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

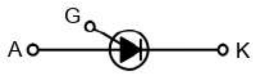
- Programmable − R_{BB}, η, I_V and I_P
- Low On−State Voltage − 1.5 V Maximum @ I_F = 50 mA
- Low Gate to Anode Leakage Current − 10 nA Maximum
- High Peak Output Voltage − 11 V Typical
- Low Offset Voltage − 0.35 V Typical (R_G = 10 kΩ)
- Pb−Free Packages are Available*

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

ON Semiconductor®

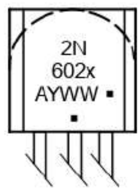
http://onsemi.com

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	
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.

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

Rating	Symbol	Value	Unit
Power Dissipation* Derate Above 25°C	P_F $1/\theta_{JA}$	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 • CV^2 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	$R_{\theta JC}$	75	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	200	°C/W
Maximum Lead Temperature for Soldering Purposes (< 1/16″ from case, 10 seconds maximum)	T_L	260	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Fig. No.	Symbol	Min	Typ	Max	Unit
Peak Current*		2,9,11	I_P				μA
(V_S = 10 Vdc, R_G = 1 MΩ)	2N6027			–	1.25	2.0	
	2N6028			–	0.08	0.15	
(V_S = 10 Vdc, R_G = 10 kΩ)	2N6027			–	4.0	5.0	
	2N6028			–	0.70	1.0	
Offset Voltage*		1	V_T				V
(V_S = 10 Vdc, R_G = 1 MΩ)	2N6027			0.2	0.70	1.6	
	2N6028			0.2	0.50	0.6	
(V_S = 10 Vdc, R_G = 10 kΩ)	(Both Types)			0.2	0.35	0.6	
Valley Current*		1,4,5	I_V				μA
(V_S = 10 Vdc, R_G = 1 MΩ)	2N6027			–	18	50	
	2N6028			–	18	25	
(V_S = 10 Vdc, R_G = 10 k Ω)	2N6027			70	150	–	
	2N6028			25	150	–	
(V_S = 10 Vdc, R_G = 200 Ω)	2N6027			1.5	–	–	
	2N6028			1.0	–	–	mA
Gate to Anode Leakage Current*		–	I_{GAO}				nAdc
(V_S = 40 Vdc, T_A = 25°C, Cathode Open)				–	1.0	10	
(V_S = 40 Vdc, T_A = 75°C, Cathode Open)				–	3.0	–	
Gate to Cathode Leakage Current (V_S = 40 Vdc, Anode to Cathode Shorted)		–	I_{GKS}	–	5.0	50	nAdc
Forward Voltage* (I_F = 50 mA Peak) (Note 4)		1,6	V_F	–	0.8	1.5	V
Peak Output Voltage* (V_G = 20 Vdc, C_C = 0.2 μF)		3,7	V_o	6.0	11	–	V
Pulse Voltage Rise Time (V_B = 20 Vdc, C_C = 0.2 μF)		3	t_r	–	40	80	ns

*Indicates JEDEC Registered Data

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

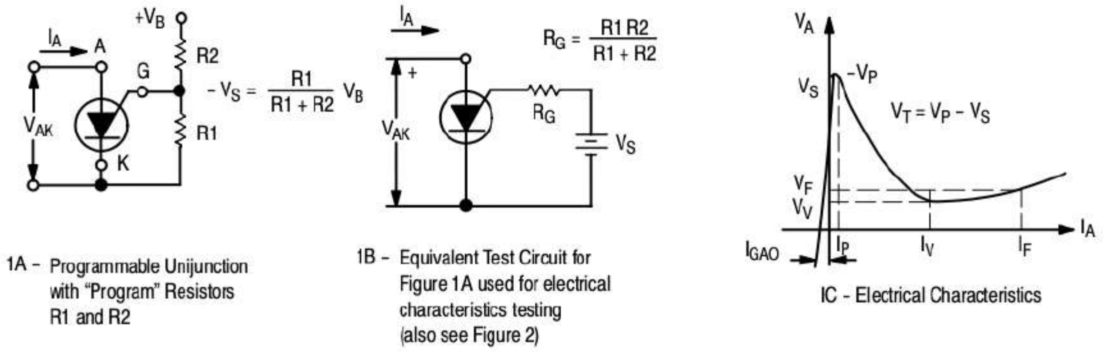


Figure 1. Electrical Characterization

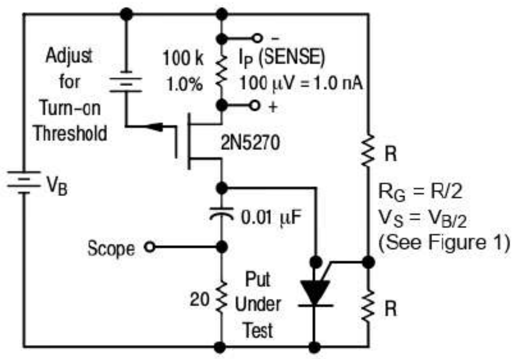


Figure 2. Peak Current (I_P) Test Circuit

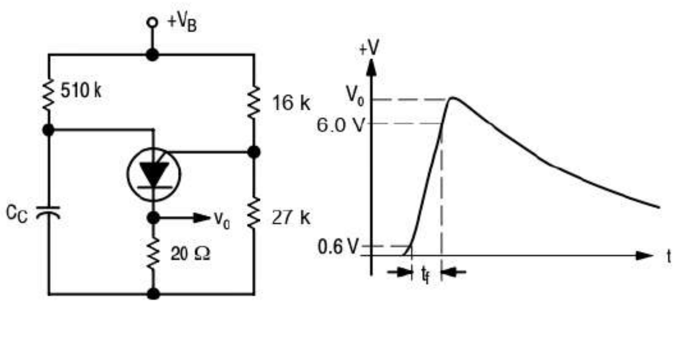


Figure 3. V_o and t_r Test Circuit

TYPICAL VALLEY CURRENT BEHAVIOR

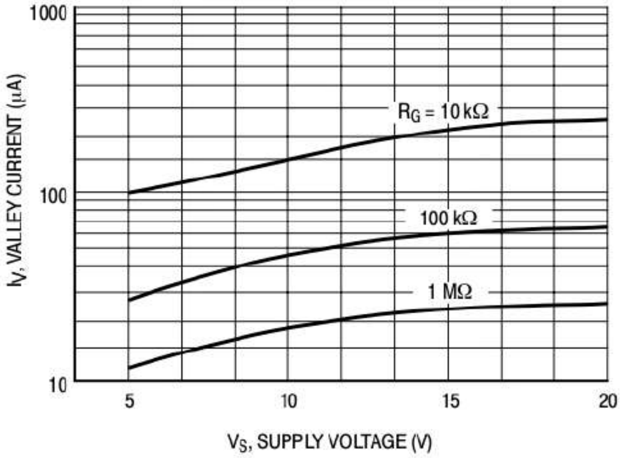


Figure 4. Effect of Supply Voltage

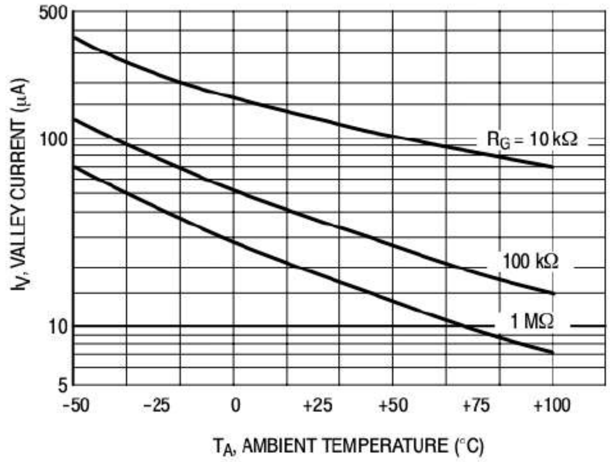


Figure 5. Effect of Temperature

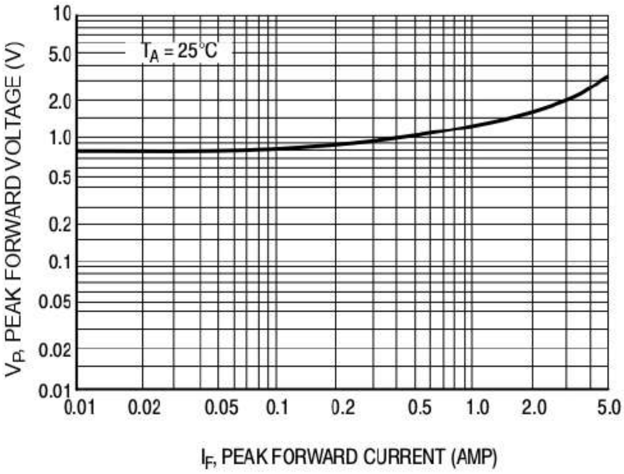


Figure 6. Forward Voltage

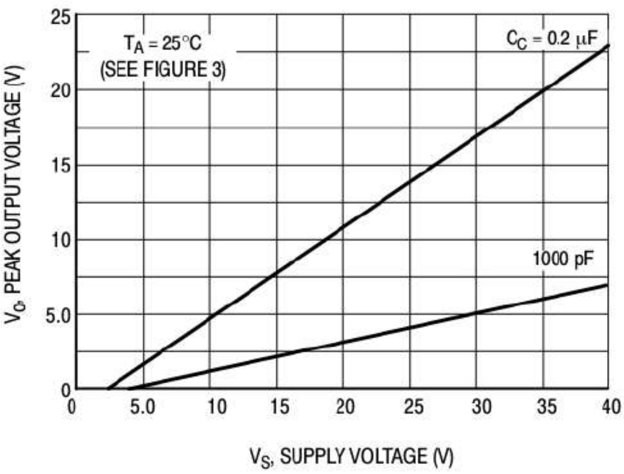


Figure 7. Peak Output Voltage

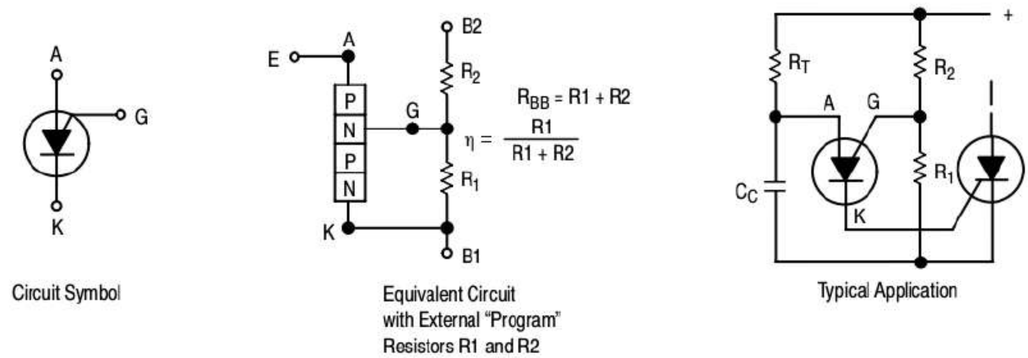


Figure 8. Programmable Unijunction

TYPICAL PEAK CURRENT BEHAVIOR

2N6027

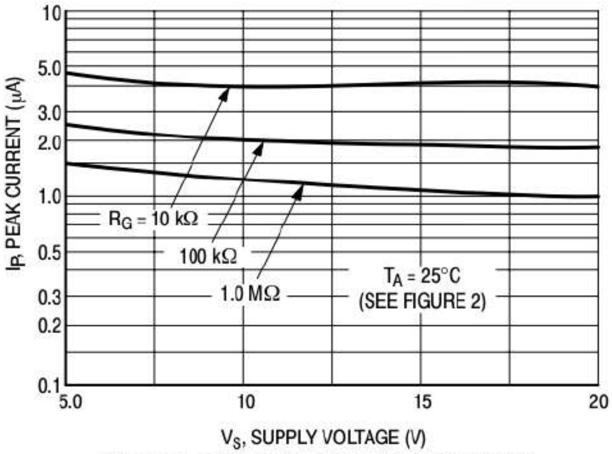


Figure 9. Effect of Supply Voltage and R_G

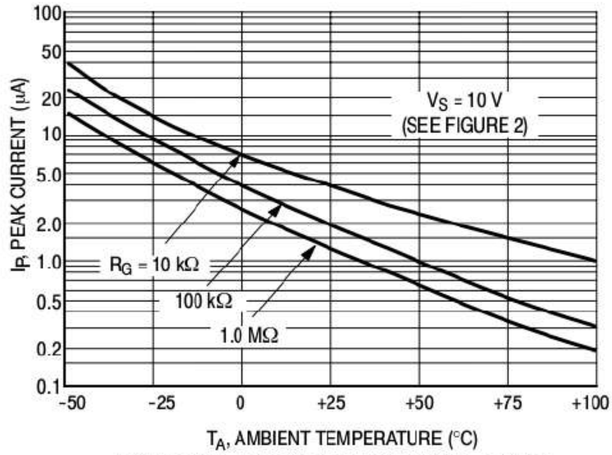


Figure 10. Effect of Temperature and R_G

2N6028

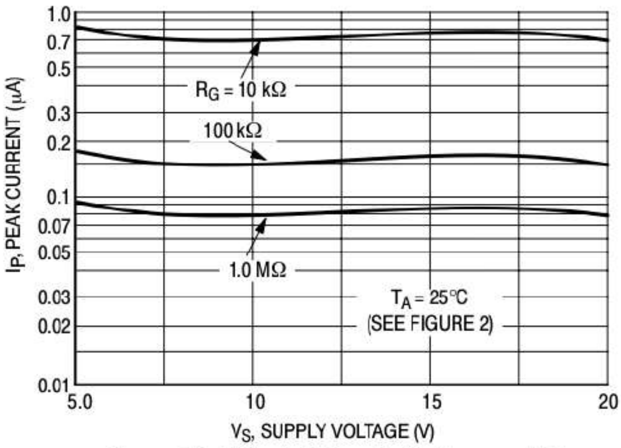


Figure 11. Effect of Supply Voltage and R_G

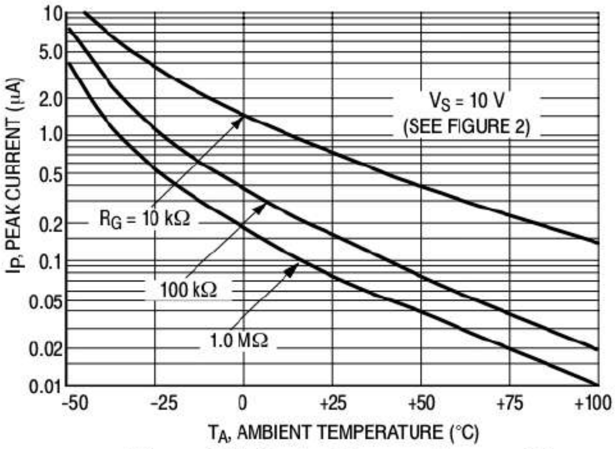


Figure 12. Effect of Temperature and R_G

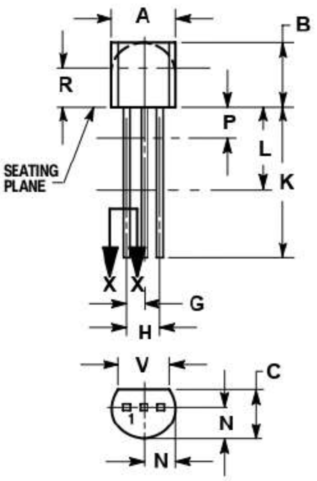
ORDERING INFORMATION

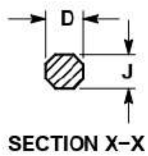
U.S.	European Equivalent	Shipping†	Description of TO−92 Tape Orientation
2N6027	2N6027RL1 2N6027RL1G	5000 Units / Box	N/A − Bulk
2N6027G			
2N6028			
2N6028G			
2N6027RLRA		2000 / Tape & Reel	Round side of TO−92 and adhesive tape visible
2N6027RLRAG			
2N6028RLRA			
2N6028RLRAG			
2N6028RLRM		2000 / 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.

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.

	INCHES		MILLIMETERS	
DIM	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:
PIN 1. ANODE
2. GATE
3. CATHODE

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

ON Semiconductor Website: www.onsemi.com

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative