



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 μ 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.

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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

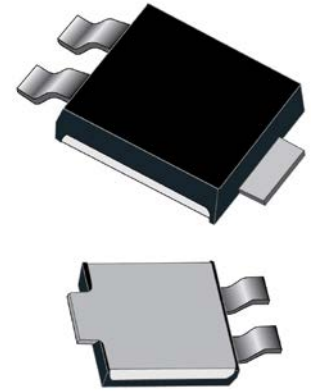
APPLICATIONS / BENEFITS

- 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 μ A)
- Ideal for laser range finder and camera applications
- Ideal for automotive collision avoidance applications
- Small 8.45 mm² foot print (See [mounting pad](#) details)

MAXIMUM RATINGS @ 25 °C unless otherwise specified

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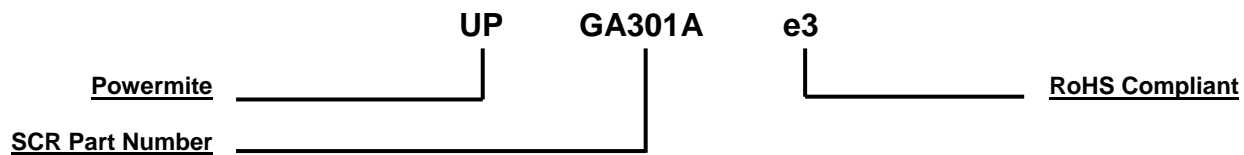
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MECHANICAL and PACKAGING

- 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 | μA |
| 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} | $V_D = 5\text{ V}, R_{GS} = 100\ \Omega$ | | 0.5 | 0.75 | V |
| Gate Trigger Current | I_{GT} | $V_D = 5\text{ V}, R_{GS} = 10\text{ k}\Omega$ | | 10 | 200 | μA |
| 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 | $V_D = 60\text{ V}, I_T = 1\text{ A}, I_g = 10\text{ mA}$ dc < 1% | | 15 | 25 | ns |
| Circuit Commutated Turn—off Time | tq | $I_T = 1.0\text{ A}, I_R = 1.0\text{ A max},$ $R_{GK} = 1\text{ k}\Omega$ | | 0.3 | 0.5 | μs |
| Gate Trigger—on Pulse Width | tpg(on) | $I_g = 10\text{ mA}, I_T = 1\text{ A}$ | | 20 | 50 | ns |
| Critical Rate of Rise Off -State Voltage | dv/dt | $V_D = 30\text{ V}, R_{GK} = 1\text{ k}\Omega$ | 15 | 30 | | V/ μs |

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

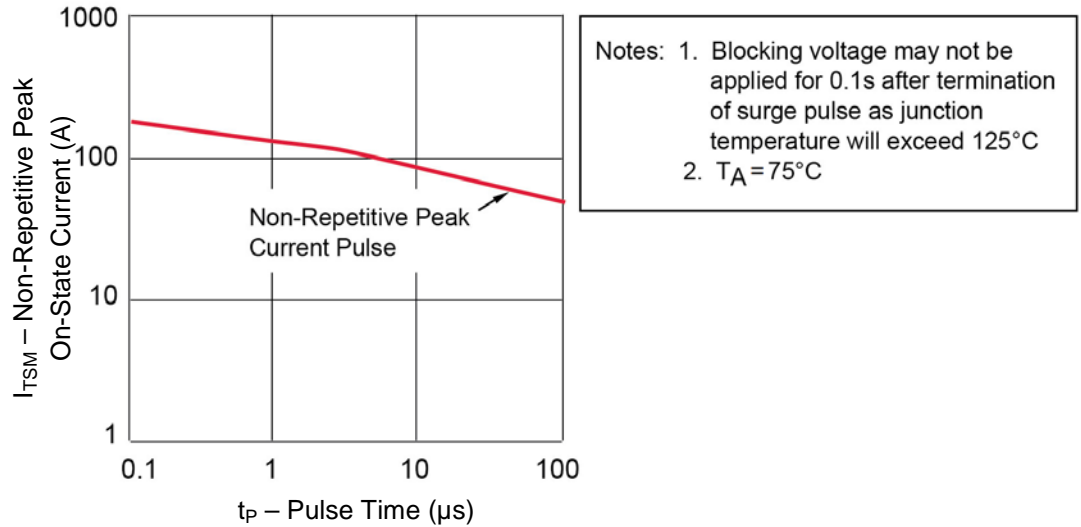


FIGURE 1
Surge Rating

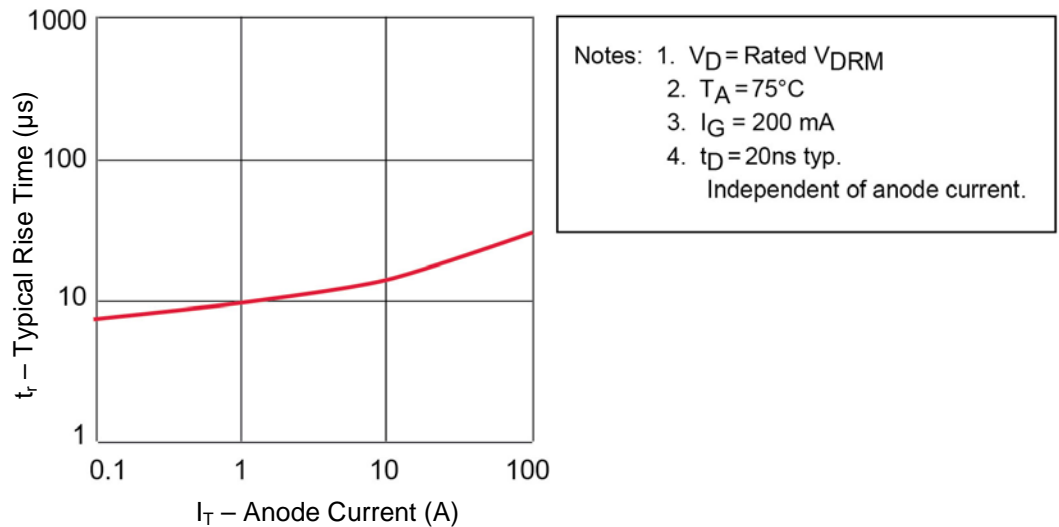
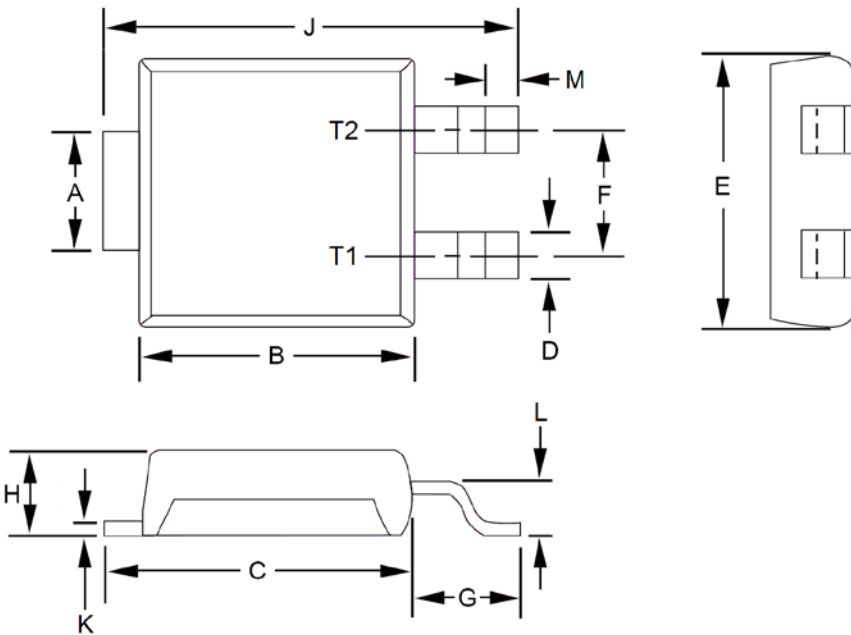


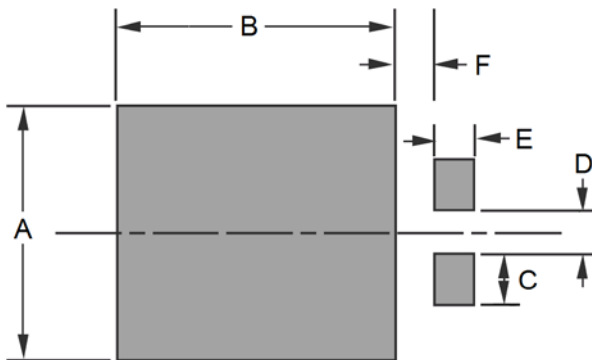
FIGURE 2
Switching Speed vs. Current

PACKAGE DIMENSIONS



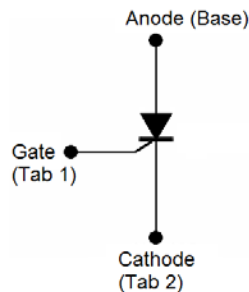
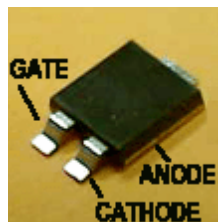
| DIM | INCH | | MILLIMETERS | |
|------|-----------------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.068 | 0.072 | 1.73 | 1.83 |
| B | 0.172 | 0.174 | 4.37 | 4.43 |
| C | 0.197 | 0.204 | 5.01 | 5.17 |
| D | 0.035 NOM | | 0.889 NOM | |
| E | 0.159 | 0.161 | 4.03 | 4.09 |
| F | 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



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