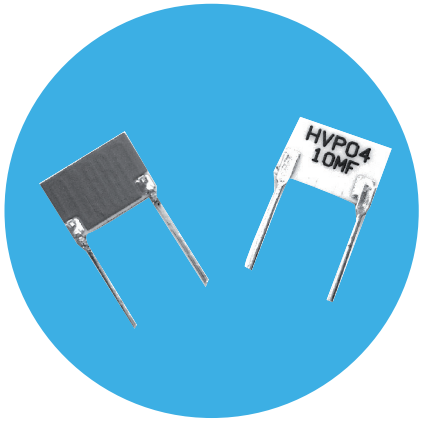
# Resistors

# High Voltage Planar Resistors




**HVP Series**

- Excellent reliability
- Ideally suited for medical applications
- Voltages up to 20kV
- Resistance values up to 10G
- Small footprint
- Printed or powder coat protection
- Planar construction gives low inductance and capacitance

All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

## Electrical Data

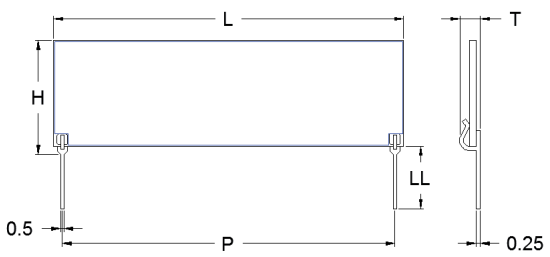
| | | HVP04 | HVP06 | HVP08 | HVP10 | HVP15 | HVP20 |
|---|---|---|---|---|---|---|---|
| Power rating at 70°C | watts | 0.4 | 0.6 | 0.8 | 1 | 1.5 | 2 |
| Resistance range | ohms | 1K0 to 250M | 1K5 to 1G0 | 2K0 to 1G0 | 3K0 to 2G0 | 4K0 to 5G0 | 5K0 to 10G |
| Limiting element voltage (dc or ac peak) | kV | 2 | 5 | 7.5 | 10 | 15 | 20 |
| TCR (20°C to 70°C) | ppm/°C | 100 | 100, 50, 25 | | | | |
| Resistance tolerance | % | 0.5, 1, 5 | 0.25, 0.5, 1, 5 | | | | |
| Values | | E24 preferred | | | | | |
| Ambient temperature range | °C | -55 to 155 | | | | | |
| Insulation resistance at 500V | ohms | >10G | | | | | |
| Dielectric strength of insulation | volts | Screen printed protection: >1000 Powder coated: >2000 | | | | | |

Other resistance, tolerance and TCR values are available on request.

| Size | TCR(ppm/°C) | Tolerance (%) | |
|---|---|---|---|
| | | 0.25 | 0.5, 1, 5 |
| HVP04 | 100 | - | 1K0 to 250M |
| HVP06 | 25 | 1K5 to 500M | |
| | 50, 100 | 1K5 to 500M | 1K5 to 1G0 |
| HVP08 | 25 | 2K0 to 500M | |
| | 50, 100 | 2K0 to 500M | 2K0 to 1G0 |
| HVP10 | 25 | 3K0 to 1G0 | |
| | 50, 100 | 3K0 to 1G0 | 3K0 to 2G0 |
| HVP15 | 25 | 4K0 to 1G0 | |
| | 50, 100 | 4K0 to 1G0 | 4K0 to 5G0 |
| HVP20 | 25 | 5K0 to 1G0 | |
| | 50, 100 | 5K0 to 1G0 | 5K0 to 10G |

## Physical Data

| Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|
| Type | L ±0.75 | H ±0.5 | T ±0.5 | P ±0.5 | Wt Nom | LL (±0.25) |
| HVP04 | 10.16 | 7.35 | 2 | 7.62 | 0.208g | 9.25 |
| HVP06 | 12.7 | 7.35 | 2 | 10.16 | 0.251g | |
| HVP08 | 19.05 | 7.35 | 2 | 15.24 | 0.352g | |
| HVP10 | 25.4 | 7.35 | 2 | 22.86 | 0.454g | |
| HVP15 | 38.1 | 7.35 | 2 | 35.56 | 0.654g | |
| HVP20 | 50.8 | 7.35 | 2 | 48.26 | 0.854g | |




For powder coat option add 0.25mm to L, H & T.

**General Note**

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BI Technologies IRC Welwyn

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## Construction
Conductor pads are printed to the rear and front faces of a 96% alumina substrate. A specially selected high voltage thick film resistor ink, based on a ruthenium oxide/glass system, is printed between the front face conductors and then covered in an overglaze before being protected either with powder coating or a special screen printed material which gives excellent high voltage and climatic performance.

## Marking
Type, resistance value and tolerance are legend marked in black ink on the rear of the component. The resistance value conforms to IEC 62.

## Solvent Resistance
The component protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuit boards

## Terminations
Solder coated phosphor bronze leadframe terminations are solder dipped in SnAgCu and meet the following IEC requirements:

IEC 68.2.21 – Strength
IEC 115-1, Clause 4.17.3.2 – Solderability

## Packaging
Packed in foam within a box. See Ordering Procedure for box quantities.

# Performance Data

| | | | Maximum | Typical |
|---|---|---|---|---|
| Load at rated power: 1000 hours at 70°C | | ΔR% | 1 | 0.1 |
| Dry heat: 1000 hours at 155°C | | ΔR% | 1 | 0.1 |
| Shelf life: 12 months at room temperature | | ΔR% | 0.3 | <0.1 |
| Derating from power at 70°C | | | Zero at 155°C | |
| Climatic | | ΔR% | 1 | 0.1 |
| Climatic category | | | -55/155/56 | |
| Biased humidity: 1000 hours, 85%RH, 85°C, 10%Pr | | ΔR% | 0.25 | 0.1 |
| Temperature rapid change: 5 cycles -55/155°C | | ΔR% | 0.25 | 0.1 |
| Resistance to solder heat | | ΔR% | 0.25 | 0.02 |
| Moisture resistance: MIL Std. 202, method 106 (powder coat option) | | ΔR% | 0.25 | 0.1 |
| Solderability | | | >95% coverage | |
| Voltage coefficient of resistance | HVP04, 06, 08 | ppm/V | -2.5 | -1 |
| | HVP10, 15, 20 | ppm/V | -1.5 | -0.5 |

# Application Notes

Due to the high voltage which can appear between the resistor body and any adjacent metal part, resistors should be mounted at an adequate distance from other conducting parts.

Due to the possibility of surface condensation it is recommended that high voltages are not applied to resistors in areas of high humidity without the application of suitable moisture resistant lacquer

## Design Flexibility
The experience of Welwyn engineers has been used to design this generation of high voltage planar resistors to be suitable for a majority of applications. However, should an application require particular consideration, Welwyn designers are able to provide advice and where applicable, to recommend a non-standard product. Special sizes, designs etc, can be prototyped at short notice.

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# Ordering Procedure

Example: HVP06C-100MFB016 (HVP06 with screen printed protection, at 50ppm/°C TCR, 100 megohms, and 1% tolerance, Pb-free and packed in a box of 160 pieces)

| H | V | P | 0 | 6 | | C | - | 1 | 0 | 0 | M | F | B | 0 | 1 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 2 | 3 | | 4 | | | | 5 | 6 | | | |

| 1 Type | 2 Coating (optional) | | 3 TCR (optional) | | 4 Value | 5 Tolerance | | 6 Packing | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HVP04 | | screen printed protection | | ±100 ppm/°C | 3/4 characters | J | ±5% | B02 | HVP04 | 200/box |
| HVP06 | | | C | ±50 ppm/°C | K = kilohms | F | ±1% | B016 | HVP06 | 160/box |
| HVP08 | P | powder coated protection | D | ±25 ppm/°C | M = megohms | D | ±0.5% | B012 | HVP08 | 120/box |
| HVP10 | | | | | G = gigohms | C | ±0.25% | B008 | HVP10 | 80/box |
| HVP15 | | | | | | | | B006 | HVP15 | 60/box |
| HVP20 | | | | | | | | B004 | HVP20 | 40/box |

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