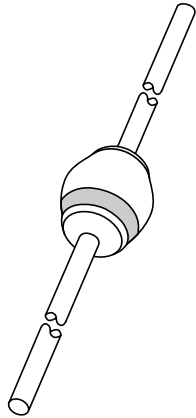


# DATA SHEET



## **BYM36 series** Fast soft-recovery controlled avalanche rectifiers

Product specification  
Supersedes data of 1996 May 30

1996 Sep 18

## Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

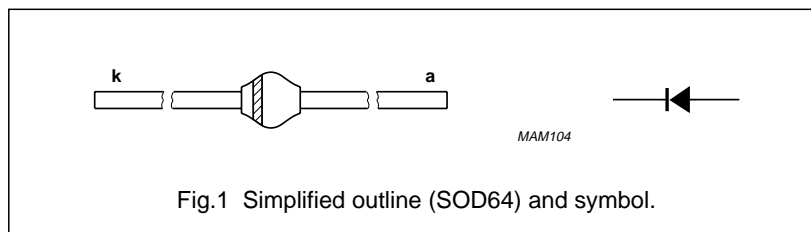
### FEATURES

- 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.



### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{RRM}$	repetitive peak reverse voltage				
	BYM36A		—	200	V
	BYM36B		—	400	V
	BYM36C		—	600	V
	BYM36D		—	800	V
	BYM36E		—	1000	V
	BYM36F		—	1200	V
	BYM36G		—	1400	V
$V_R$	continuous reverse voltage				
	BYM36A		—	200	V
	BYM36B		—	400	V
	BYM36C		—	600	V
	BYM36D		—	800	V
	BYM36E		—	1000	V
	BYM36F		—	1200	V
	BYM36G		—	1400	V
$I_{F(AV)}$	average forward current	$T_{tp} = 55\text{ °C}$ ; lead length = 10 mm; see Figs 2; 3 and 4			
	BYM36A to C	averaged over any 20 ms period;	—	3.0	A
	BYM36D and E	see also Figs 14; 15 and 16	—	2.9	A
$I_{F(AV)}$	average forward current	$T_{amb} = 65\text{ °C}$ ; PCB mounting (see Fig.25); see Figs 5; 6 and 7			
	BYM36A to C	averaged over any 20 ms period;	—	1.25	A
	BYM36D and E	see also Figs 14; 15 and 16	—	1.20	A
$I_{F(AV)}$	average forward current				
	BYM36F and G		—	1.15	A

# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{FRM}$	repetitive peak forward current BYM36A to C	$T_{tp} = 55\text{ °C}$ ; see Figs 8; 9 and 10	–	37	A
	BYM36D and E		–	33	A
	BYM36F and G		–	27	A
$I_{FRM}$	repetitive peak forward current BYM36A to C	$T_{amb} = 65\text{ °C}$ ; see Figs 11; 12 and 13	–	13	A
	BYM36D and E		–	11	A
	BYM36F and G		–	10	A
$I_{FSM}$	non-repetitive peak forward current	$t = 10\text{ ms}$ half sine wave; $T_j = T_{j\text{ max}}$ prior to surge; $V_R = V_{RRM\text{ max}}$	–	65	A
$E_{RSM}$	non-repetitive peak reverse avalanche energy	$L = 120\text{ mH}$ ; $T_j = T_{j\text{ max}}$ 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

$T_j = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_F$	forward voltage BYM36A to C	$I_F = 3\text{ A}$ ; $T_j = T_{j\text{ max}}$ ; see Figs 19; 20 and 21	–	–	1.22	V
	BYM36D and E		–	–	1.28	V
	BYM36F and G		–	–	1.24	V
$V_F$	forward voltage BYM36A to C	$I_F = 3\text{ A}$ ; see Figs 19; 20 and 21	–	–	1.60	V
	BYM36D and E		–	–	1.78	V
	BYM36F and G		–	–	1.57	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	$I_R = 0.1\text{ mA}$				
	BYM36A		300	–	–	V
	BYM36B		500	–	–	V
	BYM36C		700	–	–	V
	BYM36D		900	–	–	V
	BYM36E		1100	–	–	V
	BYM36F		1300	–	–	V
	BYM36G		1500	–	–	V
$I_R$	reverse current	$V_R = V_{RRM\text{ max}}$ ; see Fig.22	–	–	5	µA
		$V_R = V_{RRM\text{ max}}$ ; $T_j = 165\text{ °C}$ ; see Fig.22	–	–	150	µA

# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$t_{rr}$	reverse recovery time	when switched from				
	BYM36A to C	$I_F = 0.5$ A to $I_R = 1$ A;	–	–	100	ns
	BYM36D and E	measured at $I_R = 0.25$ A;	–	–	150	ns
	BYM36F and G	see Fig. 26	–	–	250	ns
$C_d$	diode capacitance	$f = 1$ MHz; $V_R = 0$ V;				
	BYM36A to C	see Figs 23 and 24	–	85	–	pF
	BYM36D and E		–	75	–	pF
	BYM36F and G		–	65	–	pF
$\left  \frac{dI_R}{dt} \right $	maximum slope of reverse recovery current	when switched from				
	BYM36A to C	$I_F = 1$ A to $V_R \geq 30$ V and	–	–	7	A/ $\mu$ s
	BYM36D and E	$dI_F/dt = -1$ A/ $\mu$ s;	–	–	6	A/ $\mu$ s
	BYM36F and G	see Fig.27	–	–	5	A/ $\mu$ s

### THERMAL CHARACTERISTICS

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

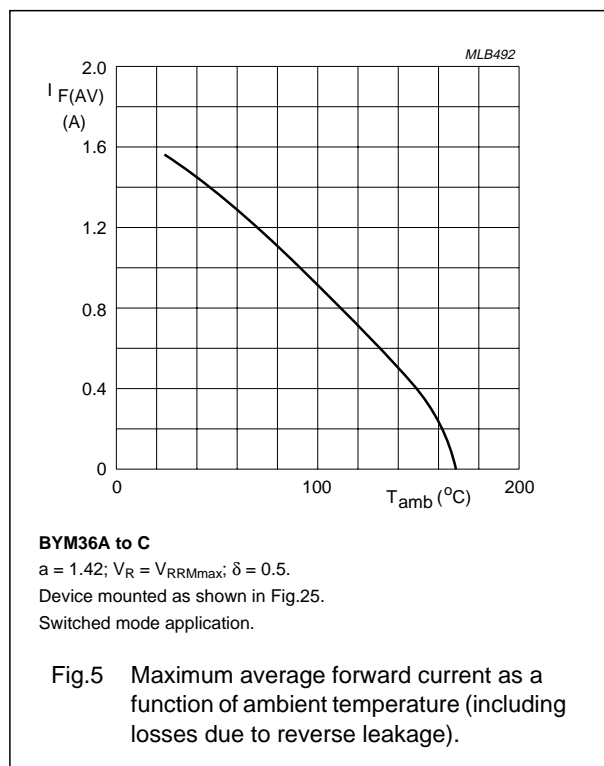
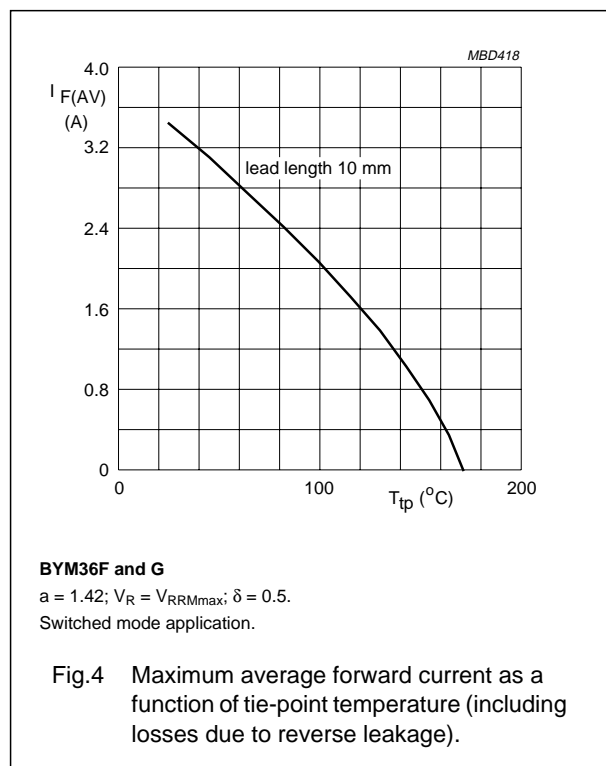
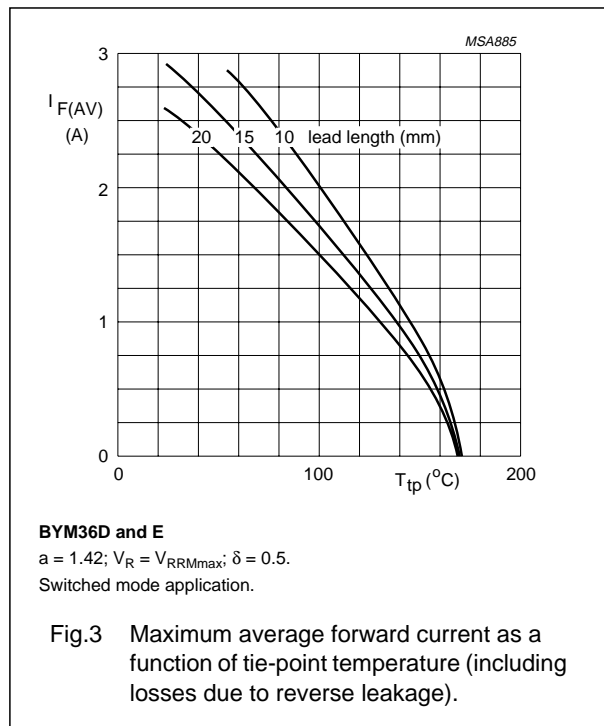
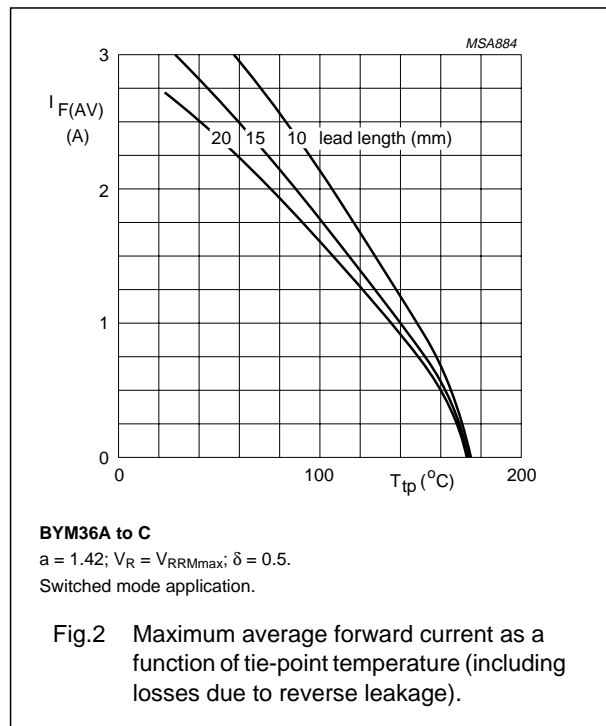
#### Note

1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer  $\geq 40$   $\mu$ m, see Fig.25. For more information please refer to the "General Part of associated Handbook".

# Fast soft-recovery controlled avalanche rectifiers

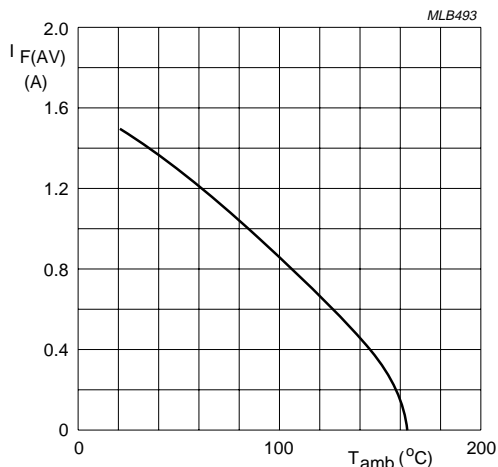
## BYM36 series

### GRAPHICAL DATA



# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series



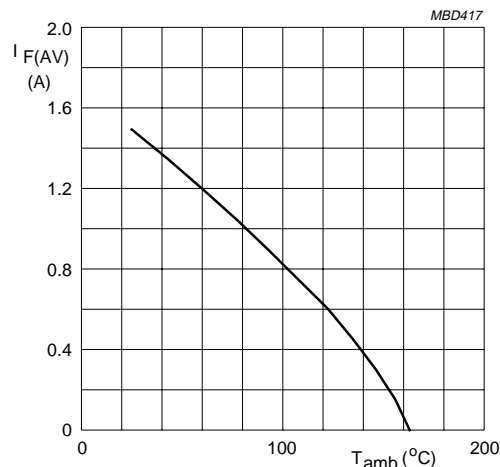
### BYM36D and E

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

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).



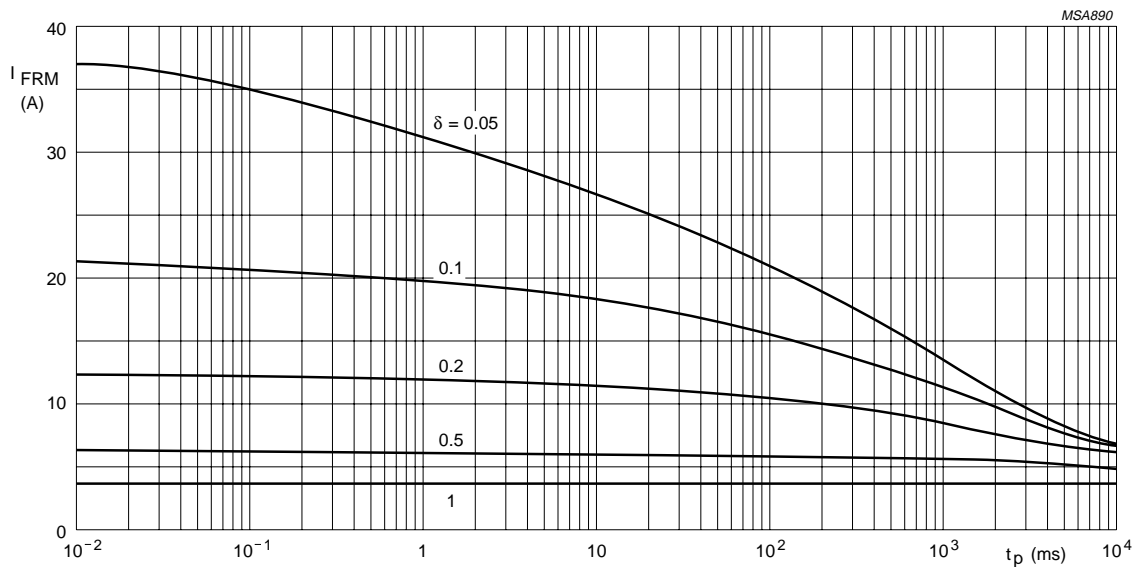
### BYM36F and G

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

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).



### BYM36A to C

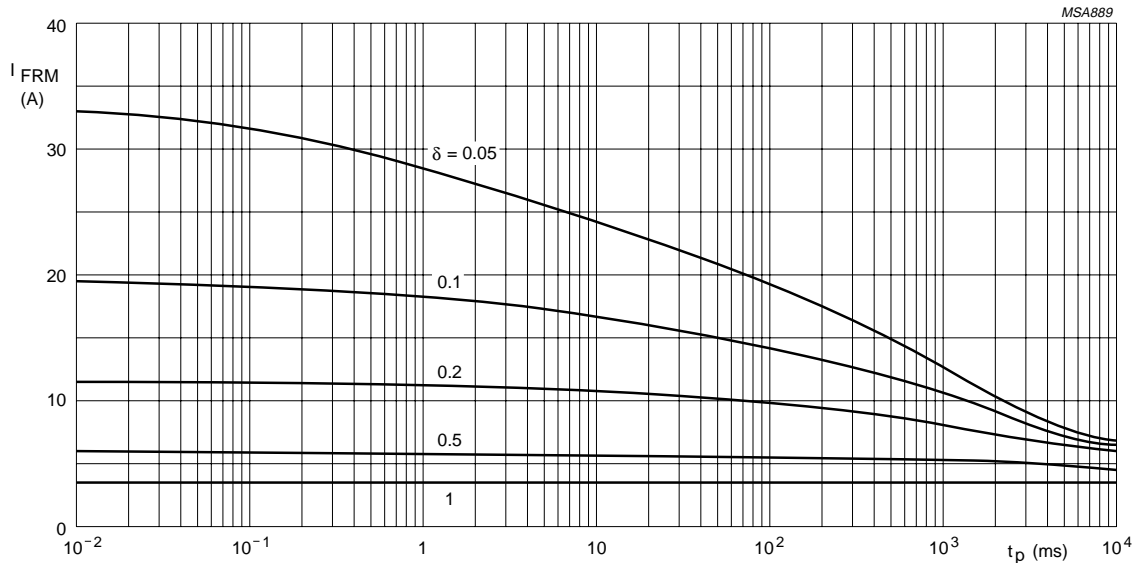
$T_{tp} = 55^{\circ}C$ ;  $R_{th j-tp} = 25 K/W$ .

$V_{RRMmax}$  during  $1 - \delta$ ; 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.

# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

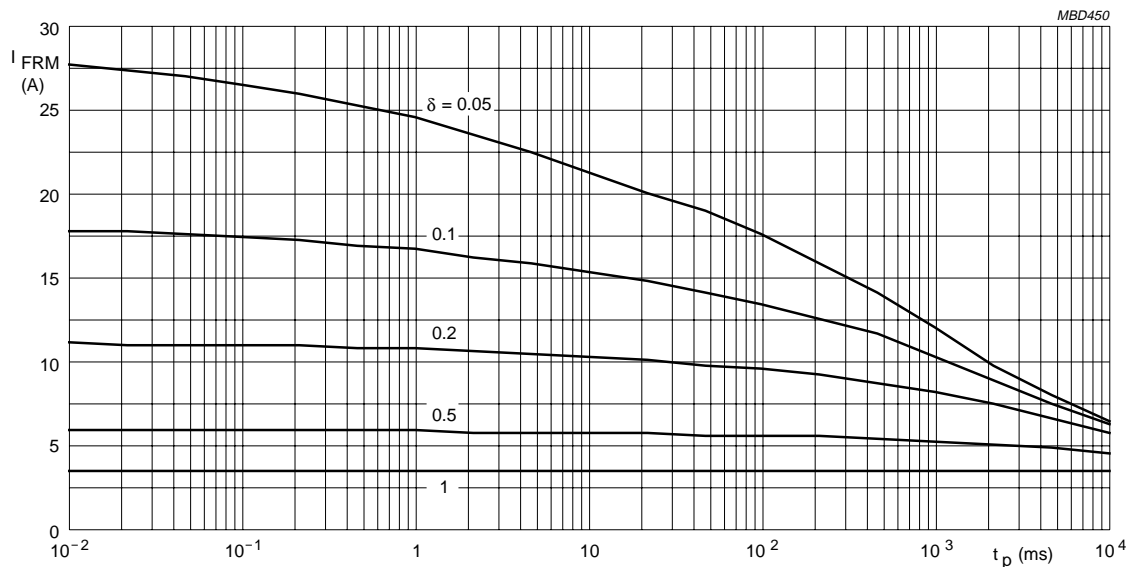


### BYM36D and E

$T_{ip} = 55^\circ\text{C}$ ;  $R_{th\ j-tp} = 25\text{ K/W}$ .

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

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



### BYM36F and G

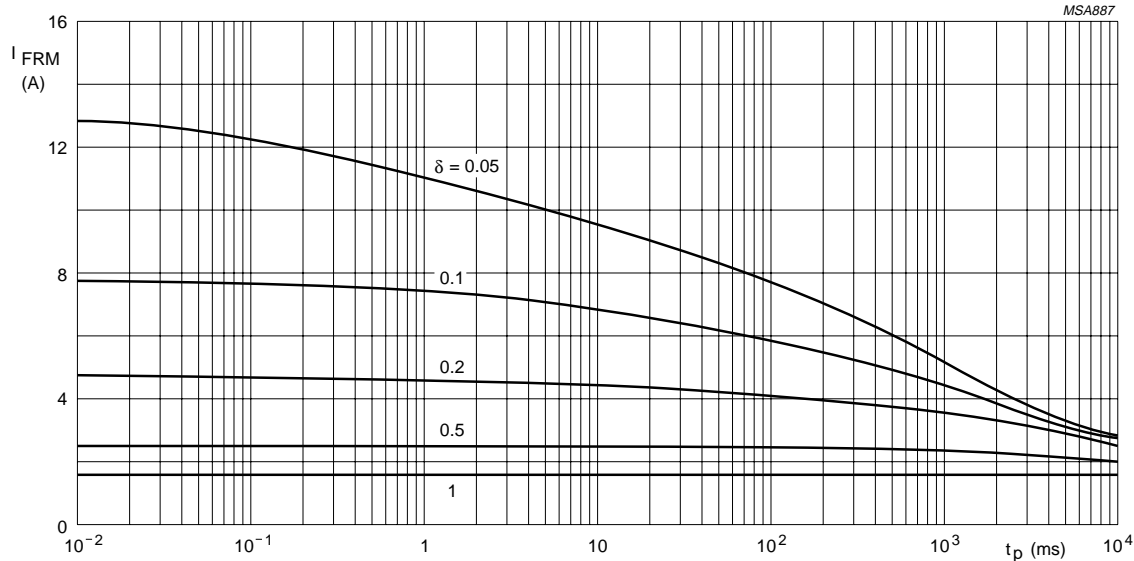
$T_{ip} = 55^\circ\text{C}$ ;  $R_{th\ j-tp} = 25\text{ K/W}$ .

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

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

# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

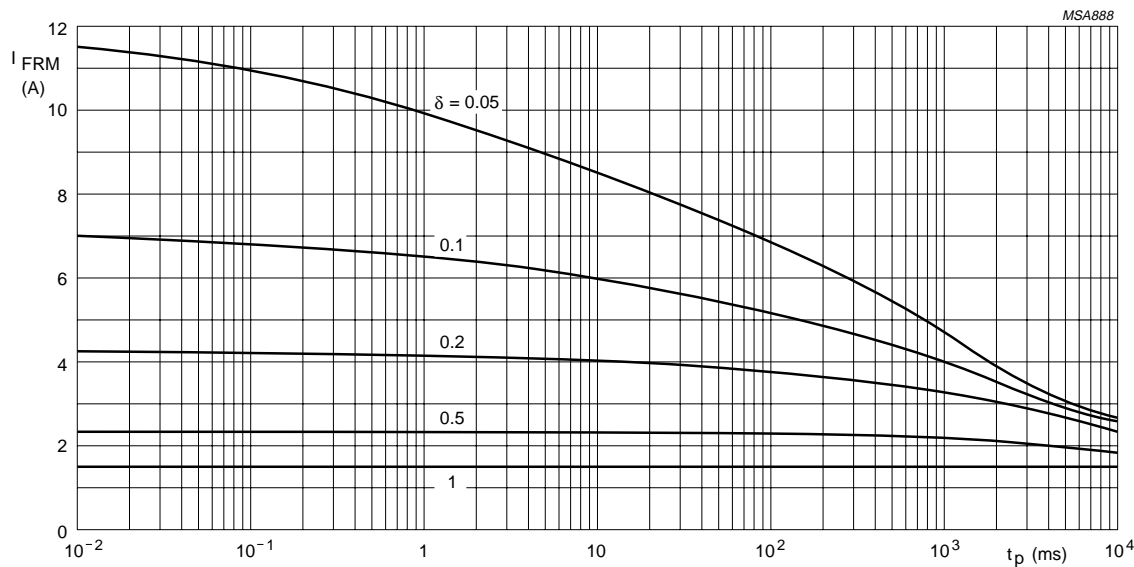


### BYM36A to C

$T_{amb} = 65\text{ }^{\circ}\text{C}$ ;  $R_{thj-a} = 75\text{ K/W}$ .

$V_{RRMmax}$  during  $1 - \delta$ ; curves include derating for  $T_{jmax}$  at  $V_{RRM} = 600\text{ V}$ .

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



### BYM36D and E

$T_{amb} = 65\text{ }^{\circ}\text{C}$ ;  $R_{thj-a} = 75\text{ K/W}$ .

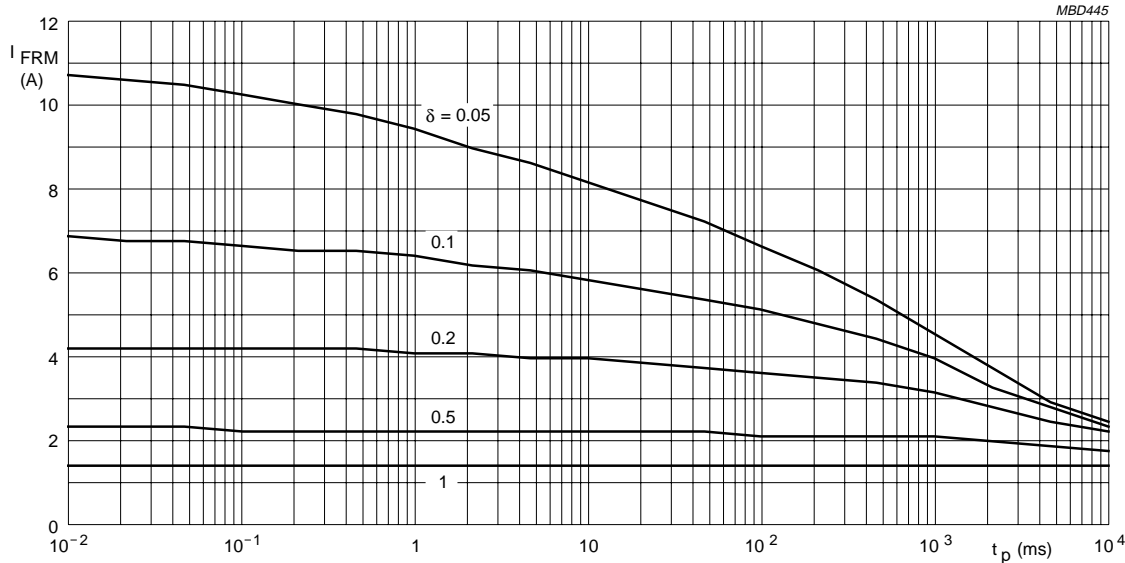
$V_{RRMmax}$  during  $1 - \delta$ ; curves include derating for  $T_{jmax}$  at  $V_{RRM} = 1000\text{ V}$ .

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



# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

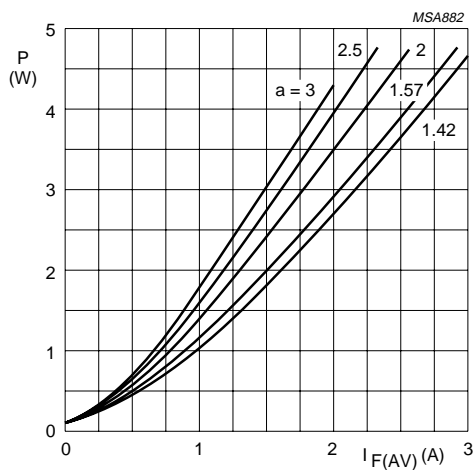


### BYM36F and G

$T_{amb} = 65\text{ }^{\circ}\text{C}$ ;  $R_{th\ j-a} = 75\text{ K/W}$ .

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

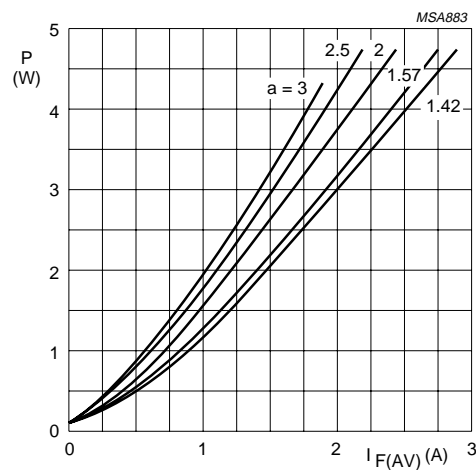
Fig.13 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



### BYM36A to C

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

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



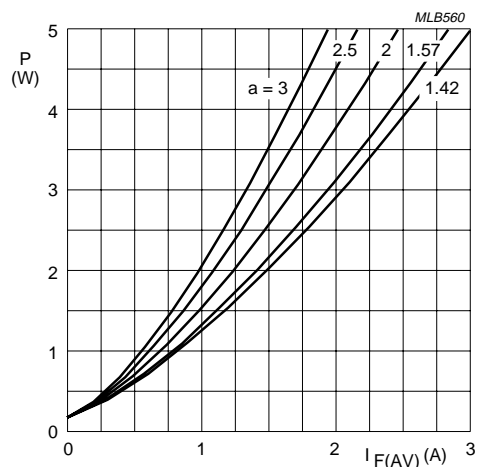
### BYM36D and E

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

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

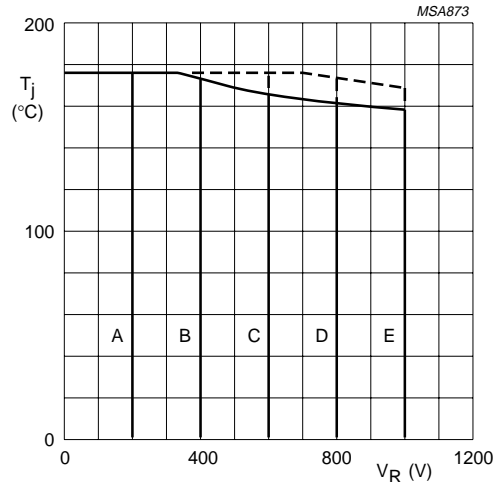
## BYM36 series



### BYM36F 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.

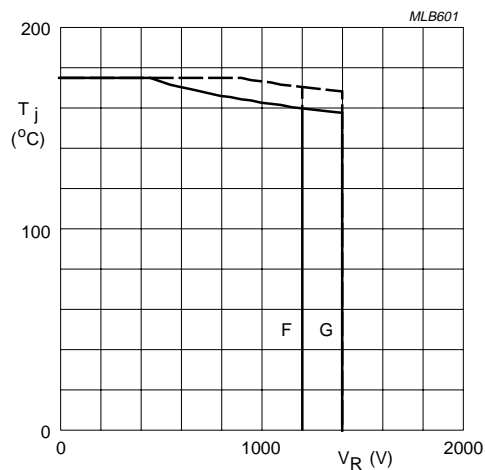


### BYM36A to E

Solid line =  $V_R$ .

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

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

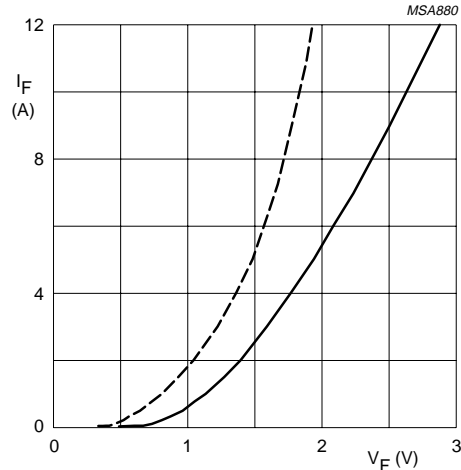


### BYM36F and G

Solid line =  $V_R$ .

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

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



### BYM36A to C

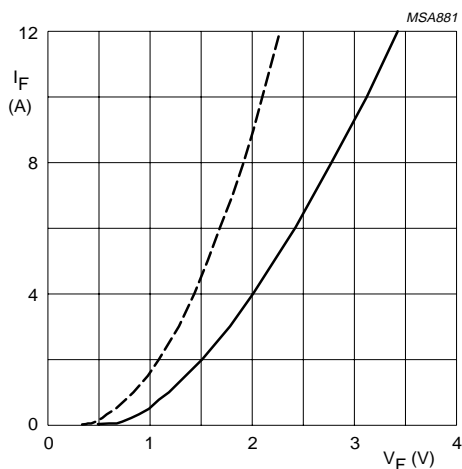
Dotted line:  $T_j = 175\text{ °C}$ .

Solid line:  $T_j = 25\text{ °C}$ .

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

# Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

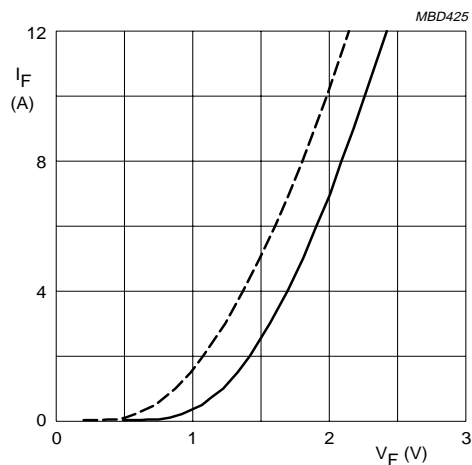


**BYM36D and E.**

Dotted line:  $T_j = 175\text{ °C}$ .

Solid line:  $T_j = 25\text{ °C}$ .

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

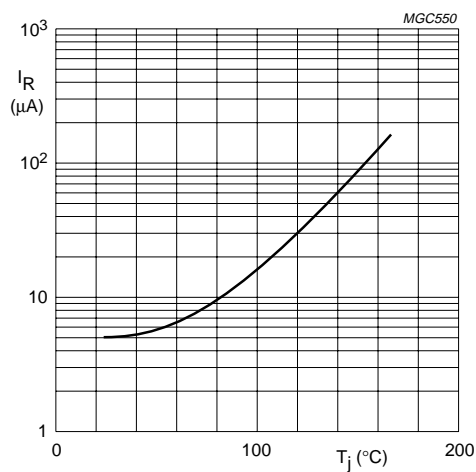


**BYM36F and G.**

Dotted line:  $T_j = 175\text{ °C}$ .

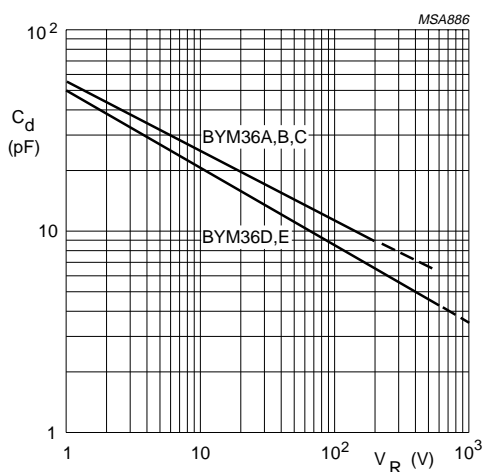
Solid line:  $T_j = 25\text{ °C}$ .

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.



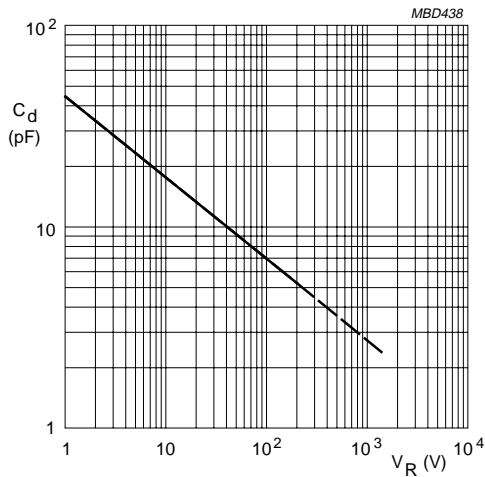
**BYM36A to E**

$f = 1\text{ MHz}$ ;  $T_j = 25\text{ °C}$ .

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

# Fast soft-recovery controlled avalanche rectifiers

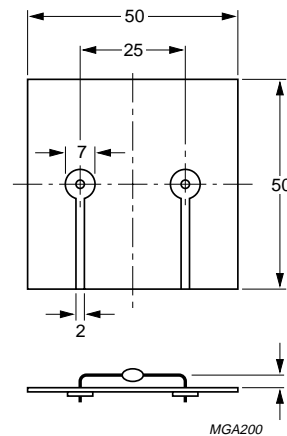
## BYM36 series



### BYM36F and G

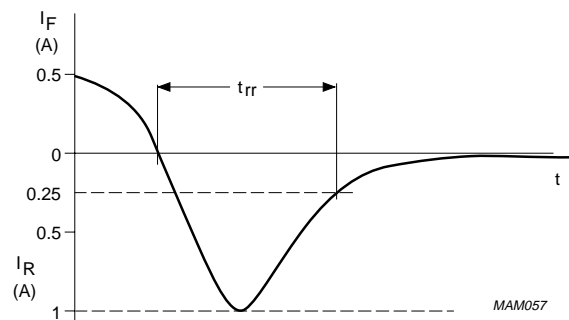
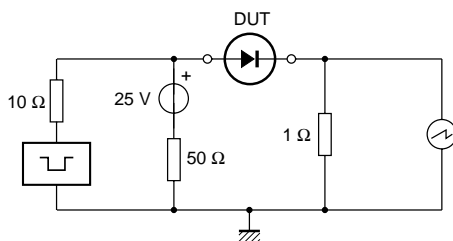
$f = 1 \text{ MHz}$ ;  $T_j = 25^\circ\text{C}$ .

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



Dimensions in mm.

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



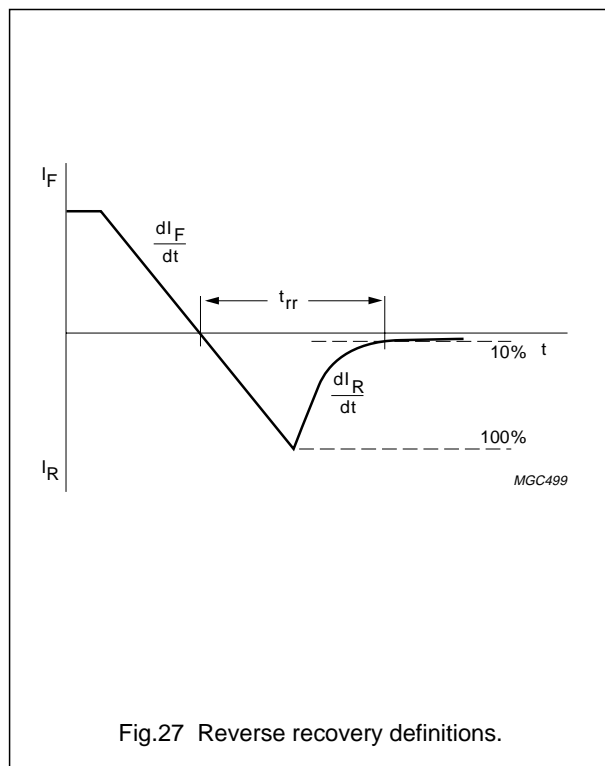
Input impedance oscilloscope:  $1 \text{ M}\Omega$ ,  $22 \text{ pF}$ ;  $t_r \leq 7 \text{ ns}$ .

Source impedance:  $50 \Omega$ ;  $t_r \leq 15 \text{ ns}$ .

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

## Fast soft-recovery controlled avalanche rectifiers

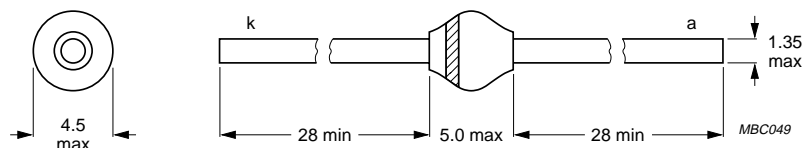
### BYM36 series



## Fast soft-recovery controlled avalanche rectifiers

## BYM36 series

### PACKAGE OUTLINE



Dimensions in mm.  
The marking band indicates the cathode.

Fig.28 SOD64.

### 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.