Susumu, established in Kyoto, Japan, in 1964, has been the industrial leader in thin film resistors for over 40 years enjoying the largest share of the thin film resistor market in the world. Our core technology consists of various methods of thin film deposition and patterning. The technology and experience accumulated over 40 years has given us the technological edge in innovation of thin film passive electronics components. One such latest innovation is the ultimate thin film chip resistor, RG series, for applications that demand high precision, excellent environmental tolerance, and long-term reliability.

Our proprietary NiCr based alloy exhibits excellent TCR characteristics as compared to other resistive materials such as tantalum nitride. Despite the belief that NiCr thin film has reliability issues, especially in humid environment, Susumu has developed technologies to apply an inorganic passivation that acts as a hermetic seal, and the ability to laser trim through the passivation without damaging it. The result is an ultimate thin-film resistor that far exceeds even thick film resistor reliability, reaching 0.01fit (=10 parts per trillion!).

RG series thin-film chip resistors boast high precision, near zero TCR and unprecedented reliability with all the benefits of thin-film resistors!

Features:
- Absolute resistive tolerance as low as +/- 0.02%
- TCR as low as 5 ppm
- Operating temperature up to 155°C
- Moisture load life: maximum drift +/-0.1% after 85/85 2000 hours
- Temperature cycle: maximum drift +/-0.1% after −55°C/+125°C 1000 cycles
- High temperature exposure: maximum drift +/-0.1% after 1000 hours at 155°C
- Load life test: maximum drift +/-0.1%, rated voltage on/off 1000 cycles at 85°C (2000 hours)
- Various standard sizes: from 0402 to 1206
- E-24, E-96 series ranging 10 Ohm to 1M Ohm

Advantages
- Highly precise and maintains its tolerance for a long time period.
- Tight resistant value distribution for matching application with multiple chips (custom network is available upon request)
- Robust against any harsh environment such as heat, chemical, dust etc.
- Thin-film resistors have better general performance compared to thick film resistors in such characteristics as high frequency performance and low noise.
- Completely RoHS compliant.
Applications
Any applications that require precision and/or environmental tolerance and long term reliability. We currently serve the following industries:
- Power Supply
- Medical electronics
- Military/aerospace/aviation
- Automotive
- Automation/production equipment
- Measurement/testing

<table>
<thead>
<tr>
<th>Item</th>
<th>RG Series</th>
<th>RR Series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition</td>
<td>Drift</td>
</tr>
<tr>
<td>Moisture Load Life</td>
<td>THB: 85°C-85% 1000 hours</td>
<td>+/-0.1%</td>
</tr>
<tr>
<td>Load Life</td>
<td>85°C (rated power) 1000 hours</td>
<td>+/- 0.1%</td>
</tr>
<tr>
<td>High Temperature Exposure</td>
<td>155°C (no load) 1000 hours</td>
<td>+/- 0.1%</td>
</tr>
<tr>
<td></td>
<td>Operation at 125°C is possible (Derating is needed)</td>
<td></td>
</tr>
</tbody>
</table>
ML60
Because the standard reliability test methods are not severe enough to fail Susumu products, Susumu developed a more stringent patented reliability test method, ML60, where artificial sweat is applied over the products before they are exposed to a high temperature high humidity environment. This test is so severe that Susumu’s conventional products that show far better moisture tolerance compared to competitors’ thin film chip resistors begin failing at about 250 hours. However during this test, RG series does not begin to fail at least for 5000 hours.

ML60 : Comparison to other Thin-Film Resistors

High temperature exposure
At 155°C, most resistors start drifting after a short period at this temperature. This is the case for our conventional RR series whose operating temperature can reach 125°C. Not the RG series! You will not see any significant change, not even 0.1% drift, for up to 10000 hours. Moreover, at this temperature, thick film chip resistors that are believed to be more reliable than thin film resistors, start drifting at 100 hours. This provides clear and convincing evidence that Susumu’s RG has superior reliability to even thick film chip resistors.
Thin Film Resistors
Susumu’s typical resistive thin film is 20-200nm thick whereas thick film resistors can be up to 50um thick. Moreover, thin film is deposited using molecular processes such as sputtering and plasma enhanced chemical vapor deposition, whereas thick film is made of screen printed metal particles suspended in polymer. This fundamental difference results in the clear advantage of thin film resistors in performance. Thin film resistors have better high frequency characteristics (no skin effect: resistance change due to high frequency), low noise due to the evenness of the thin film, and high resistance accuracy due to precise trimming of the thin film. The RG series combines the merit of such thin film performance with robustness and reliability that exceed thick film resistors.