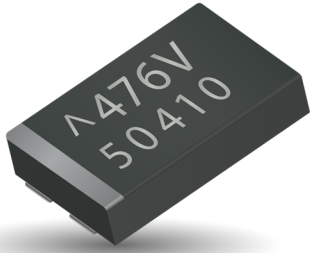


# TCN Series

## Highest CV/CC Conductive Polymer Chip Capacitors Undertab

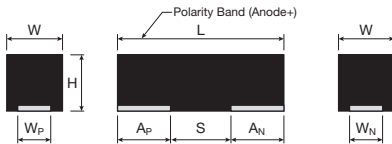


### FEATURES

- Highest CV/cc in Broad Range of Low Profiles
- Conductive Polymer Electrode
- Lower ESR
- Undertab Terminations Layout:
  - » High Volumetric Efficiency
  - » High PCB Assembly Density
  - » High Capacitance in Smaller Dimensions
- 3x reflow cycles according to J-STD-020
- 100% Surge Current Tested
- 8 Case Sizes Available

### APPLICATIONS

- Consumer Applications (e.g. Mobiles, MP3 etc.)
- Bulk Decoupling of SoC (System on Chip)

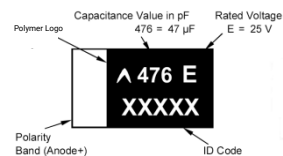


### CASE DIMENSIONS millimeters (inches)

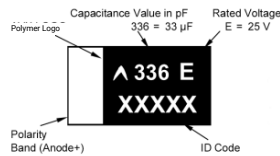
| Code | EIA Code | EIA Metric | L±0.20 (0.008)              | W±0.20 (0.008) -0.10 (0.004) | H max.       | Wp±0.10 (0.004) | Wn±0.10 (0.004) | Ap±0.10 (0.004)             | An±0.10 (0.004)             | S Min.       |
|------|----------|------------|-----------------------------|------------------------------|--------------|-----------------|-----------------|-----------------------------|-----------------------------|--------------|
| H    | 1210     | 3528-15    | 3.50 (0.138)                | 2.80 (0.110)                 | 1.50 (0.059) | 2.50 (0.098)    | 2.10 (0.083)    | 1.15 (0.045)                | 1.35 (0.053)                | 1.00 (0.039) |
| L    | 1210     | 3528-10    | 3.50 (0.138)                | 2.80 (0.110)                 | 1.00 (0.039) | 2.50 (0.098)    | 2.10 (0.083)    | 1.15 (0.045)                | 1.35 (0.053)                | 1.00 (0.039) |
| T    | 1210     | 3528-12    | 3.50 (0.138)                | 2.80 (0.110)                 | 1.20 (0.047) | 2.50 (0.098)    | 2.10 (0.083)    | 1.15 (0.045)                | 1.35 (0.053)                | 1.00 (0.039) |
| X    | 2917     | 7343-15    | 7.30 (0.287)                | 4.30 (0.169)                 | 1.50 (0.059) | 3.25 (0.128)    | 3.25 (0.128)    | 2.00 (0.079)                | 3.20 (0.126)                | 2.10 (0.083) |
| Y    | 2917     | 7343-20    | 7.30±0.30 (0.287±0.012)     | 4.30±0.30 (0.169±0.012)      | 2.00 (0.079) | 2.40 (0.094)    | 2.40 (0.094)    | 1.30±0.30 (0.051±0.012)     | 1.30±0.30 (0.051±0.012)     | 4.40 (0.173) |
| Z    | 2917     | 7343-15    | 7.30 ± 0.30 (0.287 ± 0.012) | 4.30 ± 0.30 (0.169 ± 0.012)  | 1.50 (0.059) | 2.40 (0.094)    | 2.40 (0.094)    | 1.30 ± 0.30 (0.051 ± 0.012) | 1.30 ± 0.30 (0.051 ± 0.012) | 4.40 (0.173) |
| 4    | 2924     | 7361-20    | 7.30 (0.287)                | 6.10 (0.240)                 | 2.00 (0.079) | 4.75 (0.187)    | 4.75 (0.187)    | 2.00 (0.079)                | 3.20 (0.126)                | 2.10 (0.083) |
| 8    | 2924     | 7360-20    | 7.30 ± 0.30 (0.287 ± 0.012) | 6.00 ± 0.30 (0.236 ± 0.012)  | 2.00 (0.079) | 4.45 (0.175)    | 4.45 (0.175)    | 1.60 ± 0.30 (0.063 ± 0.012) | 1.60 ± 0.30 (0.063 ± 0.012) | 3.80 (0.150) |

### MARKING

#### H, L, T, X, Y, Z CASE



#### 4, 8 CASE



### HOW TO ORDER

|                                                                                                                   |     |   |     |   |     |   |      |   |                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------|-----|---|-----|---|-----|---|------|---|-----------------------------------------------------------------------------------------------------------------------|
| Type                                                                                                              | TCN | T | 157 | M | 006 | R | 0200 | E | Additional Character                                                                                                  |
| Case Size                                                                                                         |     |   |     |   |     |   |      |   | E = Black Resin<br>(it is possible to order PN without "E" as identical product)                                      |
| See table above                                                                                                   |     |   |     |   |     |   |      |   |                                                                                                                       |
| Capacitance Code                                                                                                  |     |   |     |   |     |   |      |   | ESR in mΩ                                                                                                             |
| pF code: 1st two digits represent significant figures 3rd digit represents multiplier (number of zeros to follow) |     |   |     |   |     |   |      |   | Packaging                                                                                                             |
| Tolerance                                                                                                         |     |   |     |   |     |   |      |   | R = Pure Tin 7" Reel<br>S = Pure Tin 13" Reel<br>A= NiPdAu 7" Reel<br>B= NiPdAu 13" Reel<br>A,B = only case 8 and Z   |
| M = ± 20%                                                                                                         |     |   |     |   |     |   |      |   | Rated DC Voltage                                                                                                      |
|                                                                                                                   |     |   |     |   |     |   |      |   | 006 = 6.3Vdc    025 = 25Vdc<br>010 = 10Vdc    035 = 35Vdc<br>016 = 16Vdc    040 = 40Vdc<br>020 = 20Vdc    050 = 50Vdc |

# TCN Series

## Highest CV/CC Conductive Polymer Chip Capacitors Undertab



### TECHNICAL SPECIFICATIONS

|                            |                             |                                                              |    |    |    |    |    |    |    |  |
|----------------------------|-----------------------------|--------------------------------------------------------------|----|----|----|----|----|----|----|--|
| Technical Data:            |                             | All technical data relate to an ambient temperature of +25°C |    |    |    |    |    |    |    |  |
| Capacitance Range:         |                             | 4.7 $\mu$ F to 1500 $\mu$ F                                  |    |    |    |    |    |    |    |  |
| Capacitance Tolerance:     |                             | $\pm$ 20%                                                    |    |    |    |    |    |    |    |  |
| Leakage Current DCL:       |                             | 0.1CV                                                        |    |    |    |    |    |    |    |  |
| Rated Voltage DC ( $V_R$ ) | $\leq +85^\circ\text{C}$ :  | 6.3                                                          | 10 | 16 | 20 | 25 | 35 | 40 | 50 |  |
| Category Voltage ( $V_C$ ) | $\leq +105^\circ\text{C}$ : | 5                                                            | 8  | 13 | 16 | 20 | 28 | 32 | 40 |  |
| Surge Voltage ( $V_S$ )    | $\leq +85^\circ\text{C}$ :  | 8                                                            | 13 | 21 | 26 | 33 | 46 | 52 | 65 |  |
| Surge Voltage ( $V_S$ )    | $\leq +105^\circ\text{C}$ : | 6                                                            | 10 | 16 | 20 | 25 | 35 | 40 | 50 |  |
| Temperature Range:         |                             | -55°C to +105°C                                              |    |    |    |    |    |    |    |  |

NOTE: Conductive Polymer Capacitors are designed to operate within the limits of the environmental conditions specified for each series. If operated continuously at their maximum temperature and / or humidity limit, or beyond these limits, capacitors may exhibit a parametric shift in capacitance and increases in ESR. These changes may occur earlier if the specified environmental conditions are exceeded. Similarly, their normal operational time period will be significantly extended if their general duty cycle includes operation below maximum temperature within humidity controlled environments. Careful attention should be paid to maximum temperature with associated high humidity environments as well as voltage derating, ripple current and current surges. Please reference the KYOCERA AVX Conductive Polymer Capacitor Guidelines for more information or contact factory for application assistance.

### CAPACITANCE AND RATED VOLTAGE RANGE (LETTER DENOTES CASE SIZE)

| Capacitance |      | Rated Voltage DC to 85°C / 0.66DC to 105°C |         |               |         |             |                           |             |         |
|-------------|------|--------------------------------------------|---------|---------------|---------|-------------|---------------------------|-------------|---------|
| $\mu$ F     | Code | 6.3V (J)                                   | 10V (A) | 16V (C)       | 20V (D) | 25V (E)     | 35V (V)                   | 40V (G)     | 50V (T) |
| 4.7         | 475  |                                            |         |               |         |             | T(200)                    |             |         |
| 10          | 106  |                                            |         |               |         |             | T(150, 200)               |             |         |
| 22          | 226  |                                            |         |               |         | T(200)      |                           |             |         |
| 33          | 336  |                                            |         | L(200)/T(200) |         | H(250)      |                           |             | 4(200)  |
| 47          | 476  |                                            |         | T(150)        |         | X(100)      | X(100,150)/<br>Z(100,150) | Z(100, 150) |         |
| 56          | 566  |                                            |         |               |         |             | Z(100,150)                |             |         |
| 68          | 686  |                                            |         |               |         |             | Y(100,150)                |             |         |
| 100         | 107  |                                            |         |               | Z(100)  | 4(100)      | 4(100)/8(100)             |             |         |
| 150         | 157  | T(200)                                     |         | X(100)        |         | 4(70)/8(70) |                           |             |         |
| 220         | 227  |                                            |         | 4(70)         | 4(100)  | 4(100)      |                           |             |         |
| 330         | 337  |                                            |         | 4(70)/8(70)   | 4(100)  |             |                           |             |         |
| 470         | 477  | X(50)                                      |         | 4(70,100)     |         |             |                           |             |         |
| 680         | 687  |                                            | 4(70)   |               |         |             |                           |             |         |
| 1000        | 108  | X(200)/4(55)                               |         |               |         |             |                           |             |         |
| 1500        | 158  | 4(55)                                      |         |               |         |             |                           |             |         |

Released ratings, (ESR ratings in mOhms in parentheses)

Engineering Samples - Please Contact KYOCERA AVX

Note: Voltage ratings are minimum values. KYOCERA AVX reserves the right to supply higher voltage ratings in the same case size, to the same reliability standards.

# TCN Series

## Highest CV/CC Conductive Polymer Chip Capacitors Undertab



### RATINGS & PART NUMBER REFERENCE

| Part Number       | Case Size | Capacitance (μF) | Rated Voltage (V) | Maximum Operating Temperature (°C) | DCL Max. (μA) | DF Max. (%) | ESR Max. @ 100kHz (mΩ) | 100kHz RMS Current (mA) |      |       | Product Category | MSL |
|-------------------|-----------|------------------|-------------------|------------------------------------|---------------|-------------|------------------------|-------------------------|------|-------|------------------|-----|
|                   |           |                  |                   |                                    |               |             |                        | 45°C                    | 85°C | 105°C |                  |     |
| 6.3 Volt          |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCNT157M006#0200E | T         | 150              | 6.3               | 105                                | 90            | 10          | 200                    | 700                     | 500  | 300   | 3                | 4   |
| TCNX477M006#0050E | X         | 470              | 6.3               | 85                                 | 282           | 10          | 50                     | 1900                    | 1300 | —     | 5                | 5   |
| TCNX108M006#0200E | X         | 1000             | 6.3               | 85                                 | 600           | 30          | 200                    | 900                     | 600  | —     | 5                | 5   |
| TCN4108M006#0055E | 4         | 1000             | 6.3               | 85                                 | 600           | 20          | 55                     | 1860                    | 1302 | —     | 5                | 4   |
| TCN4158M006#0055E | 4         | 1500             | 6.3               | 85                                 | 900           | 20          | 55                     | 1860                    | 1302 | —     | 5                | 4   |
| 10 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCN4687M010#0070E | 4         | 680              | 10                | 105                                | 680           | 20          | 70                     | 1650                    | 1155 | 660   | 3                | 4   |
| 16 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCNL336M016#0200E | L         | 33               | 16                | 85                                 | 52.8          | 6           | 200                    | 700                     | 500  | -     | 5                | 5   |
| TCNT336M016#0200E | T         | 33               | 16                | 105                                | 52.8          | 6           | 200                    | 700                     | 500  | 300   | 3                | 4   |
| TCNT476M016#0150E | T         | 47               | 16                | 105                                | 75.2          | 6           | 150                    | 800                     | 600  | 400   | 3                | 4   |
| TCNX157M016#0100E | X         | 150              | 16                | 105                                | 240           | 6           | 100                    | 1300                    | 900  | 600   | 3                | 4   |
| TCN4227M016#0070E | 4         | 220              | 16                | 105                                | 352           | 20          | 70                     | 1650                    | 1155 | 660   | 2                | 4   |
| TCN4337M016#0070E | 4         | 330              | 16                | 105                                | 528           | 20          | 70                     | 1650                    | 1155 | 660   | 3                | 4   |
| TCN8337M016#0070E | 8         | 330              | 16                | 105                                | 528           | 20          | 70                     | 1650                    | 1155 | 660   | 3                | 4   |
| TCN4477M016#0070E | 4         | 470              | 16                | 105                                | 752           | 20          | 70                     | 1650                    | 1155 | 660   | 3                | 4   |
| TCN4477M016#0100E | 4         | 470              | 16                | 105                                | 752           | 20          | 100                    | 1380                    | 966  | 552   | 3                | 4   |
| 20 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCNZ107M020#0100E | Z         | 100              | 20                | 105                                | 200           | 8           | 100                    | 1300                    | 900  | 600   | 3                | 4   |
| TCN4227M020#0100E | 4         | 220              | 20                | 85                                 | 440           | 10          | 100                    | 1380                    | 966  | —     | 5                | 4   |
| TCN4337M020#0100E | 4         | 330              | 20                | 105                                | 660           | 20          | 100                    | 1380                    | 966  | 552   | 3                | 4   |
| 25 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCNT226M025#0200E | T         | 22               | 25                | 105                                | 55            | 6           | 200                    | 700                     | 500  | 300   | 3                | 4   |
| TCNH336M025#0250E | H         | 33               | 25                | 105                                | 82.5          | 10          | 250                    | 600                     | 400  | 300   | 3                | 4   |
| TCNX476M025#0100E | X         | 47               | 25                | 105                                | 117.5         | 6           | 100                    | 1300                    | 900  | 600   | 2                | 5   |
| TCN4107M025#0100E | 4         | 100              | 25                | 105                                | 250           | 6           | 100                    | 1380                    | 966  | 552   | 2                | 4   |
| TCN4157M025#0070E | 4         | 150              | 25                | 105                                | 375           | 6           | 70                     | 1650                    | 1155 | 660   | 2                | 4   |
| TCN8157M025#0070E | 8         | 150              | 25                | 105                                | 375           | 8           | 70                     | 1650                    | 1155 | 660   | 2                | 3   |
| TCN4227M025#0100E | 4         | 220              | 25                | 105                                | 550           | 10          | 100                    | 1380                    | 966  | 552   | 3                | 4   |
| 35 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCNT475M035#0200E | T         | 4.7              | 35                | 105                                | 16.5          | 10          | 200                    | 700                     | 500  | 300   | 3                | 4   |
| TCNT106M035#0150E | T         | 10               | 35                | 105                                | 35            | 10          | 150                    | 800                     | 600  | 400   | 3                | 4   |
| TCNT106M035#0200E | T         | 10               | 35                | 105                                | 35            | 10          | 200                    | 700                     | 500  | 300   | 3                | 4   |
| TCNX476M035#0100E | X         | 47               | 35                | 105                                | 165           | 10          | 100                    | 1300                    | 900  | 600   | 3                | 4   |
| TCNX476M035#0150E | X         | 47               | 35                | 105                                | 165           | 10          | 150                    | 1100                    | 800  | 500   | 3                | 4   |
| TCNZ476M035#0100E | Z         | 47               | 35                | 105                                | 165           | 10          | 100                    | 1300                    | 900  | 600   | 3                | 4   |
| TCNZ476M035#0150E | Z         | 47               | 35                | 105                                | 165           | 10          | 150                    | 1100                    | 800  | 500   | 3                | 4   |
| TCNZ566M035#0100E | Z         | 56               | 35                | 105                                | 196           | 10          | 100                    | 1300                    | 900  | 600   | 3                | 4   |
| TCNZ566M035#0150E | Z         | 56               | 35                | 105                                | 196           | 10          | 150                    | 1100                    | 800  | 500   | 3                | 4   |
| TCNY686M035#0100E | Y         | 68               | 35                | 105                                | 238           | 10          | 100                    | 1400                    | 1000 | 600   | 3                | 4   |
| TCNY686M035#0150E | Y         | 68               | 35                | 105                                | 238           | 10          | 150                    | 1100                    | 800  | 500   | 3                | 4   |
| TCN4107M035#0100E | 4         | 100              | 35                | 105                                | 350           | 10          | 100                    | 1380                    | 966  | 552   | 2                | 3   |
| TCN8107M035#0100E | 8         | 100              | 35                | 105                                | 350           | 10          | 100                    | 1380                    | 966  | 552   | 2                | 3   |
| 40 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCNZ476M040#0100E | Z         | 47               | 40                | 105                                | 188           | 10          | 100                    | 1300                    | 900  | 600   | 3                | 4   |
| TCNZ476M040#0150E | Z         | 47               | 40                | 105                                | 188           | 10          | 150                    | 1100                    | 800  | 500   | 3                | 4   |
| 50 Volt           |           |                  |                   |                                    |               |             |                        |                         |      |       |                  |     |
| TCN4336M050#0200E | 4         | 33               | 50                | 85                                 | 165           | 12          | 200                    | 970                     | 679  | -     | 5                | 3   |

Moisture Sensitivity Level (MSL) is defined according to J-STD-020.

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts.

DCL is measured at rated voltage after 5 minutes.

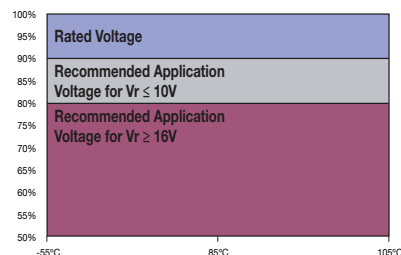
ESR allowed to move up to 1.25 times catalog limit post mounting. For typical weight and composition see page 253.

NOTE: KYOCERA AVX reserves the right to supply higher voltage ratings in the same case size to the same reliability standards.

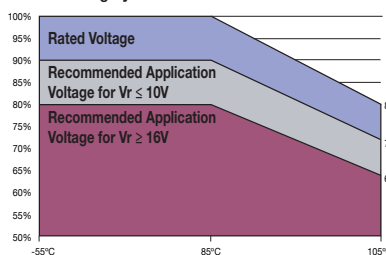
### RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of Vr

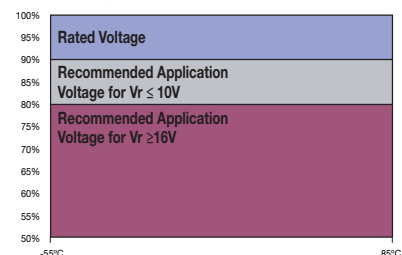
Product Category 2



Product Category 3



Product Category 5



# TCN Series

## Highest CV/CC Conductive Polymer Chip Capacitors Undertab



### PRODUCT CATEGORY 2, 3 (TEMPERATURE RANGE -55°C TO +105°C)

| TEST                  | Condition                                                                                                                                                                                                                                                                                                                       |               |               | Characteristics            |                                                                                                |           |       |           |            |       |  |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|----------------------------|------------------------------------------------------------------------------------------------|-----------|-------|-----------|------------|-------|--|
| Endurance             | Apply rated voltage (Ur) at 85°C for 2000 hours through a circuit impedance of ≤0.1Ω/V (all CATEGORIES). And / or apply rated voltage (Ur) (CATEGORY 2) or 0.8x rated voltage (CATEGORY 3) at 105°C for 2000 hours through a circuit impedance of ≤0.1Ω/V. Always stabilize at room temperature for 1-2 hours before measuring. |               |               | Visual examination         | no visible damage                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL                        | 1.25 x initial limit                                                                           |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ΔC/C                       | within ±20% of initial value                                                                   |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DF                         | 1.5 x initial limit                                                                            |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ESR                        | 2 x initial limit                                                                              |           |       |           |            |       |  |
| Storage Life          | Store at 105°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.                                                                                                                                                                                                               |               |               | Visual examination         | no visible damage                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL (V <sub>R</sub> ≤ 75V) | 1.25 x initial limit                                                                           |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL (V <sub>R</sub> > 75V) | 2 x initial limit                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ΔC/C                       | within ±20% of initial value                                                                   |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DF                         | 1.5 x initial limit                                                                            |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ESR                        | 2 x initial limit                                                                              |           |       |           |            |       |  |
| Humidity              | Store at 65°C and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.                                                                                                                                                                      |               |               | Visual examination         | no visible damage                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL                        | 3 x initial limit                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ΔC/C                       | within +30/-20% of initial value                                                               |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DF                         | 1.5 x initial limit                                                                            |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ESR                        | 2 x initial limit                                                                              |           |       |           |            |       |  |
| Temperature Stability | Step                                                                                                                                                                                                                                                                                                                            | Temperature°C | Duration(min) |                            | +20°C                                                                                          | -55°C     | +20°C | +85°C     | +105°C     | +20°C |  |
|                       | 1                                                                                                                                                                                                                                                                                                                               | +20           | 15            |                            |                                                                                                |           |       |           |            |       |  |
|                       | 2                                                                                                                                                                                                                                                                                                                               | -55           | 15            | DCL                        | IL*                                                                                            | n/a       | IL*   | 10 x IL*  | 12.5 x IL* | IL*   |  |
|                       | 3                                                                                                                                                                                                                                                                                                                               | +20           | 15            |                            |                                                                                                |           |       |           |            |       |  |
|                       | 4                                                                                                                                                                                                                                                                                                                               | +85           | 15            | ΔC/C                       | n/a                                                                                            | +0/-20%   | ±5%   | +20/-0%   | +30/-0%    | ±5%   |  |
|                       | 5                                                                                                                                                                                                                                                                                                                               | +105          | 15            |                            |                                                                                                |           |       |           |            |       |  |
|                       | 6                                                                                                                                                                                                                                                                                                                               | +20           | 15            | DF                         | IL*                                                                                            | 1.5 x IL* | IL*   | 1.5 x IL* | 2 x IL*    | IL*   |  |
| Surge Voltage         | Apply 1.3x rated voltage (Ur) at 105°C for CATEGORY 2, or apply 1.3x 0.8x rated voltage (Ur) at 105°C for CATEGORY 3 for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000Ω                                                                                 |               |               | Visual examination         | no visible damage                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL                        | initial limit                                                                                  |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ΔC/C                       | within +10/-20% of initial value for Vr ≤ 10V<br>within +20/-30% of initial value for Vr ≥ 16V |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DF                         | 1.25 x initial limit                                                                           |           |       |           |            |       |  |
| Mechanical Shock      | MIL-STD-202, Method 213, Condition C                                                                                                                                                                                                                                                                                            |               |               | Visual examination         | no visible damage                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL                        | initial limit                                                                                  |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ΔC/C                       | within ±5% of initial value                                                                    |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DF                         | initial limit                                                                                  |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ESR                        | 1.25 x initial limit                                                                           |           |       |           |            |       |  |
| Vibration             | MIL-STD-202, Method 204, Condition D                                                                                                                                                                                                                                                                                            |               |               | Visual examination         | no visible damage                                                                              |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DCL                        | initial limit                                                                                  |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ΔC/C                       | within ±5% of initial value                                                                    |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | DF                         | initial limit                                                                                  |           |       |           |            |       |  |
|                       |                                                                                                                                                                                                                                                                                                                                 |               |               | ESR                        | 1.25 x initial limit                                                                           |           |       |           |            |       |  |

\*Initial Limit

Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.

# TCN Series

## Highest CV/CC Conductive Polymer Chip Capacitors Undertab



### PRODUCT CATEGORY 5 (TEMPERATURE RANGE -55°C TO +85°C)

| TEST                         | Condition                                                                                                                                                                |               |               | Characteristics    |                                                                                                            |           |           |           |           |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|--------------------|------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|
| <b>Endurance</b>             | Apply rated voltage (Ur) at 85°C for 2000 hours through a circuit impedance of $\leq 0.1\Omega/V$ . Stabilize at room temperature for 1-2 hours before measuring.        |               |               | Visual examination | no visible damage                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DCL                | 1.25 x initial limit                                                                                       |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | $\Delta C/C$       | within $\pm 20\%$ of initial value                                                                         |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DF                 | 1.5 x initial limit                                                                                        |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | ESR                | 2 x initial limit                                                                                          |           |           |           |           |
| <b>Storage Life</b>          | Store at 85°C, no voltage applied, for 2000 hours. Stabilize at room temperature for 1-2 hours before measuring.                                                         |               |               | Visual examination | no visible damage                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DCL                | 1.25 x initial limit                                                                                       |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | $\Delta C/C$       | within $\pm 20\%$ of initial value                                                                         |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DF                 | 1.5 x initial limit                                                                                        |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | ESR                | 2 x initial limit                                                                                          |           |           |           |           |
| <b>Humidity</b>              | Store at 65°C and 95% relative humidity for 500 hours, with no applied voltage. Stabilize at room temperature and humidity for 1-2 hours before measuring.               |               |               | Visual examination | no visible damage                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DCL                | 5 x initial limit                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | $\Delta C/C$       | within +40/-20% of initial value                                                                           |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DF                 | 1.5 x initial limit                                                                                        |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | ESR                | 2 x initial limit                                                                                          |           |           |           |           |
| <b>Temperature Stability</b> | Step                                                                                                                                                                     | Temperature°C | Duration(min) |                    | +20°C                                                                                                      | -55°C     | +20°C     | +85°C     | +20°C     |
|                              | 1                                                                                                                                                                        | +20           | 15            |                    |                                                                                                            |           |           |           |           |
|                              | 2                                                                                                                                                                        | -55           | 15            | DCL                | IL*                                                                                                        | n/a       | IL*       | 10 x IL*  | IL*       |
|                              | 3                                                                                                                                                                        | +20           | 15            | $\Delta C/C$       | n/a                                                                                                        | +0/-20%   | $\pm 5\%$ | +20/-0%   | $\pm 5\%$ |
|                              | 4                                                                                                                                                                        | +85           | 15            | DF                 | IL*                                                                                                        | 1.5 x IL* | IL*       | 1.5 x IL* | IL*       |
|                              | 5                                                                                                                                                                        | +20           | 15            |                    |                                                                                                            |           |           |           |           |
| <b>Surge Voltage</b>         | Apply 1.3x rated voltage (Ur) at 85°C for 1000 cycles of duration 6 min (30 sec charge, 5 min 30 sec discharge) through a charge / discharge resistance of 1000 $\Omega$ |               |               | Visual examination | no visible damage                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DCL                | initial limit                                                                                              |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | $\Delta C/C$       | within +10/-20% of initial value for $V_r \leq 10V$<br>within +20/-30% of initial value for $V_r \geq 16V$ |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DF                 | 1.25 x initial limit                                                                                       |           |           |           |           |
| <b>Mechanical Shock</b>      | MIL-STD-202, Method 213, Condition C                                                                                                                                     |               |               | Visual examination | no visible damage                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DCL                | initial limit                                                                                              |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | $\Delta C/C$       | within $\pm 5\%$ of initial value                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DF                 | initial limit                                                                                              |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | ESR                | 1.25 x initial limit                                                                                       |           |           |           |           |
| <b>Vibration</b>             | MIL-STD-202, Method 204, Condition D                                                                                                                                     |               |               | Visual examination | no visible damage                                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DCL                | initial limit                                                                                              |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | $\Delta C/C$       | within $\pm 5\%$ of initial value                                                                          |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | DF                 | initial limit                                                                                              |           |           |           |           |
|                              |                                                                                                                                                                          |               |               | ESR                | 1.25 x initial limit                                                                                       |           |           |           |           |

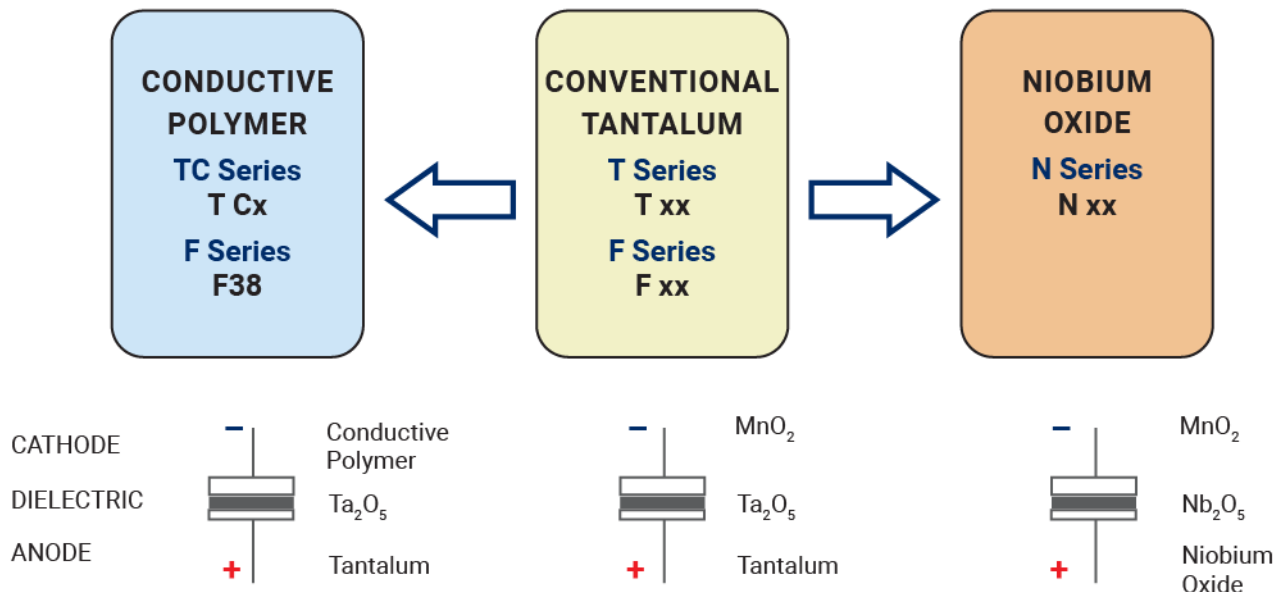
\*Initial Limit

Initial measurement max. 1hr after the removal from dry pack or after pretreatment at 85°C for 24 hours.

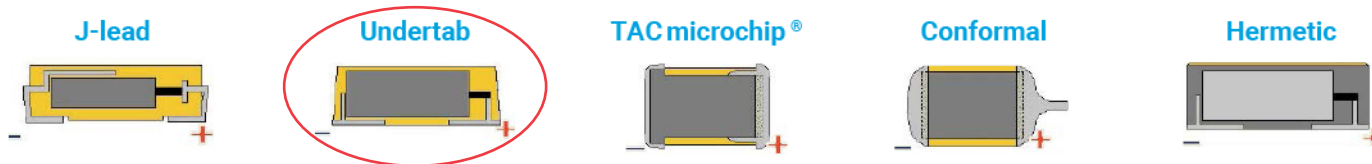
# TCN Series

## Highest CV/CC Conductive Polymer Chip Capacitors Undertab

### SOLID ELECTROLYTIC CAPACITOR ROADMAP



### FIVE CAPACITOR CONSTRUCTION STYLES



### SERIES LINE UP : Conductive Polymer

