



## Nanosecond SCR Switch

### DESCRIPTION

The UPGA301Ae3 is designed for high current narrow-pulse switching applications where size and current handling capability are critical. These devices may be triggered on using low power logic drivers from (+0.8 V at 200  $\mu$ A). Epoxy packaged, oxide passivated planar SCR chips with metallurgic bonds on both sides to achieve high reliability. Internal wire bond connection allows high current surge capability for narrow pulse applications.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

- Low thermal resistance package for higher current operation
- High speed switching capability
- Efficient heat path with Integral locking bottom metal tab
- Full metallic bottom eliminates flux entrapment
- Compatible with automatic insertion equipment
- Low profile-maximum height of 1mm
- RoHS compliant

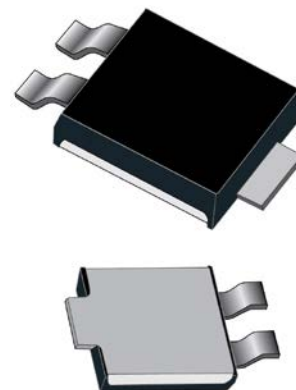
### APPLICATIONS / BENEFITS

- Reference Microsemi MicroNote [601](#) and [602](#)
- Nanosecond SCR switch for reliable high current pulse generators, modulators and photo-flash quenching
- Logic drive capability (0.8 V, 200  $\mu$ A)
- Ideal for laser range finder and camera applications
- Ideal for automotive collision avoidance applications
- Small 8.45 mm<sup>2</sup> foot print (See [mounting pad](#) details)

### MAXIMUM RATINGS @ 25 °C unless otherwise specified

| Parameters/Test Conditions                            | Symbol           | Value       | Unit |
|-------------------------------------------------------|------------------|-------------|------|
| Storage Temperature                                   | T <sub>STG</sub> | -50 to +150 | °C   |
| Junction Temperature                                  | T <sub>J</sub>   | 0 to +125   | °C   |
| Thermal Resistance Junction-to-Case                   | R <sub>θJC</sub> | 4.0         | °C/W |
| Thermal Resistance Junction-to-Ambient <sup>(1)</sup> | R <sub>θJA</sub> | 65          | °C/W |
| Repetitive Peak Off-State Voltage                     | V <sub>DRM</sub> | 100         | V    |
| Peak On-State Current for 50 ns (max)                 | I <sub>TSM</sub> | 100         | A    |
| Peak Gate Current                                     | I <sub>GM</sub>  | 250         | mA   |
| Reverse Gate Voltage                                  | V <sub>GR</sub>  | 5           | V    |
| Solder Temperature @ 10 s                             | T <sub>SP</sub>  | 260         | °C   |

**Notes:** 1. When mounted on 0.06" thick FR-4PC board using 2 oz copper with recommended minimum foot print



**Powermite 3  
Package**

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**MECHANICAL and PACKAGING**

- CASE: Void-free transfer molded thermosetting epoxy compound meeting UL94V-0
- TERMINALS: Annealed matte-tin plating over copper and readily solderable per MIL-STD-750, method 2026. (Consult factor for tin-lead plating.)
- MARKING: 301A• (dot indicates “e3” designation)
- POLARITY: Cathode designated by TAB 2
- TAPE & REEL option: 16 mm tape per standard EIA-481-B. Consult factory for quantities.
- WEIGHT: Approximately 0.072 gram
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE****SYMBOLS & DEFINITIONS**

| Symbol    | Definition                                                                                                                                                                                   |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_G$     | Gate Current: The direct current into the gate terminal.                                                                                                                                     |
| $I_R$     | Reverse Current: The anode current for a negative anode voltage.                                                                                                                             |
| $I_T$     | On-State Current: The anode, principal or thyristor current when the thyristor is in the on state.                                                                                           |
| $V_D$     | Off-State Voltage: The anode, principal, or thyristor voltage when the thyristor is in the off state.                                                                                        |
| $V_{RRM}$ | Reverse Voltage, Repetitive Peak: The peak reverse voltage including all repetitive transient voltages but excluding all nonrepetitive transient voltages.                                   |
| $V_{DRM}$ | Repetitive Peak Off-State Voltage: The highest instantaneous value of the off-state voltage, including all repetitive transient voltages but excluding all nonrepetitive transient voltages. |

**ELECTRICAL CHARACTERISTICS @  $T_A = +25\text{ }^{\circ}\text{C}$  unless otherwise noted**

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-----------|--------|------------|------|------|------|-------|
|-----------|--------|------------|------|------|------|-------|

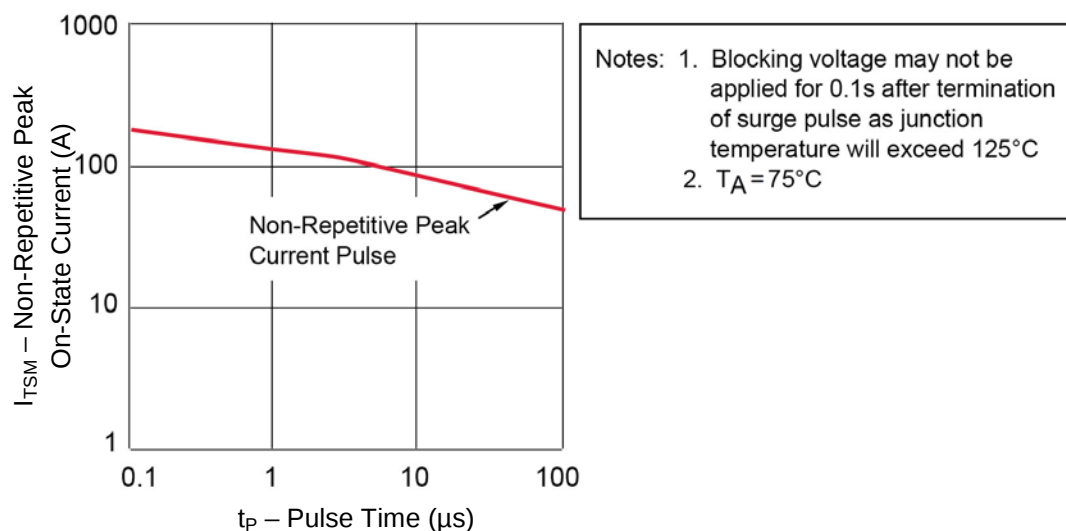
**On characteristics (up to 100 A w/ 100 ns pulse @ Duty Cycle = 0.0001% or less)**

|                          |           |                                                        |     |      |      |               |
|--------------------------|-----------|--------------------------------------------------------|-----|------|------|---------------|
| Forward Blocking Current | $I_{DRM}$ | $V_{DRM} = 100\text{ V}$ , $R_{GK} = 1\text{ k}\Omega$ |     |      | 1.0  | $\mu\text{A}$ |
| On - State Voltage       | $V_T$     | $I_T = 1\text{ A}$ , $I_g = 10\text{ mA}$              |     | 1.1  | 1.5  | V             |
| Gate Trigger Voltage     | $V_{GT}$  | $V_D = 5\text{ V}$ , $R_{GS} = 100\text{ }\Omega$      |     | 0.5  | 0.75 | V             |
| Gate Trigger Current     | $I_{GT}$  | $V_D = 5\text{ V}$ , $R_{GS} = 10\text{ k}\Omega$      |     | 10   | 200  | $\mu\text{A}$ |
| Reverse Gate Current     | $I_{GR}$  | $V_{GR} = 5\text{ V}$                                  |     | 0.01 | 0.1  | mA            |
| Holding Current          | $I_H$     | $V_D = 5\text{ V}$ , $R_{GK} = 1\text{ k}\Omega$       | 1.0 | 3.0  | 5.0  | mA            |
| Reverse Current (Note 1) | $I_{RRM}$ | $V_{RRM} = 30\text{ V}$ , $R_{GK} = 1\text{ k}\Omega$  |     | 1    | 10   | mA            |

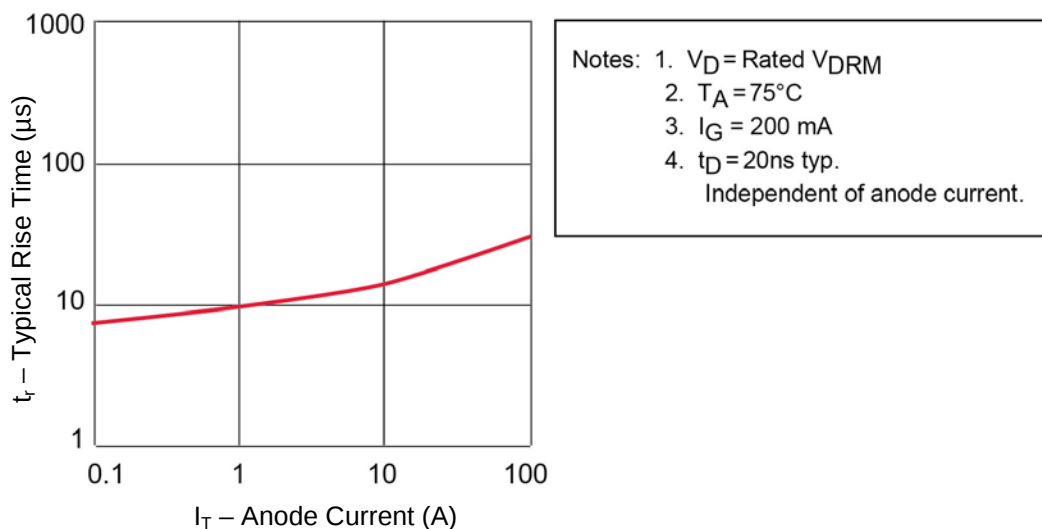
**Switching characteristics ( $T_c = 25\text{ }^{\circ}\text{C}$ )**

|                                             |         |                                                                                  |    |     |     |                  |
|---------------------------------------------|---------|----------------------------------------------------------------------------------|----|-----|-----|------------------|
| Delay Time                                  | td      | $I_g = 20\text{ mA}$ , $I_T = 1\text{ A}$                                        |    | 20  | 30  | ns               |
| Rise Time                                   | tr      | $V_D = 60\text{ V}$ , $I_T = 1\text{ A}$ , $I_g = 10\text{ mA}$<br>dc < 1%       |    | 15  | 25  | ns               |
| Circuit Commutated Turn—off Time            | tq      | $I_T = 1.0\text{ A}$ , $I_R = 1.0\text{ A max}$ ,<br>$R_{GK} = 1\text{ k}\Omega$ |    | 0.3 | 0.5 | $\mu\text{s}$    |
| Gate Trigger—on Pulse Width                 | tpg(on) | $I_g = 10\text{ mA}$ , $I_T = 1\text{ A}$                                        |    | 20  | 50  | ns               |
| Critical Rate of Rise<br>Off -State Voltage | dv/dt   | $V_D = 30\text{ V}$ , $R_{GK} = 1\text{ k}\Omega$                                | 15 | 30  |     | V/ $\mu\text{s}$ |

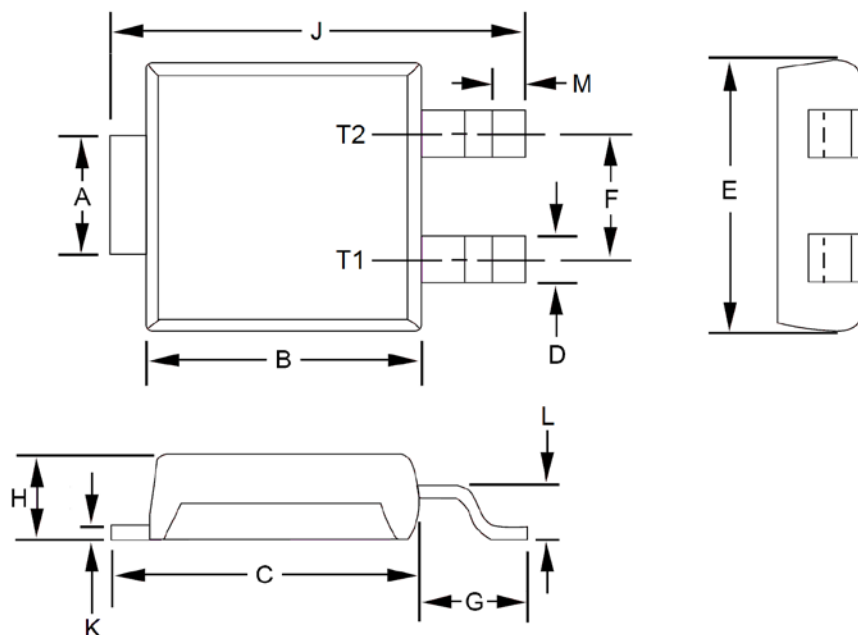
**Note 1:** Pulse Test intended to guarantee reverse anode voltage capability for pulse commutation. The device should not be operated in the reverse blocking mode on a continuous basis.

**GRAPHS**


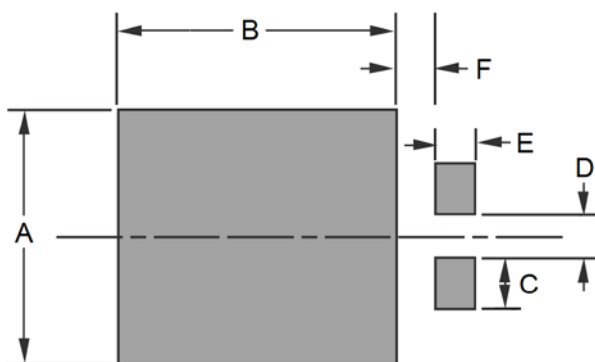
**FIGURE 1**  
Surge Rating



**FIGURE 2**  
Switching Speed vs. Current

**PACKAGE DIMENSIONS**


| DIM  | INCH            |       | MILLIMETERS |      |
|------|-----------------|-------|-------------|------|
|      | MIN             | MAX   | MIN         | MAX  |
| A    | 0.068           | 0.072 | 1.73        | 1.83 |
| B    | 0.172           | 0.174 | 4.37        | 4.43 |
| C    | 0.197           | 0.204 | 5.01        | 5.17 |
| D    | 0.035 NOM       |       | 0.889 NOM   |      |
| E    | 0.159           | 0.161 | 4.03        | 4.09 |
| F    | 0.072 NOM       |       | 1.83 NOM    |      |
| G    | 0.056 NOM       |       | 1.422 NOM   |      |
| H    | 0.043           | 0.045 | 1.10        | 1.14 |
| J    | 0.252           | 0.260 | 6.40        | 6.61 |
| K    | 0.007 NOM       |       | 0.178 NOM   |      |
| L    | 0.028           | 0.030 | 0.71        | 0.77 |
| M    | 0.014           | 0.018 | 0.36        | 0.46 |
| T1   | Gate (Tab 1)    |       |             |      |
| T2   | Cathode (Tab 2) |       |             |      |
| Base | Anode           |       |             |      |

**PAD LAYOUT**


| DIM | INCH    | MILLIMETERS |
|-----|---------|-------------|
|     | NOMINAL | NOMINAL     |
| A   | 0.190   | 4.826       |
| B   | 0.210   | 5.344       |
| C   | 0.038   | 0.965       |
| D   | 0.034   | 0.864       |
| E   | 0.030   | 0.762       |
| F   | 0.030   | 0.762       |

**SCHEMATIC**
