passive components
SELECTION GUIDE
Our commitment to quality in everything we do is paying off... in the past two years we’ve received ten major customer quality awards. We’re the industry’s most recognized and awarded supplier for achieving the highest product quality, on-time delivery and responsive customer service.

From Concept to Reality

Our wide range of passive component solutions will help you make the leap

Whether you’re designing the car of tomorrow or connecting the Internet of Things, you need cutting-edge product solutions to bring your design to fruition. At KOA Speer, we’re the ideal partner to help you do just that. Our constantly expanding line of passive components will give you the solution to make your concept a reality!

Quality 1st

You expect product quality from any component that makes it into one of your designs. But in today’s competitive global marketplace, much more to the quality equation. At KOA Speer, our Quality 1st initiative reinforces our organization wide focus on serving you at the highest possible level.


Our commitment to quality in everything we do is paying off... in the past two years we’ve received ten major customer quality awards. We’re the industry’s most recognized and awarded supplier for achieving the highest product quality, on-time delivery and responsive customer service.
KOA SPEER... More Than Just Resistors

**Resistors**
- Precision • Surge • Wide Terminal
- High Voltage • Thin Film
- High Temperature • Embedded • General Purpose
- Networks • Anti-Sulfur • Fusing • Melf

**Low Resistance Current Sense/Shunts**
- Metal Plate • Thick Film • Power Shunt
- Molded • Wide Terminal

**Lede Resistors**
- General Purpose Carbon Film
- Precision Metal Film • High Voltage • Power
- Wirewound • Current Sense • Networks
- Fusing • Jumpers

**Thermistors/Thermal Sensors**
- Platinum Thin Film
- Thin Film Linear PTC
- NTC Thermistors • PTC Thermistors

**Fuses**
- Thin Film • Automotive • Anti-Pulse
- Fast Blow • Anti-Surge

**Varistors**
- Chip Varistors • Automotive Varistors

**LTCC Substrates**
- LTCC Substrates • Hybrid IC

**Other Products**
- Check Terminal • Lab Kits
**RESISTORS**

**Precision Thick Film**

RS73-Ultra Precision High Reliability Thick Film
- Excellent anti-sulfur characteristics (see page 7)
- Excellent long-term stability with $\Delta R$ of $\pm 0.2\%$ for $0.125W$ (0402)
- Power rating: 0.2W (0603), 0.25W (0805), 0.33W (1206)
- Low TCR: $\pm 25ppm/°C$, $\pm 50ppm/°C$
- Tolerance: $\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$
- Resistance range: 10 $\sim$ 10M$\Omega$

**WG73 Surge Current Thick Film**
- Superior to WK73 in pulse withstanding voltage
- Power rating: 0.2W (0603), 0.25W (0805), 0.33W (1206)
- Low TCR: $\pm 25ppm/°C$, $\pm 50ppm/°C$
- Tolerance: $\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$
- Resistance range: 10 $\sim$ 10M$\Omega$

**WK73R Wide Terminal**
- Excellent anti-sulfur characteristics (see page 7)
- Offers excellent heat dissipation & achieves high rated power
- Power rating: 0.33W (0204), 0.5W (0306), 1W (0508)
- Higher power rating: 1.5W (0612), 2W (1020), 3W (1225)
- Sizes available: 0204 $\sim$ 1225
- Tolerance: $\pm 10\%$, $\pm 20\%$

**Surge Current Thick Film**

SG73G Endured Pulse Power
- Excellent anti-sulfur characteristics (see page 7)
- Ultra precision grade, high power
- TCR: $\pm 50ppm/°C$
- Resistance range: 10 $\sim$ 1M$\Omega$
- Sizes available: 0603 $\sim$ 1206
- Tolerance: $\pm 0.25\%$, $\pm 0.5\%$

**SG73 Pulse/Surge**
- Excellent anti-sulfur characteristics (see page 7)
- Superior to RK73 series in surge/pulse withstanding voltage
- Resistance range: 1 $\sim$ 1M$\Omega$
- Sizes available: 0603 $\sim$ 2512
- Tolerance: $\pm 10\%$, $\pm 20\%$

**SG73P Precision Pulse**
- Excellent anti-sulfur characteristics (see page 7)
- Provides higher pulse ratings than standard RK73
- Resistance range: 1 $\sim$ 10M$\Omega$
- Sizes available: 0402 $\sim$ 1210
- Tolerances: $\pm 0.5\%$, $\pm 1\%$, $\pm 2\%$, $\pm 5\%$

**SG73S Surge Protection**
- Excellent anti-sulfur characteristics (see page 7)
- Endures high ESD limiting voltage
- Resistance range: 1 $\sim$ 10M$\Omega$
- Sizes available: 0402 $\sim$ 1210
- Tolerances: $\pm 0.5\%$, $\pm 1\%$, $\pm 2\%$, $\pm 5\%$

**Wide Terminal Thick Film**

**WG73 Surge Current Wide Terminal**
- Superior to WK73 in pulse withstanding voltage
- Power rating: 1W (0612), 1.5W (1020), 2W (1225)
- Resistance range: 560m $\sim$ 1k$\Omega$
- Tolerance: $\pm 10\%$, $\pm 20\%$

**Excellent Surge & Pulse Withstanding Voltages**

- **Surge overload**
  - High peak voltage, short duration
  - Ex.: CR discharge, ESD surge

- **Pulse overload**
  - Higher power than rated power, lower voltage than surge is applied for long time.
  - Ex.: Gate resistors of FET

Voltage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1us~1ms</td>
</tr>
<tr>
<td>100ns~1us</td>
<td></td>
</tr>
</tbody>
</table>

**KOASpeer.com/Resistors**
High Voltage

**HV73-High Voltage**
- Excellent anti-sulfur characteristics (see page 7)
- Maximum working voltage as high as 800V (1206), 3000V D.C. (2512)
- Superior to RK73 in maximum working voltage
- Resistance range: 10k ~ 100MΩ
- Sizes: 0603 ~ 2512

**HV73V-High Voltage for Automotive**
- Excellent anti-sulfur characteristics (see page 7)
- AEC-Q200 Tested
- Maximum working voltage as high as 800V (1206)
- Superior to RK73 in maximum working voltage
- Resistance range: 10k ~ 51MΩ
- Sizes: 0603 ~ 1206

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Thin Film

**RN73R-High Reliability Thin Film**
- Improved moisture resistance with high humidity coating
- High precision tolerance: ±0.05% ~ ±1%
- High performance TCR: ±5 ~ ±100ppm/°C
- Resistance range: 10 ~ 1.5MΩ
- Sizes: 0402 ~ 1210
- AEC-Q200 Tested

**RN73H-Thin Film for Automotive**
- Improved moisture resistance by special gloss protective coating
- High stability ΔR = 0.1% after 3,000 hrs
- High precision tolerance: ±0.05% ~ ±1%
- High performance TCR: ±5 ~ ±100ppm/°C
- Resistance range: 10 ~ 1.5MΩ
- Sizes: 0402 ~ 1210
- AEC-Q200 Tested

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High Temperature

**HSG73P-High Temperature Gold Terminations**
- High heat resistance that can be used even at high temperatures of 155°C or higher. The maximum operating temperature of Sn plating products compatible with solder mounting is 175°C, and Au plating products compatible with conductive glue mounting is 200°C.
- Metal glaze thick film ensures excellent heat and weather resistance
- Resistance range: 1 ~ 10MΩ
- Sizes available: 0402 ~ 1206
- AEC-Q200 Tested

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Embedded

**XR73-Embedded Flat Chip Resistor**
- Interlayer embedding in the multilayer substrates applicable from the height of 0.13 to 0.14mm
- Cu via hole connection is applicable
- Resistance range: 1 ~ 10MΩ, zero ohm offered
- Sizes available: 0201, 0402

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CNN-Thin Film Chip Network
- Excellent relative TCR (5ppm/°C)
- Pair resistors for high precision OP-amplifiers
- Custom products: any pairs between 1K ~ 100kΩ available upon request
RESISTORS

CONTINUED

General Purpose
RK73B-General Purpose 2%, 5%
Tolerance Thick Film Chip Resistor
• Excellent anti-sulfur characteristics
  (see page 7)
• Passes ASTM-809 anti-sulfuration testing
RK73G-Ultra Precision 0.25%, 0.5%,
1% Tolerance Thick Chip Resistor
• Excellent anti-sulfur characteristics
  (see page 7)
RK73H-Precision 0.5%, 1% Tolerance
Thick Film Chip Resistor
• Excellent anti-sulfur characteristics
  (see page 7)
• Passes ASTM-809 anti-sulfuration testing
RK73Z-Zero ohm Jumper
Thick Film Chip Resistor
• Excellent anti-sulfur characteristics
  (see page 7)
• Zero ohm with max. resistance
  of 50mΩ, 100mΩ

Fusing Resistors
RF73-Fusing Resistor Performs
Like RK73 under normal conditions
• Fuses when overloaded
• Fusing Power: 1.75W ~ 6.5W
• Fusing Time: 60 seconds, maximum
• Sizes available: 0603 ~ 2512

Melf Resistors
CC, RD41-Fixed Carbon Film
MELF Resistor
• Metal plated terminals
• Power Rating: 0.25W (RD41)
• Current rating: 5A (CC)
RN41-Fixed Metal Film
MELF Resistors
• Higher stability in short and
  long term tests
• TCR: ±10, ±25, ±50ppm/°C
• Power Rating: 0.4W (1406/0204),
  1W (2309/0207)
• Resistance range: 0.22 ~ 5.11M

Networks
HVD-High Voltage Divider
-Precision Type
• Max. resistance value 51MΩ
• Max. working voltage 1000V
• Max. resistance Ratio 1:1000
• Relative tolerance: 0.1%, 0.25%, 0.5%
• TCR: ±10, ±25ppm/°C
• Absolute resistance tolerance:
  ±0.1% ~ ±1%

RBA, RBB-Bussed Resistor Network
• TCR: ±25, ±50, ±100ppm/°C
• Resistance range: 10 ~ 100kΩ
• Absolute tolerance: ±1% ~ ±5%

RNX-High Precision Custom
Resistor Network
• Number of pins: 8, 14, 16, 20, 24
• Resistance range: 10 ~ 510kΩ
• TCR tracking: 5, 10, 25, 50ppm/°C

RIA-Isolated Resistor Network
• Number of pins: 8, 14, 16, 20, 24
• Absolute tolerance: ±0.1% ~ ±5%
• TCR tracking: 5, 10, 25, 50ppm/°C
Anti-Sulfuration Chip Resistors

Why Choose Anti-Sulfuration?
Sulfuration is a phenomenon that occurs in most thick film resistors, with silver-based inner electrodes. When a resistor is used in a high-sulfur atmosphere, the sulfur molecules can migrate between the protective film and the outer electrode to the inner electrode, where they react to form silver sulfide. Silver sulfide is an insulator, and the resistance of the device increases toward an open circuit. KOA’s product line includes resistors with sulfuration-resistant inner electrodes.

![Structural Chart of Flat Chip Resistor (Standard)](image)

All KOA Speer anti-sulfuration components (-RT) pass EIA-977 Anti-Sulfuration Testing

Anti-Sulfur Performance Comparison

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS73-RT</td>
<td>High Precision with $\Delta R$ of $\pm 0.2%$, Low TCR: $\pm 25\text{ppm}^\circ\text{C}$, Power rating: 0.125W (0402), 0.2W (0603), 0.25W (0805), 0.33W (1206)</td>
</tr>
<tr>
<td>RK73G-RT</td>
<td>$\pm 0.25%$ Ultra Precision Flat Chip Resistor, Low TCR: $\pm 50\text{ppm}^\circ\text{C}$, Power rating: 0.1W (0402/0603), 0.125W (0805), 0.25W (1206)</td>
</tr>
<tr>
<td>WK73R-RT/WK73S-RT</td>
<td>Higher power rating: 1.5W (0612), 2W (1225)</td>
</tr>
<tr>
<td>RK73H-RT</td>
<td>$\pm 0.5%$, $\pm 1%$ High Precision Flat Chip Resistor, Power rating: 0.03W (01005), 0.05W (0201), 0.1W (0402), 0.125W (0603), 0.25W (0805), 0.25W (1206), 0.5W (1210), 0.75W (2010), 2W (2512)</td>
</tr>
<tr>
<td>RK73Z-RT</td>
<td>Zero ohm with max. resistance of 50m$\Omega$</td>
</tr>
<tr>
<td>RK73B-RT</td>
<td>$\pm \frac{2}{10%}$, $\pm \frac{5}{10%}$ General Purpose Flat Chip Resistor, Power rating: 0.03W (01005), 0.05W (0201), 0.1W (0402), 0.125W (0603), 0.25W (0805), 0.25W (1206), 0.5W (1210), 0.75W (2010), 2W (2512)</td>
</tr>
<tr>
<td>RK73Z-RT</td>
<td>Surge Precision, Power rating: 0.2W (0402), 0.33W (0603), 0.5W (0805), 0.75W (1206), 1W (1210)</td>
</tr>
<tr>
<td>SR73-RT</td>
<td>Low Resistance (0.1–10$\Omega$), Power rating: 0.166W (0402), 0.2W (0603), 0.5W (0805, 1206), 0.66W (1210)</td>
</tr>
</tbody>
</table>

KOASpeer.com/Resistors
Metal Plate

**TLR-Current Sensing, Low Resistance**
- Power rating: 1W (0805), 2W (2010), 3W (1206), 5W (2512)
- Resistance range: 0.5 ~ 20mΩ
- Ultra-low TCR (+50ppm/°C) available
- Tolerance: ±1%

**TLRH-Current Sensing, Extended Resistance Range, Low Resistance**
- Power rating: 0.5W (0805) to 5W (2512)
- Resistance range: 6 ~ 270mΩ
- TCR: ±50, ±75ppm/°C
- Tolerance: ±1%

**TLRZ-Current Sensing, Zero Ohm Jumper**
- Current Ratings: 10A (0402), 26A (0603), 31.6A (0805), 50A (1206)
- Ultra low resistance not to exceed 0.5mΩ
- Operating temperature: -65 ~ +170°C

**LR72-Custom Milliohm**
- Flexible leads allow for thermal expansion
- Unique open-center shapes for cooler operation
- Resistance values: 2 ~ 8mΩ

KOA’s Metal Plate
LARGE Pulse Capability Due to NO Trim Lines

KOA Current Sense Resistor Lineup

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**Thick Film Current Sense**

**SR73-Low Resistance**
- Excellent anti-sulfur characteristics (see page 7)
- Resistance range: 24m ~ 10Ω
- Power rating: 0.1W (0201), 0.166W (0402), 0.25W (0603), 0.5W (0805, 1206), 0.66W (1210), 0.75W (2010), 2W (2512)
- TCR: Down to 1000ppm/°C
- Tolerance: ±0.5%, ±1%, ±2%, ±5%

**UR73-Low Resistance, Low TCR**
- Resistance range: 10m ~ 100mΩ
- TCR: ±100 ~ ±500ppm/°C
- Power rating: 0.125W (0402), 0.25W (0603), 0.33W (0805), 0.5W (1206), 0.75W (2010), 1W (2512)

**UR73V-High Heat, Low Resistance, Low TCR**
- Operating temp range: -55°C ~ +155°C
- Resistance range: 10m ~ 100mΩ
- TCR: ±75 available
- Power rating: 0.5W (0805), 1W (1206)
- AEC-Q200 Tested
**Wide Terminal Thick Film**

**WK73S-Low Resistance, Wide Terminal**
- Excellent anti-sulfur characteristics (see page 7)
- Power rating: 1W (0508, 1218), 1.5W (0612), 2W (1020), 3W (1225)
- Resistance range: 10m ~ 9.76Ω
- Tolerance: ±0.5%, ±1%, ±5%

**WU73-Low Resistance, Wide Terminal**
- Power rating: 1.5W (0612)
- Resistance range: 10m ~ 100mΩ
- Tolerance: ±1%
- Low TCR: ±75, ±100ppm/°C

**Power Shunts**

**PSL2-Large Current Sensing, Ultra Low Resistance, 2-Terminal**
- Resistance range: 0.2, 0.3, 0.5mΩ
- Power rating: 8W, 9W (2512)
- TCR: Down to ±115ppm/°C
- Tolerance: ±1%

**PSF4-Large Current Sensing, Ultra Low Resistance, 4-Terminal, Low TCR**
- Resistance range: 0.5, 1mΩ
- Power rating: 3W, 5W (1206)
- TCR: ±50ppm/°C
- Tolerance: ±1%

**HS-Large Current Sensing, Ultra Low Resistance**
- Resistance Range: 50μΩ, 100μΩ, 200μΩ
- Power Rating: Up to 50W (1,000A)
- Size: 4015, 4022, 8018, 8022
- Tolerance: ±5%
- TCR: 50±25, 75±50ppm/°C

**Molded Plate**

**SLR1-High Temperature Resistance**
- Power rating: 1W (2512)
- Resistance range: 301m ~ 1MΩ
- Tolerance: ±0.5%, ±1%, ±5%
- TCR: ±100ppm/°C

**SL-Current Sensing, Low Resistance**
- Power rating: 0.75W (2010), 1W (2512), 2W (4527), 3W (4527)
- Resistance range: 3m ~ 360mΩ
- Tolerance: ±0.5%, ±1%, ±2%, ±5%
- TCR as low as: ±50ppm/°C

**SLN-SLW-Higher Power Current Sensing**
- Power rating: 1W (2010), 1.5W (2512), 7W (4527)
- Resistance range: 3 ~ 200mΩ
- Tolerance: ±0.5%, ±1%, ±5%
- TCR: As low as ±50ppm/°C

**TSL-Low Profile Current Sensing**
- Power rating: 1W (2512)
- Resistance range: 5 - 100mΩ
- Operating temperature: -55 ~ +180°C
- Tolerance: ±0.5%, ±1%, ±5%

**CSR-Current Sensing, 4-Terminal, Molded**
- Power rating: 1W, 2W
- TCR: ±50ppm/°C
- Resistance values: 5 ~ 50mΩ
- Tolerance: ±0.5%, ±1%

**BLR-Ceramic, Custom**
- Power rating: 1W, 2W, 15W
- Resistance range: 8m ~ 50mΩ
- Tolerance: ±5%, ±10%

**MWS-Power Type, Wirewound**
- Power rating: 5W
- Resistance range: 1 ~ 470Ω
- TCR: ±200ppm/°C
- Tolerance: ±5%
- AEC-Q200 Tested

KOASpeer.com/CurrentSense
LEADED RESISTORS

General Purpose Ledged

CF-Carbon Film
- Flameproof coating available (CFP)
- Reduced body size offered (CFS, CFPS)
- Resistance range: 1 ~ 5.1MΩ
- Power rating: 0.25W, 0.5W
- Tolerance: ±2%, ±5%

Precision Ledged

MF-Precision Metal Film
- Meets requirements of MIL-R-22684
- MFS two times the power rating of the standard body type
- Resistance range: 0.51 ~ 5.11MΩ
- Power rating: 0.25W, 0.5W
- Low tolerance: ~ ±0.5%

MRS-Plate Shaped High Precision Metal Film
- Ultra precision TCR as low as ±2.5ppm/°C
- Low tolerance: ±0.01%, ~ ±0.5%
- Wide resistance range: 10 ~ 1MΩ

RNS-High Precision Metal Film
- Excellent long term stability in resistance value
- Resistance range: 0.2 ~ 6.8MΩ
- High precision resistance: +0.1% ~ 1%
- Power rating: 0.125W, 0.25W, 0.5W, 1W

SN3A/3D-High Precision
- TCR: As low as ±0.5%
- Wide resistance range: 10 ~ 1.5MΩ
- Power rating: 1W, 2W

SNF-Flame Retardant, Fixed Resistor
- TCR: +350 ~ -450ppm/°C
- Wide resistance range: 0.47 ~ 100Ω
- Power rating: 0.25W, 0.5W

High Voltage Circuit Ledged

RK92-High Voltage SIP Resistor
- High resistance resistor for high voltage circuits
- Flame retardant coatings corresponding to UL94V-0 are used
- Thick film resistors (Ru02) ensure high stability in life and aging
- Resistance range: 1M ~ 1GΩ
- Up to 15kV

RK-Metal Glaze Discharge Path Resistors
- TCR as low as ±100ppm/°C
- Highly stable against environmental conditions and overload
- Power rating: 0.25W, 0.5W, 1W
- RK1/2G: Discharge path resistor UL1676 available

RCR-Anti-Surge Resistor
- Excellent anti-surge characteristics
- Stable characteristics of moisture resistance up to 100MΩ resistance range
- RCR50+, RCR50EN (1M ~ 12MΩ), RCR60 are conductive-path and discharge path resistors recognized by UL1676 and c-UL (CSA-C22.2 No. 1-M94)
- RCR25EN, RCR50EN (100k ~ 33MΩ), RCR60 (100k ~ 56MΩ) are approved by EN6268-1 G.10 safety

GS-High Voltage, High Resistance Thick Film
- Miniature construction can endure to high power voltage (up to 40kV)
- High power rating up to 12W
- Excellent anti-surge characteristics
- Wide resistance range: 500k ~ 10GΩ

PCF-Ceramic Resistor for Anti-Pulse Surge
- KOA original bulk ceramic resistor
- Coated with UL94V0 flameproof material
- Excellent in anti-pulse characteristics
- Power rating: 0.5W, 1W, 2W
- Resistance range: 3.3 ~ 390kΩ

HPC-Ceramic Resistor for Anti-Pulse Surge
- KOA original bulk ceramic resistor
- Higher reliability against disconnection compared to wirewound resistors and film resistors
- Excellent in anti-pulse characteristics
- Power rating: 0.5W ~ 5W
- Resistance range: 3.3 ~ 330kΩ

CPCN-Fixed Ceramic Resistor
- Suitable for noise suppression of engine ignition systems
- Reliable in pulse/transient applications
- Power rating: 0.25W, 0.5W, 1W, 1.5W, 2W
- TCR: -1200 ±300ppm/°C

RK92-L-High Voltage SIP Discharge Resistor
- Excellent overload capability and high stability life and aging even in insulating oil
- Thin SIP shape suitable for space saving mounting
- Power rating: 4W
- Resistance range: 1.2 ~ 16MΩ

SN3A/3D- High Precision
KOASpeer.com/LedgedResistors
P-High Voltage Power Resistor
- PSN is higher power (up to 250W) and for high voltage surge (up to 400kV)
- PSO is a completely moisture resistant version of PSN
- PN is non-inductive type and can be used for high frequency
- PWW are non-inductive wirewound resistors for high voltage with resistance wires wound on insulation pipes
- PAP are non-inductive wirewound resistors with inductance less than PWW, can be used for pulse wave measurement
- Wide power rating: 1.5 ~ 250W

PSN • PV

KOASpeer.com/LeadedResistors

Power Leaded
BGR, BWR, BSR-High Power Resistors
- BGR - rectangular type wirewound resistor with glass core
- BWR - rectangular type wirewound resistor with ceramic core
- BSR - rectangular type metal oxide film resistor
- Uses flame retardant insulated ceramic case
- Power rating: BWR - 1W ~ 20W, BGR-5W ~ 40W, BSR - 2W ~ 20W
- Various styles available

Wirewound Leaded
CWF-Coat Insulated Wirewound Resistor with Fusing Function
- Fail-safe fusing at AC 250V
- Flameproof coating
- Power rating: 3W, 5W
- Fusing power: 90W, 150W
- Fusing time: 30 S. Max

CW-Coat Insulated Wirewound Resistor
- Flameproof silicone coating equivalent (UL94V0)
- CW1SS- UL1412 approval (file No. E320246)
- CW_X - power type & CW_S - small type available
- Power rating: 0.25W - 5W
- Resistance range: 0.01 ~ 390Ω

CWH-Miniature Wirewound Leaded Resistor
- Meets MIL-PRF-26 (U characteristics)
- High precision resistor with TCR ±20, ±50ppm/°C
- Power rating: 1W, 2W, 3W
- Resistance range: 0.1 ~ 3kΩ
- Tolerance: ±0.5% ~ ±1%

CWP-Precision Coat Insulated Wirewound Resistor
- Flameproof silicone coating equivalent (UL94V0)
- Power rating: 1W, 2W, 3W
- Resistance range: 0.1 ~ 3kΩ
- TCR: ±50, ±90ppm/°C
- Tolerance: ±0.25%, ±1%

RW-Coat-Insulated Miniature Precision Power Wirewound Resistor
- Meets MIL-R-26E (U and V characteristics) and surface temperature (hot spot) 350°C max.
- Wide resistance range: 0.1 ~ 62kΩ
- RW_N are non-inductive wound and can be used in high frequency applications
- Tolerance: ±0.5%, ±1%, ±3%, ±5%

MOS/MOSX-Reduced Size Metal Oxide Power Type
- MOS/MOSX Small size power type resistor
- Coated with UL94V0 equivalent flameproof material
- Power rating: 0.5W - 5W
- Resistance range: MOS- 10 ~ 100kΩ, MOSX - low resistance range: 0.1 ~ 9.1Ω
- TCR: ±300ppm/°C

SPR-Power Carbon Film
- Coated with UL94V0 equivalent flameproof material
- High reliability performance
- SPRX- fixed metal film resistor available
- Power rating: 0.25W - 5W

KOASpeer.com/LeadedResistors
**Current Sense Leaded**

BPR-Rectangular Metal Plate Resistor
- Power type current detecting resistor with flame retardant ceramic case
- Automatic insertion for a 5mm pitch between terminals is applicable (26 type, 58 type)
- Low resistance range: 0.01 ~ 1Ω
- TCR: ±350ppm/°C
- Low inductance

LR-Custom Milliohm Resistor
- The super low resistance (3m ~ 100mΩ) is suitable for high power current detection
- Pitches and heights are adjustable according to mounting conditions
- All custom made parts
- Max. current rating: 3A ~ 21A

**Leaded Resistor Networks/Resistor Arrays**

MRP-Precision Metal Film SIP Network
- Custom design network
- Ultra-precision performance for precision analog circuits
- Absolute TCR: ±25, ±50ppm/°C
- Tracking TCR: ±2, ±5, ±10ppm/°C
- Power rating: (mW): element-100, package-200

**RKC, RKH, RKL-Thick Film SIP Resistor Network**
- Various type of standard circuits in different sizes and power (seated height 0.20", 0.26", 0.42")
- Higher temperature soldering of the leads prevents terminals from loosening during board assembly
- Number of pins: 3 ~ 16
- Tolerance: ±0.5%, ±1%, ±2%, ±5%
- Resistance range: 10 ~ 10MΩ

**Jumper Leaded**

Z-Jumper (Coating Type)
- Size compatible with 1/8, 1/4 watt resistors
- Max. Amperage: 15A
- Resistance: 20mΩ or less

**J-Molded Jumper**
- Max. allowable current: 8A, 10A
- Operating temperature range: -55°C ~ +125°C

**JL-Jumper Wire**
- Suitable for automatic machine insertion
- Max. current rating: 8A, 10A, 12A
- 20, 22, 24 gauge wire

**Fusing Leaded**

RF-Coat Insulated Fusing Resistor
- Functions as a resistor in normal conditions
- Quick fusing protects circuit from excessive overload at an abnormal time
- Fusing time: 30s max, 60s max
- Flame retardant coating equivalent to UL94V0
- Fusing power: 2.5W ~ 36W

RF25CC-Coat-Insulated Fusing Resistor
- Constant current fuse type
- Fuse with 60 sec in case of over-current
- Fuse in low magnification at 5 times or 10 times the power rating
- Flame retardant coating equivalent to UL94V-0
- Fusing power: 2.5W, 1.25W
Platinum Thin Film Thermal Sensors

SDT310VASP2-Small Type Platinum Thin Film Thermal Sensor, Fast Response
- Achieves a thermal time constant of 2.3 seconds due to volume reduction
- Excellent heat-resistance
- Applies axial lead type suitable to use as a heater element
- TCR: +3850±40ppm/°C

SDT101-Axial Platinum Thin Film Thermal Series
- Stable characteristics even in use for a long time with an excellent environment resistance
- Resistance: 10Ω ~ 1kΩ
- TCR: +3500ppm/°C

SDT310HCTP-Small Type Platinum Thin Film Thermal Sensor
- Characteristics are equivalent with IEC 60751-2008, JISC 1604-2013
- Small package of 1.2mm x 3mm with 100Ω resistance
- Operating temperature range: -55°C ~ +300°C, -55°C ~ +400°C
- Specified current: 1mA Max.

SDT310-Small Type Platinum Thin Film Thermal Sensor
- TCR: +3850ppm/°C is in accordance with JIS-DIN standards IEC
- Small package with a real ability of 1kΩ resistance
- Thermal time constant is improved with the small package
- Operating temperature range: -55°C ~ 155°C, -55°C ~ 400°C, -55°C ~ +650°C

ST-Custom Thermal Sensor
- All ST-series thermal sensors are custom designed in various shapes in accordance with your application
- TCR: +3500ppm/°C, +3850ppm/°C
- Resistance values at 0°C: 100, 500, 1kΩ
- Utilize SDT310 or SDT101

A2S-Air Flow Sensors
- Realized high and long-term stability
- Small platinum thin film thermal sensor and an even temperature differential operating circuit ensure a quick response
- Built-in temperature compensation circuit assures correct values regardless of air temperature
- Products have no rotating mechanism and are resistant to vibration

Platinum Thin Film Surface Mount Thermal Sensors

SDT73H-General Purpose Chip Series
- SMD platinum thin film thermal sensor
- TCR: +3850ppm/°C is in accordance with JIS-DIN standards IEC
- 1206 Size
- Operating temperature range: -55°C ~ +155°C
- Thermal dissipation constant: 2.4mW/°C
- Resistance values at 0°C: 100Ω, 500Ω
**THERMAL SENSORS**

**Linear PTC Resistors**

**Thin Film Linear PTC Thermistors**

**Thermistor Styles**

<table>
<thead>
<tr>
<th>Thermistor Type</th>
<th>Resistance Range</th>
<th>TCR Tolerance</th>
<th>Sizes</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP73-Thin Film Thermal Sensors of SMD Type</td>
<td>100Ω ~ 1kΩ</td>
<td>±1%, ±2%, ±5%</td>
<td>0603, 0805, 1206</td>
<td>Suitable for control of temperatures in various industrial equipment</td>
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<tr>
<td>LT73-Linear Positive Tempco Thermistor</td>
<td>51Ω ~ 51kΩ</td>
<td>±150 ~ ±4500ppm/°C</td>
<td>0805, 1206</td>
<td>Thermal time constant: 1 second, 1.5 seconds</td>
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<tr>
<td>LT73V-Linear Positive Tempco Flat Chip for Automotive</td>
<td>51Ω ~ 22kΩ</td>
<td>±150 ~ ±4500ppm/°C</td>
<td>0805, 1206</td>
<td>Rated ambient temperature: +85°C</td>
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<tr>
<td>LP-Thin Film Resistance Thermal Sensor</td>
<td>1 ~ 100kΩ</td>
<td>±150 ~ ±5000ppm/°C</td>
<td>0805, 1206</td>
<td>Power rating: 0.063W, 0.125W</td>
</tr>
</tbody>
</table>

**Negative Tempco Thermistors**

**NT73-Temperature Compensation**

**Thick Film**

- Twelve standard resistance values; 1kΩ ~ 150kΩ
- Sizes: 0603, 0805, 1206
- B constant @25°C/75°C: 3200K ~ 4100K
- B constant tolerance: ±3%, ±5%, ±10%
Fuses – Flat Chip

TF16VN - Chip Current Fuse for Automotive
- Small and light for the secondary circuit
- Current rating: 0.4 - 3.15A
- Temperature cycle (-55°C ~ 125°C), 1000 cycle
- Anti-pulse type in 0603 size
- AEC-Q200 Tested

Fusing Characteristics

RF73-Fusing Flat Chip Resistor
- Fuses when overloaded
- Resistance range: 0.2 ~ 510Ω
- Tolerance: ±5%
- Sizes available: 0603 ~ 2512
- UL1412 Approved (0805 ~ 2512 sizes)

TF-Thin Film Chip Fuse
- Special manufacturing method stabilizes fusing characteristics
- Low power consumption and less voltage drop due to low internal resistance
- Rated current from 0.20 ~ 5A
- Sizes available: 0402, 0603
- TF16AT is Anti-Pulse

Varistors

NV73-Metal Oxide Varistor
- Multilayer structure with high surge current
- Protect against static electricity, switching and incoming surges
- Varistor voltage: 6.8 ~ 165 VA
- Clamping voltage: 18V ~ 350V
- Sizes available: 0201 ~ 2220
- Max. energy: 0.01J ~ 14J
- Max. current: 4,500A

NV73DS - Load Dump Surge Metal Oxide Varistor
- Symmetrical non-linearity V-I characteristics absorb positive and negative surge
- Meets JASO load dump surge test requirements
- Max. load dump surge energy: 63 ~ 70J
- Operating temperature: up to +125°C
- Varistor voltage: 20 ~ 45VA
- Size available: 2420
- AEC-Q200 Tested

Fuses – Chip

CCF1N-Anti-Surge Chip Fuse
- Ceramic case provides excellent mechanical strength
- Current rating: 400mA ~ 30A
- UL248, 14, c-UL(CAS)C22.2 approved
- Up to 125V AC and 160V DC
- Standard size: 2410

CCF1F-Anti Surge, Anti-Sulfuration Chip Fuse
- Meets IEC60127-4 specifications (7A or less)
- Stable fusing characteristics due to proprietary technology
- Current rating: 0.4 ~ 15A
- Standard size: 2410
- Fast-acting type

NV73DL-Metal Oxide Varistor for Automotive
- Ideal for countermeasures against ESD (conforming to IEC61000-4-2)
- Max. energy type up to 1.5J
- High resistance to cyclic temperature stress
- Varistor voltage: 10 ~ 90VA
- Clamping voltage: 24V ~ 135V
- Sizes available: 0603 ~ 1206
- AEC-Q200 Tested

CCF1F-Anti Surge, Anti-Sulfuration Chip Fuse
- Meets IEC60127-4 specifications (7A or less)
- Stable fusing characteristics due to proprietary technology
- Current rating: 0.4 ~ 15A
- Standard size: 2410
- Fast-acting type

RF73-Fusing Flat Chip Resistor
- Fuses when overloaded
- Resistance range: 0.2 ~ 510Ω
- Tolerance: ±5%
- Sizes available: 0603 ~ 2512
- UL1412 Approved (0805 ~ 2512 sizes)

TF-Thin Film Chip Fuse
- Special manufacturing method stabilizes fusing characteristics
- Low power consumption and less voltage drop due to low internal resistance
- Rated current from 0.20 ~ 5A
- Sizes available: 0402, 0603
- TF16AT is Anti-Pulse

Varistors

NV73-Metal Oxide Varistor
- Multilayer structure with high surge current
- Protect against static electricity, switching and incoming surges
- Varistor voltage: 6.8 ~ 165 VA
- Clamping voltage: 18V ~ 350V
- Sizes available: 0201 ~ 2220
- Max. energy: 0.01J ~ 14J
- Max. current: 4,500A

NV73DS - Load Dump Surge Metal Oxide Varistor
- Symmetrical non-linearity V-I characteristics absorb positive and negative surge
- Meets JASO load dump surge test requirements
- Max. load dump surge energy: 63 ~ 70J
- Operating temperature: up to +125°C
- Varistor voltage: 20 ~ 45VA
- Size available: 2420
- AEC-Q200 Tested

Fusing Characteristics

KOASpeer.com/Fuses • KOASpeer.com/Varistors
**LTCC Substrates**

**KLC-LTCC Multilayer Substrates**
- Stack accuracy <20µm
- Line width as low as 60µm
- Special shapes of substrates and cavity (circle, polygonal, concave or convex shape available)
- Line-to-line spacing as low as 60µm
- Cavity flatness: <25µm
- Cavity width: 600µm min.
- Cavity depth: 100µm min.
- Cavity wall thickness: 500µm min.
- Flexural/bending strength: 250MPa
- TCE: 5.5x10⁻⁶/K
- Thermal conductivity: 3W/m.K
- Min. insulation resistance: 1x10¹³Ω.cm
- Density: 2.8g/cm³
- Fired layer thickness: 80µm, 100µm, 125µm
- Via diameter: 100µm, 150µm, 200µm

**Hybrid IC**

**KA-Hybrid IC**
- High density mounting by bonding (COB)
- Adjustment processes are decreased by function and ratio trimmings
- Substrate materials: Al₂O₃ alumina and glass epoxy
- Conductor: Ag-Pd, Ag-Pt, RuO₂
- Printed resistor: 5Ω ~ 10MΩ ±100x10⁻⁶/K

**Other Products**

**RC-Test Point Chip**
- Surface-mountable chip type test terminal
- Rated Current: 2A
- Standard resistance: 50mΩ or less
- Sizes available: 0603, 0805, 1206
- AEC-Q200 Tested
**Surface Mount Resistors**

**Anti-Sulfur Precision Flat Chip Resistors**
RK73H1 ERT-Kit1 (0402 chip size)
122 values, 100 pcs each

RK73H1 JRT-Kit1 (0603 chip size)
122 values, 100 pcs each

**Precision Flat Chip Resistors**
RK73H1 FTK001Kit (01005 chip size)
38 values, Lead-free, 25 pcs each
(10R0 ~ 620K = ±1%)

RK73H1 HTK001Kit (0201 chip size)
217 values, Lead-free, 50 pcs each
(0, 10R0 ~ 1M00 = ±1%)

RK73H1 ETKit1 (0402 chip size)
122 values, Lead-free, 100 pcs each
(0, 10R0 ~ 1M00 = ±1%) E-24

RK73H1 JTKit1 (0603 chip size)
122 values, Lead-free, 100 pcs each
(0, 10R0 ~ 1M00 = ±1%) E-24

RK73H2 ATKit1 (0805 chip size)
122 values, Lead-free, 100 pcs each
(0, 10R0 ~ 1M00 = ±1%)

RK73H2 BTKit1 (1206 chip size)
122 values, Lead-free, 100 pcs each
(0, 10R0 ~ 1M00 = ±1%)

**General Purpose Flat Chip Resistors**
RK73B1 FTK001Kit (01005 chip size)
51 values, Lead-free, 25 pcs each
(0, 10 ~ 1M = ±5%)

RK73B1 HTK001Kit (0201 chip size)
139 values, Lead-free, 50 pcs each
(0, 2R2 ~ 2M2 = ±5%)

**High Voltage Flat Chip Resistors**
HV73TK001Kit (0603, 0805, 1206, 2010 chip sizes)
156 values, Lead-free, 25 pcs each
(10k ~ 10M = +1%)

**Varistors**
NV73TK001Kit (0201, 0402, 0603, 0805, 1206, 1210, 1812, 2220 chip sizes)
Lead-free, 122 values, 10 pcs each size

NV73DLTK001Kit (0603, 0805, 1206 chip sizes)
17 values, Lead-free, 10 pcs each size

**Surge Current Flat Chip Resistors**
SG73TK001Kit (0603, 0805, 1206, 1210, 2010, 2512 chip sizes)
204 values, ±10%, Lead-free, 25 pcs each

SG73STK001Kit (0603, 0805, 1206, 1210 chip sizes)
101 values, ±1%, Lead-free, 25 pcs each

SG73PTK001Kit (0603, 0805, 1206, 1210 chip sizes)
97 values, ±1%, Lead-free, 25 pcs each

**Wide Terminal Flat Chip Resistors**
WK73TK001Kit (0612, 1020, 1218 & 1225 chip sizes)
79 values, Lead-free, 25 pcs each

WU73TK001Kit (0612 chip sizes)
27 values, 20 pcs each

**Circuit Protection - Thermal Sensors**
NT73TK001Kit (0603, 0805, 1206 chip sizes)
Lead-free, 53 values (1J, 2A, 2B), 10 pcs each size

**Circuit Protection - Fuses**
CCFTK001Kit (2410 chip size)
18 values, Lead-free, 20 pcs each

FuseKit-TF10BN (0402 chip size)
12 values, Lead-free, 100 pcs each

FuseKit-TF16SN (0603 chip size)
14 values, Lead-free, 100 pcs each

FuseKit-TF16AT (0603 chip size)
13 values, Lead-free, 100 pcs each

**NOTE:** Reference product data pages for available values.
**Surface Mount Resistors** (continued)

**Ultra Precision Flat Chip Resistor**

RN73H1ET-Kit (0402 chip size)
- 49 values, Lead-free, 50 pcs each (±0.1%, 25ppm°C)

RN73H1JT-Kit (0603 chip size)
- 67 values, Lead-free, 50 pcs each (±0.1%, 25ppm°C)

RN73H2AT-Kit (0805 chip size)
- 73 values, Lead-free, 50 pcs each (±0.1%, 25ppm°C)

RN73R1ET-Kit1 (0402 chip size)
- 49 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RN73R1JT-Kit1 (0603 chip size)
- 67 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RN73R2AT-Kit1 (0805 chip size)
- 73 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RN73R2BT-Kit1 (1206 chip size)
- 74 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

RS73F1JT-Kit1 (0603 chip size)
- 97 values, Lead-free, 100 pcs each (±0.1%, 25ppm°C)

NOTE: Reference product data pages for available values.

**Current Sense Resistors**

**Surface Mount Molded**

SLW07TK001Kit (2010, 1W size)
- 27 values, 20 pcs each (±1%)

SLW1TK001Kit (2512, 1.5W size)
- 25 values, 20 pcs each (±0.5%)

SL1TK001Kit (2512, 1W size)
- 33 values, 20 pcs each (±1%)

SL2TK001Kit (4528, 2W size)
- 45 values, 20 pcs each (±1%)

SL3TK001Kit (4528, 3W size)
- 33 values, 20 pcs each (±1%)

SLN3TK001Kit (4528, 3W size)
- 32 values, 20 pcs each (±0.5%)

SLN5TK001Kit (4528, 5W size)
- 21 values, 10 pcs each (±0.5%)

TSL1TK001Kit (2512, 1W size)
- 33 values, Lead-free, 20 pcs each (±1%)

SLRTK001Kit (2513, 1W size)
- 40 values, 15 pcs each (±1%)

**Metal Plate**

TLR2ATK001Kit (0805 chip size)
- 6 values, complete range, 20 pcs each (±1%)

TLR2BWD-Kit (1206 chip size)
- 17 values, 15 pcs each (±1%)

TLR2HWD-Kit (2010 chip size)
- 10 values, 15 pcs each (±1%)

TLR3APD-Kit (2512 chip size)
- 10 values, 20 pcs each (±1%)

TLRDK001Kit (1206, 1210, 2512 chip sizes)
- 36 values, Lead-free, complete range, 20 pcs each (±1%)

TLR2BP-Kit (1206 chip size)
- 17 values, 15 pcs each (±1%)

**Chip Resistors**

UR73TK001Kit (0402, 0603, 0805, 1206, 2512 chip sizes)
- 144 values, Lead-free, 20 pcs each (±1%)

UR73VTK001Kit (1206 chip sizes)
- 8 values, 20 pcs each (±1%)

**Thick Film**

SR731HTK001Kit (0201 chip size)
- 29 values, Lead-free, 50 pcs each (R47 ~ 10R0, ±1%, ±5%)

SR731ETK001Kit (0402 chip size)
- 25 values, Lead-free, 50 pcs each (R100 ~ 1R00, ±1%)

SR731JTK001Kit (0603 chip size)
- 49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732ATK001Kit (0805 chip size)
- 49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732BTK001Kit (1206 chip size)
- 49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732ETK001Kit (1210 chip size)
- 49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR732HTK001Kit (2010 chip size)
- 49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

SR733ATK001Kit (2512 chip size)
- 49 values, Lead-free, 50 pcs each (R100 ~ 10R0, ±1%)

**Power Shunt**

PSF4-Kit (1216 chip size)
- 2 values, Lead-free, 10 pcs each (±1%)

PSL2-Kit (2512 chip size)
- 3 values, Lead-free, 10 pcs each (±1%)

NOTE: Reference product data pages for available values.
### Significant Figures of Nominal Resistance

#### E-12 Decade Values

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<th>Value</th>
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