ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

MOUSER

Description : Extra - High Power Thick Film Chip Resistors (KIT)

Royalohm Part no.:

SP123WFE024KIT (KIT SP12 3W +/-1% E-24 Series)

Approved by

RoHS V3 Compliant (EU) 2015/863

REACH Compliant

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Issue Date: 2024/01/16

CHANGE NOTIFICATION HISTORY

Version	Date of Version	History	Remark
1	2024/01/16	1. KIT (SP12) Series.	
		2. Power Rating : 3W	
		3. Resistance tolerance: ±1% & Jumper	
		4. 136 Values	

Extra - High Power Thick Film Chip Resistors (KIT)

1. Scope:

This specification for approval relates to Extra - High Power Thick Film Chip Resistors (KIT) manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form:

	Type	Power Rating	Resistance tolerance	Nominal Resistance
Ex.	SP12 (2512)	3W	F	10Ω

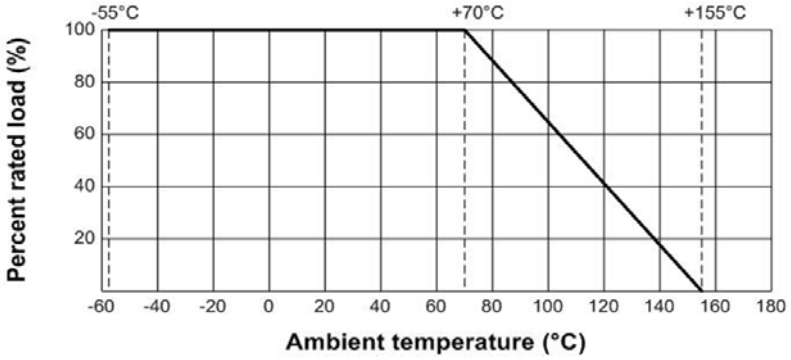
3. Ratings:

Type	SP12 (2512)
Power Rating at 70 ℃	3W
Rated Current (Jumper)	2 A
Max. Overload Current (Jumper)	10 A
Max. Working Voltage	250 V
Max. Overload Voltage	500 V
Diclectric Withstanding Voltage	500 V
Temperature Range	-55℃～ +155℃
Ambient Temperature	70 ℃

3.1 Power rating:

Resistors shall have a power rating based on continuous load operation at an ambient temperature of 70 ℃ . For temperature in excess of 70 ℃ , The load shall be derate as shown in figure 1.

Figure 1



3.2 Nominal Resistance

Effective figures of nominal resistance shall be in accordance with E-24 series

3.3 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

Note : Max. Working Voltage or $\sqrt{P \times R}$ whichever is lesser

Max. Overload Voltage or $2.5\sqrt{P \times R}$ whichever is lesser

Where : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

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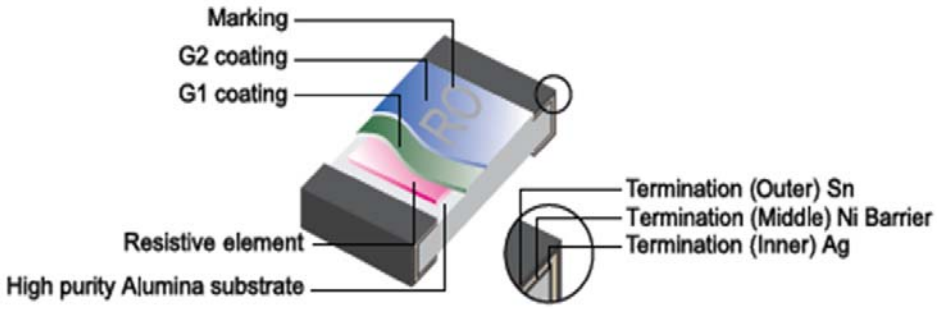
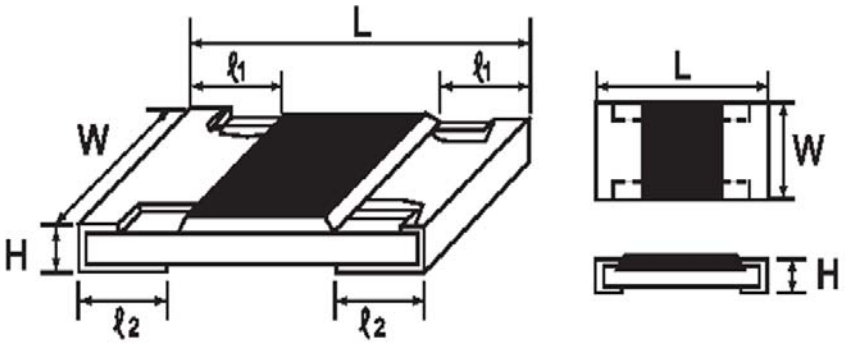
4. Construction :



5. Power rating and dimensions



Dimension :

Type	Dimension (mm)				
	L ± 0.10	W ± 0.15	H ± 0.10	ℓ1 ± 0.25	ℓ2 ± 0.20
SP12 (2512)	6.35	3.20	1.10	0.60	1.80

Power Rating :

Type	Power Rating at 70 ℃	Tolerance %	Resistance Range	Standard Series
SP12 (2512)	3W	Jumper	< 30mΩ	
		± 1	1Ω ~ 10MΩ	E-24

Extra - High Power Thick Film Chip Resistors (KIT)

6. Marking :

6.1 Resistors

A. Marking for E-24 series 1% in SP12 size : 4 Digits

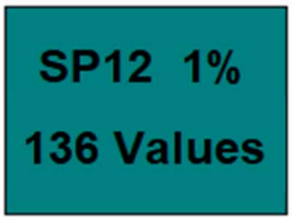
*The first 3 digits are singnificant figures of resistance and the 4th digit denoted number of zeros.

Ex. | | 1003 | | 100KΩ

*For ohmic values below 100 Ω, letter"R" is for decimal point.

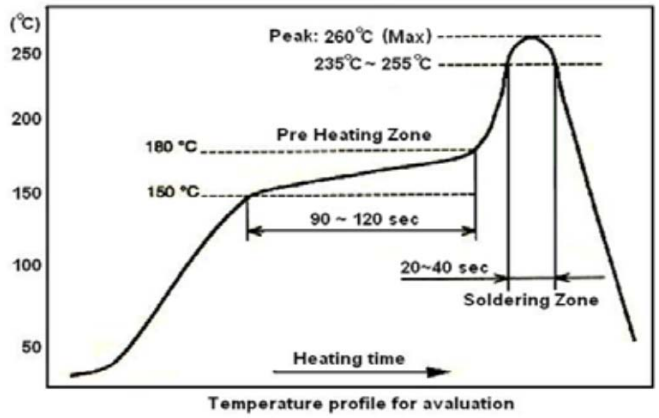
Ex. | | 1R80 | | 1.8Ω

6.2 Labels



Extra - High Power Thick Film Chip Resistors (KIT)

7. Performance specification :

Characteristics	Limits	Test Methods (JIS C 5201-1)
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down	4.7 Clamped in the trough of a 90°C metallic v-block and shall be tested at ac potential respectively specified in the type for 60-70 seconds
Temperature Coefficient	1Ω~10Ω ≤± 200PPM/°C 10.1Ω~10MΩ ≤± 100PPM/°C	4.8 Natural resistance change per temp. degree centigrade. $\frac{R2-R1}{R1(t2-t1)} \times 10^6$ (PPM/°C) R1: Resistance value at room temperature (T1) R2: Resistance value at room temp. plus 100 °C(T2) Test pattern: room temp. (T1), room temp. +100°C(T2)
Short time overload	Resistance change rate is ± (1.0% + 0.1Ω) Max.	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds
Soldering temp. reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)	Wave soldering condition: (2 cycles Max.) Pre-heat : 100 ~ 120 °C, 30 ± 5 sec. Suggestion solder temp.: 235 ~ 255 °C, 10 sec. (Max.) Peak temp.: 260 °C Reflow soldering condition: (2 cycles Max.) Pre-heat : 150 ~ 180 °C, 90 ~ 120 sec. Suggestion solder temp.: 235 ~ 255 °C, 20 ~ 40 sec. Peak temp.: 260 °C  Temperature profile for avaluation Hand soldering condition: The soldering iron tip temperature should be less than 300°Cand maximum contract time should be 5 sec.
Soldering heat	Resistance change rate is: ± (1.0%+0.05Ω) Max.	4.18 Dip the resistor into a solder bath having a temperature of 260°C±3°C and hold it for 10±1 seconds.

Extra - High Power Thick Film Chip Resistors (KIT)

7. Performance specification :

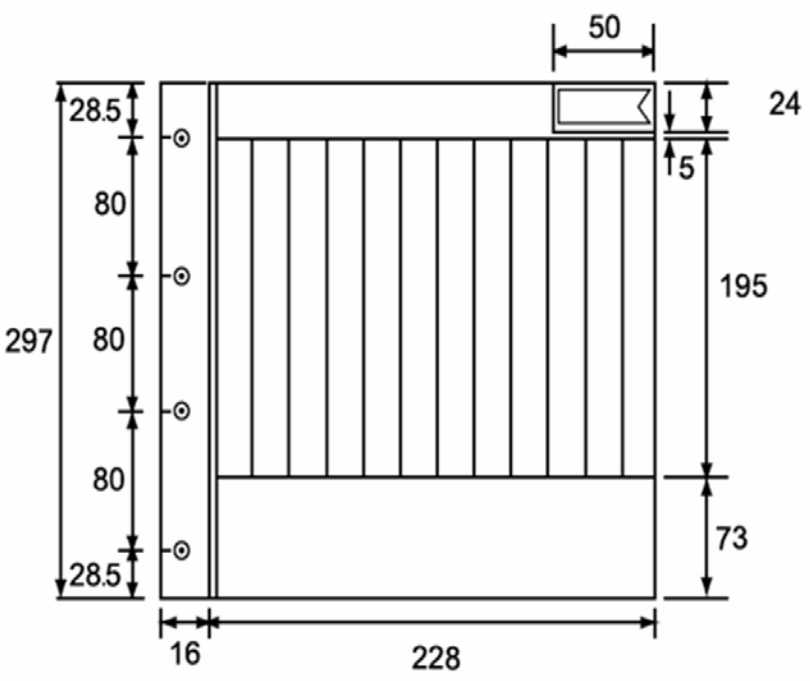
<table>
<tr><th>Characteristics</th><th>Limits</th><th>Test Methods
(JIS C 5201-1)</th></tr>
<tr><td rowspan="2">Temperature cycling</td><td rowspan="2">Resistance change rate is
± (0.5% + 0.1Ω) Max.</td><td>4.19 Resistance change after continuous
100 cycles for duty cycle specified below :
<table>
<tr><th>Step</th><th>Temperature</th><th>Time</th></tr>
<tr><td>1</td><td>-55℃ ± 3℃</td><td>30 mins</td></tr>
<tr><td>2</td><td>Room temp.</td><td>10～15 mins</td></tr>
<tr><td>3</td><td>+155℃ ± 2℃</td><td>30 mins</td></tr>
<tr><td>4</td><td>Room temp.</td><td>10～15 mins</td></tr>
</table></td></tr>
<tr><td></td></tr>
<tr><td>Humidity</td><td>Resistance change rate is
± (0.5% + 0.1Ω) Max.</td><td>4.24 Temporary resistance change after 240 hours
exposure in a humidity test chamber controlled at
40±2°C and 90-95% relative humidity</td></tr>
<tr><td>Load life in humidity</td><td>Resistance change rate is
± (1.0% + 0.1Ω) Max.</td><td>7.9 Resistance change after 1,000 hours
(1.5 hours "on", 0.5 hour "off") at RCWV
in a humidity chamber controlled at
40℃ ± 2℃ and 90 to 95 % relative humidity</td></tr>
<tr><td>Load Life</td><td>Resistance change rate is
± (1.0% + 0.1Ω) Max.</td><td>4.25.1 Permanent resistance change after 1,000 hours
operating at RCWV, with duty cycle of
(1.5 hours"on", 0.5 hour"off") at 70℃ ± 2℃ ambient</td></tr>
<tr><td>Terminal bending</td><td>Resistance change rate is
± (1.0% + 0.05Ω) Max.</td><td>4.33 Twist of Test Board :
Y/X = 3/90 mm for 60 seconds</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Extra - High Power Thick Film Chip Resistors (KIT)

8. Kit resistors :

8.1 Insert for Chip Kit

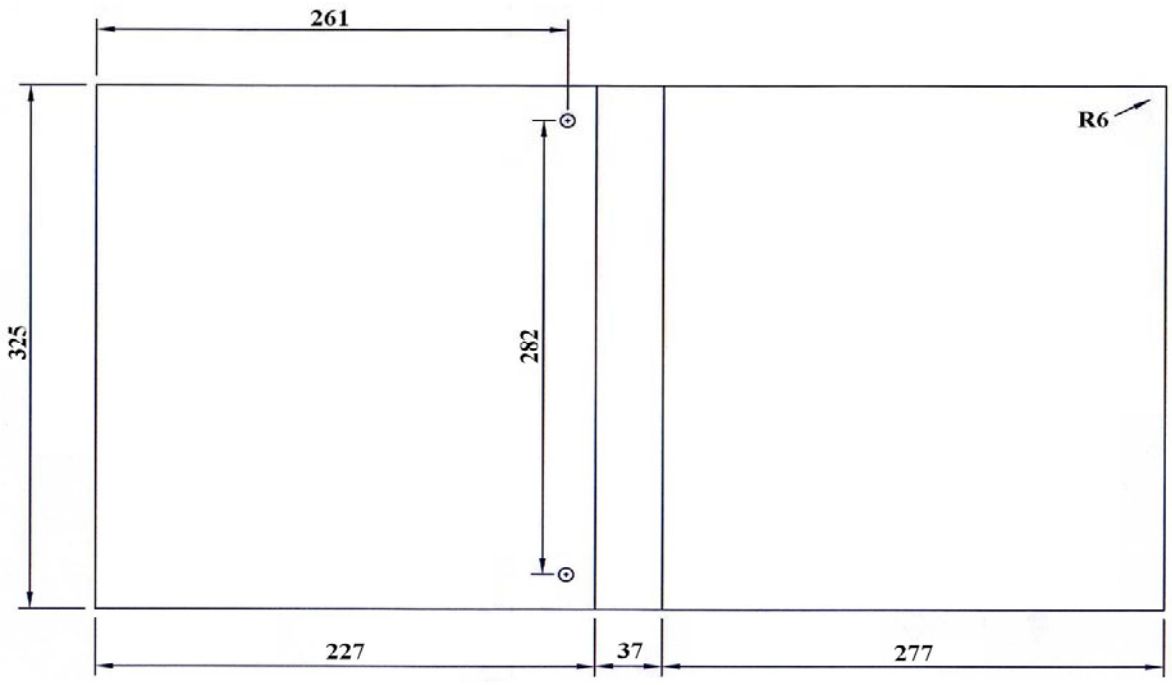
Dimension (mm)



8.2 Album for Chip Kit

Dimension (mm)

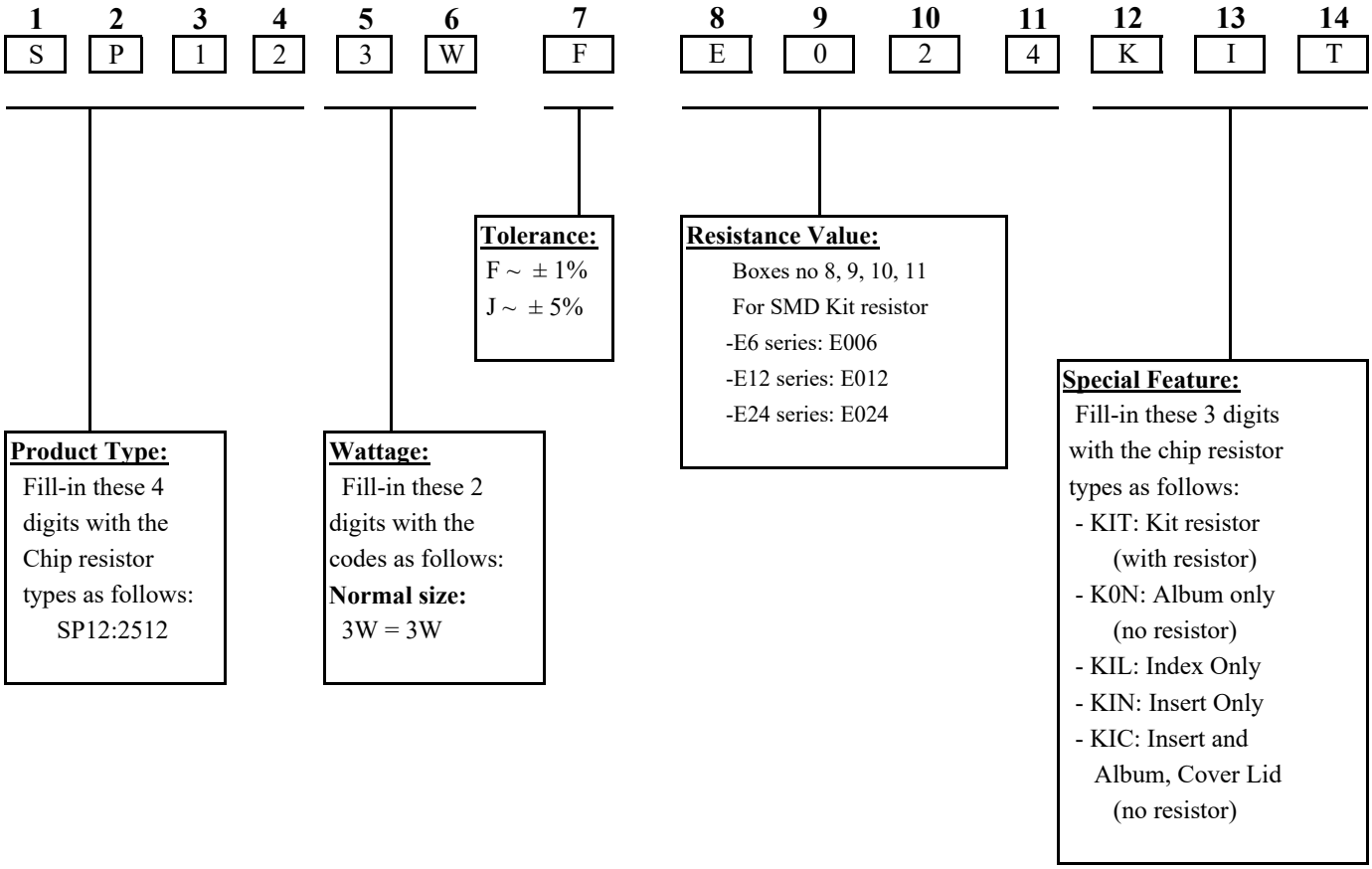
* Green Album



Part Number System

Explanation of Part Number System

(Extra - High Power Thick Film Chip Resistors (KIT))



Sample : SP12 3W (2512) +/-1% KIT E-24 Series → SP123WFE024KIT

Extra - High Power Thick Film Chip Resistors (KIT)

Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.
This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

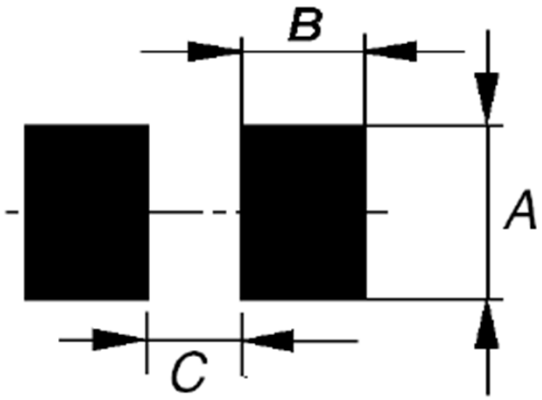
Storage Condition (MSL1)

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 25°C ± 10°C and a relative humidity of 60%RH ± 10%RH, chemical and dust free atmosphere

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight

Recommended solder pad



A	B	C
3.7 mm.	2.8 mm.	2.7 mm.

4 layers PCB specification:

1) Outside 2 layers (Top and Bottom) with copper foil thickness at 2oz.

2) Inside 2 layers (Middle layers) with copper foil thickness at 4 oz.

Extra - High Power Thick Film Chip Resistors (KIT)

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Regardless of the application of ROYALOHM products, it is recommended to carry out safety tests while using measures such as protective circuits and redundant circuits to protect the safety of equipment.

Extra - High Power Thick Film Chip Resistors (KIT)

PRODUCT: Kit (SP12) +/-1%
E24 Series = 136 values (0R/1R to 10M)
(With resistor 2 strip per value)
Total Qty: (SP12) 13,600pcs.)

NO.	Value
1	0R
2	1R
3	1R5
4	2R2
5	3R3
6	4R7
7	5R1
8	6R2
9	6R8
10	10R
11	11R
12	12R
13	13R
14	15R
15	16R
16	18R
17	20R
18	22R
19	24R
20	27R
21	30R
22	33R
23	36R
24	39R
25	43R
26	47R
27	51R
28	56R
29	62R
30	68R
31	75R
32	82R
33	91R
34	100R
35	110R

NO.	Value
36	120R
37	130R
38	150R
39	160R
40	180R
41	200R
42	220R
43	240R
44	270R
45	300R
46	330R
47	360R
48	390R
49	430R
50	470R
51	510R
52	560R
53	620R
54	680R
55	750R
56	820R
57	910R
58	1K
59	1K1
60	1K2
61	1K3
62	1K5
63	1K6
64	1K8
65	2K
66	2K2
67	2K4
68	2K7
69	3K
70	3K3

NO.	Value
71	3K6
72	3K9
73	4K3
74	4K7
75	5K1
76	5K6
77	6K2
78	6K8
79	7K5
80	8K2
81	9K1
82	10K
83	11K
84	12K
85	13K
86	15K
87	16K
88	18K
89	20K
90	22K
91	24K
92	27K
93	30K
94	33K
95	36K
96	39K
97	43K
98	47K
99	51K
100	56K
101	62K
102	68K
103	75K
104	82K
105	91K

NO.	Value
106	100K
107	110K
108	120K
109	130K
110	150K
111	160K
112	180K
113	200K
114	220K
115	240K
116	270K
117	300K
118	330K
119	360K
120	390K
121	430K
122	470K
123	510K
124	560K
125	620K
126	680K
127	750K
128	820K
129	910K
130	1M
131	1M5
132	2M2
133	3M3
134	4M7
135	6M8
136	10M

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