BAX12
Controlled avalanche diode

Product specification
Supersedes data of April 1992
File under Discrete Semiconductors, SC01

1996 Apr 23
Controlled avalanche diode  

BAX12

FEATURES

- Hermetically sealed leaded glass SOD27 (DO-35) package
- Switching speed: max. 50 ns
- General application
- Continuous reverse voltage: max. 90 V
- Repetitive peak reverse voltage: max. 90 V
- Repetitive peak forward current: max. 800 mA
- Repetitive peak reverse current: max. 600 mA
- Forward voltage: max. 1 V
- Capable of absorbing transients repetitively.

APPLICATIONS

- Switching of inductive loads in semi-electronic telephone exchanges.

DESCRIPTION

The BAX12 is a controlled avalanche diode fabricated in planar technology, and encapsulated in the hermetically sealed leaded glass SOD27 (DO-35) package.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{RRM} )</td>
<td>repetitive peak reverse voltage</td>
<td>note 1</td>
<td>–</td>
<td>90</td>
<td>V</td>
</tr>
<tr>
<td>( V_R )</td>
<td>continuous reverse voltage</td>
<td>note 1</td>
<td>–</td>
<td>90</td>
<td>V</td>
</tr>
<tr>
<td>( I_F )</td>
<td>continuous forward current</td>
<td>see Fig.2; note 2</td>
<td>–</td>
<td>400</td>
<td>mA</td>
</tr>
<tr>
<td>( I_{FRM} )</td>
<td>repetitive peak forward current</td>
<td>–</td>
<td>800</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>( I_{FSM} )</td>
<td>non-repetitive peak forward current</td>
<td>square wave; ( T_j = 25 , ^\circ\text{C} ) prior to surge; see Fig.4</td>
<td>–</td>
<td>55</td>
<td>A</td>
</tr>
<tr>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td>9</td>
<td>A</td>
</tr>
<tr>
<td>( P_{tot} )</td>
<td>total power dissipation</td>
<td>( T_{amb} = 25 , ^\circ\text{C}; , \text{note 2} )</td>
<td>–</td>
<td>450</td>
<td>mW</td>
</tr>
<tr>
<td>( I_{RRM} )</td>
<td>repetitive peak reverse current</td>
<td>–</td>
<td>600</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>( E_{RRM} )</td>
<td>repetitive peak reverse energy</td>
<td>( t_p \geq 50 , \mu\text{s}; , f \leq 20 , \text{Hz}; , T_j = 25 , ^\circ\text{C} )</td>
<td>–</td>
<td>5.0</td>
<td>mJ</td>
</tr>
<tr>
<td>( T_{slg} )</td>
<td>storage temperature</td>
<td>–</td>
<td>–56 to +200</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>( T_j )</td>
<td>junction temperature</td>
<td>–</td>
<td>–</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

Notes

1. It is allowed to exceed this value; see Figs 8 and 9. Care should be taken not to exceed the \( I_{RRM} \) rating.
2. Device mounted on an FR4 printed circuit-board; lead length 10 mm.
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ELECTRICAL CHARACTERISTICS

\( T_j = 25 \, ^\circ\text{C}; \) unless otherwise specified.

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<tr>
<th>SYMBOL</th>
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<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_F )</td>
<td>forward voltage</td>
<td>see Fig.3</td>
<td>–</td>
<td>750</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 10 , \text{mA} )</td>
<td>–</td>
<td>840</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 50 , \text{mA} )</td>
<td>–</td>
<td>900</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 100 , \text{mA} )</td>
<td>–</td>
<td>1.0</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 200 , \text{mA} )</td>
<td>–</td>
<td>1.25</td>
<td>V</td>
</tr>
<tr>
<td>( I_R )</td>
<td>reverse current</td>
<td>see Fig.5</td>
<td>( V_R = 90 , \text{V} )</td>
<td>–</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 90 , \text{V} ; , T_j = 150 , ^\circ\text{C} )</td>
<td>–</td>
<td>100</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>( V_{(BR)R} )</td>
<td>reverse avalanche breakdown voltage</td>
<td>( I_R = 1 , \text{mA} )</td>
<td>120</td>
<td>170</td>
<td>V</td>
</tr>
<tr>
<td>( C_d )</td>
<td>diode capacitance</td>
<td>( f = 1 , \text{MHz}; , V_R = 0 ); see Fig.6</td>
<td>–</td>
<td>35</td>
<td>pF</td>
</tr>
<tr>
<td>( t_{rr} )</td>
<td>reverse recovery time</td>
<td>when switched from ( I_F = 30 , \text{mA} ) to ( I_R = 30 , \text{mA} ); ( R_L = 100 , \Omega ); measured at ( I_R = 3 , \text{mA} ); see Fig.10</td>
<td>–</td>
<td>50</td>
<td>ns</td>
</tr>
</tbody>
</table>

THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
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<th>CONDITIONS</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_{th , j-tp} )</td>
<td>thermal resistance from junction to tie-point</td>
<td>lead length 10 mm</td>
<td>240</td>
<td>K/W</td>
</tr>
<tr>
<td>( R_{th , j-a} )</td>
<td>thermal resistance from junction to ambient</td>
<td>lead length 10 mm; note 1</td>
<td>375</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Note
1. Device mounted on a printed circuit-board without metallization pad.
Philips Semiconductors Product specification

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GRAPHICAL DATA

Fig.2 Maximum permissible continuous forward current as a function of ambient temperature.

Device mounted on an FR4 printed-circuit board; lead length 10 mm.

Fig.3 Forward current as a function of forward voltage.

(1) $T_J = 175 \, ^\circ C$; typical values.
(2) $T_J = 25 \, ^\circ C$; typical values.
(3) $T_J = 25 \, ^\circ C$; maximum values.

Fig.4 Maximum permissible non-repetitive peak forward current as a function of pulse duration.

Based on square wave currents.
$T_J = 25 \, ^\circ C$ prior to surge.
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**Fig.5** Reverse current as a function of junction temperature.

\[ I_R (\text{nA}) \]

\[ T_j \text{ (°C)} \]

\[ V_R = 90 \text{ V}. \]

Solid line; maximum values. Dotted line; typical values.

**Fig.6** Diode capacitance as a function of reverse voltage; typical values.

\[ C_d \text{ (pF)} \]

\[ V_R \text{ (V)} \]

\[ f = 1 \text{ MHz}; T_j = 25 \text{ °C}. \]

Solid line; rectangular waveform; \( \delta \leq 0.01 \).

Dotted line; triangular waveform; \( \delta \leq 0.02 \).

(1) Limited by \( I_{R\text{MM}} = 600 \text{ mA} \).

**Fig.7** Maximum permissible repetitive peak reverse power as a function of the pulse duration \( T \geq 50 \text{ ms} \); \( T_j = 25 \text{ °C} \).
Reverse voltages higher than the $V_R$ ratings are allowed, provided:

a. The transient energy $\leq 7.5 \text{ mJ} \text{ at } P_{PRM} \leq 30 \text{ W}; T_j = 25 ^\circ \text{C};$
   the transient energy $\leq 5 \text{ mJ} \text{ at } P_{PRM} = 120 \text{ W}; T_j = 25 ^\circ \text{C}$ (see Fig.7).

b. $T \geq 50 \text{ ms}; \delta \leq 0.01$ (rectangular waveform) (see Fig.9).
   $\delta \leq 0.02$ (triangular waveform) (see Fig.9).

With increasing temperature, the maximum permissible transient energy must be decreased by 0.03 mJ/K.

(1) $T_j = 25 ^\circ \text{C}$; minimum values.
(2) $T_j = 175 ^\circ \text{C}$; minimum values.
(3) $T_j = 25 ^\circ \text{C}$; maximum values.
(4) $T_j = 175 ^\circ \text{C}$; maximum values.

Fig. 8 Reverse current as a function of continuous reverse voltage.

Fig. 9 Peak reverse voltage and current test pulses.
Fig. 10  Reverse recovery voltage test circuit and waveforms.

**Input signal**: reverse pulse rise time $t_r = 0.6$ ns; reverse pulse duration $t_p = 100$ ns; duty factor $\delta = 0.05$.

**Oscilloscope**: rise time $t_r = 0.35$ ns.

**Circuit capacitance**: $C \leq 1$ pF (oscilloscope input capacitance + parasitic capacitance).

(1) $I_R = 3$ mA.
CONTROLLED AVALANCHE DIODE

PACKAGE OUTLINE

Fig.11  SOD27 (DO-35).

DEFINITIONS

Data Sheet Status

<table>
<thead>
<tr>
<th>Description</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective specification</td>
<td>This data sheet contains target or goal specifications for product development.</td>
</tr>
<tr>
<td>Preliminary specification</td>
<td>This data sheet contains preliminary data; supplementary data may be published later.</td>
</tr>
<tr>
<td>Product specification</td>
<td>This data sheet contains final product specifications.</td>
</tr>
</tbody>
</table>

Limiting values

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

LIFE SUPPORT APPLICATIONS

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