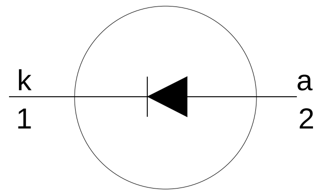
Rectifier diode ultrafast, low switching loss

BYC10-600

FEATURES

- Extremely fast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET

SYMBOL



QUICK REFERENCE DATA

V_R = 600 V

$V_F \leq$ 1.8 V

$I_{F(AV)}$ = 10 A

t_{rr} = 19 ns (typ)

APPLICATIONS

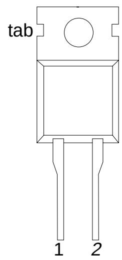
- Active power factor correction
- Half-bridge lighting ballasts
- Half-bridge/ full-bridge switched mode power supplies.

The BYC10-600 is supplied in the SOD59 (TO220AC) conventional leaded package.

PINNING

PIN	DESCRIPTION
1	cathode
2	anode
tab	cathode

SOD59 (TO220AC)



LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	Peak repetitive reverse voltage		-	600	V
V_{RWM}	Crest working reverse voltage		-	600	V
V_R	Continuous reverse voltage	$T_{mb} \leq 114$ ˚C	-	500	V
$I_{F(AV)}$	Average forward current	$\delta = 0.5$; with reapplied $V_{RRM(max)}$; $T_{mb} \leq 78$ ˚C	-	10	A
I_{FRM}	Repetitive peak forward current	$\delta = 0.5$; with reapplied $V_{RRM(max)}$; $T_{mb} \leq 78$ ˚C	-	20	A
I_{FSM}	Non-repetitive peak forward current.	t = 10 ms	-	65	A
		t = 8.3 ms	-	71	A
		sinusoidal; $T_j = 150$˚C prior to surge with reapplied $V_{RWM(max)}$			
T_{stg}	Storage temperature		-40	150	˚C
T_j	Operating junction temperature		-	150	˚C

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j\text{-}mb}$	Thermal resistance junction to mounting base		-	-	2	K/W
$R_{th\ j\text{-}a}$	Thermal resistance junction to ambient	in free air.	-	60	-	K/W

ELECTRICAL CHARACTERISTICS

T_j = 25 ˚C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_F	Forward voltage	I_F = 10 A; T_j = 150˚C	-	1.4	1.8	V
		I_F = 20 A; T_j = 150˚C	-	1.7	2.3	V
		I_F = 10 A;	-	2.0	2.8	V
I_R	Reverse current	V_R = 600 V	-	9	200	µA
		V_R = 500 V; T_j = 100 ˚C	-	1.1	3.0	mA
t_{rr}	Reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 50 A/µs	-	35	55	ns
t_{rr}	Reverse recovery time	I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs	-	19	-	ns
t_{rr}	Reverse recovery time	I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 125˚C	-	32	40	ns
I_{rrm}	Peak reverse recovery current	I_F = 10 A; V_R = 400 V; dI_F/dt = 100 A/µs; T_j = 125˚C	-	3	7.5	A
I_{rrm}	Peak reverse recovery current	I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 125˚C	-	9.5	12	A
V_{fr}	Forward recovery voltage	I_F = 10 A; dI_F/dt = 100 A/µs	-	8	11	V

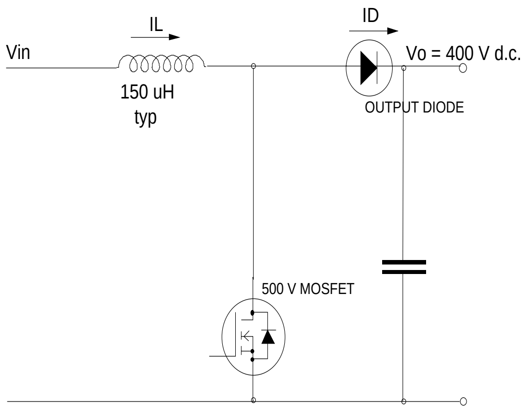


Fig.1. Typical application, output rectifier in boost converter power factor correction circuit. Continuous conduction, mode where the transistor turns on whilst forward current is still flowing in the diode.

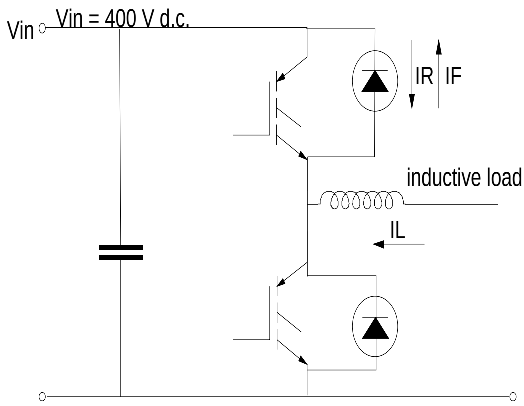


Fig.2. Typical application, freewheeling diode in half bridge converter. Continuous conduction mode, where each transistor turns on whilst forward current is still flowing in the other bridge leg diode.

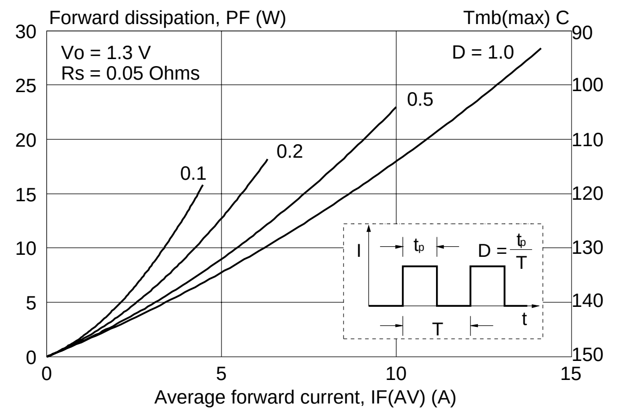


Fig.3. Maximum forward dissipation as a function of average forward current; rectangular current waveform where $I_{F(AV)} = I_{F(RMS)} \times \sqrt{D}$.

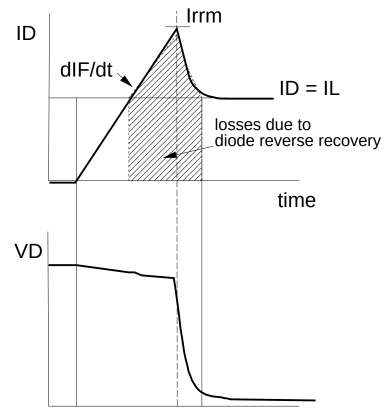


Fig.6. Origin of switching losses in transistor due to diode reverse recovery.

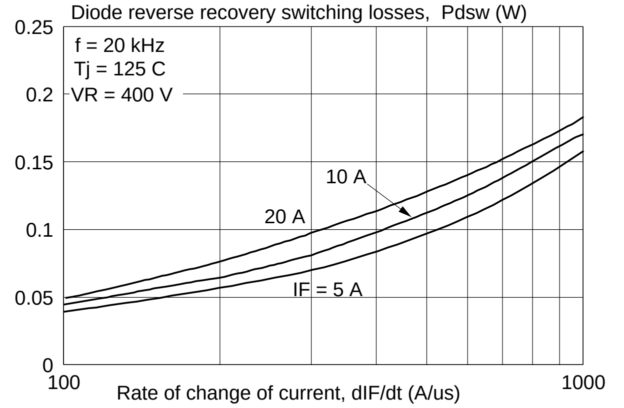


Fig.4. Typical reverse recovery switching losses in diode, as a function of rate of change of current dI_F/dt.

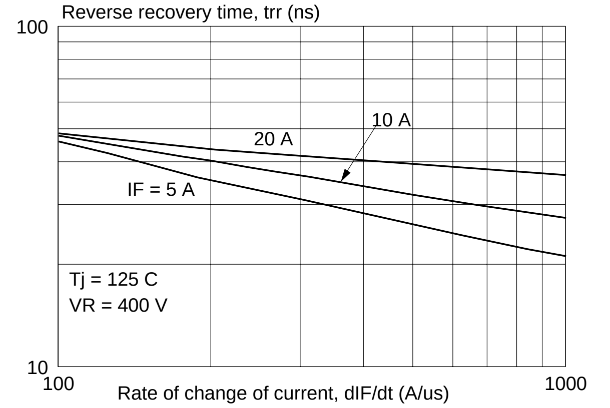


Fig.7. Typical reverse recovery time t_{rr}, as a function of rate of change of current dI_F/dt.

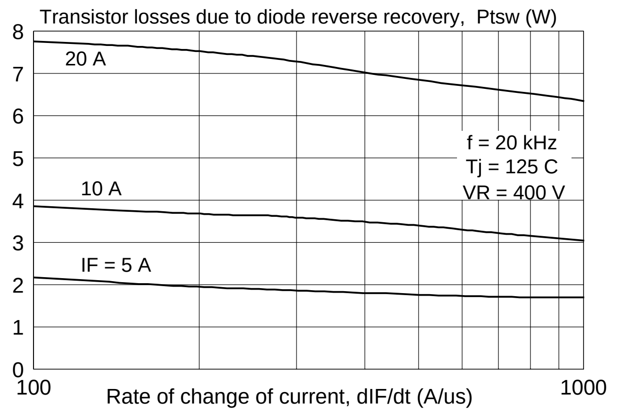


Fig.5. Typical switching losses in transistor due to reverse recovery of diode, as a function of of change of current dI_F/dt.

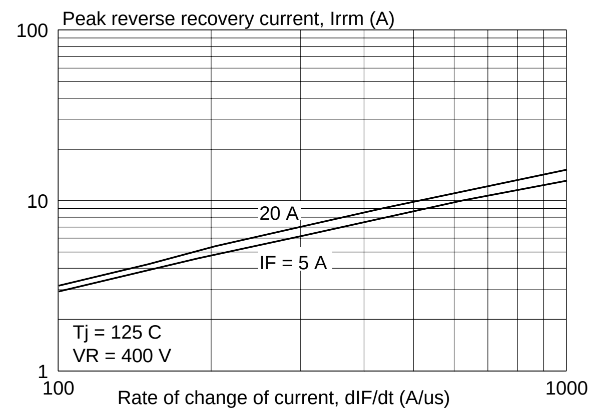


Fig.8. Typical peak reverse recovery current, I_{rrm} as a function of rate of change of current dI_F/dt.

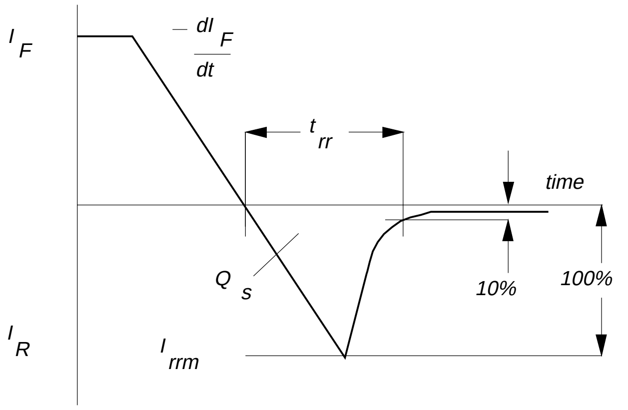


Fig.9. Definition of reverse recovery parameters t_{rr}, I_{rrm}

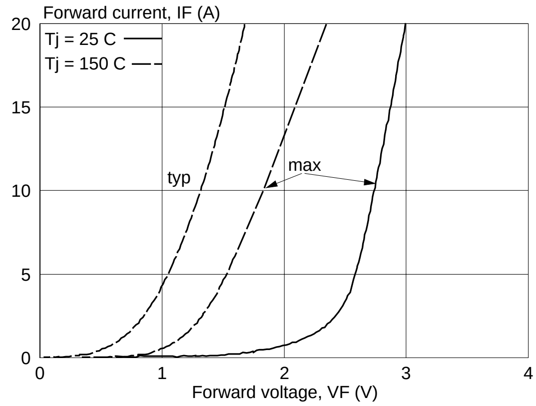


Fig.12. Typical and maximum forward characteristic $I_F = f(V_F)$; $T_j = 25˚C$ and 150˚C.

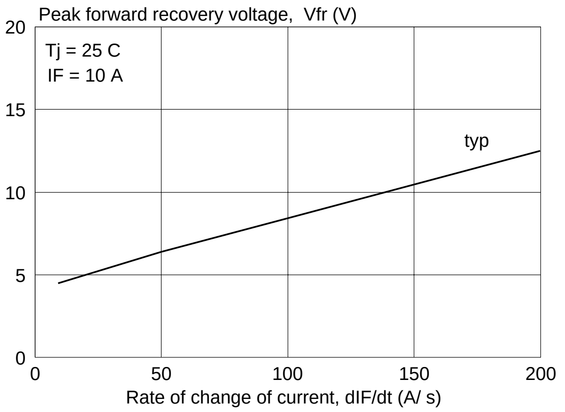


Fig.10. Typical forward recovery voltage, V_{fr} as a function of rate of change of current dI_F/dt.

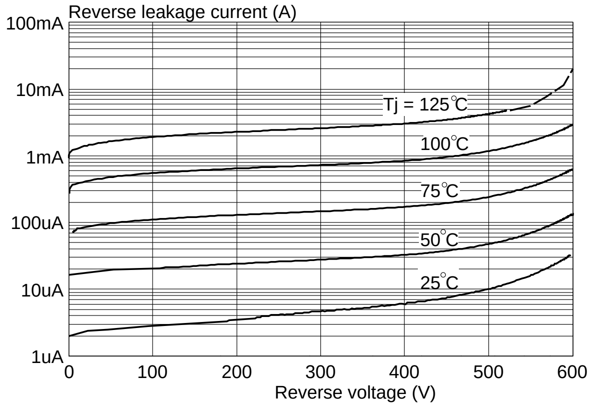


Fig.13. Typical reverse leakage current as a function of reverse voltage. $I_R = f(V_R)$; parameter T_j

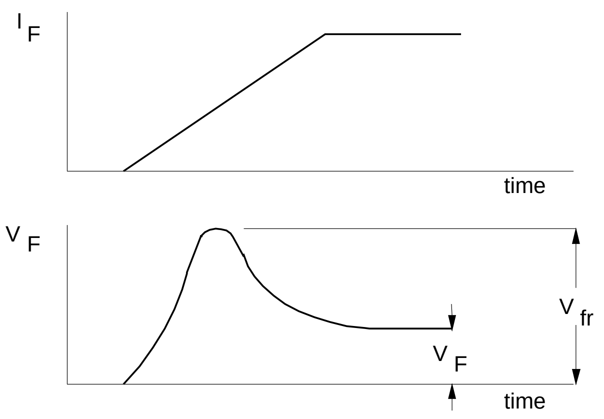


Fig.11. Definition of forward recovery voltage V_{fr}

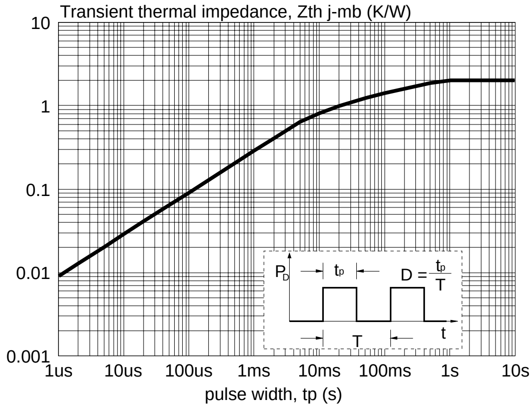


Fig.14. Maximum thermal impedance $Z_{th\ j-mb}$ as a function of pulse width.

MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

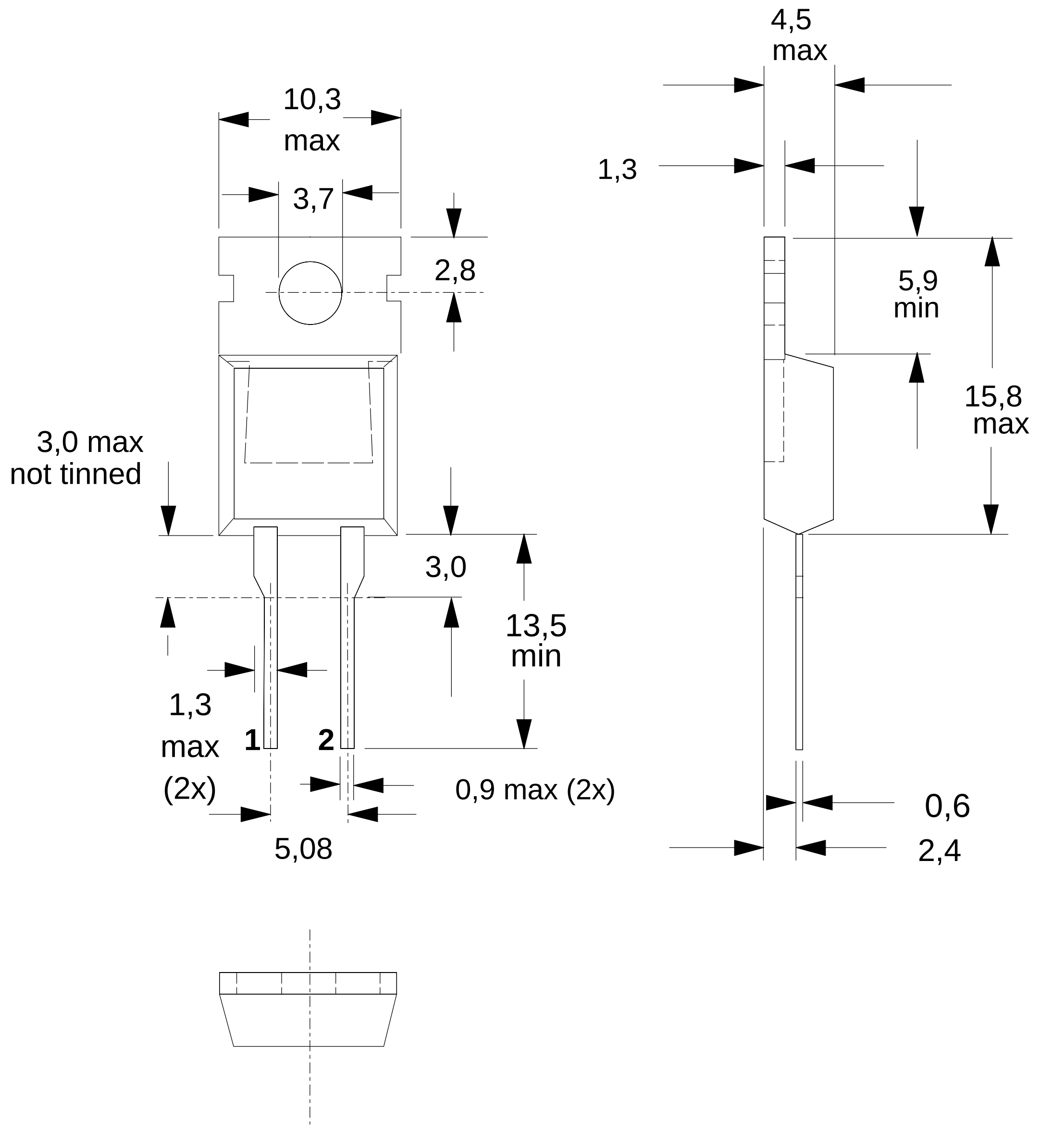


Fig.15. SOD59 (TO220AC). pin 1 connected to mounting base.

Notes
1. Refer to mounting instructions for TO220 envelopes.
2. Epoxy meets UL94 V0 at 1/8".

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	
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