FAST SOFT-RECOVERY RECTIFIER DIODES

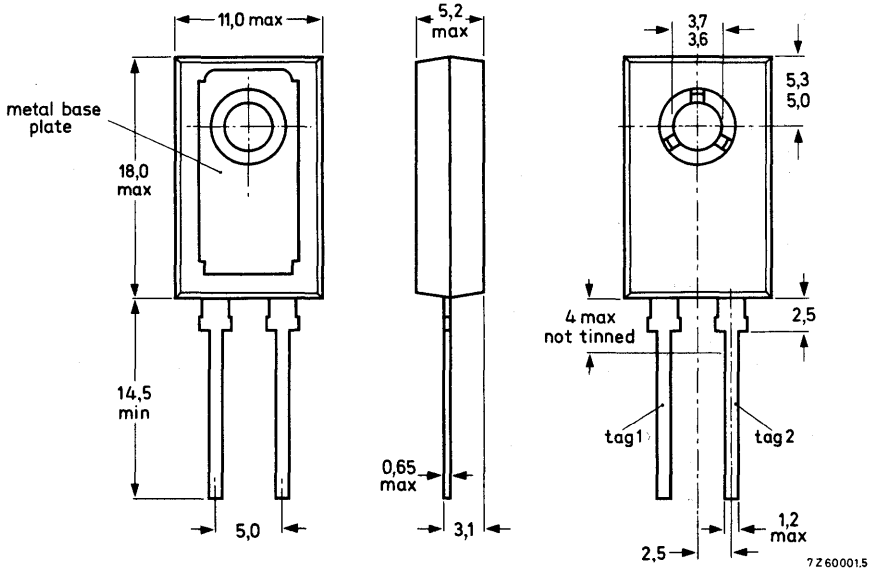
Silicon double-diffused rectifier diodes in plastic envelopes. They are intended for use as clamp diode, dV/dt limiter and output rectifier diodes in professional and consumer switched-mode power supply applications and as scan rectifier diodes in television receivers. The devices feature non-snap-off characteristics and a very fast turn-on behaviour, which makes them extremely suitable for clamp and dV/dt limiting applications.

QUICK REFERENCE DATA

			BYW19-800(R)	1000(R)	
Repetitive peak reverse voltage	V_{RRM}	max	800	1000	V
Average forward current	$I_{F(AV)}$	max	7		A
Non-repetitive peak forward current	I_{FSM}	max	40		A
Reverse recovery time	t_{rr}	<	450		ns

MECHANICAL DATA (see also page 2) Dimensions in mm

SOD-38



The exposed metal base-plate is directly connected to tag 1.

MECHANICAL DATA (continued)

Net mass: 2,5 g

Recommended diameter of fixing screw: 3,5 mm

Torque on screw
when using washer and heatsink compound: min 0,95 Nm (9,5 kg cm)
max 1,5 Nm (15 kg cm)

Accessories:
supplied with device: washer
available on request : 56316 (mica insulating washer)

POLARITY OF CONNECTIONS

	BYW19-800 and BYW19-1000	BYW19-800R and BYW19-1000R
Base-plate	cathode	anode
Tag 1	cathode	anode
Tag 2	anode	cathode

RATINGS

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

Voltages		BYW19-800(R)	1000(R)	
→ Non-repetitive peak reverse voltage	V_{RSM}	max 1000	1000	V
Repetitive peak reverse voltage	V_{RRM}	max 800	1000	V
Working reverse voltage	V_{RW}	max 800	800	V
Continuous reverse voltage	V_R	max 800	800	V

Currents				
Average forward current assuming zero switching losses (averaged over any 20 ms period; see page 7)				
square-wave; δ = 0,5; up to T_{mb} = 98 °C	$I_{F(AV)}$	max	7	A
square-wave; δ = 0,5; at T_{mb} = 125 °C	$I_{F(AV)}$	max	4	A
sinusoidal; up to T_{mb} = 98 °C	$I_{F(AV)}$	max	7	A
sinusoidal; at T_{mb} = 125 °C	$I_{F(AV)}$	max	4	A
Repetitive peak forward current; t_p = 20 μs; $\delta \leqslant 0{,}02$	I_{FRM}	max	75	A
Non-repetitive peak forward current square-wave; t = 10 ms; T_j = 150 °C prior to surge; with reapplied V_{RWmax}	I_{FSM}	max	40	A

Temperatures			
Storage temperature	T_{stg}	−40 to +125	°C
Junction temperature	T_j	max 150	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4,5 °C/W
Transient thermal impedance (t = 1 ms)	$Z_{th\ j\text{-}mb}$	=	0,3 °C/W

Influence of mounting method

1. Heatsink mounted

Thermal resistance from mounting base to heatsink

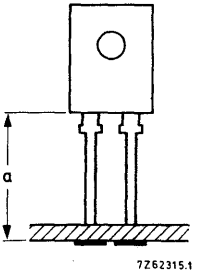
a. with heatsink compound	$R_{th\ mb\text{-}h}$	=	1,5 °C/W
b. with heatsink compound and 56316 mica washer	$R_{th\ mb\text{-}h}$	=	2,7 °C/W
c. without heatsink compound	$R_{th\ mb\text{-}h}$	=	2,7 °C/W
d. without heatsink compound with 56316 mica washer	$R_{th\ mb\text{-}h}$	=	5 °C/W

2. Free air operation

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

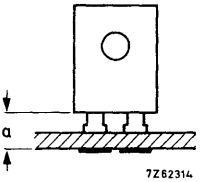
Thermal resistance from junction to ambient in free air:
mounted on a printed-circuit board at a = maximum lead length and with a copper laminate

a. $> 1\ cm^2$ $R_{th\ j\text{-}a} = 50$ °C/W
b. $< 1\ cm^2$ $R_{th\ j\text{-}a} = 55$ °C/W



mounted on a printed-circuit board at a lead length a = 3 mm and with a copper laminate

c. $> 1\ cm^2$ $R_{th\ j\text{-}a} = 55$ °C/W
d. $< 1\ cm^2$ $R_{th\ j\text{-}a} = 60$ °C/W



CHARACTERISTICS

Forward voltage

I_F = 20 A; T_j = 25 °C — V_F < 2,3 V *

Reverse current

$V_R = V_{RWmax}$; T_j = 125 °C — I_R < 0,6 mA

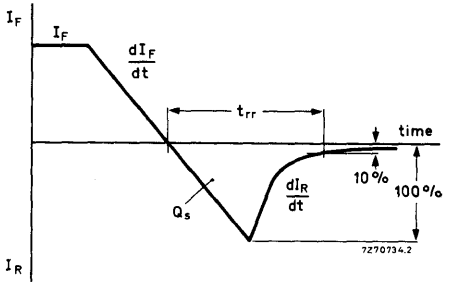
Reverse recovery when switched from

I_F = 2 A to $V_R \geqslant$ 30 V; $-dI_F/dt$ = 20 A/μs; T_j = 25 °C

Recovered charge	Q_s	<	0,7 μC
Recovery time	t_{rr}	<	450 ns

Maximum slope of the reverse recovery current

when switched from I_F = 2 A to $V_R \geqslant$ 30 V;
with $-dI_F/dt$ = 2 A/μs; T_j = 25 °C — $|dI_R/dt|$ < 5 A/μs



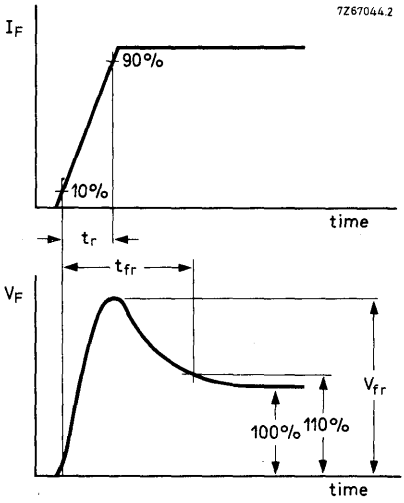
* Measured under pulse conditions to avoid excessive dissipation.

CHARACTERISTICS (continued)

Forward recovery when switched to

I_F = 10 A with t_r = 1 μs at T_j = 25 °C

Recovery time	t_{fr}	<	1 μs
Recovery voltage	V_{fr}	<	15 V



Forward output waveform

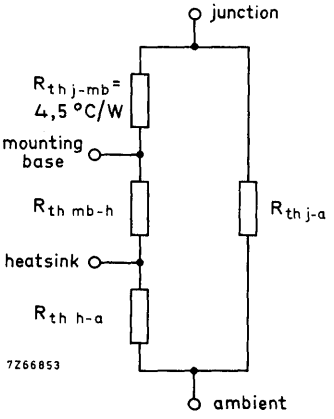
MOUNTING INSTRUCTIONS

1. Soldered joints must be at least 2,5 mm from the seal.
2. The maximum permissible temperature of the soldering iron or bath is 270 °C; contact with the joint must not exceed 3 seconds.
3. The devices should not be immersed in oil, and few potting resins are suitable for re-encapsulation. Advice on these materials is available on request.
4. Leads should not be bent less than 2,5 mm from the seal. Exert no axial pull when bending.
5. For good thermal contact heatsink compound should be used between base-plate and heatsink.

OPERATING NOTES

Dissipation and heatsink considerations:

a. The various components of junction temperature rise above ambient are illustrated below:



b. The method of using the graphs on page 7 is as follows:
Starting with the required current on the $I_{F(AV)}$ axis, trace upwards to meet the appropriate form factor curve. Trace right horizontally and upwards from the appropriate value on the T_{amb} scale. The intersection determines the $R_{th\ mb\text{-}a}$. The heatsink thermal resistance value ($R_{th\ h\text{-}a}$) can now be calculated from:

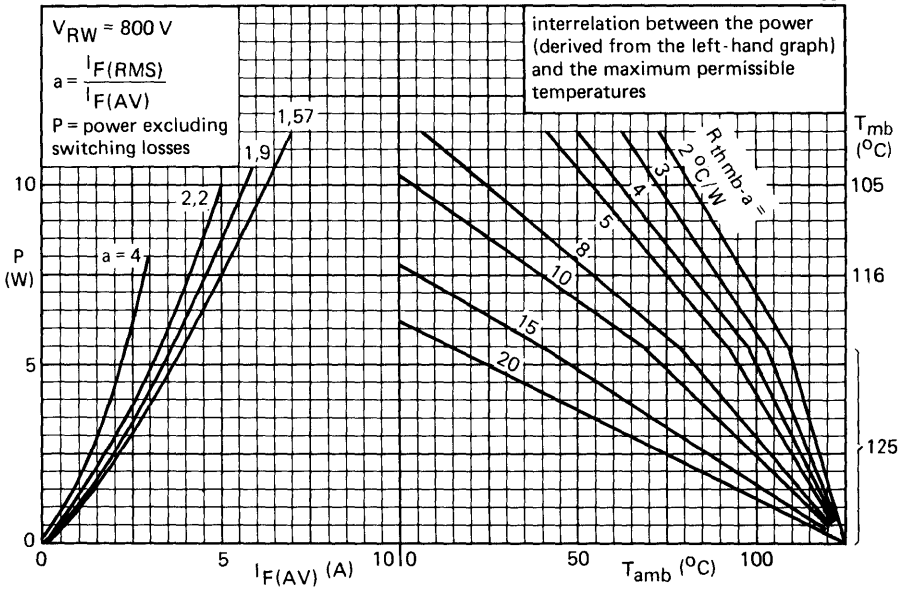
$$R_{th\ h\text{-}a} = R_{th\ mb\text{-}a} - R_{th\ mb\text{-}h}.$$

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

c. The heatsink curves are optimized to allow the junction temperature to run up to a maximum of 150 °C ($T_{j\ max}$) whilst limiting T_{mb} to 125 °C (or less).

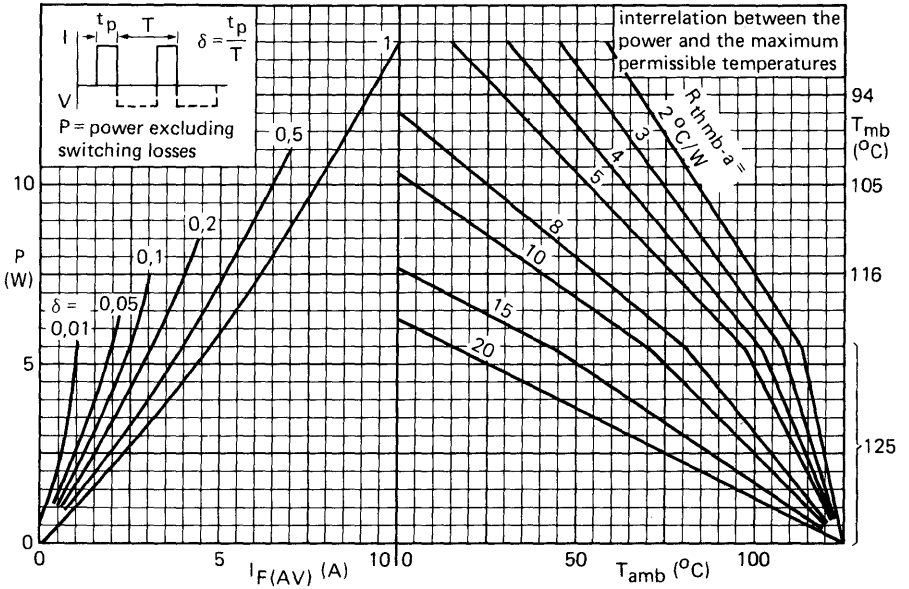
SINUSOIDAL OPERATION

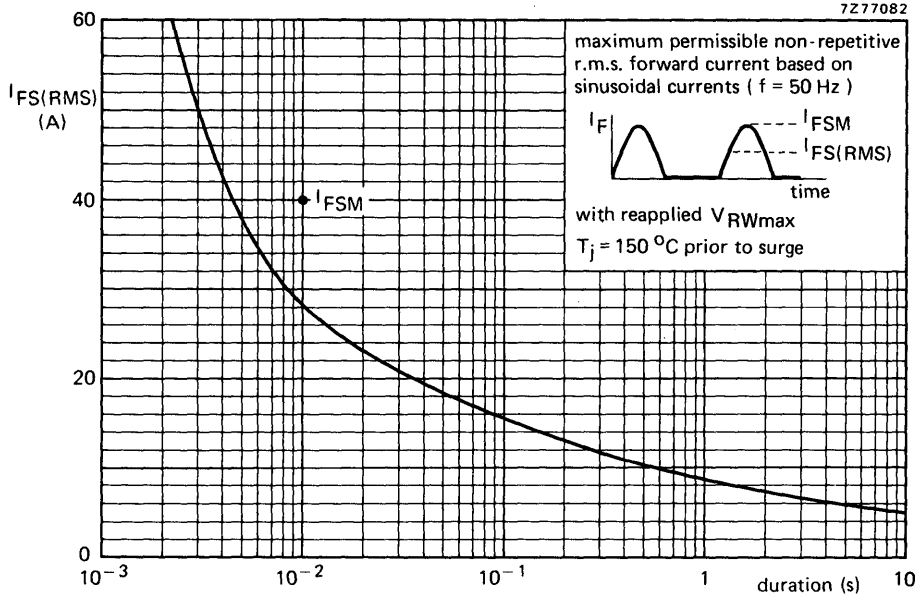
7Z77081

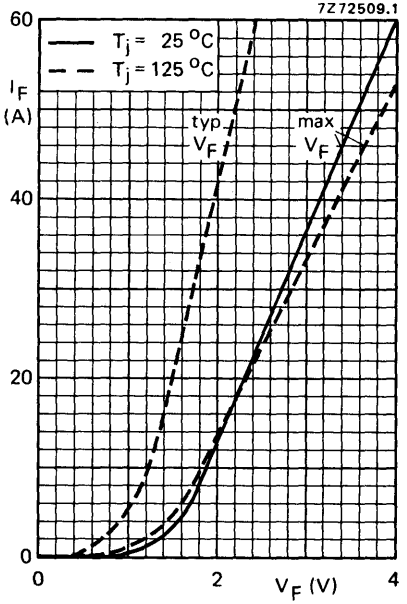


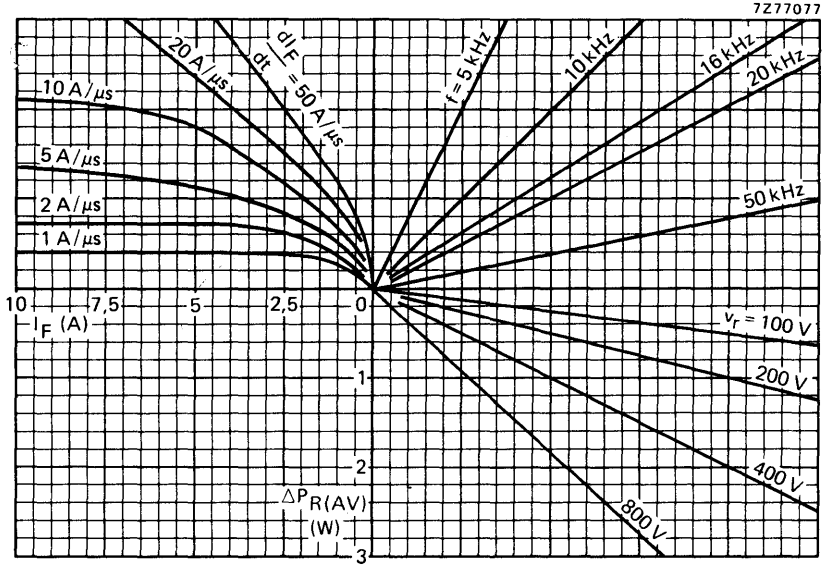
SQUARE-WAVE OPERATION

7Z77080




7Z77082
maximum permissible non-repetitive r.m.s. forward current based on sinusoidal currents (f = 50 Hz)
I_F
I_{FSM}
$I_{FS(RMS)}$
time
with reapplied V_{RWmax}
T_j = 150 °C prior to surge
$I_{FS(RMS)}$ (A)
I_{FSM}
60
40
20
0
10^{-3}
10^{-2}
10^{-1}
1
10
duration (s)

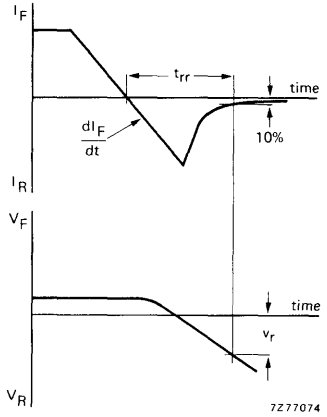

7Z72509.1
T_j = 25 °C
T_j = 125 °C
typ V_F
max V_F
I_F (A)
60
40
20
0
0
2
4
V_F (V)

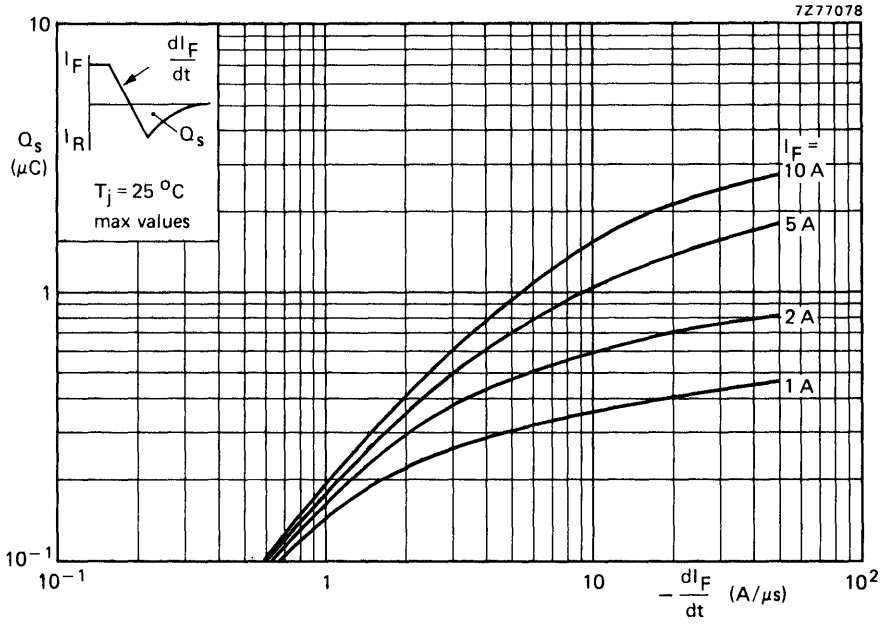


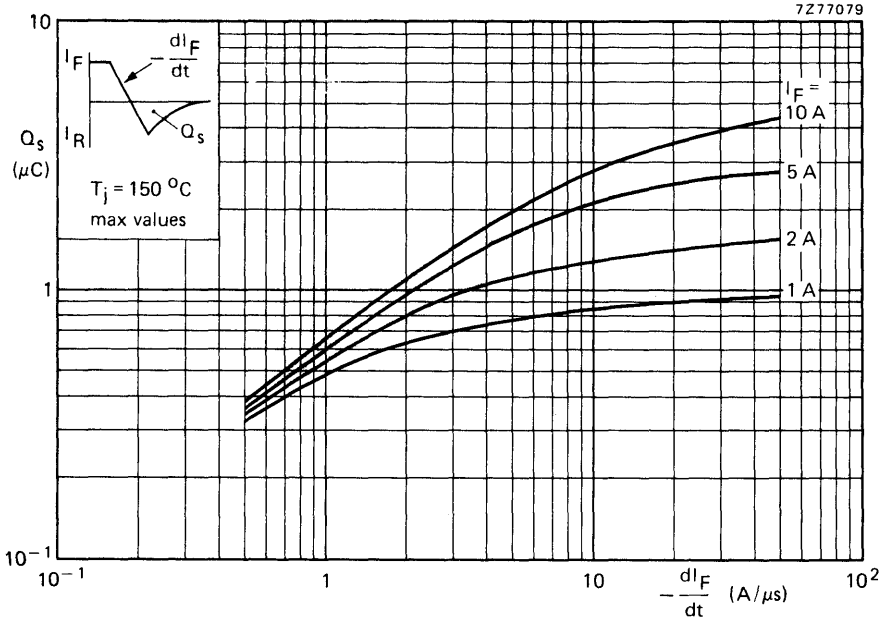
NOMOGRAM

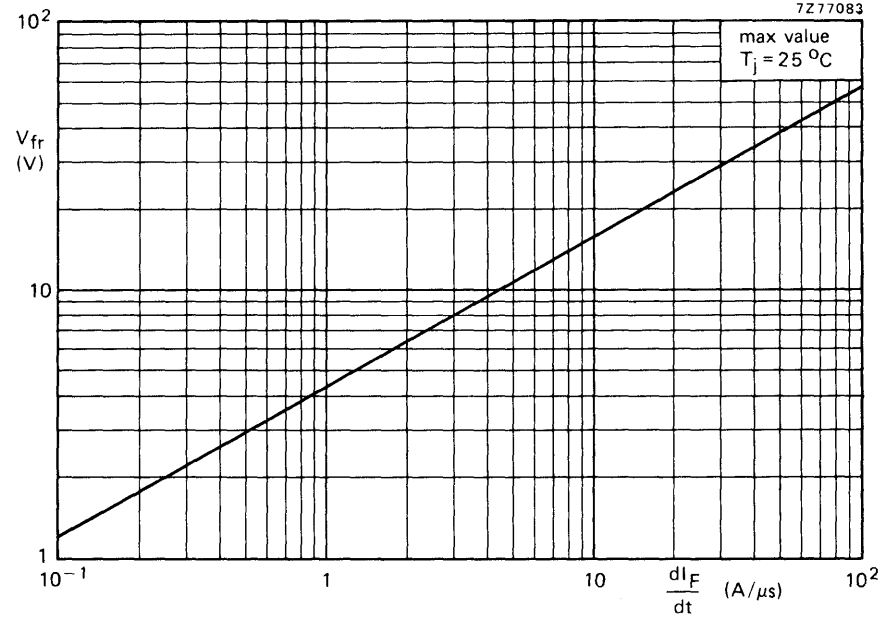
Power loss $\Delta P_{R(AV)}$ due to switching only (to be added to steady state power losses).

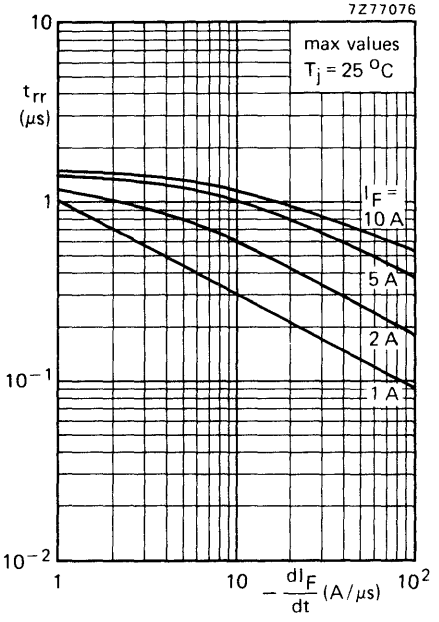
I_F = forward current just before switching off; T_j = 150 °C

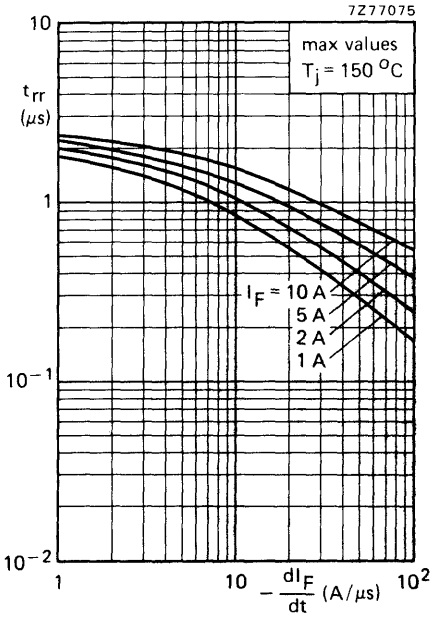


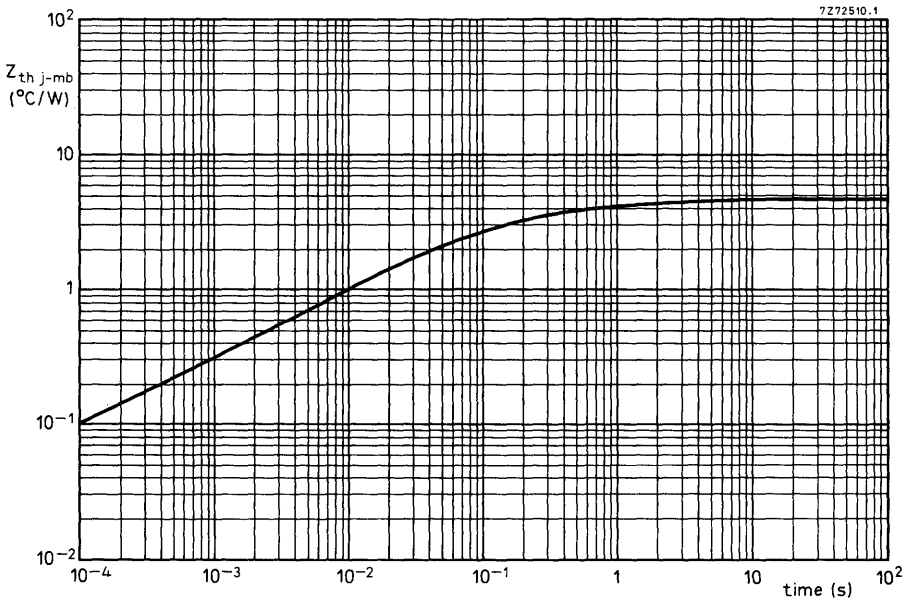

7Z77078
10
1
10^{-1}
Q_s (μC)
I_F
I_R
$\frac{dI_F}{dt}$
Q_s
$T_j = 25\ ^oC$
max values
I_F =
10 A
5 A
2 A
1 A
10^{-1}
1
10
$-\frac{dI_F}{dt}$ (A/μs)
10^2


7Z77079
10
1
10^{-1}
Q_s (μC)
I_F
I_R
$-\frac{dI_F}{dt}$
Q_s
$T_j = 150\ ^oC$
max values
I_F =
10 A
5 A
2 A
1 A
10^{-1}
1
10
$-\frac{dI_F}{dt}$ (A/μs)
10^2


7Z77083
max value
$T_j = 25\ ^oC$
V_{fr} (V)
10^2
10
1
10^{-1}
1
10
$\frac{dI_F}{dt}$ (A/μs)
10^2


7Z77076
max values
$T_j = 25\ ^oC$
t_{rr} (μs)
10
1
10^{-1}
10^{-2}
I_F = 10 A
5 A
2 A
1 A
1
10
$-\frac{dI_F}{dt}$ (A/μs)
10^2


7Z77075
max values
$T_j = 150\ ^oC$
t_{rr} (μs)
10
1
10^{-1}
10^{-2}
I_F = 10 A
5 A
2 A
1 A
1
10
$-\frac{dI_F}{dt}$ (A/μs)
10^2


7Z72510.1
10^2
$Z_{th\ j\text{-}mb}$
(°C/W)
10
1
10^{-1}
10^{-2}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
10
10^2
time (s)