

**RTG Series Pulse-Proof Low-Resistance  
Thick Film Chip Resistors Product  
Specification**

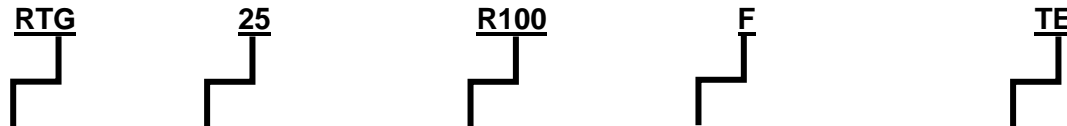
<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>1</b>

**1 Scope:**

- 1.1 This specification is applicable to lead free and halogen free of RoHS directive for RTG series pulse-proof Low-Resistance thick film chip resistors.
- 1.2 The product is for general purpose.

**2 Explanation Of Part Numbers:**

(EX)



Type	Size	Nominal Resistance		Resistance Tolerance	Packaging
Pulse-Proof Low-Resistance Thick Film Chip Resistors	25(2512)	4-Digits	EX. 0.10Ω=R100 0.47Ω=R470 0.56Ω=R560	F=± 1% J=± 5%	TE:4 mm Pitch Carrier Tape 4,000 pcs

**3 General Specifications:**

Type	Rate Power at 70°C	Max. Working Current	Max. Overload Current	T.C.R (ppm/°C)	Resistance Range
					F(±1%)、J(±5%) E-24、E-96
RTG25 (2512)	2W	3.16A	7.90A	±400	200mΩ ≤ R < 1Ω
<b>Operating Temperature Range</b>					-55°C ~ +155°C

<b>RD</b>		<b>QA</b>		<b>Remark</b> IT'S NOT UNDER CONTROL FOR PDF FILE PLS NOTE THE VERSION STATED.. Do not copy without permission	Issue Dep. <b>DATA Center.</b>  Series No. <b>60</b>
<b>Written</b> 朱华	<b>Checked</b> 	<b>Approved</b> 	<b>Signing</b> 许国敏		

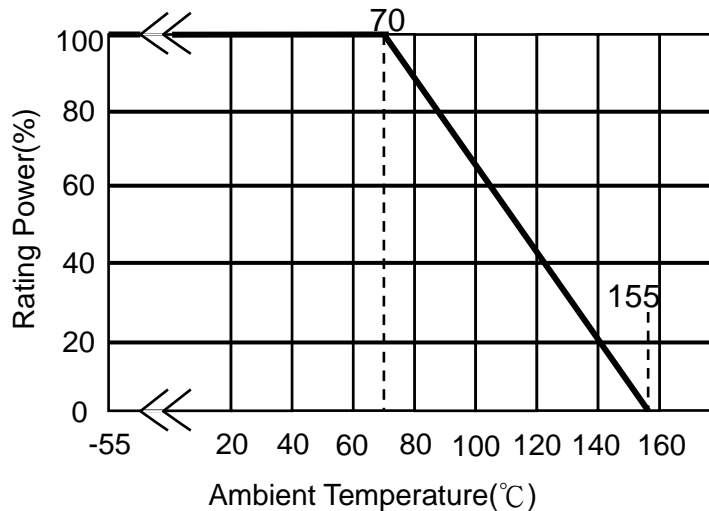
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<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>2</b>

**3.1 Power Derating Curve:**

Operating Temperature Range:- 55~155 °C

If the ambient temperature exceeds 70 degrees centigrade to 155 degrees centigrade, the power can be modified by the curve as below.



**3.2 Current Rating:**

Rated Current: DC Current or AC Current (rms) based on the rated power.

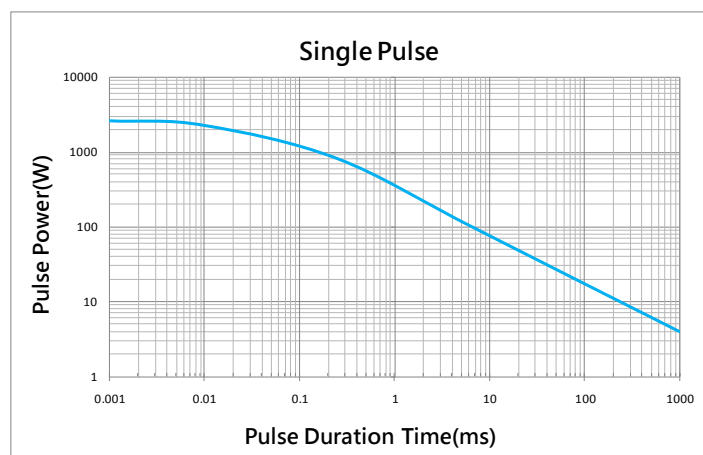
The current can be calculated by the following formula. If the calculated value exceeds the Max. current specified in the Table 3, the Max. current rating is set as the current rating.

$$I = \sqrt{P/R}$$

I= Rated current (A)  
P= Power rating (w)  
R= Resistance(Ω)

**3.3 Single Pulse Loading Capability**

Single pulse power is shown in the curve below, maximum permissible peak current ( $I_{peak}$ ) cannot exceed 7.90A when the maximum pulse power ( $P_{max}$ ) transforms to the current.



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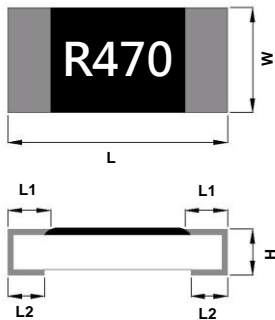
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Series No. **60**

**RTG Series Pulse-Proof Low-Resistance  
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<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>3</b>

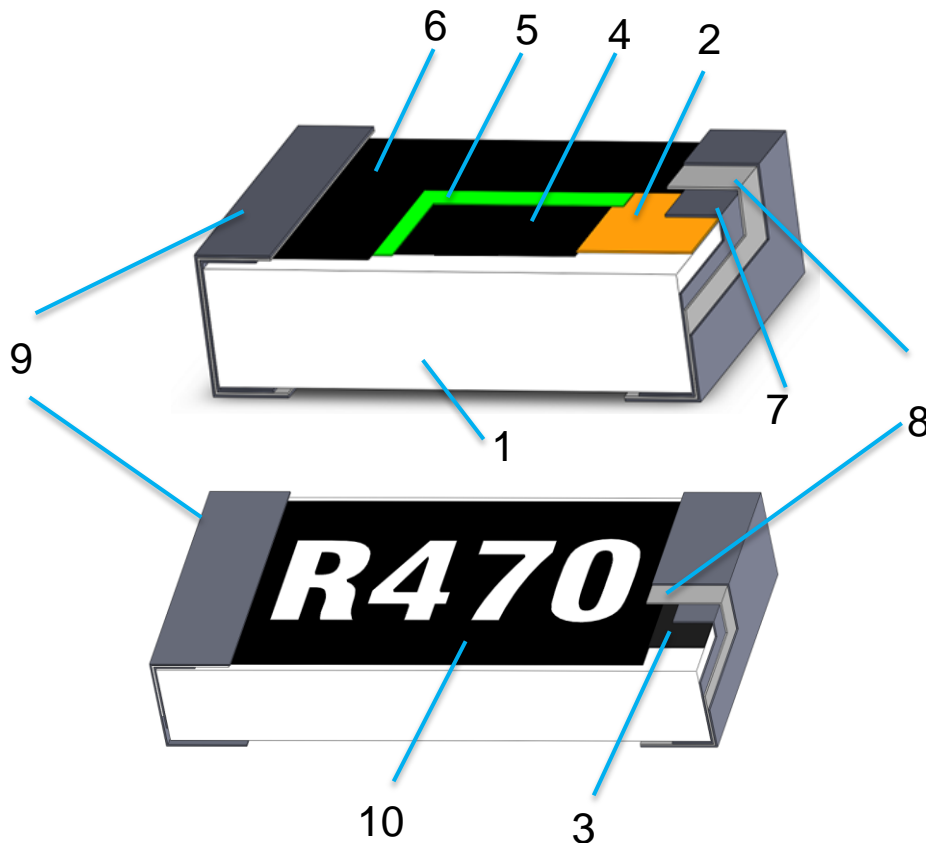
**4 Dimensions:**



Unit:mm

Dimension		L	W	H	L1	L2
Type	Size Code					
RTG25	2512	6.40±0.20	3.20±0.20	0.70±0.10	0.72±0.20	0.69±0.20

**5 Structure Graph:**



1	Ceramic substrate	6	2nd Protective coating
2	Bottom inner electrode	7	Terminal inner electrode
3	Top inner electrode	8	Ni plating
4	Resistive layer	9	Sn plating
5	1st Protective coating	10	G2+MK layer

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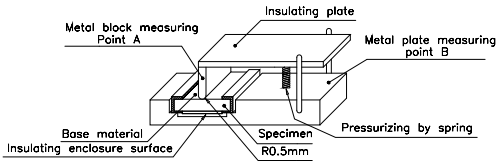
Series No. **60**

**RTG Series Pulse-Proof Low-Resistance  
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<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>4</b>

**6 Reliability Test:**

**6.1 Electrical Performance Test**

Item	Conditions	Specifications
		Resistors
Temperature Coefficient of Resistance	$TCR \text{ (ppm/}^\circ\text{C)} = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10^6$ R1: Resistance at room temperature R2: Resistance at -55°C or +125°C T1: Room temperature T2: Temperature -55°C or +125°C  Refer to JIS-C5201-1 4.8	Refer to item 3. general specifications
Short Time Overload	Applied 2.5 times rated current for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Rated current refer to item 3. general specifications)  Refer to JIS-C5201-1 4.13	$\Delta R = \pm 2.0\%$
Insulation Resistance	Put the resistor in the fixture, add 100 VDC in +, - terminal for 60 sec then measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base material. Refer to JIS-C5201-1 4.6  	$\geq 10^9 \Omega$
Dielectric Withstand Voltage	Put the resistor in the fixture, add VAC (see spec. below) in +, - terminal. RTG25 apply 500 VAC 1 minute.  Refer to JIS-C5201-1 4.7	No short or burned on the appearance.
Intermittent Overload	Put the tested resistor in chamber under temperature $25 \pm 2^\circ\text{C}$ and load the rated current for 1 sec on, 25 sec off, $10000^{+400}_0$ test cycles, then it be left at no-load for 1 hour, then measure its resistance variance rate.  Refer to JIS-C5201-1 4.13	$\Delta R = \pm 2.0\%$
ESD	Put the specimens on the test fixture and apply $\pm 3\text{KVDC}$ on terminals for 1sec. Afterwards, the specimens stabilize for 30min or more and measure of its resistance variance rate.  Refer to EIAJED-4701-300 304	$\Delta R = \pm 5.0\%$

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<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>5</b>

**6.2 Mechanical Performance Test**

Item	Conditions	Specifications
		Resistors
Terminal Strength	Test1:The resistor mounted on the board applied 5N pushing force on the sample rear for 10 sec. Test2:The resistor mounted on the board slowly add force on the sample rear until the sample termination is breakdown.  Refer to JIS-C5201-1 4.16	Test1:No evidence of mechanical damage. Test2: $\geq 5N$
Resistance to Solvent	The tested resistor be immersed into isopropyl alcohol of 20~25°C for 5 minutes, then the resistor is left in the room for 48 hrs, and measured its resistance variance rate.  Refer to JIS-C5201-1 4.29	$\Delta R = \pm 1.0\%$
Solderability	Preconditioning: Put the tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of $1.22 \times 10^5$ Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: The resistor be immersed into solder pot in temperature $235 \pm 5^\circ C$ for $2 \pm 0.5$ sec, then the resistor is left as placed under microscope to observe its solder area.  Refer to JIS-C5201-1 4.17	Solder coverage over 95%
Resistance to Soldering Heat	◎Test method 1 (solder pot test): The tested resistor be immersed into molten solder of $260 + 5 / - 0^\circ C$ for $10 + 1 / - 0$ seconds. Then the resistor is left in the room for 1 hour.  ◎Test method 2 (solder pot test): The tested resistor be immersed into molten solder of $260 + 5 / - 0^\circ C$ for $30 + 1 / - 0$ seconds. Then the resistor is left as placed under microscope to observe its solder area.  ◎Test method 3 (Electric iron test): Preheating temperature: $350 \pm 10^\circ C$ Electric iron preheating time : $3 + 1 / - 0$ sec Preheating the electric iron on electrode termination, as after that step placed the iron over 60 min. and measured its resistance variance rate.  Refer to JIS-C5201-1 4.18	Test item 1: (1)Variance rate on resistance $\Delta R = \pm 2.0\%$  Test item 2: (1)Solder coverage over 95%. (2)The underlying material (such as ceramic) shall not be visible at the crest corner area of the electrode.  Test item 3: (1)Variance rate on resistance $\Delta R = \pm 2.0\%$

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<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>6</b>

Item	Conditions	Specifications
		Resistors
Joint Strength of Solder	<p>Bending Strength: Solder tested resistor on to PC board. Add force in the middle down, and under load measured its resistance variance rate. D:RTG25=2mm</p> <p>Refer to JIS-C5201-1 4.33</p>	<p>(1).Variance rate on resistance <math>\pm 1.0\%</math> (2).No evidence of mechanical damage. No terminal peeling off and core body cracked.</p>

**6.3 Environmental Test**

Item	Conditions	Specifications								
		Resistors								
Resistance to Dry Heat	<p>Put tested resistor in chamber under temperature <math>155\pm 5^{\circ}\text{C}</math> for 1000 +48/-0 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</p> <p>Refer to JIS-C5201-1 4.25</p>	$\Delta R = \pm 2.0\%$								
Thermal Shock	<p>Put the tested resistor in the chamber under the Thermal Shock which shown in the following table shall be repeated 300 times consecutively. Then leaving the tested resistor in the room temperature for 1 hours, and measure its resistance variance rate.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Testing Condition</th> </tr> </thead> <tbody> <tr> <td>Lowest Temperature</td> <td><math>-55\pm 5^{\circ}\text{C}</math></td> </tr> <tr> <td>Highest Temperature</td> <td><math>125\pm 5^{\circ}\text{C}</math></td> </tr> <tr> <td>Temperature-retaining time</td> <td>15 minutes each</td> </tr> </tbody> </table> <p>Refer to MIL-STD 202 Method 107</p>	Testing Condition		Lowest Temperature	$-55\pm 5^{\circ}\text{C}$	Highest Temperature	$125\pm 5^{\circ}\text{C}$	Temperature-retaining time	15 minutes each	$\Delta R = \pm 2.0\%$
Testing Condition										
Lowest Temperature	$-55\pm 5^{\circ}\text{C}$									
Highest Temperature	$125\pm 5^{\circ}\text{C}$									
Temperature-retaining time	15 minutes each									
Loading Life in Moisture	<p>Put the tested resistor in the chamber under temperature <math>40\pm 2^{\circ}\text{C}</math>, relative humidity 90~95% and load the rated current for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</p> <p>Refer to JIS-C5201-1 4.24</p>	$\Delta R = \pm 3.0\%$								
Load Life	<p>Put the tested resistor in chamber under temperature <math>70\pm 2^{\circ}\text{C}</math> and load the rated current for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate.</p> <p>Refer to JIS-C5201-1 4.25</p>	$\Delta R = \pm 3.0\%$								

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**RTG Series Pulse-Proof Low-Resistance  
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Document No.	IE-SP-155
Released Date	2018/11/13
Page No.	7

**7 Plating Thickness:**

- 7.1 Ni:  $\geq 2\mu\text{m}$
- 7.2 Sn(Tin):  $\geq 3\mu\text{m}$
- 7.3 Sn(Tin): Mate Sn

**8 Measurement Point:**

Bottom electrode		Unit : mm	
TYPE	DIM	A	B
	RTG25		5.90±0.05

● Current Terminal  
 ⊖ Voltage Terminal

**9 Rule of package empty quantity:**

- 9.1 Empty quantity for each reels not allowed to exceed 0.1% of the whole quantity, and continuous 2pcs (included) empty are also unallowed.

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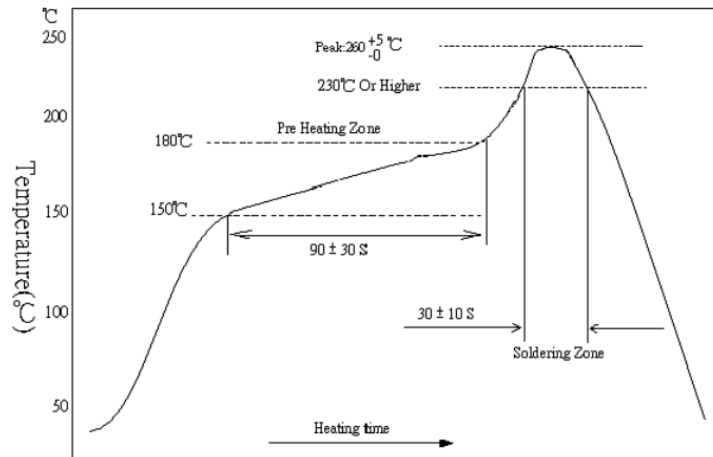
**RTG Series Pulse-Proof Low-Resistance  
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Specification**

Document No.	IE-SP-155
Released Date	2018/11/13
Page No.	8

**10 Technical application notes (This is for recommendation, please customer perform adjustment according to actual application):**

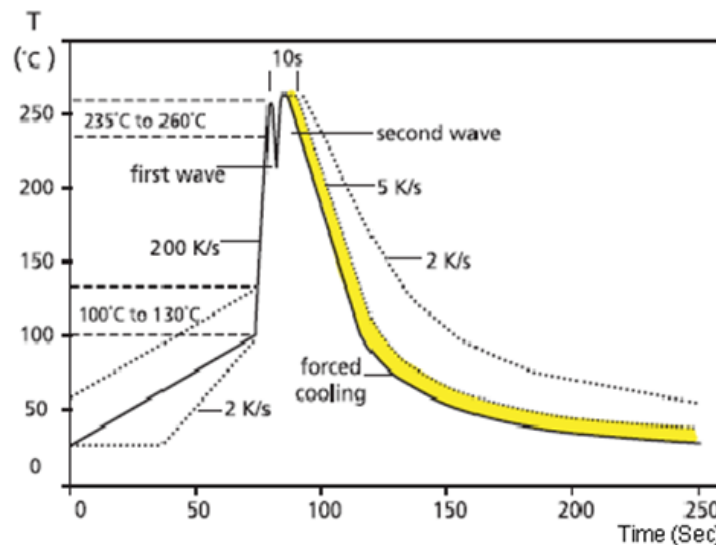
10.1 Recommend Soldering Method:

10.1.1 Lead Free IR Reflow Soldering Profile



Remark: The peak temperature of soldering heat is 260 +5/-0 °C for 10 seconds.

10.1.2 Lead Free Double-Wave Soldering Profile.



10.1.3 Soldering Iron: temperature 350°C ± 10°C, dwell time shall be less than 3 sec.

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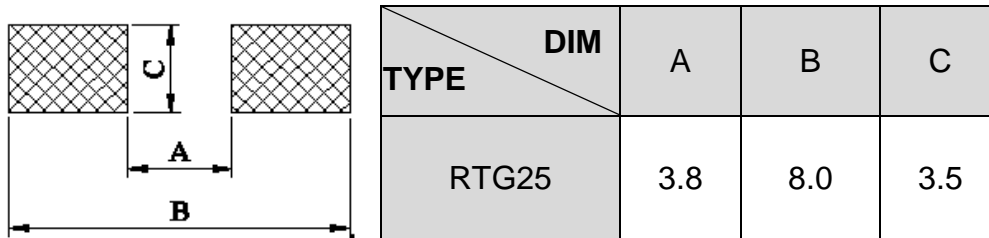
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<b>Document No.</b>	<b>IE-SP-155</b>
<b>Released Date</b>	<b>2018/11/13</b>
<b>Page No.</b>	<b>9</b>

**10.2 Recommend Land Pattern Design (For Reflow Soldering):**

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.

Unit:mm



**10.3 Environment Precautions:**

This specification product is for general electronic use, RALEC will not be responsible for any damage, cost or loss caused by using this specification product in any special environment. If other applications need to confirm with RALEC.

If consumer intends to use our Company product in special environment or condition (including but not limited to those mentioned below), then will need to make individual recognition of product features and reliability accordingly.

- (a) Used in high temperature and humidity environment;
- (b) Exposed to sea breeze or other corrosive gas, such as Cl<sub>2</sub>、H<sub>2</sub>S、NH<sub>3</sub>、SO<sub>2</sub> and NO<sub>2</sub>;
- (c) Used in non-verified liquids including water, oil, chemical and organic solvents;
- (d) Using non-verified resin or other coating material to seal or coat our Company product;
- (e) After soldering, it is necessary to use water-soluble detergents to clean residual solder fluxes, even though no-clean fluxes are recommended.

**10.4 Momentary Overload Precautions:**

The product might be out of function when momentary overloaded. Please make sure to avoid momentary overloading while using and preserving.

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	Do not copy without permission	Series No. <b>60</b>

**RTG Series Pulse-Proof Low-Resistance  
Thick Film Chip Resistors Product  
Specification**

**Document No.**

**IE-SP-155**

**Released Date**

**2018/11/13**

**Page No.**

**10**

**10.5 Operation and Processing Precautions:**

- (a) Avoid damage to the edge of resistor and protective layer caused by mechanical stress.
- (b) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.
- (c) Make sure the power rating is under the limit when using the resistor. When power rating is over the limit, the resistor will be overloaded. There might be machinery damage due to the climbing temperature.
- (d) If the resistor will be exposed under massive impact load (shock wave) in a short period of time, the working environment must be set up well before use.
- (e) Please make evaluation and confirmation when the product is well used in your company and have a through consideration of it's fail-safe design to ensure the system safety.

**11 Stock period:**

11.1 The temperature condition must be controlled at  $25\pm 5^{\circ}\text{C}$ , the R.H. must be controlled at  $60\pm 15\%$ . The stock can maintain quality level in two years.

11.2 Please avoid the mentioned harsh environment below when storing to ensure product performance and its' weldability. Places exposed to sea breeze or other corrosive gas, such as  $\text{Cl}_2$ 、 $\text{H}_2\text{S}$ 、 $\text{NH}_3$ 、 $\text{SO}_2$  and  $\text{NO}_2$ .

11.3 When the product is moved and stored, please ensure the correct orientation of the box. Do not drop or squeeze the box. Otherwise, the electrode or the body of the product may be damaged.

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Series No. **60**

**RTG Series Pulse-Proof Low-Resistance  
Thick Film Chip Resistors Product  
Specification**

**Document No.**

**IE-SP-155**



**Released Date**

**2018/11/13**

**Page No.**

**11**

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Thick Film Chip Resistors Product  
Specification**

**Document No.**

**IE-SP-155**

**Released Date**

**2018/11/13**

**Page No.**

**12**

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