

## HBV Series

### Features

- 105°C, 10,000 hours assured
- Low ESR and High ripple current
- RoHS Compliance

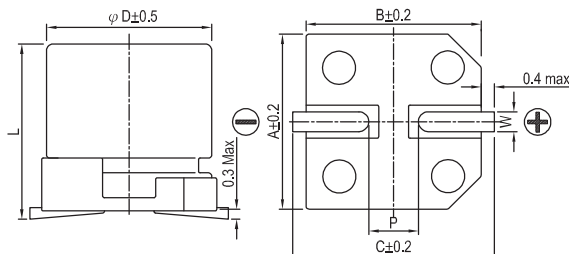


Marking color: Dark Green

### Specifications

| Items                                                                                                                                                                       | Performance                                                                                                                                                                                                                                                                                                                                                                                       |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------|----------------|-----------------|--------------------|------------------------------|--------------|----------------|-----------------|--------------------|------------------------------|-----|-----|-----|------|-----------------------------------|--|--|--|-----------------|-----------------------------------|--|--|--|-----------------|------------------------|--|--|--|
| Category Temperature Range                                                                                                                                                  | -55°C ~ +105°C                                                                                                                                                                                                                                                                                                                                                                                    |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Capacitance Tolerance                                                                                                                                                       | ±20%<br>(at 120Hz, 20°C)                                                                                                                                                                                                                                                                                                                                                                          |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Leakage Current (at 20°C)                                                                                                                                                   | I = 0.01CV or 3 (μA) whichever is greater (after 2 minutes)<br>Where, C = rated capacitance in μF, V = rated DC working voltage in V                                                                                                                                                                                                                                                              |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Tanδ (at 120Hz, 20°C)                                                                                                                                                       | See Standard Ratings                                                                                                                                                                                                                                                                                                                                                                              |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Endurance                                                                                                                                                                   | <table><tr><td>Test Time</td><td colspan="4">10,000 Hrs</td></tr><tr><td>Capacitance Change</td><td colspan="4">Within ±30% of initial value</td></tr><tr><td>Tanδ</td><td colspan="4">Less than 200% of specified value</td></tr><tr><td>ESR</td><td colspan="4">Less than 200% of specified value</td></tr><tr><td>Leakage Current</td><td colspan="4">Within specified value</td></tr></table> |                                   |              |                |                 | Test Time          | 10,000 Hrs                   |              |                |                 | Capacitance Change | Within ±30% of initial value |     |     |     | Tanδ | Less than 200% of specified value |  |  |  | ESR             | Less than 200% of specified value |  |  |  | Leakage Current | Within specified value |  |  |  |
|                                                                                                                                                                             | Test Time                                                                                                                                                                                                                                                                                                                                                                                         | 10,000 Hrs                        |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Capacitance Change                                                                                                                                                                                                                                                                                                                                                                                | Within ±30% of initial value      |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Tanδ                                                                                                                                                                                                                                                                                                                                                                                              | Less than 200% of specified value |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | ESR                                                                                                                                                                                                                                                                                                                                                                                               | Less than 200% of specified value |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Leakage Current                                                                                                                                                                                                                                                                                                                                                                                   | Within specified value            |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| * The above specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage applied with rated ripple current for 10,000 hours at 105°C. |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Shelf Life Test                                                                                                                                                             | * After storage for 1,000 hours at 105 ± 2°C with no voltage applied and then being stabilized at 20°C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)                                                                                                                                                                                                         |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Resistance to Soldering Heat<br>(Please refer to page 25 for reflowsoldering conditions)                                                                                    | <table><tr><td>Capacitance Change</td><td colspan="4">Within ±10% of initial value</td></tr><tr><td>Tanδ</td><td colspan="4">Within specified value</td></tr><tr><td>ESR</td><td colspan="4">Within specified value</td></tr><tr><td>Leakage Current</td><td colspan="4">Within specified value</td></tr></table>                                                                                 |                                   |              |                |                 | Capacitance Change | Within ±10% of initial value |              |                |                 | Tanδ               | Within specified value       |     |     |     | ESR  | Within specified value            |  |  |  | Leakage Current | Within specified value            |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Capacitance Change                                                                                                                                                                                                                                                                                                                                                                                | Within ±10% of initial value      |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Tanδ                                                                                                                                                                                                                                                                                                                                                                                              | Within specified value            |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | ESR                                                                                                                                                                                                                                                                                                                                                                                               | Within specified value            |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Leakage Current                                                                                                                                                                                                                                                                                                                                                                                   | Within specified value            |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |              |                |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Ripple Current and Frequency Multipliers                                                                                                                                    | <table><tr><td>Frequency (Hz)</td><td>120 ≤ f &lt; 1k</td><td>1k ≤ f &lt; 10k</td><td>10k ≤ f &lt; 100k</td><td>100k ≤ f &lt; 500k</td></tr><tr><td>Multiplier</td><td>0.1</td><td>0.3</td><td>0.6</td><td>1.0</td></tr></table>                                                                                                                                                                  |                                   |              |                |                 | Frequency (Hz)     | 120 ≤ f < 1k                 | 1k ≤ f < 10k | 10k ≤ f < 100k | 100k ≤ f < 500k | Multiplier         | 0.1                          | 0.3 | 0.6 | 1.0 |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
|                                                                                                                                                                             | Frequency (Hz)                                                                                                                                                                                                                                                                                                                                                                                    | 120 ≤ f < 1k                      | 1k ≤ f < 10k | 10k ≤ f < 100k | 100k ≤ f < 500k |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |
| Multiplier                                                                                                                                                                  | 0.1                                                                                                                                                                                                                                                                                                                                                                                               | 0.3                               | 0.6          | 1.0            |                 |                    |                              |              |                |                 |                    |                              |     |     |     |      |                                   |  |  |  |                 |                                   |  |  |  |                 |                        |  |  |  |

### Diagram of Dimensions



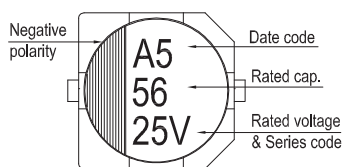
### Lead Spacing and Diameter

Unit: mm

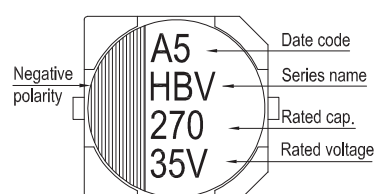
| φD  | L          | A    | B    | C    | W         | P ± 0.2 |
|-----|------------|------|------|------|-----------|---------|
| 6.3 | 5.8 ± 0.3  | 6.6  | 6.6  | 7.2  | 0.5 ~ 0.8 | 2.0     |
| 6.3 | 7.7 ± 0.3  | 6.6  | 6.6  | 7.2  | 0.5 ~ 0.8 | 2.0     |
| 8   | 10.0 ± 0.5 | 8.4  | 8.4  | 9.0  | 0.7 ~ 1.1 | 3.1     |
| 8   | 12.0 ± 0.5 | 8.4  | 8.4  | 9.0  | 0.7 ~ 1.1 | 3.1     |
| 10  | 10.0 ± 0.5 | 10.4 | 10.4 | 11.0 | 0.7 ~ 1.3 | 4.7     |
| 10  | 12.5 ± 0.5 | 10.4 | 10.4 | 11.0 | 0.7 ~ 1.3 | 4.7     |

### Marking

φD = 6.3 mm



φD = 8 ~ 10 mm



Dimension:  $\phi D \times L$ (mm)

Ripple Current: mA/rms at 100k Hz, 105°C

## Standard Ratings

| W. V. (V) | Surge Voltage (V) | Capacitance ( $\mu$ F) | Size $\phi D \times L$ (mm) | Tan $\delta$ (120Hz, 20°C) | L C ( $\mu$ A) | E S R (m $\Omega$ /at 100kHz, 20°C Max) | Rated R. C. (mA/rms at 100k Hz, 105°C) |
|-----------|-------------------|------------------------|-----------------------------|----------------------------|----------------|-----------------------------------------|----------------------------------------|
| 16V (1C)  | 18.4              | 82                     | 6.3 $\times$ 5.8            | 0.16                       | 13.1           | 50                                      | 1,300                                  |
|           |                   | 150                    | 6.3 $\times$ 7.7            | 0.16                       | 24             | 30                                      | 2,000                                  |
|           |                   | 270                    | 8 $\times$ 10               | 0.16                       | 43.2           | 27                                      | 2,300                                  |
|           |                   | 470                    | 10 $\times$ 10              | 0.16                       | 75.2           | 20                                      | 2,500                                  |
| 25V (1E)  | 28.8              | 56                     | 6.3 $\times$ 5.8            | 0.14                       | 14             | 50                                      | 1,300                                  |
|           |                   | 100                    | 6.3 $\times$ 7.7            | 0.14                       | 25             | 30                                      | 2,000                                  |
|           |                   | 220                    | 8 $\times$ 10               | 0.14                       | 55             | 27                                      | 2,300                                  |
|           |                   | 330                    | 10 $\times$ 10              | 0.14                       | 82.5           | 20                                      | 2,500                                  |
|           |                   | 330                    | 10 $\times$ 12.5            | 0.14                       | 82.5           | 16                                      | 2,900                                  |
| 35V (1V)  | 40.3              | 27                     | 6.3 $\times$ 5.8            | 0.12                       | 9.5            | 60                                      | 1,300                                  |
|           |                   | 68                     | 6.3 $\times$ 7.7            | 0.12                       | 23.8           | 35                                      | 2,000                                  |
|           |                   | 150                    | 8 $\times$ 10               | 0.12                       | 52.5           | 27                                      | 2,300                                  |
|           |                   | 270                    | 10 $\times$ 10              | 0.12                       | 94.5           | 20                                      | 2,500                                  |
| 50V(1H)   | 57.5              | 22                     | 6.3 $\times$ 5.8            | 0.10                       | 11             | 80                                      | 1,100                                  |
|           |                   | 33                     | 6.3 $\times$ 7.7            | 0.10                       | 16.5           | 40                                      | 1,600                                  |
|           |                   | 68                     | 8 $\times$ 10               | 0.10                       | 34             | 30                                      | 1,800                                  |
|           |                   | 100                    | 10 $\times$ 10              | 0.10                       | 50             | 28                                      | 2,000                                  |
| 63V(1J)   | 72.5              | 10                     | 6.3 $\times$ 5.8            | 0.08                       | 6.3            | 120                                     | 1,000                                  |
|           |                   | 22                     | 6.3 $\times$ 7.7            | 0.08                       | 13.9           | 80                                      | 1,500                                  |
|           |                   | 27                     | 8 $\times$ 12               | 0.08                       | 17             | 40                                      | 1,700                                  |
|           |                   | 33                     | 8 $\times$ 10               | 0.08                       | 20.8           | 40                                      | 1,700                                  |
|           |                   | 56                     | 10 $\times$ 10              | 0.08                       | 35.3           | 30                                      | 1,800                                  |
| 80V(1K)   | 92.0              | 22                     | 8 $\times$ 10               | 0.08                       | 17.6           | 45                                      | 1,550                                  |
|           |                   | 33                     | 10 $\times$ 10              | 0.08                       | 26.4           | 36                                      | 1,700                                  |

## Part Numbering System

|             |             |                       |               |              |               |                     |                              |
|-------------|-------------|-----------------------|---------------|--------------|---------------|---------------------|------------------------------|
| HBV Series  | 220 $\mu$ F | $\pm 20\%$            | 25V           | Carrier Tape |               | 8 $\phi \times 10L$ | Pb-free and PET coating case |
| <b>HBV</b>  | <b>221</b>  | <b>M</b>              | <b>1E</b>     | <b>TR</b>    | -             | <b>0810</b>         |                              |
| Series Name | Capacitance | Capacitance Tolerance | Rated Voltage | Package Type | Terminal Type | Case size           | Lead Wire and Coating Type   |

Note: For more details, please refer to "Part Numbering System (SMD Type)" on page 15.