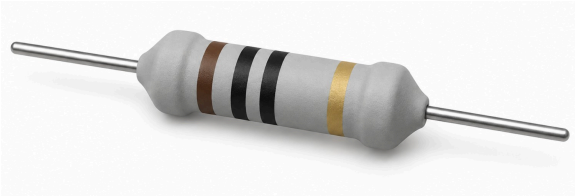
KOME

Metal Oxide Film Resistors

Axial-lead metal oxide film resistors · product code KRSF



Illustration; not a photograph of a specific part.

Features

- Metal oxide film on a ceramic rod with end caps, epoxy resin coating
- Flame-proof coating
- Colour code marking (4 bands)
- Straight leads or formed leads (M, MB, MK, F, FK2, FKK and FK1 types)
- Supplied in taping boxes or in bulk

POWER RATING	MAX. WORKING VOLTAGE	MAX. OVERLOAD VOLTAGE	TOLERANCE
1/16W – 5W	200V – 600V	400V – 1000V	±1%, ±5%

How to order

KRSF	25	B	J	2	100
1 · Product code Metal oxide film resistor	2 · Rated power 1/4W	3 · Packing Bulk	4 · Tolerance ±5%	5 · Total characters 100 = 10R = 2	6 · Resistance value 100 = 10R

Ordering example as given on the original sheet; positions 1 to 6 are explained in the tables below.

1 · Product code ①	
KRSF	Metal oxide film resistor

3 · Packing ③	
T52	Tape / box
T73	Tape / box
B	Bulk
R	Tape reel

4 · Tolerance ④	
F	±1%
J	±5%

2 · Rated power ②	
Code	Rated power
12	1/6W
25	1/4W
50	1/2W
125	1/8W
100	1W
200	2W
1WS	1WS
2WS	2WS
500	5W
700	7W

5 · Total characters ⑤
100 = 10R = 2
100R = 101 = 3
10K = 1000 = 4

6 · Resistance value ⑤
100 = 10R
100R = 101
10K = 10,000

Definitions

Item	Definition
Kind	“MO” stands for metal oxide film resistors; the added “F” stands for flame-proof coating. ①
Rated power	“W” denotes the rated power (see Power rating and rated voltage, and Ratings). ⑥
Type	The type distinguishes the shapes of the resistors (see Dimensions). ⑥
Characteristics	“Characteristics” means the various electrical properties (see Table 1). ⑥
Nominal resistance value	Expressed in ohms (Ω), kilohms (kΩ) or megohms (MΩ).
Resistance tolerance	F (±1%), G (±2%), J (±5%). ④

Ratings

Style ⑦	Max. working voltage	Max. overload voltage	Dielectric withstanding voltage ⑧	Resistance value range
MOF1/6W, 1/8W, 1/16W	200V	400V	200	0.1E – 1M ⑨
MOF1/4W / 1/4WS ⑦	250V	500V	250	
MOF1/2W / 1/2WS	350V	700V	350	
MOF1W / 1WS	350V	700V	350	
MOF2W / 2WS	350V	700V	500	
MOF3W / 3WS	500V	1000V	500	
MOF5W	600V	1000V	700	

Power rating and rated voltage

The rated power is the maximum power (and voltage) that may be applied continuously at an ambient temperature of 70 °C. When the ambient temperature exceeds 70 °C, the rated power shall be derated according to Chart 1.

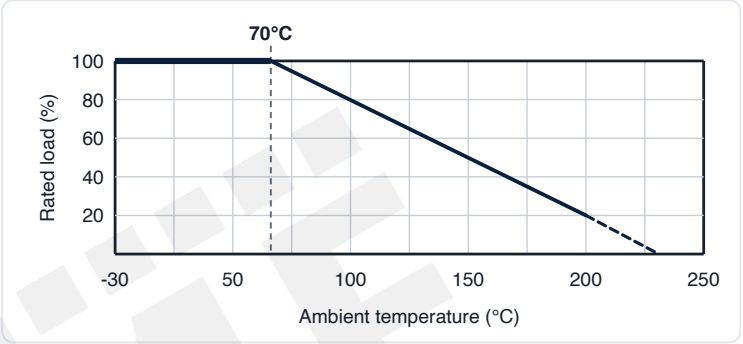


Chart 1 – power derating curve ⑪

Rated voltage

The rated voltage is the DC voltage, or the AC voltage (effective value at commercial frequency, e.g. 50 C/S or 60 C/S), that corresponds to the rated power. It is calculated with the following equation: ⑩

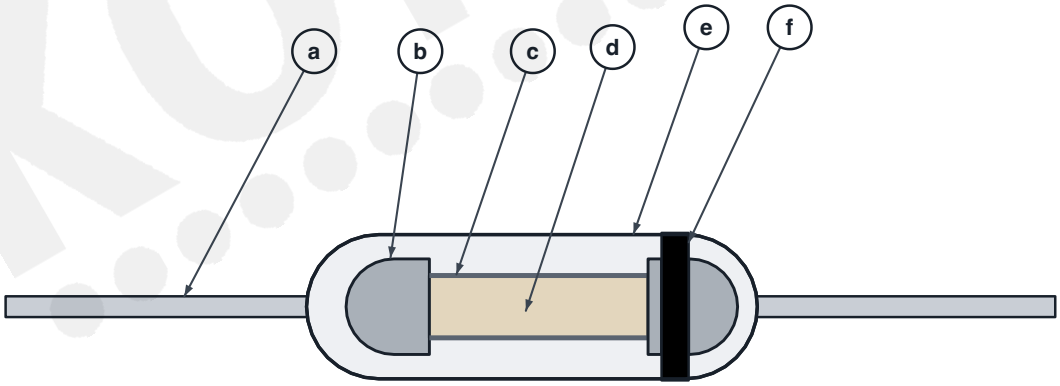
$$E = \sqrt{(P \times R)}$$

E: rated voltage (V) · P: rated power (W) · R: nominal resistance value (Ω)

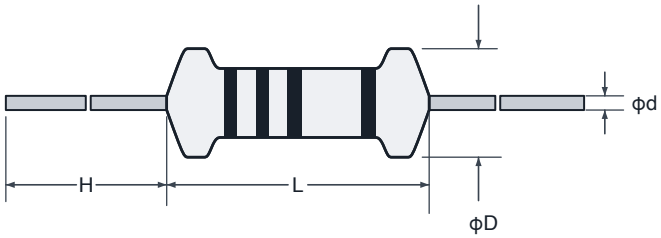
When the calculated rated voltage exceeds the maximum usable voltage shown in Chart 1, the maximum usable voltage is the voltage given by the power derating curve in Chart 1. If the rated voltage exceeds the maximum voltage, the maximum working voltage applies. ⑩

Construction

	Part
a	Lead wire
b	End cap
c	Metal oxide film
d	Ceramic rod
e	Epoxy resin
f	Colour code



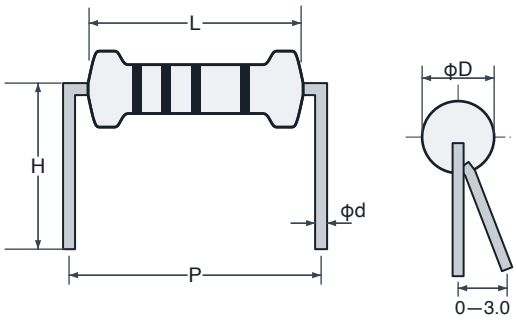
Dimensions ⑫



Watts	L	D	H(Min)	d±0.05
MO 1/4W	6.0±0.5	2.3±0.3	28±2.0	0.45
MO 1/2WS				
MO 1/2W	9.0±0.5	3.2±0.3	26±2.0	0.52
MO 1WS				
MO 1W	11±1.0	4.2±0.5	35±3.0	0.65
MO 2WS				
MO 2W	15±1.0	5.0±0.5	33±3.0	0.72
MO 3WS				
MO 3W	17.0±1.0	6.0±0.5	36±3.0	0.72
MO 5WS				
MO 5W, 7WS	24.0±1.0	8.0±1.0	33±3.0	0.72

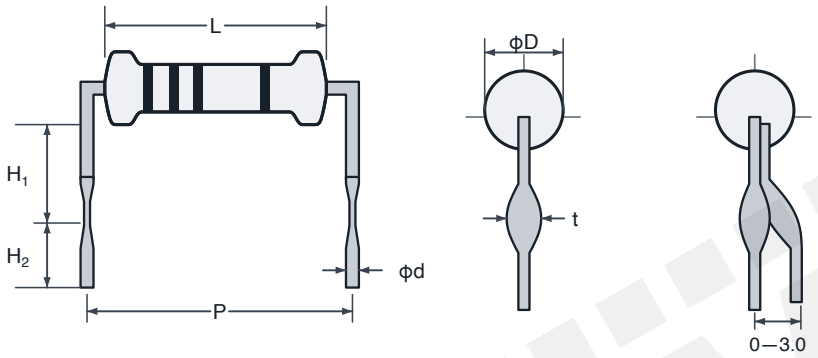
Formed dimensions ⑬

M type



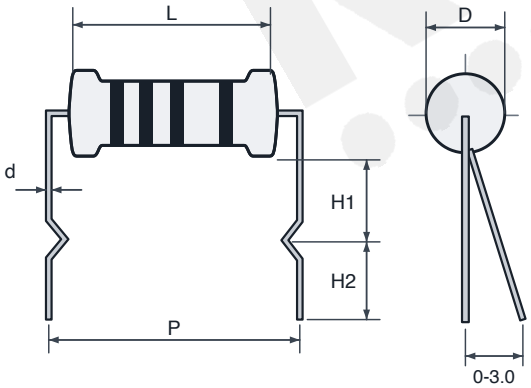
Watts	Dimensions (mm)				
	L	P±1.0	D	d±0.02	H±1.0
1/6W / 1/8W / 1/16W / 1/4WS	3.2±0.3	6	1.8±0.3	0.40	8.0
1/4W / 1/2WS	6.0±0.3	10	2.3±0.3	0.45	8.0
1/2W / 1WS	9.0±0.5	12.5/15	3.2±0.3	0.52	8.0
1W / 2WS	11.0±1.0	15	4.2±0.5	0.65	10
2W / 3WS	15.0±1.0	20	5.0±0.5	0.72	10
3W / 5WS	17.0±1.0	25	6.0±0.5	0.72	10
5W	24.0±1.0	30	8.0±1.0	0.72	10

MB type



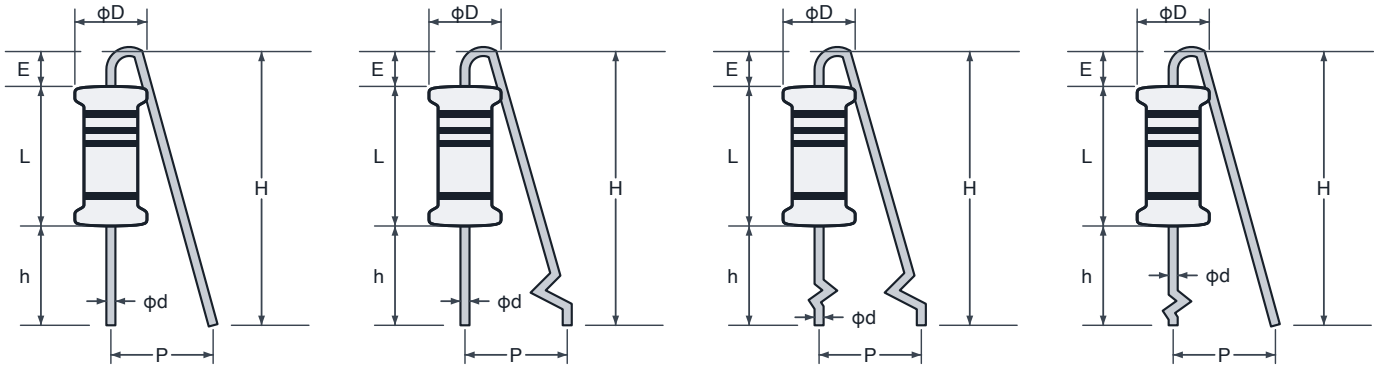
Watts	Dimensions (mm)						
	L	P±1.0	D	d±0.02	H1±1.0	H2±1.0	t±0.2
1/2W / 1WS	9.0±0.5	12.5	3.2±0.3	0.52	10.5	5.0	1.20
1W / 2WS	11.0±1.0	15	4.2±0.5	0.65	10.5	5.0	1.25
2W / 3WS	15.0±1.0	20	5.0±0.5	0.72	10.5	5.0	1.25
3W / 5WS	17.0±1.0	25	6.0±0.5	0.72	10.5	5.0	1.25
5W	24.0±1.0	30	8.0±1.0	0.72	10.5	5.0	1.25

MK type ⑭



Watts	Dimensions (mm)			
	P±0.5	H1±1.0	H2±1.0	t±0.1
1W / 2WS	15	10.5	5.0	1.25
2W / 3WS	20	10.5	5.0	1.25
3W / 5WS	25	10.5	5.0	1.25

F, FK2, FKK and FK1 types ⑭



F type FK2 type FKK type FK1 type

F type

Watts	Dimensions (mm)					
	L	P±1.0	D	d±0.05	h±1.0	Emax
1/4W / 1/2WS	6.0±0.5	7-10	2.3±0.3	0.45	5	3
1/2W / 1WS	9.0±0.5	7-10	3.2±0.3	0.52	5	3.5
1W / 2WS	11.0±1.0	7-10	4.2±0.5	0.65	5	3.5
2W / 3WS	15.0±1.0	7-10	5.0±0.5	0.72	5	3.5
3W / 5WS	17.0±1.0	7-10	6.0±0.5	0.72	5	3.5

FK2, FKK and FK1 types

Watts	Dimensions (mm)						
	L	P±1.0	D	d±0.05	h+1/-0	H±1.0	Emax
1/2W / 1WS	9.0±0.5	5-7	3.2±0.3	0.52	8	18	3.5
1W / 2WS	11.0±1.0	5-9	4.2±0.5	0.65	8	20	3.5
2W / 3WS	15.0±1.0	5-9	5.0±0.5	0.72	8	25	3.5
3W / 5WS	17.0±1.0	5-10	6.0±0.5	0.72	8	30	3.5

Mechanical characteristics

Test	Ref. standard	Test method	Requirement
Tensile strength	—	With the lead wire welded and fixed at one terminal, a load of 2.5 kg is applied to the other terminal in the axial direction of the body for 5 seconds. ⑮	The terminal lead wire shall not be broken or loosened. ⑮
Solderability	JIS-C-5202 6.5	Both lead wires of the resistor are dipped into a solder pot at 260 ±5 °C containing Sn 60/Pb 40 (or Sn 63/Pb 37) solder, at a speed of 25 ±6 mm per second, for 5±1 seconds.	The lead wires shall be covered with a new layer of smooth solder; the coverage shall be over 95%.

Electrical characteristics

Test conditions: standard tests are performed at an ambient temperature of 20±2 °C. Tests may be performed at temperatures from 10 to 35 °C and R.H. 45 to 85%.

Test	Ref. standard	Test method	Requirement
Short-time overload	JIS-C-5202 5.5	2.5 times the rated voltage is applied to the resistor for 5 seconds (if this exceeds the maximum overload voltage, the maximum overload voltage is applied). The resistance is measured 30 minutes after the load is removed.	Resistance change within ±(1.00%+0.05 Ω). ⑯
Load life	JIS-C-5202 7.10	The resistors are placed in a temperature chamber at 70±2 °C, connected by their lead wires at a point 25 mm from each terminal and arranged so that their temperatures do not noticeably affect one another; excessive ventilation shall not be applied. The rated DC voltage is applied, 90 minutes ON and 30 minutes OFF, continuously for 1,000 ±12 hours ⑯; the resistors are then left at room temperature without load for 1 hour.	Resistance change within ±(5.00%+0.05 Ω) compared with the value before the test.
Moisture resistance load life	JIS-C-5202 7.9	The resistors are placed in a constant temperature chamber at 40±2 °C and R.H. 90 to 95%. The rated voltage is applied repeatedly, 90 minutes ON and 30 minutes OFF, for a total of 500 hours. The resistance is measured after the test, after 1 hour at room temperature.	Resistance change within ±(5.00%+0.05 Ω). No remarkable change in appearance and no mechanical damage.

Test	Ref. standard	Test method	Requirement
Resistance to soldering heat ⑰	JIS-C-5202 7.10	The terminal lead wires are dipped into molten solder at 350±10 °C for 3±0.5 seconds, up to 3.2 to 4.8 mm from the resistor body. The resistors are then left at room temperature for 3 hours.	Resistance change within ±(1%+0.05 Ω) compared with the value before the test. No remarkable change in appearance and no mechanical damage.
Temperature coefficient	JIS-C-5202 5.2	The resistor is tested above room temperature, at 40 °C ~ 60 °C (testing temperature), in a constant temperature oven for 30 ~ 40 minutes; the resistance is then measured. The temperature coefficient is calculated with the equation below.	Within the range of Table 1.
Dielectric withstanding voltage	JIS-C-5202 5.7	The resistor is placed on a metal V-block with its terminals connected together, for about 60 seconds. ⑧	The resistor shall withstand the voltage without any sign of breakdown or flashover.

Temperature coefficient equation ⑱

$$\text{Temperature coefficient} = \frac{R - R_0}{R_0} \times \frac{1}{t - t_0} \times 10^6 \ (\text{ppm/°C})$$

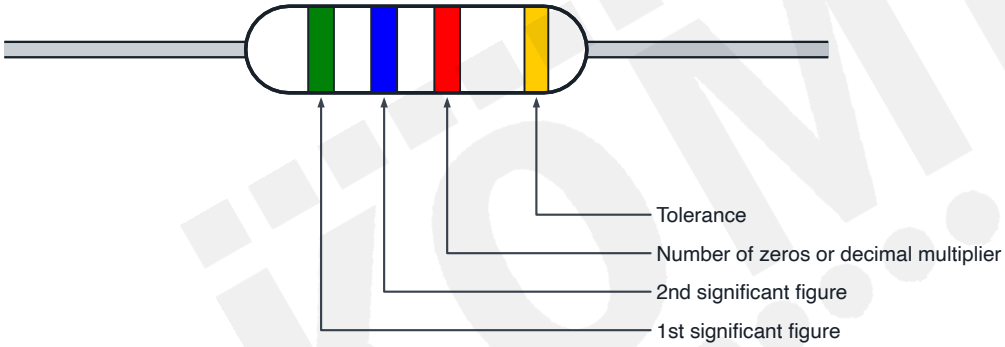
R_1	Resistance value at the testing temperature
R_2	Resistance value at room temperature
T_1	Testing temperature
T_2	Room temperature

Table 1 – Temperature coefficient ⑥

Resistance range	Temperature coefficient
0.1Ω ≤ Rx < 10Ω	-200 ~ +200 ppm/°C
10Ω ≤ Rx < 120kΩ	-350 ~ +350 ppm/°C

Marking

Colour code marking, refer to ELA-RS-279 standard. ⑲



Colour code (refer to ELA-RS-359) ⑲

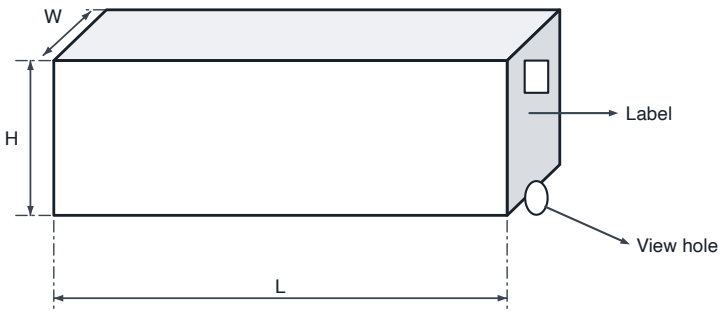
Colour	Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Grey	White	Gold	Silver
1st band	0	1	2	3	4	5	6	7	8	9		
2nd band	0	1	2	3	4	5	6	7	8	9		
3rd band	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^{-1}	10^{-2}
4th band		±1%	±2%			±0.5%					±5%	±10%

Packing

Taping type ③

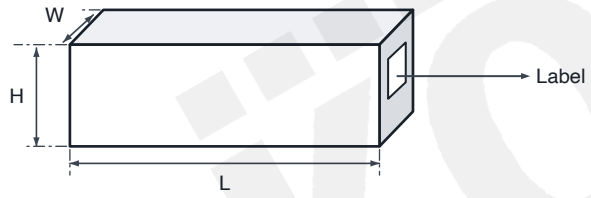
Label specification:

1	Type
2	Watts, tolerance
3	Resistance, quantity
4	P/N
5	Lot no.



Type	Watts	W (mm)	H (mm)	L (mm)	Qty (pcs)
T-26	**1/6W / 1/8W**	50	67	260	5000
	1/16W / 1/4WS	50	67	260	5000
	1/4W / 1/2WS	50	100	260	5000
T-52(60)	**1/6W / 1/8W**	80	72	260	5000
	1/16W / 1/4WS	80	72	260	5000
	1/4W / 1/2WS	80	100	260	5000
	1/2W / 1WS	80	85	260	2000
T-73(81)	**1W / 2WS**	90	77	260	1000
	2W / 3WS	90	95	260	1000
	3W	90	77	260	500
T-84(94) ⑳	**5WS**	90	77	260	500
	5W	110	92	260	250

Bulk ③



Watts		Type	L (mm)	W (mm)	H (mm)	Poly bag	Box (pcs)
1/6W 1/8W	**1/16W 1/4WS**	P	240	140	76	1000	20000
1/4W	**1/2WS**	P	240	140	76	500	10000
1/2W	**1WS**	P	240	140	76	500	5000
1W	**2WS**	P	240	140	76	200	2000
2W	**3WS**	P	240	140	76	100	1500
3W/5WS		P	240	140	76	100	1000
5W		P	240	140	76	50	500

Notes

① Product code and series name: How to order uses product code “KRSF” for metal oxide film resistors, while the text uses “MO” (with “F” for the flame-proof coating), the Dimensions table “MO 1/4W” to “MO 5W, 7WS” and the Ratings table “MOF1/6W.1/8W.1/16W” to “MOF5W” — subject to manufacturer confirmation.

② Rated power codes: 25S = 1/4WS, 50S = 1/2WS, 300 = 3W and 500 = 5W; small-size ratings are ordered as written (1WS, 2WS, 3WS, 5WS, 7WS) (not listed on the manufacturer's sheet; added on supplementary confirmation). A code does not mean the rating is available in this series. 1/6W and 1/16W have no small-size (S) version; not every power rating has one. As printed: “12 = 1/6W” is printed twice (shown once); there is no code for 1/16W, and the codes do not follow one rule (e.g. 25 = 1/4W and 100 = 1W, but 125 = 1/8W and 12 = 1/6W). Code 700 = 7W has no ratings, dimensions or packing data; 7WS appears only in the Dimensions table (“MO 5W, 7WS”) — subject to manufacturer confirmation — subject to manufacturer confirmation.

③ Packing codes: How to order lists T52 and T73 (tape/box), B (bulk) and R (tape reel), while the Packing tables use the taping types T-26, T-52(60), T-73(81) and T-84(94) and type “P” for bulk; no tape-reel data are given — subject to manufacturer confirmation.

④ Tolerance: How to order gives F ±1% and J ±5% only (printed “+-1%”, “+-5%”); the Definitions add G (±2%) and the Colour code table lists ±0.5% to ±10% — subject to manufacturer confirmation.

⑤ Positions 5 and 6: “No. ofTotal Character” (as printed) is not explained on the original sheet, and the examples “10K=1000=4” and “10K = 10,000” do not follow the 3-character coding of the other examples (100 = 10R, 101 = 100R) — subject to manufacturer confirmation.

⑥ Cross-references: the original refers to “Table, PARAGRAPH 3” for the rated power (that paragraph has no table; the rated powers are in the Ratings table), to “Paragraph 4.2” for the type and to “Table 1” (characteristics; temperature coefficient test), but no table is labelled Table 1; the temperature coefficient table is labelled Table 1 here because that test refers to it — subject to manufacturer confirmation.

⑦ Ratings table: the styles pair 1/4W, 1/2W, 1W, 2W and 3W with 1/4WS, 1/2WS, 1WS, 2WS and 3WS, while the Dimensions, Formed dimensions and Packing tables pair them with 1/2WS, 1WS, 2WS, 3WS and 5WS. Row 2 is printed “MOFl/4 W / 1/4WS” and is shown as MOF1/4W / 1/4WS — subject to manufacturer confirmation.

⑧ Dielectric withstanding voltage: the Ratings values (200 to 700) are printed without a unit, and the test description does not state the test voltage or how it is applied (“A. terminals connected Together with the block for about 60 seconds”) — subject to manufacturer confirmation.

⑨ Resistance value range: printed “0.1E——1M” in one cell for all styles and shown with the units as printed; Table 1 (temperature coefficient) covers 0.1Ω ≤ Rx < 120kΩ only — subject to manufacturer confirmation.

⑩ Rated voltage: the equation is printed “E = √ P×R” and “E=√P · R” and is shown as E = √(P × R). The text refers to a maximum usable voltage “shown in CHART 1” (printed “Maximum usable voltage flue shown in CHART 1”, read as “value”), but Chart 1 shows no voltages; the maximum working voltages are given in the Ratings table — subject to manufacturer confirmation.

⑪ Chart 1 is not captioned on the original. The temperature scale is drawn as printed: “-30” at the left edge is two grid divisions from “50”, as is each following 50 °C step, so the 70 °C line does not fall at 70 on that scale (it lies between “50” and the next, unlabelled grid line); from 20% at 200 the curve continues dashed to 0% between 200 and 250 (no printed value); the 0% line has no label — subject to manufacturer confirmation.

⑫ Dimensions table: no unit is printed (the Formed dimensions tables state mm); the header reads “H(Min)” although every H value carries a ± tolerance; H of 2W / 3WS and of 5W, 7WS (33±3.0) is smaller than that of 1W / 2WS (35±3.0); there is no row for 1/6W, 1/8W or 1/16W (these are given in the M type table only) — subject to manufacturer confirmation.

⑬ Formed dimensions: the P headers carry a tolerance (±1.0; MK ±0.5) while the F and FK values are ranges (7-10, 5-7, 5-9, 5-10) and M type 1/2W / 1WS gives two values (12.5/15); t is ±0.2 (MB) but ±0.1 (MK), and MB t is 1.20 for 1/2W / 1WS but 1.25 for the others. Body length L of 1/4W / 1/2WS is 6.0±0.5 in the Dimensions and F type tables but 6.0±0.3 in the M type table; the lead diameter tolerance is ±0.05 (Dimensions, F and FK types) but ±0.02 (M and MB types) — subject to manufacturer confirmation.

⑭ Drawings and tables differ: the MK drawing shows L, D and d, which the MK table lacks, and the table's t is not in the drawing; the F type drawing shows H, which the F type table lacks; the FK table does not say whether it covers all of FK2, FKK and FK1. F type Emax of 1/4W / 1/2WS is printed “3” in a different font from the other rows (3.5). The meaning of “0—3.0” (end views of M, MB and MK) is not stated — subject to manufacturer confirmation.

⑮ Tensile strength: the load is printed “2.5 Kegs” (read as 2.5 kg); the last sentence is incomplete (“… and The compared with the value before the test.”) and gives no limit — subject to manufacturer confirmation.

⑯ Short-time overload: the limit is printed “±1.00%+0.05 Ohm)” (opening parenthesis missing) and is shown as ±(1.00%+0.05 Ω). Load life: the rated voltage is applied “90 minutes ON and 30 minutes OFF” and also “continuously for 1,000 ±12hours” — subject to manufacturer confirmation.

⑰ Resistance to soldering heat is headed “7.5 Effective Soldering” on the original and cites JIS-C-5202 7.10, the same clause as Load life — subject to manufacturer confirmation.

⑱ The temperature coefficient equation uses R, R_0, t and t_0, but the legend defines R_1, R_2, T_1 and T_2 (both as printed) — subject to manufacturer confirmation.

⑲ The marking standards are printed “ELA－RS－ 279” and “ELA – RS – 359” (shown as ELA-RS-279 and ELA-RS-359) — subject to manufacturer confirmation.

⑳ Taping table: T-73(81) and T-84(94) are printed in one cell spanning the last five rows; T-84(94) stands at the bottom of that cell, level with the 5W row — subject to manufacturer confirmation.