Metal (Oxide) Film Resistors

Type: **ERG(X)S (Small size)**
(0.5 W, 1 W, 2 W, 3 W, 5 W)
ERG(X)F (Anti-heat conducting for PCB)
(1 W, 2 W, 3 W, 5 W)

Features

- Miniaturized
  50 % smaller compared to existing models
- Non-flammable
- High Reliability
- Automatic Insertion
- Reference Standards
  IEC 60115-2, IEC 60115-4, JIS C 5201-4, EIAJ RC-2138
- RoHS compliant

Explanation of Part Numbers

Ex.1 : ERX type

1	2	3	4	5	6	7	8	9	10	11	12
E	R	X		2	S	Z	J	W	1	R	0	E

Product Code	
ERX	Metal Film Resistors

Power Rating at 70 °C	
12	0.5 W
1	1 W
2	2 W
3	3 W
5	5 W

Style · Specification	
S	Small size 0.5 W to 5 W
F	Small size Anti-heat conducting type (Fe lead wire) 1 W to 5 W

Resistance Tolerance	
J	±5 %
G	±2 %

Resistance Value
The first two digits are significant figures of resistance and the third one denotes number of zeros following.
Decimal point is expressed by
(Ex.) 1R0 : 1.0 Ω

"Z" is added according to resistance.

Part No.	Resistance Tolerance	Resistance Value Range (Ω) ERX□□SZ	Resistance Value Range (Ω) ERX□□S
ERX12S	±5 %	0.10 to 0.18	0.20 to 9.1
	±2 %	0.10 to 0.91	1.0 to 9.1
ERX1S	±5 %	0.10 to 0.18	0.20 to 9.1
ERX1F	±2 %	0.10 to 0.91	1.0 to 9.1
ERX2S	±5 %	0.10 to 0.20	0.22 to 9.1
ERX2F	±2 %	0.10 to 0.91	1.0 to 9.1
ERX3S	±5 %	0.10 to 0.20	0.22 to 9.1
ERX3F	±2 %	0.10 to 0.91	1.0 to 9.1
ERX5S	±5 %	—	0.33 to 9.1
ERX5F	±2 %		1.0 to 9.1

The matrix of forming and packaging is as shown in the table below.

Code	Forming / Packaging	Forming & Taping matrix 12S	1S	2S	3S	5S	1F	2F	3F	5F
□···□	Straight lead wire type	○	○	○	○	○	○	○	○	○
□···P	Cut & Forming type	○	○	○	○	○				
□···V	Axial taping type (Straight lead)	○	○	○	○		○	○	○	
U···V	Axial taping type (Stand off)		○	○	○					
□···E	Radial taping type (E type)	○	○	○						
W···E	Radial taping type (WE type)	○	○	○	○					
□··H	Cut & Forming type						○	○	○	○
S···E	Radial taping type (SE type)						○	○	○	

The above example 1 shows a small metal film resistor, 2 W power rating, resistance value of 1.0 Ω, tolerance ±5 %, and package of radial taping.

Ex.2 : ERG type

1	2	3	4	5	6	7	8	9	10	11	12
E	R	G		2	S	J	W	1	0	3	E

Product Code	
ERG	Metal Oxide Film Resistors

Power Rating at 70 °C	
12	0.5 W
1	1 W
2	2 W
3	3 W
5	5 W

Style · Specification	
S	Small size 0.5 W to 5 W
F	Small size Anti-heat conducting type (Fe lead wire) 1 W to 5 W

Resistance Tolerance	
J	±5 %
G	±2 %

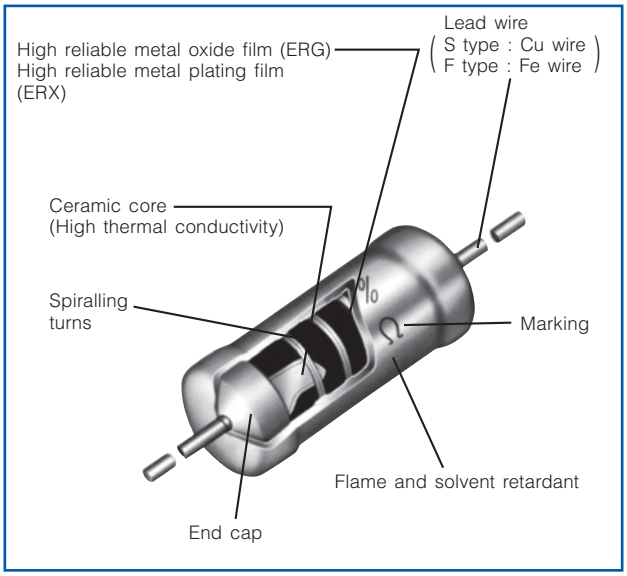
Resistance Value
The first two digits are significant figures of resistance and the third one denotes number of zeros following.
Decimal point is expressed by
(Ex.) 103 : 10 kΩ

The matrix of forming and packaging is as shown in the table below.

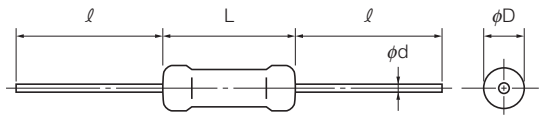
Code	Forming / Packaging	Forming & Taping matrix 12S	1S	2S	3S	5S	1F	2F	3F	5F
□···□	Straight lead wire type	○	○	○	○	○	○	○	○	○
□···P	Cut & Forming type	○	○	○	○	○				
□···V	Axial taping type(Straight lead)	○	○	○	○		○	○	○	
U···V	Axial taping type(Stand off)		○	○	○					
□···E	Radial taping type(E type)	○	○	○						
W···E	Radial taping type(WE type)	○	○	○	○					
□···H	Cut & Forming type					○	○	○	○	○
S···E	Radial taping type(SE type)					○	○	○		

The above example 2 shows a small metal oxide film resistor, 2 W power rating, resistance value of 10 kΩ, tolerance ±5 %, and package of radial taping.

Construction



Dimensions in mm (not to scale)



Part No.	Dimensions (mm)				Mass (Weight) [g/pc.]
	L	ϕD	ℓ	ϕd	
ERG(X)12S	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.26
ERG(X)1S	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm0.5}$	$30.0^{\pm3.0}$	$0.65^{\pm0.05}$	0.33
ERG(X)1F				$0.80^{\pm0.05}$	
ERG(X)2S ERG(X)2F	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm1.0}$	$30.0^{\pm3.0}$	$0.80^{\pm0.05}$	0.66
ERG(X)3S ERG(X)3F	$15.00^{\pm1.50}$	$5.5^{\pm1.0}$	$38.0^{\pm3.0}$	$0.80^{\pm0.05}$	1.47
ERG(X)5S ERG(X)5F	$24.00^{\pm1.50}$	$8.0^{\pm1.0}$	$38.0^{\pm3.0}$	$0.80^{\pm0.05}$	3.54

Ratings

Part No.	Power Rating at 70 °C (W)	Limiting Element Voltage[1] (V)	Maximum Overload Voltage[2] (V)	Maximum Intermittent Overload Voltage[3] (V)	Dielectric Withstanding Voltage (VAC)	Res. Tol. (%)[4]	Resistance Range (Ω)[5] min.[6]	Resistance Range (Ω)[5] max.	T.C.R. ($\times10^{-6}$/°C)	Standard Resistance Value
ERG(X)12S	0.5	300	600	600	350	G (±2)	1	22 k	±350	E24
						J (±5)	0.2	47 k		
ERG(X)1S ERG(X)1F	1	350	600	600	350	G (±2)	1	68 k	±350	E24
						J (±5)	0.2	100 k		
ERG(X)2S ERG(X)2F	2	350	700	1000	600	G (±2)	1	100 k	±350	E24
						J (±5)	0.22	100 k		
ERG(X)3S ERG(X)3F	3	350	700	1000	1000	G (±2)	1	100 k	±300	E24
						J (±5)	0.22	100 k		
ERG(X)5S ERG(X)5F	5	500	1000	1500	1000	G (±2)	1	100 k	±200	E24
						J (±5)	0.33	100 k		

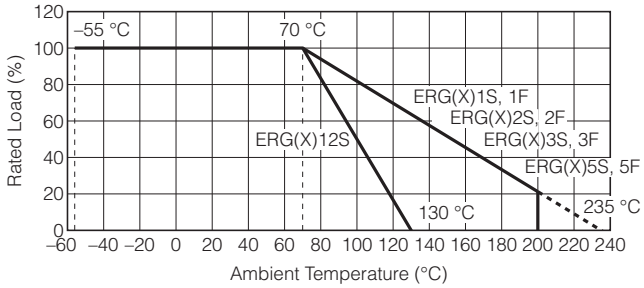
(1) Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=$\sqrt{\text{Power Rating}\times\text{Resistance Value}}$ or Limiting Element Voltage listed above whichever less.
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from SOTV=2.5×Power Rating or max. Overload Voltage listed above whichever less.
(3) Intermittent Overload Test Voltage (IOTV) shall be determined from IOTV=4.0×Power Rating or max. Intermittent Overload Voltage listed above whichever less.
(4) Resistance tolerance is of use besides range listed, please inquire.
(5) Resistance Range Type ERG : ≧10 Ω
Type ERX : ≦9.1 Ω
(6) As for the low resistance value range, "Z" is given to the part number. (Refer to the explanation of part numbers.)

✻ Z type is non standard resistance values.

Code	Part No.	Res.Tol.	Res. Value Range	Code	Part No.	Res.Tol.	Res. Value Range
Z	12S	±2 %	0.1 to 0.91 Ω	Z	2S	±2 %	0.1 to 0.91 Ω
		±5 %	0.1 to 0.18 Ω		2F	±5 %	0.1 to 0.2 Ω
	1S	±2 %	0.1 to 0.91 Ω		3S	±2 %	0.1 to 0.91 Ω
	1F	±5 %	0.1 to 0.18 Ω		3F	±5 %	0.1 to 0.2 Ω

Power Derating Curve

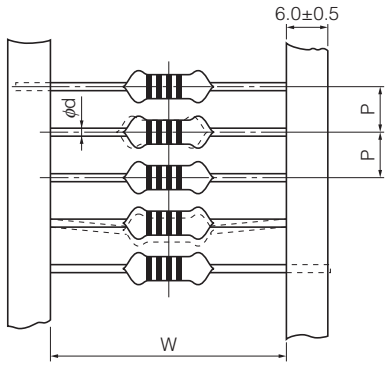
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Metal (Oxide) Film Resistors Packaging Methods

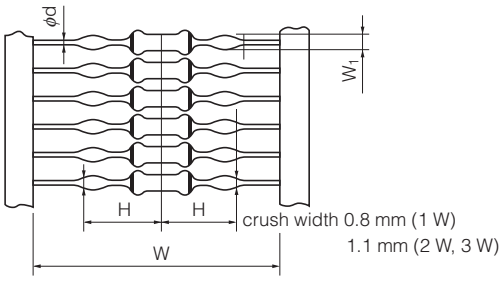
Taped & Box

ERG(X)□□S□□□□V

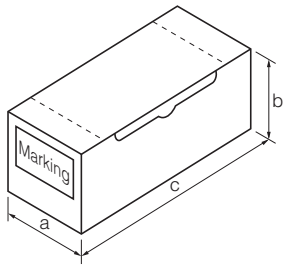


Stand-off Taped & Box

ERG(X)□□S□U□□□V

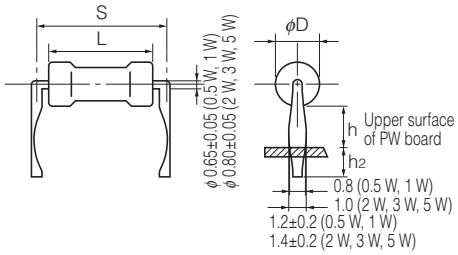


Part Number	Standard Quantity (pcs./box)	Taping (mm)						Box (mm)		
		P	50×P	W	H	W_1	ϕd	a	b	c
ERG(X) 12S□□□□□V	2,000	$5.0^{\pm0.3}$	$250^{\pm2}$	$52.0^{\pm1.5}$	—	—	$0.65^{\pm0.05}$	85	80	255
ERG(X) 1S□□□□□V	2,000	$5.0^{\pm0.3}$	$250^{\pm2}$	$52.0^{\pm1.5}$	—	—	$0.65^{\pm0.05}$	85	80	255
ERG(X) 1S□U□□□V					$12.0^{0}_{-2.0}$	$1.20^{+0.15}_{0}$				
ERG(X) 2S□□□□□V	1,000	$5.0^{\pm0.3}$	$250^{\pm2}$	$52.0^{\pm1.5}$	—	—	$0.80^{\pm0.05}$	85	80	255
ERG(X) 2S□U□□□V					$15.5^{0}_{-2.0}$	$1.40^{+0.15}_{0}$				
ERG(X) 3S□□□□□V	1,000	$10.0^{\pm0.5}$	$500^{\pm2}$	$74.0^{\pm2.0}$	—	—	$0.80^{\pm0.05}$	105	100	325
ERG(X) 3S□U□□□V					$23.0^{0}_{-2.0}$	$1.4^{+0.15}_{0}$				



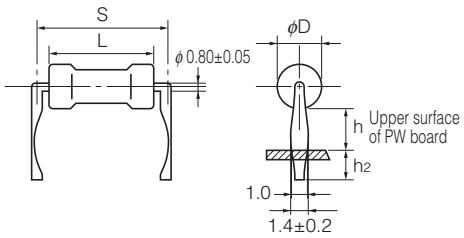
Cut & Formed Type

ERG(X)□□S□□□□P



Part Number	Standard Quantity (pcs./box)	Dimensions (mm)				
		L	ϕD	S	h	h_2
ERG(X) 12S□□□□P	1,000	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$10.0^{\pm1.5}$	$4.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 1S□□□□P	1,000	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm0.5}$	$12.5^{\pm1.5}$	$4.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 2S□□□□P	1,000	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm1.0}$	$15.0^{\pm1.5}$	$6.0^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 3S□□□□P	1,000	$15.00^{\pm1.50}$	$5.5^{\pm1.0}$	$20.0^{\pm2.0}$	$6.5^{\pm1.5}$	$4.0^{\pm1.5}$
ERG(X) 5S□□□□P	500	$24.00^{\pm1.50}$	$8.0^{\pm1.0}$	$30.0^{\pm2.0}$	$7.5^{\pm1.5}$	$4.0^{\pm1.5}$

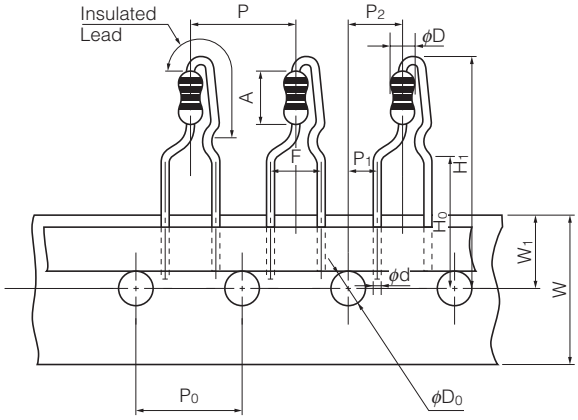
ERG(X)□F□□□□H



Part Number	Standard Quantity (pcs./box)	Dimensions (mm)				
		L	ϕD	S	h	h_2
ERG(X)1F□□□□H	1,000	$9.0^{+1.5}_{-1.0}$	$2.8^{\pm0.5}$	$12.5^{\pm1.5}$	$8^{\pm2}$	$4.0^{\pm1.5}$
ERG(X)2F□□□□H	1,000	$12.0^{+1.5}_{-1.0}$	$4.0^{\pm1.0}$	$15.0^{\pm1.5}$	$6^{\pm2}$	$5.0^{\pm1.5}$
ERG(X)3F□□□□H	1,000	$15.0^{\pm1.5}$	$5.5^{\pm1.0}$	$20.0^{\pm2.0}$	$10^{\pm2}$	$5.0^{\pm1.5}$
ERG(X)5F□□□□H	500	$24.0^{\pm1.5}$	$8.0^{\pm1.0}$	$30.0^{\pm2.0}$	$10^{\pm2}$	$5.0^{\pm1.5}$

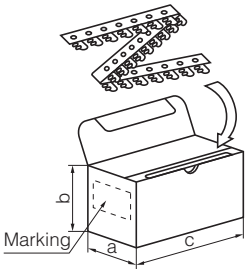
For Panasert Automatic Insertion Machine Radial Taped & Box

ERG(X)□□S□□□□E (12S, 1S, 2S)



Dimensions (mm)		Dimensions (mm)		Dimensions (mm)			Dimensions (mm)		Dimensions (mm)		
P	12.7±1.0	W	18.0±0.5	H1	12S	32 max.	A	12S	$6.35^{+0.65}_{-0.35}$	φD	12S	$2.3^{+0.5}_{-0.3}$
P0	12.7±0.3	W1	9.0±0.5		1S	32 max.		1S	$9.0^{+1.5}_{-1.0}$		1S	2.8±0.5
P1	3.85±0.70				2S	38 max.		2S	$12.0^{+1.5}_{-1.0}$		2S	4.0±1.0
P2	6.35±1.00			H0	16.0±0.5		φd	0.65±0.05				
F	5.0±0.8			φD0	4.0±0.2							

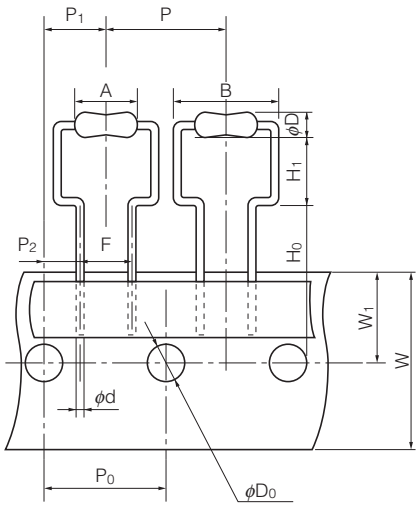
● Radial Tape Package Specifications



Part Number	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERG(X) 12S□□□□E	46	130	335	2,000
ERG(X) 1S□□□□E	46	130	335	2,000
ERG(X) 2S□□□□E	49	100	335	1,000

For Panasert Automatic Insertion Machine Radial Taped & Box

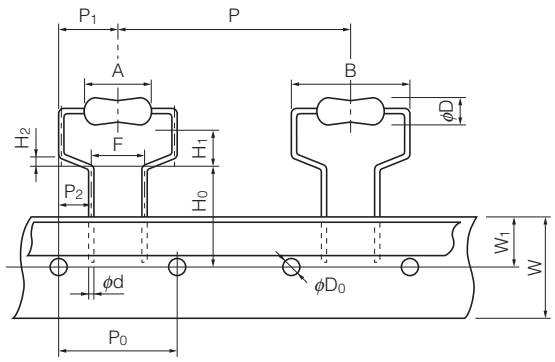
ERG(X)□□S□W□□□E (12S, 1S, 2S, 3S)



Dimensions (mm)			Dimensions (mm)		
P	12S	12.7±1.0	φD0	12S, 1S, 2S, 3S	4.0±0.2
	1S, 2S, 3S	30.0±1.0	A	12S	$6.35^{+0.65}_{-0.35}$
P0	12S	12.7±0.3		1S	$9.0^{+1.5}_{-1.0}$
	1S, 2S, 3S	15.0±0.3		2S	$12.0^{+1.5}_{-1.0}$
P1	12S	6.35±1.00		3S	15.0±1.5
	1S, 2S, 3S	7.5±1.0	B	12S	11.2 max.
P2	12S	3.85±0.70		1S	14.0 max.
	1S, 2S, 3S	3.75±0.50		2S	17.0 max.
F	12S	5.0±0.5		3S	21.0 max.
	1S, 2S, 3S	7.5±0.8	φD	12S	$2.3^{+0.5}_{-0.3}$
W	12S, 1S, 2S, 3S	18.0±0.5		1S	2.8±0.5
W1	12S, 1S, 2S, 3S	9.0±0.5		2S	4.0±1.0
H0	12S	16.0±0.5		3S	5.5±1.0
	1S, 2S	18.0±1.0	φd	12S	φ0.65±0.05
	3S	19.0±1.0		1S, 2S, 3S	φ0.80±0.05
H1	12S	$6.5^{+0.6}_{0}$			
	1S, 2S	$6.5^{+1.0}_{0}$			
	3S	$8.0^{+1.0}_{0}$			

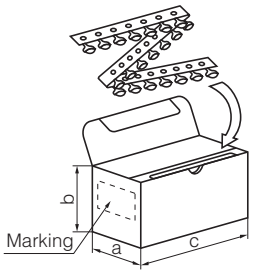
For Panasert Automatic Insertion Machine Radial Taped & Box

ERG(X)□F□S□□□E (1F, 2F, 3F)



Dimensions (mm)			Dimensions (mm)		
P	30.0±1.0		H_2	1.0±0.3	
P_0	15.0±0.3		ϕD_0	4.0±0.2	
P_1	7.5±1.0		A	1F	$9.0^{+1.5}_{-1.0}$
P_2	3.75±0.50			2F	$12.0^{+1.5}_{-1.0}$
F	7.5±0.8			3F	15.0±1.5
W	18.0±0.5		B	1F	14 max.
W_1	9.0±0.5			2F	17 max.
H_0	$16.0^{+1.0}_{0}$			3F	21 max.
H_1	1F	$7.0^{+1.0}_{0}$	ϕD	1F	2.8±0.5
	2F	$8.0^{+1.0}_{0}$		2F	4.0±1.0
	3F	$9.0^{+1.0}_{0}$		3F	5.5±1.0
			ϕd	0.80±0.05	

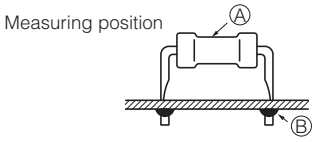
● Radial Tape Package Specifications

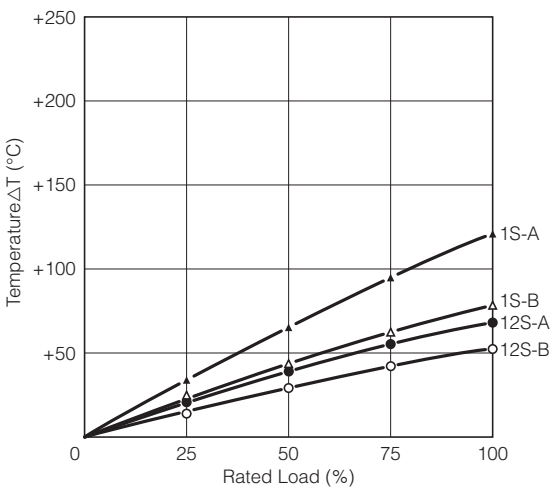


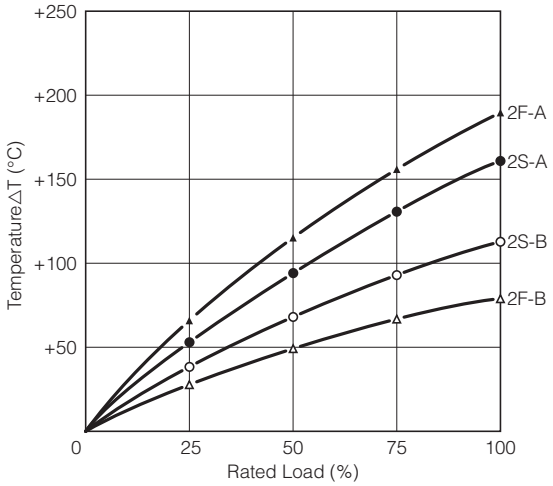
Part No.	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERG(X)12S□W□□□E	46	145	325	2,000
ERG(X) 1S□W□□□E	49	150	317	1,000
ERG(X) 1F□ S□□□E				
ERG(X) 2S□W□□□E	49	150	317	500
ERG(X) 2F□ S□□□E				
ERG(X) 3F□ S□□□E	49	190	315	500

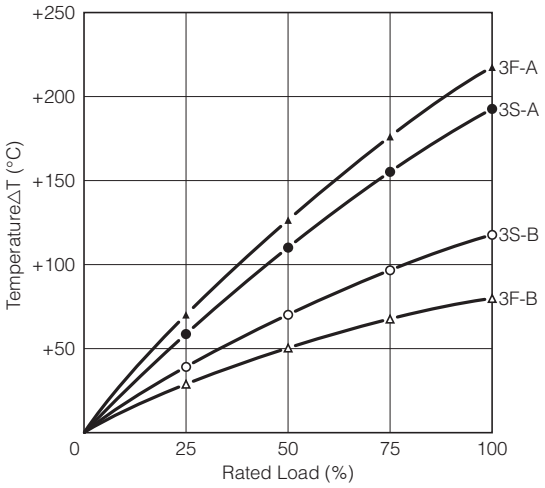
Hot-spot Temperature (for Reference)

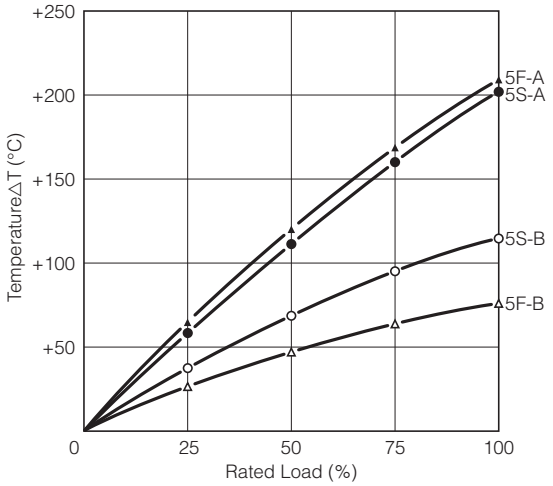
The temperature of the resistor body increases with the curve below. A touching vinyl wire may cause damages to resistor element. Do not place vinyl wires around resistors and be sure to consider where the resistors will be placed.











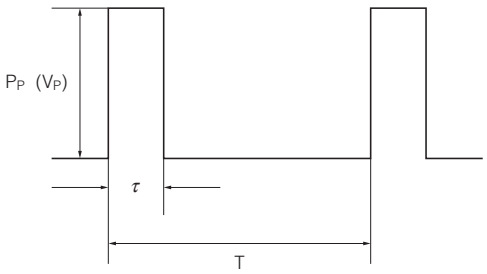
⚠ Safety Precautions

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Transient voltage
   If there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a high voltage pulse may be applied, make sure to evaluate and check the characteristics of Metal(Oxide) Film Resistors (hereafter called the resistors) mounted on your product rather than only depending on the calculated power limit or steady-state conditions to complete the design or decide to use the resistors.
2. The resistors are covered with a special coating. Do not apply shock or vibration to them, or pinch them with long-nose pliers. Otherwise, the resistors may be damaged.
3. Do not apply excessive tension to the lead-connected sections. When bending the lead wire, do not apply excessive stress to the resistors and provide the wire with a natural curvature.
4. Do not brush the resistors during or after the cleaning process, which may be conducted after soldering. Otherwise, the coating film may be damaged.

(Data for Reference)

Pulse Characteristics (Usual)



P_P : Pulse limit power (W)
V_P : Pulse limit voltage (V)
τ : Pulse continuous time (s)
T : Period (s)
V_R : Rated voltage (V)
P : Rated power (W)
R : Resistance value (Ω)
$V_{p\ max.}$: Max. pulse limit voltage (V)

Withstand pulse limit power is calculated by the next method.

$P_P = K \cdot P \cdot T/\tau$

$V_P = \sqrt{K \cdot P \cdot R \cdot T/\tau}$

Reference to the right about a fixed number of $V_{P\ max.}$

- T>1(s) → T=1(s)
- T/τ>100 → T/τ=100
- P_P<P → P stands for P_P
  (V_P<V_R → V_R stands for V_P)
- Added voltage≦$V_{p\ max.}$
- P_P or V_P is referent value
  Conditions: Pulse added time=1000 h
  Resistance change=±5 %
  Room temperature

Part No.	K	$V_{P\ max.}$ (V)
ERG(X) 12S	0.5	600
ERG(X) 1S	0.5	600
ERG(X) 2S	0.5	700
ERG(X) 3S	0.5	700
ERG(X) 5S	0.5	1000

Panasonic:

ERG-2SJ470E ERG-3SJ362V ERG-2SJ222V ERG-2SJ390V ERG-2SJ430V ERG-2SJ560V ERG-2SJ620V ERG-2SJ201V ERG-2SJ221V ERG-3SJ103V ERG-3SJ270V ERG-3SJ910V ERG-2SJ271V ERG-2SJ100V ERG-2SJ103V ERG-2SJ153V ERG-2SJ270V ERG-2SJ680V ERG-3SJ100V ERG-3SJ101V ERG-3SJ102V ERG-3SJ123V ERG-3SJ200V ERG-3SJ222V ERG-3SJ470V ERG-3SJ510V ERG-3SJ621V ERX-3SJ1R0V ERX-3SJ3R9V ERX-12SJ2R2V ERG-2SJ470V ERG-3SJ130V ERG-12SJ101P ERG-12SJ112V ERG-12SJ122V ERG-12SJ243V ERG-12SJ270V ERG-12SJ431V ERG-12SJ621V ERG-12SJ681V ERG-12SJ751V ERG-12SJ821V ERG-12SJ911V ERG-2FG223V ERG-2SG331V ERG-2SJ102P ERG-3SJ101P ERG-5SJ753P ERX-2SJ7R5V ERG-2SG151V ERG-3SG432V ERG-3SJ511P ERX-2SJ6R2P ERX-3SG1R2V ERX-2SJ3R3V ERG-3SJ620V ERX-2SJ1R0V ERG-3SJ152V ERG-2SJ331V ERG-1FJS100E ERG-1FJS101E ERG-1FJS102E ERG-1FJS103E ERG-1FJS110E ERG-1FJS111E ERG-1FJS112E ERG-1FJS113E ERG-1FJS120E ERG-1FJS121E ERG-1FJS122E ERG-1FJS123E ERG-1FJS130E ERG-1FJS131E ERG-1FJS132E ERG-1FJS133E ERG-1FJS150E ERG-1FJS151E ERG-1FJS152E ERG-1FJS153E ERG-1FJS160E ERG-1FJS161E ERG-1FJS162E ERG-1FJS163E ERG-1FJS180E ERG-1FJS181E ERG-1FJS182E ERG-1FJS183E ERG-1FJS200E ERG-1FJS201E ERG-1FJS202E ERG-1FJS203E ERG-1FJS220E ERG-1FJS221E ERG-1FJS222E ERG-1FJS223E ERG-1FJS240E ERG-1FJS241E ERG-1FJS242E ERG-1FJS243E ERG-1FJS270E