DATA SHEET

BYD57 series
Ultra-fast soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of 1998 Dec 04

1999 Nov 11

Philips Semiconductors

PHILIPS

Ultra-fast soft-recovery controlled avalanche rectifiers

BYD57 series

FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- Shipped in 8 mm embossed tape
- Smallest surface mount rectifier outline.

DESCRIPTION

Cavity free cylindrical glass SOD87 package through Implotec™(1) technology. The SOD87 is hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.

(1) Implotec is a trademark of Philips.

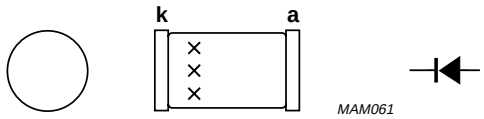


Fig.1 Simplified outline (SOD87) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYD57D		–	200	V
	BYD57G		–	400	V
	BYD57J		–	600	V
	BYD57K		–	800	V
	BYD57M		–	1000	V
	BYD57U		–	1200	V
	BYD57V		–	1400	V
V_R	continuous reverse voltage				
	BYD57D		–	200	V
	BYD57G		–	400	V
	BYD57J		–	600	V
	BYD57K		–	800	V
	BYD57M		–	1000	V
	BYD57U		–	1200	V
	BYD57V		–	1400	V
$I_{F(AV)}$	average forward current	T_{tp} = 85 °C; see Figs 2 and 3; averaged over any 20 ms period; see also Figs 10 and 11			
	BYD57D to M		–	1.0	A
	BYD57U and V		–	1.2	A
$I_{F(AV)}$	average forward current	T_{amb} = 60 °C; PCB mounting (see Fig.17); see Figs 4 and 5; averaged over any 20 ms period; see also Figs 10 and 11			
	BYD57D to M		–	0.4	A
	BYD57U and V		–	0.4	A
I_{FRM}	repetitive peak forward current	T_{tp} = 85 °C; see Figs 6 and 7			
	BYD57D to M		–	8.5	A
	BYD57U and V		–	11	A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FRM}	repetitive peak forward current	T_{amb} = 60 °C; see Figs 8 and 9			
	BYD57D to M		–	3.0	A
	BYD57U and V		–	3.7	A
I_{FSM}	non-repetitive peak forward current	t = 10 ms half sinewave; T_j = 25 °C prior to surge; $V_R = V_{RRMmax}$	–	5.0	A
E_{RSM}	non-repetitive peak reverse avalanche energy	L = 120 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.12	–65	+175	°C

ELECTRICAL CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_F	forward voltage	I_F = 1 A; $T_j = T_{j\,max}$; see Figs 13 and 14				
	BYD57D to M		–	–	2.1	V
	BYD57U and V		–	–	1.7	V
V_F	forward voltage	I_F = 1 A; see Figs 13 and 14				
	BYD57D to M		–	–	3.6	V
	BYD57U and V		–	–	2.3	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	I_R = 0.1 mA				
	BYD57D		300	–	–	V
	BYD57G		500	–	–	V
	BYD57J		700	–	–	V
	BYD57K		900	–	–	V
	BYD57M		1100	–	–	V
	BYD57U		1300	–	–	V
	BYD57V		1500	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Fig.15	–	–	5	µA
		$V_R = V_{RRMmax}$; T_j = 165 °C; see Fig.15	–	–	100	µA
t_{rr}	reverse recovery time	when switched from I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25 A; see Fig.18				
	BYD57D to J		–	–	30	ns
	BYD57K and M		–	–	75	ns
	BYD57U and V		–	–	150	ns
C_d	diode capacitance	f = 1 MHz; V_R = 0; see Fig.16	–	20	–	pF

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\left\|\frac{dI_R}{dt}\right\|$	maximum slope of reverse recovery current	when switched from I_F = 1 A to $V_R \geq$ 30 V and dI_F/dt = –1 A/μs; see Fig.19				
	BYD57D to J		–	–	7	A/μs
	BYD57K and M		–	–	6	A/μs
	BYD57U and V		–	–	5	A/μs

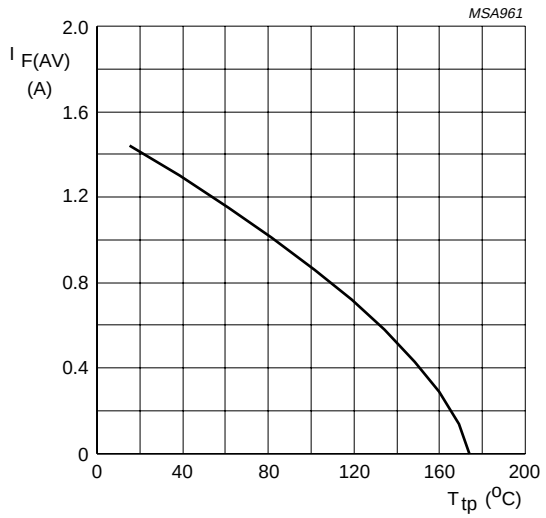
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point		30	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	150	K/W

Note

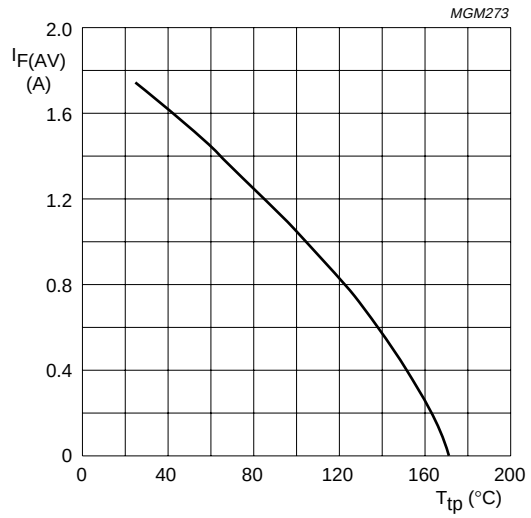
1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer ≥40 μm, see Fig.17. For more information please refer to the *'General Part of associated Handbook'*.

GRAPHICAL DATA



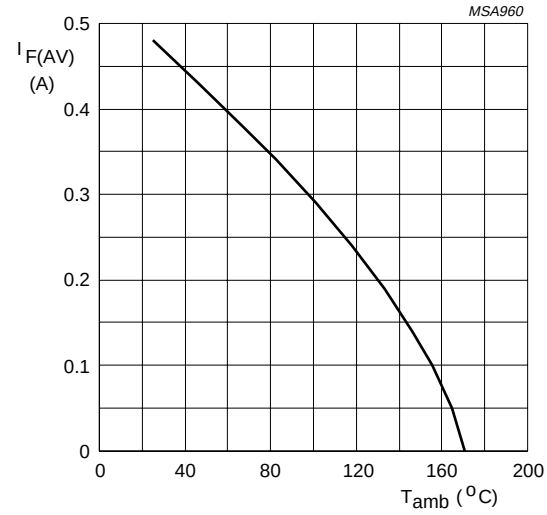
BYD57D to M
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



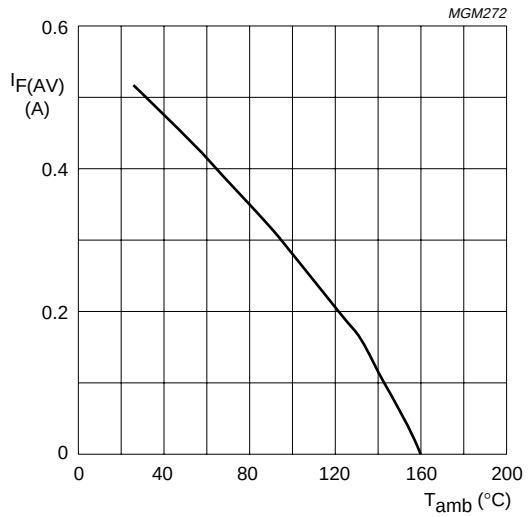
BYDU and V
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



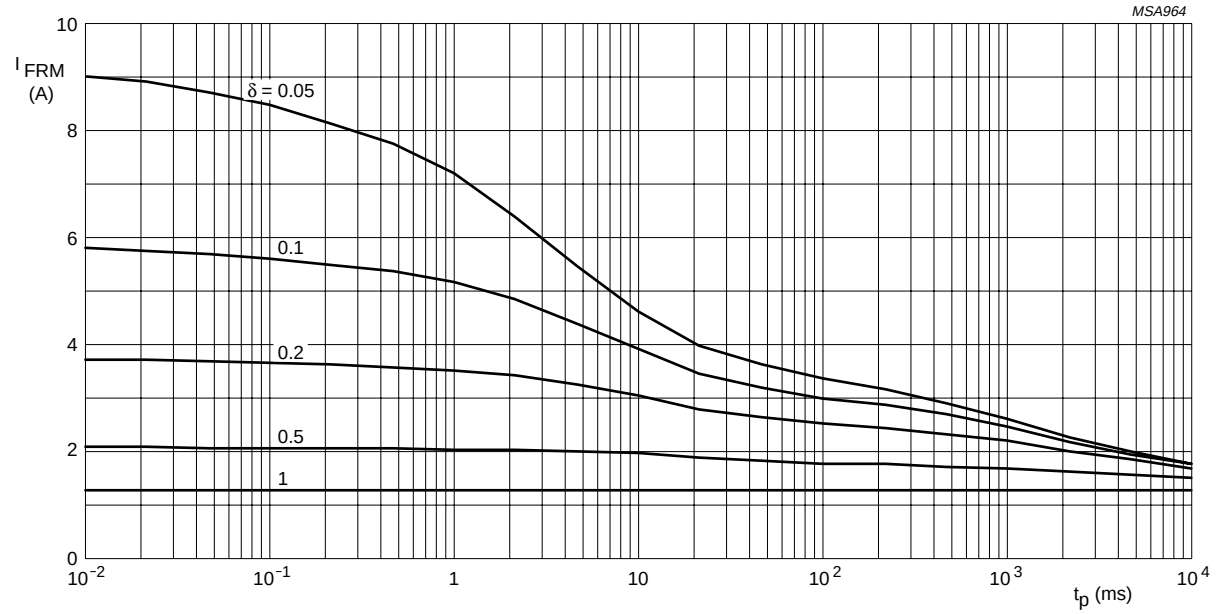
BYD57D to M
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Device mounted as shown in Fig.17.
Switched mode application.

Fig.4 Maximum permissible average forward current as a function of ambient temperature (including losses due to reverse leakage).



BYD57U and V
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Device mounted as shown in Fig.17.
Switched mode application.

Fig.5 Maximum permissible average forward current as a function of ambient temperature (including losses due to reverse leakage).

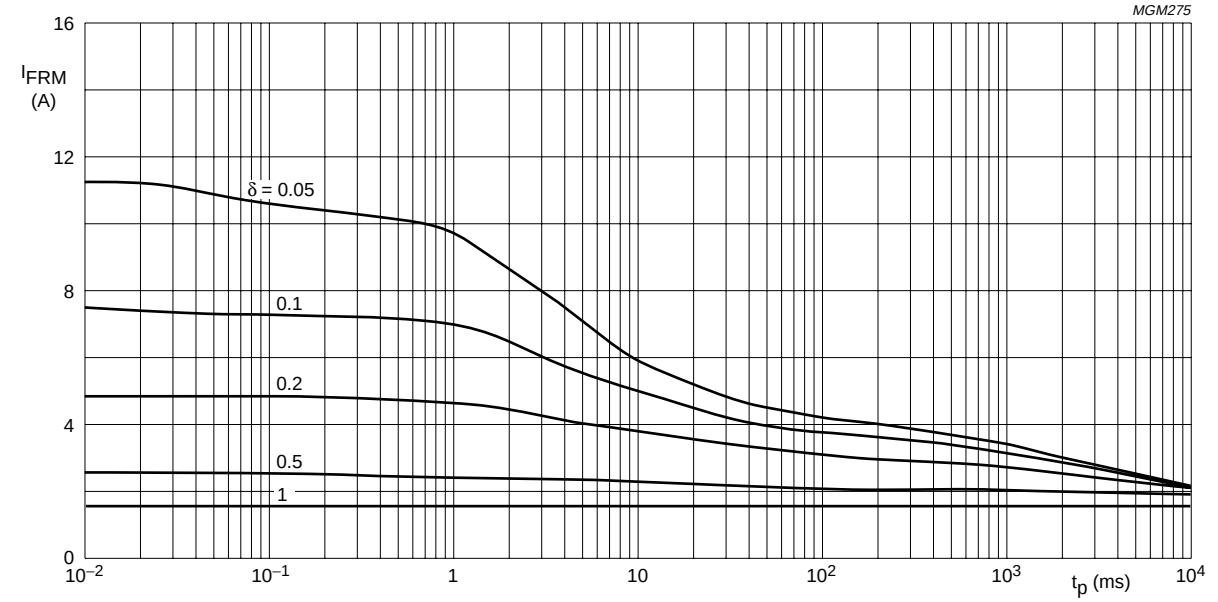


BYD57D to M

T_{tp} = 85 °C; $R_{th\ j\text{-}tp}$ = 30 K/W.

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

Fig.6 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

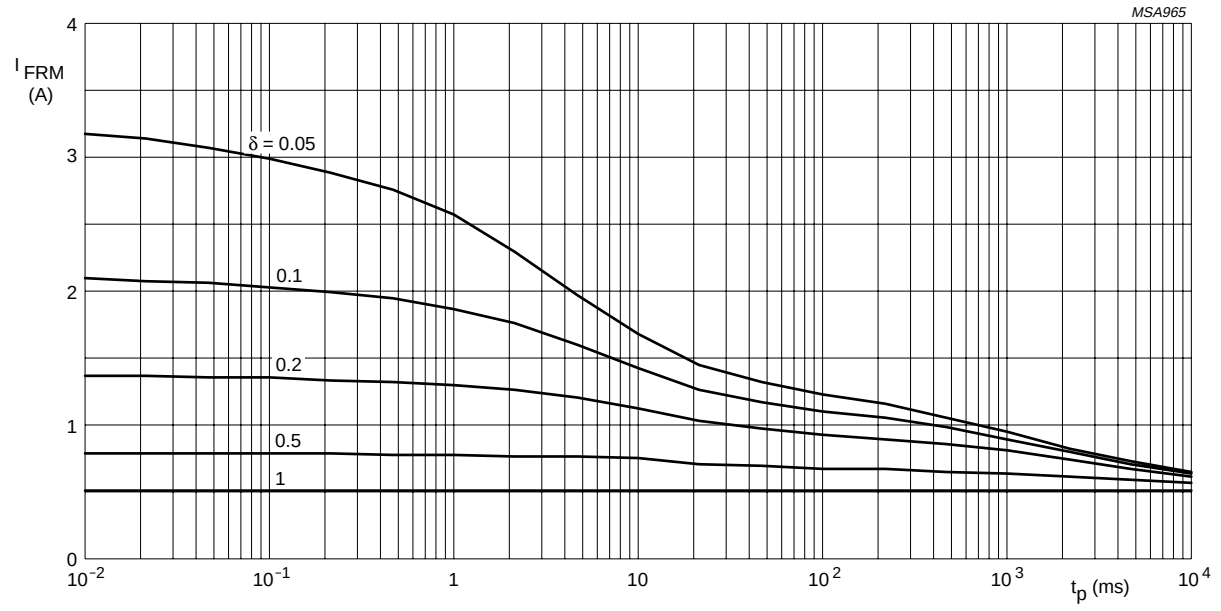


BYD57U and V

T_{tp} = 85 °C; $R_{th\ j\text{-}tp}$ = 30 K/W.

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

Fig.7 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

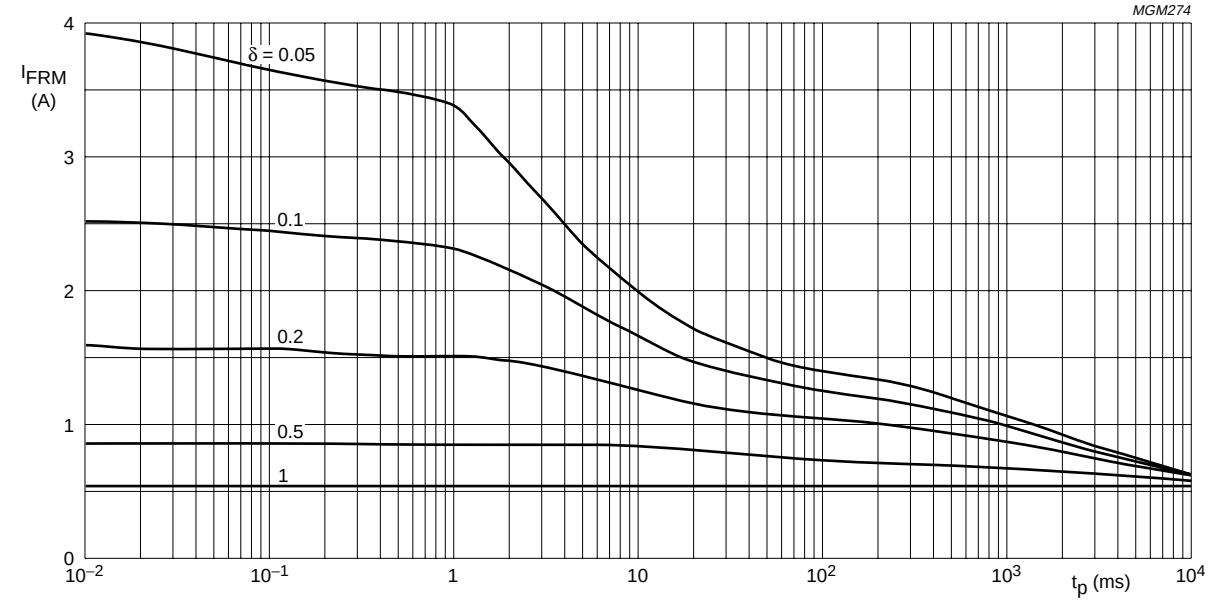


BYD57D to M

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 150K/W.

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

Fig.8 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

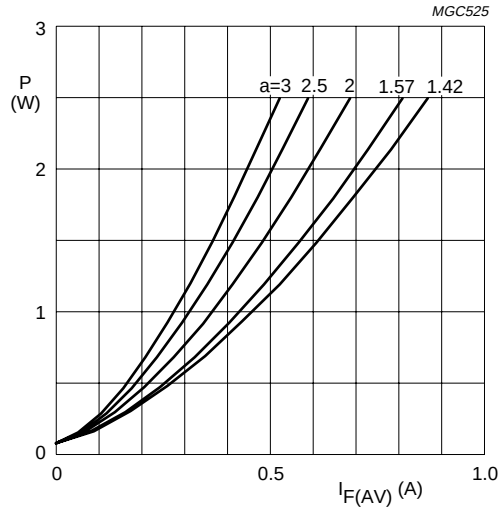


BYD57U and V

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 150K/W.

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

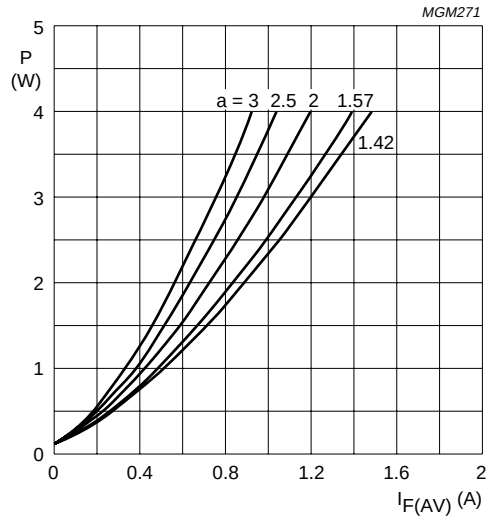
Fig.9 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



BYD57D to M

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

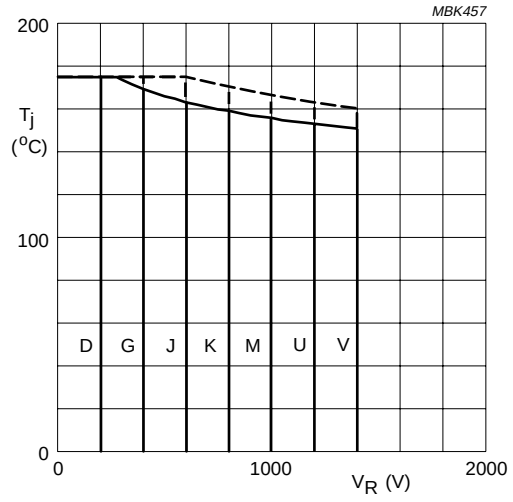
Fig.10 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYD57U and V

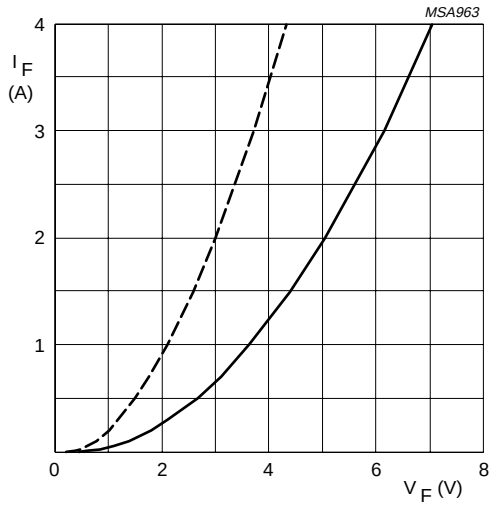
$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$; $\delta = 0.5$.

Fig.11 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}; $\delta = 0.5$.

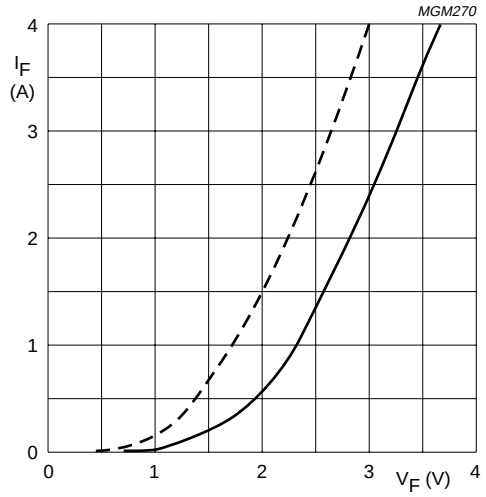
Fig.12 Maximum permissible junction temperature as a function of reverse voltage.



BYD57D to M

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

Fig.13 Forward current as a function of forward voltage; maximum values.

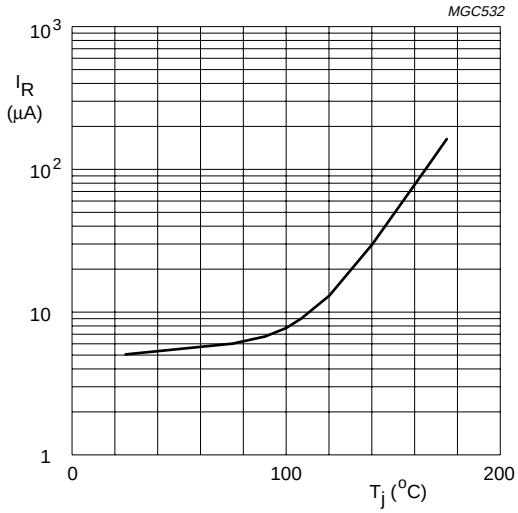


BYD57U and V

Dotted line: T_j = 175 °C.

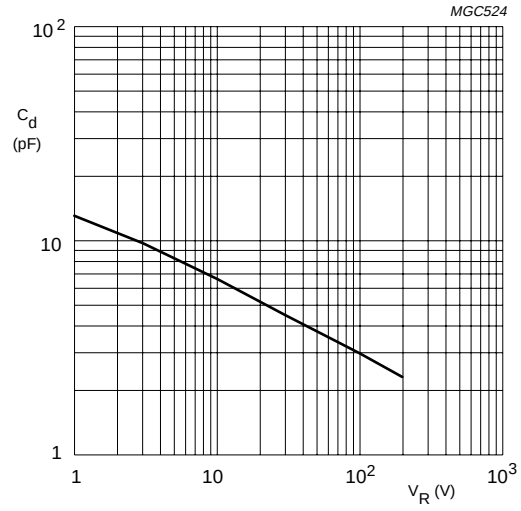
Solid line: T_j = 25 °C.

Fig.14 Forward current as a function of forward voltage; maximum values.



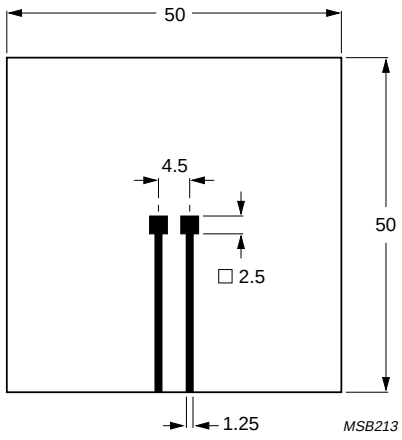
$V_R = V_{RRMmax}$.

Fig.15 Reverse current as a function of junction temperature; maximum values.



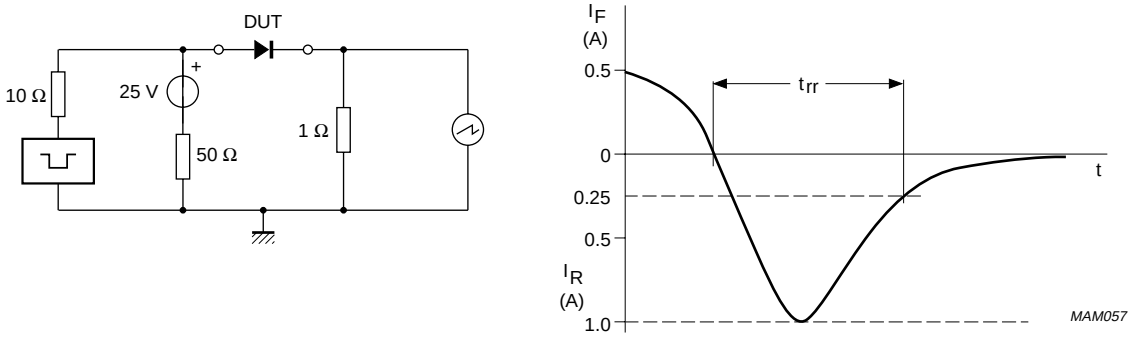
f = 1 MHz; T_j = 25 °C.

Fig.16 Diode capacitance as a function of reverse voltage; typical values.



Dimensions in mm.

Fig.17 Printed-circuit board for surface mounting.



Input impedance oscilloscope: 1 MΩ, 22 pF; $t_r \leq 7$ ns.
Source impedance: 50 Ω; $t_r \leq 15$ ns.

Fig.18 Test circuit and reverse recovery time waveform and definition.

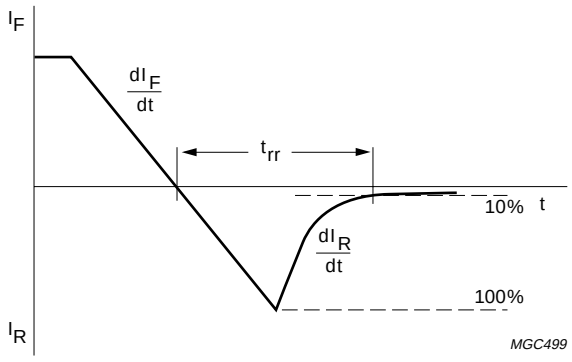
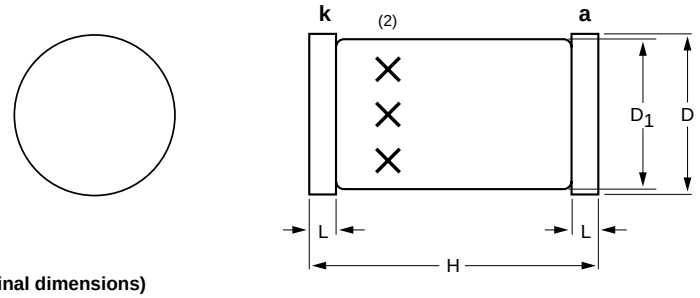


Fig.19 Reverse recovery definitions.

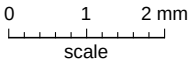
PACKAGE OUTLINE

Hermetically sealed glass surface mounted package; Implotec™(1) technology; 2 connectors **SOD87**



DIMENSIONS (mm are the original dimensions)

UNIT	D	D1	H	L
mm	2.1 2.0	2.0 1.8	3.7 3.3	0.3



Notes

1. Implotec is a trademark of Philips.
2. The marking indicates the cathode.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOD87	100H03					~~99-03-31~~ 99-06-04

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.	

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