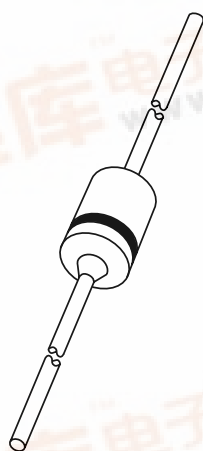


DISCRETE SEMICONDUCTORS

DATA SHEET



BYD53 series Fast soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of 1996 Sep 18

1998 Dec 04

Fast soft-recovery controlled avalanche rectifiers

BYD53 series

FEATURES

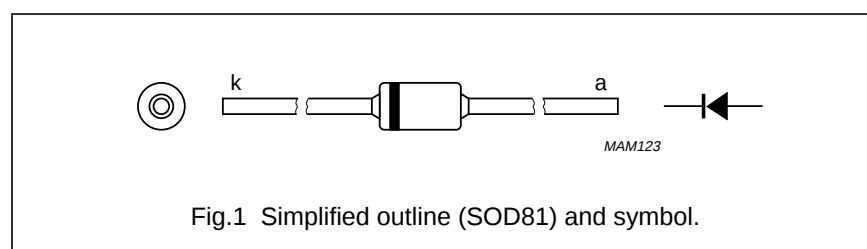
- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- Available in ammo-pack.

DESCRIPTION

Cavity free cylindrical glass SOD81 package through Implotec™⁽¹⁾ technology. The SOD81 package is

hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.

(1) Implotec is a trademark of Philips.



LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYD53D		—	200	V
	BYD53G		—	400	V
	BYD53J		—	600	V
	BYD53K		—	800	V
	BYD53M		—	1000	V
	BYD53U		—	1200	V
	BYD53V		—	1400	V
V_R	continuous reverse voltage				
	BYD53D		—	200	V
	BYD53G		—	400	V
	BYD53J		—	600	V
	BYD53K		—	800	V
	BYD53M		—	1000	V
	BYD53U		—	1200	V
	BYD53V		—	1400	V
$I_{F(AV)}$	average forward current	$T_{tp} = 55\text{ °C}$; lead length = 10 mm			
	BYD53D to M	see Figs 2 and 3;	—	0.75	A
	BYD53U and V	averaged over any 20 ms period;	—	0.85	A
		see also Figs 10 and 11			
$I_{F(AV)}$	average forward current	$T_{amb} = 65\text{ °C}$; PCB mounting (see			
	BYD53D to M	Fig.17); see Figs 4 and 5;	—	0.40	A
	BYD53U and V	averaged over any 20 ms period;	—	0.45	A
		see also Figs 10 and 11			
I_{FRM}	repetitive peak forward current	$T_{tp} = 55\text{ °C}$; see Figs 6 and 7			
	BYD53D to M		—	6.5	A
	BYD53U and V		—	8.25	A

Fast soft-recovery controlled avalanche rectifiers

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SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FRM}	repetitive peak forward current BYD53D to M BYD53U and V	$T_{amb} = 65\text{ }^{\circ}\text{C}$; see Figs 8 and 9	–	3.6	A
			–	4.45	A
I_{FSM}	non-repetitive peak forward current	$t = 10\text{ ms}$ half sine wave; $T_j = T_{j\text{ max}}$ prior to surge; $V_R = V_{RRM\text{ max}}$	–	5	A
E_{RSM}	non-repetitive peak reverse avalanche energy	$L = 120\text{ mH}$; $T_j = T_{j\text{ max}}$ prior to surge; inductive load switched off	–	10	mJ
T_{stg}	storage temperature		–65	+175	$^{\circ}\text{C}$
T_j	junction temperature	see Fig.12	–65	+175	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_F	forward voltage BYD53D to M BYD53U and V	$I_F = 1\text{ A}$; $T_j = T_{j\text{ max}}$; see Figs 13 and 14	–	–	2.1	V
			–	–	1.7	V
V_F	forward voltage BYD53D to M BYD53U and V	$I_F = 1\text{ A}$; see Figs 13 and 14	–	–	3.6	V
			–	–	2.3	V
$V_{(BR)R}$	reverse avalanche breakdown voltage BYD53D BYD53G BYD53J BYD53K BYD53M BYD53U BYD53V	$I_R = 0.1\text{ mA}$				
			300	–	–	V
			500	–	–	V
			700	–	–	V
			900	–	–	V
			1100	–	–	V
			1300	–	–	V
			1500	–	–	V
I_R	reverse current	$V_R = V_{RRM\text{ max}}$; see Fig.15	–	–	1	μA
		$V_R = V_{RRM\text{ max}}$; $T_j = 165\text{ }^{\circ}\text{C}$; see Fig.15	–	–	100	μA
t_{rr}	reverse recovery time BYD53D to J BYD53K and M BYD53U and V	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.18	–	–	30	ns
			–	–	75	ns
			–	–	150	ns
C_d	diode capacitance	$f = 1\text{ MHz}$; $V_R = 0$; see Fig.16	–	20	–	pF

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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/ μ s; see Fig.19	—	—	7	A/ μ s
	BYD53D to J		—	—	6	A/ μ s
	BYD53K and M		—	—	5	A/ μ s
	BYD53U and V		—	—		

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	60	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	120	K/W

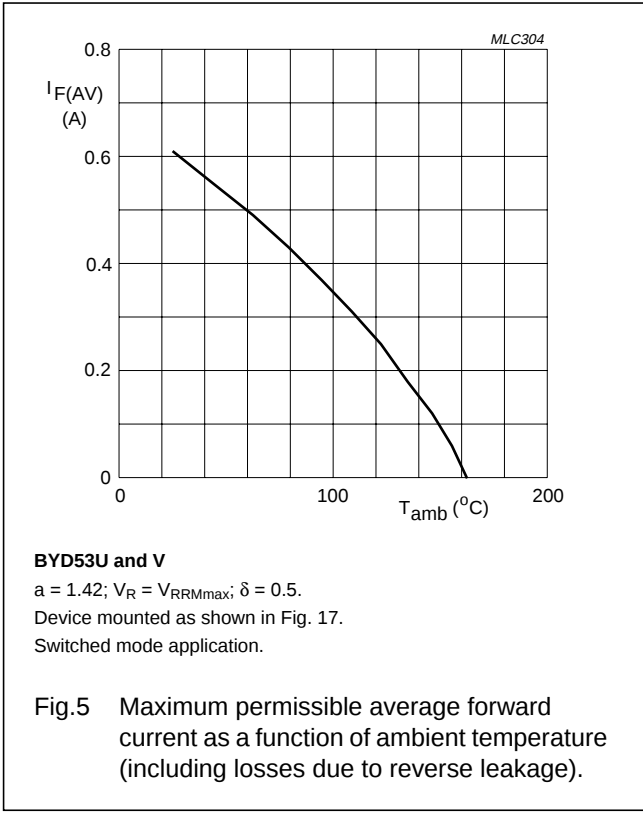
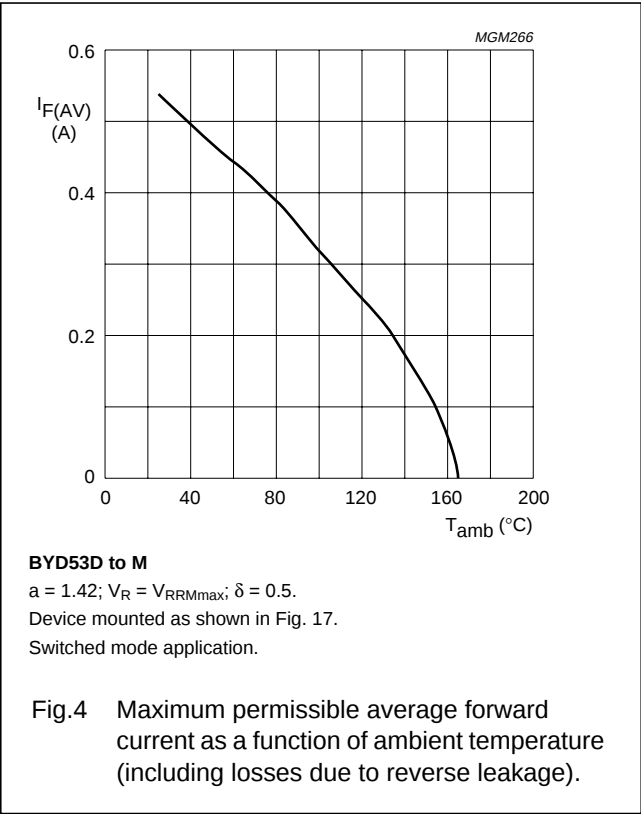
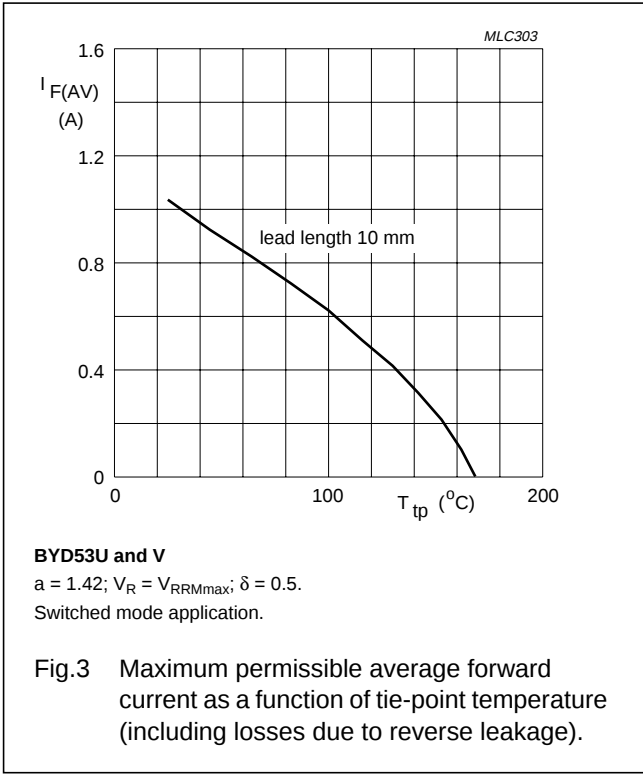
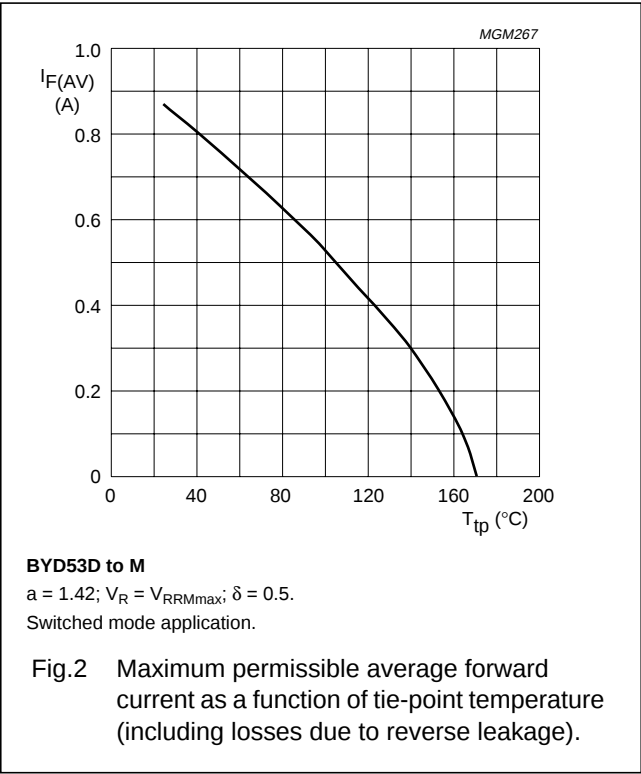
Note

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

Fast soft-recovery controlled
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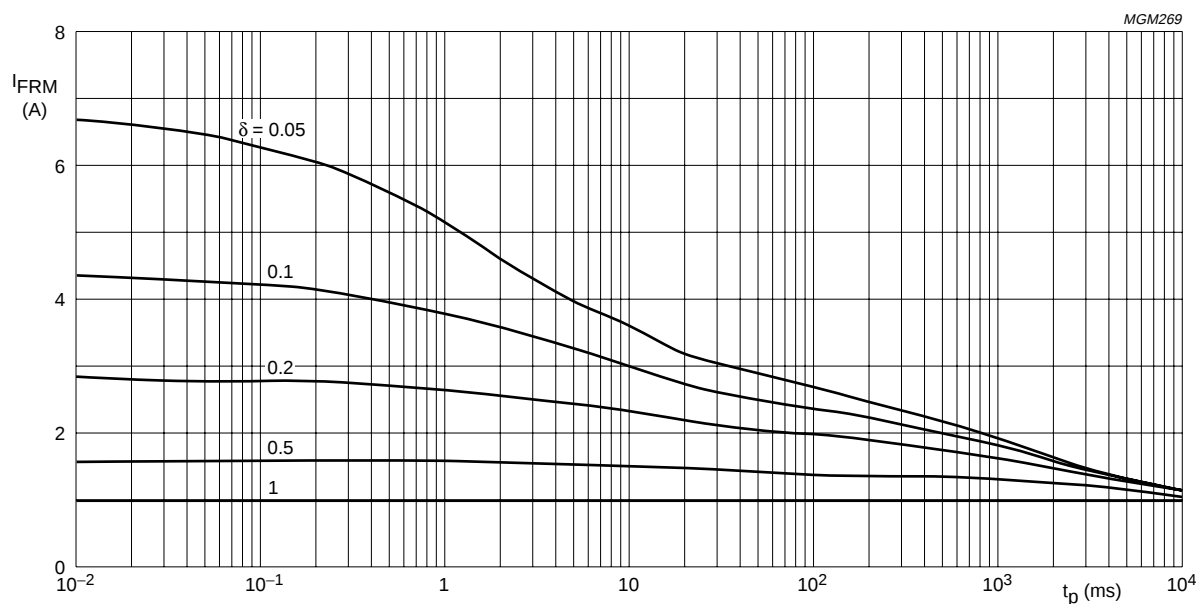
BYD53 series

GRAPHICAL DATA



Fast soft-recovery controlled avalanche rectifiers

BYD53 series

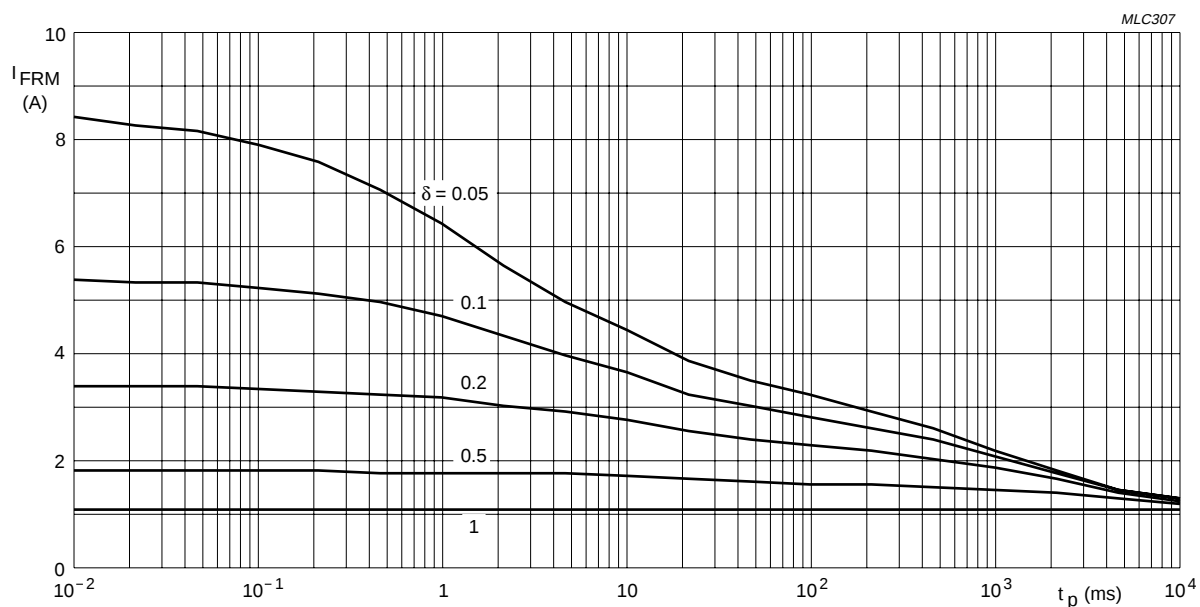


BYD53D to M

$T_{ip} = 55^\circ\text{C}$; $R_{th\ j-ip} = 60\text{ K/W}$.

V_{RRMmax} during $1 - \delta$; curves include derating for $T_{j\ max}$ at $V_{RRM} = 1400\text{ V}$.

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



BYD53U and V

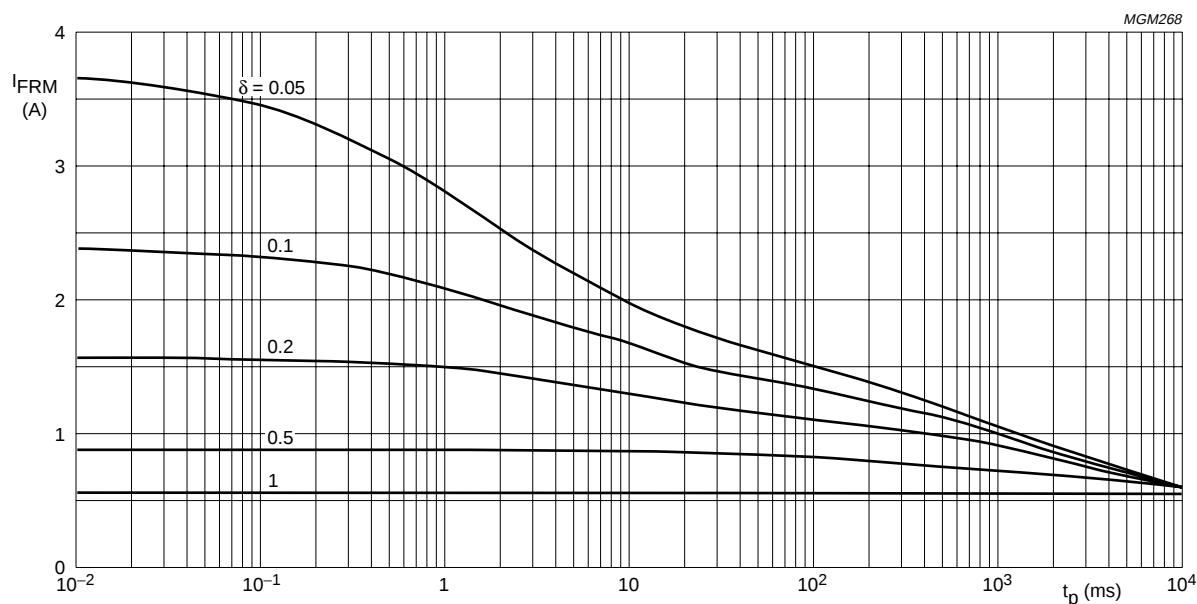
$T_{ip} = 55^\circ\text{C}$; $R_{th\ j-ip} = 60\text{ K/W}$.

V_{RRMmax} during $1 - \delta$; curves include derating for $T_{j\ max}$ at $V_{RRM} = 1400\text{ V}$.

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

Fast soft-recovery controlled avalanche rectifiers

BYD53 series

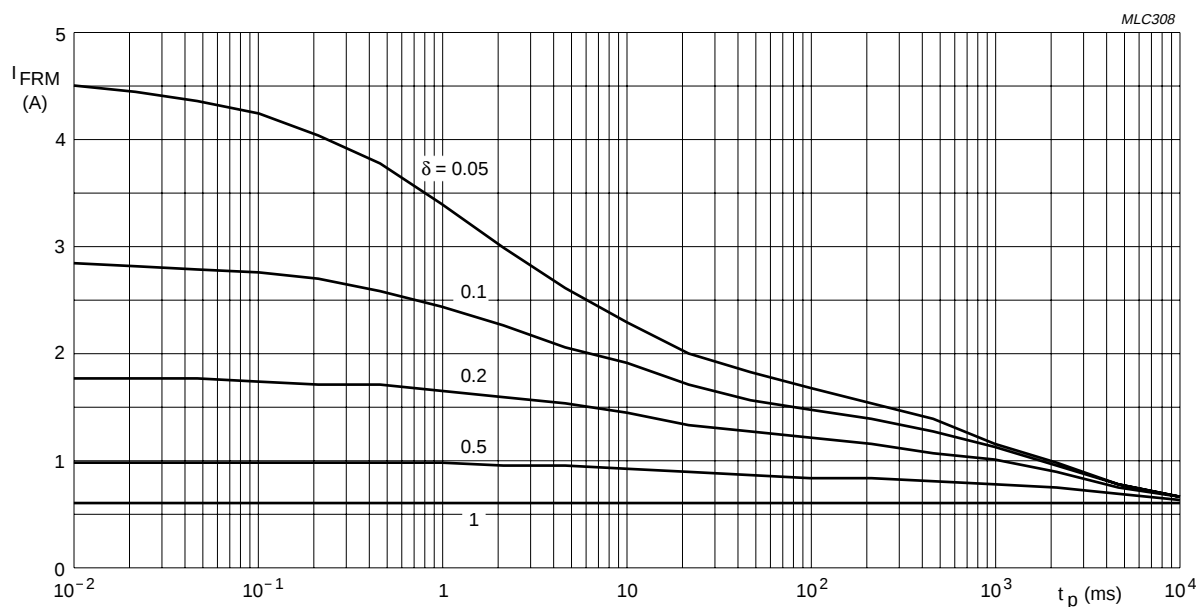


BYD53D to M

$T_{amb} = 65^\circ\text{C}$; $R_{th\ j-a} = 120\text{ K/W}$.

V_{RRMmax} during $1 - \delta$; curves include derating for $T_{j\ max}$ at $V_{RRM} = 1400\text{ V}$.

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



BYD53U and V

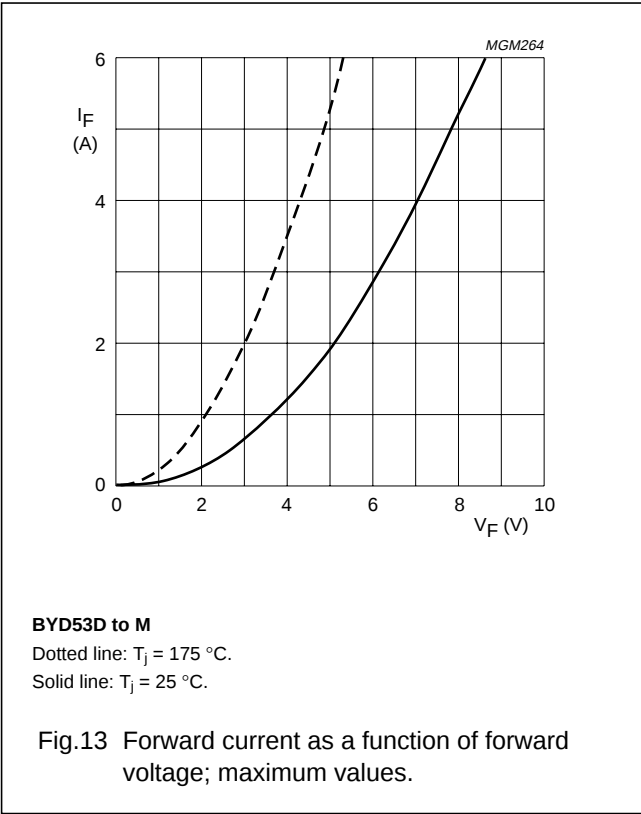
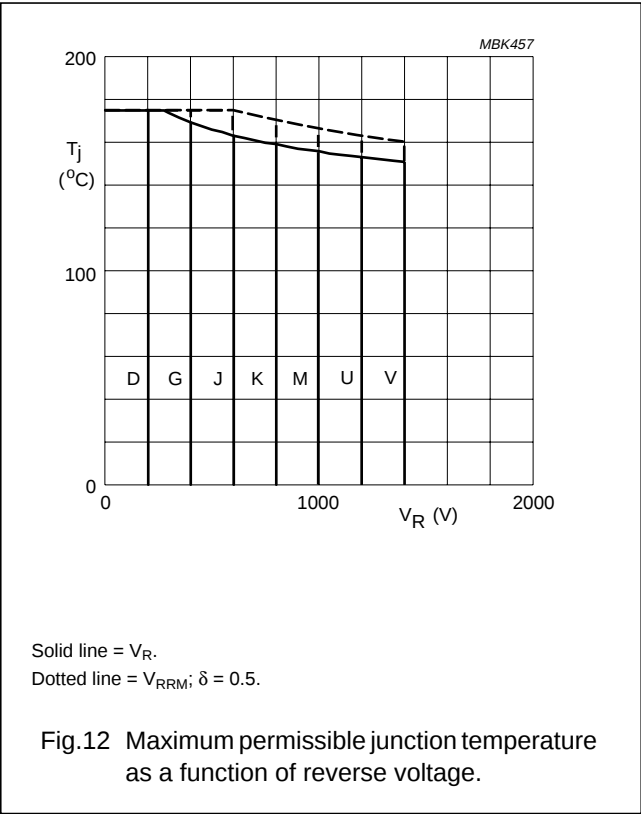
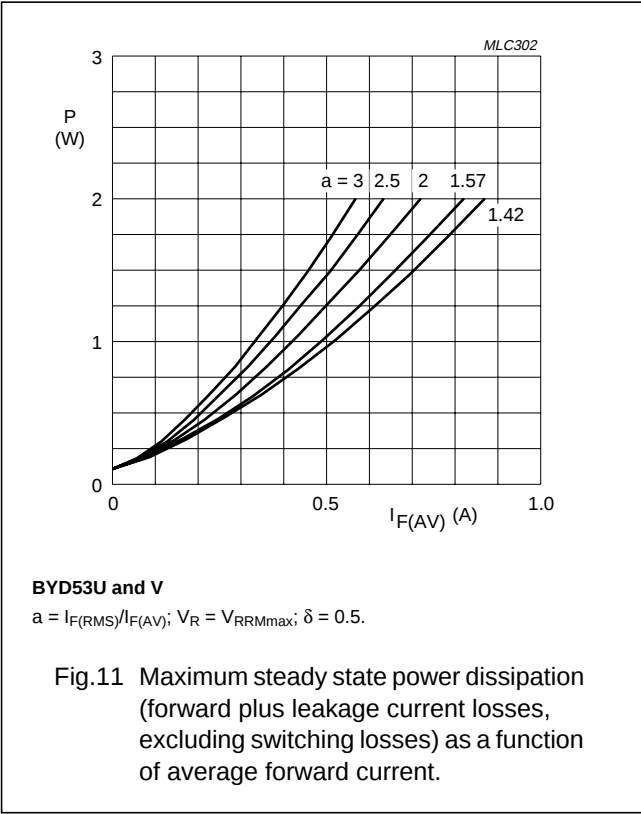
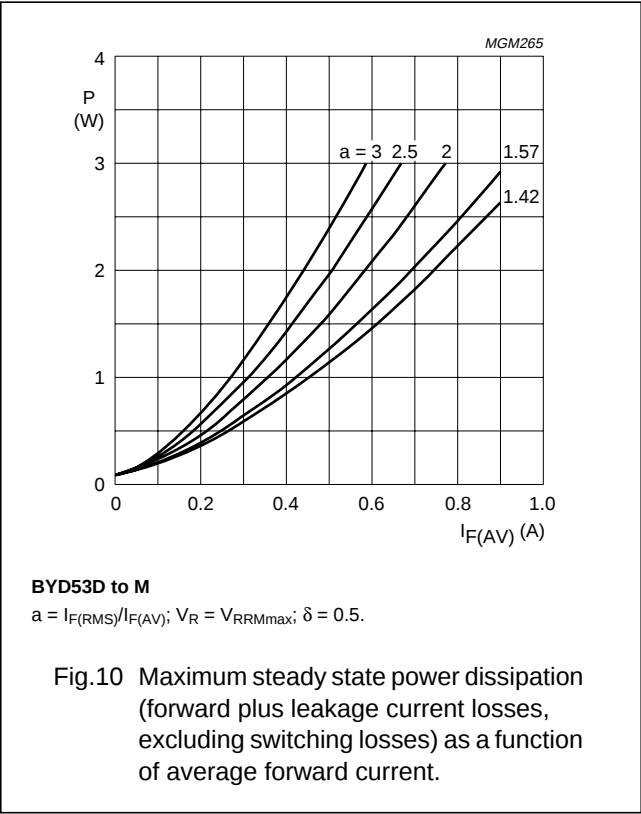
$T_{amb} = 65^\circ\text{C}$; $R_{th\ j-a} = 120\text{ K/W}$.

V_{RRMmax} during $1 - \delta$; curves include derating for $T_{j\ max}$ at $V_{RRM} = 1400\text{ V}$.

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

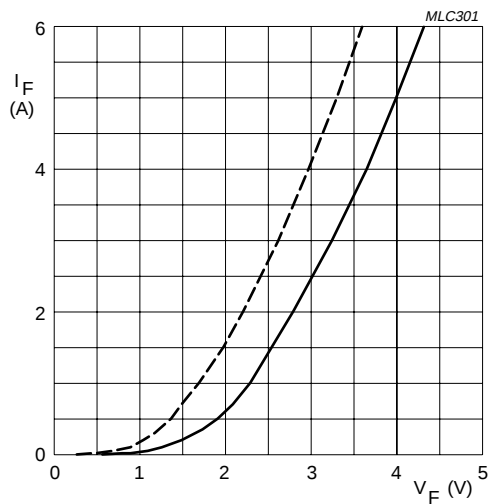
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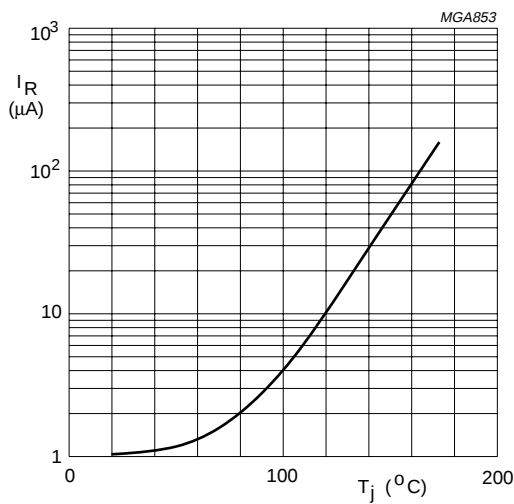
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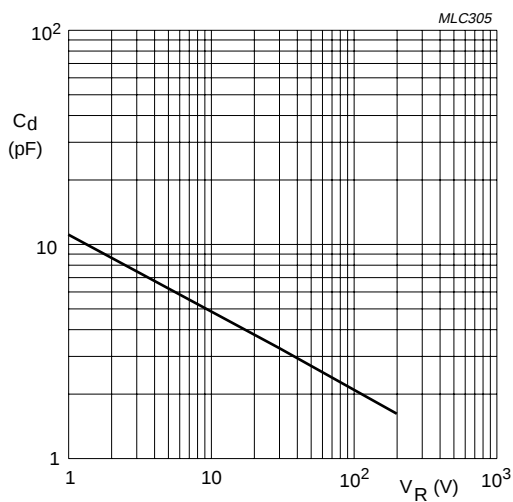
BYD53U and V
Dotted line: $T_j = 175^\circ\text{C}$.
Solid line: $T_j = 25^\circ\text{C}$.

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



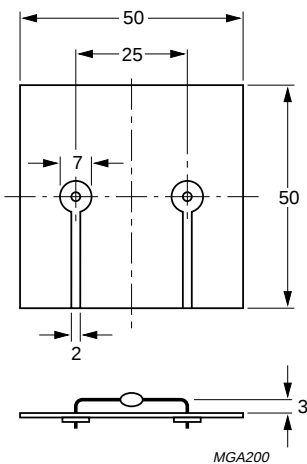
$V_R = V_{RRMmax}$.

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



$f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$.

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

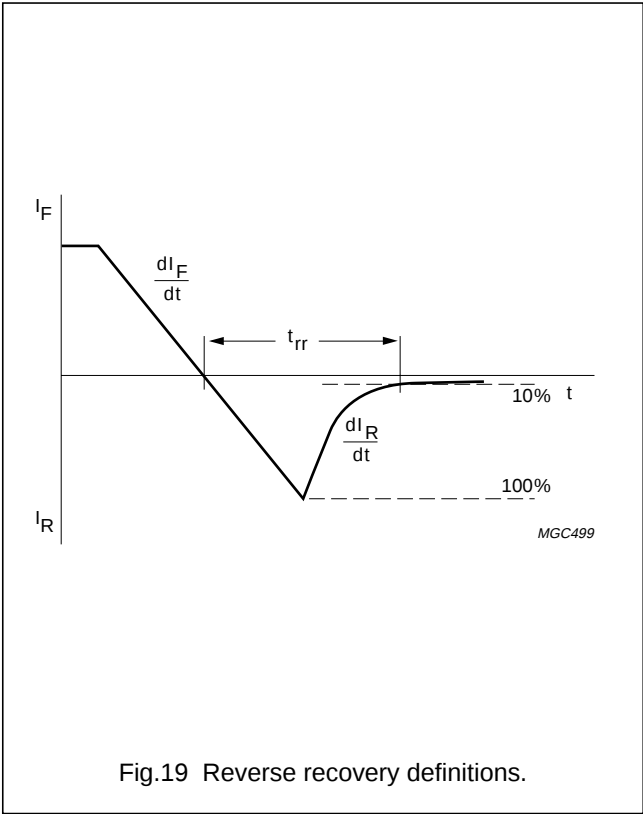
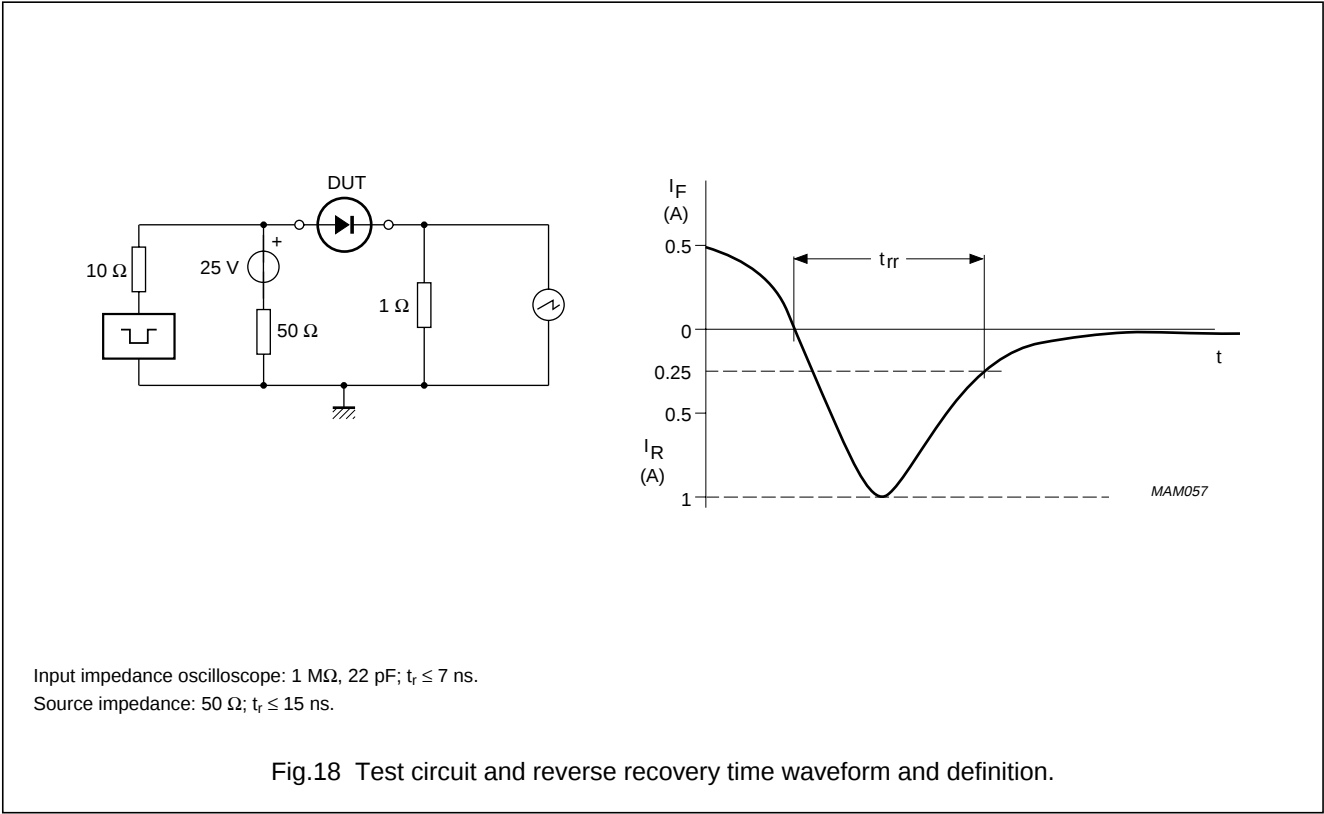


Dimensions in mm.

Fig.17 Device mounted on a printed-circuit board.

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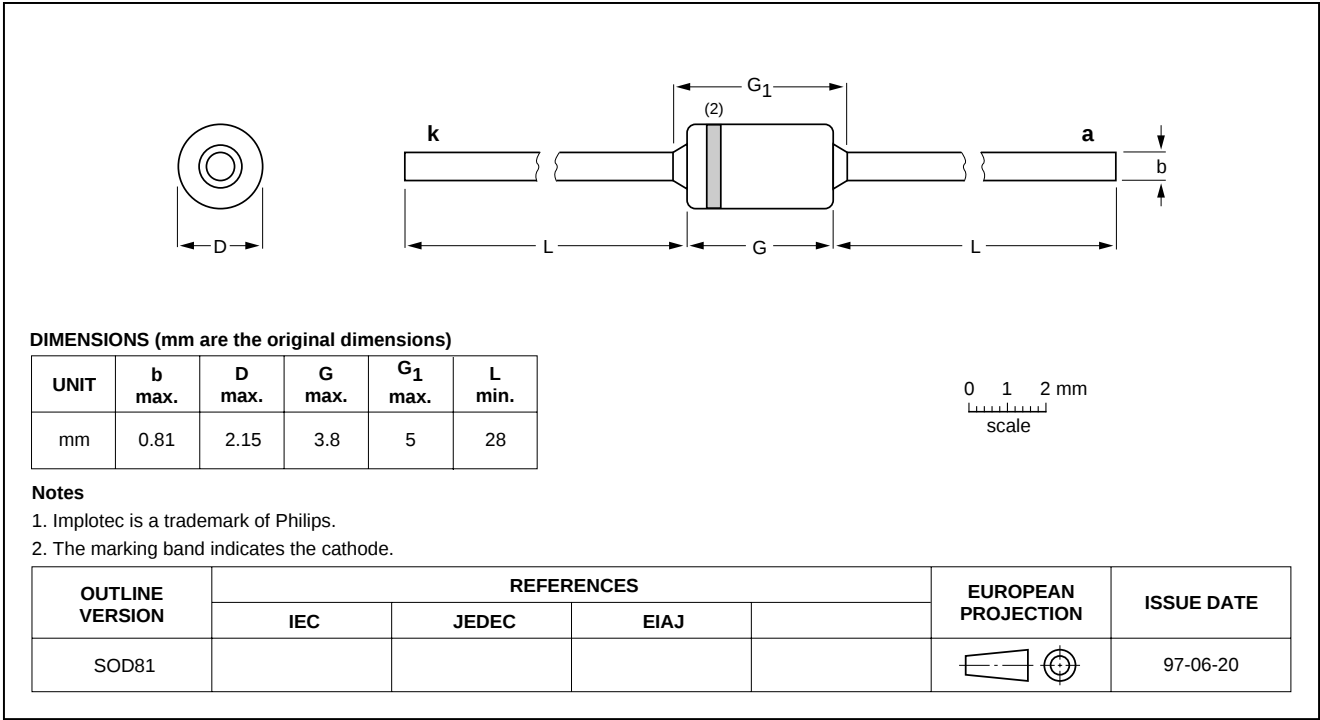
Fast soft-recovery controlled
avalanche rectifiers

BYD53 series

PACKAGE OUTLINE

Hermetically sealed glass package;
ImplotecTM(1) technology; axial leaded; 2 leads

SOD81



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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