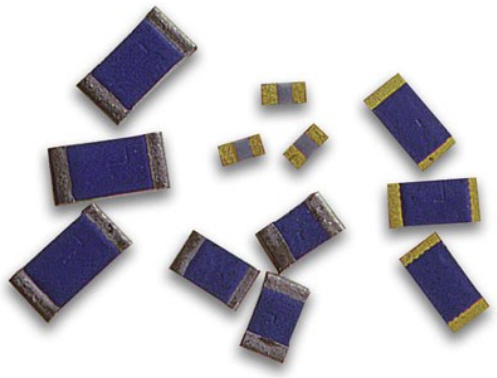
# High Value Surface Mounted Resistors

## HR Series



### Features:

- Resistance range to 50G ohms
- Terminations available for wire bonding or soldering
- Low voltage coefficient of resistance
- Custom designs / sizes available

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

## Electrical Data

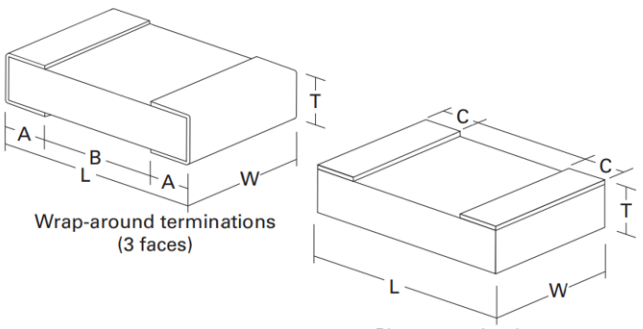
| | | 0503 | 0603 | 0805 | 1005 | 1206 | 2512 |
|---|---|---|---|---|---|---|---|
| Limiting element voltage | V | 50 | 75 | 100 | 150 | 200 | 200 |
| Resistance range [1,3] | Ω | 10M to 20G | | 100M to 50G | | | 27M to 10G |
| Resistance tolerance | % | ≤500M: 10<br>>500M: 25, 50 | ≤1G: 5, 10<br>>1G: 25, 50 | | | | 5, 10, 20 |
| Values | | E24 preferred [4] | | | | | |
| TCR [3] | ppm/°C | +250 to -2500 | +250 to -2000 | | +250 to -1500 | +250 to -1000 | |
| Power rating | W | Due to high ohmic values no power rating applies. The maximum power is $LEV^2/R$. | | | | | |
| Ambient temperature range | °C | -55 to +155 | | | | | |

Notes
1. Higher values are available – consult factory for details.
2. Anti-sulphur termination types are available – consult factory for details.
3. Resistance value measurements are made at 15V.
4. Special values may be requested.

## Physical Data

**Dimensions in mm and weight in mg**

| | L | W | T max. | A | B [1] min. | C | Wt. nom. |
|---|---|---|---|---|---|---|---|
| **0503G** | 1.25±0.1 | 0.63±.1 | 0.5 | - | - | 0.2±0.1 | 1.5 |
| **0603F** | 1.6±0.1 | 0.8±0.1 | 0.55 | 0.3±0.15 | 0.6 | - | 2.2 |
| **0603G** | | | | - | - | 0.3±0.15 | |
| **0805F** | 2.0±0.15 | 1.25±0.15 | 0.6 | 0.3±0.15 | 0.9 | - | 4.7 |
| **0805G** | | | | - | - | 0.3±0.1 | |
| **1005G** | 2.5±0.2 | 1.25±0.2 | 0.7 | - | - | 0.4±0.15 | 6.5 |
| **1206F** | 3.2±0.2 | 1.6±0.2 | | 0.4±0.2 | 1.7 | - | 8.5 |
| **1206G** | | | | - | - | 0.4±0.15 | |
| **2512F** | 6.3±0.2 | 3.2±0.2 | | 0.7±0.2 | 4.3 | - | 38.1 |




**F-style wrap-around and G-style planar termination options.**

Notes 1. This dimension determines the number of conductors which may pass under the surface mounted device.

### Construction

The resistor material is screen printed onto a 96% alumina substrate and covered with a protection comprising of a glaze followed by an organic coating. This construction gives an insulated device.

### Marking

All relevant information is recorded on the primary package or reel.

### Terminations

Planar (or single-sided) termination is gold and suitable for wire-bonding. Wrap-around termination is suitable for soldering.

### Solderability

Wrap-around terminations on HR resistors have good leach resistance properties. They will withstand immersion in solder at 260°C for 30 seconds.

## Performance Data

| Test | Method | | Maximum | Typical |
|---|---|---|---|---|
| Load life | 1000 hours, cyclic load at $T_A$ = 70°C, LEV | ±ΔR% | 2 | 1 |
| Short Term Overload | 2.5 x LEV for 5 s | ±ΔR% | 1 | 0.2 |
| Shelf-Life Test | 12 months, room temperature, unpowered | ±ΔR% | 2 | 1 |
| Temperature Cycle | 5 cycles, -55°C to +155°C | ±ΔR% | 1 | 0.3 |
| Resistance to Solder Heat | 260 ± 5°C, 10 ± 1s | ±ΔR% | 1 | 0.5 |
| Voltage Proof | | V | 0503:100V, 0603: 300V, 0805 to 1206: 500V, 2512: 400V | |

| | %/V | Maximum | Typical |
|---|---|---|---|
| Voltage Coefficient of Resistance (VCR) | 0603 | -2 | -0.7 |
| | 0805 | -1 | -0.4 |
| | 1005 | -0.8 | -0.3 |
| | 1206 | -0.2 | -0.05 |
| | 2512 | -0.1 | -0.02 |

### Mounting

This chip resistor is ideally suited for handling by automatic methods due to its rectangular shape and the small dimensional tolerances. Electrical connection to a ceramic substrate or to a printed circuit board can be made by wire bonding to planar terminations or by reflow soldering of wrap-around terminations. The 'F' terminations provide good leach properties and ensure reliable contact. Due to the robust construction the resistor chip can be immersed in the solder bath for 30 seconds at 260°C. This enables the resistor to be mounted on one side of a printed circuit and through-hole components on the other side. The resistor must be kept dry during use to avoid leakage. The presence of moisture will not damage the resistor in any way.

### Packaging

Solderable wraparound chips are supplied in plastic tape and reeled to IEC 286-3. The 2512 size is packed at 4mm pitch on 12mm wide tape, and the smaller sizes are on 8mm wide tape. Other dimensions conform to:
https://www.ttelectronics.com/TTElectronics/media/ProductFiles/ApplicationNotes/PS003-Packing-of-Specialist-Chip-Resistors.pdf

Gold pad planar chips are supplied in waffle packs.

## Ordering Procedure

**Example: HR1206F-10GYI** (1206 with solderable wraparound terminations, 10 gigohms ±50%, Pb-free)

| H | R | 1 | 2 | 0 | 6 | F | - | 1 | 0 | G | | Y | I | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 2 | | | 3 | | | 4 | | | 5 | 6 | |

| 1 Type | 2 Size | 3 Termination | | | 4 Value | 5 Tolerance | 6 Termination Finish & Packing | | |
|---|---|---|---|---|---|---|---|---|---|
| HR | 0503 | F | 0603, 0805, 1206, 2512 | Solderable wraparound | E24<br>3/4 characters<br>M = megohms<br>G = gigohms | J = ±5% | Solderable wraparound | | |
| | 0603 | | | | | K = ±10% | I = Pb-free<br>PB = SnPb | 0603F | 5000/7" reel |
| | 0805 | G | 0503, 0603, 0805, 1005, 1206 | Gold pad planar | | M = ±20% | | 0805F, 1206F | 3000/7" reel |
| | 1005 | | | | | 5 = ±25% | | | |
| | 1206 | | | | | Y = ±50% | I = Pb-free | 2512F | 4000/7" reel |
| | 2512 | | | | | | Gold pad planar | | |
| | | | | | | | I | xxxxG | Waffle |