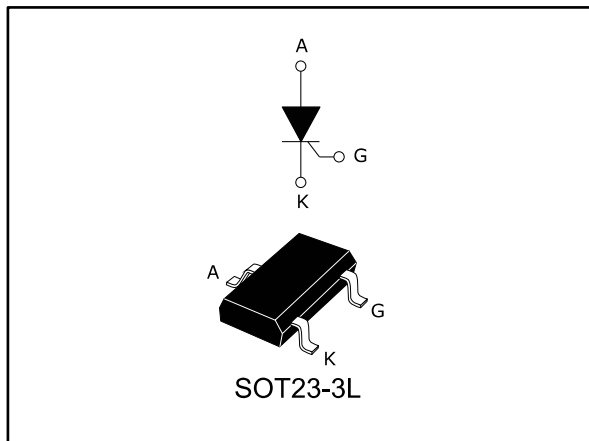


## Sensitive high immunity 0.25 A SCR Thyristor

Datasheet - production data



### Description

Thanks to highly sensitive triggering levels, the 0.25 A P0109AL SCR Thyristor is suitable for all applications where available gate current is limited. Its high immunity makes it ideal for high electric noise circuits.

The surface mount SOT23-3L package allows compact SMD based designs for automated manufacturing.

Table 1: Device summary

| Symbol             | Value | Unit        |
|--------------------|-------|-------------|
| $I_{T(RMS)}$       | 0.25  | A           |
| $V_{DRM}/V_{RRM}$  | 100   | V           |
| $I_{GT}$           | 1     | $\mu A$     |
| $T_j \text{ max.}$ | 125   | $^{\circ}C$ |

### Features

- $I_{T(RMS)}$  0.25 A
- Low 1  $\mu A$  gate current
- High noise immunity 100 V/ $\mu s$
- ECOPACK®2 compliant component

### Applications

- Standby mode power supplies
- Smoke detectors
- DC 24/48 V proximity sensors
- Gate driver for large Thyristors
- Overvoltage crowbar protection
- Capacitive ignition circuit

# 1 Characteristics

**Table 2: Absolute maximum ratings (limiting values),  $T_j = 25\text{ °C}$  unless otherwise specified**

| Symbol                             | Parameter                                                                                                   |                        | Value                    | Unit        |                  |
|------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|-------------|------------------|
| I <sub>T(RMS)</sub>                | RMS on-state current<br>(180 ° conduction angle)                                                            |                        | T <sub>amb</sub> = 36 °C | 0.25        | A                |
| I <sub>T(AV)</sub>                 | Average on-state current<br>(180 ° conduction angle)                                                        |                        |                          |             |                  |
| I <sub>TSM</sub>                   | Non repetitive surge peak on-state current<br>(T <sub>j</sub> initial = 25 °C)                              |                        | t <sub>p</sub> = 8.3 ms  | 7           | A                |
|                                    |                                                                                                             |                        | t <sub>p</sub> = 10 ms   | 6           |                  |
| I <sup>2</sup> t                   | I <sup>2</sup> t value for fusing                                                                           |                        | t <sub>p</sub> = 10 ms   | 0.18        | A <sup>2</sup> s |
| di/dt                              | Critical rate of rise of on-state current<br>I <sub>G</sub> = 2 x I <sub>GT</sub> , t <sub>r</sub> ≤ 100 ns | f = 60 Hz              | T <sub>j</sub> = 125 °C  | 50          | A/μs             |
| V <sub>DRM</sub> /V <sub>RRM</sub> | Repetitive peak off-state voltage                                                                           |                        | T <sub>j</sub> = 125 °C  | 100         | V                |
| I <sub>GM</sub>                    | Peak gate current                                                                                           | t <sub>p</sub> = 20 μs | T <sub>j</sub> = 125 °C  | 0.5         | A                |
| P <sub>G(AV)</sub>                 | Average gate power dissipation                                                                              |                        | T <sub>j</sub> = 125 °C  | 0.02        | W                |
| T <sub>stg</sub>                   | Storage junction temperature range                                                                          |                        |                          | -40 to +150 | °C               |
| T <sub>j</sub>                     | Operating junction temperature                                                                              |                        |                          | -40 to +125 | °C               |

**Table 3: Electrical characteristics ( $T_j = 25\text{ °C}$  unless otherwise specified)**

| Symbol   | Test conditions                                                              |                       |      | Value | Unit      |
|----------|------------------------------------------------------------------------------|-----------------------|------|-------|-----------|
| $I_{GT}$ | $V_D = 12\text{ V}$ , $R_L = 140\text{ }\Omega$                              |                       | Max. | 1     | $\mu A$   |
| $V_{GT}$ |                                                                              |                       | Max. | 0.8   | V         |
| $V_{GD}$ | $V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$ , $R_{GK} = 1000\text{ }\Omega$ | $T_j = 125\text{ °C}$ | Min. | 0.1   | V         |
| $V_{RG}$ | $I_{RG} = 10\text{ }\mu A$                                                   |                       | Min. | 8     | V         |
| $I_H$    | $I_T = 50\text{ mA}$ , $R_{GK} = 1000\text{ }\Omega$                         |                       | Max. | 6     | mA        |
| $I_L$    | $I_G = 1.2 \times I_{GT}$ , $R_{GK} = 1000\text{ }\Omega$                    |                       | Max. | 7     | mA        |
| $dV/dt$  | $V_D = 67\% V_{DRM}$ , $R_{GK} = 1000\text{ }\Omega$                         | $T_j = 125\text{ °C}$ | Min. | 100   | $V/\mu s$ |

**Table 4: Static characteristics**

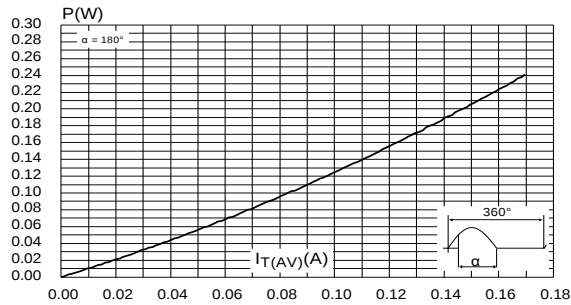
| Symbol                             | Test conditions                                                                                  |                         |      | Value | Unit |
|------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------|------|-------|------|
| V <sub>TM</sub>                    | I <sub>TM</sub> = 0.4 A, t <sub>p</sub> = 380 μs                                                 | T <sub>j</sub> = 25 °C  | Max. | 1.7   | V    |
| V <sub>TO</sub>                    | Threshold voltage                                                                                | T <sub>j</sub> = 125 °C | Max. | 1     |      |
| R <sub>D</sub>                     | Dynamic resistance                                                                               | T <sub>j</sub> = 125 °C | Max. | 1000  | mΩ   |
| I <sub>DRM</sub> /I <sub>RRM</sub> | V <sub>D</sub> = V <sub>DRM</sub> ; V <sub>R</sub> = V <sub>RRM</sub> , R <sub>GK</sub> = 1000 Ω | T <sub>j</sub> = 25 °C  | Max. | 1     | μA   |
|                                    |                                                                                                  | T <sub>j</sub> = 125 °C |      | 100   |      |

**Table 5: Thermal parameters**

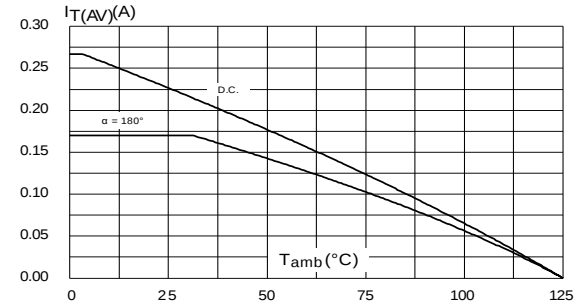
| Symbol        | Parameter                                                        | Value | Unit |
|---------------|------------------------------------------------------------------|-------|------|
| $R_{th(j-a)}$ | Junction to ambient (Mounted on FR4 with recommended pad layout) | 400   | °C/W |

## 1.1 Characteristics (curves)

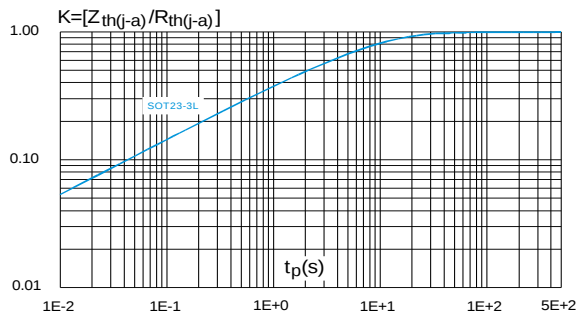
**Figure 1: Maximum average power dissipation versus average on-state current**



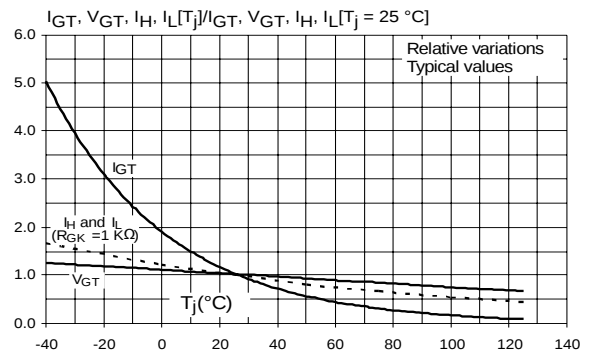
**Figure 2: Average and DC on-state current versus ambient temperature**



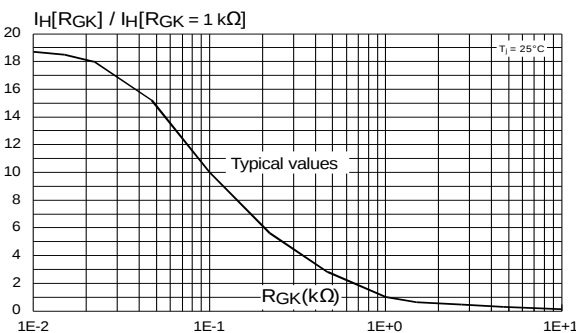
**Figure 3: Relative variation of thermal impedance junction to ambient versus pulse duration**



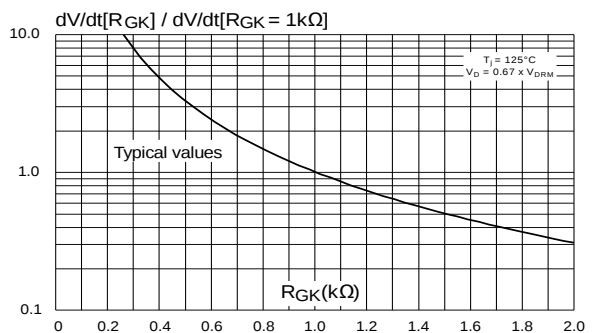
**Figure 4: Gate trigger, holding, and latching currents with gate trigger voltage versus junction temperature**



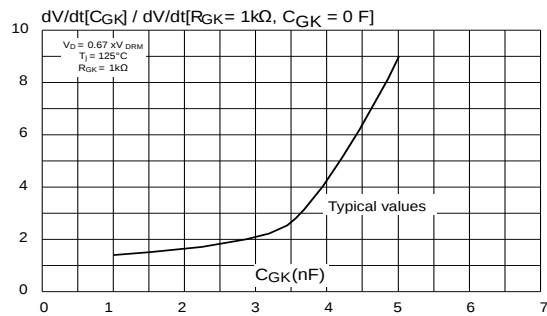
**Figure 5: Relative variation of holding current versus gate-cathode resistance**



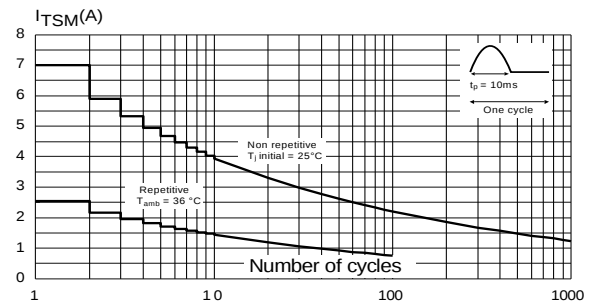
**Figure 6: Relative variation of dV/dt immunity versus gate-cathode resistance**



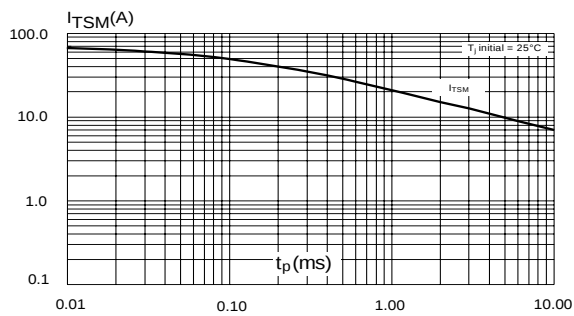
**Figure 7: Relative variation of  $dV/dt$  immunity versus gate-cathode capacitance**



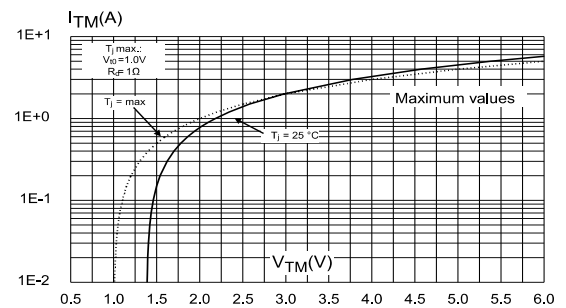
**Figure 8: Surge peak on-state current versus number of cycles**



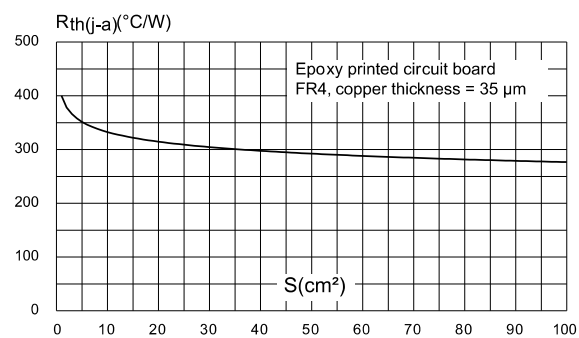
**Figure 9: Non-repetitive surge peak on-state current for sinusoidal pulse ( $t_p < 10$  ms)**



**Figure 10: On-state characteristics**



**Figure 11: Thermal resistance junction to ambient versus copper surface under tab**



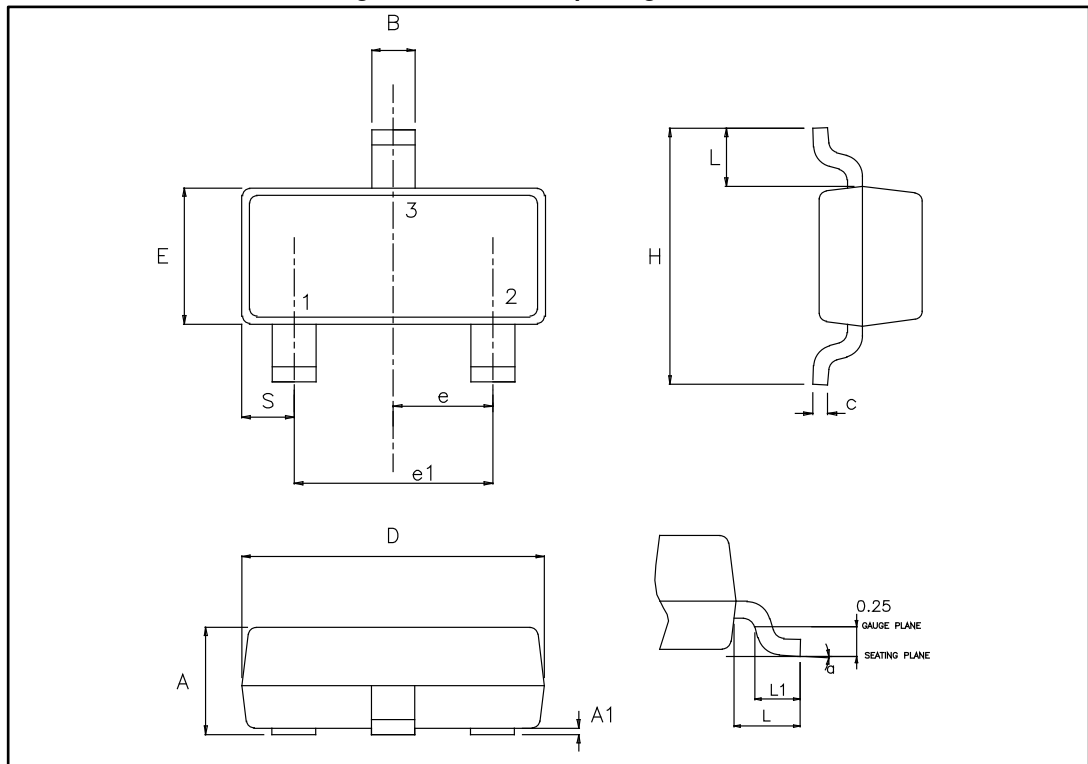
## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

- Lead-free package
- Halogen free molding resin
- Epoxy meets UL94, V0

### 2.1 SOT23-3L package information

Figure 12: SOT23-3L package outline



This package drawing may slightly differ from the physical package. However, all the specified dimensions in the following table are guaranteed.

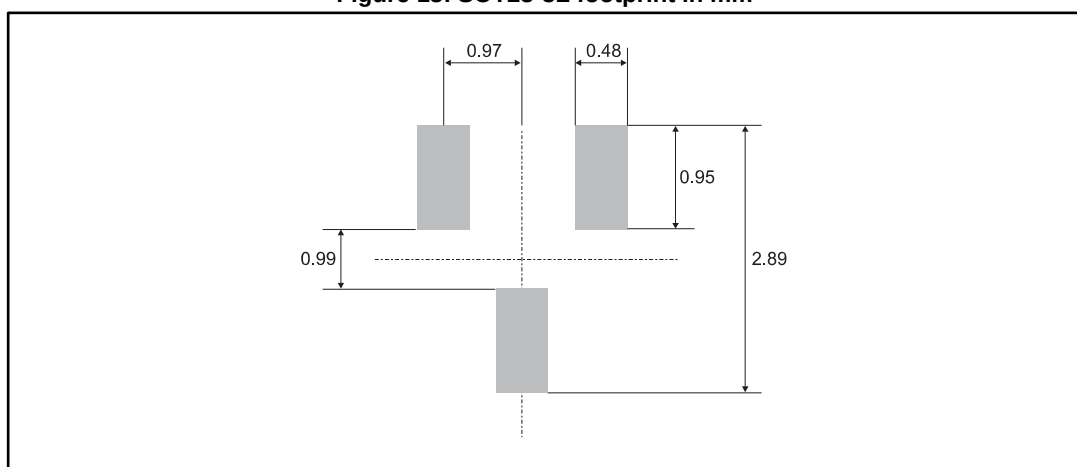
Table 6: SOT23-3L package mechanical data

| Ref. | Dimensions  |      |      |                       |        |        |
|------|-------------|------|------|-----------------------|--------|--------|
|      | Millimeters |      |      | Inches <sup>(1)</sup> |        |        |
|      | Min.        | Typ. | Max. | Min.                  | Typ.   | Max.   |
| A    | 0.89        |      | 1.40 | 0.0350                |        | 0.0551 |
| A1   | 0.00        |      | 0.10 | 0.0000                |        | 0.0039 |
| B    | 0.30        |      | 0.51 | 0.0118                |        | 0.0201 |
| C    | 0.085       |      | 0.18 | 0.0033                |        | 0.0071 |
| D    | 2.75        |      | 3.04 | 0.1083                |        | 0.1197 |
| e    | 0.85        |      | 1.05 | 0.0335                |        | 0.0413 |
| e1   | 1.70        |      | 2.10 | 0.0669                |        | 0.0827 |
| E    | 1.20        |      | 1.75 | 0.0472                |        | 0.0689 |
| H    | 2.10        |      | 3.00 | 0.0827                |        | 0.1181 |
| L    |             | 0.60 |      |                       | 0.0236 |        |
| S    | 0.35        |      | 0.65 | 0.0138                |        | 0.256  |
| L1   | 0.25        |      | 0.55 | 0.0098                |        | 0.0217 |
| a    | 0°          |      | 8°   | 0°                    |        | 8°     |

**Notes:**

<sup>(1)</sup>Dimension in inches are given for reference only.

Figure 13: SOT23-3L footprint in mm



This drawing may not be in scale; however, all the specified dimensions are guaranteed.

### 3 Ordering information

Figure 14: Ordering information scheme

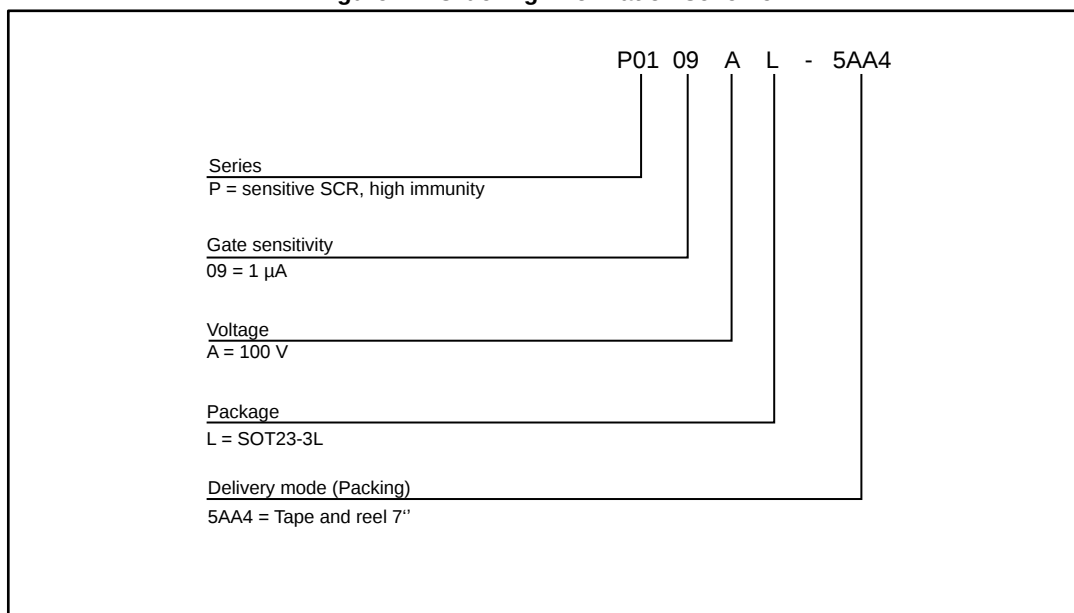


Table 7: Ordering information

| Order code   | Marking | Package  | Weight | Base qty. | Delivery mode    |
|--------------|---------|----------|--------|-----------|------------------|
| P0109AL 5AA4 | P9A     | SOT23-3L | 0.01 g | 3000      | Tape and reel 7" |

### 4 Revision history

Table 8: Document revision history

| Date        | Revision | Changes                        |
|-------------|----------|--------------------------------|
| 05-Jun-2017 | 1        | Initial release.               |
| 09-Aug-2017 | 2        | Updated drawing in cover page. |

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