Silicon Diode

BYV28-400

400V/3.5A

DATASHEET

OEM – Philips

Source: Philips Databook 1999

Ultra fast low-loss controlled avalanche rectifiers

BYV28 series

FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- Available in ammo-pack
- Also available with preformed leads for easy insertion.

DESCRIPTION

Rugged glass SOD64 package, using a high temperature alloyed construction.

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

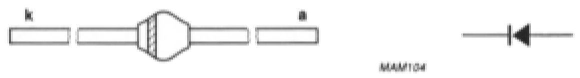


Fig.1 Simplified outline (SOD64) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYV28-50		–	50	V
	BYV28-100		–	100	V
	BYV28-150		–	150	V
	BYV28-200		–	200	V
	BYV28-300		–	300	V
	BYV28-400		–	400	V
	BYV28-500		–	500	V
	BYV28-600		–	600	V
V_R	continuous reverse voltage				
	BYV28-50		–	50	V
	BYV28-100		–	100	V
	BYV28-150		–	150	V
	BYV28-200		–	200	V
	BYV28-300		–	300	V
	BYV28-400		–	400	V
	BYV28-500		–	500	V
	BYV28-600		–	600	V
$I_{F(AV)}$	average forward current	T_{tp} = 85 °C; lead length = 10 mm; see Figs 2 and 3; averaged over any 20 ms period; see also Figs 10 and 11			
	BYV28-50 to 400		–	3.5	A
	BYV28-500 and 600		–	3.1	A
$I_{F(AV)}$	average forward current	T_{amb} = 60 °C; printed-circuit board mounting (see Fig.20); see Figs 4 and 5; averaged over any 20 ms period; see also Figs 10 and 11			
	BYV28-50 to 400		–	1.9	A
	BYV28-500 and 600		–	1.5	A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FRM}	repetitive peak forward current	T_{tp} = 85 °C; see Figs 6 and 7			
	BYV28-50 to 400		–	32	A
	BYV28-500 and 600		–	31	A
I_{FRM}	repetitive peak forward current	T_{amb} = 60 °C; see Figs 8 and 9			
	BYV28-50 to 400		–	17	A
	BYV28-500 and 600		–	16	A
I_{FSM}	non-repetitive peak forward current	t = 10 ms half sine wave; $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	–	90	A
E_{RSM}	non-repetitive peak reverse avalanche energy	L = 120 mH; $T_j = T_{j\,max}$ prior to surge; inductive load switched off	–	20	mJ
T_{stg}	storage temperature		−65	+175	°C
T_j	junction temperature	see Fig.12	−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 = 3.5 A; $T_j = T_{j\,max}$; see Figs 13, 14 and 15				
	BYV28-50 to 200		–	–	0.80	V
	BYV28-300 and 400		–	–	0.83	V
	BYV28-500 and 600		–	–	0.98	V
V_F	forward voltage	I_F = 3.5 A; see Figs 13, 14 and 15				
	BYV28-50 to 200		–	–	1.02	V
	BYV28-300 and 400		–	–	1.05	V
	BYV28-500 and 600		–	–	1.25	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	I_R = 0.1 mA				
	BYV28-50		55	–	–	V
	BYV28-100		110	–	–	V
	BYV28-150		165	–	–	V
	BYV28-200		220	–	–	V
	BYV28-300		330	–	–	V
	BYV28-400		440	–	–	V
	BYV28-500		560	–	–	V
	BYV28-600		675	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Fig.16	–	–	5	μA
		$V_R = V_{RRMmax}$; T_j = 165 °C; see Fig.16	–	–	150	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				
	BYV28-50 to 200		–	–	25	ns
	BYV28-300 to 600		–	–	50	ns

Ultra fast low-loss controlled avalanche rectifiers — BYV28 series

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
C_d	diode capacitance	f = 1 MHz; V_R = 0; see Figs 17, 18 and 19				
	BYV28-50 to 200		–	190	–	pF
	BYV28-300 and 400		–	150	–	pF
	BYV28-500 and 600		–	125	–	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	–	–	4	A/µs

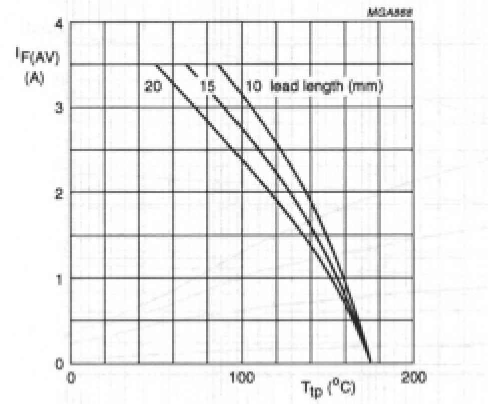
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	25	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	75	K/W

Note

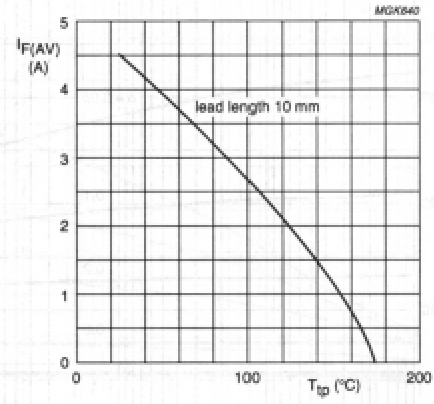
1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer ≥40 µm, see Fig.20 For more information please refer to the *'General Part of Handbook SC01'*.

GRAPHICAL DATA



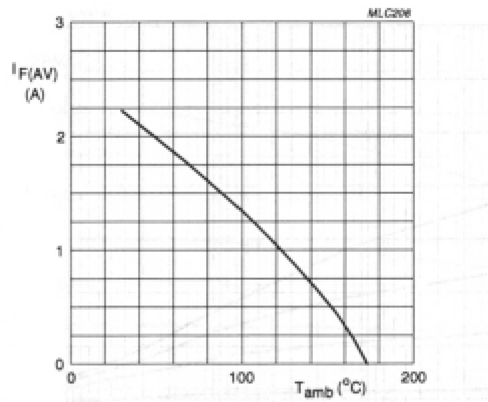
BYV28-50 to 400
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



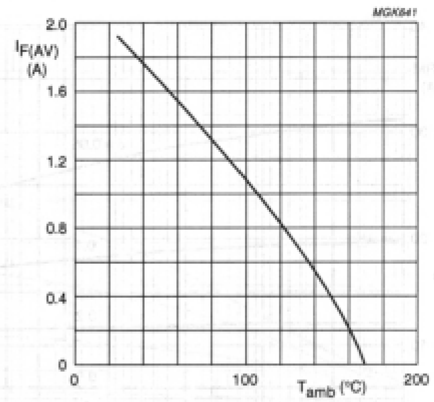
BYV28-500 and 600
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Switched mode application.

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



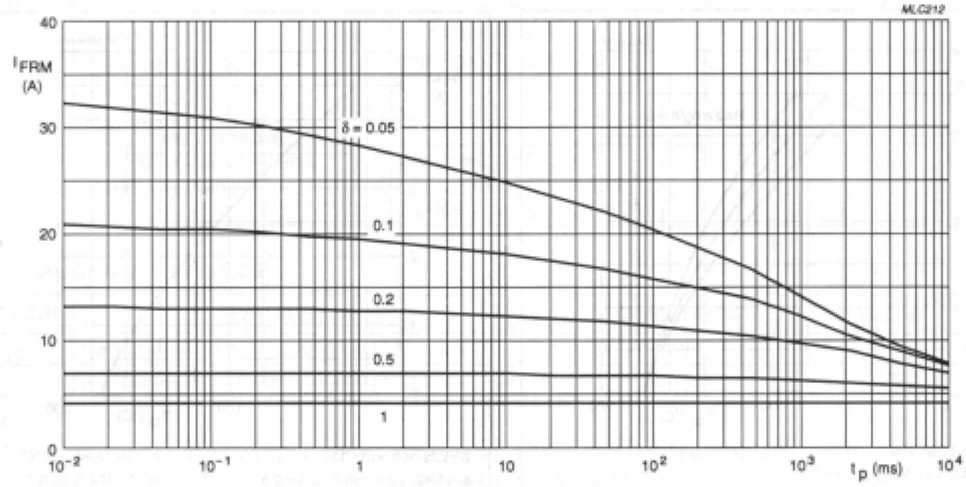
BYV28-50 to 400
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5; switched mode application.
Device mounted as shown in Fig.20.

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



BYV28-500 and 600
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5; switched mode application.
Device mounted as shown in Fig.20.

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

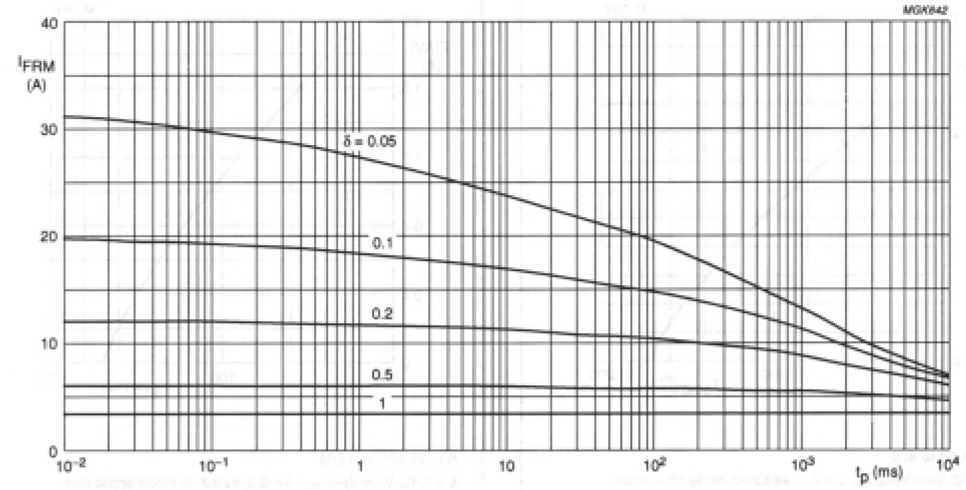


BYV28-50 to 400

T_{tp} = 85°C; $R_{th\ j\text{-}tp}$ = 25 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.

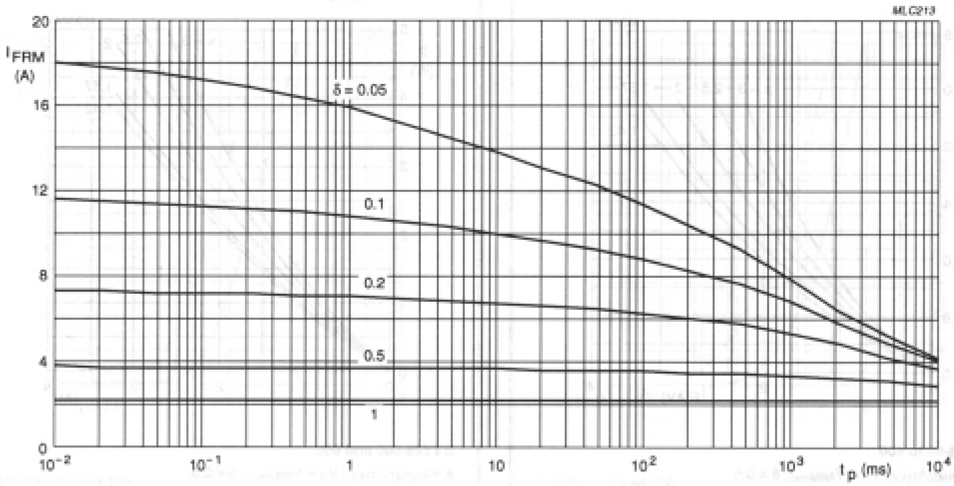


BYV28-500 and 600

T_{tp} = 85°C; $R_{th\ j\text{-}tp}$ = 25 K/W.

V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 600 V.

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

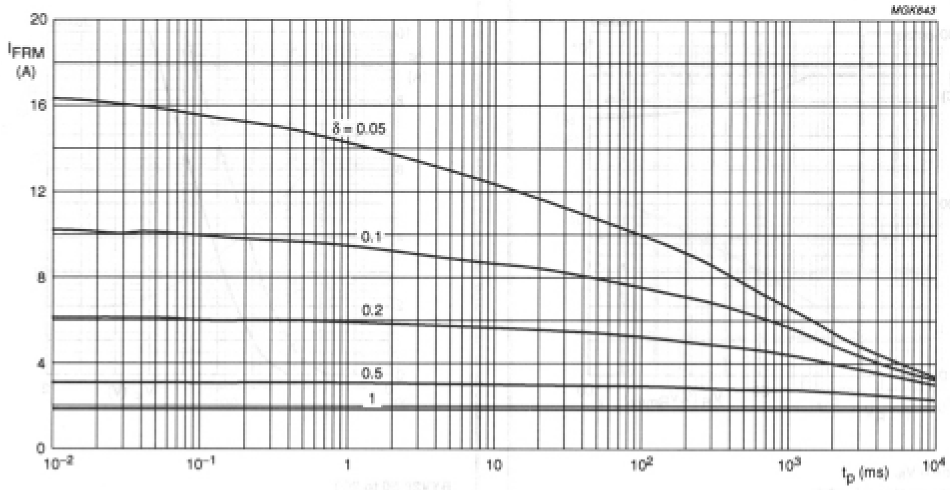


BYV28-50 to 400

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 75 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.

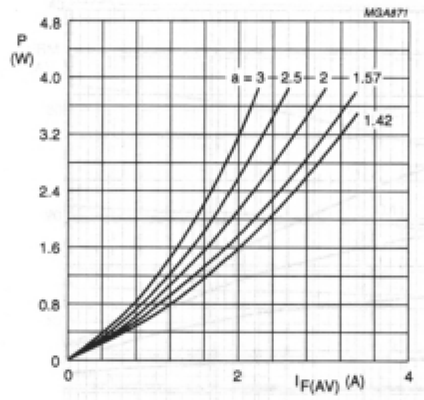


BYV28-500 and 600

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 75 K/W.

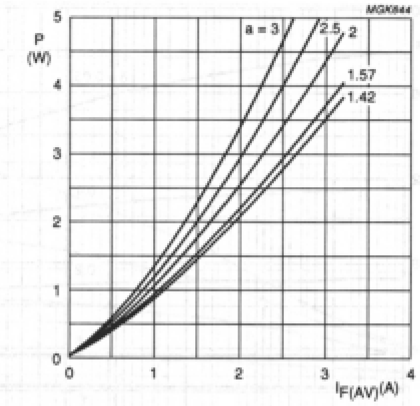
V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 600 V.

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



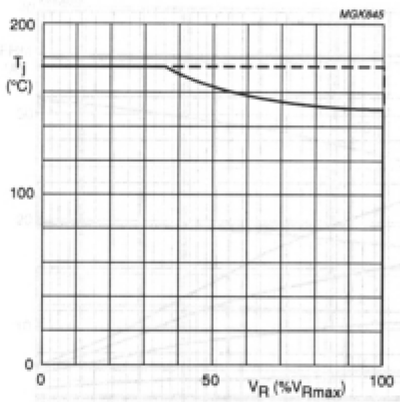
BYV28-50 to 400
$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$; $\delta = 0.5$.

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



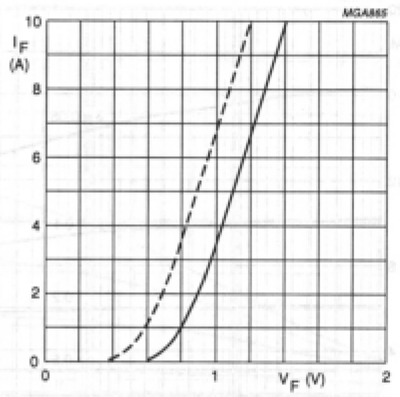
BYV28-500 and 600
$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$; $\delta = 0.5$.

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



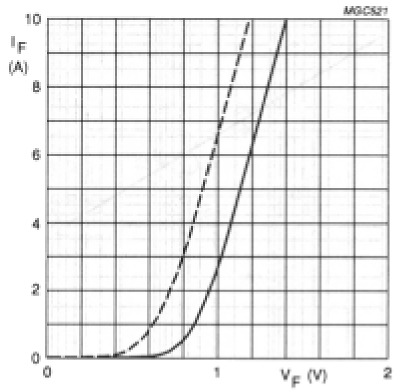
Solid line = V_R.
Dotted line = V_{RRM}; $\delta = 0.5$.

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



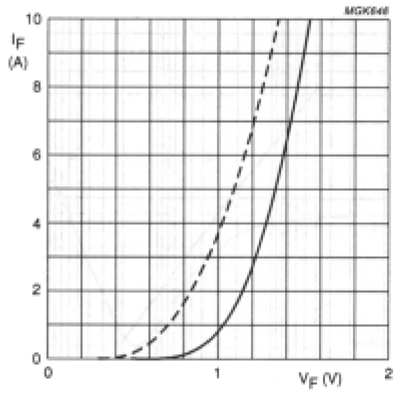
BYV28-50 to 200
Dotted line: $T_j = 175$ °C.
Solid line: $T_j = 25$ °C.

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



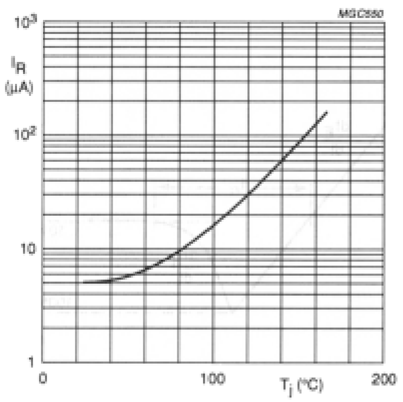
BYV28-300 and 400
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

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



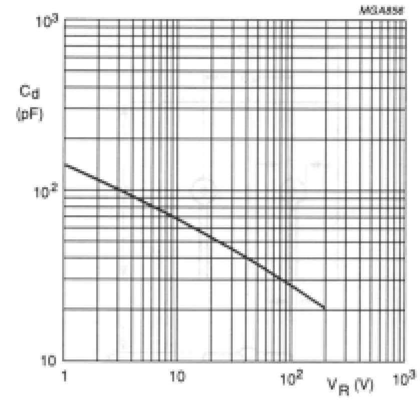
BYV28-500 and 600
Dotted line: T_j = 175 °C.
Solid line: T_j = 25 °C.

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



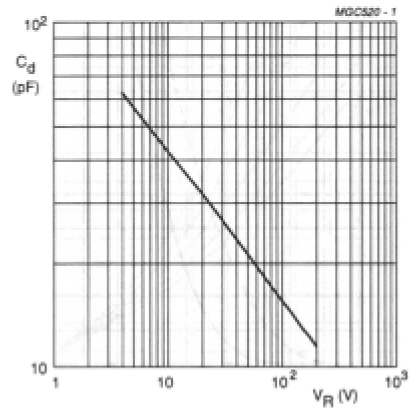
$V_R = V_{RRMmax}$.

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



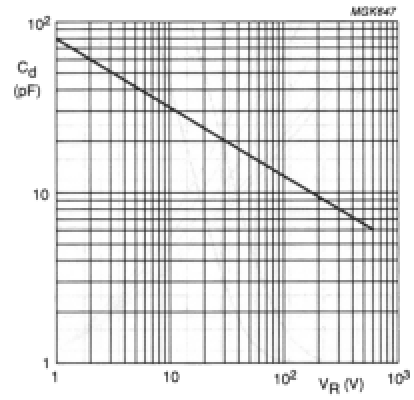
BYV28-50 to 200
f = 1 MHz; T_j = 25 °C.

Fig.17 Diode capacitance as a function of reverse voltage; typical values.



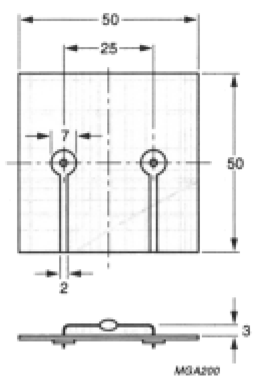
BYV28-300 and 400
f = 1 MHz; T_j = 25 °C.

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



BYV28-500 and 600
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.

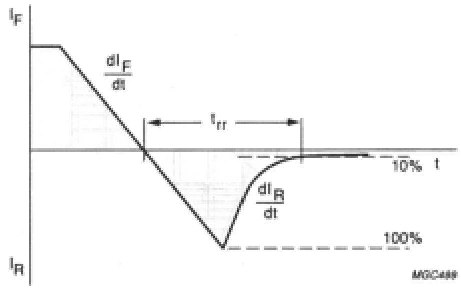
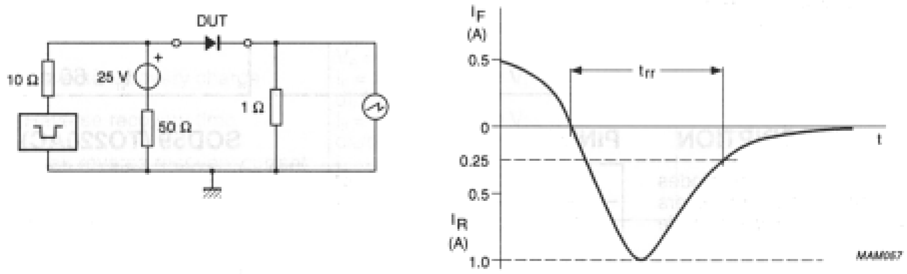


Fig.21 Reverse recovery definitions.



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.