

# J-CAP™ Series



## Highest Joules/cc Conductive Polymer Solid Electrolytic Chip Capacitors



### FEATURES

- Highest Energy per volume
- Conductive polymer electrode
- Benign failure mode under recommended use conditions
- Low ESR
- Undertab terminations layout:
  - High Volumetric Efficiency
  - Low profile case sizes
  - High capacitance in smaller dimensions
  - Close positioning of several parts for efficient high density PCB layout
- 3x reflow 260°C compatible



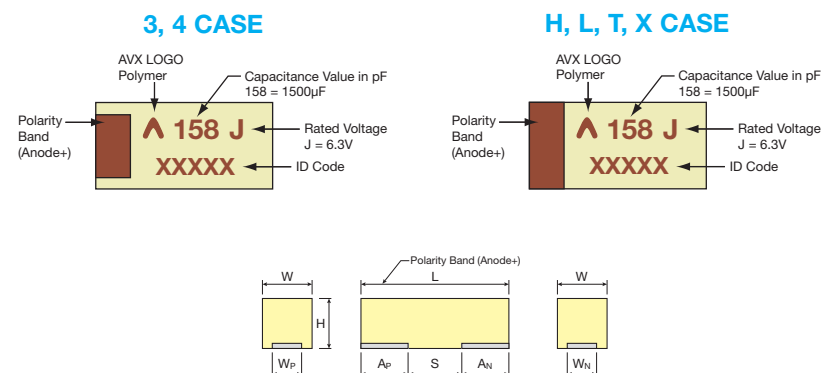
### APPLICATIONS

- Power backup for SSDs (MLC, SLC, EFD, PCIe), battery-powered portable equipment, industrial alarms, smart power meters, and mobile devices.

### 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.       | W <sub>P</sub> ±0.10 (0.004) | W <sub>N</sub> ±0.10 (0.004) | A <sub>P</sub> ±0.10 (0.004) | A <sub>N</sub> ±0.10 (0.004) | S Min.       |
|------|----------|------------|----------------|------------------------------|--------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------|
| 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) |
| 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) |
| 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) |
| 3    | 2924     | 7361-15    | 7.30 (0.287)   | 6.10 (0.240)                 | 1.50 (0.059) | 4.75 (0.187)                 | 4.75 (0.187)                 | 2.00 (0.079)                 | 3.20 (0.126)                 | 2.10 (0.083) |
| 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) |

### MARKING



### MAXIMUM ENERGY PER CASE SIZE

| Case Size | Approved (mJ) |
|-----------|---------------|
| L         | 4.7           |
| T         | 6.5           |
| H         | 2.6           |
| X         | 18.2          |
| 3         | 19.6          |
| 4         | 38.8          |

### HOW TO ORDER

|            |                              |                                                                                                                                        |                       |                                                                                                             |                                   |             |
|------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------|
| <b>TCN</b> | <b>4</b>                     | <b>158</b>                                                                                                                             | <b>M</b>              | <b>006</b>                                                                                                  | <b>R</b>                          | <b>0055</b> |
| Type       | Case Size<br>See table above | Capacitance Code<br>pF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow) | Tolerance<br>M = ±20% | Rated DC Voltage<br>006 = 6.3Vdc<br>016 = 16Vdc<br>020 = 20Vdc<br>025 = 25Vdc<br>035 = 35Vdc<br>050 = 50Vdc | Packaging<br>R = Pure Tin 7" Reel | ESR in mΩ   |

### TECHNICAL SPECIFICATIONS

|                                 |          |                                                                        |    |    |    |    |    |  |
|---------------------------------|----------|------------------------------------------------------------------------|----|----|----|----|----|--|
| Technical Data:                 |          | All technical data relate to an ambient temperature of +25°C           |    |    |    |    |    |  |
| Capacitance Range:              |          | 4.7 µF to 1500 µF                                                      |    |    |    |    |    |  |
| Capacitance Tolerance:          |          | ±20%                                                                   |    |    |    |    |    |  |
| Leakage Current DCL:            |          | 0.1CV                                                                  |    |    |    |    |    |  |
| Rated Voltage (V <sub>R</sub> ) | ≤ +85°C: | 6.3                                                                    | 16 | 20 | 25 | 35 | 50 |  |
| Surge Voltage (V <sub>S</sub> ) | ≤ +85°C: | 8                                                                      | 21 | 26 | 33 | 46 | 65 |  |
| Temperature Range:              |          | -55°C to +105°C                                                        |    |    |    |    |    |  |
| Reliability:                    |          | 1% per 1000 hours at 85°C, V <sub>R</sub> with 0.1Ω/V series impedance |    |    |    |    |    |  |
|                                 |          | 60% confidence level                                                   |    |    |    |    |    |  |

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 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, [mJ] |                         |               |                     |                     |
|-------------|------|--------------------------------|-------------------------|---------------|---------------------|---------------------|
| µF          | Code | 6.3V (J)                       | 16V (C)                 | 20V (D)       | 25V (E)             | 35V (V)             |
| 4.7         | 475  |                                |                         |               |                     | L(300)/T(200) [1.8] |
| 10          | 106  |                                |                         |               |                     | T(200) [3.9]        |
| 22          | 226  |                                |                         |               | T(200) [4.3]        |                     |
| 33          | 336  |                                | L(200)/T(200) [3.3]     |               | T(250) [6.5]        |                     |
| 47          | 476  |                                | L(250)/T(150,200) [4.7] |               | X(100) [9.2]        | X(100) [18.2]       |
| 100         | 107  | L(200) [1.2]                   |                         |               | 3(70)/4(100) [19.6] | 4(100) [38.8]       |
| 150         | 157  | L(200)/T(200) [1.7]            | X(100) [14.9]           |               | 4(70) [29.3]        |                     |
| 220         | 227  | H(170)/T(200) [2.6]            | 4(70) [21.8]            | 4(100) [34.7] |                     |                     |
| 330         | 337  |                                | 4(70) [32.7]            |               |                     |                     |
| 470         | 477  | X(50) [5.4]                    |                         |               |                     |                     |
| 1000        | 108  | 3(100)<br>X(200)/4(55) [11.6]  |                         |               |                     |                     |
| 1500        | 158  | 4(55) [17.4]                   |                         |               |                     |                     |

Available Ratings, (ESR ratings in mOhms in brackets) [Energy in mJ]

Engineering samples - please contact manufacturer

\*Codes under development - subject to change

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

### RATINGS & PART NUMBER REFERENCE

| AVX<br>Part No.  | Case<br>Size | Capacitance<br>(μF) | Rated<br>Voltage<br>(V) | Maximum<br>Operating<br>Temperature<br>(°C) | DCL<br>Max.<br>(μA) | DF<br>Max.<br>(%) | ESR<br>Max.<br>@ 100kHz<br>(mΩ) | MSL | Product<br>Category | ENERGY         |                           |                         |
|------------------|--------------|---------------------|-------------------------|---------------------------------------------|---------------------|-------------------|---------------------------------|-----|---------------------|----------------|---------------------------|-------------------------|
|                  |              |                     |                         |                                             |                     |                   |                                 |     |                     | Energy<br>(mJ) | Energy/volume<br>(mJ/cm³) | Energy/area<br>(mJ/cm²) |
| 6.3 Volt @ 85°C  |              |                     |                         |                                             |                     |                   |                                 |     |                     |                |                           |                         |
| TCNL107M006#0200 | L            | 100                 | 6.3                     | 105                                         | 60                  | 10                | 200                             | 3   | 3                   | 1.2            | 118                       | 11.8                    |
| TCNL157M006#0200 | L            | 150                 | 6.3                     | 105                                         | 90                  | 10                | 200                             | 3   | 3                   | 1.7            | 177                       | 17.7                    |
| TCNT157M006#0200 | T            | 150                 | 6.3                     | 105                                         | 90                  | 10                | 200                             | 3   | 3                   | 1.7            | 147                       | 17.7                    |
| TCNH227M006#0170 | H            | 220                 | 6.3                     | 105                                         | 132                 | 10                | 170                             | 5   | 3                   | 2.6            | 173                       | 26.0                    |
| TCNT227M006#0200 | T            | 220                 | 6.3                     | 85                                          | 132                 | 10                | 200                             | 3   | 5                   | 2.6            | 216                       | 26.0                    |
| TCNX477M006#0050 | X            | 470                 | 6.3                     | 85                                          | 282                 | 10                | 50                              | 3   | 5                   | 5.4            | 115                       | 17.3                    |
| TCNX108M006#0200 | X            | 1000                | 6.3                     | 85                                          | 600                 | 30                | 200                             | 3   | 5                   | 11.6           | 246                       | 36.9                    |
| TCN3108M006#0100 | 3            | 1000                | 6.3                     | 105                                         | 600                 | 20                | 100                             | 4   | 3                   | 11.6           | 176                       | 26.4                    |
| TCN4108M006#0055 | 4            | 1000                | 6.3                     | 85                                          | 600                 | 20                | 55                              | 4   | 5                   | 11.6           | 132                       | 26.4                    |
| TCN4158M006#0055 | 4            | 1500                | 6.3                     | 85                                          | 900                 | 20                | 55                              | 4   | 5                   | 17.4           | 198                       | 39.6                    |
| 16 Volt @ 85°C   |              |                     |                         |                                             |                     |                   |                                 |     |                     |                |                           |                         |
| TCNL336M016#0200 | L            | 33                  | 16                      | 85                                          | 52.8                | 6                 | 200                             | 3   | 5                   | 3.3            | 334                       | 33.4                    |
| TCNT336M016#0200 | T            | 33                  | 16                      | 85                                          | 52.8                | 6                 | 200                             | 3   | 5                   | 3.3            | 277                       | 33.4                    |
| TCNL476M016#0250 | L            | 47                  | 16                      | 85                                          | 75.2                | 6                 | 250                             | 3   | 5                   | 4.7            | 476                       | 47.6                    |
| TCNT476M016#0150 | T            | 47                  | 16                      | 85                                          | 75.2                | 6                 | 150                             | 3   | 5                   | 4.7            | 395                       | 47.6                    |
| TCNT476M016#0200 | T            | 47                  | 16                      | 85                                          | 75.2                | 6                 | 200                             | 3   | 5                   | 4.7            | 395                       | 47.6                    |
| TCNX157M016#0100 | X            | 150                 | 16                      | 85                                          | 240                 | 6                 | 100                             | 3   | 5                   | 14.9           | 316                       | 47.4                    |
| TCN4227M016#0070 | 4            | 220                 | 16                      | 105                                         | 352                 | 20                | 70                              | 4   | 2                   | 21.8           | 249                       | 49.8                    |
| TCN4337M016#0070 | 4            | 330                 | 16                      | 105                                         | 528                 | 20                | 70                              | 4   | 3                   | 32.7           | 374                       | 74.7                    |
| 20 Volt @ 85°C   |              |                     |                         |                                             |                     |                   |                                 |     |                     |                |                           |                         |
| TCN4227M020#0100 | 4            | 220                 | 20                      | 85                                          | 440                 | 10                | 100                             | 4   | 5                   | 34.7           | 389                       | 77.9                    |
| 25 Volt @ 85°C   |              |                     |                         |                                             |                     |                   |                                 |     |                     |                |                           |                         |
| TCNT226M025#0200 | T            | 22                  | 25                      | 105                                         | 55                  | 6                 | 200                             | 3   | 3                   | 4.3            | 364                       | 43.9                    |
| TCNT336M025#0250 | T            | 33                  | 25                      | 105                                         | 82.5                | 10                | 250                             | 5   | 3                   | 6.5            | 547                       | 65.8                    |
| TCNX476M025#0100 | X            | 47                  | 25                      | 105                                         | 117.5               | 6                 | 100                             | 3   | 2                   | 9.2            | 195                       | 29.3                    |
| TCN3107M025#0070 | 3            | 100                 | 25                      | 105                                         | 250                 | 6                 | 70                              | 4   | 2                   | 19.6           | 298                       | 44.6                    |
| TCN4107M025#0100 | 4            | 100                 | 25                      | 105                                         | 250                 | 6                 | 100                             | 4   | 2                   | 19.6           | 219                       | 43.9                    |
| TCN4157M025#0070 | 4            | 150                 | 25                      | 105                                         | 375                 | 6                 | 70                              | 4   | 2                   | 29.3           | 335                       | 67.0                    |
| 35 Volt @ 85°C   |              |                     |                         |                                             |                     |                   |                                 |     |                     |                |                           |                         |
| TCNL475M035#0300 | L            | 4.7                 | 35                      | 105                                         | 16.5                | 6                 | 300                             | 3   | 2                   | 1.8            | 186                       | 18.6                    |
| TCNT475M035#0200 | T            | 4.7                 | 35                      | 85                                          | 16.5                | 10                | 200                             | 3   | 5                   | 1.8            | 154                       | 18.6                    |
| TCNT106M035#0200 | T            | 10                  | 35                      | 85                                          | 35                  | 10                | 200                             | 3   | 5                   | 3.9            | 328                       | 39.5                    |
| TCNX476M035#0100 | X            | 47                  | 35                      | 105                                         | 165                 | 10                | 100                             | 3   | 2                   | 18.2           | 387                       | 58.0                    |
| TCN4107M035#0100 | 4            | 100                 | 35                      | 105                                         | 350                 | 10                | 100                             | 4   | 3                   | 38.8           | 435                       | 87.1                    |

Energy is calculated by this formula (consider derating factor):

$$\text{Energy} = \frac{1}{2} C \times ((V_r \times X)^2 - V_x^2)$$

where C = Capacitance

V<sub>r</sub> = Rated Voltage

X = Recommended derating factor

V<sub>x</sub> = 3V (invariable)

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

All technical data relates to an ambient temperature of +25°C. Capacitance is 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.

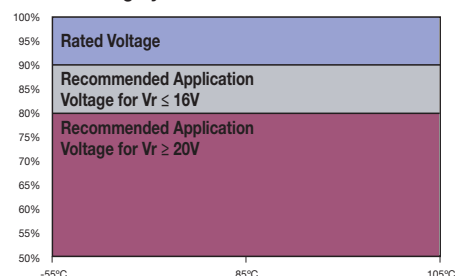
For typical weight and composition see page 226.

**NOTE:** AVX reserves the right to supply a higher voltage rating in the same case size, to the same reliability standards.

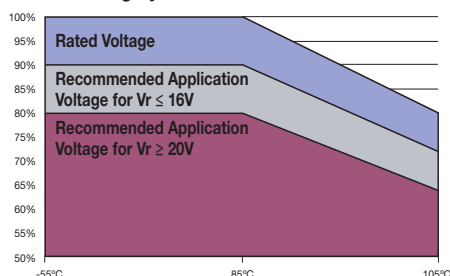
### RECOMMENDED DERATING FACTOR

Voltage and temperature derating as percentage of V<sub>r</sub>

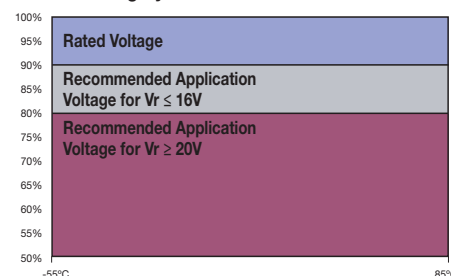
Product Category 2



Product Category 3



Product Category 5



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

| TEST                         | Condition                                                                                                                                                                                                                                                                                                         | Characteristics    |                                                                                                |       |       |           |          |            |         |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|-------|-------|-----------|----------|------------|---------|
| <b>Endurance</b>             | Determine after application of rated voltage for 2000 +48/-0 hours at 85±2°C and then leaving 1-2 hours at room temperature. Also determine after application of 105°C temperature, category voltage for 2000 +48/-0 hours and then leaving 1-2 hours at room temperature. Power supply impedance to be ≤ 0.1Ω/V. | Visual examination | no visible damage                                                                              |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | DCL                | 1.25 x initial limit                                                                           |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | ΔC/C               | within +10/-20% of initial value for Vr ≤ 16V<br>within ±20% of initial value for Vr ≥ 20V     |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | DF                 | 1.5 x initial limit                                                                            |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | ESR                | 2 x initial limit                                                                              |       |       |           |          |            |         |
| <b>Storage Life</b>          | 105°C, 0V, 2000h                                                                                                                                                                                                                                                                                                  | Visual examination | no visible damage                                                                              |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | DCL                | 1.25 x initial limit                                                                           |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | ΔC/C               | within +10/-20% of initial value for Vr ≤ 16V<br>within ±20% of initial value for Vr ≥ 20V     |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | DF                 | 1.5 x initial limit                                                                            |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | ESR                | 2 x initial limit                                                                              |       |       |           |          |            |         |
| <b>Humidity</b>              | Determine after storage without applied voltage at 65±2°C and 95±2% relative humidity for 500 hours and then recovery 1-2 hours at room temperature.                                                                                                                                                              | 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                                                                              |       |       |           |          |            |         |
| <b>Temperature Stability</b> | Step                                                                                                                                                                                                                                                                                                              | Temperature°C      | Duration(min)                                                                                  | +20°C | -55°C | +20°C     | +85°C    | +105°C     | +20°C   |
|                              | 1                                                                                                                                                                                                                                                                                                                 | +20±2              | 15                                                                                             | IL*   | n/a   | IL*       | 10 x IL* | 12.5 x IL* | IL*     |
|                              | 2                                                                                                                                                                                                                                                                                                                 | -55+0/-3           | 15                                                                                             | ΔC/C  | n/a   | +0/-20%   | ±5%      | +20/-0%    | +30/-0% |
|                              | 3                                                                                                                                                                                                                                                                                                                 | +20±2              | 15                                                                                             | DF    | IL*   | 1.5 x IL* | IL*      | 1.5 x IL*  | 2 x IL* |
|                              | 4                                                                                                                                                                                                                                                                                                                 | +85+3/-0           | 15                                                                                             |       |       |           |          |            |         |
|                              | 5                                                                                                                                                                                                                                                                                                                 | +105+3/-0          | 15                                                                                             |       |       |           |          |            |         |
|                              | 6                                                                                                                                                                                                                                                                                                                 | +20±2              | 15                                                                                             |       |       |           |          |            |         |
| <b>Surge Voltage</b>         | Test temperature: 105°C+3/0°C<br>Test voltage: Category voltage at 105°C<br>Surge voltage: 1.3 x category voltage at 105°C<br>Series protection resistance 1000±100Ω<br>Discharge resistance: 1000Ω<br>Number of cycles: 1000x<br>Cycle duration: 6 min; 30 sec charge,<br>5 min 30 sec discharge                 | Visual examination | no visible damage                                                                              |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | DCL                | initial limit                                                                                  |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | ΔC/C               | within +10/-20% of initial value for Vr ≤ 16V<br>within +20/-30% of initial value for Vr ≥ 20V |       |       |           |          |            |         |
|                              |                                                                                                                                                                                                                                                                                                                   | DF                 | 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.

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

| TEST                         | Condition                                                                                                                                                                                                                                                               | Characteristics    |                                                                                                |       |       |           |          |           |     |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|-------|-------|-----------|----------|-----------|-----|
| <b>Endurance</b>             | Determine after application of rated voltage for 2000 +48/-0 hours at 85±2°C and then leaving 1-2 hours at room temperature. Power supply impedance to be ≤ 0.1Ω/V.                                                                                                     | Visual examination | no visible damage                                                                              |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DCL                | 1.25 x initial limit                                                                           |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | ΔC/C               | within +10/-20% of initial value for Vr ≤ 16V<br>within ±20% of initial value for Vr ≥ 20V     |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DF                 | 1.5 x initial limit                                                                            |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | ESR                | 2 x initial limit                                                                              |       |       |           |          |           |     |
| <b>Storage Life</b>          | 85°C, 0V, 2000h                                                                                                                                                                                                                                                         | Visual examination | no visible damage                                                                              |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DCL                | 1.25 x initial limit                                                                           |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | ΔC/C               | within +10/-20% of initial value for Vr ≤ 16V<br>within ±20% of initial value for Vr ≥ 20V     |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DF                 | 1.5 x initial limit                                                                            |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | ESR                | 2 x initial limit                                                                              |       |       |           |          |           |     |
| <b>Humidity</b>              | Determine after storage without applied voltage at 65±2°C and 95±2% relative humidity for 500 hours and then recovery 1-2 hours at room temperature.                                                                                                                    | Visual examination | no visible damage                                                                              |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DCL                | 5 x initial limit                                                                              |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | ΔC/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±2              | 15                                                                                             | IL*   | n/a   | IL*       | 10 x IL* | IL*       |     |
|                              | 2                                                                                                                                                                                                                                                                       | -55+0/-3           | 15                                                                                             | ΔC/C  | n/a   | +0/-20%   | ±5%      | +20/-0%   | ±5% |
|                              | 3                                                                                                                                                                                                                                                                       | +20±2              | 15                                                                                             | DF    | IL*   | 1.5 x IL* | IL*      | 1.5 x IL* | IL* |
|                              | 4                                                                                                                                                                                                                                                                       | +85+3/-0           | 15                                                                                             |       |       |           |          |           |     |
|                              | 5                                                                                                                                                                                                                                                                       | +20±2              | 15                                                                                             |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         |                    |                                                                                                |       |       |           |          |           |     |
| <b>Surge Voltage</b>         | Test temperature: 85+3/0°C<br>Test voltage: Rated voltage<br>Surge voltage: 1.3 x rated voltage<br>Series protection resistance 1000±100Ω.<br>Discharge resistance: 1000Ω<br>Number of cycles: 1000x<br>Cycle duration: 6 min; 30 sec charge,<br>5 min 30 sec discharge | Visual examination | no visible damage                                                                              |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DCL                | initial limit                                                                                  |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | ΔC/C               | within +10/-20% of initial value for Vr ≤ 16V<br>within +20/-30% of initial value for Vr ≥ 20V |       |       |           |          |           |     |
|                              |                                                                                                                                                                                                                                                                         | DF                 | 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.

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