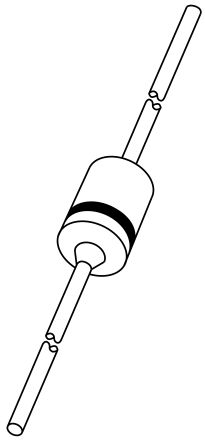
DATA SHEET



BYD31 series
Fast soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of 1996 Jun 05
File under Discrete Semiconductors, SC01

1996 Sep 18

Philips Semiconductors

PHILIPS

Fast soft-recovery controlled avalanche rectifiers

BYD31 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 package through Implotec™(1) technology. This package is hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.

(1) Implotec is a trademark of Philips.

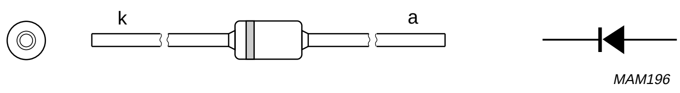


Fig.1 Simplified outline (SOD91) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYD31D		–	200	V
	BYD31G		–	400	V
	BYD31J		–	600	V
	BYD31K		–	800	V
	BYD31M		–	1000	V
V_R	continuous reverse voltage				
	BYD31D		–	200	V
	BYD31G		–	400	V
	BYD31J		–	600	V
	BYD31K		–	800	V
	BYD31M		–	1000	V
$I_{F(AV)}$	average forward current	T_{tp} = 55 °C; lead length = 10 mm; see Fig.2; averaged over any 20 ms period; see also Fig.6	–	440	mA
		T_{amb} = 60 °C; PCB mounting (see Fig.11); see Fig.3; averaged over any 20 ms period; see also Fig.6	–	320	mA
I_{FRM}	repetitive peak forward current	T_{tp} = 55 °C; see Fig.4	–	4	A
		T_{amb} = 60 °C; see Fig.5	–	3	A
I_{FSM}	non-repetitive peak forward current	t = 10 ms half sine wave; $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	–	5	A

FOR REPLACEMENT TYPE SEE INDEX SECTION OF HANDBOOK SC01

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
P_{RSM}	non-repetitive peak reverse power dissipation	t = 20 µs half sine wave; $T_j = T_{j\,max}$ prior to surge			
	BYD31D to J		–	100	W
	BYD31K and M		–	50	W
T_{stg}	storage temperature		–65	+175	°C
T_j	junction temperature	see Fig.7	–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 = 0.5 A; $T_j = T_{j\,max}$; see Fig.8	–	–	1.15	V
		I_F = 0.5 A; see Fig.8	–	–	1.35	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	I_R = 0.1 mA				
	BYD31D		300	–	–	V
	BYD31G		500	–	–	V
	BYD31J		700	–	–	V
	BYD31K		900	–	–	V
	BYD31M		1100	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Fig.9	–	–	1	µA
		$V_R = V_{RRMmax}$; T_j = 165 °C; see Fig.9	–	–	75	µA
t_{rr}	reverse recovery time	when switched from I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25A see Fig.12				
	BYD31D to J		–	–	250	ns
	BYD31K and M		–	–	300	ns
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; see Fig.10	–	9	–	pF
$\left\lvert \frac{dI_R}{dt} \right\rvert$	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.13				
	BYD31D to J		–	–	6	A/µs
	BYD31K and M		–	–	5	A/µs

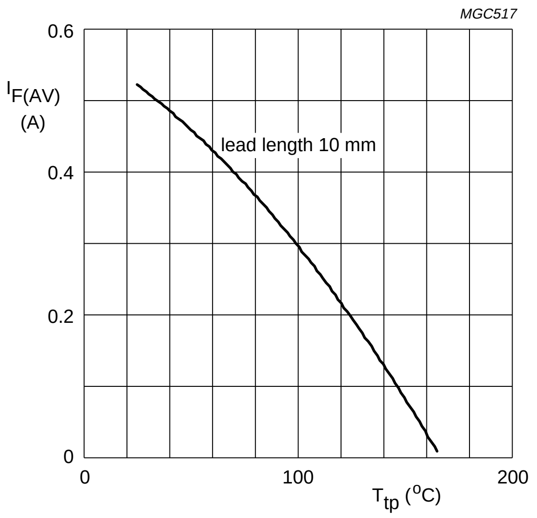
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	180	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	250	K/W

Note

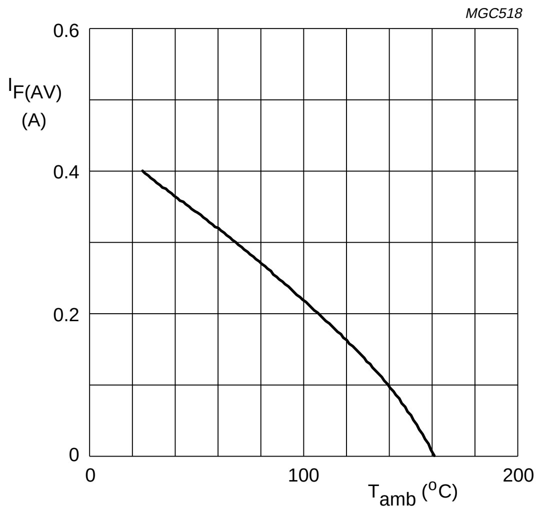
1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer ≥40 µm, see Fig.11. For more information please refer to the *‘General Part of Handbook SC01’*.

GRAPHICAL DATA



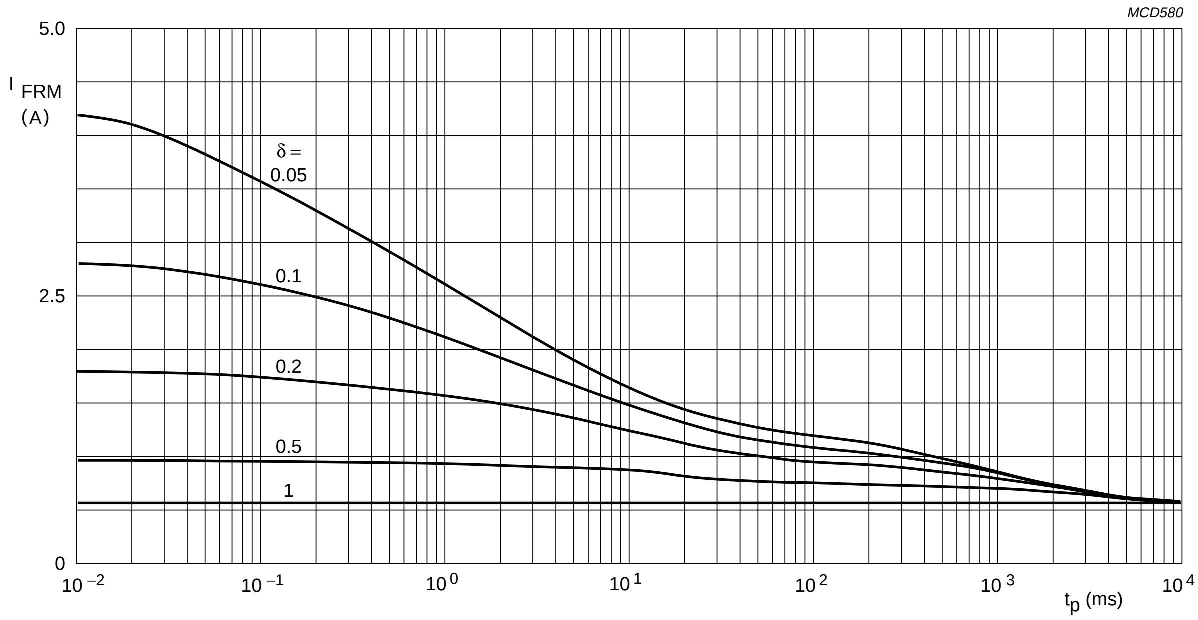
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



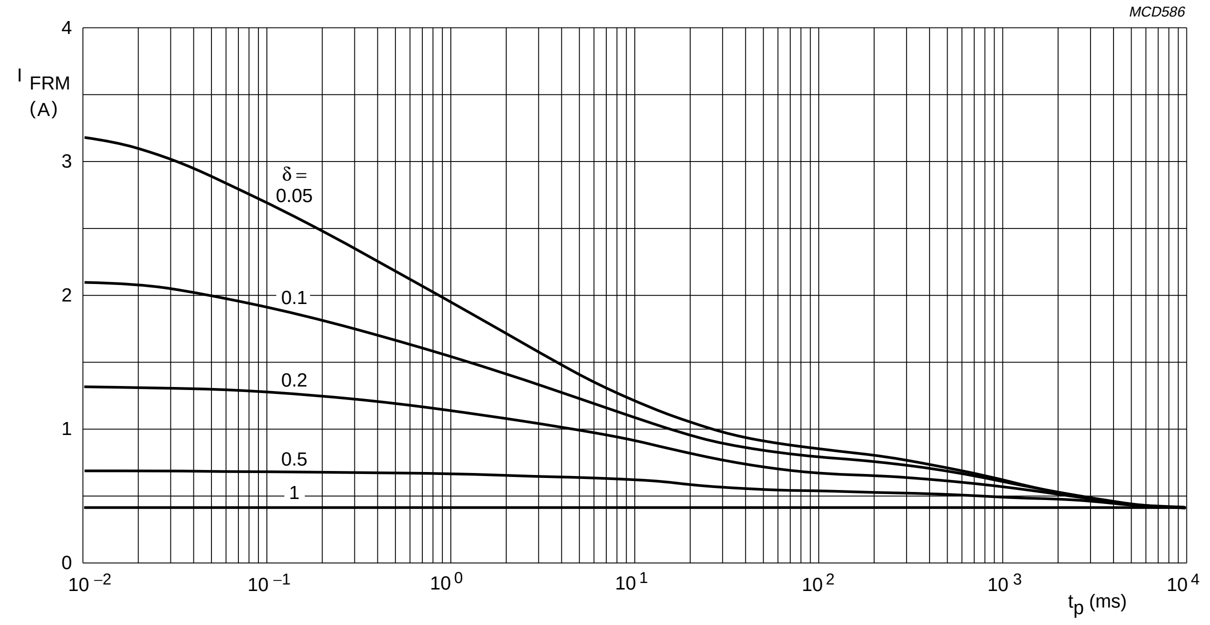
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Device mounted as shown in Fig.11.
Switched mode application.

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



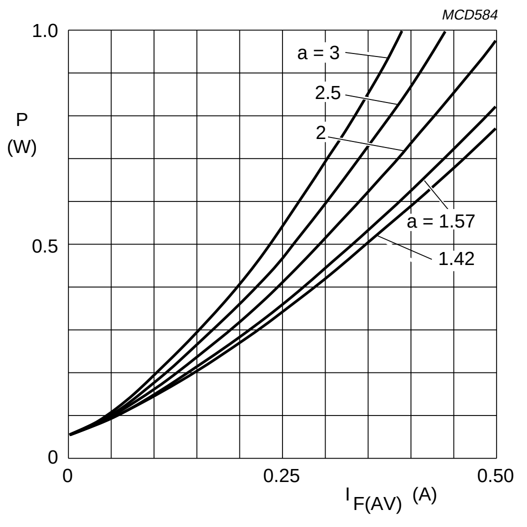
T_{tp} = 55 °C; $R_{th\ j\text{-}tp}$ = 180 K/W.
V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 1000 V.

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



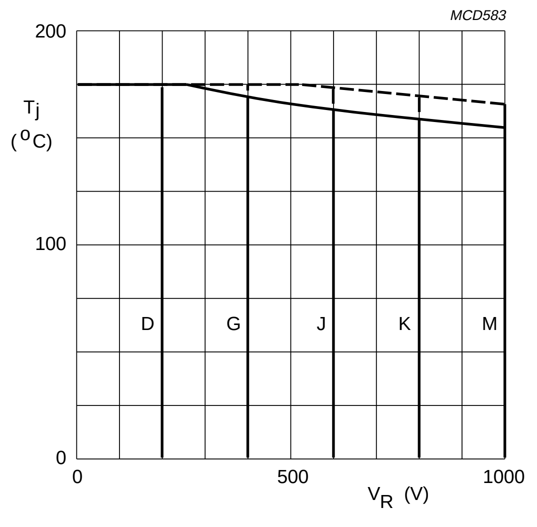
T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 250 K/W.
V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 1000 V.

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



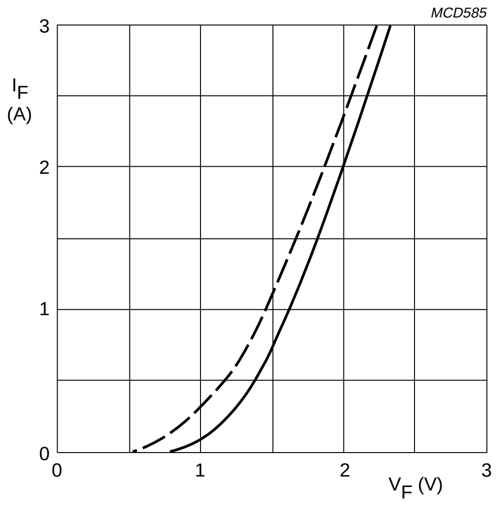
a = $I_{F(RMS)}/I_{F(AV)}$; V_R = V_{RRMmax}; δ = 0.5.

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



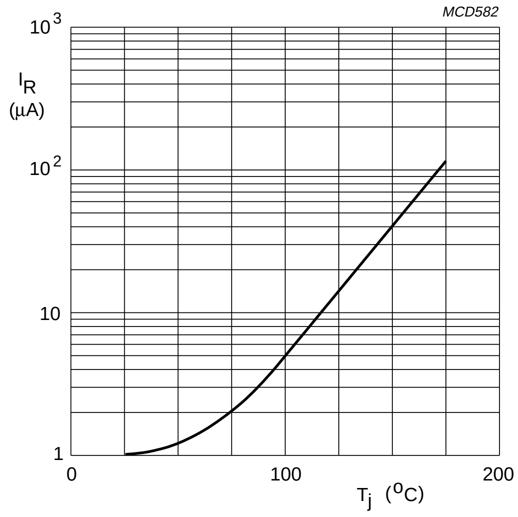
Solid line = V_R.
Dotted line = V_{RRM}; δ = 0.5.

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



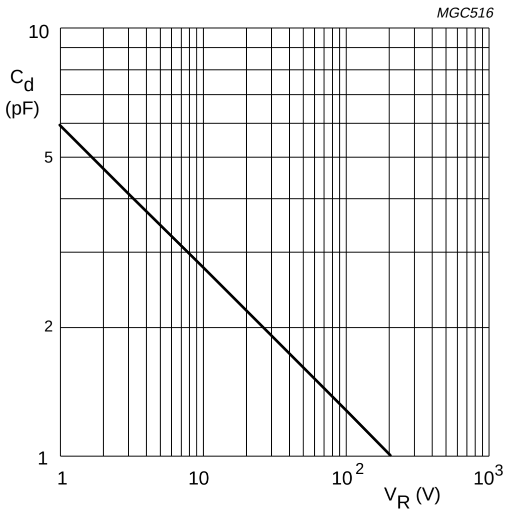
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

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



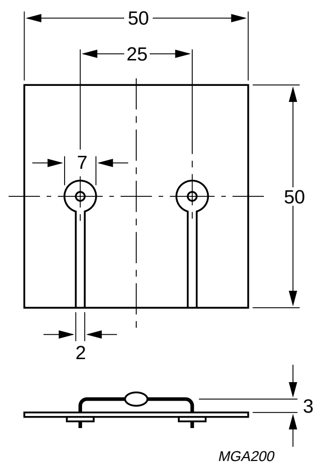
$V_R = V_{RRMmax}$.

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



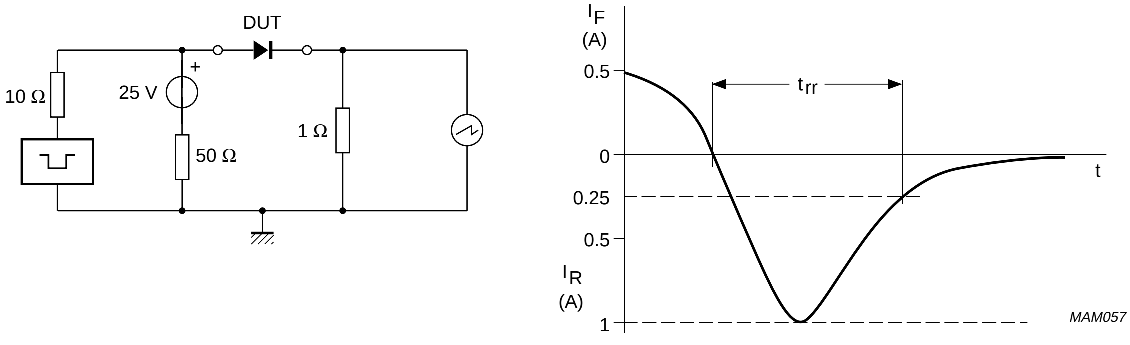
f = 1 MHz; T_j = 25 °C.

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



Dimensions in mm.

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



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

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

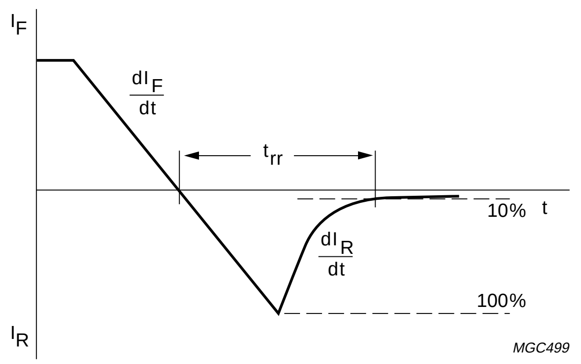


Fig.13 Reverse recovery definitions.

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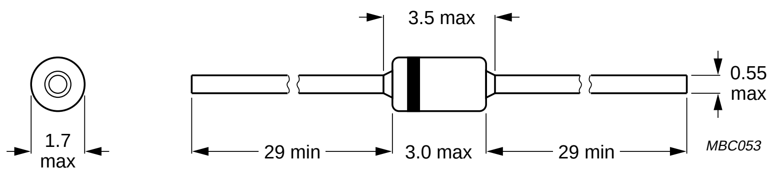
BYD31 series

PACKAGE OUTLINE



Dimensions in mm.
The marking band indicates the cathode.

Fig.14 SOD91.

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.