

# SMG Series

- Endurance : 2,000 hours at 85°C
- Solvent resistant type except 350 to 450V<sub>dc</sub>  
(see PRECAUTIONS AND GUIDELINES)
- RoHS2 Compliant



## SPECIFICATIONS

| Items   | Characteristics  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
|---|--|--------------------------------------|------|------|------|------|------|--------------------------------------|------|---------------------------|-------------|-----------------|-------------------|------------------|
| Category  | -40 to +85°C (6.3 to 400V <sub>dc</sub> ) -25 to +85°C (450V <sub>dc</sub> )   |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Temperature Range   |  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Rated Voltage Range   | 6.3 to 450V <sub>dc</sub>  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Capacitance Tolerance   | ±20% (M) (at 20°C, 120Hz)  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Leakage Current   | 6.3 to 100V <sub>dc</sub>  |                                      |      |      |      |      |      |                                      |      | 160 to 450V <sub>dc</sub> |             |                 |                   |                  |
|   | I=0.03CV or 4μA, whichever is greater.   |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
|   |  |                                      |      |      |      |      |      |                                      |      | CV                        | Time        | After 1 minute  | After 5 minute    |                  |
|   |  |                                      |      |      |      |      |      |                                      |      | CV ≤ 1,000                |             | I=0.1CV+40 max. | I=0.03CV+15 max.  |                  |
|   |  |                                      |      |      |      |      |      |                                      |      |                           | CV > 1,000  |                 | I=0.04CV+100 max. | I=0.02CV+25 max. |
| (after 1 minute)  |  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Where, I : Max. leakage current (μA), C : Nominal capacitance (μF), V : Rated voltage (V) (at 20°C) |  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Dissipation Factor (tan δ)  | Rated voltage (V <sub>dc</sub> )   | 6.3V                                 | 10V  | 16V  | 25V  | 35V  | 50V  | 63V                                  | 100V | 160 to 250V               | 350 to 400V | 450V            |                   |                  |
|   | tan δ (Max.)   | 0.34                                 | 0.24 | 0.20 | 0.16 | 0.14 | 0.12 | 0.09                                 | 0.08 | 0.20                      | 0.24        | 0.24            |                   |                  |
|   | When nominal capacitance exceeds 1,000μF, add 0.02 to the value above for each 1,000μF increase. (at 20°C, 120Hz)  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Low Temperature Characteristics (Max. Impedance Ratio)  | Rated voltage (V <sub>dc</sub> )   | 6.3V                                 | 10V  | 16V  | 25V  | 35V  | 50V  | 63V                                  | 100V | 160 to 250V               | 350 to 400V | 450V            |                   |                  |
|   | Z(-25°C)/Z(+20°C)  | 5                                    | 4    | 3    | 2    | 2    | 2    | 2                                    | 2    | 3                         | 6           | 6               |                   |                  |
|   | Z(-40°C)/Z(+20°C)  | 12                                   | 10   | 8    | 5    | 4    | 3    | 3                                    | 3    | 4                         | 6           | —               |                   |                  |
| (at 120Hz)  |  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Endurance   | The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2,000 hours at 85°C.   |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
|   | Capacitance change   | ≤ ±20% of the initial value          |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
|   | D.F. (tan δ)   | ≤200% of the initial specified value |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
|   | Leakage current  | ≤The initial specified value         |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
| Shelf Life  | The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1,000 hours at 85°C without voltage applied. Before the measurement, the capacitor shall be preconditioned by applying voltage according to Item 4.1 of JIS C 5101-4. |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |
|   | Rated voltage  | 6.3 to 100V <sub>dc</sub>            |      |      |      |      |      | 160 to 450V <sub>dc</sub>            |      |                           |             |                 |                   |                  |
|   | Capacitance change   | ≤ ±20% of the initial value          |      |      |      |      |      | ≤ ±20% of the initial value          |      |                           |             |                 |                   |                  |
|   | D.F. (tan δ)   | ≤200% of the initial specified value |      |      |      |      |      | ≤200% of the initial specified value |      |                           |             |                 |                   |                  |
|   | Leakage current  | ≤The initial specified value         |      |      |      |      |      | ≤500% of the initial specified value |      |                           |             |                 |                   |                  |
|   |  |                                      |      |      |      |      |      |                                      |      |                           |             |                 |                   |                  |

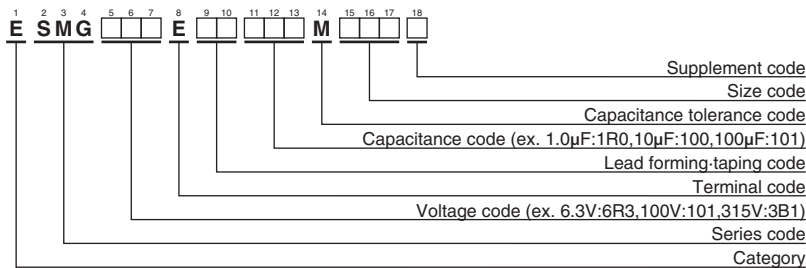
## DIMENSIONS [mm]

- Terminal Code : E



| φD  | 5          | 6.3 | 8   | 10  | 12.5 | 16  | 18  |
|-----|------------|-----|-----|-----|------|-----|-----|
| φd  | 0.5        | 0.5 | 0.6 | 0.6 | 0.6  | 0.8 | 0.8 |
| F   | 2.0        | 2.5 | 3.5 | 5.0 | 5.0  | 7.5 | 7.5 |
| φD' | φD+0.5max. |     |     |     |      |     |     |
| L'  | L+1.5max.  |     |     |     |      |     |     |

## PART NUMBERING SYSTEM



Please refer to "Product code guide (radial lead type)"

## ◆STANDARD RATINGS

 is not solvent resistant.

| WV (V <sub>dc</sub> ) | Cap (μF) | Case size φD×L(mm) | tan δ  | Rated ripple current (mAmps/85°C, 120Hz) | Part No.           | WV (V <sub>dc</sub> ) | Cap (μF)           | Case size φD×L(mm) | tan δ              | Rated ripple current (mAmps/85°C, 120Hz) | Part No.           |
|-----------------------|----------|--------------------|--------|--|--------------------|-----------------------|--------------------|--------------------|--------------------|--|--------------------|
| 6.3                   | 220      | 5 × 11             | 0.34   | 200                                      | ESMG6R3E□□221ME11D | 63                    | 22                 | 5 × 11             | 0.09               | 100                                      | ESMG630E□□220ME11D |
|                       | 330      | 6.3 × 11           | 0.34   | 270                                      | ESMG6R3E□□331MF11D |                       | 33                 | 6.3 × 11           | 0.09               | 140                                      | ESMG630E□□330MF11D |
|                       | 470      | 6.3 × 11           | 0.34   | 320                                      | ESMG6R3E□□471MF11D |                       | 47                 | 6.3 × 11           | 0.09               | 170                                      | ESMG630E□□470MF11D |
|                       | 1,000    | 8 × 11.5           | 0.34   | 540                                      | ESMG6R3E□□102MHB5D |                       | 100                | 10 × 12.5          | 0.09               | 300                                      | ESMG630E□□101MJC5S |
|                       | 2,200    | 10 × 20            | 0.36   | 1,000                                    | ESMG6R3E□□222MJ20S |                       | 220                | 10 × 16            | 0.09               | 490                                      | ESMG630E□□221MJ16S |
|                       | 3,300    | 10 × 20            | 0.38   | 1,185                                    | ESMG6R3E□□332MJ20S |                       | 330                | 10 × 20            | 0.09               | 710                                      | ESMG630E□□331MJ20S |
|                       | 4,700    | 12.5 × 20          | 0.40   | 1,545                                    | ESMG6R3E□□472MK20S |                       | 470                | 12.5 × 20          | 0.09               | 900                                      | ESMG630E□□471MK20S |
|                       | 6,800    | 12.5 × 25          | 0.44   | 1,915                                    | ESMG6R3E□□682MK25S |                       | 1,000              | 16 × 25            | 0.09               | 1,300                                    | ESMG630E□□102ML25S |
|                       | 10,000   | 16 × 25            | 0.52   | 2,330                                    | ESMG6R3E□□103ML25S |                       | 1.0                | 5 × 11             | 0.08               | 21                                       | ESMG101E□□1R0ME11D |
|                       | 15,000   | 16 × 35.5          | 0.62   | 2,845                                    | ESMG6R3E□□153MLP1S |                       | 2.2                | 5 × 11             | 0.08               | 30                                       | ESMG101E□□2R2ME11D |
| 22,000                | 18 × 40  | 0.76               | 3,320  | ESMG6R3E□□223MM40S                       | 3.3                | 5 × 11                | 0.08               | 40                 | ESMG101E□□3R3ME11D |  |                    |
| 10                    | 220      | 5 × 11             | 0.24   | 240                                      | ESMG100E□□221ME11D | 100                   | 4.7                | 5 × 11             | 0.08               | 45                                       | ESMG101E□□4R7ME11D |
|                       | 330      | 6.3 × 11           | 0.24   | 290                                      | ESMG100E□□331MF11D |                       | 10                 | 6.3 × 11           | 0.08               | 75                                       | ESMG101E□□100MF11D |
|                       | 470      | 6.3 × 11           | 0.24   | 350                                      | ESMG100E□□471MF11D |                       | 22                 | 8 × 11.5           | 0.08               | 130                                      | ESMG101E□□220MHB5D |
|                       | 1,000    | 10 × 12.5          | 0.24   | 650                                      | ESMG100E□□331MJC5S |                       | 33                 | 8 × 11.5           | 0.08               | 180                                      | ESMG101E□□330MHB5D |
|                       | 2,200    | 10 × 20            | 0.26   | 1,070                                    | ESMG100E□□222MJ20S |                       | 47                 | 10 × 12.5          | 0.08               | 230                                      | ESMG101E□□470MJC5S |
|                       | 3,300    | 12.5 × 20          | 0.28   | 1,420                                    | ESMG100E□□332MK20S |                       | 100                | 10 × 20            | 0.08               | 370                                      | ESMG101E□□101MJ20S |
|                       | 4,700    | 12.5 × 25          | 0.30   | 1,780                                    | ESMG100E□□472MK25S |                       | 220                | 12.5 × 25          | 0.08               | 620                                      | ESMG101E□□221MK25S |
|                       | 6,800    | 16 × 25            | 0.34   | 2,220                                    | ESMG100E□□682ML25S |                       | 330                | 12.5 × 25          | 0.08               | 760                                      | ESMG101E□□331MK25S |
|                       | 10,000   | 16 × 35.5          | 0.42   | 2,670                                    | ESMG100E□□103MLP1S |                       | 470                | 16 × 25            | 0.08               | 1,000                                    | ESMG101E□□471ML25S |
|                       | 15,000   | 18 × 35.5          | 0.52   | 3,080                                    | ESMG100E□□153MMP1S |                       | 1,000              | 18 × 40            | 0.08               | 1,380                                    | ESMG101E□□102MM40S |
| 16                    | 100      | 5 × 11             | 0.20   | 160                                      | ESMG160E□□101ME11D | 160                   | 3.3                | 6.3 × 11           | 0.20               | 40                                       | ESMG161E□□3R3MF11D |
|                       | 220      | 6.3 × 11           | 0.20   | 260                                      | ESMG160E□□221MF11D |                       | 4.7                | 6.3 × 11           | 0.20               | 48                                       | ESMG161E□□4R7MF11D |
|                       | 330      | 8 × 11.5           | 0.20   | 370                                      | ESMG160E□□331MHB5D |                       | 10                 | 10 × 12.5          | 0.20               | 94                                       | ESMG161E□□100MJC5S |
|                       | 470      | 8 × 11.5           | 0.20   | 440                                      | ESMG160E□□471MHB5D |                       | 22                 | 10 × 20            | 0.20               | 170                                      | ESMG161E□□220MJ20S |
|                       | 1,000    | 10 × 16            | 0.20   | 785                                      | ESMG160E□□102MJ16S |                       | 33                 | 10 × 20            | 0.20               | 205                                      | ESMG161E□□330MJ20S |
|                       | 2,200    | 12.5 × 20          | 0.22   | 1,295                                    | ESMG160E□□222MK20S |                       | 47                 | 12.5 × 20          | 0.20               | 270                                      | ESMG161E□□470MK20S |
|                       | 3,300    | 12.5 × 25          | 0.24   | 1,655                                    | ESMG160E□□332MK25S |                       | 100                | 12.5 × 25          | 0.20               | 430                                      | ESMG161E□□101MK25S |
|                       | 4,700    | 16 × 25            | 0.26   | 2,090                                    | ESMG160E□□472ML25S |                       | 220                | 16 × 31.5          | 0.20               | 760                                      | ESMG161E□□221MLN3S |
|                       | 6,800    | 16 × 31.5          | 0.30   | 2,520                                    | ESMG160E□□682MLN3S |                       | 330                | 18 × 35.5          | 0.20               | 995                                      | ESMG161E□□331MMP1S |
|                       | 10,000   | 18 × 35.5          | 0.38   | 2,920                                    | ESMG160E□□103MMP1S |                       | 3.3                | 6.3 × 11           | 0.20               | 40                                       | ESMG201E□□3R3MF11D |
| 25                    | 47       | 5 × 11             | 0.16   | 115                                      | ESMG250E□□470ME11D | 200                   | 4.7                | 8 × 11.5           | 0.20               | 55                                       | ESMG201E□□4R7MHB5D |
|                       | 100      | 6.3 × 11           | 0.16   | 190                                      | ESMG250E□□101MF11D |                       | 10                 | 10 × 12.5          | 0.20               | 94                                       | ESMG201E□□100MJC5S |
|                       | 220      | 8 × 11.5           | 0.16   | 330                                      | ESMG250E□□221MHB5D |                       | 22                 | 10 × 20            | 0.20               | 170                                      | ESMG201E□□220MJ20S |
|                       | 330      | 8 × 11.5           | 0.16   | 440                                      | ESMG250E□□331MHB5D |                       | 33                 | 10 × 20            | 0.20               | 205                                      | ESMG201E□□330MJ20S |
|                       | 470      | 10 × 12.5          | 0.16   | 545                                      | ESMG250E□□471MJC5S |                       | 47                 | 12.5 × 20          | 0.20               | 270                                      | ESMG201E□□470MK20S |
|                       | 1,000    | 10 × 20            | 0.16   | 955                                      | ESMG250E□□102MJ20S |                       | 100                | 16 × 25            | 0.20               | 475                                      | ESMG201E□□101ML25S |
|                       | 2,200    | 12.5 × 25          | 0.18   | 1,540                                    | ESMG250E□□222MK25S |                       | 220                | 18 × 35.5          | 0.20               | 810                                      | ESMG201E□□221MMP1S |
|                       | 3,300    | 16 × 25            | 0.20   | 1,975                                    | ESMG250E□□332ML25S |                       | 2.2                | 6.3 × 11           | 0.20               | 32                                       | ESMG251E□□2R2MF11D |
|                       | 4,700    | 16 × 31.5          | 0.22   | 2,420                                    | ESMG250E□□472MLN3S |                       | 3.3                | 8 × 11.5           | 0.20               | 46                                       | ESMG251E□□3R3MHB5D |
|                       | 6,800    | 18 × 35.5          | 0.26   | 2,880                                    | ESMG250E□□682MMP1S |                       | 4.7                | 8 × 11.5           | 0.20               | 55                                       | ESMG251E□□4R7MHB5D |
| 35                    | 47       | 5 × 11             | 0.14   | 130                                      | ESMG350E□□470ME11D | 250                   | 10                 | 10 × 16            | 0.20               | 105                                      | ESMG251E□□100MJ16S |
|                       | 100      | 6.3 × 11           | 0.14   | 210                                      | ESMG350E□□101MF11D |                       | 22                 | 10 × 20            | 0.20               | 170                                      | ESMG251E□□220MJ20S |
|                       | 220      | 8 × 11.5           | 0.14   | 385                                      | ESMG350E□□221MHB5D |                       | 33                 | 12.5 × 20          | 0.20               | 230                                      | ESMG251E□□330MK20S |
|                       | 330      | 10 × 12.5          | 0.14   | 490                                      | ESMG350E□□331MJC5S |                       | 47                 | 12.5 × 25          | 0.20               | 295                                      | ESMG251E□□470MK25S |
|                       | 470      | 10 × 16            | 0.14   | 645                                      | ESMG350E□□471MJ16S |                       | 100                | 16 × 31.5          | 0.20               | 515                                      | ESMG251E□□101MLN3S |
|                       | 1,000    | 12.5 × 20          | 0.14   | 1,145                                    | ESMG350E□□102MK20S |                       | 220                | 18 × 40            | 0.20               | 825                                      | ESMG251E□□221MM40S |
|                       | 2,200    | 16 × 25            | 0.16   | 1,785                                    | ESMG350E□□222ML25S |                       | 1.0                | 6.3 × 11           | 0.24               | 22                                       | ESMG351E□□1R0MF11D |
|                       | 3,300    | 16 × 35.5          | 0.18   | 2,275                                    | ESMG350E□□332MLP1S |                       | 2.2                | 8 × 11.5           | 0.24               | 38                                       | ESMG351E□□2R2MHB5D |
|                       | 4,700    | 18 × 35.5          | 0.20   | 2,700                                    | ESMG350E□□472MMP1S |                       | 3.3                | 8 × 11.5           | 0.24               | 46                                       | ESMG351E□□3R3MHB5D |
|                       | 50       | 1.0                | 5 × 11 | 0.12                                     | 17                 |                       | ESMG500E□□1R0ME11D | 350                | 4.7                | 10 × 12.5                                | 0.24               |
| 2.2                   |          | 5 × 11             | 0.12   | 28                                       | ESMG500E□□2R2ME11D | 10                    | 10 × 20            |                    | 0.24               | 115                                      | ESMG351E□□100MJ20S |
| 3.3                   |          | 5 × 11             | 0.12   | 35                                       | ESMG500E□□3R3ME11D | 22                    | 12.5 × 20          |                    | 0.24               | 185                                      | ESMG351E□□220MK20S |
| 4.7                   |          | 5 × 11             | 0.12   | 41                                       | ESMG500E□□4R7ME11D | 33                    | 16 × 25            |                    | 0.24               | 275                                      | ESMG351E□□330ML25S |
| 10                    |          | 5 × 11             | 0.12   | 60                                       | ESMG500E□□100ME11D | 47                    | 16 × 25            |                    | 0.24               | 325                                      | ESMG351E□□470ML25S |
| 22                    |          | 5 × 11             | 0.12   | 95                                       | ESMG500E□□220ME11D | 100                   | 18 × 31.5          |                    | 0.24               | 530                                      | ESMG351E□□101MMN3S |
| 33                    |          | 5 × 11             | 0.12   | 125                                      | ESMG500E□□330ME11D | 1.0                   | 6.3 × 11           |                    | 0.24               | 22                                       | ESMG401E□□1R0MF11D |
| 47                    |          | 6.3 × 11           | 0.12   | 155                                      | ESMG500E□□470MF11D | 2.2                   | 8 × 11.5           |                    | 0.24               | 38                                       | ESMG401E□□2R2MHB5D |
| 100                   |          | 8 × 11.5           | 0.12   | 260                                      | ESMG500E□□101MHB5D | 3.3                   | 10 × 12.5          |                    | 0.24               | 54                                       | ESMG401E□□3R3MJC5S |
| 220                   |          | 10 × 12.5          | 0.12   | 430                                      | ESMG500E□□221MJC5S | 4.7                   | 10 × 16            |                    | 0.24               | 71                                       | ESMG401E□□4R7MJ16S |
| 63                    | 330      | 10 × 16            | 0.12   | 585                                      | ESMG500E□□331MJ16S | 400                   | 10                 | 10 × 20            | 0.24               | 115                                      | ESMG401E□□100MJ20S |
|                       | 470      | 10 × 20            | 0.12   | 755                                      | ESMG500E□□471MJ20S |                       | 22                 | 12.5 × 25          | 0.24               | 205                                      | ESMG401E□□220MK25S |
|                       | 1,000    | 12.5 × 25          | 0.12   | 1,340                                    | ESMG500E□□102MK25S |                       | 33                 | 16 × 25            | 0.24               | 275                                      | ESMG401E□□330ML25S |
|                       | 2,200    | 16 × 35.5          | 0.14   | 2,075                                    | ESMG500E□□222MLP1S |                       | 47                 | 16 × 31.5          | 0.24               | 350                                      | ESMG401E□□470MLN3S |
|                       | 3,300    | 18 × 35.5          | 0.16   | 2,500                                    | ESMG500E□□332MMP1S |                       | 2.2                | 10 × 12.5          | 0.24               | 32                                       | ESMG451E□□2R2MJC5S |
|                       | 10       | 5 × 11             | 0.09   | 65                                       | ESMG630E□□100ME11D |                       | 3.3                | 10 × 16            | 0.24               | 44                                       | ESMG451E□□3R3MJ16S |

 : Enter the appropriate lead forming or taping code.

**SMG** Series

◆ **STANDARD RATINGS**

is not solvent resistant.

| WV (V <sub>dc</sub> ) | Cap (μF) | Case size φD×L(mm) | tan δ | Rated ripple current (mA <sub>rms</sub> /85°C, 120Hz) | Part No.           | WV (V <sub>dc</sub> ) | Cap (μF) | Case size φD×L(mm) | tan δ | Rated ripple current (mA <sub>rms</sub> /85°C, 120Hz) | Part No.           |
|-----------------------|----------|--------------------|-------|---|--------------------|-----------------------|----------|--------------------|-------|---|--------------------|
| 450                   | 4.7      | 10 × 20            | 0.24  | 56  | ESMG451E□□4R7MJ20S | 450                   | 33       | 16 × 31.5          | 0.24  | 215   | ESMG451E□□330MLN3S |
|                       | 10       | 12.5 × 20          | 0.24  | 91  | ESMG451E□□100MK20S |                       | 47       | 16 × 35.5          | 0.24  | 265   | ESMG451E□□470MLP1S |
|                       | 22       | 16 × 25            | 0.24  | 165   | ESMG451E□□220ML25S |                       |          |                    |       |   |                    |

□□ : Enter the appropriate lead forming or taping code.

◆ **RATED RIPPLE CURRENT MULTIPLIERS**

⊙ Frequency Multipliers

| Capacitance(μF) | Frequency(Hz) |      |      |      |      |      |  |
|-----------------|---------------|------|------|------|------|------|--|
|                 | 50            | 120  | 300  | 1k   | 10k  | 100k |  |
| 1.0 to 4.7      | 0.65          | 1.00 | 1.35 | 1.75 | 2.30 | 2.50 |  |
| 10 to 47        | 0.75          | 1.00 | 1.25 | 1.50 | 1.75 | 1.80 |  |
| 100 to 1,000    | 0.80          | 1.00 | 1.15 | 1.30 | 1.40 | 1.50 |  |
| 2,200 to        | 0.85          | 1.00 | 1.03 | 1.05 | 1.08 | 1.08 |  |

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use, the rms ripple current has to be reduced.