

# TCS Series 85°C V- chip Aluminum Electrolytic Capacitor

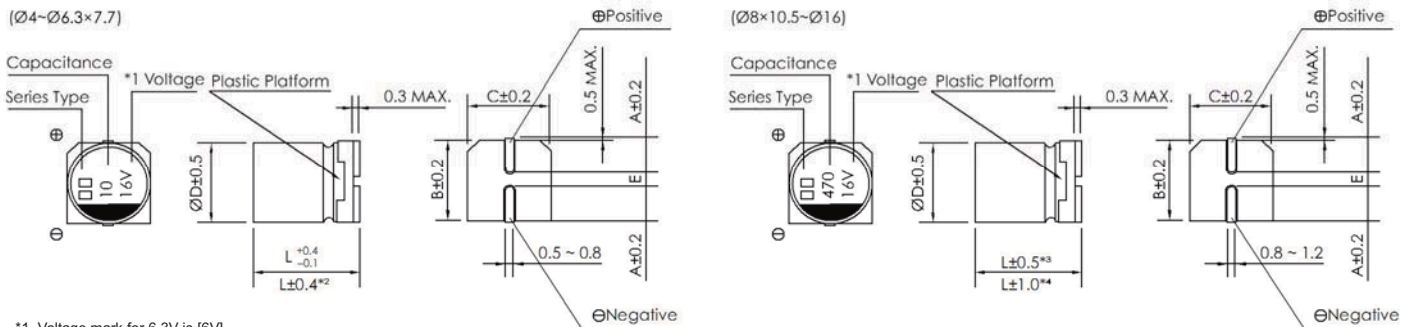
Designed for surface mounting on high density circuit board.  
 Operating with general temperature range -40~+85°C  
 Load life of 2000 hours  
 Comply with the RoHS directive



## SPECIFICATIONS

| Items                        | Characteristics  |  |   |   |      |      |      |      |        |         |         |         |
|------------------------------|--|--|---|---|------|------|------|------|--------|---------|---------|---------|
| Operation Temperature Range  | -40 ~ +85°C  |  |   |   |      |      |      |      |        |         |         |         |
| Voltage Range                | 4 ~ 450V   |  |   |   |      |      |      |      |        |         |         |         |
| Capacitance Range            | 0.1 ~ 6800μF   |  |   |   |      |      |      |      |        |         |         |         |
| Capacitance Tolerance        | ±20% at 120Hz, 20°C  |  |   |   |      |      |      |      |        |         |         |         |
| Leakage Current              | Rated Voltage  | 6.3 ~ 100V   | 160 ~ 450V                                  |   |      |      |      |      |        |         |         |         |
|                              | Case size  | ∅4~∅10   | ∅12.5~∅16                                   | ∅6.3~∅16                                    |      |      |      |      |        |         |         |         |
|                              | Time   | after 2 min. (application of rated voltage)                        | after 1 min. (application of rated voltage) | after 5 min. (application of rated voltage) |      |      |      |      |        |         |         |         |
|                              | Leakage current  | ≤0.01CV or 3μA, whichever is greater                               | ≤0.03CV or 4μA, whichever is greater        | ≤0.04CV+100μA, whichever is greater         |      |      |      |      |        |         |         |         |
| Dissipation Factor (tan δ)   | Measurement frequency : 120Hz, Temperature   |  |   |   |      |      |      |      |        |         |         |         |
|                              | Rated Voltage (V)  | 4  | 6.3   | 10  | 16   | 25   | 35   | 50   | 63     | 100     | 160~250 | 350~450 |
|                              | tan δ (max.)   | ∅4~∅10   | 0.42  | 0.28  | 0.24 | 0.20 | 0.14 | 0.12 | 0.12   | 0.10    | 0.10    | 0.20    |
| Stability at Low Temperature | Measurement frequency : 120Hz  |  |   |   |      |      |      |      |        |         |         |         |
|                              | Rated Voltage (V)  |  | 4   | 6.3   | 10   | 16   | 25   | 35   | 50~100 | 160~250 | 350~450 |         |
|                              | Impedance Ratio  | ∅4~∅10   | Z(-25°C)/Z(20°C)                            | 7   | 4    | 3    | 2    | 2    | 2      | 2       | 2       | 3       |
|                              |  |  | Z(-40°C)/Z(20°C)                            | 15  | 8    | 6    | 4    | 4    | 3      | 3       | 3       | 6       |
| ZT/Z20 (max.)                | ∅12.5~∅16  | Z(-25°C)/Z(20°C)   | 7   | 5   | 4    | 3    | 2    | 2    | 2      | 2       | 4       |         |
|                              |  | Z(-40°C)/Z(20°C)   | 17  | 12  | 10   | 8    | 5    | 4    | 3      | 6       | 10      |         |
| Load Life                    | After 2000 hours application of the rated voltage at 85°C, they meet the characteristics listed below.                                   |  |   |   |      |      |      |      |        |         |         |         |
|                              | Capacitance Change   | Within ±20% of initial value (Within ±30% of initial value for 4V) |   |   |      |      |      |      |        |         |         |         |
|                              | Dissipation Factor   | 200% or less of initial specified value                            |   |   |      |      |      |      |        |         |         |         |
|                              | Leakage Current  | initial specified value or less                                    |   |   |      |      |      |      |        |         |         |         |
| Shelf Life                   | After leaving capacitors under no load at 85°C for 1000 hours, they meet the specified value for load life characteristics listed above. |  |   |   |      |      |      |      |        |         |         |         |
| Resistance to Soldering Heat | After reflow soldering and restored at room temperature, they meet the characteristics listed below.                                     |  |   |   |      |      |      |      |        |         |         |         |
|                              | Capacitance Change   | Within ±10% of initial value                                       |   |   |      |      |      |      |        |         |         |         |
|                              | Dissipation Factor   | initial specified value or less                                    |   |   |      |      |      |      |        |         |         |         |
|                              | Leakage Current  | initial specified value or less                                    |   |   |      |      |      |      |        |         |         |         |
| Marking                      | Black print on the case top.   |  |   |   |      |      |      |      |        |         |         |         |

## DRAWING (Unit: mm)



\*1. Voltage mark for 6.3V is [6V]  
 \*2. Applicable to ∅6.3×7.7  
 \*3. Applicable to ∅8×10.5~∅10  
 \*4. Applicable to ∅12.5~∅16



**DIMENSIONS (Unit: mm)**

| ∅D x L  | 4 x 5.4 | 5 x 5.4 | 6.3 x 5.4 | 6.3 x 7.7 | 8 x 10.5 | 10 x 10.5 | 10 x 13.5 | 12.5 x 13.5 | 12.5 x 16 | 16 x 16.5 |
|---------|---------|---------|-----------|-----------|----------|-----------|-----------|-------------|-----------|-----------|
| A       | 2.0     | 2.2     | 2.6       | 2.6       | 3.0      | 3.3       | 3.3       | 4.9         | 4.9       | 5.8       |
| B       | 4.3     | 5.3     | 6.6       | 6.6       | 8.4      | 10.4      | 10.4      | 13.0        | 13.0      | 17.0      |
| C       | 4.3     | 5.3     | 6.6       | 6.6       | 8.4      | 10.4      | 10.4      | 13.0        | 13.0      | 17.0      |
| E ± 0.2 | 1.0     | 1.4     | 1.9       | 1.9       | 3.1      | 4.7       | 4.7       | 4.7         | 4.7       | 6.4       |
| L       | 5.4     | 5.4     | 5.4       | 7.7       | 10.5     | 10.5      | 13.5      | 13.5        | 16.0      | 16.5      |

**DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT**

•Case size ∅DxL(mm), ripple current (mA rms) at 85°C, 120Hz

| WV<br>Code |     | 4 V                      |                | 6.3V                       |                | 10 V                     |                | 16 V                                      |                       | 25 V                    |                |
|------------|-----|--------------------------|----------------|----------------------------|----------------|--------------------------|----------------|---|-----------------------|-------------------------|----------------|
| μF         |     | Size                     | Ripple current | Size                       | Ripple current | Size                     | Ripple current | Size                                      | Ripple current        | Size                    | Ripple current |
| 4.7        | 475 |                          |                |                            |                |                          |                |   |                       | 4 x 5.4                 | 19             |
| 10         | 106 |                          |                |                            |                |                          |                | 4 x 5.4                                   | 25                    | 5 x 5.4<br>(4 x 5.4)    | 28<br>(20)     |
| 15         | 156 |                          |                |                            |                |                          |                | 4 x 5.4                                   | 28                    | 5 x 5.4                 | 34             |
| 22         | 226 |                          |                | 4 x 5.4                    | 31             | 5 x 5.4<br>(4 x 5.4)     | 35<br>(28)     | 5 x 5.4<br>(4 x 5.4)                      | 39<br>(28)            | 6.3 x 5.4<br>(5 x 5.4)  | 52<br>(35)     |
| 33         | 336 | 4 x 5.4                  | 26             | 5 x 5.4<br>(4 x 5.4)       | 39<br>(31)     | 5 x 5.4<br>(4 x 5.4)     | 43<br>(32)     | 6.3 x 5.4<br>(5 x 5.4)                    | 57<br>(40)            | 6.3 x 5.4<br>(5 x 5.4)  | 63<br>(42)     |
| 47         | 476 | 4 x 5.4                  | 34             | 5 x 5.4<br>(4 x 5.4)       | 47<br>(36)     | 5 x 5.4                  | 43             | 6.3 x 5.4<br>(5 x 5.4)                    | 68<br>(44)            | 6.3 x 5.4               | 68             |
| 56         | 566 | 4 x 5.4                  | 39             | 5 x 5.4                    | 46             | 6.3 x 5.4                | 57             | 6.3 x 5.4                                 | 74                    | 6.3 x 5.4               | 82             |
| 68         | 686 | 5 x 5.4                  | 45             | 6.3 x 5.4<br>(5 x 5.4)     | 62<br>(52)     | 6.3 x 5.4                | 72             | 6.3 x 5.4                                 | 80                    | 6.3 x 5.4               | 94             |
| 100        | 107 | 5 x 5.4                  | 61             | 6.3 x 5.4<br>(5 x 5.4)     | 71<br>(55)     | 6.3 x 5.4<br>(5 x 5.4)   | 76<br>(70)     | 6.3 x 5.4                                 | 86                    | 6.3 x 7.7               | 130            |
| 150        | 157 | 6.3 x 5.4                | 74             | 6.3 x 5.4                  | 78             | 6.3 x 5.4                | 88             | 6.3 x 7.7                                 | 135                   | 8 x 10.5<br>(6.3 x 7.7) | 200<br>(130)   |
| 220        | 227 | 6.3 x 5.4                | 82             | 6.3 x 5.4                  | 95             | 6.3 x 7.7                | 150            | 8 x 10.5<br>(6.3 x 7.7)                   | 215<br>(150)          | 8 x 10.5                | 250            |
| 330        | 337 | 6.3 x 7.7                | 150            | 6.3 x 7.7                  | 150            | 8 x 10.5                 | 280            | 8 x 10.5                                  | 280                   | 10 x 10.5<br>(8 x 10.5) | 340<br>(310)   |
| 470        | 477 | 6.3 x 7.7                | 150            | 8 x 10.5<br>(6.3 x 7.7)    | 300<br>(150)   | 10 x 10.5<br>(8 x 10.5)  | 320<br>(300)   | 10 x 10.5<br>(8 x 10.5)                   | 420<br>(330)          | 10 x 10.5               | 400            |
| 680        | 687 | 8 x 10.5                 | 300            | 8 x 10.5                   | 300            | 10 x 10.5                | 380            | 10 x 10.5                                 | 450                   | 10 x 13.5               | 550            |
| 1000       | 108 | 8 x 10.5                 | 330            | 10 x 10.5<br>(8 x 10.5)    | 430<br>(330)   | 10 x 10.5                | 450            | 12.5 x 13.5<br>(10 x 13.5)<br>(10 x 10.5) | 710<br>(550)<br>(490) | 12.5 x 13.5             | 820            |
| 1500       | 158 | 10 x 10.5                | 450            | 10 x 13.5<br>(10 x 10.5)   | 650<br>(450)   | 10 x 13.5                | 650            | 12.5 x 13.5                               | 750                   | 12.5 x 16               | 1000           |
| 2200       | 228 | 10 x 13.5<br>(10 x 10.5) | 620<br>(480)   | 12.5 x 13.5<br>(10 x 13.5) | 890<br>(720)   | 12.5 x 13.5              | 960            | 16 x 16.5<br>(12.5 x 16)                  | 1150<br>(1000)        | 16 x 16.5               | 1250           |
| 3300       | 338 | 10 x 13.5                | 700            | 12.5 x 16<br>(12.5 x 13.5) | 1000<br>(900)  | 16 x 16.5<br>(12.5 x 16) | 1300<br>(1050) | 16 x 16.5                                 | 1350                  |                         |                |
| 4700       | 478 | 12.5 x 13.5              | 850            | 16 x 16.5                  | 1400           | 16 x 16.5                | 1450           |   |                       |                         |                |
| 6800       | 688 | 16 x 16.5<br>(12.5 x 16) | 1350<br>(900)  |                            |                |                          |                |   |                       |                         |                |

| WV<br>Code |     | 35V                      |                | 50V                                    |                      | 63V                      |                | 100V                     |                |
|------------|-----|--------------------------|----------------|--|----------------------|--------------------------|----------------|--------------------------|----------------|
| μF         |     | Size                     | Ripple current | Size                                   | Ripple current       | Size                     | Ripple current | Size                     | Ripple current |
| 0.1        | 104 |                          |                | 4 x 5.4                                | 1.0                  | 4 x 5.4                  | 1.0            |                          |                |
| 0.22       | 224 |                          |                | 4 x 5.4                                | 2.3                  | 4 x 5.4                  | 2.3            |                          |                |
| 0.33       | 334 |                          |                | 4 x 5.4                                | 3.5                  | 4 x 5.4                  | 3.5            |                          |                |
| 0.47       | 474 |                          |                | 4 x 5.4                                | 5.0                  | 4 x 5.4                  | 5.0            |                          |                |
| 1          | 105 |                          |                | 4 x 5.4                                | 10                   | 4 x 5.4                  | 10             | 4 x 5.4                  | 10             |
| 1.5        | 155 |                          |                | 4 x 5.4                                | 12                   | 4 x 5.4                  | 12             | 6.3 x 5.4                | 15             |
| 2.2        | 225 |                          |                | 4 x 5.4                                | 15                   | 4 x 5.4                  | 15             | 6.3 x 5.4                | 20             |
| 3.3        | 335 | 4 x 5.4                  | 18             | 4 x 5.4                                | 18                   | 5 x 5.4                  | 20             | 6.3 x 7.7<br>(6.3 x 5.4) | 45<br>(28)     |
| 4.7        | 475 | 4 x 5.4                  | 20             | 5 x 5.4<br>(4 x 5.4)                   | 23<br>(19)           | 5 x 5.4                  | 23             | 6.3 x 7.7<br>(6.3 x 5.4) | 50<br>(30)     |
| 10         | 106 | 5 x 5.4<br>(4 x 5.4)     | 30<br>(20)     | 6.3 x 5.4<br>(5 x 5.4)                 | 34<br>(27)           | 6.3 x 7.7<br>(6.3 x 5.4) | 55<br>(34)     | 8 x 10.5<br>(6.3 x 7.7)  | 110<br>(50)    |
| 22         | 226 | 6.3 x 5.4<br>(5 x 5.4)   | 54<br>(42)     | 6.3 x 5.4                              | 60                   | 8 x 10.5<br>(6.3 x 7.7)  | 140<br>(70)    | 10 x 10.5<br>(8 x 10.5)  | 180<br>(120)   |
| 33         | 336 | 6.3 x 5.4                | 60             | 6.3 x 7.7                              | 85                   | 8 x 10.5<br>(6.3 x 7.7)  | 160<br>(85)    | 10 x 10.5                | 190            |
| 47         | 476 | 6.3 x 5.4<br>(6.3 x 7.7) | 70<br>(165)    | 10 x 10.5<br>(8 x 10.5)<br>(6.3 x 7.7) | 130<br>(110)<br>(90) | 10 x 10.5<br>(8 x 10.5)  | 230<br>(170)   |                          |                |



### DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

•Case size ØD×L(mm), ripple current (mA rms) at 85°C, 120Hz

| WV<br>Code |     | 35V                                       |                       | 50V                        |                | 63 V                                      |                       | 100 V       |                | 160 V                      |                |
|------------|-----|---|-----------------------|----------------------------|----------------|---|-----------------------|-------------|----------------|----------------------------|----------------|
| μF         |     | Size                                      | Ripple current        | Size                       | Ripple current | Size                                      | Ripple current        | Size        | Ripple current | Size                       | Ripple current |
| 22         | 226 |   |                       |                            |                |   |                       |             |                | 10 × 13.5                  | 50             |
| 33         | 336 |   |                       |                            |                |   |                       |             |                | 12.5 × 13.5                | 95             |
| 47         | 476 |   |                       |                            |                |   |                       |             |                | 12.5 × 13.5<br>(16 × 16.5) | 205<br>(240)   |
| 56         | 566 | 6.3 × 7.7                                 | 80                    | 6.3 × 7.7                  | 110            | 10 × 10.5                                 | 250                   |             |                |                            |                |
| 68         | 686 | 6.3 × 7.7                                 | 110                   | 8 × 10.5                   | 170            | 10 × 10.5                                 | 260                   |             |                |                            |                |
| 100        | 107 | 8 × 10.5<br>(6.3 × 7.7)                   | 175<br>(120)          | 10 × 10.5<br>(8 × 10.5)    | 240<br>(200)   | 12.5 × 13.5<br>(10 × 13.5)<br>(10 × 10.5) | 380<br>(290)<br>(280) | 12.5 × 13.5 | 440            | 16 × 16.5                  | 250            |
| 150        | 157 | 8 × 10.5                                  | 220                   | 10 × 10.5                  | 240            | 10 × 13.5                                 | 310                   |             |                |                            |                |
| 220        | 227 | 10 × 10.5<br>(8 × 10.5)                   | 310<br>(270)          | 10 × 13.5<br>(10 × 10.5)   | 400<br>(320)   | 12.5 × 13.5                               | 580                   | 16 × 16.5   | 700            |                            |                |
| 330        | 337 | 10 × 10.5                                 | 350                   | 12.5 × 13.5<br>(10 × 13.5) | 600<br>(420)   | 16 × 16.5<br>(12.5 × 16)                  | 820<br>(720)          |             |                |                            |                |
| 470        | 477 | 12.5 × 13.5<br>(10 × 13.5)<br>(10 × 10.5) | 600<br>(530)<br>(400) | 16 × 16.5<br>(12.5 × 16)   | 850<br>(740)   | 16 × 16.5                                 | 950                   |             |                |                            |                |
| 680        | 687 | 12.5 × 13.5                               | 750                   | 16 × 16.5                  | 950            |   |                       |             |                |                            |                |
| 1000       | 108 | 16 × 16.5<br>(12.5 × 16)                  | 1100<br>(800)         |                            |                |   |                       |             |                |                            |                |

| WV<br>Code |     | 200 V       |                | 250 V       |                | 350 V       |                | 400V                       |                | 450 V                      |                |
|------------|-----|-------------|----------------|-------------|----------------|-------------|----------------|----------------------------|----------------|----------------------------|----------------|
| μF         |     | Size        | Ripple current | Size        | Ripple current | Size        | Ripple current | Size                       | Ripple current | Size                       | Ripple current |
| 3.3        | 335 |             |                |             |                |             |                | 10 × 13.5                  | 40             | 10 × 13.5                  | 40             |
| 4.7        | 475 |             |                | 10 × 13.5   |                | 10 × 13.5   | 85             | 10 × 13.5<br>(12.5 × 13.5) | 45<br>(48)     | 10 × 13.5<br>(12.5 × 13.5) | 42<br>(45)     |
| 10         | 106 | 10 × 13.5   | 75             | 10 × 13.5   | 75             | 12.5 × 13.5 | 105            | 12.5 × 13.5                | 50             | 12.5 × 13.5                | 55             |
| 22         | 226 | 12.5 × 13.5 | 105            | 12.5 × 13.5 | 105            | 16 × 16.5   | 130            | 16 × 16.5                  | 85             | 16 × 16.5                  | 85             |
| 33         | 336 | 12.5 × 13.5 | 120            | 16 × 16.5   | 135            |             |                |                            |                |                            |                |
| 47         | 476 |             |                | 16 × 16.5   | 220            |             |                |                            |                |                            |                |
| 100        | 107 |             |                |             |                |             |                |                            |                |                            |                |

### FREQUENCY COEFFICIENT OF ALLOWABLE RIPPLE CURRENT

| Frequency   |             | 50Hz          | 120Hz | 300Hz | 1KHz | 10KHz~ |
|-------------|-------------|---------------|-------|-------|------|--------|
| Coefficient | Ø4 ~ Ø10    | 0.1 ~ 68μF    | 0.70  | 1.00  | 1.17 | 1.50   |
|             |             | 100 ~ 3300μF  | 0.85  | 1.00  | 1.08 | 1.30   |
|             | Ø12.5 ~ Ø16 | ~ 68 μF       | 0.75  | 1.00  | 1.35 | 1.57   |
|             |             | 100 ~ 680μF   | 0.80  | 1.00  | 1.23 | 1.34   |
|             |             | 1000 ~ 6800μF | 0.85  | 1.00  | 1.10 | 1.13   |
|             |             |               |       |       |      |        |

### ◆ How to order

|             |                      |   |                  |  |  |                     |  |
|-------------|----------------------|---|------------------|--|--|---------------------|--|
| <u>TCS</u>  | <u>A</u>             | <u>106</u>  | <u>M</u>         | <u>0035</u>  | <u>0505</u>  | <u>R</u>            | <u>000</u>                                 |
| ↓           | ↓                    | ↓   | ↓                | ↓  | ↓  | ↓                   | ↓  |
| <b>Type</b> | <b>Material Code</b> | <b>Capacitance Code</b>   | <b>Tolerance</b> | <b>Rated Voltage</b>   | <b>Size Code</b>   | <b>Package Code</b> | <b>Suffix Indicate Special Requirement</b> |
| TCS         | A: Aluminum Cap      | pF Code: 1st two digits represent significant figures<br>3rd digit represents multiplier (number of zeros to follow)<br>106 = 10uF<br>107 = 100uF | M: +/-20%        | Code 0035: 35VDC<br><b>For DC Voltage</b><br>0006: 6.3VDC<br>0035: 35VDC<br>0100: 100VDC | Code 0505: Size 5x5.4mm<br><b>Size Code for V-chip E-cap</b><br>0405: Size 4x5.4mm<br>0605: Size 6.3x5.4mm<br>0607: Size 6.3x7.7mm<br>1010: Size 10x10.5mm | R: Tape & Reel      | 000: Indicating Standard                   |