

### KL SERIES • HIGH VOLTAGE, AUTOMOTIVE 105°C TYPE

#### KEY FEATURES



AEC-Q 200



LONG LIFE



HIGH VOLTAGE

- ALUMINUM ELECTROLYTIC CAPACITOR • THT type
- Endurance: 105°C • 5 000 hours
- High voltage version up to 500V
- High reliability
- AEC-Q200 version available



#### SPECIFICATIONS

| Items                                              |                   | Performance Characteristics                                           |     |     |     |                                                                |     |     |     |
|----------------------------------------------------|-------------------|-----------------------------------------------------------------------|-----|-----|-----|----------------------------------------------------------------|-----|-----|-----|
| Operating Temperature Range                        |                   | -40 ~ +105°C                                                          |     |     |     | -25 ~ +105°C                                                   |     |     |     |
| Rated Voltage Range                                | V <sub>R</sub>    | 160 ~ 400V DC                                                         |     |     |     | 450V ~ 500V DC                                                 |     |     |     |
| Surge Voltage                                      | V <sub>S</sub>    | (V <sub>R</sub> ≤ 315V): V <sub>S</sub> = 1.15·V <sub>R</sub>         |     |     |     | (V <sub>R</sub> > 315V): V <sub>S</sub> = 1.10·V <sub>R</sub>  |     |     |     |
| Capacitance Range                                  | C <sub>R</sub>    | 3.3 ~ 330μF                                                           |     |     |     | 2.2 ~ 180μF                                                    |     |     |     |
| Cap. Tolerance                                     | ΔC                | ±20% (120Hz ▪ 20°C)                                                   |     |     |     |                                                                |     |     |     |
| Leakage Current<br>(20°C ▪ V <sub>R</sub> applied) | I <sub>LEAK</sub> | C <sub>R</sub> ·V <sub>R</sub> ≤ 1000                                 |     |     |     | ≤ 0.1·C <sub>R</sub> ·V <sub>R</sub> + 40μA (After 1 minute)   |     |     |     |
|                                                    |                   | C <sub>R</sub> ·V <sub>R</sub> > 1000                                 |     |     |     | ≤ 0.04·C <sub>R</sub> ·V <sub>R</sub> + 100μA (After 1 minute) |     |     |     |
|                                                    |                   | [ I <sub>LEAK</sub> (μA) ; C <sub>R</sub> (μF) ; V <sub>R</sub> (V) ] |     |     |     |                                                                |     |     |     |
| Dissipation Factor %<br>(20°C ▪ 120Hz)             | tanδ              | V <sub>R</sub> (V DC)                                                 | 160 | 200 | 250 | 350                                                            | 400 | 450 | 500 |
|                                                    |                   | tanδ (%)                                                              | 12  | 12  | 12  | 15                                                             | 15  | 17  | 20  |
| Low Temperature<br>Characteristics at<br>120Hz     | Z ratio<br>max.   | V <sub>R</sub> (V DC)                                                 | 160 | 200 | 250 | 350                                                            | 400 | 450 | 500 |
|                                                    |                   | Z-25°C/Z+20°C                                                         | 3   | 3   | 3   | 6                                                              | 6   | 6   | 6   |
|                                                    |                   | Z-40°C/Z+20°C                                                         | 6   | 6   | 6   | 6                                                              | 6   | -   | -   |

| Lifetime Test                                  |                |                                                                                              |  |  |  |  |  |  |  |
|------------------------------------------------|----------------|----------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|
| Endurance<br>105°C<br>( $V_R$ & $I_R$ applied) | Test           | 5 000 hours                                                                                  |  |  |  |  |  |  |  |
|                                                | $\Delta C/C_R$ | $\leq \pm 20\%$ of initial measured value                                                    |  |  |  |  |  |  |  |
|                                                | $\tan \delta$  | $\leq 200\%$ of initial specified value                                                      |  |  |  |  |  |  |  |
|                                                | $I_{Leak}$     | $\leq$ the initial specified value                                                           |  |  |  |  |  |  |  |
| Shelf Life<br>105°C<br>( $V_R = 0$ )           | Test           | 1 000 hours                                                                                  |  |  |  |  |  |  |  |
|                                                | $\Delta C/C_R$ | $\leq \pm 20\%$ of initial measured value                                                    |  |  |  |  |  |  |  |
|                                                | $\tan \delta$  | $\leq 200\%$ of initial specified value                                                      |  |  |  |  |  |  |  |
|                                                | $I_{Leak}$     | $\leq$ the initial specified value                                                           |  |  |  |  |  |  |  |
|                                                |                | Before measurement: Restore capacitor to 20°C, apply $V_R$ for 30 min according JIS-C-5101-4 |  |  |  |  |  |  |  |

## STANDARD RATINGS

Part number shows bulk version with straight leads

| V <sub>R</sub><br>(V) | C <sub>R</sub><br>(μF) | ø D<br>(mm) | L<br>(mm) | I <sub>R</sub> • Max.<br>Ripple Current<br>+105°C • 120Hz<br>(mA rms) | CapXon Part Number |
|-----------------------|------------------------|-------------|-----------|-----------------------------------------------------------------------|--------------------|
| 160                   | 3.3                    | 10          | 12.5      | 52                                                                    | KL3R3M160G125A □   |
|                       | 4.7                    | 10          | 12.5      | 60                                                                    | KL4R7M160G125A □   |
|                       | 10                     | 10          | 12.5      | 104                                                                   | KL100M160G125A □   |
|                       | 10                     | 10          | 16        | 115                                                                   | KL100M160G160A □   |
|                       | 15                     | 10          | 16        | 150                                                                   | KL150M160G160A □   |
|                       | 22                     | 10          | 16        | 190                                                                   | KL220M160G160A □   |
|                       | 22                     | 10          | 20        | 210                                                                   | KL220M160G200A □   |
|                       | 33                     | 10          | 16        | 235                                                                   | KL330M160G160A □   |
|                       | 33                     | 10          | 20        | 258                                                                   | KL330M160G200A □   |
|                       | 33                     | 13          | 20        | 300                                                                   | KL330M160I200A □   |
|                       | 47                     | 10          | 20        | 270                                                                   | KL470M160G200A □   |
|                       | 47                     | 13          | 20        | 310                                                                   | KL470M160I200A □   |
|                       | 68                     | 13          | 20        | 430                                                                   | KL680M160I200A □   |
|                       | 68                     | 13          | 25        | 470                                                                   | KL680M160I250A □   |
|                       | 100                    | 13          | 25        | 540                                                                   | KL101M160I250A □   |
|                       | 100                    | 16          | 20        | 540                                                                   | KL101M160J200A □   |
|                       | 100                    | 16          | 25        | 590                                                                   | KL101M160J250A □   |
|                       | 120                    | 16          | 20        | 560                                                                   | KL121M160J200A □   |
|                       | 150                    | 16          | 25        | 650                                                                   | KL151M160J250A □   |
|                       | 180                    | 16          | 31.5      | 750                                                                   | KL181M160J315A □   |
|                       | 220                    | 16          | 31.5      | 820                                                                   | KL221M160J315A □   |
|                       | 220                    | 18          | 25        | 710                                                                   | KL221M160K250A □   |
|                       | 270                    | 18          | 31.5      | 880                                                                   | KL271M160K315A □   |
|                       | 330                    | 18          | 31.5      | 930                                                                   | KL331M160K315A □   |
|                       | 330                    | 18          | 40        | 1000                                                                  | KL331M160K400A □   |
| 200                   | 3.3                    | 10          | 12.5      | 52                                                                    | KL3R3M200G125A □   |
|                       | 4.7                    | 10          | 12.5      | 60                                                                    | KL4R7M200G125A □   |
|                       | 6.8                    | 10          | 12.5      | 70                                                                    | KL6R8M200G125A □   |
|                       | 10                     | 10          | 12.5      | 104                                                                   | KL100M200G125A □   |
|                       | 10                     | 10          | 16        | 115                                                                   | KL100M200G160A □   |
|                       | 10                     | 10          | 20        | 125                                                                   | KL100M200G200A □   |
|                       | 15                     | 10          | 16        | 150                                                                   | KL150M200G160A □   |
|                       | 22                     | 10          | 16        | 210                                                                   | KL220M200G160A □   |
|                       | 22                     | 10          | 20        | 230                                                                   | KL220M200G200A □   |
|                       | 33                     | 10          | 20        | 290                                                                   | KL330M200G200A □   |
|                       | 33                     | 13          | 20        | 350                                                                   | KL330M200I200A □   |
|                       | 47                     | 13          | 20        | 380                                                                   | KL470M200I200A □   |
|                       | 68                     | 13          | 25        | 530                                                                   | KL680M200I250A □   |
|                       | 68                     | 16          | 20        | 530                                                                   | KL680M200J200A □   |
|                       | 100                    | 16          | 20        | 570                                                                   | KL101M200J200A □   |
|                       | 100                    | 16          | 25        | 610                                                                   | KL101M200J250A □   |
|                       | 120                    | 16          | 25        | 700                                                                   | KL121M200J250A □   |
|                       | 150                    | 16          | 25        | 700                                                                   | KL151M200J250A □   |

□: Enter **blank** for Standard version

□: Enter **X** for AEC-Q200 version

See "PACKAGING INFORMATION" to taped or formed products.

## STANDARD RATINGS

Part number shows bulk version with straight leads

| V <sub>R</sub><br>(V) | C <sub>R</sub><br>(μF) | ø D<br>(mm) | L<br>(mm) | I <sub>R</sub> • Max.<br>Ripple Current<br>+105°C • 120Hz<br>(mA rms) | CapXon Part Number |
|-----------------------|------------------------|-------------|-----------|-----------------------------------------------------------------------|--------------------|
| 200                   | 150                    | 16          | 31.5      | 750                                                                   | KL151M200J315A     |
|                       | 180                    | 18          | 31.5      | 830                                                                   | KL181M200K315A     |
|                       | 220                    | 18          | 31.5      | 970                                                                   | KL221M200K315A     |
|                       | 270                    | 18          | 40        | 1100                                                                  | KL271M200K400A     |
|                       | 330                    | 18          | 45        | 1250                                                                  | KL331M200K450A     |
| 250                   | 4.7                    | 10          | 12.5      | 60                                                                    | KL4R7M250G125A     |
|                       | 6.8                    | 10          | 12.5      | 75                                                                    | KL6R8M250G125A     |
|                       | 10                     | 10          | 16        | 160                                                                   | KL100M250G160A     |
|                       | 10                     | 10          | 20        | 170                                                                   | KL100M250G200A     |
|                       | 15                     | 10          | 16        | 180                                                                   | KL150M250G160A     |
|                       | 22                     | 10          | 20        | 250                                                                   | KL220M250G200A     |
|                       | 22                     | 13          | 20        | 290                                                                   | KL220M250I200A     |
|                       | 33                     | 13          | 20        | 360                                                                   | KL330M250I200A     |
|                       | 33                     | 13          | 25        | 380                                                                   | KL330M250I250A     |
|                       | 47                     | 13          | 25        | 430                                                                   | KL470M250I250A     |
|                       | 68                     | 16          | 20        | 530                                                                   | KL680M250J200A     |
|                       | 68                     | 16          | 25        | 550                                                                   | KL680M250J250A     |
|                       | 68                     | 18          | 20        | 550                                                                   | KL680M250K200A     |
|                       | 100                    | 16          | 25        | 630                                                                   | KL101M250J250A     |
|                       | 100                    | 16          | 31.5      | 700                                                                   | KL101M250J315A     |
|                       | 100                    | 18          | 25        | 680                                                                   | KL101M250K250A     |
|                       | 100                    | 18          | 31.5      | 750                                                                   | KL101M250K315A     |
|                       | 120                    | 18          | 31.5      | 790                                                                   | KL121M250K315A     |
|                       | 150                    | 18          | 31.5      | 840                                                                   | KL151M250K315A     |
|                       | 150                    | 18          | 35.5      | 880                                                                   | KL151M250K355A     |
|                       | 180                    | 18          | 40        | 980                                                                   | KL181M250K400A     |
|                       | 220                    | 18          | 35.5      | 960                                                                   | KL221M250K355A     |
|                       | 220                    | 18          | 40        | 1020                                                                  | KL221M250K400A     |
| 350                   | 4.7                    | 10          | 12.5      | 65                                                                    | KL4R7M350G125A     |
|                       | 6.8                    | 10          | 16        | 100                                                                   | KL6R8M350G160A     |
|                       | 10                     | 10          | 20        | 170                                                                   | KL100M350G200A     |
|                       | 10                     | 13          | 20        | 180                                                                   | KL100M350I200A     |
|                       | 15                     | 13          | 20        | 200                                                                   | KL150M350I200A     |
|                       | 22                     | 13          | 20        | 290                                                                   | KL220M350I200A     |
|                       | 33                     | 13          | 25        | 320                                                                   | KL330M350I250A     |
|                       | 33                     | 16          | 20        | 320                                                                   | KL330M350J200A     |
|                       | 47                     | 16          | 25        | 430                                                                   | KL470M350J250A     |
|                       | 47                     | 16          | 31.5      | 440                                                                   | KL470M350J315A     |
|                       | 68                     | 16          | 35.5      | 550                                                                   | KL680M350J355A     |
|                       | 100                    | 18          | 31.5      | 750                                                                   | KL101M350K315A     |
|                       | 100                    | 18          | 35.5      | 780                                                                   | KL101M350K355A     |
| 400                   | 3.3                    | 10          | 12.5      | 55                                                                    | KL3R3M400G125A     |
|                       | 4.7                    | 10          | 16        | 100                                                                   | KL4R7M400G160A     |

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Part number shows bulk version with straight leads

| V <sub>R</sub><br>(V) | C <sub>R</sub><br>(μF) | ø D<br>(mm) | L<br>(mm) | I <sub>R</sub> • Max.<br>Ripple Current<br>+105°C • 120Hz<br>(mA rms) | CapXon Part Number |
|-----------------------|------------------------|-------------|-----------|-----------------------------------------------------------------------|--------------------|
| 400                   | 6.8                    | 10          | 16        | 120                                                                   | KL6R8M400G160A □   |
|                       | 6.8                    | 10          | 20        | 125                                                                   | KL6R8M400G200A □   |
|                       | 10                     | 10          | 16        | 156                                                                   | KL100M400G160A □   |
|                       | 10                     | 10          | 20        | 170                                                                   | KL100M400G200A □   |
|                       | 10                     | 13          | 20        | 200                                                                   | KL100M400I200A □   |
|                       | 15                     | 10          | 16        | 156                                                                   | KL150M400G160A □   |
|                       | 15                     | 13          | 20        | 200                                                                   | KL150M400I200A □   |
|                       | 22                     | 13          | 25        | 320                                                                   | KL220M400I250A □   |
|                       | 22                     | 16          | 20        | 320                                                                   | KL220M400J200A □   |
|                       | 33                     | 16          | 20        | 400                                                                   | KL330M400J200A □   |
|                       | 33                     | 16          | 25        | 430                                                                   | KL330M400J250A □   |
|                       | 47                     | 16          | 20        | 420                                                                   | KL470M400J200A □   |
|                       | 47                     | 16          | 25        | 450                                                                   | KL470M400J250A □   |
|                       | 47                     | 16          | 31.5      | 530                                                                   | KL470M400J315A □   |
|                       | 68                     | 16          | 25        | 480                                                                   | KL680M400J250A □   |
|                       | 68                     | 16          | 31.5      | 530                                                                   | KL680M400J315A □   |
|                       | 82                     | 16          | 31.5      | 580                                                                   | KL820M400J315A □   |
|                       | 100                    | 16          | 31.5      | 710                                                                   | KL101M400J315A □   |
|                       | 100                    | 18          | 35.5      | 750                                                                   | KL101M400K355A □   |
|                       | 120                    | 16          | 35.5      | 800                                                                   | KL121M400J355A □   |
|                       | 120                    | 18          | 31.5      | 800                                                                   | KL121M400K315A □   |
|                       | 150                    | 16          | 40        | 920                                                                   | KL151M400J400A □   |
|                       | 150                    | 18          | 31.5      | 890                                                                   | KL151M400K315A □   |
|                       | 180                    | 18          | 40        | 1060                                                                  | KL181M400K400A □   |
|                       | 220                    | 18          | 45        | 1200                                                                  | KL221M400K450A □   |
| 450                   | 2.2                    | 10          | 12.5      | 45                                                                    | KL2R2M450G125A □   |
|                       | 3.3                    | 10          | 16        | 65                                                                    | KL3R3M450G160A □   |
|                       | 4.7                    | 10          | 12.5      | 95                                                                    | KL4R7M450G125A □   |
|                       | 4.7                    | 10          | 16        | 105                                                                   | KL4R7M450G160A □   |
|                       | 6.8                    | 10          | 16        | 125                                                                   | KL6R8M450G160A □   |
|                       | 6.8                    | 10          | 20        | 140                                                                   | KL6R8M450G200A □   |
|                       | 10                     | 10          | 20        | 170                                                                   | KL100M450G200A □   |
|                       | 10                     | 13          | 20        | 190                                                                   | KL100M450I200A □   |
|                       | 10                     | 13          | 25        | 220                                                                   | KL100M450I250A □   |
|                       | 15                     | 16          | 20        | 270                                                                   | KL150M450J200A □   |
|                       | 22                     | 13          | 20        | 280                                                                   | KL220M450I200A □   |
|                       | 22                     | 16          | 20        | 320                                                                   | KL220M450J200A □   |
|                       | 22                     | 16          | 25        | 360                                                                   | KL220M450J250A □   |
|                       | 33                     | 16          | 25        | 440                                                                   | KL330M450J250A □   |
|                       | 33                     | 18          | 25        | 460                                                                   | KL330M450K250A □   |
|                       | 47                     | 16          | 31.5      | 480                                                                   | KL470M450J315A □   |
|                       | 47                     | 18          | 25        | 450                                                                   | KL470M450K250A □   |
|                       | 56                     | 16          | 31.5      | 530                                                                   | KL560M450J315A □   |

□: Enter **blank** for Standard version

□: Enter **X** for AEC-Q200 version

See "PACKAGING INFORMATION" to taped or formed products.

## STANDARD RATINGS

Part number shows bulk version with straight leads

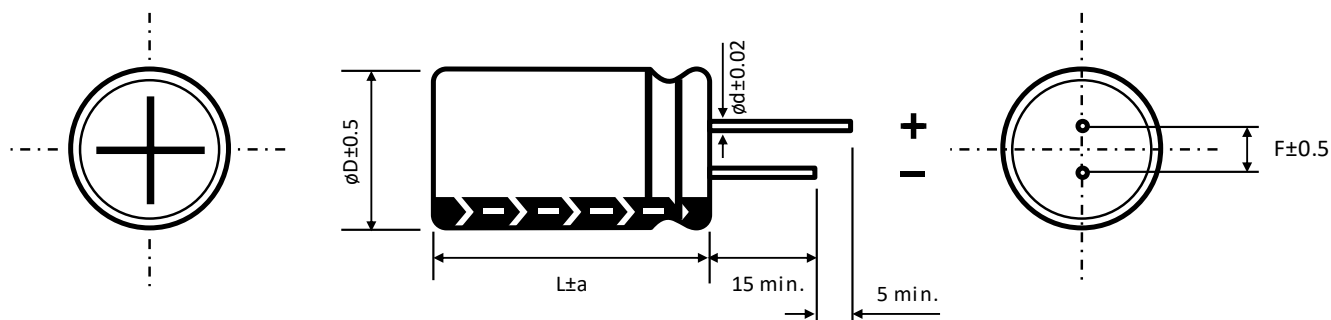
| V <sub>R</sub><br>(V) | C <sub>R</sub><br>(μF) | ø D<br>(mm) | L<br>(mm) | I <sub>R</sub> • Max.<br>Ripple Current<br>+105°C • 120Hz<br>(mA rms) | CapXon Part Number |
|-----------------------|------------------------|-------------|-----------|-----------------------------------------------------------------------|--------------------|
| 450                   | 68                     | 16          | 35.5      | 600                                                                   | KL680M450J355A □   |
|                       | 68                     | 18          | 25        | 580                                                                   | KL680M450K250A □   |
|                       | 68                     | 18          | 31.5      | 620                                                                   | KL680M450K315A □   |
|                       | 82                     | 16          | 35.5      | 680                                                                   | KL820M450J355A □   |
|                       | 100                    | 16          | 35.5      | 750                                                                   | KL101M450J355A □   |
|                       | 120                    | 18          | 35.5      | 840                                                                   | KL121M450K355A □   |
|                       | 150                    | 18          | 40        | 970                                                                   | KL151M450K400A □   |
|                       | 180                    | 18          | 45        | 1090                                                                  | KL181M450K450A □   |
| 500                   | 4.7                    | 13          | 20        | 82                                                                    | KL4R7M500I200A □   |
|                       | 6.8                    | 13          | 20        | 96                                                                    | KL6R8M500I200A □   |
|                       | 10                     | 13          | 25        | 130                                                                   | KL100M500I250A □   |
|                       | 22                     | 16          | 25        | 210                                                                   | KL220M500J250A □   |
|                       | 33                     | 16          | 31.5      | 280                                                                   | KL330M500J315A □   |
|                       | 47                     | 16          | 35.5      | 360                                                                   | KL470M500J355A □   |
|                       | 47                     | 18          | 31.5      | 360                                                                   | KL470M500K315A □   |
|                       | 56                     | 16          | 40        | 420                                                                   | KL560M500J400A □   |
|                       | 56                     | 18          | 31.5      | 400                                                                   | KL560M500K315A □   |
|                       | 68                     | 16          | 45        | 480                                                                   | KL680M500J450A □   |
|                       | 68                     | 18          | 35.5      | 460                                                                   | KL680M500K355A □   |
|                       | 68                     | 18          | 40        | 490                                                                   | KL680M500K400A □   |
|                       | 82                     | 18          | 40        | 540                                                                   | KL820M500K400A □   |
|                       | 100                    | 18          | 45        | 630                                                                   | KL101M500K450A □   |
|                       | 100                    | 20          | 40        | 660                                                                   | KL101M500L400A □   |
|                       | 120                    | 22          | 45        | 800                                                                   | KL121M500M450A □   |

□: Enter **blank** for Standard version

□: Enter **X** for AEC-Q200 version

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### DIMENSIONS • All dimensions in mm



| $\phi D$ | 10  | 13 | 16  | 18  | 22 |
|----------|-----|----|-----|-----|----|
| F        | 5   | 5  | 7.5 | 7.5 | 10 |
| $\phi d$ | 0.6 |    | 0.8 |     |    |

| a | $\phi D < 16$ | $\phi D = 16$  |                        | $\phi D = 18$  |                          | $\phi D > 18$ |
|---|---------------|----------------|------------------------|----------------|--------------------------|---------------|
|   | 1.5           | L = 25 to 35.5 | L < 25 and L $\geq$ 40 | L = 25 to 31.5 | L < 25 and L $\geq$ 35.5 | 2             |
|   |               | 1.5            | 2                      | 1.5            | 2                        |               |

### MULTIPLIER $K_f$ for RIPPLE CURRENT vs. FREQUENCY

| $C_R$ ( $\mu F$ ) / Frequency (Hz) | 100/120 | 1k  | 10k | $\geq 50k$ |
|------------------------------------|---------|-----|-----|------------|
| $3.3 < C_R \leq 330$               | 1       | 1.5 | 1.7 | 1.9        |

### PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our “General Precautions and Guidelines” as well as our “Packaging Information”. Please refer to the following links in the table.

|                                                      |                                       |                           |
|------------------------------------------------------|---------------------------------------|---------------------------|
|                                                      |                                       |                           |
| <a href="#">General Precautions &amp; Guidelines</a> | <a href="#">Packaging Information</a> | <a href="#">3D Models</a> |



### DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website [www.capxongroup.com](http://www.capxongroup.com) or contact CapXon directly.