Silicon Diode

BYG80J

600V/2A

DATASHEET

OEM – Philips

Source: Philips Databook 1999

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.

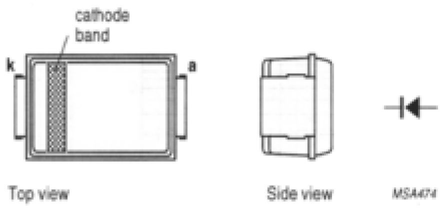

Fig.1 Simplified outline (DO-214AC; SOD106) and symbol.

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

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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

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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 Handbook SC01'*.

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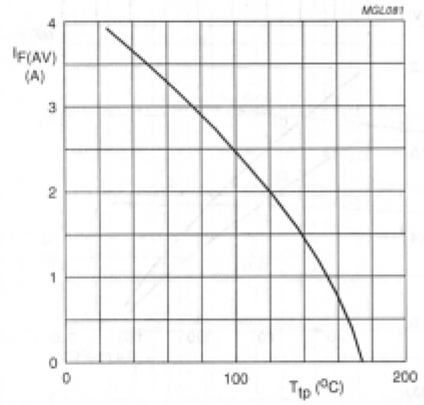
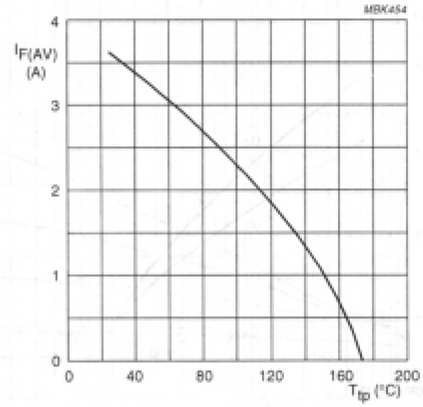
GRAPHICAL DATA



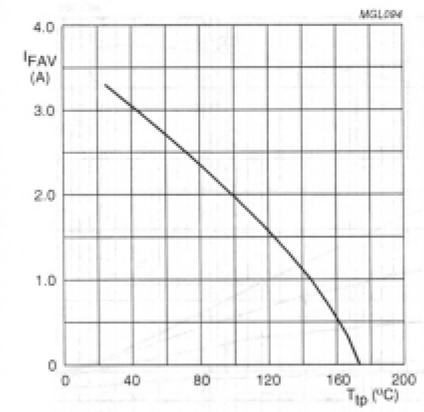
BYG80A to D
Switched mode application; $V_R = V_{RRMmax}$; $\delta = 0.5$; a = 1.42.

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



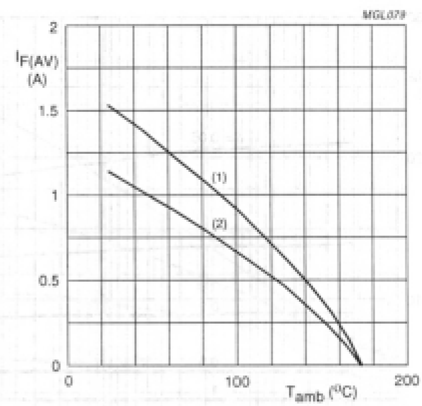
BYG80F and G
Switched mode application; $V_R = V_{RRMmax}$; $\delta = 0.5$; a = 1.42.

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



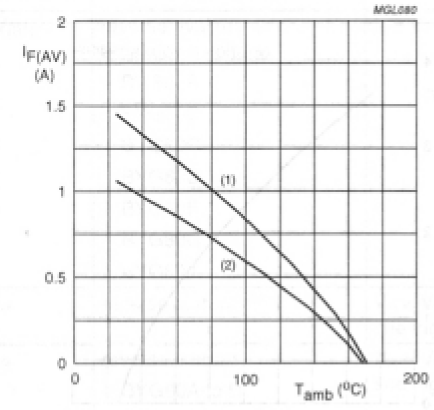
BYG80J
Switched mode application.
$V_R = V_{RRMmax}$; $\delta = 0.5$; a = 1.42.

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



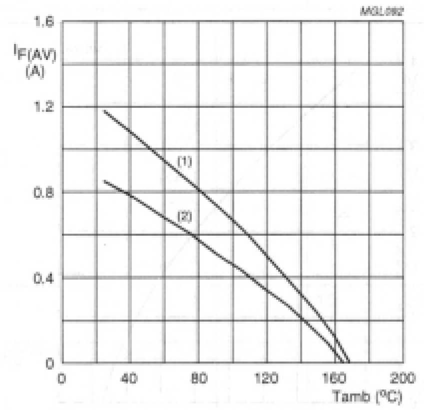
BYG80A to D
Switched mode application; $V_R = V_{RRMmax}$; $\delta = 0.5$; a = 1.42
Device mounted as shown in Fig.27;
1: Al_2O_3 PCB; 2: epoxy PCB.

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



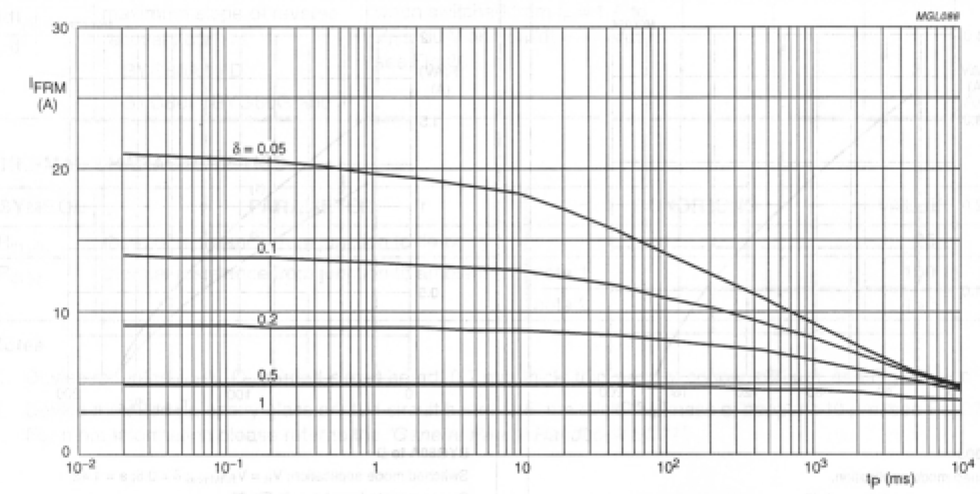
BYG80F and G
Switched mode application; $V_R = V_{RRMmax}$; $\delta = 0.5$; a = 1.42
Device mounted as shown in Fig.27;
1: Al_2O_3 PCB; 2: epoxy PCB.

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



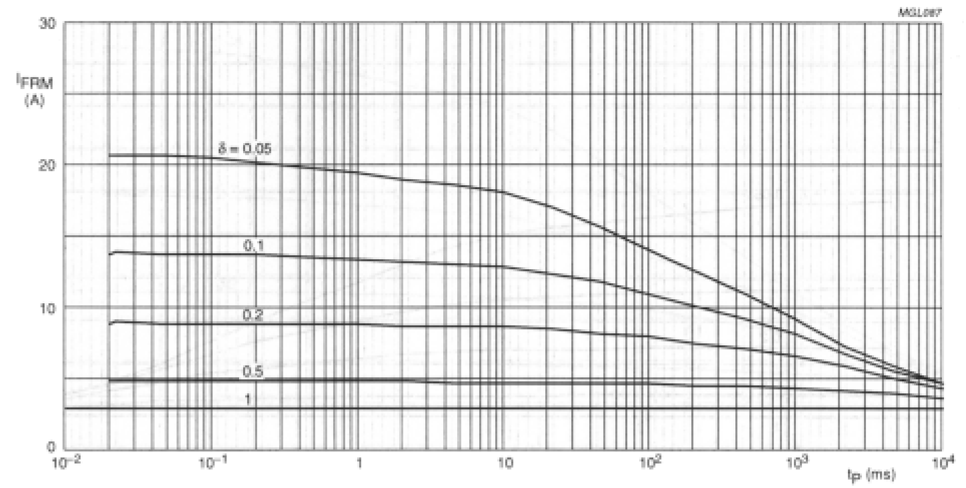
BYG80J
Switched mode application; $V_R = V_{RRMmax}$; $\delta = 0.5$; a = 1.42
Device mounted as shown in Fig.27;
1: Al_2O_3 PCB; 2: epoxy PCB.

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 $1 - \delta$; 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.

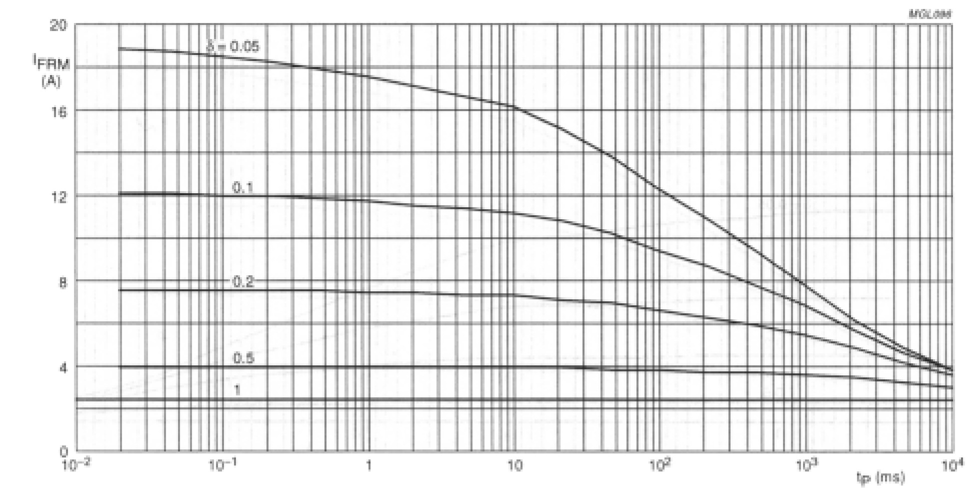


BYGF and G

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.

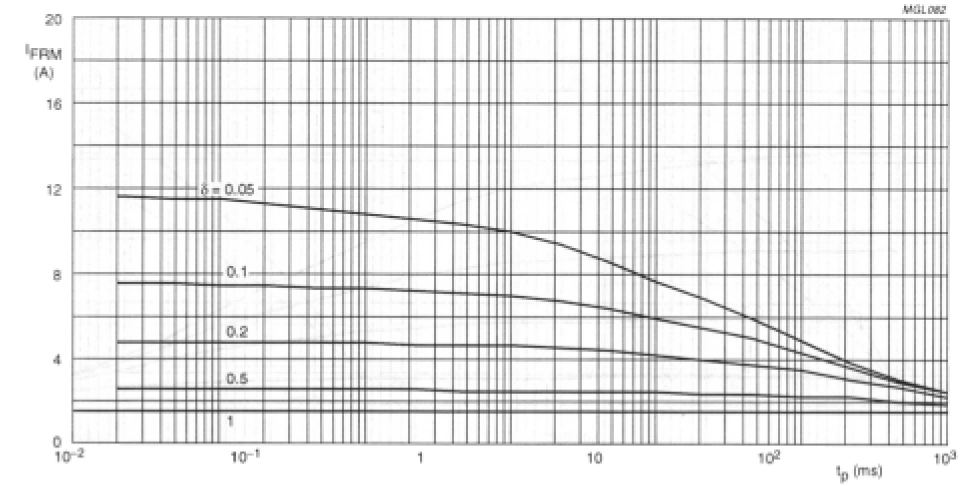


BYG80J

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.

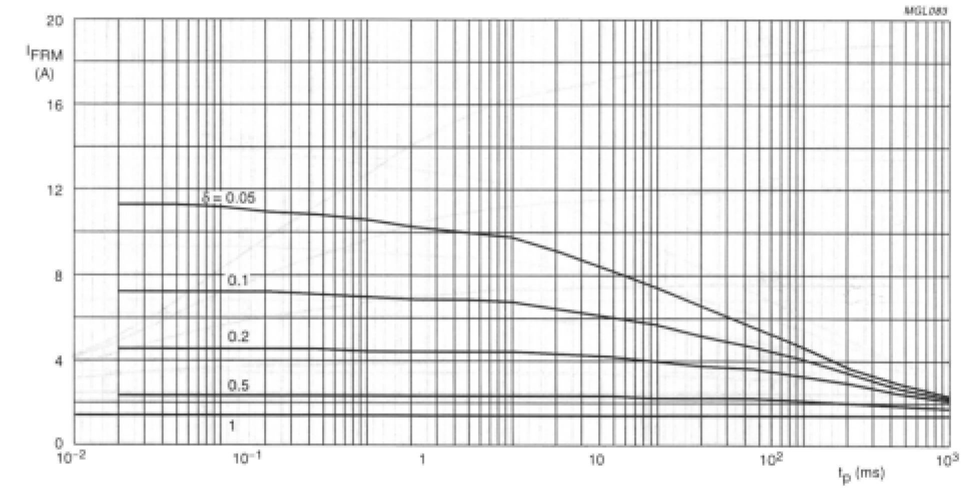


BYG80A to D

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.

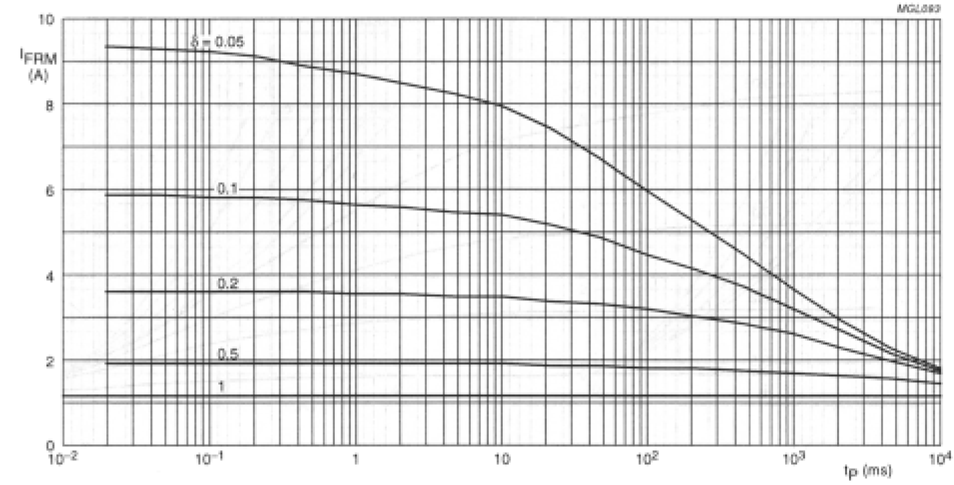


BYG80F and G

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.

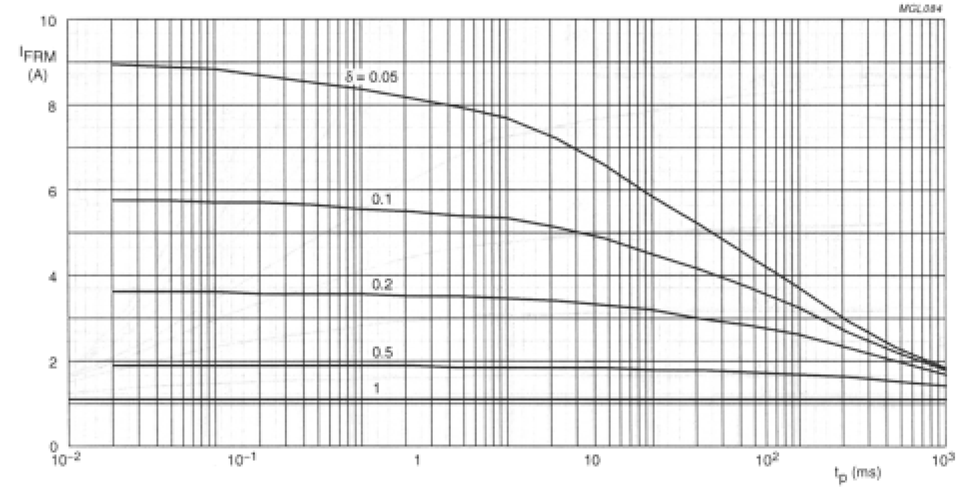


BYG80J

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.

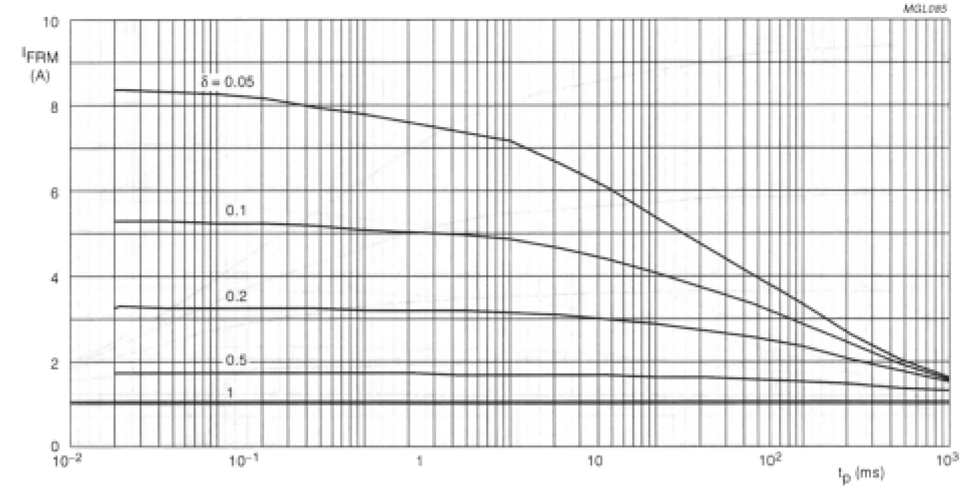


BYG80A to D

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.

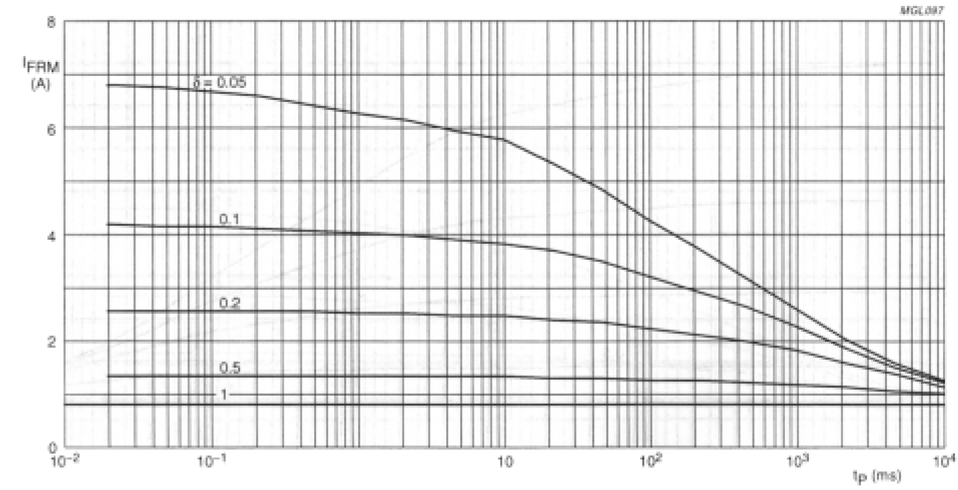


BYG80F and G

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.

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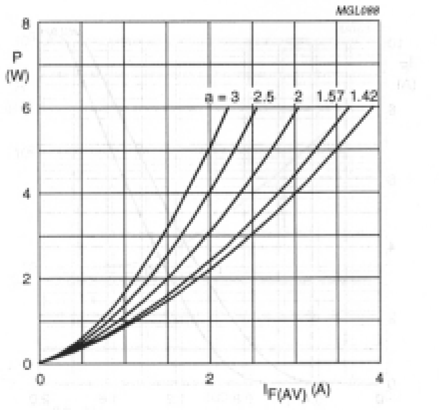
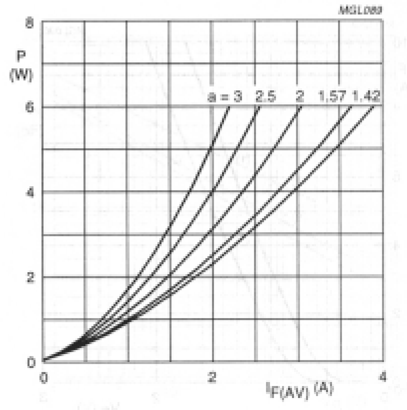


BYG80A to D

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

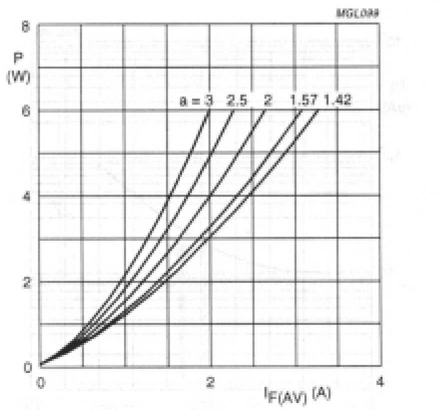
Fig.17 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



BYG80F and G

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

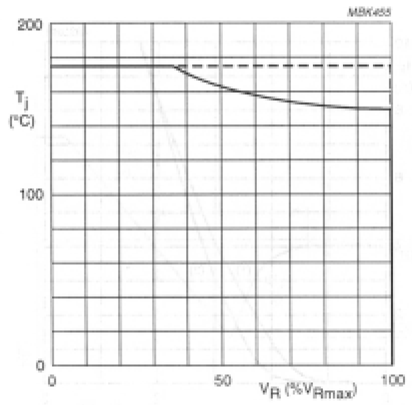
Fig.18 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



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.

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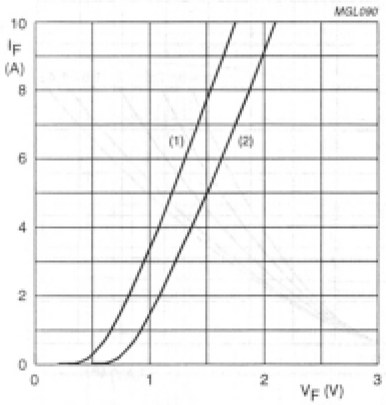
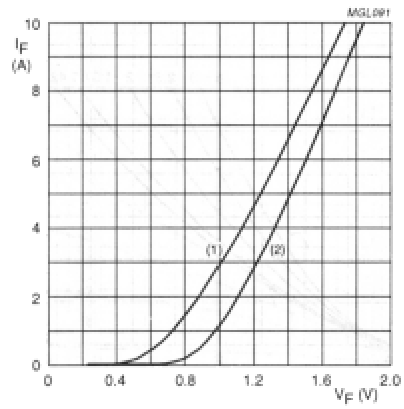


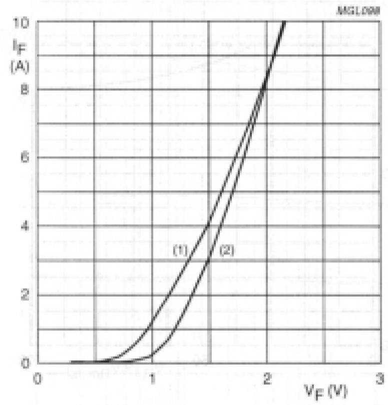
BYG80A to D
(1) T_j = 175 °C.
(2) T_j = 25 °C.

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



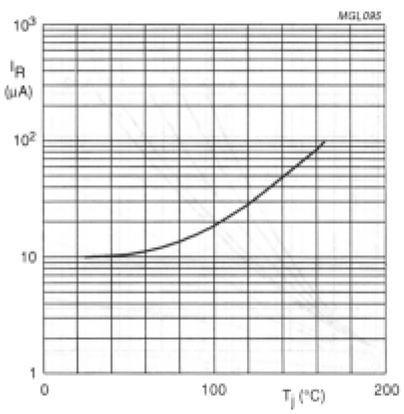
BYG80F and G
(1) T_j = 175 °C.
(2) T_j = 25 °C.

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



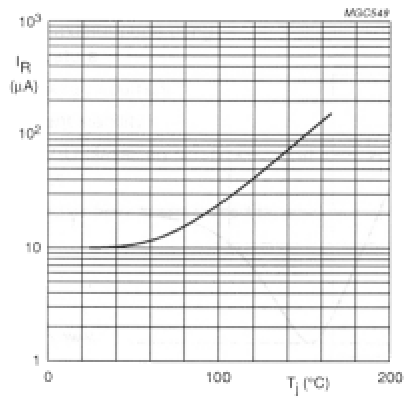
BYG80J
(1) T_j = 175 °C.
(2) T_j = 25 °C.

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



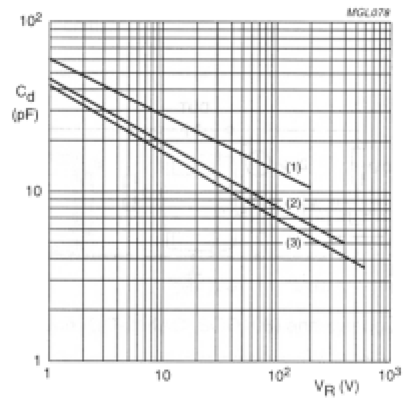
BYG80A to D
$V_R = V_{RMMmax}$.

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



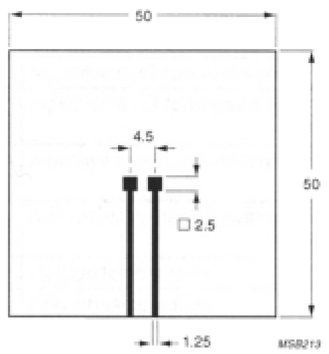
BYG80F to J
$V_R = V_{RWMmax}$.

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.

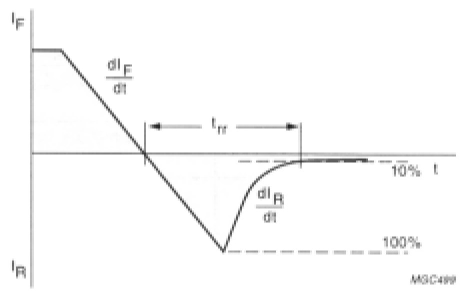
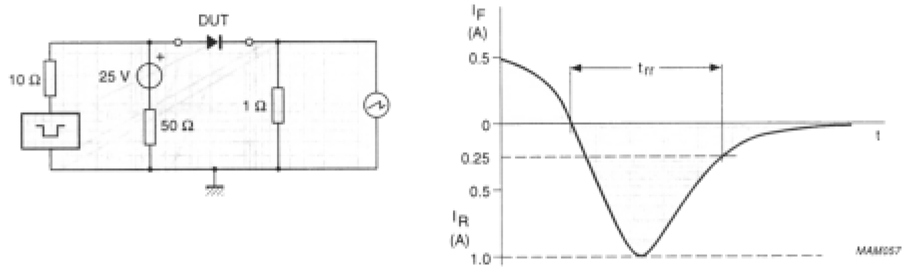


Fig.28 Reverse recovery definitions.



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.