

REGULATOR DIODES

Also available to BS9305—F052

A range of diffused silicon diodes in DO-5 metal envelopes, intended for use as voltage regulator and transient suppressor diodes in power stabilization and transient suppression circuits.

The series consists of the following types:

Normal polarity (cathode to stud): BZY91-C7V5 to BZY91-C75.

Reverse polarity (anode to stud): BZY91-C7V5R to BZY91-C75R.

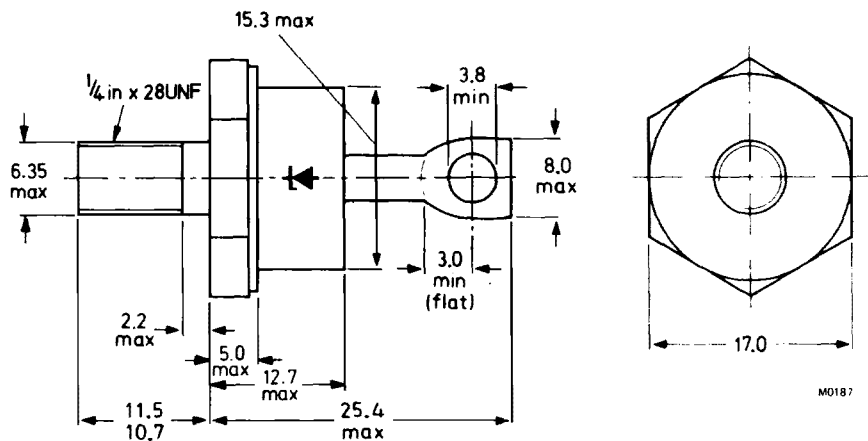
QUICK REFERENCE DATA

			voltage regulator		transient suppressor	
Working voltage (5% range)	V_Z	nom.	7,5 to 75	—	—	V
Stand-off voltage	V_R		—	5,6 to 56	—	V
Total power dissipation	P_{tot}	max.	100	—	—	W
Non-repetitive peak reverse power dissipation	P_{PRSM}	max.	—	9,5	—	kW

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-5.



Net mass: 22 g

Diameter of clearance hole: max. 6,5 mm

Accessories supplied on request:
see ACCESSORIES section

Supplied with device: 1 nut, 1 lock washer
Nut dimensions across the flats: 11,1 mm

Torque on nut: min. 1,7 Nm (17 kg cm)
max. 3,5 Nm (35 kg cm)

RATINGS

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

Peak working current	I_{ZM}	max.	400 A
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	20 A
Non-repetitive peak reverse current $T_j = 25\text{ }^\circ\text{C}$ prior to surge; $t_p = 1\text{ ms}$ (exponential pulse); BZY91-C7V5(R) to BZY91-C75(R)	I_{RSM}	max.	1000 to 85 A
Total power dissipation up to $T_{mb} = 25\text{ }^\circ\text{C}$ at $T_{mb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	100 W
	P_{tot}	max.	75 W
Non-repetitive peak reverse power dissipation $T_j = 25\text{ }^\circ\text{C}$ prior to surge; $t_p = 1\text{ ms}$ (exponential pulse)	P_{RSM}	max.	9,5 kW
Storage temperature	T_{stg}		-55 to + 175 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	1,5 $^\circ\text{C/W}$
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,2 $^\circ\text{C/W}$

CHARACTERISTICS

Forward voltage $I_F = 10\text{ A}$; $T_{mb} = 25\text{ }^\circ\text{C}$	V_F	<	1,5 V
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OPERATION AS A VOLTAGE REGULATOR

Dissipation and heatsink considerations

a. Steady-state conditions

The maximum permissible steady-state dissipation $P_{s\ max}$ is given by the relationship

$$P_{s\ max} = \frac{T_{j\ max} - T_{amb}}{R_{th\ j-a}}$$

where: $T_{j\ max}$ is the maximum permissible operating junction temperature

T_{amb} is the ambient temperature

$R_{th\ j-a}$ is the total thermal resistance from junction to ambient

$$R_{th\ j-a} = R_{th\ j-mb} + R_{th\ mb-h} + R_{th\ h-a}$$

$R_{th\ mb-h}$ is the thermal resistance from mounting base to heatsink, that is, 0,2 $^\circ\text{C/W}$.

$R_{th\ h-a}$ is the thermal resistance of the heatsink.

b. Pulse conditions (see Fig. 2)

The heating effect of repetitive power pulses can be found from the curves in Figs 5 and 6 which are given for operation as a transient suppressor at 50 Hz and 400 Hz respectively. This value ΔT is in addition to the mean heating effect. The value of ΔT found from the curves for the particular operating condition should be added to the known value for ambient temperature used in calculating the required heatsink.

The required heatsink is calculated as follows:

$$R_{th\ j-a} = \frac{T_{j\ max} - T_{amb} - \Delta T}{P_s + \delta \cdot P_p}$$

where: $T_{j\ max} = 175\ ^\circ C$

T_{amb} = ambient temperature

ΔT = from Fig. 5 or 6

P_s = any steady-state dissipation excluding that in pulses

P_p = peak pulse power

δ = duty factor (t_p/T)

$R_{th\ j-a} = R_{th\ j-mb} + R_{th\ mb-h} + R_{th\ h-a} = 1,5 + 0,2 + R_{th\ h-a}\ ^\circ C/W$.

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

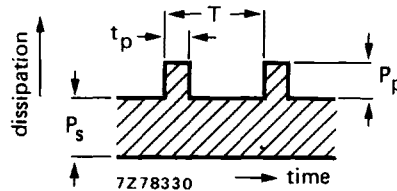


Fig. 2.

OPERATION AS A TRANSIENT SUPPRESSOR

Heatsink considerations

- For non-repetitive transients, the device may be used without a heatsink for pulses up to 10 ms in duration.
- For repetitive transients which fall within the permitted operating range shown in Figs 26 and 27 the required heatsink is found as follows:

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

where: $T_{j\ max} = 175\ ^\circ C$

T_{amb} = ambient temperature

P_s = any steady-state dissipation excluding that in pulses

δ = duty factor (t_p/T)

$R_{th\ j-mb} = 1,5\ ^\circ C/W$

$R_{th\ mb-h} = 0,2\ ^\circ C/W$

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

Notes

- The stand-off voltage is the maximum reverse voltage recommended for continuous operation; at this value non-conduction is ensured.
- The maximum clamping voltage is the maximum reverse voltage which appears across the diode at the specified pulse duration and junction temperature.
- 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.
- Surge suppressor diodes are extremely fast in clamping, switching on in less than 5 ns.

CHARACTERISTICS – WHEN USED AS VOLTAGE REGULATOR DIODES; $T_{mb} = 25\text{ }^{\circ}\text{C}$

BZY91- . . .	working voltage *V _Z V		differential resistance *r _Z Ω	temperature coefficient *S _Z %/ $^{\circ}\text{C}$	test I _Z A	reverse current ^{at} I _R mA	reverse voltage V _R V
	min.	max.	max.	typ.		max.	
C7V5(R)	7.0	7.9	0.2	0.09	5.0	5.0	2.0
C8V2(R)	7.7	8.7	0.3	0.09	5.0	5.0	5.6
C9V1(R)	8.5	9.6	0.4	0.07	2.0	5.0	6.2
C10(R)	9.4	10.6	0.4	0.07	2.0	1.0	6.8
C11(R)	10.4	11.6	0.4	0.07	2.0	1.0	7.5
C12(R)	11.4	12.7	0.5	0.07	2.0	1.0	8.2
C13(R)	12.4	14.1	0.5	0.07	2.0	1.0	9.1
C15(R)	13.8	15.6	0.6	0.075	2.0	1.0	10
C16(R)	15.3	17.1	0.6	0.075	2.0	1.0	11
C18(R)	16.8	19.1	0.7	0.075	2.0	1.0	12
C20(R)	18.8	21.2	0.8	0.075	1.0	1.0	13
C22(R)	20.8	23.3	0.8	0.075	1.0	1.0	15
C24(R)	22.7	25.9	0.9	0.08	1.0	1.0	16
C27(R)	25.1	28.9	1.0	0.082	1.0	1.0	18
C30(R)	28	32	1.1	0.085	1.0	1.0	20
C33(R)	31	35	1.2	0.088	1.0	1.0	22
C36(R)	34	38	1.3	0.09	1.0	1.0	24
C39(R)	37	41	1.4	0.09	0.5	1.0	27
C43(R)	40	46	1.5	0.092	0.5	1.0	30
C47(R)	44	50	1.7	0.093	0.5	1.0	33
C51(R)	48	54	1.8	0.093	0.5	1.0	36
C56(R)	52	60	2.0	0.094	0.5	1.0	39
C62(R)	58	66	2.2	0.094	0.5	1.0	43
C68(R)	64	72	2.4	0.094	0.5	1.0	47
C75(R)	70	79	2.6	0.095	0.5	1.0	51

*At test I_Z; measured using a pulse method with $t_p \leq 100\ \mu\text{s}$ and $\delta \leq 0.001$ so that the values correspond to a T_j of approximately $25\text{ }^{\circ}\text{C}$.

CHARACTERISTICS – WHEN USED AS TRANSIENT SUPPRESSOR DIODES; $T_{mb} = 25\text{ }^{\circ}\text{C}$

clamping voltage at $t_p = 500\ \mu\text{s}$ exp. pulse $V_{(CL)R}$ V		non-repetitive peak reverse current I_{RSM} A	reverse current at recommended stand-off voltage		BZY91-...
typ.	max.		I_R mA max.	V_R V	
–	–	–	–	–	C7V5(R)
9.5	10.5	150	20	6.2	C8V2(R)
10	11	150	20	6.8	C9V1(R)
11	12.5	150	5	7.5	C10(R)
12	13.5	150	5	8.2	C11(R)
13	15	150	5	9.1	C12(R)
14.5	17	150	5	10	C13(R)
16	19	150	5	11	C15(R)
17.5	22	150	5	12	C16(R)
19	26	150	5	13	C18(R)
22	28	100	5	15	C20(R)
24	31	100	5	16	C22(R)
26	34	100	5	18	C24(R)
28	37	100	5	20	C27(R)
31	40	100	5	22	C30(R)
34	44	100	5	24	C33(R)
38	48	100	5	27	C36(R)
40	52	50	5	30	C39(R)
44	56	50	10	33	C43(R)
49	61	50	10	36	C47(R)
54	66	50	10	39	C51(R)
60	72	50	10	43	C56(R)
66	79	50	10	47	C62(R)
72	87	50	10	51	C68(R)
79	97	50	10	56	C75(R)

MOUNTING INSTRUCTIONS

The top connector should neither be bent nor twisted; it should be soldered into the circuit so that there is no strain on it.

During soldering the heat conduction to the junction should be kept to a minimum.