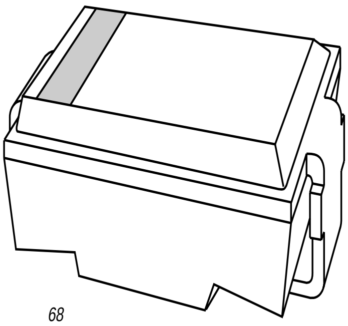
DATA SHEET



BYG80 series
Ultra fast low-loss controlled avalanche rectifiers

Product specification
Supersedes data of 1996 May 24

1997 Nov 25

Philips Semiconductors

PHILIPS

Ultra fast low-loss controlled avalanche rectifiers

BYG80 series

FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- UL 94V-O classified plastic package
- Shipped in 12 mm embossed tape.

DESCRIPTION

DO-214AC surface mountable package with glass passivated chip.

The well-defined void-free case is of a transfer-moulded thermo-setting plastic.

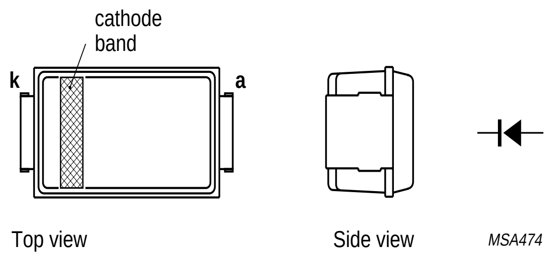


Fig.1 Simplified outline (DO-214AC; SOD106) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYG80A		–	50	V
	BYG80B		–	100	V
	BYG80C		–	150	V
	BYG80D		–	200	V
	BYG80F		–	300	V
	BYG80G		–	400	V
	BYG80J		–	600	V
V_R	continuous reverse voltage				
	BYG80A		–	50	V
	BYG80B		–	100	V
	BYG80C		–	150	V
	BYG80D		–	200	V
	BYG80F		–	300	V
	BYG80G		–	400	V
	BYG80J		–	600	V
$I_{F(AV)}$	average forward current	T_{tp} = 100 °C; see Figs 2, 3 and 4 averaged over any 20 ms period; see also Figs 17, 18 and 19			
	BYG80A to D		–	2.4	A
	BYG80F; BYG80G		–	2.3	A
	BYG80J		–	2.0	A
$I_{F(AV)}$	average forward current	T_{amb} = 60 °C; AL_2O_3 PCB mounting (see Fig.27); see Figs 5, 6 and 7 averaged over any 20 ms period; see also Figs 17, 18 and 19			
	BYG80A to D		–	1.25	A
	BYG80F; BYG80G		–	1.15	A
	BYG80J		–	0.95	A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{F(AV)}$	average forward current	T_{amb} = 60 °C; epoxy PCB mounting (see Fig.27); see Figs 5, 6 and 7 averaged over any 20 ms period; see also Figs 17, 18 and 19			
	BYG80A to D		–	0.95	A
	BYG80F; BYG80G		–	0.85	A
	BYG80J		–	0.65	A
I_{FRM}	repetitive peak forward current	T_{tp} = 100 °C; see Figs 8, 9 and 10			
	BYG80A to D		–	21	A
	BYG80F; BYG80G		–	21	A
	BYG80J		–	18	A
I_{FRM}	repetitive peak forward current	T_{amb} = 60 °C; AL_2O_3 PCB mounting; see Figs 11, 12 and 13			
	BYG80A to D		–	11	A
	BYG80F; BYG80G		–	11	A
	BYG80J		–	9	A
I_{FRM}	repetitive peak forward current	T_{amb} = 60 °C; epoxy PCB mounting; see Figs 14, 15 and 16			
	BYG80A to D		–	8	A
	BYG80F; BYG80G		–	8	A
	BYG80J		–	6	A
I_{FSM}	non-repetitive peak forward current	t = 8.3 ms half sine wave; T_j = 25 °C prior to surge; $V_R = V_{RRMmax}$			
	BYG80A to D		–	36	A
	BYG80F; BYG80G; BYG80J		–	32	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 Fig.20	–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 21, 22 and 23				
	BYG80A to D		–	–	0.67	V
	BYG80F; BYG80G		–	–	0.73	V
	BYG80J		–	–	0.96	V
V_F	forward voltage	I_F = 1 A; see Figs 21, 22 and 23				
	BYG80A to D		–	–	0.93	V
	BYG80F; BYG80G		–	–	0.98	V
	BYG80J		–	–	1.20	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)R}$	reverse avalanche breakdown voltage	I_R = 0.1 mA				
	BYG80A		55	–	–	V
	BYG80B		110	–	–	V
	BYG80C		165	–	–	V
	BYG80D		220	–	–	V
	BYG80F		330	–	–	V
	BYG80G		440	–	–	V
	BYG80J		675	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Figs 24 and 25	–	–	10	µA
I_R	reverse current	$V_R = V_{RRMmax}$; T_j = 165 °C; see Figs 24 and 25				
	BYG80A to D		–	–	100	µA
	BYG80F; BYG80G and J		–	–	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.29				
	BYG80A to D		–	–	25	ns
	BYG80F; BYG80G and J		–	–	50	ns
C_d	diode capacitance	f = 1 MHz; V_R = 0; see Fig.26				
	BYG80A to D		–	90	–	pF
	BYG80F; BYG80G		–	70	–	pF
	BYG80J		–	65	–	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.28				
	BYG80A to D		–	–	3	A/µs
	BYG80F; BYG80G and J		–	–	4	A/µs

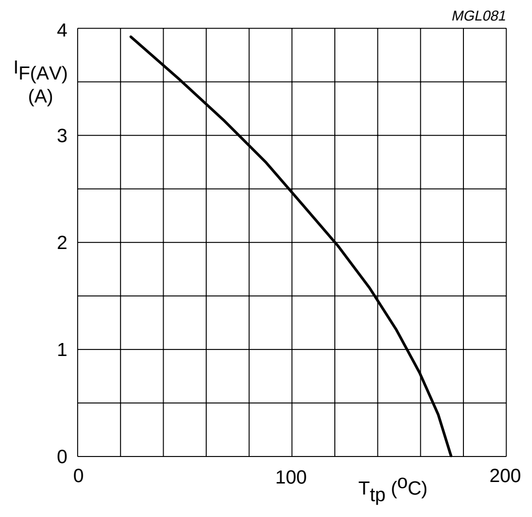
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point		25	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	100	K/W
		note 2	150	K/W

Notes

1. Device mounted on Al_2O_3 printed-circuit board, 0.7 mm thick; thickness of copper ≥35 µm, see Fig.27.
2. Device mounted on epoxy-glass printed-circuit board, 1.5 mm thick; thickness of copper ≥40 µm, see Fig.27. For more information please refer to the *“General Part of associated Handbook”*.

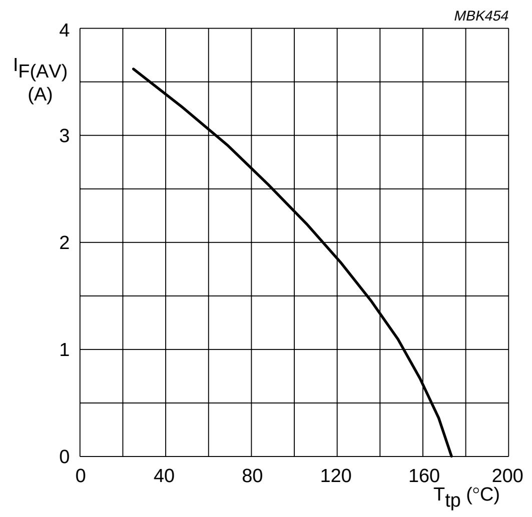
GRAPHICAL DATA



BYG80A to D

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

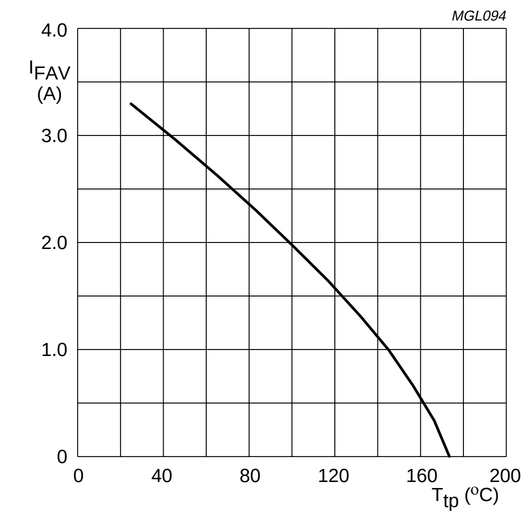
Fig.2 Maximum permissible average forward current as a function of tie-point temperature (including losses due to reverse leakage).



BYG80F and G

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

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

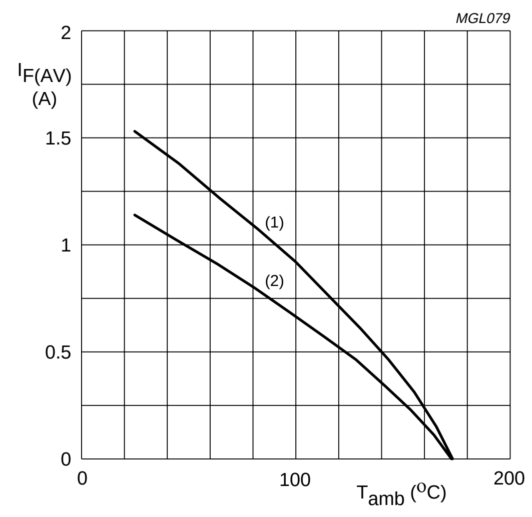


BYG80J

Switched mode application.

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

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



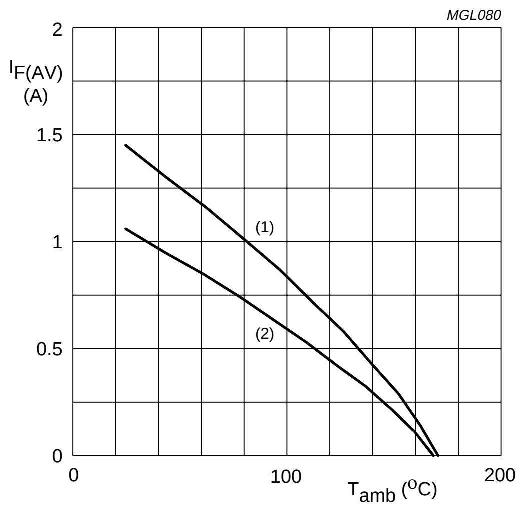
BYG80A to D

Switched mode application; $V_R = V_{RRMmax}$; δ = 0.5; a = 1.42

Device mounted as shown in Fig.27;

1: Al_2O_3 PCB; 2: epoxy PCB.

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



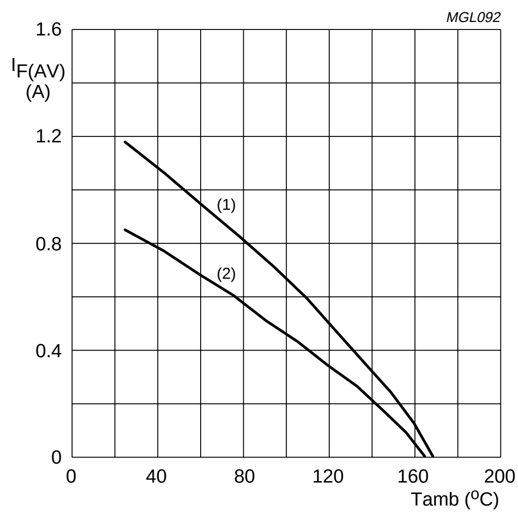
BYG80F and G

Switched mode application; $V_R = V_{RRMmax}$; δ = 0.5; a = 1.42

Device mounted as shown in Fig.27;

1: Al_2O_3 PCB; 2: epoxy PCB.

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



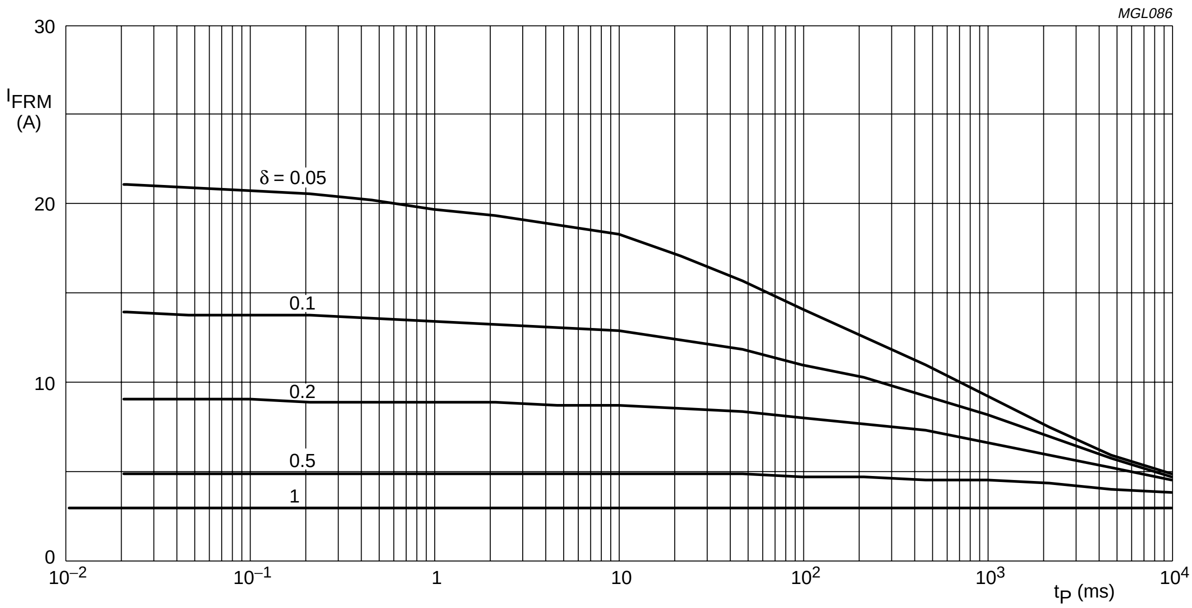
BYG80J

Switched mode application; $V_R = V_{RRMmax}$; δ = 0.5; a = 1.42

Device mounted as shown in Fig.27;

1: Al_2O_3 PCB; 2: epoxy PCB.

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

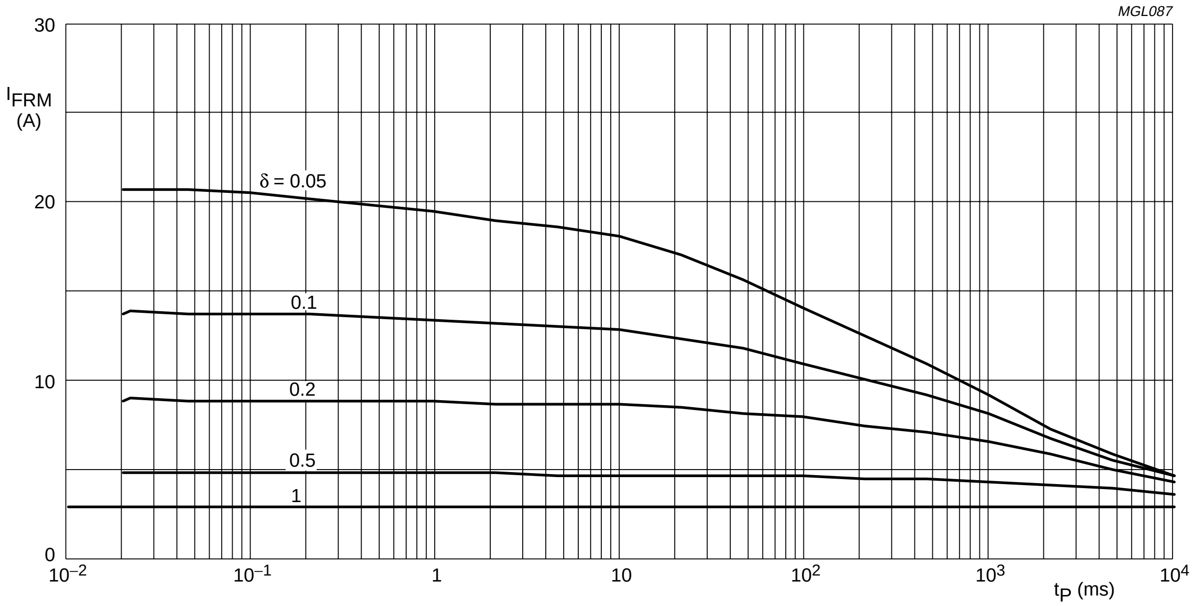


BYG80A to D

T_{tp} = 100 °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.8 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

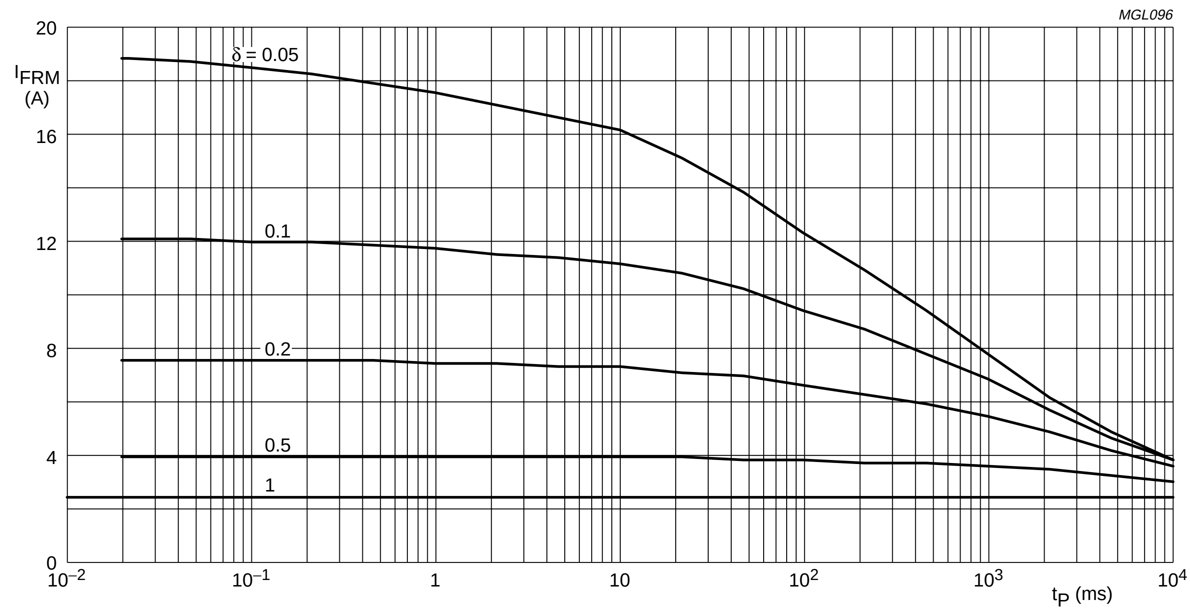


BYGF and G

T_{tp} = 100 °C; $R_{th\ j\text{-}tp}$ = 25 K/W.

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

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

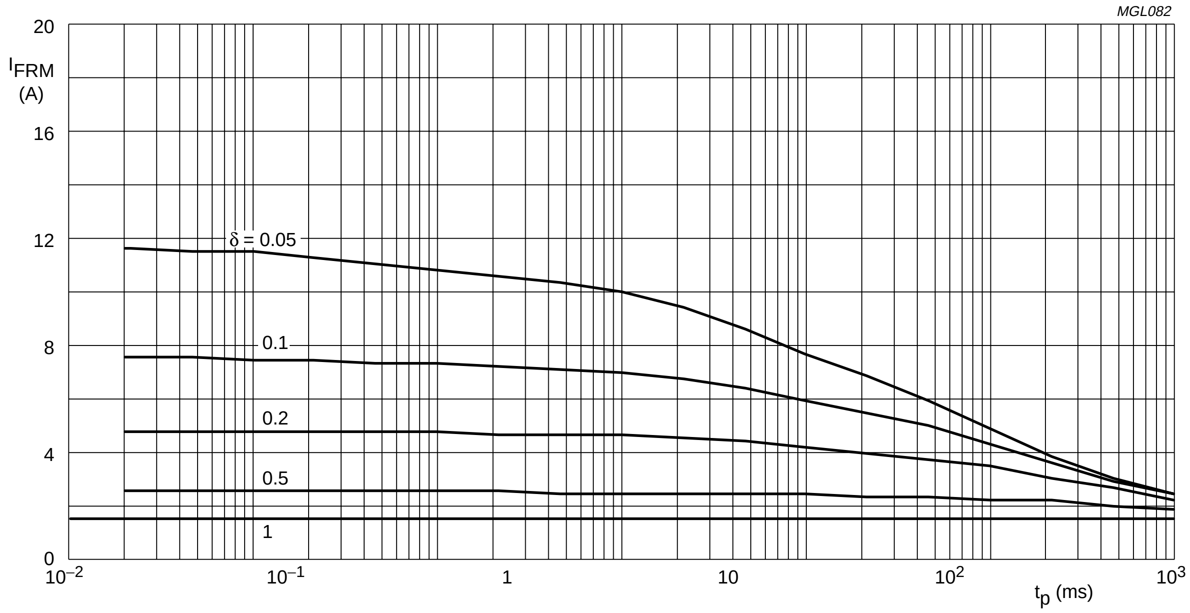


BYG80J

T_{tp} = 100 °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.10 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

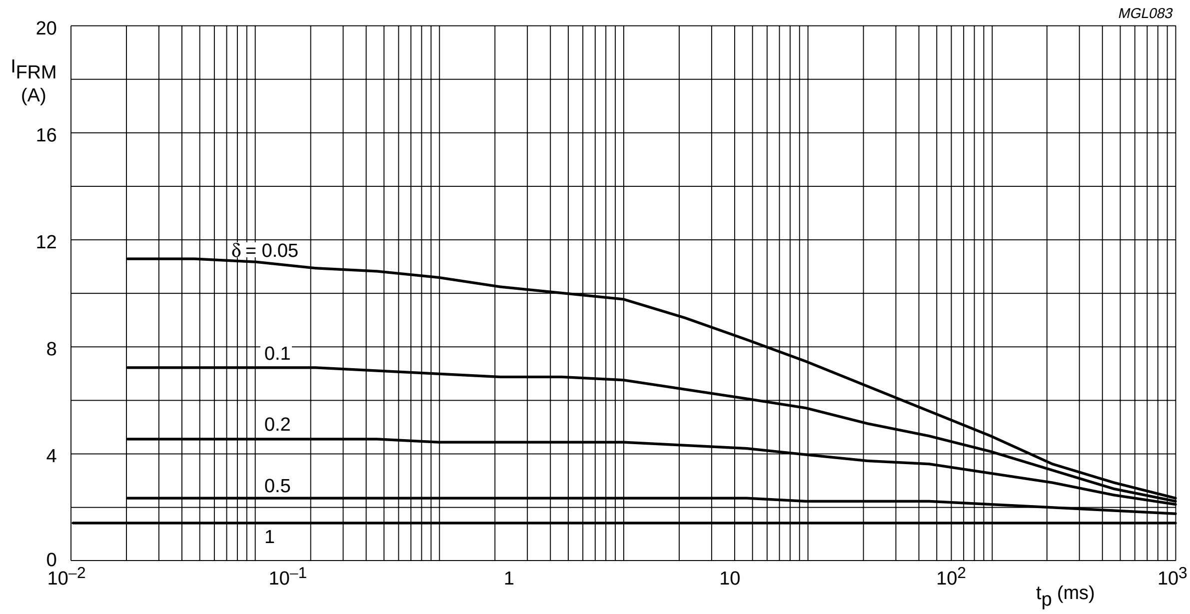


BYG80A to D

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} = 200 V.

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

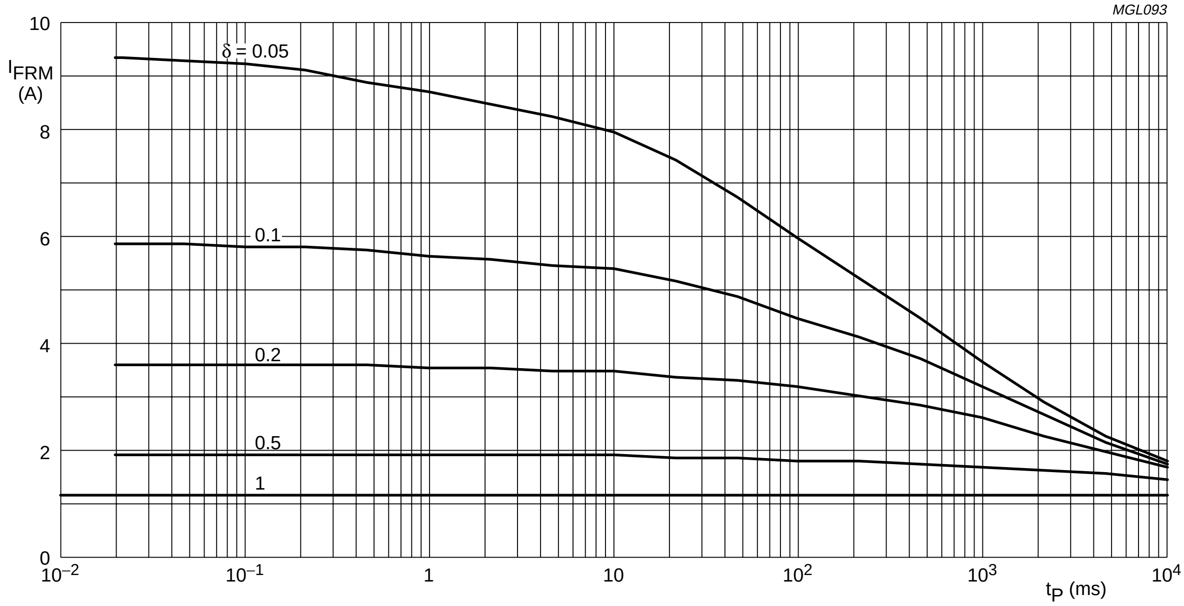


BYG80F and G

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} = 400 V.

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

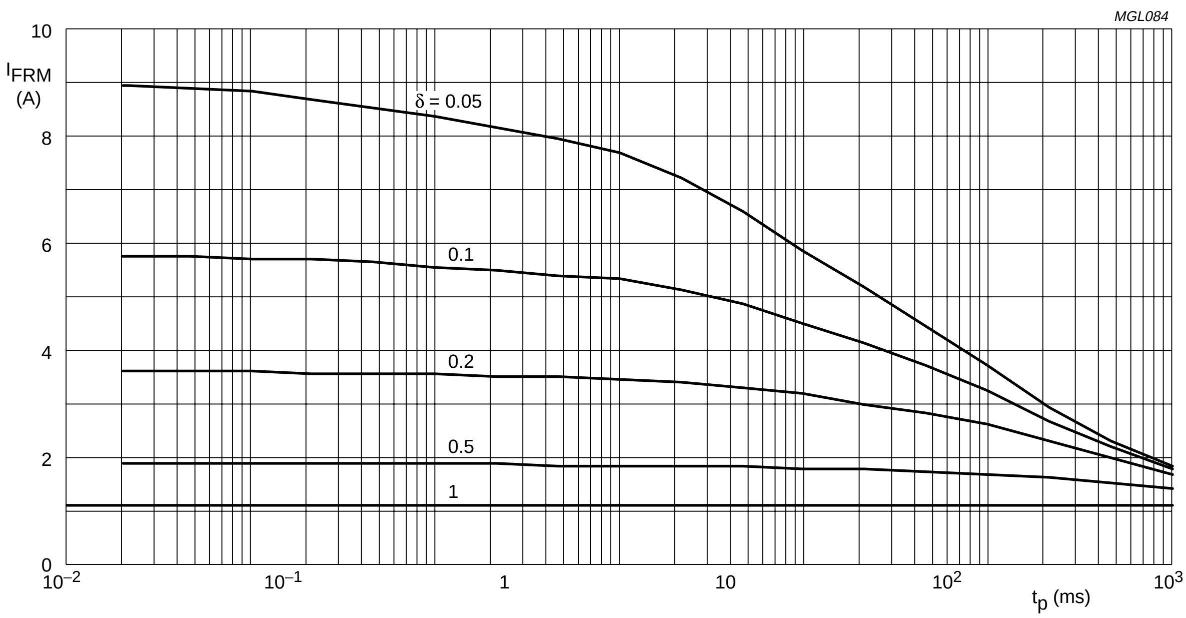


BYG80J

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

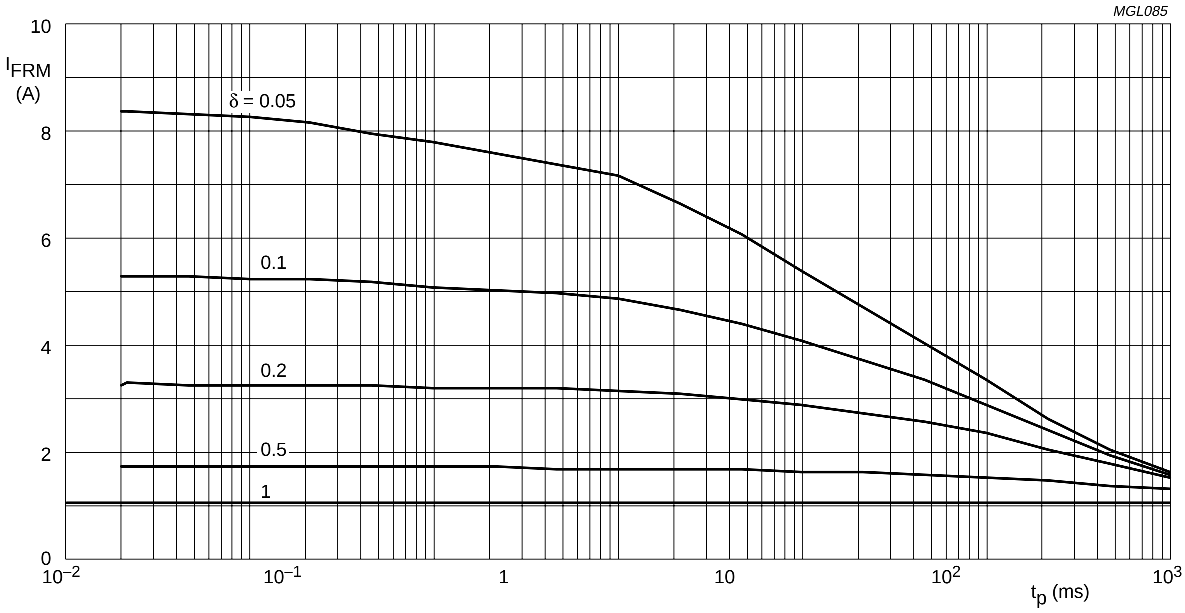


BYG80A to D

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 150 K/W.

V_{RRMmax} during 1 - δ; curves include derating for $T_{j\ max}$ at V_{RRM} = 200 V.

Fig.14 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

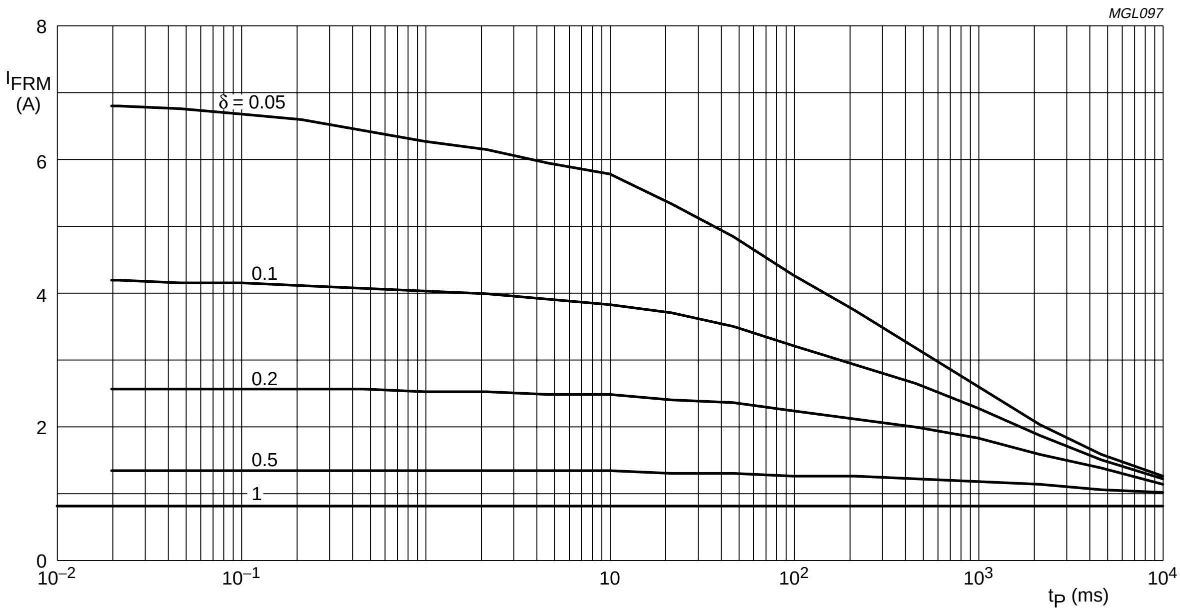


BYG80F and G

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 150 K/W.

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

Fig.15 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.

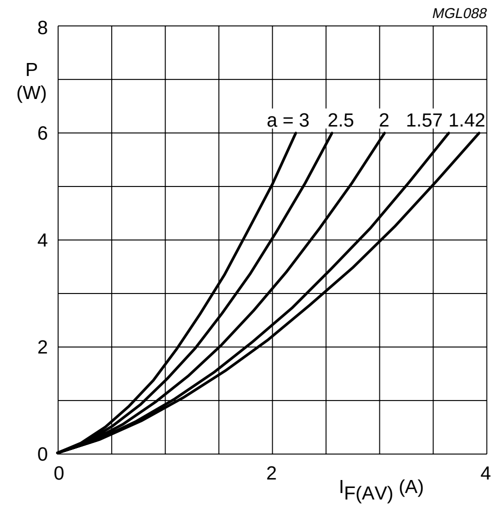


BYG80J

T_{amb} = 60 °C; $R_{th\ j\text{-}a}$ = 150 K/W.

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

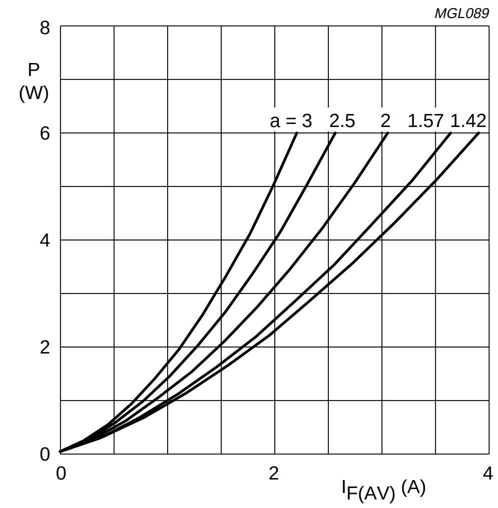
Fig.16 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



BYG80A to D

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

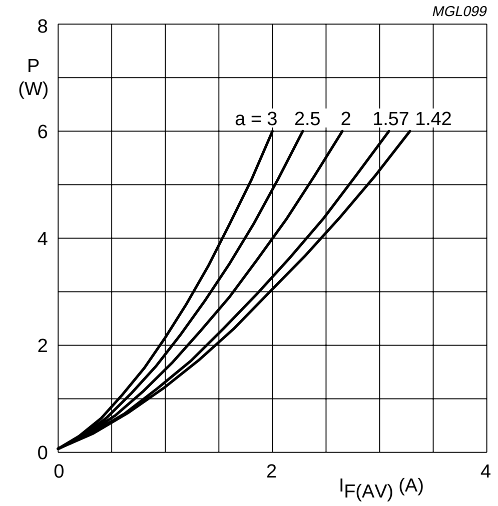
Fig.17 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYG80F and G

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

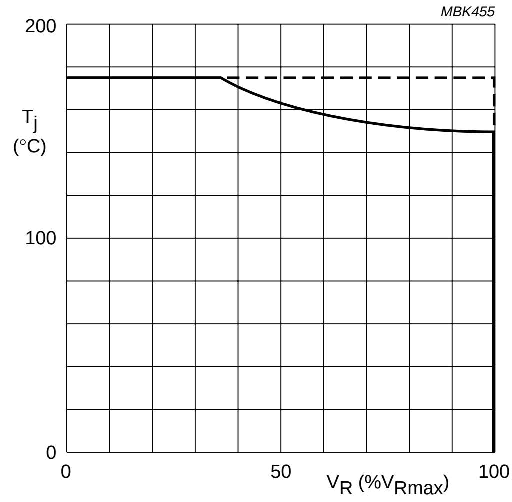
Fig.18 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYG80J

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

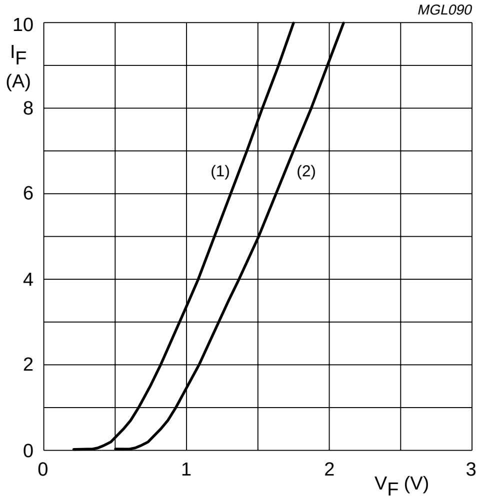
Fig.19 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



Solid line = V_R.

Dotted line = V_{RRM}; δ = 0.5.

Fig.20 Maximum permissible junction temperature as a function of maximum reverse voltage percentage.

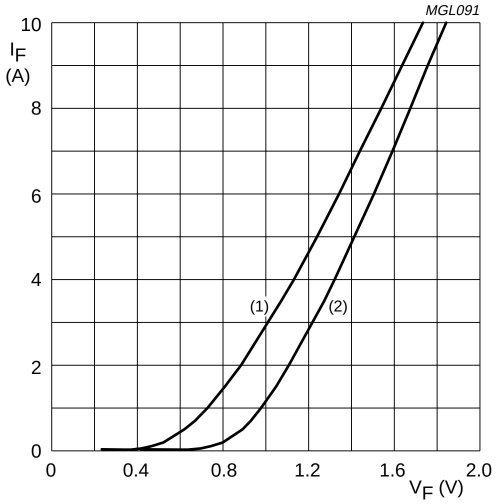


BYG80A to D

(1) T_j = 175 °C.

(2) T_j = 25 °C.

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

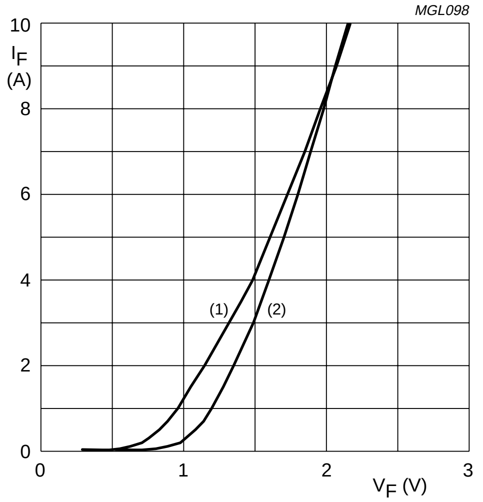


BYG80F and G

(1) T_j = 175 °C.

(2) T_j = 25 °C.

Fig.22 Forward current as a function of forward voltage; maximum values.

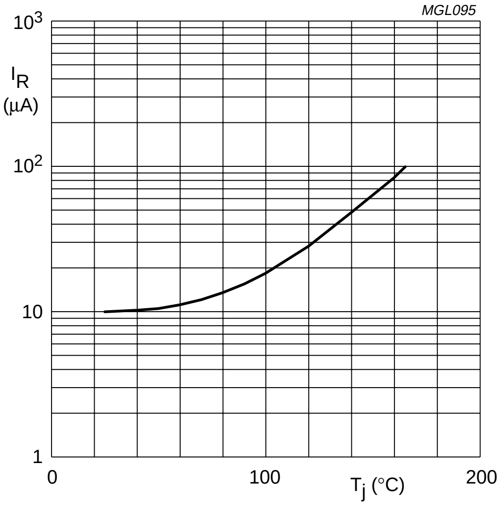


BYG80J

(1) T_j = 175 °C.

(2) T_j = 25 °C.

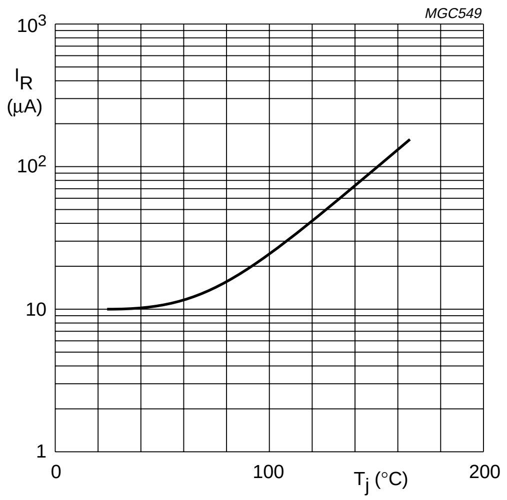
Fig.23 Forward current as a function of forward voltage; maximum values.



BYG80A to D

$V_R = V_{RMMmax}$.

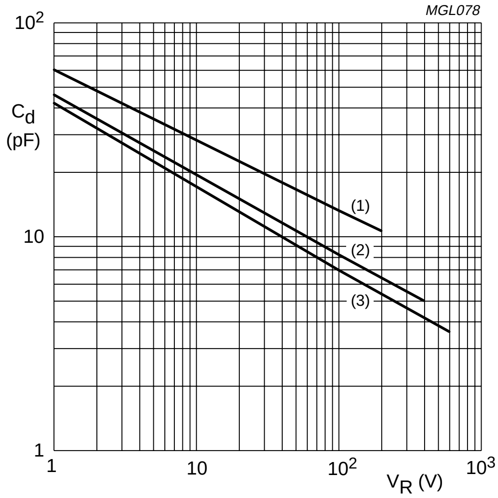
Fig.24 Reverse current as a function of junction temperature; maximum values.



BYG80F to J

$V_R = V_{RMMmax}$.

Fig.25 Reverse current as a function of junction temperature; maximum values.



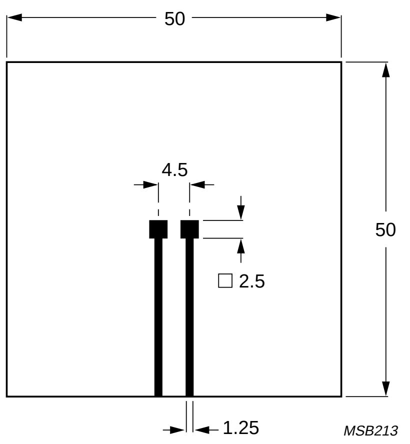
f = 1 MHz; T_j = 25 °C.

(1) **BYG80A to D**

(2) **BYG80F and G**

(3) **BYG80J**

Fig.26 Diode capacitance as a function of reverse voltage; typical values.



Dimensions in mm.

Fig.27 Printed-circuit board for surface mounting.

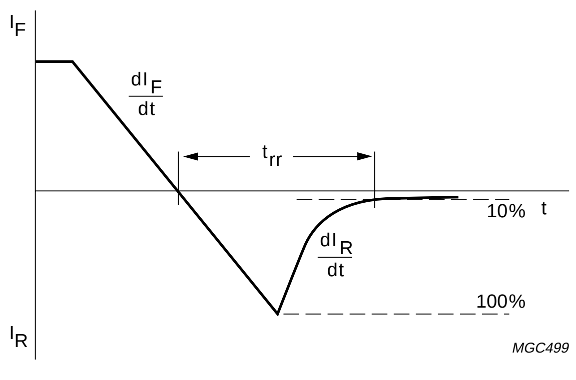
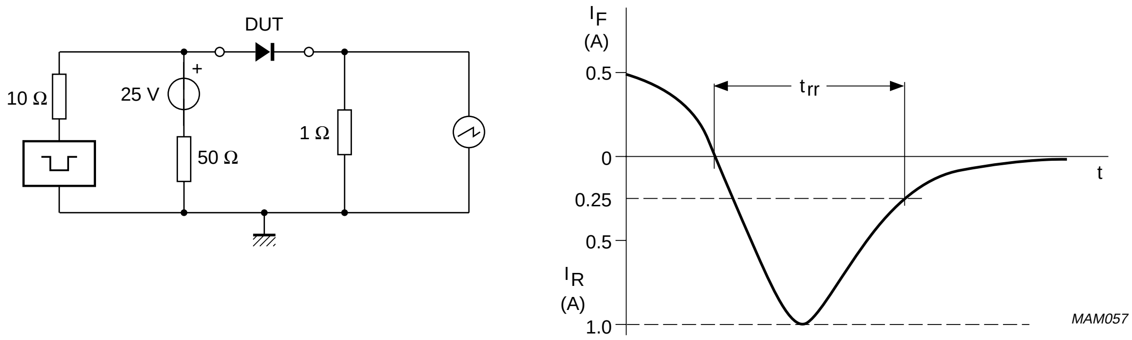


Fig.28 Reverse recovery definitions.

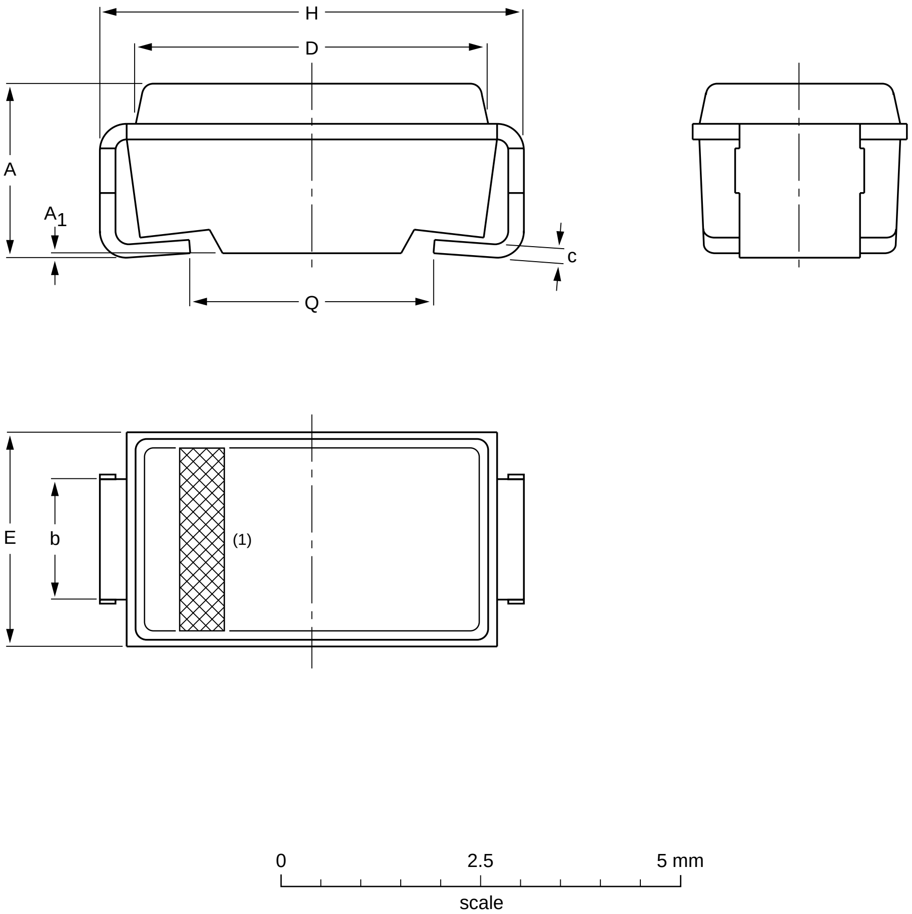


Input impedance oscilloscope: 1 MΩ, 22 pF; $t_r \leq 7$ ns.
Source impedance: 50 Ω; $t_r \leq 15$ ns.

Fig.29 Test circuit and reverse recovery time waveform and definition.

PACKAGE OUTLINE

Transfer-moulded thermo-setting plastic small rectangular surface mounted package; 2 connectors **SOD106**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D	E	H	Q
mm	2.3 2.0	0.05	1.6 1.4	0.2	4.5 4.3	2.8 2.4	5.5 5.1	3.3 2.7

Note

1. The marking band indicates the cathode.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOD106		DO-214AC				97-06-09

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.

NOTES

NOTES

NOTES

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