

1N5820, 1N5821, 1N5822

1N5820 and 1N5822 are Preferred Devices

Axial Lead Rectifiers

This series employs the Schottky Barrier principle in a large area metal-to-silicon power diode. State-of-the-art geometry features chrome barrier metal, epitaxial construction with oxide passivation and metal overlap contact. Ideally suited for use as rectifiers in low-voltage, high-frequency inverters, free wheeling diodes, and polarity protection diodes.

Features

- Extremely Low V_F
- Low Power Loss/High Efficiency
- Low Stored Charge, Majority Carrier Conduction
- Shipped in plastic bags, 500 per bag
- Available in Tape and Reel, 1500 per reel, by adding a "RL" suffix to the part number
- Pb-Free Packages are Available*

Mechanical Characteristics:

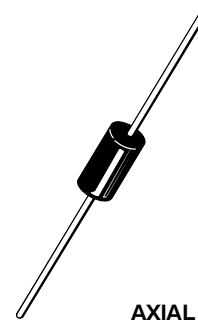
- Case: Epoxy, Molded
- Weight: 1.1 Gram (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes:
260°C Max. for 10 Seconds
- Polarity: Cathode indicated by Polarity Band



ON Semiconductor®

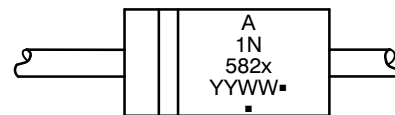
<http://onsemi.com>

**SCHOTTKY BARRIER
RECTIFIERS
3.0 AMPERES
20, 30, 40 VOLTS**



**AXIAL LEAD
CASE 267-05
(DO-201AD)
STYLE 1**

MARKING DIAGRAM



A = Assembly Location
1N582x = Device Code
x = 0, 1, or 2
YY = Year
WW = Work Week
■ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 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.

1N5820, 1N5821, 1N5822

MAXIMUM RATINGS

| Rating | Symbol | 1N5820 | 1N5821 | 1N5822 | Unit |
|---|---------------------------------|--------------------|--------|--------|------------------|
| Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage | V_{RRM} V_{RWM} V_R | 20 | 30 | 40 | V |
| Non-Repetitive Peak Reverse Voltage | V_{RSM} | 24 | 36 | 48 | V |
| RMS Reverse Voltage | $V_{R(RMS)}$ | 14 | 21 | 28 | V |
| Average Rectified Forward Current (Note 1) $V_{R(equiv)} \leq 0.2 V_{R(dc)}$, $T_L = 95^\circ\text{C}$ ($R_{\theta JA} = 28^\circ\text{C/W}$, P.C. Board Mounting, see Note 5) | I_O | ← 3.0 → | | | A |
| Ambient Temperature Rated $V_{R(dc)}$, $P_{F(AV)} = 0$ $R_{\theta JA} = 28^\circ\text{C/W}$ | T_A | 90 | 85 | 80 | $^\circ\text{C}$ |
| Non-Repetitive Peak Surge Current (Surge applied at rated load conditions, half wave, single phase 60 Hz, $T_L = 75^\circ\text{C}$) | I_{FSM} | 80 (for one cycle) | | | A |
| Operating and Storage Junction Temperature Range (Reverse Voltage applied) | T_J, T_{stg} | -65 to +125 | | | $^\circ\text{C}$ |

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.

*THERMAL CHARACTERISTICS (Note 5)

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-----|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 28 | $^\circ\text{C/W}$ |

*ELECTRICAL CHARACTERISTICS ($T_L = 25^\circ\text{C}$ unless otherwise noted) (Note 1)

| Characteristic | Symbol | 1N5820 | 1N5821 | 1N5822 | Unit |
|---|--------|-------------------------|-------------------------|-------------------------|------|
| Maximum Instantaneous Forward Voltage (Note 2) ($i_F = 1.0$ Amp) ($i_F = 3.0$ Amp) ($i_F = 9.4$ Amp) | V_F | 0.370 0.475 0.850 | 0.380 0.500 0.900 | 0.390 0.525 0.950 | V |
| Maximum Instantaneous Reverse Current @ Rated dc Voltage (Note 2) $T_L = 25^\circ\text{C}$ $T_L = 100^\circ\text{C}$ | i_R | 2.0 20 | 2.0 20 | 2.0 20 | mA |

1. Lead Temperature reference is cathode lead 1/32" from case.

2. Pulse Test: Pulse Width = 300 μs , Duty Cycle = 2.0%.

*Indicates JEDEC Registered Data for 1N5820-22.

1N5820, 1N5821, 1N5822

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------|-------------------------|------------------|
| 1N5820 | Axial Lead | 500 Units/Bag |
| 1N5820G | Axial Lead (Pb-Free) | 500 Units/Bag |
| 1N5820RL | Axial Lead | 1500/Tape & Reel |
| 1N5820RLG | Axial Lead (Pb-Free) | 1500/Tape & Reel |
| 1N5821 | Axial Lead | 500 Units/Bag |
| 1N5821G | Axial Lead (Pb-Free) | 500 Units/Bag |
| 1N5821RL | Axial Lead | 1500/Tape & Reel |
| 1N5821RLG | Axial Lead (Pb-Free) | 1500/Tape & Reel |
| 1N5822 | Axial Lead | 500 Units/Bag |
| 1N5822G | Axial Lead (Pb-Free) | 500 Units/Bag |
| 1N5822RL | Axial Lead | 1500/Tape & Reel |
| 1N5822RLG | Axial Lead (Pb-Free) | 1500/Tape & Reel |

†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.

NOTE 3 — DETERMINING MAXIMUM RATINGS

Reverse power dissipation and the possibility of thermal runaway must be considered when operating this rectifier at reverse voltages above 0.1 V_{RWM} . Proper derating may be accomplished by use of equation (1).

$$T_{A(max)} = T_{J(max)} - R_{\theta JA} P_{F(AV)} - R_{\theta JA} P_{R(AV)} \quad (1)$$

where $T_{A(max)}$ = Maximum allowable ambient temperature
 $T_{J(max)}$ = Maximum allowable junction temperature (125°C or the temperature at which thermal runaway occurs, whichever is lowest)
 $P_{F(AV)}$ = Average forward power dissipation
 $P_{R(AV)}$ = Average reverse power dissipation
 $R_{\theta JA}$ = Junction-to-ambient thermal resistance

Figures 1, 2, and 3 permit easier use of equation (1) by taking reverse power dissipation and thermal runaway into consideration. The figures solve for a reference temperature as determined by equation (2).

$$T_R = T_{J(max)} - R_{\theta JA} P_{R(AV)} \quad (2)$$

Substituting equation (2) into equation (1) yields:

$$T_{A(max)} = T_R - R_{\theta JA} P_{F(AV)} \quad (3)$$

Inspection of equations (2) and (3) reveals that T_R is the ambient temperature at which thermal runaway occurs or where $T_J = 125^\circ\text{C}$, when forward power is zero. The transition from one boundary condition to the other is evident on the curves of Figures 1, 2, and 3 as a difference in the rate of change of the slope in the vicinity of 115°C. The data of Figures 1, 2, and 3 is based upon dc conditions. For

use in common rectifier circuits, Table 1 indicates suggested factors for an equivalent dc voltage to use for conservative design, that is:

$$V_{R(equiv)} = V_{(FM)} \times F \quad (4)$$

The factor F is derived by considering the properties of the various rectifier circuits and the reverse characteristics of Schottky diodes.

EXAMPLE: Find $T_{A(max)}$ for 1N5821 operated in a 12-volt dc supply using a bridge circuit with capacitive filter such that $I_{DC} = 2.0 \text{ A}$ ($I_{F(AV)} = 1.0 \text{ A}$), $I_{(FM)}/I_{(AV)} = 10$, Input Voltage = 10 $V_{(rms)}$, $R_{\theta JA} = 40^\circ\text{C/W}$.

Step 1. Find $V_{R(equiv)}$. Read $F = 0.65$ from Table 1,

$$\therefore V_{R(equiv)} = (1.41) (10) (0.65) = 9.2 \text{ V.}$$

Step 2. Find T_R from Figure 2. Read $T_R = 108^\circ\text{C}$

$$@ V_R = 9.2 \text{ V and } R_{\theta JA} = 40^\circ\text{C/W.}$$

Step 3. Find $P_{F(AV)}$ from Figure 6. **Read $P_{F(AV)} = 0.85 \text{ W}$

$$@ \frac{I_{(FM)}}{I_{(AV)}} = 10 \text{ and } I_{F(AV)} = 1.0 \text{ A.}$$

Step 4. Find $T_{A(max)}$ from equation (3).

$$T_{A(max)} = 108 - (0.85) (40) = 74^\circ\text{C.}$$

**Values given are for the 1N5821. Power is slightly lower for the 1N5820 because of its lower forward voltage, and higher for the 1N5822. Variations will be similar for the MBR-prefix devices, using $P_{F(AV)}$ from Figure 6.

Table 1. Values for Factor F

| Circuit | Half Wave | | Full Wave, Bridge | | Full Wave, Center Tapped*† | |
|-------------|-----------|-------------|-------------------|------------|----------------------------|------------|
| | Resistive | Capacitive* | Resistive | Capacitive | Resistive | Capacitive |
| Sine Wave | 0.5 | 1.3 | 0.5 | 0.65 | 1.0 | 1.3 |
| Square Wave | 0.75 | 1.5 | 0.75 | 0.75 | 1.5 | 1.5 |

*Note that $V_{R(PK)} \approx 2.0 V_{in(PK)}$.

†Use line to center tap voltage for V_{in} .

1N5820, 1N5821, 1N5822

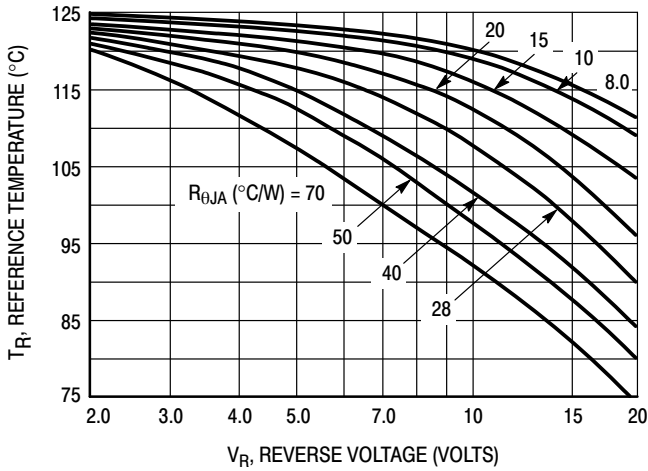


Figure 1. Maximum Reference Temperature
1N5820

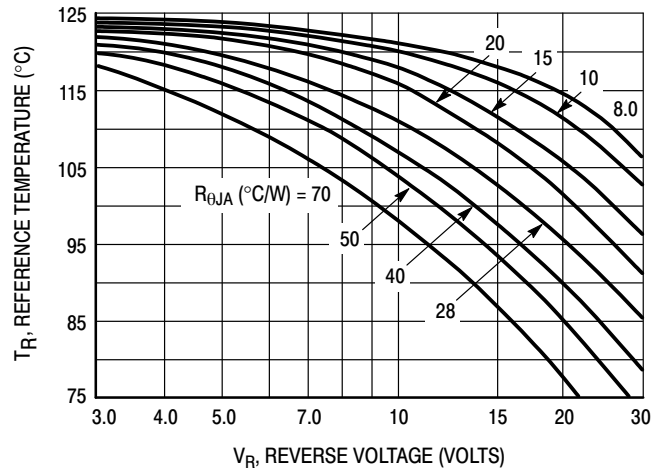


Figure 2. Maximum Reference Temperature
1N5821

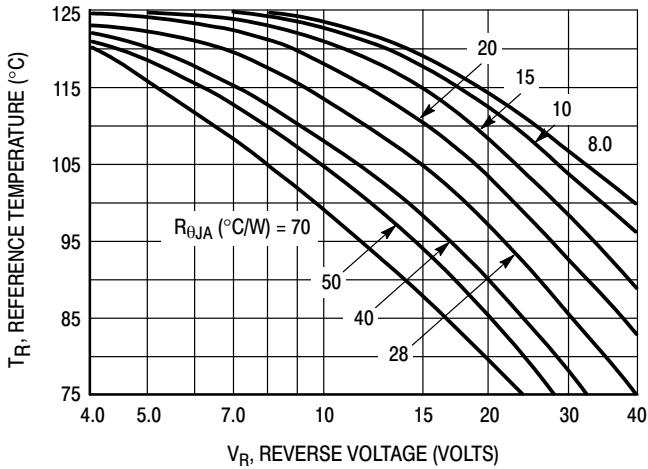


Figure 3. Maximum Reference Temperature
1N5822

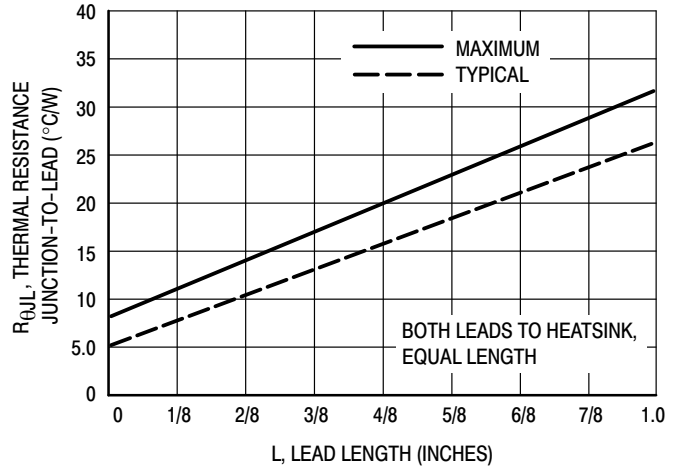


Figure 4. Steady-State Thermal Resistance

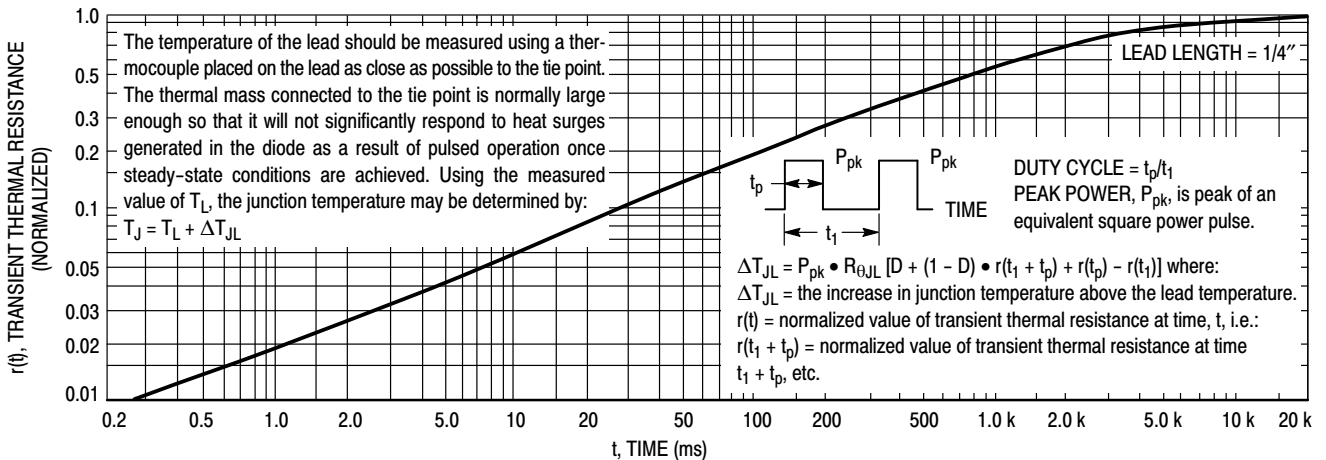


Figure 5. Thermal Response

1N5820, 1N5821, 1N5822

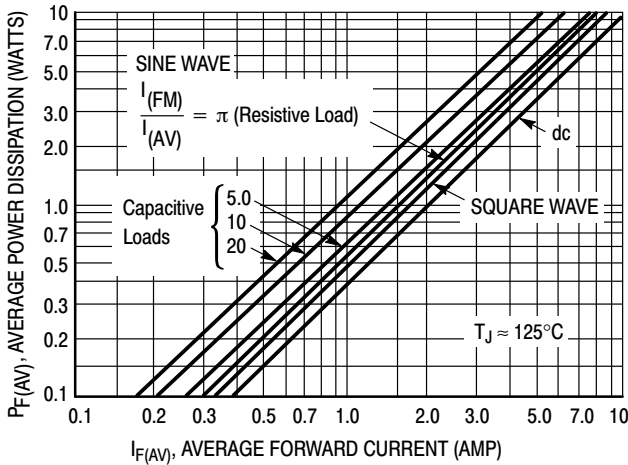
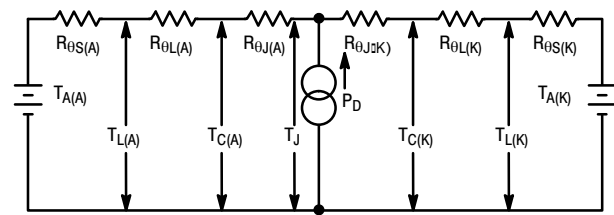


Figure 6. Forward Power Dissipation 1N5820-22

NOTE 4 – APPROXIMATE THERMAL CIRCUIT MODEL



Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. For a given total lead length, lowest values occur when one side of the rectifier is brought as close as possible to the heat sink. Terms in the model signify:

- T_A = Ambient Temperature T_C = Case Temperature
 - T_L = Lead Temperature T_J = Junction Temperature
 - $R_{\theta S}$ = Thermal Resistance, Heatsink to Ambient
 - $R_{\theta L}$ = Thermal Resistance, Lead-to-Heatsink
 - $R_{\theta J}$ = Thermal Resistance, Junction-to-Case
 - P_D = Total Power Dissipation = $P_F + P_R$
 - P_F = Forward Power Dissipation
 - P_R = Reverse Power Dissipation
- (Subscripts (A) and (K) refer to anode and cathode sides, respectively.) Values for thermal resistance components are:

- $R_{\theta L} = 42^\circ\text{C/W/in}$ typically and 48°C/W/in maximum
 - $R_{\theta J} = 10^\circ\text{C/W}$ typically and 16°C/W maximum
- The maximum lead temperature may be found as follows:
 $T_L = T_{J(\text{max})} - \Delta T_{JL}$
 where $\Delta T_{JL} \approx R_{\theta JL} \cdot P_D$

NOTE 5 — MOUNTING DATA

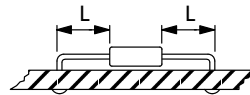
Data shown for thermal resistance junction-to-ambient ($R_{\theta JA}$) for the mountings shown is to be used as typical guideline values for preliminary engineering, or in case the tie point temperature cannot be measured.

TYPICAL VALUES FOR $R_{\theta JA}$ IN STILL AIR

| Mounting Method | Lead Length, L (in) | | | | $R_{\theta JA}$ |
|-----------------|---------------------|-----|-----|-----|--------------------|
| | 1/8 | 1/4 | 1/2 | 3/4 | |
| 1 | 50 | 51 | 53 | 55 | $^\circ\text{C/W}$ |
| 2 | 58 | 59 | 61 | 63 | $^\circ\text{C/W}$ |
| 3 | 28 | | | | $^\circ\text{C/W}$ |

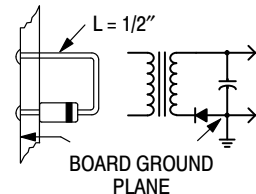
Mounting Method 1

P.C. Board where available copper surface is small.

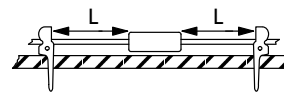


Mounting Method 3

P.C. Board with 2-1/2, x 2-1/2, copper surface.



Mounting Method 2



VECTOR PUSH-IN TERMINALS T-28

1N5820, 1N5821, 1N5822

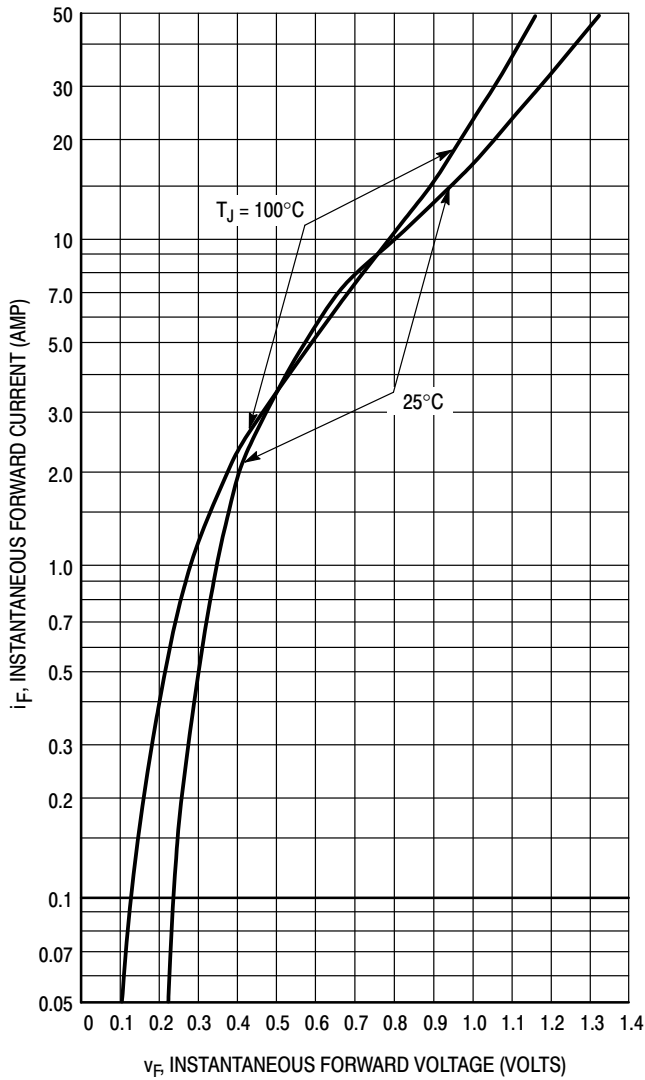


Figure 7. Typical Forward Voltage

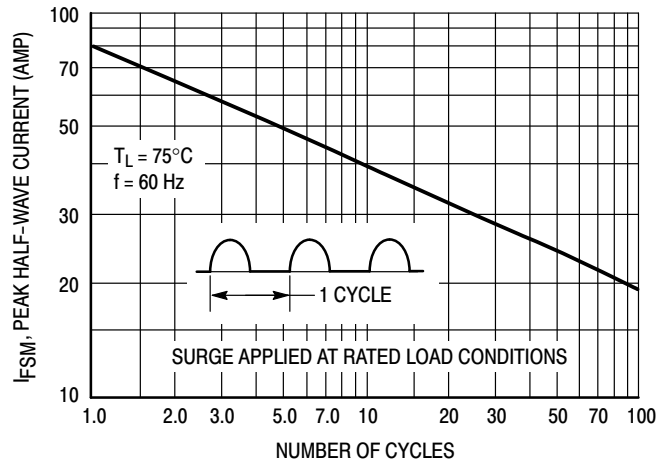


Figure 8. Maximum Non-Repetitive Surge Current

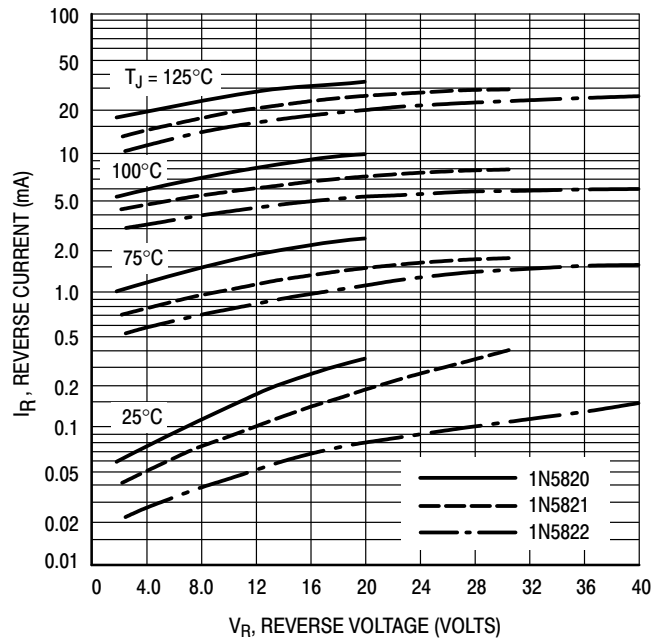


Figure 9. Typical Reverse Current

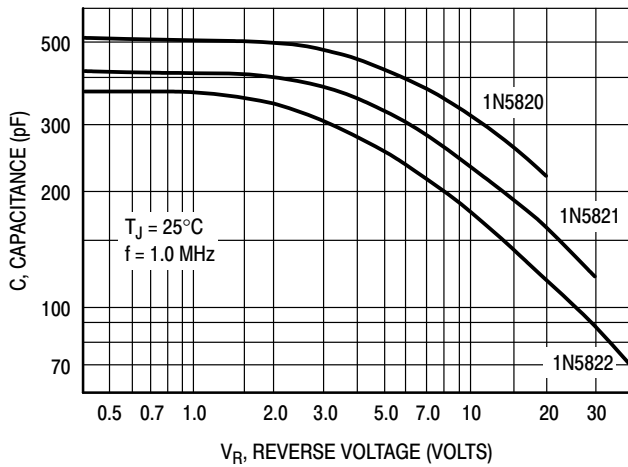


Figure 10. Typical Capacitance

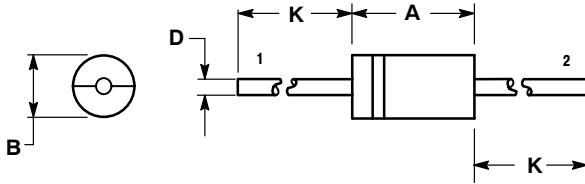
NOTE 6 — HIGH FREQUENCY OPERATION

Since current flow in a Schottky rectifier is the result of majority carrier conduction, it is not subject to junction diode forward and reverse recovery transients due to minority carrier injection and stored charge. Satisfactory circuit analysis work may be performed by using a model consisting of an ideal diode in parallel with a variable capacitance. (See Figure 10.)

1N5820, 1N5821, 1N5822

PACKAGE DIMENSIONS

AXIAL LEAD
CASE 267-05
(DO-201AD)
ISSUE G




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.287 | 0.374 | 7.30 | 9.50 |
| B | 0.189 | 0.209 | 4.80 | 5.30 |
| D | 0.047 | 0.051 | 1.20 | 1.30 |
| K | 1.000 | --- | 25.40 | --- |

STYLE 1:

- PIN 1. CATHODE (POLARITY BAND)
- ANODE

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View 1N5820RLG on WIN SOURCE](#)
-  [ON Semiconductor](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management