ULTRA FAST-RECOVERY RECTIFIER DIODES

T-03-17

Glass-passivated, high-efficiency epitaxial rectifier diodes in DO-4 metal envelopes, featuring low forward voltage drop, ultra fast reverse recovery times, very low stored charge and soft-recovery characteristic. They are intended for use in switched-mode power supplies and high-frequency circuits in general, where both low conduction losses and low switching losses are essential. The series consists of normal polarity (cathode to stud) types.

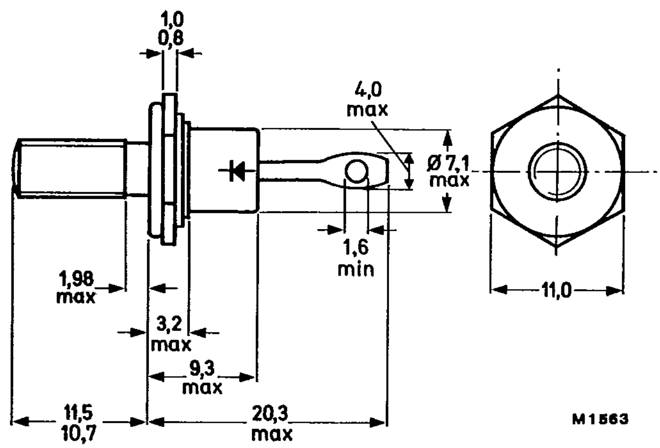
QUICK REFERENCE DATA

			BYR30–500	600	700	
Repetitive peak reverse voltage	V_{RRM}	max.	500	600	700	V
Average forward current	$I_{F(AV)}$	max.		14		A
Forward voltage	V_F	<		1.5		V
Reverse recovery time	t_{rr}	<		100		ns

MECHANICAL DATA

Dimensions in mm

Fig.1 DO-4: with metric M5 stud (ϕ5 mm); e.g. BYR30-600.
with 10-32 UNF stud (ϕ4.83 mm) e.g. BYR30-600U.



Net mass: 6 g

Diameter of clearance hole: max. 5.2 mm

Accessories supplied on request:
56295a (mica washer);
56295b (PTFE ring);
56295c (insulating bush).

Supplied with device: 1 nut, 1 lock washer

Torque on nut: min. 0.9 Nm (9 kg cm)
max. 1.7 Nm (17 kg cm)

Nut dimensions across the flats:
M5: 8.0 mm; 10-32 UNF: 9.5 mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Voltages			BYR30-500	600	700	
Repetitive peak reverse voltage	V_{RRM}	max.	500	600	700	V
Crest working reverse voltage	V_{RWM}	max.	400	500	500	V
Continuous reverse voltage*	V_R	max.	400	500	500	V

Currents				
Average forward current; switching losses negligible up to 100 kHz;				
→ square wave; $\delta = 0.5$; up to $T_{mb} = 98\ ^oC$	$I_{F(AV)}$	max.	14	A
→ sinusoidal; up to $T_{mb} = 106\ ^oC$	$I_{F(AV)}$	max.	12.5	A
R.M.S. forward current	$I_{F(RMS)}$	max.	20	A
Repetitive peak forward current $t_p = 20\ \mu s$, $\delta = 0.02$	I_{FRM}	max.	360	A
Non-repetitive peak forward current half sinewave; $T_j = 150\ ^oC$ prior to surge; with reapplied V_{RWM} max				
t = 10 ms	I_{FSM}	max.	150	A
t = 8.3 ms	I_{FSM}	max.	180	A
I^2t for fusing (t = 10 ms)	I^2t	max.	112	A^2s
Temperatures				
Storage temperature	T_{stg}		−55 to +150	^oC
Junction temperature	T_j	max.	150	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	2.0	K/W
From mounting base to heatsink:				
a. with heatsink compound	$R_{th\ mb\text{-}h}$	=	0.3	K/W
b. without heatsink compound	$R_{th\ mb\text{-}h}$	=	0.6	K/W
Transient thermal impedance; t = 1 ms	$Z_{th\ j\text{-}mb}$	=	0.3	K/W

MOUNTING INSTRUCTIONS

The top connector should be neither bent nor twisted; it should be soldered into the circuit so that there is no strain on it.
During soldering the heat conduction to the junction should be kept to a minimum.

*To ensure thermal stability: $R_{th\ j\text{-}a} \leqslant 5.6$ K/W.

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CHARACTERISTICS

Forward voltage				
$I_F = 15$ A; $T_j = 150$ °C	V_F	<	1.5	V*
$I_F = 50$ A; $T_j = 25$ °C	V_F	<	2.0	V*
Reverse current				
$V_R = V_{RWM\ max}$; $T_j = 100$ °C	I_R	<	0.4	mA
$V_R = V_{RWM\ max}$; $T_j = 25$ °C	I_R	<	25	µA
Reverse recovery when switched from				
$I_F = 1$ A to $V_R \geq 30$ V with $-dI_F/dt = 100$ A/µs; $T_j = 25$ °C; recovery time	t_{rr}	<	100	ns
$I_F = 2$ A to $V_R \geq 30$ V with $-dI_F/dt = 20$ A/µs; $T_j = 25$ °C; recovered charge	Q_s	<	220	nC
$I_F = 10$ A to $V_R \geq 30$ V with $-dI_F/dt = 50$ A/µs; $T_j = 100$ °C; peak recovery current	I_{RRM}	<	8	A
Forward recovery when switched to $I_F = 10$ A with $dI_F/dt = 10$ A/µs; $T_j = 25$ °C	V_{fr}	typ.	5.1	V

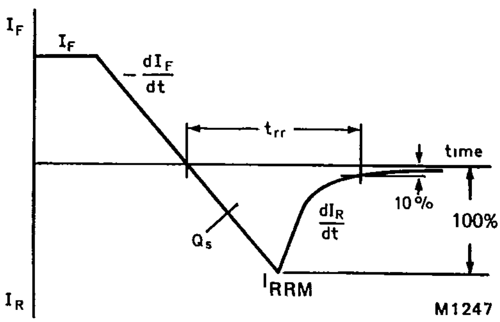


Fig.2 Definition of t_{rr}, Q_s and I_{RRM}.

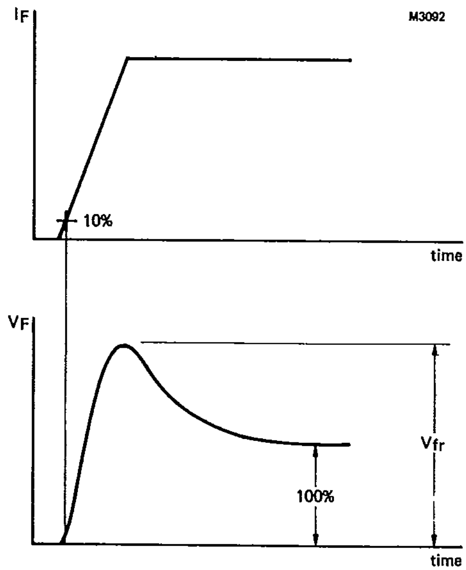


Fig.3 Definition of V_{fr}.

*Measured under pulse conditions to avoid excessive dissipation.

SQUARE-WAVE OPERATION

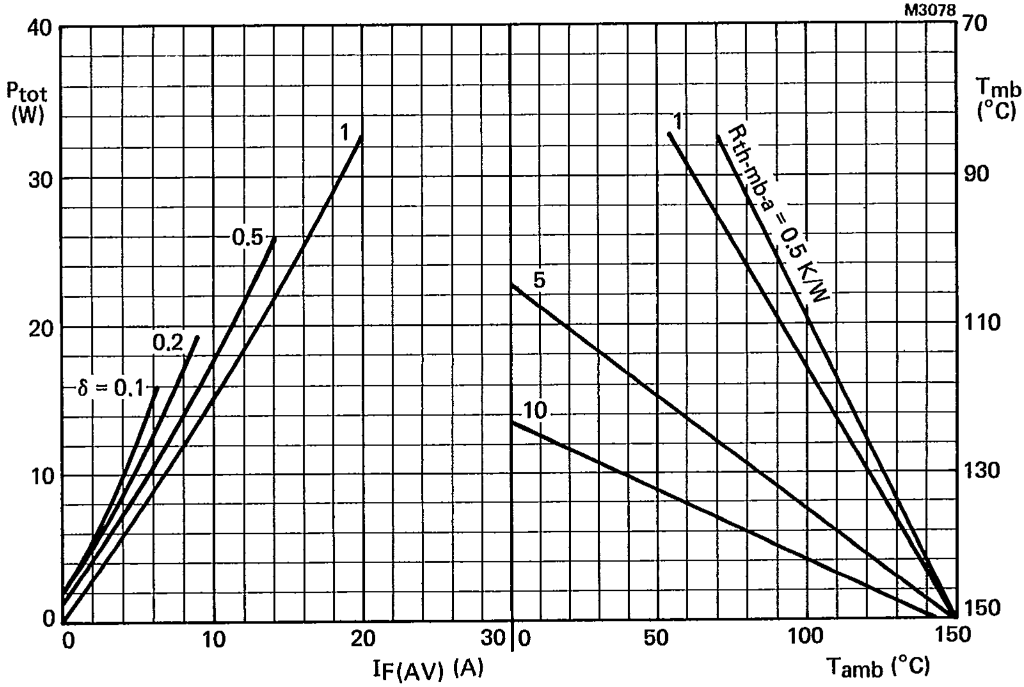
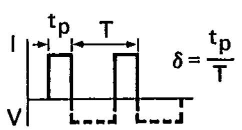


Fig.4 The right-hand part shows the relationship between the power (derived from the left-hand part) and the maximum permissible temperatures. Power includes reverse current losses and switching losses up to f = 100 kHz.



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$

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SINUSOIDAL OPERATION

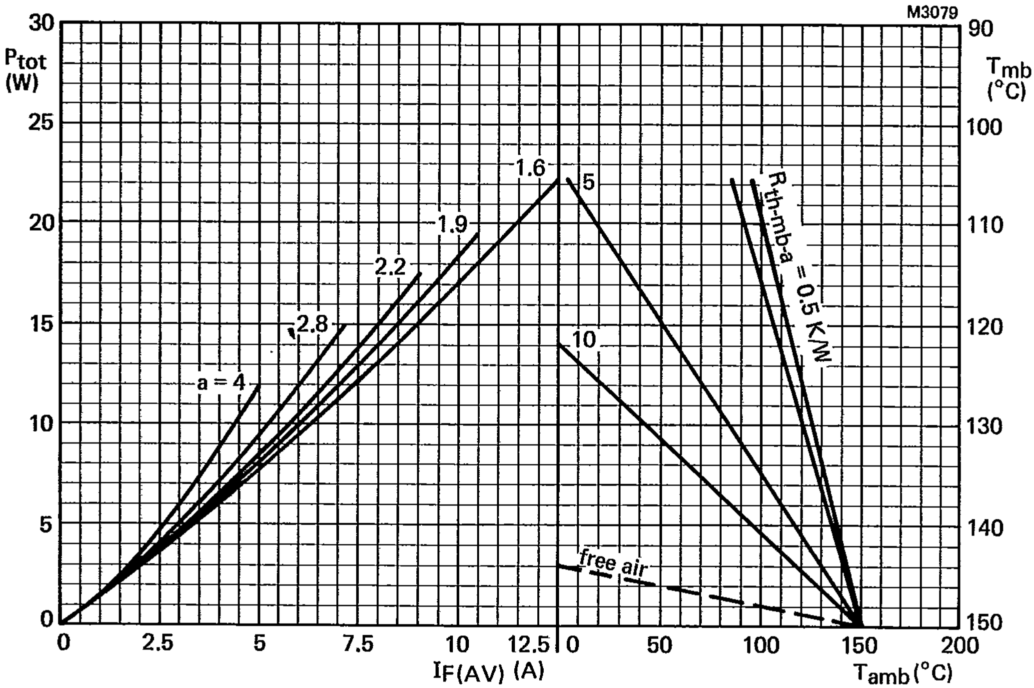


Fig.5 The right-hand part shows the interrelationship between the power (derived from the left-hand part) and the maximum permissible temperatures.
a = form factor = $I_{F(RMS)}/I_{F(AV)}$.

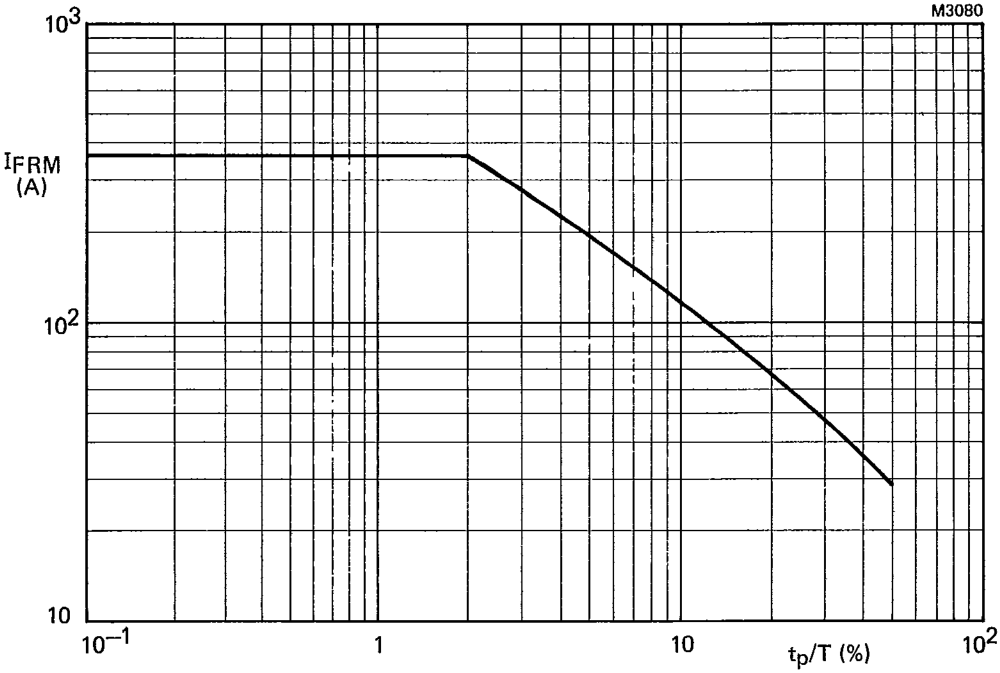
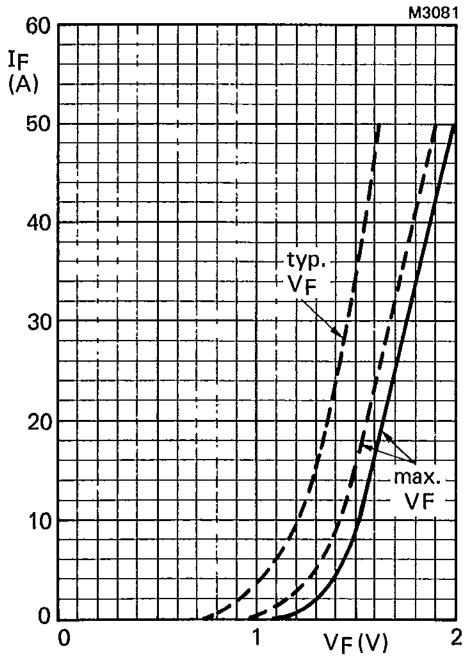
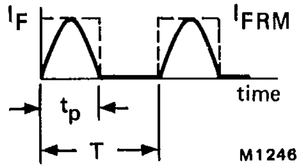


Fig.6 Maximum permissible repetitive peak forward current for square or sinusoidal currents; $1\ \mu s < t_p < 1$ ms.





Definition of I_{FRM} and t_p/T.

Fig.7 —— T_j = 25 °C – – – T_j = 150 °C.

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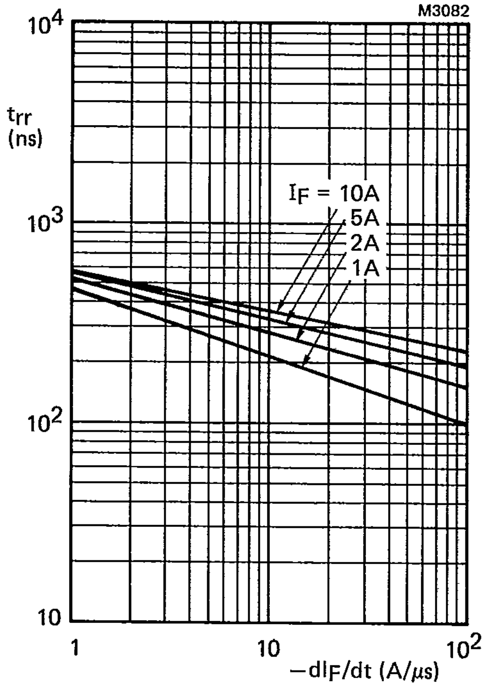

Fig.8 Maximum t_{rr} at T_j = 25 °C.

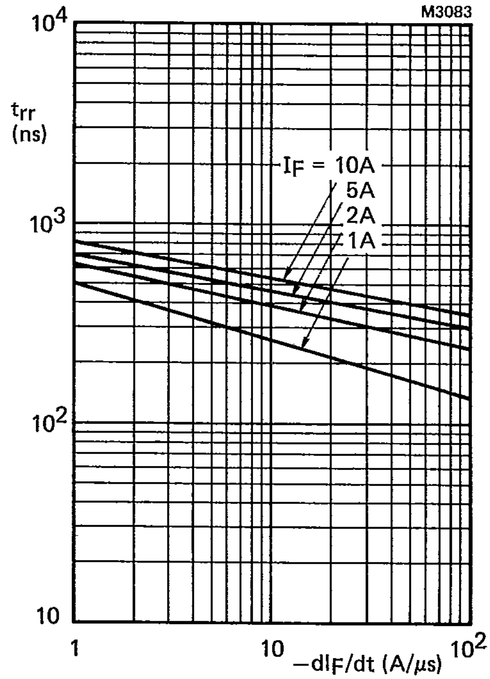

Fig.9 Maximum t_{rr} at T_j = 100 °C.

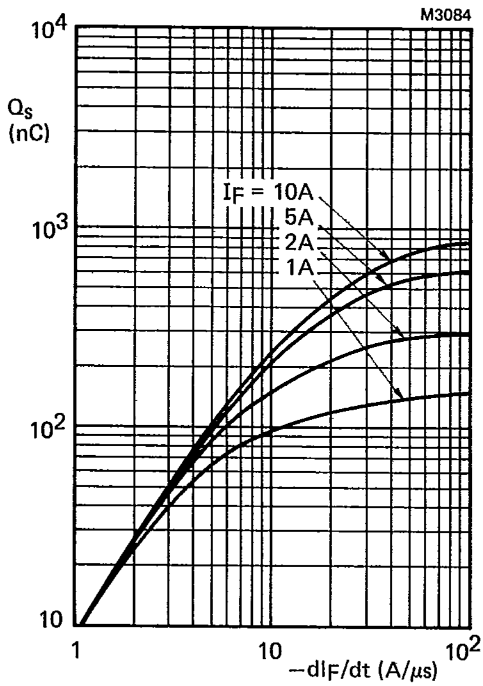

Fig.10 Maximum Q_s at T_j = 25 °C.

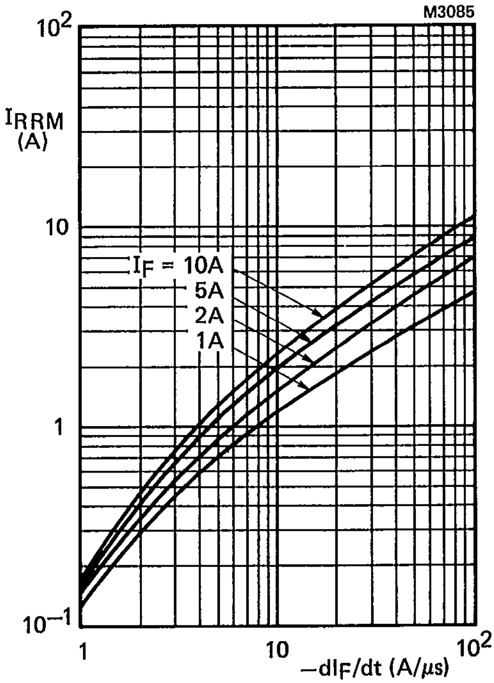

Fig.11 Maximum I_{RRM} at T_j = 25 °C.

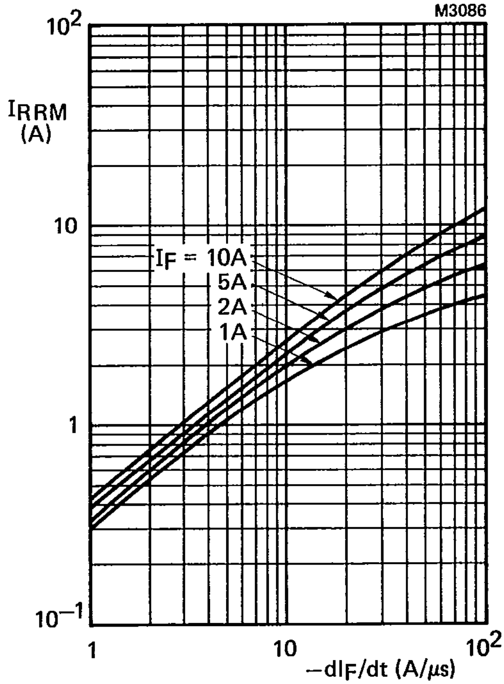

Fig.12 Maximum I_{RRM} at T_j = 100 °C.

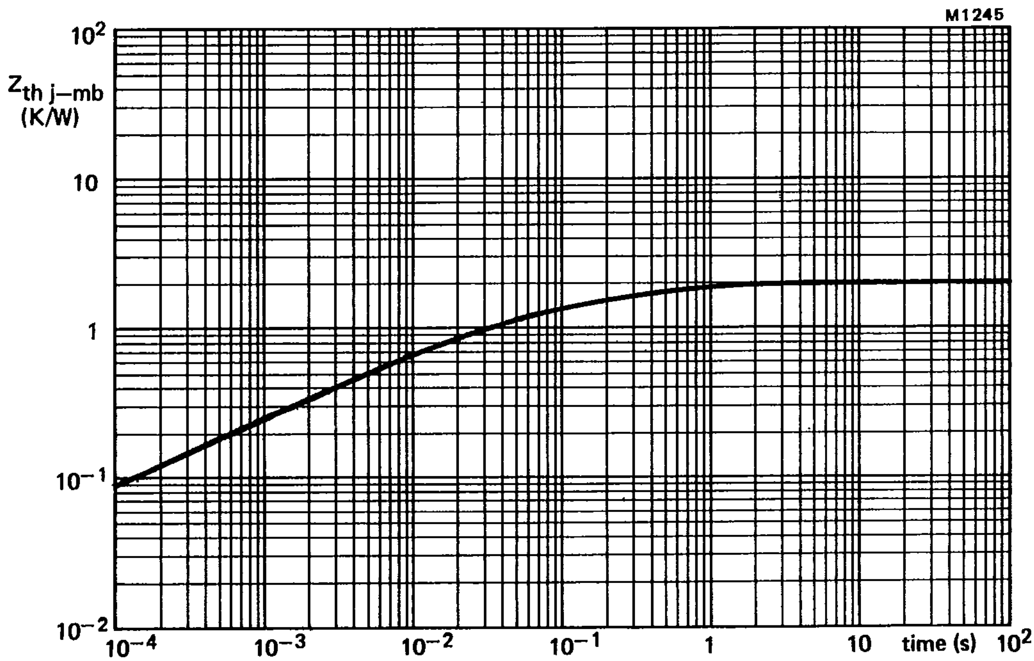

Fig.13 Transient thermal impedance.