CAUTION

YSD series devices are intended for use in standard applications, such as industrial, communications, and measurement equipment, personal, office, and factory equipment.

Customers considering the use of YSD series devices in special applications where failure or abnormal operation may directly affect human lived or cause physical injury or property damage, or where extremely high levels of reliability are demanded (such as aerospace systems, atomic energy controls, sea floor repeaters, vehicle operating controls, medical devices for life support, etc.) are requested to consult with sales agent before use. YOKOWO will not be responsible for damages arising from such use without prior approval.
Contents

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2. Overview of YSD Series Schottky barrier diodes
   1. Packaged Device Structure
   2. Die Structure
   3. Product Line-up
   4. Package Tray
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   6. Lot-Code Rule
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   1. Storage
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   3. Packaged-Device Attachment
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4. Basic Characteristics
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   3. S-Parameters : YSD040SLPP01
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1. Introduction

YSD Series : Schottky Barrier Diodes

Features
- Low Series Resistance
- Low Capacitance
- High Cut-off frequency

Description
YOKOWO's YSD Series diodes are gallium arsenide Schottky barrier diodes designed for use through K, U, V, E and W-bands.

Typical applications are:
- Mixers in communication equipment
- Detectors in sensors and ITS radars
- Switches for millimeter-wave signal control in transceivers.

The diodes can be assembled easily by flip-chip bonding. SMT packaged part is available.

RoHS compliant
2. Overview of YSD Series Schottky Barrier Diodes

2.1 Packaged Device Structure

Cross Sectional View
- Package: Polyimide
- Die
- Gold Stud Bump
- Bonding Pad: Cu (18 μm) + Ni/Au Plating 3 μm min.

YSD040SLPP01

Unit: mm

- Height: 0.4 mm max.

Cathode Index

Package Dimensions:
- Width: 1.60 mm
- Depth: 0.30 mm
- Height: 1.20 mm

Cross Sectional View Details:
- Die location
- Bonding Pad details
- Gold Stud Bump placement

Yokowo GaAs Schottky Barrier Diode YSD Series

2014/11/28
2. Overview of YSD Series Schottky Barrier Diodes

2.2 Die Structure

Die Thickness : 0.1 mm  
Material : GaAs  
Backside : No backside Epoxy / Resin, nor metal  
Bonding Pad : Au-Plating 3 μm min.
2. Overview of YSD Series Schottky Barrier Diodes

2.3 Products Line-up

<table>
<thead>
<tr>
<th>Part Number Rule</th>
<th>YSD 110 SL BD 01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number</td>
<td></td>
</tr>
<tr>
<td>Highest Usable Frequency in GHz</td>
<td></td>
</tr>
<tr>
<td>Configuration (Single type)</td>
<td></td>
</tr>
<tr>
<td>Technology Generation Number</td>
<td></td>
</tr>
<tr>
<td>Outline Code</td>
<td></td>
</tr>
<tr>
<td>BD : Bare Die</td>
<td></td>
</tr>
<tr>
<td>PP : Polymer Package</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parts No.</th>
<th>Form</th>
<th>Applicable frequency Range</th>
<th>Function</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>YSD040SLPP01</td>
<td>SMT Package</td>
<td>DC – 40 GHz</td>
<td>Detector, Mixer, Switch</td>
<td>K-Band Radar, Sensor, Communication</td>
</tr>
<tr>
<td>YSD080SLBD01</td>
<td>Bare Die</td>
<td>DC – 80 GHz</td>
<td>Detector, Mixer, Switch</td>
<td>Communication, Sensor</td>
</tr>
<tr>
<td>YSD110SLBD01</td>
<td>Bare Die</td>
<td>DC – 110 GHz</td>
<td>Detector, Mixer, Switch</td>
<td>77GHz, 79GHz Radar, Imaging</td>
</tr>
</tbody>
</table>
2. Overview of YSD Series Schottky Barrier Diodes

2.4 Package Tray

Material: ABS

Maximum Qty.: 100 pcs

Type.
Lot No.
Date Code
Qty.

Attention: Observe precautions for handling electrostatic sensitive devices.

Label
2.5 Chip Tray

Material: ABS

Maximum Qty.: 400 pcs

Type: 
Lot No.:
Date Code:
Qty.: ___ pcs.

Attention: Observe precautions for handling electrostatic sensitive devices.
2. Overview of YSD Series Schottky Barrier Diodes

2.6 Lot Code Rule

![Lot Code Diagram]

<table>
<thead>
<tr>
<th>Code</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
</table>

Year Code Definition

<table>
<thead>
<tr>
<th>Code</th>
<th>H</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
</table>
3. Handling Precautions

3.1. Storage

• Improper storage may cause degradation in solderability, electrical characteristics, and reliability.
• Store devices in the original packing. General storage conditions:
  ■ Temperature: 5 – 35 deg-C
  ■ Humidity: 40 – 70 % RH
  ■ Free from corrosive gasses and damage of salt
  ■ Avoid rapid temperature changes (not to generate dew condensation)
  ■ Not to be exposed to direct sunlight
• After opened the packing, store devices in desiccator. Storage conditions:
  ■ Temperature: 5 – 35 deg-C
  ■ Humidity: lower than 40 % RH,
    Dry nitrogen desiccator is strongly recommended.
• In case when devices are partially unpacked, the operation should be done at protected workstation.
• Any devices that are stored temporarily should be packed in anti-static packing or carrier.
• Packaged devices that have absorbed moisture should be de-moisturized by baking.
  Baking Condition: 125 deg-C, 24 hrs.
3. Handling Precautions

3.2. Handling

- Semiconductor devices, including SBDs, are sensitive to electro-static discharge. They require static controlled work stations.
- Operators at work bench should be earthed through a wrist straps. (Resistance : 1MΩ) Operators should wear dissipative boots, dissipative envelops.
- Dissipative table mat should be placed on the work bench and earthed. (Resistance : 1MΩ) It is recommended to cover floor with grounded conductive mat. (Resistance : 1MΩ)
- Work bench or working area should be maintained as follows:
  - Relative humidity : 40 – 70 %
  - Temperature : 10 – 30 deg-C.
- Use anti-static containers and tools.
3. Handling Precautions

3.3. Packaged-Device Attachment : Solder reflow

• Please follow the recommended soldering methods below.

■ Soldering method : IR reflow soldering
■ Pre-heat : Temperature : 160-190deg-C / Time : 110sec
■ Reflow profile : (Next page)
■ Number of reflow : 3 times max

• Keep the reflow profile, otherwise the quality or reliability of the device would be damaged.
• Proceed as quickly as possible while high temperature is added to the device, otherwise it could be likely to have an adverse impact on the reliability of the device.
3. Handling Precautions

3.3.1 Packaged-Device Attachment: Solder reflow

The maximum number of reflow cycles is two.
3. Handling Precautions

3.3.2 Foot-Print (1)

Parts Number: YSD040SLPP01

PCB: MSL
Material: RO4350B  
($\varepsilon=3.48, \tan\delta=0.0037$)
Thickness: 0.254mm
Metalize: Cu $t=18\mu m$

Shaded Area: Solder lands

Unit: mm
Tolerance: ±0.05
3. Handling Precautions

3.3.3  Foot-Print (2)

Parts Number : YSD040SLPP01

PCB : MSL
Material : Al₂O₃
(ε=9.8,tanδ=0.0001)
Thickness : 0.254mm
Metalize : Ti/Pd/Au t=2-4μm

Shaded Area : Solder lands

Unit : mm
Tolerance : ±0.01
3. Handling Precautions

3.3.4 Foot-Print (3)

Parts Number : YSD040SLPP01

PCB : CPW
Material : Al₂O₃
(ε=9.8, tanδ=0.0001)
Thickness : 0.254mm
Metalize : Ti/Pd/Au t=2-4μm

Unit : mm
Tolerance : ±0.01

Shaded Area : Solder lands
3. Handling Precautions

3.3.5 Metal Mask Pattern

Parts Number : YSD040SLPP01

Solder Type
Alloy        : Sn-3Ag-0.5Cu
Particle Size : 10 – 28μm

Metal Mask Thickness : 0.10mm
Tolerance : ±5%

Unit : mm
Tolerance : ±0.01
3. Handling Precautions

3.4. Die Attachment : Flip-Chip

Several die attachment methods are applicable :
1. Flip-chip bonding using gold stud bump
2. Flip-chip bonding using solder bump
YOKOWO recommend flip-chip bonding using gold stud bump regarding high frequency interconnectivity and long term reliability.

3.4.1 Precautions for flip-chip bonding using solder bump

• YOKOWO does not recommend solder bump bonding. Customers use solder bump bonding only when gold stud bump is not possible.
• Solder bump conditions:
  Footprint pattern : Refer the figure of Foot-print
  Solder thickness : 100-130 μm
• Temperature profile: same as reflow profile in 3.3.1
3. Handling Precautions

3.4.2 Precautions for flip-chip bonding using gold stud bump

• Gold stud bump formation :
  Gold wire : 25 μm, Temperature : 100 deg-C
• Coining :
  Condition depends on machine.
  Make diameter of the bump to be 80 μm after coining.
• Flip-chip die attach :
  Condition depends on machine.
  Example of the condition :
    With US assist : Substrate Temperature : 150 - 250 deg-C,
    Weight : 100 – 400 gf, Ultra sonic power : 100 mW
  Die attach conditions should be tuned so as to be the gold bump height 15 – 20 μm.
• No under-filler is recommended.
3. Handling Precautions

3.4.3 Foot-Print

Parts Number : YSD110SLBD01

PCB : MSL
Material : Al$_2$O$_3$
($\varepsilon=9.8$, tan$\delta=0.0001$)
Thickness : 0.254mm
Metalize : Ti/Pd/Au $t=2$-$4\mu$m
Shaded Area : Gold stud bump area
Number of bumps
YSD110SLBD01 : 1 bump each
YSD080SLBD01 : 2 bumps each (recommend)

Parts Number : YSD080SLBD01

Unit : mm
Tolerance : $\pm0.01$
3. Handling Precautions

3.4.4 Metal Mask Pattern

Parts Number: YSD110SLBD01

Parts Number: YSD080SLBD01

Unit: mm
Tolerance: ±0.01

Solder Type
Alloy: Sn-3Ag-0.5Cu
Particle Size: 10 – 28µm

Metal Mask Thickness: 0.10mm
Tolerance: ±5%
3. Handling Precautions

3.5 Miscellaneous Precautions

- **Rework**
  YOKOWO does not recommend to rework, and not guarantee to use the removed device.

  Soldering rework process for packaged device is as follows:
  (1) Adjust the temperature of hot gun to 240 – 260 deg-C.
  (2) Blow hot gun.
  (3) After the solder melts, rework the device using tweezers.

  Flip-chip bonded die should not be reworked.

- **Treatment of GaAs devices**
  The Device contains GaAs (Gallium Arsenide).
  
  0.132 mg for YSD110SLBD01, YSD080SLBD01 and YSD040SLPP01

  Cautions on using this product
  - Do NOT dispose in fire or break up this product.
  - Do NOT chemically make gas or powder with this product.
  - To waste this product, please obey the relating law of your country
4. Basic Characteristics

4.1. DC Characteristics

**Absolute Maximum Ratings, \( T_j = 25^\circ \text{C} \), Single Diode**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Unit</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction Temperature</td>
<td>( T_j )</td>
<td>°C</td>
<td>125</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{stg} )</td>
<td>°C</td>
<td>-55 to +125</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>( R_{th} )</td>
<td>°C/W</td>
<td>500</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>( V_r )</td>
<td>V</td>
<td>5</td>
</tr>
</tbody>
</table>

**Electrical Specifications, \( T_j = 25^\circ \text{C} \), Single Diode**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Symbol</th>
<th>Units</th>
<th>Parts No.</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD040</td>
<td>Min.</td>
</tr>
<tr>
<td>Total Capacitance</td>
<td>( V = 0\text{V at 1 MHz} )</td>
<td>( C_T )</td>
<td>fF</td>
<td>YSD040</td>
<td>45</td>
</tr>
<tr>
<td>Junction Capacitance</td>
<td>( V = 0\text{V at 1 MHz} )</td>
<td>( C_j )</td>
<td>fF</td>
<td>YSD080</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD110</td>
<td>25</td>
</tr>
<tr>
<td>Forward Turn-on Voltage</td>
<td>( I_F = 1\text{mA} )</td>
<td>( V_F )</td>
<td>mV</td>
<td>YSD040</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD080</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD110</td>
<td>600</td>
</tr>
<tr>
<td>Series Resistance</td>
<td>( I_{max} = 10\text{mA} )</td>
<td>( R_S )</td>
<td>Ω</td>
<td>YSD040</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD080</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD110</td>
<td>---</td>
</tr>
<tr>
<td>Reverse Breakdown Voltage</td>
<td>( I_R = 10\text{uA} )</td>
<td>( V_R )</td>
<td>V</td>
<td>YSD040</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD080</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YSD110</td>
<td>7</td>
</tr>
</tbody>
</table>
4. Basic Characteristics

Parts Number: YSD040SLPP01 YSD080SLBD01 YSD110SLBD01

Forward Current vs. Forward Voltage
Parameter: Temperature

Reverse Current vs. Reverse Voltage
Parameter: Temperature
4.2. AC Characteristics

CV Curve

Total Capacitance [fF]

Voltage [V]
4. Basic Characteristics

4.3 S-Parameters : Measurement Set-up

- Reference planes are adjusted by port extension.
- Bias is applied through the bias network of network analyzer.
4. Basic Characteristics

4.3. S-Parameters (1)

Parts Number: YSD040SLPP01
S-Parameters: Single Diode, Packaged Device

Port 1  Port 2

- $V_a = +0.75\, \text{V}$
- $0.0\, \text{V}$
- $-4.0\, \text{V}$

$f = 1 \sim 67\, \text{GHz}, 5\, \text{GHz step}$
4. Basic Characteristics

4.3. S-Parameters (1)  
Parts Number: YSD040SLPP01

Equivalent Circuit: Valid up to 67 GHz

---

### Equivalent Circuit

- **Z = 60 Ω**
  - L = 455 μm
- **Z = 35 Ω**
  - L = 75 μm
- **0.09 nH**
- **32 fF**
- **200 Ω**
- **8 fF**
- **R1**: 32 fF
- **R2**: 32 fF
- **C1**: 32 fF
- **C2**: 0.09 nH

---

### Intrinsic Diode

---

### Periphery

---

### Table: S-Parameters

<table>
<thead>
<tr>
<th>Va (V)</th>
<th>C1 (fF)</th>
<th>C2 (fF)</th>
<th>R1 (Ω)</th>
<th>R2 (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>15</td>
<td>5</td>
<td>100k</td>
<td>40</td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>5</td>
<td>100k</td>
<td>25</td>
</tr>
<tr>
<td>+0.75</td>
<td>50</td>
<td>5</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

---

2014/11/28

GaAs Schottky Barrier Diode YSD Series
4. Basic Characteristics

4.4. S-Parameters (2)

Parts Number: YSD080SLBD01

S-Parameters: Single Diode, Bare Chip

Port 1  Port 2

$V_a = +0.75 \, V$

$0.0 \, V$

$-4.0 \, V$

$f = 1 \sim 86 \, GHz$, 5GHz step
4. Basic Characteristics

4.4. S-Parameters (2)

Equivalent Circuit: Valid up to 86 GHz

<table>
<thead>
<tr>
<th>Va (V)</th>
<th>C1 (fF)</th>
<th>C2 (fF)</th>
<th>R1 (Ω)</th>
<th>R2 (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>15</td>
<td>5</td>
<td>100k</td>
<td>40</td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>5</td>
<td>100k</td>
<td>25</td>
</tr>
<tr>
<td>+0.75</td>
<td>50</td>
<td>5</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Parts Number: YSD080SLBD01
4. Basic Characteristics

4.5. S-Parameters (3)

Parts Number: YSD110SLBD01

S-Parameters: Single Diode, Bare Chip

Port 1  Port 2

$V_a = +0.75 \, V$
$0.0 \, V$
$-4.0 \, V$

$1 \sim 110\, \text{GHz}$, 5GHz step
4. Basic Characteristics

4.5. S-Parameters (3)

Parts Number: YSD110SLBD01

Equivalent Circuit: Valid up to 110 GHz

### 200 Ω

**R1**

**C1**

**R2**

**C2**

**Z = 50 Ω**

**0.07 nH**

**Z = 25 Ω**

L = 75 μm

**12 fF**

**Periphery**

### Equivalent Circuit Values

<table>
<thead>
<tr>
<th>Va (V)</th>
<th>C1 (fF)</th>
<th>C2 (fF)</th>
<th>R1 (Ω)</th>
<th>R2 (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>15</td>
<td>5</td>
<td>100k</td>
<td>40</td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>5</td>
<td>100k</td>
<td>25</td>
</tr>
<tr>
<td>+0.75</td>
<td>50</td>
<td>5</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>
4.6. Non-Linear Model

(Intrinsic Diode)

**Typical SPICE Parameters**

<table>
<thead>
<tr>
<th>$I_S$ (A)</th>
<th>$R_S$ (Ω)</th>
<th>N</th>
<th>$C_{JO}$ (fF)</th>
<th>M</th>
<th>$V_j$ (V)</th>
<th>$F_C$</th>
<th>$B_V$ (V)</th>
<th>$I_{BV}$ (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0E-14</td>
<td>4.9</td>
<td>1.13</td>
<td>39</td>
<td>0.22</td>
<td>0.70</td>
<td>0.40</td>
<td>10</td>
<td>1.0E-05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$I_{SR}$ (A)</th>
<th>$N_R$</th>
<th>$C_P$ (fF)</th>
<th>$T_T$ (psec)</th>
<th>$X_{ti}$</th>
<th>$E_g$ (eV)</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0E-09</td>
<td>2</td>
<td>2</td>
<td>0.005</td>
<td>2</td>
<td>0.85</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: The parameter $E_g$ (Band gap) is the barrier height of Schottky junction.
5. Application

5.1. Detector (1)

The block diagram of a typical video detector circuit
5. Application

5.1. Detector (2)

Typical Performance Curves

<table>
<thead>
<tr>
<th>YSD040SLPP01</th>
<th>YSD080SLBD01</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Freq. : 1GHz</td>
<td>RF Freq. : 1GHz</td>
</tr>
<tr>
<td>$R_L$ : 100kΩ</td>
<td>$R_L$ : 100kΩ</td>
</tr>
<tr>
<td>$I_F$ : 20uA</td>
<td>$I_F$ : 20uA</td>
</tr>
<tr>
<td>Video BW : 30kHz</td>
<td>Video BW : 30kHz</td>
</tr>
<tr>
<td>Video Amp Gain : 50dB</td>
<td>Video Amp Gain : 50dB</td>
</tr>
</tbody>
</table>

Tangential Signal Sensitivity

-55dBm

TSS signal level to be when the video output signal is 8dB greater than the video noise signal
5. Application

5.2. Mixer (1)

The block diagram of radar/sensor front end

[Diagram of radar/sensor front end]

- OSC
- ANT
- Coupler
- Combiner
- Mixer Diode
- DC Bias Current
- Video Amp
- Low Pass Filter
- Oscilloscope
5.2. Mixer (2)

Typical Performance Curves

Free-space Path Loss [dB] vs. Output Voltage [mV]

YSD080SLBD01
RF Freq. : 79GHz
Output Power : +5dBm
R_L : 100kΩ
I_F : 2mA
Video BW : 5kHz
Video Amp Gain : 50dB

Mixer sensitivity is -85 dB

Free-space Path Loss : The ratio of the received power and transmit power
6. Reliability

Reliability Test

<table>
<thead>
<tr>
<th>No.</th>
<th>Stress</th>
<th>Sample size</th>
<th>Accept on # failed</th>
<th>Test condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High temperature reverse bias</td>
<td>45</td>
<td>0</td>
<td>125°C 1000h</td>
</tr>
<tr>
<td>2</td>
<td>High temperature forward bias</td>
<td>45</td>
<td>0</td>
<td>125°C 1000h</td>
</tr>
<tr>
<td>3</td>
<td>Temperature cycling</td>
<td>22</td>
<td>0</td>
<td>-55°C ~ 150°C 1000 cycles</td>
</tr>
<tr>
<td>4</td>
<td>High humidity high temp. reverse bias</td>
<td>22</td>
<td>0</td>
<td>85°C 85% 1000h</td>
</tr>
<tr>
<td>5</td>
<td>Highly accelerated stress test</td>
<td>22</td>
<td>0</td>
<td>130°C 85% 96h</td>
</tr>
<tr>
<td>6</td>
<td>ESD characterization (HBM)</td>
<td>30</td>
<td>0</td>
<td>80V</td>
</tr>
<tr>
<td>7</td>
<td>Mechanical shock</td>
<td>22</td>
<td>0</td>
<td>1500g 0.5mS</td>
</tr>
<tr>
<td>8</td>
<td>Vibration variable frequency</td>
<td>22</td>
<td>0</td>
<td>20Hz ~ 2KHz 50g</td>
</tr>
</tbody>
</table>

Test Sample: YSD040SLPP01

ESDS: Class 0 (Human body model), Class C1 (Charged device model)
6. Reliability

Prediction of Reliability in SBD
Ref. : MIL-HDBK-217F Diodes, High Frequency (Microwave)

\[ \lambda_p = \lambda_b \times \pi_T \times \pi_A \times \pi_R \times \pi_Q \times \pi_E \text{ failures/10}^6 \text{ hours} \]

<table>
<thead>
<tr>
<th>Factor</th>
<th>Symbol</th>
<th>Value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Failure Rate</td>
<td>( \lambda_b )</td>
<td>0.027</td>
<td>Schottky Barrier Diode</td>
</tr>
<tr>
<td>Temperature Factor</td>
<td>( \pi_T )</td>
<td>1.0</td>
<td>for ( T_J = 25 \text{ deg-C} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.9</td>
<td>for ( T_J = 55 \text{ deg-C} )</td>
</tr>
<tr>
<td>Application Factor</td>
<td>( \pi_A )</td>
<td>1.0</td>
<td>All Types Except Varactor</td>
</tr>
<tr>
<td>Power Rating Factor</td>
<td>( \pi_R )</td>
<td>1.0</td>
<td>All Types Except PIN</td>
</tr>
<tr>
<td>Quality Factor</td>
<td>( \pi_Q )</td>
<td>1.8</td>
<td>JAN (MIL-STD-19500)</td>
</tr>
<tr>
<td>Environment Factor</td>
<td>( \pi_E )</td>
<td>1.0</td>
<td>Ground, Benign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>Ground, Fixed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.0</td>
<td>Ground, Mobile</td>
</tr>
</tbody>
</table>

Example: \( T_J = 55 \text{ deg-C} \), Ground-Fixed Application
\[ \lambda_p = 0.027 \times 1.9 \times 1.0 \times 1.0 \times 1.8 \times 2.0 = 0.185 \text{ Failures/10}^6 \text{ hours} = 185 \text{ Fit} \]
# 7. Quality Assurance

## QC Flow for YSD Series

<table>
<thead>
<tr>
<th>Process</th>
<th>Check Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wafer</td>
<td>Electrical characteristics, Capacitance (PCM chip)</td>
</tr>
<tr>
<td>Wafer test</td>
<td>Visual Inspection (wafer)</td>
</tr>
<tr>
<td>External visual</td>
<td>Electrical characteristics (100% chip)</td>
</tr>
<tr>
<td>Electrical characteristics test</td>
<td></td>
</tr>
<tr>
<td>Dicing</td>
<td>Thickness</td>
</tr>
<tr>
<td>External visual</td>
<td>Visual Inspection (100% chip)</td>
</tr>
<tr>
<td>Polyimide sheet</td>
<td>Product’s name, Lot Code, Quantity</td>
</tr>
<tr>
<td>Au wire</td>
<td>Temperature, US power</td>
</tr>
<tr>
<td>Stud bump forming</td>
<td>Temperature, Load power, US power</td>
</tr>
<tr>
<td>Flip chip mounting</td>
<td>Temperature, Load power</td>
</tr>
<tr>
<td>Packaging</td>
<td>Electrical characteristics (100% chip)</td>
</tr>
<tr>
<td>Electrical characteristics test</td>
<td></td>
</tr>
<tr>
<td>Final inspection</td>
<td>Product’s name, Lot Code, Quantity</td>
</tr>
<tr>
<td>Shipping (package)</td>
<td></td>
</tr>
</tbody>
</table>
Ordering Contact
<Sales Agent>
Ryoden Trading CO., LTD.
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FAX : +81-3-5396-6641
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