

# ALUMINUM ELECTROLYTIC CAPACITORS



**PM series** Extremely Low Impedance, High Reliability

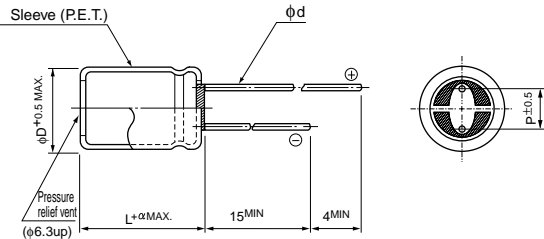


- High reliability withstanding 5000 hour load life at +105°C (3000/2000 hours for smaller case sizes as specified below).
- Capacitance ranges available based on the numerical values in E12 series under JIS.
- Compliant to the RoHS directive (2002/95/EC).

## Specifications

| Item                          | Performance Characteristics  |   |   |
|-------------------------------|--|---|---|
| Category Temperature Range    | -55 to +105°C (6.3 to 100V), -40 to +105°C (160 to 400V), -25 to +105°C (450V)   |   |   |
| Rated Voltage Range           | 6.3 to 450V  |   |   |
| Rated Capacitance Range       | 0.47 to 15000µF  |   |   |
| Capacitance Tolerance         | ±20% at 120Hz, 20°C  |   |   |
| Leakage Current               | Rated Voltage (V)  | 6.3 to 100 <span style="float:right">160 to 450</span>  |   |
|                               | Leakage current  | After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4 (µA), whichever is greater. <span style="float:right">CV ≤ 1000 : I = 0.1CV+40 (µA) max. (1 minute's)<br/>CV &gt; 1000 : I = 0.04CV+100 (µA) max. (1 minute's)</span> |   |
| Tangent of loss angle (tan δ) | For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency : 120Hz at 20°C  |   |   |
|                               | Rated Voltage (V)  | 6.3    10    16    25    35    50    63 to 100    160 to 350    400 · 450   |   |
| Stability at Low Temperature  | Rated voltage (V)  | 6.3 · 10    16    25 · 35    50 to 100    160 · 200    250    315 · 350    400    450   |   |
|                               | Impedance ratio (MAX.)   | Z-25°C / Z+20°C   | —    —    —    —    —    —    —    —    —    15 |
|                               |  | Z-40°C / Z+20°C   | —    —    —    —    —    4    6    8    10    — |
| Z-55°C / Z+20°C               | 4    3    3    2    —    —    —    —    —    —   |   |   |
| Endurance                     | The specifications listed at right shall be met when the capacitors are restored to 20°C after D.C. bias plus rated ripple current is applied for 5000 hours (2000 hours for φD=5 and 6.3, 3000 hours for φD=8) at 105°C, the peak voltage shall not exceed the rated voltage. |   |   |
|                               | Capacitance change   | Within ±20% of the initial capacitance value  |   |
|                               | tan δ  | 200% or less than the initial specified value   |   |
| Shelf Life                    | After storing the capacitors under no load at 105°C for 1000 hours and then performing voltage treatment based on JIS C 5101-4 clause 4.1 at 20°C, they shall meet the characteristic requirements listed at right.  |   |   |
|                               | Capacitance change   | Within ±20% of the initial capacitance value  |   |
|                               | tan δ  | 150% or less than the initial specified value   |   |
| Marking                       | Printed with white color letter on dark brown sleeve.  |   |   |

## Radial Lead Type



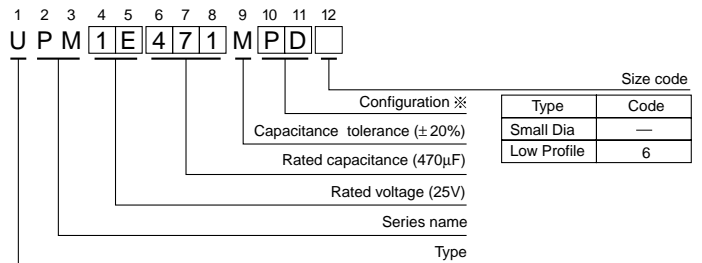
|   |           |     |
|---|-----------|-----|
| α | (φD < 10) | 1.5 |
|   | (φD ≥ 10) | 2.0 |

|    | (mm) |     |     |     |      |     |     |  |
|----|------|-----|-----|-----|------|-----|-----|--|
| φD | 5    | 6.3 | 8   | 10  | 12.5 | 16  | 18  |  |
| P  | 2.0  | 2.5 | 3.5 | 5.0 | 5.0  | 7.5 | 7.5 |  |
| φd | 0.5  | 0.5 | 0.6 | 0.6 | 0.6* | 0.8 | 0.8 |  |

※: In case L > 25 for the φ12.5 dia. unit, lead dia. φd = 0.8mm.

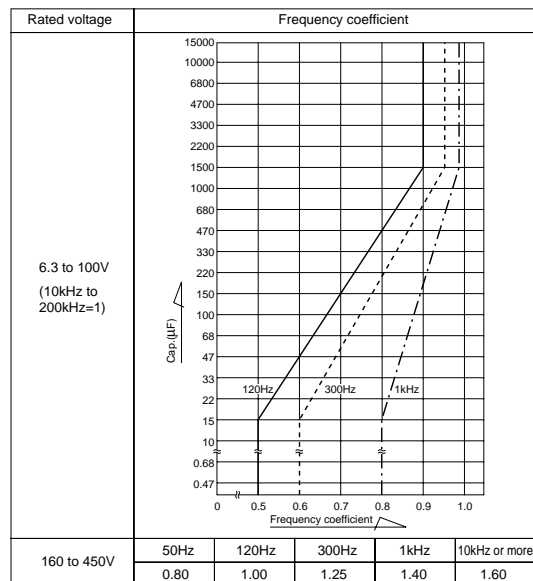
- Please refer to page 20 about the end seal configuration.

## Type numbering system (Example : 25V 470µF)



| φ D        | Pb-free leadwire<br>Pb-free PET sleeve |
|------------|--|
| 5          | DD                                     |
| 6.3        | ED                                     |
| 8 · 10     | PD                                     |
| 12.5 to 18 | HD                                     |

## Frequency coefficient of rated ripple current



Please refer to page 20, 21, 22 about the formed or taped product spec.  
Please refer to page 4 for the minimum order quantity.

- Dimension table in next page.

# ALUMINUM ELECTROLYTIC CAPACITORS

## ■ Dimensions

φD×L (mm)

| Cap.(μF) | Code | V(Code)<br>Size code | 6.3 (0J)    |           | 10 (1A)     |           | 16 (1C)     |           | 25 (1E)     |           | 35 (1V)     |           |
|----------|------|----------------------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|
|          |      |                      | —           | 6         | —           | 6         | —           | 6         | —           | 6         | —           | 6         |
| 22       | 220  |                      |             |           |             |           |             |           |             |           |             | 5 × 11    |
| 27       | 270  |                      |             |           |             |           |             |           |             |           |             | 5 × 11    |
| 33       | 330  |                      |             |           |             |           |             |           |             | 5 × 11    |             | 6.3 × 11  |
| 39       | 390  |                      |             |           |             |           |             |           |             | 5 × 11    |             | 6.3 × 11  |
| 47       | 470  |                      |             |           |             |           |             | 5 × 11    |             | 6.3 × 11  |             | 6.3 × 11  |
| 56       | 560  |                      |             |           |             |           |             | 5 × 11    |             | 6.3 × 11  |             | 6.3 × 11  |
| 68       | 680  |                      |             |           | 5 × 11      |           |             | 6.3 × 11  |             | 6.3 × 11  |             | 6.3 × 15  |
| 82       | 820  |                      |             |           | 5 × 11      |           |             | 6.3 × 11  |             | 6.3 × 11  |             | 6.3 × 15  |
| 100      | 101  |                      | 5 × 11      |           | 6.3 × 11    |           |             | 6.3 × 11  |             | 6.3 × 15  |             | 8 × 11.5  |
| 120      | 121  |                      | 5 × 11      |           | 6.3 × 11    |           |             | 6.3 × 11  |             | 6.3 × 15  |             | 8 × 15    |
| 150      | 151  |                      | 6.3 × 11    |           | 6.3 × 11    |           |             | 6.3 × 15  |             | 8 × 11.5  |             | 8 × 15    |
| 180      | 181  |                      | 6.3 × 11    |           | 6.3 × 11    |           |             | 6.3 × 15  |             | 8 × 15    | 10 × 12.5   | 8 × 20    |
| 220      | 221  |                      | 6.3 × 11    |           | 6.3 × 15    |           |             | 8 × 11.5  |             | 8 × 15    | 10 × 12.5   | 8 × 20    |
| 270      | 271  |                      | 6.3 × 15    |           | 6.3 × 15    |           |             | 8 × 15    | 10 × 12.5   | 8 × 20    | 10 × 15     | 10 × 20   |
| 330      | 331  |                      | 6.3 × 15    |           | 8 × 11.5    |           |             | 8 × 15    | 10 × 12.5   | 8 × 20    | 10 × 15     | 10 × 20   |
| 390      | 391  |                      | 8 × 11.5    |           | 8 × 15      | 10 × 12.5 |             | 8 × 20    | 10 × 15     | 10 × 20   | 12.5 × 15   | 10 × 25   |
| 470      | 471  |                      | 8 × 15      | 10 × 12.5 | 8 × 15      | 10 × 12.5 |             | 8 × 20    | 10 × 15     | 10 × 20   | 12.5 × 15   | 10 × 31.5 |
| 560      | 561  |                      | 8 × 15      | 10 × 12.5 | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 | 10 × 25     | 12.5 × 15 | 12.5 × 15   | 12.5 × 20 |
| 680      | 681  |                      | 8 × 20      | 10 × 15   | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   |
| 820      | 821  |                      | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 | 10 × 25     | 12.5 × 15 | 12.5 × 20   | 16 × 15   | 12.5 × 25   | 18 × 15   |
| 1000     | 102  |                      | 10 × 20     | 12.5 × 15 | 10 × 20     | 12.5 × 15 | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   | 12.5 × 31.5 | 16 × 20   |
| 1200     | 122  |                      | 10 × 20     | 12.5 × 15 | 10 × 25     | 12.5 × 15 | 12.5 × 20   | 16 × 15   | 12.5 × 25   | 18 × 15   | 12.5 × 35.5 | 16 × 25   |
| 1500     | 152  |                      | 10 × 25     | 12.5 × 15 | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   | 12.5 × 31.5 | 16 × 20   | 12.5 × 40   | 18 × 20   |
| 1800     | 182  |                      | 10 × 31.5   | 16 × 15   | 12.5 × 20   | 16 × 15   | 12.5 × 31.5 | 16 × 20   | 12.5 × 35.5 | 16 × 25   | 16 × 31.5   | 18 × 25   |
| 2200     | 222  |                      | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   | 12.5 × 31.5 | 16 × 20   | 12.5 × 40   | 18 × 20   | 16 × 35.5   | 18 × 31.5 |
| 2700     | 272  |                      | 12.5 × 25   | 18 × 15   | 12.5 × 31.5 | 16 × 20   | 12.5 × 35.5 | 16 × 25   | 16 × 31.5   | 18 × 25   | 16 × 40     | 18 × 35.5 |
| 3300     | 332  |                      | 12.5 × 25   | 18 × 15   | 12.5 × 35.5 | 16 × 20   | 12.5 × 40   | 18 × 20   | 16 × 35.5   | 18 × 31.5 | 18 × 40     |           |
| 3900     | 392  |                      | 12.5 × 31.5 | 16 × 20   | 12.5 × 40   | 18 × 20   | 16 × 31.5   | 18 × 25   | 16 × 40     | 18 × 35.5 |             |           |
| 4700     | 472  |                      | 12.5 × 35.5 | 18 × 20   | 16 × 31.5   | 18 × 25   | 16 × 35.5   | 18 × 31.5 | 18 × 40     |           |             |           |
| 5600     | 562  |                      | 12.5 × 40   | 18 × 20   | 16 × 35.5   | 18 × 25   | 16 × 40     | 18 × 35.5 |             |           |             |           |
| 6800     | 682  |                      | 16 × 31.5   | 18 × 25   | 16 × 35.5   | 18 × 31.5 | 18 × 35.5   |           |             |           |             |           |
| 8200     | 822  |                      | 16 × 35.5   | 18 × 31.5 | 16 × 40     | 18 × 35.5 | 18 × 40     |           |             |           |             |           |
| 10000    | 103  |                      | 16 × 40     | 18 × 31.5 | 18 × 40     |           |             |           |             |           |             |           |
| 12000    | 123  |                      | 18 × 35.5   |           |             |           |             |           |             |           |             |           |
| 15000    | 153  |                      | 18 × 40     |           |             |           |             |           |             |           |             |           |

| Cap.(μF) | Code | V(Code)<br>Size code | 50 (1H)     |           | 63 (1J)     |           | 80 (1K)     |           | 100 (2A)    |           |
|----------|------|----------------------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|
|          |      |                      | —           | 6         | —           | 6         | —           | 6         | —           | 6         |
| 0.47     | R47  |                      | 5 × 11      |           |             |           |             |           | 5 × 11      |           |
| 0.68     | R68  |                      | 5 × 11      |           |             |           |             |           | 5 × 11      |           |
| 1        | 010  |                      | 5 × 11      |           |             |           |             |           | 5 × 11      |           |
| 1.5      | 1R5  |                      | 5 × 11      |           |             |           |             |           | 5 × 11      |           |
| 2.2      | 2R2  |                      | 5 × 11      |           |             |           |             |           | 5 × 11      |           |
| 3.3      | 3R3  |                      | 5 × 11      |           |             |           |             |           | 5 × 11      |           |
| 4.7      | 4R7  |                      | 5 × 11      |           |             |           | 5 × 11      |           | 6.3 × 11    |           |
| 6.8      | 6R8  |                      | 5 × 11      |           |             |           | 5 × 11      |           | 6.3 × 11    |           |
| 10       | 100  |                      | 5 × 11      |           | 5 × 11      |           | 6.3 × 11    |           | 6.3 × 11    |           |
| 12       | 120  |                      | 5 × 11      |           | 5 × 11      |           | 6.3 × 11    |           | 6.3 × 11    |           |
| 15       | 150  |                      | 5 × 11      |           | 6.3 × 11    |           | 6.3 × 11    |           | 6.3 × 15    |           |
| 18       | 180  |                      | 5 × 11      |           | 6.3 × 11    |           | 6.3 × 11    |           | 6.3 × 15    |           |
| 22       | 220  |                      | 6.3 × 11    |           | 6.3 × 11    |           | 6.3 × 15    |           | 8 × 11.5    |           |
| 27       | 270  |                      | 6.3 × 11    |           | 6.3 × 11    |           | 6.3 × 15    |           | 8 × 15      | 10 × 12.5 |
| 33       | 330  |                      | 6.3 × 11    |           | 6.3 × 15    |           | 8 × 11.5    |           | 8 × 15      | 10 × 12.5 |
| 39       | 390  |                      | 6.3 × 11    |           | 6.3 × 15    |           | 8 × 15      | 10 × 12.5 | 8 × 20      | 10 × 15   |
| 47       | 470  |                      | 6.3 × 15    |           | 8 × 11.5    |           | 8 × 15      | 10 × 12.5 | 10 × 20     | 12.5 × 15 |
| 56       | 560  |                      | 6.3 × 15    |           | 8 × 15      | 10 × 12.5 | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 |
| 68       | 680  |                      | 8 × 11.5    |           | 8 × 15      | 10 × 12.5 | 10 × 20     | 12.5 × 15 | 10 × 25     | 12.5 × 15 |
| 82       | 820  |                      | 8 × 15      | 10 × 12.5 | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 | 10 × 31.5   | 16 × 15   |
| 100      | 101  |                      | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 | 10 × 25     | 12.5 × 15 | 10 × 31.5   | 16 × 15   |
| 120      | 121  |                      | 8 × 20      | 10 × 15   | 10 × 20     | 12.5 × 15 | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 16 × 15   |
| 150      | 151  |                      | 10 × 20     | 12.5 × 15 | 10 × 25     | 12.5 × 15 | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   |
| 180      | 181  |                      | 10 × 20     | 12.5 × 15 | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 16 × 15   | 12.5 × 31.5 | 16 × 20   |
| 220      | 221  |                      | 10 × 25     | 12.5 × 15 | 12.5 × 20   | 16 × 15   | 12.5 × 31.5 | 18 × 15   | 12.5 × 35.5 | 16 × 25   |
| 270      | 271  |                      | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   | 12.5 × 31.5 | 16 × 20   | 12.5 × 40   | 18 × 20   |
| 330      | 331  |                      | 10 × 31.5   | 16 × 15   | 12.5 × 25   | 18 × 15   | 12.5 × 35.5 | 16 × 25   | 16 × 31.5   | 18 × 25   |
| 390      | 391  |                      | 12.5 × 25   | 16 × 15   | 12.5 × 31.5 | 16 × 20   | 12.5 × 40   | 18 × 20   | 16 × 35.5   | 18 × 31.5 |
| 470      | 471  |                      | 12.5 × 25   | 18 × 15   | 12.5 × 35.5 | 16 × 25   | 16 × 31.5   | 18 × 25   | 16 × 40     | 18 × 35.5 |
| 560      | 561  |                      | 12.5 × 31.5 | 16 × 20   | 12.5 × 40   | 18 × 20   | 16 × 35.5   | 18 × 31.5 | 18 × 35.5   |           |
| 680      | 681  |                      | 12.5 × 35.5 | 16 × 20   | 16 × 31.5   | 18 × 25   | 16 × 40     | 18 × 31.5 | 18 × 40     |           |
| 820      | 821  |                      | 12.5 × 40   | 18 × 20   | 16 × 35.5   | 18 × 31.5 | 18 × 35.5   |           |             |           |
| 1000     | 102  |                      | 16 × 31.5   | 18 × 25   | 16 × 40     | 18 × 35.5 | 18 × 40     |           |             |           |
| 1200     | 122  |                      | 16 × 35.5   | 18 × 31.5 | 18 × 40     |           |             |           |             |           |
| 1500     | 152  |                      | 16 × 40     | 18 × 31.5 |             |           |             |           |             |           |
| 1800     | 182  |                      | 18 × 35.5   |           |             |           |             |           |             |           |
| 2200     | 222  |                      | 18 × 40     |           |             |           |             |           |             |           |

※In case of low profile type, ⑥ will be put at 12th digit of type numbering system.

Dimension table for 160 to 450V products are shown in 160 page.

## Standard Ratings

| V(Code)<br>Size code |              | 6.3 (0J)                    |                    |                |                         |               |                    |                |                         |               |      |
|----------------------|--------------|-----------------------------|--------------------|----------------|-------------------------|---------------|--------------------|----------------|-------------------------|---------------|------|
| Cap.(μF)             | Item<br>Code | Case size<br>φD × L<br>(mm) | —                  |                |                         |               | 6                  |                |                         |               |      |
|                      |              |                             | Impedance (Ω) MAX. |                | Rated ripple (mArms)    |               | Impedance (Ω) MAX. |                | Rated ripple (mArms)    |               |      |
|                      |              |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |      |
| 100                  | 101          | 5 × 11                      | 0.85               | 1.70           | 150                     | 99            |                    |                |                         |               |      |
| 120                  | 121          | 5 × 11                      | 0.65               | 1.30           | 175                     | 115           |                    |                |                         |               |      |
| 150                  | 151          | 6.3 × 11                    | 0.49               | 0.98           | 225                     | 155           |                    |                |                         |               |      |
| 180                  | 181          | 6.3 × 11                    | 0.39               | 0.78           | 250                     | 175           |                    |                |                         |               |      |
| 220                  | 221          | 6.3 × 11                    | 0.30               | 0.60           | 285                     | 205           |                    |                |                         |               |      |
| 270                  | 271          | 6.3 × 15                    | 0.24               | 0.48           | 370                     | 275           |                    |                |                         |               |      |
| 330                  | 331          | 6.3 × 15                    | 0.20               | 0.40           | 405                     | 310           |                    |                |                         |               |      |
| 390                  | 391          | 8 × 11.5                    | 0.17               | 0.34           | 445                     | 345           |                    |                |                         |               |      |
| 470                  | 471          | 8 × 15                      | 0.14               | 0.28           | 550                     | 435           | 10 × 12.5          | 0.14           | 0.28                    | 635           | 455  |
| 560                  | 561          | 8 × 15                      | 0.12               | 0.24           | 595                     | 480           | 10 × 12.5          | 0.13           | 0.26                    | 670           | 485  |
| 680                  | 681          | 8 × 20                      | 0.10               | 0.20           | 730                     | 605           | 10 × 15            | 0.11           | 0.22                    | 825           | 580  |
| 820                  | 821          | 8 × 20                      | 0.085              | 0.17           | 795                     | 670           | 10 × 15            | 0.095          | 0.19                    | 840           | 635  |
| 1000                 | 102          | 10 × 20                     | 0.075              | 0.15           | 950                     | 820           | 12.5 × 15          | 0.085          | 0.17                    | 890           | 765  |
| 1200                 | 122          | 10 × 20                     | 0.065              | 0.13           | 1060                    | 895           | 12.5 × 15          | 0.075          | 0.15                    | 950           | 835  |
| 1500                 | 152          | 10 × 25                     | 0.055              | 0.11           | 1260                    | 1090          | 12.5 × 15          | 0.065          | 0.13                    | 1020          | 915  |
| 1800                 | 182          | 10 × 31.5                   | 0.050              | 0.10           | 1370                    | 1230          | 16 × 15            | 0.055          | 0.11                    | 1270          | 1140 |
| 2200                 | 222          | 10 × 31.5                   | 0.043              | 0.086          | 1470                    | 1320          | 16 × 15            | 0.049          | 0.098                   | 1340          | 1200 |
| 2700                 | 272          | 12.5 × 25                   | 0.038              | 0.076          | 1700                    | 1430          | 18 × 15            | 0.044          | 0.088                   | 1500          | 1350 |
| 3300                 | 332          | 12.5 × 25                   | 0.034              | 0.068          | 1710                    | 1530          | 18 × 15            | 0.039          | 0.078                   | 1600          | 1440 |
| 3900                 | 392          | 12.5 × 31.5                 | 0.031              | 0.062          | 1980                    | 1710          | 16 × 20            | 0.036          | 0.072                   | 1770          | 1540 |
| 4700                 | 472          | 12.5 × 35.5                 | 0.028              | 0.056          | 2230                    | 1890          | 18 × 20            | 0.032          | 0.064                   | 1920          | 1720 |
| 5600                 | 562          | 12.5 × 40                   | 0.026              | 0.052          | 2460                    | 2040          | 18 × 20            | 0.030          | 0.060                   | 1980          | 1780 |
| 6800                 | 682          | 16 × 31.5                   | 0.024              | 0.048          | 2510                    | 2130          | 18 × 25            | 0.027          | 0.054                   | 2350          | 1980 |
| 8200                 | 822          | 16 × 35.5                   | 0.022              | 0.044          | 2770                    | 2290          | 18 × 31.5          | 0.025          | 0.050                   | 2600          | 2150 |
| 10000                | 103          | 16 × 40                     | 0.020              | 0.040          | 3110                    | 2470          | 18 × 31.5          | 0.023          | 0.046                   | 2720          | 2240 |
| 12000                | 123          | 18 × 35.5                   | 0.019              | 0.038          | 3050                    | 2530          |                    |                |                         |               |      |
| 15000                | 153          | 18 × 40                     | 0.018              | 0.036          | 3300                    | 2660          |                    |                |                         |               |      |

| V(Code)<br>Size code |              | 10 (1A)                     |                   |                |                         |               |                    |                |                         |               |      |
|----------------------|--------------|-----------------------------|-------------------|----------------|-------------------------|---------------|--------------------|----------------|-------------------------|---------------|------|
| Cap.(μF)             | Item<br>Code | Case size<br>φD × L<br>(mm) | —                 |                |                         |               | 6                  |                |                         |               |      |
|                      |              |                             | Impedance (Ω)MAX. |                | Rated ripple (mArms)    |               | Impedance (Ω) MAX. |                | Rated ripple (mArms)    |               |      |
|                      |              |                             | 20°C / 100kHz     | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |      |
| 68                   | 680          | 5 × 11                      | 0.80              | 1.60           | 155                     | 97            |                    |                |                         |               |      |
| 82                   | 820          | 5 × 11                      | 0.65              | 1.30           | 175                     | 110           |                    |                |                         |               |      |
| 100                  | 101          | 6.3 × 11                    | 0.55              | 1.10           | 210                     | 135           |                    |                |                         |               |      |
| 120                  | 121          | 6.3 × 11                    | 0.44              | 0.88           | 235                     | 160           |                    |                |                         |               |      |
| 150                  | 151          | 6.3 × 11                    | 0.35              | 0.70           | 265                     | 185           |                    |                |                         |               |      |
| 180                  | 181          | 6.3 × 11                    | 0.29              | 0.58           | 290                     | 205           |                    |                |                         |               |      |
| 220                  | 221          | 6.3 × 15                    | 0.24              | 0.48           | 370                     | 270           |                    |                |                         |               |      |
| 270                  | 271          | 6.3 × 15                    | 0.20              | 0.40           | 405                     | 300           |                    |                |                         |               |      |
| 330                  | 331          | 8 × 11.5                    | 0.16              | 0.32           | 460                     | 350           |                    |                |                         |               |      |
| 390                  | 391          | 8 × 15                      | 0.14              | 0.28           | 550                     | 430           | 10 × 12.5          | 0.15           | 0.30                    | 635           | 430  |
| 470                  | 471          | 8 × 15                      | 0.12              | 0.24           | 595                     | 475           | 10 × 12.5          | 0.13           | 0.26                    | 670           | 475  |
| 560                  | 561          | 8 × 20                      | 0.10              | 0.20           | 730                     | 590           | 10 × 15            | 0.11           | 0.22                    | 700           | 565  |
| 680                  | 681          | 8 × 20                      | 0.085             | 0.17           | 795                     | 660           | 10 × 15            | 0.090          | 0.18                    | 825           | 635  |
| 820                  | 821          | 10 × 20                     | 0.070             | 0.14           | 985                     | 835           | 12.5 × 15          | 0.080          | 0.16                    | 920           | 780  |
| 1000                 | 102          | 10 × 20                     | 0.060             | 0.12           | 1060                    | 915           | 12.5 × 15          | 0.065          | 0.13                    | 1040          | 895  |
| 1200                 | 122          | 10 × 25                     | 0.050             | 0.10           | 1260                    | 1120          | 12.5 × 15          | 0.060          | 0.12                    | 1060          | 930  |
| 1500                 | 152          | 10 × 31.5                   | 0.045             | 0.090          | 1450                    | 1290          | 16 × 15            | 0.050          | 0.10                    | 1330          | 1190 |
| 1800                 | 182          | 12.5 × 20                   | 0.039             | 0.078          | 1470                    | 1320          | 16 × 15            | 0.044          | 0.088                   | 1420          | 1270 |
| 2200                 | 222          | 12.5 × 25                   | 0.034             | 0.068          | 1710                    | 1530          | 18 × 15            | 0.039          | 0.078                   | 1600          | 1440 |
| 2700                 | 272          | 12.5 × 31.5                 | 0.030             | 0.060          | 1980                    | 1740          | 16 × 20            | 0.035          | 0.070                   | 1740          | 1560 |
| 3300                 | 332          | 12.5 × 35.5                 | 0.026             | 0.052          | 2230                    | 1960          | 16 × 20            | 0.031          | 0.062                   | 1850          | 1660 |
| 3900                 | 392          | 12.5 × 40                   | 0.024             | 0.048          | 2460                    | 2120          | 18 × 20            | 0.028          | 0.056                   | 2050          | 1840 |
| 4700                 | 472          | 16 × 31.5                   | 0.023             | 0.046          | 2420                    | 2170          | 18 × 25            | 0.026          | 0.052                   | 2350          | 2020 |
| 5600                 | 562          | 16 × 35.5                   | 0.021             | 0.042          | 2610                    | 2340          | 18 × 25            | 0.024          | 0.048                   | 2440          | 2100 |
| 6800                 | 682          | 16 × 35.5                   | 0.020             | 0.040          | 2770                    | 2410          | 18 × 31.5          | 0.022          | 0.044                   | 2720          | 2280 |
| 8200                 | 822          | 16 × 40                     | 0.019             | 0.038          | 3110                    | 2530          | 18 × 35.5          | 0.021          | 0.042                   | 3050          | 2420 |
| 10000                | 103          | 18 × 40                     | 0.017             | 0.034          | 3300                    | 2730          |                    |                |                         |               |      |

※In case of low profile type, ⑥ will be put at 12th digit of type numbering system.

## Standard Ratings

| Cap.(μF) | V(Code)<br>Size Code<br>Item<br>Code | 16 (1C)                     |                    |                |                                     |               |                             |                    |                |                                     |               |
|----------|--------------------------------------|-----------------------------|--------------------|----------------|-------------------------------------|---------------|-----------------------------|--------------------|----------------|-------------------------------------|---------------|
|          |                                      | Case size<br>φD × L<br>(mm) | —                  |                |                                     |               | 6                           |                    |                |                                     |               |
|          |                                      |                             | Impedance (Ω) MAX. |                | Rated ripple (mArms)                |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mArms)                |               |
|          |                                      |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / $\frac{10kHz}{200kHz}^{10}$ | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / $\frac{10kHz}{200kHz}^{10}$ | 105°C / 120Hz |
| 47       | 470                                  | 5 × 11                      | 0.80               | 1.60           | 155                                 | 92            |                             |                    |                |                                     |               |
| 56       | 560                                  | 5 × 11                      | 0.65               | 1.30           | 175                                 | 105           |                             |                    |                |                                     |               |
| 68       | 680                                  | 6.3 × 11                    | 0.50               | 1.00           | 220                                 | 135           |                             |                    |                |                                     |               |
| 82       | 820                                  | 6.3 × 11                    | 0.42               | 0.84           | 240                                 | 155           |                             |                    |                |                                     |               |
| 100      | 101                                  | 6.3 × 11                    | 0.35               | 0.70           | 265                                 | 175           |                             |                    |                |                                     |               |
| 120      | 121                                  | 6.3 × 11                    | 0.29               | 0.58           | 290                                 | 195           |                             |                    |                |                                     |               |
| 150      | 151                                  | 6.3 × 15                    | 0.23               | 0.46           | 375                                 | 260           |                             |                    |                |                                     |               |
| 180      | 181                                  | 6.3 × 15                    | 0.20               | 0.40           | 405                                 | 285           |                             |                    |                |                                     |               |
| 220      | 221                                  | 8 × 11.5                    | 0.16               | 0.32           | 460                                 | 335           |                             |                    |                |                                     |               |
| 270      | 271                                  | 8 × 15                      | 0.14               | 0.28           | 550                                 | 410           | 10 × 12.5                   | 0.14               | 0.28           | 635                                 | 430           |
| 330      | 331                                  | 8 × 15                      | 0.12               | 0.24           | 595                                 | 455           | 10 × 12.5                   | 0.12               | 0.24           | 670                                 | 480           |
| 390      | 391                                  | 8 × 20                      | 0.10               | 0.20           | 730                                 | 570           | 10 × 15                     | 0.10               | 0.20           | 730                                 | 570           |
| 470      | 471                                  | 8 × 20                      | 0.090              | 0.18           | 770                                 | 615           | 10 × 15                     | 0.090              | 0.18           | 825                                 | 615           |
| 560      | 561                                  | 10 × 20                     | 0.075              | 0.15           | 950                                 | 770           | 12.5 × 15                   | 0.080              | 0.16           | 920                                 | 745           |
| 680      | 681                                  | 10 × 20                     | 0.065              | 0.13           | 1060                                | 845           | 12.5 × 15                   | 0.070              | 0.14           | 985                                 | 815           |
| 820      | 821                                  | 10 × 25                     | 0.055              | 0.11           | 1260                                | 1030          | 12.5 × 15                   | 0.060              | 0.12           | 1060                                | 895           |
| 1000     | 102                                  | 10 × 31.5                   | 0.047              | 0.094          | 1410                                | 1210          | 16 × 15                     | 0.055              | 0.11           | 1270                                | 1090          |
| 1200     | 122                                  | 12.5 × 20                   | 0.041              | 0.082          | 1430                                | 1250          | 16 × 15                     | 0.046              | 0.092          | 1390                                | 1220          |
| 1500     | 152                                  | 12.5 × 25                   | 0.036              | 0.072          | 1700                                | 1490          | 18 × 15                     | 0.041              | 0.082          | 1560                                | 1400          |
| 1800     | 182                                  | 12.5 × 31.5                 | 0.032              | 0.064          | 1880                                | 1690          | 16 × 20                     | 0.037              | 0.074          | 1700                                | 1530          |
| 2200     | 222                                  | 12.5 × 31.5                 | 0.028              | 0.056          | 2010                                | 1800          | 16 × 20                     | 0.033              | 0.066          | 1800                                | 1620          |
| 2700     | 272                                  | 12.5 × 35.5                 | 0.025              | 0.050          | 2230                                | 1990          | 16 × 25                     | 0.030              | 0.060          | 2190                                | 1800          |
| 3300     | 332                                  | 12.5 × 40                   | 0.023              | 0.046          | 2460                                | 2160          | 18 × 20                     | 0.027              | 0.054          | 2090                                | 1880          |
| 3900     | 392                                  | 16 × 31.5                   | 0.022              | 0.044          | 2510                                | 2220          | 18 × 25                     | 0.025              | 0.050          | 2350                                | 2060          |
| 4700     | 472                                  | 16 × 35.5                   | 0.020              | 0.040          | 2770                                | 2410          | 18 × 31.5                   | 0.023              | 0.046          | 2720                                | 2240          |
| 5600     | 562                                  | 16 × 40                     | 0.019              | 0.038          | 3110                                | 2530          | 18 × 35.5                   | 0.022              | 0.044          | 2620                                | 2350          |
| 6800     | 682                                  | 18 × 35.5                   | 0.018              | 0.036          | 3050                                | 2610          |                             |                    |                |                                     |               |
| 8200     | 822                                  | 18 × 40                     | 0.017              | 0.034          | 3300                                | 2730          |                             |                    |                |                                     |               |

| Cap.(μF) | V(Code)<br>Size Code<br>Item<br>Code | 25 (1E)                     |                    |                |                                     |               |                             |                    |                |                                     |               |
|----------|--------------------------------------|-----------------------------|--------------------|----------------|-------------------------------------|---------------|-----------------------------|--------------------|----------------|-------------------------------------|---------------|
|          |                                      | Case size<br>φD × L<br>(mm) | —                  |                |                                     |               | 6                           |                    |                |                                     |               |
|          |                                      |                             | Impedance (Ω) MAX. |                | Rated ripple (mArms)                |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mArms)                |               |
|          |                                      |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / $\frac{10kHz}{200kHz}^{10}$ | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / $\frac{10kHz}{200kHz}^{10}$ | 105°C / 120Hz |
| 33       | 330                                  | 5 × 11                      | 0.80               | 1.60           | 155                                 | 88            |                             |                    |                |                                     |               |
| 39       | 390                                  | 5 × 11                      | 0.65               | 1.30           | 175                                 | 100           |                             |                    |                |                                     |               |
| 47       | 470                                  | 6.3 × 11                    | 0.55               | 1.10           | 210                                 | 125           |                             |                    |                |                                     |               |
| 56       | 560                                  | 6.3 × 11                    | 0.44               | 0.88           | 235                                 | 140           |                             |                    |                |                                     |               |
| 68       | 680                                  | 6.3 × 11                    | 0.36               | 0.72           | 260                                 | 160           |                             |                    |                |                                     |               |
| 82       | 820                                  | 6.3 × 11                    | 0.30               | 0.60           | 285                                 | 180           |                             |                    |                |                                     |               |
| 100      | 101                                  | 6.3 × 15                    | 0.24               | 0.48           | 370                                 | 245           |                             |                    |                |                                     |               |
| 120      | 121                                  | 6.3 × 15                    | 0.20               | 0.40           | 405                                 | 275           |                             |                    |                |                                     |               |
| 150      | 151                                  | 8 × 11.5                    | 0.16               | 0.32           | 460                                 | 320           |                             |                    |                |                                     |               |
| 180      | 181                                  | 8 × 15                      | 0.14               | 0.28           | 550                                 | 390           | 10 × 12.5                   | 0.15               | 0.30           | 635                                 | 395           |
| 220      | 221                                  | 8 × 15                      | 0.11               | 0.22           | 625                                 | 455           | 10 × 12.5                   | 0.13               | 0.26           | 670                                 | 435           |
| 270      | 271                                  | 8 × 20                      | 0.095              | 0.19           | 750                                 | 560           | 10 × 15                     | 0.11               | 0.22           | 700                                 | 525           |
| 330      | 331                                  | 8 × 20                      | 0.085              | 0.17           | 795                                 | 610           | 10 × 15                     | 0.095              | 0.19           | 825                                 | 575           |
| 390      | 391                                  | 10 × 20                     | 0.070              | 0.14           | 985                                 | 770           | 12.5 × 15                   | 0.080              | 0.16           | 920                                 | 720           |
| 470      | 471                                  | 10 × 20                     | 0.065              | 0.13           | 1060                                | 810           | 12.5 × 15                   | 0.070              | 0.14           | 985                                 | 785           |
| 560      | 561                                  | 10 × 25                     | 0.055              | 0.11           | 1260                                | 990           | 12.5 × 15                   | 0.060              | 0.12           | 1060                                | 860           |
| 680      | 681                                  | 10 × 31.5                   | 0.046              | 0.092          | 1420                                | 1180          | 16 × 15                     | 0.055              | 0.11           | 1270                                | 1050          |
| 820      | 821                                  | 12.5 × 20                   | 0.041              | 0.082          | 1440                                | 1210          | 16 × 15                     | 0.049              | 0.098          | 1340                                | 1130          |
| 1000     | 102                                  | 12.5 × 25                   | 0.036              | 0.072          | 1700                                | 1430          | 18 × 15                     | 0.043              | 0.086          | 1520                                | 1310          |
| 1200     | 122                                  | 12.5 × 25                   | 0.032              | 0.064          | 1760                                | 1550          | 18 × 15                     | 0.039              | 0.078          | 1600                                | 1400          |
| 1500     | 152                                  | 12.5 × 31.5                 | 0.029              | 0.058          | 1980                                | 1780          | 16 × 20                     | 0.034              | 0.068          | 1770                                | 1590          |
| 1800     | 182                                  | 12.5 × 35.5                 | 0.026              | 0.052          | 2230                                | 1960          | 16 × 25                     | 0.031              | 0.062          | 2190                                | 1780          |
| 2200     | 222                                  | 12.5 × 40                   | 0.024              | 0.048          | 2460                                | 2120          | 18 × 20                     | 0.028              | 0.056          | 2050                                | 1840          |
| 2700     | 272                                  | 16 × 31.5                   | 0.022              | 0.044          | 2510                                | 2220          | 18 × 25                     | 0.025              | 0.050          | 2350                                | 2060          |
| 3300     | 332                                  | 16 × 35.5                   | 0.020              | 0.040          | 2770                                | 2410          | 18 × 31.5                   | 0.023              | 0.046          | 2720                                | 2240          |
| 3900     | 392                                  | 16 × 40                     | 0.019              | 0.038          | 3110                                | 2530          | 18 × 35.5                   | 0.021              | 0.042          | 3050                                | 2420          |
| 4700     | 472                                  | 18 × 40                     | 0.018              | 0.036          | 3300                                | 2660          |                             |                    |                |                                     |               |

※ In case of low profile type, [6] will be put at 12th digit of type numbering system.

**PM** series

■ Standard Ratings

| Cap. (μF)     |                | V(Code)<br>Size code<br>Item<br>Code          |               | 35 (1V)                     |                    |                |   |               |                             |                    |      |                      |  |
|---------------|----------------|---|---------------|-----------------------------|--------------------|----------------|---|---------------|-----------------------------|--------------------|------|----------------------|--|
|               |                |   |               | —                           |                    |                |   | 6             |                             |                    |      |                      |  |
|               |                |   |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mArms)                          |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |      | Rated ripple (mArms) |  |
| 20°C / 100kHz | -10°C / 100kHz | 105°C / <sup>10kHz to</sup> <sub>200kHz</sub> | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / <sup>10kHz to</sup> <sub>200kHz</sub> | 105°C / 120Hz |                             |                    |      |                      |  |
| 22            | 220            | 5 × 11  | 0.75          | 1.50                        | 160                | 85             |   |               |                             |                    |      |                      |  |
| 27            | 270            | 5 × 11  | 0.60          | 1.20                        | 180                | 99             |   |               |                             |                    |      |                      |  |
| 33            | 330            | 6.3 × 11                                      | 0.49          | 0.98                        | 225                | 125            |   |               |                             |                    |      |                      |  |
| 39            | 390            | 6.3 × 11                                      | 0.41          | 0.82                        | 245                | 140            |   |               |                             |                    |      |                      |  |
| 47            | 470            | 6.3 × 11                                      | 0.34          | 0.68                        | 270                | 160            |   |               |                             |                    |      |                      |  |
| 56            | 560            | 6.3 × 11                                      | 0.28          | 0.56                        | 295                | 180            |   |               |                             |                    |      |                      |  |
| 68            | 680            | 6.3 × 15                                      | 0.24          | 0.48                        | 370                | 230            |   |               |                             |                    |      |                      |  |
| 82            | 820            | 6.3 × 15                                      | 0.19          | 0.38                        | 415                | 265            |   |               |                             |                    |      |                      |  |
| 100           | 101            | 8 × 11.5                                      | 0.16          | 0.32                        | 460                | 305            |   |               |                             |                    |      |                      |  |
| 120           | 121            | 8 × 15  | 0.14          | 0.28                        | 550                | 370            | 10 × 12.5                                     | 0.15          | 0.30                        | 635                | 375  |                      |  |
| 150           | 151            | 8 × 15  | 0.12          | 0.24                        | 595                | 415            | 10 × 12.5                                     | 0.12          | 0.24                        | 680                | 435  |                      |  |
| 180           | 181            | 8 × 20  | 0.10          | 0.20                        | 730                | 520            | 10 × 15                                       | 0.11          | 0.22                        | 700                | 500  |                      |  |
| 220           | 221            | 8 × 20  | 0.085         | 0.17                        | 795                | 580            | 10 × 15                                       | 0.090         | 0.18                        | 825                | 560  |                      |  |
| 270           | 271            | 10 × 20                                       | 0.070         | 0.14                        | 985                | 735            | 12.5 × 15                                     | 0.080         | 0.16                        | 920                | 690  |                      |  |
| 330           | 331            | 10 × 20                                       | 0.060         | 0.12                        | 1060               | 810            | 12.5 × 15                                     | 0.065         | 0.13                        | 1020               | 780  |                      |  |
| 390           | 391            | 10 × 25                                       | 0.055         | 0.11                        | 1260               | 955            | 12.5 × 15                                     | 0.060         | 0.12                        | 1060               | 825  |                      |  |
| 470           | 471            | 10 × 31.5                                     | 0.046         | 0.092                       | 1450               | 1130           | 16 × 15                                       | 0.055         | 0.11                        | 1270               | 1010 |                      |  |
| 560           | 561            | 12.5 × 20                                     | 0.041         | 0.082                       | 1430               | 1160           | 16 × 15                                       | 0.048         | 0.096                       | 1360               | 1100 |                      |  |
| 680           | 681            | 12.5 × 25                                     | 0.036         | 0.072                       | 1700               | 1370           | 18 × 15                                       | 0.042         | 0.084                       | 1540               | 1270 |                      |  |
| 820           | 821            | 12.5 × 25                                     | 0.032         | 0.064                       | 1760               | 1490           | 18 × 15                                       | 0.038         | 0.076                       | 1620               | 1370 |                      |  |
| 1000          | 102            | 12.5 × 31.5                                   | 0.029         | 0.058                       | 1980               | 1710           | 16 × 20                                       | 0.034         | 0.068                       | 1770               | 1530 |                      |  |
| 1200          | 122            | 12.5 × 35.5                                   | 0.026         | 0.052                       | 2230               | 1920           | 16 × 25                                       | 0.031         | 0.062                       | 2190               | 1740 |                      |  |
| 1500          | 152            | 12.5 × 40                                     | 0.024         | 0.048                       | 2460               | 2120           | 18 × 20                                       | 0.028         | 0.056                       | 2050               | 1840 |                      |  |
| 1800          | 182            | 16 × 31.5                                     | 0.022         | 0.044                       | 2510               | 2220           | 18 × 25                                       | 0.025         | 0.050                       | 2350               | 2060 |                      |  |
| 2200          | 222            | 16 × 35.5                                     | 0.020         | 0.040                       | 2770               | 2410           | 18 × 31.5                                     | 0.023         | 0.046                       | 2720               | 2240 |                      |  |
| 2700          | 272            | 16 × 40                                       | 0.018         | 0.036                       | 3110               | 2610           | 18 × 35.5                                     | 0.021         | 0.042                       | 3050               | 2420 |                      |  |
| 3300          | 332            | 18 × 40                                       | 0.017         | 0.034                       | 3300               | 2730           |   |               |                             |                    |      |                      |  |

| Cap. (μF)     |                | V(Code)<br>Size code<br>Item<br>Code          |               | 50 (1H)                     |                    |                |   |               |                             |                    |      |                      |  |
|---------------|----------------|---|---------------|-----------------------------|--------------------|----------------|---|---------------|-----------------------------|--------------------|------|----------------------|--|
|               |                |   |               | —                           |                    |                |   | 6             |                             |                    |      |                      |  |
|               |                |   |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mArms)                          |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |      | Rated ripple (mArms) |  |
| 20°C / 100kHz | -10°C / 100kHz | 105°C / <sup>10kHz to</sup> <sub>200kHz</sub> | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / <sup>10kHz to</sup> <sub>200kHz</sub> | 105°C / 120Hz |                             |                    |      |                      |  |
| 0.47          | R47            | 5 × 11  | 23.0          | 46.0                        | 22                 | 11             |   |               |                             |                    |      |                      |  |
| 0.68          | R68            | 5 × 11  | 16.0          | 32.0                        | 28                 | 14             |   |               |                             |                    |      |                      |  |
| 1             | 010            | 5 × 11  | 11.0          | 22.0                        | 36                 | 18             |   |               |                             |                    |      |                      |  |
| 1.5           | 1R5            | 5 × 11  | 7.50          | 15.0                        | 45                 | 22             |   |               |                             |                    |      |                      |  |
| 2.2           | 2R2            | 5 × 11  | 5.00          | 10.0                        | 54                 | 27             |   |               |                             |                    |      |                      |  |
| 3.3           | 3R3            | 5 × 11  | 3.30          | 6.60                        | 66                 | 33             |   |               |                             |                    |      |                      |  |
| 4.7           | 4R7            | 5 × 11  | 2.20          | 4.40                        | 81                 | 40             |   |               |                             |                    |      |                      |  |
| 6.8           | 6R8            | 5 × 11  | 1.80          | 3.60                        | 91                 | 45             |   |               |                             |                    |      |                      |  |
| 10            | 100            | 5 × 11  | 1.40          | 2.80                        | 115                | 57             |   |               |                             |                    |      |                      |  |
| 12            | 120            | 5 × 11  | 1.20          | 2.40                        | 125                | 62             |   |               |                             |                    |      |                      |  |
| 15            | 150            | 5 × 11  | 0.93          | 1.86                        | 145                | 72             |   |               |                             |                    |      |                      |  |
| 18            | 180            | 5 × 11  | 0.80          | 1.60                        | 165                | 79             |   |               |                             |                    |      |                      |  |
| 22            | 220            | 6.3 × 11                                      | 0.65          | 1.30                        | 195                | 100            |   |               |                             |                    |      |                      |  |
| 27            | 270            | 6.3 × 11                                      | 0.53          | 1.06                        | 215                | 115            |   |               |                             |                    |      |                      |  |
| 33            | 330            | 6.3 × 11                                      | 0.43          | 0.86                        | 240                | 135            |   |               |                             |                    |      |                      |  |
| 39            | 390            | 6.3 × 11                                      | 0.36          | 0.72                        | 260                | 150            |   |               |                             |                    |      |                      |  |
| 47            | 470            | 6.3 × 15                                      | 0.30          | 0.60                        | 330                | 195            |   |               |                             |                    |      |                      |  |
| 56            | 560            | 6.3 × 15                                      | 0.25          | 0.50                        | 360                | 220            |   |               |                             |                    |      |                      |  |
| 68            | 680            | 8 × 11.5                                      | 0.20          | 0.40                        | 415                | 255            |   |               |                             |                    |      |                      |  |
| 82            | 820            | 8 × 15  | 0.17          | 0.34                        | 505                | 320            | 10 × 12.5                                     | 0.18          | 0.36                        | 530                | 330  |                      |  |
| 100           | 101            | 8 × 20  | 0.14          | 0.28                        | 620                | 410            | 10 × 15                                       | 0.16          | 0.32                        | 580                | 385  |                      |  |
| 120           | 121            | 8 × 20  | 0.12          | 0.24                        | 755                | 455            | 10 × 15                                       | 0.13          | 0.26                        | 755                | 435  |                      |  |
| 150           | 151            | 10 × 20                                       | 0.10          | 0.20                        | 820                | 570            | 12.5 × 15                                     | 0.11          | 0.22                        | 785                | 545  |                      |  |
| 180           | 181            | 10 × 20                                       | 0.085         | 0.17                        | 945                | 635            | 12.5 × 15                                     | 0.095         | 0.19                        | 845                | 605  |                      |  |
| 220           | 221            | 10 × 25                                       | 0.075         | 0.15                        | 1150               | 760            | 12.5 × 15                                     | 0.080         | 0.16                        | 920                | 670  |                      |  |
| 270           | 271            | 10 × 31.5                                     | 0.065         | 0.13                        | 1200               | 900            | 16 × 15                                       | 0.070         | 0.14                        | 1120               | 840  |                      |  |
| 330           | 331            | 10 × 31.5                                     | 0.055         | 0.11                        | 1300               | 995            | 16 × 15                                       | 0.060         | 0.12                        | 1210               | 925  |                      |  |
| 390           | 391            | 12.5 × 25                                     | 0.048         | 0.096                       | 1440               | 1120           | 16 × 15                                       | 0.055         | 0.11                        | 1270               | 990  |                      |  |
| 470           | 471            | 12.5 × 25                                     | 0.044         | 0.088                       | 1500               | 1190           | 16 × 15                                       | 0.046         | 0.092                       | 1470               | 1170 |                      |  |
| 560           | 561            | 12.5 × 31.5                                   | 0.040         | 0.080                       | 1720               | 1360           | 16 × 20                                       | 0.044         | 0.088                       | 1550               | 1260 |                      |  |
| 680           | 681            | 12.5 × 35.5                                   | 0.036         | 0.072                       | 1900               | 1530           | 16 × 20                                       | 0.040         | 0.080                       | 1630               | 1350 |                      |  |
| 820           | 821            | 12.5 × 40                                     | 0.033         | 0.066                       | 2120               | 1700           | 18 × 20                                       | 0.036         | 0.072                       | 1810               | 1530 |                      |  |
| 1000          | 102            | 16 × 31.5                                     | 0.030         | 0.060                       | 2150               | 1830           | 18 × 25                                       | 0.033         | 0.066                       | 2020               | 1730 |                      |  |
| 1200          | 122            | 16 × 35.5                                     | 0.028         | 0.056                       | 2320               | 1990           | 18 × 31.5                                     | 0.031         | 0.062                       | 2140               | 1880 |                      |  |
| 1500          | 152            | 16 × 40                                       | 0.026         | 0.052                       | 2650               | 2170           | 18 × 31.5                                     | 0.029         | 0.058                       | 2340               | 1990 |                      |  |
| 1800          | 182            | 18 × 35.5                                     | 0.025         | 0.050                       | 2620               | 2210           |   |               |                             |                    |      |                      |  |
| 2200          | 222            | 18 × 40                                       | 0.024         | 0.048                       | 2790               | 2300           |   |               |                             |                    |      |                      |  |

※ In case of low profile type, [6] will be put at 12th digit of type numbering system.



## Standard Ratings

| Cap. (μF) | V(Code)<br>Size code | Item<br>Code | 63 (1J)                     |                    |                |                         |               |                             |                    |                |                         |               |
|-----------|----------------------|--------------|-----------------------------|--------------------|----------------|-------------------------|---------------|-----------------------------|--------------------|----------------|-------------------------|---------------|
|           |                      |              | —                           |                    |                |                         | 6             |                             |                    |                |                         |               |
|           |                      |              | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mA rms)   |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mA rms)   |               |
|           |                      |              |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |
| 10        | 100                  | 5 × 11       | 1.06                        | 2.12               | 135            | 67                      |               |                             |                    |                |                         |               |
| 12        | 120                  | 5 × 11       | 0.93                        | 1.86               | 145            | 72                      |               |                             |                    |                |                         |               |
| 15        | 150                  | 6.3 × 11     | 0.73                        | 1.46               | 185            | 92                      |               |                             |                    |                |                         |               |
| 18        | 180                  | 6.3 × 11     | 0.63                        | 1.26               | 195            | 100                     |               |                             |                    |                |                         |               |
| 22        | 220                  | 6.3 × 11     | 0.52                        | 1.04               | 215            | 110                     |               |                             |                    |                |                         |               |
| 27        | 270                  | 6.3 × 11     | 0.43                        | 0.86               | 240            | 130                     |               |                             |                    |                |                         |               |
| 33        | 330                  | 6.3 × 15     | 0.35                        | 0.70               | 305            | 170                     |               |                             |                    |                |                         |               |
| 39        | 390                  | 6.3 × 15     | 0.30                        | 0.60               | 330            | 190                     |               |                             |                    |                |                         |               |
| 47        | 470                  | 8 × 11.5     | 0.25                        | 0.50               | 365            | 215                     |               |                             |                    |                |                         |               |
| 56        | 560                  | 8 × 15       | 0.21                        | 0.42               | 450            | 275                     | 10 × 12.5     | 0.23                        | 0.46               | 450            | 275                     |               |
| 68        | 680                  | 8 × 15       | 0.17                        | 0.34               | 500            | 315                     | 10 × 12.5     | 0.19                        | 0.38               | 495            | 310                     |               |
| 82        | 820                  | 8 × 20       | 0.15                        | 0.30               | 600            | 385                     | 10 × 15       | 0.16                        | 0.32               | 580            | 375                     |               |
| 100       | 101                  | 10 × 20      | 0.12                        | 0.24               | 750            | 495                     | 12.5 × 15     | 0.14                        | 0.28               | 695            | 460                     |               |
| 120       | 121                  | 10 × 20      | 0.10                        | 0.20               | 820            | 555                     | 12.5 × 15     | 0.12                        | 0.24               | 750            | 510                     |               |
| 150       | 151                  | 10 × 25      | 0.090                       | 0.18               | 950            | 665                     | 12.5 × 15     | 0.095                       | 0.19               | 845            | 590                     |               |
| 180       | 181                  | 10 × 31.5    | 0.075                       | 0.15               | 1110           | 790                     | 16 × 15       | 0.080                       | 0.16               | 1050           | 750                     |               |
| 220       | 221                  | 12.5 × 20    | 0.065                       | 0.13               | 1140           | 835                     | 16 × 15       | 0.070                       | 0.14               | 1120           | 820                     |               |
| 270       | 271                  | 12.5 × 25    | 0.055                       | 0.11               | 1340           | 1000                    | 18 × 15       | 0.060                       | 0.12               | 1290           | 965                     |               |
| 330       | 331                  | 12.5 × 25    | 0.049                       | 0.098              | 1420           | 1090                    | 18 × 15       | 0.050                       | 0.10               | 1410           | 1080                    |               |
| 390       | 391                  | 12.5 × 31.5  | 0.043                       | 0.086              | 1620           | 1260                    | 16 × 20       | 0.047                       | 0.094              | 1500           | 1170                    |               |
| 470       | 471                  | 12.5 × 35.5  | 0.039                       | 0.078              | 1780           | 1420                    | 16 × 25       | 0.042                       | 0.084              | 1700           | 1350                    |               |
| 560       | 561                  | 12.5 × 40    | 0.035                       | 0.070              | 1950           | 1580                    | 18 × 20       | 0.039                       | 0.078              | 1730           | 1400                    |               |
| 680       | 681                  | 16 × 31.5    | 0.032                       | 0.064              | 2050           | 1700                    | 18 × 25       | 0.035                       | 0.070              | 1940           | 1610                    |               |
| 820       | 821                  | 16 × 35.5    | 0.029                       | 0.058              | 2220           | 1880                    | 18 × 31.5     | 0.032                       | 0.064              | 2110           | 1780                    |               |
| 1000      | 102                  | 16 × 40      | 0.027                       | 0.054              | 2370           | 2050                    | 18 × 35.5     | 0.029                       | 0.058              | 2280           | 1970                    |               |
| 1200      | 122                  | 18 × 40      | 0.025                       | 0.050              | 2510           | 2210                    |               |                             |                    |                |                         |               |

| Cap. (μF) | V(Code)<br>Size code | Item<br>Code | 80 (1K)                     |                    |                |                         |               |                             |                    |                |                         |               |
|-----------|----------------------|--------------|-----------------------------|--------------------|----------------|-------------------------|---------------|-----------------------------|--------------------|----------------|-------------------------|---------------|
|           |                      |              | —                           |                    |                |                         | 6             |                             |                    |                |                         |               |
|           |                      |              | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mA rms)   |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mA rms)   |               |
|           |                      |              |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |
| 4.7       | 4R7                  | 5 × 11       | 4.20                        | 11.00              | 53             | 26                      |               |                             |                    |                |                         |               |
| 6.8       | 6R8                  | 5 × 11       | 2.60                        | 7.00               | 68             | 34                      |               |                             |                    |                |                         |               |
| 10        | 100                  | 6.3 × 11     | 1.70                        | 4.60               | 87             | 43                      |               |                             |                    |                |                         |               |
| 12        | 120                  | 6.3 × 11     | 1.40                        | 3.80               | 96             | 48                      |               |                             |                    |                |                         |               |
| 15        | 150                  | 6.3 × 11     | 1.20                        | 3.20               | 104            | 52                      |               |                             |                    |                |                         |               |
| 18        | 180                  | 6.3 × 11     | 1.00                        | 2.70               | 150            | 58                      |               |                             |                    |                |                         |               |
| 22        | 220                  | 6.3 × 15     | 0.77                        | 2.10               | 180            | 71                      |               |                             |                    |                |                         |               |
| 27        | 270                  | 6.3 × 15     | 0.63                        | 1.70               | 220            | 80                      |               |                             |                    |                |                         |               |
| 33        | 330                  | 8 × 11.5     | 0.53                        | 1.40               | 275            | 132                     |               |                             |                    |                |                         |               |
| 39        | 390                  | 8 × 15       | 0.46                        | 1.20               | 300            | 156                     | 10 × 12.5     | 0.49                        | 1.30               | 380            | 155                     |               |
| 47        | 470                  | 8 × 15       | 0.39                        | 1.10               | 360            | 175                     | 10 × 12.5     | 0.42                        | 1.10               | 410            | 174                     |               |
| 56        | 560                  | 8 × 20       | 0.34                        | 0.92               | 490            | 208                     | 10 × 15       | 0.36                        | 0.97               | 500            | 202                     |               |
| 68        | 680                  | 10 × 20      | 0.28                        | 0.76               | 570            | 264                     | 12.5 × 15     | 0.31                        | 0.84               | 520            | 249                     |               |
| 82        | 820                  | 10 × 20      | 0.25                        | 0.68               | 620            | 284                     | 12.5 × 15     | 0.27                        | 0.73               | 560            | 273                     |               |
| 100       | 101                  | 10 × 25      | 0.21                        | 0.57               | 795            | 347                     | 12.5 × 15     | 0.23                        | 0.62               | 605            | 308                     |               |
| 120       | 121                  | 10 × 31.5    | 0.18                        | 0.49               | 870            | 406                     | 16 × 15       | 0.20                        | 0.54               | 663            | 444                     |               |
| 150       | 151                  | 10 × 31.5    | 0.15                        | 0.41               | 955            | 459                     | 16 × 15       | 0.18                        | 0.47               | 699            | 484                     |               |
| 180       | 181                  | 12.5 × 25    | 0.13                        | 0.35               | 1040           | 520                     | 16 × 15       | 0.15                        | 0.41               | 766            | 543                     |               |
| 220       | 221                  | 12.5 × 31.5  | 0.12                        | 0.32               | 1160           | 595                     | 18 × 15       | 0.13                        | 0.35               | 881            | 643                     |               |
| 270       | 271                  | 12.5 × 31.5  | 0.10                        | 0.27               | 1270           | 667                     | 16 × 20       | 0.11                        | 0.30               | 1240           | 742                     |               |
| 330       | 331                  | 12.5 × 35.5  | 0.088                       | 0.24               | 1450           | 767                     | 16 × 25       | 0.099                       | 0.27               | 1440           | 874                     |               |
| 390       | 391                  | 12.5 × 40    | 0.078                       | 0.21               | 1610           | 822                     | 18 × 20       | 0.089                       | 0.24               | 1450           | 908                     |               |
| 470       | 471                  | 16 × 31.5    | 0.069                       | 0.19               | 1790           | 1150                    | 18 × 25       | 0.080                       | 0.22               | 1650           | 1060                    |               |
| 560       | 561                  | 16 × 35.5    | 0.062                       | 0.17               | 2000           | 1300                    | 18 × 31.5     | 0.072                       | 0.19               | 1750           | 1210                    |               |
| 680       | 681                  | 16 × 40      | 0.055                       | 0.15               | 2200           | 1470                    | 18 × 31.5     | 0.065                       | 0.18               | 1850           | 1300                    |               |
| 820       | 821                  | 18 × 35.5    | 0.049                       | 0.13               | 2250           | 1590                    |               |                             |                    |                |                         |               |
| 1000      | 102                  | 18 × 40      | 0.044                       | 0.12               | 2370           | 1790                    |               |                             |                    |                |                         |               |

※ In case of low profile type, [6] will be put at 12th digit of type numbering system.

## Standard Ratings

| Cap. (μF) | V(Code) | Size code   | 100 (2A) |                             |                    |                |                         |               |                             |                    |                |                         |               |
|-----------|---------|-------------|----------|-----------------------------|--------------------|----------------|-------------------------|---------------|-----------------------------|--------------------|----------------|-------------------------|---------------|
|           |         |             | Item     | —                           |                    |                |                         |               |                             | 6                  |                |                         |               |
|           |         |             |          | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mA rms)   |               | Case size<br>φD × L<br>(mm) | Impedance (Ω) MAX. |                | Rated ripple (mA rms)   |               |
|           |         |             |          |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |                             | 20°C / 100kHz      | -10°C / 100kHz | 105°C / 10kHz to 200kHz | 105°C / 120Hz |
| 0.47      | R47     | 5 × 11      | 43.0     | 116.0                       | 17                 | 8              |                         |               |                             |                    |                |                         |               |
| 0.68      | R68     | 5 × 11      | 23.0     | 62.0                        | 23                 | 11             |                         |               |                             |                    |                |                         |               |
| 1         | 010     | 5 × 11      | 17.0     | 46.0                        | 27                 | 13             |                         |               |                             |                    |                |                         |               |
| 1.5       | 1R5     | 5 × 11      | 10.0     | 27.0                        | 35                 | 17             |                         |               |                             |                    |                |                         |               |
| 2.2       | 2R2     | 5 × 11      | 6.60     | 18.0                        | 43                 | 21             |                         |               |                             |                    |                |                         |               |
| 3.3       | 3R3     | 5 × 11      | 4.10     | 11.0                        | 54                 | 27             |                         |               |                             |                    |                |                         |               |
| 4.7       | 4R7     | 6.3 × 11    | 2.80     | 7.60                        | 68                 | 34             |                         |               |                             |                    |                |                         |               |
| 6.8       | 6R8     | 6.3 × 11    | 1.90     | 5.10                        | 83                 | 41             |                         |               |                             |                    |                |                         |               |
| 10        | 100     | 6.3 × 11    | 1.20     | 3.20                        | 104                | 52             |                         |               |                             |                    |                |                         |               |
| 12        | 120     | 6.3 × 11    | 1.00     | 2.70                        | 150                | 57             |                         |               |                             |                    |                |                         |               |
| 15        | 150     | 6.3 × 15    | 0.81     | 2.20                        | 180                | 65             |                         |               |                             |                    |                |                         |               |
| 18        | 180     | 6.3 × 15    | 0.67     | 1.80                        | 220                | 73             |                         |               |                             |                    |                |                         |               |
| 22        | 220     | 8 × 11.5    | 0.55     | 1.50                        | 275                | 122            |                         |               |                             |                    |                |                         |               |
| 27        | 270     | 8 × 15      | 0.47     | 1.30                        | 300                | 146            | 10 × 12.5               | 0.50          | 1.40                        | 380                | 145            |                         |               |
| 33        | 330     | 8 × 15      | 0.38     | 1.00                        | 360                | 169            | 10 × 12.5               | 0.42          | 1.10                        | 410                | 166            |                         |               |
| 39        | 390     | 8 × 20      | 0.33     | 0.89                        | 490                | 202            | 10 × 15                 | 0.36          | 0.97                        | 500                | 193            |                         |               |
| 47        | 470     | 10 × 20     | 0.28     | 0.76                        | 570                | 252            | 12.5 × 15               | 0.31          | 0.84                        | 520                | 239            |                         |               |
| 56        | 560     | 10 × 20     | 0.24     | 0.65                        | 620                | 274            | 12.5 × 15               | 0.27          | 0.73                        | 560                | 258            |                         |               |
| 68        | 680     | 10 × 25     | 0.21     | 0.57                        | 795                | 326            | 12.5 × 15               | 0.23          | 0.62                        | 605                | 289            |                         |               |
| 82        | 820     | 10 × 31.5   | 0.18     | 0.49                        | 870                | 386            | 16 × 15                 | 0.19          | 0.51                        | 681                | 433            |                         |               |
| 100       | 101     | 10 × 31.5   | 0.15     | 0.41                        | 955                | 438            | 16 × 15                 | 0.17          | 0.46                        | 719                | 475            |                         |               |
| 120       | 121     | 12.5 × 25   | 0.13     | 0.35                        | 1040               | 519            | 16 × 15                 | 0.14          | 0.38                        | 793                | 531            |                         |               |
| 150       | 151     | 12.5 × 25   | 0.11     | 0.30                        | 1120               | 553            | 18 × 15                 | 0.12          | 0.32                        | 917                | 635            |                         |               |
| 180       | 181     | 12.5 × 31.5 | 0.098    | 0.26                        | 1270               | 641            | 16 × 20                 | 0.11          | 0.30                        | 1240               | 706            |                         |               |
| 220       | 221     | 12.5 × 35.5 | 0.087    | 0.23                        | 1450               | 730            | 16 × 25                 | 0.093         | 0.25                        | 1440               | 854            |                         |               |
| 270       | 271     | 12.5 × 40   | 0.072    | 0.19                        | 1610               | 843            | 18 × 20                 | 0.080         | 0.22                        | 1450               | 918            |                         |               |
| 330       | 331     | 16 × 31.5   | 0.062    | 0.17                        | 1790               | 1160           | 18 × 25                 | 0.070         | 0.19                        | 1650               | 1080           |                         |               |
| 390       | 391     | 16 × 35.5   | 0.053    | 0.14                        | 2000               | 1340           | 18 × 31.5               | 0.062         | 0.17                        | 1850               | 1240           |                         |               |
| 470       | 471     | 16 × 40     | 0.047    | 0.13                        | 2200               | 1530           | 18 × 35.5               | 0.056         | 0.15                        | 1970               | 1410           |                         |               |
| 560       | 561     | 18 × 35.5   | 0.041    | 0.11                        | 2250               | 1680           |                         |               |                             |                    |                |                         |               |
| 680       | 681     | 18 × 40     | 0.036    | 0.097                       | 2300               | 1910           |                         |               |                             |                    |                |                         |               |

※ In case of low profile type, 6 will be put at 12th digit of type numbering system.

| Cap. (μF) | V(Code) | 160       |     | 200       |     | 250       |     | 315       |     | 350       |     | 400       |     | 450                      |     |
|-----------|---------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|--------------------------|-----|
|           |         | 2C        | 2D  | 2E        | 2F  | 2V        | 2G  | 2W        |     |           |     |           |     |                          |     |
| 1         | 010     | 8 × 11.5  | 19  | 8 × 11.5  | 19  | 8 × 11.5  | 19  | 8 × 11.5  | 19  | 10 × 12.5 | 21  | 10 × 12.5 | 17  | 10 × 15                  | 17  |
| 2.2       | 2R2     | 8 × 11.5  | 30  | 8 × 11.5  | 30  | 10 × 12.5 | 32  | 10 × 12.5 | 32  | 10 × 15   | 34  | 10 × 15   | 28  | 10 × 20                  | 28  |
| 3.3       | 3R3     | 10 × 12.5 | 50  | 10 × 12.5 | 50  | 10 × 15   | 52  | 10 × 15   | 52  | 10 × 20   | 54  | 10 × 20   | 47  | 12.5 × 20                | 48  |
| 4.7       | 4R7     | 10 × 12.5 | 57  | 10 × 15   | 60  | 10 × 15   | 60  | 10 × 20   | 65  | 10 × 20   | 65  | 12.5 × 20 | 55  | 12.5 × 25                | 55  |
| 10        | 100     | 10 × 15   | 90  | 10 × 20   | 95  | 12.5 × 20 | 98  | 12.5 × 20 | 98  | 12.5 × 25 | 100 | 12.5 × 25 | 85  | 16 × 25                  | 90  |
| 22        | 220     | 12.5 × 20 | 140 | 12.5 × 25 | 145 | 16 × 25   | 150 | 16 × 25   | 150 | 16 × 25   | 150 | 16 × 31.5 | 130 | 16 × 35.5                | 135 |
| 33        | 330     | 12.5 × 25 | 175 | 16 × 25   | 180 | 16 × 25   | 180 | 16 × 31.5 | 185 | 16 × 35.5 | 190 | 18 × 35.5 | 170 | 18 × 40                  | 170 |
| 47        | 470     | 16 × 25   | 220 | 16 × 25   | 220 | 16 × 31.5 | 225 | 18 × 35.5 | 235 | 18 × 40   | 240 |           |     |                          |     |
| 100       | 101     | 16 × 35.5 | 330 | 18 × 40   | 345 | 18 × 40   | 345 |           |     |           |     |           |     | Case size<br>φD × L (mm) | ※   |

※ Rated ripple current (mA rms) at 105°C 120Hz



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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