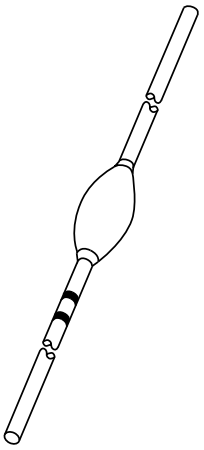
DATA SHEET



BY8400 series
Fast high-voltage soft-recovery rectifiers

Product specification
Supersedes data of June 1994
File under Discrete Semiconductors, SC01

1996 May 24

Philips
Semiconductors

PHILIPS

Fast high-voltage soft-recovery rectifiers

BY8400 series

FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Soft-recovery switching characteristics
- Compact construction.

APPLICATIONS

- For colour television and monitors up to 25 kHz
- High-voltage applications for:
  - Multipliers
  - Slot-wound diode-split-transformers.

DESCRIPTION

Rugged glass package, using a high temperature alloyed construction.

This package is hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.

The package is designed to be used in an insulating medium such as resin, oil or SF6 gas.

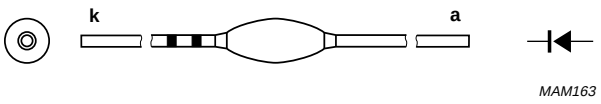


Fig.1 Simplified outline (SOD61) and symbol.

MARKING

Cathode band colour codes

TYPE NUMBER	PACKAGE CODE	INNER BAND	OUTER BAND
BY8404	SOD61AB	black	black
BY8406	SOD61AC	black	green
BY8408	SOD61AD	black	red
BY8410	SOD61AE	black	violet
BY8412	SOD61AF	black	orange
BY8414	SOD61AG	black	lilac
BY8416	SOD61AH	black	grey
BY8418	SOD61AI	black	brown
BY8420	SOD61AJ	black	dark blue
BY8424	SOD61AK	black	no band

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RSM}	non-repetitive peak reverse voltage				
	BY8404		–	5	kV
	BY8406		–	8	kV
	BY8408		–	10	kV
	BY8410		–	12	kV
	BY8412		–	14	kV
	BY8414		–	17	kV
	BY8416		–	19	kV
	BY8418		–	22	kV
	BY8420		–	24	kV
	BY8424		–	30	kV
V_{RRM}	repetitive peak reverse voltage				
	BY8404		–	5	kV
	BY8406		–	8	kV
	BY8408		–	10	kV
	BY8410		–	12	kV
	BY8412		–	14	kV
	BY8414		–	17	kV
	BY8416		–	19	kV
	BY8418		–	22	kV
	BY8420		–	24	kV
	BY8424		–	30	kV
V_{RW}	working reverse voltage				
	BY8404		–	4	kV
	BY8406		–	6	kV
	BY8408		–	8	kV
	BY8410		–	10	kV
	BY8412		–	12	kV
	BY8414		–	14	kV
	BY8416		–	16	kV
	BY8418		–	18	kV
	BY8420		–	20	kV
	BY8424		–	24	kV

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{F(AV)}$	average forward current	averaged over any 20 ms period; see Figs 2 to 11			
	BY8404		–	20	mA
	BY8406		–	10	mA
	BY8408		–	5	mA
	BY8410		–	5	mA
	BY8412		–	5	mA
	BY8414		–	5	mA
	BY8416		–	3	mA
	BY8418		–	3	mA
	BY8420		–	3	mA
	BY8424		–	3	mA
I_{FRM}	repetitive peak forward current	note 1	–	500	mA
T_{stg}	storage temperature		–65	+120	°C
T_j	junction temperature		–65	+120	°C

Note

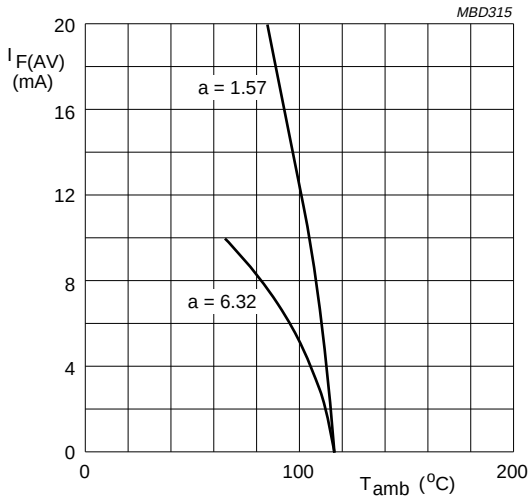
1. Withstands peak currents during flash-over in a picture tube.

ELECTRICAL CHARACTERISTICS

T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_F	forward voltage	I_F = 100 mA; $T_j = T_{j\,max}$; see Figs 12 to 21				
	BY8404		–	–	20	V
	BY8406		–	–	25	V
	BY8408		–	–	35	V
	BY8410		–	–	42	V
	BY8412		–	–	52	V
	BY8414		–	–	60	V
	BY8416		–	–	70	V
	BY8418		–	–	77	V
	BY8420		–	–	88	V
	BY8424		–	–	98	V
I_R	reverse current	$V_R = V_{RWmax}$; T_j = 120 °C	–	–	3	μA
Q_r	recovery charge	when switched from I_F = 100 mA to $V_R \geq$ 100 V and dI_F/dt = –200 mA/μs; see Fig.22	–	–	1	nC
t_f	fall time	when switched from I_F = 100 mA to $V_R \geq$ 100 V and dI_F/dt = –200 mA/μs; see Fig.22	100	–	–	ns
t_{rr}	reverse recovery time	when switched from I_F = 2 mA to I_R = 4 mA; measured at I_R = 1 mA; see Fig.23	–	–	100	ns
C_d	diode capacitance	V_R = 0 V; f = 1 MHz				
	BY8404		–	1.20	–	pF
	BY8406		–	0.80	–	pF
	BY8408		–	0.60	–	pF
	BY8410		–	0.50	–	pF
	BY8412		–	0.40	–	pF
	BY8414		–	0.35	–	pF
	BY8416		–	0.30	–	pF
	BY8418		–	0.28	–	pF
	BY8420		–	0.28	–	pF
	BY8424		–	0.28	–	pF

GRAPHICAL DATA



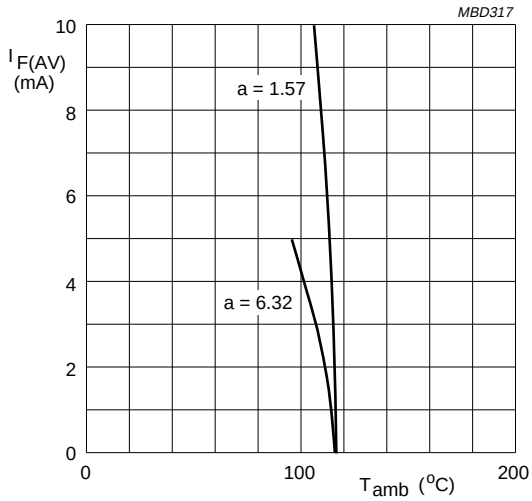
BY8404.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see Fig.24.

Fig.2 Maximum permissible average forward current as a function of ambient temperature.



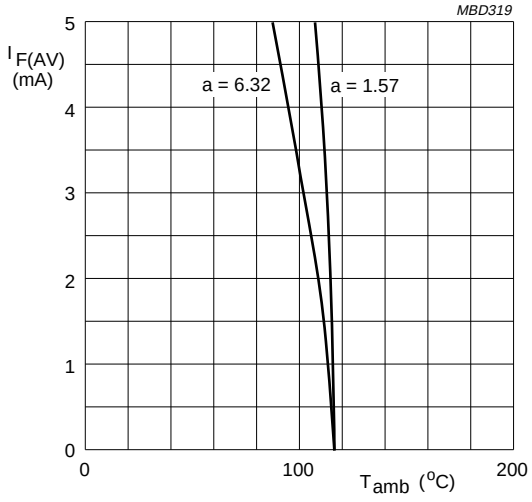
BY8406.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see see Fig.24.

Fig.3 Maximum permissible average forward current as a function of ambient temperature.



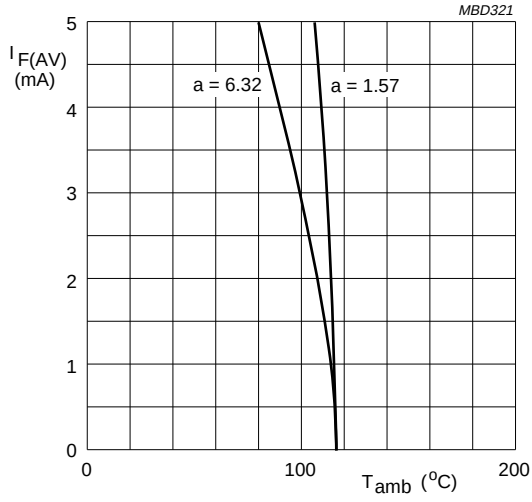
BY8408.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see Fig.24.

Fig.4 Maximum permissible average forward current as a function of ambient temperature.



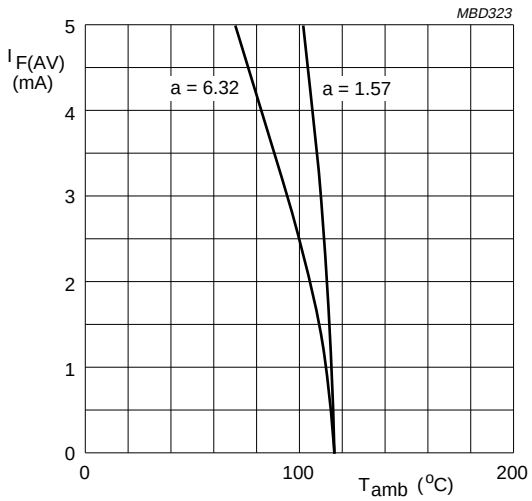
BY8410.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see see Fig.24.

Fig.5 Maximum permissible average forward current as a function of ambient temperature.



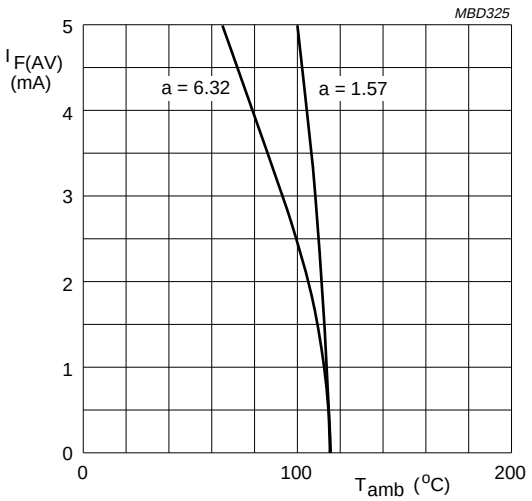
BY8412.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see Fig.24.

Fig.6 Maximum permissible average forward current as a function of ambient temperature.



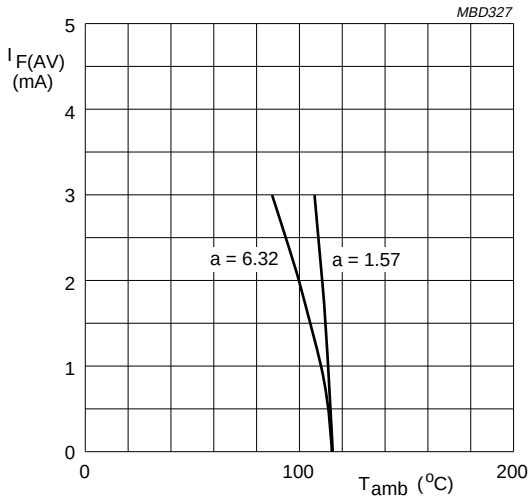
BY8414.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see Fig.24.

Fig.7 Maximum permissible average forward current as a function of ambient temperature.



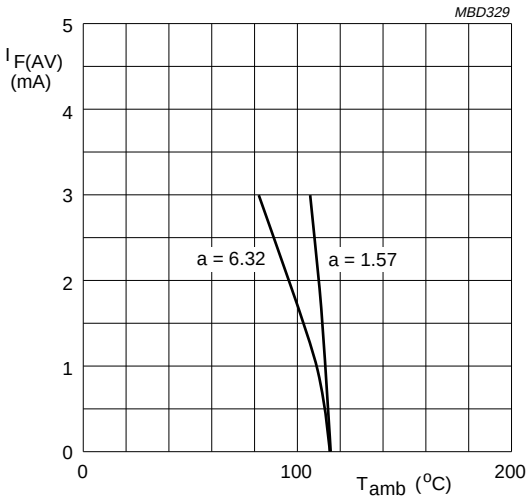
BY8416.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application; see Fig.24.

Fig.8 Maximum permissible average forward current as a function of ambient temperature.



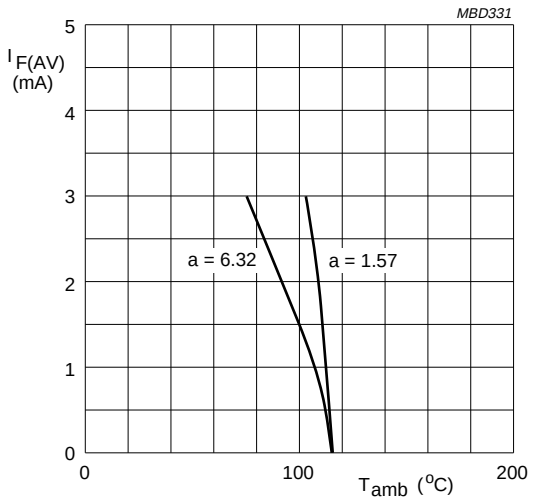
BY8418.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

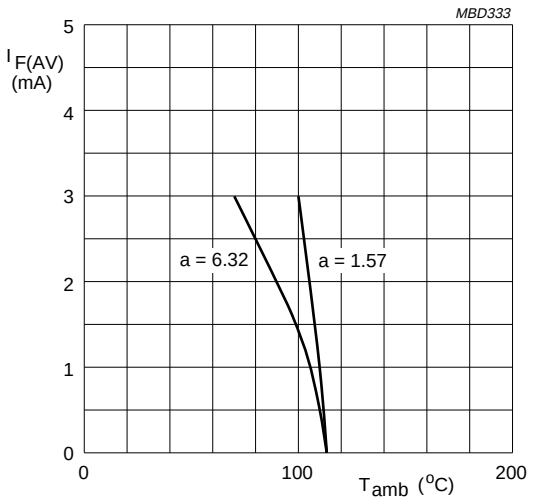
a = 6.32: line output transformer application; see Fig.24.

Fig.9 Maximum permissible average forward current as a function of ambient temperature.



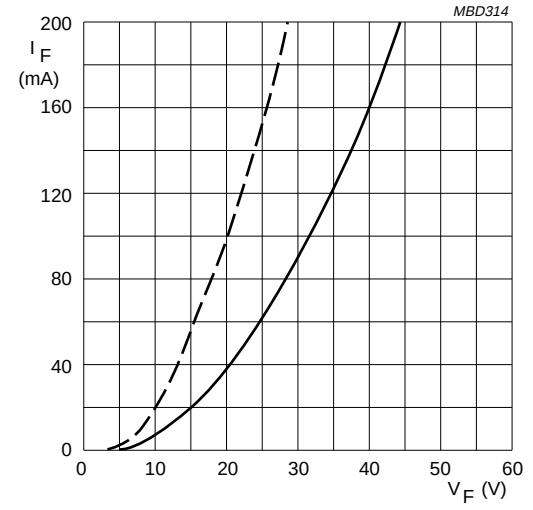
BY8420.
$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.
a = 1.57: half sinewave.
a = 6.32: line output transformer application; see Fig.24.

Fig.10 Maximum permissible average forward current as a function of ambient temperature.



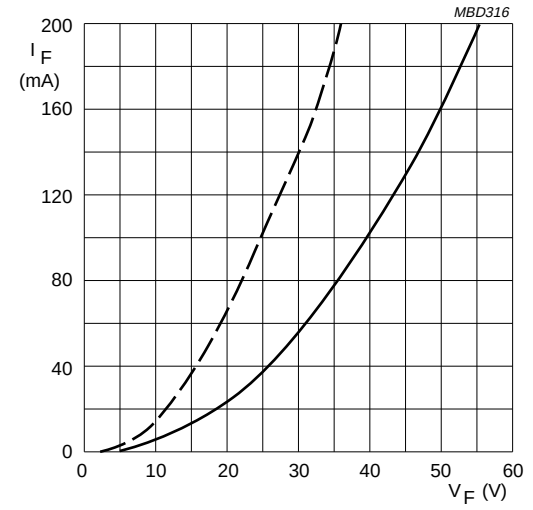
BY8424.
$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.
a = 1.57: half sinewave.
a = 6.32: line output transformer application; see Fig.24.

Fig.11 Maximum permissible average forward current as a function of ambient temperature.



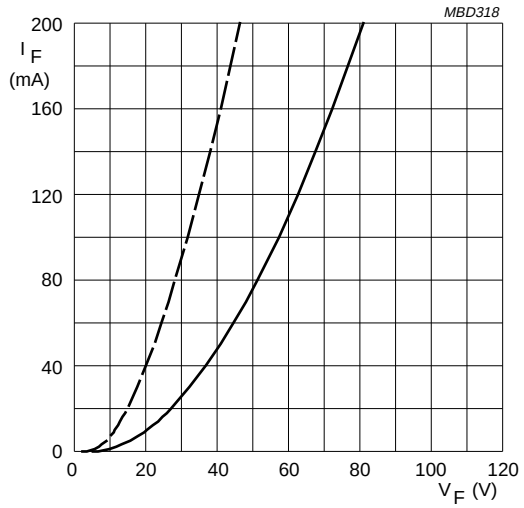
BY8404.
Dotted line: $T_j = 120$ °C.
Solid line: $T_j = 25$ °C.

Fig.12 Forward current as a function of maximum forward voltage.



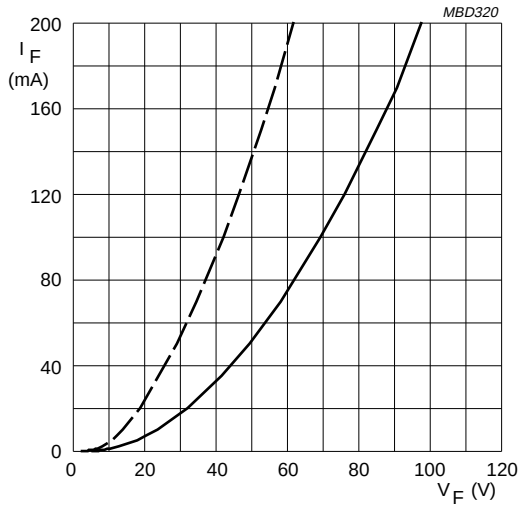
BY8406.
Dotted line: $T_j = 120$ °C.
Solid line: $T_j = 25$ °C.

Fig.13 Forward current as a function of maximum forward voltage.



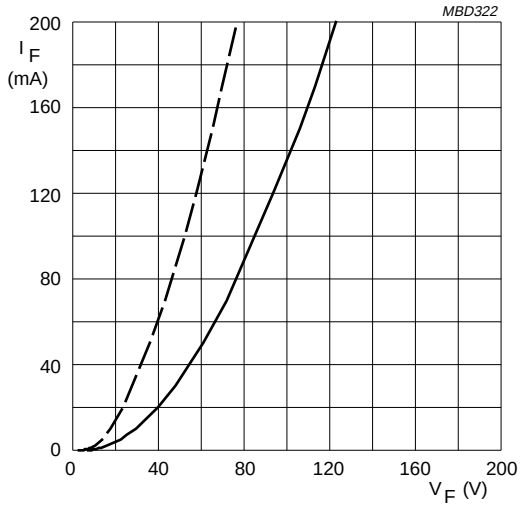
BY8408.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.14 Forward current as a function of maximum forward voltage.



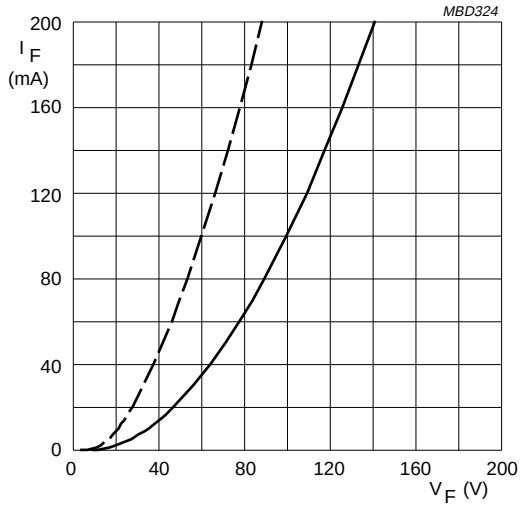
BY8410.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.15 Forward current as a function of maximum forward voltage.



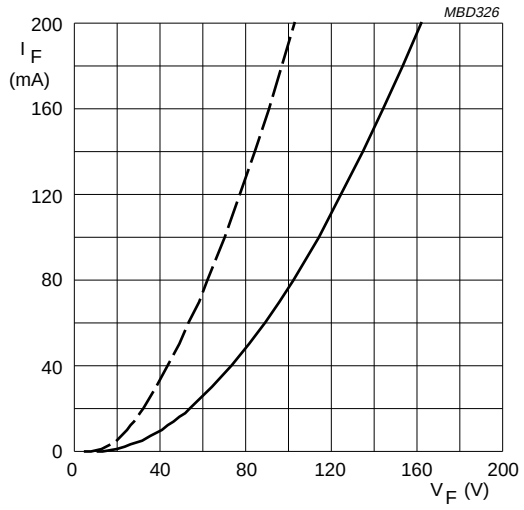
BY8412.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.16 Forward current as a function of maximum forward voltage.



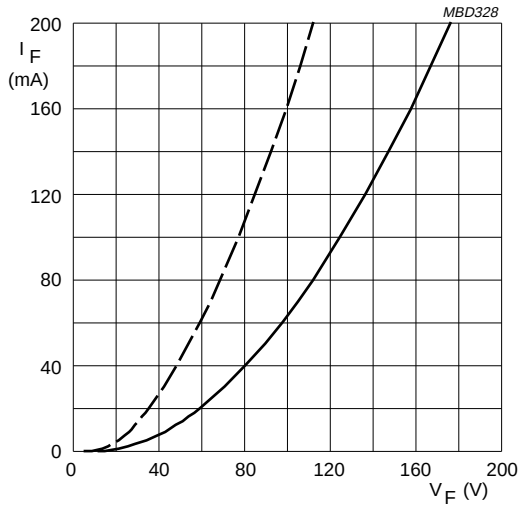
BY8414.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.17 Forward current as a function of maximum forward voltage.



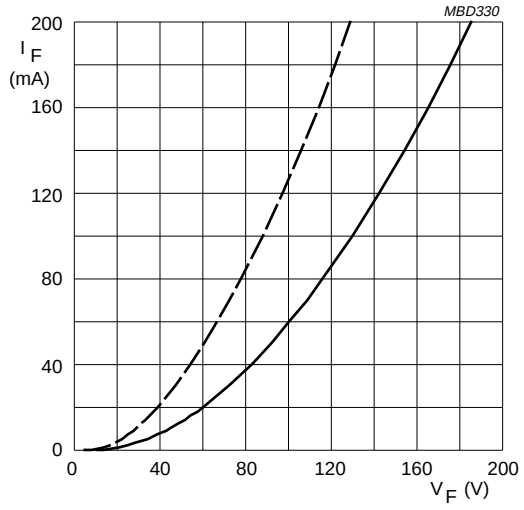
BY8416.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.18 Forward current as a function of maximum forward voltage.



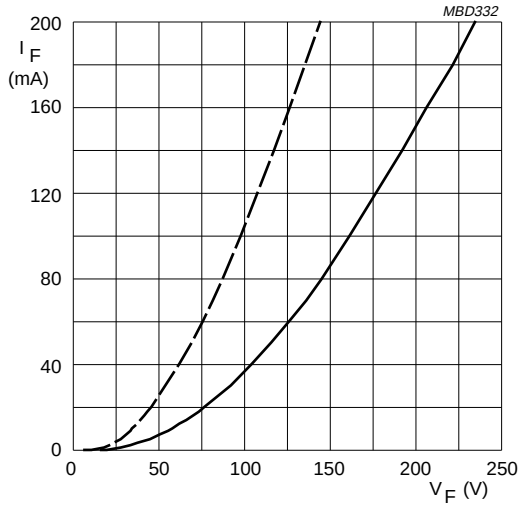
BY8418.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.19 Forward current as a function of maximum forward voltage.



BY8420.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.20 Forward current as a function of maximum forward voltage.



BY8424.
Dotted line: T_j = 120 °C.
Solid line: T_j = 25 °C.

Fig.21 Forward current as a function of maximum forward voltage.

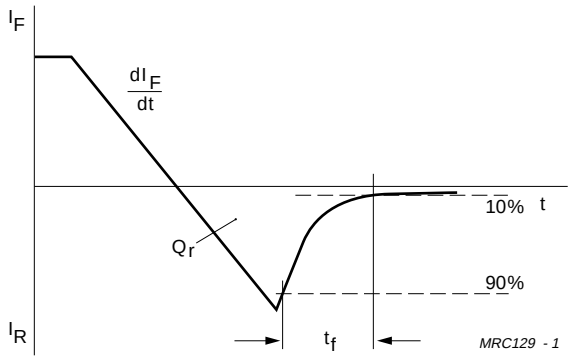
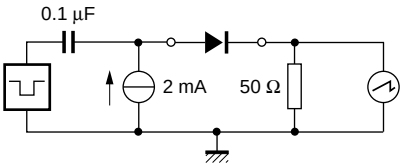
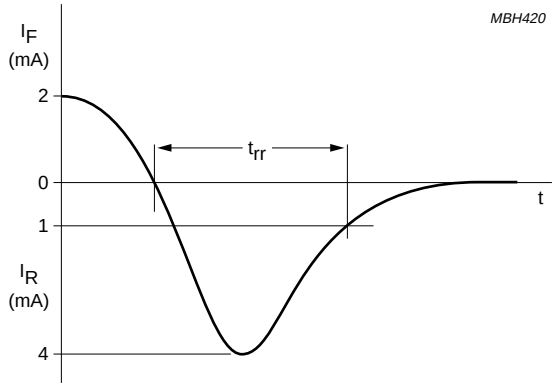


Fig.22 Reverse recovery definitions.





Rise time oscilloscope: t_r < 7 ns.
Generator pulse width: 1.0 µs.

Fig.23 Test circuit and reverse recovery time waveform and definition.

APPLICATION INFORMATION

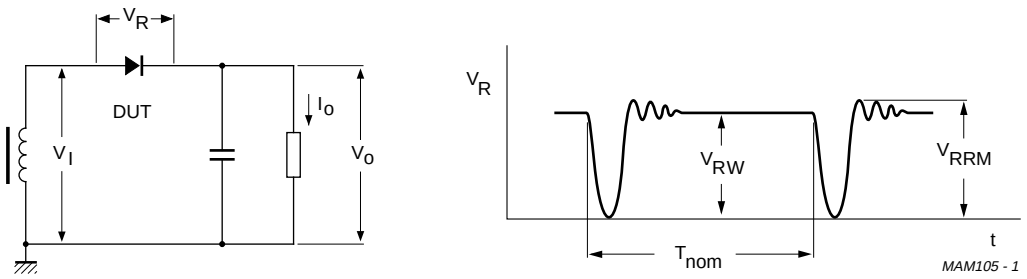
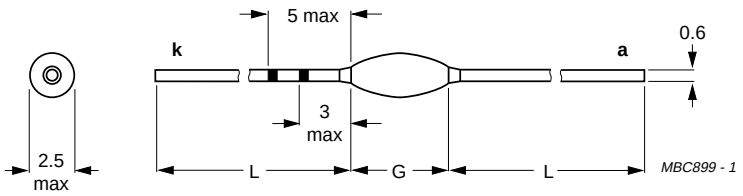


Fig.24 Typical operation circuit and voltage waveform.

PACKAGE OUTLINE



Dimensions in mm.

Fig.25 SOD61.

SOD61 package specification

TYPE NUMBER	PACKAGE CODE	L_{min} (mm)	G_{max} (mm)
BY8404	SOD61AB	31.8	5.5
BY8406	SOD61AC	30.4	8.3
BY8408	SOD61AD	30.2	8.7
BY8410	SOD61AE	30.0	9.1
BY8412	SOD61AF	29.8	9.5
BY8414	SOD61AG	29.6	9.9
BY8416	SOD61AH	29.3	10.5
BY8418	SOD61AI	28.8	11.5
BY8420	SOD61AJ	28.3	12.5
BY8424	SOD61AK	27.8	13.5

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 given are 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 the 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.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.