# TRANSIENT SUPPRESSOR DIODES

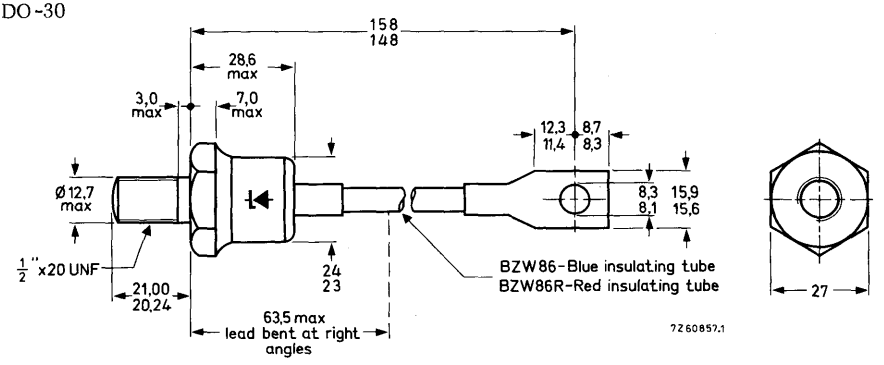
A range of diffused silicon diodes in a DO-30 metal envelope intended for use in the protection of the electrical and electronic equipment against voltage transients.
The series consists of the following types:
Normal polarity (cathode to stud): BZW86-7V5 to 56
Reverse polarity (anode to stud) : BZW86-7V5R to 56R

| QUICK REFERENCE DATA | | | | |
|---|---|---|---|---|
| Stand-off voltage (15% range) * | $V_R$ | | 7,5 to 56 | V |
| Reverse breakdown voltage | $V_{(BR)R}$ | | 9,4 to 64 | V |
| Non-repetitive peak reverse power dissipation; exponential pulse | $P_{RSM}$ | max. | 25 | kW |

* The stand-off voltage is the maximum reverse voltage recommended for continuous operation; at this value non-conduction is ensured.

**MECHANICAL DATA** Dimensions in mm

DO-30




Supplied with device: 1 nut, 1 lock washer
Nut dimensions across the flats: 19 mm

Diameter of clearance hole: max. 13 mm
Net weight: 123 g
The mark shown applies to the normal polarity types.

Torque on nut: min. 9 Nm (90 kgcm)
max. 17,5 Nm (175 kgcm)

**RATINGS** Limiting values in accordance with the Absolute Maximum System (IEC134)

| | | | | |
|---|---|---|---|---|
| Stand-off voltage * | $V_R$ | equal to type number suffix | | |
| **Currents** | | | | |
| Non-repetitive peak reverse current | | | | |
| $T_j$ = 25 °C prior to surge | | | | |
| $t_p$ = 10 µs; square pulse | | | | |
| BZW86-9V1(R) | $I_{RSM}$ | max. | 3700 | A |
| BZW86-27(R) | $I_{RSM}$ | max. | 1200 | A |
| BZW86-56(R) | $I_{RSM}$ | max. | 700 | A |
| $t_p$ = 1 ms; exponential pulse | | | | |
| BZW86-9V1(R) | $I_{RSM}$ | max. | 1200 | A |
| BZW86-27(R) | $I_{RSM}$ | max. | 400 | A |
| BZW86-56(R) | $I_{RSM}$ | max. | 250 | A |
| **Power dissipation** | | | | |
| Repetitive peak reverse power dissipation $T_{mb}$ = 65 °C; f = 50 Hz; $t_p$ = 10 µs (square pulse; see also graphs on page 6) | $P_{RRM}$ | max. | 50 | kW |
| Non-repetitive peak reverse power dissipation $T_j$ = 25 °C prior to surge; exponential pulse: see also graph on page 5 | | | | |
| $t_p$ = 100 µs | $P_{RSM}$ | max. | 60 | kW |
| $t_p$ = 1 ms | $P_{RSM}$ | max. | 25 | kW |
| **Temperatures** | | | | |
| Storage temperature | $T_{stg}$ | | −55 to +175 | °C |
| Junction temperature | $T_j$ | max. | 175 | °C |
| **THERMAL RESISTANCE** | | | | |
| From junction to mounting base | $R_{th\ j\text{-}mb}$ | = | 0,3 | °C/W |
| From mounting base to heatsink | $R_{th\ mb\text{-}h}$ | = | 0,1 | °C/W |
| **CHARACTERISTICS** | | | | |
| **Forward voltage** | | | | |
| $I_F$ = 500 A at $T_j$ = 25 °C | $V_F$ | < | 1,5 | V ** |

* The stand-off voltage is the maximum reverse voltage recommended for continuous operation; at this value non-conduction is ensured.

** Measured under pulse condition.

**CHARACTERISTICS** (continued)

| | Clamping voltages (exp. pulse) at $T_j$ = 25 °C prior to surge; $t_p$ = 500 µs $V_{(CL)R}$ (V) | | | Reverse breakdown voltage at $T_j$ = 25 °C $V_{(BR)R}$ (V) | |
|---|---|---|---|---|---|
| | typ. | max. | | min. | |
| BZW86 -7V5(R) | 12 | 14 | | 8,5 | |
| -8V2(R) | 13 | 15,5 | | 9,4 | |
| -9V1(R) | 14 | 17 | | 10,4 | |
| -10(R) | 15,5 | 18,5 | $I_R$ = 1000 A | 11,4 | $I_R$ = 10 A |
| -11(R) | 17 | 20 | | 12,4 | |
| -12(R) | 18,5 | 22 | | 13,8 | |
| -13(R) | 20 | 24 | | 15,3 | |
| -15(R) | 23 | 27 | | 16,8 | |
| -16(R) | 27 | 32 | | 18,8 | |
| -18(R) | 31 | 36 | | 20,8 | |
| -20(R) | 34 | 40 | $I_R$ = 500 A | 22,8 | $I_R$ = 5 A |
| -22(R) | 37 | 43 | | 25,1 | |
| -24(R) | 40 | 47 | | 28 | |
| -27(R) | 44 | 52 | | 31 | |
| -30(R) | 47 | 55 | | 34 | |
| -33(R) | 51 | 60 | | 37 | |
| -36(R) | 55 | 65 | | 40 | |
| -39(R) | 60 | 70 | | 44 | |
| -43(R) | 66 | 77 | $I_R$ = 250 A | 48 | $I_R$ = 2 A |
| -47(R) | 72 | 84 | | 52 | |
| -51(R) | 78 | 92 | | 58 | |
| -56(R) | 85 | 102 | | 64 | |

The maximum clamping voltage is the maximum reverse voltage which appear across the diode at the specified pulse duration and junction temperature.
See curves on pages 8 and 9 for square pulses and pages 10 and 11 for exponential pulses.

**CHARACTERISTICS** (continued) $T_j$ = 25 °C unless otherwise specified

| | | | | |
|---|---|---|---|---|
| Peak reverse current | | | | |
| $V_{RM}$ = recommended stand-off voltage | $I_{RM}$ | < | 2 | mA |
| Temperature coefficient of clamping voltage | S | typ. | +0,1 | %/°C |

**OPERATING NOTES**

Heatsink considerations

(a) For non-repetitive transients, the device may be used without a heatsink for pulses up to 10 ms in duration.

(b) For repetitive transients which fall within the permitted operating range shown in the curves on page 6 the required heatsink is found as follows:

$$R_{th\ j\text{-}mb} + R_{th\ mb\text{-}h} + R_{th\ h\text{-}a} = \frac{T_{j\ max} - T_{amb}}{P_S + \delta .\ P_{RRM}}$$

where $T_{j\ max}$ = 175 °C

$T_{amb}$ = ambient temperature

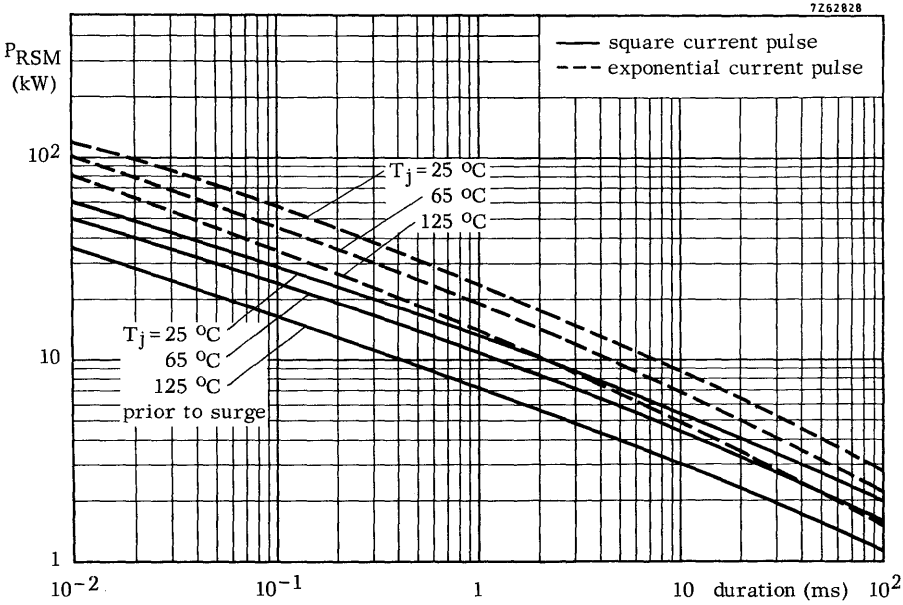
$P_S$ = any steady state dissipation excluding that in pulses

$\delta$ = duty factor ($t_p/T$)

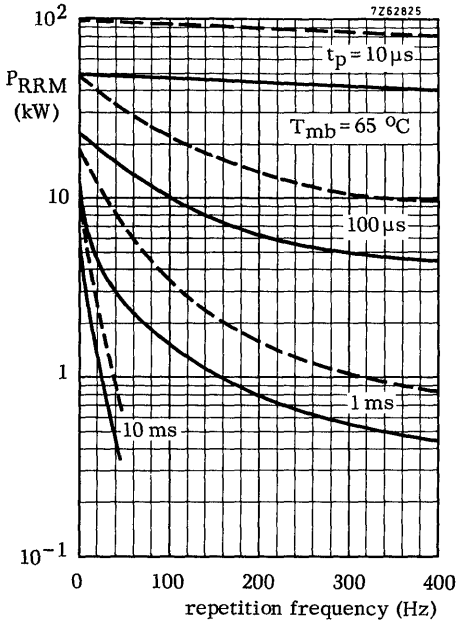
$R_{th\ j\text{-}mb}$ = 0,3 °C/W

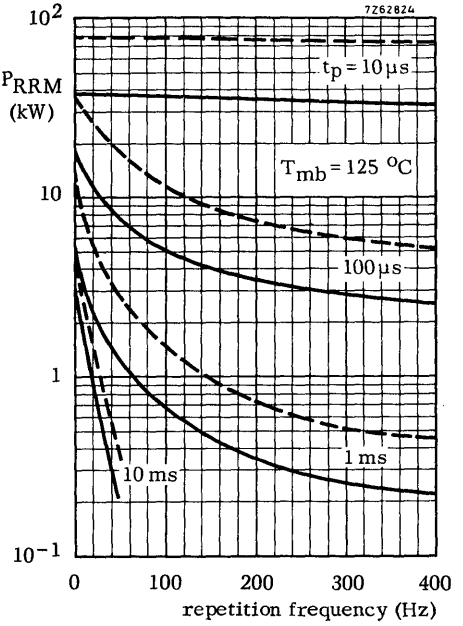
$R_{th\ mb\text{-}h}$ = 0,1 °C/W

thus $R_{th\ h\text{-}a}$ can be found.



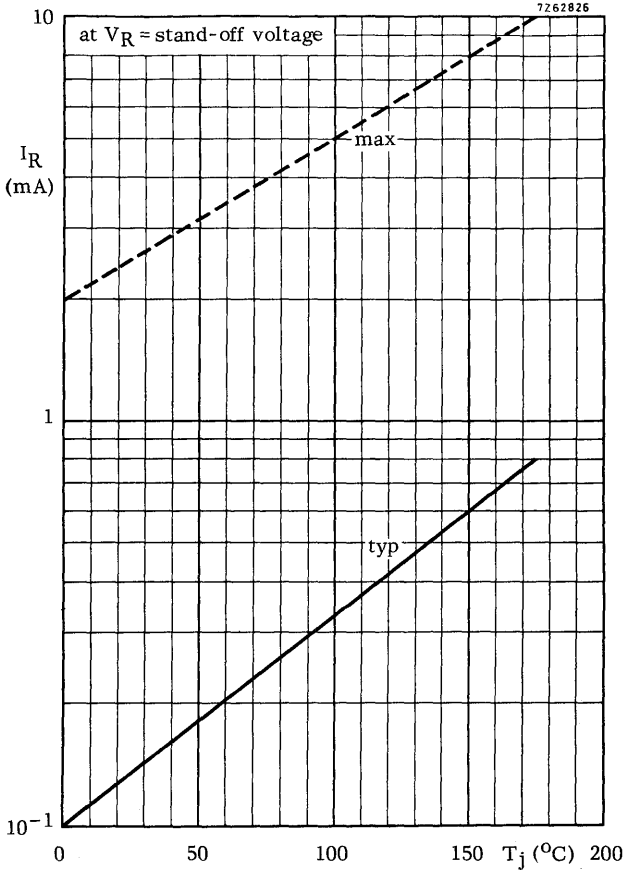

Duration of an exponential pulse is defined as the time taken for the pulse to fall to 37% of its initial value. It is assumed that the energy content does not continue beyond twice this time.

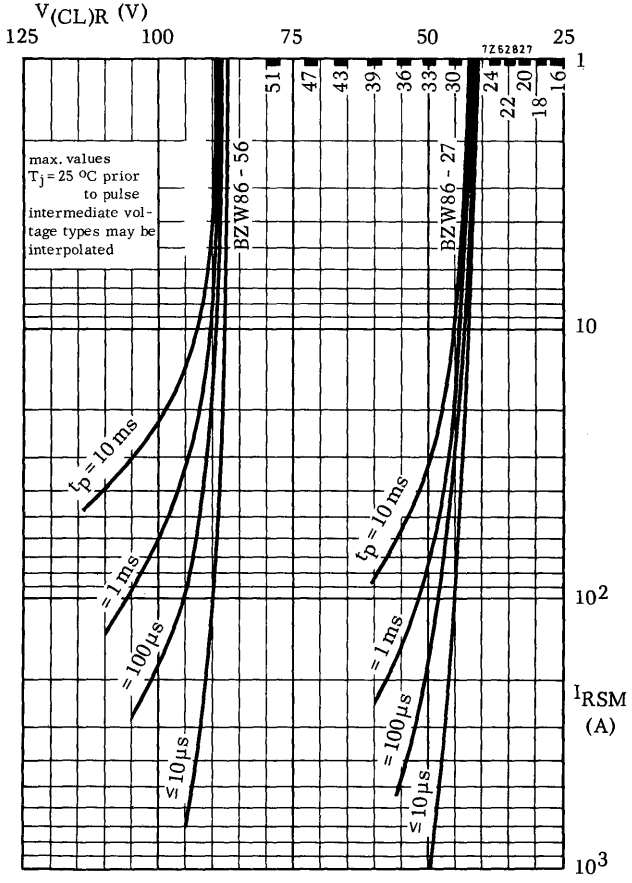


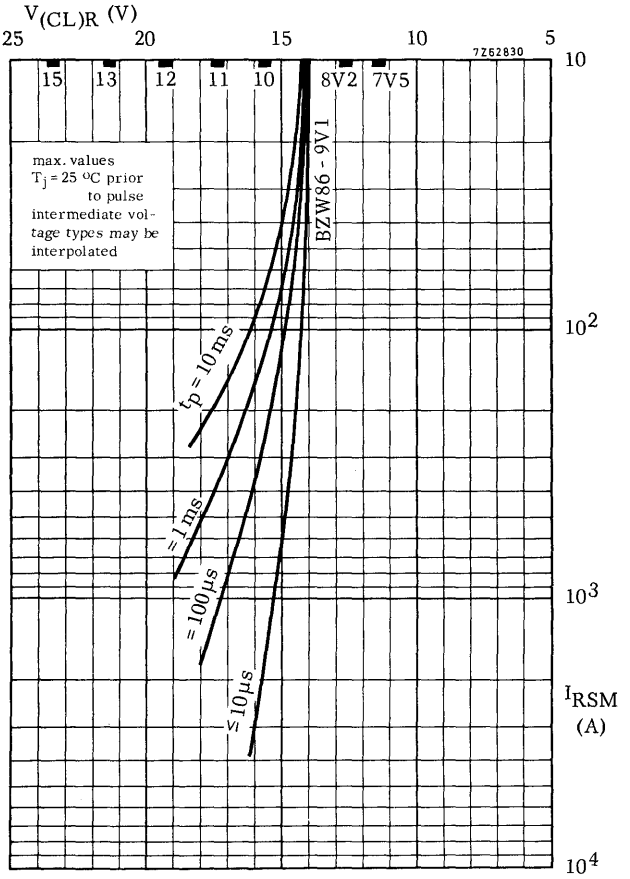

——— square current pulses

– – – exponential current pulses

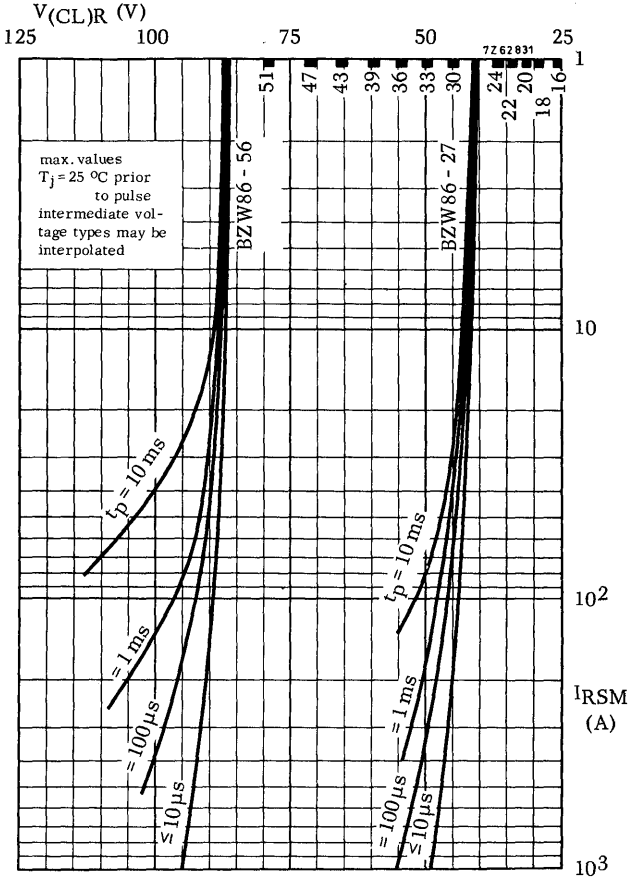

7Z62826
10
at $V_R$ = stand-off voltage
max
$I_R$
(mA)
1
typ
$10^{-1}$
0
50
100
150
$T_j$ (°C)
200



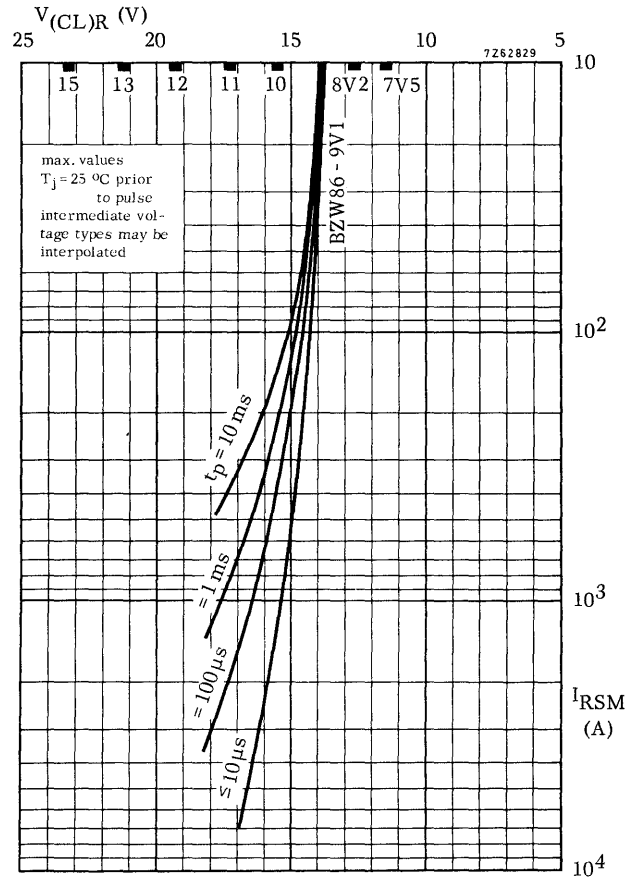

**square pulses**




**square pulses**




**exponential pulses**




**exponential pulses**