FAST SOFT-RECOVERY RECTIFIER DIODES

Silicon double-diffused rectifier diodes in plastic envelopes. They are intended for use in chopper applications as well as in switched-mode power supplies, as efficiency diodes and scan rectifiers in television receivers. The devices feature non-snap-off character-istics. Normal and reverse polarity types are available.
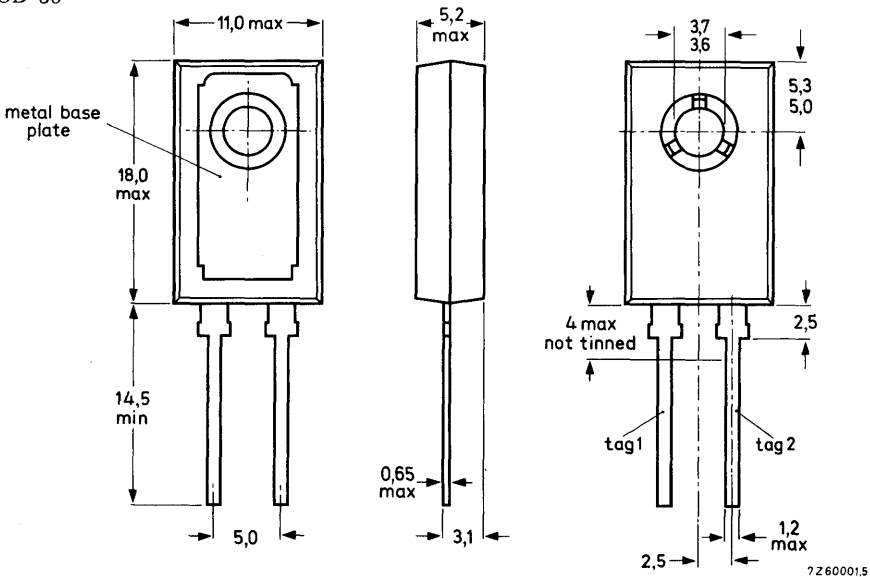
QUICK REFERENCE DATA					
			BYX71-350(R)	600(R)	
Repetitive peak reverse voltage	V_{RRM}	max.	350	600	V
Average forward current	$I_{F(AV)}$	max.		7	A
Non-repetitive peak forward current	I_{FSM}	max.		60	A
Reverse recovery time	t_{rr}	<		450	ns

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 the device: **56355 (washer)**
  available on request: 56316 (mica insulating washer)

POLARITY OF CONNECTIONS

	BYX71-350 and BYX71-600	BYX71-350R and BYX71-600R
Base-plate :	cathode	anode
Tag 1 :	cathode	anode
Tag 2 :	anode	cathode

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

Voltages			BYX71 -350(R)	600(R)	
Continuous reverse voltage	V_R	max.	300	500	V
Working reverse voltage	V_{RW}	max.	300	500	V
Repetitive peak reverse voltage $(\delta \leq 0,01)$	V_{RRM}	max.	350	600	V
Non-repetitive peak reverse voltage (t $\leq$ 10 ms)	V_{RSM}	max.	350	600	V

Currents

Average on-state current assuming zero switching losses (averaged over any 20 ms period)				
square wave: δ = 0,5; up to T_{mb} = 85 $^{\circ}$C	$I_{F(AV)}$	max.	7	A
without heatsink at T_{amb} = 50 $^{\circ}$C	$I_{F(AV)}$	max.	1,4	A
sinusoidal: at T_{mb} = 85 $^{\circ}$C	$I_{F(AV)}$	max.	6,5	A
R.M.S. forward current	$I_{F(RMS)}$	max.	10	A
Repetitive peak forward current	I_{FRM}	max.	25	A
Non-repetitive peak forward current half sine wave; t = 10 ms; T_j = 150 $^{\circ}$C prior to surge	I_{FSM}	max.	60	A
square pulse; t = 5 ms; T_j = 150 $^{\circ}$C prior to surge	I_{FSM}	max.	60	A
Rate of change of commutation current	$-\dfrac{dI}{dt}$	max.	50	A/μs

Temperatures

Storage temperature	T_{stg}		-55 to $+125$	$^{\circ}$C
Junction temperature	T_j	max.	150	$^{\circ}$C

THERMAL RESISTANCE

From junction to mounting base $\qquad$ $R_{th\ j\text{-}mb}$ = 6,5 °C/W

Transient thermal impedance; t = 1 ms $\qquad$ $Z_{th\ j\text{-}mb}$ = 0,3 °C/W

Influence of mounting method

1. Heatsink mounted

   From mounting base to heatsink
   a. with heatsink compound $\qquad$ $R_{th\ mb\text{-}h}$ = 1,5 °C/W
   b. with heatsink compound and
      56316 mica washer $\qquad$ $R_{th\ mb\text{-}h}$ = 2,7 °C/W
   c. without heatsink compound $\qquad$ $R_{th\ mb\text{-}h}$ = 2,7 °C/W
   d. without heatsink compound;
      with 56316 mica washer $\qquad$ $R_{th\ mb\text{-}h}$ = 5 °C/W
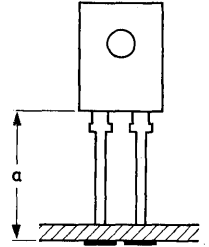
2. Free air operation

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

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

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   at a lead-length a = 3 mm
   and with a copper laminate
   c. > 1 cm^2 $\qquad$ $R_{th\ j\text{-}a}$ = 55 °C/W
   d. < 1 cm^2 $\qquad$ $R_{th\ j\text{-}a}$ = 60 °C/W
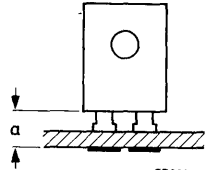
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SOLDERING AND MOUNTING NOTES

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 device 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.

CHARACTERISTICS

Forward voltage

$I_F = 5$ A; $T_j = 25$ °C $\qquad$ V_F $\qquad$ < $\qquad$ 1,25 $\qquad$ V $\qquad$ [1]

Reverse current

$V_R = V_{RWmax}$; $T_j = 125$ °C $\qquad$ I_R $\qquad$ < $\qquad$ 0,4 $\qquad$ mA

Reverse recovery when switched from

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

Recovery charge	Q_s	<	700	nC
Recovery time	t_{rr}	<	450	ns
Max. slope of the reverse recovery current with $-dI_F/dt = 2$ A/μs	$\lvert dI_R/dt \rvert$	<	5	A/μs

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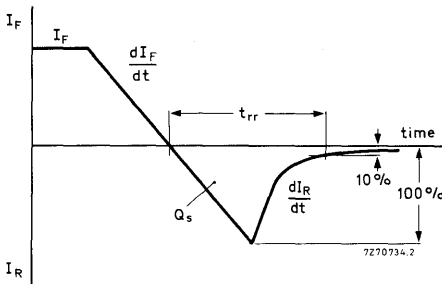
[1] Measured under pulse conditions to avoid excessive dissipation.

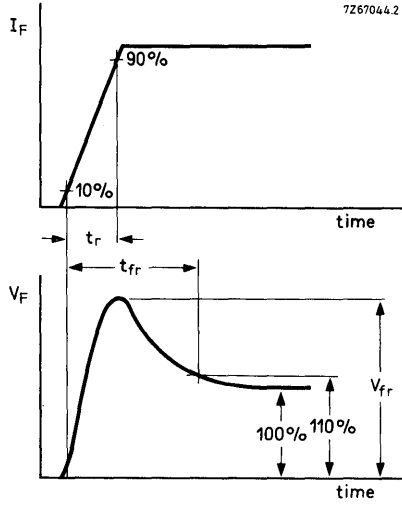**CHARACTERISTICS** (continued)

Forward recovery when switched to

I_F = 25 A with t_r = 0, 5 μs at T_j = 25 °C

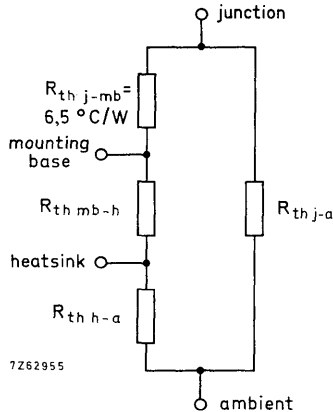|				
Recovery time	t_{fr}	<	0, 8	μs
Recovery voltage	V_{fr}	<	3, 5	V

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Forward output waveform

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 graph on page 8 is as follows:
Starting with the curve of maximum dissipation as a function of $I_{F(AV)}$, for a particular current trace horizontally to meet the appropriate form factor; upwards to the operating duty cycle (δ) line; horizontally until the $R_{th\ mb-a}$ curve is reached. Finally trace upwards from the T_{amb} scale. The intersection determines the $R_{th\ mb-a}$ required.
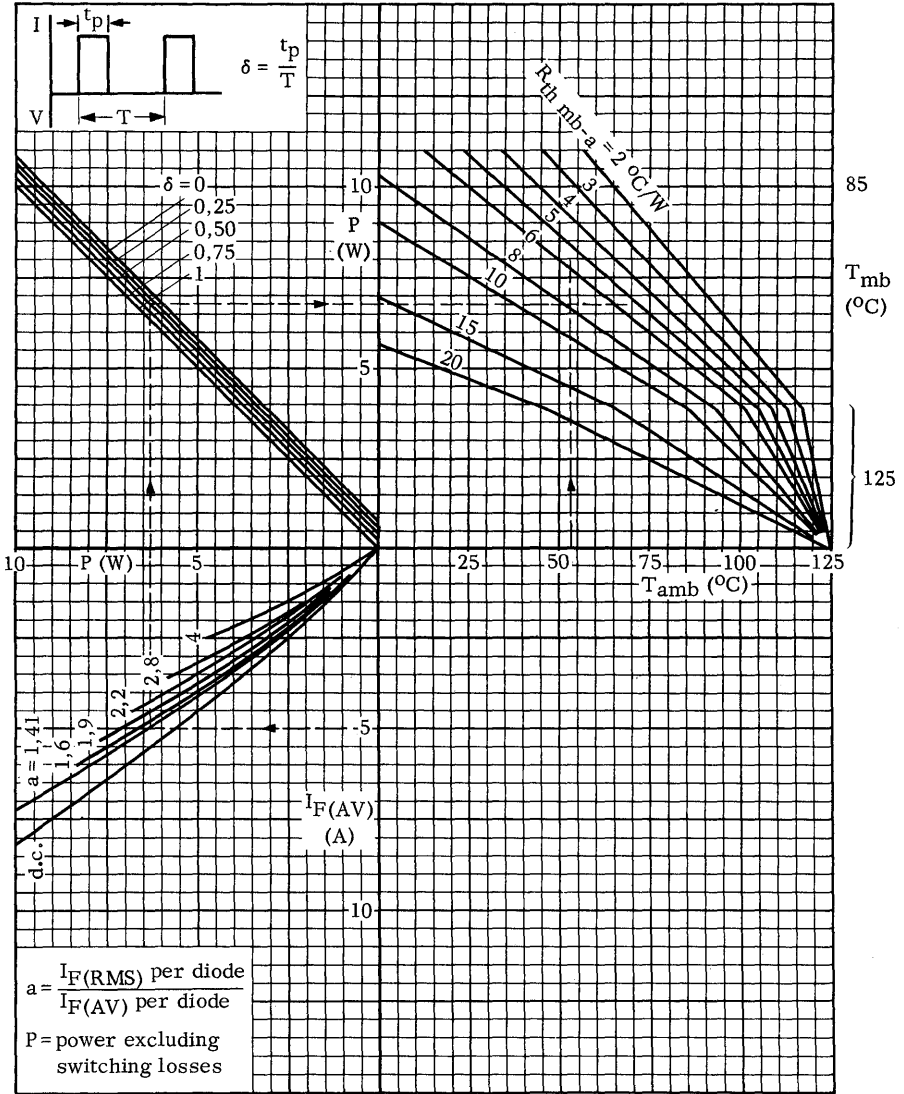The heatsink thermal resistance value ($R_{th\ h-a}$) can now be calculated from:

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

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

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

CHOPPER APPLICATIONS
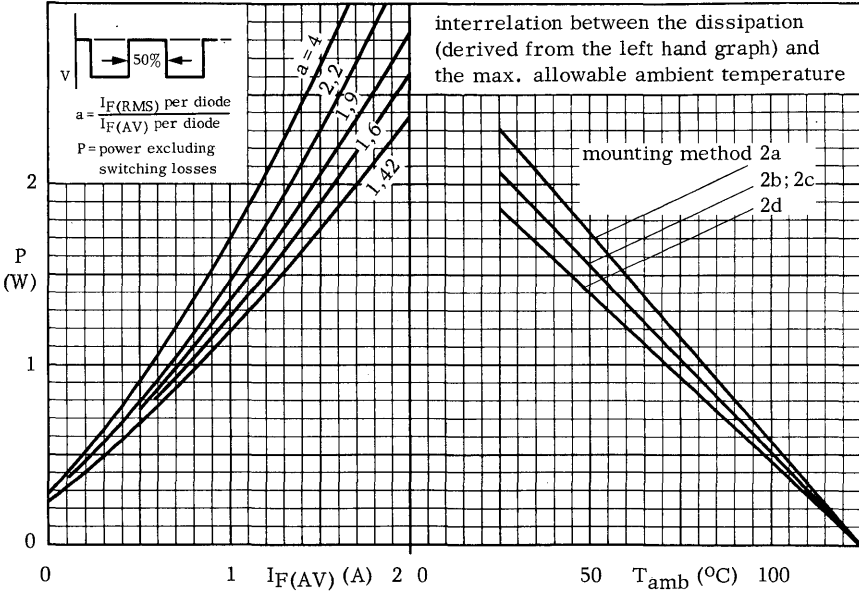
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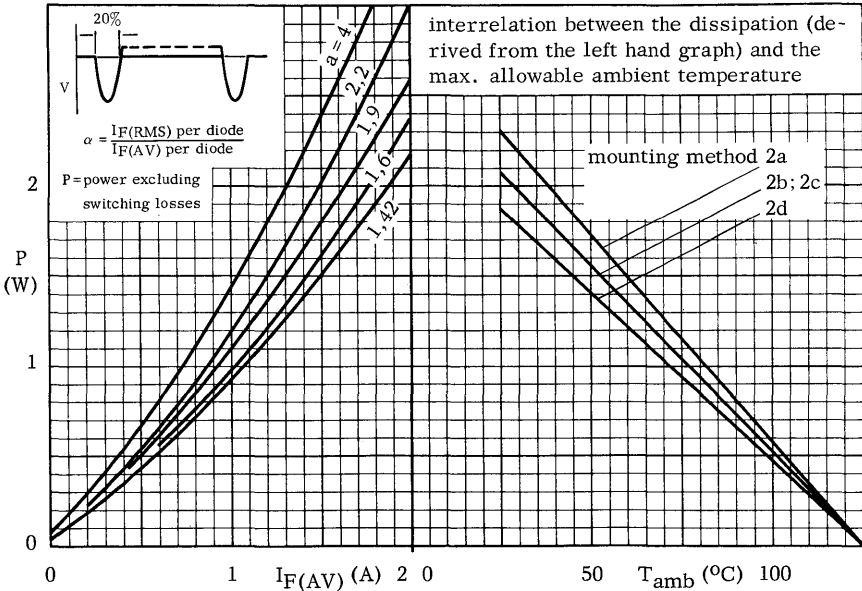$$\delta = \frac{t_p}{T}$$

$$a = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$$

P = power excluding switching losses

SWITCHED-MODE APPLICATION

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interrelation between the dissipation (derived from the left hand graph) and the max. allowable ambient temperature

$$a = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$$
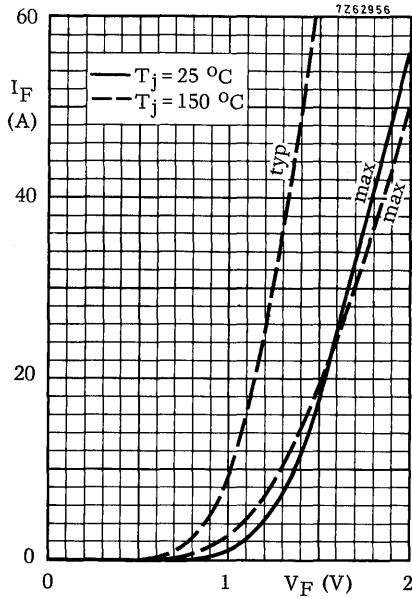
P = power excluding switching losses

mounting method 2a
2b; 2c
2d

$I_{F(AV)}$ (A) T_{amb} (°C)

SCAN RECTIFICATION

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interrelation between the dissipation (de-rived from the left hand graph) and the max. allowable ambient temperature

$$\alpha = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$$

P = power excluding switching losses

mounting method 2a
2b; 2c
2d

$I_{F(AV)}$ (A) T_{amb} (°C)

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maximum permissible non-repetitive peak forward current based on sinusoidal currents (f = 50 Hz)

each current pulse is followed by the working reverse voltage

$T_j = 150\ ^oC$ prior to surge

I_{FSM} (A)

duration (s)
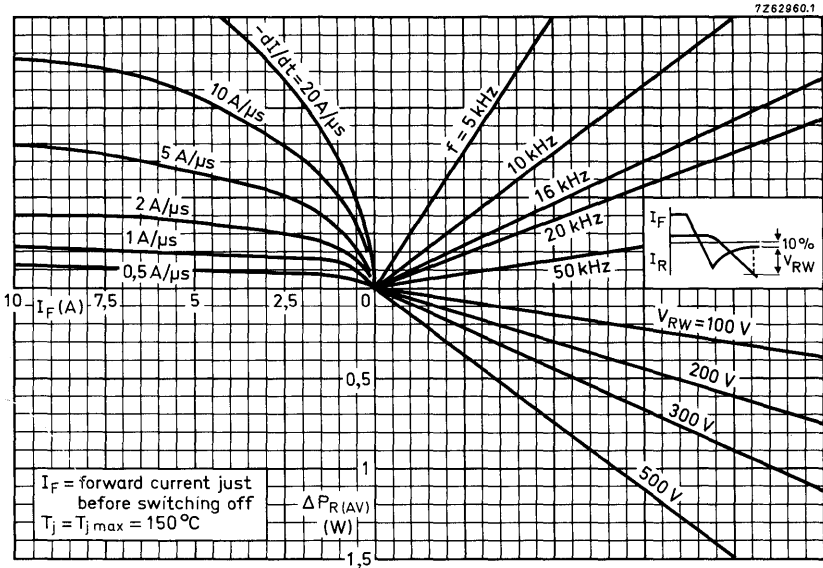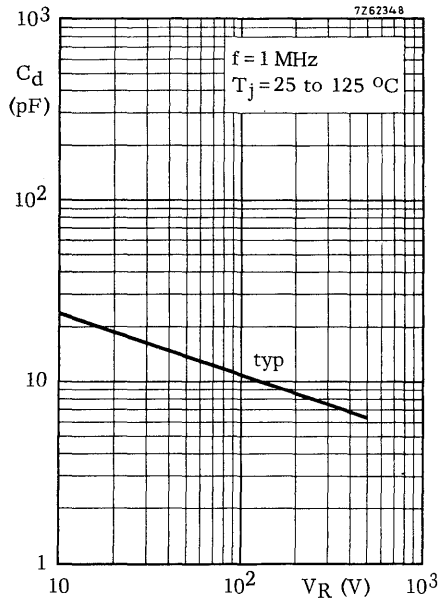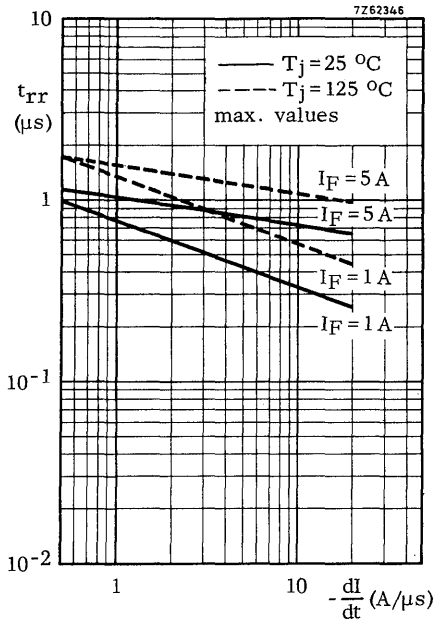

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I_F (A)

$T_j = 25\ ^oC$
$T_j = 150\ ^oC$

typ
max
max

V_F (V)

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Nomogram: power loss $\Delta P_{R(AV)}$ due to switching only (to be added to forward and reverse power losses).

$T_j = 25\ ^oC$
max. values

$T_j = 150\ ^oC$
max. values

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$Z_{th\ j-mb}$ (^{o}C/W)

time (s)