

The content of this specification may change without notification 12/07/07

Custom solutions are available.

## HOW TO ORDER

### RHP-10A-100 F Y R

#### Packaging (50 pieces)

T = tube or R = tray (flanged type only)

#### TCR (ppm/°C)

Y =  $\pm 50$  Z =  $\pm 100$  N =  $\pm 250$

#### Tolerance

J =  $\pm 5\%$  F =  $\pm 1\%$

#### Resistance

R02 = 0.02  $\Omega$       100 = 10.0  $\Omega$   
 R10 = 0.10  $\Omega$       101 = 100  $\Omega$   
 1R0 = 1.00  $\Omega$       512 = 51.0K  $\Omega$

#### Size/Type (refer to spec)

10X    20B    50A    100A  
 10B    20C    50B  
 10C    20D    50C

#### Series

High Power Resistor

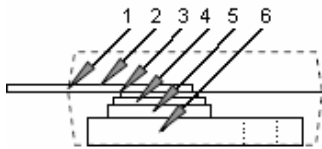
## FEATURES

- 20W, 35W, 50W, 100W, and 140W available
- TO126, TO220, TO263, TO247 packaging
- Surface Mount and Through Hole technology
- Resistance Tolerance from  $\pm 5\%$  to  $\pm 1\%$
- TCR (ppm/°C) from  $\pm 250$ ppm to  $\pm 50$ ppm
- Complete thermal flow design
- Non-Inductive impedance characteristic and heat venting through the insulated metal tab
- Durable design with complete thermal conduction, heat dissipation, and vibration

## APPLICATIONS

- RF circuit termination resistors
- CRT color video amplifiers
- Suits high-density compact installations
- High precision CRT and high speed pulse handling circuit
- High speed SW power supply
- Power unit of machines
- Motor control
- Drive circuits
- Automotive
- Measurements
- AC motor control
- RF linear amplifiers
- VHF amplifiers
- Industrial computers
- IPM, SW power supply
- Volt power sources
- Constant current sources
- Industrial RF power
- Precision voltage sources

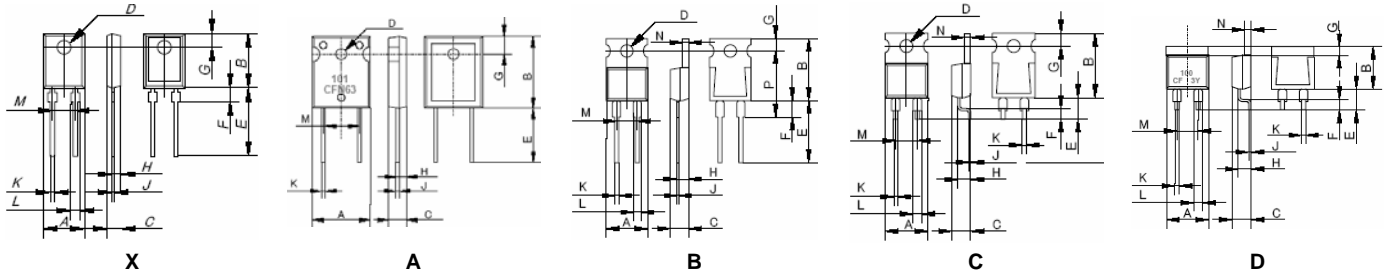
## CONSTRUCTION – shape X and A



there is insulation between the flange and the resistor

1	Molding	Epoxy
2	Leads	Tin plated Cu
3	Conductor	Copper
4	Resistor	Ni-Cr
5	Substrate	Alumina
6	Flange	Ni plated Cu

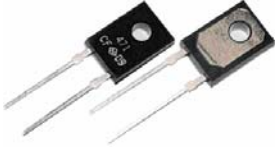

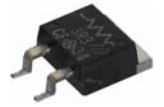
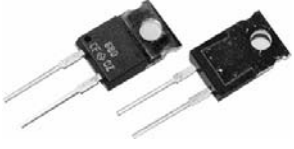


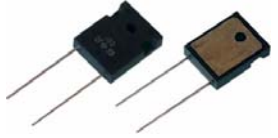



## SCHEMATIC



## DIMENSIONS (mm)

Model	RHP-10X	RHP-10B	RHP-10C	RHP-20B	RHP-20C	RHP-20D	RHP-50A	RHP-50B	RHP-50C	RHP-100E
Shape	X	B	C	B	C	D	A	B	C	A
A	8.5 $\pm$ 0.2	8.5 $\pm$ 0.2	10.1 $\pm$ 0.2	10.1 $\pm$ 0.2	10.1 $\pm$ 0.2	10.1 $\pm$ 0.2	16.0 $\pm$ 0.2	10.6 $\pm$ 0.2	10.6 $\pm$ 0.2	16.0 $\pm$ 0.2
B	12.0 $\pm$ 0.2	12.0 $\pm$ 0.2	15.0 $\pm$ 0.2	15.0 $\pm$ 0.2	15.0 $\pm$ 0.2	10.3 $\pm$ 0.2	20.0 $\pm$ 0.5	15.0 $\pm$ 0.2	15.0 $\pm$ 0.2	20.0 $\pm$ 0.5
C	3.1 $\pm$ 0.2	3.1 $\pm$ 0.2	4.5 $\pm$ 0.2	4.5 $\pm$ 0.2	4.5 $\pm$ 0.2	4.5 $\pm$ 0.2	4.8 $\pm$ 0.2	4.5 $\pm$ 0.2	4.5 $\pm$ 0.2	4.8 $\pm$ 0.2
D	3.1 $\pm$ 0.1	3.1 $\pm$ 0.1	3.6 $\pm$ 0.1	3.6 $\pm$ 0.1	3.6 $\pm$ 0.1	-	3.2 $\pm$ 0.1	1.5 $\pm$ 0.1	1.5 $\pm$ 0.1	3.2 $\pm$ 0.1
E	17.0 $\pm$ 0.1	17.0 $\pm$ 0.1	5.0 $\pm$ 0.1	15.5 $\pm$ 0.1	5.0 $\pm$ 0.1	5.0 $\pm$ 0.1	14.5 $\pm$ 0.1	2.7 $\pm$ 0.1	2.7 $\pm$ 0.1	14.5 $\pm$ 0.5
F	3.2 $\pm$ 0.5	3.2 $\pm$ 0.5	2.5 $\pm$ 0.5	4.0 $\pm$ 0.5	2.5 $\pm$ 0.5	2.5 $\pm$ 0.5	-	5.08 $\pm$ 0.5	5.08 $\pm$ 0.5	-
G	3.8 $\pm$ 0.2	3.8 $\pm$ 0.2	3.0 $\pm$ 0.2	3.0 $\pm$ 0.2	3.0 $\pm$ 0.2	2.2 $\pm$ 0.2	5.1 $\pm$ 0.5	0.75 $\pm$ 0.2	0.75 $\pm$ 0.2	5.1 $\pm$ 0.5
H	1.75 $\pm$ 0.1	1.75 $\pm$ 0.1	2.75 $\pm$ 0.1	2.75 $\pm$ 0.2	2.75 $\pm$ 0.2	2.75 $\pm$ 0.2	3.63 $\pm$ 0.2	0.5 $\pm$ 0.2	0.5 $\pm$ 0.2	3.63 $\pm$ 0.2
J	0.5 $\pm$ 0.05	0.5 $\pm$ 0.05	0.5 $\pm$ 0.05	0.5 $\pm$ 0.05	0.5 $\pm$ 0.05	0.5 $\pm$ 0.05	-	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	-
K	0.6 $\pm$ 0.05	0.6 $\pm$ 0.05	0.75 $\pm$ 0.05	0.75 $\pm$ 0.05	0.75 $\pm$ 0.05	0.75 $\pm$ 0.05	0.8 $\pm$ 0.05	19 $\pm$ 0.05	19 $\pm$ 0.05	0.8 $\pm$ 0.05
L	1.4 $\pm$ 0.05	1.4 $\pm$ 0.05	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	-	2.7 $\pm$ 0.05	2.7 $\pm$ 0.05	-
M	5.08 $\pm$ 0.1	5.08 $\pm$ 0.1	5.08 $\pm$ 0.1	5.08 $\pm$ 0.1	5.08 $\pm$ 0.1	5.08 $\pm$ 0.1	10.9 $\pm$ 0.1	3.6 $\pm$ 0.1	3.6 $\pm$ 0.1	10.9 $\pm$ 0.1
N	-	-	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	1.5 $\pm$ 0.05	-	15 $\pm$ 0.05	2.0 $\pm$ 0.05	-
P	-	-	-	16.0 $\pm$ 0.5	-	-	-	-	-	-

## OVERVIEW

Model	Physical (top & bottom view)	Features
RHP-10X		<ul style="list-style-type: none"> <li>TO126 Package</li> <li>20W high power resistor</li> <li>5.9 C/W heat resistance from hot spot to flange.</li> <li>0.10 ohm to 220 ohm resistance range</li> </ul>
RPH-10B		<ul style="list-style-type: none"> <li>TO220 Package</li> <li>Through hole RPH-10B 20W high power</li> <li>5.9 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.10 ohm to 220 ohm resistance range</li> </ul>
RHP-10C		<ul style="list-style-type: none"> <li>TO220 Package</li> <li>Surface mount RHP-10C 10W high power</li> <li>5.9 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.10 ohm to 220 ohm resistance range</li> </ul>
RHP-20B		<ul style="list-style-type: none"> <li>TO220 Package</li> <li>Through hole RHP-20B 35W high power</li> <li>3.3 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.02 ohm to 220 ohm resistance range</li> </ul>
RHP-20C		<ul style="list-style-type: none"> <li>TO220 Package</li> <li>Surface mount RHP-20C 20W</li> <li>3.3 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.02 ohm to 220 ohm resistance range</li> </ul>
RHP-20D		<ul style="list-style-type: none"> <li>TO263 (D2P) Package - Surface Mount Molded</li> <li>20W high power resistor</li> <li>3.3 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.01 ohm to 51K ohm resistance range</li> </ul>
RHP-50A		<ul style="list-style-type: none"> <li>TO247 Package</li> <li>100W high power resistor</li> <li>1.3 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.01 ohm to 220 ohm resistance range</li> </ul>
RHP-50B		<ul style="list-style-type: none"> <li>TO220 Package</li> <li>Through hole RHP-50B 50W high power</li> <li>2.3 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.10 ohm to 220 ohm resistance range</li> </ul>
RHP-50C		<ul style="list-style-type: none"> <li>TO220 Package</li> <li>Surface mount RHP-50C 50W high power</li> <li>2.3 C/W heat resistance from hot spot to flange via thin film metallization technology</li> <li>0.10 ohm to 220 ohm resistance range</li> </ul>
RHP-100A		<ul style="list-style-type: none"> <li>TO247 Package</li> <li>140W high power resistor</li> <li>0.9 C/W heat resistance from hot spot to flange or metal back plate. via thin film metallization technology</li> <li>0.02 ohm to 220 ohm resistance range</li> </ul>



# HIGH POWER RESISTOR – 20W to 140W

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## ELECTRICAL SPECIFICATIONS

Model	RHP-10X	RHP-10B	RHP-10C	RHP-20D	RHP-20B	RHP-20C
Rated Power(heat sink)	20W	20W	20W	20W	35W	20W
Rated Power	1W	1W	1W	2W	1W	1W
Heat Resistance	5.9 C/W	5.9 C/W	5.9 C/W	3.3 C/W	3.3 C/W	3.3 C/W
Withstanding Voltage	2000V AC	2000V DC	2000V DC	2000V DC	2200V DC (1500V AC)	2200V DC (1500V AC)
Max. Operating Voltage	-	500V or $\sqrt{P \cdot R}$	500V or $\sqrt{P \cdot R}$	500V or $\sqrt{P \cdot R}$	500V or $\sqrt{P \cdot R}$	500V or $\sqrt{P \cdot R}$

Resistance	0.01 ~ 0.091		0.10 ~ 9.1		10 ~ 220	
Nominal Resistance	E6		E24		E24	
TCR (ppm°C)	±250		±100		±50	
Tolerance	±5%		±5%, ±1%		±1%	
Operating Temp.	-55°C ~ +155°C					

Model	RHP-50A	RHP-50B & RHP-50C	RHP-100A
Rated Power(heat sink)	100W	50W	140W
Rated Power	3W	1W	3W
Max. Applied Power	100W	-	-
Heat Resistance	1.3 C/W	2.3 C/W	0.9 C/W
Withstanding Voltage	2500V AC	2000V DC	2500V AC
Max. Operating Voltage	700V or $\sqrt{P \cdot R}$ (applied)	500V or $\sqrt{P \cdot R}$	700V or $\sqrt{P \cdot R}$ (applied)

Resistance	0.01~0.091	0.1 ~ 9.1	10 ~ 220	0.1 ~ 9.1	10 ~ 220	0.02~0.091	0.1 ~ 9.1	10 ~ 220
Nominal Resistance	E6	E12	E24	E24	E24	E6	E12	E24
TCR (ppm°C)	> ±250	±100	±50	±100	±50	> ±250	±100	±50
Tolerance	±5%	±5%, ±1%	±1%	±5%, ±1%	±1%	±5%	±5%, ±1%	±1%
Operating Temp.	-55°C ~ +155°C							

Resistance Range from 240 ohm to 51K ohm is available as a semi-custom solution for all of the RHP series.  
Values such as 2.0, 2.5, 4.0, and 5.0 are available upon special request.

## PERFORMANCE

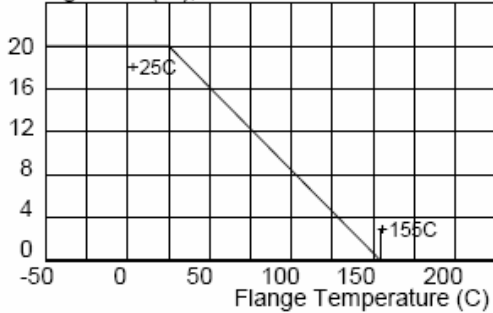
Item	Performance	Condition
Rated Power	All other models	As specified
	RHP-50A, 100A	As specified
Rated Power (without heat sink)	All other models	Free Air
	RHP-20D	Attached on a simple footprint
Withstanding Voltage	As specified	60 seconds
Load Life	± (1.0%+0.05Ω)	25°C, 90 min on, 30 min. off, 1000 hrs.
Humidity	All other models	± (1.0%+0.05Ω)
	RHP-10X	± (1.0%+0.05Ω)
Temperature Cycle	All other models; RHP-20B & 20C (0.10 ~ 220Ω)	± (0.25%+0.05Ω)
	RHP-20B & 20C (0.02 ~ 0.091Ω)	± (1.0%+0.05Ω)
Soldering Heat	All other models; RHP-20B & 20C (0.10 ~ 220Ω)	± (0.1%+0.05Ω)
	RHP-50A, 100A	± (0.25%+0.05Ω)
	RHP-20B & 20C (0.02 ~ 0.091Ω)	± (0.5%+0.05Ω)
Solderability	All other models	> 95% of the surface
	RHP-10X, RHP-50A, 100A	> 75% of round
Insulation Resistance	> 1,000 Meg Ω	Between terminals and metal back plate
Vibration	± (0.25%+0.05Ω)	

The performance data applies to all RHP models unless otherwise noted.

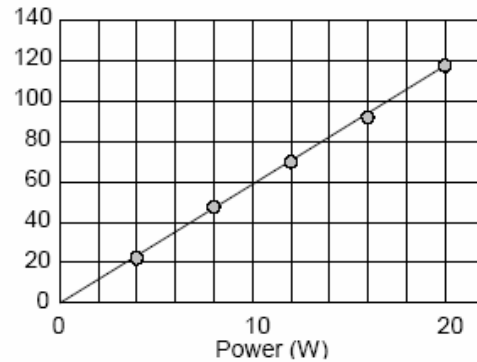
## RHP-10X

Derating Curve

Rating Power(W), with 2.8K/W heat sink.

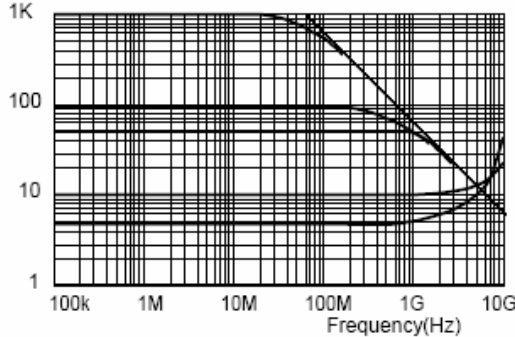


Temperature Rise at Flange Temperature(C)



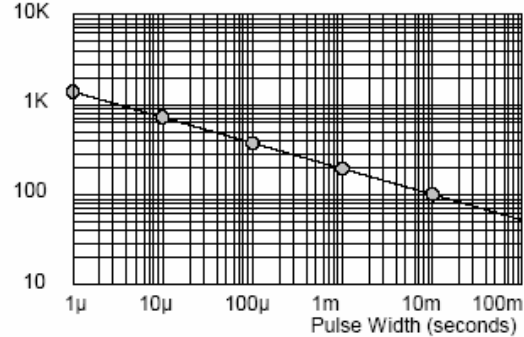
Frequency Characteristics

Impedance (ohm)



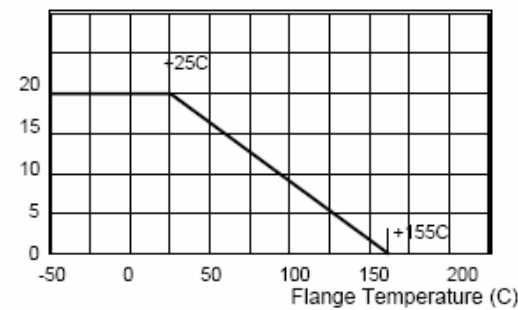
One time rectangular impulse Durability

Pulse Peak Watt (Watts)

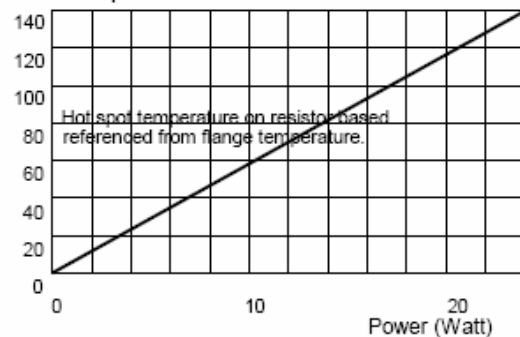


## RHP-10B, RHP-10C

Power(W) Derating

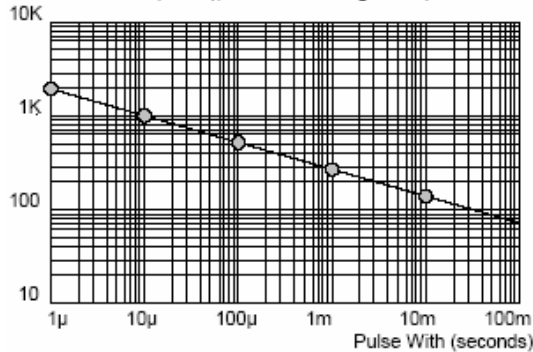


(C) Temperature Rise



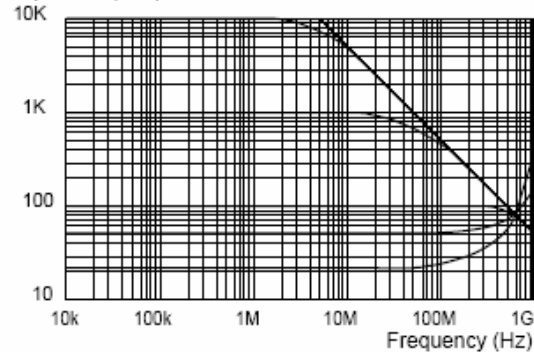
Pulse Energy Durability

Pulse Peak Watt (Watts), one time rectangular impulse.



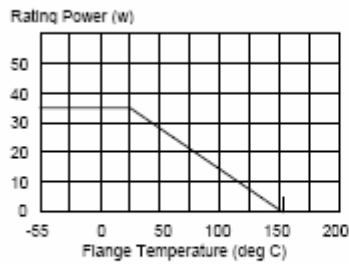
Frequency Characteristics

Impedance (ohm)

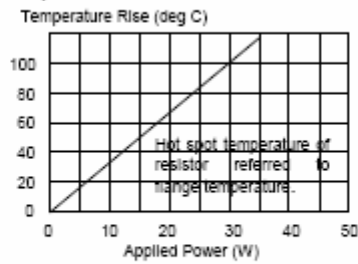


## RHP-20B, RHP-20C

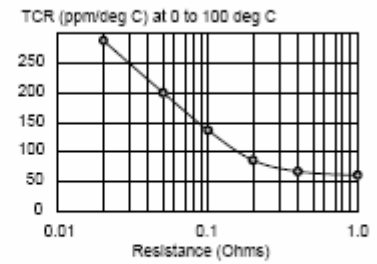
### Derating



### Temperature Rise

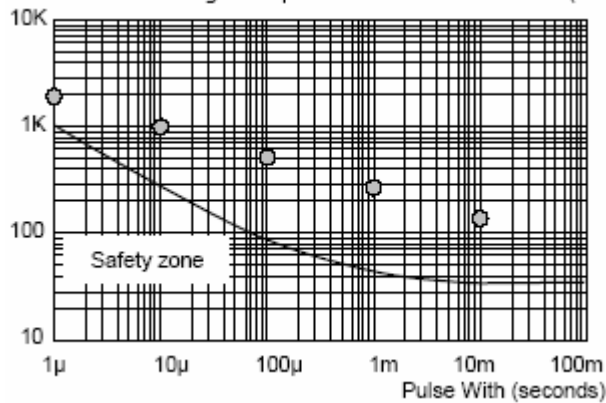


### Typical TCR in Low Ohms



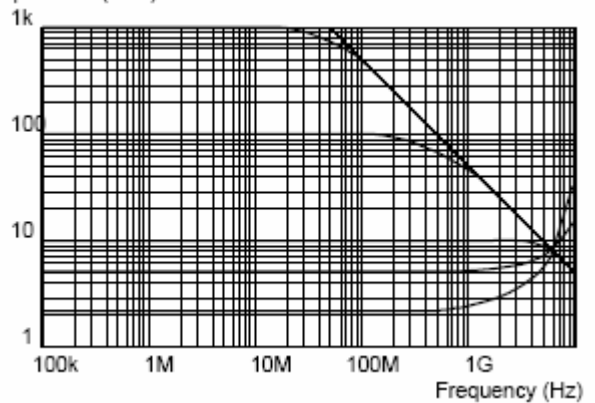
### Pulse Energy Durability (Dot shows damage)

One time rectangular impulse test. Pulse Peak Watt (Watts)



### Frequency Characteristics

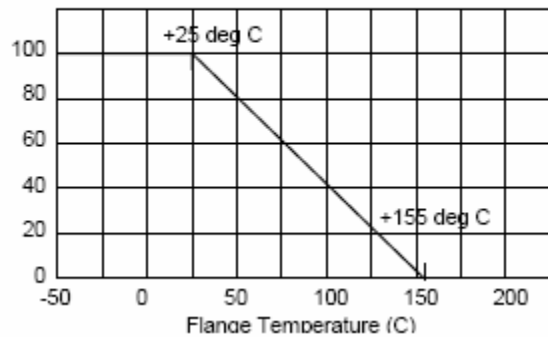
Impedance (ohm)



## RHP-20D

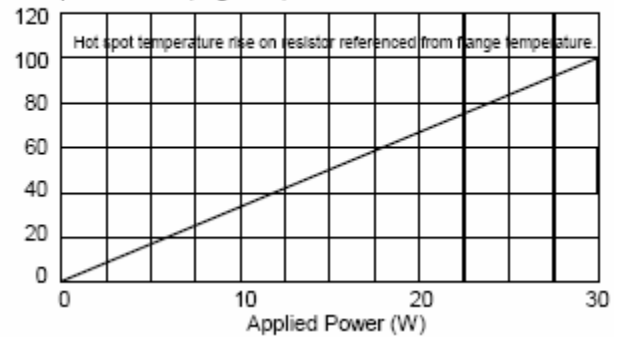
### Power Derating

% Power



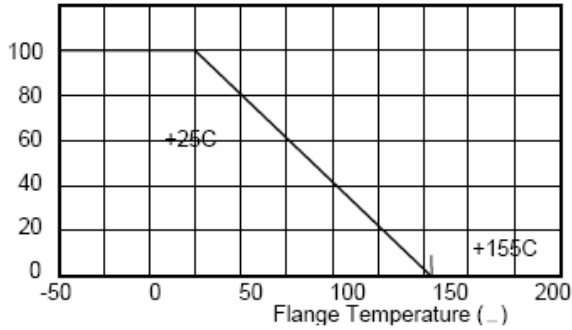
### Temperature Rise

Temperature rise (degree C)

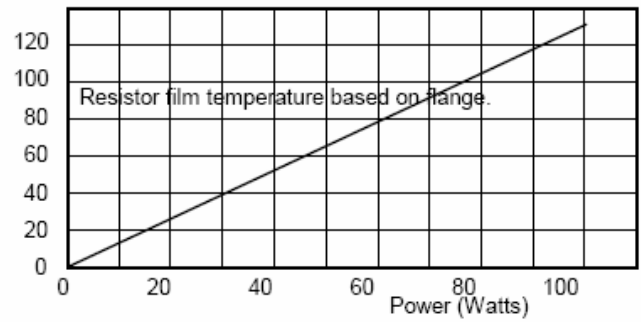


## RHP-50A

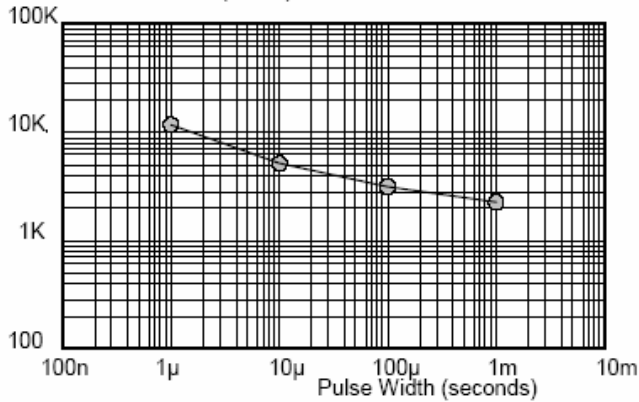
**Derating Curve**  
Rating Power(W)



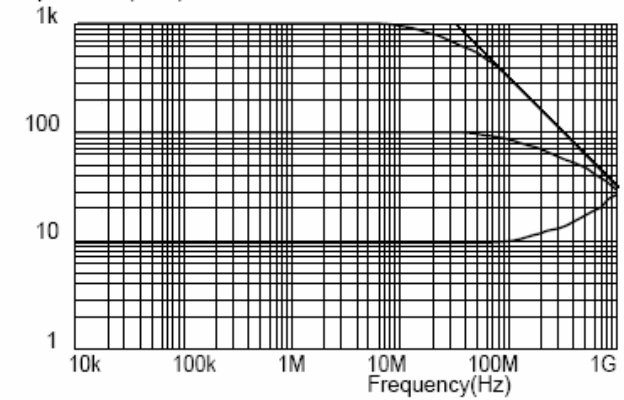
**Temperature Rise**  
Temperature Rise (C)



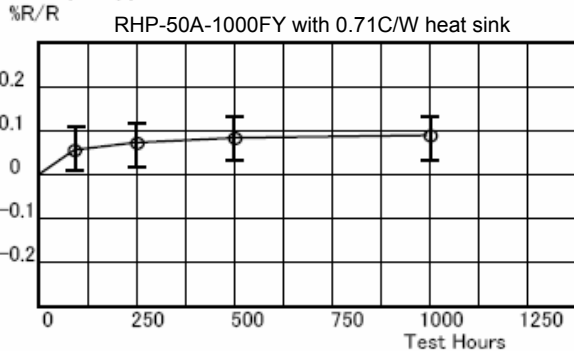
**Pulse Energy Durability**  
Pulse Peak Watt (Watts)



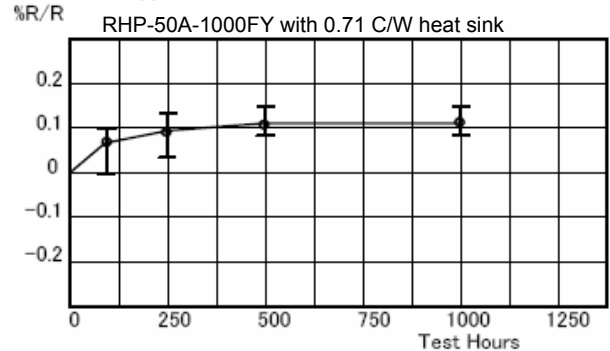
**Frequency Characteristics**  
Impedance (ohm)



**Humidity (Typical)**

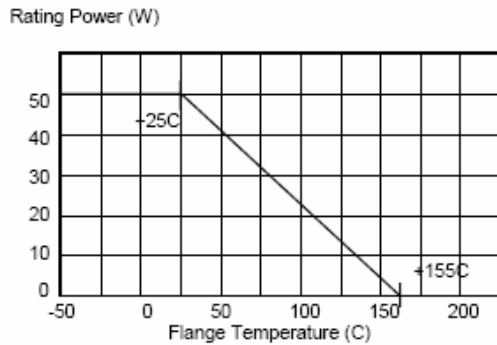


**Load Life (Typical)**

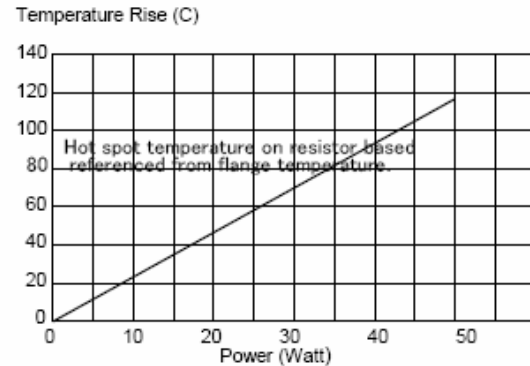


## RHP-50B, RHP-50C

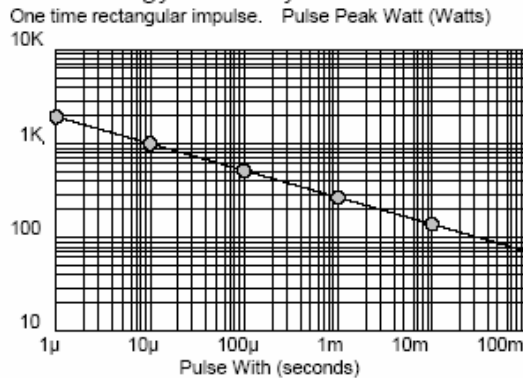
### Derating



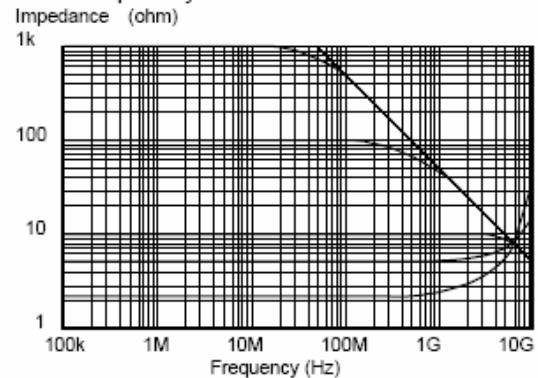
### Temperature Rise



### Pulse Energy Durability

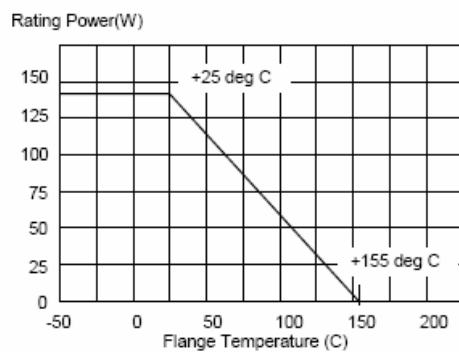


### Frequency Characteristics

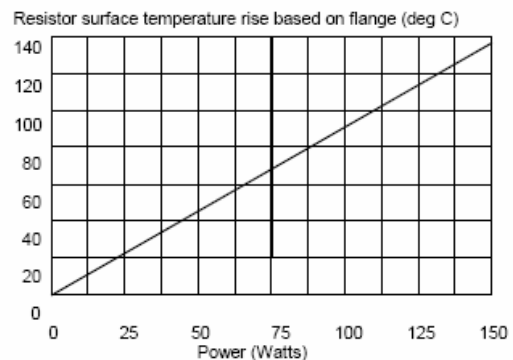


## RHP-100A

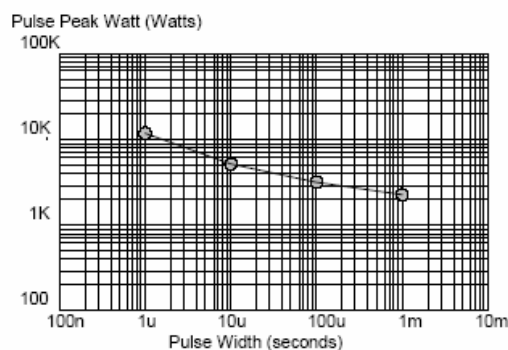
### Derating Curve



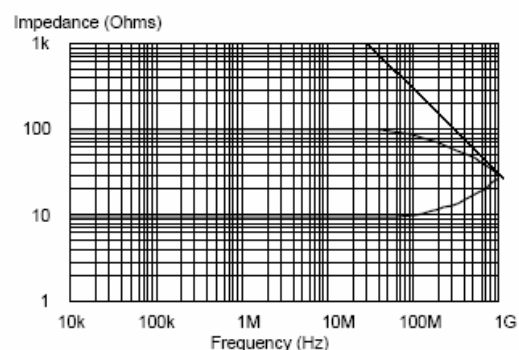
### Temperature Rise



### Pulse Energy Durability



### Frequency Characteristics



## NOTES

### GENERAL

- 0.1% tolerance resistors and resistance range from 240 ohm to 51K ohm are available as a semi-custom solution
- Use of heat conduction grease on surface of flange is recommended.
- Insulation material is unnecessary between flange and resistors; the flange and resistor are separated by alumina substrate.
- It surface mount soldering, temperature profile in the flange shall not exceed 220°C.
- Heat sink design will be performed when the resistor operating temperature is less than 155°C

### RHP-10X

- Heat resistance between resistor and flange is 3.6K/W
- For application to r-f circuit, Lead formed RHP-10X (smd) is prepared; RHP-10X are screw mount style.
- At resistance from 220 to 51kohms rating power shall be restricted in 10W.

### RHP-10B, RHP-10C

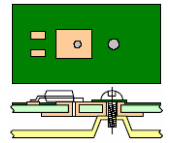
- Heat resistance between resistor and flange is 5.9 C/W.

### RHP-20B, RHP-20C

- Heat resistance between resistor and flange is 3.3 C/W
- At resistance from 220 to 51kohms rating power shall be restricted in 20W.
- The terminal material is Tin plated copper, but inside of resistor contains PbAg high melting solder that is exempted by RoHS directive 2002/95/EC.

### RHP-20D

- At flange soldering, temperature profile in flange shall not exceed 270°C for 30 minutes.
- Heat resistance between resistor and flange is 3.3C/W.
- This model shall be fit to Copper of printed wiring board with lower temperature solder than 220°C. Sn-Cu soldering will be done by soldering iron with 300°C -350°C tip temperature for less than 30 minutes.



### RHP-50A

- Using heat conduction grease on surface of flange is recommended.
- Heat resistance between resistor and flange is 1.3 K/W. Heat design will be done, as resistor temperature shall be under 155°C in operation.

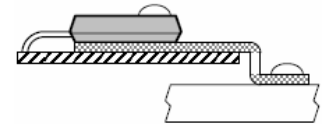
### RHP-50B, RHP-50-C

- Heat resistance between resistor and flange is 3.3 C/W.
- 5ppm TCR resistors are available as a semi-custom product
- At resistance from 220 to 51kohms rating power shall be restricted in 30W.
- Please note, terminal material is Tin plated copper, but inside of resistor contains PbAg high melting solder that is exempted by RoHS directive 2002/95/EC.

### RHP-100A

#### Recommendation

- Flat surface heat sink, thermal compound and sufficient mount screw torque will be necessary for good heat transfer.
- In a rush current protection application, such as charge current limitation resistor, sufficient power derating will be necessary.



Design for Heat Release

## TAPE DIMENSIONS (mm)

### Reel Dimensions

Outer Diameter: 300mm  
 Inner Diameter: 100mm  
 Width: 23.9mm min., 27.4mm max

Standard packaging is RoHS PS/PE tube packaging, which contains 50 pieces per tube. When ordering, note Tube (T) or Tray (R)

