# Power Resistors, for Mounting onto a Heatsink Thick Film Technology

Manufactured in cermet thick film technology, these power resistors exhibit remarkable characteristics and the series includes 4 types ranging from 5W to 50W

Designed to be mounted onto a heatsink, the resistors can bear high short time overloads and 3 types of terminations are available.

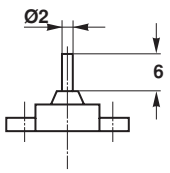
The resistors are non inductive and are particularly suitable for high frequency operation and cut-out circuits.

## FEATURES

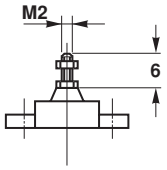
- 5 Watt to 50W
- High power rating
- High overload capabilities
- High stability at rated power
- Wide resistance range
- High thermal capacity
- Easy mounting
- Reduced size and weight
- High insulation: $10^6 M\Omega$

## DIMENSIONS in millimeters

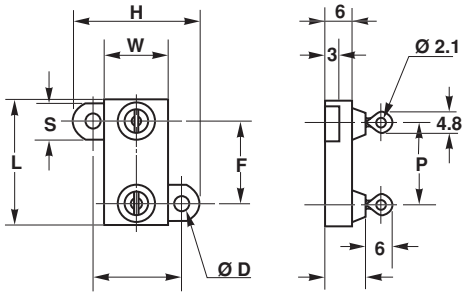
**RCH...R**




**RCH...V**




**RCH...S**




• **General Tolerance: ± 0.3mm**

| DIMENSIONS | | | | |
|---|---|---|---|---|
| **MODEL** | **RCH 5** | **RCH 10** | **RCH 25** | **RCH 50** |
| L | 16.6 | 19 | 28 | 47.8 |
| W | 9 | 11 | 14 | 15.5 |
| H | 16.4 | 20.6 | 27.5 | 29.4 |
| P Leads pitch | 10.2 | 12.7 | 18.3 | 30.5 |
| F Connections pitch | 11.3 | 14.3 | 18.3 | 39.7 |
| T | 12.5 | 15.9 | 19.8 | 21.4 |
| S | 5.3 | 5 | 7.7 | 8 |
| Ø D | 2.4<br>M2 | 2.4<br>M2 | 3.2<br>M3 | 3.2<br>M3 |
| WEIGHT (g) | 4 | 5 | 7 | 12 |



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## MECHANICAL SPECIFICATIONS

| | |
|---|---|
| **Mechanical Protection** | Insulated Case |
| **Substrate** | Alumina |
| **Resistive Element** | Cermet |
| **Connections** | Tinned copper alloy |

## ENVIRONMENTAL SPECIFICATIONS

| | |
|---|---|
| **Temperature Range** | - 55°C to + 125°C |
| **Climatic Category** | 55/125/56 |

## ELECTRICAL SPECIFICATIONS

| | |
|---|---|
| **Resistance Range** | 0.24Ω to 1MΩ E24 series |
| **Standard Resistance Tolerances** | ± 1%, ± 2%, ± 5%, ± 10% |
| **Power Rating** | |
| **Chassis Mounted** | 5W to 50W |
| **Unmounted** | 2W to 5.5W |
| **Temperature Coefficient** | ± 150ppm/°C (R > 1Ω) |
| **Insulation Resistance** | $10^6$ MΩ |
| **Total Inductance** | ≤ 0.1µH |

## PERFORMANCE

| TESTS | CONDITIONS | TYPICAL DRIFTS |
|---|---|---|
| **Momentary Overload** | 2Pr/5s<br>Us < 2 UL | < ± (0.25% ± 0.05Ω) |
| **Climatic Sequence** | 5 cycles<br>nominal power Pn - 55°C to + 155°C | < ± (0.25% ± 0.05Ω) |
| **Load Life** | 1000h Pr at + 25°C | < ± (0.5% ± 0.05Ω) |
| **Humidity (Steady State)** | 56 days R.H. 95% | < ± (0.5% ± 0.05Ω) |

## RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR

| | | |
|---|---|---|
| **Resistance Value** | < 1Ω | > 1Ω |
| **Standard Tolerances** | ± 5%<br>± 10% | |
| **Standard T.C.** | ± 250ppm/°C | ± 150ppm/°C |
| **Tolerance on Request** | ± 1% to ± 2% | |

## SPECIAL FEATURES

| MODEL | RCH 5 | RCH 10 | RCH 25 | RCH 50 |
|---|---|---|---|---|
| **Power Rating-Chassis Mounted** | 5W | 10W | 25W | 50W |
| **Power Rating-Unmounted** | 2W | 2.5W | 4W | 5.5W |
| **Thermal Resistance RTH (j-c)** | 4.8°C/W | 3.2°C/W | 1.4°C/W | 0.8°C/W |
| **Limiting Element Voltage ($V_{RMS}$)** | 160V | 250V | 550V | 1285V |
| **Max. Overload Voltage ($V_{RMS}$)** | 320V | 500V | 1100V | 2500V |
| **Dielectric Strength ($V_{RMS}$) 50Hz** | 3000V | 3000V | 3500V | 3500V |
| **Critical Resistance** | 5120Ω | 6250Ω | 12100Ω | 33024Ω |

## RECOMMENDATIONS FOR MOUNTING ONTO A HEATSINK

Surfaces in contact must be carefully cleaned.

The heatsink must have an acceptable flatness: from 0.05mm to 0.1mm/100mm.

Roughness of the heatsink must be around 6.3µm. In order to improve thermal conductivity, surfaces in contact (alumina, heatsink) are coated with a silicone grease (type SI 340 from Rhône-Poulenc or Dow 340 from Dow Corning).

The fastening of the resistor to the heatsink is under pressure control of two screws (not supplied).

| **Tightening Torque** | RCH 5 | RCH 10 | RCH 25 | RCH 50 |
|---|---|---|---|---|
| **on heatsink** | 0.5Nm | 0.6Nm | 0.7Nm | 1Nm |

In order to improve the dissipation, either forced-air cooling or liquid cooling may be used.

A low thermal radiation of the case allows several resistors to be mounted onto the same heatsink.

Do not forget to respect an insulation value between two resistors (dielectric strength in dry air 1kV/mm).

In any case the hot spot temperature, measured locally on the case must not exceed 125°C.

Tests should be performed by the user.

## CHOICE OF HEATSINK

The user must choose the heatsink according to working conditions of the component (power, room temperature). Maximum working temperature must not exceed 125°C. The dissipated power is simply calculated by the following ratio:

$$P = \frac{\Delta T}{[RT_H (j\text{-}c) + RT_H (c\text{-}a)]} \quad (1)$$

P: Expressed in W

ΔT: Difference between maximum working temperature and room temperature.

$R_{TH}$: (j-c): Thermal resistance value measured between resistance layer and outer side of the resistor.

It is the thermal resistance of the component (See Special Features table).

$R_{TH}$: (c-a): Thermal resistance value measured between outer side of the resistor and room temperature.

It is the thermal resistance of the heatsink depending on the heatsink itself (type, shape) and the quality of the fastening device.

**Example:**

$R_{TH}$: (c-a) for RCH 25 power rating 20W at ambient temperature + 50°C.

$\Delta T \leq 125°C - 50°C \leq 75°C$

$R_{TH}$ (j-c) = 1.4°C/W (Special Features)

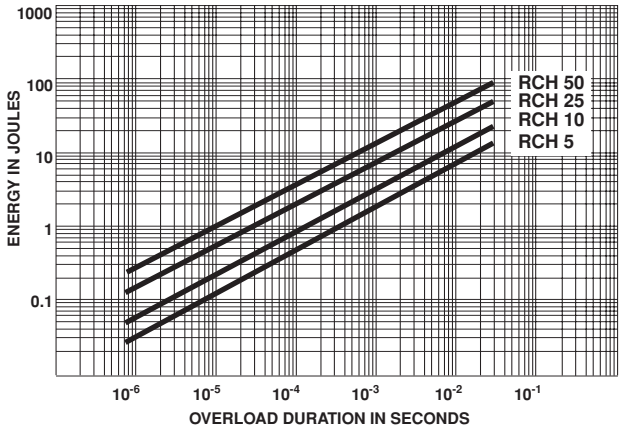
$$R_{TH} (j\text{-}c) + R_{TH} (c\text{-}a) = \frac{\Delta T}{P} = \frac{75}{20} = 3.75°C/W$$

$R_{TH} (c\text{-}a) \leq 3.75°C/W - 1.4°C/W \leq 2.35°C/W$

## OVERLOADS

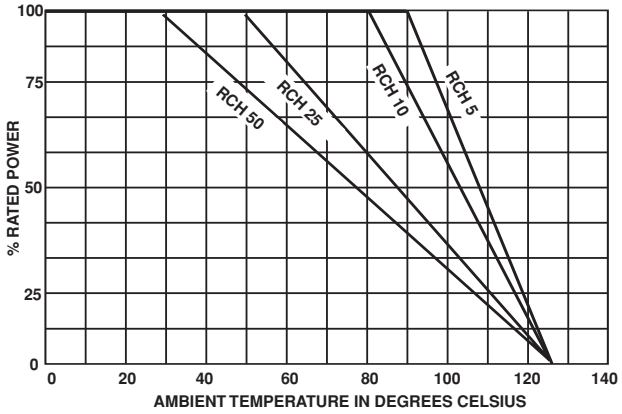
The applied voltage must always be lower than the maximum overload voltage as shown in the special features table.
The values indicated on the graph below are applicable to resistors in air or mounted onto a heatsink.

### ENERGY CURVE




## POWER RATING CHART

For resistors mounted onto heatsink and thermal resistance of 1°C/W.
To improve the thermal conductivity, surfaces in contact should be coated with a silicone grease.




## MARKING

Model, Style, Resistance Value (in ), Tolerance (in %), Manufacturing Date, VISHAY trade mark.

## ORDERING INFORMATION

| RCH | 25 | 3.3k | ± 5% | R | xxx |
|---|---|---|---|---|---|
| MODEL | STYLE | RESISTANCE VALUE | TOLERANCE | CONNECTIONS | CUSTOM DESIGN |
| | | | Optional<br>± 1%<br>± 2%<br>± 5%<br>± 10% | Optional<br>S: Flat with hole<br>R: Round lead<br>V: M2 screw | Optional |