

## MA series

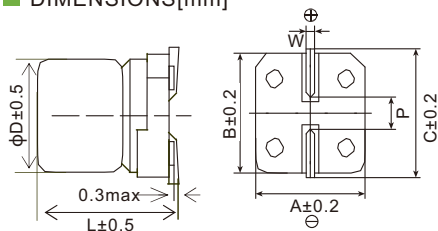
- Endurance: 10,000 hours at 105°C
- Designed for surface mounting on high density PC board
- Compliant to AEC-Q200
- RoHS Compliant



### SPECIFICATIONS

| Items                                                     | Characteristics                                                                                                                                       |                                      |      |      |      |                                      |      |                                      |         |         |                  |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------|------|------|--------------------------------------|------|--------------------------------------|---------|---------|------------------|
| Category Temperature Range                                | -55~+105°C(16~100 V <sub>dc</sub> )                                                                                                                   |                                      |      |      |      | -40~+105°C(160~450 V <sub>dc</sub> ) |      |                                      |         |         |                  |
| Rated Voltage Range                                       | 16~450 V <sub>dc</sub>                                                                                                                                |                                      |      |      |      |                                      |      |                                      |         |         |                  |
| Capacitance Tolerance                                     | ±20%(M) (at 20°C, 120Hz)                                                                                                                              |                                      |      |      |      |                                      |      |                                      |         |         |                  |
| Leakage Current                                           | 16~100 V <sub>dc</sub>                                                                                                                                |                                      |      |      |      | 160~450 V <sub>dc</sub>              |      |                                      |         |         | (at 20°C)        |
|                                                           | I≤0.03CV or 4μA, whichever is greater. (2 minutes)                                                                                                    |                                      |      |      |      | I≤0.04CV+100μA (1 minute)            |      |                                      |         |         |                  |
|                                                           | Where, I:Max.leakage current (μA),C:Nominal capacitance (μF),V: Rated voltage (V)                                                                     |                                      |      |      |      |                                      |      |                                      |         |         |                  |
| Dissipation Factor (tanδ)                                 | Rated Voltage(V <sub>dc</sub> )                                                                                                                       | 16                                   | 25   | 35   | 50   | 63                                   | 80   | 100                                  | 160~250 | 400~450 | (at 20°C, 120Hz) |
|                                                           | Dissipation Factor(Max.)                                                                                                                              | 0.26                                 | 0.16 | 0.14 | 0.14 | 0.20                                 | 0.20 | 0.20                                 | 0.20    | 0.24    |                  |
| Low Temperature Characteristics<br>(Max. Impedance Ratio) | Rated Voltage(V <sub>dc</sub> )                                                                                                                       | 16                                   | 25   | 35   | 50   | 63                                   | 80   | 100                                  | 160~250 | 400~450 | (at 120Hz)       |
|                                                           | Z(-25°C)/Z(+20°C)                                                                                                                                     | 2                                    | 2    | 2    | 2    | 2                                    | 2    | 2                                    | 6       | 6       |                  |
|                                                           | Z(-40°C)/Z(+20°C)                                                                                                                                     | 3                                    | 3    | 3    | 3    | 3                                    | 3    | 3                                    | 10      | 18      |                  |
|                                                           | Z(-55°C)/Z(+20°C)                                                                                                                                     | 4                                    | 3    | 3    | 3    | 3                                    | 3    | 3                                    | -       | -       |                  |
| Endurance                                                 | The specifications listed below shall be satisfied when the capacitors are restored to 20°C after rated voltage is applied for 10,000 hours at 105°C. |                                      |      |      |      |                                      |      |                                      |         |         |                  |
|                                                           | Rated Voltage(V <sub>dc</sub> )                                                                                                                       | 16~100                               |      |      |      |                                      |      | 160~450                              |         |         |                  |
|                                                           | Capacitance Change                                                                                                                                    | ≤±30% of the initial value           |      |      |      |                                      |      | ≤±20% of the initial value           |         |         |                  |
|                                                           | Dissipation Factor (tanδ)                                                                                                                             | ≤300% of the initial specified value |      |      |      |                                      |      | ≤200% of the initial specified value |         |         |                  |
|                                                           | Leakage Current                                                                                                                                       | ≤The initial specified value         |      |      |      |                                      |      | ≤The initial specified value         |         |         |                  |
| Shelf Life                                                | The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 105°C for 1,000 hours.   |                                      |      |      |      |                                      |      |                                      |         |         |                  |
|                                                           | Rated Voltage(V <sub>dc</sub> )                                                                                                                       | 16~100                               |      |      |      |                                      |      | 160~450                              |         |         |                  |
|                                                           | Capacitance Change                                                                                                                                    | ≤±30% of the initial value           |      |      |      |                                      |      | ≤±20% of the initial value           |         |         |                  |
|                                                           | Dissipation Factor (tanδ)                                                                                                                             | ≤300% of the initial specified value |      |      |      |                                      |      | ≤200% of the initial specified value |         |         |                  |
|                                                           | Leakage Current                                                                                                                                       | ≤300% of the initial specified value |      |      |      |                                      |      | ≤200% of the initial specified value |         |         |                  |

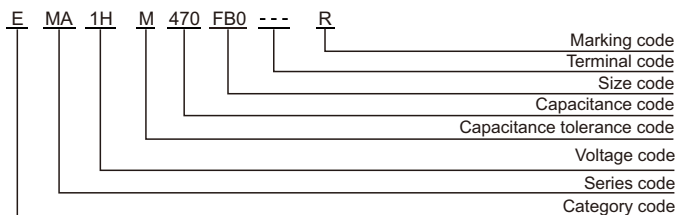
### DIMENSIONS[mm]



| Size code | D    | L    | A    | B    | C    | W       | P   |
|-----------|------|------|------|------|------|---------|-----|
| E83       | 6.3  | 8.0  | 6.6  | 6.6  | 7.2  | 0.5~0.8 | 1.9 |
| EB0       | 6.3  | 10.5 | 6.6  | 6.6  | 7.2  | 0.5~0.8 | 1.9 |
| FB0       | 8    | 10.5 | 8.3  | 8.3  | 9.0  | 0.7~1.1 | 3.1 |
| FD0       | 8    | 12.5 | 8.3  | 8.3  | 9.0  | 0.7~1.1 | 3.1 |
| FE0       | 8    | 13.5 | 8.3  | 8.3  | 9.0  | 0.7~1.1 | 3.1 |
| GB0       | 10   | 10.5 | 10.3 | 10.3 | 11.0 | 0.7~1.1 | 4.5 |
| GD0       | 10   | 12.5 | 10.3 | 10.3 | 11.0 | 0.7~1.1 | 4.5 |
| GE0       | 10   | 13.5 | 10.3 | 10.3 | 11.0 | 0.7~1.1 | 4.5 |
| GH0       | 10   | 16.5 | 10.3 | 10.3 | 11.0 | 0.7~1.1 | 4.5 |
| WE0       | 12.5 | 13.5 | 13.0 | 13.0 | 13.7 | 1.0~1.3 | 4.5 |
| WG5       | 12.5 | 16.0 | 13.0 | 13.0 | 13.7 | 1.0~1.3 | 4.5 |
| WM5       | 12.5 | 21.0 | 13.0 | 13.0 | 13.7 | 1.0~1.3 | 4.5 |

Note: M type forming is available for Size E83 ~ GH0.

### PART NUMBERING SYSTEM



### RATED RIPPLE CURRENT MULTIPLIERS

Frequency correction factor for ripple current

| Freq.(Hz)                       | 120  | 1k   | 10k  | 100k |
|---------------------------------|------|------|------|------|
| Rated voltage(V <sub>dc</sub> ) |      |      |      |      |
| 6.3~450                         | 0.50 | 0.80 | 0.90 | 1.00 |

# MA series

## ■ STANDARD RATINGS

| WV (Vdc) | Cap (μF) | Size code | Rated ripple current (mA rms/105°C, 100kHz) | Part Number      |
|----------|----------|-----------|---------------------------------------------|------------------|
| 16       | 47       | E83       | 125                                         | EMA1CM470E83---R |
|          | 100      | E83       | 245                                         | EMA1CM101E83---R |
|          | 220      | FB0       | 260                                         | EMA1CM221FB0---R |
|          | 330      | GB0       | 450                                         | EMA1CM331GB0---R |
|          | 470      | GD0       | 480                                         | EMA1CM471GD0---R |
|          | 680      | WE0       | 820                                         | EMA1CM681WE0---R |
|          | 1000     | WG5       | 860                                         | EMA1CM102WG5---R |
| 25       | 47       | E83       | 125                                         | EMA1EM470E83---R |
|          | 100      | FB0       | 245                                         | EMA1EM101FB0---R |
|          | 220      | GB0       | 440                                         | EMA1EM221GB0---R |
|          | 330      | GB0       | 460                                         | EMA1EM331GB0---R |
|          | 470      | WE0       | 820                                         | EMA1EM471WE0---R |
|          | 680      | WG5       | 860                                         | EMA1EM681WG5---R |
| 35       | 47       | E83       | 140                                         | EMA1VM470E83---R |
|          | 100      | FB0       | 245                                         | EMA1VM101FB0---R |
|          | 220      | GB0       | 440                                         | EMA1VM221GB0---R |
|          | 330      | WE0       | 820                                         | EMA1VM331WE0---R |
|          | 470      | WG5       | 860                                         | EMA1VM471WG5---R |
| 50       | 10       | E83       | 100                                         | EMA1HM100E83---R |
|          | 22       | E83       | 105                                         | EMA1HM220E83---R |
|          | 33       | E83       | 110                                         | EMA1HM330E83---R |
|          | 47       | FB0       | 260                                         | EMA1HM470FB0---R |
|          | 47       | GB0       | 400                                         | EMA1HM470GB0---R |
|          | 100      | GB0       | 420                                         | EMA1HM101GB0---R |
|          | 220      | WE0       | 800                                         | EMA1HM221WE0---R |
|          | 330      | WG5       | 845                                         | EMA1HM331WG5---R |
| 63       | 22       | E83       | 95                                          | EMA1JM220E83---R |
|          | 33       | FB0       | 180                                         | EMA1JM330FB0---R |
|          | 47       | FB0       | 210                                         | EMA1JM470FB0---R |
|          | 100      | GD0       | 420                                         | EMA1JM101GD0---R |
|          | 220      | WG5       | 820                                         | EMA1JM221WG5---R |
| 80       | 10       | FB0       | 165                                         | EMA1BM100FB0---R |
|          | 22       | FB0       | 180                                         | EMA1BM220FB0---R |
|          | 22       | GB0       | 305                                         | EMA1BM220GB0---R |
|          | 33       | FB0       | 190                                         | EMA1BM330FB0---R |
|          | 47       | GB0       | 350                                         | EMA1BM470GB0---R |
|          | 100      | WE0       | 760                                         | EMA1BM101WE0---R |
| 100      | 10       | E83       | 150                                         | EMA1KM100E83---R |
|          | 22       | FB0       | 165                                         | EMA1KM220FB0---R |
|          | 33       | GB0       | 280                                         | EMA1KM330GB0---R |
|          | 47       | GB0       | 320                                         | EMA1KM470GB0---R |
|          | 68       | GD0       | 350                                         | EMA1KM680GD0---R |
|          | 82       | WE0       | 530                                         | EMA1KM820WE0---R |
|          | 100      | WE0       | 555                                         | EMA1KM101WE0---R |
| 160      | 10       | GB0       | 190                                         | EMA2CM100GB0---R |
|          | 15       | FD0       | 220                                         | EMA2CM150FD0---R |
|          | 22       | GB0       | 315                                         | EMA2CM220GB0---R |
|          | 33       | GE0       | 420                                         | EMA2CM330GE0---R |
|          | 47       | GH0       | 530                                         | EMA2CM470GH0---R |
|          | 68       | WM5       | 640                                         | EMA2CM680WM5---R |
|          | 100      | WM5       | 840                                         | EMA2CM101WM5---R |
| 200      | 4.7      | FB0       | 110                                         | EMA2DM4R7FB0---R |
|          | 6.8      | FB0       | 150                                         | EMA2DM6R8FB0---R |
|          | 10       | FD0       | 180                                         | EMA2DM100FD0---R |
|          | 10       | GB0       | 198                                         | EMA2DM100GB0---R |
|          | 15       | FE0       | 230                                         | EMA2DM150FE0---R |
|          | 22       | GE0       | 350                                         | EMA2DM220GE0---R |
|          | 33       | GH0       | 440                                         | EMA2DM330GH0---R |
|          | 68       | WM5       | 670                                         | EMA2DM680WM5---R |
| 250      | 2.2      | EB0       | 52                                          | EMA2EM2R2EB0---R |
|          | 4.7      | FB0       | 120                                         | EMA2EM4R7FB0---R |
|          | 10       | FE0       | 180                                         | EMA2EM100FE0---R |
|          | 10       | GB0       | 200                                         | EMA2EM100GB0---R |
|          | 22       | GH0       | 360                                         | EMA2EM220GH0---R |
|          | 33       | WM5       | 435                                         | EMA2EM330WM5---R |
|          | 47       | WM5       | 600                                         | EMA2EM470WM5---R |

| WV (Vdc) | Cap (μF) | Size code | Rated ripple current (mA rms/105°C, 100kHz) | Part Number      |
|----------|----------|-----------|---------------------------------------------|------------------|
| 400      | 2.2      | FB0       | 60                                          | EMA2GM2R2FB0---R |
|          | 3.3      | FB0       | 76                                          | EMA2GM3R3FB0---R |
|          | 4.7      | FE0       | 124                                         | EMA2GM4R7FE0---R |
|          | 4.7      | GB0       | 124                                         | EMA2GM4R7GB0---R |
|          | 6.8      | GE0       | 176                                         | EMA2GM6R8GE0---R |
|          | 10       | GH0       | 250                                         | EMA2GM100GH0---R |
|          | 15       | WG5       | 300                                         | EMA2GM150WG5---R |
|          | 22       | WM5       | 380                                         | EMA2GM220WM5---R |
| 450      | 2.2      | GB0       | 70                                          | EMA2WM2R2GB0---R |
|          | 3.3      | GB0       | 80                                          | EMA2WM3R3GB0---R |
|          | 4.7      | GE0       | 130                                         | EMA2WM4R7GE0---R |
|          | 10       | GH0       | 265                                         | EMA2WM100GH0---R |
|          | 15       | WM5       | 310                                         | EMA2WM150WM5---R |
|          | 22       | WM5       | 390                                         | EMA2WM220WM5---R |