

## DATA SHEET

# Surface-Mount Mixer and Detector Schottky Diodes

## Applications

- Sensitive RF and microwave detector circuits
- Sampling and mixer circuits
- High-volume wireless
- Wi-Fi and mobile
- Low-noise receivers in high-sensitivity ID tags
- Radio designs

## Features

- Tight parameter distribution
- Available as singles, pairs, and dual pairs
- Packages rated MSL1, 260 °C per JEDEC J-STD-020



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.



## Description

These low-cost, surface-mountable, plastic-packaged silicon mixer Schottky diodes are designed for RF and microwave mixers and detectors. They include low-barrier diodes and zero-bias detectors that combine Skyworks advanced semiconductor technology with low-cost packaging techniques. All diodes are 100 percent DC tested and deliver tight parameter distribution, which minimizes performance variability.

These diodes are available in SOD-882, SC-79, and SOT-23 packages. Wiring configurations include singles, series pairs, and reverse series pairs. They may be used at frequencies up to 24 GHz.

Table 1 describes the various packages and marking of the mixer and detector Schottky diodes.

**Table 1. Schottky Diode Packaging and Marking**

|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |
| Single                                                                            | Single                                                                            | Series Pair                                                                       | Reverse Series Pair                                                               | Single                                                                              |
| SC-79<br>Green™                                                                   | SOT-23                                                                            | SOT-23                                                                            | SOT-23                                                                            | SOD-882<br>Green™                                                                   |
| ◆ <b>SMS7621-079LF</b><br>Marking: Cathode and SA                                 | <b>SMS7621-001LF</b><br>Green™<br>Marking: XH1                                    | ◆ <b>SMS7621-005LF</b><br>Green™<br>Marking: XH2                                  | ◆ <b>SMS7621-006LF</b><br>Green™<br>Marking: XH8                                  | <b>SMS7621-040LF</b><br>Marking: E                                                  |
| ◆ <b>SMS7630-079LF</b><br>Marking: Anode and SC                                   |                                                                                   | <b>SMS7630-005LF</b><br>Green™<br>Marking: XD2                                    | ◆ <b>SMS7630-006LF</b><br>Green™<br>Marking: XD8                                  | <b>SMS7630-040LF</b><br>Marking: P                                                  |
| $L_S = 0.7 \text{ nH}$                                                            | $L_S = 1.5 \text{ nH}$                                                            | $L_S = 1.5 \text{ nH}$                                                            | $L_S = 1.5 \text{ nH}$                                                            | $L_S = 0.45 \text{ nH}$                                                             |

## Electrical and Mechanical Specifications

The absolute maximum ratings of the mixer and detector Schottky diodes are provided in Table 2. Electrical specifications are provided in Tables 3 and 4. The associated SPICE model parameters are provided in Table 5. A typical detector schematic diagram is shown in Figure 1.

Typical performance characteristics are illustrated in Figures 2 and 3. Package dimensions are shown in Figures 4 to 8 (even numbers), and tape and reel dimensions are provided in Figures 5 to 9 (odd numbers).

## Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The mixer and detector Schottky diodes are rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C for 5 seconds. They can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

**Table 2. Absolute Maximum Ratings<sup>1</sup>**

| Parameter                     | Symbol    | Minimum | Maximum     | Units |
|-------------------------------|-----------|---------|-------------|-------|
| Reverse voltage               | $V_R$     |         | Rated $V_B$ | V     |
| Forward current, steady state | $I_F$     |         | 50          | mA    |
| Power dissipation             | $P_D$     |         | 75          | mW    |
| Storage temperature           | $T_{STG}$ | -65     | +150        | °C    |
| Operating temperature         | $T_A$     | -65     | +150        | °C    |
| Junction temperature          | $T_J$     |         | +150        | °C    |

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

**ESD HANDLING:** *Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

**Table 3. Electrical Specifications<sup>1</sup>**

( $T_A = +25\text{ °C}$  Per Junction, Unless Otherwise Noted)

| Part Number    | Barrier | Minimum $V_B$ @ 10 $\mu$ A (V) | Typical $C_T$ @ 0 V (pF) | $V_F$ @ 1 mA (mV) | Maximum Pair Configuration $\Delta V_F$ @ 1 mA (mV) | Maximum $R_T$ <sup>2</sup> ( $\Omega$ ) |
|----------------|---------|--------------------------------|--------------------------|-------------------|-----------------------------------------------------|-----------------------------------------|
| SMS7621 series | Low     | 2                              | 0.25                     | 260 to 320        | 10                                                  | 18 @ 5 mA                               |

<sup>1</sup> Performance is guaranteed only under the conditions listed in this table.

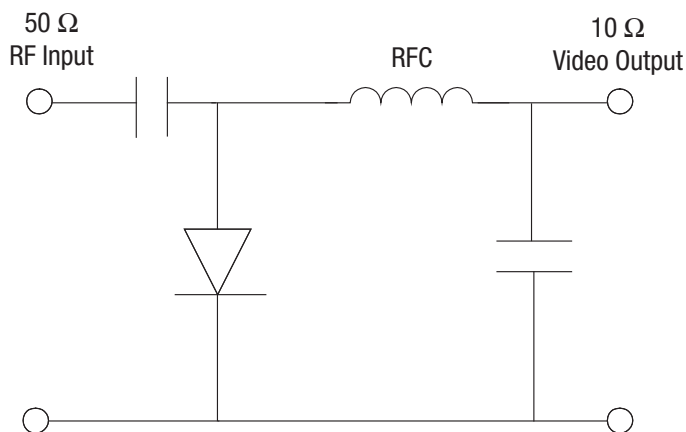
<sup>2</sup>  $R_T$  is the slope resistance.

**Table 4. Electrical Specifications<sup>1</sup>****(T<sub>A</sub> = +25 °C Per Junction, Unless Otherwise Noted)**

| Part Number    | Minimum V <sub>B</sub><br>@ 100 $\mu$ A<br>(V) | Typical C <sub>T</sub> @ 0.15 V<br>(pF) | V <sub>F</sub> @ 0.1 mA<br>(mV) | V <sub>F</sub> @ 1 mA<br>(mV) | Maximum Pair Configuration<br>$\Delta$ V <sub>F</sub> @ 1 mA<br>(mV) | Typical R <sub>v</sub><br>( $\Omega$ ) |
|----------------|------------------------------------------------|-----------------------------------------|---------------------------------|-------------------------------|----------------------------------------------------------------------|----------------------------------------|
| SMS7630 series | 1                                              | 0.3                                     | 60 to 120                       | 135 to 240                    | 10                                                                   | 5000                                   |

<sup>1</sup> Performance is guaranteed only under the conditions listed in this table.**Table 5. SPICE Model Parameters (Per Junction)**

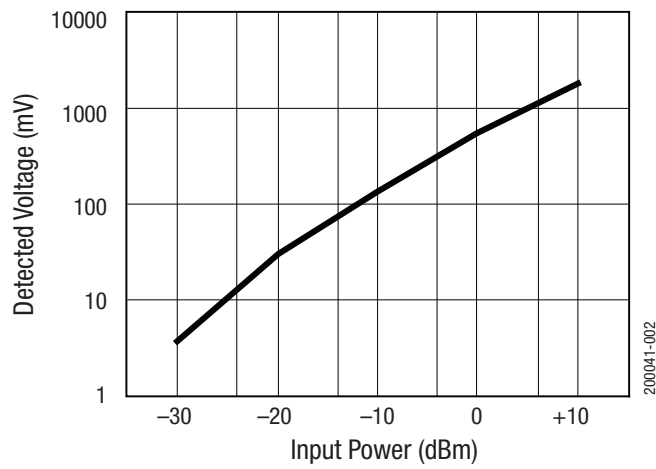
| Parameter       | Units    | SMS7621 Series | SMS7630 Series |
|-----------------|----------|----------------|----------------|
| I <sub>S</sub>  | A        | 4E-8           | 5E-6           |
| R <sub>S</sub>  | $\Omega$ | 12             | 20             |
| N               | -        | 1.05           | 1.05           |
| T <sub>T</sub>  | sec      | 1E-11          | 1E-11          |
| C <sub>J0</sub> | pF       | 0.1            | 0.14           |
| M               | -        | 0.35           | 0.40           |
| E <sub>G</sub>  | eV       | 0.69           | 0.69           |
| X <sub>TI</sub> | -        | 2              | 2              |
| F <sub>C</sub>  | -        | 0.5            | 0.5            |
| B <sub>V</sub>  | V        | 3              | 2              |
| I <sub>BV</sub> | A        | 1E-5           | 1E-4           |
| V <sub>J</sub>  | V        | 0.51           | 0.34           |



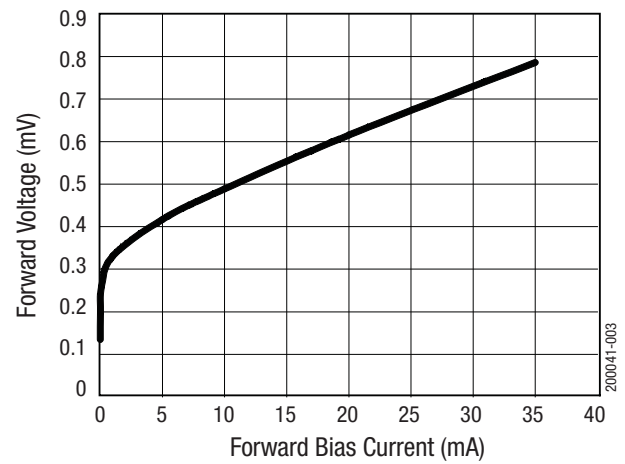
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**Figure 1. Typical Detector Circuit**

## Typical Performance Characteristics

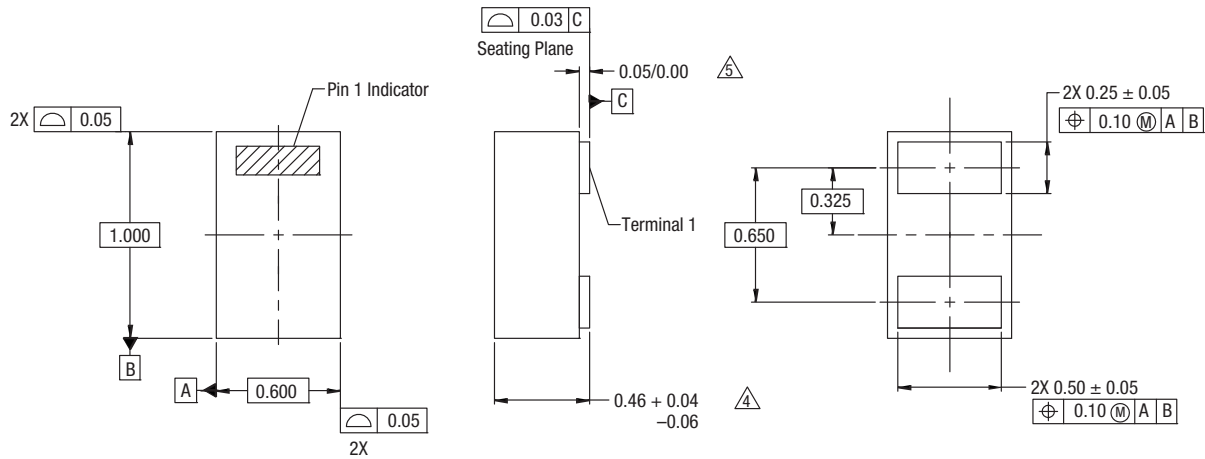


**Figure 2. Typical Detector Characteristics @ 1.8 GHz**



**Figure 3. SMS7621 Forward Voltage vs Forward Bias Current**



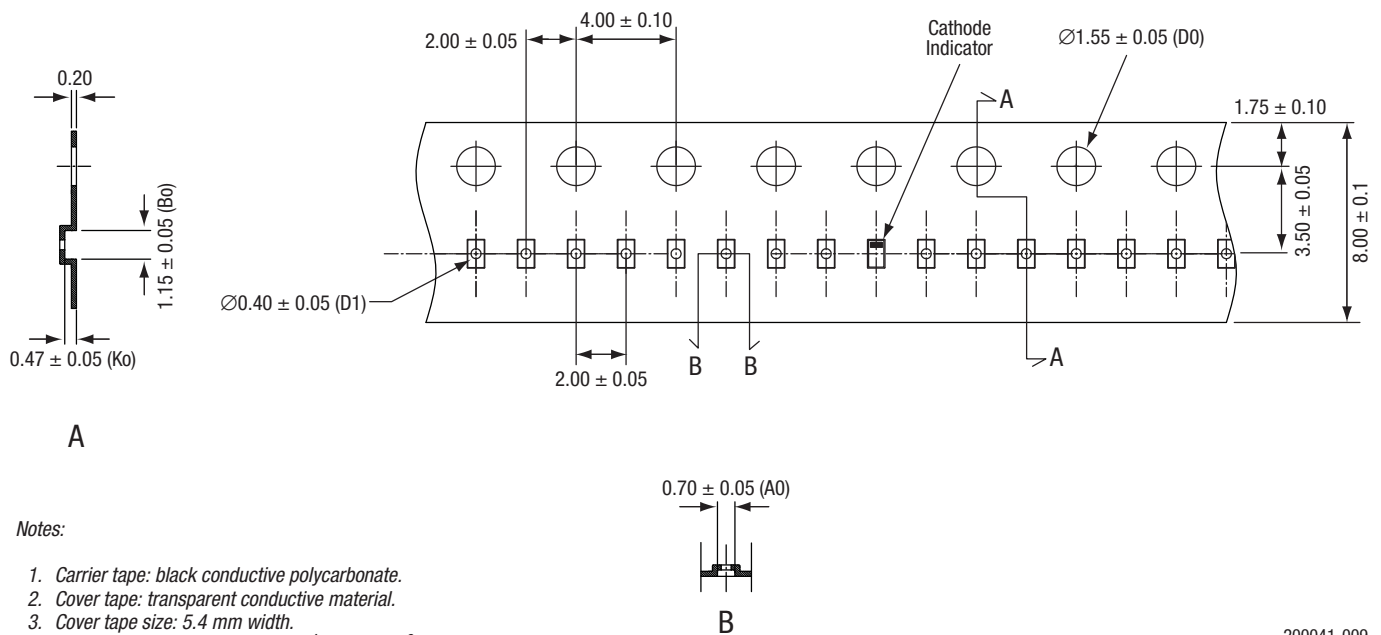


Notes:

1. All measurements are in millimeters.
2. Dimensions and tolerances according to ASME Y14.5M-1994.
3. These packages are used principally for discrete devices.
4. This dimension includes stand-off height and package body thickness, but does not include attached features, e.g., external heatsink or chip capacitors. An integral heatslug is not considered an attached feature.
5. This dimension is primarily terminal plating, but does not include small metal protrusion.

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Figure 6. SOD-882 Package Dimension Drawing

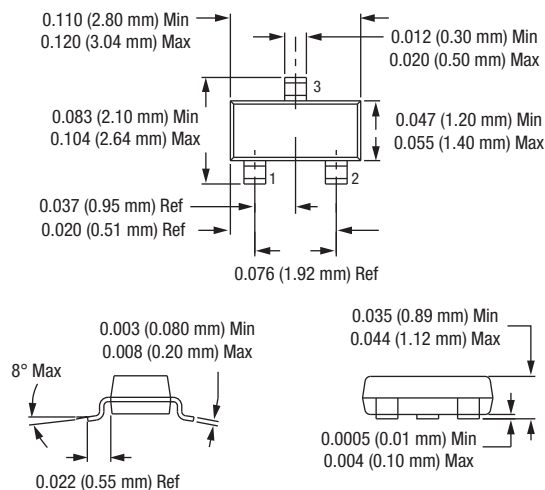


Notes:

1. Carrier tape: black conductive polycarbonate.
2. Cover tape: transparent conductive material.
3. Cover tape size: 5.4 mm width.
4. ESD surface resistivity is  $\geq 1 \times 10^4 \sim \leq 1 \times 10^8$  Ohms/square.
5. All dimensions are in millimeters.

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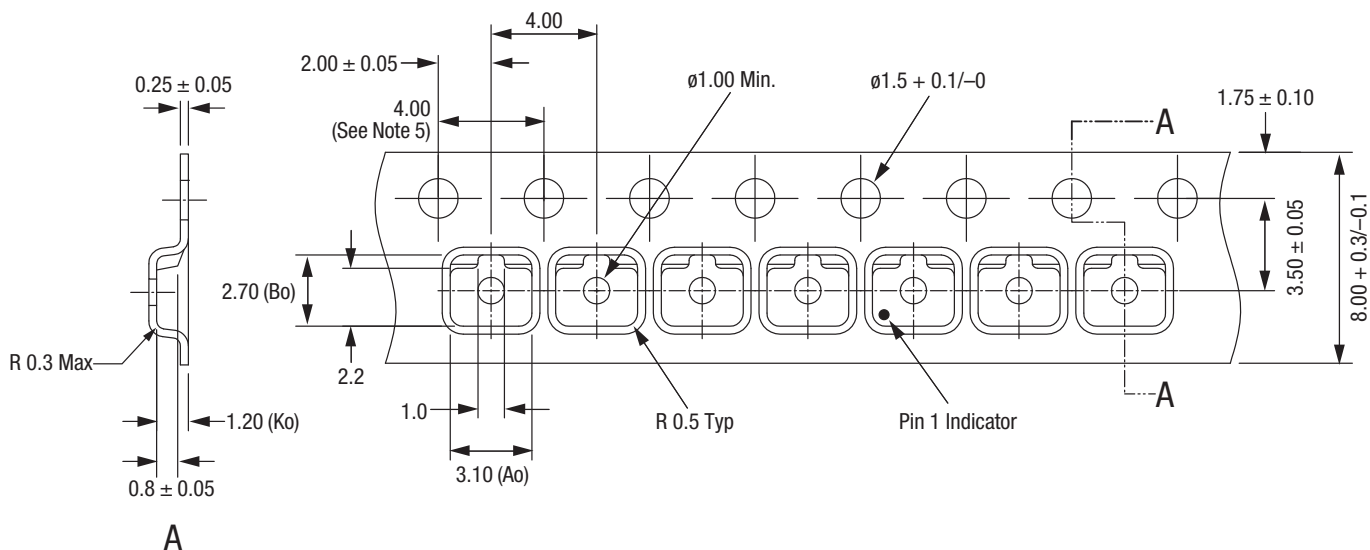
Figure 7. SOD-882 Tape and Reel Dimensions



Dimensions are in inches (millimeters shown in parentheses)

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**Figure 8. SOT-23 Package Dimension Drawing**



Notes:

1. Carrier tape: black conductive polycarbonate.
2. Cover tape material: transparent conductive PSA.
3. Cover tape size: 5.40 mm width.
4. Tolerance  $\pm 0.10$  mm.
5. Ten sprocket hole pitch cumulative tolerance:  $\pm 0.2$  mm.
6. All measurements are in millimeters.
7. Alternative carrier tape dimensions are:  
 $A_o = 3.3$   
 $B_o = 2.9$   
 $K_o = 1.22$

200041-011

**Figure 9. SOT-23 Tape and Reel Dimensions**

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