BYV97 series
Fast soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of February 1994
File under Discrete Semiconductors, SC01
Philips Semiconductors

Fast soft-recovery controlled avalanche rectifiers

BYV97 series

FEATURES

• Glass passivated
• High maximum operating temperature
• Low leakage current
• Excellent stability
• Guaranteed avalanche energy absorption capability
• Available in ammo-pack.

DESCRIPTION

Rugged glass SOD57 package, using a high temperature alloyed construction. This package is hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.

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>( BYV97F )</td>
<td>–</td>
<td>1200 V</td>
<td></td>
</tr>
<tr>
<td>( V_{RRM} )</td>
<td>repetitive peak reverse voltage</td>
<td>( BYV97G )</td>
<td>–</td>
<td>1400 V</td>
<td></td>
</tr>
<tr>
<td>( V_R )</td>
<td>continuous reverse voltage</td>
<td>( BYV97F )</td>
<td>–</td>
<td>1200 V</td>
<td></td>
</tr>
<tr>
<td>( V_R )</td>
<td>continuous reverse voltage</td>
<td>( BYV97G )</td>
<td>–</td>
<td>1400 V</td>
<td></td>
</tr>
<tr>
<td>( I_{F(AV)} )</td>
<td>average forward current</td>
<td>( T_{tp} = 60 , ^\circ C; ) lead length = 10 mm; see Fig.2; averaged over any 20 ms period; see also Fig.6</td>
<td>–</td>
<td>1.6 A</td>
<td></td>
</tr>
<tr>
<td>( I_{F(AV)} )</td>
<td>average forward current</td>
<td>( T_{amb} = 50 , ^\circ C; ) PCB mounting (see Fig.12); see Fig.3; averaged over any 20 ms period; see also Fig.6</td>
<td>–</td>
<td>0.9 A</td>
<td></td>
</tr>
<tr>
<td>( I_{FRM} )</td>
<td>repetitive peak forward current</td>
<td>( T_{tp} = 65 , ^\circ C; ) see Fig.4</td>
<td>–</td>
<td>15 A</td>
<td></td>
</tr>
<tr>
<td>( I_{FRM} )</td>
<td>repetitive peak forward current</td>
<td>( T_{amb} = 65 , ^\circ C; ) see Fig.5</td>
<td>–</td>
<td>8 A</td>
<td></td>
</tr>
<tr>
<td>( I_{FSM} )</td>
<td>non-repetitive peak forward current</td>
<td>( T_j = 10 , ms ) half sine wave; ( T_j = T_{j \max } ) prior to surge; ( V_R = V_{RRM} )</td>
<td>–</td>
<td>20 A</td>
<td></td>
</tr>
<tr>
<td>( E_{RSM} )</td>
<td>non-repetitive peak reverse avalanche energy</td>
<td>( L = 120 , mH; ) ( T_j = T_{j \max } ) prior to surge; inductive load switched off</td>
<td>–</td>
<td>10 mJ</td>
<td></td>
</tr>
<tr>
<td>( T_{stg} )</td>
<td>storage temperature</td>
<td></td>
<td>–65</td>
<td>+175 °C</td>
<td></td>
</tr>
<tr>
<td>( T_j )</td>
<td>junction temperature</td>
<td></td>
<td>–65</td>
<td>+175 °C</td>
<td></td>
</tr>
</tbody>
</table>
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ELECTRICAL CHARACTERISTICS

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

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_F )</td>
<td>forward voltage</td>
<td>( I_F = 3 , \text{A}; ; T_j = T_{j,\text{max}}; ) see Fig.8</td>
<td>1.35</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>( I_F = 3 , \text{A}; ; ) see Fig.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{(BR)R} )</td>
<td>reverse avalanche breakdown voltage</td>
<td>( I_R = 0.1 , \text{mA} )</td>
<td></td>
<td></td>
<td>1300</td>
<td>1.65</td>
</tr>
<tr>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td></td>
<td></td>
<td>1500</td>
<td>V</td>
</tr>
<tr>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td></td>
<td></td>
<td>( )</td>
<td>V</td>
</tr>
<tr>
<td>( I_R )</td>
<td>reverse current</td>
<td>( V_R = V_{RR,\text{max}}; ) see Fig.9</td>
<td></td>
<td></td>
<td>1</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td></td>
<td></td>
<td>( )</td>
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<tr>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td></td>
<td></td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>( I_{rr} )</td>
<td>reverse recovery time</td>
<td>( ) when switched from ( I_F = 0.5 , \text{A} ) to ( I_R = 1 , \text{A}; ) measured at ( I_R = 0.25 , \text{A}; ) see Fig.14</td>
<td></td>
<td></td>
<td>500</td>
<td>ns</td>
</tr>
<tr>
<td>( C_d )</td>
<td>diode capacitance</td>
<td>( f = 1 , \text{MHz}; ; V_R = 0 , \text{V}; ) see Fig.11</td>
<td></td>
<td></td>
<td>35</td>
<td>( ) pF</td>
</tr>
<tr>
<td>( \frac{</td>
<td>dI_R</td>
<td>}{dt} )</td>
<td>maximum slope of reverse recovery current</td>
<td>( ) when switched from ( I_F = 1 , \text{A} ) to ( V_R \geq 30 , \text{V} ) and ( \frac{dI_F}{dt} = -1 , \text{A}/\mu\text{s}; ) see Figs 10 and 13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>SYMBOL</th>
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<th>CONDITIONS</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_{th,\text{jp}} )</td>
<td>thermal resistance from junction to tie-point</td>
<td>lead length = 10 mm</td>
<td>46</td>
<td>K/W</td>
</tr>
<tr>
<td>( R_{th,\text{ja}} )</td>
<td>thermal resistance from junction to ambient</td>
<td>note 1</td>
<td>100</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Note

1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer \( \geq 40 \, \mu\text{m} \), see Fig. 12. For more information please refer to the ‘General Part of Handbook SC01’. 

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GRAPHICAL DATA

Fig. 2  Maximum permissible average forward current as a function of tie-point temperature (including losses due to reverse leakage).

Fig. 3  Maximum permissible average forward current as a function of ambient temperature (including losses due to reverse leakage).

Fig. 4  Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

$T_{tp} = 65^\circ C; R_{th,j-tp} = 46 \, K/W.$

$V_{RRM_{max}}$ during $1 - \delta$; curves include derating for $T_{j_{max}}$ at $V_{RRM} = 1400 \, V$.
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- $T_{\text{amb}} = 65 \, ^\circ C; R_{\text{th} j-a} = 100 \, K/W$
- $V_{\text{RRMmax}}$ during $1 - \delta$; curves include derating for $T_{\text{j max}}$ at $V_{\text{RRM}} = 1400 \, V$.

**Fig. 5** Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

- $I_{\text{FRM}} (A)$
- $t_p (ms)$

- $\delta = 0.05$
- $0.1$
- $0.2$
- $0.5$
- $1$

**Fig. 6** Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.

- $P (W)$
- $a = I_{\text{FRMS}}/I_{\text{FAV}}; V_R = V_{\text{RRMmax}}; \delta = 0.5$

**Fig. 7** Maximum permissible junction temperature as a function of reverse voltage.

- $T_j (\, ^\circ C)$
- $V_R (V)$

- Solid line = $V_R$
- Dotted line = $V_{\text{RRM}}; \delta = 0.5$

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Fig. 8  Forward current as a function of forward voltage; maximum values.

Dotted line: \( T_j = 175 \, ^\circ C \).
Solid line: \( T_j = 25 \, ^\circ C \).

Fig. 9  Reverse current as a function of junction temperature; maximum values.

\( V_R = V_{RR\text{MAX}} \).

Fig. 10  Maximum reverse recovery time as a function of the rate of fall of forward current.

\( T_j = 25^\circ C \).
For definitions see Fig. 13.
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\[ f = 1 \text{ MHz}; T_j = 25 \, ^\circ\text{C}. \]

Fig. 11 Diode capacitance as a function of reverse voltage; typical values.

Fig. 12 Device mounted on a printed-circuit board.

Fig. 13 Reverse recovery definitions.
Input impedance oscilloscope: 1 MΩ, 22 pF; \( t_r < 7 \) ns.
Source impedance: 50 Ω; \( t_r < 15 \) ns.

Fig.14 Test circuit and reverse recovery time waveform and definition.
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PACKAGE OUTLINE

DEFINITIONS

### Data Sheet Status

<table>
<thead>
<tr>
<th>Objective specification</th>
<th>This data sheet contains target or goal specifications for product development.</th>
</tr>
</thead>
<tbody>
<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

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.