THYRISTORS

Silicon thyristors in metal envelopes, intended for power control and power switching applications. The series consists of reverse polarity types (anode to stud) identified by a suffix R: BTY87-400R to 800R.

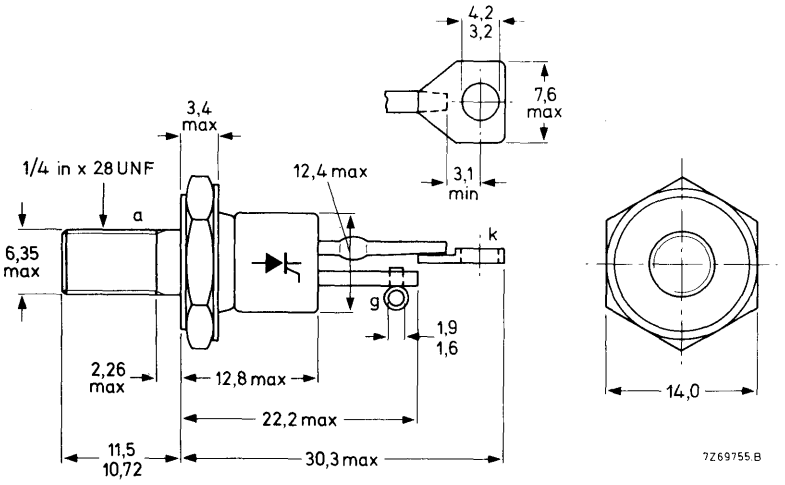
QUICK REFERENCE DATA

		BTY87-	400R	500R	600R	800R	
Repetitive peak voltages	V_{DRM}/V_{RRM}	max.	400	500	600	800	V
Average on-state current	$I_{T(AV)}$	max.			16		A
R.M.S. on-state current	$I_{T(RMS)}$	max.			25		A
Non-repetitive peak on-state current	I_{TSM}	max.			140		A

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-48: with ¼ in x 28 UNF stud (ϕ 6,35 mm).



Net mass: 14 g
Diameter of clearance hole: max. 6,5 mm
Accessories supplied on request: 56264A
(mica washer, insulating ring, soldering tag)

Torque on nut: min. 1,7 Nm (17 kg cm)
max. 3,5 Nm (35 kg cm)
Supplied with the device:
1 nut, 1 lock washer
Nut dimensions across the flats: 11,1 mm

RATINGS

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

			BTY87-400R	500R	600R	800R	
Anode to cathode							
Non-repetitive peak off-state voltage ($t \leqslant 10$ ms)	V_{DSM}	max.	500	850	850	850	V
Non-repetitive peak reverse voltage ($t \leqslant 5$ ms)	V_{RSM}	max.	500	600	850	960	V
Repetitive peak voltages	V_{DRM}/V_{RRM}	max.	400	500	600	800	V
Crest working voltages	V_{DWM}/V_{RWM}	max.	400	500	600	800	V *

Average on-state current (averaged over any 20 ms period) up to $T_{mb} = 52$ °C	$I_{T(AV)}$	max.	16	A
at $T_{mb} = 85$ °C	$I_{T(AV)}$	max.	10	A
R.M.S. on-state current	$I_{T(RMS)}$	max.	25	A
Repetitive peak on-state current	I_{TRM}	max.	140	A
Non-repetitive peak on-state current; t = 10 ms; half sine-wave; $T_j = 125$ °C prior to surge; with reapplied V_{RWMmax}	I_{TSM}	max.	140	A
I^2t for fusing (t = 10 ms)	I^2t	max.	100	A^2s
Rate of rise of on-state current after triggering with $I_G = 325$ mA to $I_T = 50$ A	dI_T/dt	max.	20	A/μs
Gate to cathode				
Reverse peak voltage	V_{RGM}	max.	5	V
Average power dissipation (averaged over any 20 ms period)	$P_{G(AV)}$	max.	0,5	W
Peak power dissipation	P_{GM}	max.	5	W
Temperatures				
Storage temperature	T_{stg}		−55 to + 125	°C
Junction temperature	T_j	max.	125	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6	°C/W
From mounting base to heatsink with heatsink compound	$R_{th\ mb\text{-}h}$	=	0,2	°C/W
Transient thermal impedance (t = 1 ms)	$Z_{th\ j\text{-}mb}$	=	0,09	°C/W

OPERATING NOTE

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

* To ensure thermal stability: $R_{th\ j\text{-}a} < 4{,}5$ °C/W (d.c. blocking) or < 9 °C/W (a.c.). For smaller heatsinks $T_{j\ max}$ should be derated. For a.c. see Fig. 3.

CHARACTERISTICS

Anode to cathode

On-state voltage I_T = 50 A; T_j = 25 °C	V_T	<	3 V *
Rate of rise of off-state voltage that will not trigger any device; exponential method; V_D = 2/3 V_{DRMmax}; T_j = 125 °C	dV_D/dt	<	20 V/μs
Reverse current V_R = V_{RWMmax}; T_j = 125 °C	I_R	<	3 mA
Off-state current V_D = V_{DWMmax}; T_j = 125 °C	I_D	<	3 mA
Latching current; T_j = 25 °C	I_L	typ.	20 mA
Holding current; T_j = 25 °C	I_H	typ.	10 mA

Gate to cathode

Voltage that will trigger all devices V_D = 6 V; T_j = 25 °C	V_{GT}	>	3,5 V
Voltage that will not trigger any device V_D = V_{DRMmax}; T_j = 125 °C	V_{GD}	<	200 mV
Current that will trigger all devices V_D = 6 V; T_j = 25 °C	I_{GT}	>	65 mA

Switching characteristics

Gate-controlled turn-on time (t_{gt} = t_d + t_r) when switched from V_D = 400 V to I_T = 50 A; I_{GT} = 200 mA; T_j = 25 °C	t_{gt}	typ.	2 μs

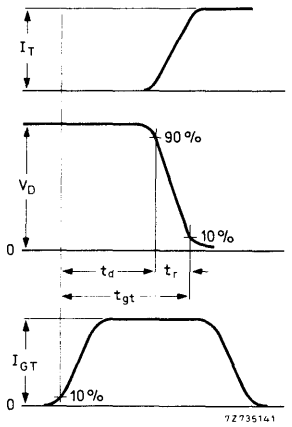


Fig. 2 Gate-controlled turn-on time definitions.

* Measured under pulse conditions to avoid excessive dissipation.

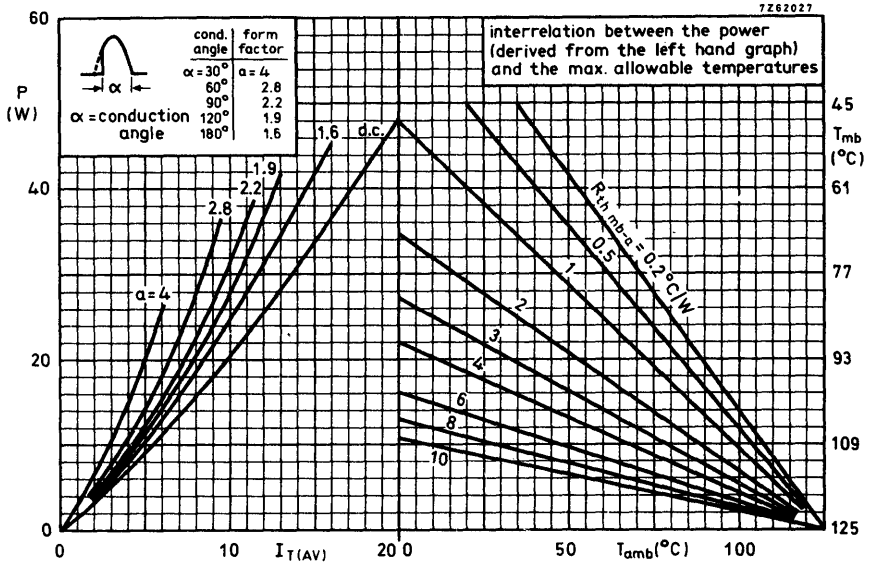

7Z62027
interrelation between the power (derived from the left hand graph) and the max. allowable temperatures
cond. angle
form factor
α = 30° a = 4
60° 2.8
90° 2.2
120° 1.9
180° 1.6
α = conduction angle
P (W)
1.6 d.c.
1.9
2.2
2.8
a = 4
R th mb-a = 0.2 °C/W
0.5
1
2
3
4
6
8
10
$I_{T(AV)}$
T_{amb}(°C)
T_{mb} (°C)
45
61
77
93
109
125
0
10
20
50
100
60
40
20

Fig. 3.

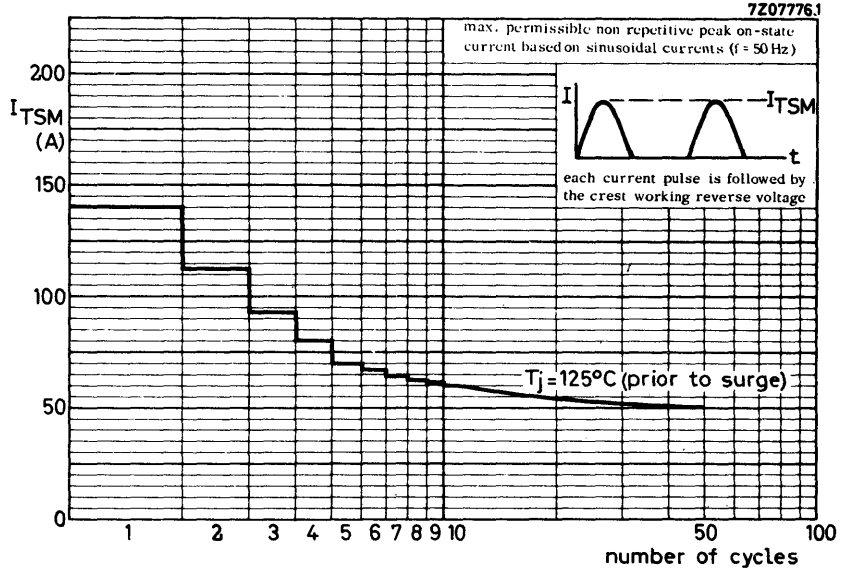

7Z07776.1
max. permissible non repetitive peak on-state current based on sinusoidal currents (f = 50 Hz)
I
I_{TSM}
t
each current pulse is followed by the crest working reverse voltage
I_{TSM} (A)
T_j = 125°C (prior to surge)
number of cycles
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10
50
100

Fig. 4.

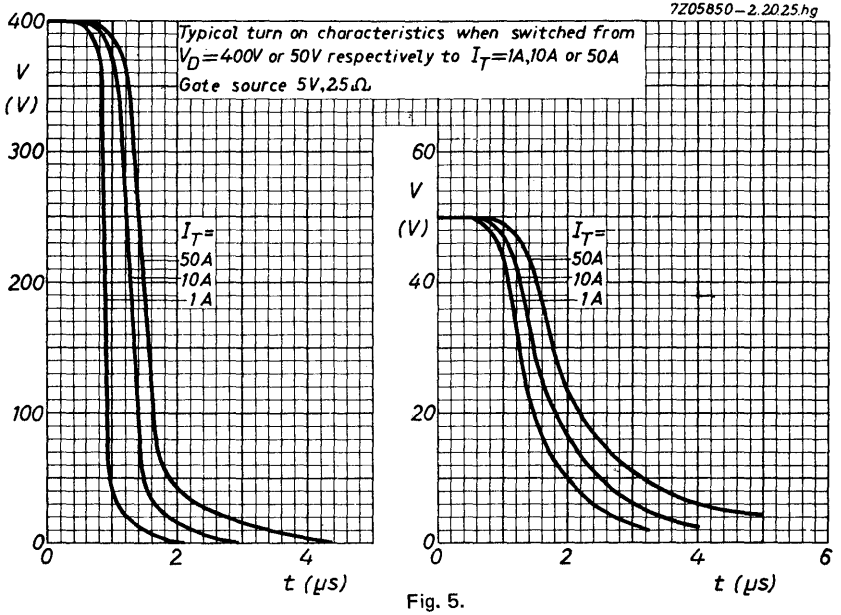

7Z05850–2.20.25.hg
Typical turn on characteristics when switched from
V_D=400V or 50V respectively to I_T=1A,10A or 50A
Gate source 5V,25Ω
400
V
(V)
300
200
100
0
I_T=
50A
10A
1A
0
2
4
t (μs)
60
V
(V)
40
20
0
2
4
6
t (μs)

Fig. 5.

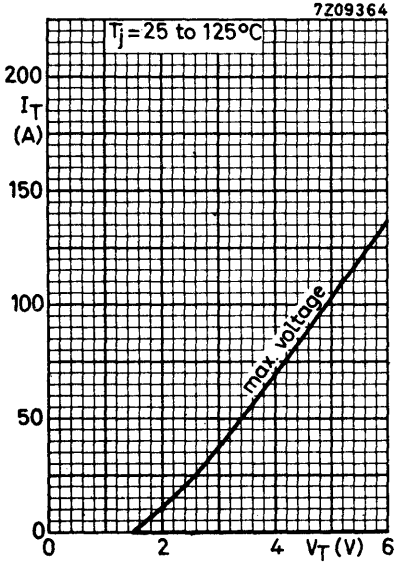
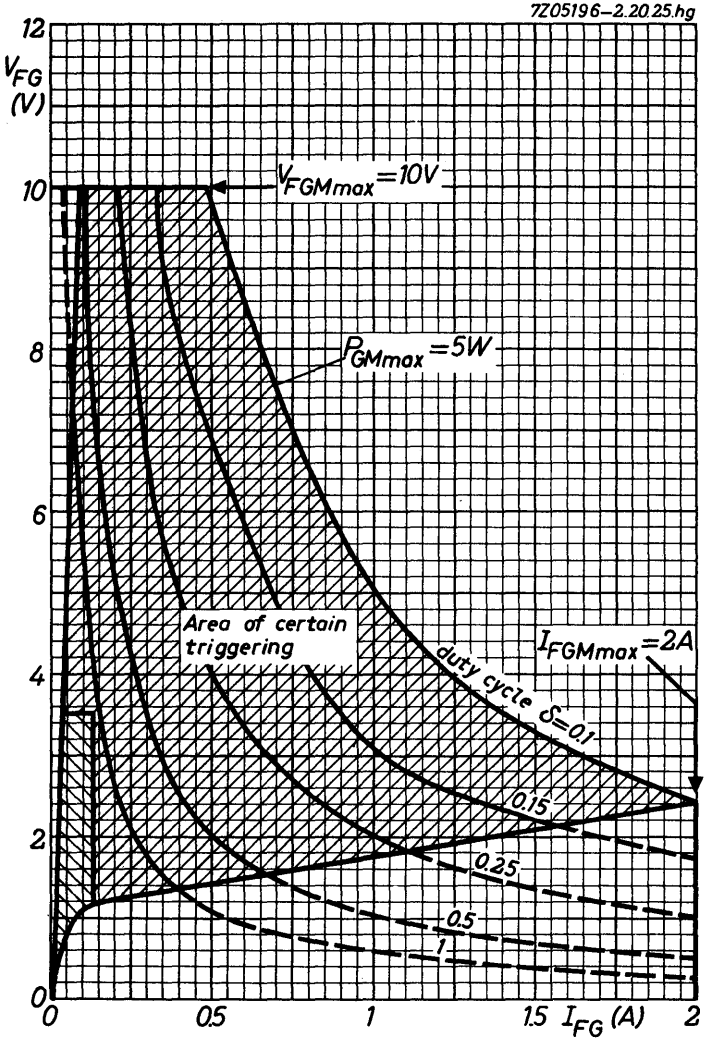

7Z09364
T_j=25 to 125°C
200
I_T
(A)
150
100
50
0
max. voltage
0
2
4
V_T(V)
6

Fig. 6.



Gate characteristics with curves P_{GAV}=0.5W

Fig. 7.

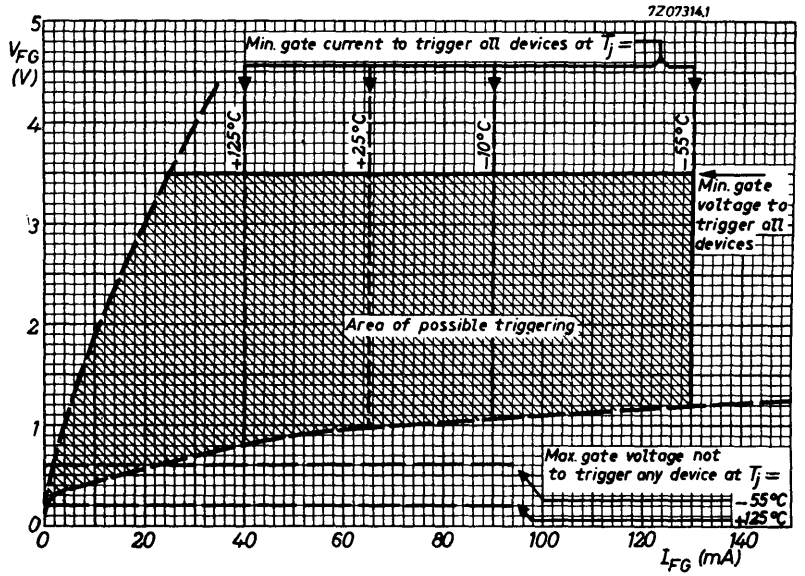

7Z07314.1
V_{FG} (V)
Min. gate current to trigger all devices at T_j =
+125°C
+25°C
−10°C
−55°C
Min. gate voltage to trigger all devices
Area of possible triggering
Max. gate voltage not to trigger any device at T_j =
−55°C
+125°C
I_{FG} (mA)

Fig. 8.

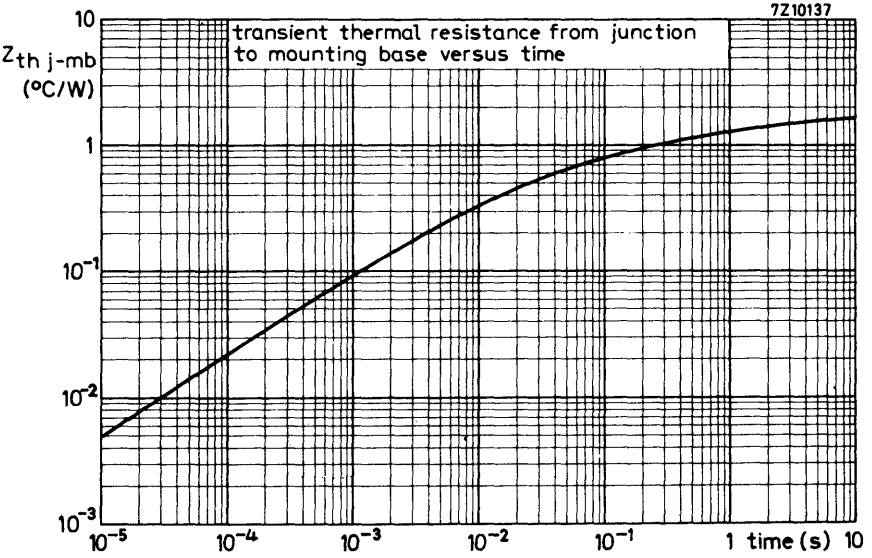

7Z10137
transient thermal resistance from junction to mounting base versus time
$Z_{th\ j\text{-}mb}$ (°C/W)
time (s)

Fig. 9.

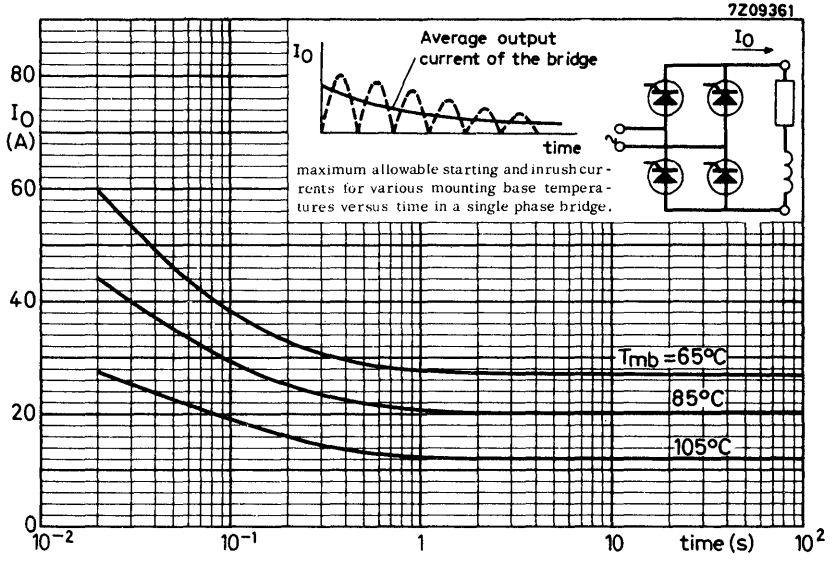

7Z09361
Average output current of the bridge
I_O
time
maximum allowable starting and inrush currents for various mounting base temperatures versus time in a single phase bridge.
I_O (A)
80
60
40
20
0
10^{-2}
10^{-1}
1
10
time (s)
10^2
T_{mb} = 65°C
85°C
105°C

Fig. 10.

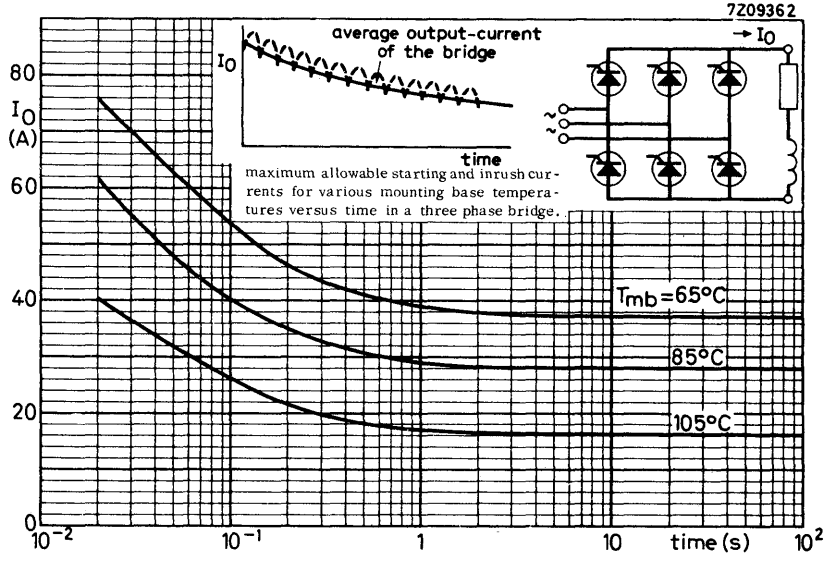

7Z09362
average output-current of the bridge
I_O
time
maximum allowable starting and inrush currents for various mounting base temperatures versus time in a three phase bridge.
I_O (A)
80
60
40
20
0
10^{-2}
10^{-1}
1
10
time (s)
10^2
T_{mb} = 65°C
85°C
105°C

Fig. 11.