

TMA

+105°C Standard Axial Lead Aluminum Electrolytic Capacitors



For long life/Extended Temperature Applications

FEATURES

- High ripple current ratings
- Wide capacitance range: 0.47 μ F to 22,000 μ F
- Voltage range: 6.3 WVDC to 450 WVDC
- Solvent tolerant end seals standard (\leq 250 WVDC)

SPECIFICATIONS

| | | | | | | | | | | | | | | | | |
|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------|------|------|------|-----|------------------|-------------------------------------------------------------------------------------------------|---------------------------------------|-----|-----|-----------------------------------|-----|-----|-----|-----------------|
| Capacitance Tolerance | | $\pm 20\%$ at 120Hz, 20°C | | | | | | | | | | | | | | |
| Operating Temperature Range | | -40°C to +105°C | | | | | | | | | | | | | | -25°C to +105°C |
| Dissipation Factor 120Hz, 20°C (Max) | WVDC | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | 350 | 400 | 450 | |
| | tan δ | .28 | .24 | .20 | .16 | .14 | .12 | .10 | .09 | .20 | .20 | .20 | .20 | .25 | .25 | |
| Note: For above D.F. specifications, add .02 for every 1,000 μ F above 1,000 μ F | | | | | | | | | | | | | | | | |
| Impedance Ratio (Max.) @120Hz | WVDC | 6 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | 350 | 400 | 450 | |
| | -25°C/20°C | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 5 | |
| | -40°C/20°C | 12 | 10 | 8 | 6 | 5 | 4 | 4 | 4 | 6 | 6 | 6 | 6 | 6 | - | |
| Leakage Current | WVDC | \leq 100 WVDC | | | | | | | 100 < WVDC \leq 450 | | | | | | | |
| | Time | 1 minute | | | | | | | 1 minute | | | | | | | |
| | | .03 CV or 4 μ A whichever is greater | | | | | | | CV \leq 1000 .01 CV + 40 μ A | | | CV > 1000 .04 CV + 100 μ A | | | | |
| Load Life | 1,000 hours at 105°C with rated WVDC | | | | | | | | | | | | | | | |
| | Capacitance change Dissipation factor Leakage current | | | | | | | < 20% of initial measured value <200% of initial specified value <Initial specified value | | | | | | | | |
| Shelf life | 1,000 hours at 105°C with no voltage applied. Units will meet load life specification. | | | | | | | | | | | | | | | |
| Ripple Current Multipliers | Capacitance (μ F) | Frequency (Hz) | | | | | Temperature (C°) | | | | | | | | | |
| | | 50 | 120 | 400 | 1k | 10k | +105 | +85 | +70 | | | | | | | |
| | C \leq 47 | .75 | 1.0 | 1.35 | 1.57 | 2.0 | 1.0 | 1.4 | 1.62 | | | | | | | |
| | 100 \leq C \leq 470 | .8 | 1.0 | 1.23 | 1.34 | 1.5 | 1.0 | 1.4 | 1.62 | | | | | | | |
| C > 470 | .85 | 1.0 | 1.10 | 1.13 | 1.15 | 1.0 | 1.4 | 1.62 | | | | | | | | |

Aluminum Electrolytic

SPECIAL ORDER OPTIONS

(See Pages 33 thru 37)

- Special tolerances: $\pm 10\%$ (K), -10% + 30% (Q)
- Tape and Reel
- Epoxy end seal



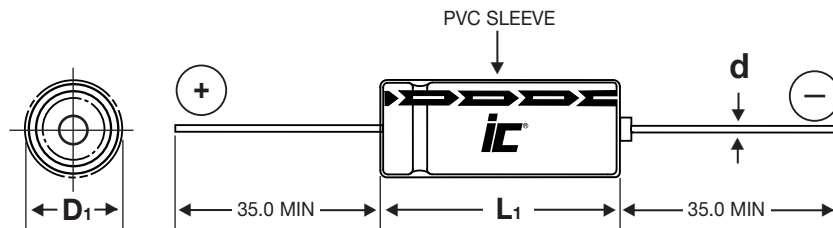
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PHYSICAL DIMENSIONS

| WVDC (SV) μF | 6.3 (8) | 10 (13) | 16 (20) | 25 (32) | 35 (44) | 50 (63) | 63 (79) | 100 (125) | 160 (200) | 200 (250) | 250 (300) | 350 (400) | 400 (450) | 450 (500) |
|-----------------|----------|---------|----------|----------|----------|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0.47 | | | | | | | | 5x12.5 | | | | | | |
| 1 | | | | | | 5x12.5 | 5x12.5 | 5x12.5 | 6.3x12.5 | 6.3x16 | 8x16 | 8x16 | | |
| 2.2 | | | | | | 5x12.5 | 5x12.5 | 5x12.5 | 6.3x16 | 8x16 | 8x20 | 10x20 | | |
| 3.3 | | | | | | 5x12.5 | 5x12.5 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x20 | 10x20 | |
| 4.7 | | | | | | | 5x12.5 | 6.3x12.5 | 8x16 | 8x20 | 10x20 | 10x20 | 10x20 | 10x25 |
| 10 | | | | 5x12.5 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x20 | 10x20 | 12.5x25 | 12.5x25 | 12.5x30 | |
| 22 | | | 5x12.5 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x25 | 12.5x25 | 12.5x25 | 12.5x30 | 16x30 | 16x30 | 16x40 |
| 33 | | 5x12.5 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x25 | 12.5x25 | 12.5x25 | 12.5x30 | 16x30 | 16x40 | 18x40 | |
| 47 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x20 | 10x25 | 12.5x25 | 12.5x30 | 16x30 | 16x40 | 22x40 | 22x50 | | |
| 100 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x20 | 10x25 | 12.5x25 | 12.5x30 | 16x30 | 16x40 | 22x40 | 22x50 | | |
| 220 | 6.3x12.5 | 6.3x16 | 8x16 | 8x20 | 10x20 | 10x25 | 12.5x25 | 12.5x30 | 16x30 | 16x40 | 22x40 | 22x50 | | |
| 330 | | 8x16 | 8x20 | 10x20 | 10x25 | 12.5x25 | 12.5x30 | 16x40 | | | | | | |
| 470 | | 8x16 | 8x20 | 10x20 | 10x25 | 12.5x25 | 12.5x30 | 16x40 | | | | | | |
| 1,000 | | 10x20 | 10x25 | 12.5x25 | 12.5x30 | 16x30 | 16x30 | 22x40 | | | | | | |
| 2,200 | | 12.5x25 | 12.5x30 | 16x30 | 16x30 | 18x40 | 22x40 | | | | | | | |
| 3,300 | 12.5x25 | 12.5x30 | 16x30 | 16x30 | 16x40 | 22x40 | 22x50 | | | | | | | |
| 4,700 | 12.5x30 | 16x30 | 16x30 | 18x40 | 22x40 | 22x50 | | | | | | | | |
| 6,800 | | 16x30 | 16x40 | 22x40 | 22x50 | | | | | | | | | |
| 10,000 | 16x40 | 18x40 | 22x40 | 22x50 | | | | | | | | | | |
| 15,000 | 18x40 | 22x40 | 22x50 | | | | | | | | | | | |
| 22,000 | 22x40 | 22x50 | | | | | | | | | | | | |

Convert to inches, divide by 25.4

DxL (mm)



LEAD INFORMATION VS. CASE DIAMETER

| D | 5.0 | 6.3 | 8.0 | 10.0 | 12.5 | 16.0 | 18.0 | 22.0 |
|---|-----|-----|-----|------|------|------|------|------|
| d | 0.6 | 0.5 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | 0.8 |
| B | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

D₁ = D + B Max.
L₁ = L + 2 Max.

NOTE: Case Vent is standard on all diameter ≥ 8.0mm

STANDARD PARTS LISTING

| Capacitance (μF) | WVDC | IC [®] PART NUMBER | Maximum ESR Ω 120Hz, +25°C | Maximum RMS Ripple Current (mA) 120Hz, +105°C | Dimension D x L (mm) |
|------------------|------|-----------------------------|-------------------------------|--------------------------------------------------|----------------------|
| 0.47 | 100 | 474TMA100M | 317.46 | 10 | 5x12.5 |
| 1 | 50 | 105TMA050M | 198.94 | 10 | 5x12.5 |
| 1 | 100 | 105TMA100M | 149.21 | 15 | 5x12.5 |
| 1 | 200 | 105TMA200M | 331.6 | 9 | 6.3x12.5 |
| 1 | 350 | 105TMA350M | 331.57 | 10 | 6.3x16 |
| 1 | 400 | 105TMA400M | 414.47 | 11 | 8x16 |
| 1 | 450 | 105TMA450M | 414.5 | 11 | 8x16 |
| 2.2 | 50 | 225TMA050M | 90.43 | 20 | 5x12.5 |
| 2.2 | 100 | 225TMA100M | 67.82 | 23 | 5x12.5 |
| 2.2 | 200 | 225TMA200M | 150.71 | 16 | 6.3x16 |
| 2.2 | 350 | 225TMA350M | 150.71 | 19 | 8x16 |
| 2.2 | 400 | 225TMA400M | 188.39 | 19 | 8x20 |
| 2.2 | 450 | 225TMA450M | 188.39 | 22 | 10x20 |
| 3.3 | 50 | 335TMA050M | 60.29 | 25 | 5x12.5 |
| 3.3 | 100 | 335TMA100M | 45.21 | 30 | 6.3x12.5 |
| 3.3 | 250 | 335TMA250M | 100.48 | 23 | 8x16 |
| 3.3 | 350 | 335TMA350M | 100.48 | 26 | 8x20 |
| 3.3 | 400 | 335TMA400M | 125.60 | 27 | 10x20 |
| 3.3 | 450 | 335TMA450M | 125.60 | 27 | 10x20 |
| 4.7 | 63 | 475TMA063M | 35.27 | 32 | 5x12.5 |
| 4.7 | 100 | 475TMA100M | 31.75 | 36 | 6.3x12.5 |
| 4.7 | 200 | 475TMA200M | 70.55 | 27 | 8x16 |
| 4.7 | 250 | 475TMA250M | 70.55 | 32 | 8x20 |
| 4.7 | 350 | 475TMA350M | 70.55 | 35 | 10x20 |
| 4.7 | 400 | 475TMA400M | 88.18 | 32 | 10x20 |
| 4.7 | 450 | 475TMA450M | 88.18 | 35 | 10x25 |
| 10 | 35 | 106TMA035M | 23.21 | 40 | 5x12.5 |
| 10 | 50 | 106TMA050M | 19.89 | 41 | 5x12.5 |
| 10 | 63 | 106TMA063M | 35.27 | 49 | 6.3x12.5 |
| 10 | 100 | 106TMA100M | 14.92 | 58 | 6.3x16 |
| 10 | 160 | 106TMA160M | 33.16 | 43 | 8x20 |
| 10 | 200 | 106TMA200M | 33.16 | 50 | 10x20 |
| 10 | 250 | 106TMA250M | 33.16 | 50 | 10x20 |
| 10 | 350 | 106TMA350M | 33.16 | 64 | 12.5x25 |
| 10 | 400 | 106TMA400M | 41.45 | 60 | 12.5x25 |
| 10 | 450 | 106TMA450M | 41.45 | 60 | 12.5x30 |
| 22 | 25 | 226TMA025M | 12.06 | 52 | 5x12.5 |
| 22 | 35 | 226TMA035M | 10.55 | 61 | 6.3x12.5 |
| 22 | 63 | 226TMA063M | 7.54 | 81 | 6.3x16 |
| 22 | 100 | 226TMA100M | 6.78 | 95 | 8x16 |
| 22 | 160 | 226TMA160M | 15.07 | 85 | 10x25 |

| Capacitance (μF) | WVDC | IC [®] PART NUMBER | Maximum ESR Ω 120Hz, +25°C | Maximum RMS Ripple Current (mA) 120Hz, +105°C | Dimension D x L (mm) |
|------------------|------|-----------------------------|-------------------------------|--------------------------------------------------|----------------------|
| 22 | 250 | 226TMA250M | 15.07 | 100 | 12.5x25 |
| 22 | 350 | 226TMA350M | 15.07 | 120 | 16x30 |
| 22 | 400 | 226TMA400M | 18.84 | 105 | 16x30 |
| 22 | 450 | 226TMA450M | 18.84 | 105 | 16x40 |
| 33 | 16 | 336TMA016M | 10.05 | 57 | 5x12.5 |
| 33 | 25 | 336TMA025M | 98.04 | 70 | 6.3x12.5 |
| 33 | 63 | 336TMA063M | 5.02 | 100 | 6.3x16 |
| 33 | 100 | 336TMA100M | 4.52 | 130 | 8x20 |
| 33 | 160 | 336TMA160M | 10.05 | 120 | 12.5x25 |
| 33 | 200 | 336TMA200M | 10.05 | 135 | 12.5x25 |
| 33 | 250 | 336TMA250M | 10.05 | 135 | 12.5x30 |
| 33 | 350 | 336TMA350M | 10.05 | 150 | 16x30 |
| 33 | 400 | 336TMA400M | 12.56 | 155 | 16x40 |
| 33 | 450 | 336TMA450M | 12.56 | 160 | 18x40 |
| 47 | 10 | 476TMA010M | 8.47 | 62 | 5x12.5 |
| 47 | 16 | 476TMA016M | 7.05 | 75 | 6.3x12.5 |
| 47 | 50 | 476TMA050M | 4.23 | 110 | 6.3x16 |
| 47 | 63 | 476TMA063M | 3.53 | 130 | 8x16 |
| 47 | 100 | 476TMA100M | 3.17 | 155 | 8x20 |
| 47 | 160 | 476TMA160M | 7.05 | 155 | 12.5x30 |
| 47 | 200 | 476TMA200M | 7.05 | 155 | 12.5x30 |
| 47 | 250 | 476TMA250M | 7.05 | 175 | 16x30 |
| 47 | 350 | 476TMA350M | 7.05 | 205 | 16x40 |
| 47 | 400 | 476TMA400M | 8.82 | 200 | 18x40 |
| 47 | 450 | 476TMA450M | 8.82 | 210 | 22x40 |
| 100 | 6.3 | 107TMA6R3M | 4.64 | 93 | 6.3x12.5 |
| 100 | 25 | 107TMA025M | 2.65 | 140 | 6.3x16 |
| 100 | 50 | 107TMA050M | 1.99 | 175 | 8x16 |
| 100 | 63 | 107TMA063M | 1.66 | 215 | 8x20 |
| 100 | 100 | 107TMA100M | 1.49 | 280 | 10x25 |
| 100 | 160 | 107TMA160M | 3.32 | 300 | 16x40 |
| 100 | 200 | 107TMA200M | 3.32 | 300 | 16x40 |
| 100 | 250 | 107TMA250M | 3.32 | 300 | 16x40 |
| 100 | 350 | 107TMA350M | 3.32 | 350 | 22x40 |
| 100 | 400 | 107TMA400M | 4.14 | 330 | 22x50 |
| 220 | 10 | 227TMA010M | 1.81 | 170 | 6.3x16 |
| 220 | 25 | 227TMA025M | 1.21 | 225 | 8x16 |
| 220 | 35 | 227TMA035M | 1.06 | 265 | 8x20 |
| 220 | 50 | 227TMA050M | 0.9 | 325 | 10x20 |
| 220 | 63 | 227TMA063M | 0.75 | 390 | 10x25 |
| 220 | 100 | 227TMA100M | 0.68 | 485 | 12.5x30 |

STANDARD PARTS LISTING

| Capacitance (µF) | WVDC | IC [®] PART NUMBER | Maximum ESR Ω 120Hz, +25°C | Maximum RMS Ripple Current (mA) 120Hz, +105°C | Dimension D x L (mm) |
|------------------|------|-----------------------------|-------------------------------|--------------------------------------------------|----------------------|
| 220 | 160 | 227TMA160M | 1.51 | 520 | 22x40 |
| 220 | 200 | 227TMA200M | 1.51 | 520 | 22x40 |
| 220 | 250 | 227TMA250M | 1.51 | 550 | 22x50 |
| 330 | 16 | 337TMA016M | 1 | 250 | 8x16 |
| 330 | 25 | 337TMA025M | 0.8 | 305 | 8x20 |
| 330 | 35 | 337TMA035M | 0.7 | 365 | 10x20 |
| 330 | 50 | 337TMA050M | 0.6 | 435 | 10x25 |
| 330 | 63 | 337TMA063M | 0.5 | 520 | 12.5x25 |
| 330 | 100 | 337TMA100M | 0.45 | 600 | 16x30 |
| 470 | 10 | 477TMA010M | 0.85 | 270 | 8x16 |
| 470 | 16 | 477TMA016M | 0.71 | 325 | 8x20 |
| 470 | 25 | 477TMA025M | 0.56 | 410 | 10x20 |
| 470 | 35 | 477TMA035M | 0.49 | 480 | 10x25 |
| 470 | 50 | 477TMA050M | 0.42 | 565 | 12.5x25 |
| 470 | 63 | 477TMA063M | 0.35 | 670 | 12.5x30 |
| 470 | 100 | 477TMA100M | 0.32 | 870 | 16x40 |
| 1000 | 10 | 108TMA010M | 0.4 | 485 | 10x20 |
| 1000 | 16 | 108TMA016M | 0.33 | 585 | 10x25 |
| 1000 | 25 | 108TMA025M | 0.27 | 715 | 12.5x25 |
| 1000 | 35 | 108TMA035M | 0.23 | 830 | 12.5x30 |
| 1000 | 50 | 108TMA050M | 0.2 | 905 | 16x30 |
| 1000 | 63 | 108TMA063M | 0.17 | 1070 | 16x30 |
| 1000 | 100 | 108TMA100M | 0.15 | 1360 | 22x40 |
| 2200 | 10 | 228TMA010M | 0.21 | 835 | 12.5x25 |
| 2200 | 16 | 228TMA016M | 0.18 | 980 | 12.5x30 |
| 2200 | 25 | 228TMA025M | 0.15 | 1100 | 16x30 |
| 2200 | 35 | 228TMA035M | 0.14 | 1250 | 16x30 |
| 2200 | 50 | 228TMA050M | 0.12 | 1500 | 18x40 |

| Capacitance (µF) | WVDC | IC [®] PART NUMBER | Maximum ESR Ω 120Hz, +25°C | Maximum RMS Ripple Current (mA) 120Hz, +105°C | Dimension D x L (mm) |
|------------------|------|-----------------------------|-------------------------------|--------------------------------------------------|----------------------|
| 2200 | 63 | 228TMA063M | 0.11 | 1740 | 22x40 |
| 3300 | 6.3 | 338TMA6R3M | 0.17 | 920 | 12.5x25 |
| 3300 | 10 | 338TMA010M | 0.15 | 1070 | 12.5x30 |
| 3300 | 16 | 338TMA016M | 0.13 | 1160 | 16x30 |
| 3300 | 25 | 338TMA025M | 0.11 | 1370 | 16x30 |
| 3300 | 35 | 338TMA035M | 0.1 | 1640 | 16x40 |
| 3300 | 50 | 338TMA 050M | 0.09 | 1850 | 22x40 |
| 3300 | 63 | 338TMA063M | 0.08 | 2180 | 22x50 |
| 4700 | 6.3 | 478TMA6R3M | 0.13 | 1160 | 12.5x30 |
| 4700 | 10 | 478TMA010M | 0.11 | 1240 | 16x30 |
| 4700 | 16 | 478TMA016M | 0.1 | 1440 | 16x30 |
| 4700 | 25 | 478TMA025M | 0.08 | 1750 | 18x40 |
| 4700 | 35 | 478TMA035M | 0.08 | 1970 | 22x40 |
| 4700 | 50 | 478TMA050M | 0.07 | 2290 | 22x50 |
| 6800 | 10 | 688TMA010M | 0.09 | 1560 | 16x30 |
| 6800 | 16 | 688TMA016M | 0.08 | 1820 | 16x40 |
| 6800 | 25 | 688TMA025M | 0.07 | 2080 | 22x40 |
| 6800 | 35 | 688TMA035M | 0.06 | 2390 | 22x50 |
| 10000 | 6.3 | 109TMA6R3M | 0.08 | 1790 | 16x40 |
| 10000 | 10 | 109TMA010M | 0.07 | 1850 | 18x40 |
| 10000 | 16 | 109TMA016M | 0.06 | 2090 | 22x40 |
| 10000 | 25 | 109TMA025M | 0.06 | 2430 | 22x50 |
| 15000 | 6.3 | 159TMA6R3M | 0.06 | 1960 | 18x40 |
| 15000 | 10 | 159TMA010M | 0.06 | 2180 | 22x40 |
| 15000 | 16 | 159TMA016M | 0.05 | 2510 | 22x50 |
| 22000 | 6.3 | 229TMA6R3M | 0.05 | 2280 | 22x40 |
| 22000 | 10 | 229TMA010M | 0.05 | 2590 | 22x50 |