

KMG 系列

标准品

耐清洗

RoHS2  
适应品

~250V<sub>dc</sub>

KMG  
小型化



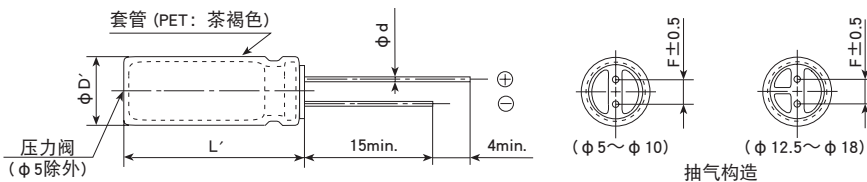
- 保证 105°C 1,000~2,000 小时 (叠加纹波电流)。
- 请注意 350~450V<sub>dc</sub> 不属于基板清洗类型。

◆ 规格表

| 项 目  | 性 能  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|--|--|------------------------|------|------|--------------------------------------|------------------------|------|------|----------------------------------|----------|----------|------|--|
| 工作温度范围   | -55~+105°C (6.3~100V <sub>dc</sub> )   |                        |      |      | -40~+105°C (160~400V <sub>dc</sub> ) |                        |      |      | -25~+105°C (450V <sub>dc</sub> ) |          |          |      |  |
| 额定电压范围   | 6.3~450V <sub>dc</sub>   |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| 静电容量容许差  | ±20% (M) (20°C、120Hz)  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| 漏电流  | 6.3~100V <sub>dc</sub>   |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | I ≤ 0.03CV 或者 4 μA 中任意一个较大值  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | 160~450V <sub>dc</sub>   |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | CV 时间 1分 5分  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| CV ≤ 1,000 I ≤ 0.1CV + 40 I ≤ 0.03CV + 15                  |  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| CV > 1,000 I ≤ 0.04CV + 100 I ≤ 0.02CV + 25                |  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| I: 漏电流 (μA)、C: 静电容量 (μF)、V: 额定电压 (V <sub>dc</sub> ) (20°C) |  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| 损失角正切值 (tan δ)   | 额定电压 (V <sub>dc</sub> )  | 6.3V                   | 10V  | 16V  | 25V                                  | 35V                    | 50V  | 63V  | 100V                             | 160~250V | 350~400V | 450V |  |
|  | tan δ (Max.)   | 0.34                   | 0.24 | 0.20 | 0.16                                 | 0.14                   | 0.12 | 0.10 | 0.08                             | 0.20     | 0.24     | 0.24 |  |
|  | 但是, 超过1,000 μF 的每增加1,000 μF 则 tan δ 设定增加0.02。 (20°C、120Hz)   |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| 温度特性<br>(阻抗比)<br>(Max右表值)                                  | 额定电压 (V <sub>dc</sub> )  | 6.3V                   | 10V  | 16V  | 25V                                  | 35V                    | 50V  | 63V  | 100V                             | 160~250V | 350~400V | 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        | —    |  |
| 耐久性  | 在105°C环境中, 不超过额定电压的范围内叠加额定纹波电流, 连续加载电压1,000小时后 (但, 160V <sub>dc</sub> 以上且 φ 12.5以上的为2,000小时后), 待温度恢复到20°C进行测量时, 应满足以下要求。 |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | 静电容量变化率  | ≤ 初始值的 ±20%            |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | 损失角正切值   | ≤ 初始规格值的200%           |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | 漏电流  | ≤ 初始规格值                |      |      |                                      |                        |      |      |                                  |          |          |      |  |
| 高温无负荷特性  | 在105°C环境中, 无负荷放置1,000小时后待温度恢复到20°C, 进行试验前处理 (JIS C 5101-4 4.1项) 后进行测量时, 应满足以下要求  |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |
|  | 额定电压 (V <sub>dc</sub> )  | 6.3~100V <sub>dc</sub> |      |      |                                      | 160~450V <sub>dc</sub> |      |      |                                  |          |          |      |  |
|  | 静电容量变化率  | ≤ 初始值的 ±20%            |      |      |                                      | ≤ 初始值的 ±20%            |      |      |                                  |          |          |      |  |
|  | 损失角正切值   | ≤ 初始规格值的200%           |      |      |                                      | ≤ 初始规格值的200%           |      |      |                                  |          |          |      |  |
|  | 漏电流  | ≤ 初始规格值                |      |      |                                      | ≤ 初始规格值的500%           |      |      |                                  |          |          |      |  |
| 容许清洗条件   | 请参照 Technical note 第6项 「基板清洗」<br>(另外, 额定电压为350V <sub>dc</sub> ~450V <sub>dc</sub> 的产品不属于基板清洗类型。)                         |                        |      |      |                                      |                        |      |      |                                  |          |          |      |  |

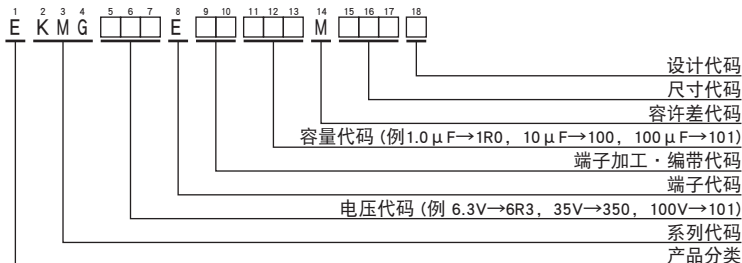
◆ 尺寸图 (CE04 形) [mm]

● 端子代码: 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.  |     |     |     |      |     |     |

◆ 产品型号体系



产品型号代码的详细介绍请参考「产品型号表示方法 (引线型)」。

◆标准品一览表

| WV (Vdc) | Cap (μF) | 尺寸 φD×L(mm) | tan δ  | 额定纹波电流 (mA <sub>rms</sub> /105°C, 120Hz) | 产品型号               | WV (Vdc)           | Cap (μF)           | 尺寸 φD×L(mm)        | tan δ   | 额定纹波电流 (mA <sub>rms</sub> /105°C, 120Hz) | 产品型号               |                    |                    |
|----------|----------|-------------|--------|--|--------------------|--------------------|--------------------|--------------------|---------|--|--------------------|--------------------|--------------------|
| 6.3      | 220      | 5×11        | 0.34   | 140                                      | EKMG6R3E□□221ME11D | 63                 | 10                 | 5×11               | 0.10    | 46                                       | EKMG630E□□100ME11D |                    |                    |
|          | 330      | 6.3×11      | 0.34   | 190                                      | EKMG6R3E□□331MF11D |                    | 22                 | 5×11               | 0.10    | 71                                       | EKMG630E□□220ME11D |                    |                    |
|          | 470      | 6.3×11      | 0.34   | 230                                      | EKMG6R3E□□471MF11D |                    | 33                 | 6.3×11             | 0.10    | 100                                      | EKMG630E□□330MF11D |                    |                    |
|          | 1,000    | 8×11.5      | 0.34   | 380                                      | EKMG6R3E□□102MHB5D |                    | 47                 | 6.3×11             | 0.10    | 120                                      | EKMG630E□□470MF11D |                    |                    |
|          | 2,200    | 10×20       | 0.36   | 710                                      | EKMG6R3E□□222MJ20S |                    | 100                | 10×12.5            | 0.10    | 215                                      | EKMG630E□□101MJC5S |                    |                    |
|          | 3,300    | 10×20       | 0.38   | 840                                      | EKMG6R3E□□332MLP1S |                    | 220                | 10×16              | 0.10    | 335                                      | EKMG630E□□221MJ16S |                    |                    |
|          | 4,700    | 12.5×20     | 0.40   | 1,090                                    | EKMG6R3E□□472MK20S |                    | 330                | 10×20              | 0.10    | 510                                      | EKMG630E□□331MJ20S |                    |                    |
|          | 6,800    | 12.5×25     | 0.44   | 1,350                                    | EKMG6R3E□□682MK25S |                    | 470                | 12.5×20            | 0.10    | 640                                      | EKMG630E□□471MK20S |                    |                    |
|          | 10,000   | 16×25       | 0.52   | 1,650                                    | EKMG6R3E□□103ML25S |                    | 1,000              | 16×25              | 0.10    | 930                                      | EKMG630E□□102ML25S |                    |                    |
|          | 15,000   | 16×35.5     | 0.62   | 2,010                                    | EKMG6R3E□□153MLP1S |                    | 100                | 1.0                | 5×11    | 0.08                                     | 15                 | EKMG101E□□1R0ME11D |                    |
|          | 22,000   | 18×40       | 0.76   | 2,350                                    | EKMG6R3E□□223MM40S |                    |                    | 2.2                | 5×11    | 0.08                                     | 21                 | EKMG101E□□2R2ME11D |                    |
|          | 10       | 220         | 6.3×11 | 0.24                                     | 170                |                    |                    | EKMG100E□□221MF11D | 3.3     | 5×11                                     | 0.08               | 29                 | EKMG101E□□3R3ME11D |
| 330      |          | 6.3×11      | 0.24   | 200                                      | EKMG100E□□331MF11D | 4.7                |                    | 5×11               | 0.08    | 32                                       | EKMG101E□□4R7ME11D |                    |                    |
| 470      |          | 8×11.5      | 0.24   | 250                                      | EKMG100E□□471MHB5D | 10                 |                    | 6.3×11             | 0.08    | 54                                       | EKMG101E□□100MF11D |                    |                    |
| 1,000    |          | 10×12.5     | 0.24   | 460                                      | EKMG100E□□102MJC5S | 22                 |                    | 8×11.5             | 0.08    | 93                                       | EKMG101E□□220MHB5D |                    |                    |
| 2,200    |          | 10×20       | 0.26   | 760                                      | EKMG100E□□222MJ20S | 33                 |                    | 8×11.5             | 0.08    | 130                                      | EKMG101E□□330MHB5D |                    |                    |
| 3,300    |          | 12.5×20     | 0.28   | 1,000                                    | EKMG100E□□332MK20S | 47                 |                    | 10×12.5            | 0.08    | 165                                      | EKMG101E□□470MJC5S |                    |                    |
| 4,700    |          | 12.5×25     | 0.30   | 1,260                                    | EKMG100E□□472MK25S | 100                |                    | 10×20              | 0.08    | 265                                      | EKMG101E□□101MJ20S |                    |                    |
| 6,800    |          | 16×25       | 0.34   | 1,570                                    | EKMG100E□□682ML25S | 220                |                    | 12.5×25            | 0.08    | 440                                      | EKMG101E□□221MK25S |                    |                    |
| 10,000   |          | 16×35.5     | 0.42   | 1,890                                    | EKMG100E□□103MLP1S | 330                |                    | 16×25              | 0.08    | 540                                      | EKMG101E□□331ML25S |                    |                    |
| 15,000   |          | 18×35.5     | 0.52   | 2,180                                    | EKMG100E□□153MMP1S | 470                |                    | 16×31.5            | 0.08    | 715                                      | EKMG101E□□471MLN3S |                    |                    |
| 16       |          | 100         | 5×11   | 0.20                                     | 110                | EKMG160E□□101ME11D | 1,000              | 18×40              | 0.08    | 985                                      | EKMG101E□□102MM40S |                    |                    |
|          |          | 220         | 6.3×11 | 0.20                                     | 180                | EKMG160E□□221MF11D | 160                | 3.3                | 6.3×11  | 0.20                                     | 28                 | EKMG161E□□3R3MF11D |                    |
|          | 330      | 8×11.5      | 0.20   | 260                                      | EKMG160E□□331MHB5D | 4.7                |                    | 6.3×11             | 0.20    | 34                                       | EKMG161E□□4R7MF11D |                    |                    |
|          | 470      | 8×11.5      | 0.20   | 310                                      | EKMG160E□□471MHB5D | 10                 |                    | 10×12.5            | 0.20    | 67                                       | EKMG161E□□100MJC5S |                    |                    |
|          | 1,000    | 10×16       | 0.20   | 560                                      | EKMG160E□□102MJ16S | 22                 |                    | 10×20              | 0.20    | 120                                      | EKMG161E□□220MJ20S |                    |                    |
|          | 2,200    | 12.5×20     | 0.22   | 920                                      | EKMG160E□□222MK20S | 33                 |                    | 10×20              | 0.20    | 145                                      | EKMG161E□□330MJ20S |                    |                    |
|          | 3,300    | 12.5×25     | 0.24   | 1,170                                    | EKMG160E□□332MK25S | 47                 |                    | 12.5×20            | 0.20    | 195                                      | EKMG161E□□470MK20S |                    |                    |
|          | 4,700    | 16×25       | 0.26   | 1,480                                    | EKMG160E□□472ML25S | 100                |                    | 16×25              | 0.20    | 335                                      | EKMG161E□□101ML25S |                    |                    |
|          | 6,800    | 16×31.5     | 0.30   | 1,780                                    | EKMG160E□□682MLN3S | 220                |                    | 16×31.5            | 0.20    | 540                                      | EKMG161E□□221MLN3S |                    |                    |
|          | 10,000   | 18×35.5     | 0.38   | 2,060                                    | EKMG160E□□103MMP1S | 330                |                    | 18×35.5            | 0.20    | 705                                      | EKMG161E□□331MMP1S |                    |                    |
|          | 25       | 47          | 5×11   | 0.16                                     | 80                 | EKMG250E□□470ME11D |                    | 200                | 3.3     | 6.3×11                                   | 0.20               | 28                 | EKMG201E□□3R3MF11D |
|          |          | 100         | 6.3×11 | 0.16                                     | 130                | EKMG250E□□101MF11D |                    |                    | 4.7     | 8×11.5                                   | 0.20               | 39                 | EKMG201E□□4R7MHB5D |
| 220      |          | 8×11.5      | 0.16   | 230                                      | EKMG250E□□221MHB5D | 10                 |                    |                    | 10×16   | 0.20                                     | 74                 | EKMG201E□□220MJ16S |                    |
| 330      |          | 8×11.5      | 0.16   | 310                                      | EKMG250E□□331MHB5D | 22                 | 10×20              |                    | 0.20    | 120                                      | EKMG201E□□220MJ20S |                    |                    |
| 470      |          | 10×12.5     | 0.16   | 380                                      | EKMG250E□□471MJC5S | 33                 | 12.5×20            |                    | 0.20    | 160                                      | EKMG201E□□330MK20S |                    |                    |
| 1,000    |          | 10×20       | 0.16   | 680                                      | EKMG250E□□102MJ20S | 47                 | 12.5×20            |                    | 0.20    | 195                                      | EKMG201E□□470MK20S |                    |                    |
| 2,200    |          | 12.5×25     | 0.18   | 1,090                                    | EKMG250E□□222MK25S | 100                | 16×25              |                    | 0.20    | 335                                      | EKMG201E□□101ML25S |                    |                    |
| 3,300    |          | 16×25       | 0.20   | 1,400                                    | EKMG250E□□332ML25S | 220                | 18×35.5            |                    | 0.20    | 575                                      | EKMG201E□□221MMP1S |                    |                    |
| 4,700    |          | 16×31.5     | 0.22   | 1,710                                    | EKMG250E□□472MLN3S | 250                | 2.2                |                    | 6.3×11  | 0.20                                     | 23                 | EKMG251E□□2R2MF11D |                    |
| 6,800    |          | 18×35.5     | 0.26   | 2,040                                    | EKMG250E□□682MMP1S |                    | 3.3                |                    | 8×11.5  | 0.20                                     | 32                 | EKMG251E□□3R3MHB5D |                    |
| 35       |          | 47          | 5×11   | 0.14                                     | 90                 |                    | EKMG350E□□470ME11D |                    | 4.7     | 8×11.5                                   | 0.20               | 39                 | EKMG251E□□4R7MHB5D |
|          |          | 100         | 6.3×11 | 0.14                                     | 150                |                    | EKMG350E□□101MF11D |                    | 10      | 10×16                                    | 0.20               | 74                 | EKMG251E□□100MJ16S |
|          | 220      | 8×11.5      | 0.14   | 270                                      | EKMG350E□□221MHB5D |                    | 22                 | 12.5×20            | 0.20    | 130                                      | EKMG251E□□220MK20S |                    |                    |
|          | 330      | 10×12.5     | 0.14   | 350                                      | EKMG350E□□331MJC5S |                    | 33                 | 12.5×20            | 0.20    | 160                                      | EKMG251E□□330MK20S |                    |                    |
|          | 470      | 10×16       | 0.14   | 460                                      | EKMG350E□□471MJ16S |                    | 47                 | 12.5×25            | 0.20    | 210                                      | EKMG251E□□470MK25S |                    |                    |
|          | 1,000    | 12.5×20     | 0.14   | 810                                      | EKMG350E□□102MK20S |                    | 100                | 16×31.5            | 0.20    | 365                                      | EKMG251E□□101MLN3S |                    |                    |
|          | 2,200    | 16×25       | 0.16   | 1,260                                    | EKMG350E□□222ML25S |                    | 220                | 18×40              | 0.20    | 585                                      | EKMG251E□□221MM40S |                    |                    |
|          | 3,300    | 16×35.5     | 0.18   | 1,610                                    | EKMG350E□□332MLP1S |                    | 350                | 1.0                | 6.3×11  | 0.24                                     | 15                 | EKMG351E□□1R0MF11D |                    |
|          | 4,700    | 18×35.5     | 0.20   | 1,910                                    | EKMG350E□□472MMP1S |                    |                    | 2.2                | 8×11.5  | 0.24                                     | 26                 | EKMG351E□□2R2MHB5D |                    |
|          | 50       | 1.0         | 5×11   | 0.12                                     | 13                 |                    |                    | EKMG500E□□1R0ME11D | 3.3     | 10×12.5                                  | 0.24               | 38                 | EKMG351E□□3R3MJC5S |
|          |          | 2.2         | 5×11   | 0.12                                     | 20                 | EKMG500E□□2R2ME11D |                    | 4.7                | 10×16   | 0.24                                     | 50                 | EKMG351E□□4R7MJ16S |                    |
|          |          | 3.3         | 5×11   | 0.12                                     | 25                 | EKMG500E□□3R3ME11D |                    | 10                 | 10×20   | 0.24                                     | 80                 | EKMG351E□□100MJ20S |                    |
| 4.7      |          | 5×11        | 0.12   | 30                                       | EKMG500E□□4R7ME11D | 22                 |                    | 12.5×20            | 0.24    | 130                                      | EKMG351E□□220MK20S |                    |                    |
| 10       |          | 5×11        | 0.12   | 40                                       | EKMG500E□□100ME11D | 33                 |                    | 16×25              | 0.24    | 195                                      | EKMG351E□□330ML25S |                    |                    |
| 22       |          | 5×11        | 0.12   | 65                                       | EKMG500E□□220ME11D | 47                 |                    | 16×25              | 0.24    | 230                                      | EKMG351E□□470ML25S |                    |                    |
| 33       |          | 5×11        | 0.12   | 90                                       | EKMG500E□□330ME11D | 100                |                    | 18×31.5            | 0.24    | 375                                      | EKMG351E□□101MMN3S |                    |                    |
| 47       |          | 6.3×11      | 0.12   | 110                                      | EKMG500E□□470MF11D | 400                |                    | 1.0                | 6.3×11  | 0.24                                     | 15                 | EKMG401E□□1R0MF11D |                    |
| 100      |          | 8×11.5      | 0.12   | 180                                      | EKMG500E□□101MHB5D |                    |                    | 2.2                | 8×11.5  | 0.24                                     | 26                 | EKMG401E□□2R2MHB5D |                    |
| 220      |          | 10×12.5     | 0.12   | 300                                      | EKMG500E□□221MJC5S |                    |                    | 3.3                | 10×12.5 | 0.24                                     | 38                 | EKMG401E□□3R3MJC5S |                    |
| 330      |          | 10×16       | 0.12   | 410                                      | EKMG500E□□331MJ16S |                    | 4.7                | 10×16              | 0.24    | 50                                       | EKMG401E□□4R7MJ16S |                    |                    |
| 470      |          | 10×20       | 0.12   | 530                                      | EKMG500E□□471MJ20S |                    | 10                 | 10×20              | 0.24    | 80                                       | EKMG401E□□100MJ20S |                    |                    |
| 1,000    | 12.5×25  | 0.12        | 950    | EKMG500E□□102MK25S                       | 22                 |                    | 12.5×25            | 0.24               | 145     | EKMG401E□□220MK25S                       |                    |                    |                    |
| 2,200    | 16×35.5  | 0.14        | 1,470  | EKMG500E□□222MLP1S                       | 33                 |                    | 16×25              | 0.24               | 195     | EKMG401E□□330ML25S                       |                    |                    |                    |
| 3,300    | 18×35.5  | 0.16        | 1,770  | EKMG500E□□332MMP1S                       | 47                 |                    | 16×31.5            | 0.24               | 250     | EKMG401E□□470MLN3S                       |                    |                    |                    |
|          |          |             |        |  |                    |                    | 100                | 16×40              | 0.24    | 350                                      | EKMG401E□□101ML40S |                    |                    |

□□内为端子加工·编带代码。

KMG系列

◆标准品一览表   内的产品 (350~450V<sub>dc</sub>) 不能进行基板清洗。

| WV<br>(V <sub>dc</sub> ) | Cap<br>( $\mu$ F) | 尺寸<br>$\phi$ D×L(mm) | tan $\delta$ | 额定纹波<br>电流<br>(mA <sub>rms</sub> /<br>105°C, 120Hz) | 产品型号  |
|--------------------------|-------------------|----------------------|--------------|---|---|
| 450                      | 2.2               | 10×12.5              | 0.24         | 23  | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 2R2MJC5S |
|                          | 3.3               | 10×16                | 0.24         | 31  | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 3R3MJ16S |
|                          | 4.7               | 10×20                | 0.24         | 40  | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 4R7MJ20S |
|                          | 10                | 12.5×20              | 0.24         | 65  | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 100MK20S |
|                          | 22                | 16×25                | 0.24         | 115   | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 220ML25S |
|                          | 33                | 16×31.5              | 0.24         | 155   | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 330MLN3S |
|                          | 47                | 16×35.5              | 0.24         | 185   | EKMG451E <span style="border: 1px solid black; padding: 0 2px;"> </span> <span style="border: 1px solid black; padding: 0 2px;"> </span> 470MLP1S |

  内为端子加工·编带代码。

◆额定纹波电流频率修正系数

纹波频率与标准品一览表的规定值相异时, 请使用小于乘以下表系数所得之值的值。

●频率修正系数

| 静电容量 ( $\mu$ F) | 频率 (Hz) |      |      |      |      |      |
|-----------------|---------|------|------|------|------|------|
|                 | 50      | 120  | 300  | 1k   | 10k  | 100k |
| 1.0~4.7         | 0.65    | 1.00 | 1.35 | 1.75 | 2.30 | 2.50 |
| 10~47           | 0.75    | 1.00 | 1.25 | 1.50 | 1.75 | 1.80 |
| 100~1,000       | 0.80    | 1.00 | 1.15 | 1.30 | 1.40 | 1.50 |
| 2,200~          | 0.85    | 1.00 | 1.03 | 1.05 | 1.08 | 1.08 |

※ 铝电解电容器由于在纹波电流叠加时自我发热、温度上升而老化, 每升温 5°C 寿命减少一半。  
要想保持长寿命请在使用过程中降低纹波电流。