

## Spark Gap (SPG) Data Sheet

### Features

- Approximately zero leaking current before clamping voltage
- Less decay at on/off state.
- High capability to withstand repeated lightning strikes.
- Low electrode capacitance( $\leq 0.8\text{pF}$ ) and high isolation( $\geq 100\text{M}\Omega$ ).
- RoHS compliant.
- Bilateral symmetrical.
- Temperature, humidity and lightness insensitive.
- Operating temperature:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Storage temperature:  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Meets MSL level 1, per J-STD-020
- Safety certification: UL: E244458



### Applications

- Power Supplies
- Motor sparks eliminating
- Relay switching spark absorbing
- Data line pulse guarding
- Electronic devices requiring UL497A and UL497B compliant
- Telephone/Fax/Modem
- High frequency signal transmitters/receivers
- Satellite antenna
- Radio amplifiers
- Alarm systems
- Cathode ray tubes in Monitors/TVs

### Dimensions

|  | Symbol | Dimension (mm)      |
|--|--------|---------------------|
|  | L      | $4.0 \pm 0.5$       |
|  | L1     | $28.0 \pm 3.0$      |
|  | D      | $\Phi 2.0 \pm 0.5$  |
|  | d      | $\Phi 0.5 \pm 0.05$ |

## Electrical Characteristics

| Part Number<br>① | DC<br>Spark-over<br>Voltage | Minimum<br>Insulation Resistance |                        | Maximum<br>Capacitance<br>(1KHz-6V <sub>MAX</sub> ) | Surge current<br>capacity<br>(8/20μs) | Surge Life<br>Test |
|------------------|-----------------------------|----------------------------------|------------------------|-----------------------------------------------------|---------------------------------------|--------------------|
|                  | Vs(V)                       | Test<br>Voltage(V)               | IR <sub>OHM</sub> (MΩ) | C(pf)                                               |                                       | 8/20μs, 100A       |
| BK3XX00702       | 140                         | 50                               | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX01002       | 200                         | 100                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX01102       | 220                         | 100                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX01502       | 300                         | 100                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX02002       | 400                         | 250                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX02502       | 500                         | 250                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX03002       | 600                         | 250                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX03502       | 700                         | 250                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX05002       | 1000                        | 500                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |
| BK3XX07502       | 1500                        | 500                              | 100                    | 0.8                                                 | 500A                                  | 150 times          |

Note: ① Vs±XX%

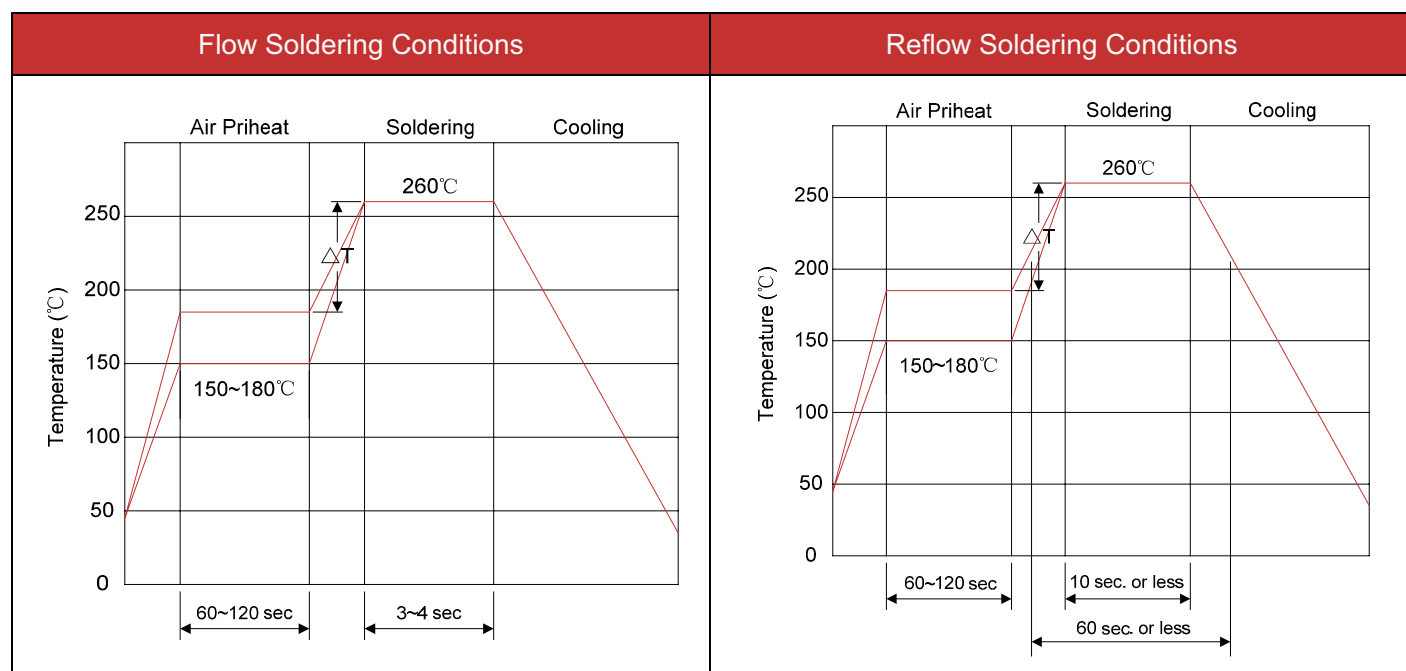
## Color Code

| Part Number | Color Code 1 | Color Code 2 | Color Code 3 |
|-------------|--------------|--------------|--------------|
| BK3XX00702  | Black        | Yellow       | -            |
| BK3XX01002  | Red          | -            | -            |
| BK3XX01102  | Red          | Red          | -            |
| BK3XX01502  | Orange       | Orange       | -            |
| BK3XX02002  | Yellow       | -            | -            |
| BK3XX02502  | Green        | -            | -            |
| BK3XX03002  | Blue         | -            | -            |
| BK3XX03502  | White        | Brown        | -            |
| BK3XX05002  | Black        | -            | -            |
| BK3XX07502  | Brown        | Green        | Red          |

## Test Methods and Results

| Items                  | Test Method                                                                                                                                                                                                                                                                                                                                                                                                              | Standard                                                                       |                 |           |                         |           |                                                                          |                          |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------|-----------|-------------------------|-----------|--------------------------------------------------------------------------|--------------------------|
| DC Spark-over Voltage  | Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within 100V/s(Vs<1000V) or 500V/s(Vs≥1000V).                                                                                                                                                                                                                                | Meet specified value.                                                          |                 |           |                         |           |                                                                          |                          |
| Insulation Resistance  | Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn't over the DC spark-over voltage.                                                                                                                                                                                                                                                                                   |                                                                                |                 |           |                         |           |                                                                          |                          |
| Capacitance            | Measure the electrostatic capacitance by applying a voltage of less than 6V (at 1KHz) between terminals.                                                                                                                                                                                                                                                                                                                 |                                                                                |                 |           |                         |           |                                                                          |                          |
| Static Life            | 10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10sec.                                                                                                                                                                                                                                                                                                                         | ΔVs/Vs   ≤30%<br>Characteristics of other items must meet the specified value. |                 |           |                         |           |                                                                          |                          |
| Surge Current Capacity | <div>The following impulse current for specified current applied ±5 times, each time interval 60 seconds. Thereafter, outer appearance shall be visually examined.</div> <table><tr><td>Type</td><td>Impulse current</td></tr><tr><td>Vs &lt; 400V</td><td>1.2/50μs &amp; 8/20μs, 500A</td></tr><tr><td>Vs ≥ 400V</td><td>1.2/50μs &amp; 8/20μs, 500A, electrically connected with a resistor (1~2 Ω).</td></tr></table> | Type                                                                           | Impulse current | Vs < 400V | 1.2/50μs & 8/20μs, 500A | Vs ≥ 400V | 1.2/50μs & 8/20μs, 500A, electrically connected with a resistor (1~2 Ω). | No crack and no failures |
| Type                   | Impulse current                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                 |           |                         |           |                                                                          |                          |
| Vs < 400V              | 1.2/50μs & 8/20μs, 500A                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                 |           |                         |           |                                                                          |                          |
| Vs ≥ 400V              | 1.2/50μs & 8/20μs, 500A, electrically connected with a resistor (1~2 Ω).                                                                                                                                                                                                                                                                                                                                                 |                                                                                |                 |           |                         |           |                                                                          |                          |
| Cold Resistance        | Measurement after -40℃/1000 HRS & normal temperature/2 HRS.                                                                                                                                                                                                                                                                                                                                                              | Features are conformed to rated spec.                                          |                 |           |                         |           |                                                                          |                          |
| Heat Resistance        | Measurement after 125℃/1000 HRS & normal temperature/2 HRS.                                                                                                                                                                                                                                                                                                                                                              |                                                                                |                 |           |                         |           |                                                                          |                          |
| Humidity Resistance    | Measurement after humidity 90~95℃(45℃) /1000 HRS & normal temperature/2 HRS.                                                                                                                                                                                                                                                                                                                                             |                                                                                |                 |           |                         |           |                                                                          |                          |
| Temperature Cycle      | 10 times repetition of cycle -40℃/30min →normal, temp/2 min →125℃/30min, measurement after normal temp/2 HRS.                                                                                                                                                                                                                                                                                                            |                                                                                |                 |           |                         |           |                                                                          |                          |
| Solder Ability         | Apply flux and immerse in molten solder 230±5℃ for 3sec up to the point of 1.5mm from body. Check for solder adhesion.                                                                                                                                                                                                                                                                                                   | Lead wire is evenly covered by solder.                                         |                 |           |                         |           |                                                                          |                          |
| Solder Heat            | Measurement after lead wire is dipped up to the point of 1.5mm from body into 260±5℃ solder for 10sec.                                                                                                                                                                                                                                                                                                                   | Conformed to rated spec.                                                       |                 |           |                         |           |                                                                          |                          |
| Pull Strength          | Apply 0.5kg load for 10sec.                                                                                                                                                                                                                                                                                                                                                                                              | Lead shall not pull out to snap.                                               |                 |           |                         |           |                                                                          |                          |
| Flexural Strength      | Bend lead wire at the point of 2mm from body under 0.25 load and back to its original point. Repeat 1 time.                                                                                                                                                                                                                                                                                                              |                                                                                |                 |           |                         |           |                                                                          |                          |

## Recommended Soldering Conditions



- 1) Time shown in the above figures is measured from the point when chip surface reaches temperature.
- 2) Temperature difference in high temperature part should be within 110°C.
- 3) After soldering, do not force cool, allow the parts to cool gradually.

### Hand Soldering

Solder iron temperature: 350±5°C

Heating time: 3 seconds max.

### General attention to soldering

- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200°C to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

### Cleaning

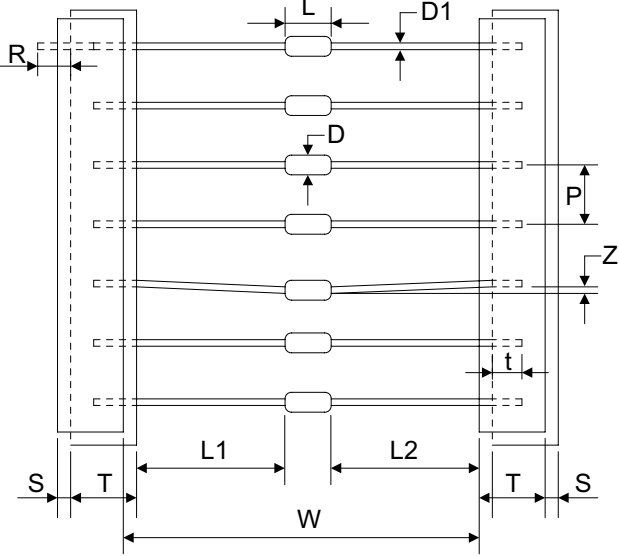
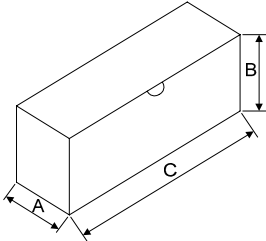
When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.

Frequency: 40kHz max.

Output power: 20W/liter

Cleaning time: 5 minutes max.

## Packaging

| Tape                                                                                                 | Symbol            | Dimension (mm)                        |
|------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------|
|                     | W                 | $52.0 \pm 1.5$                        |
|                                                                                                      | P                 | $5.0 \pm 0.5$                         |
|                                                                                                      | L1-L2             | 1.0max.                               |
|                                                                                                      | T                 | $6.0 \pm 1.0$                         |
|                                                                                                      | Z                 | 1.2max.                               |
|                                                                                                      | R                 | Terminals must not project from tape. |
|                                                                                                      | t                 | 3.2max.                               |
|                                                                                                      | S                 | 0.8max.                               |
|                                                                                                      | D                 | $\Phi 2.5 \text{max.}$                |
|                                                                                                      | D1                | $\Phi 0.5 \pm 0.05$                   |
|                                                                                                      | L                 | 4.5max.                               |
|                                                                                                      | A                 | 78.0                                  |
|                                                                                                      | B                 | 78.0                                  |
|                                                                                                      | C                 | 255.0                                 |
| Inner Box<br><br> | Quantity: 5000PCS |                                       |