



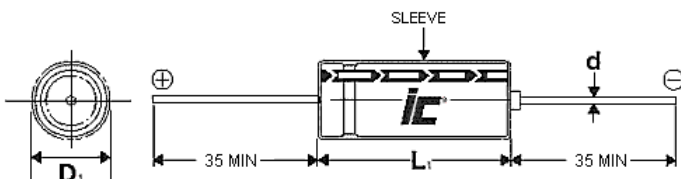
#### FEATMRES

Extended Life - High voltage

#### APPLICATIONS

Filtering – Bypass – Coupling – Blocking

| Operating Temperature Range                              |                | -40°C to +105°C (6.3 to 400 WVDC)<br>-25°C to +105°C (450 WVDC) |     |                                  |      |      |      |      |      |                       |      |     |                        |     |     |
|----------------------------------------------------------|----------------|-----------------------------------------------------------------|-----|----------------------------------|------|------|------|------|------|-----------------------|------|-----|------------------------|-----|-----|
| Capacitance Tolerance                                    |                | +20% at 120 Hz, 20°C                                            |     |                                  |      |      |      |      |      |                       |      |     |                        |     |     |
| Surge voltage                                            | WVDC           | 6.3                                                             | 10  | 16                               | 25   | 35   | 50   | 63   | 100  | 160                   | 200  | 250 | 350                    | 400 | 450 |
|                                                          | SVDC           | 7.9                                                             | 13  | 20                               | 32   | 44   | 63   | 79   | 125  | 200                   | 250  | 300 | 400                    | 450 | 500 |
| Dissipation Factor                                       | WVDC           | 6.3                                                             | 10  | 16                               | 25   | 35   | 50   | 63   | 100  | 160                   | 200  | 250 | 350                    | 400 | 450 |
|                                                          | Tan δ          | .28                                                             | .24 | .2                               | .18  | .14  | .12  | .1   | .09  | .2                    | .2   | .2  | .2                     | .25 | .25 |
|                                                          |                | Add .02 for every 1000μF above 1000μF                           |     |                                  |      |      |      |      |      |                       |      |     |                        |     |     |
| Leakage current                                          |                | 6.3 to 100 WVDC                                                 |     |                                  |      |      |      |      |      | 160 to 450 WVDC       |      |     |                        |     |     |
|                                                          |                | 1 Minutes                                                       |     |                                  |      |      |      |      |      | 1 Minute              |      |     | 1 Minute               |     |     |
|                                                          |                | .03CV or 4uA,<br>Whichever is greater                           |     |                                  |      |      |      |      |      | CV≤1000<br>.01CV+40μA |      |     | CV>1000<br>.04CV+100μA |     |     |
| Low temperature stability<br>Impedance ratio<br>(120 Hz) | WVDC           | 6.3                                                             | 10  | 16                               | 25   | 35   | 50   | 63   | 100  | 160                   | 200  | 250 | 350                    | 400 | 450 |
|                                                          | -25°C to +20°C | 5                                                               | 4   | 3                                | 2    | 2    | 2    | 2    | 2    | 3                     | 3    | 3   | 3                      | 3   | 5   |
|                                                          | -40°C to +20°C | 12                                                              | 10  | 8                                | 6    | 5    | 4    | 4    | 4    | 8                     | 6    | 6   | 6                      | 6   | -   |
| Load Life                                                |                | 2000 hours at 105°C with rated WVDC and ripple current applied  |     |                                  |      |      |      |      |      |                       |      |     |                        |     |     |
|                                                          |                | Capacitance change                                              |     | ≤20% of initial measured value   |      |      |      |      |      |                       |      |     |                        |     |     |
|                                                          |                | Dissipation factor                                              |     | ≤200% of maximum specified value |      |      |      |      |      |                       |      |     |                        |     |     |
|                                                          |                | Leakage current                                                 |     | ≤100% of maximum specified value |      |      |      |      |      |                       |      |     |                        |     |     |
| Shelf Life                                               |                | 1000 hours at 105°C with no voltage applied                     |     |                                  |      |      |      |      |      |                       |      |     |                        |     |     |
|                                                          |                | Capacitance change                                              |     | ≤20% initial measured value      |      |      |      |      |      |                       |      |     |                        |     |     |
|                                                          |                | Dissipation factor                                              |     | ≤200% of maximum specified value |      |      |      |      |      |                       |      |     |                        |     |     |
|                                                          |                | Leakage current                                                 |     | ≤100% of maximum specified value |      |      |      |      |      |                       |      |     |                        |     |     |
| Ripple Current Multipliers                               |                | Capacitance                                                     |     | Frequency (Hz)                   |      |      |      |      |      | Temperature (°C)      |      |     |                        |     |     |
|                                                          |                | μF                                                              | 50  | 120                              | 400  | 1k   | 10k  | 50k  | +105 | +85                   | +70  |     |                        |     |     |
|                                                          |                | C≤47                                                            | .75 | 1.0                              | 1.35 | 1.57 | 2.0  | 2.0  | 1.0  | 1.4                   | 1.62 |     |                        |     |     |
|                                                          |                | 47<C≤470                                                        | .8  | 1.0                              | 1.23 | 1.34 | 1.5  | 1.5  | 1.0  | 1.4                   | 1.62 |     |                        |     |     |
|                                                          |                | C>470                                                           | .85 | 1.0                              | 1.1  | 1.13 | 1.15 | 1.15 | 1.0  | 1.4                   | 1.62 |     |                        |     |     |



| D | 5   | 6.3 | 8   | 10  | 12.5 | 16  | 18  | 22  | 25  |
|---|-----|-----|-----|-----|------|-----|-----|-----|-----|
| d | 0.5 | 0.5 | 0.6 | 0.6 | 0.6  | 0.8 | 0.8 | 0.8 | 0.8 |
| B | 0.5 | 0.5 | 0.5 | 0.5 | 0.8  | 0.5 | 0.5 | 1.0 | 1.0 |

D ≤ 10mm, L<sub>1</sub> = L + 1.5mm Max.  
 D > 10mm, L<sub>1</sub> = L + 2mm Max.  
 D<sub>1</sub> = D + B Max.

# TMA

+105°C, Extended Life, 2000 hours

| Capacitance (µF) | WVDC | IC PART NUMBER | Maximum ESR (Ω)<br>120 Hz, +20°C | Maximum RMS Ripple Current (mA)<br>120 Hz, +105°C | Dims DxL (mm) |
|------------------|------|----------------|----------------------------------|---------------------------------------------------|---------------|
| 0.47             | 100  | 474TMA100M     | 317.463                          | 10                                                | 5x13          |
| 1                | 50   | 105TMA050M     | 198.944                          | 10                                                | 5x13          |
| 1                | 100  | 105TMA100M     | 149.208                          | 14                                                | 5x13          |
| 1                | 200  | 105TMA200M     | 331.573                          | 9                                                 | 6.3x13        |
| 1                | 350  | 105TMA350M     | 331.573                          | 10                                                | 6.3x16        |
| 1                | 400  | 105TMA400M     | 414.466                          | 12                                                | 8x16          |
| 1                | 450  | 105TMA450M     | 414.466                          | 12                                                | 8x16          |
| 2.2              | 50   | 225TMA050M     | 90.428                           | 18                                                | 5x13          |
| 2.2              | 100  | 225TMA100M     | 67.822                           | 19                                                | 5x13          |
| 2.2              | 200  | 225TMA200M     | 150.715                          | 17                                                | 6.3x16        |
| 2.2              | 350  | 225TMA350M     | 150.715                          | 17                                                | 8x16          |
| 2.2              | 400  | 225TMA400M     | 188.394                          | 19                                                | 8x20          |
| 2.2              | 450  | 225TMA450M     | 199.394                          | 22                                                | 10x20         |
| 3.3              | 50   | 335TMA050M     | 60.286                           | 22                                                | 5x13          |
| 3.3              | 100  | 335TMA100M     | 45.215                           | 27                                                | 6.3x13        |
| 3.3              | 250  | 335TMA250M     | 100.477                          | 24                                                | 8x16          |
| 3.3              | 350  | 335TMA350M     | 100.477                          | 24                                                | 8x20          |
| 3.3              | 400  | 335TMA400M     | 125.596                          | 27                                                | 10x21         |
| 3.3              | 450  | 335TMA450M     | 125.596                          | 27                                                | 10x21         |
| 4.7              | 63   | 475TMA063M     | 35.274                           | 32                                                | 5x13          |
| 4.7              | 100  | 475TMA100M     | 31.746                           | 32                                                | 6.3x13        |
| 4.7              | 200  | 475TMA200M     | 70.547                           | 28                                                | 8x16          |
| 4.7              | 250  | 475TMA250M     | 70.547                           | 32                                                | 8x20          |
| 4.7              | 350  | 475TMA350M     | 70.547                           | 33                                                | 10x20         |
| 4.7              | 400  | 475TMA400M     | 88.184                           | 33                                                | 10x20         |
| 4.7              | 450  | 475TMA450M     | 88.184                           | 36                                                | 10x25         |
| 10               | 35   | 106TMA035M     | 23.21                            | 33                                                | 5x13          |
| 10               | 50   | 106TMA050M     | 19.894                           | 41                                                | 5x13          |
| 10               | 63   | 106TMA063M     | 16.579                           | 44                                                | 6.3x13        |
| 10               | 100  | 106TMA100M     | 14.921                           | 52                                                | 6.3x16        |
| 10               | 160  | 106TMA160M     | 33.157                           | 43                                                | 8x20          |
| 10               | 200  | 106TMA200M     | 33.157                           | 50                                                | 10x21         |
| 10               | 250  | 106TMA250M     | 33.157                           | 50                                                | 10x21         |
| 10               | 350  | 106TMA350M     | 33.157                           | 60                                                | 13x26         |
| 10               | 400  | 106TMA400M     | 41.447                           | 60                                                | 13x26         |
| 10               | 450  | 106TMA450M     | 41.447                           | 67                                                | 12.5x30       |
| 22               | 25   | 226TMA025M     | 12.057                           | 48                                                | 5x13          |
| 22               | 35   | 226TMA035M     | 10.55                            | 57                                                | 6.3x13        |
| 22               | 63   | 226TMA063M     | 7.536                            | 73                                                | 6.3x16        |
| 22               | 100  | 226TMA100M     | 6.782                            | 85                                                | 8x16          |
| 22               | 160  | 226TMA160M     | 15.071                           | 85                                                | 10x26         |
| 22               | 250  | 226TMA250M     | 15.071                           | 100                                               | 13x26         |
| 22               | 350  | 226TMA350M     | 15.071                           | 110                                               | 16x31         |
| 22               | 400  | 226TMA400M     | 18.839                           | 110                                               | 16x31         |
| 22               | 450  | 226TMA450M     | 18.839                           | 130                                               | 16x40         |
| 33               | 16   | 336TMA016M     | 10.048                           | 54                                                | 5x13          |
| 33               | 25   | 336TMA025M     | 8.038                            | 64                                                | 6.3x13        |
| 33               | 63   | 336TMA063M     | 5.024                            | 89                                                | 6.3x16        |
| 33               | 100  | 336TMA100M     | 4.522                            | 115                                               | 8x20          |
| 33               | 160  | 336TMA160M     | 10.048                           | 120                                               | 13x26         |
| 33               | 200  | 336TMA200M     | 10.048                           | 135                                               | 13x26         |
| 33               | 250  | 336TMA250M     | 10.048                           | 135                                               | 13x26         |
| 33               | 350  | 336TMA350M     | 10.048                           | 150                                               | 16x31         |
| 33               | 400  | 336TMA400M     | 12.56                            | 155                                               | 16x41         |
| 33               | 450  | 336TMA450M     | 12.56                            | 160                                               | 18x40         |
| 47               | 10   | 476TMA010M     | 8.466                            | 57                                                | 5x13          |
| 47               | 16   | 476TMA016M     | 7.055                            | 71                                                | 6.3x13        |
| 47               | 50   | 476TMA050M     | 4.233                            | 100                                               | 6.3x16        |

| Capacitance (µF) | WVDC | IC PART NUMBER | Maximum ESR (Ω)<br>120 Hz, +20°C | Maximum RMS Ripple Current (mA)<br>120 Hz, +105°C | Dims DxL (mm) |
|------------------|------|----------------|----------------------------------|---------------------------------------------------|---------------|
| 47               | 63   | 476TMA063M     | 3.527                            | 115                                               | 8x16          |
| 47               | 100  | 476TMA100M     | 3.175                            | 135                                               | 8x20          |
| 47               | 160  | 476TMA160M     | 7.055                            | 155                                               | 13x31         |
| 47               | 200  | 476TMA200M     | 7.055                            | 155                                               | 13x31         |
| 47               | 250  | 476TMA250M     | 7.055                            | 175                                               | 16x31         |
| 47               | 350  | 476TMA350M     | 7.055                            | 185                                               | 16x41         |
| 47               | 400  | 476TMA400M     | 8.818                            | 200                                               | 18x41         |
| 47               | 450  | 476TMA450M     | 8.818                            | 220                                               | 22x40         |
| 100              | 6.3  | 107TMA063M     | 4.642                            | 89                                                | 6.3x13        |
| 100              | 25   | 107TMA025M     | 2.653                            | 120                                               | 6.3x16        |
| 100              | 50   | 107TMA050M     | 1.989                            | 155                                               | 8x16          |
| 100              | 63   | 107TMA063M     | 1.658                            | 185                                               | 8x20          |
| 100              | 100  | 107TMA100M     | 1.492                            | 240                                               | 10x26         |
| 100              | 160  | 107TMA160M     | 3.316                            | 300                                               | 16x41         |
| 100              | 200  | 107TMA200M     | 3.316                            | 300                                               | 16x41         |
| 100              | 250  | 107TMA250M     | 3.316                            | 300                                               | 16x41         |
| 100              | 350  | 107TMA350M     | 3.316                            | 310                                               | 22x41         |
| 100              | 400  | 107TMA400M     | 4.145                            | 330                                               | 22x51         |
| 220              | 10   | 227TMA010M     | 1.809                            | 115                                               | 6.3x16        |
| 220              | 25   | 227TMA025M     | 1.206                            | 200                                               | 8x16          |
| 220              | 35   | 227TMA035M     | 1.055                            | 240                                               | 8x20          |
| 220              | 50   | 227TMA050M     | 0.904                            | 290                                               | 10x21         |
| 220              | 63   | 227TMA063M     | 0.754                            | 340                                               | 10x26         |
| 220              | 100  | 227TMA100M     | 0.678                            | 430                                               | 13x31         |
| 220              | 160  | 227TMA160M     | 1.507                            | 510                                               | 22x41         |
| 220              | 200  | 227TMA200M     | 1.507                            | 510                                               | 22x41         |
| 220              | 250  | 227TMA250M     | 1.507                            | 550                                               | 22x51         |
| 330              | 16   | 337TMA016M     | 1.005                            | 230                                               | 8x16          |
| 330              | 25   | 337TMA025M     | 0.804                            | 270                                               | 8x20          |
| 330              | 35   | 337TMA035M     | 0.703                            | 330                                               | 10x21         |
| 330              | 50   | 337TMA050M     | 0.603                            | 400                                               | 10x26         |
| 330              | 63   | 337TMA063M     | 0.504                            | 460                                               | 13x26         |
| 330              | 100  | 337TMA100M     | 0.452                            | 570                                               | 16x31         |
| 470              | 10   | 477TMA010M     | 0.847                            | 250                                               | 8x16          |
| 470              | 16   | 477TMA016M     | 0.706                            | 310                                               | 8x20          |
| 470              | 25   | 477TMA025M     | 0.564                            | 370                                               | 10x21         |
| 470              | 35   | 477TMA035M     | 0.494                            | 430                                               | 10x26         |
| 470              | 50   | 477TMA050M     | 0.423                            | 530                                               | 13x26         |
| 470              | 63   | 477TMA063M     | 0.353                            | 590                                               | 13x31         |
| 470              | 100  | 477TMA100M     | 0.318                            | 770                                               | 16x41         |
| 1000             | 10   | 108TMA010M     | 0.398                            | 460                                               | 10x21         |
| 1000             | 16   | 108TMA016M     | 0.332                            | 550                                               | 10x26         |
| 1000             | 25   | 108TMA025M     | 0.265                            | 640                                               | 13x26         |
| 1000             | 35   | 108TMA035M     | 0.232                            | 750                                               | 13x31         |
| 1000             | 50   | 108TMA050M     | 0.199                            | 890                                               | 16x31         |
| 1000             | 63   | 108TMA063M     | 0.166                            | 940                                               | 16x31         |
| 1000             | 100  | 108TMA100M     | 0.149                            | 1210                                              | 22x41         |
| 2200             | 10   | 228TMA010M     | 0.211                            | 780                                               | 13x26         |
| 2200             | 16   | 228TMA016M     | 0.181                            | 910                                               | 13x31         |
| 2200             | 25   | 228TMA025M     | 0.151                            | 1040                                              | 16x31         |
| 2200             | 35   | 228TMA035M     | 0.136                            | 1120                                              | 16x31         |
| 2200             | 50   | 228TMA050M     | 0.121                            | 1360                                              | 18x41         |
| 2200             | 63   | 228TMA063M     | 0.106                            | 1740                                              | 22x41         |
| 3300             | 6.3  | 338TMA063M     | 0.171                            | 860                                               | 13x26         |
| 3300             | 10   | 338TMA010M     | 0.151                            | 980                                               | 13x31         |
| 3300             | 16   | 338TMA016M     | 0.131                            | 1140                                              | 16x31         |
| 3300             | 25   | 338TMA025M     | 0.111                            | 1200                                              | 16x31         |
| 3300             | 35   | 338TMA035M     | 0.101                            | 1430                                              | 16x41         |

# TMA

**+105°C, Extended Life, 2000 hours**

| Capacitance (μF) | WVDC | IC PART NUMBER    | Maximum ESR (Ω)<br>120 Hz,<br>+20°C | Maximum RMS Ripple Current (mA)<br>120 Hz,<br>+105°C | Dims DxL (mm) |
|------------------|------|-------------------|-------------------------------------|------------------------------------------------------|---------------|
| 3300             | 50   | <b>338TMA050M</b> | 0.0904                              | 1660                                                 | 22x41         |
| 3300             | 63   | <b>338TMA063M</b> | 0.0804                              | 1740                                                 | 22x51         |
| 4700             | 6.3  | <b>478TMA6R3M</b> | 0.0127                              | 1060                                                 | 13x31         |
| 4700             | 10   | <b>478TMA010M</b> | 0.113                               | 1220                                                 | 16x31         |
| 4700             | 16   | <b>478TMA016M</b> | 0.099                               | 1300                                                 | 16x31         |
| 4700             | 25   | <b>478TMA025M</b> | 0.085                               | 1540                                                 | 18x41         |
| 4700             | 35   | <b>478TMA035M</b> | 0.078                               | 1740                                                 | 22x41         |
| 4700             | 50   | <b>478TMA050M</b> | 0.071                               | 1860                                                 | 22x51         |
| 6800             | 10   | <b>688TMA010M</b> | 0.0878                              | 1370                                                 | 16x31         |
| 6800             | 16   | <b>688TMA016M</b> | 0.078                               | 1620                                                 | 16x41         |
| 6800             | 25   | <b>688TMA025M</b> | 0.0683                              | 1810                                                 | 22x41         |

| Capacitance (μF) | WVDC | IC PART NUMBER    | Maximum ESR (Ω)<br>120 Hz,<br>+20°C | Maximum RMS Ripple Current (mA)<br>120 Hz,<br>+105°C | Dims DxL (mm) |
|------------------|------|-------------------|-------------------------------------|------------------------------------------------------|---------------|
| 6800             | 35   | <b>688TMA035M</b> | 0.0634                              | 1910                                                 | 22x51         |
| 10000            | 6.3  | <b>109TMA6R3M</b> | 0.076                               | 1620                                                 | 16x41         |
| 10000            | 10   | <b>109TMA010M</b> | 0.0696                              | 1690                                                 | 18x41         |
| 10000            | 16   | <b>109TMA016M</b> | 0.063                               | 1900                                                 | 22x41         |
| 10000            | 25   | <b>109TMA025M</b> | 0.0729                              | 1980                                                 | 22x51         |
| 15000            | 6.3  | <b>159TMA6R3M</b> | 0.062                               | 1740                                                 | 18x41         |
| 15000            | 10   | <b>159TMA010M</b> | 0.0575                              | 1950                                                 | 22x41         |
| 15000            | 16   | <b>159TMA016M</b> | 0.053                               | 2050                                                 | 22x51         |
| 22000            | 6.3  | <b>229TMA6R3M</b> | 0.054                               | 2000                                                 | 22x41         |
| 22000            | 10   | <b>229TMA010M</b> | 0.053                               | 2080                                                 | 22x51         |