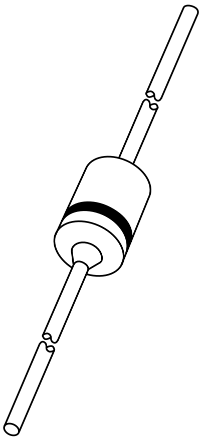
DATA SHEET



BYD71 series
Ultra fast low-loss controlled avalanche rectifiers

Product specification
Supersedes data of 1996 May 24

1996 Sep 19

Philips Semiconductors

PHILIPS

Ultra fast low-loss controlled avalanche rectifiers

BYD71 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 SOD91 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.

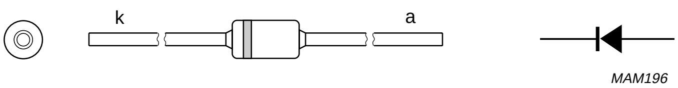


Fig.1 Simplified outline (SOD91) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYD71A		–	50	V
	BYD71B		–	100	V
	BYD71C		–	150	V
	BYD71D		–	200	V
	BYD71E		–	250	V
	BYD71F		–	300	V
	BYD71G		–	400	V
V_R	continuous reverse voltage				
	BYD71A		–	50	V
	BYD71B		–	100	V
	BYD71C		–	150	V
	BYD71D		–	200	V
	BYD71E		–	250	V
	BYD71F		–	300	V
	BYD71G		–	400	V
$I_{F(AV)}$	average forward current	T_{tp} = 55 °C; lead length = 10 mm; see Figs 2 and 3; averaged over any 20 ms period; see also Figs 10 and 11			
	BYD71A to D		–	0.56	A
	BYD71E to G		–	0.54	A
$I_{F(AV)}$	average forward current	T_{amb} = 60 °C; PCB mounting (see Fig.16); see Figs 4 and 5; averaged over any 20 ms period; see also Figs 10 and 11			
	BYD71A to D		–	0.43	A
	BYD71E to G		–	0.41	A

Ultra fast low-loss controlled avalanche rectifiers

BYD71 series

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FRM}	repetitive peak forward current	T_{tp} = 55 °C; see Figs 6 and 7			
	BYD71A to D		–	4.7	A
	BYD71E to G		–	5.0	A
I_{FRM}	repetitive peak forward current	T_{amb} = 60 °C; see Figs 8 and 9			
	BYD71A to D		–	3.7	A
	BYD71E to G		–	3.9	A
I_{FSM}	non-repetitive peak forward current	t = 10 ms half sine wave; $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	–	7	A
P_{RSM}	non-repetitive peak reverse power dissipation	t = 20 µs half sine wave; $T_j = T_{j\,max}$ prior to surge			
	BYD71A to D		–	250	W
	BYD71E to G		–	150	W
T_{stg}	storage temperature		–65	+175	°C
T_j	junction temperature		–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 Figs 12 and 13				
	BYD71A to D		–	–	0.84	V
	BYD71E to G		–	–	0.90	V
V_F	forward voltage	I_F = 0.5 A; see Figs 12 and 13				
	BYD71A to D		–	–	1.05	V
	BYD71E to G		–	–	1.11	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	I_R = 0.1 mA				
	BYD71A		55	–	–	V
	BYD71B		110	–	–	V
	BYD71C		165	–	–	V
	BYD71D		220	–	–	V
	BYD71E		275	–	–	V
	BYD71F		330	–	–	V
	BYD71G		440	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Fig 14	–	–	1	µA
		$V_R = V_{RRMmax}$; T_j = 165 °C; see Fig 14	–	–	75	µA
t_{rr}	reverse recovery time	when switched from I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25 A see Fig 18				
	BYD71A to D		–	–	25	ns
	BYD71E to G		–	–	50	ns

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; see Fig.15				
	BYD71A to D		–	25	–	pF
	BYD71E to G		–	20	–	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.17				
	BYD71A to D		–	–	4	A/µs
	BYD71E to G		–	–	5	A/µs

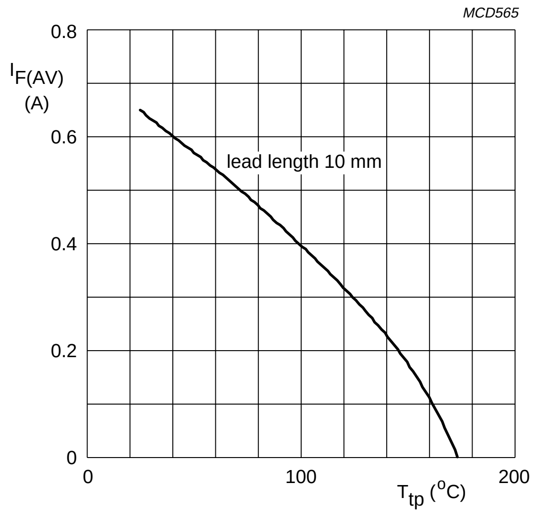
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	180	K/W
$R_{th\ j-a}$	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.16. For more information please refer to the *“General Part of associated Handbook”*.

GRAPHICAL DATA

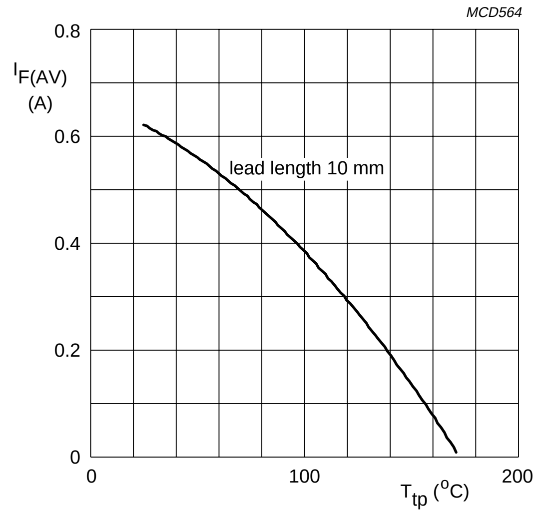


BYD71A to D

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).

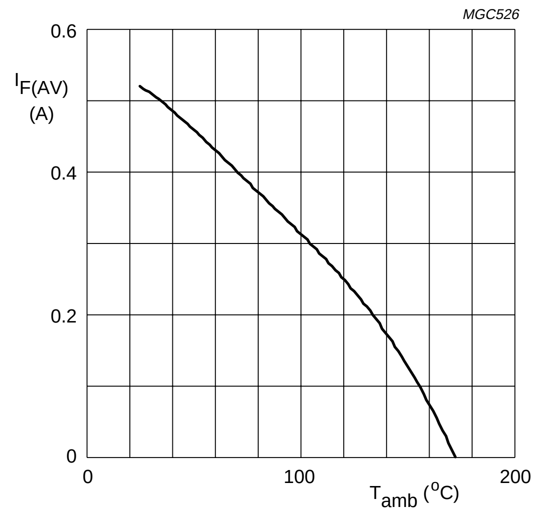


BYD71E to G

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).



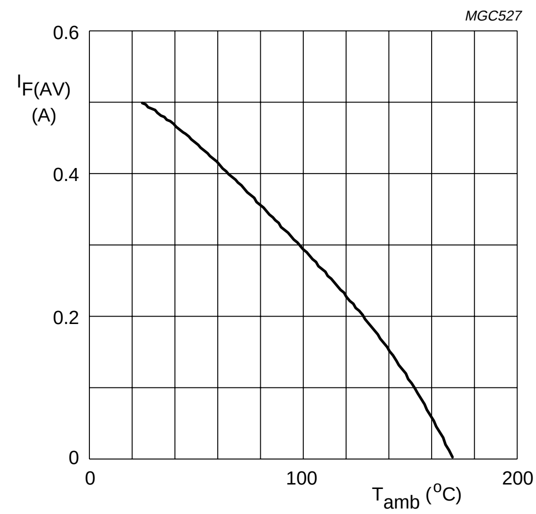
BYD71A to D

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

Device mounted as shown in Fig.16.

Switched mode application.

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



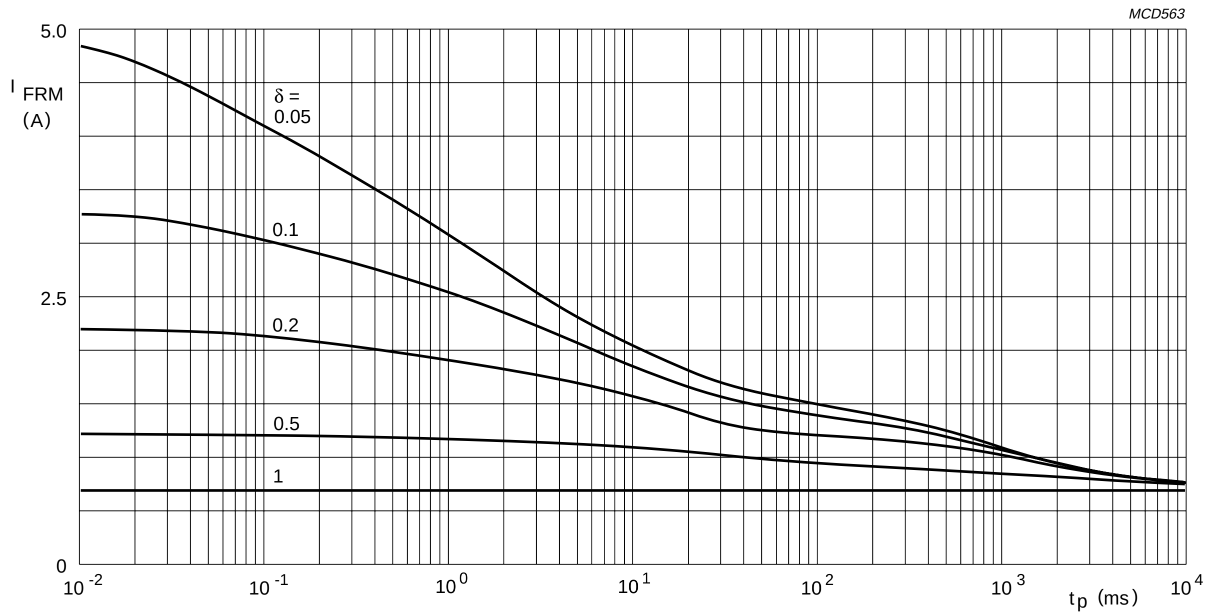
BYD71E to G

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

Device mounted as shown in Fig.16.

Switched mode application.

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

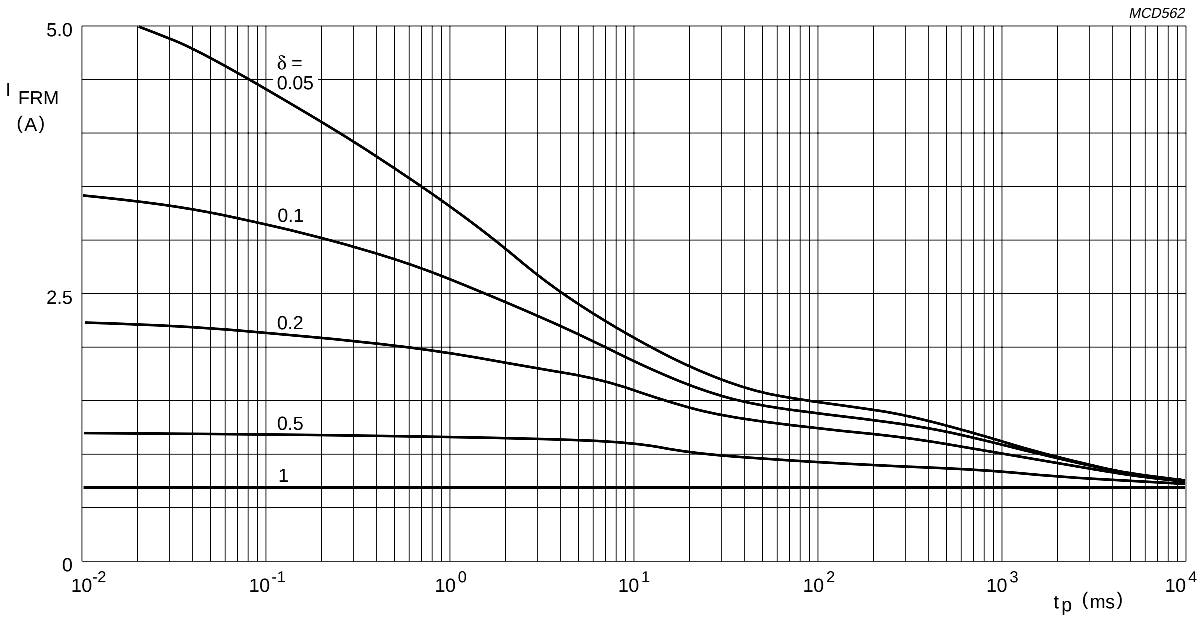


BYD71A to D

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} = 200 V.

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

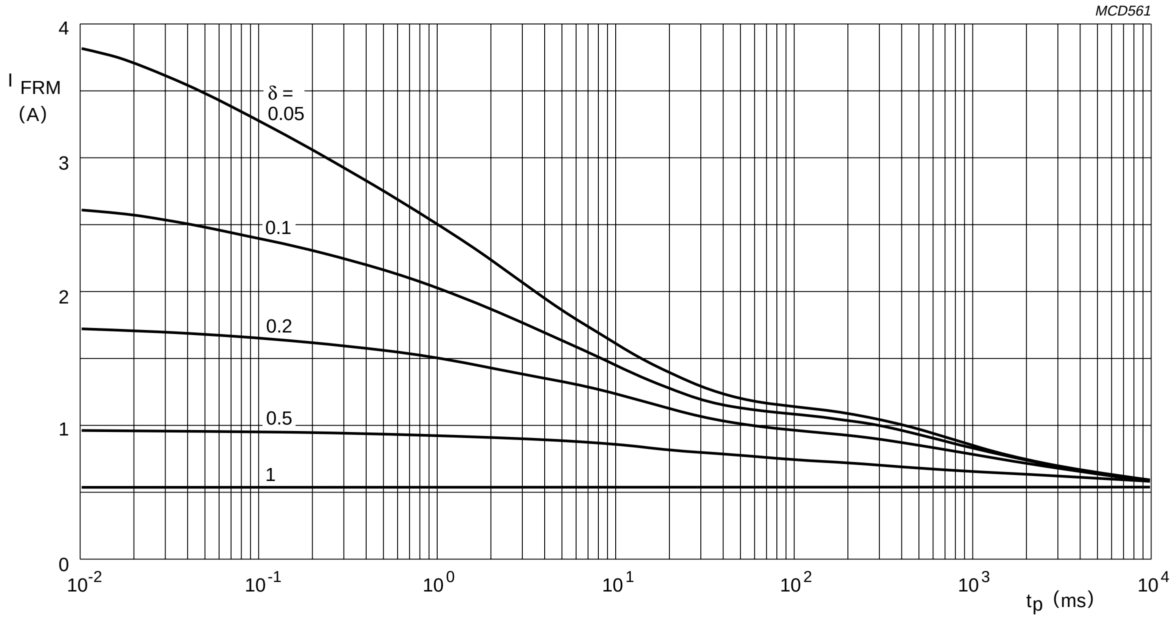


BYD71E to G

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} = 400 V.

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

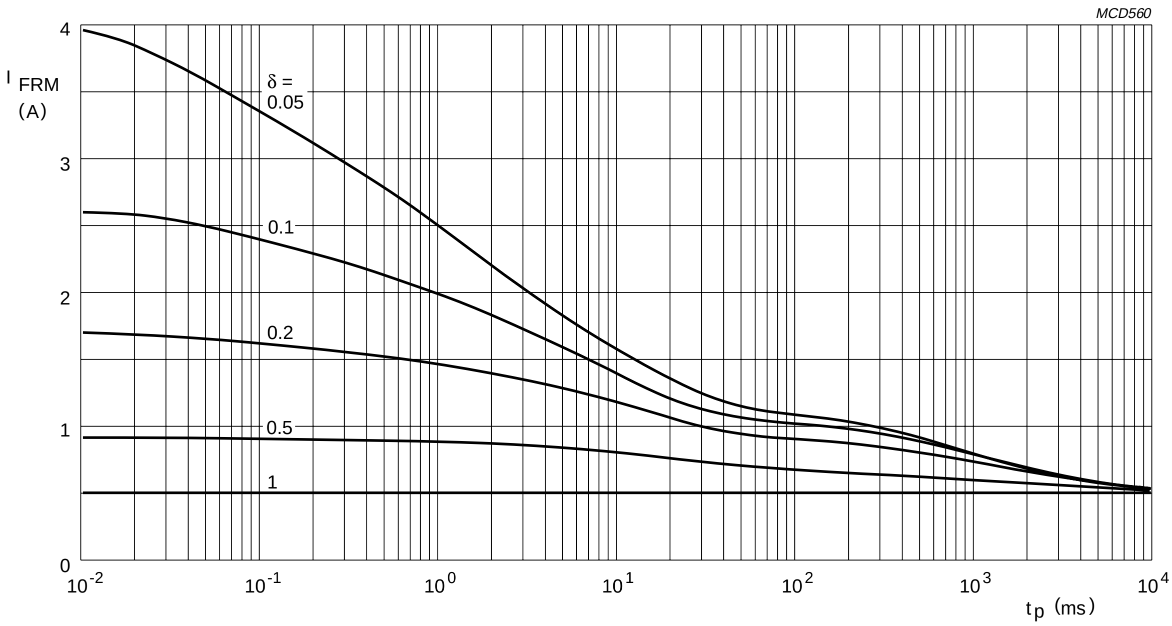


BYD71A to D

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} = 200 V.

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

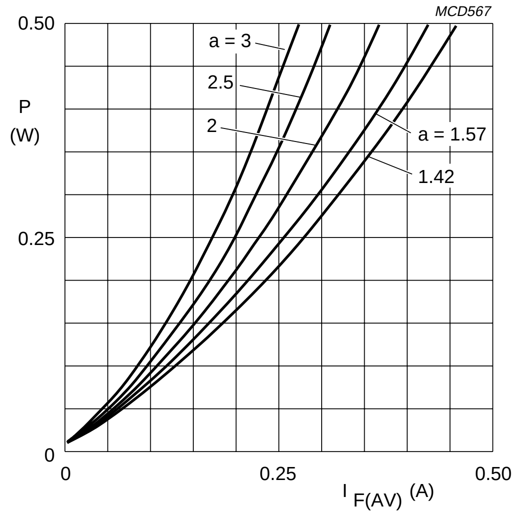


BYD71E to G

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} = 400 V.

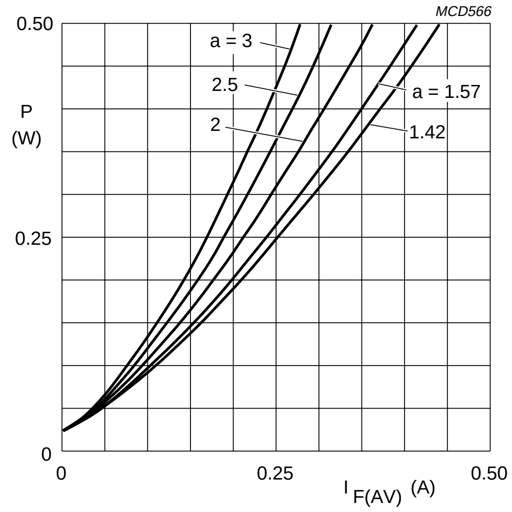
Fig.9 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



BYD71A to D

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

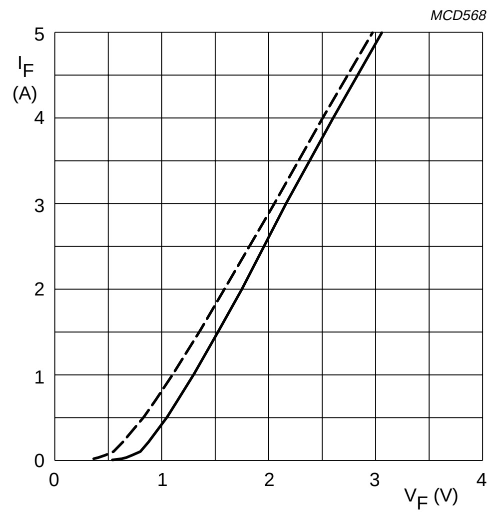
Fig.10 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYD71E to G

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.

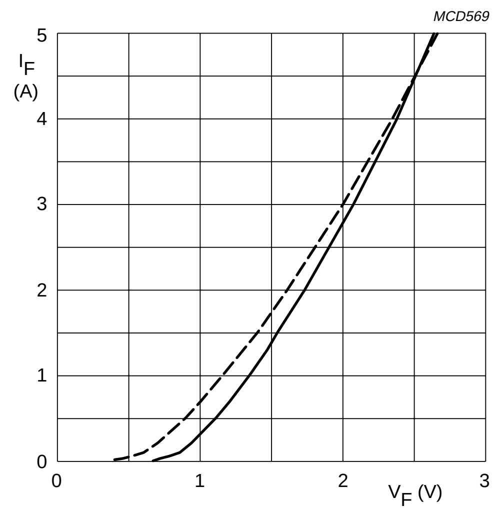


BYD71A to D

Dotted line: T_j = 175 °C.

Solid line: T_j = 25 °C.

Fig.12 Forward current as a function of forward voltage; maximum values.

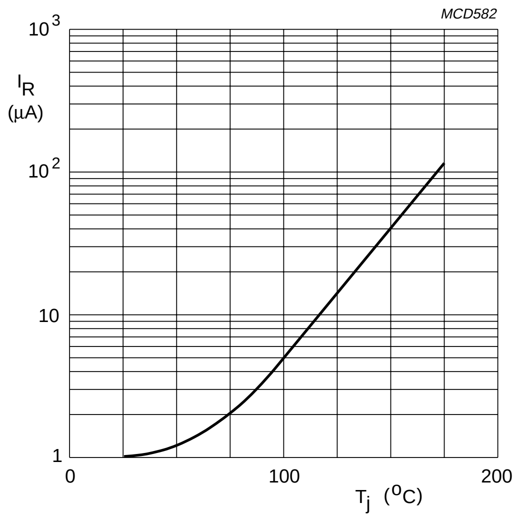


BYD71E to G

Dotted line: T_j = 175 °C.

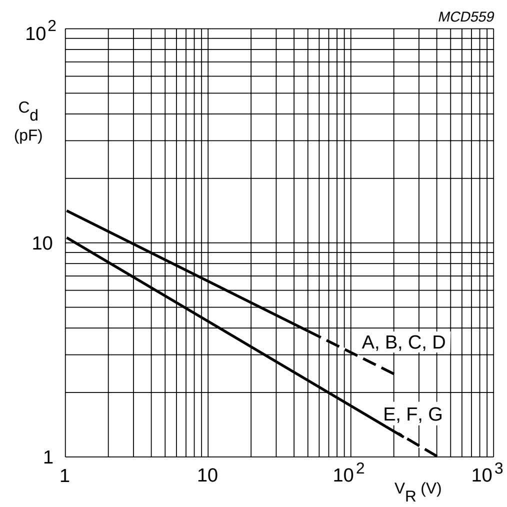
Solid line: T_j = 25 °C.

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



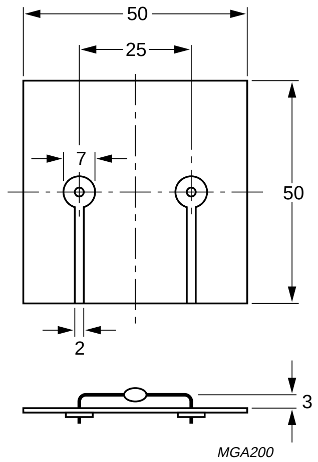
$V_R = V_{RRMmax}$.

Fig.14 Reverse current as a function of junction temperature; maximum values.



f = 1 MHz; T_j = 25 °C.

Fig.15 Diode capacitance as a function of reverse voltage; typical values.



Dimensions in mm.

Fig.16 Device mounted on a printed-circuit board.

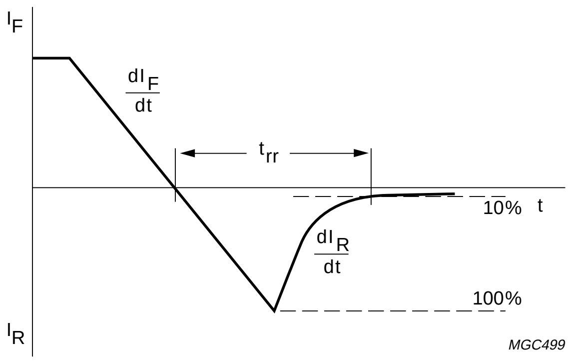
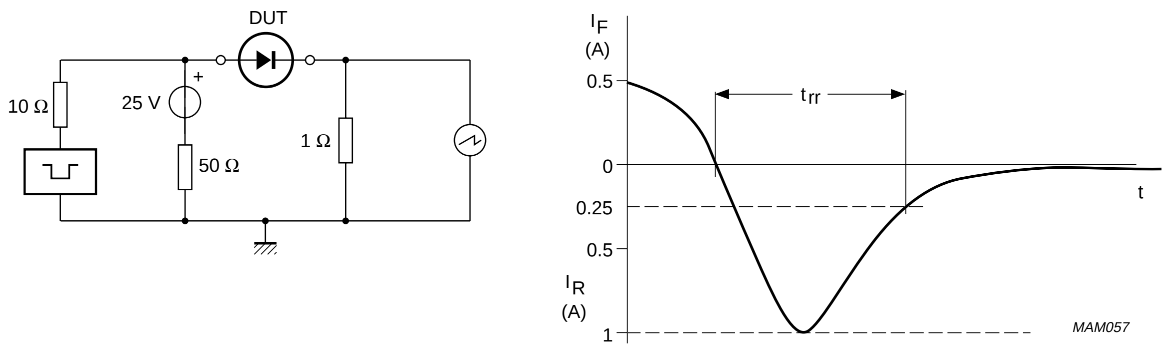


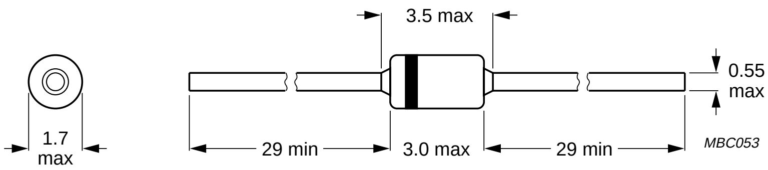
Fig.17 Reverse recovery definitions.



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

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

PACKAGE OUTLINE



Dimensions in mm.
The marking band indicates the cathode.

Fig.19 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.