

# SURGING

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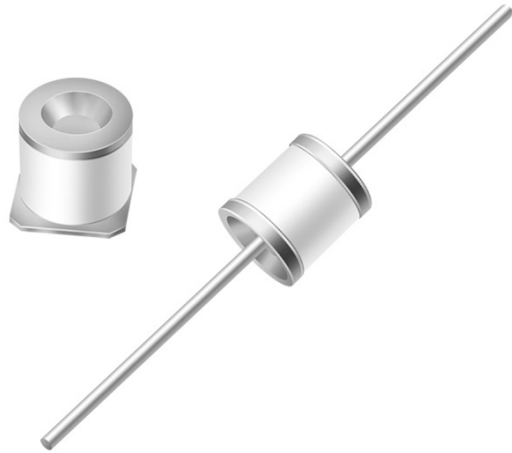


# Switching Spark Gap

开关放电管

KG5 Series

## Switching spark gap - KG5 Series



SURGING  
GAS DISCHARGE TUBE KG5 SERIES

### Description

The principle of gas discharge is used not only for overvoltage protection but also in switching applications. Unlike surge arresters, switching spark gaps are active components that work reliably even after igniting hundreds of thousands of times.

SURGING KG5 series Switching Spark Gaps(SSG) can be used in all applications where high voltage pulses are generated, for example to ignite modern high-pressure gas discharge lamps such as xenon lamps in automotive headlights. Ignition performance is determined to a large degree by the properties of the switching component. An extremely fast switch is called for, which operates virtually without loss and with high insulation resistance in the non-conducting state. It should also be as compact as possible, rugged, highly reliable, and capable of operating over a wide temperature range.

### Features

- I Extremely long life time
- I Stable performance over life
- I Insensitive performance against variations in temperature
- I Low switching losses
- I Very short breakdown time
- I High reliability by robust design
- I Lead-free and RoHS compliant
- I Non-Radioactive

### Applications

- I Igniters for architectural and automotive Xenon discharge lamps
- I Electronic igniters for gas heating and gas domestic appliances, e.g., cookers
- I Ignition of ultra-high pressure gas discharge lamps for data and video projectors

### Part Number Code

**KG**    **5** - **600**    **T**

**Series:**  
Switching spark gap

**Volume:**  
5.5\*6

**DC Line Voltage:**  
600=600V

**Lead Type:**  
T:Lead  
S:SMD

## Switching spark gap - KG5 Series

### Electrical Characteristics

| Part Number  | DIP | KG5-230T            | KG5-250T        | KG5-300T        | KG5-350T        |
|--|-----|---------------------|-----------------|-----------------|-----------------|
|  | SMD | KG5-230S            | KG5-250S        | KG5-300S        | KG5-350S        |
| <b>Initial Values</b>                                |     |                     |                 |                 |                 |
| Static Breakdown Voltage $V_S$ @100V/S <sup>1)</sup> |     |                     |                 |                 |                 |
| First ignition Value after 24 hours in darkness      |     | <275 V              | <300 V          | <360 V          | <420 V          |
| Following Ignition Values                            |     | 207~253 V           | 225~275 V       | 270~330 V       | 315~385 V       |
| <b>Electrical Life Time</b>                          |     |                     |                 |                 |                 |
| Breakdown Voltage $V_B$ <sup>2)</sup>                |     |                     |                 |                 |                 |
| First ignition Value after 24 hours in darkness      |     | <285 V              | <310 V          | <370 V          | <435 V          |
| Following Ignition Values                            |     | 196~265 V           | 215~290 V       | 255~350 V       | 300~405 V       |
| Switching Operations @ +25°C                         |     | 10 <sup>5</sup>     | 10 <sup>5</sup> | 10 <sup>5</sup> | 10 <sup>5</sup> |
| Breakdown Time                                       |     | <50 ns              | <50 ns          | <50 ns          | <50 ns          |
| Maximum Switching Frequency                          |     | 100 Hz              | 100 Hz          | 200 Hz          | 200 Hz          |
| <b>Test Circuit Parameters</b>                       |     |                     |                 |                 |                 |
| Open Circuit Voltage $V_0$                           |     | 230 V <sub>AC</sub> | 350 V           | 400 V           | 450 V           |
| Loading Resistance $R$                               |     | 15 KΩ               | 10 KΩ           | 10 KΩ           | 10 KΩ           |
| Discharge Capacitance $C$                            |     | 2.2 μF              | 680 nF          | 680 nF          | 680 nF          |
| Inductance $L$                                       |     | 10 μH               | 0.5 μH          | 0.5 μH          | 0.5 μH          |
| Discharge Peak Current $I_P$                         |     | ~300 A              | ~500 A          | ~500 A          | ~500 A          |

| Part Number  | DIP | KG5-380T        | KG5-400T        | KG5-450T        | KG5-470T        |
|--|-----|-----------------|-----------------|-----------------|-----------------|
|  | SMD | KG5-380S        | KG5-400S        | KG5-450S        | KG5-470S        |
| <b>Initial Values</b>                                |     |                 |                 |                 |                 |
| Static Breakdown Voltage $V_S$ @100V/S <sup>1)</sup> |     |                 |                 |                 |                 |
| First ignition Value after 24 hours in darkness      |     | <460 V          | <480 V          | <540 V          | <560 V          |
| Following Ignition Values                            |     | 350~420 V       | 360~440 V       | 405~495 V       | 423~517 V       |
| <b>Electrical Life Time</b>                          |     |                 |                 |                 |                 |
| Breakdown Voltage $V_B$ <sup>2)</sup>                |     |                 |                 |                 |                 |
| First ignition Value after 24 hours in darkness      |     | <460 V          | <500 V          | <560 V          | <585V           |
| Following Ignition Values                            |     | 330~440 V       | 340~460 V       | 385~515 V       | 400~540 V       |
| Switching Operations @ +25°C                         |     | 10 <sup>5</sup> | 10 <sup>5</sup> | 10 <sup>5</sup> | 10 <sup>5</sup> |
| Breakdown Time                                       |     | <50 ns          | <50 ns          | <50 ns          | <50 ns          |
| Maximum Switching Frequency                          |     | 200 Hz          | 200 Hz          | 200 Hz          | 200 Hz          |
| <b>Test Circuit Parameters</b>                       |     |                 |                 |                 |                 |
| Open Circuit Voltage $V_0$                           |     | 500 V           | 520 V           | 580 V           | 600 V           |
| Loading Resistance $R$                               |     | 10 KΩ           | 10 KΩ           | 10 KΩ           | 10 KΩ           |
| Discharge Capacitance $C$                            |     | 680 nF          | 680 nF          | 680 nF          | 680 nF          |
| Inductance $L$                                       |     | 0.5 μH          | 0.5 μH          | 0.5 μH          | 0.5 μH          |
| Discharge Peak Current $I_P$                         |     | ~500 A          | ~500 A          | ~500 A          | ~500 A          |

## Switching spark gap - KG5 Series

| Part Number  | DIP | KG5-500T                                    | KG5-550T  | KG5-600T  |
|--|-----|---|-----------|-----------|
|  | SMD | KG5-500S                                    | KG5-550S  | KG5-600S  |
| <b>Initial Values</b>                                |     |   |           |           |
| Static Breakdown Voltage $V_S$ @100V/S <sup>1)</sup> |     |   |           |           |
| First ignition Value after 24 hours in darkness      |     | <600 V                                      | <680 V    | <720 V    |
| Following Ignition Values                            |     | 450~550 V                                   | 510~630 V | 540~660 V |
| <b>Electrical Life Time</b>                          |     |   |           |           |
| Breakdown Voltage $V_B$ <sup>2)</sup>                |     |   |           |           |
| First ignition Value after 24 hours in darkness      |     | <625 V                                      | <710 V    | <750 V    |
| Following Ignition Values                            |     | 425~575 V                                   | 485~655 V | 510~690 V |
| Switching Operations @ +25°C                         |     | $10^5$                                      | $10^5$    | $10^5$    |
| Breakdown Time                                       |     | <50 ns                                      | <50 ns    | <50 ns    |
| Maximum Switching Frequency                          |     | 200 Hz                                      | 200 Hz    | 200 Hz    |
| <b>Test Circuit Parameters</b>                       |     |   |           |           |
| Open Circuit Voltage $V_0$                           |     | 630 V                                       | 720 V     | 750 V     |
| Loading Resistance $R$                               |     | 13 KΩ                                       | 13 KΩ     | 13 KΩ     |
| Discharge Capacitance $C$                            |     | 470 nF                                      | 470 nF    | 470 nF    |
| Inductance $L$                                       |     | 0.1 μH                                      | 0.1 μH    | 0.1 μH    |
| Discharge Peak Current $I_P$                         |     | ~600 A                                      | ~600 A    | ~600 A    |
| <b>Insulation Resistance @100 V</b>                  |     | > $10^8 \Omega$                             |           |           |
| <b>Capacitance @1MHz</b>                             |     | <1 pF                                       |           |           |
| <b>Weight</b>  |     | ~0.85g                                      |           |           |
| <b>Operation and storage temperature</b>             |     | -40~+125°C                                  |           |           |
| <b>Surface treatment</b>                             |     | DIP -Nickel Plated<br>SMD -Matte-tin plated |           |           |

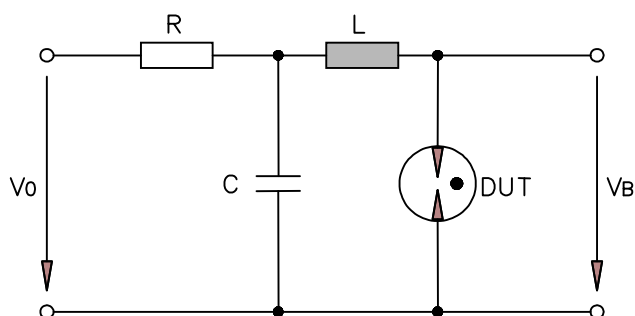
<sup>1)</sup> At delivery AQL 0.65 level II, DIN ISO 2859

<sup>2)</sup> Fig. 1

<sup>3)</sup> 350 Marking

<sup>4)</sup> 600 Marking

### Test Circuit Fig. 1

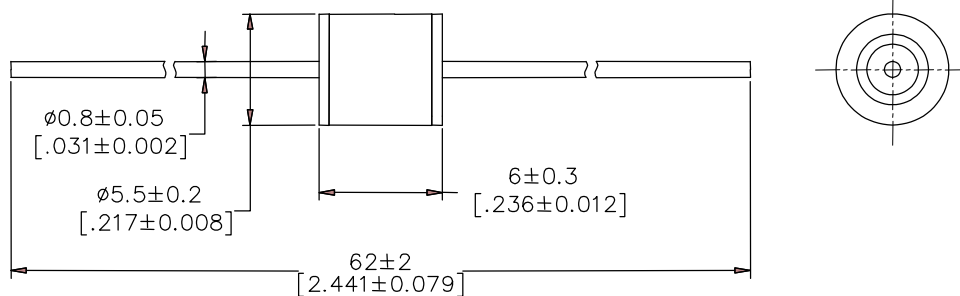


DUT Device Under Test  
 $V_B$  Breakdown Voltage  
 $V_0$ ,  $R$ ,  $L$  and  $C$  Parameters See above table

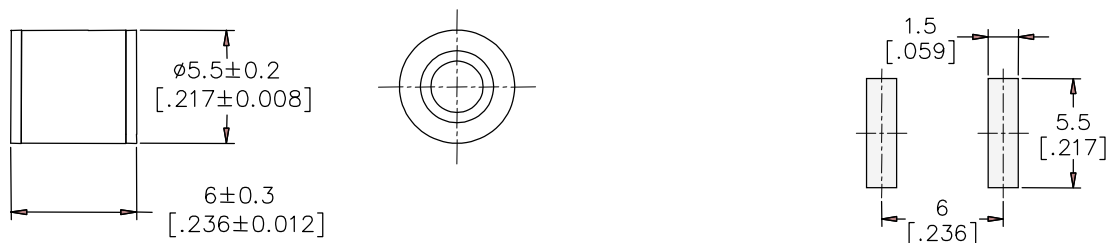
## Switching spark gap - KG5 Series

### Dimensions (Unit: mm/inch)

#### DIP Series ( KG5-xxxT )



#### SMD Series ( KG5-xxxS )

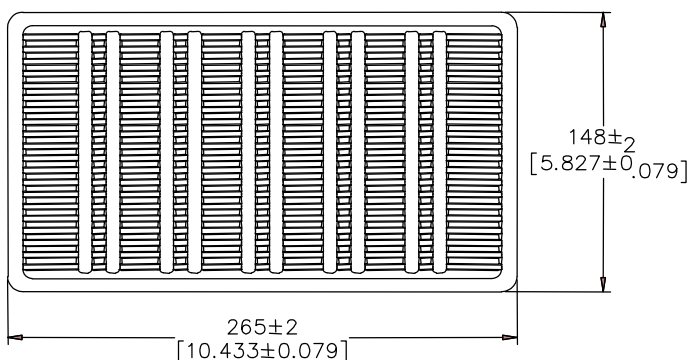


Recommended Soldering Pad Layout

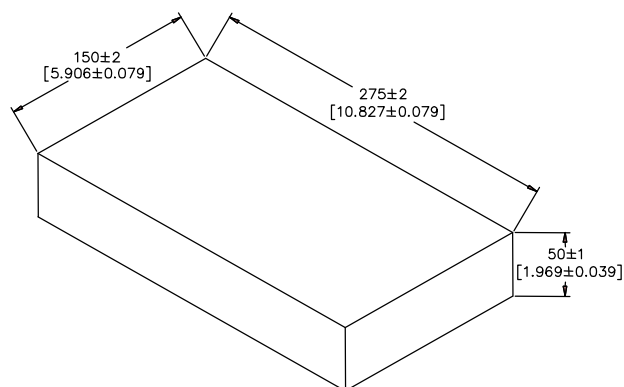
### Packaging Information (Unit: mm/inch)

#### Axial Packaging (Bulk)

##### Plastic Tray



##### Inner box



#### Packaging Quantity:

100 PCS per Plastic Tray

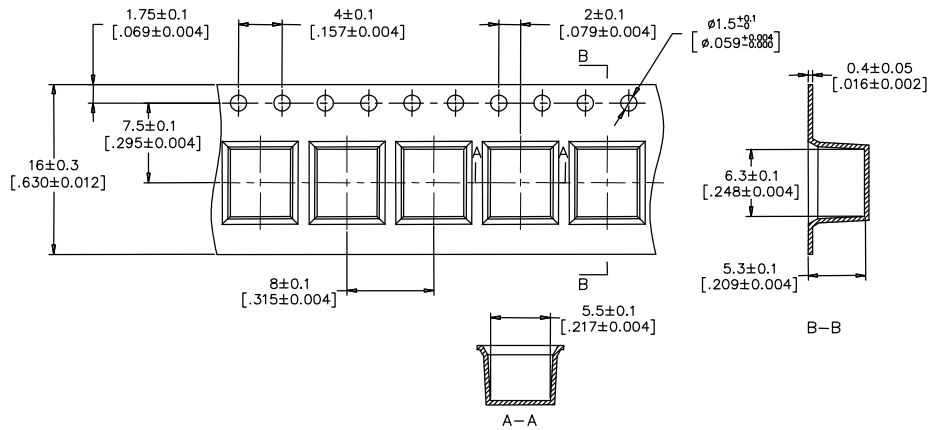
5 Plastic Trays per inner box

500 PCS per inner box

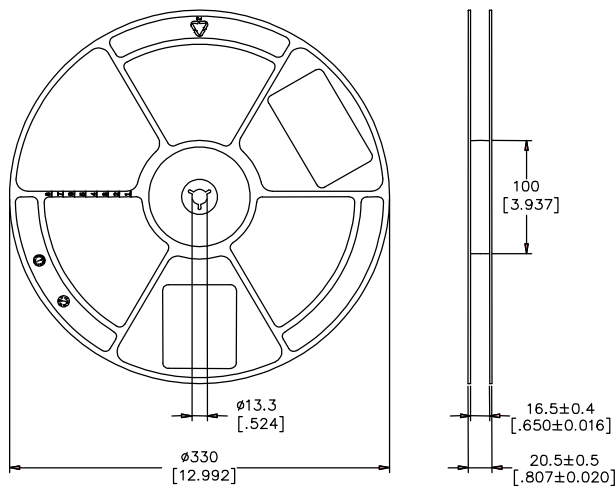
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### SMD Packaging (Tape & Reel)

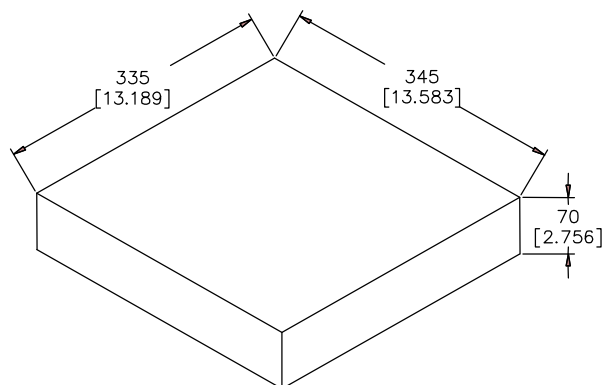
#### Tape



#### Reel



#### Inner box



#### Packaging Quantity:

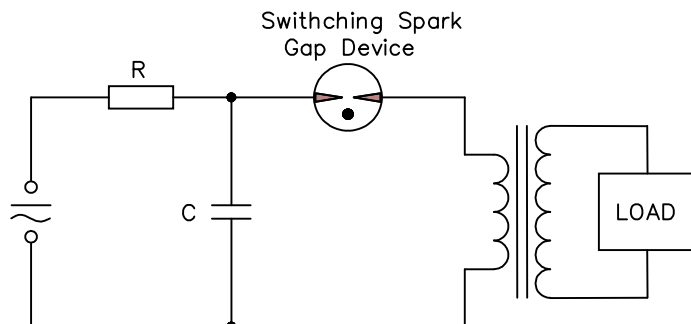
1,000 PCS per reel (13")

3 reels per inner box

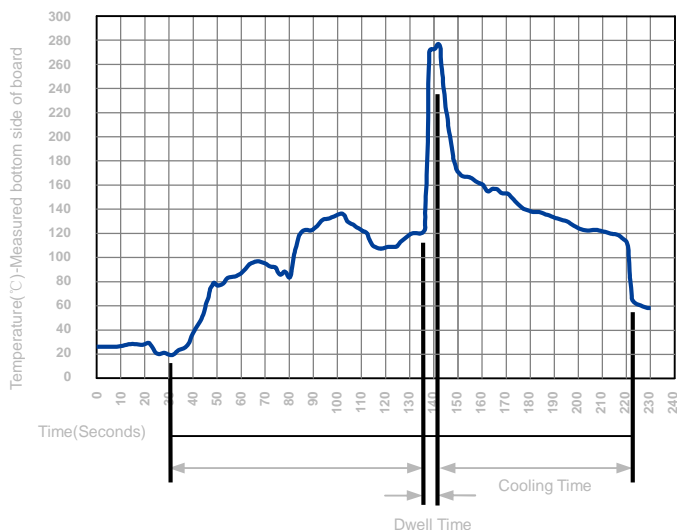
3,000 PCS per inner box

## Switching spark gap - KG5 Series

### Basic Application Circuit

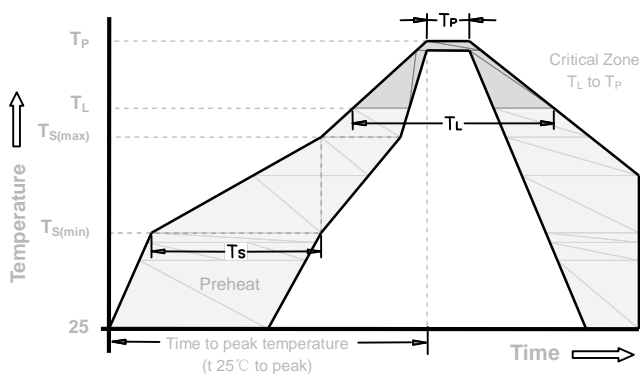


### Soldering Parameters - Wave soldering (Thru-Hole Devices)



| Wave Soldering Condition |                   | Pb-Free assembly |
|--------------------------|-------------------|------------------|
| Preheat                  | Temperature Min   | 100°C            |
|                          | Temperature Max   | 150°C            |
|                          | Time (Min to Max) | 60-180 Seconds   |
| Solder Pot Temperature   |                   | 280°C Max        |
| Solder Dwell Time        |                   | 2-5 Seconds      |

### Soldering Parameters - Reflow Soldering (Surface Mount Devices)



| Reflow Condition                                     |                                   | Pb - Free assembly |
|--|-----------------------------------|--------------------|
| Preheat  | -Temperature Min ( $T_{S(min)}$ ) | 150°C              |
|  | -Temperature Max ( $T_{S(max)}$ ) | 200°C              |
|  | - Time (min to max) ( $t_s$ )     | 60 -180 Seconds    |
| Average ramp up rate ( Liquids Temp $T_L$ to peak)   |                                   | 3°C/second max     |
| $T_{S(max)}$ to $T_L$ - Ramp-up Rate                 |                                   | 5°C/second max     |
| Reflow   | - Temperature ( $T_L$ ) (Liquids) | 217°C              |
|  | - Time (min to max) ( $t_s$ )     | 60 -150 Seconds    |
| Peak Temperature ( $T_P$ )                           |                                   | 260 +0/-5°C        |
| Time within 5°C of actual peak Temperature ( $t_p$ ) |                                   | 10 - 30 Seconds    |
| Ramp-down Rate                                       |                                   | 6°C/second max     |
| Time 25°C to peak Temperature ( $T_P$ )              |                                   | 8 minutes Max      |
| Do not exceed  |                                   | 260°C              |