ULTRA FAST-RECOVERY ELECTRICALLY-ISOLATED DOUBLE RECTIFIER DIODES

Glass-passivated, high-efficiency epitaxial double rectifier diodes in SOT-199 (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.

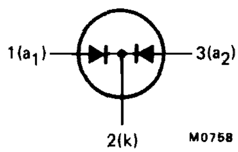
QUICK REFERERENCE DATA

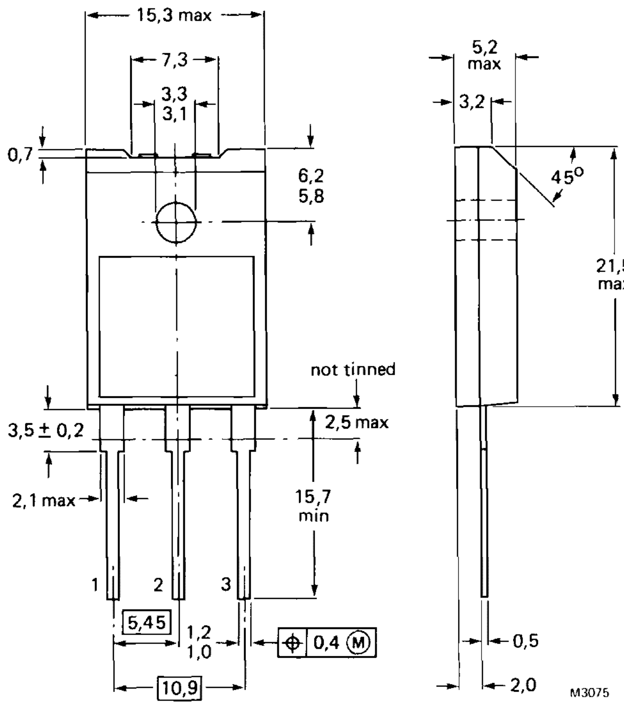
Per diode, unless otherwise stated			BYV72F-50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Output current (both diodes conducting)	I_O	max.	20				A
Forward voltage	V_F	<	0.85				V
Reverse recovery time	t_{rr}	<	28				ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-199





Note: Accessories supplied on request: see data sheets Mounting instructions and accessories for SOT-93 envelopes.

RATINGS

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

Voltages (per diode)			BYV72F-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	V_R	max.	50	100	150	200	V

Currents (both diodes conducting; note 1)

Output current; switching losses negligible up to 500 kHz; square wave; δ = 0.5; T_h = 66 °C (note 2)	I_O	max.	20	A
R.M.S. forward current	$I_{F(RMS)}$	max.	20	A
Repetitive peak forward current t_p = 20 μs; δ = 0.02 (per diode)	I_{FRM}	max.	320	A
Non-repetitive peak forward current (per diode) half sine-wave; T_j = 150 °C prior to surge; with reapplied $V_{RWM\,max}$				
t = 10 ms	I_{FSM}	max.	150	A
t = 8.3 ms	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	$V_{t\text{-}h}$	max.	1500	V
Isolation capacitance from centre lead to external heatsink (note 3)	$C_{t\text{-}h}$	typ.	12	pF

Notes:

1. The limits for both diodes apply whether both diodes conduct simultaneously or on alternate half cycles.
2. The quoted temperatures assume heatsink compound is used.
3. Mounted without heatsink compound and with 20 newtons force on the centre of the envelope.

CHARACTERISTICS

T_j = 25 °C unless otherwise stated

Forward voltage				
I_F = 10 A; T_j = 100 °C	V_F	<	0.85	V*
I_F = 30 A	V_F	<	1.15	V*
Reverse current				
$V_R = V_{RWM\ max}$; T_j = 100 °C	I_R	<	1.0	mA
$V_R = V_{RWM\ max}$	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; recovery time	t_{rr}	<	28	ns
I_F = 2 A to $V_R \geq$ 30 V with $-dI_F/dt$ = 20 A/μs; recovered charge	Q_s	<	15	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}	<	2.4	A
Forward recovery when switched to I_F = 1 A with dI_F/dt = 10 A/μs	V_{fr}	typ.	1.0	V

DEVELOPMENT DATA

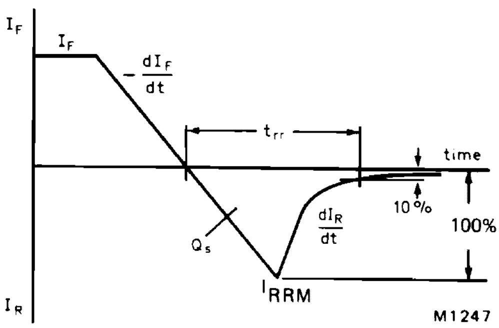


Fig.2 Definition of t_{rr}, Q_s and I_{RRM}.

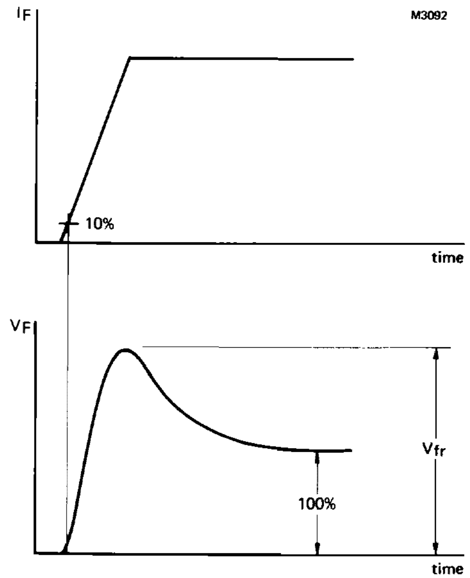


Fig.3 Definition of V_{fr}.

*Measured under pulse conditions to avoid excessive dissipation.

THERMAL RESISTANCE

From junction to external heatsink with minimum of 2 kgf (20 newtons) pressure on the centre of the envelope:

a. both diodes conducting:				
with heatsink compound	$R_{th\ j\text{-}h}$	=	4	K/W
without heatsink compound	$R_{th\ j\text{-}h}$	=	8	K/W
b. per diode:				
with heatsink compound	$R_{th\ j\text{-}h}$	=	5	K/W
without heatsink compound	$R_{th\ j\text{-}h}$	=	9	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 tie point.

Thermal resistance from junction to ambient in free air, mounted on a printed circuit board	$R_{th\ j\text{-}a}$	=	35	K/W

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 ^{o}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 not 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.

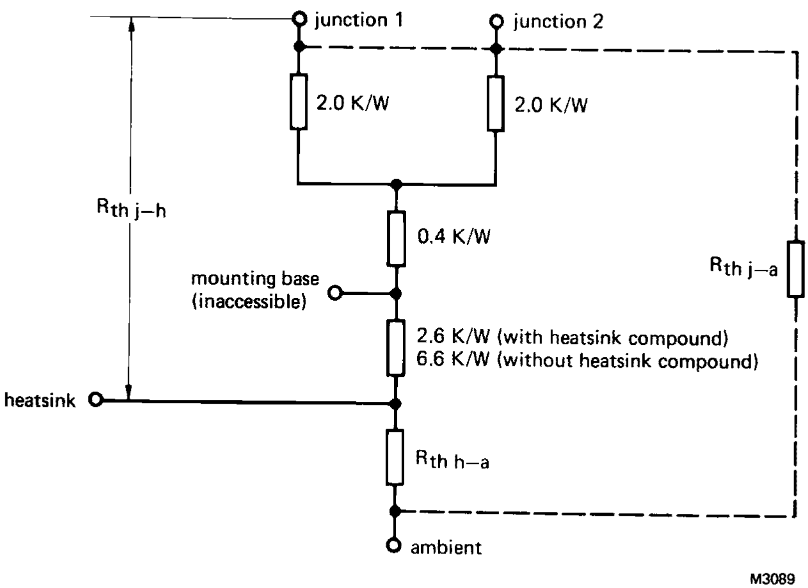


Fig.4.

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

SQUARE-WAVE OPERATION (BOTH DIODES)

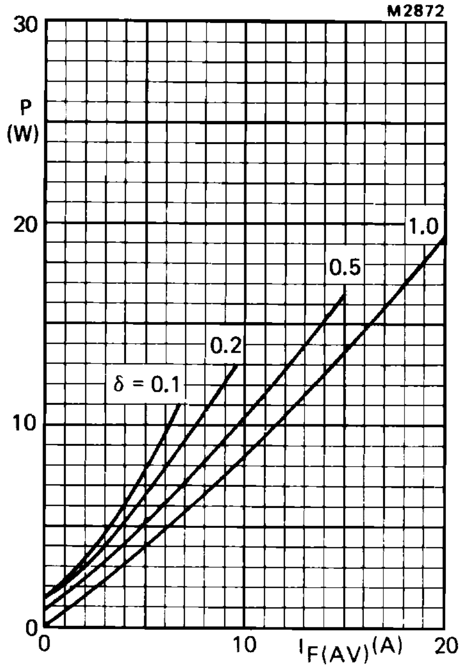
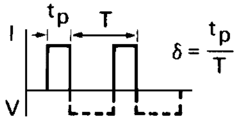


Fig.5 Power rating per diode.
The individual power loss in each diode should first be determined then both added together. The resulting total power loss is then used in conjunction with Fig.6 to determine the heatsink size and corresponding maximum ambient and mounting base temperatures.



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

Power includes reverse current losses and switching losses up to f = 500 kHz

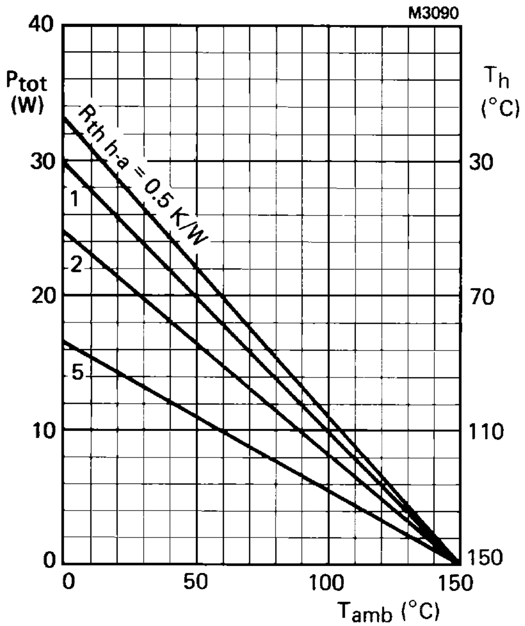


Fig.6.

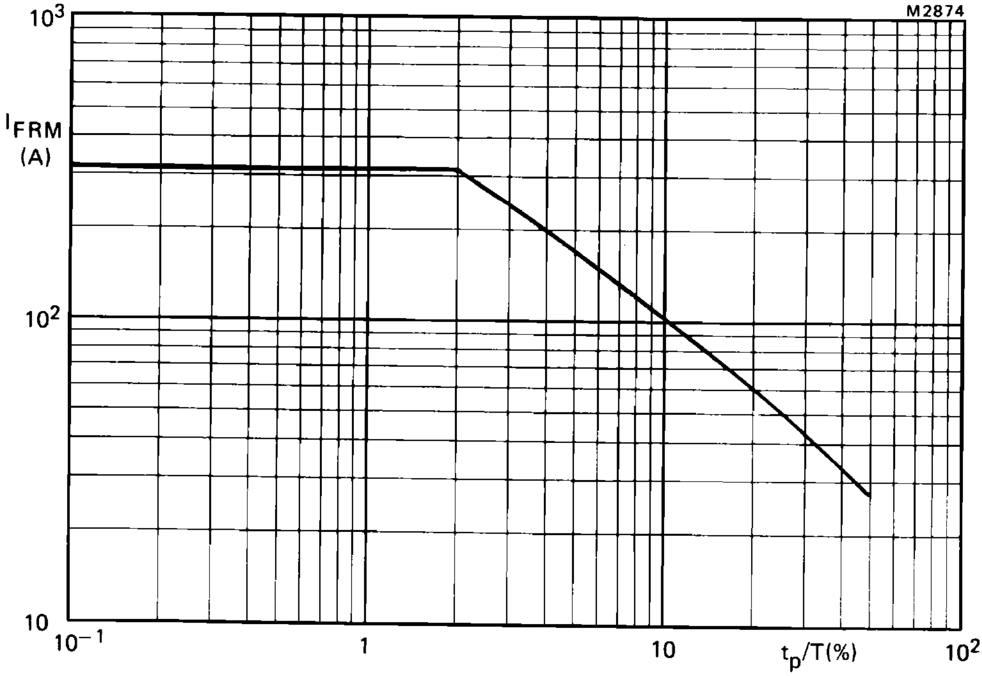
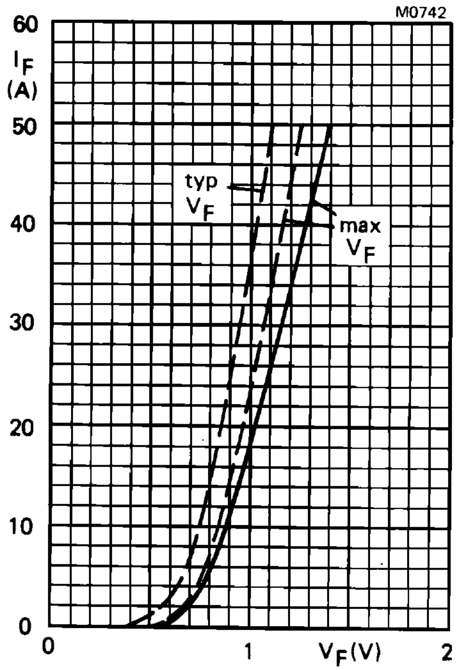
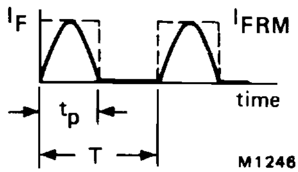


Fig.7 Maximum permissible repetitive peak forward current for either square or sinusoidal currents for 1 $\mu s < t_p < 1$ ms; per diode.





Definition of I_{FRM} and t_p/T.

Fig.8 —— T_j = 25 °C; – – – T_j = 100 °C.
per diode.

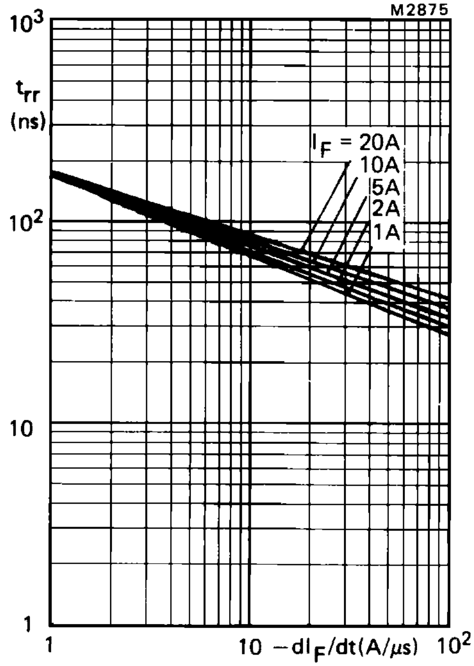


Fig.9 Maximum t_{rr} at T_j = 25 °C; per diode.

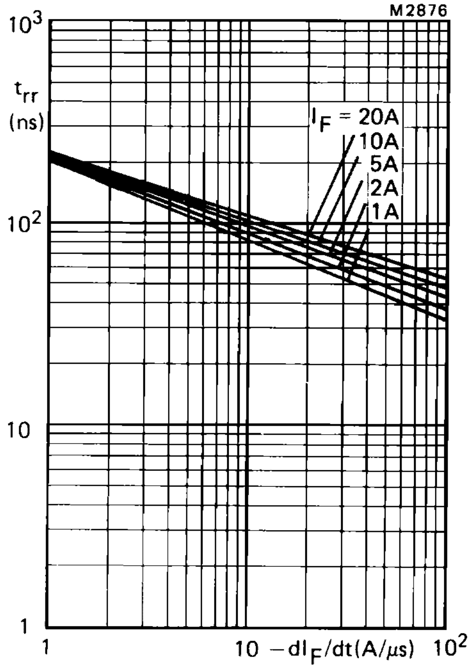


Fig.10 Maximum t_{rr} at T_j = 100 °C; per diode.

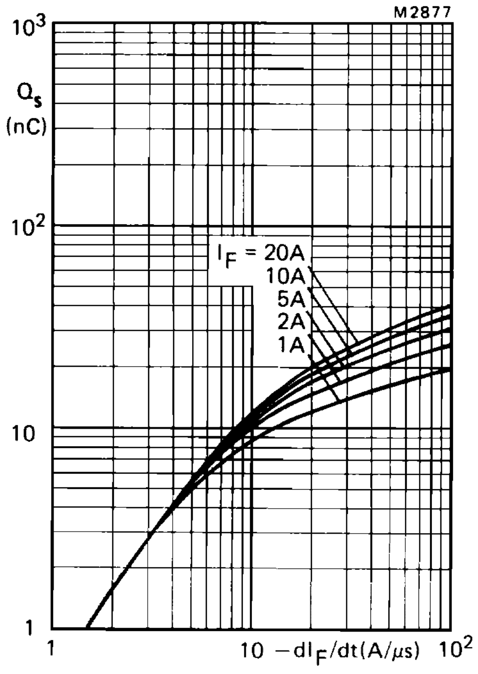


Fig.11 Maximum Q_s at T_j = 25 °C; per diode.

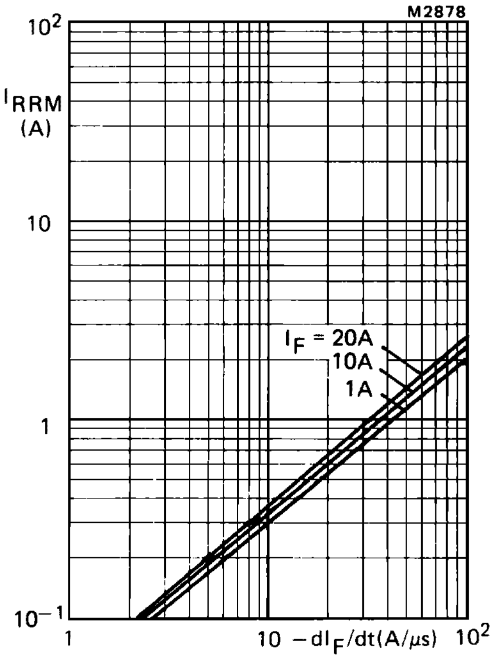


Fig.12 Maximum I_{RRM} at T_j = 25 °C; per diode.

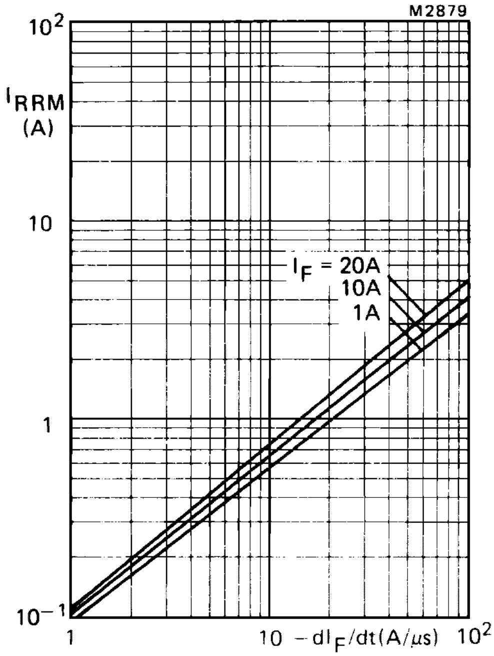


Fig.13 Maximum I_{RRM} at T_j = 100 °C; per diode.

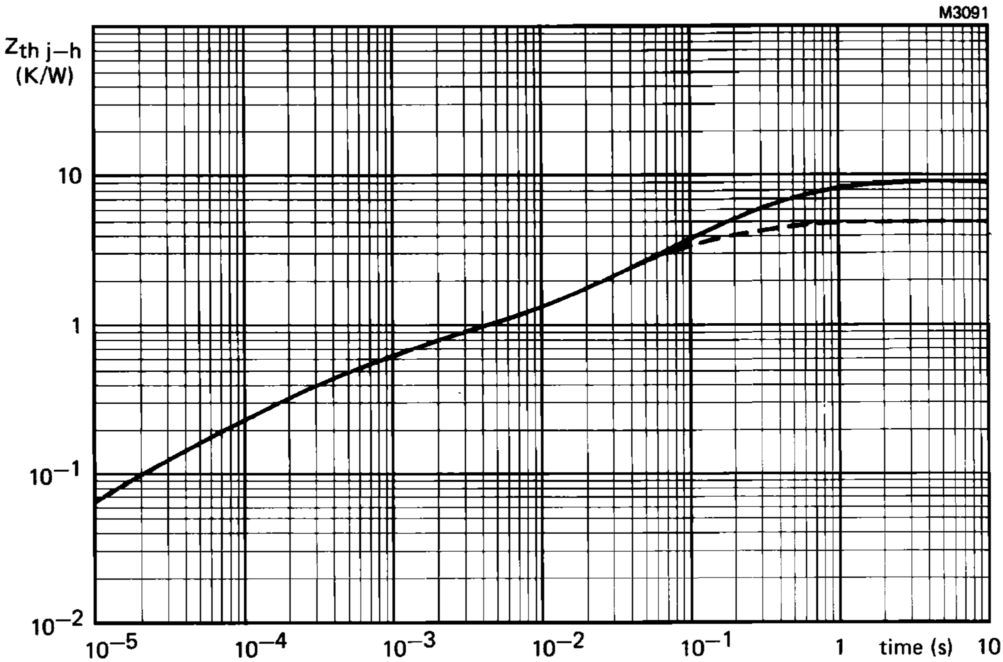


Fig.14 Transient thermal impedance; one diode conducting; — — — with heatsink compound; ——— without heatsink compound.