1 |
| 10 φ | 4.3 | 4.4 | 2.5 |
| 12.5 φ | 4.3 | 5.8 | 2.5 |
| 16 φ | 6.6 | 6.5 | 5.0 |



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

Review & Compare Reflow Soldering Heat Limits
V-chip SMT Aluminum Electrolytic Capacitors
www.nicomp.com/RSL



Surface Mount Aluminum Electrolytic Capacitors NACZ Series

CARRIER TAPE

| Case Size | A ±0.5 | B ±0.2 | C ±0.3 | D ±0.1 | P ±0.1 | T ±0.2 |
|-----------|--------|--------|--------|--------|--------|--------|
| 4 x 6.3 | 4.7 | 4.7 | 12.0 | 5.5 | 8.0 | 6.6 |
| 5 x 6.3 | 5.7 | 5.7 | 12.0 | 5.5 | 12.0 | 6.6 |
| 6.3 x 6.3 | 7.0 | 7.0 | 16.0 | 7.5 | 12.0 | 6.6 |
| 6.3 x 8 | 7.0 | 7.0 | 16.0 | 7.5 | 12.0 | 8.3 |
| 8 X 10.5 | 8.7 | 8.7 | 24.0 | 11.5 | 16.0 | 11.1 |
| 10 x 8 | 10.7 | 10.7 | 24.0 | 11.5 | 16.0 | 8.3 |
| 10 x 10.5 | 10.7 | 10.7 | 24.0 | 11.5 | 16.0 | 11.2 |
| 12.5 x 14 | 13.2 | 13.2 | 32.0 | 14.2 | 24.0 | 14.2 |
| 16 x 17 | 17.5 | 17.5 | 44.0 | 20.2 | 28.0 | 17.5 |

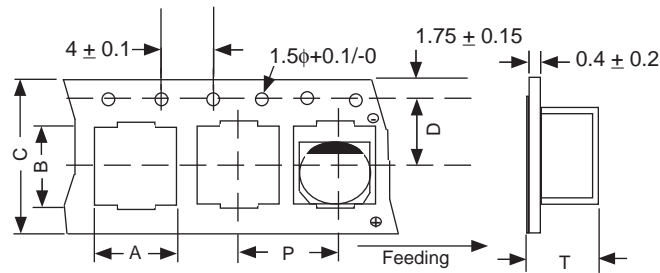
TR13 330mm (13") REEL TR15 380mm (15") REEL

| Case Size | W ±1.0 | Quantity Per Reel | |
|-----------|--------|-------------------|-----------|
| | | 13" Reel | 15" Reel |
| 4 x 6.3 | 14.0 | 1,200 pcs | 2,000 pcs |
| 5 x 6.3 | 14.0 | 800 pcs | 1,000 pcs |
| 6.3 x 6.3 | 18.0 | 800 pcs | 1,000 pcs |
| 6.3 x 8 | 18.0 | 500 pcs | 900 pcs |
| 8 X 10.5 | 26.0 | 300 pcs | 500 pcs |
| 10 x 8 | 26.0 | 400 pcs | 500 pcs |
| 10 x 10.5 | 26.0 | 300 pcs | 500 pcs |
| 12.5 x 14 | 34.0 | N/A | 250 pcs |
| 16 x 17 | 46.0 | N/A | 200 pcs |

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.

CARRIER



REEL

