

Surface Mount Type

Series: **HB** Type : **V**

- **Features**
 - Endurance: 105°C 2000 h
 - 5.8 mm height ($\leq \phi 6.3$)
 - Vibration-proof product is available upon request. ($\phi 8 \leq$)
 - RoHS directive compliant (Parts No.:EEE*)



| ■ Specifications | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|---|---|-----|-----|----|----|----|----|----|--------------|---|---|---|---|---|---|---|--------------|----|---|---|---|---|---|---|
| Category temp. range | -40 to +105°C | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated W.V. Range | 4 to 50 V .DC | | | | | | | | | | | | | | | | | | | | | | | | |
| Nominal Cap. Range | 0.1 to 220 μ F | | | | | | | | | | | | | | | | | | | | | | | | |
| Capacitance Tolerance | $\pm 20\%$ (120Hz/+20°C) | | | | | | | | | | | | | | | | | | | | | | | | |
| DC Leakage Current | $I \leq 0.01 CV$ or $3(\mu A)$ after 2 minutes (Whichever is greater) (Bi-Polar $I=0.02 CV$ or $6(\mu A)$ after 2 minutes) (Whichever is greater) | | | | | | | | | | | | | | | | | | | | | | | | |
| tan δ | Please see the attached standard products list | | | | | | | | | | | | | | | | | | | | | | | | |
| Characteristics at Low Temperature | <table border="1"> <thead> <tr> <th>W.V. (V)</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> </tr> </thead> <tbody> <tr> <td>-25 / +20 °C</td> <td>7</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>-40 / +20 °C</td> <td>15</td> <td>8</td> <td>6</td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> </tr> </tbody> </table> | W.V. (V) | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | -25 / +20 °C | 7 | 4 | 3 | 2 | 2 | 2 | 2 | -40 / +20 °C | 15 | 8 | 6 | 4 | 4 | 3 | 3 |
| | W.V. (V) | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | | | | | | | | | | | | | | | | | |
| | -25 / +20 °C | 7 | 4 | 3 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | |
| -40 / +20 °C | 15 | 8 | 6 | 4 | 4 | 3 | 3 | | | | | | | | | | | | | | | | | | |
| (Impedance ratio at 120 Hz) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Endurance | After applying rated working voltage for 2000 hours at +105 \pm 2°C and then being stabilized at +20°C, capacitors shall meet the following limits. | | | | | | | | | | | | | | | | | | | | | | | | |
| | Capacitance change | $\pm 20\%$ of initial measured value (4W.V.: $\pm 35\%$, 6.3W.V.: $\pm 25\%$) | | | | | | | | | | | | | | | | | | | | | | | |
| | tan δ | $\leq 200\%$ of initial specified value | | | | | | | | | | | | | | | | | | | | | | | |
| | DC leakage current | \leq initial specified value | | | | | | | | | | | | | | | | | | | | | | | |
| Shelf Life | After storage for 1000 hours at +105 \pm 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 | After reflow soldering (Refer to page 86 for recommended temperature profile.) and then being stabilized at +20°C, capacitor shall meet the following limits. | | | | | | | | | | | | | | | | | | | | | | | | |
| | Capacitance change | $\pm 10\%$ of initial measured value | | | | | | | | | | | | | | | | | | | | | | | |
| | tan δ | \leq initial specified value | | | | | | | | | | | | | | | | | | | | | | | |
| | DC leakage current | \leq initial specified value | | | | | | | | | | | | | | | | | | | | | | | |

■ Marking

Example: 50V 1 μ F (Polarized)

W.V. code

Negative polarity marking (No marking for the bi-polar)

Capacitance (μ F)

Series identification (HP:Bi-polar)

Lot number

W.V. code

| | | | | | | | |
|------|---|-----|----|----|----|----|----|
| V | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 |
| Code | g | j | A | C | E | V | H |

■ Dimensions in mm (not to scale)

| Size code | D | L | A, B | H | I | W | P | K |
|-----------|-----|-----|------|--------|-----|----------------|-----|---------------------|
| B | 4.0 | 5.8 | 4.3 | 5.5MAX | 1.8 | 0.65 \pm 0.1 | 1.0 | 0.35 -0.20 to +0.15 |
| C | 5.0 | 5.8 | 5.3 | 6.5MAX | 2.2 | 0.65 \pm 0.1 | 1.5 | 0.35 -0.20 to +0.15 |
| D | 6.3 | 5.8 | 6.6 | 7.8MAX | 2.6 | 0.65 \pm 0.1 | 1.8 | 0.35 -0.20 to +0.15 |

■ Case size

| W.V.(V) | 4 | | 6.3 | | 10 | | 16 | | 25 | | 35 | | 50 | |
|-----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Cap. (μ F) | Polar-ized | Polar-ized | Bi - polar | Polar-ized |
| 0.1 to 0.47 | | | | | | | | | | | | | B | B |
| 1.0 | | | | | | | | | | | | | B | B |
| 2.2 | | | | | | | | | | | | | B | B |
| 3.3 | | | | | | | | | | | | | B | D |
| 4.7 | | | | | | | | | | | | | C | D |
| 6.8 | | | | | | | | | | | | | C | |
| 10 | | | | | B | B | C | | | | | | D | D |
| 22 | | B | | | | | | | | | | | D | D |
| 33 | | B | | C | D | | | | | | | | | |
| 47 | B | C | D | | | | | | | | | | | |
| 68 | | | | | | | | | | | | | | |
| 100 | C | D | | | | | | | | | | | | |
| 150 | D | | | | | | | | | | | | | |
| 220 | D | | | | | | | | | | | | | |

■ Standard Products

| W.V. (V) | Cap. (±20%) (μF) | Case size | | | Specification | | Part No. (RoHS: not compliant) | Reflow | Part No. (RoHS: compliant) | Reflow | Min. Packaging Qty | Taping (pcs) |
|-------------|------------------------|--------------|----------------|--------------|--|-----------------------------|--------------------------------------|-------------|----------------------------------|--------|--------------------------|-----------------|
| | | Dia. (mm) | Length (mm) | Size Code | Ripple current (120Hz) (+105°C) (mA) | tan δ (120Hz) (+20°C) | | | | | | |
| 4 | 47 | 4 | 5.8 | B | 34 | 0.50 | EEVHB0G470R | (1) | EEEHB0G470R | (4) | 2000 | |
| | 100 | 5 | 5.8 | C | 61 | 0.50 | EEVHB0G101R | (1) | EEEHB0G101R | (4) | 1000 | |
| | 150 | 6.3 | 5.8 | D | 82 | 0.50 | EEVHB0G151P | (1) | EEEHB0G151P | (4) | 1000 | |
| | 220 | 6.3 | 5.8 | D | 82 | 0.50 | EEVHB0G221P | (1) | EEEHB0G221P | (4) | 1000 | |
| 6.3 | 22 | 4 | 5.8 | B | 26 | 0.30 | EEVHB0J220R | (1) | EEEHB0J220R | (4) | 2000 | |
| | 33 | 4 | 5.8 | B | 29 | 0.30 | EEVHB0J330R | (1) | EEEHB0J330R | (4) | 2000 | |
| | 47 | 5 | 5.8 | C | 46 | 0.30 | EEVHB0J470R | (1) | EEEHB0J470R | (4) | 1000 | |
| | 100 | 6.3 | 5.8 | D | 71 | 0.30 | EEVHB0J101P | (1) | EEEHB0J101P | (4) | 1000 | |
| 10 | 33 | 5 | 5.8 | C | 43 | 0.22 | EEVHB1A330R | (1) | EEEHB1A330R | (4) | 1000 | |
| 16 | 10 | 4 | 5.8 | B | 28 | 0.16 | EEVHB1C100R | (1) | EEEHB1C100R | (4) | 2000 | |
| | 22 | 5 | 5.8 | C | 39 | 0.16 | EEVHB1C220R | (1) | EEEHB1C220R | (4) | 1000 | |
| | 47 | 6.3 | 5.8 | D | 70 | 0.16 | EEVHB1C470P | (1) | EEEHB1C470P | (4) | 1000 | |
| 25 | 4.7 | 4 | 5.8 | B | 22 | 0.14 | EEVHB1E4R7R | (1) | EEEHB1E4R7R | (4) | 2000 | |
| | 6.8 | 4 | 5.8 | B | 25 | 0.14 | EEVHB1E6R8R | (1) | EEEHB1E6R8R | (4) | 2000 | |
| | 33 | 6.3 | 5.8 | D | 65 | 0.14 | EEVHB1E330P | (1) | EEEHB1E330P | (4) | 1000 | |
| 35 | 10 | 5 | 5.8 | C | 28 | 0.12 | EEVHB1V100R | (1) | EEEHB1V100R | (4) | 1000 | |
| | 22 | 6.3 | 5.8 | D | 55 | 0.12 | EEVHB1V220P | (1) | EEEHB1V220P | (4) | 1000 | |
| 50 | 0.1 | 4 | 5.8 | B | 1 | 0.12 | EEVHB1HR10R | (1) | EEEHB1HR10R | (4) | 2000 | |
| | 0.22 | 4 | 5.8 | B | 2 | 0.12 | EEVHB1HR22R | (1) | EEEHB1HR22R | (4) | 2000 | |
| | 0.33 | 4 | 5.8 | B | 3 | 0.12 | EEVHB1HR33R | (1) | EEEHB1HR33R | (4) | 2000 | |
| | 0.47 | 4 | 5.8 | B | 5 | 0.12 | EEVHB1HR47R | (1) | EEEHB1HR47R | (4) | 2000 | |
| | 1 | 4 | 5.8 | B | 10 | 0.12 | EEVHB1H1R0R | (1) | EEEHB1H1R0R | (4) | 2000 | |
| | 2.2 | 4 | 5.8 | B | 16 | 0.12 | EEVHB1H2R2R | (1) | EEEHB1H2R2R | (4) | 2000 | |
| | 3.3 | 4 | 5.8 | B | 16 | 0.12 | EEVHB1H3R3R | (1) | EEEHB1H3R3R | (4) | 2000 | |
| | 4.7 | 5 | 5.8 | C | 23 | 0.12 | EEVHB1H4R7R | (1) | EEEHB1H4R7R | (4) | 1000 | |
| | 6.8 | 5 | 5.8 | C | 23 | 0.12 | EEVHB1H6R8R | (1) | EEEHB1H6R8R | (4) | 1000 | |
| 10 | 6.3 | 5.8 | D | 35 | 0.12 | EEVHB1H100P | (1) | EEEHB1H100P | (4) | 1000 | | |

An explanation of the taping dimensions can be found on page 84.

Reflow profiles can be found on page 86.

Endurance: 105°C 2000h

■ Standard Products(Bi-polar)

| W.V. (V) | Cap. (±20%) (μF) | Case size | | | Specification | | Part No. (RoHS: not compliant) | Reflow | Part No. (RoHS: compliant) | Reflow | Min. Packaging Q'ty Taping (pcs) |
|-------------|------------------------|--------------|----------------|--------------|--|-----------------------------|--------------------------------------|--------|----------------------------------|--------|--|
| | | Dia. (mm) | Length (mm) | Size Code | Ripple current (120Hz) (+105°C) (mA) | tan δ (120Hz) (+20°C) | | | | | |
| 6.3 | 47 | 6.3 | 5.8 | D | 35 | 0.60 | EEVHP0J470P | (1) | EEEHP0J470P | (4) | 1000 |
| 10 | 10 | 4 | 5.8 | B | 20 | 0.44 | EEVHP1A100R | (1) | EEEHP1A100R | (4) | 2000 |
| | 33 | 6.3 | 5.8 | D | 26 | 0.44 | EEVHP1A330P | (1) | EEEHP1A330P | (4) | 1000 |
| 16 | 10 | 5 | 5.8 | C | 25 | 0.32 | EEVHP1C100R | (1) | EEEHP1C100R | (4) | 1000 |
| 25 | 3.3 | 4 | 5.8 | B | 12 | 0.28 | EEVHP1E3R3R | (1) | EEEHP1E3R3R | (4) | 2000 |
| | 4.7 | 4 | 5.8 | B | 12 | 0.28 | EEVHP1E4R7R | (1) | EEEHP1E4R7R | (4) | 2000 |
| | 10 | 6.3 | 5.8 | D | 28 | 0.28 | EEVHP1E100P | (1) | EEEHP1E100P | (4) | 1000 |
| | 22 | 6.3 | 5.8 | D | 55 | 0.28 | EEVHP1E220P | (1) | EEEHP1E220P | (4) | 1000 |
| 35 | 2.2 | 4 | 5.8 | B | 10 | 0.24 | EEVHP1V2R2R | (1) | EEEHP1V2R2R | (4) | 2000 |
| 50 | 0.22 | 4 | 5.8 | B | 2 | 0.24 | EEVHP1HR22R | (1) | EEEHP1HR22R | (4) | 2000 |
| | 0.33 | 4 | 5.8 | B | 3 | 0.24 | EEVHP1HR33R | (1) | EEEHP1HR33R | (4) | 2000 |
| | 0.47 | 4 | 5.8 | B | 5 | 0.24 | EEVHP1HR47R | (1) | EEEHP1HR47R | (4) | 2000 |
| | 1 | 4 | 5.8 | B | 10 | 0.24 | EEVHP1H1R0R | (1) | EEEHP1H1R0R | (4) | 2000 |
| | 3.3 | 6.3 | 5.8 | D | 16 | 0.24 | EEVHP1H3R3P | (1) | EEEHP1H3R3P | (4) | 1000 |
| | 4.7 | 6.3 | 5.8 | D | 23 | 0.24 | EEVHP1H4R7P | (1) | EEEHP1H4R7P | (4) | 1000 |

An explanation of the taping dimensions can be found on page 84.

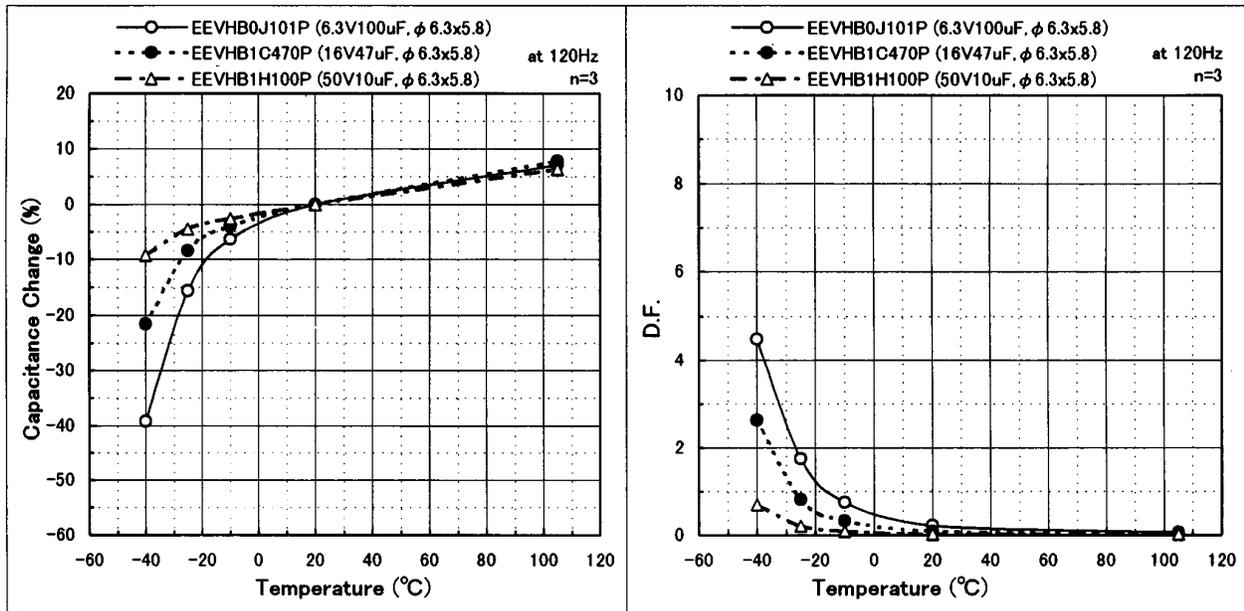
Reflow profiles can be found on page 86.

Endurance: 105°C 2000h

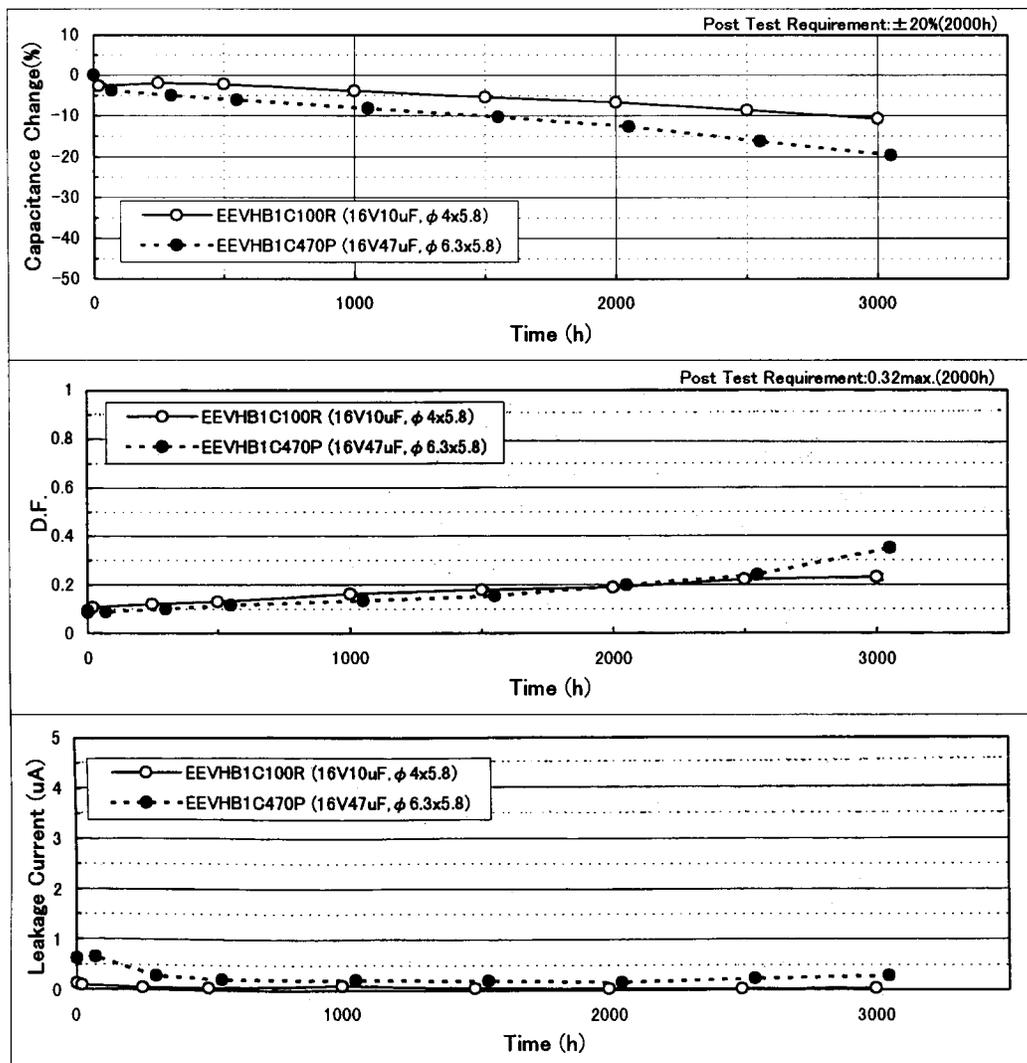
■ Frequency Correction Factor of Rated Ripple Current

| | Frequency (Hz) | | | |
|-------------|----------------|-----|-----|------|
| | 50,60 | 120 | 1k | 10k~ |
| coefficient | 0.70 | 1.0 | 1.3 | 1.7 |

Temperature Characteristics

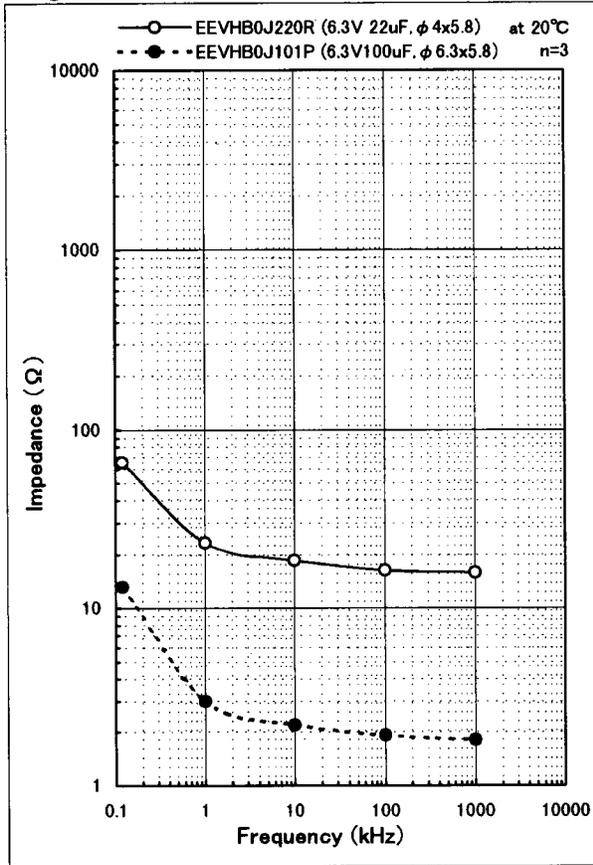


Endurance

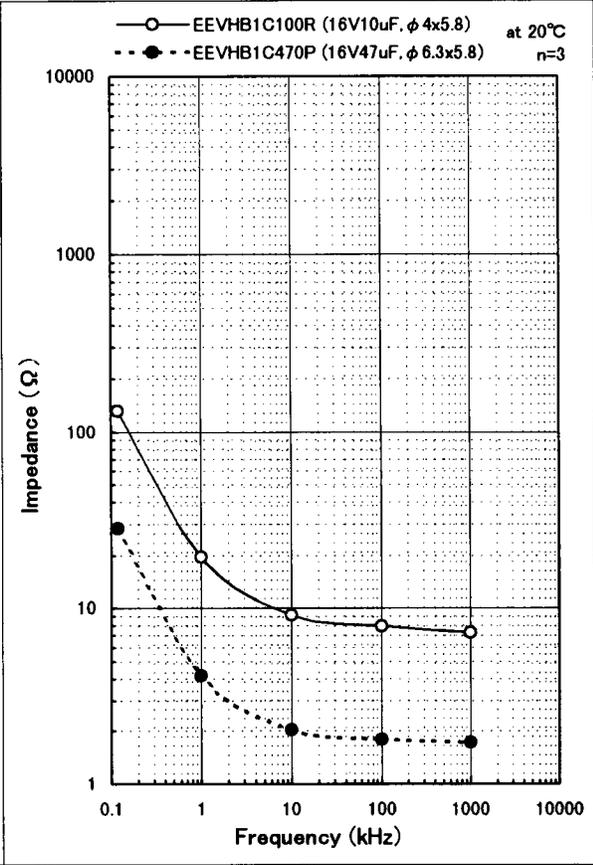


Frequency Characteristics

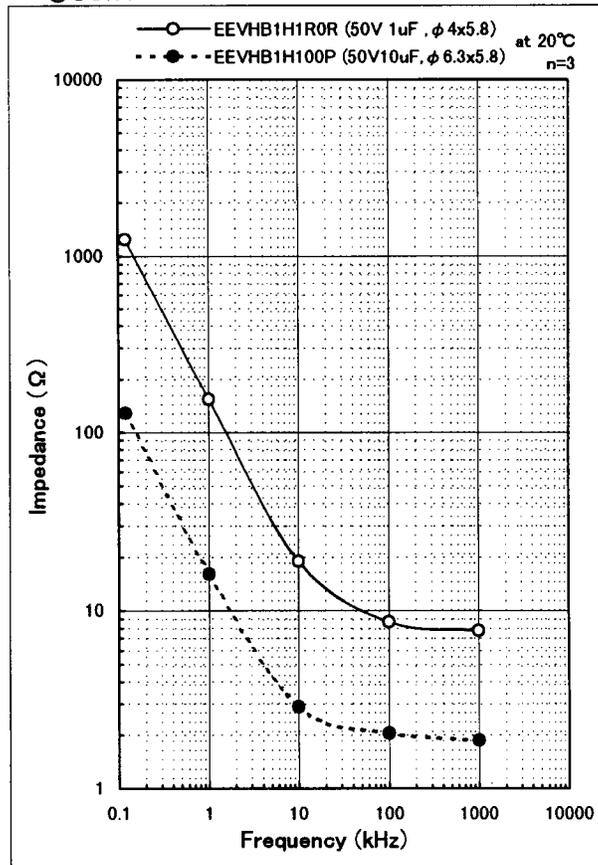
◎6.3WV



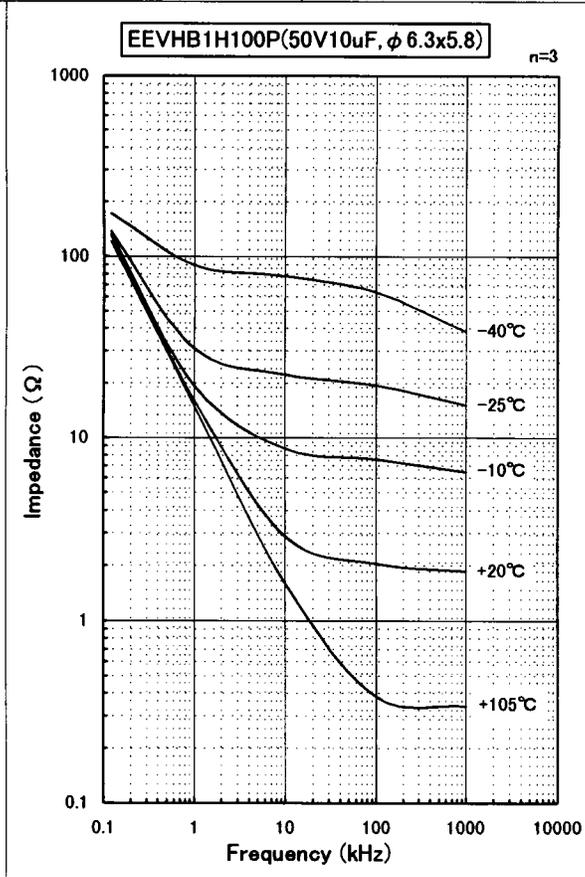
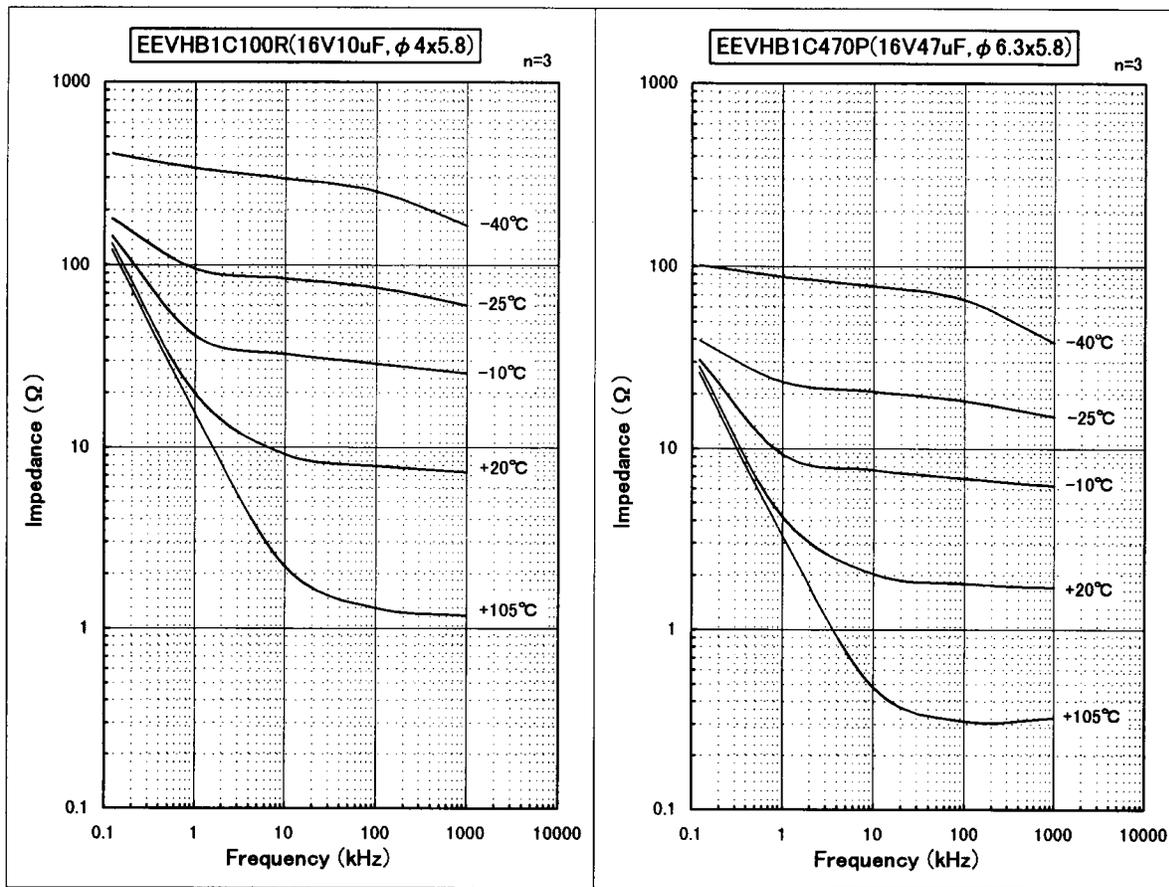
◎16WV



◎50WV



Temperature Characteristics



| Pre-fix | Suffix | Case Diameter | RoHS Compliant | Terminal Finish | Reflow Condition | | Reflow Chart |
|---------|--------|---------------|----------------|-----------------|-------------------|----------------|--|
| | | | | | Peak Temperature | Time above 200 | |
| ECE-V | R | 3mm to 5mm | No | Sn-Pb | 240 for 5 seconds | 20 seconds | (1) Fig.1 |
| | P | 6mm | No | Sn-Pb | 240 for 5 seconds | 20 seconds | (1) Fig.1 |
| | P | 8mm to 10mm | No | Sn-Pb | 230 for 5 seconds | 20 seconds | (2) Fig.2 |
| EEV- | R | 4mm to 5mm | No | Sn-Pb | 240 for 5 seconds | 20 seconds | (1) Fig.1 |
| | P | 6mm | No | Sn-Pb | 240 for 5 seconds | 20 seconds | (1) Fig.1 |
| | P | 8mm to 10mm | No | Sn-Pb | 230 for 5 seconds | 20 seconds | (2) Fig.2 |
| | Q | 12.5mm | Yes | Sn | 230 for 5 seconds | 20 seconds | (2) Fig.2 (Except for EB series) (3) Fig.3 (EB series only) |
| | M | 16mm to 18mm | Yes | Sn | 230 for 5 seconds | 20 seconds | (2) Fig.2 (Except for EB series) (3) Fig.3 (EB series only) |
| EEE- | R | 3mm to 5mm | Yes | Sn-Bi | 250 for 5 seconds | 60 seconds | (4) Fig.4 |
| | P | 6mm | Yes | Sn-Bi | 250 for 5 seconds | 60 seconds | (4) Fig.4 |
| | P | 8mm to 10mm | Yes | Sn-Bi | 235 for 5 seconds | 60 seconds | (5) Fig.5 |

