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2N6027, 2N6028

Preferred Device

Programmable Unijunction Transistor

Programmable Unijunction Transistor Triggers

Designed to enable the engineer to “program” unijunction characteristics such as R_{BB} , η , I_V , and I_P by merely selecting two resistor values. Application includes thyristor-trigger, oscillator, pulse and timing circuits. These devices may also be used in special thyristor applications due to the availability of an anode gate. Supplied in an inexpensive TO-92 plastic package for high-volume requirements, this package is readily adaptable for use in automatic insertion equipment.

Features

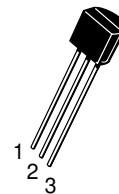
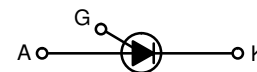
- Programmable – R_{BB} , η , I_V and I_P
- Low On-State Voltage – 1.5 V Maximum @ $I_F = 50$ mA
- Low Gate to Anode Leakage Current – 10 nA Maximum
- High Peak Output Voltage – 11 V Typical
- Low Offset Voltage – 0.35 V Typical ($R_G = 10$ k Ω)
- Pb-Free Packages are Available*



ON Semiconductor®

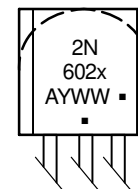
<http://onsemi.com>

PUTs
40 VOLTS, 300 mW



TO-92 (TO-226AA)
CASE 029
STYLE 16

MARKING DIAGRAM



2N602x = Device Code
x = 7 or 8

A = Assembly Location

Y = Year

WW = Work Week

▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT

| PIN ASSIGNMENT | |
|----------------|---------|
| 1 | Anode |
| 2 | Gate |
| 3 | Cathode |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|-------------------------------------|-------------|-------------|
| Power Dissipation* Derate Above 25°C | P _F 1/θ _{JA} | 300 4.0 | mW mW/°C |
| DC Forward Anode Current* Derate Above 25°C | I _T | 150 2.67 | mA mA/°C |
| DC Gate Current* | I _G | ± 50 | mA |
| Repetitive Peak Forward Current 100 μs Pulse Width, 1% Duty Cycle 20 μs Pulse Width, 1% Duty Cycle* | I _{TRM} | 1.0 2.0 | A |
| Non-Repetitive Peak Forward Current 10 μs Pulse Width | I _{TSM} | 5.0 | A |
| Gate to Cathode Forward Voltage* | V _{GKF} | 40 | V |
| Gate to Cathode Reverse Voltage* | V _{GKR} | - 5.0 | V |
| Gate to Anode Reverse Voltage* | V _{GAR} | 40 | V |
| Anode to Cathode Voltage* (Note 1) | V _{AK} | ±40 | V |
| Capacitive Discharge Energy (Note 2) | E | 250 | μJ |
| Power Dissipation (Note 3) | P _D | 300 | mW |
| Operating Temperature | T _{OPR} | -50 to +100 | °C |
| Junction Temperature | T _J | -50 to +125 | °C |
| Storage Temperature Range | T _{stg} | -55 to +150 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*Indicates JEDEC Registered Data

1. Anode positive, R_{GA} = 1000 Ω
Anode negative, R_{GA} = open
2. E = 0.5 • CV² capacitor discharge energy limiting resistor and repetition.
3. Derate current and power above 25°C.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|------------------|-----|------|
| Thermal Resistance, Junction-to-Case | R _{θJC} | 75 | °C/W |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} | 200 | °C/W |
| Maximum Lead Temperature for Soldering Purposes (< 1/16" from case, 10 seconds maximum) | T _L | 260 | °C |

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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Fig. No. | Symbol | Min | Typ | Max | Unit |
|---|----------|-----------|-------------------|------------------------------------|-------------------|-------------------------|
| Peak Current* ($V_S = 10\text{ Vdc}$, $R_G = 1\text{ M}\Omega$) ($V_S = 10\text{ Vdc}$, $R_G = 10\text{ k}\Omega$) | 2,9,11 | I_P | - | 1.25 0.08 | 2.0 0.15 | μA |
| Offset Voltage* ($V_S = 10\text{ Vdc}$, $R_G = 1\text{ M}\Omega$) ($V_S = 10\text{ Vdc}$, $R_G = 10\text{ k}\Omega$) | 1 | V_T | 0.2 0.2 0.2 | 0.70 0.50 0.35 | 1.6 0.6 0.6 | V |
| Valley Current* ($V_S = 10\text{ Vdc}$, $R_G = 1\text{ M}\Omega$) ($V_S = 10\text{ Vdc}$, $R_G = 10\text{ k}\Omega$) ($V_S = 10\text{ Vdc}$, $R_G = 200\ \Omega$) | 1,4,5 | I_V | - | 18 18 70 25 1.5 1.0 | 50 25 - | μA mA |
| Gate to Anode Leakage Current* ($V_S = 40\text{ Vdc}$, $T_A = 25^\circ\text{C}$, Cathode Open) ($V_S = 40\text{ Vdc}$, $T_A = 75^\circ\text{C}$, Cathode Open) | - | I_{GAO} | - | 1.0 3.0 | 10 - | nAdc |
| Gate to Cathode Leakage Current ($V_S = 40\text{ Vdc}$, Anode to Cathode Shorted) | - | I_{GKS} | - | 5.0 | 50 | nAdc |
| Forward Voltage* ($I_F = 50\text{ mA Peak}$) (Note 4) | 1,6 | V_F | - | 0.8 | 1.5 | V |
| Peak Output Voltage* ($V_G = 20\text{ Vdc}$, $C_C = 0.2\ \mu\text{F}$) | 3,7 | V_O | 6.0 | 11 | - | V |
| Pulse Voltage Rise Time ($V_B = 20\text{ Vdc}$, $C_C = 0.2\ \mu\text{F}$) | 3 | t_r | - | 40 | 80 | ns |

*Indicates JEDEC Registered Data

4. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

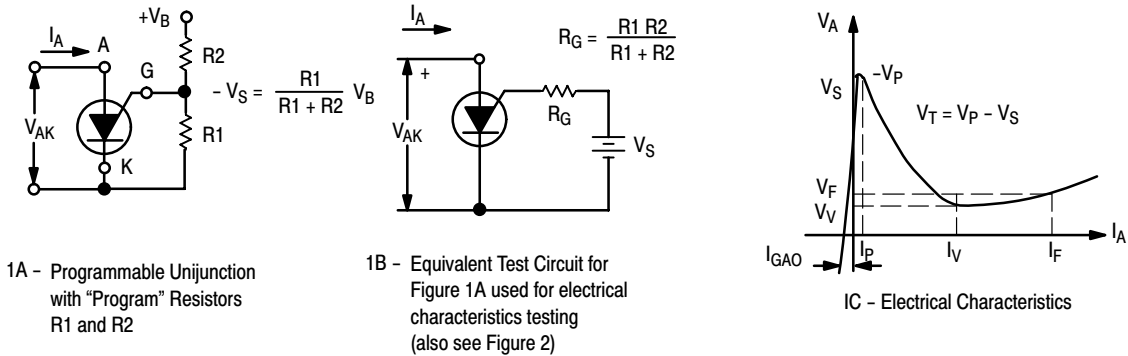


Figure 1. Electrical Characterization

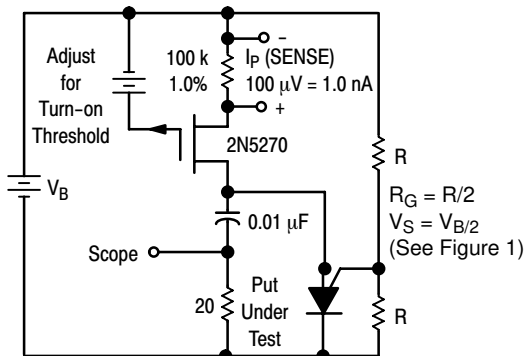


Figure 2. Peak Current (I_P) Test Circuit

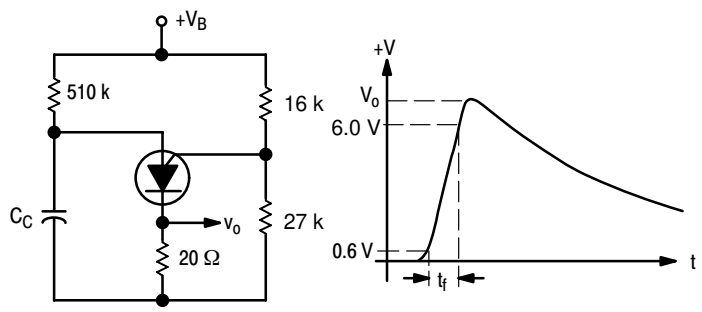


Figure 3. V_O and t_r Test Circuit

TYPICAL VALLEY CURRENT BEHAVIOR

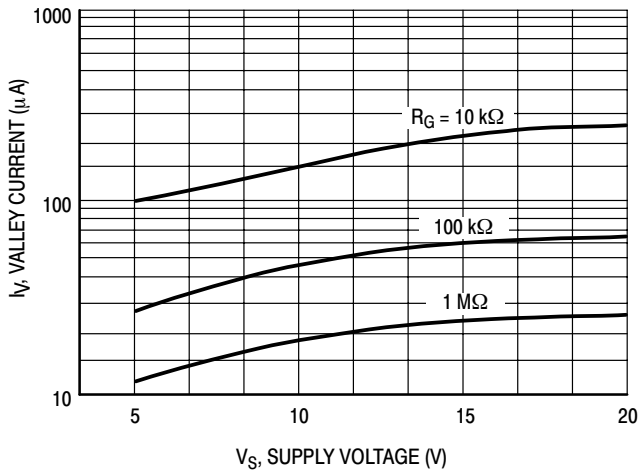


Figure 4. Effect of Supply Voltage

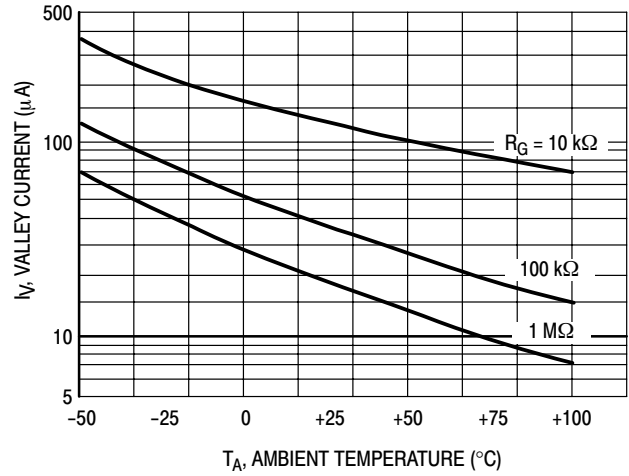


Figure 5. Effect of Temperature

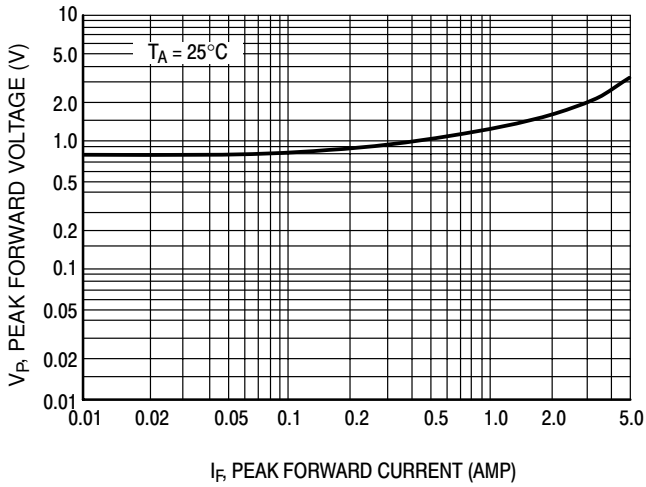


Figure 6. Forward Voltage

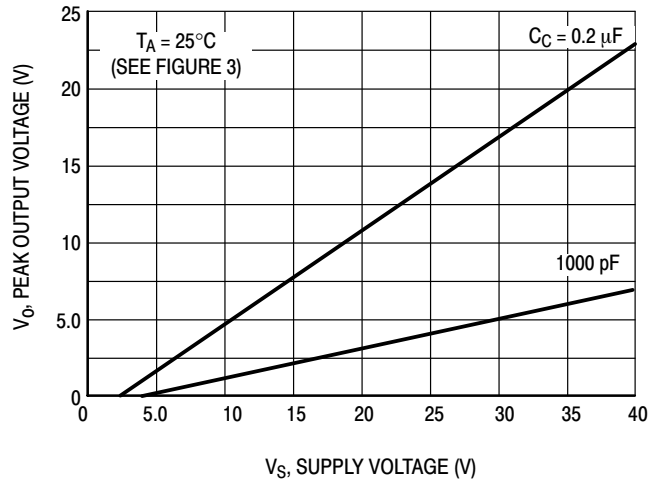


Figure 7. Peak Output Voltage

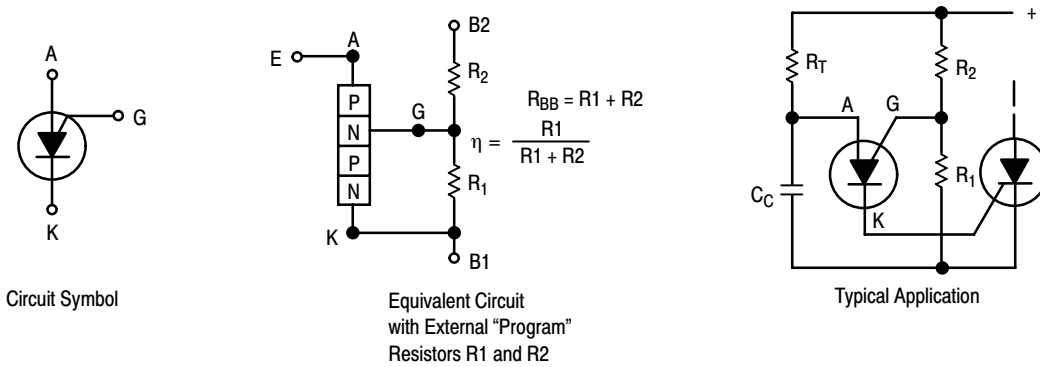


Figure 8. Programmable Unijunction

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TYPICAL PEAK CURRENT BEHAVIOR

2N6027

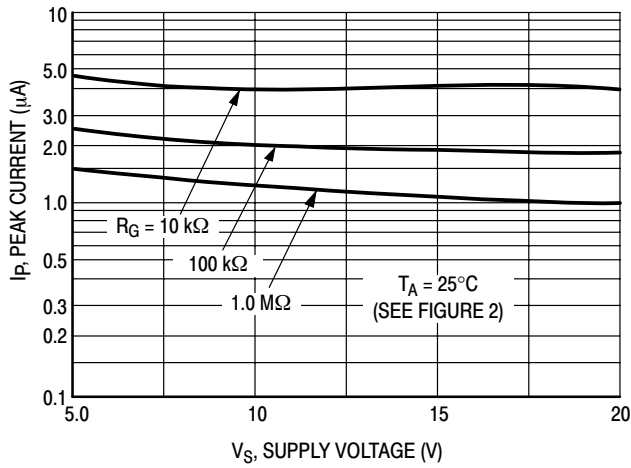


Figure 9. Effect of Supply Voltage and R_G

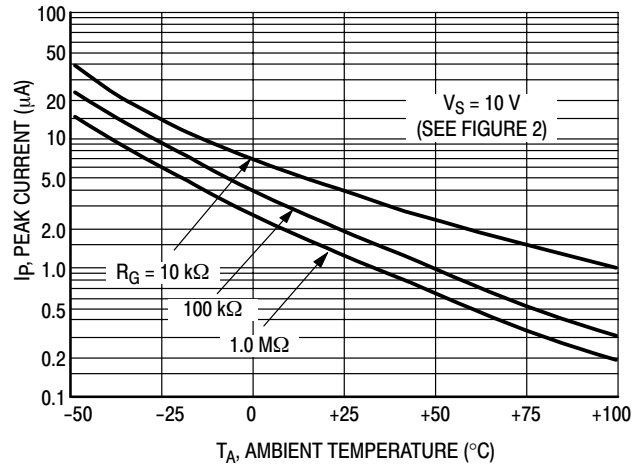


Figure 10. Effect of Temperature and R_G

2N6028

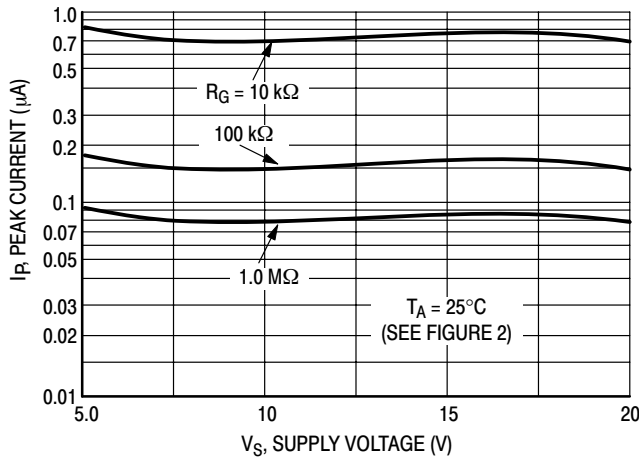


Figure 11. Effect of Supply Voltage and R_G

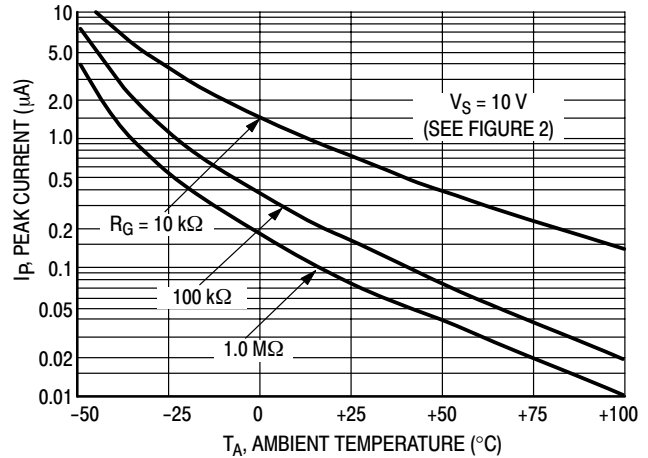


Figure 12. Effect of Temperature and R_G

ORDERING INFORMATION

| U.S. | European Equivalent | Shipping [†] | Description of TO-92 Tape Orientation |
|-------------|-------------------------|------------------------|---|
| 2N6027 | 2N6027RL1 2N6027RL1G | 5000 Units / Box | N/A – Bulk |
| 2N6027G | | | |
| 2N6028 | | | |
| 2N6028G | | | |
| 2N6027RLRA | | | |
| 2N6027RLRAG | | 2000 / Tape & Reel | Round side of TO-92 and adhesive tape visible |
| 2N6028RLRA | | | |
| 2N6028RLRAG | | | |
| 2N6028RLRM | | 2000 / Tape & Ammo Box | Flat side of TO-92 and adhesive tape visible |
| 2N6028RLRMG | | | |
| 2N6028RLRP | | | Round side of TO-92 and adhesive tape visible |
| 2N6028RLRPG | | | |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*The "G" suffix indicates Pb-Free package available.

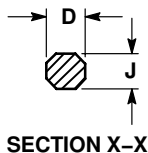
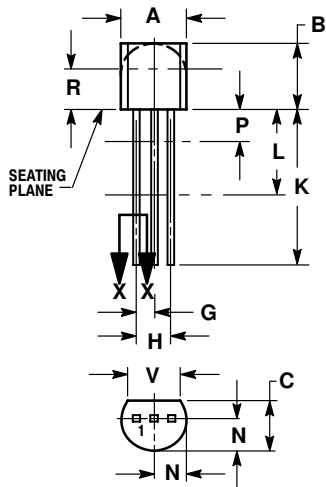
2N6027, 2N6028

PACKAGE DIMENSIONS

TO-92 (TO-226AA)

CASE 029-11

ISSUE AL



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.45 | 5.20 |
| B | 0.170 | 0.210 | 4.32 | 5.33 |
| C | 0.125 | 0.165 | 3.18 | 4.19 |
| D | 0.016 | 0.021 | 0.407 | 0.533 |
| G | 0.045 | 0.055 | 1.15 | 1.39 |
| H | 0.095 | 0.105 | 2.42 | 2.66 |
| J | 0.015 | 0.020 | 0.39 | 0.50 |
| K | 0.500 | --- | 12.70 | --- |
| L | 0.250 | --- | 6.35 | --- |
| N | 0.080 | 0.105 | 2.04 | 2.66 |
| P | --- | 0.100 | --- | 2.54 |
| R | 0.115 | --- | 2.93 | --- |
| V | 0.135 | --- | 3.43 | --- |

STYLE 16:

1. ANODE
2. GATE
3. CATHODE

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