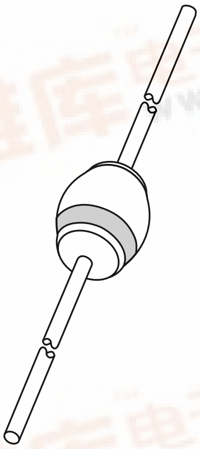
DISCRETE SEMICONDUCTORS

DATA SHEET



BYV36 series
Fast soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of 1996 May 30

1996 Jul 01

Philips Semiconductors

PHILIPS

Fast soft-recovery controlled avalanche rectifiers

BYV36 series

FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- Available in ammo-pack.

DESCRIPTION

Rugged glass SOD57 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.

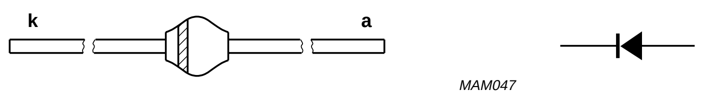


Fig.1 Simplified outline (SOD57) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYV36A		–	200	V
	BYV36B		–	400	V
	BYV36C		–	600	V
	BYV36D		–	800	V
	BYV36E		–	1000	V
	BYV36F		–	1200	V
	BYV36G		–	1400	V
V_R	continuous reverse voltage				
	BYV36A		–	200	V
	BYV36B		–	400	V
	BYV36C		–	600	V
	BYV36D		–	800	V
	BYV36E		–	1000	V
	BYV36F		–	1200	V
	BYV36G		–	1400	V
$I_{F(AV)}$	average forward current	T_{tp} = 60 °C; lead length = 10 mm; see Figs 2; 3 and 4 averaged over any 20 ms period; see also Figs 14; 15 and 16			
	BYV36A to C		–	1.6	A
	BYV36D and E		–	1.5	A
	BYV36F and G		–	1.5	A
$I_{F(AV)}$	average forward current	T_{amb} = 60 °C; PCB mounting (see Fig.25); see Figs 5; 6 and 7 averaged over any 20 ms period; see also Figs 14; 15 and 16			
	BYV36A to C		–	0.87	A
	BYV36D and E		–	0.81	A
	BYV36F and G		–	0.81	A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FRM}	repetitive peak forward current	T_{tp} = 60 °C; see Figs 8; 9 and 10			
	BYV36A to C		–	18	A
	BYV36D and E		–	17	A
	BYV36F and G		–	15	A
I_{FRM}	repetitive peak forward current	T_{amb} = 60 °C; see Figs 11; 12 and 13			
	BYV36A to C		–	9	A
	BYV36D and E		–	8	A
	BYV36F and G		–	8	A
I_{FSM}	non-repetitive peak forward current	t = 10 ms half sine wave; $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	–	30	A
E_{RSM}	non-repetitive peak reverse avalanche energy	L = 120 mH; $T_j = T_{j\,max}$ prior to surge; inductive load switched off	–	10	mJ
T_{stg}	storage temperature		–65	+175	°C
T_j	junction temperature	see Figs 17 and 18	–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 19; 20 and 21				
	BYV36A to C		–	–	1.00	V
	BYV36D and E		–	–	1.05	V
	BYV36F and G		–	–	1.05	V
V_F	forward voltage	I_F = 1 A; see Figs 19; 20 and 21				
	BYV36A to C		–	–	1.35	V
	BYV36D and E		–	–	1.45	V
	BYV36F and G		–	–	1.45	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	I_R = 0.1 mA				
	BYV36A		300	–	–	V
	BYV36B		500	–	–	V
	BYV36C		700	–	–	V
	BYV36D		900	–	–	V
	BYV36E		1100	–	–	V
	BYV36F		1300	–	–	V
	BYV36G		1500	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Fig.22	–	–	5	µA
		$V_R = V_{RRMmax}$; T_j = 165 °C; see Fig.22	–	–	150	µA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
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. 26				
	BYV36A to C		–	–	100	ns
	BYV36D and E		–	–	150	ns
	BYV36F and G		–	–	250	ns
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; see Figs 23 and 24				
	BYV36A to C		–	45	–	pF
	BYV36D and E		–	40	–	pF
	BYV36F and G		–	35	–	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.27				
	BYV36A to C		–	–	7	A/µs
	BYV36D and E		–	–	6	A/µs
	BYV36F and G		–	–	5	A/µs

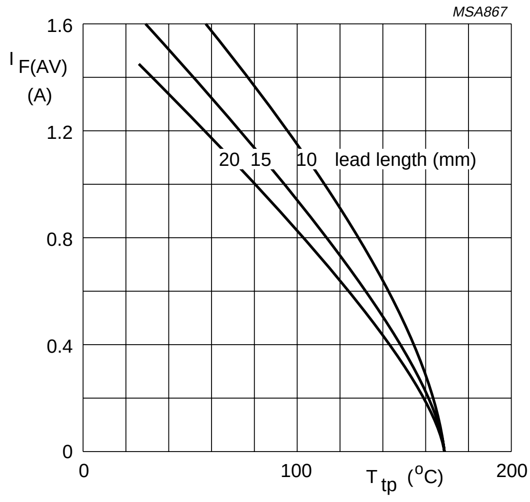
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	46	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	100	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.25. For more information please refer to the *"General Part of associated Handbook"*.

GRAPHICAL DATA

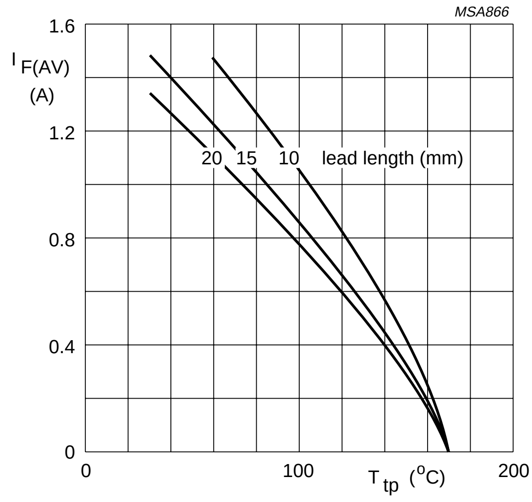


BYV36A to C

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

Switched mode application.

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

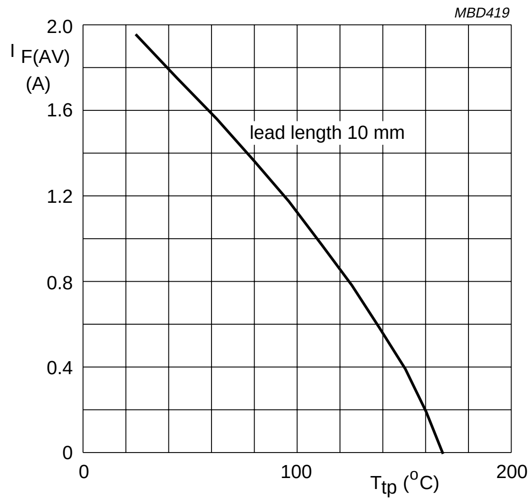


BYV36D and E

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

Switched mode application.

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

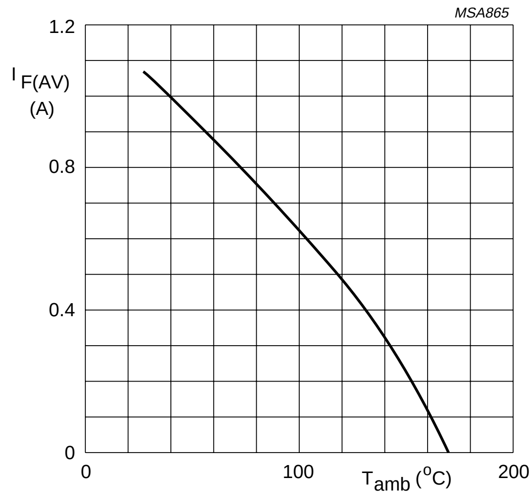


BYV36F and G

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

Switched mode application.

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



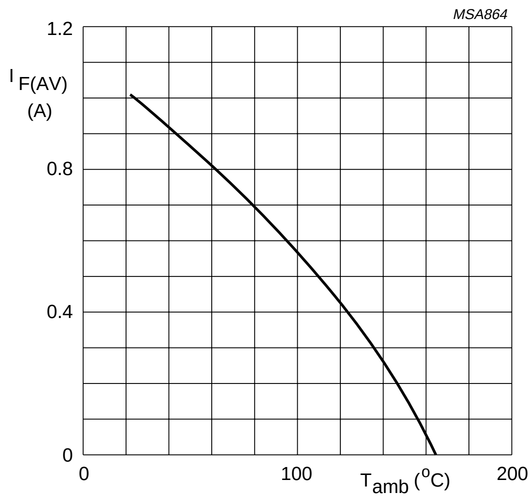
BYV36A to C

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

Device mounted as shown in Fig.25.

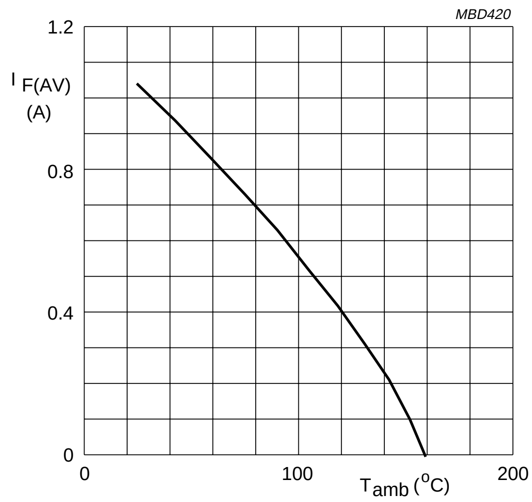
Switched mode application.

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



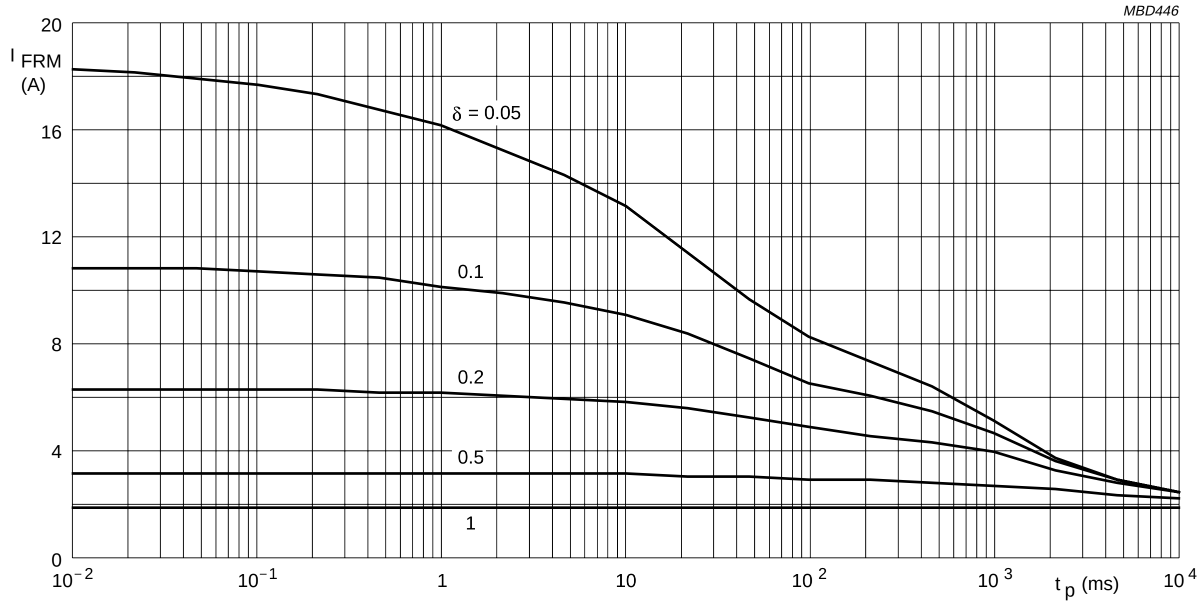
BYV36D and E
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Device mounted as shown in Fig.25.
Switched mode application.

Fig.6 Maximum average forward current as a function of ambient temperature (including losses due to reverse leakage).



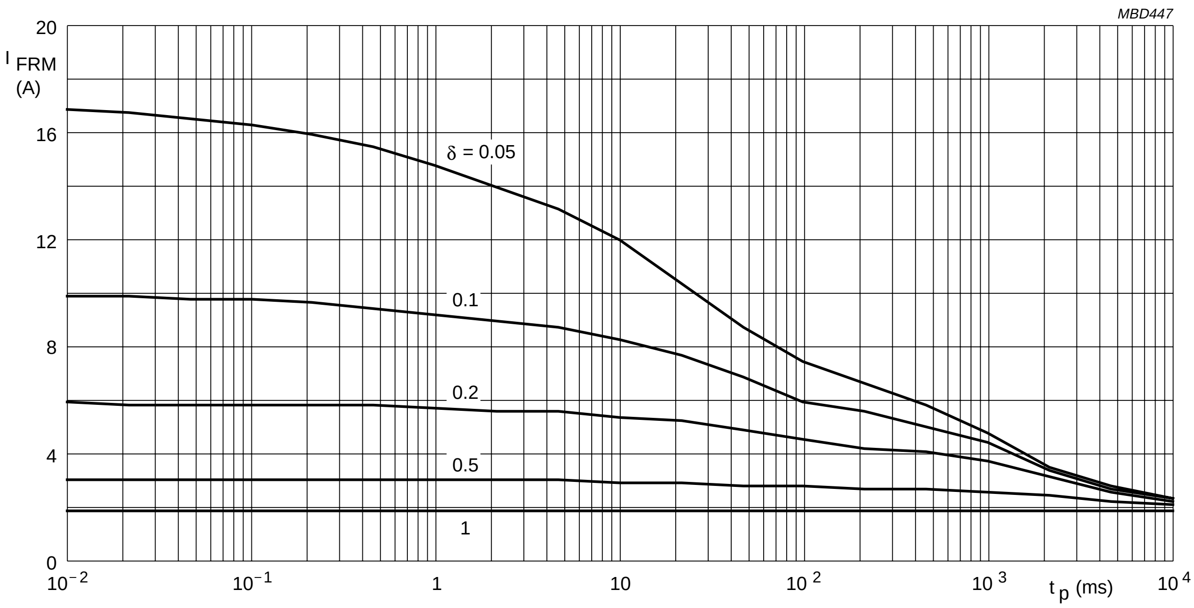
BYV36F and G
a = 1.42; $V_R = V_{RRMmax}$; δ = 0.5.
Device mounted as shown in Fig.25.
Switched mode application.

Fig.7 Maximum average forward current as a function of ambient temperature (including losses due to reverse leakage).



BYV36A to C
T_{tp} = 60°C; $R_{th\ j\text{-}tp}$ = 46 K/W.
V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 600 V.

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

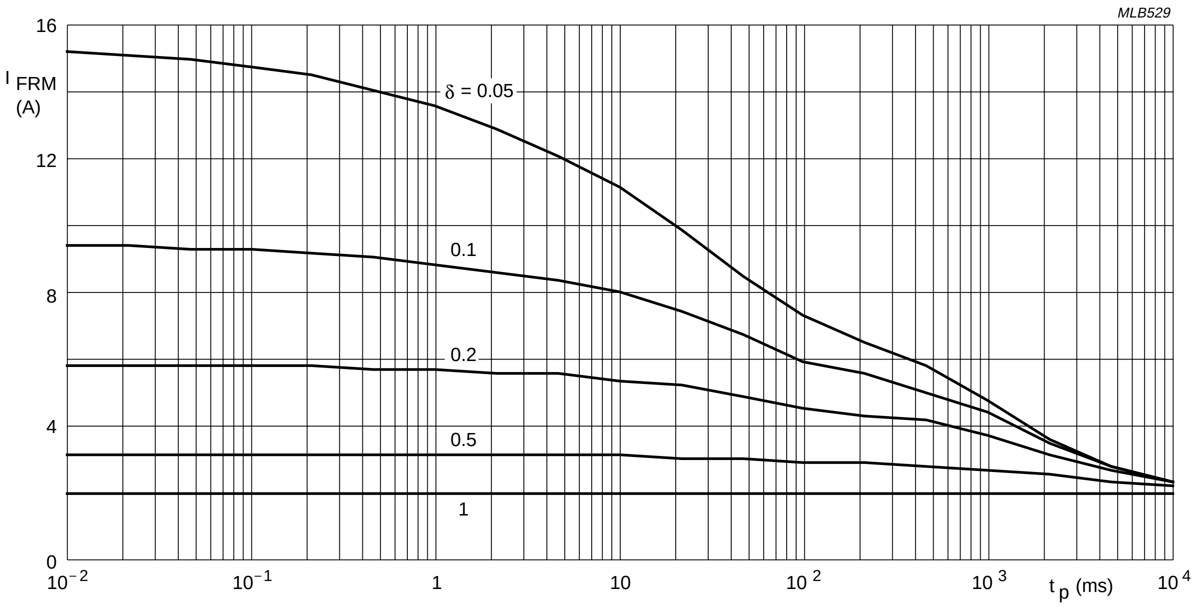


BYV36D and E

T_{tp} = 60°C; $R_{th\ j\text{-}tp}$ = 46 K/W.

V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 1000 V.

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

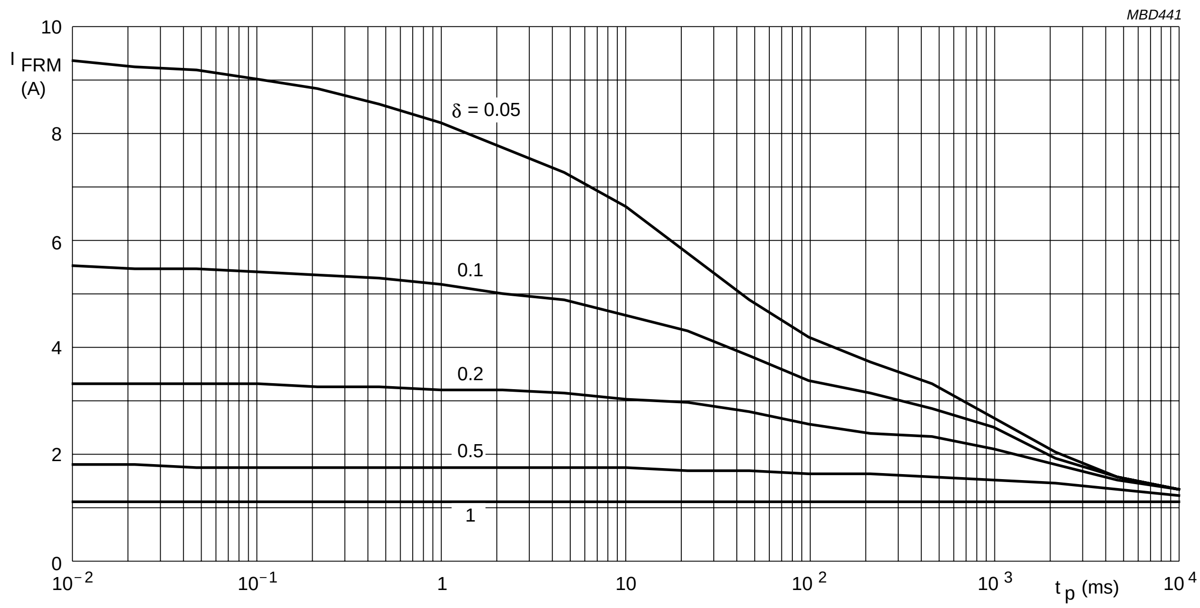


BYV36F and G

T_{tp} = 60°C; $R_{th\ j\text{-}tp}$ = 46 K/W.

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

Fig.10 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

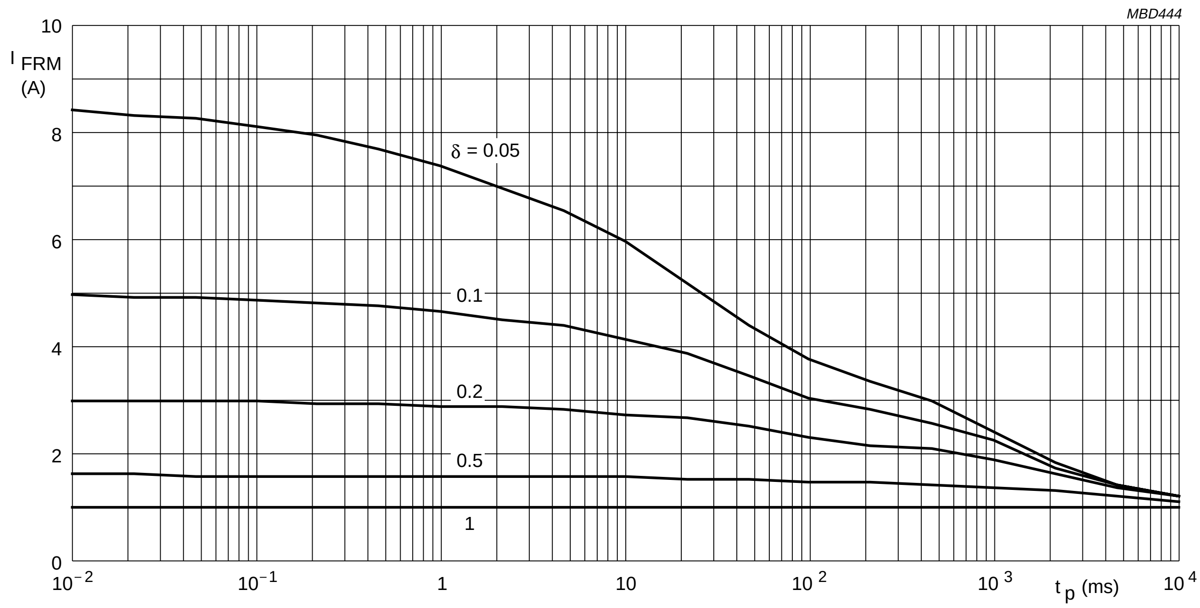


BYV36A to C

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 100 K/W.

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

Fig.11 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

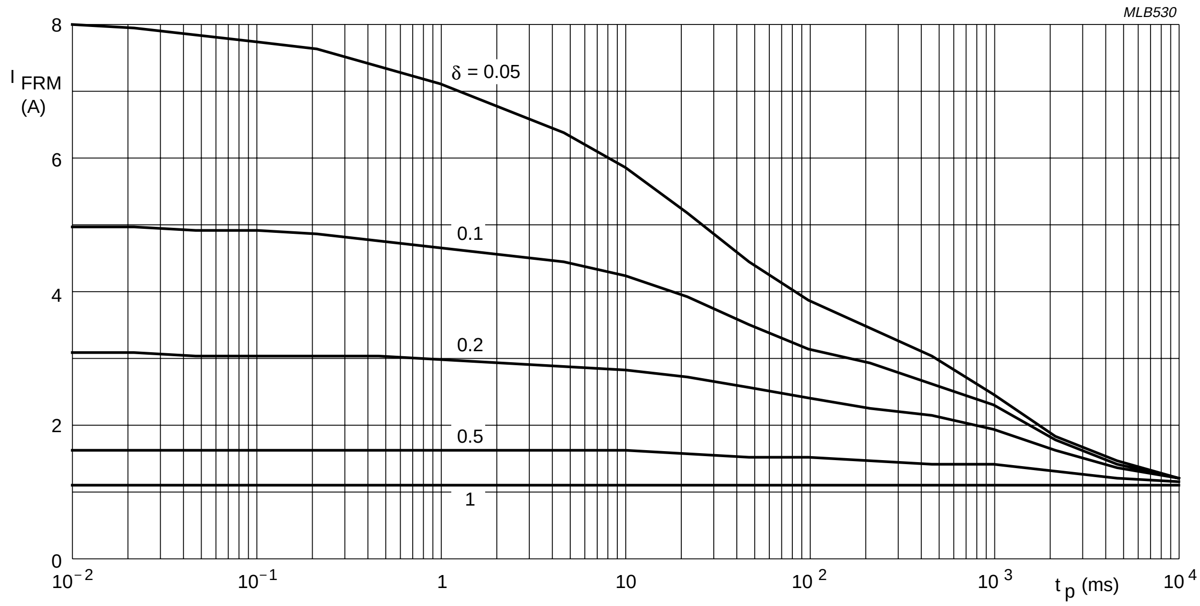


BYV36D and E

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 100 K/W.

V_{RRMmax} during 1 – δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 1000 V.

Fig.12 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

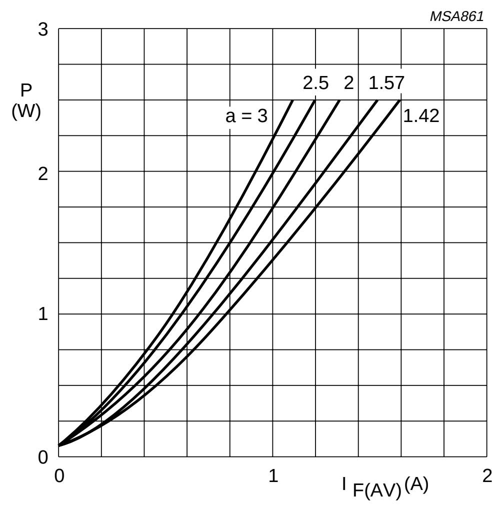


BYV36F and G

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 100 K/W.

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

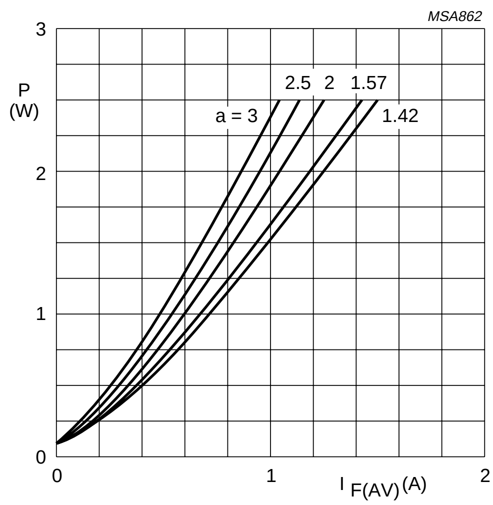
Fig.13 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



BYV36A to C

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

Fig.14 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



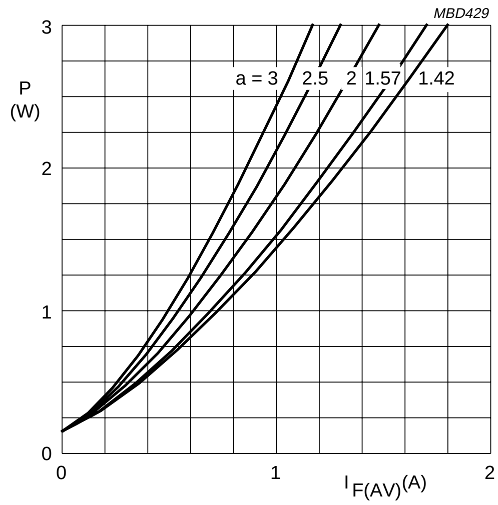
BYV36D and E

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

Fig.15 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.

Fast soft-recovery controlled avalanche rectifiers

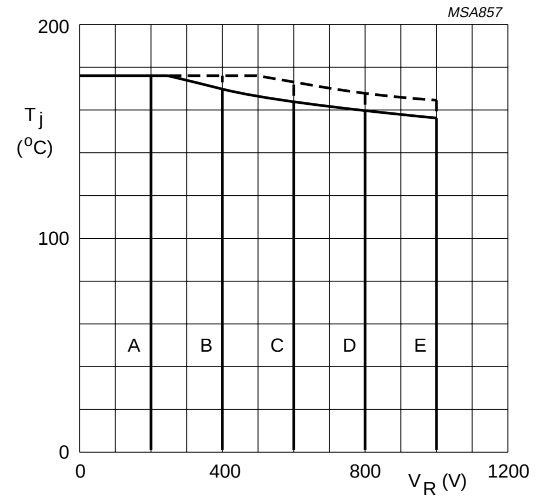
BYV36 series



BYV36F and G

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

Fig.16 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.

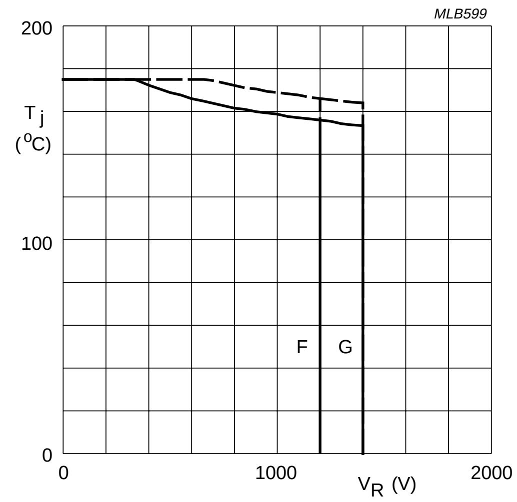


BYV36A to E

Solid line = V_R.

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

Fig.17 Maximum permissible junction temperature as a function of reverse voltage.

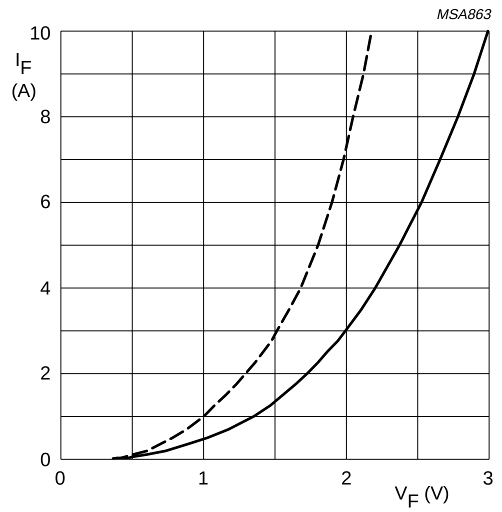


BYV36F and G

Solid line = V_R.

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

Fig.18 Maximum permissible junction temperature as a function of reverse voltage.

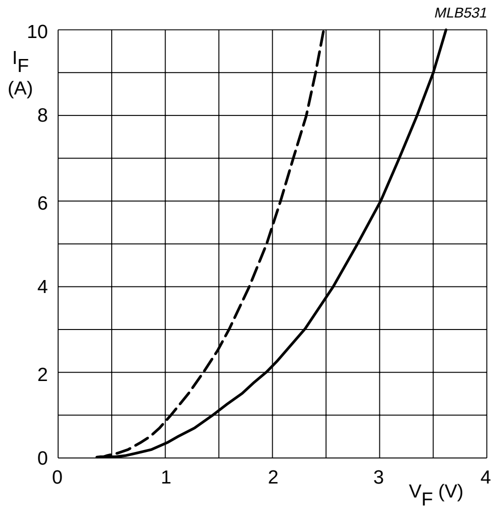


BYV36A to C

Dotted line: T_j = 175 °C.

Solid line: T_j = 25 °C.

Fig.19 Forward current as a function of forward voltage; maximum values.

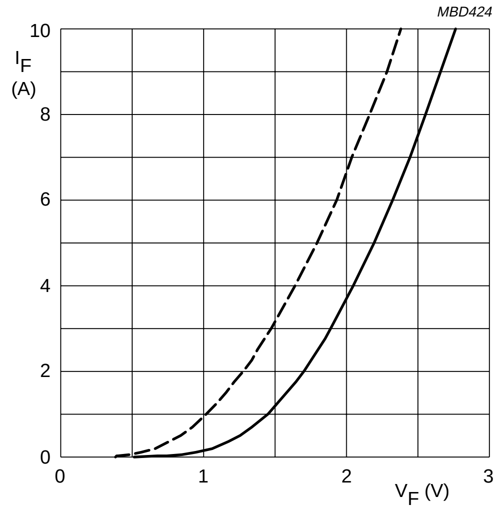


BYV36D and E

Dotted line: T_j = 175 °C.

Solid line: T_j = 25 °C.

Fig.20 Forward current as a function of forward voltage; maximum values.

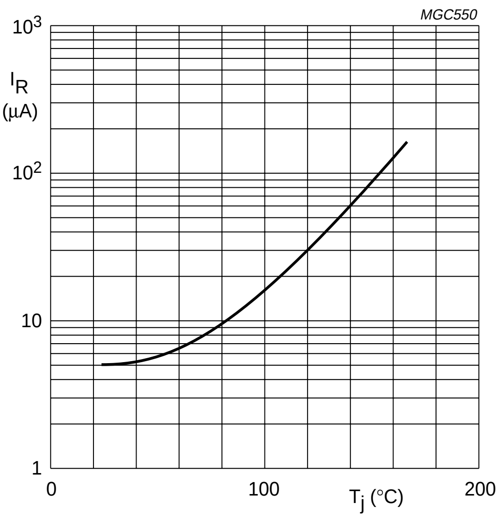


BYV36F and G

Dotted line: T_j = 175 °C.

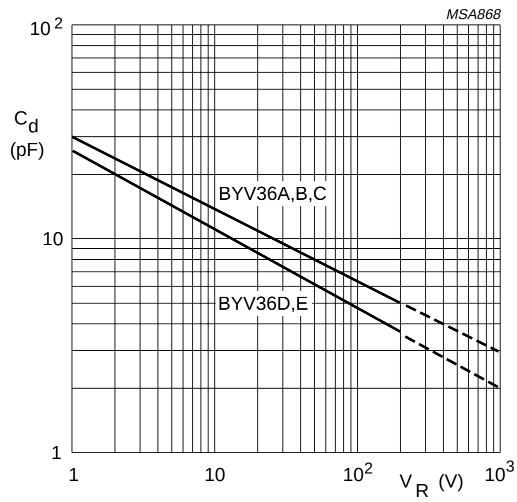
Solid line: T_j = 25 °C.

Fig.21 Forward current as a function of forward voltage; maximum values.



$V_R = V_{RRMmax}$.

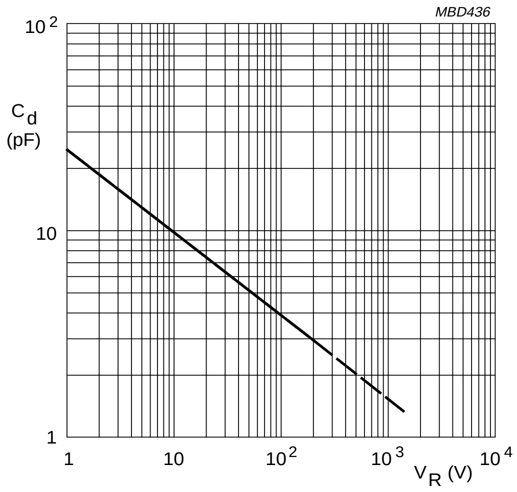
Fig.22 Reverse current as a function of junction temperature; maximum values.



BYV36A to E.

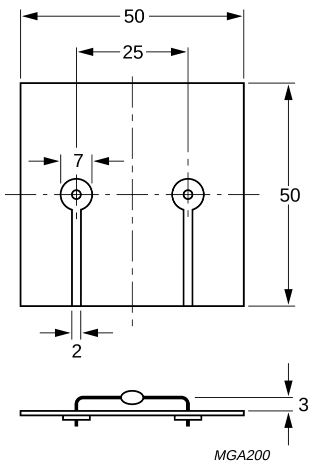
f = 1 MHz; T_j = 25 °C.

Fig.23 Diode capacitance as a function of reverse voltage, typical values.



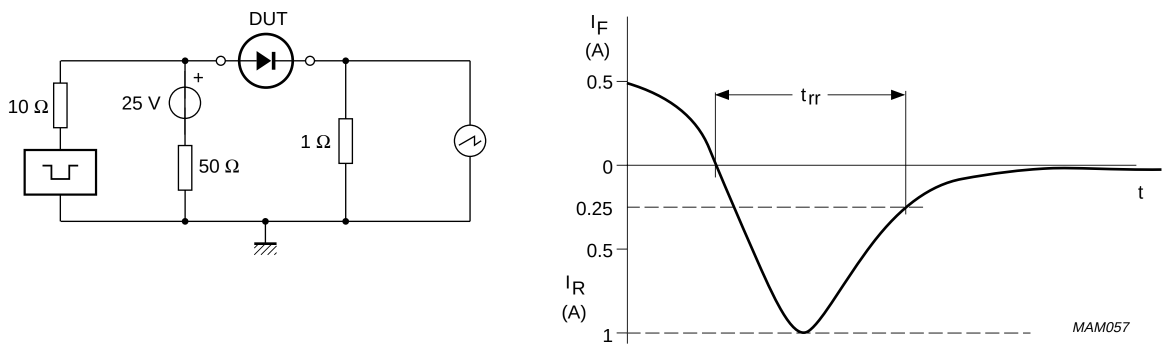
BYV36F and G.
f = 1 MHz; T_j = 25 °C.

Fig.24 Diode capacitance as a function of reverse voltage, typical values.



Dimensions in mm.

Fig.25 Device mounted on a printed-circuit board.



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

Fig.26 Test circuit and reverse recovery time waveform and definition.

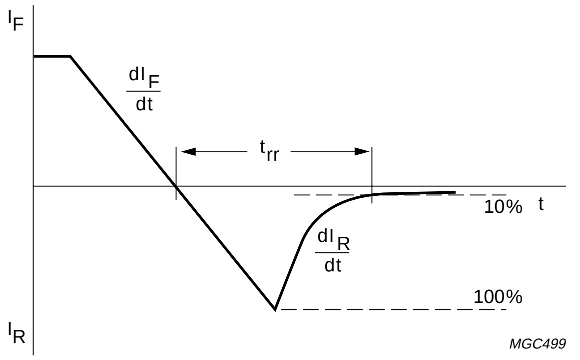
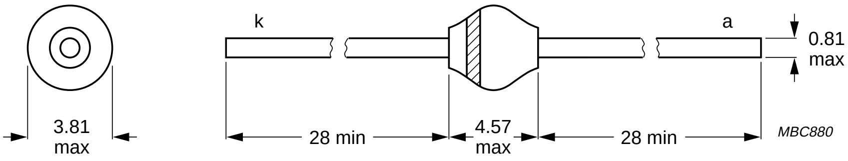


Fig.27 Reverse recovery definitions.

PACKAGE OUTLINE



Dimensions in mm.
The marking band indicates the cathode.

Fig.28 SOD57.

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.