ULTRA FAST-RECOVERY ELECTRICALLY-ISOLATED DOUBLE RECTIFIER DIODES

Glass-passivated, high-efficiency epitaxial double rectifier diodes in SOT-186 (full-pack) plastic envelopes, featuring low forward voltage drop, very fast reverse recovery times and soft-recovery characteristic. Their electrical isolation makes them ideal for mounting on a common heatsink alongside other components without the need for additional insulators. They are intended for use in switched-mode power supplies and high-frequency circuits in general, where both low conduction and switching losses are essential. Their single chip construction ensures excellent matching of the forward and switching characteristics of the two halves, allowing parallel operation without the need for derating. The series consists of common cathode types.

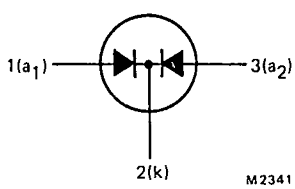
QUICK REFERENCE DATA

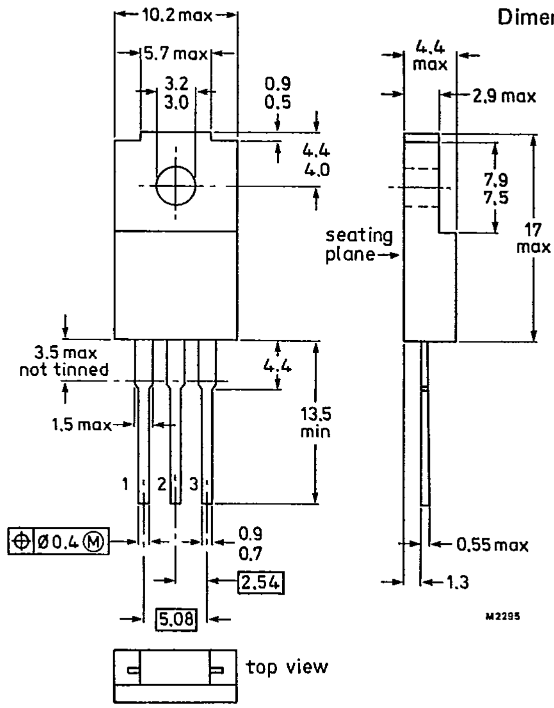
Per diode, unless otherwise stated			BYV32F-50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Output current (both diodes conducting)	I_O	max.	12				A
Forward voltage	V_F	<	0.85				V
Reverse recovery time	t_{rr}	<	25				ns

MECHANICAL DATA

Dimensions in mm

Fig.1 SOT-186 (full-pack)





Net mass: 2 g.
The seating plane is electrically isolated from all terminals.
Accessories supplied on request (see data sheets Mounting instructions for F-pack devices and Accessories for SOT-186 envelopes).

RATINGS

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

			BYV32F-50	100	150	200	
Voltages (per diode; see note 1)							
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Crest working reverse voltage	V_{RWM}	max.	50	100	150	200	V
Continuous reverse voltage	V_R	max.	50	100	150	200	V

Currents (see notes 2 and 3)				
Output current, switching losses negligible up to 500 kHz				
square wave; δ = 0.5; up to T_h = 92 °C	I_O	max.	12	A
sinusoidal; up to T_h = 100 °C	I_O	max.	10.6	A
R.M.S. forward current	$I_{F(RMS)}$	max.	12	A
Repetitive peak forward current t_p = 20 µs, δ = 0.02 (per diode)	I_{FRM}	max.	155	A
Non-repetitive peak forward current half sine-wave; T_j = 150 °C prior to surge; with reapplied $V_{RWM\,max}$;				
t = 10 ms (per diode)	I_{FSM}	max.	150	A
t = 8.3 ms (per diode)	I_{FSM}	max.	160	A
I^2t for fusing (t = 10 ms; per diode)	I^2t	max.	112	A^2s
Temperatures				
Storage temperature	T_{stg}		−40 to +150	°C
Junction temperature	T_j	max.	150	°C

ISOLATION

Peak isolation voltage from all terminals to external heatsink	V_{isol}	max.	1000	V
Isolation capacitance from cathode to external heatsink (see note 4)	C_p	typ.	12	pF

Notes

1. To ensure thermal stability: $R_{th\,j\text{-}a} < 6.3$ K/W for continuous reverse voltage.
2. The limits for both diodes apply whether both diodes conduct simultaneously or on alternate half cycles.
3. The quoted temperatures assume heatsink compound is used.
4. Mounted without heatsink compound and with 20 Newtons pressure on the centre of the envelope.

THERMAL RESISTANCE

From junction to external heatsink with minimum of 2 kgf (20 Newtons) pressure on the centre of the envelope, total package:				
without heatsink compound	$R_{th\ j\text{-}h}$	=	7.0	K/W
with heatsink compound	$R_{th\ j\text{-}h}$	=	5.0	K/W

Free-air operation

The quoted value of $R_{th\ j\text{-}a}$ should be used only when no leads of other dissipating components run to the same point.

Thermal resistance from junction to ambient in free air, device mounted on a printed circuit board	$R_{th\ j\text{-}a}$	=	55	K/W

CHARACTERISTICS

Forward voltage				
$I_F = 5$ A; $T_j = 100$ °C	V_F	<	0.85	V*
$I_F = 20$ A; $T_j = 25$ °C	V_F	<	1.15	V*
Reverse current				
$V_R = V_{RWM\ max}$; $T_j = 100$ °C	I_R	<	0.6	mA
$V_R = 200$ V; $T_j = 25$ °C	I_R	<	30	µA ←
$V_R \leqslant 150$ V; $T_j = 25$ °C	I_R	<	10	µA ←
Reverse recovery when switched from				
$I_F = 1$ A to $V_R \geqslant 30$ V with $-dI_F/dt = 100$ A/µs; $T_j = 25$ °C; recovery time	t_{rr}	<	25	ns
$I_F = 2$ A to $V_R \geqslant 30$ V with $-dI_F/dt = 20$ A/µs; $T_j = 25$ °C; recovered charge	Q_s	<	12.5	nC
$I_F = 10$ A to $V_R \geqslant 30$ V with $-dI_F/dt = 50$ A/µs; $T_j = 100$ °C; peak recovery current	I_{RRM}	<	2	A
Forward recovery when switched to $I_F = 1$ A with $dI_F/dt = 10$ A/µs; $T_j = 25$ °C	V_{fr}	typ.	1	V

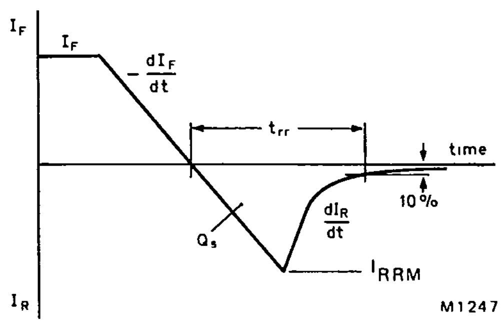


Fig.2 Definition of t_{rr}, Q_s and I_{RRM}.

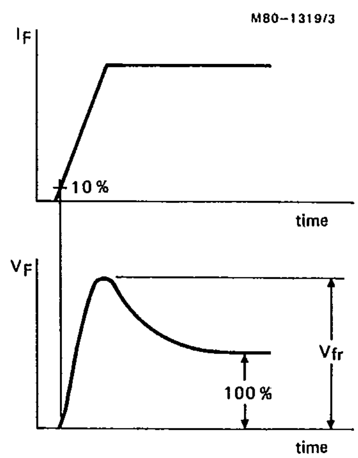


Fig.3 Definition of V_{fr}.

*Measured under pulse conditions to avoid excessive dissipation.

MOUNTING INSTRUCTIONS

1. The device may be soldered directly into the circuit, but the maximum permissible temperature of the soldering iron or bath is 275 °C; the heat source must not be in contact with the joint for more than 5 seconds. Soldered joints must be at least 4.7 mm from the seal.
2. The leads should not be bent less than 2.4 mm from the seal, and should be supported during bending. The bend radius must be no less than 1 mm.
3. Mounting by means of a spring clip is the best mounting method because it offers a good thermal contact under the crystal area and slightly lower $R_{th\ j\text{-}h}$ values than screw mounting. The force exerted on the top of the device by the clip should be at least 2 kgf (20 Newtons) to ensure good thermal contact and must not exceed 3.5 kgf (35 Newtons) to avoid damage to the device.
4. If screw mounting is used, it should be M3 cross-recess pan head.
   Minimum torque to ensure good thermal contact: 5.5 kgf (0.55 Nm)
   Maximum torque to avoid damage to the device: 8.0 kgf (0.80 Nm)
5. For good thermal contact, heatsink compound should be used between baseplate and heatsink. Values of $R_{th\ j\text{-}h}$ given for mounting with heatsink compound refer to the use of a metallic-oxide loaded compound. Ordinary silicone grease is not recommended.
6. Rivet mounting.
   It is not recommended to use rivets, since extensive damage could result to the plastic, which could destroy the insulating properties of the device.
7. The heatsink must have a flatness in the mounting area of 0.02 mm maximum per 10 mm. Mounting holes must be deburred.

OPERATING NOTES

Dissipation and heatsink considerations:

a. The various components of junction temperature rise above ambient are illustrated in Fig.4:

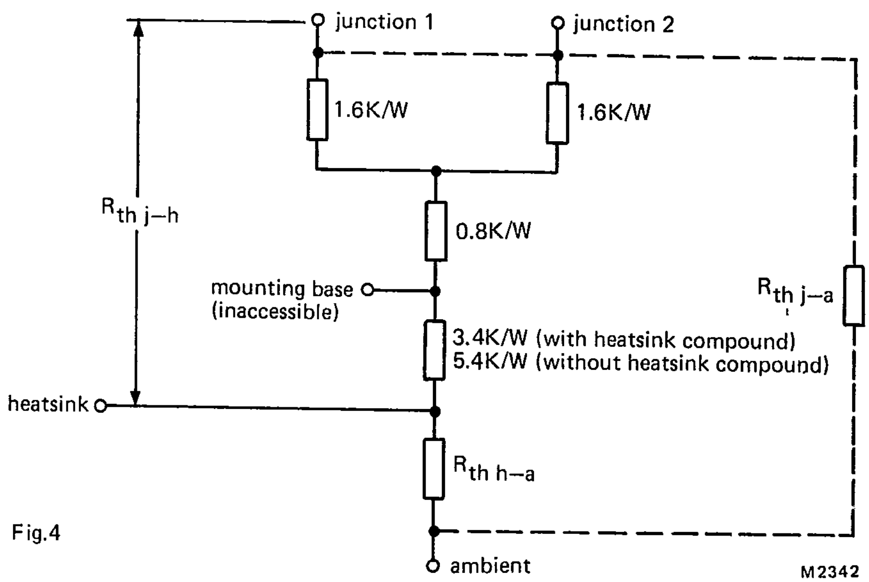


Fig.4

b. Any measurement of heatsink temperature should be immediately adjacent to the device.

SQUARE-WAVE OPERATION

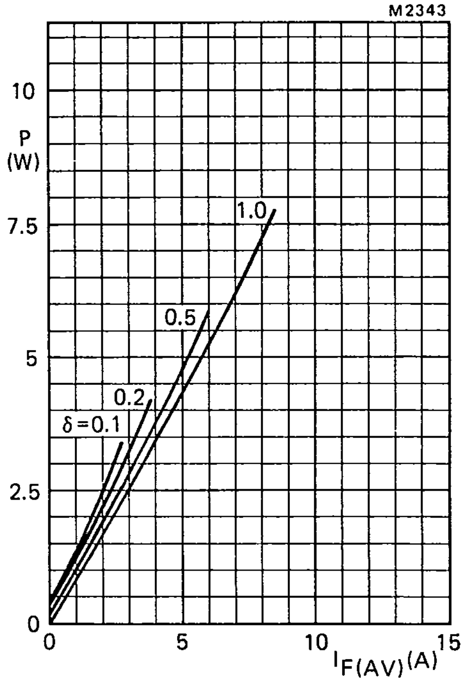
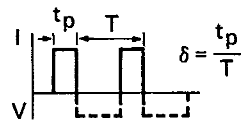


Fig.5 Power rating.

The individual power loss in each diode should first be determined from the required forward current on the $I_{F(AV)}$ axis and the appropriate duty cycle, then both added together to give a total power loss for the whole device.
Having determined this power (P), use Fig.7 (if heatsink compound is not being used) or Fig.8 (if heatsink compound is being used) to determine the heatsink size and corresponding maximum ambient and heatsink temperatures.

Note: P = power including reverse current losses but excluding switching losses.



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

SINUSOIDAL OPERATION

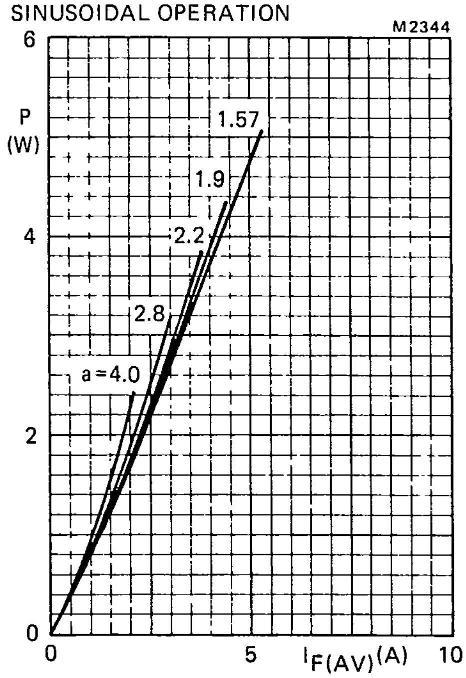


Fig.6 Power rating.

The individual power loss in each diode should first be determined from the required forward current on the $I_{F(AV)}$ axis and the appropriate form factor, then both added together to give a total power loss for the whole device.
Having determined this power (P), use Fig.7 (if heatsink compound is not being used) or Fig.8 (if heatsink compound is being used) to determine the heatsink size and corresponding maximum ambient and heatsink temperatures.

Note: P = power including reverse current losses but excluding switching losses.

a = form factor = $I_{F(RMS)}/I_{F(AV)}$

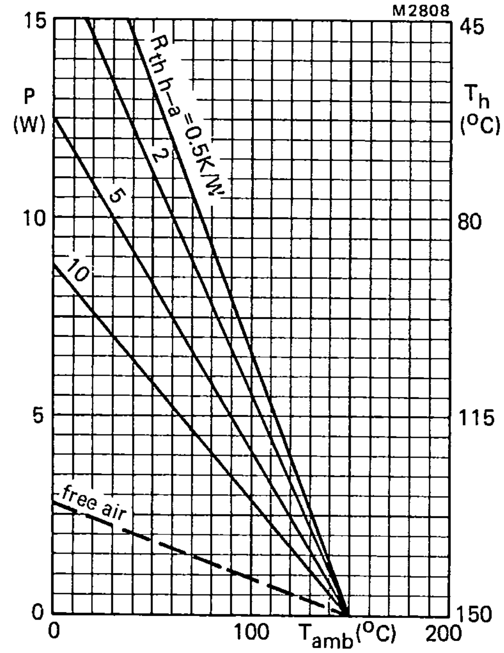


Fig.7 Heatsink rating.
Without heatsink compound.

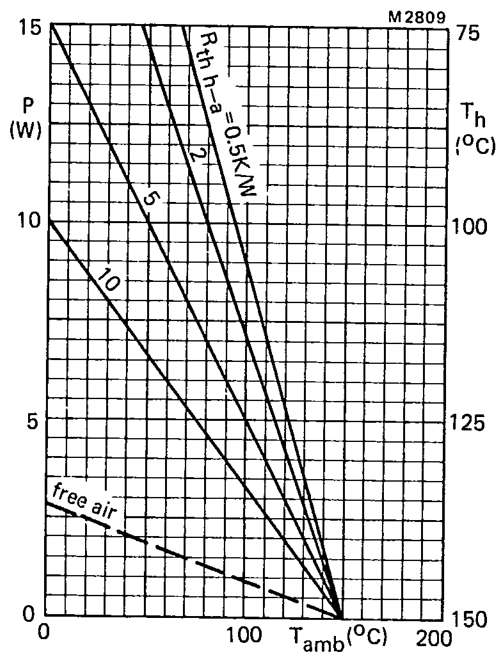


Fig.8 Heatsink rating.
With heatsink compound.

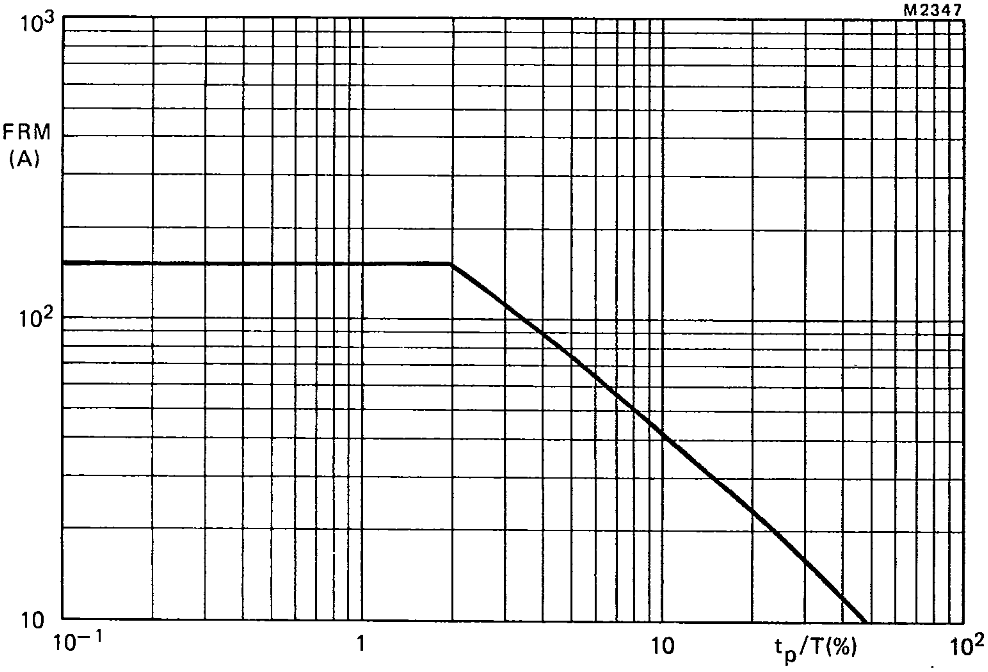
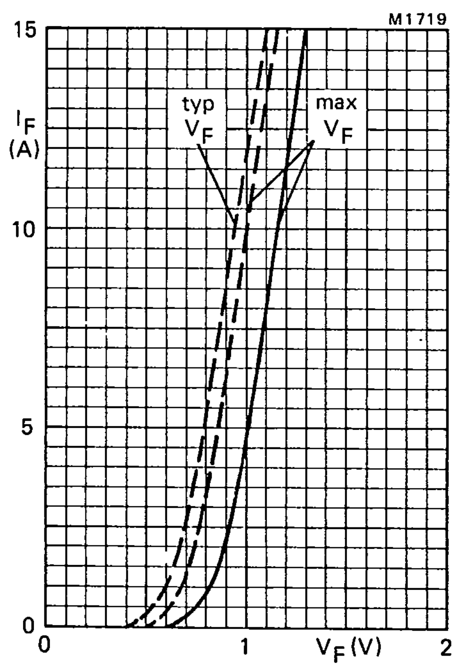
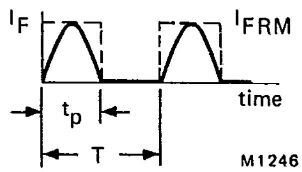


Fig.9 Maximum permissible repetitive peak forward current for either square or sinusoidal currents for 1 $\mu s < t_p < 1$ ms.





Definition of I_{FRM} and t_p/T

Fig.10 —— T_j = 25 °C; – – – T_j = 150 °C per diode.

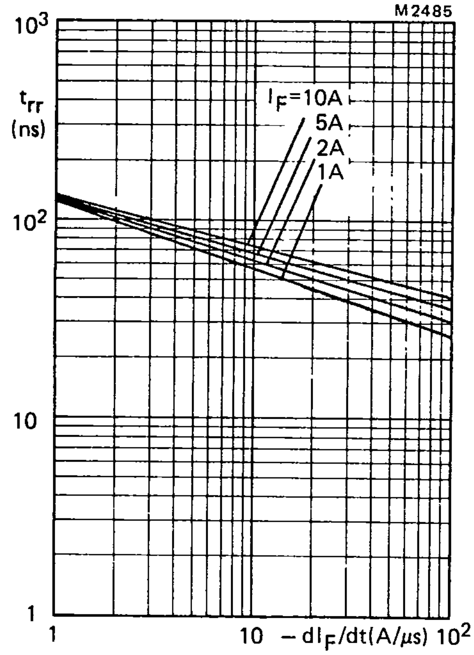


Fig.11 Maximum t_{rr} at T_j = 25 °C.

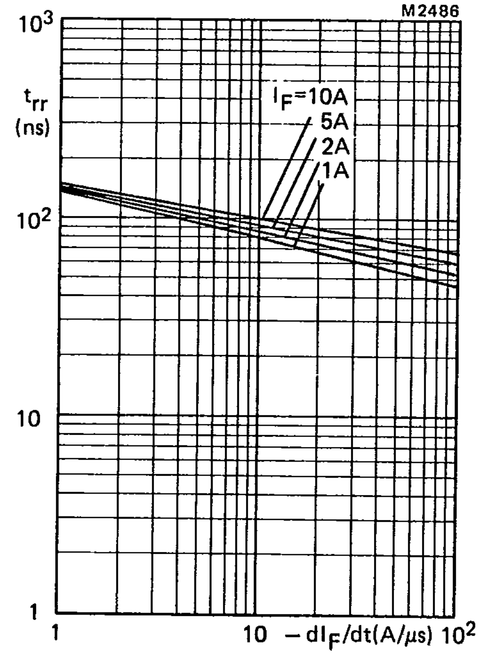


Fig.12 Maximum t_{rr} at T_j = 100 °C.

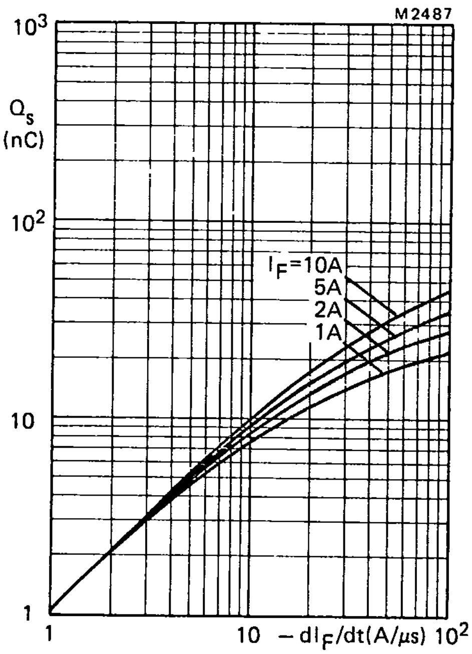


Fig.13 Maximum Q_s at T_j = 25 °C.

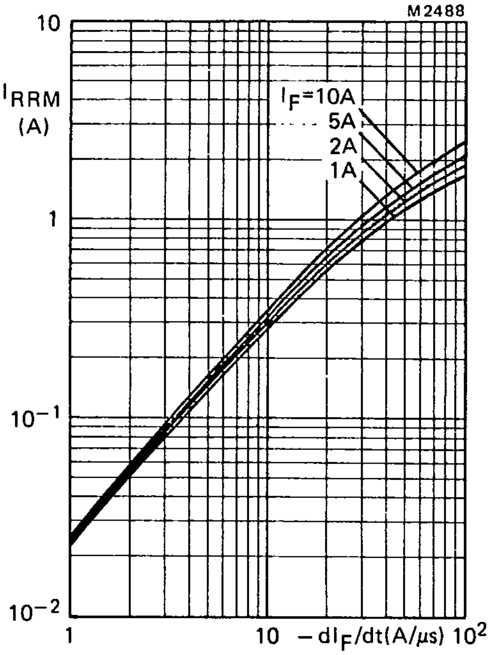


Fig.14 Maximum I_{RRM} at T_j = 25 °C

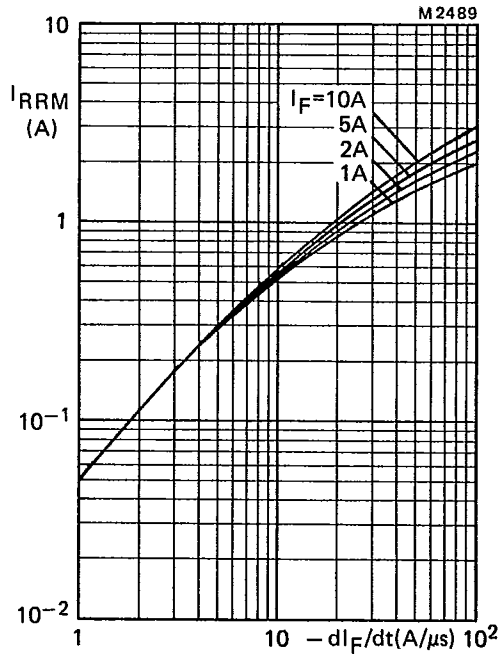


Fig.15 Maximum I_{RRM} at T_j = 100 °C;

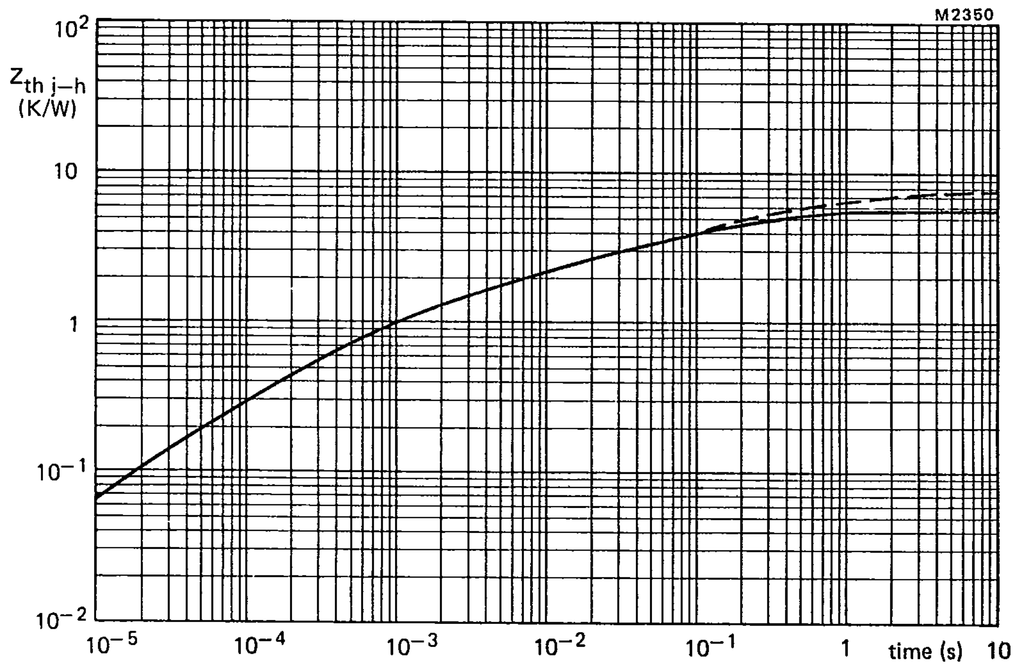


Fig.16 One diode conducting; —— with heatsink compound; — — — without heatsink compound.