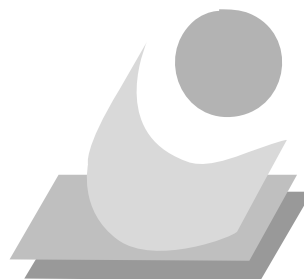


# ***DATA BOOK***

Thin Film Components

## ***Low R-Value Thin Film Chip Resistors***

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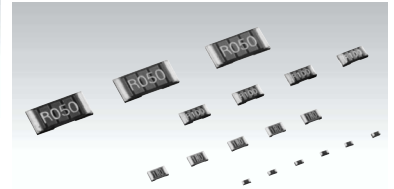
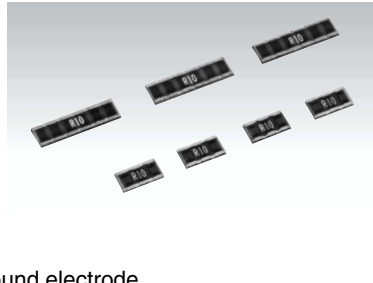
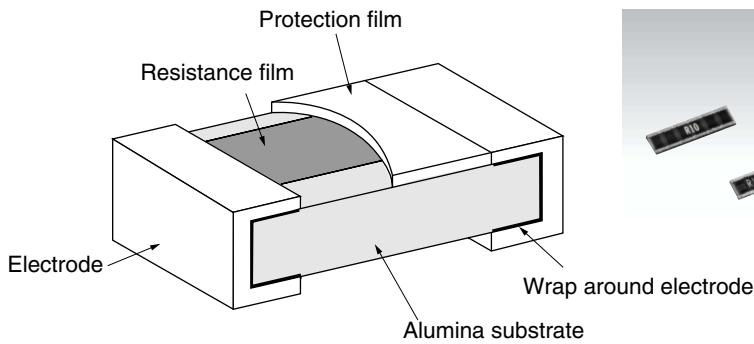


*Thin Film Power*

**SUSUMU CO.,LTD.**

# Low R-Value Thin Film Chip Resistors(Resistor for current detection)

## Structure

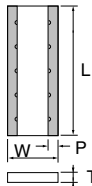


## Features

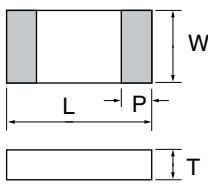
- Excellent heat split structure (Patent No.2963671) and compact size for lowering surface temperature rising.
- A tight resistance tolerance of  $\pm 1\%$  and an excellent TCR of  $\pm 100\text{ppm}/^\circ\text{C}$  assure current sensing accuracy.

## Specifications

Dimension (mm)	RL3720	RL3720W	RL7520	RL7520W
L	$3.75 \pm 0.30$	$3.75 \pm 0.30$	$7.50 \pm 0.30$	$7.50 \pm 0.30$
W	$2.00 \pm 0.20$	$2.00 \pm 0.20$	$2.00 \pm 0.20$	$2.00 \pm 0.20$
P	$0.40 \pm 0.20$	$0.40 \pm 0.20$	$0.40 \pm 0.20$	$0.40 \pm 0.20$
T	$0.40 \pm 0.10$	$0.40 + 0.15 / - 0.10$	$0.40 \pm 0.10$	$0.40 \pm 0.15 / - 0.10$



Dimension (mm)	RL0510 (0402)	RL1220 (0805)	RL1632 (1206)	RL3264 (2412)
L	$1.00 \pm 0.10$	$2.00 \pm 0.02$	$3.20 \pm 0.20$	$6.40 \pm 0.20$
W	$0.50 \pm 0.10$	$1.25 \pm 0.20$	$1.60 \pm 0.20$	$3.20 \pm 0.20$
P	$0.20 \pm 0.10$	$0.40 \pm 0.20$	$1.00 \pm 0.15$	$2.00 \pm 0.15$
T	$0.35 \pm 0.10$	$0.40 \pm 0.10$	$0.50 \pm 0.15$	$0.50 \pm 0.15$



### electric characteristics

Type	RL3720		RL3720W		RL7520		RL7520W		
Power	1/2W		1W		1W		2W		
Resistance Tolerance (code)	$\pm 1\%$ (F) $\pm 2\%$ (G)		$\pm 1\%$ (F) $\pm 2\%$ (G)		$\pm 1\%$ (F) $\pm 2\%$ (G)		$\pm 1\%$ (F) $\pm 2\%$ (G)		
Resistance range (ohm)	0.022~0.075	0.1~2.2	0.010~0.068	0.1~1.0	0.010~0.075	0.1~1.0	5,6,9mΩ	0.010~0.068	0.1~0.47
Temperature Coefficient of Resistance (ppm/°C)	0~+350 (T)	0~+200 (S)	0~+350 (T)	0~+200 (S)	0~+350 (T)	0~+200 (S)	0~+420 (T)	0~+350 (T)	0~+200 (S)
Resistance Values	E-6		E-6		E-6		—	E-6	
Package	4000pcs/reel								

Type	RL0510 (0402)	RL1220 (0805)		RL1632 (1206)	RL3264 (2412)					
Power	1/8W	1/4W		1/2W	1W					
Resistance Tolerance (code)	$\pm 1\%$ (F) $\pm 2\%$ (G)	$\pm 2\%$ (G) $\pm 5\%$ (J)	$\pm 1\%$ (F) $\pm 2\%$ (G)	1% (F)	+ % (F)					
Referance range(ohm)	0.1~4.7	0.022~0.068	0.1~10.0	0.068~0.47	0.018~0.027	0.033~0.047	0.056~0.47	0.018~0.027	0.033~0.047	0.056~0.47
Temperature Coefficient of Resistance (ppm/°C)	0~+200 (S)	0~+350 (T)	0~+200 (S)	$\pm 100$ (R)	0~+350 (T)	0~+200 (S)	+100 (R)	0~+350 (T)	0~+200 (S)	$\pm 100$ (R)
Resistance Values	E-6	E-12		E-6	E-6			E-6		
Package	10,000pcs/reel	5000pcs/reel								

▪ Please call for TCR's less than  $\pm 100\text{ppm}/^\circ\text{C}$

▪ Kevin four termination current sensor is available

# Application

Typically used with control IC for power supply protection circuits, charging/discharging control circuits of battery-packages, and motor control circuits.

◆ For power supply protection and motor control application

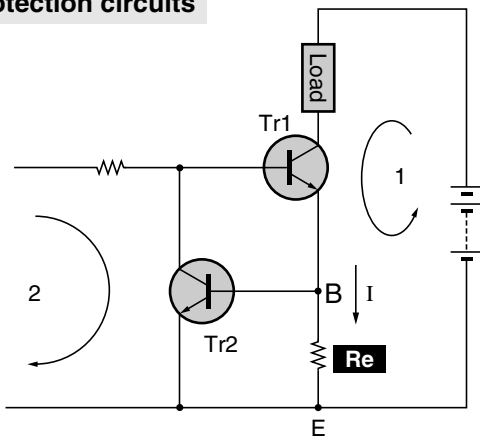
(1) A protection circuit

(2) To control the current and function

Power supply: To control the charge or discharge current and stabilize load.

Motor: To control the rotation speed, either steady or variable.

## protection circuits



**Re** : Current sensor

When loading current is low, current flows in direction 1. When loading current is increased to a certain level and turns Tr2 on, current flows in direction 2 and turns off Tr1.

Let Re be 0.2 ohm:

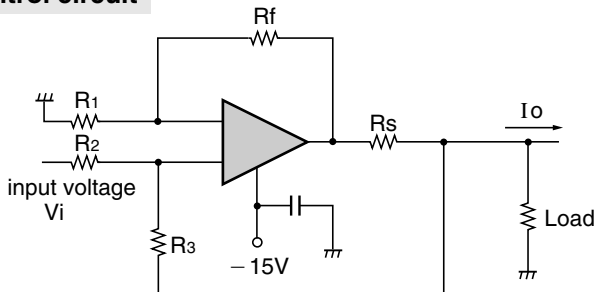
When I is 1 ampere, voltage between B and E is 0.2 volt.

When I is 2 amperes, voltage between B and E is 0.4 volts.

When I is 3 amperes, voltage between B and E is 0.6 volts and turns Tr2 on.

● Compare to conventional type low ohmic chip resistors, the structure of this RL-series has higher thermal dissipation (patent No 2963671) rate, able to assure lower surface temperature rising and lower thermal effect on surrounding parts. Strongly recommended component.

## control circuit



A basic voltage-to-current converter

Assume Vi is the input voltage on the current sensor, then output current Io could be formulated as follows:

$$I_o = \frac{V_i \cdot R_f}{R_1 \cdot R_s}$$

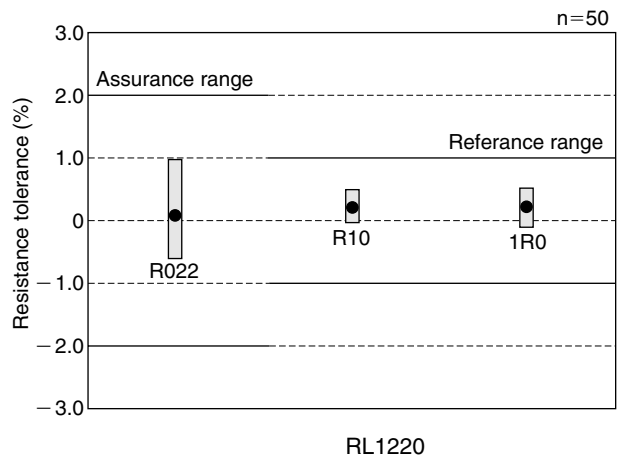
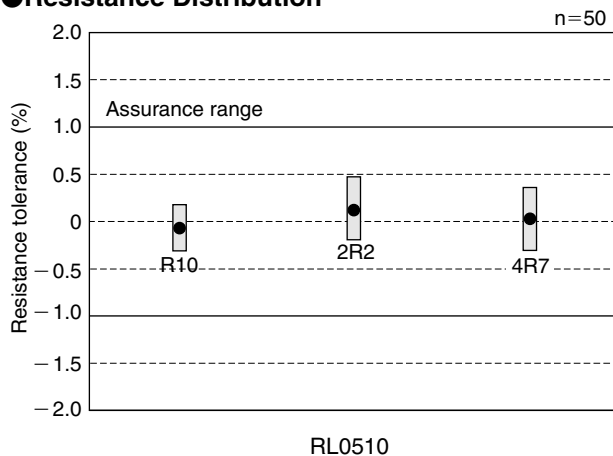
The output current is controllable and independent of load R.

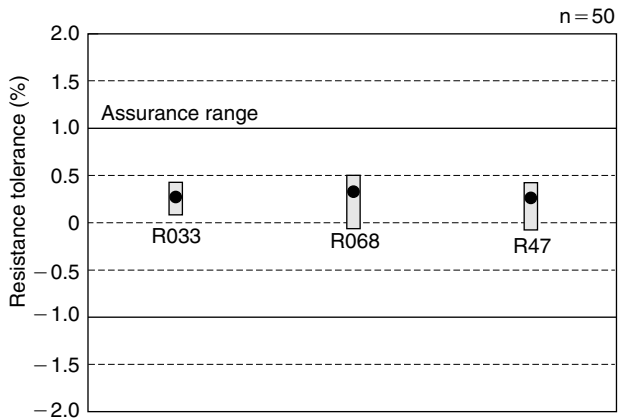
● Excellent initial characteristics, large heat dissipation, low temperature rise and excellent temperature characteristics assure high accuracy, contributing to longevity of battery packages.

# DATA

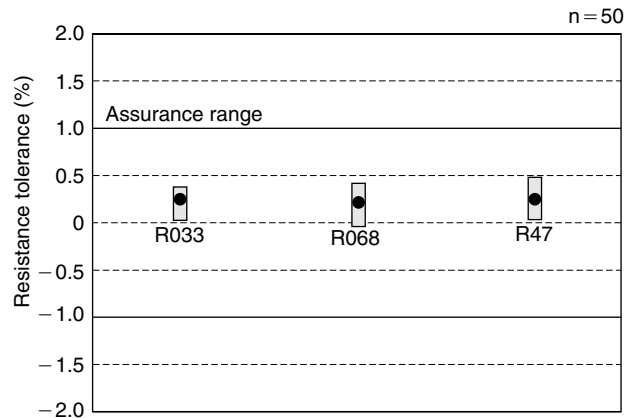
## <Electric characteristics>

### ● Resistance Distribution

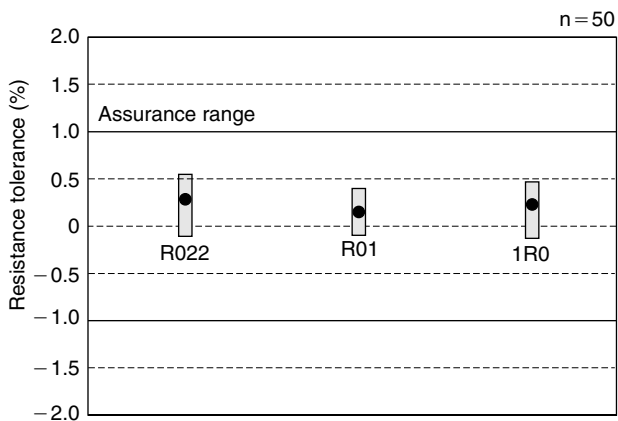




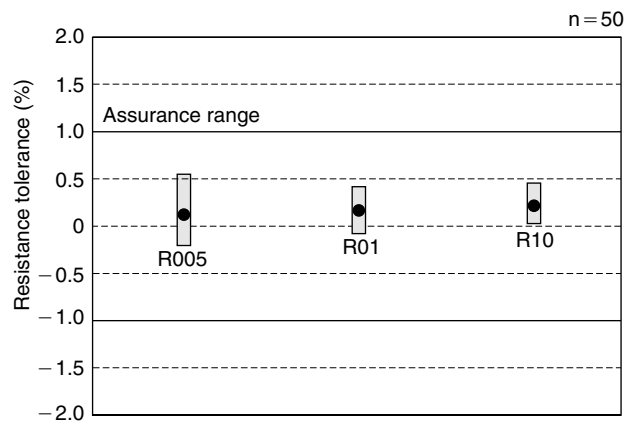
**RL1632**



**RL3264**

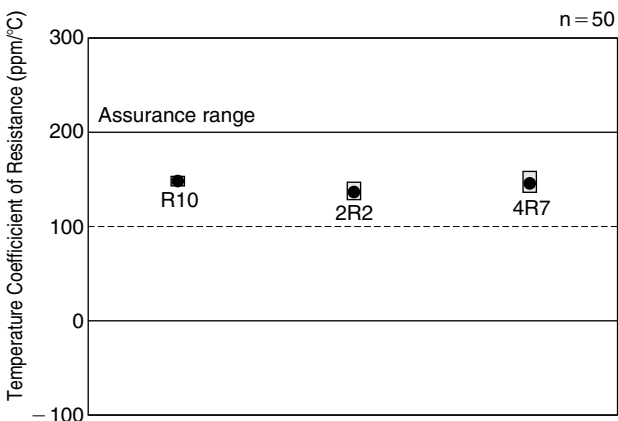


**RL3720, RL3720W**

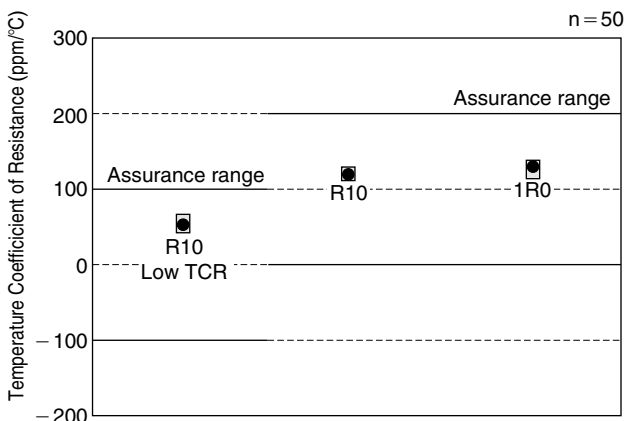


**RL7520, RL7520W**  
R005 is for RL7250W only

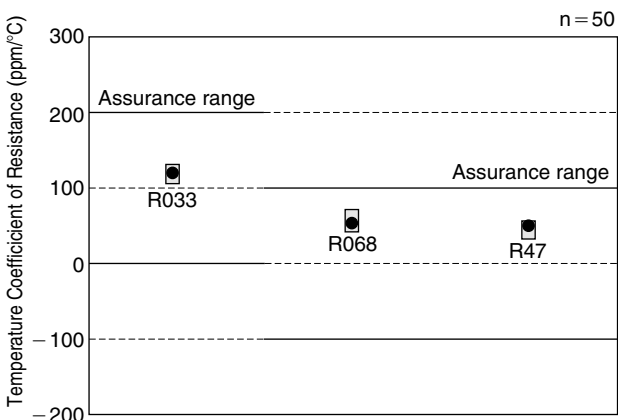
● **Temperature Coefficient of Resistance Distribution**



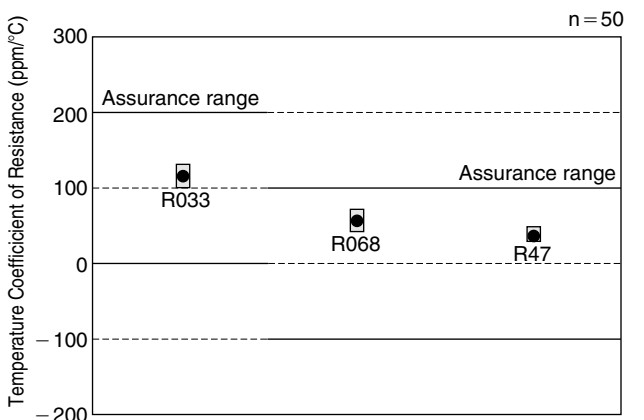
**RL0510**



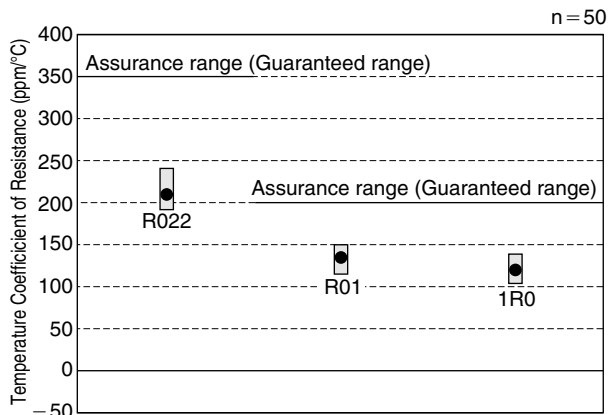
**RL1220**



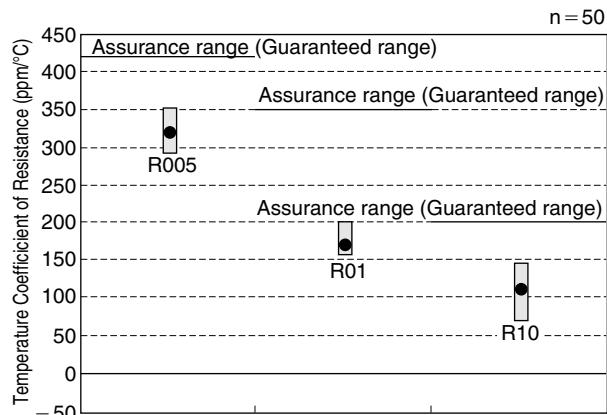
**RL1632**



**RL3264**



**RL3720,RL3720W**

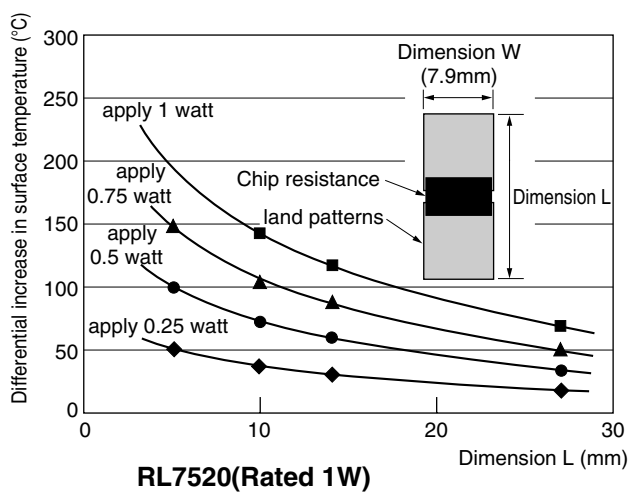
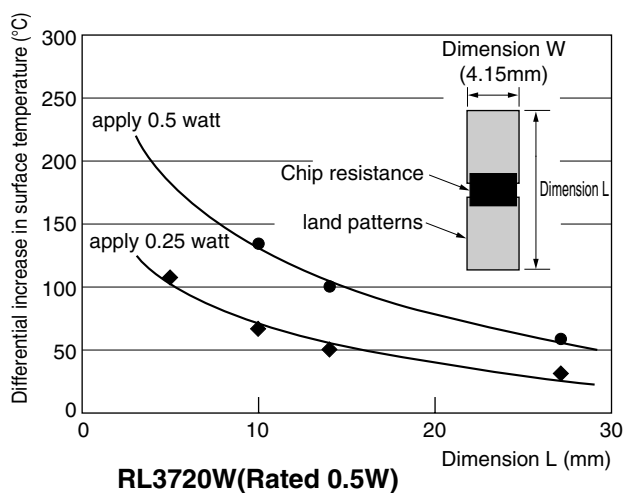
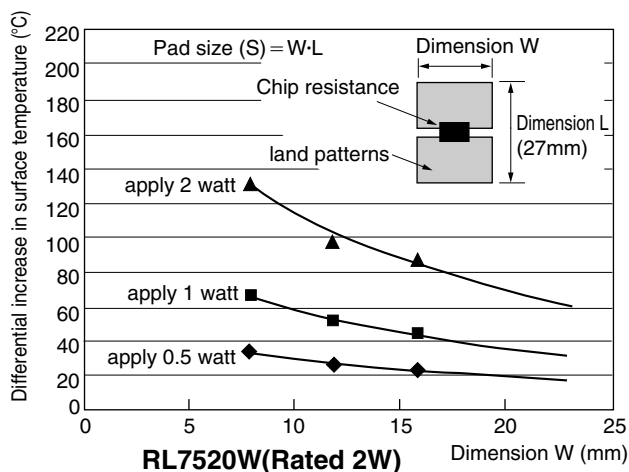
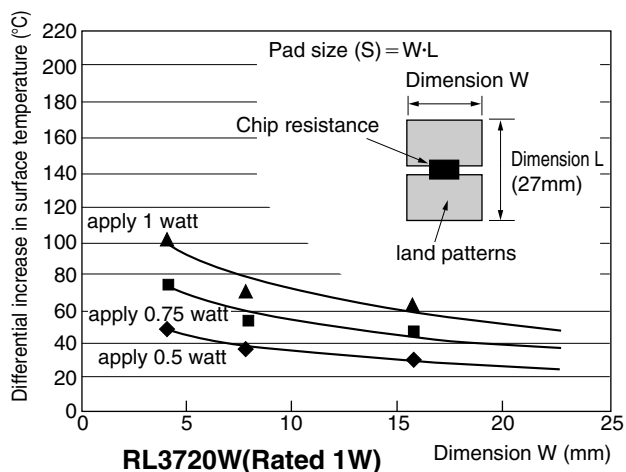


**RL7520,RL7520W**

R005 is for RL7250W only

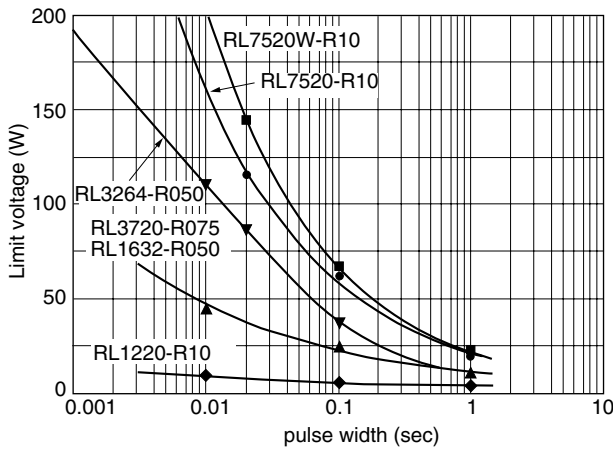
### <Data of surface temperature rises>

- This low resistance chip resistor is designed to have better heat (generated by resistor) dissipation rate than the copper pad on board, therefore surface temperature rising on the resistor depends on the pad's on PC board.



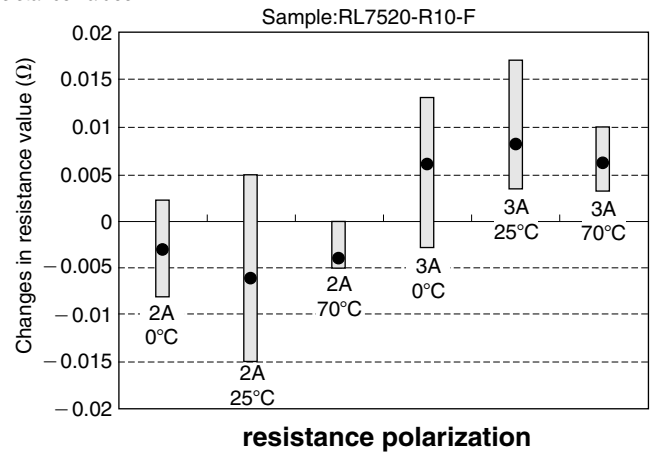
### <Resistance to surge voltage>

Apply a pulse to a sample resistor and measure the rate of resistance change. Raise the voltage gradually until the rate of resistance change exceeds  $\pm 0.5\%$ . The threshold pulse voltage is defined as the upper limit voltage to hold the rate of resistance change within 60.5%.



### <Resistance polarization>

Low ohmic resistor receive internally the effects of thermal electromotive force. We minimize the effects of thermal electromotive force of our low ohmic resistors through thin film technology. The effect of thermal electromotive power could be detected by measuring polarization of its resistance values.

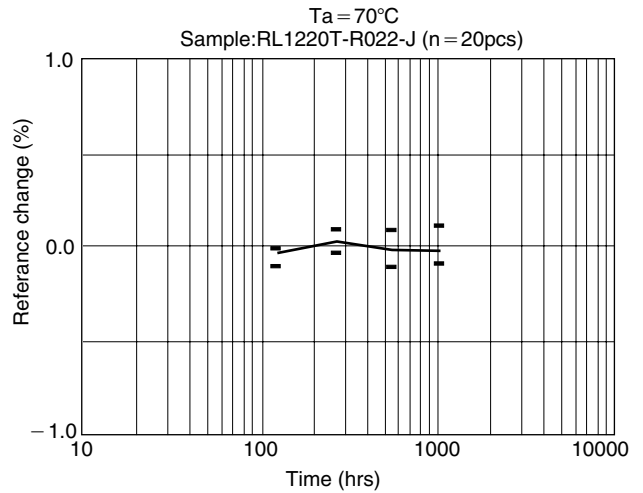
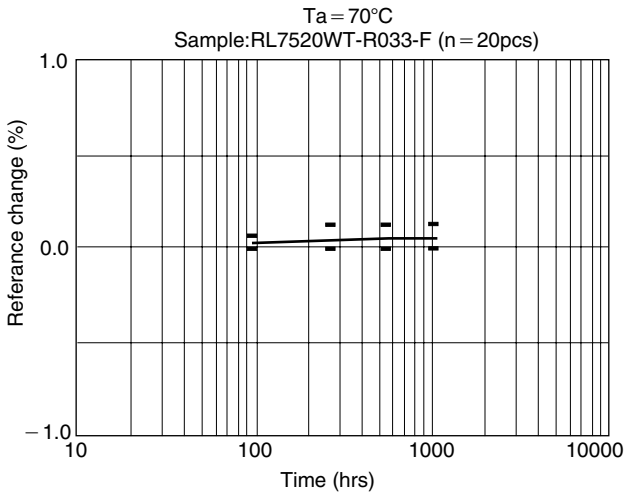


## Reliability Test DATA

Compared with general-purpose resistors, low resistance resistors are more often used in high temperature environment and high power applications where the amount of heat is high. High reliability is necessary. Susumu's low ohmic resistors have excellent reliability of less than 0.01fit.

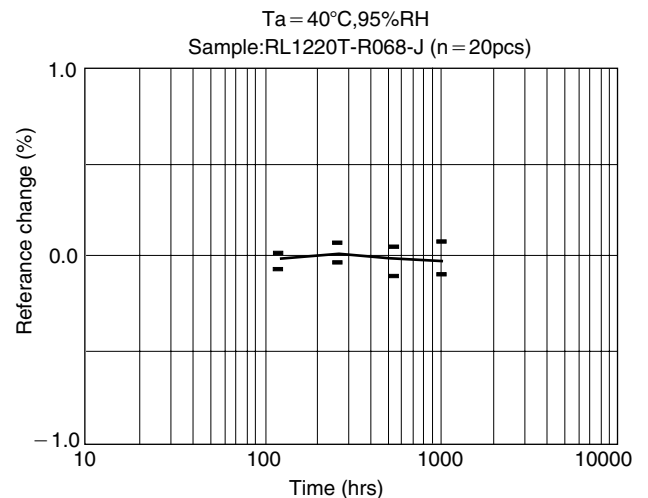
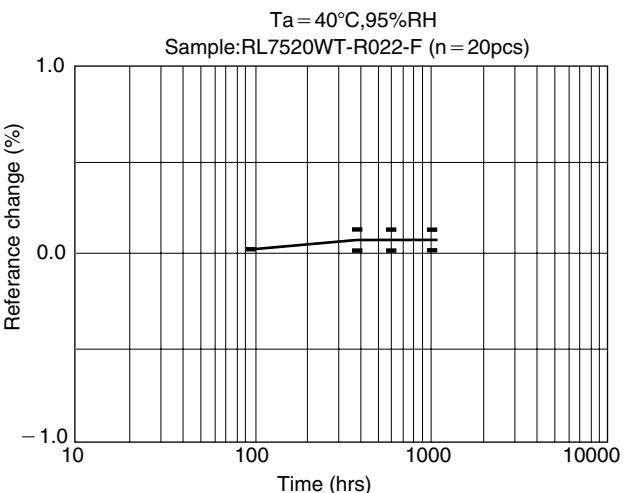
### ● Load Life Test

Test conditons:70°C Apply rated voltage for 90 minutes followed by 30 minute intermission. This cycle is repeated for 1,000 hours.



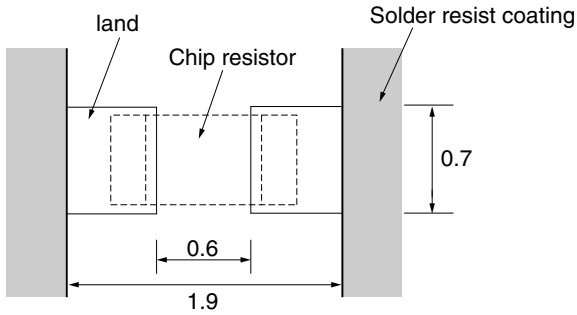
### ● Moisture Load Life Test

Test conditons:40°C,95%RH Apply rated voltage for 90 minutes followed by 30 minute intermission. This cycle is repeated for 1,000 hours.

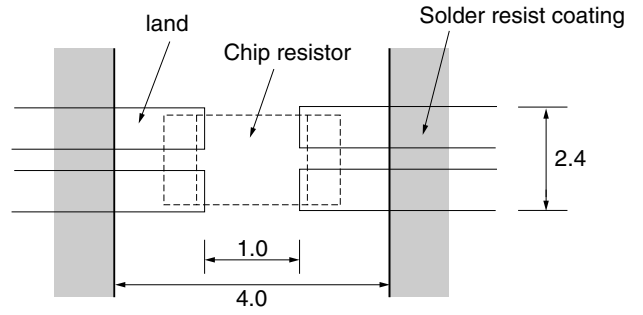


# Recommended land patterns

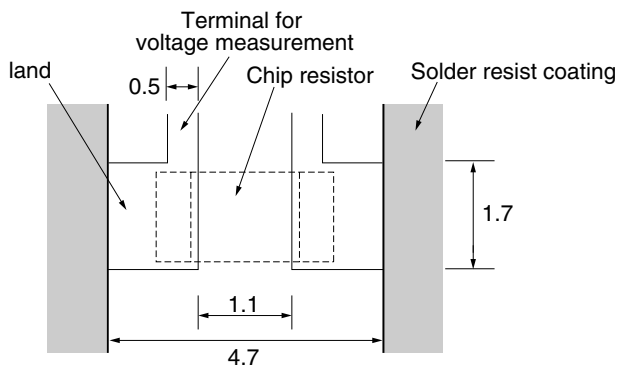
● Recommended land patterns Board thickness:1.6mm,Board material:glass fabric epoxy resin,Copper film thickness:0.035mm



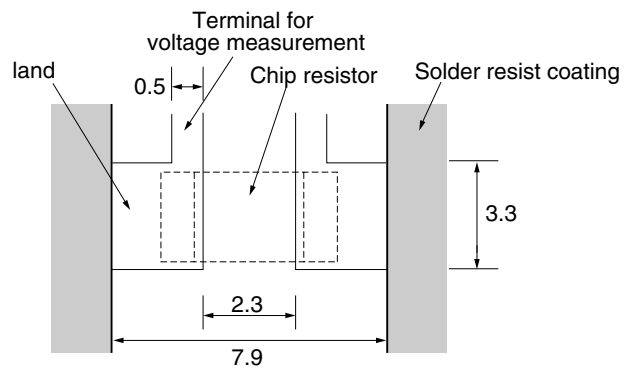
RL0510 Recommended land pattern



RL1220 Recommended land pattern

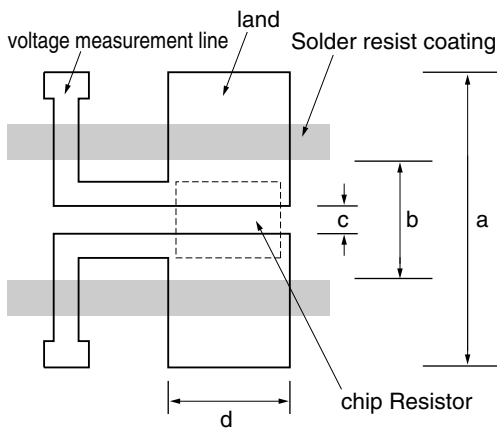


RL1632 Recommended land pattern



RL3264 Recommended land pattern

## ● Long-side electrode type Recommended land patterns



	a	b	c	d
RL3720	27.0	4.0	1.2	4.2
RL3720W	27.0	4.0	1.2	7.9
RL7520	27.0	4.0	1.2	7.9
RL7520W	27.0	4.0	1.2	15.8

dimension:mm