

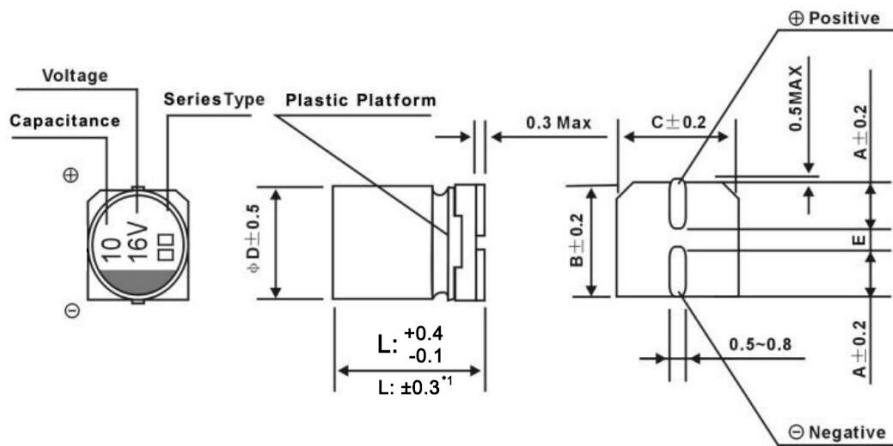
## FEATURES

- Low-Impedance
- Operating with wide temperature range -55 ~ +105° C
- Load life of 1000 ~ 2000 Hours
- Comply with the RoHS directive

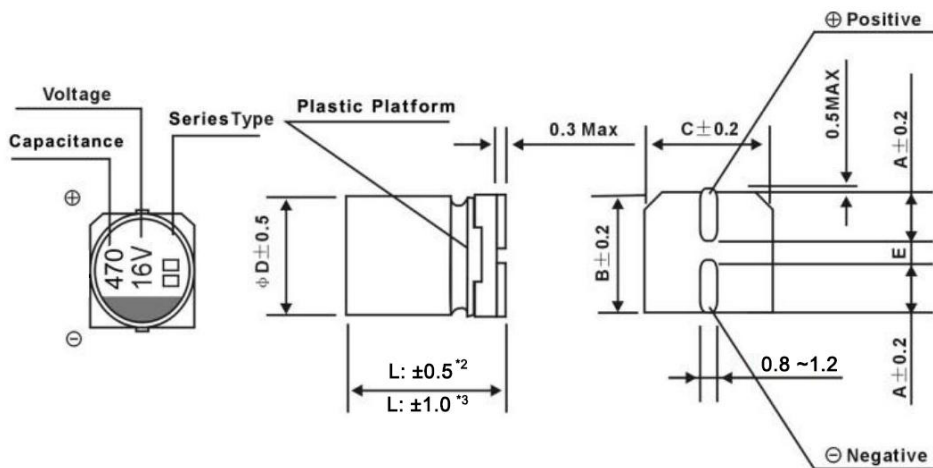


## DIMENSIONS (mm)

( $\varnothing 4 \sim \varnothing 8 \times 6.2$ )



( $\varnothing 8 \times 10.5 \sim \varnothing 16$ )



\*1. Applicable to  $\varnothing 6.3 \times 7.7 \text{ mm}$

\*2. Applicable to  $\varnothing 8 \times 10.5 \text{ mm} \sim \varnothing 10 \text{ mm}$

\*3. Applicable to  $\varnothing 12.5 \text{ mm} \sim \varnothing 16 \text{ mm}$



## SPECIFICATIONS

| Items                        | Characteristics                                                                                                                                                                                                               |           |                                         |      |      |      |      |       |        |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------|------|------|------|------|-------|--------|
| Operation Temperature Range  | -55 ~ +105°C                                                                                                                                                                                                                  |           |                                         |      |      |      |      |       |        |
| Voltage Range                | 6.3 ~ 100V                                                                                                                                                                                                                    |           |                                         |      |      |      |      |       |        |
| Capacitance Range            | 1 ~ 4700μF                                                                                                                                                                                                                    |           |                                         |      |      |      |      |       |        |
| Capacitance Tolerance        | ±20% at 120Hz, 20°C                                                                                                                                                                                                           |           |                                         |      |      |      |      |       |        |
| Leakage Current              | Leakage current (Ø4~Ø10) ≒ 0.01CV or 3μA, whichever is greater (after 2 minutes application of rated voltage) Leakage current (Ø12.5~Ø16) ≒ 0.03CV or 4μA, whichever is greater (after 1 minute application of rated voltage) |           |                                         |      |      |      |      |       |        |
| Dissipation Factor (tan δ)   | Measurement frequency: 120Hz, Temperature: 20°C                                                                                                                                                                               |           |                                         |      |      |      |      |       |        |
|                              | Rated Voltage (V)                                                                                                                                                                                                             |           | 6.3                                     | 10   | 16   | 25   | 35   | 50,63 | 80,100 |
|                              | tan δ (max.)                                                                                                                                                                                                                  | Ø4~Ø10    | 0.22                                    | 0.19 | 0.16 | 0.14 | 0.12 | 0.12  | 0.10   |
|                              |                                                                                                                                                                                                                               | Ø12.5~Ø16 | 0.26                                    | 0.22 | 0.18 | 0.16 | 0.14 | 0.12  | 0.10   |
| Stability at Low Temperature | Measurement frequency: 120Hz                                                                                                                                                                                                  |           |                                         |      |      |      |      |       |        |
|                              | Rated Voltage (V)                                                                                                                                                                                                             |           |                                         | 6.3  | 10   | 16   | 25   | 35    | 50~100 |
|                              | Impedance Ratio<br>ZT/Z20 (max.)                                                                                                                                                                                              | Ø4~Ø10    | Z(-25°C) / Z(20°C)                      | 2    | 2    | 2    | 2    | 2     | 2      |
|                              |                                                                                                                                                                                                                               |           | Z(-55°C) / Z(20°C)                      | 5    | 4    | 4    | 3    | 3     | 3      |
|                              |                                                                                                                                                                                                                               | Ø12.5~Ø16 | Z(-25°C) / Z(20°C)                      | 3    | 3    | 2    | 2    | 2     | 2      |
| Z(-55°C) / Z(20°C)           |                                                                                                                                                                                                                               |           | 10                                      | 8    | 6    | 4    | 3    | 3     |        |
| Load Life                    | After 2000 hrs. (1000 hrs. for Ø4~Ø6.3×5.4) application of the rated voltage at 105°C, they meet the characteristics listed below.                                                                                            |           |                                         |      |      |      |      |       |        |
|                              | Capacitance Change                                                                                                                                                                                                            |           | Within ±30% of initial value            |      |      |      |      |       |        |
|                              | Dissipation Factor                                                                                                                                                                                                            |           | 300% or less of initial specified value |      |      |      |      |       |        |
|                              | Leakage Current                                                                                                                                                                                                               |           | initial specified value or less         |      |      |      |      |       |        |
| Shelf Life                   | After leaving capacitors under no load at 105°C for 1000 hours, they meet the specified value for load life characteristics listed above.                                                                                     |           |                                         |      |      |      |      |       |        |
| Resistance to Soldering Heat | After reflow soldering and restored at room temperature, they meet the characteristics listed below.                                                                                                                          |           |                                         |      |      |      |      |       |        |
|                              | Capacitance Change                                                                                                                                                                                                            |           | Within ±10% of initial value            |      |      |      |      |       |        |
|                              | Dissipation Factor                                                                                                                                                                                                            |           | initial specified value or less         |      |      |      |      |       |        |
|                              | Leakage Current                                                                                                                                                                                                               |           | initial specified value or less         |      |      |      |      |       |        |
| Marking                      | Black print on the case top.                                                                                                                                                                                                  |           |                                         |      |      |      |      |       |        |

## DIMENSIONS (Unit: mm)

| ØD x L  | 4 x 5.4 | 5 x 5.4 | 6.3 x 5.4 | 6.3 x 7.7 | 8 x 6.2 | 8 x 10.5 | 10 x 10.5 | 10 x 12.5 | 12.5 x 13.5 | 12.5 x 16 | 16 x 16.5 |
|---------|---------|---------|-----------|-----------|---------|----------|-----------|-----------|-------------|-----------|-----------|
| A       | 2.0     | 2.2     | 2.6       | 2.6       | 3.3     | 3.0      | 3.2       | 3.2       | 4.6         | 4.6       | 5.8       |
| B       | 4.3     | 5.3     | 6.6       | 6.6       | 8.3     | 8.3      | 10.3      | 10.3      | 12.8        | 12.8      | 17.0      |
| C       | 4.3     | 5.3     | 6.6       | 6.6       | 8.3     | 8.3      | 10.3      | 10.3      | 12.8        | 12.8      | 17.0      |
| E ± 0.2 | 1.0     | 1.5     | 2.1       | 2.1       | 2.2     | 3.1      | 4.6       | 4.6       | 4.6         | 4.6       | 6.4       |
| L       | 5.4     | 5.4     | 5.4       | 7.7       | 6.2     | 10.5     | 10.5      | 12.5      | 13.5        | 16.0      | 16.5      |



## DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

Case size  $\varnothing D \times L$ (mm), ripple current (mA rms) at 105°C 120Hz

| WV<br>Code |     | 6.3                        |                |              | 10                                  |                     |                    | 16                                   |                        |                       |
|------------|-----|----------------------------|----------------|--------------|-------------------------------------|---------------------|--------------------|--------------------------------------|------------------------|-----------------------|
|            |     | 0J                         |                |              | 1A                                  |                     |                    | 1C                                   |                        |                       |
| 10         | 100 |                            |                |              |                                     |                     |                    | 4 x 5.4                              | 3.0                    | 60                    |
| 15         | 150 |                            |                |              |                                     |                     |                    | 5 x 5.4<br>(4 x 5.4)                 | 1.8<br>(3.0)           | 95<br>(60)            |
| 22         | 220 | 4 x 5.4                    | 3.0            | 60           | 5 x 5.4<br>(4 x 5.4)                | 1.8<br>(3.0)        | 95<br>(60)         | 5 x 5.4<br>(4 x 5.4)                 | 1.8<br>(3.0)           | 95<br>(60)            |
| 33         | 330 | 5 x 5.4<br>(4 x 5.4)       | 1.8<br>(3.0)   | 95<br>(60)   | 5 x 5.4<br>(4 x 5.4)                | 1.8<br>(3.0)        | 95<br>(60)         | 6.3 x 5.4<br>(5 x 5.4)               | 1.0<br>(1.8)           | 140<br>(95)           |
| 47         | 470 | 5 x 5.4<br>(4 x 5.4)       | 1.8<br>(3.0)   | 95<br>(60)   | 6.3 x 5.4<br>(5 x 5.4)              | 1.0<br>(1.8)        | 140<br>(95)        | 6.3 x 5.4<br>(5 x 5.4)               | 1.0<br>(1.8)           | 140<br>(95)           |
| 68         | 680 | 6.3 x 5.4<br>(5 x 5.4)     | 1.0<br>(1.8)   | 140<br>(95)  | 6.3 x 5.4                           | 1.0                 | 140                | 6.3 x 7.7<br>(6.3 x 5.4)             | 0.6<br>(1.0)           | 230<br>(140)          |
| 100        | 101 | 6.3 x 5.4<br>(5 x 5.4)     | 1.0<br>(1.8)   | 140<br>(95)  | 5 x 5.4<br>6.3 x 7.7<br>(6.3 x 5.4) | 1.8<br>0.6<br>(1.0) | 95<br>230<br>(140) | 6.3 x 7.7<br>(6.3 x 5.4)             | 0.6<br>(1.0)           | 230<br>(140)          |
| 150        | 151 | 6.3 x 7.7<br>(6.3 x 5.4)   | 0.6<br>(1.0)   | 230<br>(140) | 6.3 x 7.7<br>(6.3 x 5.4)            | 0.6<br>(1.0)        | 230<br>(140)       | 6.3 x 7.7                            | 0.6                    | 230                   |
| 220        | 221 | 6.3 x 7.7<br>(6.3 x 5.4)   | 0.6<br>(1.0)   | 230<br>(140) | 6.3 x 7.7                           | 0.60                | 230                | 8 x 10.5<br>(6.3 x 7.7)<br>(8 x 6.2) | 0.30<br>(0.6)<br>(0.6) | 450<br>(230)<br>(230) |
| 330        | 331 | 6.3 x 7.7                  | 0.6            | 230          | 8 x 10.5                            | 0.30                | 450                | 10 x 10.5<br>(8 x 10.5)              | 0.15<br>(0.30)         | 670<br>(450)          |
| 470        | 471 | 8 x 10.5                   | 0.30           | 450          | 8 x 10.5                            | 0.30                | 450                | 10 x 10.5<br>(8 x 10.5)              | 0.15<br>(0.30)         | 670<br>(450)          |
| 680        | 681 | 8 x 10.5                   | 0.30           | 450          | 10 x 10.5                           | 0.15                | 670                | 10x 10.5                             | 0.15                   | 670                   |
| 1000       | 102 | 10 x 10.5<br>(8 x 10.5)    | 0.15<br>(0.30) | 670<br>(450) | 10 x 10.5                           | 0.15                | 670                | 10 x 10.5                            | 0.15                   | 670                   |
| 1500       | 152 | 10 x 12.5<br>(10 x 10.5)   | 0.13<br>(0.15) | 750<br>(670) | 12.5 x 13.5<br>(10 x 12.5)          | 0.11<br>(0.13)      | 820<br>(750)       | 12.5 x 13.5                          | 0.11                   | 820                   |
| 2200       | 222 | 12.5 x 13.5<br>(10 x 12.5) | 0.11<br>(0.13) | 820<br>(750) | 12.5 x 16                           | 0.09                | 950                | 16 x 16.5<br>(12.5 x 16)             | 0.08<br>(0.09)         | 1260<br>(950)         |
| 3300       | 332 | 12.5 x 16<br>(12.5 x 13.5) | 0.09<br>(0.11) | 950<br>(820) | 16 x 16.5                           | 0.08                | 1260               | 16 x 16.5                            | 0.08                   | 1260                  |
| 4700       | 472 | 16 x 16.5                  | 0.08           | 1260         | 16 x 16.5                           | 0.08                | 1260               |                                      |                        |                       |

## FREQUENCY COEFFICIENT OF ALLOWABLE RIPPLE CURRENT

| Frequency   |                                        |                     | 50Hz | 120Hz | 300Hz | 1KHz | 10KHz~ |
|-------------|----------------------------------------|---------------------|------|-------|-------|------|--------|
| Coefficient | $\varnothing 4 \sim \varnothing 10$    | 1 ~ 68 $\mu$ F      | 0.35 | 0.50  | 0.64  | 0.83 | 1.00   |
|             |                                        | 100 ~ 2200 $\mu$ F  | 0.40 | 0.55  | 0.70  | 0.85 | 1.00   |
|             | $\varnothing 12.5 \sim \varnothing 16$ | ~ 680 $\mu$ F       | 0.45 | 0.65  | 0.80  | 0.90 | 1.00   |
|             |                                        | 1000 ~ 4700 $\mu$ F | 0.65 | 0.85  | 0.95  | 0.98 | 1.00   |



## DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

Case size  $\varnothing D \times L$ (mm), ripple current (mA rms) at 105°C 120Hz

| WV      |      | 25                       |               |              | 35                       |               |              | 50                                         |                                             |                                               |
|---------|------|--------------------------|---------------|--------------|--------------------------|---------------|--------------|--------------------------------------------|---------------------------------------------|-----------------------------------------------|
| $\mu F$ | Code | 1E                       |               |              | 1V                       |               |              | 1H                                         |                                             |                                               |
| 1       | 010  |                          |               |              | 4 x 5.4                  | 3.0           | 60           | 4 x 5.4                                    | 5.0                                         | 30                                            |
| 1.5     | 1R5  |                          |               |              | 4 x 5.4                  | 3.0           | 60           | 4 x 5.4                                    | 5.0                                         | 30                                            |
| 2.2     | 2R2  |                          |               |              | 4 x 5.4                  | 3.0           | 60           | 4 x 5.4                                    | 5.0                                         | 30                                            |
| 3.3     | 3R3  |                          |               |              | 4 x 5.4                  | 3.0           | 60           | 4 x 5.4                                    | 5.0                                         | 30                                            |
| 4.7     | 4R7  | 4 x 5.4                  | 3.0           | 60           | 4 x 5.4                  | 3.0           | 60           | 5 x 5.4                                    | 3.0                                         | 50                                            |
| 6.8     | 6R8  | 4 x 5.4                  | 3.0           | 60           | 5 x 5.4                  | 1.8           | 95           | 6.3 x 5.4                                  | 2.0                                         | 70                                            |
| 10      | 100  | 5 x 5.4<br>(4 x 5.4)     | 1.8<br>(3.0)  | 95<br>(60)   | 5 x 5.4<br>(4 x 5.4)     | 1.8<br>(3.0)  | 95<br>(60)   | 6.3 x 5.4<br>5 x 5.4                       | 2.0<br>3.0                                  | 70<br>50                                      |
| 15      | 150  | 6.3 x 5.4                | 1.8           | 95           | 5 x 5.4                  | 1.8           | 95           | 6.3 x 5.4                                  | 2.0                                         | 70                                            |
| 22      | 220  | 6.3 x 5.4<br>(5 x 5.4)   | 1.0<br>(1.8)  | 140<br>(95)  | 6.3 x 5.4<br>(5 x 5.4)   | 1.0<br>(1.8)  | 140<br>(95)  | 6.3 x 7.7<br>(6.3 x 5.4)                   | 1.0<br>(2.0)                                | 120<br>(70)                                   |
| 33      | 330  | 6.3 x 5.4<br>(5 x 5.4)   | 1.0<br>(1.8)  | 140<br>(95)  | 6.3 x 5.4                | 1.0           | 140          | 6.3 x 7.7                                  | 1.0                                         | 120                                           |
| 47      | 470  | 6.3 x 7.7<br>(6.3 x 5.4) | 0.6<br>(1.0)  | 230<br>(140) | 6.3 x 7.7<br>(6.3 x 5.4) | 0.60<br>(1.0) | 230<br>(140) | 6.3 x 7.7                                  | 1.0                                         | 120                                           |
| 68      | 680  | 6.3 x 7.7                | 0.6           | 230          | 6.3 x 7.7                | 0.60          | 230          | 8 x 10.5                                   | 0.60                                        | 300                                           |
| 100     | 101  | 6.3 x 7.7                | 0.6           | 230          | 8 x 10.5<br>(6.3 x 7.7)  | 0.30<br>0.6   | 450<br>(260) | 8 x 10.5                                   | 0.60                                        | 300                                           |
| 150     | 151  | 8 x 10.5<br>(6.3 x 7.7)  | 0.30<br>(0.6) | 450<br>(230) | 8 x 10.5                 | 0.30          | 450          | 10 x 10.5                                  | 0.30                                        | 500                                           |
|         |      |                          |               |              |                          |               |              | Case size<br>$\varnothing D \times L$ (mm) | Impedance ( $\Omega$ )<br>at 20°C<br>100KHz | Ripple current<br>(mA rms) at<br>105°C 100KHz |



## DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

Case size  $\varnothing D \times L$ (mm), ripple current (mA rms) at 105°C 120Hz

| WV<br>Code |     | 25                         |                |               | 35                         |                |               | 50                                         |                                             |                                               |
|------------|-----|----------------------------|----------------|---------------|----------------------------|----------------|---------------|--------------------------------------------|---------------------------------------------|-----------------------------------------------|
|            |     | 1E                         |                |               | 1V                         |                |               | 1H                                         |                                             |                                               |
| 220        | 221 | 8 x 10.5                   | 0.30           | 450           | 10 x 10.5<br>(8 x 10.5)    | 0.15<br>(0.30) | 670<br>(450)  | 10 x 10.5                                  | 0.30                                        | 500                                           |
| 330        | 331 | 10 x 10.5<br>(8 x 10.5)    | 0.15<br>(0.30) | 670<br>(450)  | 10 x 10.5                  | 0.15           | 670           | 16 x 16.5<br>(12.5 x 13.5)<br>(10 x 12.5)  | 0.12<br>(0.20)<br>(0.25)                    | 1060<br>(650)<br>(580)                        |
| 470        | 471 | 10 x 10.5                  | 0.15           | 670           | 10 x 10.5                  | 0.15           | 670           | 16 x 16.5<br>(12.5 x 16)                   | 0.12<br>(0.15)                              | 1060<br>(700)                                 |
| 680        | 681 | 10 x 12.5                  | 0.13           | 750           | 12.5 x 13.5<br>(10 x 12.5) | 0.11<br>(0.13) | 820<br>(750)  | 16 x 16.5                                  | 0.12                                        | 1060                                          |
| 1000       | 102 | 16 x 16.5<br>(12.5 x 13.5) | 0.08<br>(0.11) | 1260<br>(820) | 16 x 16.5<br>(12.5 x 16)   | 0.08<br>(0.09) | 1260<br>(950) |                                            |                                             |                                               |
| 1500       | 152 | 12.5 x 16                  | 0.09           | 950           | 16 x 16.5                  | 0.08           | 1260          | Case size<br>$\varnothing D \times L$ (mm) | Impedance ( $\Omega$ )<br>at 20°C<br>100KHz | Ripple current<br>(mA rms) at<br>105°C 100KHz |
| 2200       | 222 | 16 x 16.5                  | 0.08           | 1260          |                            |                |               |                                            |                                             |                                               |

| WV<br>Code |     | 63          |      |     | 80        |     |     | 100                                        |                                             |                                               |
|------------|-----|-------------|------|-----|-----------|-----|-----|--------------------------------------------|---------------------------------------------|-----------------------------------------------|
|            |     | 1J          |      |     | 1K        |     |     | 2A                                         |                                             |                                               |
| 10         | 100 | 6.3 x 7.7   | 1.5  | 95  |           |     |     | 6.3 x 7.7                                  | 4.0                                         | 65                                            |
| 22         | 220 | 6.3 x 7.7   | 1.0  | 130 | 6.3 x 7.7 | 2.0 | 130 | 8 x 10.5                                   | 2.0                                         |                                               |
| 47         | 470 | 8 x 10.5    | 0.65 | 250 |           |     |     | 10 x 10.5                                  | 1.0                                         | 140                                           |
| 100        | 470 | 10 x 10.5   | 0.50 | 430 |           |     |     | 12.5 x 13.5                                | 0.60                                        | 500                                           |
| 220        | 680 | 12.5 x 13.5 | 0.30 | 550 |           |     |     | Case size<br>$\varnothing D \times L$ (mm) | Impedance ( $\Omega$ )<br>at 20°C<br>100KHz | Ripple current<br>(mA rms) at<br>105°C 100KHz |
|            |     |             |      |     |           |     |     |                                            |                                             |                                               |



## PN Structure

| WVE    | 0J            | 0R1         | M                     | 040054    | T       | R  |
|--------|---------------|-------------|-----------------------|-----------|---------|----|
| Series | Rated Voltage | Capacitance | Capacitance Tolerance | Dimension | Packing | Pb |
|        | 1.            | 2.          | 3.                    | 4.        | 5.      | 6. |

### 1. Rated Voltage

| Code    | 0J   | 1A  | 1C  | 1D  | 1E  | 1V  | 1G  | 1H  | 1J | 1K  | 2A   |
|---------|------|-----|-----|-----|-----|-----|-----|-----|----|-----|------|
| Voltage | 6.3V | 10V | 16V | 20V | 25V | 35V | 40V | 50V | 63 | 80V | 100V |

### 2. Capacitance

| Code             | 0R1 | R22  | R33  | R47  | 010 | 2R2 | 3R3 | 4R7 | 100 | 220 | 330 | 470 | 101 |
|------------------|-----|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Capacitance (μF) | 0.1 | 0.22 | 0.33 | 0.47 | 1   | 2.2 | 3.3 | 4.7 | 10  | 22  | 33  | 47  | 100 |

### 3. Capacitance Tolerance

| Code      | K    | L    | M    |
|-----------|------|------|------|
| Tolerance | ±10% | ±15% | ±20% |

### 4. Dimension

| Code           | 040054 | 050054 | 063054  | 080105 | 100105  |
|----------------|--------|--------|---------|--------|---------|
| Dimension (mm) | 4x5.4  | 5x5.4  | 6.3x5.4 | 8x10.5 | 10x10.5 |

### 5. Packing

| Code    | T           |
|---------|-------------|
| Packing | Tape & Reel |

### 6. Pb

| Code | L      | R    |
|------|--------|------|
| Pb   | Leaded | RoHS |

