

**GVL** Low Impedance, Long Life  
Series



## Features

105°C, 3000~5000 hours assured.

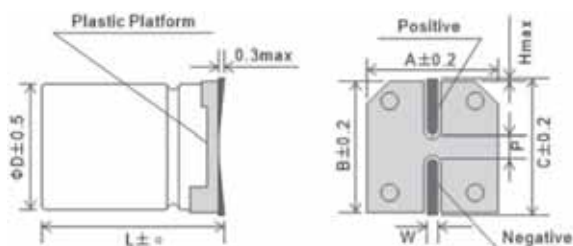
Low Impedance, High Ripple Current.

Available for high density surface mounting.

## Specifications

| Item                            | Condition                                                                |                                        | Specifications                              |      |      |      |      |      |      |      |
|---------------------------------|--------------------------------------------------------------------------|----------------------------------------|---------------------------------------------|------|------|------|------|------|------|------|
| Category Temperature Range(°C)  | —                                                                        |                                        | -55°C ~ +105°C                              |      |      |      |      |      |      |      |
| Capacitance Tolerance (%)       | 120Hz, 20°C                                                              |                                        | ±20%                                        |      |      |      |      |      |      |      |
| Rated Voltage (V)               | —                                                                        |                                        | 6.3                                         | 10   | 16   | 25   | 35   | 50   | 63   | 100  |
| Dissipation Factor (tanδ)       | 120Hz, 20°C<br>(Max.)                                                    | tanδ                                   | 0.26                                        | 0.18 | 0.16 | 0.14 | 0.12 | 0.10 | 0.10 | 0.07 |
|                                 |                                                                          | Notes                                  | Exceeding 1,000uF, +0.02 every 1,000uF      |      |      |      |      |      |      |      |
| Leakage Current (LC)            | After 2 minutes, 20°C (uA, Max.)                                         |                                        | 0.01CV or 3uA, whichever is greater.        |      |      |      |      |      |      |      |
| Low Temperature Characteristics | Impedance Ratio<br>(Max.)                                                | Z <sub>-25°C</sub> /Z <sub>+20°C</sub> | 4                                           | 3    | 2    | 2    | 2    | 2    | 2    | 2    |
|                                 |                                                                          | Z <sub>-55°C</sub> /Z <sub>+20°C</sub> | 8                                           | 5    | 4    | 3    | 3    | 3    | 3    | 3    |
| Endurance                       | 105°C,<br>Rated Voltage<br>Applied<br>(With the rated<br>ripple current) | Hours                                  | 5,000 (3,000hrs. for Ø4~Ø6.3)               |      |      |      |      |      |      |      |
|                                 |                                                                          | ΔC/C                                   | Within ±30% of initial value                |      |      |      |      |      |      |      |
|                                 |                                                                          | tanδ                                   | 300% or less of the initial specified value |      |      |      |      |      |      |      |
|                                 |                                                                          | LC                                     | The initial specified value or less         |      |      |      |      |      |      |      |
| Shelf life                      | 105°C                                                                    | Hours                                  | 1,000                                       |      |      |      |      |      |      |      |
|                                 |                                                                          | Other Items                            | same as those for the endurance.            |      |      |      |      |      |      |      |

## Dimensions



| D   | L    | A    | B    | C    | P   | α    | W       |
|-----|------|------|------|------|-----|------|---------|
| 4   | 5.7  | 4.3  | 4.3  | 5.0  | 1.0 | ±0.3 | 0.5-0.8 |
| 5   | 5.7  | 5.3  | 5.3  | 6.0  | 1.5 | ±0.3 | 0.5-0.8 |
| 6.3 | 5.7  | 6.6  | 6.6  | 7.3  | 2.0 | ±0.3 | 0.5-0.8 |
| 6.3 | 7.7  | 6.6  | 6.6  | 7.3  | 2.0 | ±0.3 | 0.5-0.8 |
| 8   | 10.5 | 8.3  | 8.3  | 9.0  | 3.1 | ±0.5 | 0.7-1.2 |
| 10  | 10.5 | 10.3 | 10.3 | 11.0 | 4.7 | ±0.5 | 0.7-1.2 |

## Rated Ripple Current Multipliers

| Frequency (Hz)<br>Capacitance (uF) | 50   | 120  | 1k   | 10k  | 100K |
|------------------------------------|------|------|------|------|------|
| Under 100                          | 0.35 | 0.50 | 0.70 | 0.90 | 1.00 |
| 100 ~ 2200uF                       | 0.40 | 0.65 | 0.85 | 0.95 | 1.00 |

# GVL

 Series

## ■ Dimensions

| uF   | WV | 6.3v(0J)          |      |      | 10v(1A)           |      |      | 16v(1C)           |      |      | 25v(1E)           |      |      | 35v(1V)           |       |      | 50v(1H)           |      |      |
|------|----|-------------------|------|------|-------------------|------|------|-------------------|------|------|-------------------|------|------|-------------------|-------|------|-------------------|------|------|
|      |    | $\Phi D \times L$ | Imp. | R.C. | $\Phi D \times L$ | Imp. | R.C. | $\Phi D \times L$ | Imp. | R.C. | $\Phi D \times L$ | Imp. | R.C. | $\Phi D \times L$ | Imp.  | R.C. | $\Phi D \times L$ | Imp. | R.C. |
| 1    |    |                   |      |      |                   |      |      |                   |      |      |                   |      |      |                   |       |      | 4x5.7             | 2.9  | 60   |
| 1.5  |    |                   |      |      |                   |      |      |                   |      |      |                   |      |      |                   |       |      | 4x5.7             | 2.9  | 60   |
| 2.2  |    |                   |      |      |                   |      |      |                   |      |      |                   |      |      |                   |       |      | 4x5.7             | 2.9  | 60   |
| 3.3  |    |                   |      |      |                   |      |      |                   |      |      |                   |      |      | 4x5.7             | 1.8   | 80   | 4x5.7             | 2.9  | 60   |
| 4.7  |    |                   |      |      |                   |      |      |                   |      |      |                   |      |      | 4x5.7             | 1.8   | 80   | 5x5.7             | 1.52 | 85   |
| 10   |    |                   |      |      |                   |      |      |                   |      |      | 4x5.7             | 1.8  | 80   | 4x5.7             | 1.8   | 80   | 5x5.7             | 1.52 | 85   |
| 15   |    |                   |      |      |                   |      |      | 4x5.7             | 1.8  | 80   | 4x5.7             | 1.8  | 80   | 5x5.7             | 0.76  | 150  | 6.3x5.7           | 0.88 | 165  |
| 22   |    |                   |      |      | 4x5.7             | 1.8  | 80   | 4x5.7             | 1.8  | 80   | 4x5.7             | 1.8  | 80   | 5x5.7             | 0.76  | 150  | 6.3x5.7           | 0.88 | 165  |
| 33   |    |                   |      |      | 4x5.7             | 1.8  | 80   | 4x5.7             | 1.8  | 80   | 5x5.7             | 0.76 | 150  | 6.3x5.7           | 0.44  | 230  | 6.3x7.7           | 0.68 | 185  |
| 47   |    | 4x5.7             | 1.8  | 80   | 5x5.7             | 0.76 | 150  | 5x5.7             | 0.76 | 150  | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44  | 230  | 6.3x7.7           | 0.68 | 185  |
| 56   |    | 5x5.7             | 0.76 | 150  | 5x5.7             | 0.76 | 150  | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44  | 230  | 6.3x7.7           | 0.68 | 185  |
| 68   |    | 5x5.7             | 0.76 | 150  | 5x5.7             | 0.76 | 150  | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44 | 230  | 6.3x7.7           | 0.34  | 280  | 8x10.5            | 0.34 | 350  |
| 100  |    | 5x5.7             | 0.76 | 150  | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44 | 230  | 6.3x7.7           | 0.34 | 280  | 6.3x7.7           | 0.34  | 280  | 8x10.5            | 0.34 | 350  |
| 150  |    | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44 | 230  | 6.3x5.7           | 0.44 | 230  | 6.3x7.7           | 0.34 | 280  | 8x10.5            | 0.17  | 600  | 10x10.5           | 0.18 | 670  |
| 220  |    | 6.3x5.7           | 0.44 | 230  | 6.3x7.7           | 0.34 | 280  | 6.3x7.7           | 0.34 | 280  | 8x10.5            | 0.17 | 600  | 8x10.5            | 0.17  | 600  | 10x10.5           | 0.18 | 670  |
| 330  |    | 6.3x7.7           | 0.34 | 280  | 6.3x7.7           | 0.34 | 280  | 8x10.5            | 0.17 | 600  | 10x10.5           | 0.09 | 820  | 10x10.5           | 0.09  | 820  |                   |      |      |
| 470  |    | 6.3x7.7           | 0.34 | 280  | 8x10.5            | 0.17 | 600  | 8x10.5            | 0.17 | 600  | 10x10.5           | 0.09 | 820  | 10x12.5           | 0.075 | 850  |                   |      |      |
| 680  |    | 8x10.5            | 0.17 | 600  | 8x10.5            | 0.17 | 600  | 10x10.5           | 0.09 | 820  |                   |      |      |                   |       |      |                   |      |      |
| 1000 |    | 8x10.5            | 0.17 | 600  | 10x10.5           | 0.09 | 820  |                   |      |      |                   |      |      |                   |       |      |                   |      |      |
| 1500 |    | 10x10.5           | 0.09 | 820  |                   |      |      |                   |      |      |                   |      |      |                   |       |      |                   |      |      |

Note1: Case size  $\Phi D \times L$ (mm), ripple current (mA, rms) at 105°C, 100KHz.

Note2: Produce custom product too, which are not found in these tables.

GVL Series

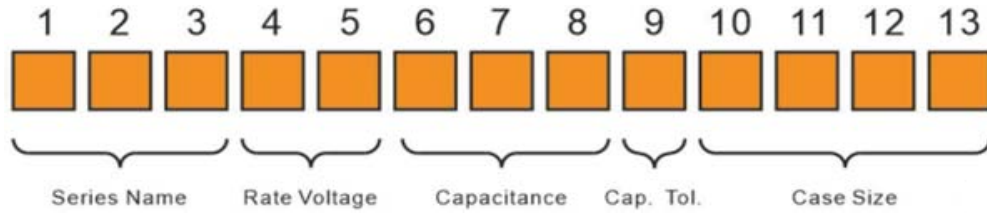
## ■ Dimensions

| WV<br>uF | 63v(1J)            |            |            | 80v(1K)            |            |           | 100v(2A)          |            |            |
|----------|--------------------|------------|------------|--------------------|------------|-----------|-------------------|------------|------------|
|          | $\Phi D \times L$  | Imp.       | R.C.       | $\Phi D \times L$  | Imp.       | R.C.      | $\Phi D \times L$ | Imp.       | R.C.       |
| 4.7      | 5x5.7              | 1.9        | 70         |                    |            |           |                   |            |            |
| 10       | 6.3x5.7<br>6.3x7.7 | 1.2<br>0.9 | 130<br>150 | 6.3x5.7<br>6.3x7.7 | 2.4<br>1.8 | 65<br>75  | 6.3x7.7           | 1.8        | 75         |
| 22       | 6.3x7.7            | 0.9        | 150        | 6.3x7.7<br>8x10.5  | 1.8<br>1.3 | 75<br>130 | 8x10.5            | 1.3        | 130        |
| 33       | 6.3x7.7<br>8x10.5  | 0.9<br>0.5 | 150<br>280 | 8x10.5             | 1.3        | 130       | 8x10.5<br>10x10.5 | 1.3<br>0.7 | 130<br>200 |
| 47       | 8x10.5             | 0.50       | 280        | 8x10.5             | 1.3        | 130       | 10x10.5           | 0.7        | 200        |
| 56       | 8x10.5             | 0.50       | 280        | 10x10.5            | 0.7        | 200       | 10x10.5           | 0.7        | 200        |
| 68       | 8x10.5             | 0.50       | 280        | 10x10.5            | 0.7        | 200       |                   |            |            |
| 82       | 10x10.5            | 0.25       | 450        | 10x10.5            | 0.7        | 200       |                   |            |            |
| 100      | 10x10.5            | 0.25       | 450        |                    |            |           |                   |            |            |

Note1: Case size  $\Phi D \times L$ (mm), ripple current (mA, rms) at 105°C, 100KHz.

Note2: Produce custom product too, which are not found in these tables.

## ■ 编码规则表



| (1-3)  | (4-5)            | (6-8) | (9)                 | (10-13) |                       |      |               |      |
|--------|------------------|-------|---------------------|---------|-----------------------|------|---------------|------|
| Series | Voltage<br>(W.V) | Code  | Capacitance<br>(uF) | Code    | Cap. Tolerance<br>(%) | Code | Size<br>φ DxL | Code |
| GVS    | 4                | 0G    | 0.1                 | 0R1     | +5                    | J    | 4x5(5.7)      | 0405 |
| GVT    | 6.3              | 0J    | 0.22                | 0R22    | -5                    |      | 4x7           | 0407 |
| GVE    | 10               | 1A    | 0.33                | 0R33    | +10                   | K    | 5x5(5.7)      | 0505 |
| GVZ    | 16               | 1C    | 0.47                | 0R47    | -10                   |      | 5x7           | 0507 |
| GVM    | 25               | 1E    | 1                   | 1R0     | +15                   | L    | 5x11          | 0511 |
| GVL    | 35               | 1V    | 2.2                 | 2R2     | -15                   |      | 6.3x5(5.7)    | 0605 |
| GVU    | 50               | 1H    | 3.3                 | 3R3     | +20                   | M    | 6.3x7(7.7)    | 0607 |
| GVY    | 63               | 1J    | 4.7                 | 4R7     | -20                   |      | 6.3x11        | 0611 |
| GVF    | 80               | 1K    | 10                  | 100     | +30                   | N    | 8x5           | 0805 |
| GVR    | 100              | 2A    | 22                  | 220     | -30                   |      | 8x6.5         | 0806 |
| GVG    | 125              | 2B    | 33                  | 330     | +20                   | V    | 8x9           | 0809 |
| GVD    | 160              | 2C    | 47                  | 470     | -10                   |      | 8x10(10.5)    | 0810 |
| GVP    | 180              | 2Z    | 68                  | 680     | +30                   | Q    | 8x11(11.5)    | 0811 |
| GVT    | 200              | 2D    | 100                 | 101     | -10                   |      | 8x12          | 0812 |
| GVC    | 220              | 2P    | 220                 | 221     | +50                   | T    | 10x10(10.5)   | 1010 |
| GVN    | 250              | 2E    | 330                 | 331     | -10                   |      | 10x12.5       | 1012 |
| GVK    | 315              | 2F    | 470                 | 471     | +50                   | S    | 10x14         | 1014 |
| GVA    | 330              | 2L    | 680                 | 681     | -20                   |      | 12.5x13.5     | 1213 |
|        | 350              | 2V    | 1000                | 102     | +80                   | Z    | 12.5x16       | 1216 |
|        | 400              | 2G    | 2200                | 222     | -20                   |      | 16x16.5       | 1616 |
|        | 420              | 2Q    | 3300                | 332     | +20                   | R    | 16x25         | 1625 |
|        | 450              | 2W    | 4700                | 472     | -0                    |      | 20x25         | 2025 |
|        | 500              | 2H    | 6800                | 682     |                       |      | 35x42         | 3542 |

## Taping Specifications

### Carrier Tape

Fig.01

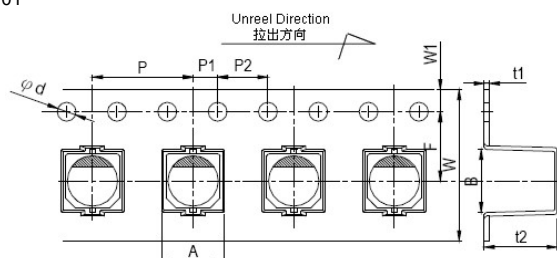


Fig.02

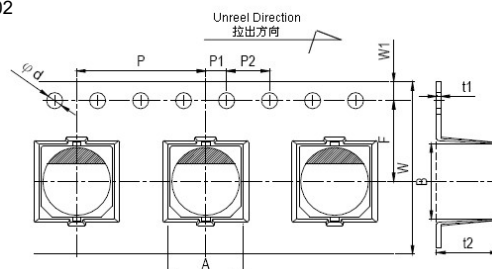
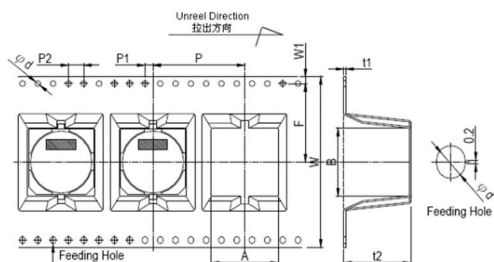
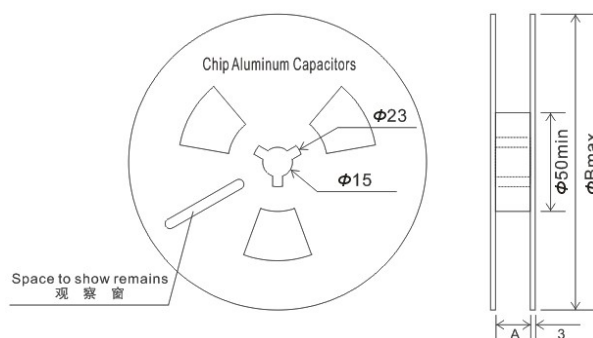


Fig.03



| Case Size     | W (mm) | W1 (mm) | F (mm) | P (mm) | P1 (mm) | P2 (mm) | A (mm) | B (mm) | t1 (mm) | t2 (mm) |
|---------------|--------|---------|--------|--------|---------|---------|--------|--------|---------|---------|
| φ 4x5.7       | 12     | 1.75    | 5.5    | 8      | 2       | 4       | 4.7    | 4.7    | 0.4     | 6.3     |
| φ 5x5.7       | 12     |         | 5.5    | 12     |         |         | 6      | 6      |         | 6.3     |
| φ 6.3x4.5     | 16     |         | 7.5    | 12     |         |         | 7      | 7      |         | 4.8     |
| φ 6.3x5.2~5.7 | 16     |         | 7.5    | 12     |         |         | 7      | 7      |         | 6.3     |
| φ 6.3x7.0     | 16     |         | 7.5    | 12     |         |         | 7      | 7      |         | 6.8     |
| φ 6.3x7.7     | 16     |         | 7.5    | 12     |         |         | 7      | 7      |         | 8.3     |
| φ 6.3x8.7     | 16     |         | 7.5    | 12     |         |         | 7      | 7      | 0.5     | 9.3     |
| φ 8x10.5      | 24     |         | 11.5   | 16     |         |         | 8.7    | 8.7    |         | 11.0    |
| φ 10x10.5     | 24     |         | 11.5   | 16     |         |         | 10.7   | 10.7   |         | 11.0    |
| φ 10x12.5     | 24     |         | 11.5   | 16     |         |         | 10.7   | 10.7   |         | 13.1    |
| φ 12.5x13.5   | 32     |         | 14.2   | 24     |         |         | 14     | 14     |         | 14.5    |
| φ 12.5x16     | 32     |         | 14.2   | 24     |         |         | 14     | 14     |         | 17.0    |
| φ 16x16.5     | 44     |         | 20.2   | 28     |         |         | 17.5   | 17.5   |         | 17.5    |
| φ 16x21.5     | 44     |         | 20.2   | 28     |         |         | 17.5   | 17.5   |         | 23.0    |
| Tolerance     | ±0.3   | ±0.15   | ±0.1   | ±0.1   | ±0.1    | ±0.1    | ±0.2   | ±0.2   | ±0.1    | ±0.2    |

### Reel & Package Quantity



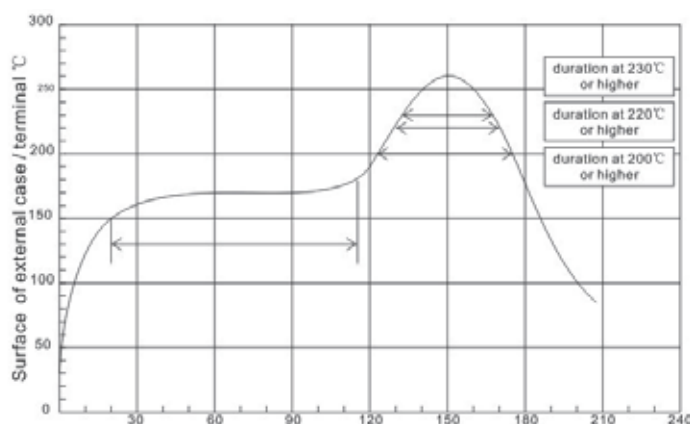
| Case Size | Reel | Carton | A±0.3 | B±2 | Case Size   | Reel | Carton | A±0.3 | B±2 |
|-----------|------|--------|-------|-----|-------------|------|--------|-------|-----|
| φ 4x5.7   | 2000 | 20000  | 14    | 382 | φ 8x10.5    | 500  | 5000   | 26    | 382 |
| φ 5x5.7   | 1250 | 12500  | 14    | 382 | φ 8x12.5    | 500  | 5000   | 26    | 382 |
| φ 6.3x4.5 | 1500 | 15000  | 18    | 382 | φ 10x10.5   | 500  | 5000   | 26    | 382 |
| φ 6.3x5.2 | 1250 | 12500  | 18    | 382 | φ 10x12.5   | 500  | 5000   | 26    | 382 |
| φ 6.3x5.7 | 1250 | 12500  | 18    | 382 | φ 12.5x13.5 | 250  | 750    | 34    | 332 |
| φ 6.3x7.0 | 1000 | 10000  | 18    | 382 | φ 12.5x16.5 | 200  | 600    | 34    | 332 |
| φ 6.3x7.7 | 1000 | 10000  | 18    | 382 | φ 16x16.5   | 200  | 600    | 34    | 332 |
| φ 6.3x8.7 | 700  | 7000   | 18    | 382 | φ 16x21.5   | 200  | 600    | 34    | 332 |

## Reflow Soldering Conditions

### Recommended soldering heat conditions

1. The following conditions are recommended for air convection and infrared reflow soldering on the SMD products onto a glass epoxy circuit boards by cream solder. The temperatures shown are the surface temperature values on the top of the can and on the capacitor terminals.
2. Reflow should be performed twice or less.
3. Please ensure that the capacitor became cold enough to the room temperature (5 to 35°C) before the second reflow.

### Classification Reflow Profile

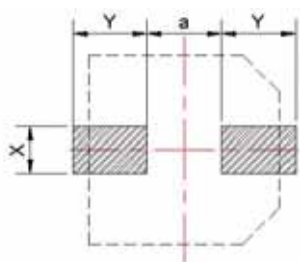


#### Notice:

1. Average ramp-up rate is 5°C/second max.
2. Ramp-down rate is 6°C/second max.
3. Time from 25°C to peak temperature is 6 minutes max.

|                      | Preheat                         | Time maintained above 200°C | Time maintained above 220°C | Time maintained above 230°C | Peak temp. | Reflow number   |
|----------------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|------------|-----------------|
| Dia. 4~10mm general  | 120°C to 180°C<br>120 sec. Max. | 60 sec.                     | 50 sec.                     | 30 sec.                     | 250°C Max. | 2 times or less |
| φ8x6.5               |                                 | 50 sec.                     | 40 sec.                     | 25 sec.                     | 245°C Max. | 2 times or less |
| WV 160v-450v         |                                 | 60 sec.                     | 50 sec.                     | 30 sec.                     | 240°C Max. | 2 times or less |
| Dia. 12.5~20mm Cap.  |                                 | 60 sec.                     | 40 sec.                     | 30 sec.                     | 240°C Max. | 2 times or less |
| 125°C Category Temp. |                                 | 60 sec.                     | 40 sec.                     | 30 sec.                     | 250°C Max. | 2 times or less |

### Recommended Solder Land Size on PC Board



| Size    | X   | Y   | a   |
|---------|-----|-----|-----|
| φ4      | 1.6 | 2.6 | 1.0 |
| φ5      | 1.6 | 3.0 | 1.4 |
| φ6.3    | 1.6 | 3.5 | 2.1 |
| φ8x6.5  | 1.6 | 4.5 | 2.1 |
| φ8x10.5 | 2.5 | 3.5 | 3.0 |
| φ10     | 2.5 | 4.0 | 4.0 |
| φ12.5   | 3.0 | 5.7 | 4.0 |
| φ16     | 3.5 | 6.5 | 6.0 |

## ■ Correspondence to Environment

We always considers the environment in product materials, designs and manufacturing. Cadmium, Mercury, Hexavalent Chromium, PBB and PBDE have never been used in our products. Furthermore, lead-containing materials have been eliminated from all our aluminum electrolytic capacitors including Conductive Polymer Aluminum Solid Capacitors to comply with RoHS. If you need "Halogen-Free" products, please consult with us.

### ① RoHS Compliance RoHS

All capacitors comply with RoHS directive (2011/65/EU)

|                                         |           |
|-----------------------------------------|-----------|
| Lead (Pb)                               | ≤1,000ppm |
| Mercury (Hg)                            | ≤1,000ppm |
| Cadmium (Cd)                            | ≤100ppm   |
| Hexavalent Chromium (Cr <sup>6+</sup> ) | ≤1,000ppm |
| Polybrominated Biphenyls (PBBs)         | ≤1,000ppm |
| Polybrominated Diphenyl Ethers (PBDEs)  | ≤1,000ppm |

### ② Lead-free Compliance

All complete parts and homogenous materials of capacitors are lead-free.

### ③ Halogen-free Compliance

The products identified in the catalogue, and their homogeneous subcomponents, do not contain any of the following substances in concentrations greater than the listed maximum limits.

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| The content percentage of chlorine (Cl)                          | ≤900ppm   |
| The content percentage of bromine (Br)                           | ≤900ppm   |
| The content percentage of chlorine (Cd) and bromine (Br) (Cl+Br) | ≤1,500ppm |

### ④ Regarding compliance for EU REACH Regulation

1). According to the content of REACH handbook (Guidance on requirements for substances in articles which is published on May 2008), our electronic components are "articles without any intended release". Therefore they are not applicable for "Registration" for EU REACH Regulation Article 7 (1).

Reference: Electrolytic Condenser Investigation Society "Study of REACH Regulation in EU about Electrolytic Capacitor" (publicized on 13 March 2008)

2). We develops the products without substance of very high concern (SVHC- Substances of Very High Concern).

### ⑤ Non-PVC Products

| Category                                     |             | Sleeve Material |
|----------------------------------------------|-------------|-----------------|
| Conductive polymer Aluminum Solid Capacitors | Chip        | Sleeveless      |
|                                              | Radial      | Sleeveless      |
| Aluminum Electrolytic Capacitors             | Chip        | Sleeveless      |
|                                              | Radial      | PVC or PET      |
|                                              | Snap-in     |                 |
|                                              | Screw Mount | PVC             |

※: Identification of friendly parts is given by a sleeve code (14th digit) of the part number. For details, please refer to "Product code guide" for each type.