Silicon Diode

BYD43V

1400V/1.2A

DATASHEET

OEM – Philips

Source: Philips Databook 1999

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

Fast soft-recovery rectifiers BYD43 series

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				
	BYD43U and V	I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25 A; see Fig 22	–	–	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
$\left\|\frac{dI_R}{dt}\right\|$	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.21				
	BYD43U and V		–	–	5	A/µs
	BYD43-16 to 20		–	–	5	A/µs

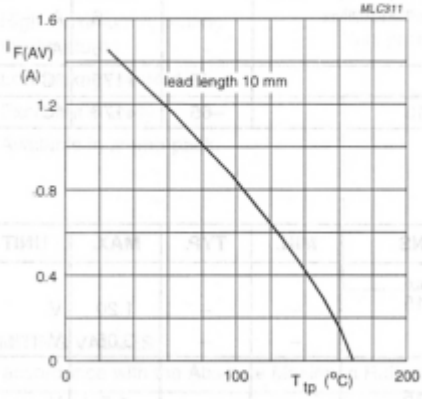
THERMAL CHARACTERISTICS

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

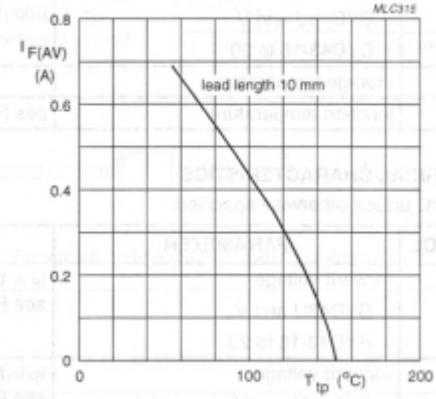
1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer ≥40 µm, see Fig.20. For more information please refer to the *'General Part of Handbook SC01'*.

GRAPHICAL DATA



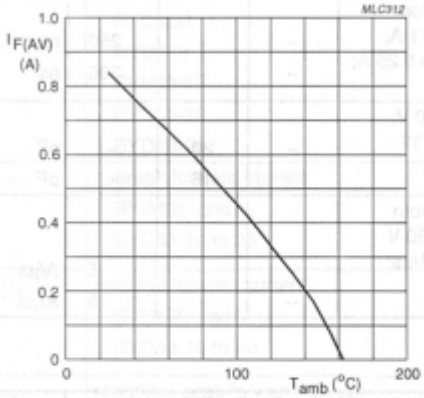
BYD43U and V
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



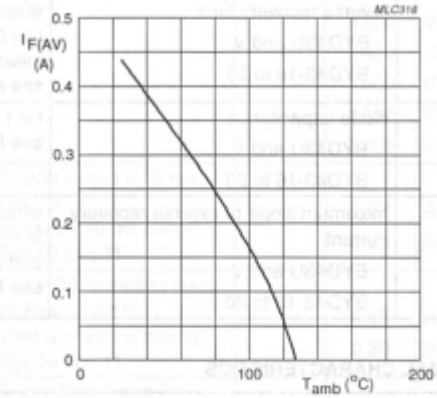
BYD43-16 to 20
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



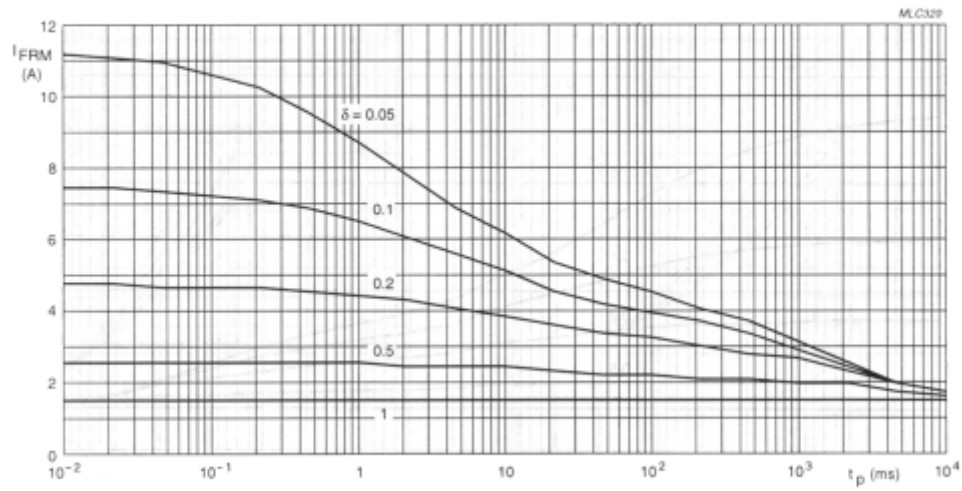
BYD43U and V
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Device mounted as shown in Fig.20.
Switched mode application.

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; $V_R = V_{RRMmax}$; δ = 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).

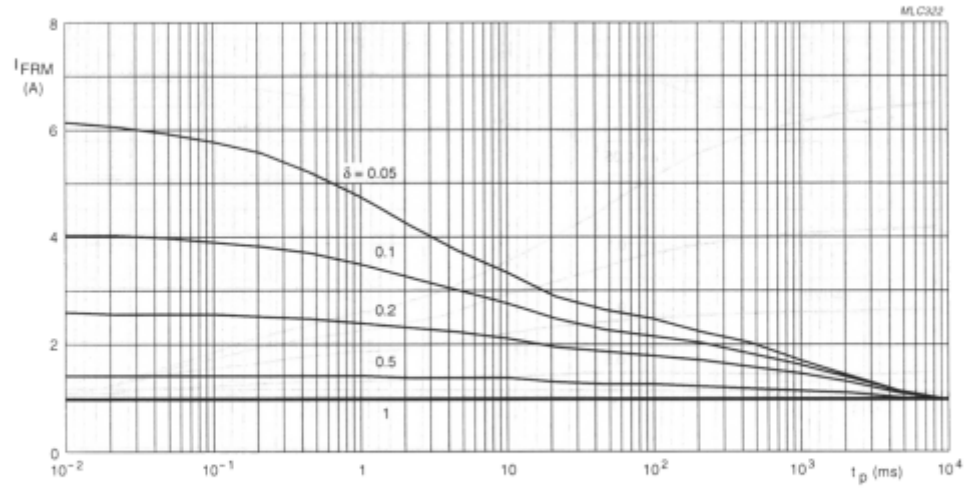


BYD43U and V

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.

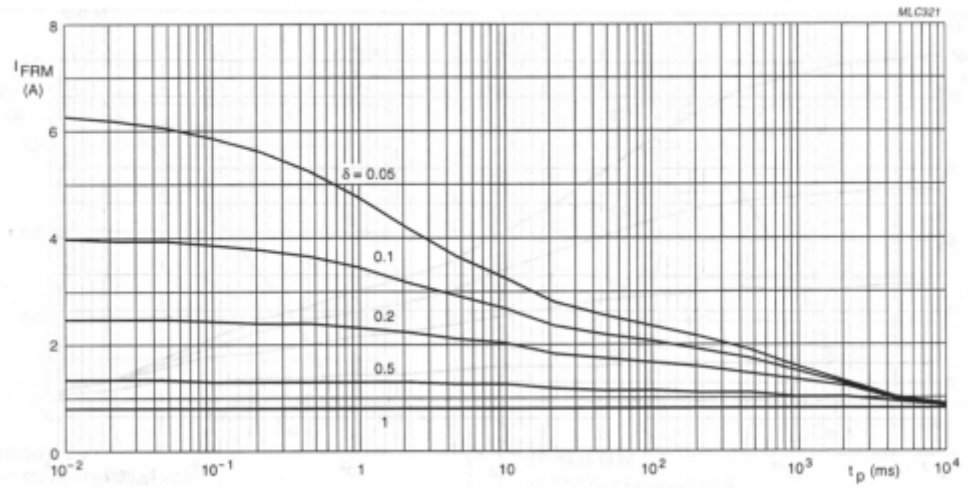


BYD43-16 to 20

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.

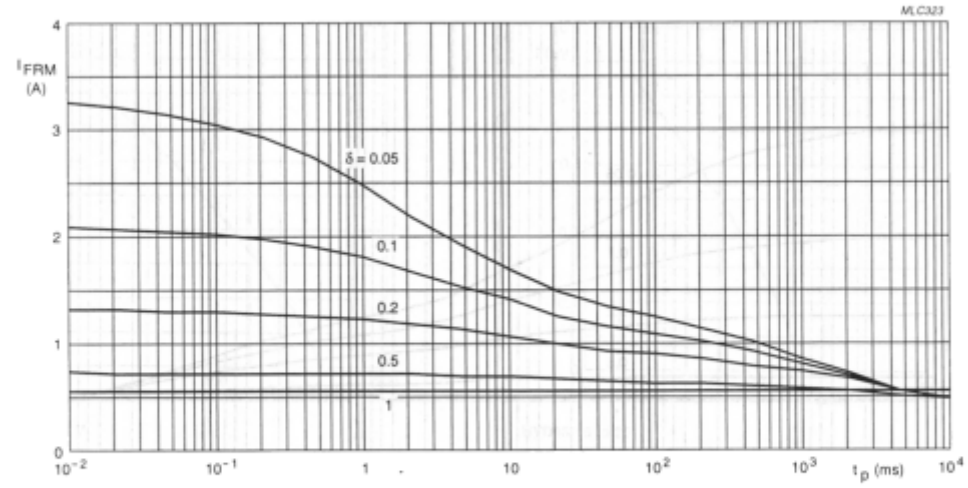


BYD43U and V

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.

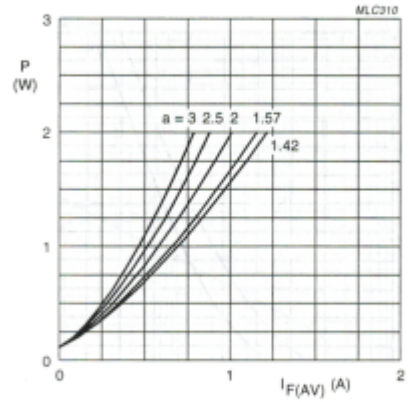


BYD43-16 to 20

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.

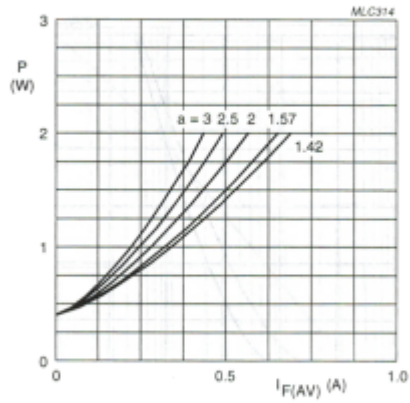
Fig.9 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



BYD43U and V

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

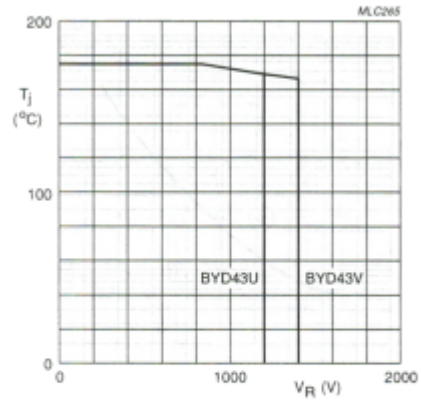
Fig.10 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYD43-16 to 20

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

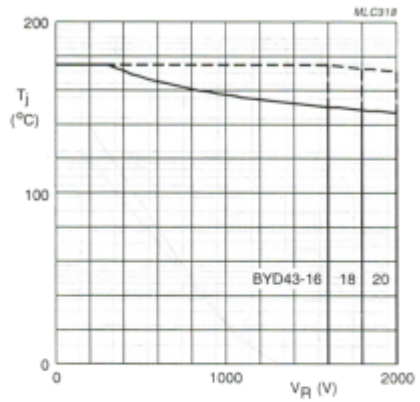
Fig.11 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYD43U and V

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

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

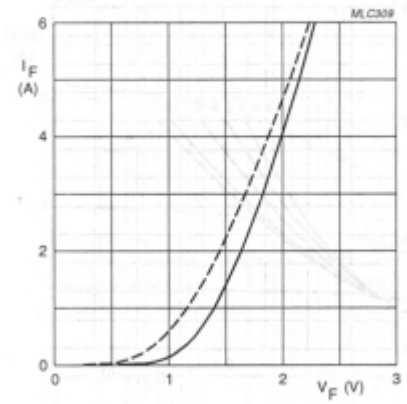


BYD43-16 to 20

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

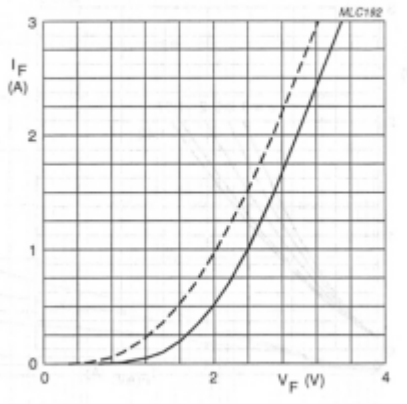
Solid line = V_{RRM}; $\delta = 0.5$.

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



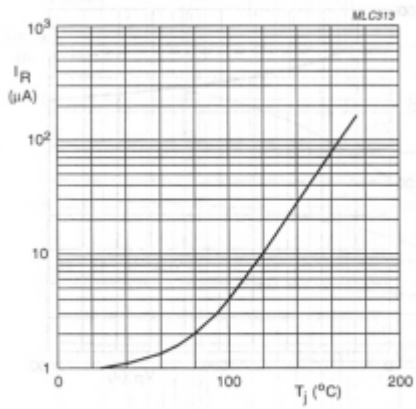
BYD43U and V
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

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



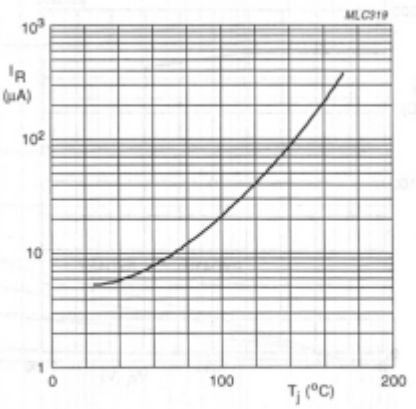
BYD43-16 to 20
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

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



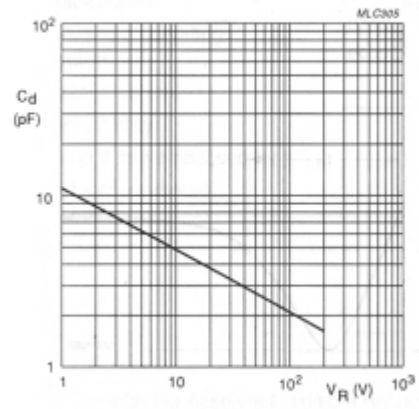
BYD43U and V
$V_R = V_{RRMmax}$.

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



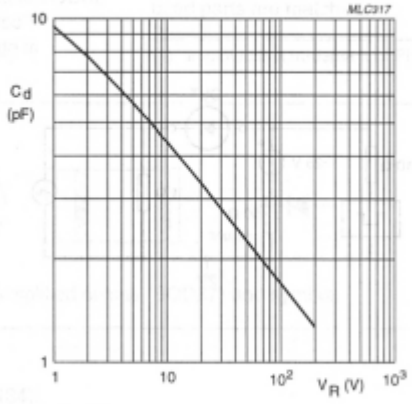
BYD43-16 to 20
$V_R = V_{RRMmax}$.

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



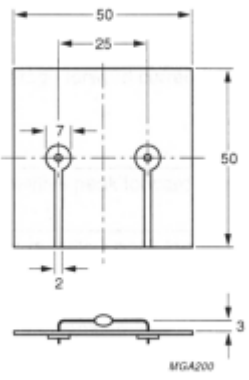
BYD43U and V
f = 1 MHz; T_j = 25 °C.

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.

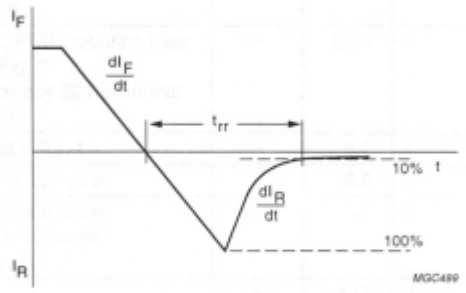
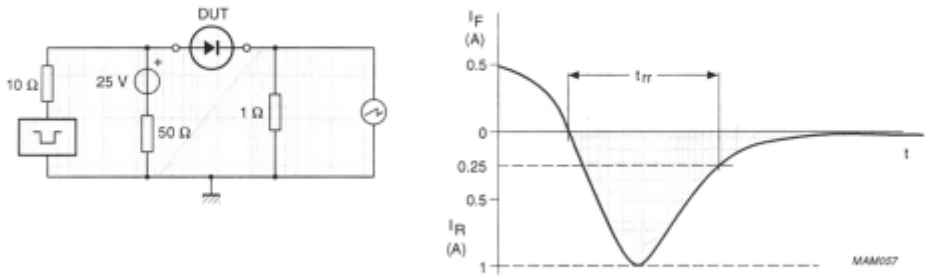


Fig.21 Reverse recovery definitions.



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.