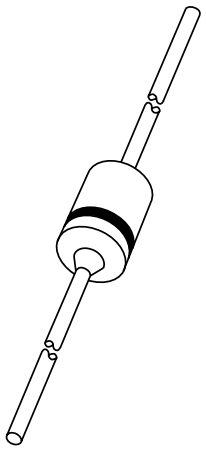
DATA SHEET



BYD43 series
Fast soft-recovery rectifiers

Product specification
Supersedes data of February 1995

1996 Jun 05

Philips
Semiconductors

PHILIPS

Fast soft-recovery rectifiers BYD43 series

FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- 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.

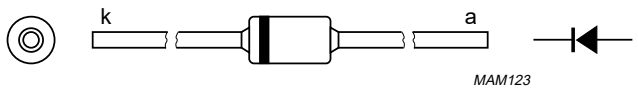


Fig.1 Simplified outline (SOD81) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RSM}	non-repetitive peak reverse voltage				
	BYD43U		–	1300	V
	BYD43V		–	1500	V
	BYD43-16		–	1700	V
	BYD43-18		–	1900	V
	BYD43-20		–	2100	V
V_{RRM}	repetitive peak reverse voltage				
	BYD43U		–	1200	V
	BYD43V		–	1400	V
	BYD43-16		–	1600	V
	BYD43-18		–	1800	V
	BYD43-20		–	2000	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			
	BYD43U and V		–	1.20	A
	BYD43-16 to 20		–	0.68	A
$I_{F(AV)}$	average forward current	T_{amb} = 65 °C; PCB mounting (see Fig.20); see Figs 4 and 5; averaged over any 20 ms period; see also Figs 10 and 11			
	BYD43U and V		–	0.65	A
	BYD43-16 to 20		–	0.30	A
I_{FRM}	repetitive peak forward current	T_{tp} = 55 °C; see Figs 6 and 7			
	BYD43U and V		–	11	A
	BYD43-16 to 20		–	6	A
I_{FRM}	repetitive peak forward current	T_{amb} = 65 °C; see Figs 8 and 9			
	BYD43U and V		–	6.0	A
	BYD43-16 to 20		–	3.2	A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FSM}	non-repetitive peak forward current	t = 10 ms half sinewave; $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$			
	BYD43U and V		–	6	A
	BYD43-16 to 20		–	6	A
T_{stg}	storage temperature		–65	+175	°C
T_j	junction temperature	see Figs 12 and 13	–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 14 and 15				
	BYD43U and V		–	–	1.20	V
	BYD43-16 to 20		–	–	2.05	V
V_F	forward voltage	I_F = 1 A; see Figs 14 and 15				
	BYD43U and V		–	–	1.5	V
	BYD43-16 to 20		–	–	2.4	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Figs 16 and 17				
	BYD43U and V		–	–	1	μA
	BYD43-16 to 20		–	–	5	μA
I_R	reverse current	$V_R = V_{RRMmax}$				
	BYD43U and V	T_j = 165 °C; see Fig 16	–	–	100	μA
	BYD43-16 to 20	T_j = 125 °C; see Fig 17	–	–	50	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 22				
	BYD43U and V		–	–	250	ns
	BYD43-16 to 20		–	–	300	ns
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; see Figs 18 and 19				
	BYD43U and V		–	20	–	pF
	BYD43-16 to 20		–	15	–	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.21				
	BYD43U and V		–	–	5	A/μs
	BYD43-16 to 20		–	–	5	A/μs

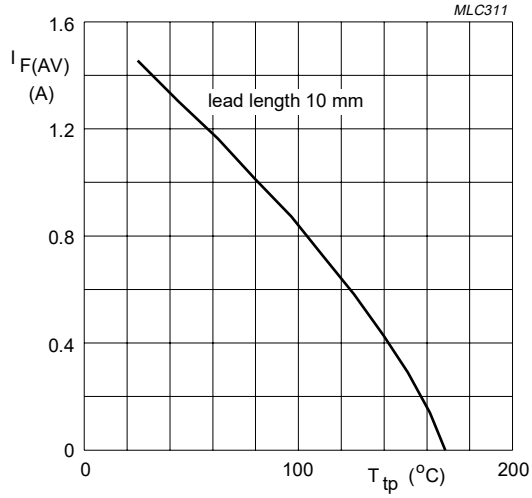
THERMAL CHARACTERISTICS

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

Note

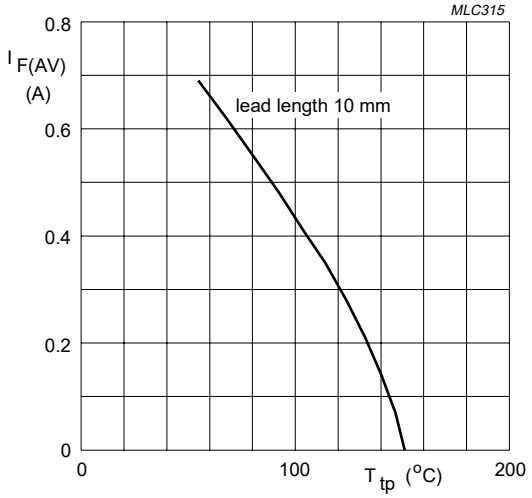
1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer ≥40 μm, see Fig.20. For more information please refer to the *"General Part of associated Handbook"*.

GRAPHICAL DATA



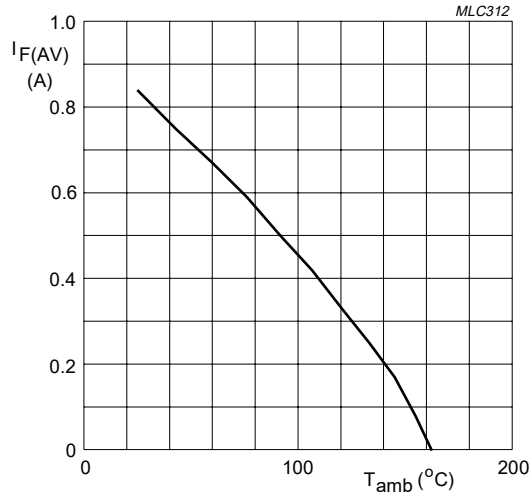
BYD43U and V
a = 1.42; $V_R = V_{RRMmax}$; $\delta = 0.5$.
Switched mode application.

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



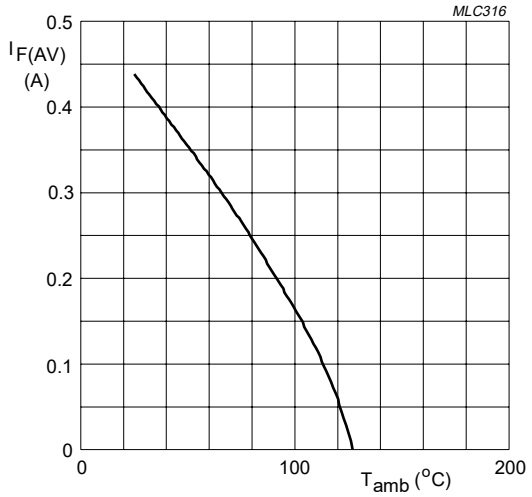
BYD43-16 to 20
a = 1.42; $V_R = V_{RRMmax}$; $\delta = 0.5$.
Switched mode application.

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



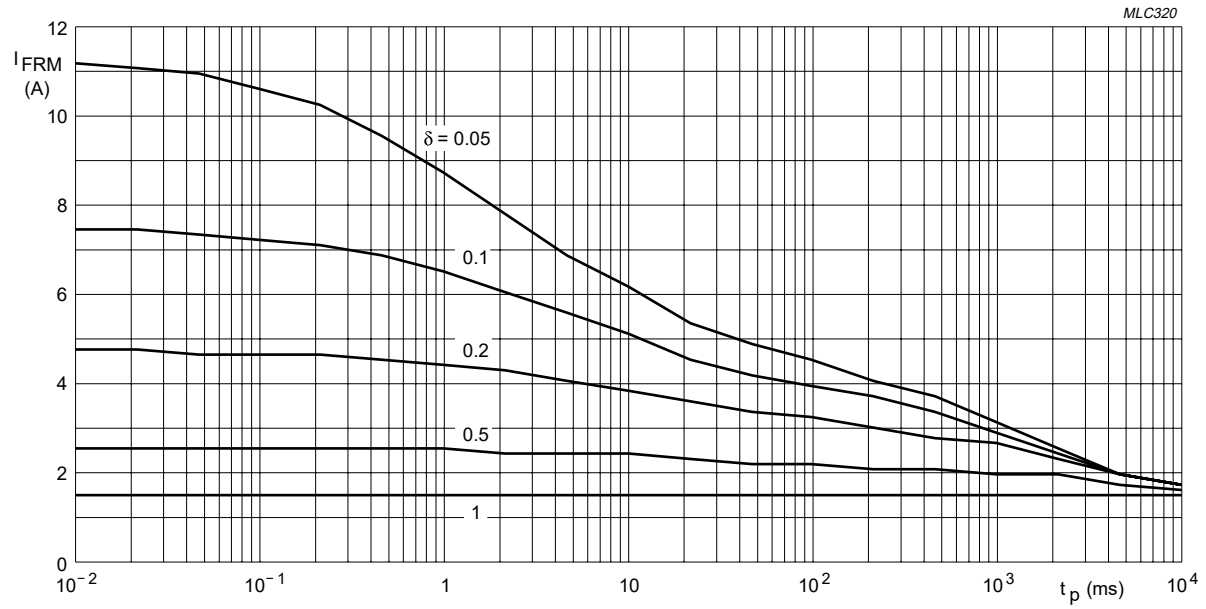
BYD43U and V
a = 1.42; $V_R = V_{RRMmax}$; $\delta = 0.5$.
Device mounted as shown in Fig.20.
Switched mode application.

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



BYD43-16 to 20
a = 1.42; $V_R = V_{RRMmax}$; $\delta = 0.5$.
Device mounted as shown in Fig.20.
Switched mode application.

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

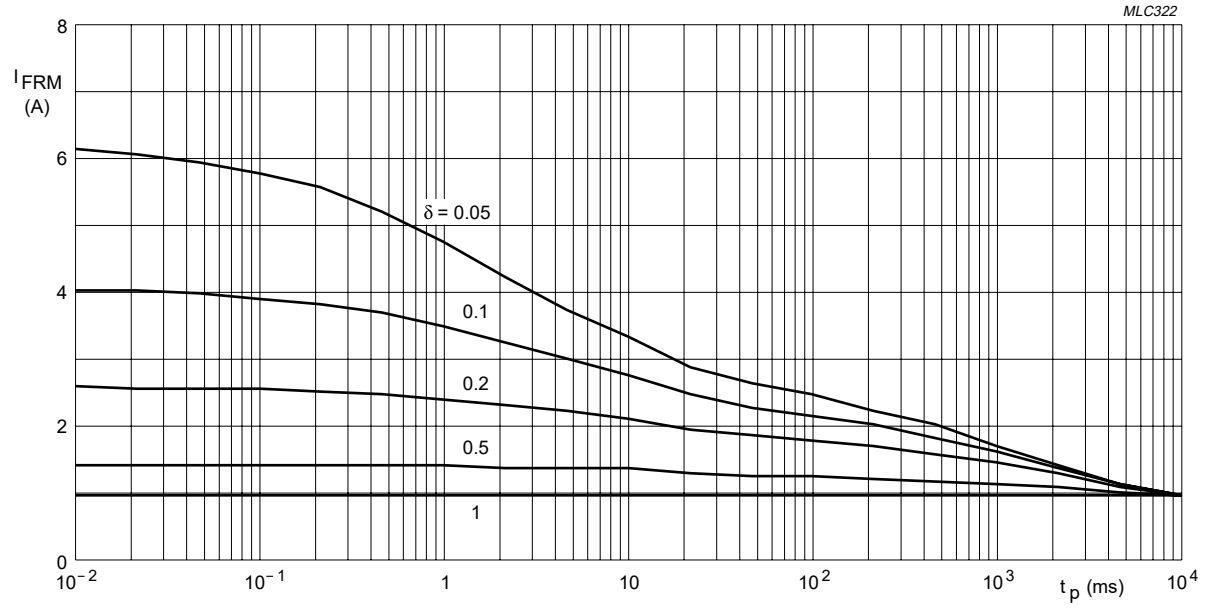


BYD43U and V

T_{tp} = 55 °C; $R_{th\ j\text{-}tp}$ = 60 K/W.

V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 1 400 V.

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

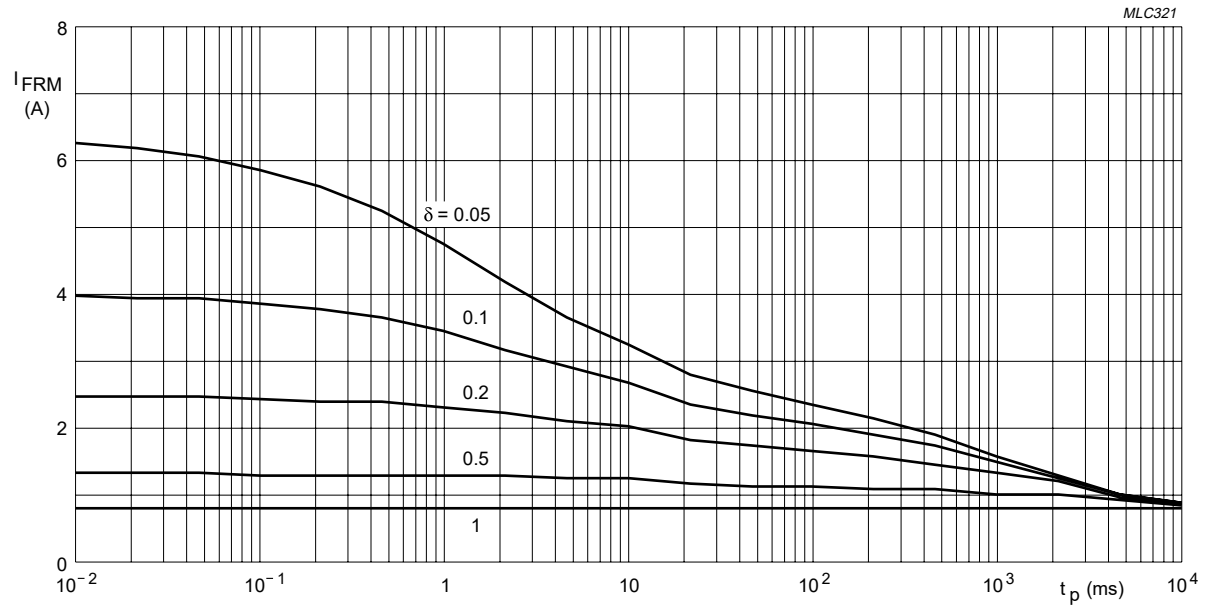


BYD43-16 to 20

T_{tp} = 55 °C; $R_{th\ j\text{-}tp}$ = 60 K/W.

V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 2000 V.

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

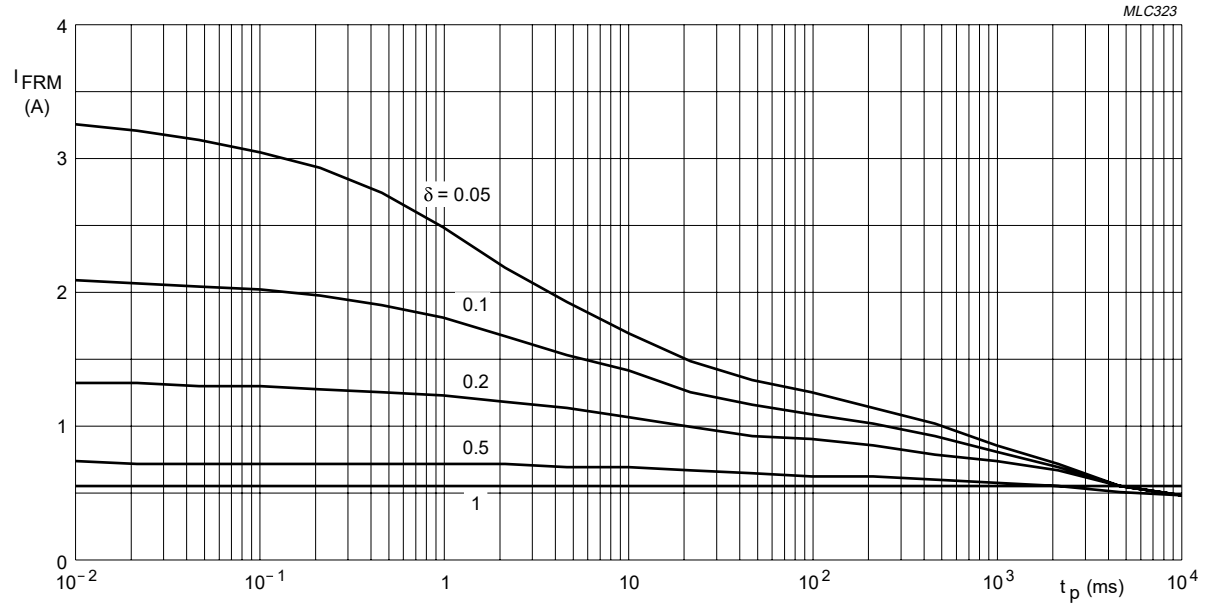


BYD43U and V

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

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

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

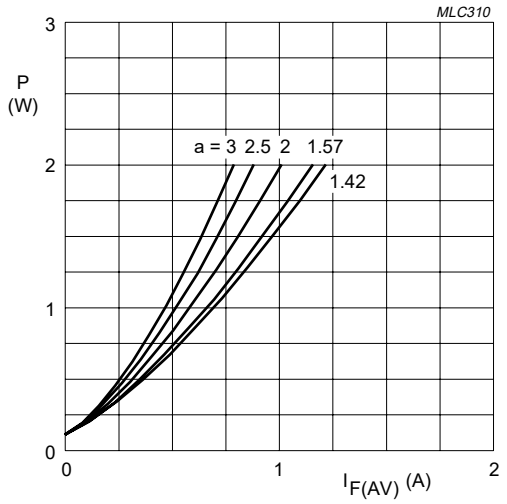


BYD43-16 to 20

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

V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 2000 V.

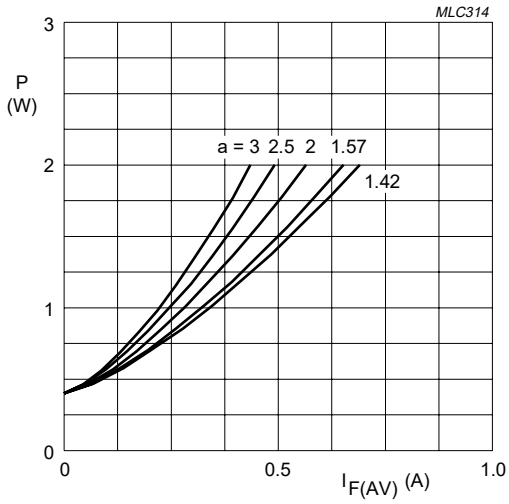
Fig.9 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



BYD43U and V

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

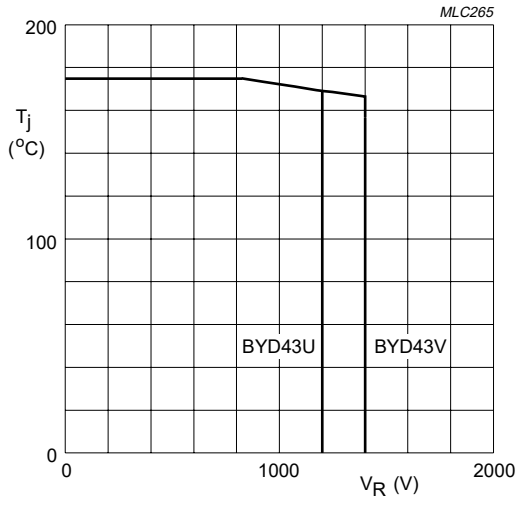
Fig.10 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYD43-16 to 20

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

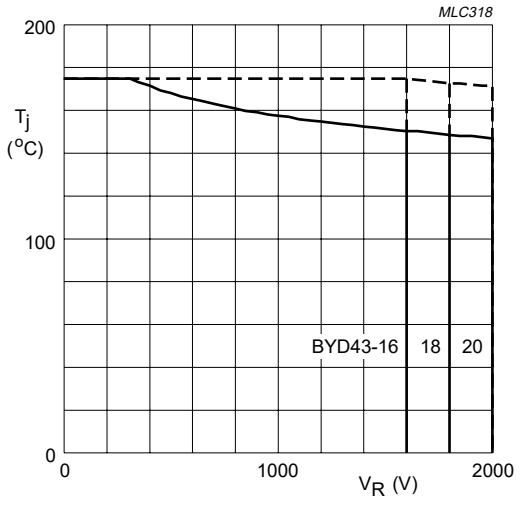
Fig.11 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYD43U and V

V_{RRM}; $\delta = 0.5$.

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

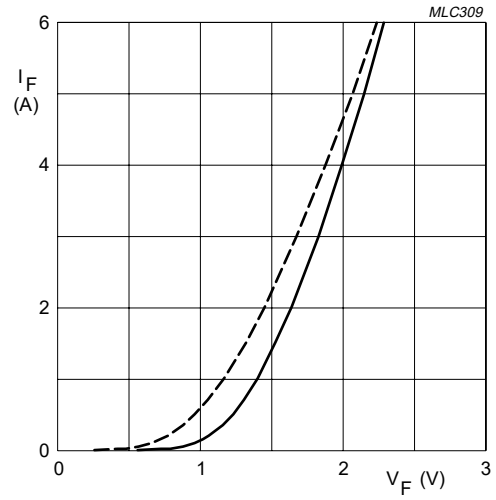


BYD43-16 to 20

Dotted line = V_{RRM}; $\delta = 0.1$.

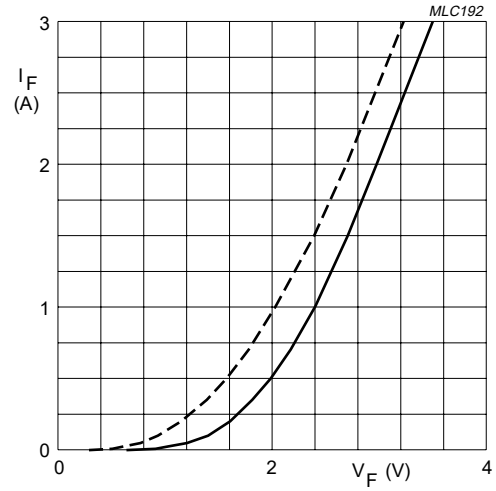
Solid line = V_{RRM}; $\delta = 0.5$.

Fig.13 Maximum permissible junction temperature as a function of reverse voltage.



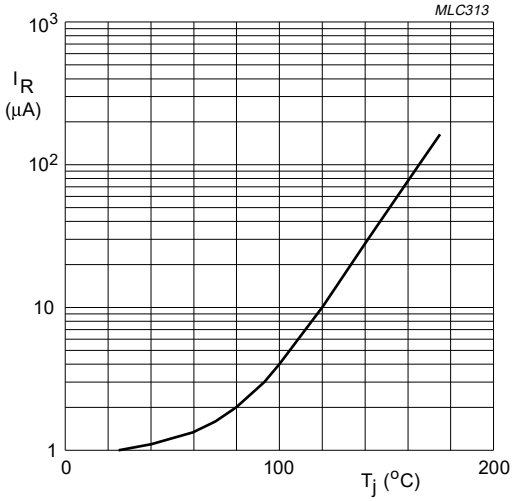
BYD43U and V
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

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



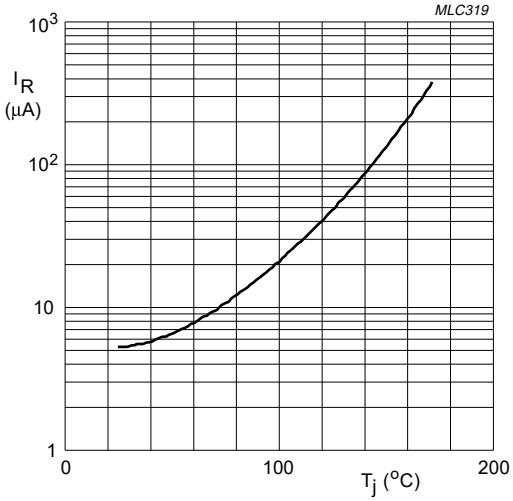
BYD43-16 to 20
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

Fig.15 Forward current as a function of forward voltage; maximum values.



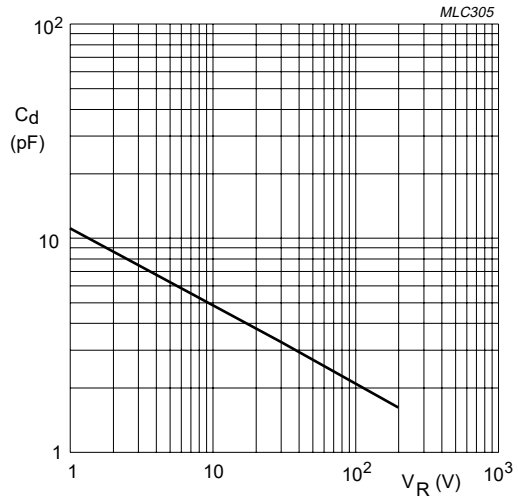
BYD43U and V
$V_R = V_{RRMmax}$.

Fig.16 Reverse current as a function of junction temperature; maximum values.



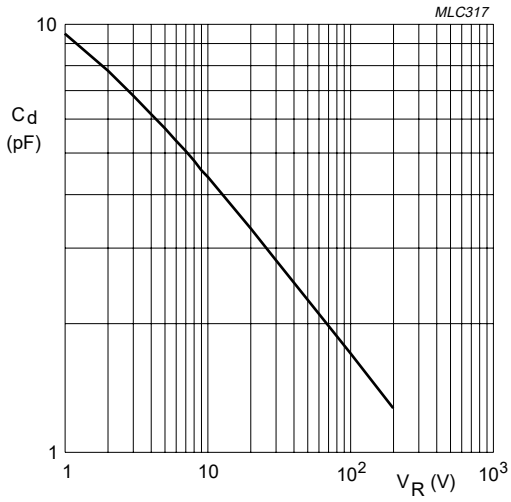
BYD43-16 to 20
$V_R = V_{RRMmax}$.

Fig.17 Reverse current as a function of junction temperature; maximum values.



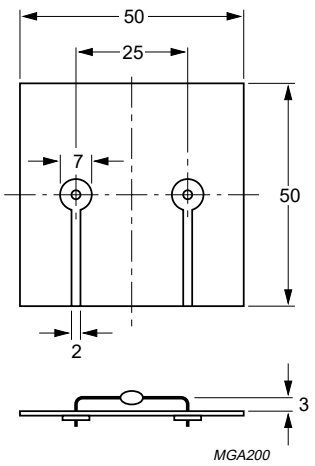
BYD43U and V
f = 1 MHz; T_j = 25 °C.

Fig.18 Diode capacitance as a function of reverse voltage; typical values.



BYD43-16 to 20
f = 1 MHz; T_j = 25 °C.

Fig.19 Diode capacitance as a function of reverse voltage; typical values.



Dimensions in mm.

Fig.20 Device mounted on a printed-circuit board.

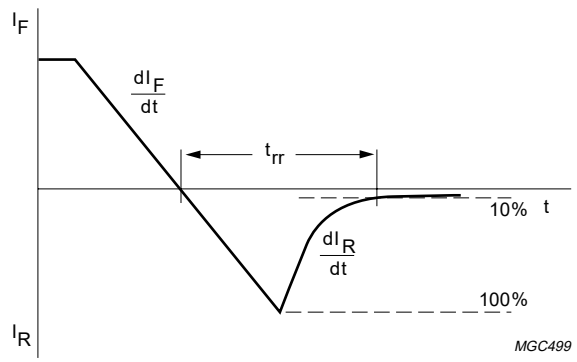
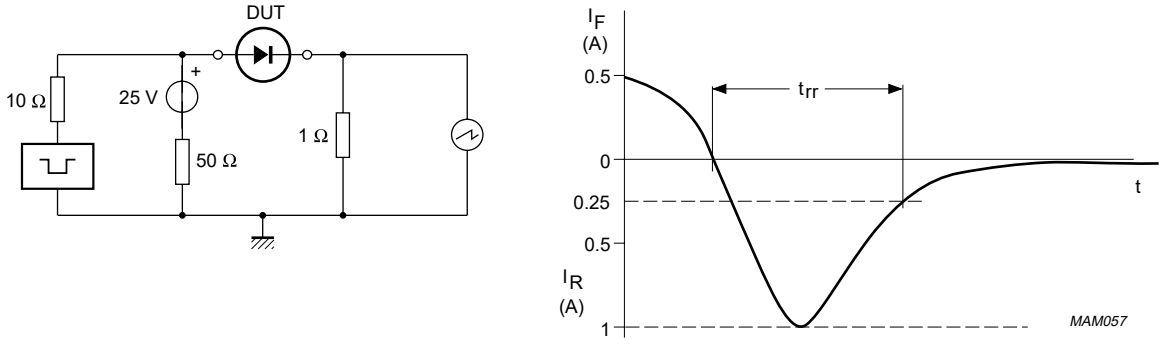


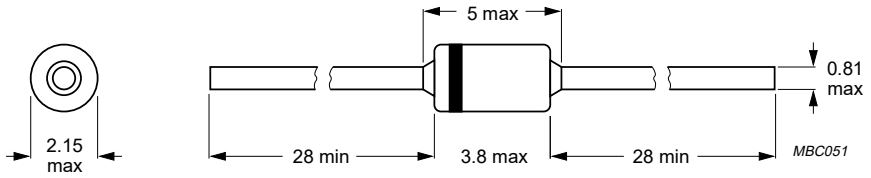
Fig.21 Reverse recovery definitions.



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

Fig.22 Test circuit and reverse recovery time waveform and definition.

PACKAGE OUTLINE



Dimensions in mm.
The marking band indicates the cathode.

Fig.23 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.	

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.