

# ML series

- One rank smaller case sizes than SL series.
- RoHS Compliance.
- SL 小型化品。



ML

## SPECIFICATIONS

| Items 項目                                                                 | Characteristics 特 性                                                                                                        |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------|------|------|------|---------------------------------------------------------------------|------|------|-------------|---------|-----|
| Capacitance Tolerance<br>靜電容量誤差                                          | ± 20% (120Hz, 20°C)                                                                                                        |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
| Operating Temperature Range<br>適用溫度範圍                                    | -40 ~ +85°C                                                                                                                |                                         |      |      |      |      | -40 ~ +85°C                                                         |      |      | -25 ~ +85°C |         |     |
| Rated Voltage Range<br>工作電壓範圍                                            | 6.3 ~ 100V                                                                                                                 |                                         |      |      |      |      | 160 ~ 250V                                                          |      |      | 350 ~ 450V  |         |     |
| Leakage Current<br>洩漏電流                                                  | I ≤ 0.01CV or 3 (μA), Which is greater. (After 2 minutes application of working voltage)                                   |                                         |      |      |      |      | I ≤ 0.03CV+20(μA), (After 3 minutes application of working voltage) |      |      |             |         |     |
| Dissipation Factor<br>散逸因素 (tan δ)                                       | Measurement Frequency: 120Hz. Temperature: 20°C                                                                            |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | Rated Voltage (V)                                                                                                          | 6.3                                     | 10   | 16   | 25   | 35   | 50                                                                  | 63   | 100  | 160~250     | 350~450 |     |
|                                                                          | tan δ (Max)                                                                                                                | 0.28                                    | 0.24 | 0.16 | 0.15 | 0.12 | 0.10                                                                | 0.10 | 0.08 | 0.20        | 0.25    |     |
|                                                                          | When nominal capacitance exceeds 1000μF, add 0.02 to the value above for each 1000μF increase. (20°C、120Hz)                |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
| Low Temperature Stability<br>低溫特性<br>Impedance Ratio (Max)<br>阻抗比率 (最大值) | Measurement Frequency: 120Hz.                                                                                              |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | Rated Voltage (V)                                                                                                          | 6.3                                     | 10   | 16   | 25   | 35   | 50                                                                  | 63   | 100  | 160~250     | 350~400 | 450 |
|                                                                          | Z (-25°C) / Z (20°C)                                                                                                       | 5                                       | 4    | 3    | 2    | 2    | 2                                                                   | 2    | 2    | 3           | 6       | 15  |
|                                                                          | Z (-40°C) / Z (20°C)                                                                                                       | 12                                      | 10   | 8    | 5    | 4    | 3                                                                   | 3    | 3    | 4           | -       | -   |
| Load Life 負荷壽命                                                           | 2000hours, with application of working voltage at 85°C                                                                     |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | Capacitance Change                                                                                                         | Within ± 20% of Initial Value           |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | tan δ                                                                                                                      | 200% or less of Initial Specified Value |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | Leakage Current                                                                                                            | Initial Specified Value or less         |      |      |      |      |                                                                     |      |      |             |         |     |
| Shelf Life 放置壽命                                                          | 1,000hours, no voltage applied, at 85°C。<br>After Test: UR to be applied for 30 minutes, 24 to 48hours before measurement. |                                         |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | Capacitance Change                                                                                                         | Within ± 20% of Initial Value           |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | tan δ                                                                                                                      | 200% or less of Initial Specified Value |      |      |      |      |                                                                     |      |      |             |         |     |
|                                                                          | Leakage Current                                                                                                            | Initial Specified Value or less         |      |      |      |      |                                                                     |      |      |             |         |     |
| Standards 參照標準                                                           | JIS C 5101-4-1 and JIS C 5101-2                                                                                            |                                         |      |      |      |      |                                                                     |      |      |             |         |     |

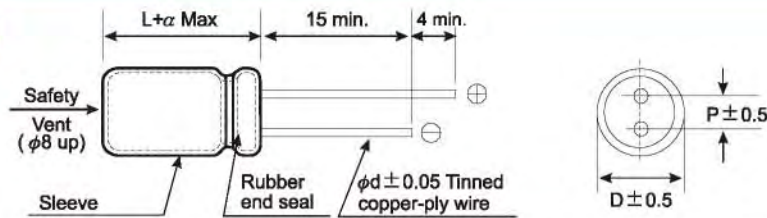
## PERMISSIBLE RIPPLE CURRENT

### Frequency Coefficient

| WV(V)     | Capacitance ( $\mu F$ ) | Frequency (Hz) |      |      |            |
|-----------|-------------------------|----------------|------|------|------------|
|           |                         | 50             | 120  | 1K   | $\geq 10K$ |
| 6.3 ~ 100 | < 100                   | 0.75           | 1.00 | 1.57 | 2.00       |
|           | 100 ~ 470               | 0.80           | 1.00 | 1.34 | 1.50       |
|           | > 470                   | 0.85           | 1.00 | 1.13 | 1.15       |
| 160 ~ 450 | 0.1 ~ 220               | 0.80           | 1.00 | 1.40 | 1.60       |
|           | 330 ~ 1000              | 0.90           | 1.00 | 1.13 | 1.15       |

## ML series

## DIMENSIONS (mm)



|     |     |     |     |     |     |     |     |     |      |      |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| φ D | 5   | 6.3 | 8   | 10  | 12  | 13  | 16  | 18  | 20   | 22   | 25   |
| P   | 2.0 | 2.5 | 3.5 | 5.0 | 5.0 | 5.0 | 7.5 | 7.5 | 10.0 | 10.0 | 12.5 |
| φ d | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | 0.8  | 0.8  | 1.0  |

|          |                              |
|----------|------------------------------|
| $\alpha$ | (L < 16) 1.0<br>(L ≥ 16) 2.0 |
|----------|------------------------------|

## STANDARD RATINGS

DxL (mm); R.C.: (mA rms) at 85°C, 120Hz.

| Cap<br>(μF) | WV(V)<br>(Code)<br>Item | 6.3<br>(0J) |      | 10<br>(1A) |      | 16<br>(1C) |      | 25<br>(1E) |      | 35<br>(1V) |      | 50<br>(1H) |      | 63<br>(1J) |      |
|-------------|-------------------------|-------------|------|------------|------|------------|------|------------|------|------------|------|------------|------|------------|------|
|             |                         | D x L       | R.C. | D x L      | R.C. | D x L      | R.C. | D x L      | R.C. | D x L      | R.C. | D x L      | R.C. | D x L      | R.C. |
| 10          |                         |             |      |            |      |            |      |            |      |            |      | 5x11       | 66   | 5x11       | 78   |
| 22          |                         |             |      |            |      |            |      |            |      |            |      | 5x11       | 109  | 5x11       | 121  |
| 33          |                         |             |      |            |      |            |      |            |      |            |      | 5x11       | 127  | 6.3x11     | 157  |
| 47          |                         |             |      |            |      |            |      |            |      | 5x11       | 157  | 6.3x11     | 169  | 6.3x11     | 194  |
| 68          |                         |             |      |            |      | 5x11       | 132  | 6.3x11     | 149  | 6.3x11     | 182  | 6.3x11     | 242  | 8x12       | 266  |
| 100         |                         |             |      |            |      | 5x11       | 194  | 6.3x11     | 218  | 6.3x11     | 254  | 8x12       | 303  | 8x12       | 327  |
| 220         |                         | 5x11        | 218  | 5x11       | 242  | 6.3x11     | 303  | 6.3x11     | 339  | 8x12       | 387  | 10x13      | 508  | 10x16      | 593  |
| 330         |                         | 6.3x11      | 303  | 6.3x11     | 339  | 6.3x11     | 363  | 8x12       | 460  | 10x13      | 581  | 10x16      | 702  | 10x20      | 847  |
| 470         |                         | 6.3x11      | 363  | 6.3x11     | 411  | 8x12       | 508  | 10x13      | 641  | 10x16      | 762  | 10x20      | 908  | 13x21      | 1089 |
| 1000        |                         | 8x12        | 616  | 10x13      | 787  | 10x13      | 905  | 10x16      | 992  | 13x21      | 1331 | 13x25      | 1513 | 16x26      | 2030 |
| 2200        |                         | 10x16       | 956  | 10x16      | 1186 | 10x20      | 1187 | 12x25      | 1573 | 16x26      | 2057 | 16x32      | 2299 | 18x35      | 2783 |
|             |                         |             |      |            |      | 12x21      | 1331 | 13x25      | 1634 |            |      |            |      |            |      |
| 3300        |                         | 10x20       | 1531 | 10x25      | 1464 | 13x25      | 1997 | 16x26      | 2045 | 16x32      | 2420 | 18x35      | 2904 | 20x40      | 3146 |
|             |                         |             |      | 13x21      | 1634 |            |      |            |      |            |      |            |      |            |      |
| 4700        |                         | 13x21       | 1755 | 13x25      | 2057 | 16x26      | 2481 | 16x32      | 2541 | 16x36      | 2904 | 20x40      | 3388 | 22x50      | 3993 |
| 6800        |                         | 13x25       | 2202 | 16x26      | 2541 | 16x32      | 2723 | 16x36      | 3025 | 18x40      | 3267 | 22x50      | 4114 | 25x50      | 4598 |
| 10000       |                         | 16x26       | 2844 | 16x32      | 2965 | 16x36      | 3146 | 18x40      | 3267 | 22x50      | 4235 | 25x50      | 4719 |            |      |
| 15000       |                         | 16x32       | 3025 | 16x36      | 3243 | 18x40      | 3691 | 22x50      | 4356 | 25x50      | 4961 |            |      |            |      |
| 22000       |                         | 18x35       | 3751 | 18x40      | 3872 | 22x40      | 4477 | 25x50      | 5324 |            |      |            |      |            |      |
| 33000       |                         | 18x40       | 4114 | 22x50      | 5082 | 25x50      | 5687 |            |      |            |      |            |      |            |      |
| 47000       |                         | 22x50       | 4598 | 25x50      | 5929 |            |      |            |      |            |      |            |      |            |      |
| 68000       |                         | 25x50       | 5082 |            |      |            |      |            |      |            |      |            |      |            |      |

| Cap<br>(μF) | WV(V)<br>(Code)<br>Item | 100<br>(2A) |      | 160<br>(2C) |      | 200<br>(2D) |      | 250<br>(2E) |      | 350<br>(2V) |      | 400<br>(2G) |      | 450<br>(2W) |      |
|-------------|-------------------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|
|             |                         | D x L       | R.C. | D x L       | R.C. | D x L       | R.C. | D x L       | R.C. | D x L       | R.C. | D x L       | R.C. | D x L       | R.C. |
| 0.1         |                         |             |      |             |      | 5x11        | 2.5  |             |      |             |      |             |      |             |      |
| 0.22        |                         |             |      |             |      | 5x11        | 5.5  |             |      |             |      |             |      |             |      |
| 0.33        |                         |             |      |             |      | 5x11        | 8    |             |      |             |      |             |      |             |      |
| 0.47        |                         |             |      |             |      | 5x11        | 17   |             |      |             |      | 6.3x11      | 20   |             |      |
| 1           |                         | 5x11        | 22   | 5x11        | 24   | 5x11        | 26   | 5x11        | 30   | 6.3x11      | 33   | 6.3x11      | 30   | 6.3x11      | 20   |
| 2.2         |                         | 5x11        | 31   | 5x11        | 31   | 5x11        | 36   | 6.3x11      | 40   | 6.3x11      | 44   | 8x12        | 44   | 8x12        | 33   |
| 3.3         |                         | 5x11        | 40   | 5x11        | 42   | 6.3x11      | 48   | 6.3x11      | 50   | 8x12        | 54   | 8x12        | 54   | 10x13       | 45   |
| 4.7         |                         | 5x11        | 53   | 6.3x11      | 55   | 6.3x11      | 61   | 6.3x11      | 63   | 8x12        | 66   | 10x13       | 66   | 10x16       | 61   |
| 10          |                         | 5x11        | 80   | 8x12        | 97   | 8x12        | 102  | 10x13       | 120  | 10x13       | 130  | 10x16       | 100  | 10x20       | 92   |
| 22          |                         | 6.3x11      | 145  | 10x13       | 160  | 10x16       | 169  | 10x20       | 180  | 13x21       | 200  | 13x21       | 242  | 13x25       | 160  |
| 33          |                         | 8x12        | 240  | 10x16       | 220  | 10x20       | 245  | 10x20       | 260  | 13x25       | 280  | 16x22       | 280  | 16x26       | 271  |
| 47          |                         | 8x12        | 266  | 10x20       | 280  | 13x21       | 310  | 13x21       | 310  | 16x26       | 370  | 16x26       | 340  | 16x32       | 280  |
| 68          |                         | 10x13       | 359  | 13x21       | 390  | 13x25       | 424  | 16x26       | 455  | 16x26       | 500  | 16x32       | 430  | 18x35       | 310  |
| 100         |                         | 10x16       | 453  | 13x25       | 530  | 16x26       | 570  | 16x26       | 610  | 18x32       | 630  | 18x35       | 515  | 18x40       | 340  |
| 220         |                         | 13x21       | 732  | 16x32       | 760  | 16x36       | 820  | 18x35       | 850  | 22x50       | 890  | 22x50       | 787  | 25x50       | 450  |
| 330         |                         | 13x25       | 1012 | 18x35       | 1050 | 18x40       | 1260 | 20x40       | 1320 | 25x50       | 1400 |             |      |             |      |
| 470         |                         | 16x26       | 1198 | 18x40       | 1350 | 22x40       | 1500 | 22x50       | 1700 |             |      |             |      |             |      |
| 1000        |                         | 18x35       | 1797 | 25x50       | 2500 |             |      |             |      |             |      |             |      |             |      |
| 2200        |                         | 22x50       | 3061 |             |      |             |      |             |      |             |      |             |      |             |      |
| 3300        |                         | 25x50       | 3727 |             |      |             |      |             |      |             |      |             |      |             |      |

※ 13mm may be replaced by 12.5mm upon customer's request.