

**DISCRETE SEMICONDUCTORS**

# DATA SHEET



## BYW96 series Fast soft-recovery controlled avalanche rectifiers

Product specification

Supersedes data of April 1982

1996 Jun 07

## Fast soft-recovery controlled avalanche rectifiers

### BYW96 series

#### FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- Available in ammo-pack
- Also available with preformed leads for easy insertion.

#### DESCRIPTION

Rugged glass SOD64 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.

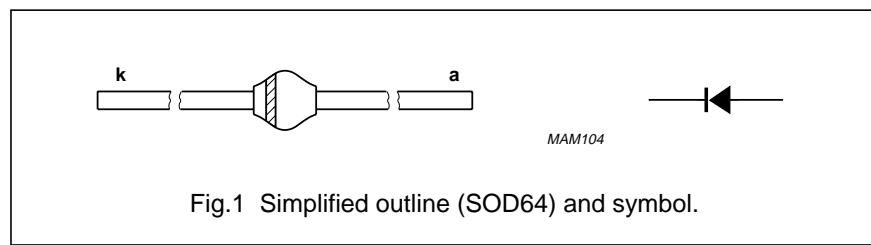


Fig.1 Simplified outline (SOD64) and symbol.

#### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{RRM}$	repetitive peak reverse voltage BYW96D BYW96E		–	800 1000	V V
$V_R$	continuous reverse voltage BYW96D BYW96E		–	800 1000	V V
$I_{F(AV)}$	average forward current	$T_{tp} = 50^\circ\text{C}$ ; lead length = 10 mm see Fig.2; averaged over any 20 ms period; see also Fig.6	–	3	A
$I_{F(AV)}$	average forward current	$T_{amb} = 55^\circ\text{C}$ ; PCB mounting (see Fig.11); see Fig.3; averaged over any 20 ms period; see also Fig.6	–	1.25	A
$I_{FRM}$	repetitive peak forward current	$T_{tp} = 50^\circ\text{C}$ ; see Fig.4	–	30	A
		$T_{amb} = 55^\circ\text{C}$ ; see Fig.5	–	13	A
$I_{FSM}$	non-repetitive peak forward current	$t = 10\text{ ms}$ half sine wave; $T_j = T_{j\ max}$ prior to surge; $V_R = V_{RRMmax}$	–	70	A
$E_{RSM}$	non-repetitive peak reverse avalanche energy	$L = 120\text{ mH}$ ; $T_j = T_{j\ max}$ prior to surge; inductive load switched off	–	10	mJ
$T_{stg}$	storage temperature		–65	+175	°C
$T_j$	junction temperature	see Fig.7	–65	+175	°C

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### ELECTRICAL CHARACTERISTICS

$T_j = 25^\circ\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_F$	forward voltage	$I_F = 5 \text{ A}; T_j = T_{j\max};$ see Fig.8	–	–	1.25	V
		$I_F = 5 \text{ A};$ see Fig.8	–	–	1.50	V
$V_{(BR)R}$	reverse avalanche breakdown voltage BYW96D BYW96E	$I_R = 0.1 \text{ mA}$	900 1100	– –	– –	V V
$I_R$	reverse current	$V_R = V_{RRM\max};$ see Fig.9	–	–	1	$\mu\text{A}$
		$V_R = V_{RRM\max}; T_j = 165^\circ\text{C};$ see Fig.9	–	–	150	$\mu\text{A}$
$t_{rr}$	reverse recovery time	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.12	–	–	300	ns
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V};$ see Fig.10	–	75	–	pF
$ \frac{dI_R}{dt} $	maximum slope of reverse recovery current	when switched from $I_F = 1 \text{ A}$ to $V_R \geq 30 \text{ V}$ and $dI_F/dt = -1 \text{ A}/\mu\text{s};$ see Fig.13	–	–	6	$\text{A}/\mu\text{s}$

### THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	25	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	75	K/W

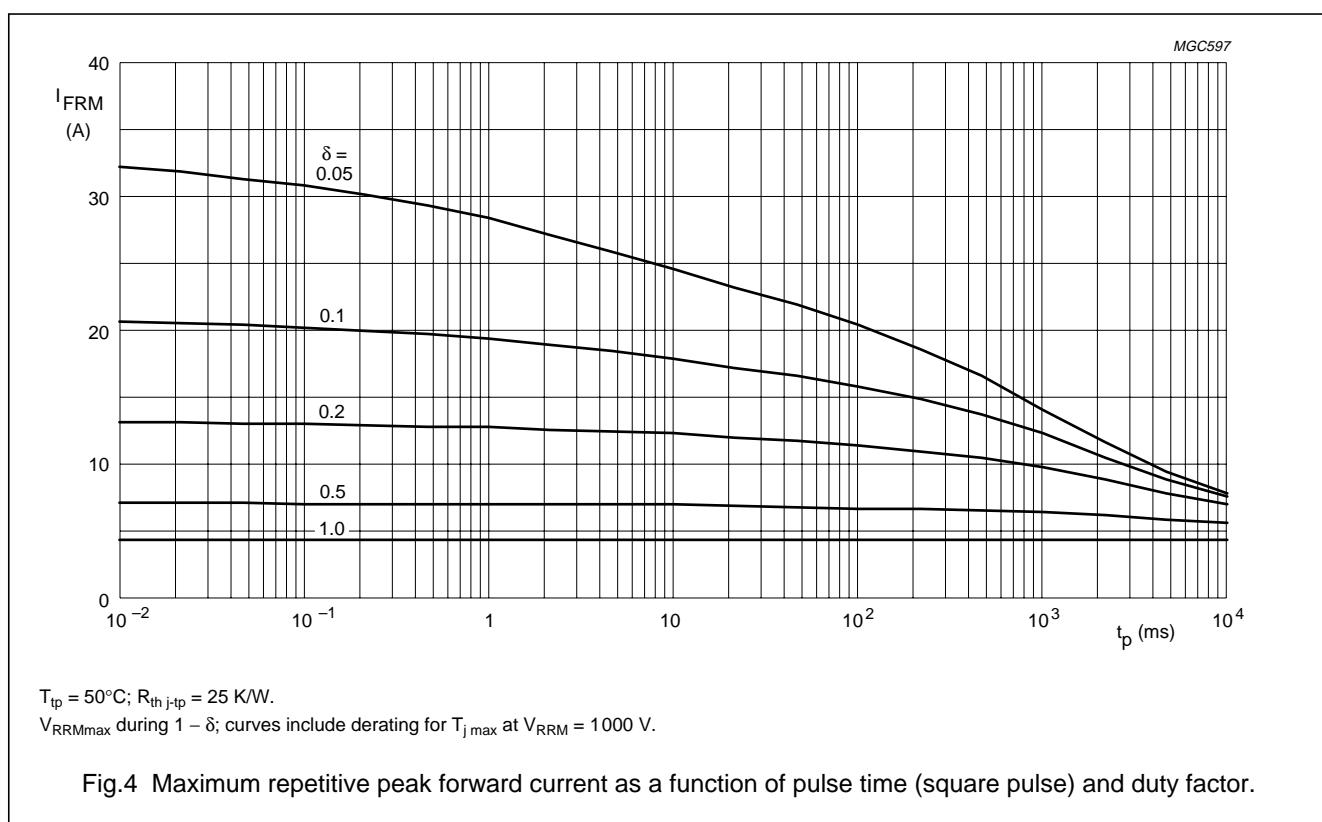
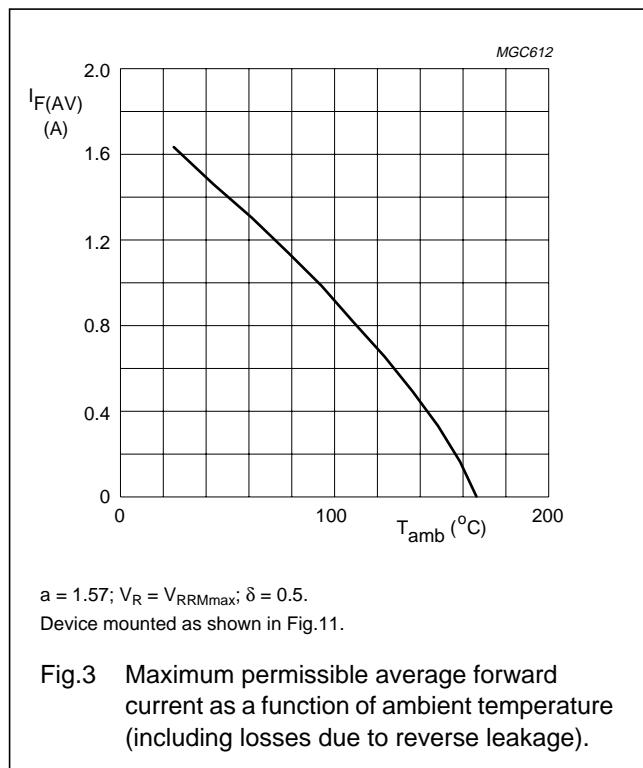
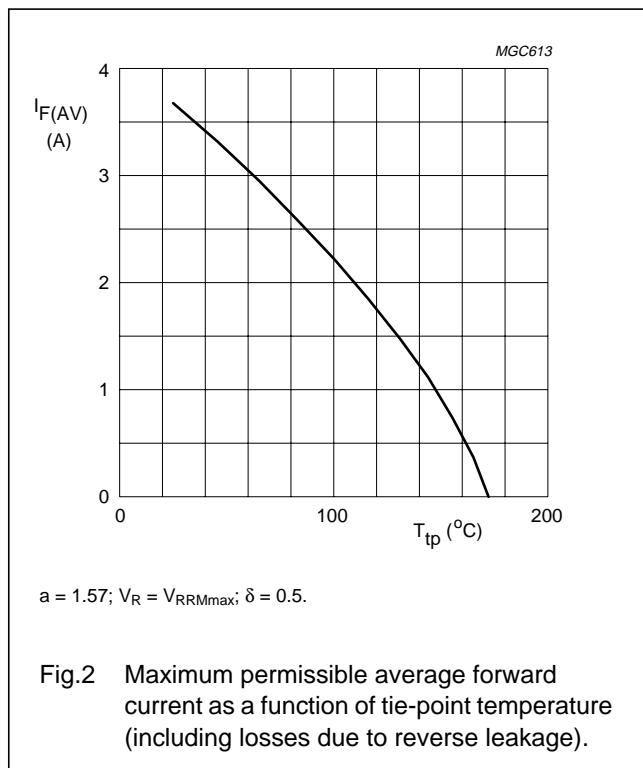
#### Note

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.11.  
For more information please refer to the "General Part of associated Handbook".

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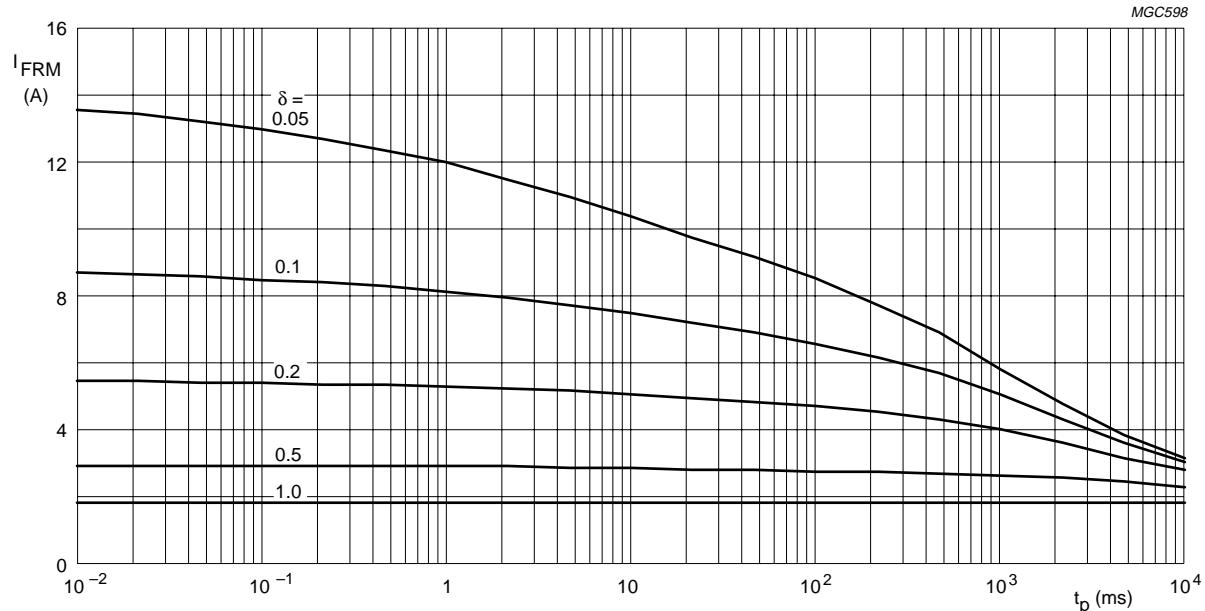
BYW96 series

### GRAPHICAL DATA



## Fast soft-recovery controlled avalanche rectifiers

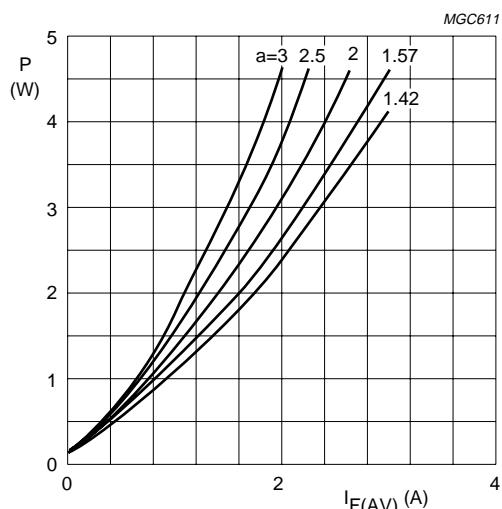
BYW96 series



$T_{amb} = 55^\circ\text{C}$ ;  $R_{th\ j-a} = 75\text{ K/W}$ .

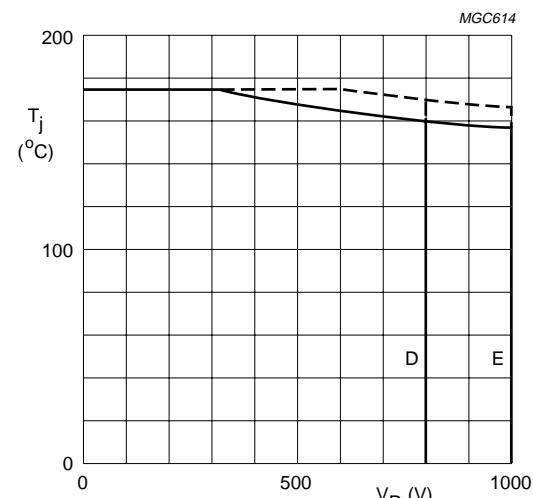
$V_{RRMmax}$  during  $1 - \delta$ ; curves include derating for  $T_{j\ max}$  at  $V_{RRM} = 1000\text{ V}$ .

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



$a = I_{F(RMS)}/I_{F(AV)}$ ;  $V_R = V_{RRMmax}$ ;  $\delta = 0.5$ .

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

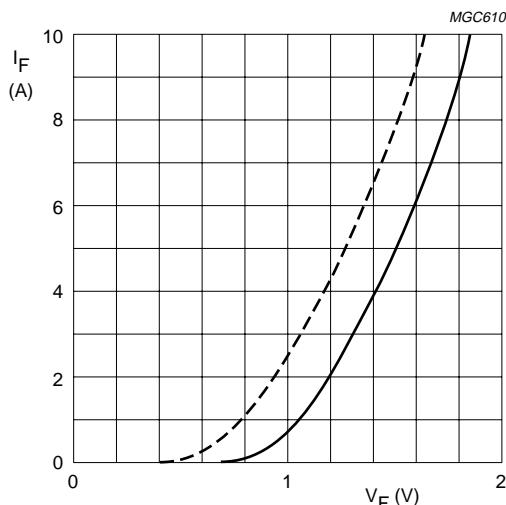


Solid line =  $V_R$ .  
Dotted line =  $V_{RRM}$ ;  $\delta = 0.5$ .

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

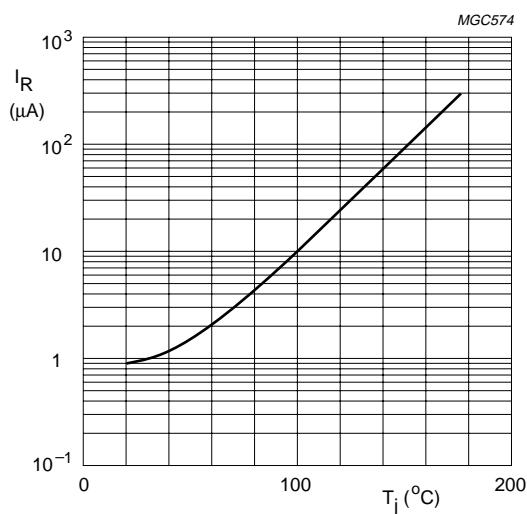
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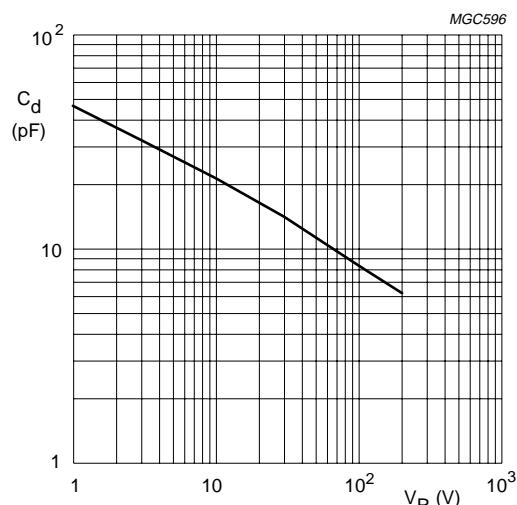
Dotted line:  $T_j = 175$  °C.  
Solid line:  $T_j = 25$  °C.

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



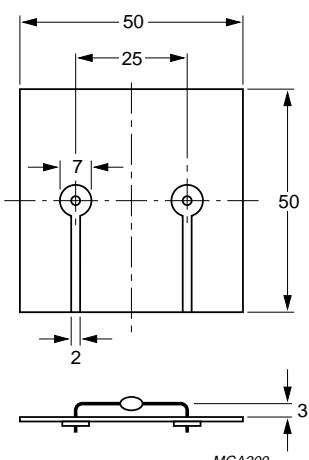
$V_R = V_{RRMmax}$ .

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



$f = 1$  MHz;  $T_j = 25$  °C.

Fig.10 Diode capacitance as a function of reverse voltage; typical values.

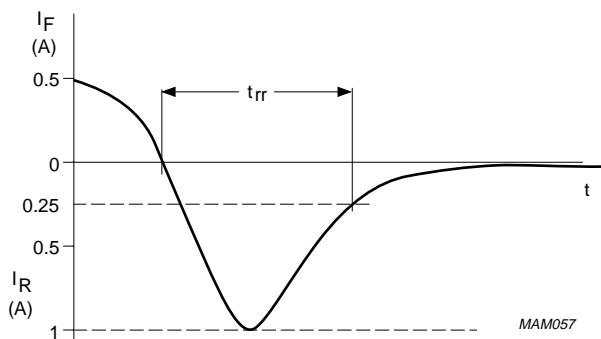
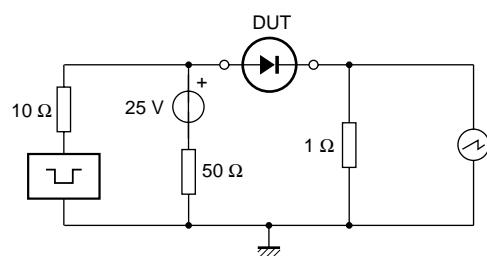


Dimensions in mm.

Fig.11 Device mounted on a printed-circuit board.

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Input impedance oscilloscope: 1 MΩ, 22 pF;  $t_r < 7$  ns.

Source impedance: 50 Ω;  $t_r < 15$  ns.

Fig.12 Test circuit and reverse recovery time waveform and definition.

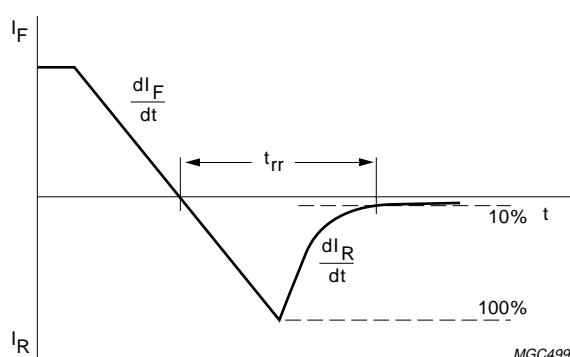
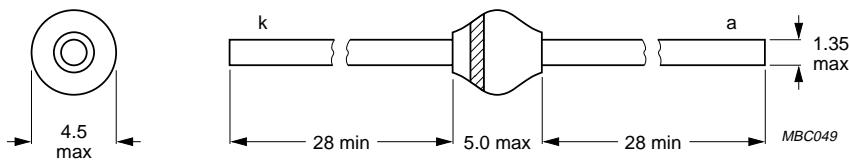


Fig.13 Reverse recovery definitions.

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### PACKAGE OUTLINE



Dimensions in mm.

The marking band indicates the cathode.

Fig.14 SOD64.

### DEFINITIONS

#### Data Sheet Status

Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.

#### 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.