ULTRA FAST RECOVERY, ELECTRICALLY-ISOLATED RECTIFIER DIODES

Glass-passivated, high-efficiency epitaxial rectifier diodes in SOT-186 (full-pack) envelopes, featuring low forward voltage drop, ultra fast reverse recovery times with very low stored charge 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 losses and low switching losses are essential.

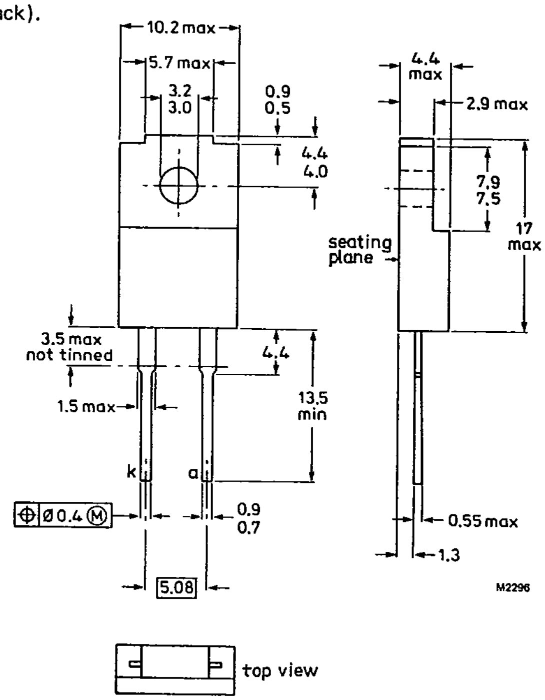
QUICK REFERENCE DATA

			BYW29F–50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Average forward current	$I_{F(AV)}$	max.		8			A
Forward voltage	V_F	<		0.8			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).

Voltages			BYW29F–50	100	150	200	
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 (note 1)	V_R	max.	50	100	150	200	V

Currents

Average forward current; switching losses negligible up to 500 kHz (note 2);				
→ square wave; δ = 0.5; up to T_h = 108 °C	$I_{F(AV)}$	max.	8	A
→ sinusoidal; up to T_h = 114 °C	$I_{F(AV)}$	max.	7.3	A
R.M.S. forward current	$I_{F(RMS)}$	max.	11.5	A
Repetitive peak forward current t_p = 20 μs, δ = 0.02	I_{FRM}	max.	240	A
Non-repetitive peak forward current half sine-wave; T_j = 150 °C prior to surge; with reapplied $V_{RWM\,max}$				
t = 10 ms	I_{FSM}	max.	80	A
t = 8.3 ms	I_{FSM}	max.	100	A
I^2t for fusing (t = 10 ms)	I^2t	max.	32	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 (note 3)	C_p	typ.	12	pF

Notes:

1. To ensure thermal stability: $R_{th\,j\text{-}a} < 11.6$ K/W.
2. The quoted temperatures assume heatsink compound is used.
3. Mounted without heatsink compound and 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,				
with heatsink compound	$R_{th\ j-h}$	=	5.5	K/W
without heatsink compound	$R_{th\ j-h}$	=	7.2	K/W

Free air operation

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

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

CHARACTERISTICS

T_j = 25 °C unless otherwise stated

Forward voltage				
I_F = 8 A; T_j = 150 °C	V_F	<	0.8	V*
I_F = 20 A	V_F	<	1.3	V*
Reverse current				
$V_R = V_{RWM\ max}$; T_j = 100 °C	I_R	<	0.6	mA
$V_R = V_{RWM\ max}$	I_R	<	10	μA
Reverse recovery when switched from				
I_F = 1 A to $V_R \geq 30$ V with $-dI_F/dt$ = 100 A/μs; recovery time	t_{rr}	<	25	ns
I_F = 2 A to $V_R \geq 30$ V with $-dI_F/dt$ = 20 A/μs; recovered charge	Q_s	<	11	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}	<	2	A
Forward recovery when switched to I_F = 1 A with dI_F/dt = 10 A/μs	V_{fr}	typ.	0.9	V

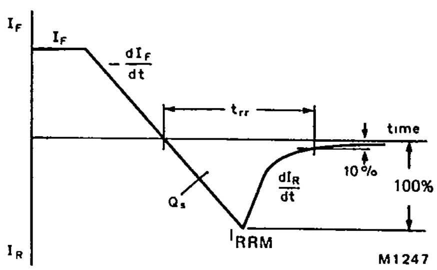


Fig.2 Definition of t_{rr}, Q_s and I_{RRM}.

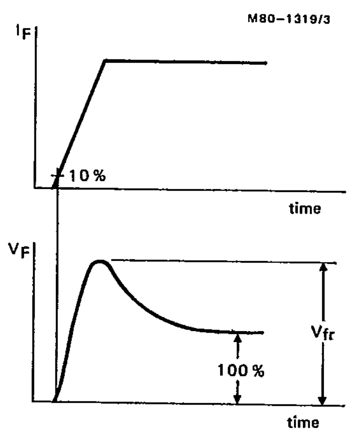


Fig.3 Definition of V_{fr}.

*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

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

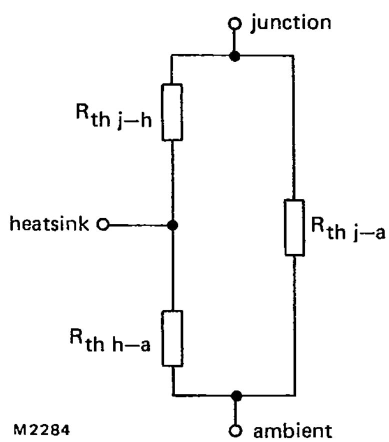


Fig.4.

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

SQUARE-WAVE OPERATION

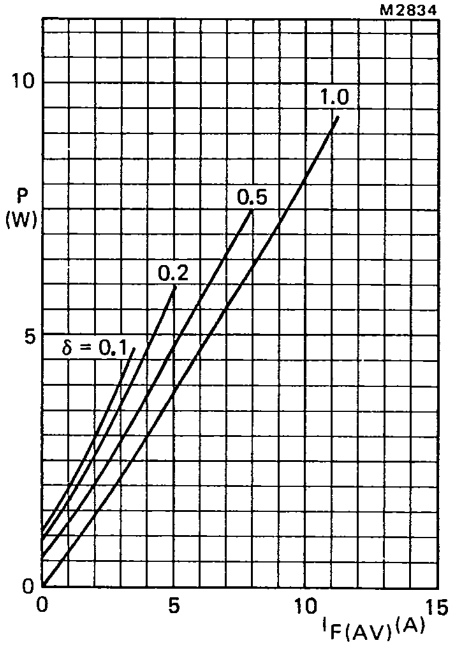
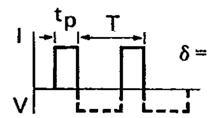


Fig.5 Power rating.

The power loss in the diode should first be determined from the required forward current on the $I_{F(AV)}$ axis and the appropriate duty cycle.

Having determined the 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.



$\delta = \frac{t_p}{T}$

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

SINUSOIDAL OPERATION

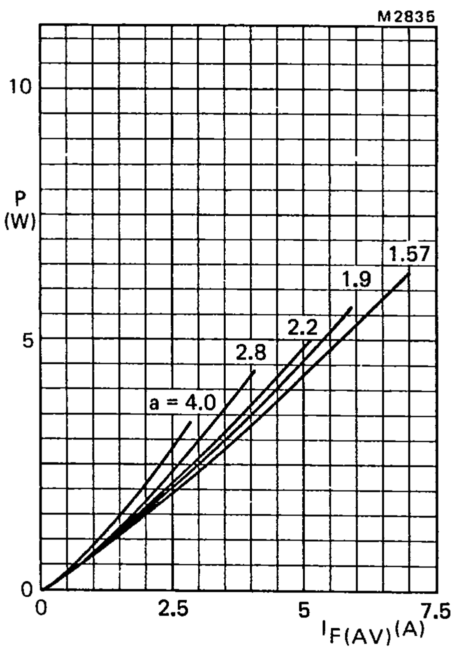


Fig.6 Power rating.

The power loss in the diode should first be determined from the required forward current on the $I_{F(AV)}$ axis and the appropriate form factor.

Having determined the 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 = $I_{F(RMS)}/I_{F(AV)}$

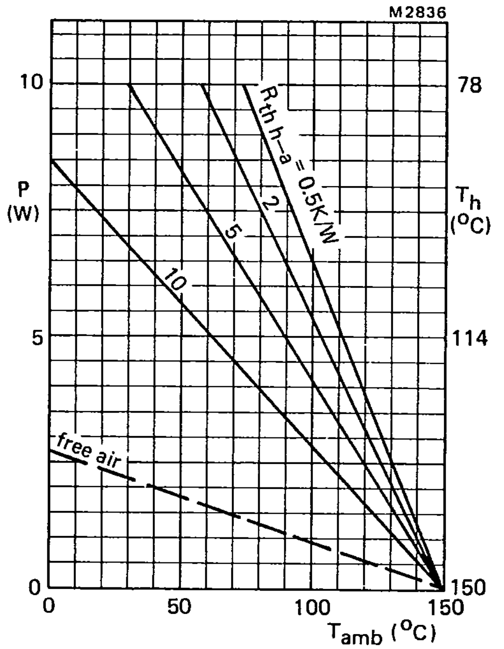


Fig.7 Heatsink rating; without heatsink compound.

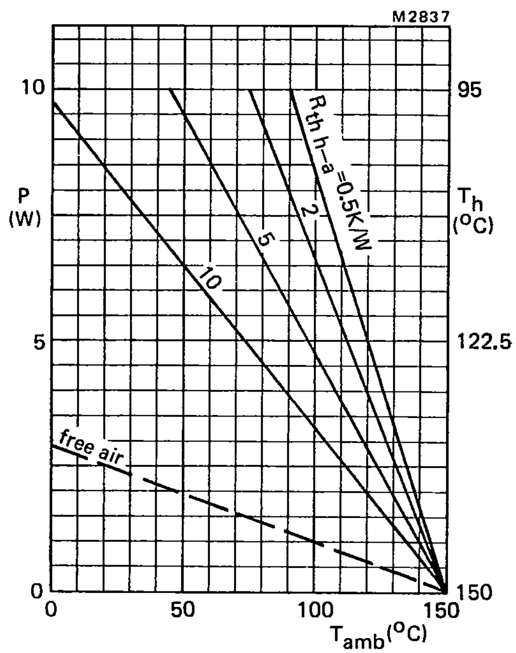


Fig.8 Heatsink rating; with heatsink compound.

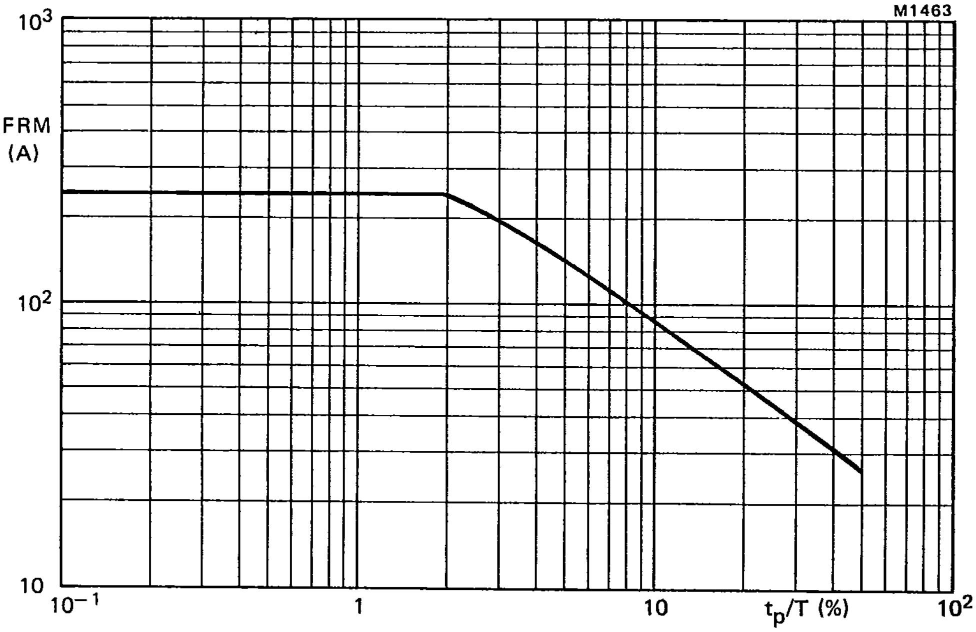
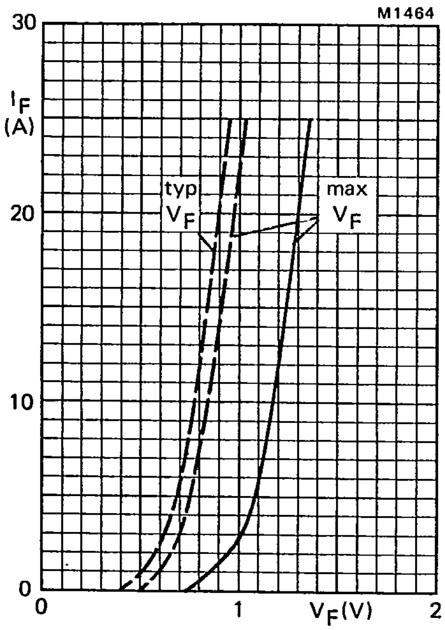
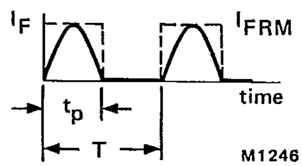


Fig.9 Maximum permissible repetitive peak forward current for square or sinusoidal currents; 1 μs $< t_p <$ 1 ms.





Definition of I_{FRM} and t_p/T.

Fig.10 —— T_j = 25 °C; — — — T_j = 150 °C.

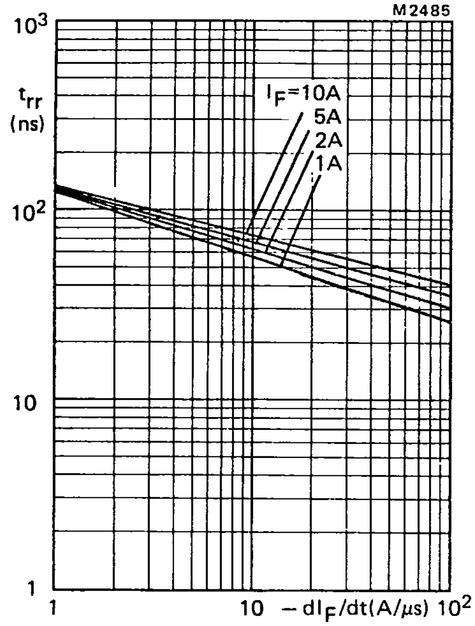


Fig.11 Maximum t_{rr} at T_j = 25 °C.

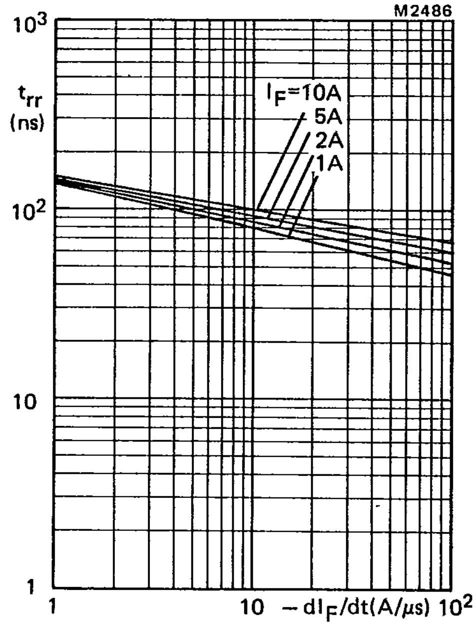


Fig.12 Maximum t_{rr} at T_j = 100 °C.

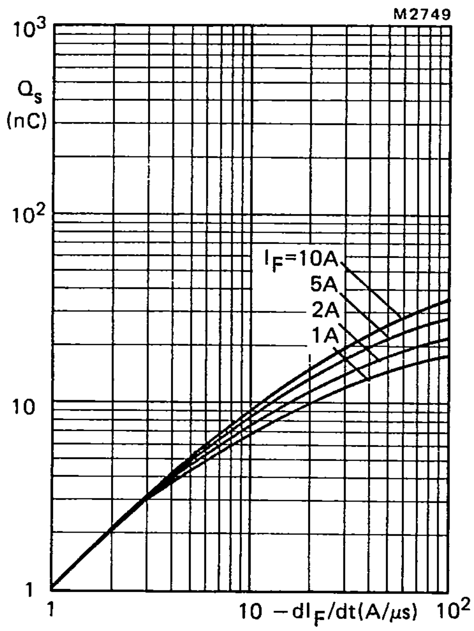


Fig.13 Maximum Q_s at T_j = 25 °C.

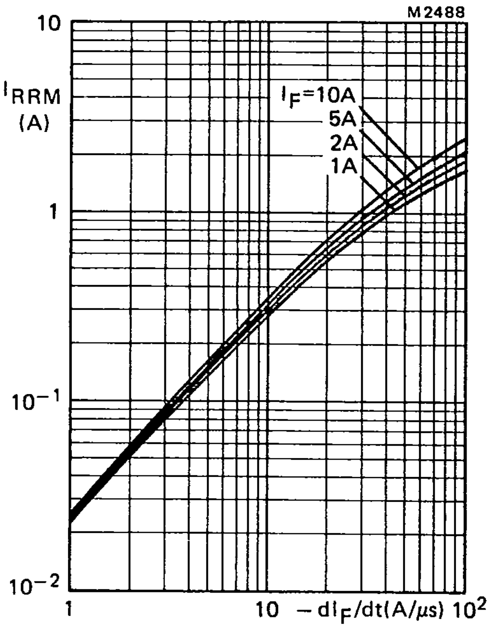


Fig.14 Maximum I_{RRM} at T_j = 25 °C.

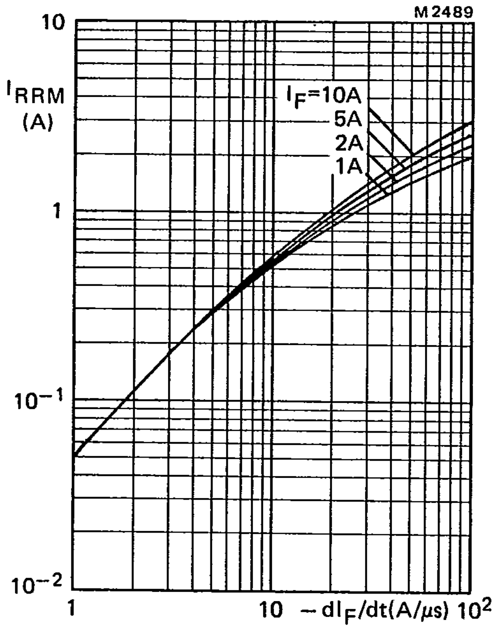


Fig.15 Maximum I_{RRM} at T_j = 100 °C.

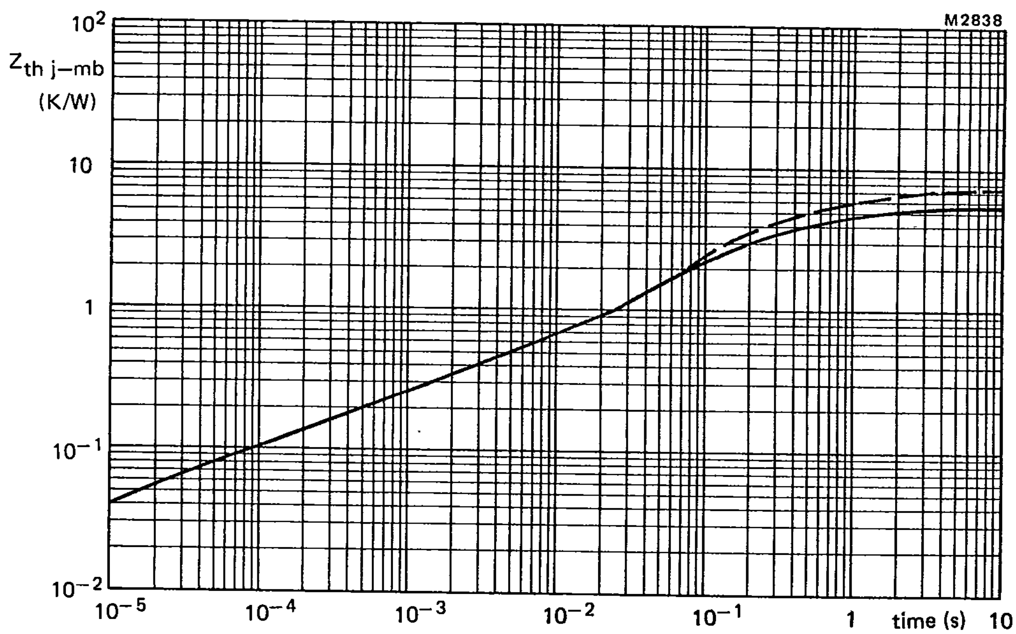


Fig.16 Transient thermal impedance: —— with heatsink compound; – – – without heatsink compound.