

# Silicon Hot-Carrier Diodes

## Schottky Barrier Diodes

### MBD301G, MMBD301LT1G, MMBD301LT3G, SMMBD301LT3G

These devices are designed primarily for high-efficiency UHF and VHF detector applications. They are readily adaptable to many other fast switching RF and digital applications. They are supplied in an inexpensive plastic package for low-cost, high-volume consumer and industrial/commercial requirements. They are also available in a Surface Mount package.

#### Features

- Extremely Low Minority Carrier Lifetime – 15 ps (Typ)
- Very Low Capacitance – 1.5 pF (Max) @  $V_R = 15$  V
- Low Reverse Leakage –  $I_R = 13$  nAdc (Typ) MBD301, MMBD301
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

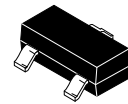
| Rating                                                                                                         | Symbol    | Value          | Unit                 |
|----------------------------------------------------------------------------------------------------------------|-----------|----------------|----------------------|
| Reverse Voltage                                                                                                | $V_R$     | 30             | V                    |
| Forward Current (DC)                                                                                           | $I_F$     | 200 (Max)      | mA                   |
| Total Device Dissipation<br>@ $T_A = 25^\circ\text{C}$<br>MBD301G<br>MMBD301LT1G, MMBD301LT3G,<br>SMMBD301LT3G | $P_F$     | 280<br>200     | MW                   |
| Derate above $25^\circ\text{C}$<br>MBD301G<br>MMBD301LT1G, MMBD301LT3G,<br>SMMBD301LT3G                        |           | 2.8<br>2.0     | mW/ $^\circ\text{C}$ |
| Operating Junction<br>Temperature Range                                                                        | $T_J$     | -55 to<br>+125 | $^\circ\text{C}$     |
| Storage Temperature Range                                                                                      | $T_{stg}$ | -55 to<br>+150 | $^\circ\text{C}$     |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

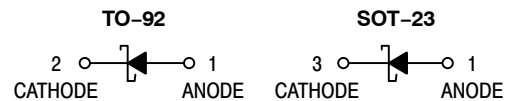
### 30 VOLTS SILICON HOT-CARRIER DETECTOR AND SWITCHING DIODES



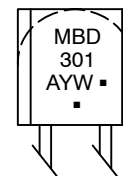
TO-92 2-Lead  
CASE 182  
STYLE 1



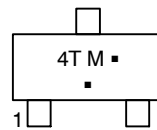
SOT-23 (TO-236)  
CASE 318  
STYLE 8



#### MARKING DIAGRAMS



TO-92



SOT-23

A = Assembly Location  
Y = Year  
W = Work Week  
4T = Device Code (SOT-23)  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# MBD301G, MMBD301LT1G, MMBD301LT3G, SMMBD301LT3G

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

| Characteristic                                                                 | Symbol      | Min | Typ  | Max  | Unit |
|--------------------------------------------------------------------------------|-------------|-----|------|------|------|
| Reverse Breakdown Voltage<br>( $I_R = 10\ \mu\text{A}$ )                       | $V_{(BR)R}$ | 30  | –    | –    | V    |
| Total Capacitance<br>( $V_R = 15\ \text{V}$ , $f = 1.0\ \text{MHz}$ ) Figure 1 | $C_T$       | –   | 0.9  | 1.5  | pF   |
| Reverse Leakage<br>( $V_R = 25\ \text{V}$ ) Figure 3                           | $I_R$       | –   | 13   | 200  | nAdc |
| Forward Voltage<br>( $I_F = 1.0\ \text{mA}_{dc}$ ) Figure 4                    | $V_F$       | –   | 0.38 | 0.45 | Vdc  |
| Forward Voltage<br>( $I_F = 10\ \text{mA}_{dc}$ ) Figure 4                     | $V_F$       | –   | 0.52 | 0.6  | Vdc  |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## ORDERING INFORMATION

| Device       | Package             | Shipping <sup>†</sup> |
|--------------|---------------------|-----------------------|
| MBD301G      | TO-92<br>(Pb-Free)  | 5,000 Units / Bulk    |
| MMBD301LT1G  | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| MMBD301LT3G  | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| SMMBD301LT3G | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |

<sup>†</sup>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.

TYPICAL ELECTRICAL CHARACTERISTICS

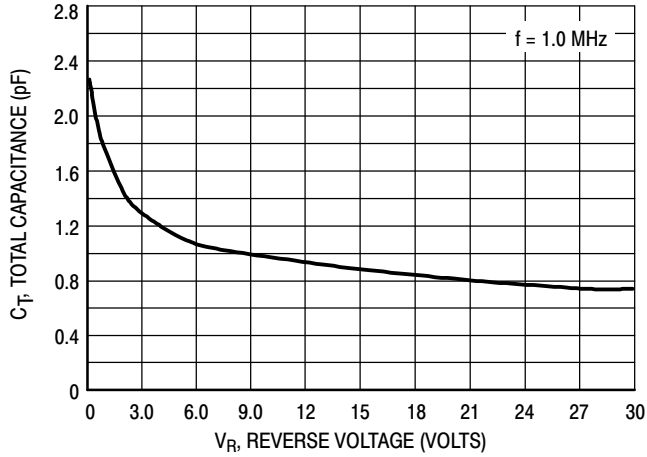


Figure 1. Total Capacitance

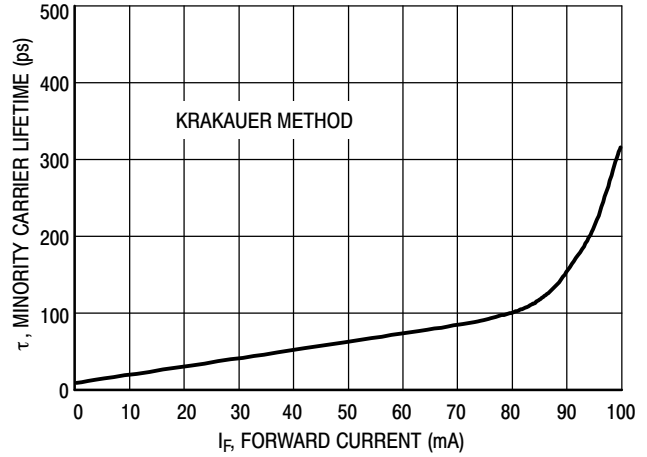


Figure 2. Minority Carrier Lifetime

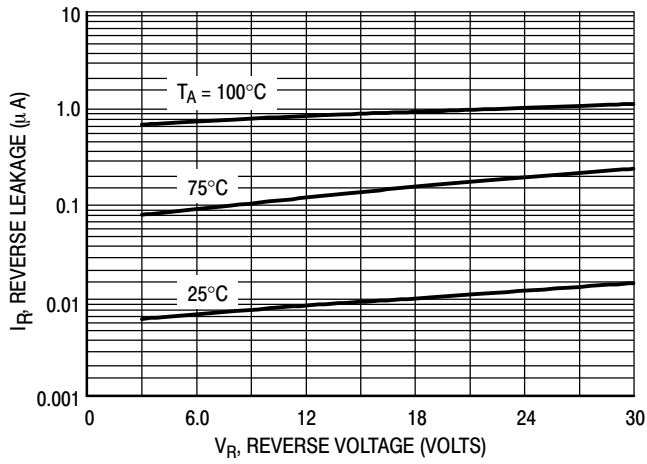


Figure 3. Reverse Leakage

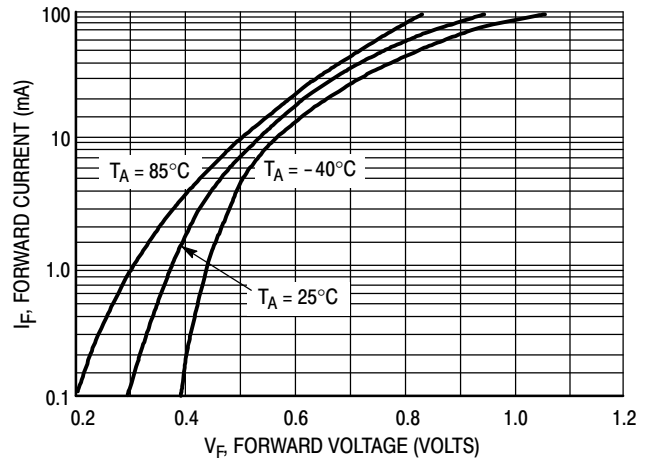


Figure 4. Forward Voltage

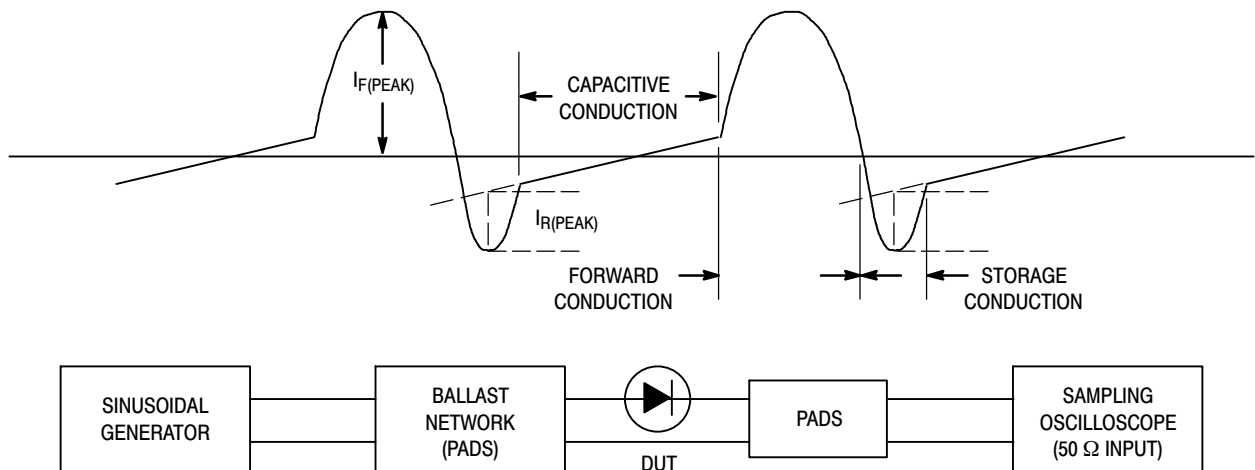


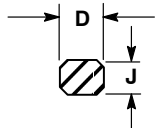
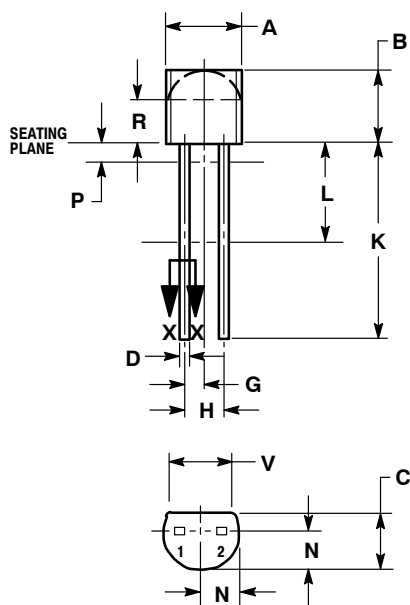
Figure 5. Krakauer Method of Measuring Lifetime



TO-92 (TO-226)  
CASE 182-06  
ISSUE L

DATE 04/18/1998

SCALE 1:1



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND ZONE 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        | 5.21  |
| 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   | 0.050 BSC |       | 1.27 BSC    |       |
| H   | 0.100 BSC |       | 2.54 BSC    |       |
| J   | 0.014     | 0.016 | 0.36        | 0.41  |
| K   | 0.500     | ---   | 12.70       | ---   |
| L   | 0.250     | ---   | 6.35        | ---   |
| N   | 0.080     | 0.105 | 2.03        | 2.66  |
| P   | ---       | 0.050 | ---         | 1.27  |
| R   | 0.115     | ---   | 2.93        | ---   |
| V   | 0.135     | ---   | 3.43        | ---   |

STYLE 1:  
PIN 1. ANODE  
2. CATHODE

STYLE 2:  
PIN 1. CATHODE  
2. ANODE

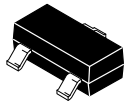
STYLE 3:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2

STYLE 4:  
CANCELLED

STYLE 5:  
PIN 1. INPUT  
2. OUTPUT

|                  |                |                                                                                                                                                                                     |
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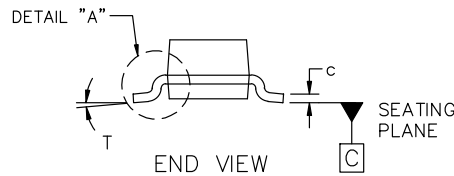
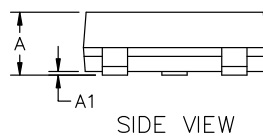
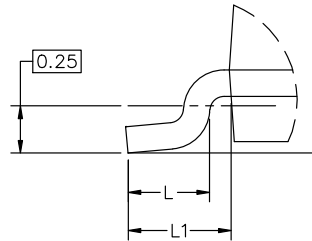
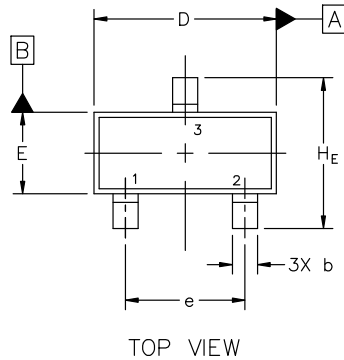
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SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
CASE 318  
ISSUE AU

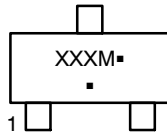
DATE 14 AUG 2024



| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 1.20 | 1.30 | 1.40 |
| e           | 1.78 | 1.90 | 2.04 |
| L           | 0.30 | 0.43 | 0.55 |
| L1          | 0.35 | 0.54 | 0.69 |
| HE          | 2.10 | 2.40 | 2.64 |
| T           | 0°   | ---  | 10°  |

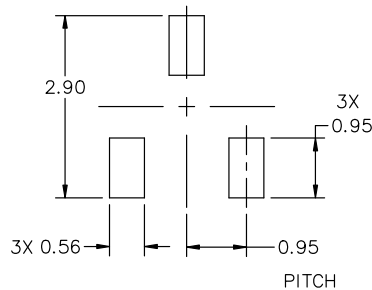
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**GENERIC MARKING DIAGRAM\***


XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.


**RECOMMENDED MOUNTING FOOTPRINT**

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

**STYLES ON PAGE 2**

|                         |                                             |                                                                                                                                                                                     |
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**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

|                                                         |                                                       |                                                             |                                                             |                                                             |                                                             |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |                                                             |                                                             |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |                                                             |                                                             |                                                             |                                                             |

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