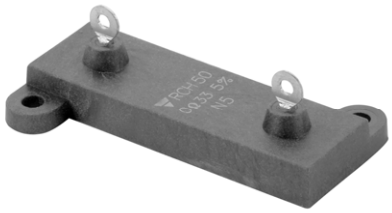
Power Resistor, for Mounting Onto a Heatsink Thick Film Technology



FEATURES

- Compliant with requirement #26 of NF-EN45545-2
- 5 W to 50 W
- High power rating
- High overload capabilities up to 2500 V_{RMS}
- Wide resistance range from 0.24 Ω to 1 MΩ
- High thermal capacity up to 0.8 °C/W
- Easy mounting
- Reduced size and weight
- High insulation: 10^6 MΩ
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

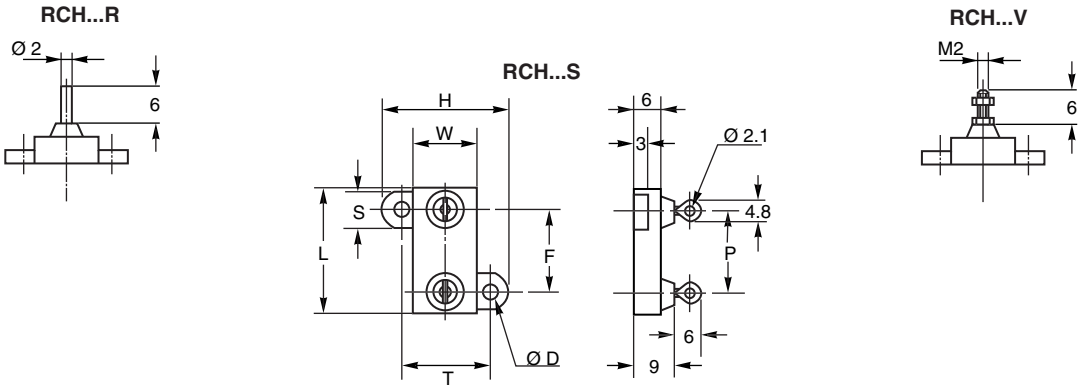
RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

3D Models

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

DIMENSIONS in millimeters



MODEL	RCH5	RCH10	RCH25	RCH50
L	16.6	19	28	47.8
W	9	11	14	15.5
H	16.4	20.6	27.5	29.5
P Leads Pitch	10.2	12.7	18.3	30.5
F Connection 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	2.4	3.2	3.2
Weight (g)	4	5	7	12

Note

- Tolerances unless stated: ± 0.3 mm

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	RESISTANCE RANGE Ω	RATED POWER $P_{25\,°C}$ W	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	SERIES
RCH 5	0.24 to 1M	5	1, 2, 5, 10	150, 250	E24 range
RCH 10	0.24 to 1M	10	1, 2, 5, 10	150, 250	E24 range
RCH 25	0.24 to 1M	25	1, 2, 5, 10	150, 250	E24 range
RCH 50	0.24 to 1M	50	1, 2, 5, 10	150, 250	E24 range

MECHANICAL SPECIFICATIONS

Mechanical Protection	Insulated case
Resistive Element	Cermet
Substrate	Alumina
Connections	Tinned copper alloy

TECHNICAL SPECIFICATIONS

Dissipation and Associated	Onto a heatsink
Power Rating: **Chassis Mounted** **Unmounted**	 5 W to 50 W 2 W to 5.5 W
Temperature Coefficient	± 150 ppm/°C
Insulation Resistance	10^6 MΩ
Total Inductance	≤ 0.1 µH

ENVIRONMENTAL SPECIFICATIONS

Temperature Range	-55 °C to +125 °C
Climatic Category	55 / 125 / 56
Flammability	IEC 60695-11-5 2 applications 30 s separated by 60 s

PERFORMANCE

TESTS	CONDITIONS	REQUIREMENTS
Momentary Overload	NF EN140000 CEI 115_1 2 Pr/5 s $U_S < 1.5\ U_L$	< ± (0.25 % + 0.05 Ω)
Rapid Temperature Change	NF EN140000 125 °C CEI 68215 Test Na 5 cycles -55 °C to +125 °C	< ± (0.25 % + 0.05 Ω)
Load Life	NF EN140000 CEI 115_1 1000 h Pr at +25 °C	< ± (0.5 % + 0.05 Ω)
Humidity (Steady State)	56 days RH 95 % MIL-STD-202 Method 103 B and C	< ± (0.5 % + 0.05 Ω)

RESISTANCE VALUE IN RELATION TO TOLERANCE AND TCR

Resistance Values	< 1 Ω	> 1 Ω
Standard Tolerances	± 5 % ± 10 %	
Standard TCR	± 250 ppm/°C	± 150 ppm/°C
Tolerance on Request	± 1 % to ± 2 %	

SPECIAL FEATURES

MODEL	RCH 5	RCH 10	RCH 25	RCH 50
Power Rating-Chassis Mounted	5 W	10 W	25 W	50 W
Power Rating-Unmounted	2 W	2.5 W	4 W	5.5 W
Thermal Resistance $R_{th\ (j\ -\ c)}$	4.8 °C/W	3.2 °C/W	1.4 °C/W	0.8 °C/W
Limiting Element Voltage (V_{RMS})	160 V	250 V	550 V	1285 V
Dielectric Strength (V_{RMS}) 50 Hz, 1 min MIL-STD-202 Method 301 10 mA max.	2000 V	2000 V	3500 V	3500 V
Critical Resistance	5120 Ω	6250 Ω	12 100 Ω	33 024 Ω

RECOMMENDATIONS FOR MOUNTING ONTO A HEATSINK

- Surfaces in contact must be carefully cleaned.
- The heatsink must have an acceptable flatness: From 0.05 mm to 0.1 mm/100 mm.
- Roughness of the heatsink must be around 6.3 µm. 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 on heatsink	RCH 5	RCH 10	RCH 25	RCH 50
	0.5 Nm	0.6 Nm	0.7 Nm	1 Nm

- 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 1 kV/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 THE HEATSINK

The user must choose according to the 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:

$$P = \frac{\Delta T}{R_{TH\ (j\ -\ c)} + R_{TH\ (c\ -\ h)} + R_{TH\ (h\ -\ a)}} \quad (1)$$

P: Expressed in W

ΔT: Difference between maximum working temperature and room temperature or fluid cooling temperature.

$R_{th\ (j\ -\ c)}$: Thermal resistance value measured between resistive layer and outer side of the resistor. It is the thermal resistance of the component.

$R_{th\ (c\ -\ h)}$: Thermal resistance value measured between outer side of the resistor and upper side of the heatsink. This is the thermal resistance of the interface (grease, thermal pad), and the quality of the fastening device.

$R_{th\ (h\ -\ a)}$: Thermal resistance of the heatsink.

Example:

$R_{TH\ (c\ -\ a)}$ for RCH 25 power rating 20 W at ambient temperature +50 °C
Thermal resistance $R_{TH\ (j\ -\ c)}$: 2.5 °C/W
Considering equation (1) we have:

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

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

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

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

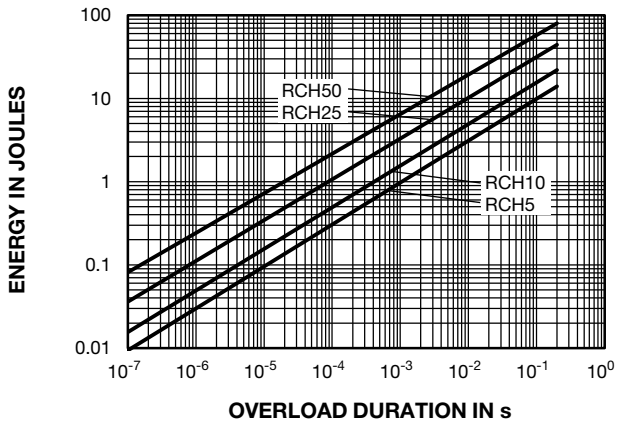
with a thermal grease $R_{TH\ (c\ -\ h)} = 1\ °C/W$, we need a heatsink with $R_{TH\ (h\ -\ a)} = 1.35\ °C/W$

OVERLOADS

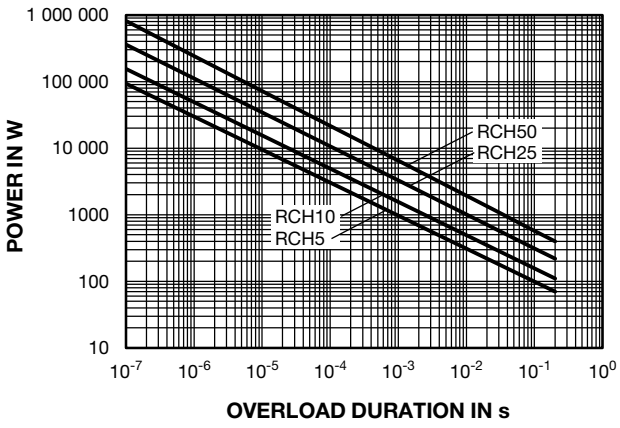
The applied voltage must always be lower than the maximum overload voltage as shown in the special features table.

The values indicated on the graph below are applicable to resistors in air or mounted onto a heatsink.

ENERGY CURVE



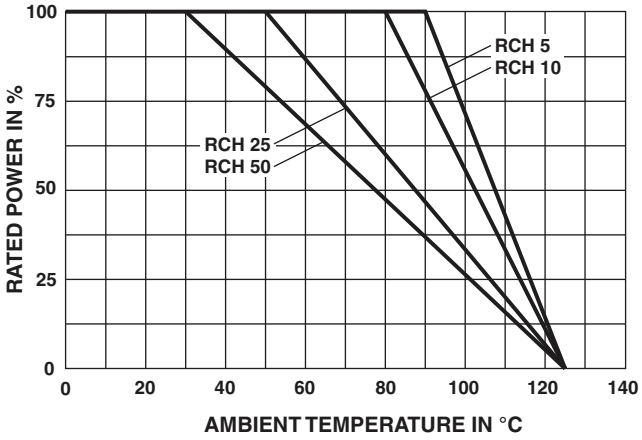
POWER CURVE



POWER RATING

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 Ω), tolerance (in %), manufacturing date, Vishay Sfernice trademark.

ORDERING INFORMATION

RCH	25	3.3 kΩ	± 5 %	R	xxx
MODEL	STYLE	RESISTANCE VALUE	TOLERANCE	CONNECTIONS	CUSTOM DESIGN
			Optional ± 1 % ± 2 % ± 5 % ± 10 %	Optional S: flat with hole R: round lead V: M2 screw	Optional

GLOBAL PART NUMBER INFORMATION

R	C	H	1	0	S	3	3	0	0	0	J	S	0	6	3

GLOBAL MODEL	SIZE	LEADS	OHMIC VALUE	TOLERANCE	PACKAGING	SPECIAL
RCH	**05** **10** **25** **50**	**R** = round lead **V** = M2 screw **S** = flat with hole	The first four digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point. **4R700** = 4.7 Ω **48701** = 48 700 Ω **R0100** = 0.01 Ω **R6800** = 0.68 Ω **27000** = 2700 Ω = 2.7 kΩ	**F** = 1 % **G** = 2 % **J** = 5 % **K** = 10 %	**S06** = bag 25 pieces	As applicable Ex = **XXX**

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