

Fixed Metal (Oxide) Film Resistors

Type: **ERG(X)S (Small size)**
(1/2 W, 1 W, 2 W, 3 W, 5 W)

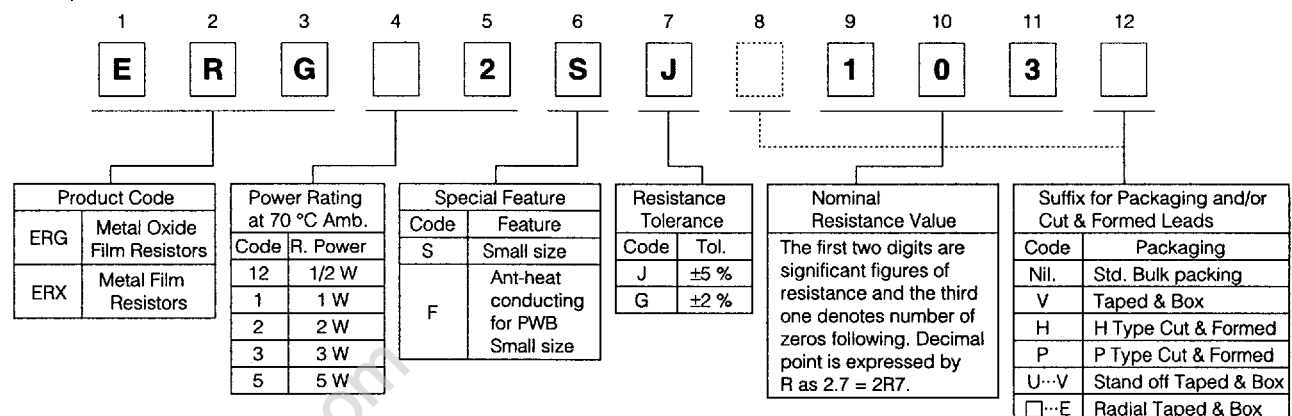
■ Features

- **Resistance Value Correspondence**
 A resistance value range is an electric power form resistor of 0.1 Ω to 100 kΩ.
- **Miniaturization**
 About 50 % of small size/measuring were materialized in comparison with an existing model.
- **Noninflammable Nature**
 It is a resistor of the noninflammable nature/resistance solvent nature that leads an industry standard.
- **High Reliability**
 It is a wide use resistor that prides in a long standing a chievement and confidence.
- **Automatic Insertion**
 An automatic insertion is possible with solid structure.
- **Approved under the ISO-9001 system**

■ Conforming to

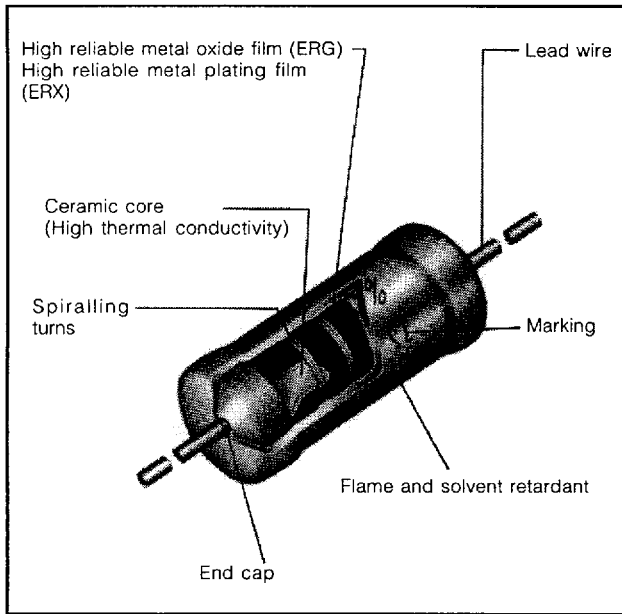
- IEC115-2, IEC115-4, JIS C6409

■ Explanation of Part Numbers

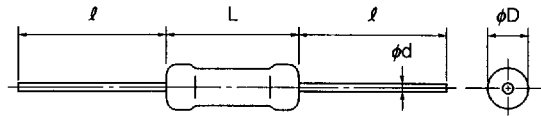


The above example shows a small size metal oxide film resistor, 2 W power rating, resistance value of 10 k ohms, tolerance ±5 %, and package of standard bulk packing.

Construction



Dimensions in mm (not to scale)



Part No.	Dimensions (mm)				Weight/ 1000 pcs.
	L	ϕD	l	ϕd	
ERG12S ERX 12S	$6.35^{+0.65}_{-0.35}$	$2.3^{+0.5}_{-0.3}$	$30.0^{\pm 3.0}$	$0.65^{\pm 0.05}$	0.257 kg
ERG 1S ERX 1S	$9.00^{+1.50}_{-1.00}$	$2.8^{\pm 0.5}$	$30.0^{\pm 3.0}$	$0.65^{\pm 0.05}$	0.334 kg
ERG 2S ERX 2S	$12.00^{+1.50}_{-1.00}$	$4.0^{\pm 1.0}$	$30.0^{\pm 3.0}$	$0.80^{\pm 0.05}$	0.663 kg
ERG 3S ERX 3S	$15.00^{+1.50}$	$5.5^{\pm 1.0}$	$38.0^{\pm 3.0}$	$0.80^{\pm 0.05}$	1.465 kg
ERG 5S ERX 5S	$24.00^{+1.50}$	$8.0^{\pm 1.0}$	$38.0^{\pm 3.0}$	$0.80^{\pm 0.05}$	3.540 kg

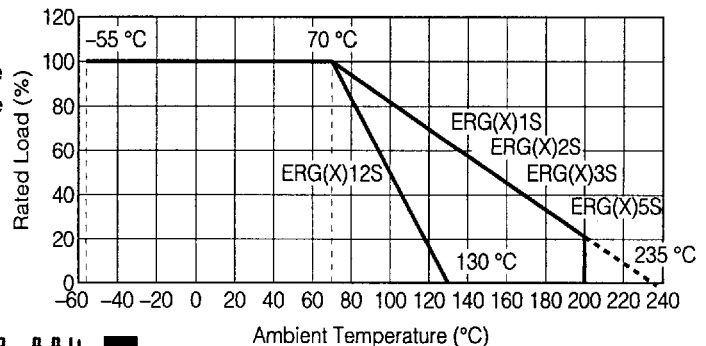
Ratings

Part No.	Power Rating at 70 °C	Maximum RCWV ⁽¹⁾	Maximum Short-Time Overload Voltage ⁽²⁾	Maximum Intermittent Overload Voltage ⁽³⁾	Dielectric With-standing Voltage	Res. Tol. (%) ⁽⁴⁾	Resistance Range (Ω) ⁽⁴⁾⁽⁵⁾		TCR ppm/°C	Standard Resistance Value
							min.	max.		
ERG12S ERX 12S	0.5 W	300 V	600 V	600 V	350 VAC	J (± 5) G (± 2)	0.10 1.00	47 k 22 k	± 350	E-24
ERG 1S ERX 1S	1.0 W	350 V	600 V	600 V	350 VAC	J (± 5) G (± 2)	0.10 1.00	100 k 68 k	± 350	E-24
ERG 2S ERX 2S	2.0 W	350 V	700 V	1000 V	600 VAC	J (± 5) G (± 2)	0.10 1.00	100 k 100 k	± 350	E-24
ERG 3S ERX 3S	3.0 W	350 V	700 V	1000 V	1000 VAC	J (± 5) G (± 2)	0.10 1.00	100 k 100 k	± 300	E-24
ERG 5S ERX 5S	5.0 W	500 V	1000 V	1500 V	1000 VAC	J (± 5) G (± 2)	0.33 1.00	100 k 100 k	± 200	E-24

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from $RCWV = \sqrt{\text{Power Rating} \times \text{Nominal Resistance Value}}$ or max. RCWV listed above whichever less.
- (2) Short-time Overload Test Voltage (SOTV) shall be determined from $SOTV = 2.5 \times \text{Power Rating}$ or max. Short-time Overload Voltage listed above whichever less.
- (3) Intermittent Overload Test Voltage (IOTV) shall be determined from $IOTV = 4.0 \times \text{Power Rating}$ or max. Intermittent Overload Voltage listed above whichever less.
- (4) Resistance tolerance and resistance range is of use besides range listed, please inquire.
- (5) Resistance Range Type ERG: $\geq 10 \Omega$
Type ERX: $\leq 9.1 \Omega$

Power Derating Curve

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

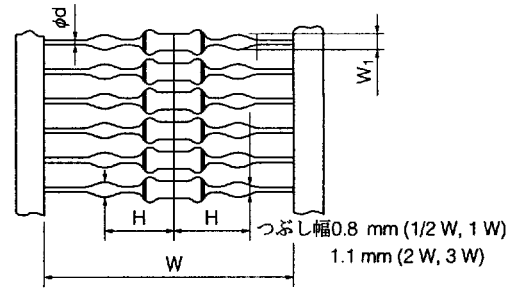
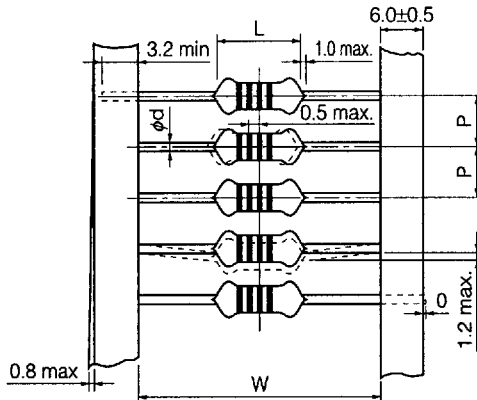


■ Taped & Box:

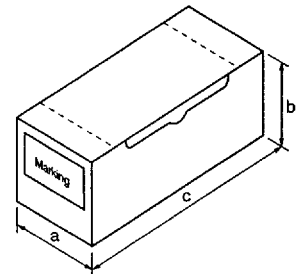
Suffix □□□V

■ Stand-off Taped & Box:

Suffix U□□□V

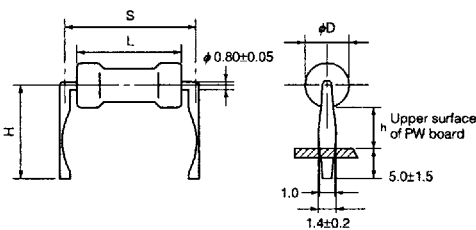


Part No.	Power Rating at 70 °C	Standard Quantity (pcs./box)	Taping (mm)					Box (mm)			
			P	50×P	W	H	W ₁	φd	a	b	c
ERG(X)12S□ □□□V	1/2 W	2000	5.0 ^{+0.3}	250 ⁺²	52.0 ^{+1.5}	—	—	0.65 ^{+0.05}	85	80	255
ERG(X)12S□U□□□V						11.0 ₀ ^{±0.15}	1.2 ₀ ^{+0.15}				
ERG(X)1S□ □□□V	1 W	2000	5.0 ^{+0.3}	250 ⁺²	52.0 ^{+1.5}	—	—	0.65 ^{+0.05}	85	80	255
ERG(X)1S□U□□□V						12.0 ₀ ^{±0.15}	1.2 ₀ ^{+0.15}				
ERG(X)2S□ □□□V	2 W	1000	5.0 ^{+0.3}	250 ⁺²	52.0 ^{+1.5}	—	—	0.80 ^{+0.05}	85	80	255
ERG(X)2S□U□□□V						15.5 ₀ ^{±0.15}	1.4 ₀ ^{+0.15}				
ERG(X)3S□ □□□V	3 W	1000	10.0 ^{+0.5}	500 ⁺²	74.0 ^{+2.0}	—	—	0.80 ^{+0.05}	105	100	325
ERG(X)3S□U□□□V						23.0 ₀ ^{±0.15}	1.4 ₀ ^{+0.15}				



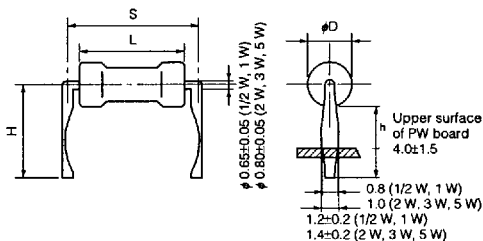
■ Cut & Formed Type

Type "H"



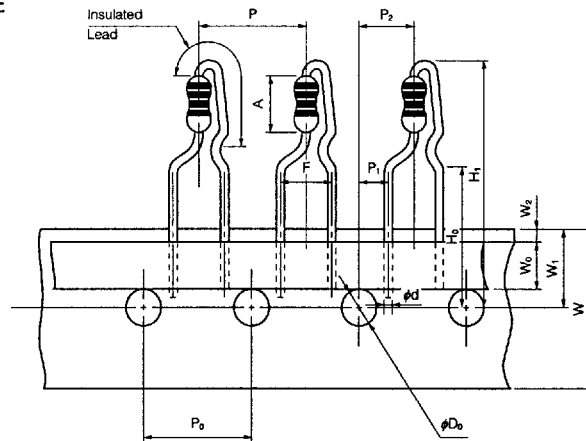
Part No.	Power Rating at 70 °C	Standard Quantity (pcs./box)	Dimensions (mm)				
			L	φD	S	H	h
ERG(X)2S□□□□H	2 W	1000	12.0 ₀ ^{+1.5}	4.0 ^{+1.0}	15.0 ^{+1.5}	13 ⁺³	6 ⁺²
ERG(X)2F□□□□H		3000					
ERG(X)3S□□□□H	3 W	1000	15.0 ^{+1.5}	5.5 ^{+1.0}	20.0 ^{+2.0}	18 ⁺³	10 ⁺²
ERG(X)3F□□□□H		2000					
ERG(X)5S□□□□H	5 W	500	24.0 ^{+1.5}	8.0 ^{+1.0}	30.0 ^{+2.0}	19 ⁺³	10 ⁺²
ERG(X)5F□□□□H		1000					

Type "P"



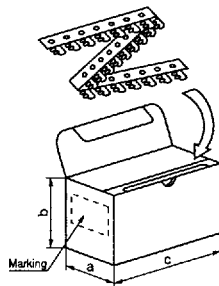
Part No.	Power Rating at 70 °C	Standard Quantity (pcs./box)	Dimensions (mm)				
			L	φD	S	H	h
ERG12S□□□□P	1/2 W	2000	6.35 _{-0.35} ^{+0.65}	2.3 _{-0.3} ^{+0.5}	10.0 ^{+1.5}	9.5 ^{+3.0}	4.0 ^{+1.5}
ERX12S□□□□P		4000					
ERG1S□□□□P	1 W	2000	9.00 _{-1.00} ^{+1.50}	2.8 ^{+0.5}	12.5 ^{+1.5}	9.5 ^{+3.0}	4.0 ^{+1.5}
ERX1S□□□□P		4000					
ERG2S□□□□P	2 W	1000	12.00 _{-1.00} ^{+1.50}	4.0 ^{+1.0}	15.0 ^{+1.5}	12.5 ^{+3.0}	6.0 ^{+1.5}
ERX2S□□□□P		3000					
ERG3S□□□□P	3 W	1000	15.00 ^{+1.50}	5.5 ^{+1.0}	20.0 ^{+2.0}	14.0 ^{+3.0}	6.5 ^{+1.5}
ERX3S□□□□P		2000					
ERG5S□□□□P	5 W	500	24.00 ^{+1.50}	8.0 ^{+1.0}	30.0 ^{+2.0}	16.0 ^{+3.0}	7.5 ^{+1.5}
ERX5S□□□□P		1000					

■ For Panaset Automatic Insertion Machine Radial Tape & Box
Type ERG(X)□□S□□□□E



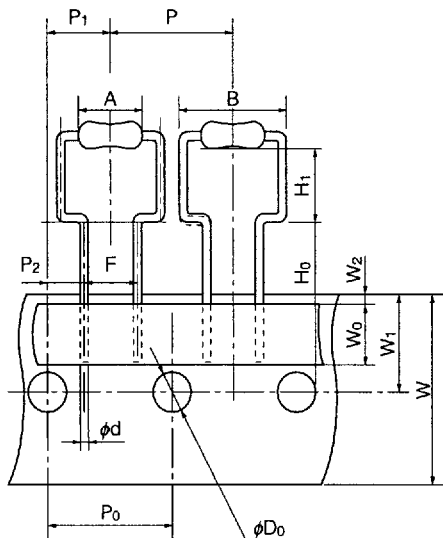
Dimensions (mm)		Dimensions (mm)		Dimensions (mm)		Dimensions (mm)		Dimensions (mm)		
P	12.7±1.0	F ₁	2S 2.0±0.5	W ₂	1.5 max.	l	0 ^{+1.0} _{-2.0}	D	12S	2.3 ^{+0.5} _{-0.3}
P ₀	12.7±0.3	F ₂	12S 2.5±0.5	H ₁	12S 32 max.	t	0.7±0.2		1S	2.8±0.5
P ₁	3.85±0.70		1S 2.5±0.5		1S 32 max.	□g	0±2.5		2S	4.0±1.0
P ₂	6.35±1.00	2S 3.0±0.5	H ₀	16.0±0.5	□h	0±2.0	A	φd 0.65±0.05		
F	5.0±0.8	W	18.0±0.5	φD ₀	4.0±0.2	A		12S	6.35 ^{+0.65} _{-0.35}	
F ₁	12S 2.5±0.5	W ₀	5.0 min.		L			11.0 max.	1S	9.0 ^{+1.5} _{-1.0}
	1S 2.5±0.5	W ₁	9.0±0.5				2S	12.0 ^{+1.5} _{-1.0}		

● Radial Tape Package Specifications



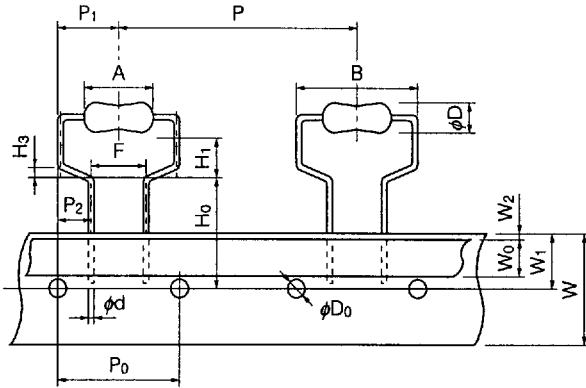
Part No.	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERG(X)12S□□□□E	46	130	335	2000
ERG(X) 1S□□□□E	46	130	335	2000
ERG(X) 2S□□□□E	49	100	335	1000

■ For Panaset Automatic Insertion Machine Radial Taped & Box
Type ERG(X)□□S□W□□□□E



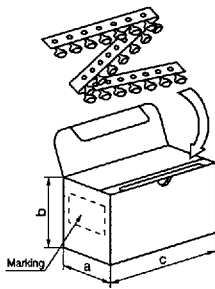
Dimensions (mm)			Dimensions (mm)		
P	12S	12.7±1.0	H ₁	1S	6.5 ^{+1.0} _{-0.5}
	1S, 2S	30.0±1.0		2S	6.5 ^{+1.0} _{-0.5}
P ₀	12S	12.7±0.3	H ₂	1.0 max.	
	1S, 2S	15.0±0.3	φD ₀	4.0±0.2	
P ₁	12S	6.35±1.00	t	0.6±0.3	
	1S, 2S	7.5±1.0	□h	0±2.0	
P ₂	12S	3.85±0.70	A	12S	6.35 ^{+0.65} _{-0.35}
	1S, 2S	3.75±0.50		1S	9.0 ^{+1.5} _{-1.0}
F	12S	5.0±0.5		2S	12.0 ^{+1.5} _{-1.0}
F ₁	1S, 2S	7.5±0.8	B	12S	11.2 max.
	W	18.0±0.5		1S	14.0 max.
W ₀	5.0 min.	2S		17.0 max.	
W ₁	9.0±0.5	φD	12S	2.3 ^{+0.5} _{-0.3}	
W ₂	1.0 max.		1S	2.8±0.5	
H ₀	12S		16.0±0.5	2S	4.0±1.0
	1S	18.0±1.0	φd	12S	0.65±0.05
2S	18.0±1.0	1S, 2S		0.80±0.05	
H ₁	12S	6.5 ^{+0.6} _{-0.3}			

■ For Panasart Automatic Insertion Machine Radial Taped & Box
Type ERG(X)□F□S□□□E



Dimensions (mm)		Dimensions (mm)			
P	30.0±1.0	φD ₀	4.0±0.2		
P ₀	15.0±0.3	t	0.6±0.3		
P ₁	7.5±1.0	∏h	0±2.0		
P ₂	3.75±0.50	A	1F	9.0±1.0	
F	7.5±0.8		2F	12.0±1.5	
W	18.0±0.5		3F	15.0±1.5	
W ₀	5.0 min.	B	1F	14.0 max.	
W ₁	9.0±0.5		2F	17.0 max.	
W ₂	1.0 max.		3F	21.0 max.	
H ₀	16.0 ^{+1.0} ₀	φD	1F	2.8±0.5	
H ₁	1F		7.0 ^{+0.1} ₀	2F	4.0±1.0
	2F		8.0 ^{+0.1} ₀	3F	5.5±1.0
	3F	9.0 ^{+0.1} ₀	φd	0.80±0.05	
H ₂	0.5 max.				
H ₃	1.0±0.3				

● Radial Tape Package Specifications



Part No.	Dimensions (mm)			Standard Quantity (pcs./box)
	a	b	c	
ERG(X)12S	46	145	325	2000
ERG(X)1S, 1F	49	150	317	1000
ERG(X)2S, 2F	49	150	317	500
ERG(X)3F	49	190	315	500

■ Performance Specifications

Characteristics	Specifications	Test Methods (JIS-C-5202)
Resistance to Solvent (See more informations on the following page.)	No deterioration of protective coatings and markings.	Specimens shall be immersed in a bath of Isopropyl alcohol completely for 2 minutes with ultrasonic.
Flame Retardant	No evidence of flaming or arcing.	Flame of it blows out a diameter of the mouth 9.5 mm burner by using, a resistor 15 seconds space with 5 times repeatedly to destruction by fire put. 120 % of loads of rated dissipation are done applied for one minute. Voltage that is equal to 16 times of rated dissipation hereafter is done applied.

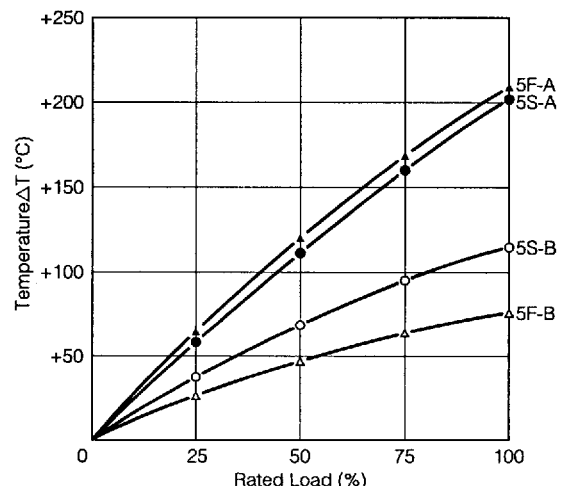
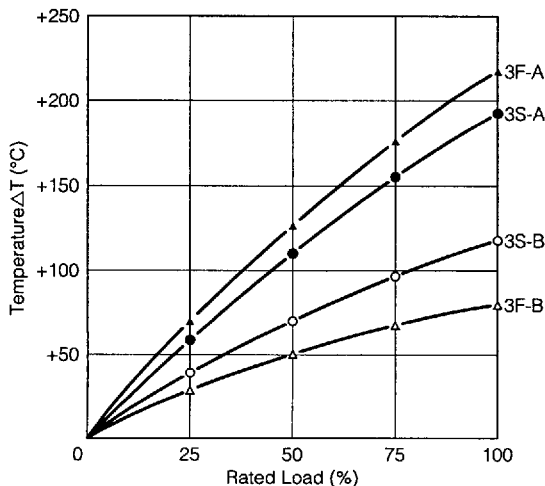
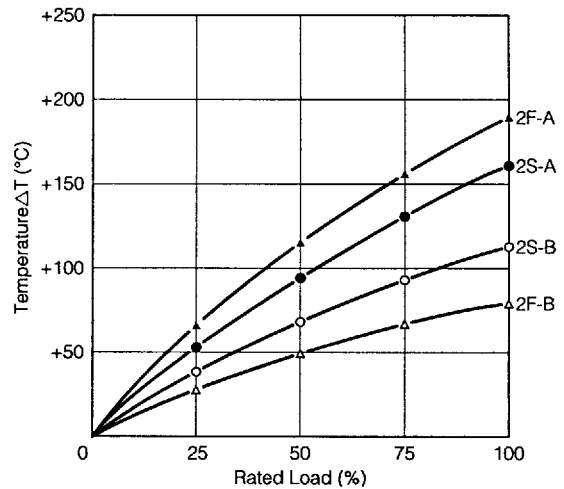
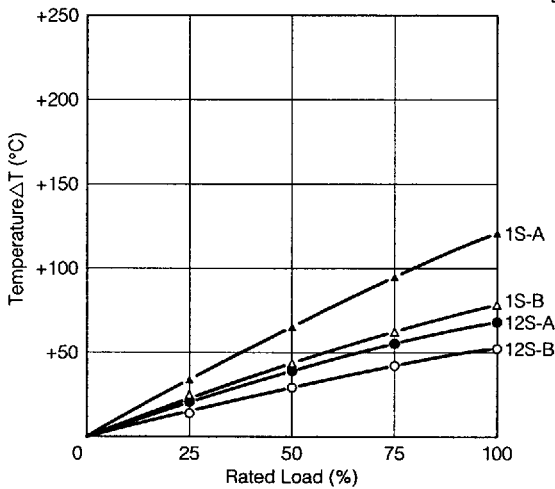
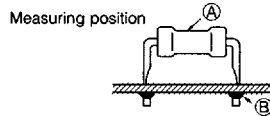
Resistance to Solvents

Matsushita metal oxide film resistors may resist following solvents and test. Any washing solvents used at commercial basis do not affect the original performance characteristics. However, the protective coating and marking may be come off only when they are purposely brushed off or rubbed off with cloth soaked in solvents such as Isopropyl alcohol. And it is also suggested not to heat up print circuit boards just after washing print circuit boards.

Test Method	Solvent	Resistance to Solvent
2 minutes immersion in solvent solution	Isopropyl alcohol	Yes

Hot-spot Temperature (for Reference)

The temperature of resistor body increase with the curve below. A touch of vinyl wire may cause damages to resistor element. It is requested not to place vinyl wires around resistors and to be considered where the resistor shall be placed.



⚠ Cautions for Safety

(1) About transitional phenomena

Regarding impact voltage circuit, transient phenomena like application of high voltage for a short-time or high pulse voltage, confer with the engineer.

(2) Storage method

If the product is stored in the following environments and conditions, the performance and solderability may be badly affected, avoid the storage in the following environments.

- ① Storage in places full of corrosive gases such as sea breeze, Cl_2 , H_2S , NH_3 , SO_2 and NO_2 .
- ② Storage in places exposed to direct sunlight.
- ③ Storage in places outside the temperature range of 5 to 35 deg. C and humidity range of 45 to 85 %RH.

(3) Precaution for use

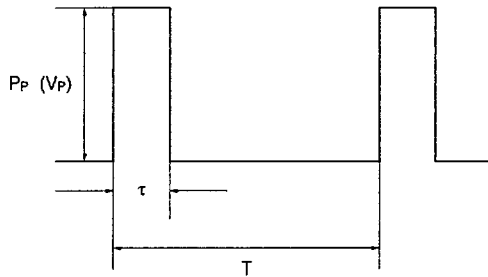
- 1) The products in this catalog are intended for use in general standard applications for general electronic equipment (AV products, household electric appliances, office equipment, information and communication equipment, etc.); hence, they do not take the use under the following special environments into consideration.

Accordingly, the use in the following special environments, and such environmental conditions may affect the performance of the products; prior to use, verify the performance, reliability, etc. thoroughly.

- ① Use in liquids such as water, oil, chemical, and organic solvent.
 - ② Use under direct sunlight and in outdoor and dusty atmospheres.
 - ③ Use in places full of corrosive gases such as sea breeze, Cl_2 , H_2S , NH_3 , SO_2 , and NO_2 .
 - ④ Use in environment with large static electricity and strong electromagnetic waves.
 - ⑤ Where the product is close to a heating component, and where an inflammable such as a polyvinyl chloride wire is arranged close to the product.
 - ⑥ Where the resistor is sealed and coated with resin, etc.
 - ⑦ Where water or a water-soluble detergent is used in cleaning free soldering and in flux cleaning after soldering. (Pay particular attention to soluble flux.)
- 2) The resistor is non-inflammable and is coated with special paint. It is sensitive to external impact. So, care should be taken not to give shocks or vibration to the resistor or not to damage it by holding with pincers.
 - 3) Do not apply excessive tension to the lead connection. When bending the lead wire, do not give excessive stress to the resistor but bend it at a natural curvature.
 - 4) For cleaning the resistor, do not use a brush as in the solvent resistance test of MIL-STD-202 which may damage the coating. Never use a brush during and after cleaning the resistor.

(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 : Nominal resistance (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 $V_{p\max}$.

- $T > 1(s) \rightarrow T = 1(s)$
 - $T/\tau > 100 \rightarrow T/\tau = 100$
 - $P_p < P \rightarrow P$ stands for P_p
($V_p < V_R \rightarrow V_R$ stands for V_p)
 - Added voltages $\leq V_{p\max}$
 - P_p or V_p is referent value
- Conditions: Pulse added time=1000 h
Resistance change= $\pm 5\%$
Room temperature

Kind	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

■ Pulse Characteristics (Inrush)

[Conditions]

Resistance change $\leq \pm 5\%$ with pulse 1000 cycles as like the figure. (Reference Only)

- 1) Added power and added voltage are within the lower territory of this graph.
- 2) Added in normal temperature and humidity.

[Waveform]

