

CONTROLLED AVALANCHE RECTIFIER DIODES



Diffused silicon diodes in DO-4 metal envelopes, capable of absorbing transients and intended for power rectifier applications. The series consists of the following types:  
 Normal polarity (cathode to stud): BYX25-600 to BYX25-1400.  
 Reverse polarity (anode to stud): BYX25-600R to BYX25-1400R.

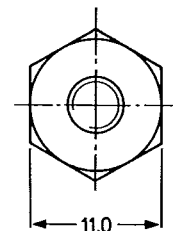
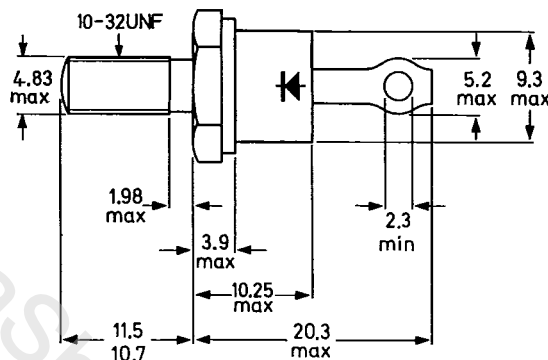
QUICK REFERENCE DATA

		BYX25-600(R)	800(R)	1000(R)	1200(R)	1400(R)	
Crest working reverse voltage	$V_{RWM}$	max. 600	800	1000	1200	1400	V
Reverse avalanche breakdown voltage	$V_{(BR)R}$	> 750	1000	1250	1450	1650	V
Average forward current	$I_{F(AV)}$	max.		20			A
Non-repetitive peak forward current	$I_{FSM}$	max.		360			A
Non-repetitive peak reverse power	$P_{RSM}$	max.		18			kW

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-4.



M0184A

Net mass: 7 g.

Diameter of clearance hole: max. 5.2 mm.

Accessories supplied on request:  
 see ACCESSORIES section

Supplied with device: 1 nut, 1 lock washer.

Nut dimensions across the flats: 9.5 mm

Products approved to CECC 50 009-022 available on request.

Torque on nut:  
 min. 0.9 Nm (9 kg cm),  
 max. 1.7 Nm (17 kg cm).

The mark shown applies to the normal polarity types.

**RATINGS**

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

Voltages*		BYX25-600(R)	800(R)	1000(R)	1200(R)	1400(R)	
Crest working reverse voltage	$V_{RWM}$	max. 600	800	1000	1200	1400	V
Continuous reverse voltage	$V_R$	max. 600	800	1000	1200	1400	V

**Currents**

Average forward current (averaged over any 20 ms period) up to $T_{mb} = 125\text{ }^\circ\text{C}$	$I_{F(AV)}$	max.	20	A
Repetitive peak forward current	$I_{FRM}$	max.	440	A
Non-repetitive peak forward current $t = 10\text{ ms}$ (half sine-wave); $T_j = 175\text{ }^\circ\text{C}$ prior to surge; with reapplied $V_{RWMmax}$	$I_{FSM}$	max.	360	A
$I^2t$ for fusing	$I^2t$	max.	650	$\text{A}^2\text{s}$

**Reverse power dissipation**

Average reverse power dissipation (averaged over any 20 ms period); $T_j = 175\text{ }^\circ\text{C}$	$P_{R(AV)}$	max.	38	W
Repetitive peak reverse power dissipation $t = 10\text{ }\mu\text{s}$ (square-wave; $f = 50\text{ Hz}$ ); $T_j = 175\text{ }^\circ\text{C}$	$P_{RRM}$	max.	3	kW
Non-repetitive peak reverse power dissipation $t = 10\text{ }\mu\text{s}$ (square-wave) $T_j = 25\text{ }^\circ\text{C}$ prior to surge	$P_{RSM}$	max.	18	kW
$T_j = 175\text{ }^\circ\text{C}$ prior to surge	$P_{RSM}$	max.	3	kW

**Temperatures**

Storage temperature	$T_{stg}$		-55 to +175	$^\circ\text{C}$
Junction temperature	$T_j$	max.	175	$^\circ\text{C}$

\*To ensure thermal stability:  $R_{th\ j-a} < 5\text{ K/W}$  (a.c.)

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## THERMAL RESISTANCE

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From junction to ambient in free air	$R_{th\ j-a}$	=	50	°C/W
From junction to mounting base	$R_{th\ j-mb}$	=	1.3	°C/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.5	°C/W

## CHARACTERISTICS

		BYX25-600(R)	800(R)	1000(R)	1200(R)	1400(R)	
Forward voltage							
$I_F = 50\text{ A}; T_j = 25\text{ °C}$	$V_F$	< 1.8	1.8	1.8	1.8	1.8	V*
Reverse avalanche breakdown voltage							
$I_R = 5\text{ mA}; T_j = 25\text{ °C}$	$V_{(BR)R}$	> 750 < 2400	1000 2400	1250 2400	1450 2400	1650 2400	V
Peak reverse current							
$V_R = V_{RWMmax};$ $T_j = 125\text{ °C}$	$I_R$	< 1.0	0.8	0.6	0.5	0.5	mA

\*Measured under pulse conditions to avoid excessive dissipation.

## OPERATING NOTES

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## 1. Voltage sharing of series connected controlled avalanche diodes.

If diodes with avalanche characteristics are connected in series, the usual R and C elements for voltage sharing can be omitted.

## 2. The top connector should not be bent; 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 by using a thermal shunt.

## Determination of the heatsink thermal resistance

Example:

Assume a diode, used in a three phase rectifier circuit.

frequency	$f = 50 \text{ Hz}$
average forward current	$I_{FAV} = 10 \text{ A (per diode)}$
ambient temperature	$T_{amb} = 40 \text{ }^\circ\text{C}$
repetitive peak reverse power dissipation in the avalanche region	$P_{RRM} = 2 \text{ kW (per diode)}$
duration of $P_{RRM}$	$t = 40 \text{ } \mu\text{s}$

From the left hand part of the upper graph on page 5 it follows that at  $I_{FAV} = 10 \text{ A}$  in a three phase rectifier circuit the average forward power + average leakage power = 19.5 W per diode (point A). The average reverse power in the avalanche region, averaged over any cycle, follows from:

$$P_{RAV} = \delta \times P_{RRM}, \text{ where the duty cycle } \delta = \frac{40 \text{ } \mu\text{s}}{20 \text{ ms}} = 0.002$$

$$\text{Thus: } P_{RAV} = 0.002 \times 2 \text{ kW} = 4 \text{ W}$$

Therefore the total device power dissipation  $P_{tot} = (19.5 + 4) \text{ W} = 23.5 \text{ W}$  (point B).

In order to avoid excessive peak junction temperatures resulting from the pulse character of the repetitive peak reverse power in the avalanche region, the value of the maximum junction temperature should be reduced. If the repetitive peak reverse power in the avalanche region is 2 kW;  $t = 40 \text{ } \mu\text{s}$ ;  $f = 50 \text{ Hz}$ , the maximum allowable junction temperature should be 163  $^\circ\text{C}$  instead of 175  $^\circ\text{C}$ , thus 12  $^\circ\text{C}$  lower (see the lower graph on page 5).

Allowance can be made for this by assuming an ambient temperature 12  $^\circ\text{C}$  higher than before, in this case 52  $^\circ\text{C}$  instead of 40  $^\circ\text{C}$ .

Using this in the curve leads to a thermal resistance

$$R_{th \text{ mb-a}} \approx 4 \text{ }^\circ\text{C/W}$$

The contact thermal resistance  $R_{th \text{ mb-h}} = 0.5 \text{ }^\circ\text{C/W}$

Hence the heatsink thermal resistance should be:

$$R_{th \text{ h-a}} = R_{th \text{ mb-a}} - R_{th \text{ mb-h}} = (4 - 0.5) \text{ }^\circ\text{C/W} = 3.5 \text{ }^\circ\text{C/W}$$



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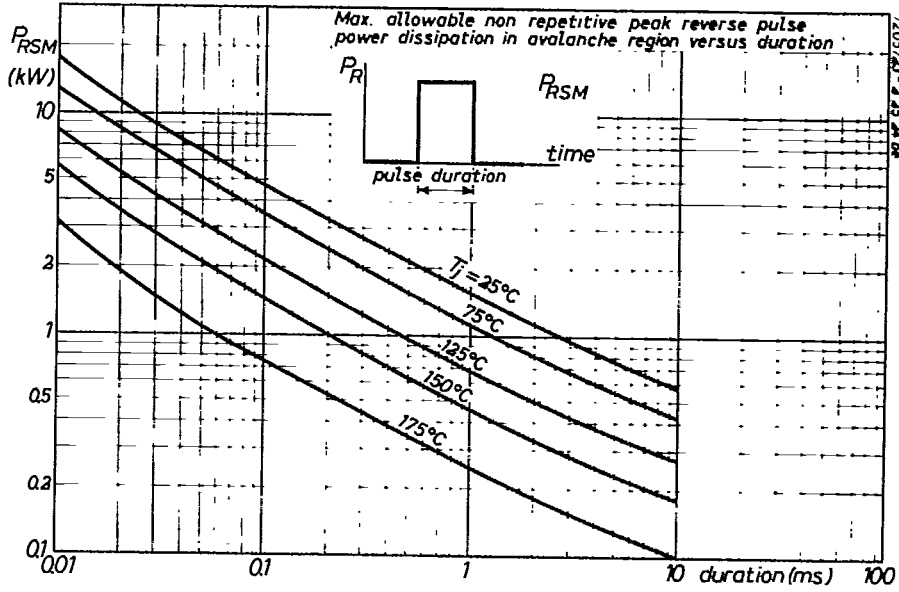


Fig.4

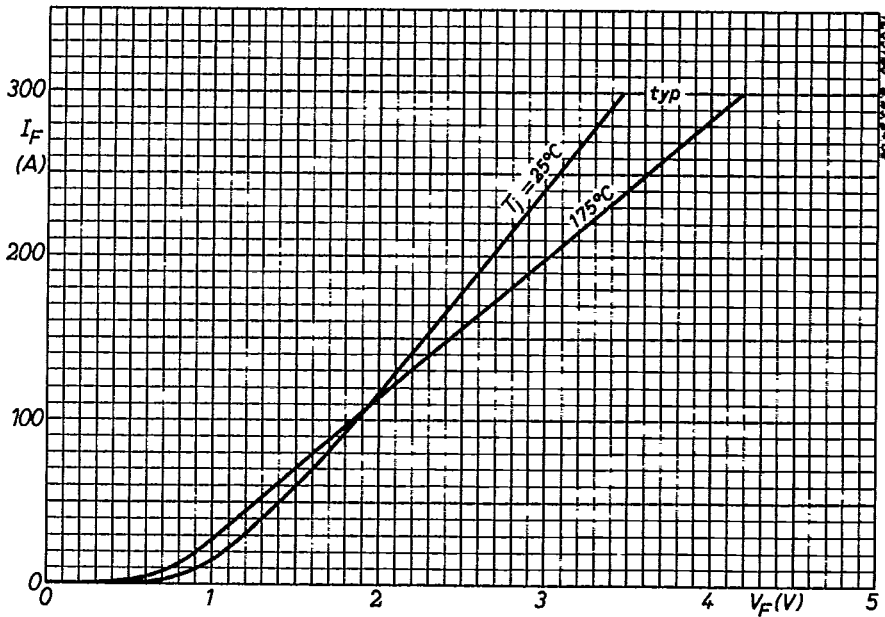


Fig.5

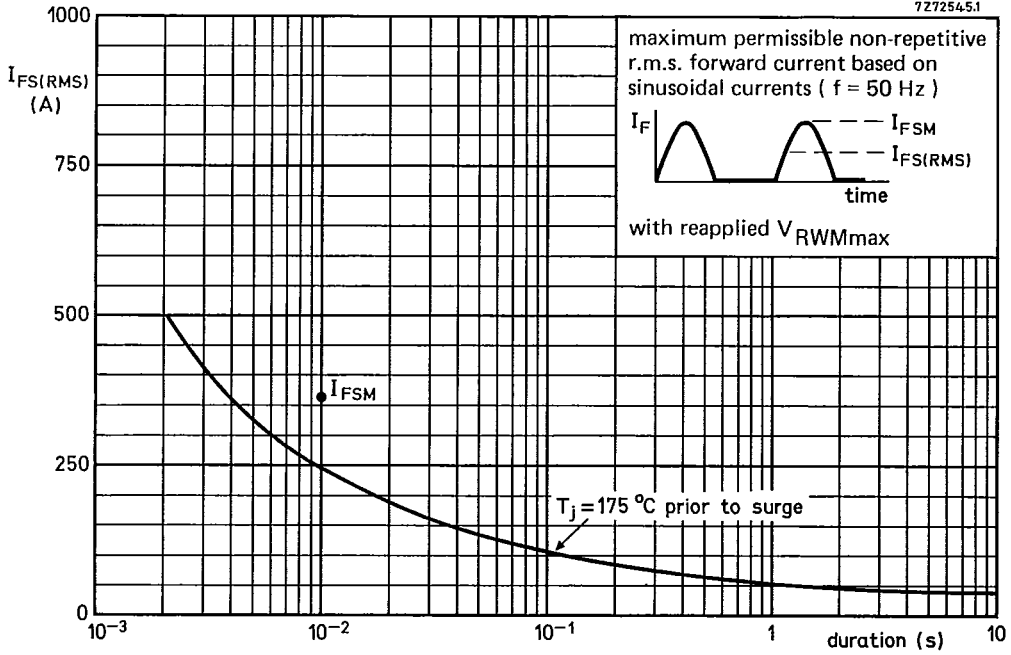


Fig.6