Semiconductors and integrated circuits

Part 1b May 1977

Small signal germanium diodes

Small signal silicon diodes

Special diodes

Voltage regulator diodes

Voltage reference diodes

Tuner diodes

SEMICONDUCTORS AND INTEGRATED CIRCUITS

Part 1b **May 1977**

General	
Germanium	small signal diodes (point contact)
	(gold bonded)
Silicon	small signal diodes (alloyed)
	(whiskerless)
	special diodes
	voltage regulator diodes
	voltage reference diodes
	tuner diodes
Index and maintenance type list	

DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, subassemblies and materials; it is made up of three series of handbooks each comprising several parts.

ELECTRON TUBES	**BLUE**
SEMICONDUCTORS AND INTEGRATED CIRCUITS	**RED**
COMPONENTS AND MATERIALS	**GREEN**

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

December 1972

ELECTRON TUBES (BLUE SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1a	**Transmitting tubes for communication** **Tubes for r.f. heating Types PE05/25 – TBW15/25**		**December 1975**
Part 1b	**Transmitting tubes for communication** **Tubes for r.f. heating** **Amplifier circuit assemblies**		**January 1976**
Part 2	**Microwave products** Communication magnetrons Magnetrons for microwave heating Klystrons Travelling-wave tubes Isolators, Circulators	Diodes Triodes T-R switches Microwave semiconductor devices	**May 1976**
Part 3	**Special Quality tubes** **Miscellaneous devices**		**January 1975**
Part 4	**Receiving tubes**		**March 1975**
Part 5a	**Cathode-ray tubes**		**August 1976**
Part 5b	**Camera tubes** **Image intensifier tubes**		**May 1975**
Part 6	**Products for nuclear technology** Channel electron multipliers Neutron tubes	Geiger-Müller tubes	**January 1977**
Part 7a	**Gas-filled tubes** Thyratrons Industrial rectifying tubes	Ignitrons High-voltage rectifying tubes	**March 1977**
Part 7b	**Gas-filled tubes** Segment indicator tubes Indicator tubes	Switching diodes Dry reed contact units	**March 1977**
Part 8	**TV picture tubes**		**May 1977**
Part 9	**Photomultiplier tubes** **Phototubes (diodes)**		**June 1976**

SEMICONDUCTORS AND INTEGRATED CIRCUITS (RED SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1a Rectifier diodes, thyristors, triacs — **March 1976**

Rectifier diodes
Voltage regulator diodes (> 1, 5 W)
Transient suppressor diodes
Rectifier stacks
Thyristors
Triacs

Part 1b Diodes — **May 1977**

Small signal germanium diodes
Small signal silicon diodes
Special diodes
Voltage regulator diodes (< 1, 5 W)
Voltage reference diodes
Tuner diodes

Part 2 Low-frequency transistors — **December 1975**

Part 3 High-frequency and switching transistors — **April 1976**

Part 4a Special semiconductors — **June 1976**

Transmitting transistors
Microwave devices
Field-effect transistors
Dual transistors
Microminiature devices for thick- and thin-film circuits

Part 4b Devices for optoelectronics — **July 1976**

Photosensitive diodes and transistors
Light emitting diodes
Displays
Photocouplers
Infrared sensitive devices
Photoconductive devices

Part 5a Professional analogue integrated circuits — **November 1976**

Part 5b Consumer integrated circuits — **March 1977**

Radio - Audio
Television

Part 6 Digital integrated circuits — **May 1976**

LOCMOS HE family
GZ family

COMPONENTS AND MATERIALS (GREEN SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1 **Functional units, Input/output devices, Peripheral devices** **November 1975**

High noise immunity logic FZ/30-Series
Circuit blocks 40-Series and CSA70
Counter modules 50-Series
NORbits 60-Series, 61-Series
Circuit blocks 90-Series
Input/output devices
Hybrid integrated circuits
Peripheral devices

Part 2a **Resistors** **February 1976**

Fixed resistors
Variable resistors
Voltage dependent resistors (VDR)
Light dependent resistors (LDR)
Negative temperature coefficient thermistors (NTC)
Positive temperature coefficient thermistors (PTC)
Test switches

Part 2b **Capacitors** **April 1976**

Electrolytic and solid capacitors
Paper capacitors and film capacitors
Ceramic capacitors
Variable capacitors

Part 3 **Radio, Audio, Television** **January 1977**

FM tuners
Loudspeakers
Television tuners and aerial input assemblies
Components for black and white television
Components for colour television

Part 4a **Soft ferrites** **October 1976**

Ferrites for radio, audio and television
Beads and chokes
Ferroxcube potcores and square cores
Ferroxcube transformer cores

Part 4b **Piezoelectric ceramics, Permanent magnet materials** **December 1976**

Part 5 **Ferrite core memory products** **July 1975**

Ferroxcube memory cores
Matrix planes and stacks
Core memory systems

Part 6 **Electric motors and accessories** **April 1977**

Small synchronous motors
Stepper motors
Miniature direct current motors

Part 7 **Circuit blocks** **September 1971**

Circuit blocks 100 kHz-Series
Circuit blocks 1-Series
Circuit blocks 10-Series
Circuit blocks for ferrite core memory drive

Part 8 **Variable mains transformers** **February 1977**

Part 9 **Piezoelectric quartz devices** **March 1976**

Part 10 **Connectors** **November 1975**

General

Type designation

Rating systems

Letter symbols

Colour codes

Packing

Mounting and soldering

PRO ELECTRON TYPE DESIGNATION CODE

FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete devices and to multiple devices [1])

The type designation consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

The first letter gives an indication of the material

A Material with a band gap of 0.6 to 1.0 eV, such as germanium

B Material with a band gap of 1.0 to 1.3 eV, such as silicon

C Material with a band gap of 1.3 eV and more, such as gallium arsenide

D Material with a band gap of less than 0.6 eV, such as indium antimonide

R Compound material as employed in Hall generators and photoconductive cells

[1]) A multiple device is defined as a combination of similar or dissimilar active devices, contained in a common encapsulation that cannot be dismantled, and of which all electrodes of the individual devices are accessible from the outside.

Multiples of similar devices as well as multiples consisting of a main device and an auxiliary device are designated according to the code for discrete devices described above.
Multiples of dissimilar devices of other nature are designated by the second letter G.

The second letter indicates primarily the main application respectively main application and construction if a further differentiation is essential

- A Detection diode, switching diode, mixer diode
- B Variable capacitance diode
- C Transistor for a.f. applications ($R_{th\ j\text{-}mb} > 15\ ^oC/W$)
- D Power transistor for a.f. applications ($R_{th\ j\text{-}mb} \leq 15\ ^oC/W$)
- E Tunnel diode
- F Transistor for h.f. applications ($R_{th\ j\text{-}mb} > 15\ ^oC/W$)
- G Multiple of dissimilar devices (see note on page 1); Miscellaneous
- H Magnetic sensitive diode; Field probe
- K Hall generator in an open magnetic circuit, e.g. magnetogram or signal probe
- L Power transistor for h.f. applications ($R_{th\ j\text{-}mb} \leq 15\ ^oC/W$)
- M Hall generator in a closed electrically energised magnetic circuit, e.g. Hall modulator or multiplier
- N Photocoupler
- P Radiation sensitive device [1)]
- Q Radiation generating device
- R Electrically triggered controlling and switching device having a breakdown characteristic ($R_{th\ j\text{-}mb} > 15\ ^oC/W$)
- S Transistor for switching applications ($R_{th\ j\text{-}mb} > 15\ ^oC/W$)
- T Electrically, or by means of light, triggered controlling and switching power device having a breakdown characteristic ($R_{th\ j\text{-}mb} \leq 15\ ^oC/W$)[1)]
- U Power transistor for switching applications ($R_{th\ j\text{-}mb} \leq 15\ ^oC/W$)
- X Multiplier diode, e.g. varactor, step recovery diode
- Y Rectifying diode, booster diode, efficiency diode [1)]
- Z Voltage reference or voltage regulator diode [1)]

1) For the type designation of a range see page 4.

The serial number consists of:

Three figures for semiconductor devices designed primarily for use in domestic equipment

One letter and two figures for semiconductor devices designed primarily for use in professional equipment

VERSION LETTER

A version letter can be used, for instance, for a diode with up-rated voltage, for a sub-division of a transistor type in different gain ranges, a low noise version of an existing transistor and for a diode, transistor, or thyristor with minor mechanical differences, such as finish of the leads, length of the leads etc. The letters never have a fixed meaning, the only exception being the letter R.

TYPE DESIGNATION FOR A RANGE OF SEMICONDUCTOR DEVICES

The type designation of a range of variants of:

a) voltage reference or voltage regulator diodes (second letter Z)

b) rectifier diodes (second letter Y)

c) thyristors (second letter T)

d) radiation detectors

distinctly belonging to one basic type may be qualified by a suffix part which is clearly separated from the basic part by a hyphen (-)

THE BASIC PART being the same for the whole range, is in accordance with the designation code for discrete devices.

THE SUFFIX PART consists of:

a) **for voltage reference or voltage regulator diodes**

one letter followed by the typical working voltage and where appropriate the letter R [1)]
The first letter indicates the nominal tolerance of the working voltage in %.

A	1%
B	2%
C	5%
D	10%
E	15%

The typical working voltage is related to the nominal current rating for the whole range. The letter V is used to denote the decimal comma when this occurs.

b) **for rectifier diodes**

a number and where appropriate the letter R [1)]
The number generally indicates the maximum repetitive peak reverse voltage.
For controlled avalanche types it indicates the maximum crest working reverse voltage.

c) **for thyristors**

a number and where appropriate the letter R [1)]
The number generally indicates either the maximum repetitive peak reverse voltage or the maximum repetitive peak off-state voltage, whichever is lower.
For controlled avalanche types it indicates the maximum crest working reverse voltage.

d) **for radiation detectors**

a figure giving the depth of the depletion layer in μm and where appropriate a version letter if there are differences in resolution.

---

1) The letter R indicates reverse polarity (anode to stud). The normal polarity (cathode to stud) and symmetrical versions are not specially indicated.

RATING SYSTEMS

ACCORDING TO I.E.C. PUBLICATION 134

1. DEFINITIONS OF TERMS USED

1.1 Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note: This definition excludes inductors, capacitors, resistors and similar components.

1.2 Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

1.3 Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

1.4 Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note: Limiting conditions may be either maxima or minima.

1.5 Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note: The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

2. ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

p.t.o.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

3. DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

4. DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

NOTE

It is common use to apply the Absolute Maximum System in semiconductor published data.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R.M.S. value
S, s	As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.

Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)
Example I_B

b) instantaneous total values
Example i_B

c) average total values
Example $I_{B(AV)}$

d) peak total values
Example I_{BM}

e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values
Example i_b

b) root-mean-square values
Example $I_{b(rms)}$

c) peak values
Example I_{bm}

d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, i_B, i_b, I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F, I_R, i_F, $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE}, v_{BE}, v_{be}, V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F, V_R, v_F, V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC}, I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example : V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

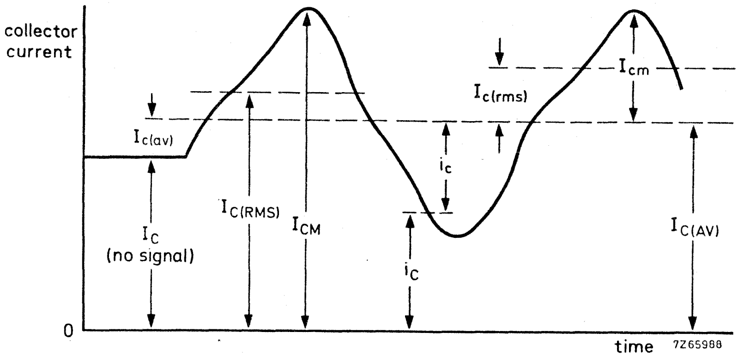
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f	=	forward; forward transfer
I, i (or 1)	=	input
L, l	=	load
O, o (or 2)	=	output
R, r	=	reverse; reverse transfer
S, s	=	source

Examples: Z_S, h_f, h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples : h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE}, y_{RE}, h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
h_o (or h_{22})
h_f (or h_{21})
h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

Examples: $Z_i = R_i + jX_i$

$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
Im (h_{ib}) etc. for the imaginary part of h_{ib}

PRO ELECTRON COLOUR CODING SYSTEM FOR PROFESSIONAL SMALL SIGNAL DIODES

Letter combination-background colour

BAV - green
BAW - blue
BAX - black
BAS - orange

Figure combination-colour bands

0 - black
1 - brown
2 - red
3 - orange
4 - yellow
5 - green
6 - blue
7 - violet
8 - grey
9 - white

The cathode side is indicated by a broad band which is at the same time the first digit of the figure combination.

Note: For BA types see individual type publications.

JEDEC assigned type numbers

(EIA-standard RS-236-B; June, 1963)

1. Prefix identification

The prefix identification consisting of a first number symbol and the letter "N" shall not be indicated in the coding.

2. Banding systems

The sequence number consisting of a two, three, or four digit number after the letter "N" may be coded as follows:

2.1 Two-digit sequence numbers shall consist of a first black band and the sequence number in second and third bands of the colours indicated in Table 1. If a suffix letter is required, it shall be indicated with a fourth band as indicated in Table 1.

2.2 Three-digit sequence numbers shall consist of the sequence number in first, second, and third bands of the colours indicated in Table 1. If a suffix letter is required, it shall be indicated with a fourth band as indicated in Table 1.

2.3 Four-digit sequence numbers shall consist of the sequence number in four bands of the colours indicated in Table 1.
If a suffix letter is required it shall be indicated as the fifth band.

3. Cathode identification and reading sequence

3.1 A double-width band shall be used as the first band reading from cathode to anode ends.

3.2 An alternative method is provided where equal width bands may be used. The bands shall be clearly grouped toward the cathode end, and shall be read from cathode to anode ends.

3.3 Either of the above colour banding methods may be used in stead of the cathode designating symbol or other marking.

4. Colour bands

The sequence numbers of the type numbers and suffix letters shall be indicated by the colours in Table 1.

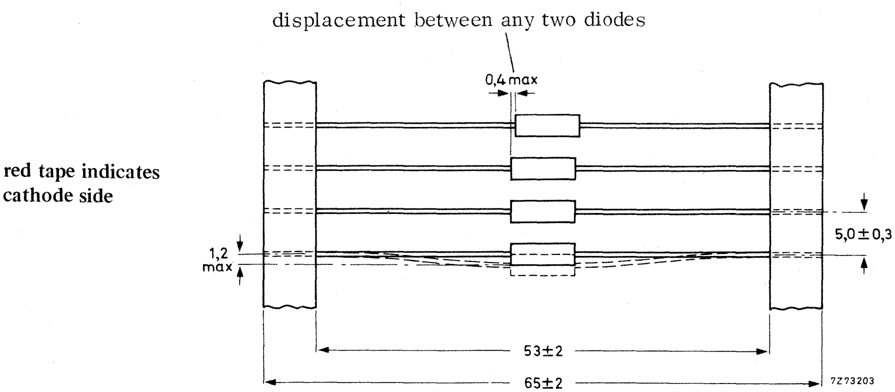
TABLE 1

NUMBER	COLOUR	SUFFIX LETTER
0	black	not applicable
1	brown	A
2	red	B
3	orange	C
4	yellow	D
5	green	E
6	blue	F
7	violet	G
8	grey	H
9	white	J

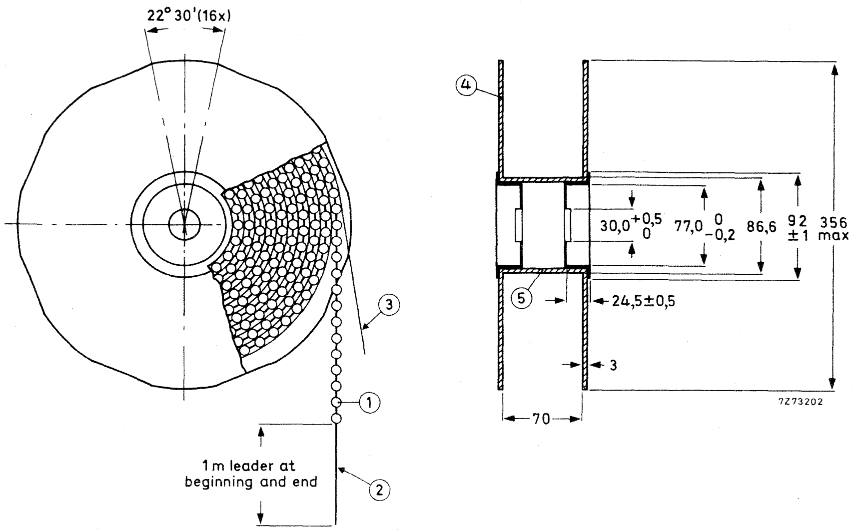
BANDOLIER AND REEL SPECIFICATION
for DO-7; DO-35 and SOD-17 envelopes

Configuration of bandolier

Dimensions in mm



Reel dimensions



(1) Diode
(2) Bandolier
(3) Paper
(4) Flange
(5) Cylinder

RULES FOR MOUNTING AND SOLDERING

Introduction

Excessive forces or temperatures applied to a diode may cause serious damage to the diode. To avoid damage when soldering and mounting the following rules should be followed.

General

Perpendicular forces on the body of the diode must be avoided.

Avoid sudden forces on the leads or body. These forces often are much higher than allowed.

High acceleration forces as a result of any shock (dropping on a hard surface for instance) must be prevented.

Bending

During bending the leads must be supported between body or stud (SOD-17) and bending point.

Axial forces on the body during the bending process must not exceed 20 N.

Bending the leads through 90^{o} is allowed at any distance from the body when it is possible to support the leads during bending without contacting the envelope or weldings.

Bending close to the body or stud without supporting the leads only is allowed if the bend radius is greater than 0,5 mm; in practice this limit will be met by hand bending without applying high pulling or pressing forces.

Twisting

Twisting the leads is allowed at any distance from the body or stud if the lead is properly clamped between body or stud and twisting point.

Without clamping, twisting the leads is only allowed at a distance of greater than 3 mm from the body; the torque angle must not exceed 30^{o}, the applied force not higher than 15 mNm.

Straightening

Straightening the leads is allowed if the applied pulling force in the axial direction does not exceed 20 N and the total duration is not longer than 5 seconds.

Soldering

Avoid any force on the body or leads during or just after soldering.

Do not correct the position of an already soldered device by pushing, pulling or twisting the body.

Do not solder a diode upright with one end of the body directly on the surface of the printed-circuit board, there should be at least 0,5 mm between body end and print surface.

When the device is to be mounted with straight or short-cropped leads, solder the leads individually.

Bent leads may be soldered simultaneously.

The diode can be mounted flat on the printed-circuit board when the body temperature of the diode will not exceed:
a. the maximum allowed junction temperature, where this is higher than 175 °C;
b. 115 °C for more than 2 minutes (with an absolute peak temperature for the junction of 160 °C), where the maximum junction temperature is less than 175 °C.

Any contact between diode body and hot spots on the printed-circuit board (such as copper layers) must be avoided.

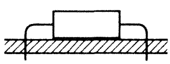
Prevent fast cooling after soldering.

Minimum distance soldering point to seal and maximum allowable soldering time for several envelopes.

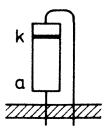
	Hand soldering iron mounted otherwise than on printed-circuit board (max. solder temp. : 300 °C		Hand soldering iron, dip or wave soldering, mounted on printed-circuit board (max. solder temp. : 300 °C)	
	time (s)	distance (mm)	time (s)	distance (mm)
DO-7 (glass)	3	5	5	5 1)
DO-35, SOD-17 (glass)	3	1,5	5	1,5
SOD-51 (glass)	3	5	5	5
SOD-23, SOD-52, (plastic) TO-18 (metal)	3	0,5	5	0,5
TO-92 variant (plastic)	3	2,5	5	2,5

MOUNTING METHODS

for DO-7, DO-35, SOD-17, SOD-51



flat



upright

1) 2 mm permissible from anode (upright mounting) if bath temperature ≤ 260 °C.

Germanium small signal diodes

Point contact

POINT CONTACT DIODES

Germanium diodes in DO-7 envelope

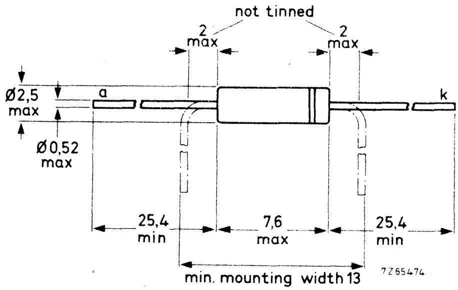
Quoted values are max.

	type	V_R (V)	I_F (mA)	I_{FRM} (mA)	V_F (V)	at I_F (mA)
general purpose	OA90	20	8	45	1,5	10
	OA91	90	50	150	1,9	10
	OA95	90	50	150	1,5	10
a.m. and f.m. detection	AA119; 2-AA119	30	35	100	2,2	10

MECHANICAL DATA

Dimensions in mm

DO-7



Cathode indicated by coloured band

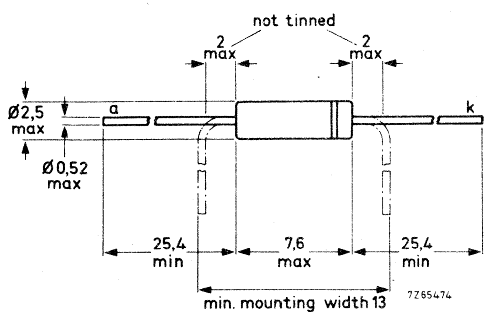
POINT CONTACT DIODE

Germanium diode in all-glass DO-7 envelope primarily intended for use in a.m. detector and ratio detector circuits.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	30	V
Repetitive peak reverse voltage	V_{RRM}	max.	45	V
Forward current (d.c.)	I_F	max.	35	mA
Repetitive peak forward current	I_{FRM}	max.	100	mA
Operating ambient temperature	T_{amb}	max.	60	°C
Forward voltage at I_F = 10 mA	V_F	<	2.2	V

MECHANICAL DATA Dimensions in mm

DO-7



The coloured band indicates the cathode

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

Voltages

Continuous reverse voltage	V_R	max.	30	V
Repetitive peak reverse voltage	V_{RRM}	max.	45	V

Currents

Forward current (d.c.)	I_F	max.	35	mA
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	35	mA
Repetitive peak forward current	I_{FRM}	max.	100	mA
Non-repetitive peak forward current (t < 1 s)	I_{FSM}	max.	200	mA

Temperatures

Storage temperature	T_{stg}		−55 to +75	°C
Operating ambient temperature	T_{amb}	max.	60	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,65	°C/mW

CHARACTERISTICS

Forward voltage at T_{amb} = 25 °C

I_F = 0.1 mA	V_F	typ.	0.23	V
		<	0.30	V
I_F = 1 mA	V_F	typ.	0.56	V
		<	0.88	V
I_F = 10 mA	V_F	typ.	1.5	V
		<	2.2	V
I_F = 30 mA [1]	V_F	typ.	2.8	V
		<	4.0	V

Forward voltage at T_{amb} = 60 °C

I_F = 0.1 mA	V_F	typ.	0.16	V
		<	0.25	V
I_F = 1 mA	V_F	typ.	0.50	V
		<	0.80	V
I_F = 10 mA	V_F	typ.	1.4	V
		<	2.1	V
I_F = 30 mA [1]	V_F	typ.	2.6	V
		<	3.8	V

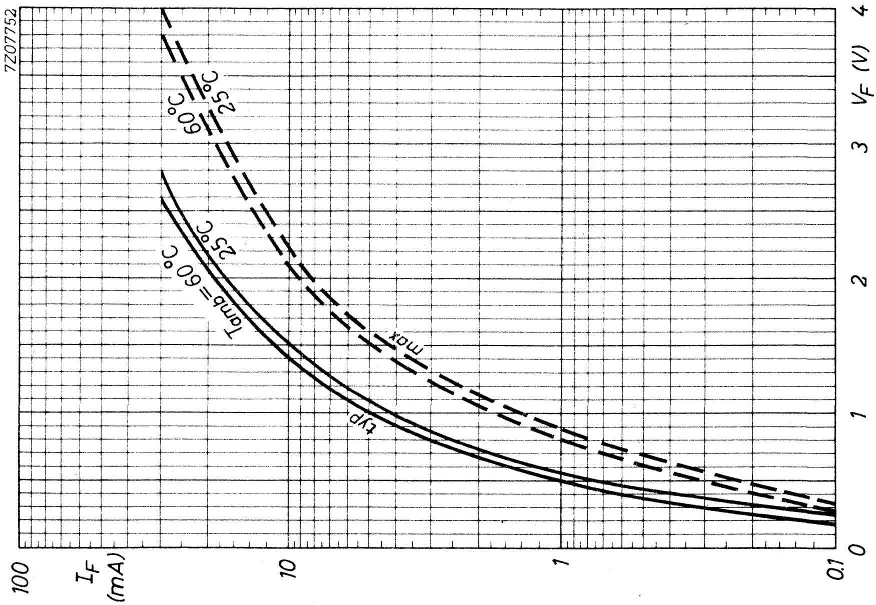
Reverse current at T_{amb} = 25 °C

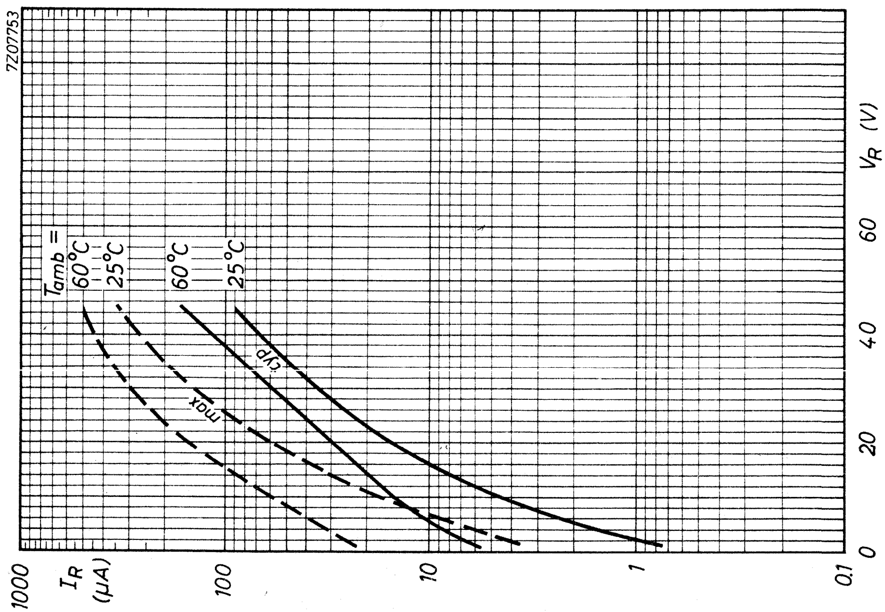
V_R = 0.1 V	I_R	typ.	0.35	μA
		<	1.0	μA
V_R = 1.5 V	I_R	typ.	0.8	μA
		<	2.8	μA
V_R = 10 v	I_R	typ.	4.5	μA
		<	18	μA
V_R = 30 V	I_R	typ.	35	μA
		<	150	μA
V_R = 45 V	I_R	typ.	90	μA
		<	350	μA

Reverse current at T_{amb} = 60 °C

V_R = 0.1 V	I_R	typ.	4.5	μA
		<	12	μA
V_R = 1.5 V	I_R	typ.	6	μA
		<	25	μA
V_R = 10 V	I_R	typ.	16	μA
		<	60	μA
V_R = 30 V	I_R	typ.	60	μA
		<	300	μA
V_R = 45 V	I_R	typ.	170	μA
		<	500	μA

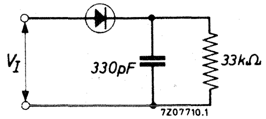
[1]) Measured under pulsed conditions to prevent excessive dissipation.


7Z07752
V_F (V)
0
1
2
3
4
100
I_F (mA)
10
1
0.1
60 °C
25 °C
T_{amb} = 60 °C
25 °C
typ
max


7Z07753
V_R (V)
0
20
40
60
1000
I_R (μA)
100
10
1
0.1
T_{amb} =
60°C
25°C
60°C
25°C
typ
max

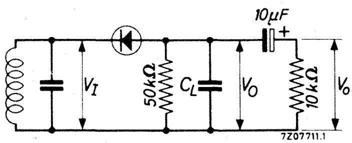
APPLICATION INFORMATION

Measuring circuit at T_{amb} = 25 °C



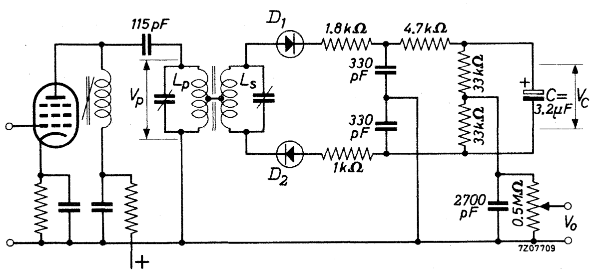
$V_{I(RMS)}$	= 3	V	η	typ.	85	%
f	= 10.7	MHz	R_d	typ.	15	kΩ
					13.5 to 19	kΩ

Diode in an a.m. detector circuit at T_{amb} = 25 °C



$V_{I(RMS)}$	= 0.1 V	V_O	typ. 55	mV	
f	= 0.5 MHz	$V_{o(rms)}$	typ. 4.5	mV	1)
		R	typ. 40	kΩ	2)

Matched pair in a ratio detector circuit



L_p	=	7.4	µH
Q_0	=	80	unloaded
R	=	40	kΩ unloaded
Tap	=	0.5	
L_s	=	4.4	µH
Q_0	=	150	unloaded
R	=	45	kΩ unloaded
kQ	=	0.8 3)	
f_0	=	10.7	MHz
Δf	=	15	kHz
m	=	0.3	

a.m. suppression factor at V_C = 2 to 20 V

$f = f_0$	α	≥ 30
$f = f_0 \pm 25$ kHz	α	≥ 15

For optimum a.m. suppression D_1 must be that diode of the matched pair which has the better dynamic forward characteristic.

---

1) Modulation factor m = 0.3
2) Modulation factor m = 0
3) Measured in the circuit with V_p = 350 mV

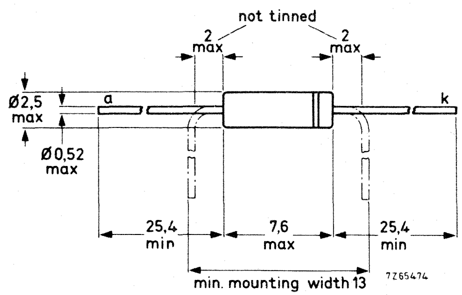
POINT CONTACT DIODE

Germanium diode in all-glass DO-7 envelope for use as video detector and for general purposes.

MECHANICAL DATA

Dimensions in mm

DO-7



The coloured band indicates the cathode

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

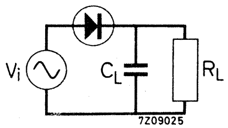
Average reverse voltage (averaged over any 20 ms period)	V_R	max.	20	V
Repetitive peak reverse voltage	V_{RRM}	max.	30	V
Non-repetitive peak reverse voltage	V_{RSM}	max.	40	V
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	8	mA
Repetitive peak forward current	I_{FRM}	max.	45	mA
Non-repetitive peak forward current (t < 1 s)	I_{FSM}	max.	200	mA
Storage temperature	T_{stg}		−55 to +90	°C
Operating ambient temperature	T_{amb}		−55 to +75	°C

CHARACTERISTICS

		T_{amb} = 25 °C	60 °C	
Forward voltage				
I_F = 0.1 mA	V_F	typ. 0.18	typ. 0.12	V
		0.1 to 0.25	< 0.20	V
I_F = 10 mA	V_F	typ. 1.0	typ. 0.95	V
		0.5 to 1.5	0.4 to 1.4	V
I_F = 30 mA	V_F	typ. 2.0	typ. 1.95	V
		1.1 to 3.2	1.0 to 3.1	V
Reverse current				
V_R = 1.5 V	I_R	typ. 2.4	typ. 11	μA
		< 10	< 40	μA
V_R = 10 V	I_R	typ. 20	typ. 45	μA
		< 135	< 270	μA
V_R = 20 V	I_R	typ. 90	typ. 140	μA
		< 450	< 650	μA
V_R = 30 V	I_R	typ. 300	typ. 400	μA
		< 1100	< 1500	μA

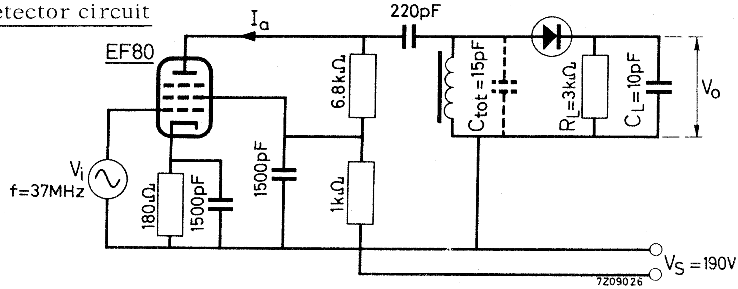
APPLICATION INFORMATION

Measuring circuit



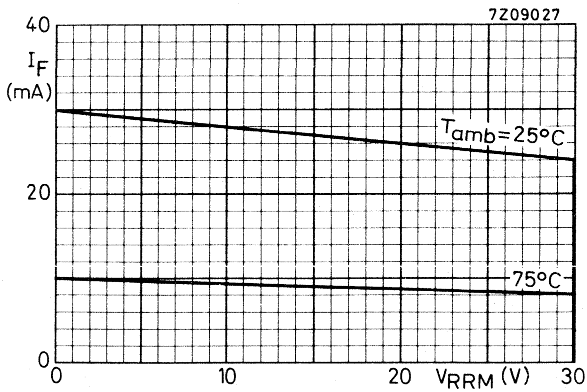
V_{im}	=	5	1.4	0.5	5	V
f	=	40	40	40	30	MHz
C_L	=	10	10	10	10	pF
R_L	=	3	3	3	3.9	kΩ
η	typ.	63	54	34	>60	%
R_d	typ.	2.4	2.8	3.7	>2.9	kΩ

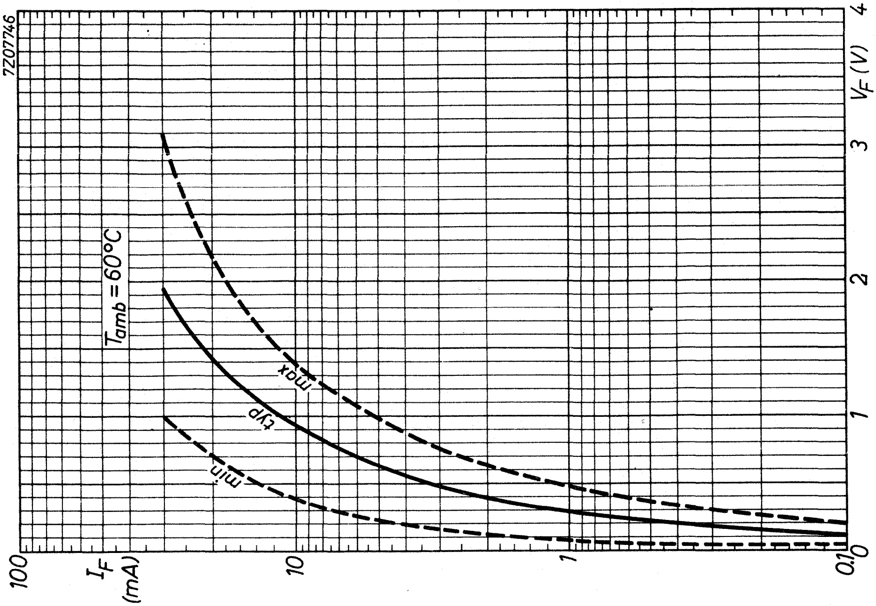
Video detector circuit

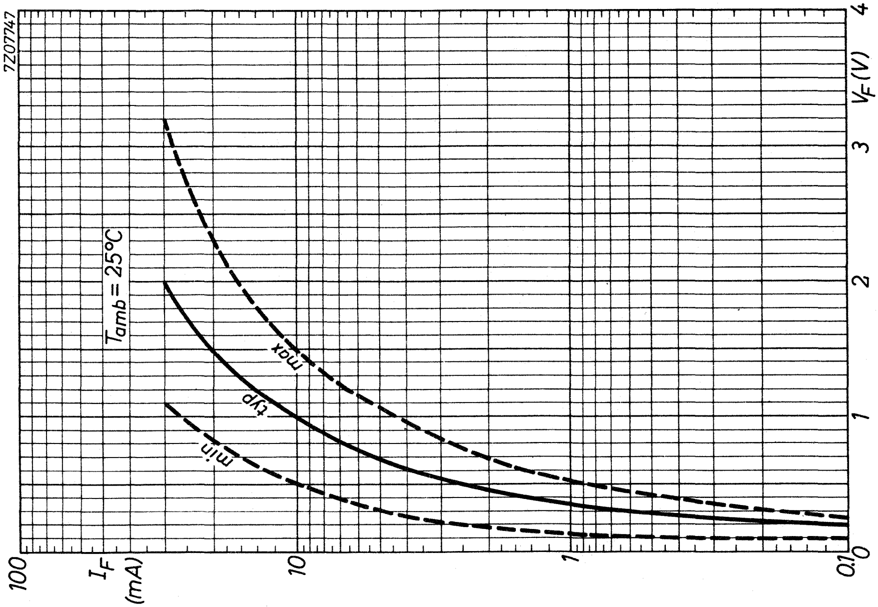


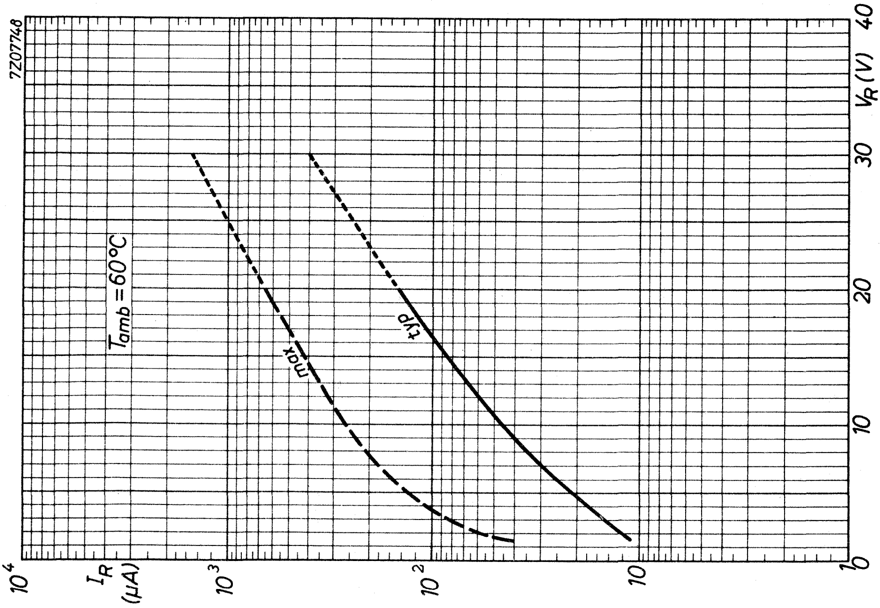
Q of the tuned circuit with removed diode: Q = 19

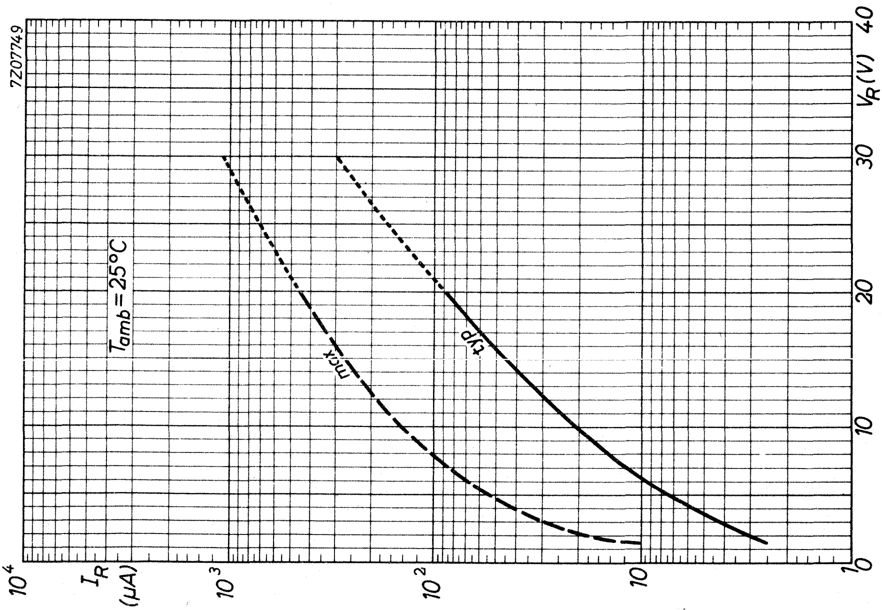
I_{am}	=	2.5	0.25	mA
B	=	4.7	4.1	MHz
V_o	typ.	2.7	0.20	V

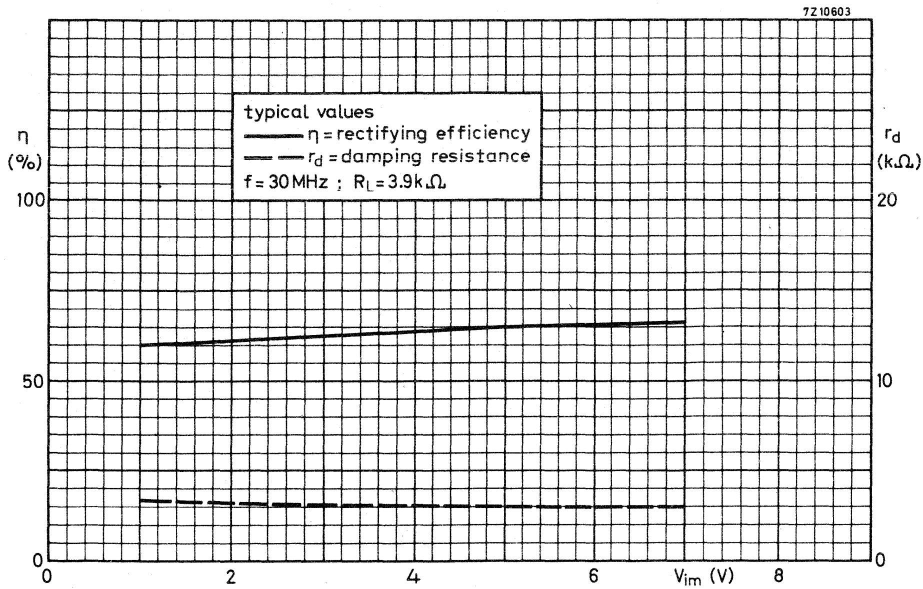



7Z07746
$T_{amb} = 60°C$
max
typ
min
100
I_F (mA)
10
1
0.1
0
1
2
3
4
V_F (V)


7Z07747
$T_{amb} = 25°C$
max
typ
min
100
I_F (mA)
10
1
0.1
0
1
2
3
4
V_F (V)


7Z07748
Tamb = 60°C
max
typ
IR (μA)
VR (V)
10^4
10^3
10^2
10
1
0
10
20
30
40


7Z07749
Tamb = 25°C
max
typ
IR (μA)
VR (V)
10^4
10^3
10^2
10
1
0
10
20
30
40

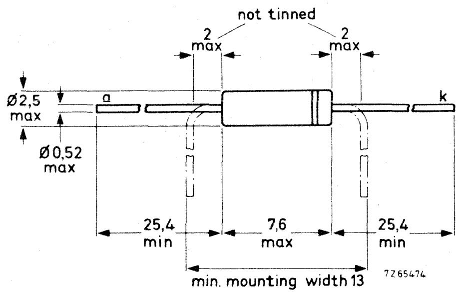

7Z10603
typical values
η = rectifying efficiency
r_d = damping resistance
f = 30 MHz ; R_L = 3.9 kΩ
η
(%)
100
50
0
r_d
(kΩ)
20
10
0
0
2
4
6
V_{im} (V)
8

POINT CONTACT DIODE

Germanium diode in all-glass DO-7 envelope intended for general purposes.

MECHANICAL DATA Dimensions in mm

DO-7



The coloured band indicates the cathode

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

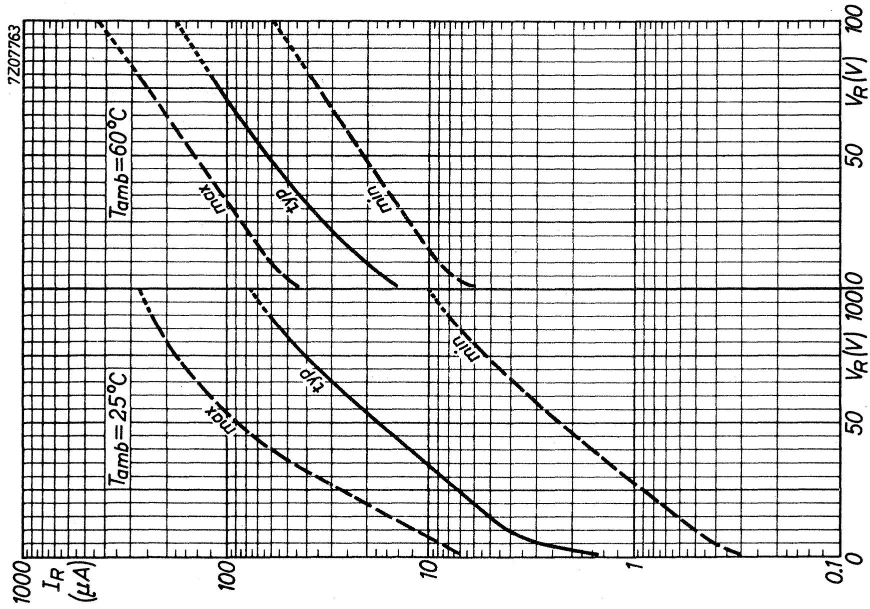
Average reverse voltage (averaged over any 20 ms period)	V_R	max.	90	V
Repetitive peak reverse voltage	V_{RRM}	max.	115	V
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	50	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	500	mA
Storage temperature	T_{stg}		−55 to +75	°C
Ambient temperature	T_{amb}		−55 to +75	°C

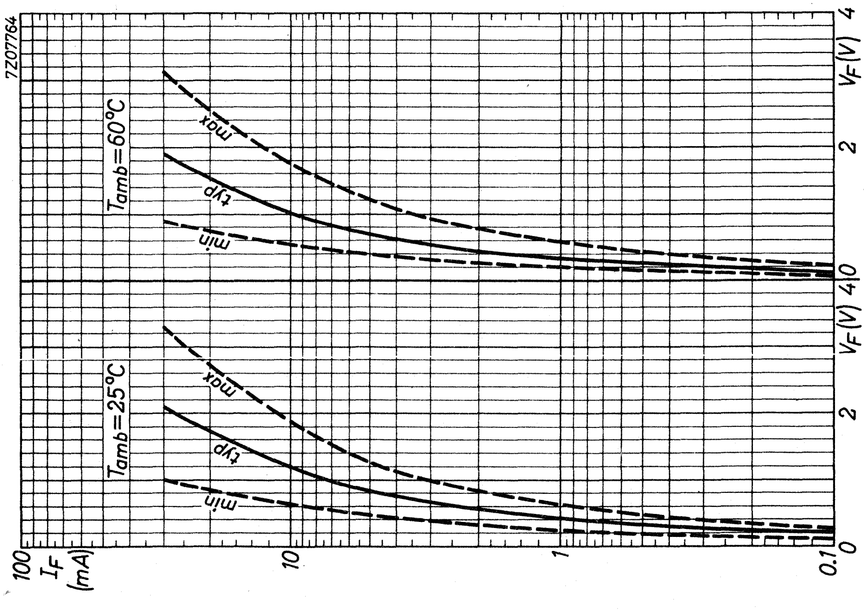
THERMAL RESISTANCE

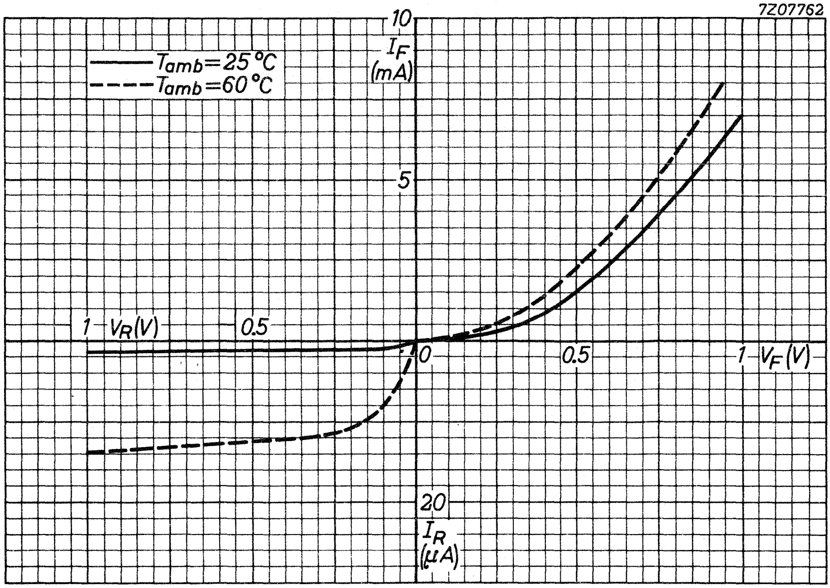
From junction to ambient in free air $R_{th\ j\text{-}a}$ = 0.55 °C/mW

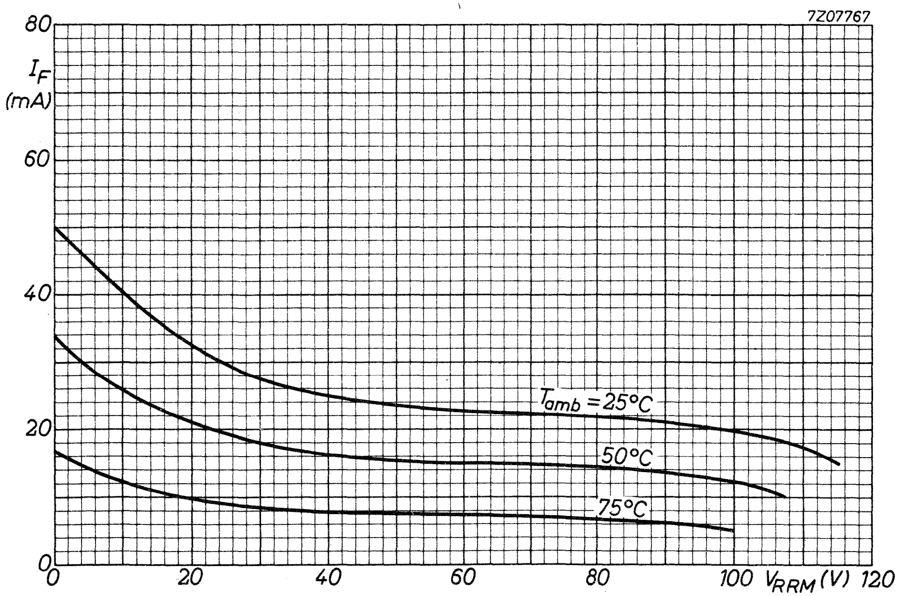
CHARACTERISTICS

		T_{amb} = 25 °C	T_{amb} = 60 °C	
Forward voltage				
I_F = 0.1 mA	V_F	typ. 0.18	typ. 0.1	V
		0.1 to 0.25	0.05 to 0.2	V
I_F = 10 mA	V_F	typ. 1.2	typ. 1.05	V
		0.65 to 1.9	0.55 to 1.8	V
I_F = 30 mA	V_F	typ. 2.1	typ. 1.9	V
		1.0 to 3.3	0.9 to 3.15	V
Reverse current				
V_R = 1.5 V	I_R	typ. 1.5	typ. 15	μA
		0.3 to 7	6 to 45	μA
V_R = 10 V	I_R	typ. 4	typ. 20	μA
		0.5 to 11	9 to 60	μA
V_R = 75 V	I_R	typ. 40	typ. 115	μA
		5.5 to 180	35 to 260	μA
V_R = 100 V	I_R	typ. 75	typ. 190	μA
		10 to 275	60 to 450	μA


7Z07763
T_{amb}=60°C
T_{amb}=25°C
max
typ
min
I_R (μA)
1000
100
10
1
0.1
V_R(V)
0
50
100


7Z07764
T_{amb}=60°C
T_{amb}=25°C
max
typ
min
I_F (mA)
100
10
1
0.1
V_F(V)
0
2
4

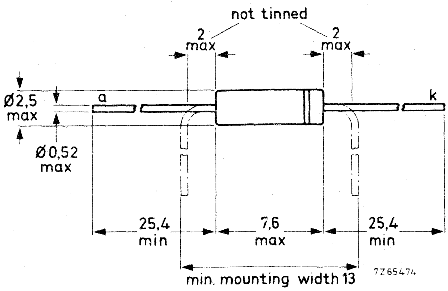

7Z07762
10
I_F
(mA)
T_{amb}=25 °C
T_{amb}=60 °C
5
1 V_R(V)
0.5
0
0.5
1 V_F(V)
20
I_R
(µA)


7Z07767
80
I_F
(mA)
60
40
20
0
T_{amb} =25°C
50°C
75°C
0
20
40
60
80
100 V_{RRM} (V) 120

POINT CONTACT DIODE

Germanium diode in all-glass DO-7 envelope intended for general purposes.

MECHANICAL DATA Dimensions in mm



The coloured band indicates the cathode

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

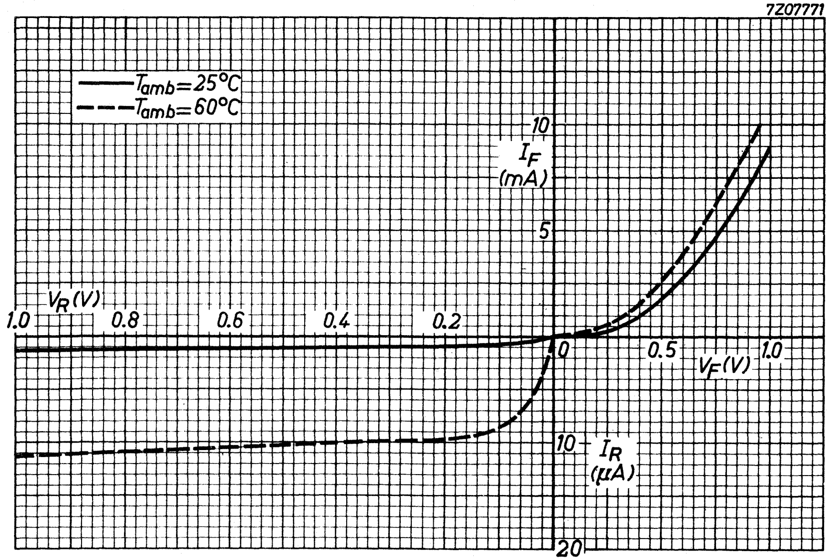
Average reverse voltage (averaged over any 20 ms period)	V_R	max.	90	V
Repetitive peak reverse voltage	V_{RRM}	max.	115	V
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	50	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	500	mA
Storage temperature	T_{stg}		−55 to +75	°C
Ambient temperature	T_{amb}		−55 to +75	°C

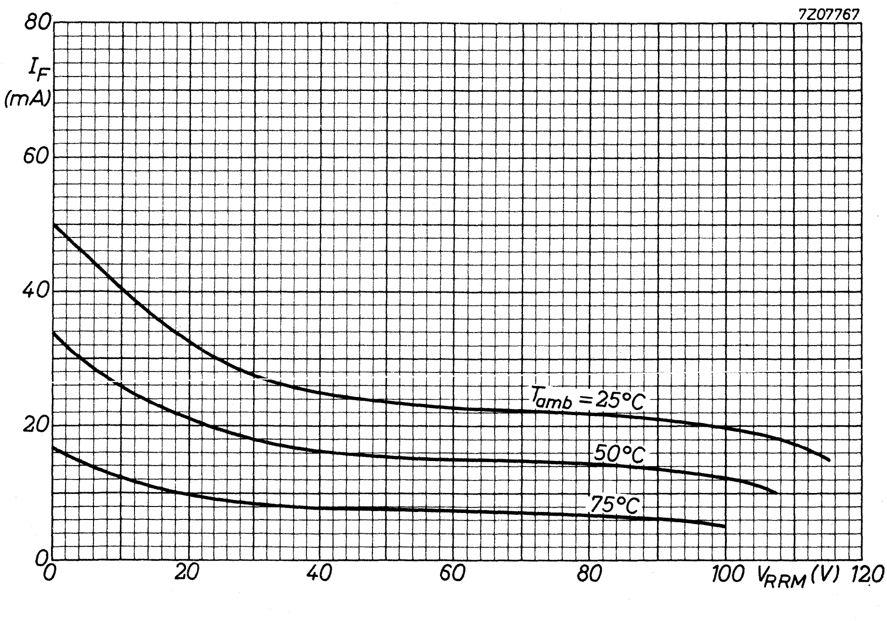
THERMAL RESISTANCE

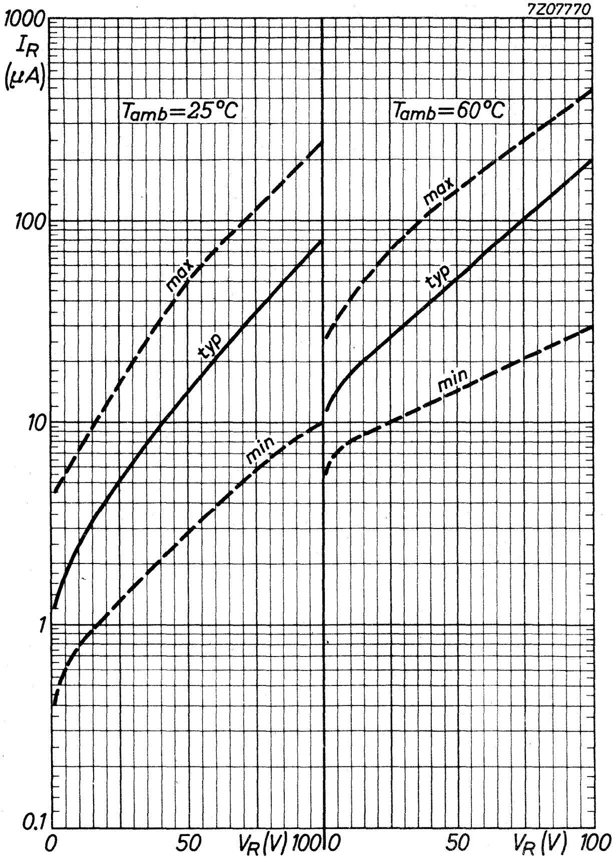
From junction to ambient in free air $R_{th\ j\text{-}a}$ = 0.55 °C/mW

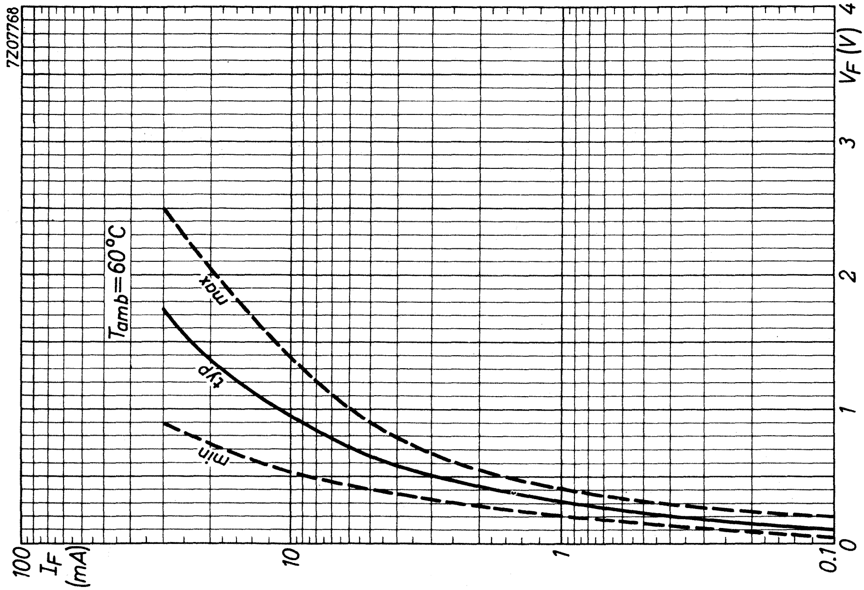
CHARACTERISTICS

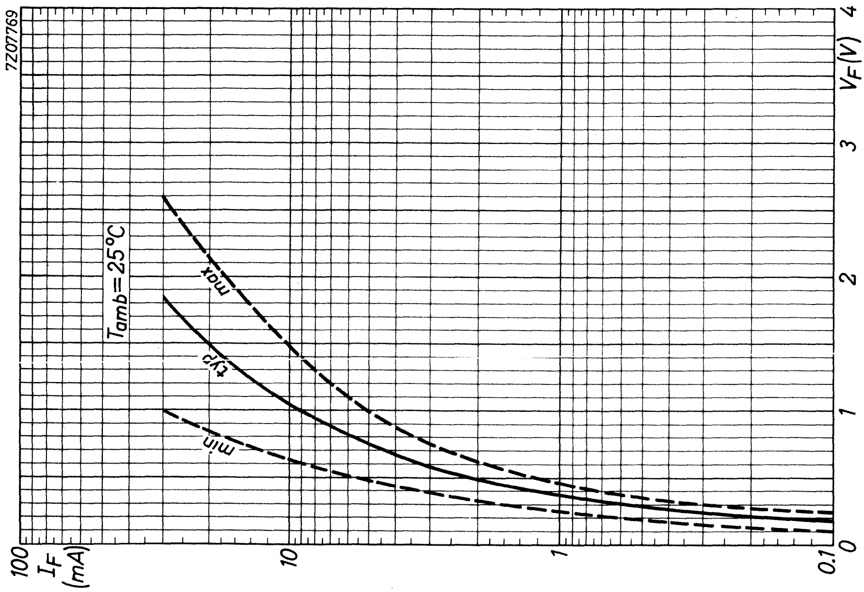
		T_{amb} = 25 °C	T_{amb} = 60 °C	
Forward voltage				
I_F = 0.1 mA	V_F	typ. 0.18	typ. 0.1	V
		0.1 to 0.25	0.05 to 0.2	V
I_F = 10 mA	V_F	typ. 1.05	typ. 0.95	V
		0.65 to 1.5	0.55 to 1.4	V
I_F = 30 mA	V_F	typ. 1.85	typ. 1.75	V
		1.0 to 2.6	0.9 to 2.5	V
Reverse current				
V_R = 1.5 V	I_R	typ. 1.2	typ. 12	μA
		0.4 to 4.5	5.5 to 26	μA
V_R = 10 V	I_R	typ. 2.5	typ. 17	μA
		0.8 to 7	8 to 40	μA
V_R = 75 V	I_R	typ. 35	typ. 100	μA
		5.7 to 110	20 to 250	μA
V_R = 100 V	I_R	typ. 80	typ. 200	μA
		10 to 250	30 to 430	μA


7Z07771
T_{amb} = 25°C
T_{amb} = 60°C
V_R (V)
1.0
0.8
0.6
0.4
0.2
I_F (mA)
10
5
0
0.5
1.0
V_F (V)
10
I_R (µA)
20


7Z07767
80
I_F (mA)
60
40
20
0
T_{amb} = 25°C
50°C
75°C
0
20
40
60
80
100
V_{RRM} (V)
120


7Z07770
1000
I_R
(μA)
T_{amb}=25°C
T_{amb}=60°C
max
typ
min
max
typ
min
100
10
1
0.1
0
50
V_R(V)
100
0
50
V_R(V)
100


7Z07768
T_{amb}=60°C
max
typ
min
I_F (mA)
100
10
1
0.1
V_F (V)
0
1
2
3
4


7Z07769
T_{amb}=25°C
max
typ
min
I_F (mA)
100
10
1
0.1
V_F (V)
0
1
2
3
4

Germanium small signal diodes

Gold bonded

GOLD BONDED DIODES

Germanium diodes in DO-7 envelope

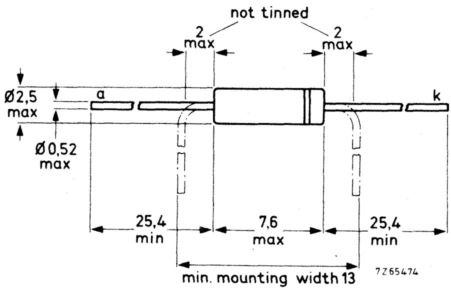
Quoted values are max.

	type	V_R (V)	I_F (mA)	I_{FRM} (mA)	t_{rr} (ns)	C_d (pF)	V_F (V)	at I_F (mA)
general purpose	AAZ15	75	140	250	–	2	1,1	250
	AAZ17	50	140	250	–	2	1,1	250
general purpose and switching	AAZ18	20	130	300	70	2,5	1,0	300
	OA47	25	110	150	70	3,5	1,1	150

MECHANICAL DATA

Dimensions in mm

DO-7



Cathode indicated by coloured band

GOLD BONDED DIODES

Germanium diodes in all-glass DO-7 envelope, intended for switching applications and general purposes.

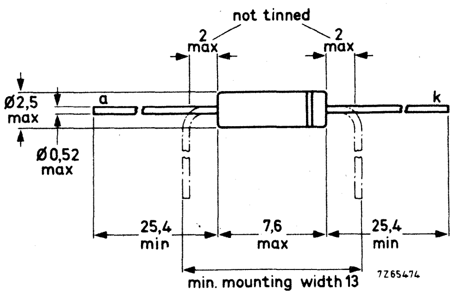
QUICK REFERENCE DATA

			AAZ15	AAZ17	
Continuous reverse voltage	V_R	max.	75	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	75	V
Forward current (d.c.)	I_F	max.	140	140	mA
Repetitive peak forward current	I_{FRM}	max.	250	250	mA
Junction temperature	T_j	max.	85	85	^oC
Forward voltage at I_F = 250 mA	V_F	<	1,1	1,1	V
Recovery charge when switched from I_F = 10 mA to V_R = 10 V	Q_s	<	1800	900	pC

MECHANICAL DATA

Dimensions in mm

DO-7



The coloured band indicates the cathode

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

Voltages

			AAZ15	AAZ17	
Continuous reverse voltage	V_R	max.	75	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	75	V
Non-repetitive peak reverse voltage ($t < 1$ s)	V_{RSM}	max.	115	75	V

Currents

Forward current (d.c.)	I_F	max.	140	mA
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	140	mA
Repetitive peak forward current	I_{FRM}	max.	250	mA
Non-repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}		-65 to +85	^{o}C
Junction temperature	T_j	max.	85	^{o}C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\,j-a}$	=	0.55	$^{o}C/mW$

CHARACTERISTICS

Forward voltage at $T_j = 25\ ^oC$

$I_F = 0,1$ mA	V_F	< 0,20 V
$I_F = 10$ mA	V_F	< 0,45 V
$I_F = 250$ mA	V_F	< 1,10 V

Forward voltage at $T_j = 60\ ^oC$

$I_F = 0,1$ mA	V_F	< 0,15 V
$I_F = 10$ mA	V_F	< 0,40 V
$I_F = 250$ mA	V_F	< 1,07 V

			AAZ15	AAZ17	
Reverse current at $T_j = 25\ ^oC$					
$V_R = 1,5$ V	I_R	<	2,5	2,5	µA
$V_R = 10$ V	I_R	<	4	15	µA
$V_R = 50$ V	I_R	<	15	150	µA
$V_R = 75$ V	I_R	<	25	300	µA
$V_R = 100$ V	I_R	<	100	–	µA
Reverse current at $T_j = 60\ ^oC$					
$V_R = 1,5$ V	I_R	<	30	30	µA
$V_R = 10$ V	I_R	<	40	60	µA
$V_R = 50$ V	I_R	<	80	300	µA
$V_R = 75$ V	I_R	<	120	500	µA
$V_R = 100$ V	I_R	<	300	–	µA
Diode capacitance at $T_j = 25\ ^oC$					
$V_R = 1$ V; f = 1 MHz	C_d	<	2	2	pF

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

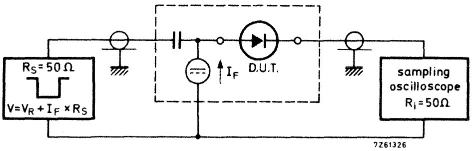
Reverse recovery time when switched from

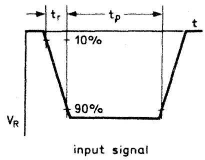
I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω;

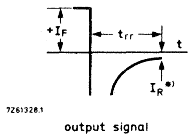
measured at I_R = 1 mA

AAZ15	t_{rr}	typ.	350	ns
AAZ17	t_{rr}	<	350	ns

Test circuit and waveforms :







Input signal : Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
Reverse pulse duration	t_p = 500 ns	
Duty factor	δ = 0,05	
Oscilloscope : Rise time	t_r = 0,35 ns	

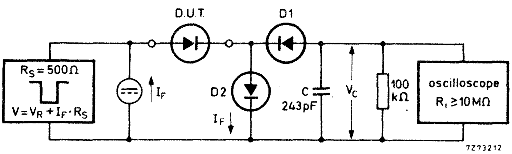
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

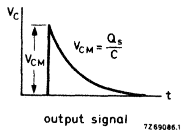
Recovery charge when switched from

I_F = 10 mA to V_R = 10 V; R_L = 1 kΩ

AAZ15	Q_s	<	1800	pC
AAZ17	Q_s	<	900	pC

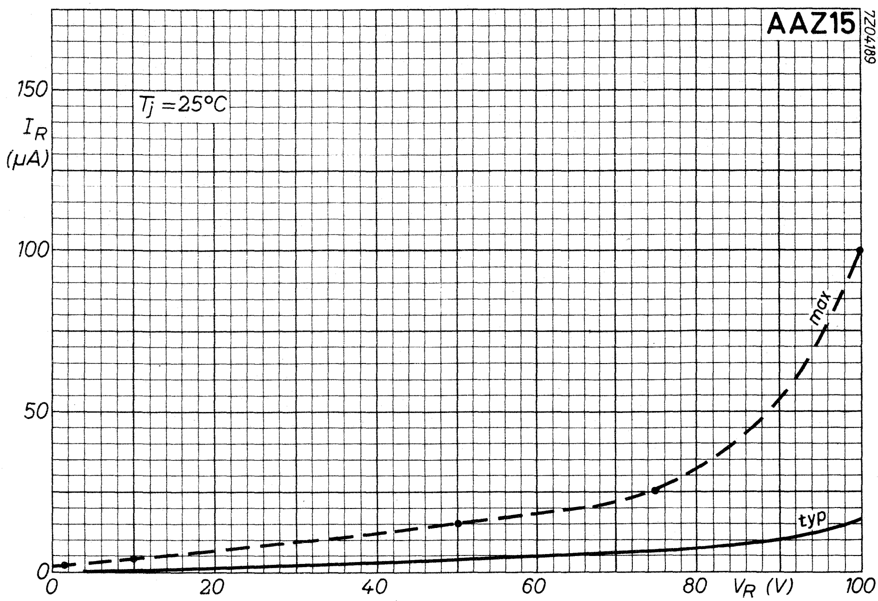
Test circuit and waveform :

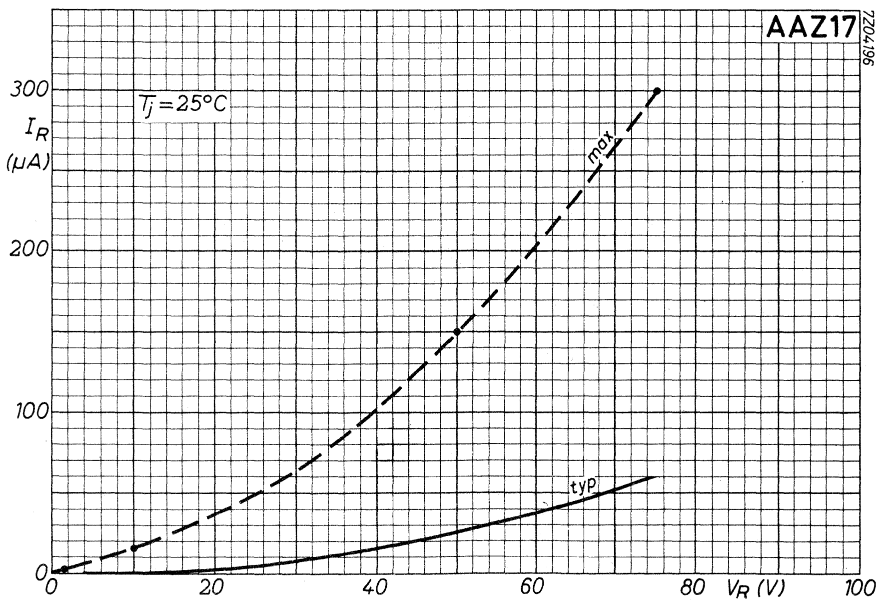


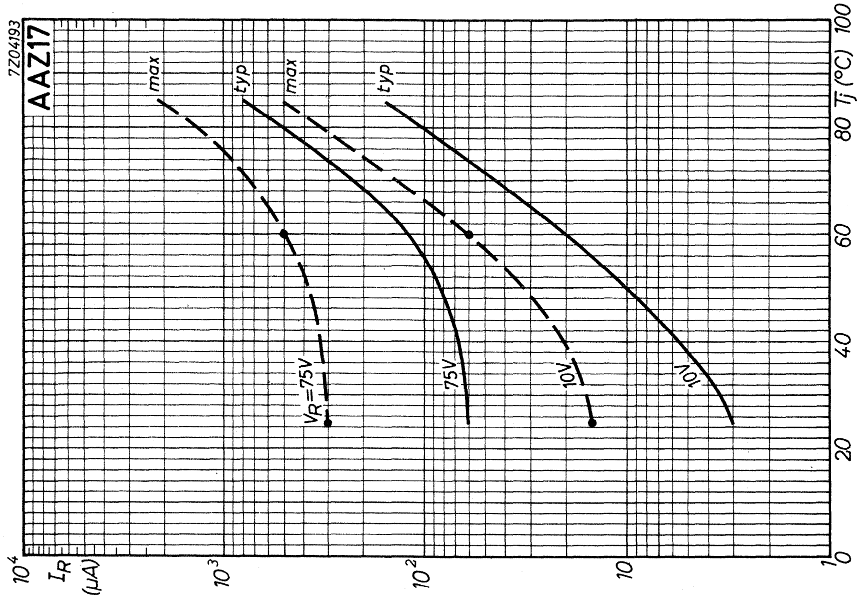


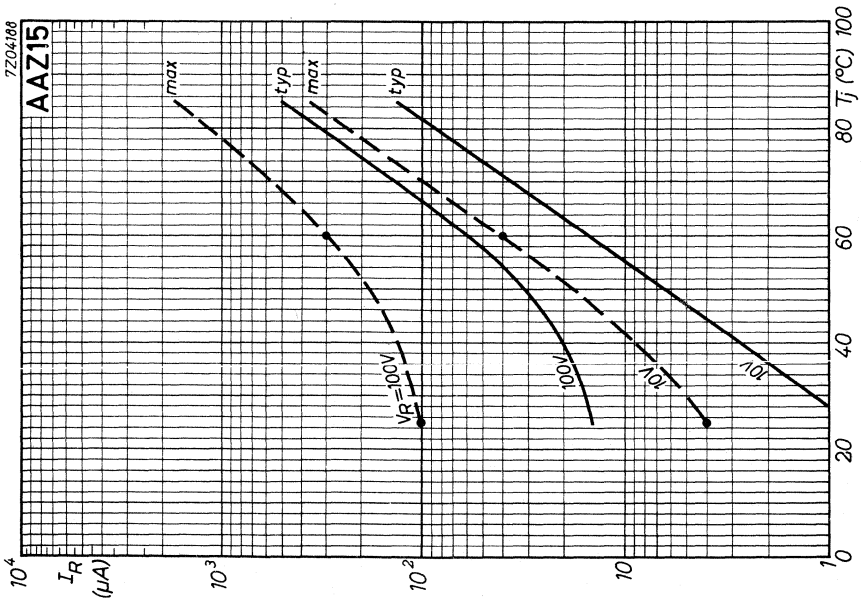
D1 = D2 = BAW62

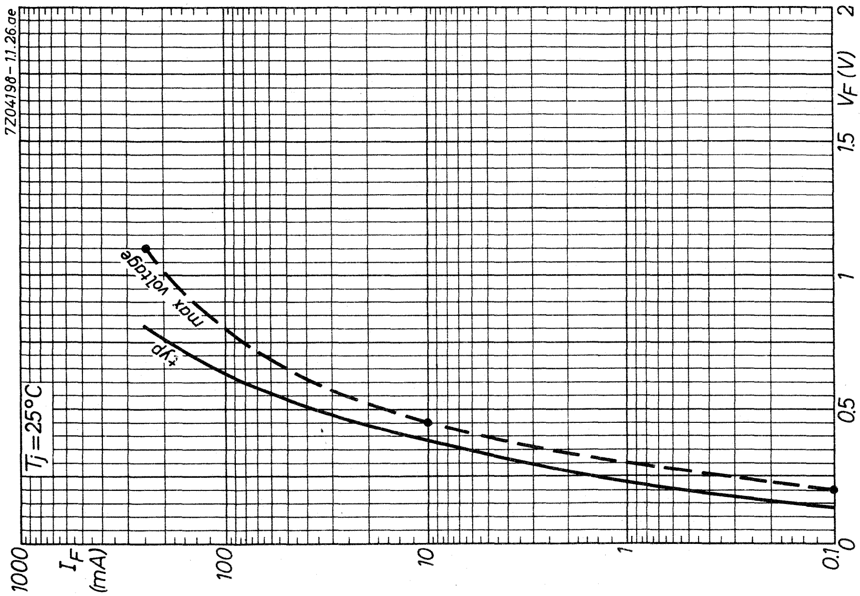
Input signal : Rise time of the reverse pulse	t_r = 2 ns
Reverse pulse duration	t_p = 400 ns
Duty factor	δ = 0,02

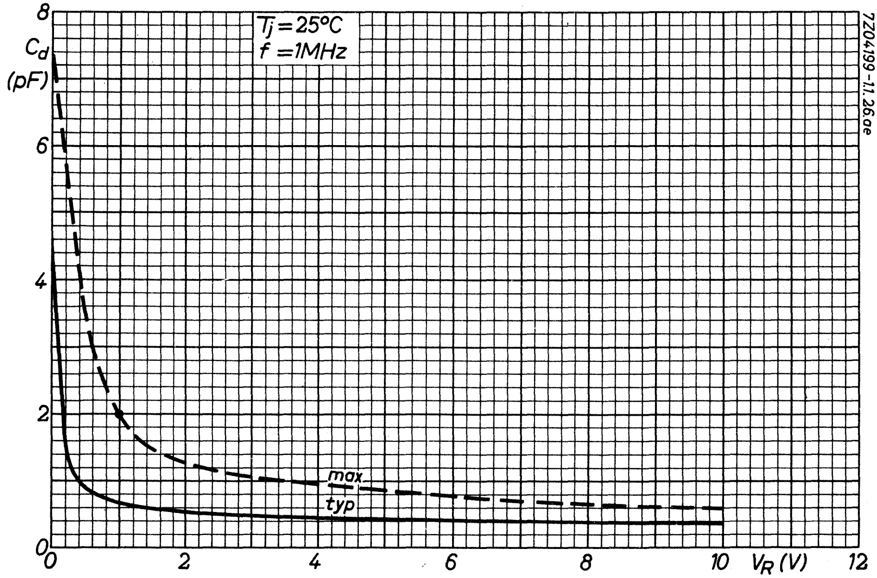

AAZ15
7Z04189
$T_j = 25°C$
I_R
(μA)
150
100
50
0
max
typ
0
20
40
60
80
V_R (V)
100

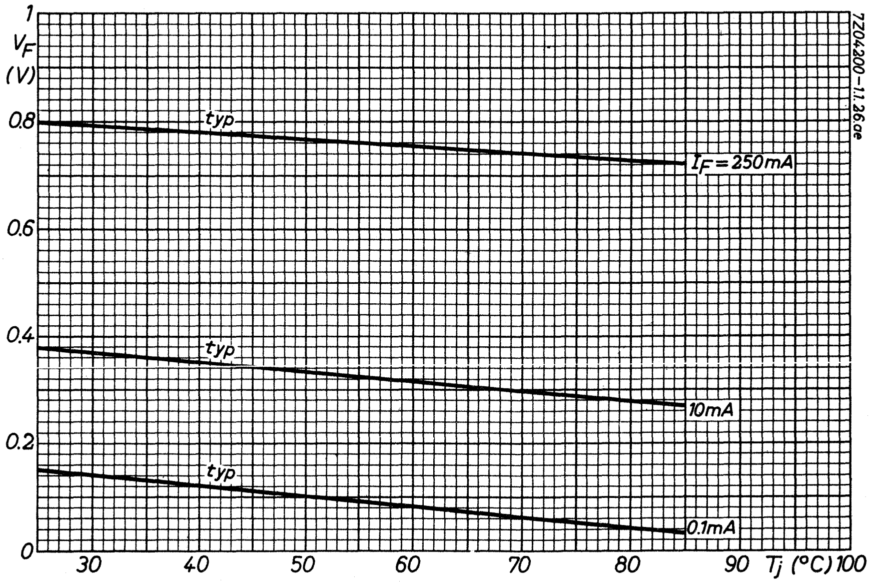

AAZ17
7Z04196
$T_j = 25°C$
I_R
(μA)
300
200
100
0
max
typ
0
20
40
60
80
V_R (V)
100

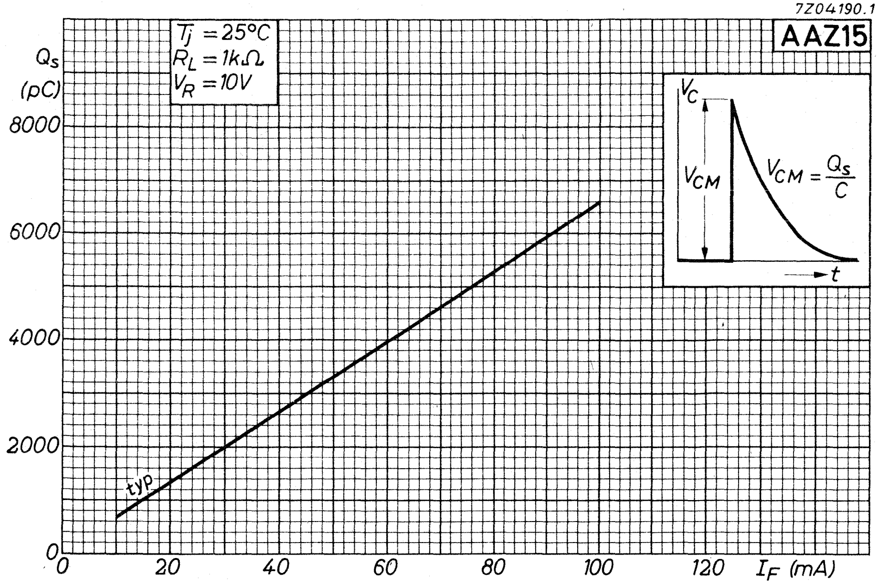

7Z04193
AAZ17
max
typ
max
typ
V_R=75V
75V
10V
10V
I_R
(µA)
10^4
10^3
10^2
10
1
0
20
40
60
80
100
T_j (°C)

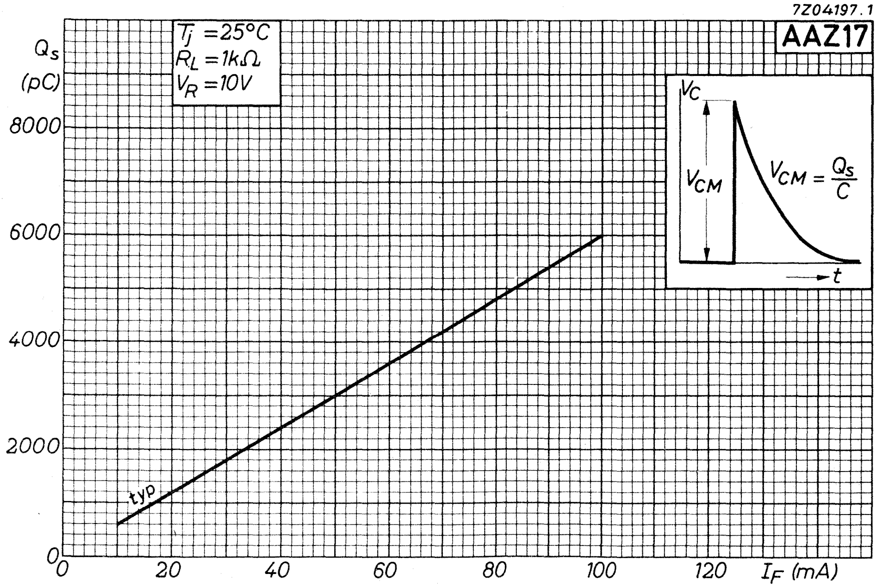

7Z04188
AAZ15
max
typ
max
typ
V_R=100V
100V
10V
10V
I_R
(µA)
10^4
10^3
10^2
10
1
0
20
40
60
80
100
T_j (°C)

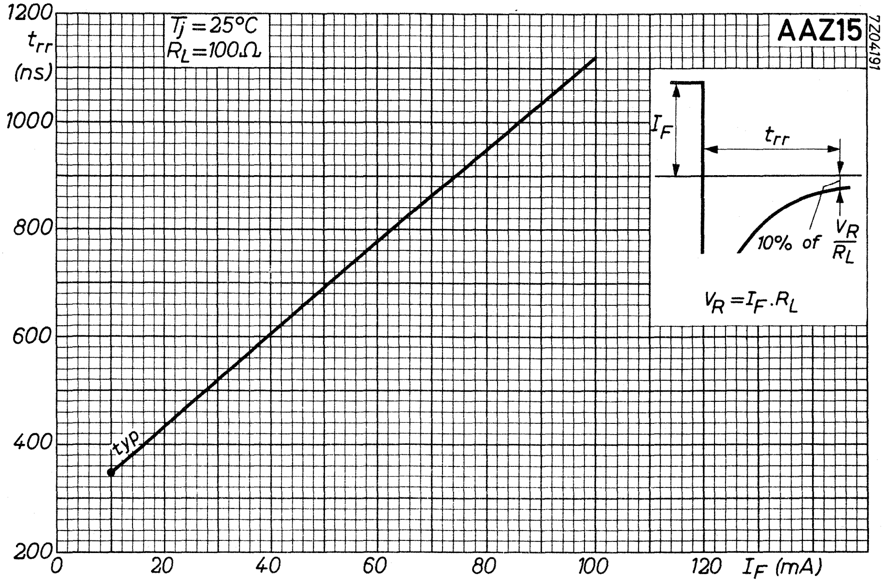

7Z04198-11.26.ae
$T_j = 25°C$
max voltage
typ
I_F (mA)
1000
100
10
1
0.1
V_F (V)
0
0.5
1
1.5
2

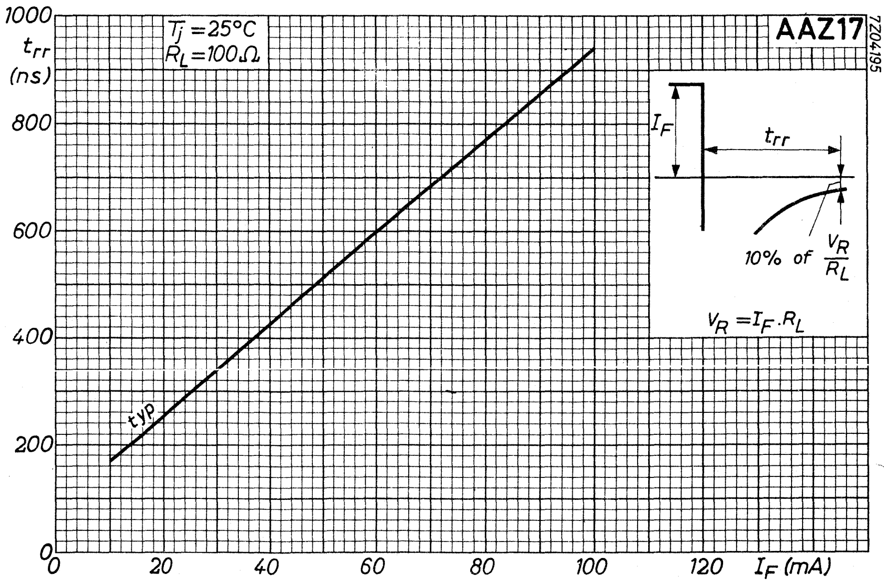

$T_j = 25°C$
f = 1MHz
C_d
(pF)
8
6
4
2
0
max
typ
0
2
4
6
8
10
V_R (V)
12
7Z04199-1.1.26ae

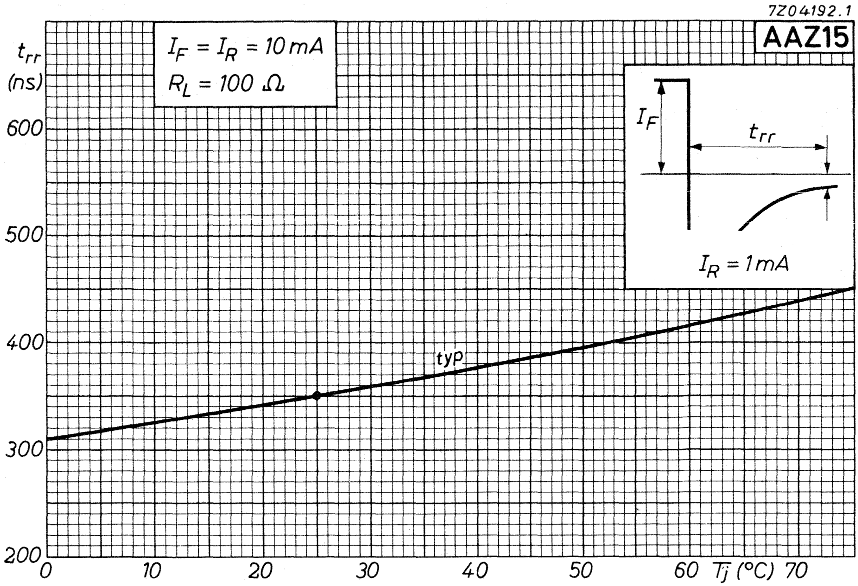

1
V_F
(V)
0.8
0.6
0.4
0.2
0
typ
$I_F = 250mA$
typ
10mA
typ
0.1mA
30
40
50
60
70
80
90
T_j (°C)
100
7Z04200-1.1.26ae

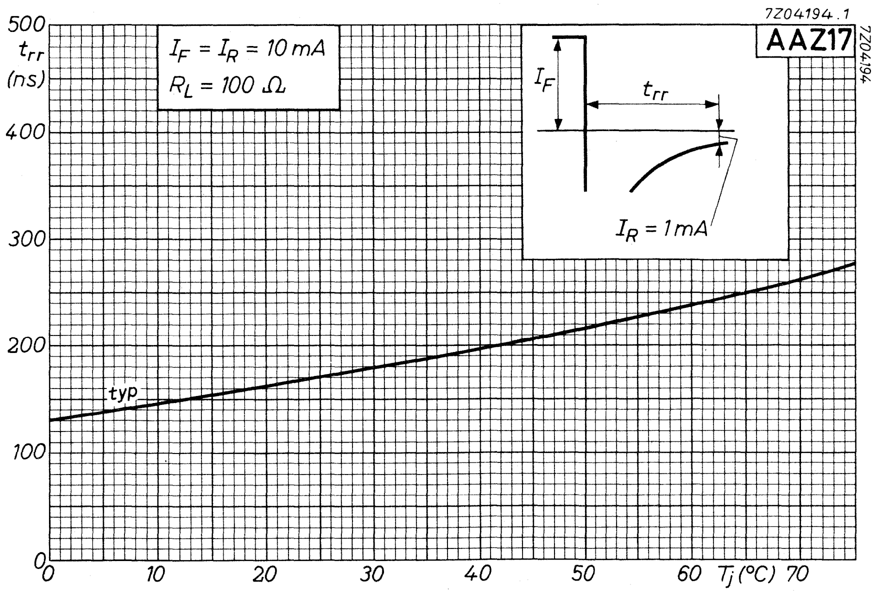

7Z04190.1
AAZ15
$T_j = 25°C$
$R_L = 1k\Omega$
$V_R = 10V$
Q_s (pC)
8000
6000
4000
2000
0
typ
0
20
40
60
80
100
120
I_F (mA)
V_C
V_{CM}
$V_{CM} = \frac{Q_s}{C}$
t


7Z04197.1
AAZ17
$T_j = 25°C$
$R_L = 1k\Omega$
$V_R = 10V$
Q_s (pC)
8000
6000
4000
2000
0
typ
0
20
40
60
80
100
120
I_F (mA)
V_C
V_{CM}
$V_{CM} = \frac{Q_s}{C}$
t


1200
t_{rr}
(ns)
1000
800
600
400
200
0
20
40
60
80
100
120
I_F (mA)
$T_j = 25°C$
$R_L = 100\Omega$
AAZ15
7Z04191
typ
I_F
t_{rr}
10% of $\frac{V_R}{R_L}$
$V_R = I_F . R_L$


1000
t_{rr}
(ns)
800
600
400
200
0
20
40
60
80
100
120
I_F (mA)
$T_j = 25°C$
$R_L = 100\Omega$
AAZ17
7Z04195
typ
I_F
t_{rr}
10% of $\frac{V_R}{R_L}$
$V_R = I_F . R_L$


7Z04192.1
AAZ15
t_{rr}
(ns)
600
500
400
300
200
$I_F = I_R = 10\,mA$
$R_L = 100\,\Omega$
I_F
t_{rr}
$I_R = 1\,mA$
typ
0
10
20
30
40
50
60
T_j (°C)
70


7Z04194.1
AAZ17
7Z04194
500
t_{rr}
(ns)
400
300
200
100
0
$I_F = I_R = 10\,mA$
$R_L = 100\,\Omega$
I_F
t_{rr}
$I_R = 1\,mA$
typ
0
10
20
30
40
50
60
T_j (°C)
70

GOLD BONDED DIODE

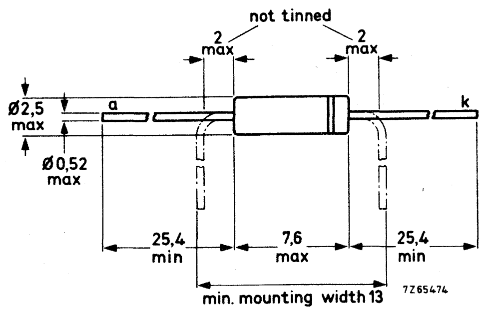
Germanium diode in all-glass DO-7 envelope, intended for switching applications and general purposes.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	20	V
Repetitive peak reverse voltage	V_{RRM}	max.	20	V
Forward current (d.c.)	I_F	max.	130	mA
Repetitive peak forward current	I_{FRM}	max.	300	mA
Junction temperature	T_j	max.	75	°C
Forward voltage at I_F = 300 mA	V_F	<	1.0	V

MECHANICAL DATA

Dimensions in mm

DO-7



The coloured band indicates the cathode

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

Voltages

Continuous reverse voltage	V_R	max.	20	V
Repetitive peak reverse voltage	V_{RRM}	max.	20	V
Non repetitive peak reverse voltage ($t < 1$ s)	V_{RSM}	max.	30	V

Currents

Forward current (d.c.)	I_F	max.	130	mA
Average rectified forward current (averaged over any 20 ms period)	I_{FAV}	max.	130	mA
Repetitive peak forward current	I_{FRM}	max.	300	mA
Non repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	400	mA

Temperatures

Storage temperature	T_{stg}	-65 to +75		^oC
Junction temperature	T_j	max.	75	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\,j-a}$	=	0.55	$^oC/mW$

CHARACTERISTICS

Forward voltage at T_j = 25 °C

I_F = 0,1 mA	V_F < 0,20 V
I_F = 1,0 mA	V_F < 0,30 V
I_F = 10 mA	V_F < 0,42 V
I_F = 30 mA	V_F < 0,50 V
I_F = 150 mA [1])	V_F < 0,75 V
I_F = 300 mA [1])	V_F < 1,00 V

Forward voltage at T_j = 60 °C

I_F = 0,1 mA	V_F < 0,14 V
I_F = 1,0 mA	V_F < 0,25 V
I_F = 10 mA	V_F < 0,38 V
I_F = 30 mA	V_F < 0,48 V
I_F = 150 mA [1])	V_F < 0,75 V

Reverse current at T_j = 25 °C

V_R = 1,5 V	I_R < 3,5 µA
V_R = 10 V	I_R < 15 µA
V_R = 20 V	I_R < 50 µA

Reverse current at T_j = 60 °C

V_R = 1,5 V	I_R < 30 µA
V_R = 10 V	I_R < 45 µA
V_R = 20 V	I_R < 100 µA

Diode capacitance at T_j = 25 °C

V_R = 1 V; f = 1 MHz	C_d < 2,5 pF

1) Measured under pulse conditions to avoid excessive dissipation.

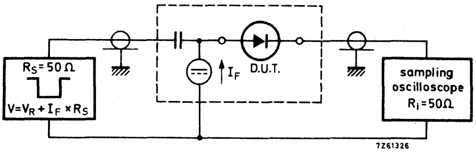
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

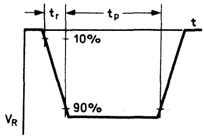
Reverse recovery time when switched from

I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω;

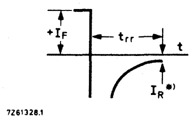
measured at I_R = 1 mA t_{rr} < 70 ns

Test circuit and waveforms :





input signal



output signal

Input signal : Rise time of the reverse pulse t_r = 0,6 ns *) I_R = 1 mA

Reverse pulse duration t_p = 100 ns

Duty factor δ = 0,05

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

GOLD BONDED DIODE

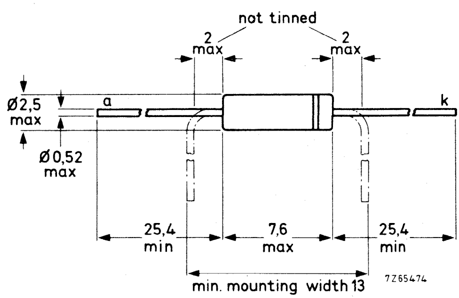
Germanium diode in all-glass DO-7 envelope, intended for switching applications and general purposes.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	25	V
Repetitive peak reverse voltage	V_{RRM}	max.	25	V
Forward current (d.c.)	I_F	max.	110	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Junction temperature	T_j	max.	75	°C
Forward voltage at I_F = 150 mA	V_F	<	1,1	V
Recovery charge when switched from I_F = 10 mA to V_R = 10 V	Q_s	<	600	pC

MECHANICAL DATA

Dimensions in mm

DO-7



The coloured band indicates the cathode

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

Voltages

Continuous reverse voltage	V_R	max.	25	V
Repetitive peak reverse voltage	V_{RRM}	max.	25	V
Non-repetitive peak reverse voltage ($t < 1$ s)	V_{RSM}	max.	30	V

Currents

Forward current (d.c.)	I_F	max.	110	mA
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	110	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	200	mA

Temperatures

Storage temperature	T_{stg}	-65 to +75		^oC
Junction temperature	T_j	max.	75	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\,j\text{-}a}$	=	0.55	$^oC/mW$

CHARACTERISTICS

Forward voltage at $T_j = 25\ ^oC$

I_F = 0,1 mA	V_F < 0,20 V
I_F = 1,0 mA	V_F < 0,31 V
I_F = 10 mA	V_F < 0,45 V
I_F = 30 mA	V_F < 0,65 V
I_F = 150 mA	V_F < 1,10 V

Forward voltage at $T_j = 60\ ^oC$

I_F = 0,1 mA	V_F < 0,14 V
I_F = 1,0 mA	V_F < 0,28 V
I_F = 10 mA	V_F < 0,43 V
I_F = 30 mA	V_F < 0,62 V
I_F = 150 mA	V_F < 1,10 V

Reverse current at $T_j = 25\ ^oC$

V_R = 1,5 V	I_R < 3,5 μA
V_R = 10 V	I_R < 15 μA
V_R = 20 V	I_R < 50 μA
V_R = 25 V	I_R < 100 μA

Reverse current at $T_j = 60\ ^oC$

V_R = 1,5 V	I_R < 20 μA
V_R = 10 V	I_R < 40 μA
V_R = 20 V	I_R < 90 μA
V_R = 25 V	I_R < 160 μA

Diode capacitance at $T_j = 25\ ^oC$

V_R = 1 V; f = 1 MHz	C_d < 3,5 pF

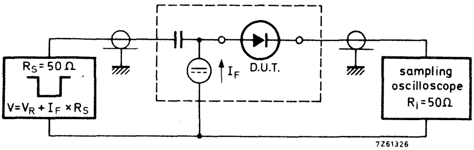
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

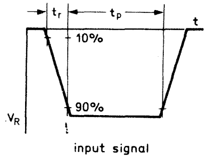
Reverse recovery time when switched from

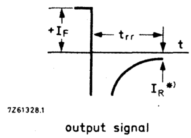
I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω;

measured at I_R = 1 mA t_{rr} < 70 ns

Test circuit and waveforms :







Input signal	: Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	

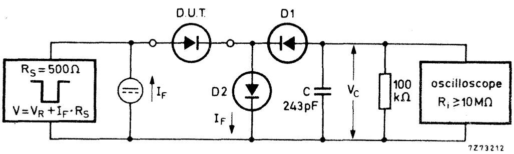
Oscilloscope : Rise time t_r = 0,35 ns

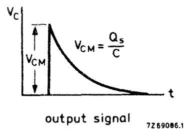
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from

I_F = 10 mA to V_R = 10 V; R_L = 1 kΩ Q_s < 600 pC

Test circuit and waveform :





D1 = D2 = BAW62

Input signal	: Rise time of the reverse pulse	t_r = 2 ns
	Reverse pulse duration	t_p = 400 ns
	Duty factor	δ = 0,02

Silicon small signal diodes

Alloyed

ALLOYED DIODES

Silicon diodes in DO-7 envelope

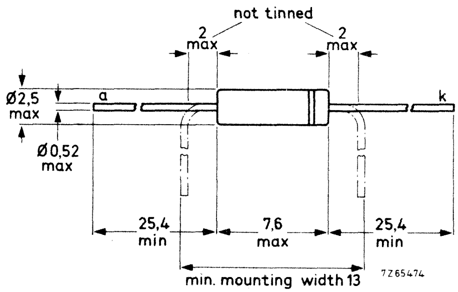
Quoted values are max.

	type	V_R (V)	I_F (mA)	I_{FRM} (mA)	C_d (pF)	V_F (V)	at I_F (mA)
general purpose	BA100	60	90	100	–	1,5	30
	OA200	50	160	250	25	1,15	30
	OA202	150	160	250	25	1,15	30

MECHANICAL DATA

Dimensions in mm

DO-7



Cathode indicated by coloured band

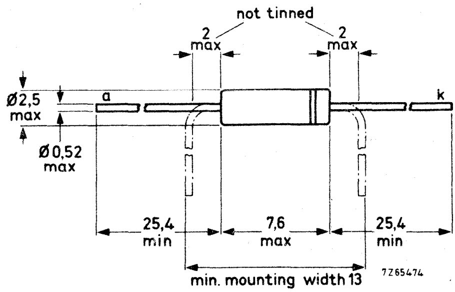
SILICON DIODE

General purpose diode in all-glass DO-7 envelope.

MECHANICAL DATA

Dimensions in mm

DO-7



The coloured band indicates the cathode

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

Voltage				
Continuous reverse voltage	V_R	max.	60	V
Currents				
Forward current (d.c.)	I_F	max.	90	mA
Repetitive peak forward current	I_{FRM}	max.	100	mA
Non-repetitive peak forward current ($t \leq 1$ s)	I_{FSM}	max.	200	mA
Temperatures				
Storage temperature	T_{stg}		−55 to +90	°C
Junction temperature	T_j	max.	90	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0.4	°C/mW

CHARACTERISTICS

Forward voltage		T_{amb} = 25 °C	T_{amb} = 60 °C	
I_F = 0.1 mA	V_F	typ. 0.55	typ. 0.5	V
		< 0.75		V
I_F = 1.0 mA	V_F	typ. 0.65	typ. 0.6	V
		0.5 to 1.0	0.4 to 0.9	V
I_F = 30 mA	V_F	typ. 0.9	typ. 0.85	V
		< 1.5	< 1.5	V

Reverse current		T_{amb} = 60 °C	T_{amb} = 75 °C	
V_R = 10 V	I_R	typ. 5.0	< 10	μA
V_R = 60 V	I_R	typ. 10	< 20	μA

SILICON DIODES

Silicon alloyed general purpose diodes in all-glass DO-7 envelopes.

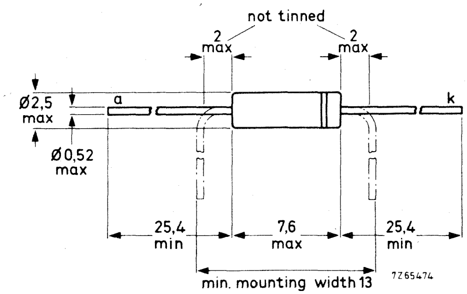
QUICK REFERENCE DATA

			OA200	OA202	
Continuous reverse voltage	V_R	max.	50	150	V
Repetitive peak forward current	I_{FRM}	max.	250		mA
Thermal resistance from junction to ambient	$R_{th\ j-a}$	=	0,4		°C/mW
Forward voltage I_F = 30 mA; T_{amb} = 25 °C	V_F	typ.	0,9		V
Reverse recovery time when switched from I_F = 30 mA to V_R = 35 V; R_L = 2,5 kΩ; measured at I_R = 4 mA	t_{rr}	typ.	3,5		μs

MECHANICAL DATA

Dimensions in mm

DO-7



The coloured band indicates the cathode

RATINGS (Limiting values) [1]

Voltage

Continuous reverse voltage OA200	V_R	max.	50	V
OA202	V_R	max.	150	V

Currents

			T_{amb} = 25 °C	T_{amb} = 125 °C	
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	160	48	mA
Average forward current for sinusoidal operation	$I_{F(AV)}$	max.	80	40	mA
Forward current (d.c.; see page 4)	I_F	max.	160	48	mA
Repetitive peak forward current	I_{FRM}	max.	250	125	mA

Temperatures

Storage temperature	T_{stg}	−55 °C to	+125	°C
Operating junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,4	°C/mW

CHARACTERISTICS

				T_{amb} = 25 °C	T_{amb} = 125 °C	
Forward voltage						
I_F = 0,1 mA		V_F	typ.	0,52	–	V
			<	0,62	0,30	V
I_F = 10 mA		V_F	typ.	0,80	–	V
			<	0,96	0,65	V
I_F = 30 mA		V_F	typ.	0,90	–	V
			<	1,15	0,80	V
Reverse current						
$V_R = V_{Rmax}$	OA200	I_R	typ.	0,02	1	μA
			<	0,10	10	μA
	OA202	I_R	typ.	0,01	0,5	μA
			<	0,10	10	μA

Diode capacitance at T_{amb} = 25 °C

V_R = 0,75 V; f = 0,5 MHz	C_d	typ.	10	pF
		<	25	pF

[1] Limiting values according to the Absolute Maximum System as defined in IEC publication 134.

CHARACTERISTICS (continued) T_{amb} = 25 °C

Reverse recovery current when switched from

I_F = 5 mA to V_R = 5 V; R_L = 2 .5 kΩ

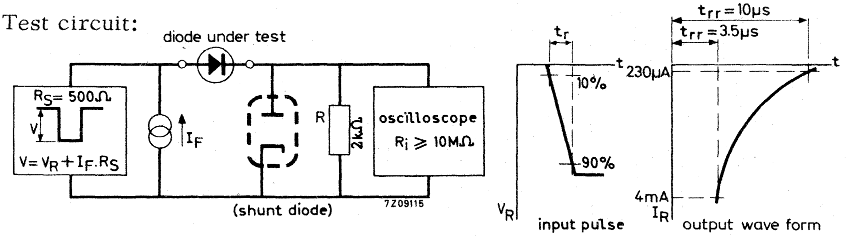
measured at t_{rr} = 3.5 μs	I_R	typ.	1.2	mA
t_{rr} = 10 μs	I_R	typ.	35	μA

Reverse recovery current when switched from

I_F = 30 mA to V_R = 35 V; R_L = 2.5 kΩ

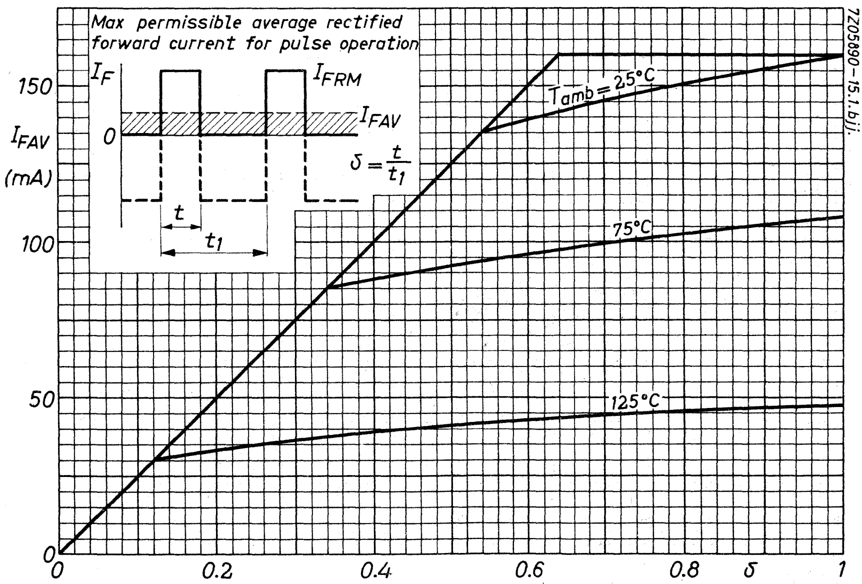
measured at t_{rr} = 3.5 μs	I_R	typ.	4	mA
t_{rr} = 10 μs	I_R	typ.	230	μA

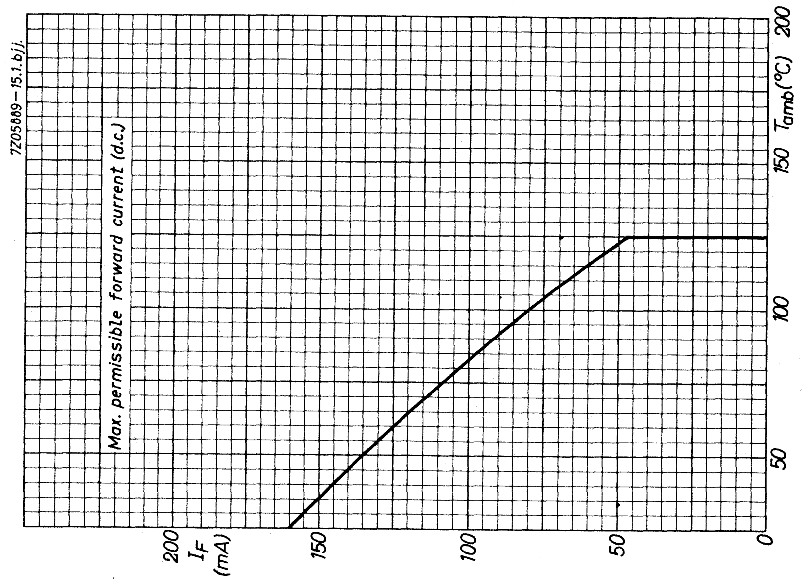
Test circuit:

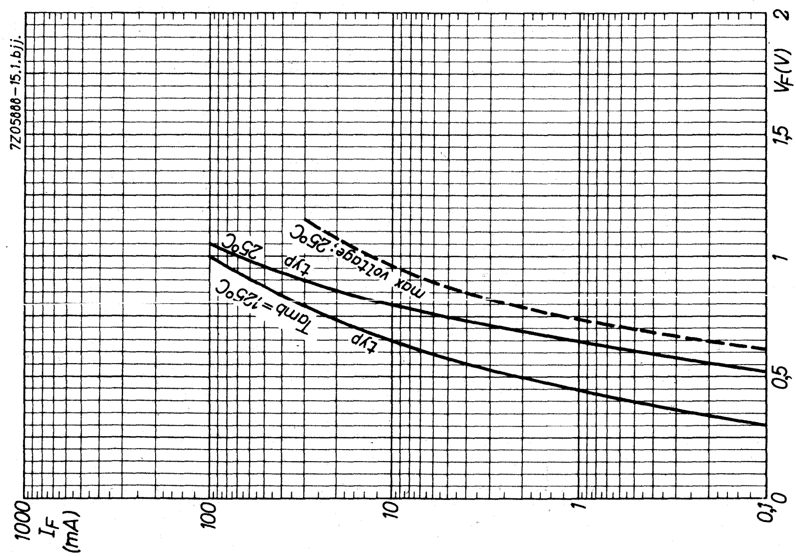


Reverse pulse: Rise time $t_r \leq 0.1$ μs
Duty cycle δ = 0.5
Frequency f = 50 kHz

Oscilloscope: Capacitance C = 40 pF
Rise time t_r = 25 ns




7Z05889-15.1.bjj.
Max. permissible forward current (d.c.)
I_F (mA)
200
150
100
50
0
T_{amb} (°C)
200
150
100
50


7Z05888-15.1.bjj.
I_F (mA)
1000
100
10
1
0,1
V_F (V)
2
1,5
1
0,5
0
max voltage; 25°C
typ 25°C
typ T_{amb} = 125°C

Silicon small signal diodes

Whiskerless

WHISKERLESS DIODES

Silicon diodes in DO-35 envelope

Quoted values are max.

	type	V_R (V)	I_F (mA)	I_{FRM} (mA)	t_{rr} (ns)	C_d (pF)	V_F (V)	at I_F (mA)
→ general purpose	BA220	–	200	400	4	2,5	0,95	100
	BA221	30	200	400	4	2,5	1,05	200
	BA222	50	75	150	4	2	1,1	50
	BA316	10	100	225	4	2	1,1	100
	BA317	30	100	225	4	2	1,1	100
	BA318	50	100	225	4	2	1,1	100
	BAX14A	20	500	2000	300	35	0,95	300
	BAX18A	75	500	2000	–	35	0,95	300
	1N914	75	75	225	4	4	1,0	10
	1N914A	75	75	225	4	4	1,0	20
	1N916	75	75	225	4	2	1,0	10
	1N916A	75	75	225	4	2	1,0	20
	1N916B	75	75	225	4	2	1,0	30
high speed switching general purpose	BAW62	75	100	225	4	2	1	100
	1N4009	25	–	–	2	4	1	30
	1N4148	75	75	225	4	4	1	10
	1N4151	50	200	450	2	2	1	50
	1N4154	25	200	450	2	4	1	30
	1N4446	75	200	450	4	4	1	20
	1N4448	75	200	450	4	4	1	100
high speed core-gating	BAV10	60	300	600	6	2,5	1,25	500
	1N4150	50	300	600	6	2,5	1	200
high speed, high voltage	BAV18	50	250	625	50	5,0	1,25	200
	BAV19	100	250	625	50	5,0	1,25	200
	BAV20	150	250	625	50	5,0	1,25	200
	BAV21	200	250	625	50	5,0	1,25	200
→ avalanche for telephony	BAW21A	70	400	800	300	35	1,0	200
	BAW21B	90	400	800	300	35	1,0	200
	BAX12A	90	400	800	50	35	1,0	200

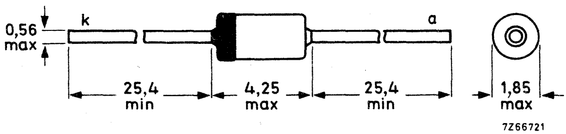
Silicon diodes in SOD-17 envelope **Quoted values are max.**

	type	V_R (V)	I_F (mA)	I_{FRM} (mA)	t_{rr} (ns)	C_d (pF)	V_F (V)	at I_F (mA)
general purpose	BA216	–	75	150	4	3	1	15
	BA217	30	75	150	4	3	1,5	50
	BA218	50	75	150	4	3	1,5	50
	BA219	100	100	300	120	5	1,4	100
general industrial	BAX13	50	75	150	4	3	1,53	75
	BAX14	20	500	2000	50	35	1,1	300
	BAX15	150	250	500	300	20	1,35	250
	BAX16	150	200	300	120	10	1,5	200
	BAX17	200	200	300	120	10	1,2	200
	BAX18	75	500	2000	–	–	1,2	500
avalanche for telephony	BAX12	90	400	800	50	35	1,25	400

MECHANICAL DATA

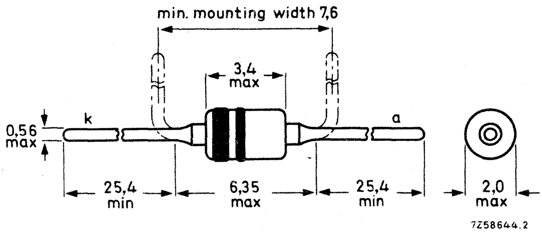
Dimensions in mm

DO-35



Cathode indicated by coloured band or
broad band of colour code

SOD-17



Cathode indicated by broad band
of colour code

SILICON OXIDE PASSIVATED DIODE

Whiskerless diode in a hard glass subminiature envelope. The diode is intended for low voltage regulation such as bias stabilizer in class-B output stages, clipping, clamping and meter protection.

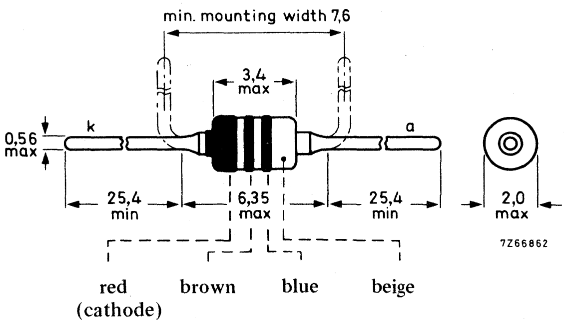
QUICK REFERENCE DATA

Repetitive peak reverse voltage	V_{RRM}	max.	10	V
Repetitive peak forward current	I_{FRM}	max.	150	mA
Storage temperature	T_{stg}	-65 to	+200	°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0, 60	°C/mW
Forward voltage at I_F = 0, 2 mA	V_F	500 to	620	mV
I_F = 3, 0 mA	V_F	600 to	800	mV
I_F = 15 mA	V_F	700 to	1000	mV
Temperature coefficient at I_F = 3 mA	S_F	typ.	-2	mV/°C
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA

Dimensions in mm

SOD-17



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

Voltage				
Repetitive peak reverse voltage	V_{RRM}	max.	10	V
Currents				
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	75	mA [1]
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current t = 1 µs	I_{FSM}	max.	1000	mA
t = 1 s	I_{FSM}	max.	250	mA
Temperatures				
Storage temperature	T_{stg}	-65 to	+200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,60	°C/mW

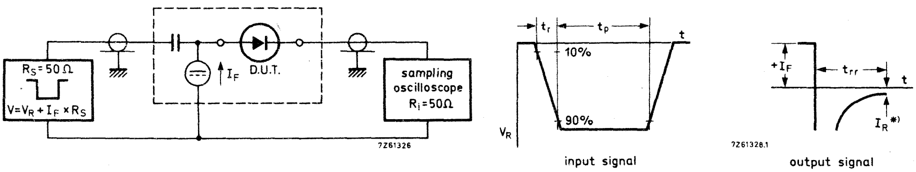
[1]) For sinusoidal operation $I_{F(AV)}$ = 48 mA.

CHARACTERISTICS

$T_j = 25\ ^oC$

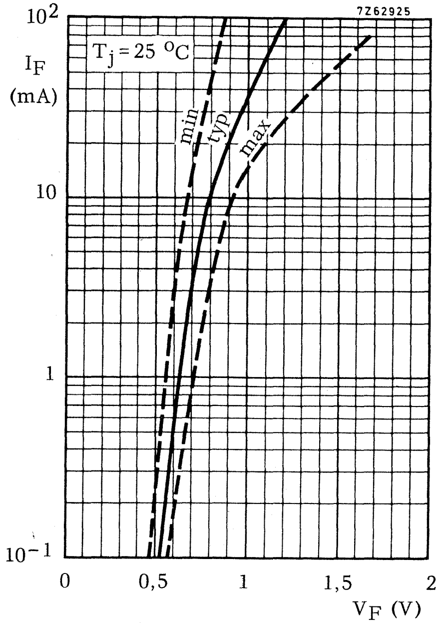
Forward voltage				
$I_F = 0,2$ mA	V_F	700 to	620	mV
$I_F = 3,0$ mA	V_F	600 to	800	mV
$I_F = 15$ mA	V_F	700 to	1000	mV
Reverse current				
$V_R = 10$ V	I_R	<	1500	nA
Diode capacitance				
$V_R = 0$; f = 1 MHz	C_d	<	3	pF
Temperature coefficient				
$I_F = 3$ mA	S_F	typ.	−2	mV/°C
Reverse recovery time when switched from $I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$; measured at $I_R = 1$ mA	t_{rr}	<	4	ns

Test circuit and waveforms:



Input signal :	Rise time of the reverse pulse	t_r = 0,6 ns	*) $I_R = 1$ mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope:	Rise time	t_r = 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z62925
10^2
I_F
(mA)
$T_j = 25\ ^oC$
min
typ
max
10
1
10^{-1}
0
0,5
1
1,5
2
V_F (V)

SILICON OXIDE PASSIVATED DIODE

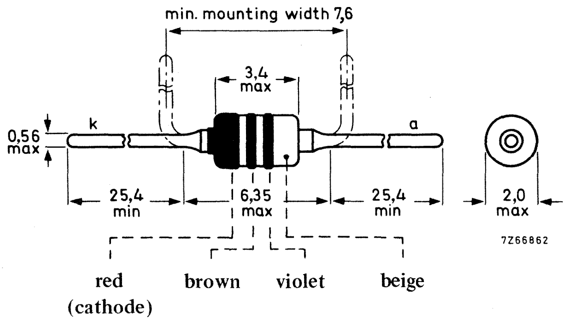
Whiskerless diode in a hard glass subminiature envelope. The diode is intended for general purpose consumer applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	30	V
Repetitive peak forward current	I_{FRM}	max.	150	mA
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 1 mA	V_F	<	0,7	V
I_F = 10 mA	V_F	<	1,0	V
I_F = 50 mA	V_F	<	1,5	
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA

Dimensions in mm

SOD-17



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

Voltages

Continuous reverse voltage	V_R	max.	30	V
Repetitive peak reverse voltage	V_{RRM}	max.	30	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	75	mA [1]
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,60	°C/mW

CHARACTERISTICS T_j = 25 °C

Forward voltage

I_F = 1 mA	V_F	<	0,7	V
I_F = 10 mA	V_F	<	1,0	V
I_F = 50 mA	V_F	<	1,5	V

Reverse current

V_R = 10 V	I_R	<	50	nA
V_R = 30 V	I_R	<	200	nA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	3	pF

[1]) For sinusoidal operation $I_{F(AV)}$ = 48 mA.

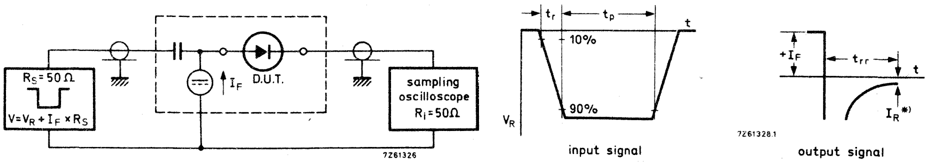
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Reverse recovery time when switched from

I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω;

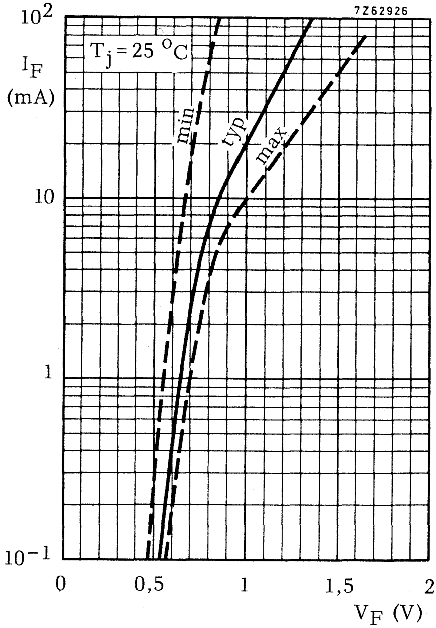
measured at I_R = 1 mA t_{rr} < 4 ns

Test circuit and waveforms :



Input signal	: Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope	: Rise time	t_r = 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z62926
10^2
I_F
(mA)
$T_j = 25\ ^oC$
min
typ
max
10
1
10^{-1}
0
0,5
1
1,5
2
V_F (V)

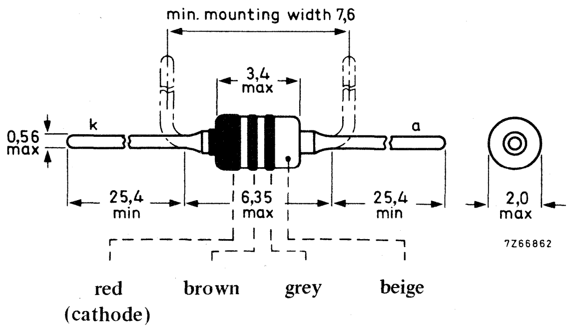
SILICON OXIDE PASSIVATED DIODE

Whiskerless diode in a hard glass subminiature envelope. The diode is intended for general purpose consumer applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	50	V
Repetitive peak forward current	I_{FRM}	max.	150	mA
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 1 mA	V_F	<	0,7	V
I_F = 10 mA	V_F	<	1,0	V
I_F = 50 mA	V_F	<	1,5	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA Dimensions in mm

SOD-17



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

Voltages

Continuous reverse voltage	V_R	max.	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	50	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	75	mA [1]
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current t = 1 µs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS T_j = 25 °C

Forward voltage

I_F = 1 mA	V_F	<	0,7	V
I_F = 10 mA	V_F	<	1,0	V
I_F = 50 mA	V_F	<	1,5	V

Reverse current

V_R = 25 V	I_R	<	50	nA
V_R = 50 V	I_R	<	200	nA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	3	pF

[1] For sinusoidal operation $I_{F(AV)}$ = 48 mA.

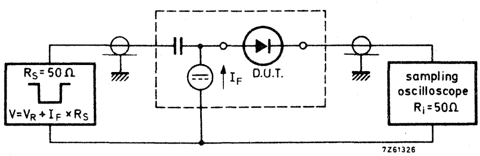
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

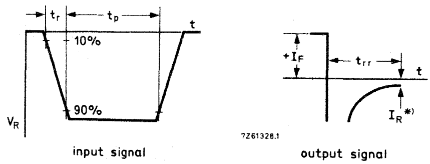
Reverse recovery time when switched from

$I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$;

measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms :





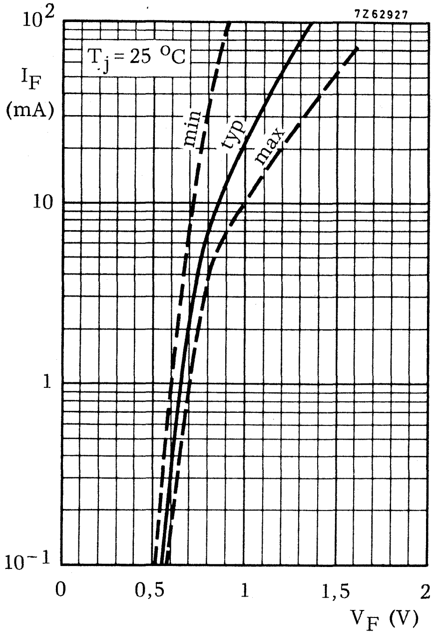
Input signal : Rise time of the reverse pulse t_r = 0, 6 ns *) $I_R = 1$ mA

Reverse pulse duration t_p = 100 ns

Duty factor δ = 0, 05

Oscilloscope : Rise time t_r = 0, 35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z62927
10^2
I_F
(mA)
$T_j = 25\ ^oC$
min
typ
max
10
1
10^{-1}
0
0,5
1
1,5
2
V_F (V)

SILICON OXIDE PASSIVATED DIODE

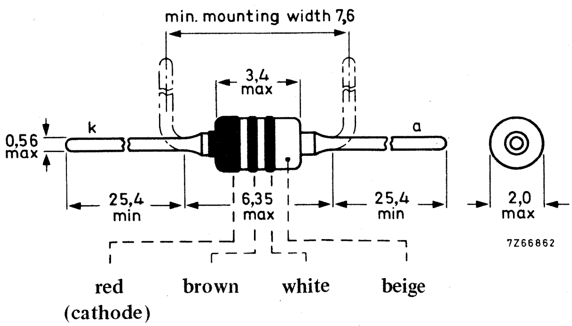
Whiskerless diode in a hard glass subminiature envelope. The diode is intended for general purpose consumer applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	100	V
Repetitive peak forward current	I_{FRM}	max.	300	mA
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 1 mA	V_F	<	0,65	V
I_F = 10 mA	V_F	<	0,85	V
I_F = 100 mA	V_F	<	1,40	V
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	120	ns

MECHANICAL DATA

Dimensions in mm

SOD-17



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

Voltages

Continuous reverse voltage	V_R	max.	100	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	100	mA
Forward current (d.c.)	I_F	max.	100	mA
Repetitive peak forward current	I_{FRM}	max.	300	mA
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS $T_j = 25\ ^oC$

Forward voltage

$I_F = 1$ mA	V_F	<	0,65	V
$I_F = 10$ mA	V_F	<	0,85	V
$I_F = 100$ mA	V_F	<	1,40	V

Reverse current

$V_R = 50$ V	I_R	<	200	nA
$V_R = 100$ V	I_R	<	500	nA

Diode capacitance

$V_R = 0$; f = 1 MHz	C_d	<	5	pF

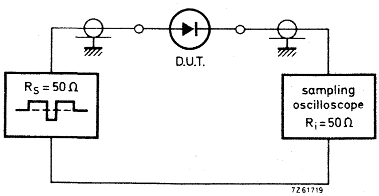
CHARACTERISTICS (continued) $T_j = 25\ ^{o}C$

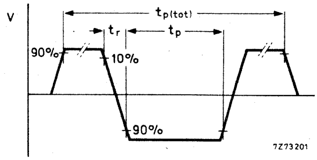
Reverse recovery time when switched from

I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω;

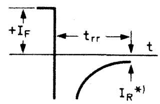
measured at I_R = 3 mA t_{rr} < 120 ns

Test circuit and waveforms:





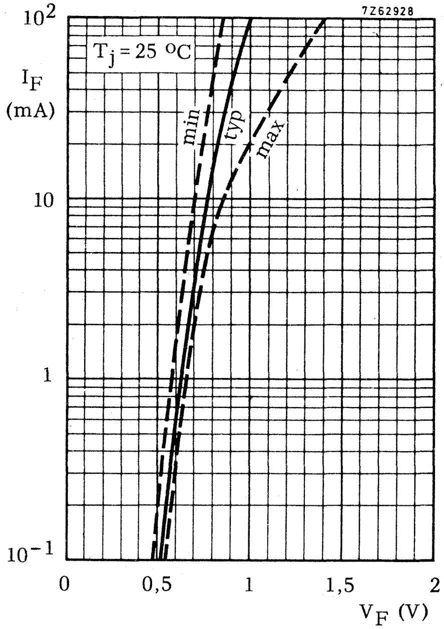
input signal



output signal

Input signal :	Total pulse duration	$t_{p(tot)}$	= 10 μs	*) I_R = 3 mA
	Duty factor	δ	= 0,0025	
	Rise time of the reverse pulse	t_r	= 0,6 ns	
	Reverse pulse duration	t_p	= 300 ns	
Oscilloscope :	Rise time	t_r	= 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z62928
10^2
$T_j = 25\ ^oC$
I_F
(mA)
min
typ
max
10
1
10^{-1}
0
0,5
1
1,5
2
V_F (V)

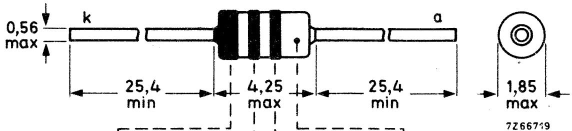
GENERAL PURPOSE DIODE

Silicon planar epitaxial diode in a DO-35 envelope; intended for general purpose and can also be used as regulator.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	10	V
Repetitive peak forward current	I_{FRM}	max.	400	mA
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,50	°C/mW
Forward voltage at I_F = 0,1 mA	V_F		460 to 520	mV
I_F = 1,0 mA	V_F		560 to 620	mV
I_F = 10 mA	V_F		680 to 750	mV
I_F = 100 mA	V_F		825 to 950	mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<	2,5	pF
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA Dimensions in mm

DO-35



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

Voltage

Repetitive peak reverse voltage	V_{RRM}	max.	10	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	200	mA [1]
Forward current (d.c.)	I_F	max.	200	mA
Repetitive peak forward current	I_{FRM}	max.	400	mA
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	4000	mA
t = 1 s	I_{FSM}	max.	1000	mA

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,50	°C/mW

CHARACTERISTICS $T_j = 25$ °C

Forward voltage

I_F = 0,1 mA	V_F	460 to 520	mV
I_F = 1,0 mA	V_F	560 to 620	mV
I_F = 5,0 mA	V_F	640 to 700	mV
I_F = 10 mA	V_F	680 to 750	mV
I_F = 100 mA	V_F	825 to 950	mV

Reverse current

V_R = 10 V	I_R	<	1500	nA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2,5	pF

[1]) For sinusoidal operation $I_{F(AV)}$ = 130 mA.

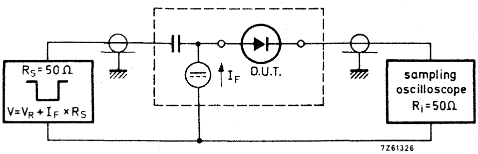
CHARACTERISTICS (continued) T_j = 25 °C

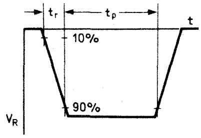
Reverse recovery time when switched from

I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω;

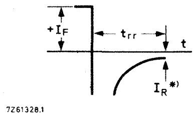
measured at I_R = 1 mA t_{rr} < 4 ns

Test circuit and waveforms :





input signal



output signal

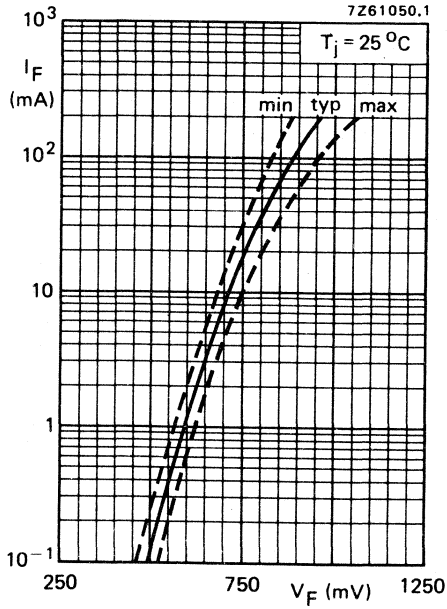
Input signal : Rise time of the reverse pulse t_r = 0,6 ns *) I_R = 1 mA

Reverse pulse duration t_p = 100 ns

Duty factor δ = 0,05

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z61050.1
T_j = 25 °C
I_F (mA)
10^3
10^2
10
1
10^{-1}
min
typ
max
250
750
1250
V_F (mV)

GENERAL PURPOSE DIODE

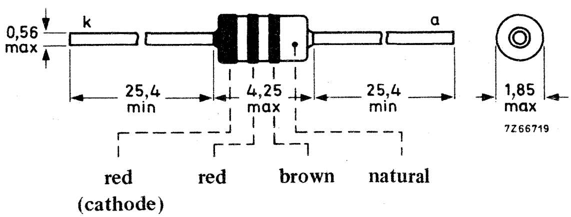
Silicon planar epitaxial diode in a DO-35 envelope; intended for general purposes.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	30	V
Repetitive peak forward current	I_{FRM}	max.	400	mA
Storage temperature	T_{stg}	−65 to +200		^oC
Junction temperature	T_j	max.	200	^oC
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,50	$^oC/mW$
Forward voltage at I_F = 1 mA	V_F	<	625	mV
I_F = 100 mA	V_F	<	950	mV
I_F = 200 mA	V_F	<	1050	mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<	2,5	pF
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA

Dimensions in mm

DO-35



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

Voltages				
Continuous reverse voltage	V_R	max.	30	V
Repetitive peak reverse voltage	V_{RRM}	max.	30	V
Currents				
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	200	mA [1]
Forward current (d.c.)	I_F	max.	200	mA
Repetitive peak forward current	I_{FRM}	max.	400	mA
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	4000	mA
t = 1 s	I_{FSM}	max.	1000	mA
Temperatures				
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,50	°C/mW

CHARACTERISTICS T_j = 25 °C

Forward voltage				
I_F = 1 mA	V_F	<	625	mV
I_F = 100 mA	V_F	<	950	mV
I_F = 200 mA	V_F	<	1050	mV
Reverse current				
V_R = 10 V	I_R	<	25	nA
V_R = 30 V	I_R	<	200	nA
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	2,5	pF

[1]) For sinusoidal operation $I_{F(AV)}$ = 130 mA.

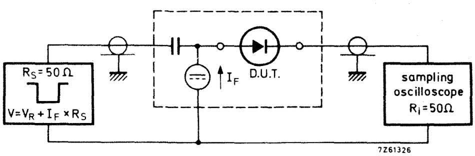
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

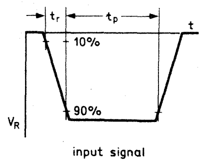
Reverse recovery time when switched from

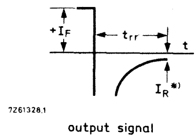
$I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$;

measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms :







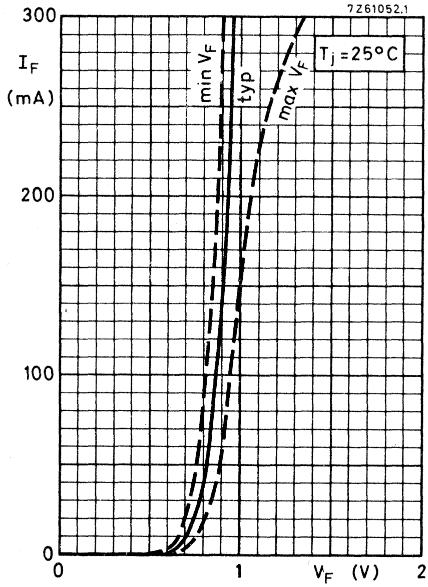
Input signal : Rise time of the reverse pulse t_r = 0,6 ns *) I_R = 1 mA

Reverse pulse duration t_p = 100 ns

Duty factor δ = 0,05

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z61052.1
300
200
100
0
I_F
(mA)
min V_F
typ
max V_F
$T_j = 25 °C$
0
1
2
V_F (V)

GENERAL PURPOSE DIODE

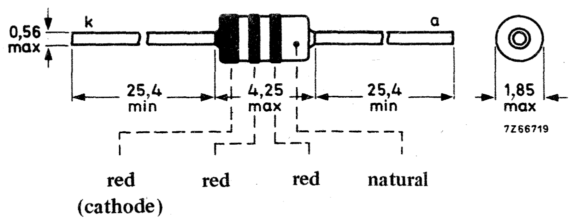
Silicon planar epitaxial diode in a DO-35 envelope; intended for general purposes.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	50	V
Repetitive peak forward current	I_{FRM}	max.	150	mA
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 1 mA	V_F	<	700	mV
I_F = 10 mA	V_F	<	900	mV
I_F = 50 mA	V_F	<	1100	mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<	2,0	pF
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA

Dimensions in mm

DO-35



FOR NEW DESIGN THE SUCCESSOR TYPE BA318 IS RECOMMENDED

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

Voltages

Continuous reverse voltage	V_R	max.	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	50	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	75	mA [1]
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current t = 1 µs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS T_j = 25 °C

Forward voltage

I_F = 1 mA	V_F	<	700	mV
I_F = 10 mA	V_F	<	900	mV
I_F = 50 mA	V_F	<	1100	mV

Reverse current

V_R = 25 V	I_R	<	50	nA
V_R = 50 V	I_R	<	200	nA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2	pF

[1] For sinusoidal operation $I_{F(AV)}$ = 48 mA.

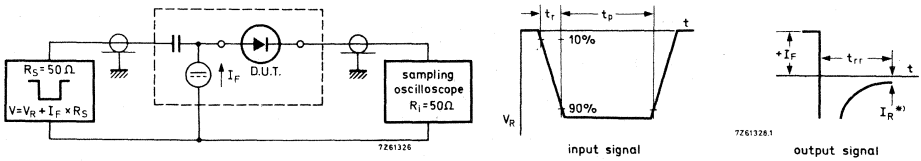
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Reverse recovery time when switched from

I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω;

measured at I_R = 1 mA t_{rr} < 4 ns

Test circuit and waveforms :



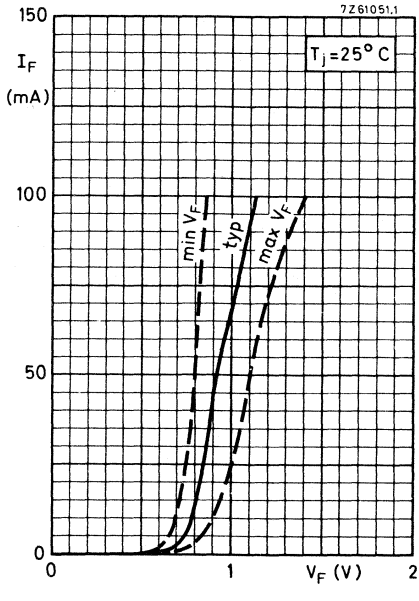
Input signal : Rise time of the reverse pulse t_r = 0,6 ns *) I_R = 1 mA

Reverse pulse duration t_p = 100 ns

Duty factor δ = 0,05

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z61051.1
150
I_F
(mA)
100
50
0
0
1
V_F (V)
2
$T_j = 25°C$
min V_F
typ
max V_F

10 V, 30 V and 50 V GENERAL PURPOSE DIODES

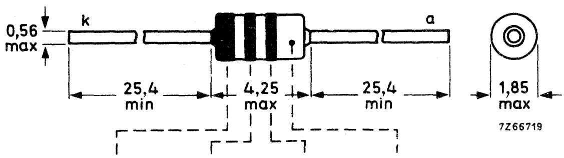
Silicon planar epitaxial diodes in DO-35 envelopes intended for general purpose applications.
They have reverse voltages up to 10 V for BA316, 30 V for BA317 and 50 V for BA318.

QUICK REFERENCE DATA

			BA316	BA317	BA318	
Continuous reverse voltage	V_R	max.	10	30	50	V
Repetitive peak forward current	I_{FRM}	max.		225		mA
Storage temperature	T_{stg}			−65 to +200		°C
Junction temperature	T_j	max.		200		°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=		0,60		°C/mW
Forward voltage at I_F = 1,0 mA	V_F	<		700		mV
I_F = 10 mA	V_F	<		850		mV
I_F = 100 mA	V_F	<		1100		mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<		2		pF
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<		4		ns

MECHANICAL DATA Dimensions in mm

DO-35



BA316:	**orange**	**brown**	**blue**	**natural**
BA317:	**orange**	**brown**	**violet**	**natural**
BA318:	**orange** (cathode)	**brown**	**grey**	**natural**

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

Voltage

			BA316	BA317	BA318	
Continuous reverse voltage	V_R	max.	10	30	50	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	100	mA	1)
Forward current (d.c.)	I_F	max.	100	mA	
Repetitive peak forward current	I_{FRM}	max.	225	mA	
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	2000	mA	
t = 1 s	I_{FSM}	max.	500	mA	

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS $T_j = 25$ °C

Forward voltage

I_F = 1,0 mA	V_F	<	700	mV
I_F = 10 mA	V_F	<	850	mV
I_F = 100 mA	V_F	<	1100	mV

Reverse current

			BA316	BA317	BA318	
V_R = 10 V	I_R	<	200	50	–	nA
V_R = 30 V	I_R	<	–	200	50	nA
V_R = 50 V	I_R	<	–	–	200	nA

Diode capacitance

→ V_R = 0; f = 1 MHz	C_d	<	2	pF

1) For sinusoidal operation see page 6. For pulse operation see pages 4 and 5.

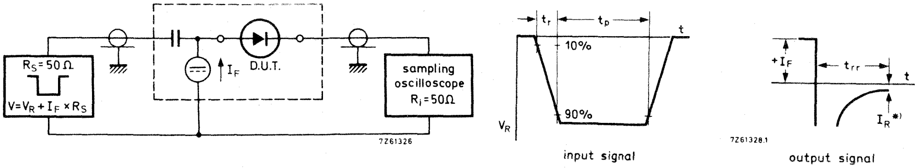
CHARACTERISTICS (continued) T_j = 25 °C

Reverse recovery time when switched from

I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω;

Measured at I_R = 1 mA t_{rr} < 4 ns

Test circuit and waveforms:



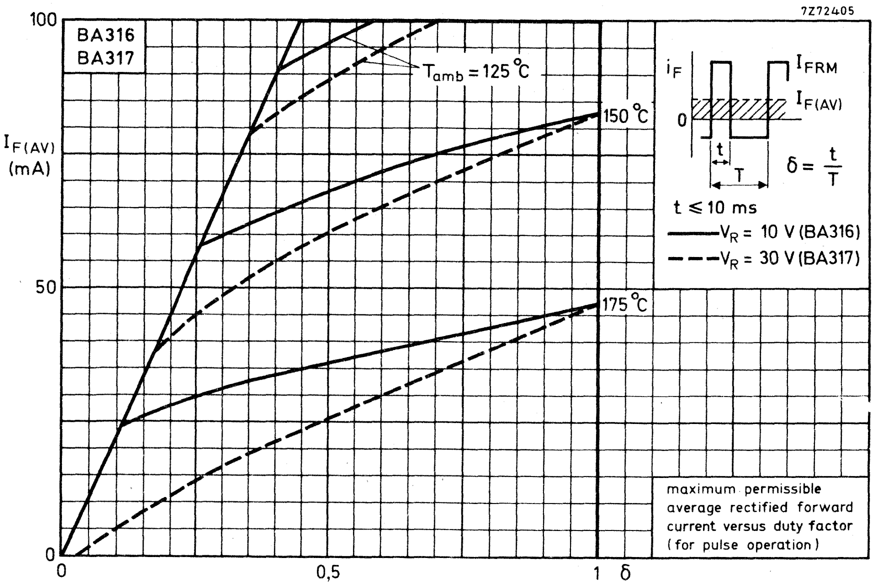
Input signal : Rise time of the reverse pulse t_r = 0,6 ns *) I_R = 1 mA

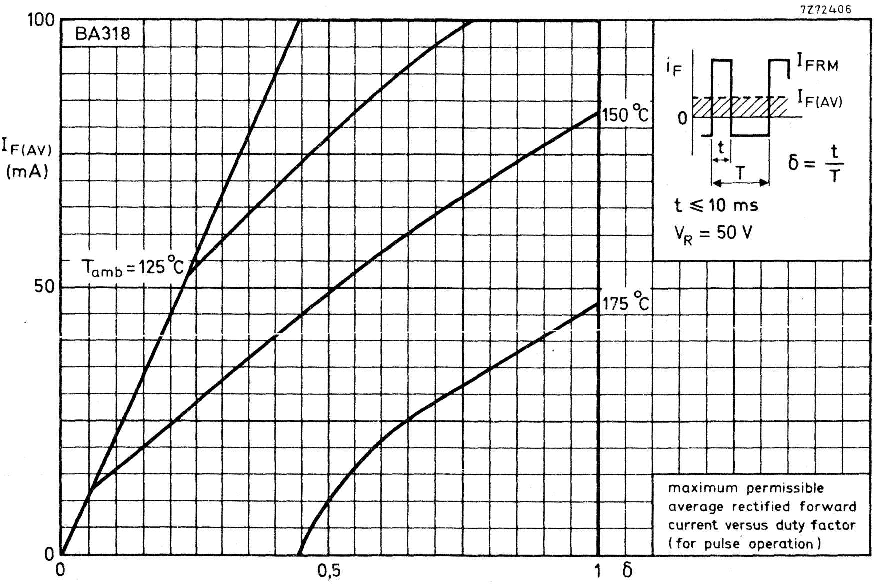
Reverse pulse duration t_p = 100 ns

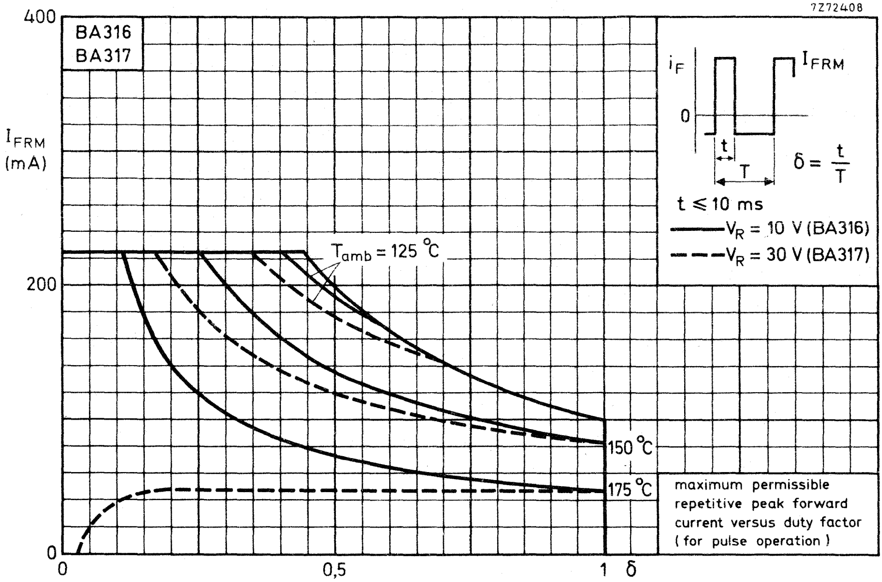
Duty factor δ = 0,05

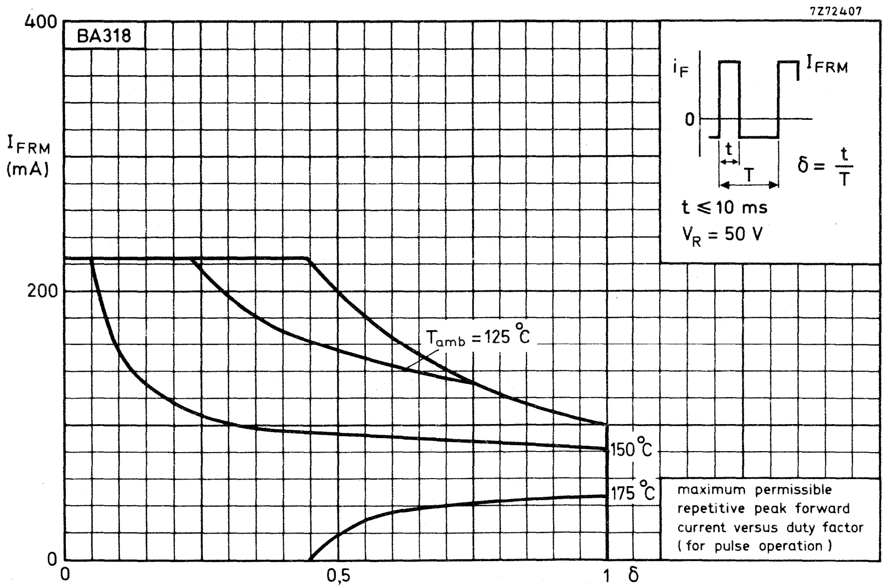
Oscilloscope: Rise time t_r = 0,35 ns

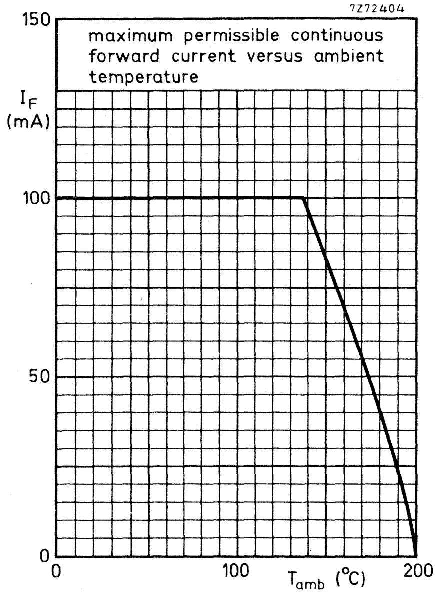
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

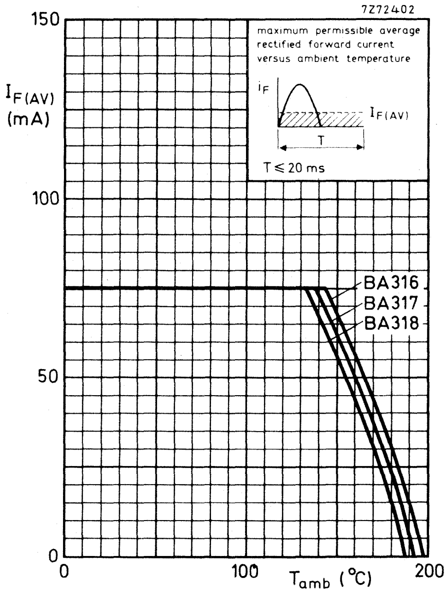

7Z72405
BA316
BA317
T_{amb} = 125 °C
150 °C
175 °C
$I_{F(AV)}$
(mA)
100
50
0
0
0,5
1
δ
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R = 10 V (BA316)
V_R = 30 V (BA317)
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

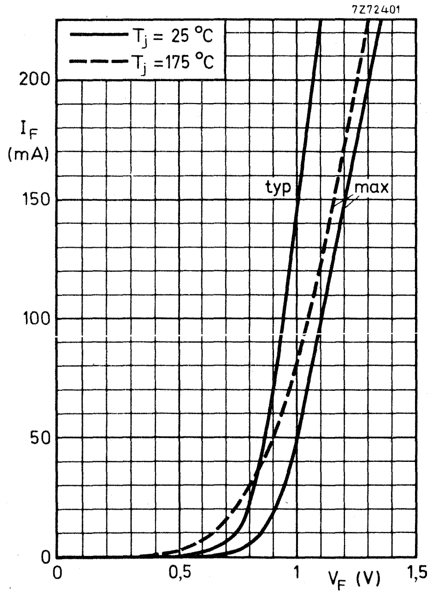

7Z72406
BA318
T_{amb} = 125 °C
150 °C
175 °C
$I_{F(AV)}$
(mA)
100
50
0
0
0,5
1
δ
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R = 50 V
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

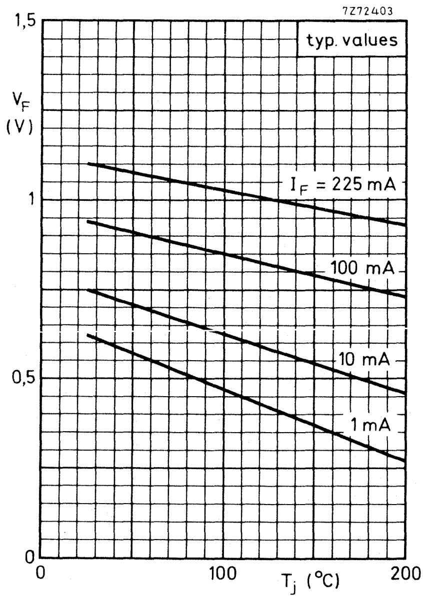

7Z72408
BA316
BA317
400
I_{FRM}
(mA)
200
0
0
0,5
1 δ
T_{amb} = 125 °C
150 °C
175 °C
i_F
I_{FRM}
0
t
T
δ = t/T
t ⩽ 10 ms
V_R = 10 V (BA316)
V_R = 30 V (BA317)
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)

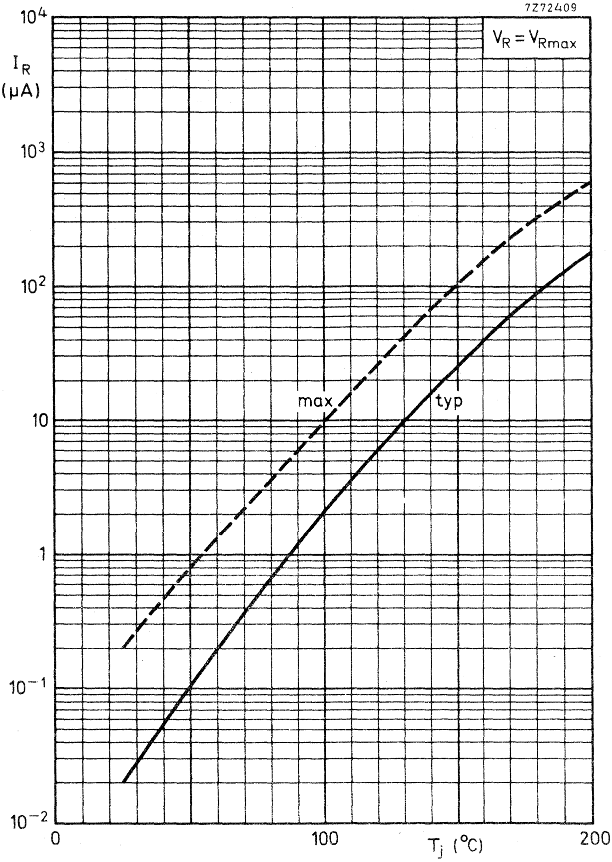

7Z72407
BA318
400
I_{FRM}
(mA)
200
0
0
0,5
1 δ
T_{amb} = 125 °C
150 °C
175 °C
i_F
I_{FRM}
0
t
T
δ = t/T
t ⩽ 10 ms
V_R = 50 V
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)


7Z72404
maximum permissible continuous forward current versus ambient temperature
I_F (mA)
150
100
50
0
0
100
200
T_amb (°C)


7Z72402
maximum permissible average rectified forward current versus ambient temperature
i_F
I_F(AV)
T
T ⩽ 20 ms
I_F(AV) (mA)
150
100
50
0
0
100
200
T_amb (°C)
BA316
BA317
BA318


7Z72401
T_j = 25 °C
T_j = 175 °C
I_F (mA)
200
150
100
50
0
typ
max
0
0,5
1
1,5
V_F (V)


7Z72403
typ. values
V_F (V)
1,5
1
0,5
0
I_F = 225 mA
100 mA
10 mA
1 mA
0
100
200
T_j (°C)


7Z72409
$V_R = V_{Rmax}$
I_R (μA)
10^4
10^3
10^2
10
1
10^{-1}
10^{-2}
max
typ
0
100
200
T_j (°C)

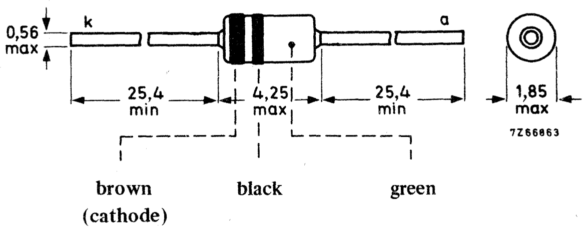
ULTRA-HIGH-SPEED DIODE

Silicon planar epitaxial, ultra-high-speed, high-conductance diode in a DO-35 envelope. The BAV10 is primarily intended for core gating in very fast memories.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	60	V
Repetitive peak reverse voltage	V_{RRM}	max.	60	V
Repetitive peak forward current	I_{FRM}	max.	600	mA
Junction temperature	T_j	max.	200	^oC
Forward voltage at I_F = 200 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 400 mA to I_R = 400 mA; R_L = 100 Ω; measured at I_R = 40 mA	t_{rr}	<	6	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	50	pC

MECHANICAL DATA Dimensions in mm

DO-35



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

Voltages

Continuous reverse voltage	V_R	max.	60	V	
Repetitive peak reverse voltage	V_{RRM}	max.	60	V	1)

Currents

Average rectified forward current	$I_{F(AV)}$	max.	300	mA	2)
Forward current (d.c.)	I_F	max.	300	mA	
Repetitive peak forward current	I_{FRM}	max.	600	mA	
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	4000	mA	
t = 1 s	I_{FSM}	max.	1000	mA	

Temperatures

Storage temperature	T_{stg}		-65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,5	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA	V_F	<	0,75	V
I_F = 200 mA	V_F	<	1,00	V
I_F = 200 mA; T_j = 100 °C	V_F	<	0,95	V
I_F = 500 mA	V_F	<	1,25	V

Reverse current

V_R = 60 V	I_R	<	100	nA
V_R = 60 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2,5	pF

1) Measured at zero life time at I_R = 10 μA; V_R = 75 V.

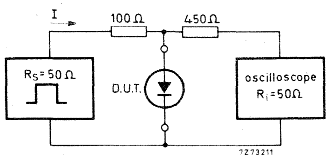
2) For sinusoidal operation see page 6. For pulse operation see page 5.

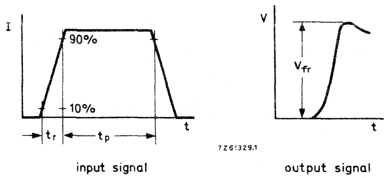
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

I_F = 400 mA; t_{r1} = 30 ns	V_{fr}	<	2,0	V
I_F = 400 mA; t_{r2} = 100 ns	V_{fr}	<	1,5	V

Test circuit and waveforms:





Input signal : 1st rise time of the forward pulse t_{r1} = 30 ns
2nd rise time of the forward pulse t_{r2} = 100 ns
Forward current pulse duration t_p = 300 ns
Duty factor δ = 0,01

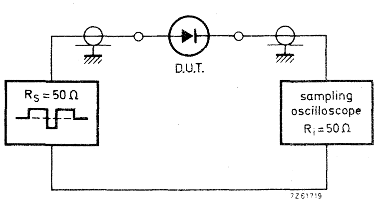
Oscilloscope: Rise time t_r = 0,35 ns
Input capacitance C_i ≤ 1 pF

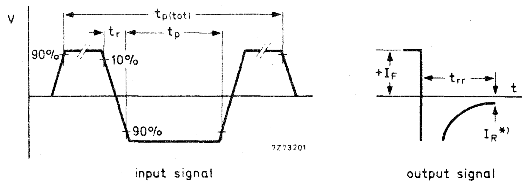
Circuit capacitance C ≤ 20 pF (C = C_i + parasitic capacitance)

Reverse recovery time when switched from

I_F = 400 mA to I_R = 400 mA; R_L = 100 Ω; measured at I_R = 40 mA	t_{rr}	<	6	ns

Test circuit and waveforms:





Input signal : Total pulse duration $t_{p(tot)}$ = 0,2 μs *) I_R = 40 mA
Duty factor δ = 0,0025
Rise time of the reverse pulse t_r = 0,6 ns
Reverse pulse duration t_p = 30 ns

Oscilloscope: Rise time t_r = 0,35 ns

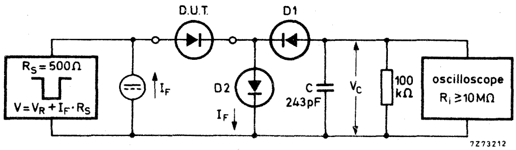
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

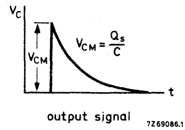
CHARACTERISTICS (continued) $T_j = 25\ ^{o}C$

Recovery charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ Q_s < 50 pC

Test circuit and waveform:



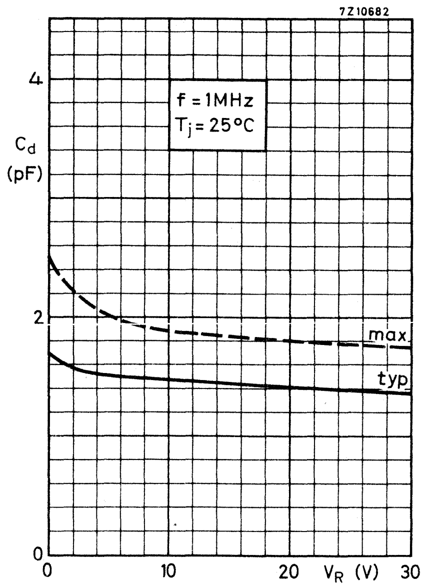


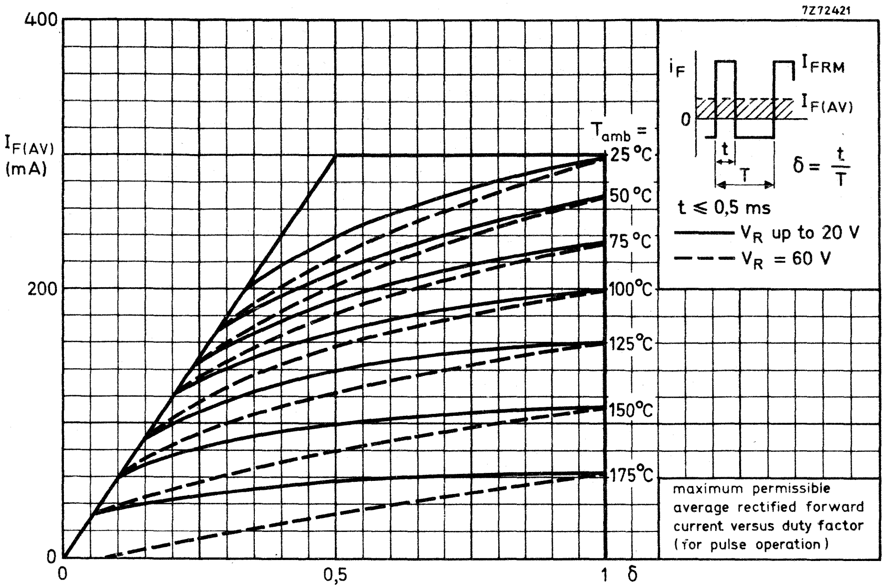
D1 = BAW62

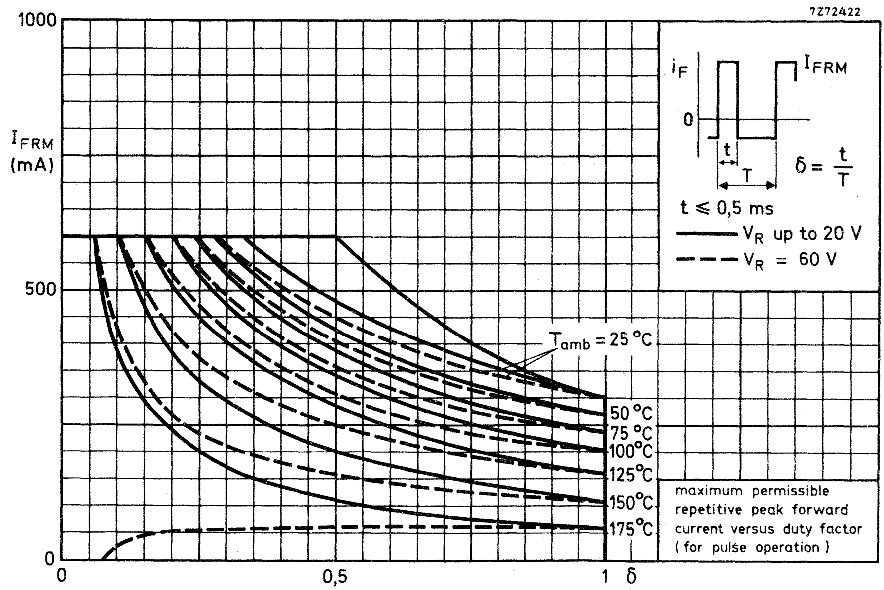
D2 = diode with minority carrier life time at 10 mA: < 200 ps

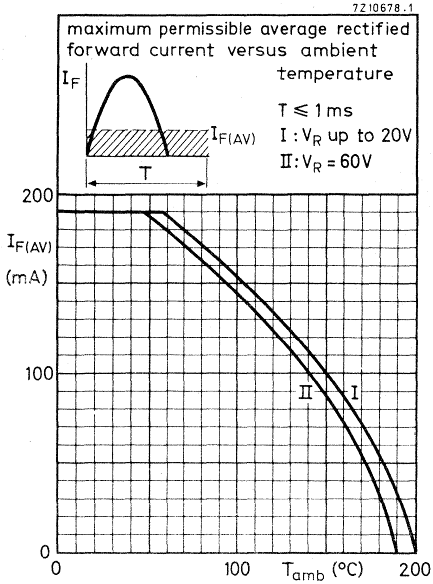
Input signal :	Rise time of the reverse pulse	t_r	=	2 ns
	Reverse pulse duration	t_p	=	400 ns
	Duty factor	δ	=	0, 02

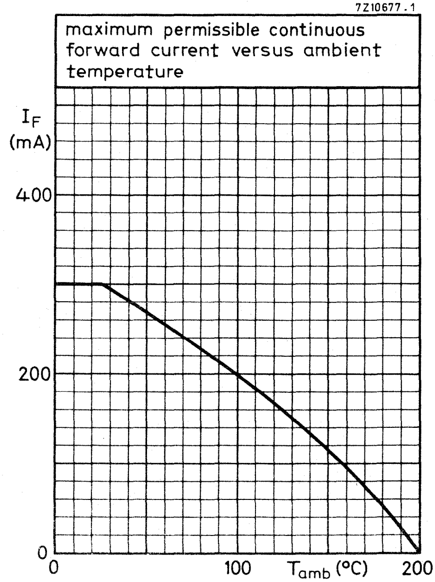
Circuit capacitance C ≤ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)

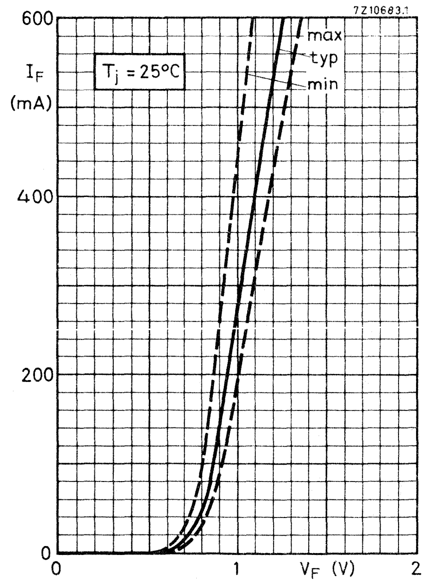


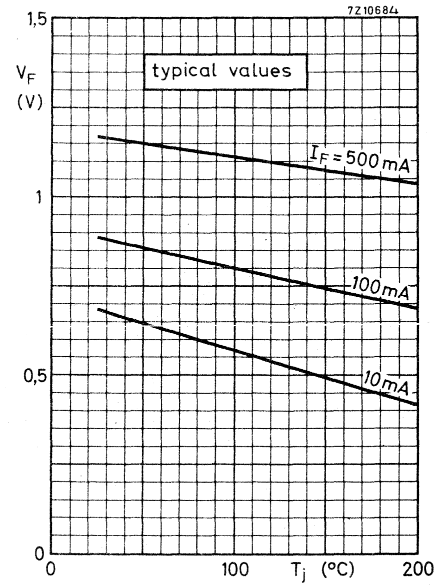

7Z72421
400
200
0
$I_{F(AV)}$ (mA)
0
0,5
1 δ
T_{amb} =
25 °C
50 °C
75 °C
100°C
125°C
150°C
175°C
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 0,5 ms
V_R up to 20 V
V_R = 60 V
maximum permissible average rectified forward current versus duty factor (for pulse operation)

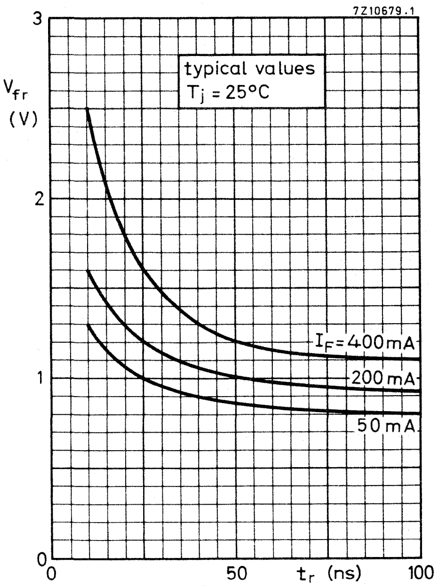

7Z72422
1000
500
0
I_{FRM} (mA)
0
0,5
1 δ
T_{amb} = 25 °C
50 °C
75 °C
100°C
125°C
150°C
175°C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 0,5 ms
V_R up to 20 V
V_R = 60 V
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

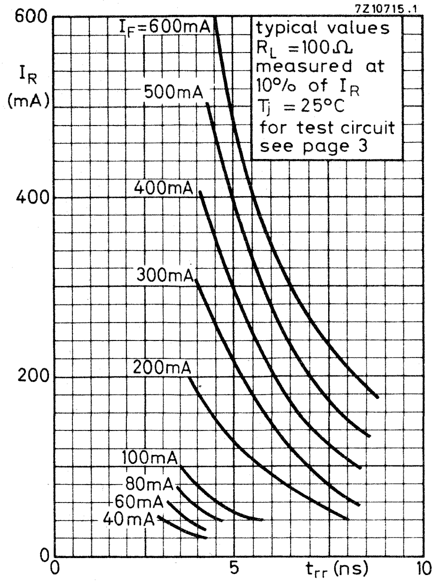

7Z10678.1
maximum permissible average rectified forward current versus ambient temperature
T ≤ 1 ms
I : V_R up to 20V
II: V_R = 60V
I_F
I_F(AV)
T
200
I_F(AV)
(mA)
100
0
II
I
0
100
T_amb (°C)
200

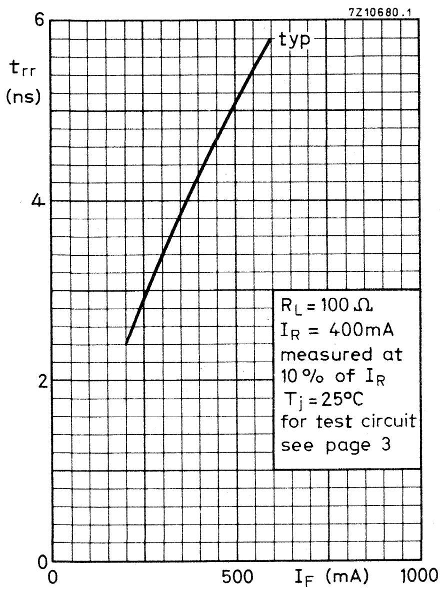

7Z10677.1
maximum permissible continuous forward current versus ambient temperature
I_F
(mA)
400
200
0
0
100
T_amb (°C)
200

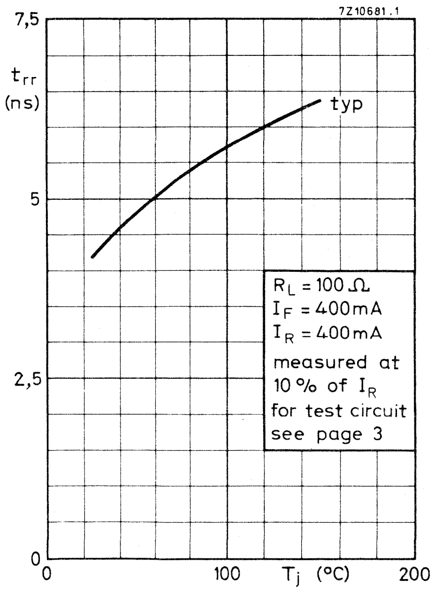

7Z10683.1
600
I_F
(mA)
T_j = 25°C
max
typ
min
400
200
0
0
1
V_F (V)
2

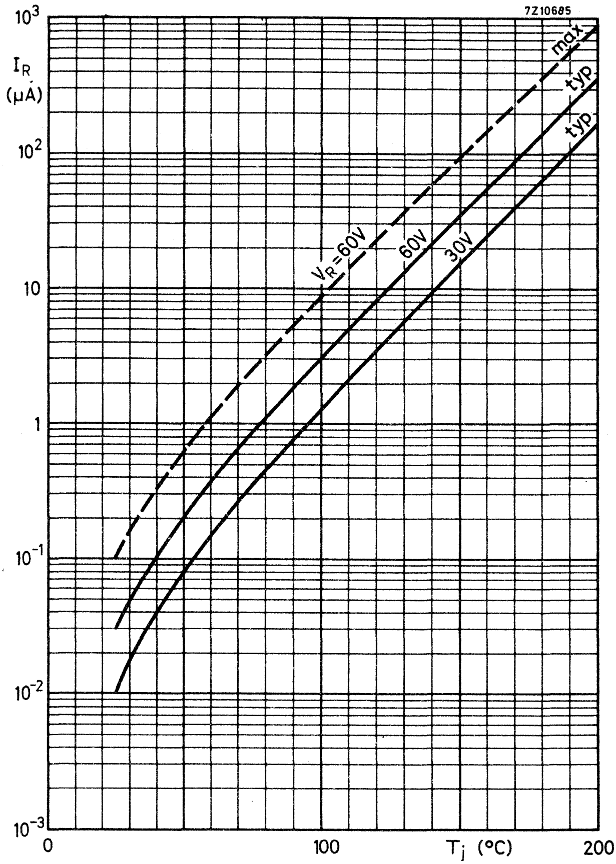

7Z10684
1,5
V_F
(V)
typical values
I_F = 500 mA
1
100 mA
0,5
10 mA
0
0
100
T_j (°C)
200


7Z10679.1
typical values
Tj = 25°C
Vfr
(V)
IF = 400 mA
200 mA
50 mA
tr (ns)
0
50
100
1
2
3


7Z10715.1
typical values
RL = 100 Ω
measured at
10% of IR
Tj = 25°C
for test circuit
see page 3
IR
(mA)
IF = 600 mA
500 mA
400 mA
300 mA
200 mA
100 mA
80 mA
60 mA
40 mA
trr (ns)
0
5
10
200
400
600


7Z10680.1
trr
(ns)
typ
RL = 100 Ω
IR = 400 mA
measured at
10 % of IR
Tj = 25°C
for test circuit
see page 3
IF (mA)
0
500
1000
2
4
6


7Z10681.1
trr
(ns)
typ
RL = 100 Ω
IF = 400 mA
IR = 400 mA
measured at
10 % of IR
for test circuit
see page 3
Tj (°C)
0
100
200
2,5
5
7,5


7Z10685
I_R
(μA)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
0
100
T_j (°C)
200
V_R=60V
60V
30V
max
typ
typ

GENERAL PURPOSE DIODES

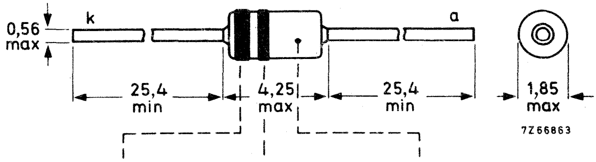
Silicon planar epitaxial diodes in DO-35 envelopes; intended for switching and general purposes in industrial equipment e.g. oscilloscopes, digital voltmeters and video output stages in colour television.

QUICK REFERENCE DATA

			BAV18	BAV19	BAV20	BAV21	
Continuous reverse voltage	V_R	max.	50	100	150	200	V
Forward current (d.c.)	I_F	max.	250	250	250	250	mA
Junction temperature	T_j	max.	175	175	175	175	^oC
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,375	0,375	0,375	0,375	$^oC/mW$
Forward voltage at I_F = 100 mA	V_F	<	1,0	1,0	1,0	1,0	V
Reverse current at							
V_R = 50 V	I_R	<	100	–	–	–	nA
V_R = 100 V	I_R	<	–	100	–	–	nA
V_R = 150 V	I_R	<	–	–	100	–	nA
V_R = 200 V	I_R	<	–	–	–	100	nA
Diode capacitance at V_R = 0; f = 1 MHz	C_d	typ.	1,5	1,5	1,5	1,5	pF
		<	5,0	5,0	5,0	5,0	pF
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	50	50	50	ns

MECHANICAL DATA Dimensions in mm

DO-35



BAV18:	brown	grey	green
BAV19:	brown	white	green
BAV20:	red	black	green
BAV21:	red	brown	green
	(cathode)		

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

Voltages

			BAV18	BAV19	BAV20	BAV21	
Continuous reverse voltage	V_R	max.	50	100	150	200	V
Repetitive peak reverse voltage	V_{RRM}	max.	60	120	200	250	V

Currents

Average rectified forward current	$I_{F(AV)}$	max.	250	mA	1)
Forward current (d.c.)	I_F	max.	250	mA	
Repetitive peak forward current	I_{FRM}	max.	625	mA	
Non-repetitive peak forward current					
$t < 1$ s ; $T_j = 25\ ^{o}C$	I_{FSM}	max.	1	A	
→ $t = 1\ \mu s$; $T_j = 25\ ^{o}C$	I_{FSM}	max.	5	A	

Power dissipation

Total power dissipation up to $T_{amb} = 25\ ^{o}C$	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}	-65 to +175		^{o}C
Junction temperature	T_j	max.	175	^{o}C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,375	$^{o}C/mW$

1) For sinusoidal operation see page 6. For pulse operation see pages 4 and 5.

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 100 mA	V_F	<	1,0	V
I_F = 200 mA	V_F	<	1,25	V

Reverse avalanche breakdown voltage

			BAV18	BAV19	BAV20	BAV21		
I_R = 100 μA	$V_{(BR)R}$	>	60	120	200	250	V	1)

Reverse current

$V_R = V_{Rmax}$	I_R	<	100	nA
$V_R = V_{Rmax}$; T_j = 150 °C	I_R	<	100	μA

Differential resistance

I_F = 10 mA	r_{diff}	typ.	5	Ω

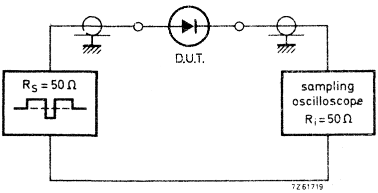
Diode capacitance

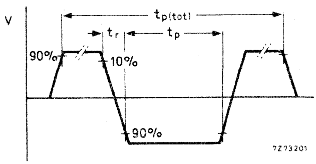
V_R = 0; f = 1 MHz	C_d	typ.	1,5	pF
		<	5,0	pF

Reverse recovery time when switched from

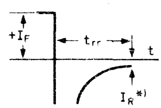
I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	ns

Test circuit and waveforms:





input signal



output signal

Input signal : Total pulse duration $t_{p(tot)}$ = 2 μs *) I_R = 3 mA

Duty factor δ = 0,0025

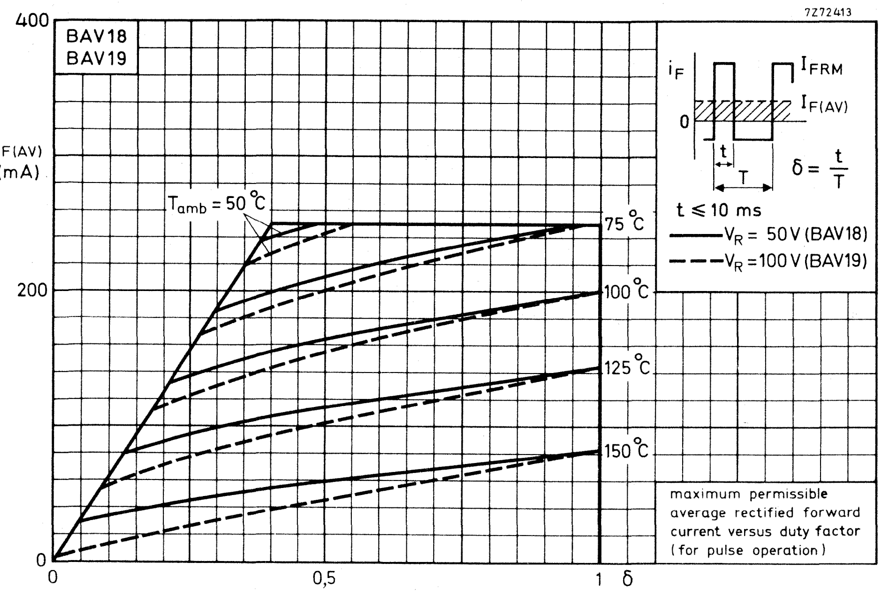
Rise time of the reverse pulse t_r = 0,6 ns

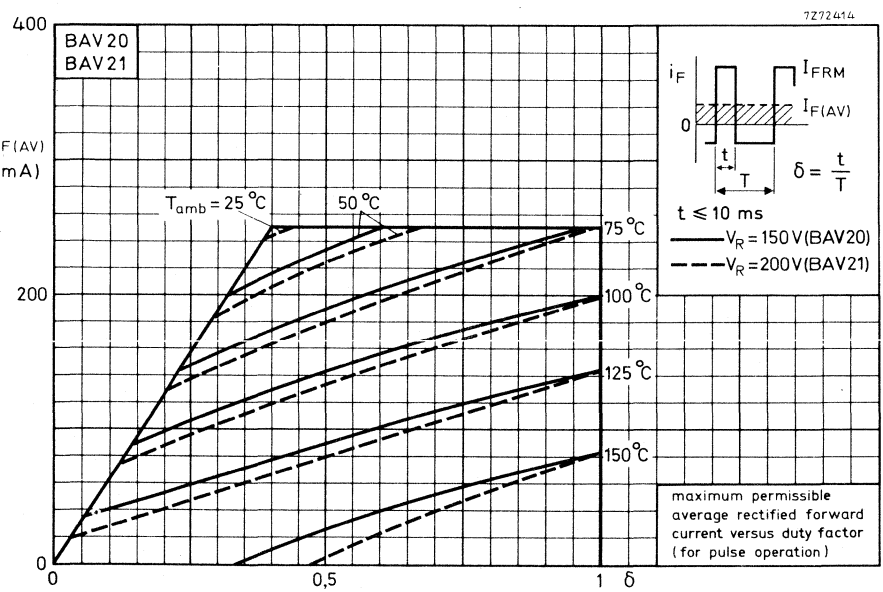
Reverse pulse duration t_p = 100 ns

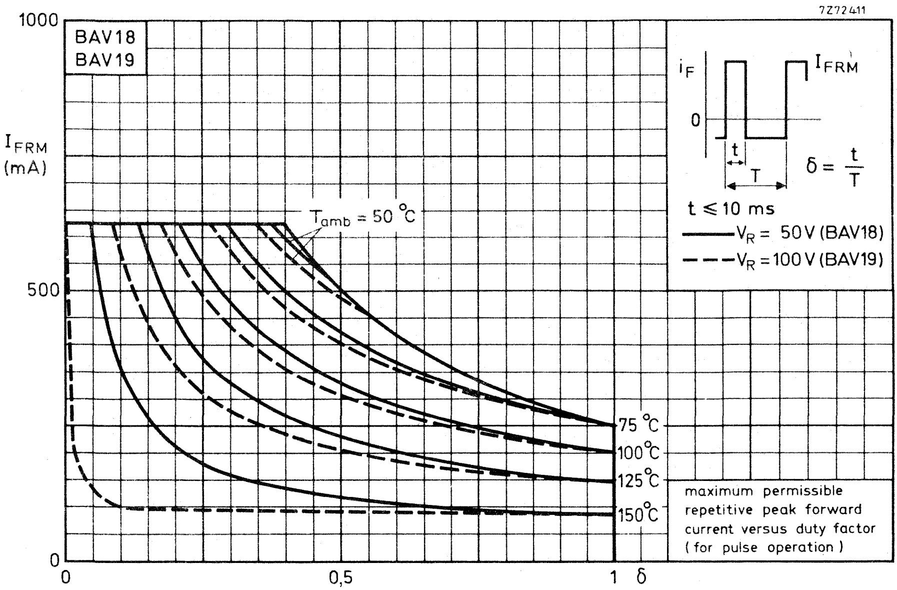
Oscilloscope: Rise time t_r = 0,35 ns

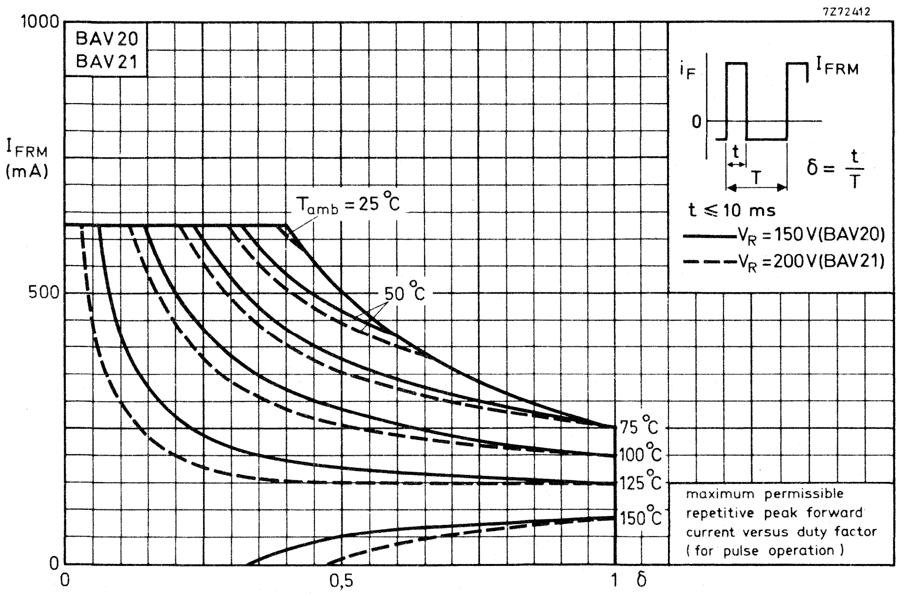
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

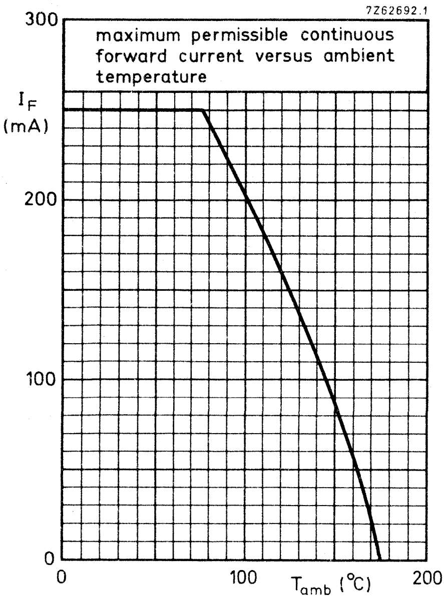
1) At zero life time, measured under pulse conditions to avoid excessive dissipation and voltage limited at 275 V.

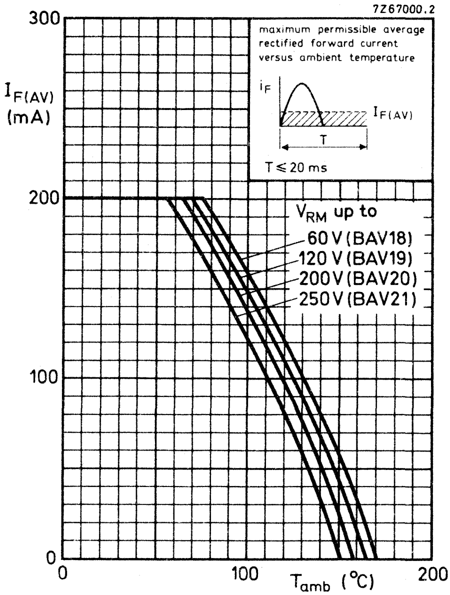

7Z72413
400
200
0
I F(AV)
(mA)
BAV18
BAV19
T amb = 50 °C
75 °C
100 °C
125 °C
150 °C
0
0,5
1 δ
i F
I FRM
I F(AV)
0
t
T
δ = t/T
t ≤ 10 ms
V R = 50 V (BAV18)
V R = 100 V (BAV19)
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

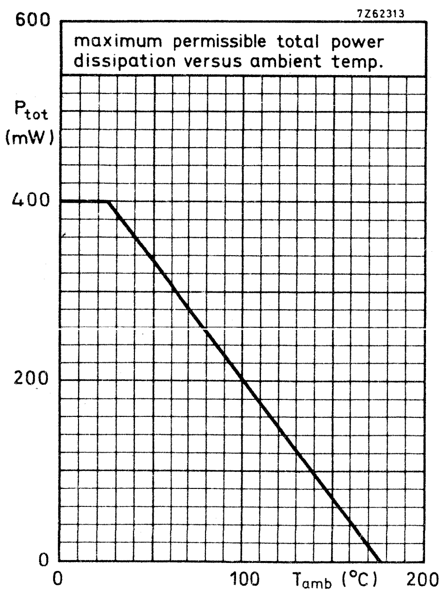

7Z72414
400
200
0
I F(AV)
(mA)
BAV20
BAV21
T amb = 25 °C
50 °C
75 °C
100 °C
125 °C
150 °C
0
0,5
1 δ
i F
I FRM
I F(AV)
0
t
T
δ = t/T
t ≤ 10 ms
V R = 150 V (BAV20)
V R = 200 V (BAV21)
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

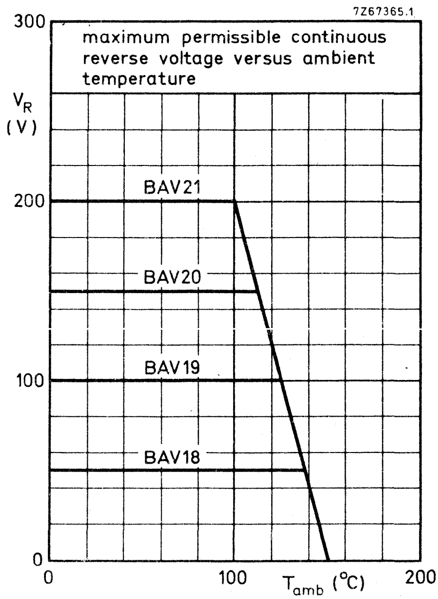

7Z72411
1000
500
0
IFRM (mA)
0
0,5
1
δ
BAV18
BAV19
Tamb = 50 °C
75 °C
100 °C
125 °C
150 °C
iF
IFRM
0
t
T
δ = t/T
t ≤ 10 ms
VR = 50 V (BAV18)
VR = 100 V (BAV19)
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

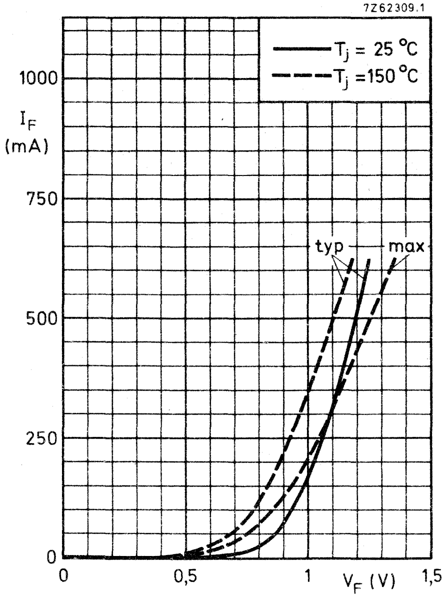

7Z72412
1000
500
0
IFRM (mA)
0
0,5
1
δ
BAV20
BAV21
Tamb = 25 °C
50 °C
75 °C
100 °C
125 °C
150 °C
iF
IFRM
0
t
T
δ = t/T
t ≤ 10 ms
VR = 150 V (BAV20)
VR = 200 V (BAV21)
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

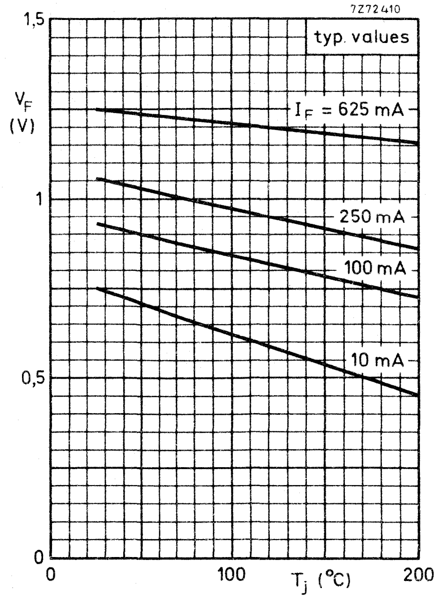

7Z62692.1
maximum permissible continuous forward current versus ambient temperature
I_F (mA)
300
200
100
0
0
100
200
T_{amb} (°C)

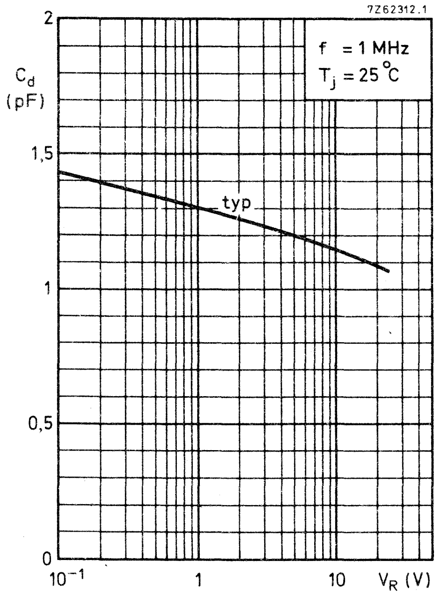

7Z67000.2
maximum permissible average rectified forward current versus ambient temperature
i_F
$I_{F(AV)}$
T
T ≤ 20 ms
$I_{F(AV)}$ (mA)
300
200
100
0
V_{RM} up to
60 V (BAV18)
120 V (BAV19)
200 V (BAV20)
250 V (BAV21)
0
100
200
T_{amb} (°C)

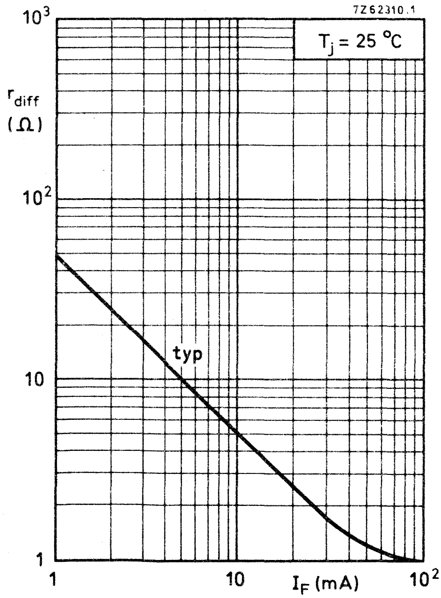

7Z62313
maximum permissible total power dissipation versus ambient temp.
P_{tot} (mW)
600
400
200
0
0
100
200
T_{amb} (°C)

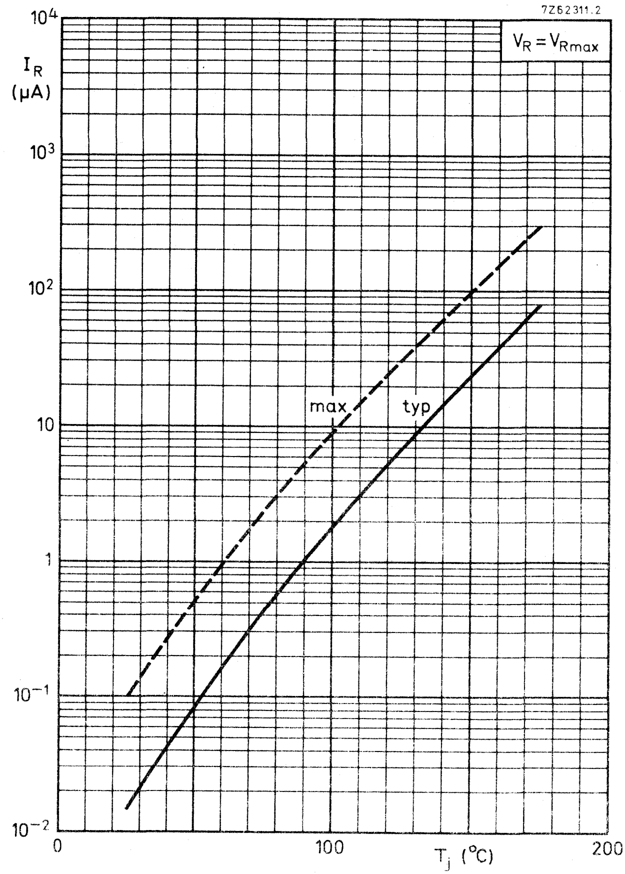

7Z67365.1
maximum permissible continuous reverse voltage versus ambient temperature
V_R (V)
300
200
100
0
BAV21
BAV20
BAV19
BAV18
0
100
200
T_{amb} (°C)


7Z62309.1
Tj = 25 °C
Tj = 150 °C
1000
IF
(mA)
750
500
250
0
typ
max
0
0,5
1
VF (V)
1,5


7Z72410
1,5
typ. values
VF
(V)
IF = 625 mA
1
250 mA
100 mA
10 mA
0,5
0
0
100
Tj (°C)
200


7Z62312.1
2
f = 1 MHz
Tj = 25 °C
Cd
(pF)
1,5
typ
1
0,5
0
10−1
1
10
VR (V)


7Z62310.1
103
Tj = 25 °C
rdiff
(Ω)
102
typ
10
1
1
10
IF (mA)
102


7Z62311.2
$V_R = V_{Rmax}$
I_R (μA)
10^4
10^3
10^2
10
1
10^{-1}
10^{-2}
max
typ
0
100
200
T_j (°C)

SILICON PLANAR EPITAXIAL CONTROLLED-AVALANCHE DIODES

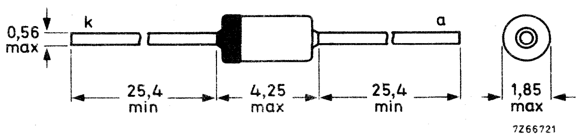
Diode in a DO-35 envelope primarily intended for switching inductive loads in semi-electronic telephone exchanges.

QUICK REFERENCE DATA

			BAW21A	BAW21B	
Repetitive peak forward current	I_{FRM}	max.	0,8		A
Repetitive peak reverse energy $t_p \geq 50$ µs; $f \leq 20$ Hz; $T_j = 25$ °C	E_{RRM}	max.	5,0		mWs
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,3		°C/mW
Forward voltage at $I_F = 200$ mA	V_F	<	1,0		V
Reverse avalanche breakdown voltage $I_R = 100$ µA	$V_{(BR)R}$	>	90	120	V
		<	150	175	V
Reverse recovery time when switched from $I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100\ \Omega$; measured at $I_R = 3$ mA	t_{rr}	<	300		ns

MECHANICAL DATA Dimensions in mm

DO-35



The coloured end indicates the cathode

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

			BAW21A	BAW21B		
Voltage						
Continuous reverse voltage	V_R	max.	70	90	V	1)
Currents						
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	0,4		A	
Forward current (d.c.)	I_F	max.	0,4		A	
Repetitive peak forward current	I_{FRM}	max.	0,8		A	
Non-repetitive peak forward current						
$t = 1\ \mu s$; $T_j = 25\ ^oC$ prior to surge	I_{FSM}	max.	6,0		A	
$t = 1\ s$; $T_j = 25\ ^oC$ prior to surge	I_{FSM}	max.	1,5		A	
Repetitive peak reverse current	I_{RRM}	max.	0,6		A	
Reverse energy						
Repetitive peak reverse energy $t_p \geq 50\ \mu s$; $f \leq 20$ Hz; $T_j = 25\ ^oC$	E_{RRM}	max.	5,0		mWs	2)
Temperatures						
Storage temperature	T_{stg}		-65 to +200		^oC	
Junction temperature	T_j	max.	200		^oC	

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,38	$^oC/mW$
From junction to ambient in free air $T_{lead} = 25\ ^oC$ at 8 mm from the body	$R_{th\ j-a}$	=	0,30	$^oC/mW$

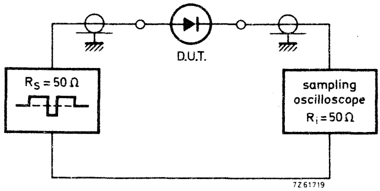
1) Reverse voltages higher than the V_R ratings are allowed, provided:
   a. the transient energy does not exceed 5 mWs at $T_j = 25\ ^oC$;
   b. T (period time) ≥ 50 ms; $\delta \leq 0{,}01$ (rectangular waveform),
   $\delta \leq 0{,}02$ (triangular waveform).

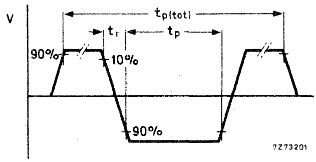
2) With increasing temperature, the maximum permissible transient energy must be decreased by 0,03 mWs/^oC.

CHARACTERISTICS — T_j = 25 °C unless otherwise specified

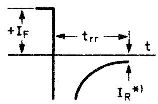
			BAW21A	BAW21B	
Forward voltage					
I_F = 200 mA	V_F	<	1,0		V
Reverse avalanche breakdown voltage					
I_R = 100 µA	$V_{(BR)R}$	>	90	120	V
		<	150	175	V
Reverse current					
V_R = 70 V	I_R	<	100	–	nA
V_R = 70 V; T_j = 150 °C	I_R	<	100	–	µA
V_R = 90 V	I_R	<	–	100	nA
V_R = 90 V; T_j = 150 °C	I_R	<	–	100	µA
Diode capacitance					
V_R = 0; f = 1 MHz	C_d	typ.	15		pF
		<	35		pF
Reverse recovery time when switched from					
I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	300		ns

Test circuit and waveforms:





input signal



output signal

Input signal :	Total pulse duration	$t_{p(tot)}$ =	10 µs
	Duty factor	δ =	0,0025
	Rise time of the reverse pulse	t_r =	0,6 ns
	Reverse pulse duration	t_p =	300 ns
Oscilloscope :	Rise time	t_r =	0,35 ns

*) I_R = 3 mA

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

HIGH-SPEED SILICON DIODE

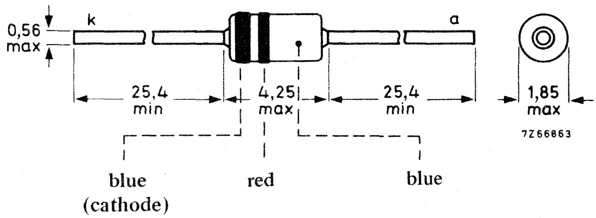
Planar epitaxial high-speed diode in a DO-35 envelope.
The BAW62 is primarily intended for fast logic applications.

QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Repetitive peak forward current	I_{FRM}	max.	225	mA
Junction temperature	T_j	max.	200	°C
Forward voltage at I_F = 100 mA	V_F	<	1	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA Dimensions in mm

DO-35



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

Voltages

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	75	V [1]

Currents

Average rectified forward current	$I_{F(AV)}$	max.	100	mA [2]
Forward current (d.c.)	I_F	max.	100	mA
Repetitive peak forward current	I_{FRM}	max.	225	mA
Non-repetitive peak forward current; t = 1 μs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,6	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltages

I_F = 5 mA	V_F		0,62 to 0,75	V
I_F = 100 mA	V_F	<	1,00	V
I_F = 100 mA; T_j = 100 °C	V_F	<	0,93	V

Reverse currents

V_R = 20 V	I_R	<	25	nA
V_R = 20 V; T_j = 150 °C	I_R	<	50	μA
V_R = 50 V	I_R	<	200	nA
V_R = 75 V	I_R	<	5	μA
V_R = 75 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2	pF

[1]) Measured at zero life time at I_R = 100 μA; V_R > 100 V.

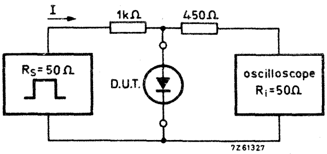
[2]) For sinusoidal operation see page 6. For pulse operation see page 5.

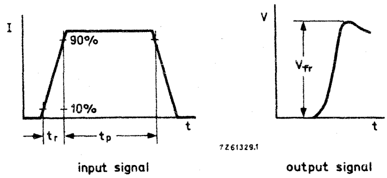
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

I_F = 50 mA; t_r = 20 ns	V_{fr}	<	2,5	V

Test circuit and waveforms:





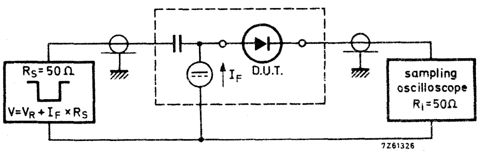
Input signal :	Rise time of the forward pulse	t_r	=	20 ns
	Forward current pulse duration	t_p	=	120 ns
	Duty factor	δ	=	0,01
Oscilloscope :	Rise time	t_r	=	0,35 ns

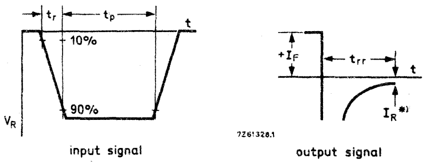
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse recovery time when switched from

I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

Test circuit and waveforms:





Input signal :	Rise time of the reverse pulse	t_r	=	0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p	=	100 ns	
	Duty factor	δ	=	0,05	
Oscilloscope:	Rise time	t_r	=	0,35 ns	

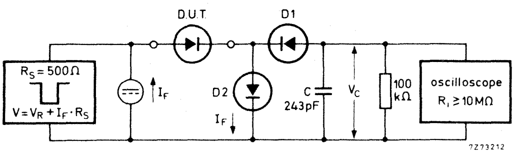
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

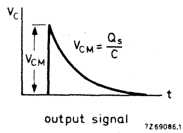
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Recovery charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ — Q_s typ. 50 pC

Test circuit and waveform:

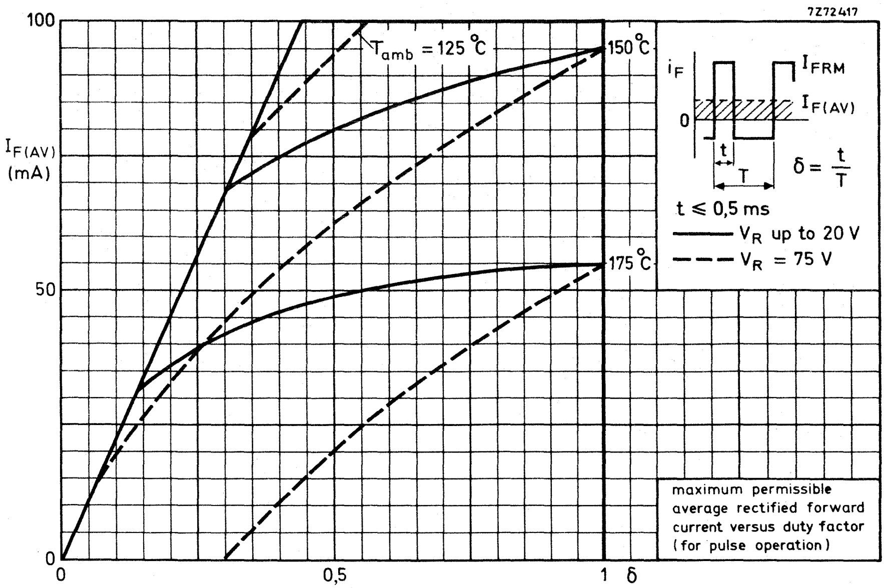


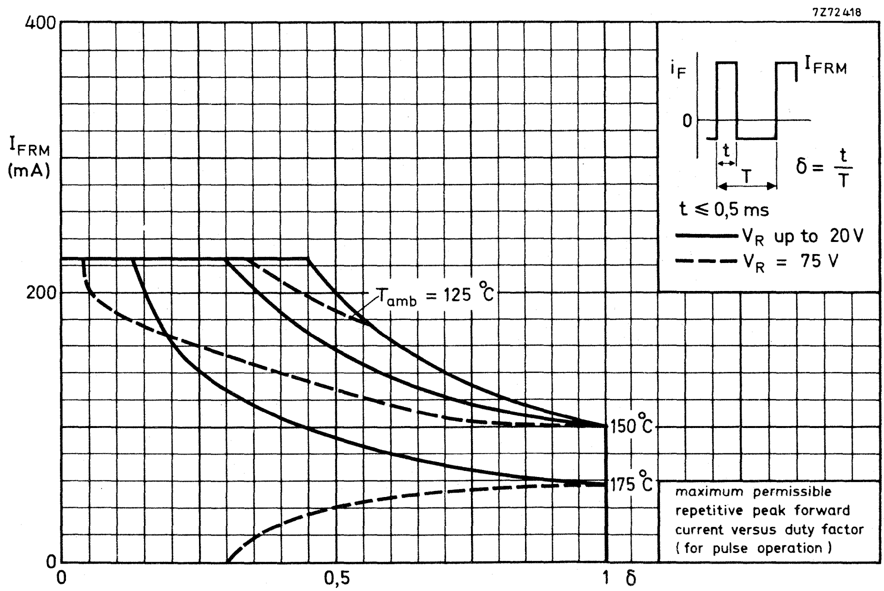


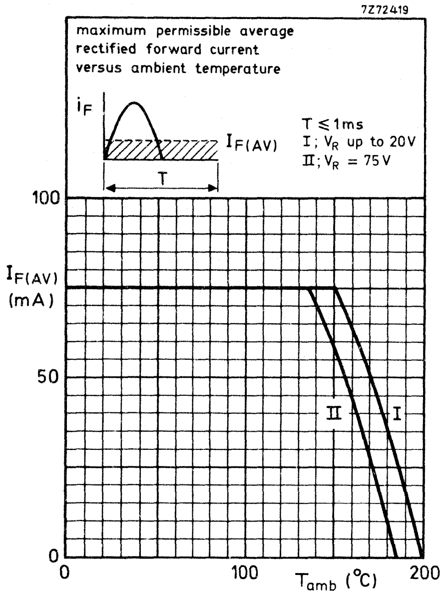
D1 = D2 = BAW62

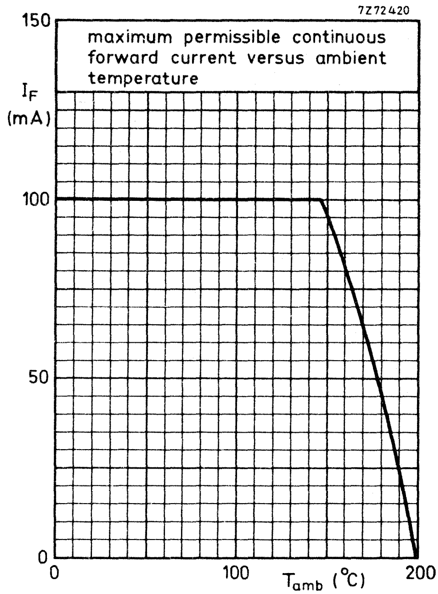
Input signal :	Rise time of the reverse pulse	t_r	=	2 ns
	Reverse pulse duration	t_p	=	400 ns
	Duty factor	δ	=	0, 02

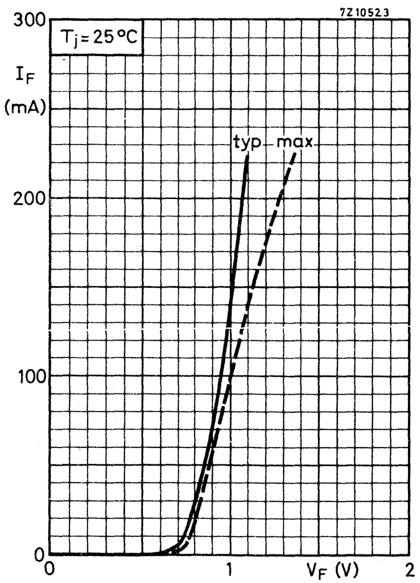
Circuit capacitance C $\leq$ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)

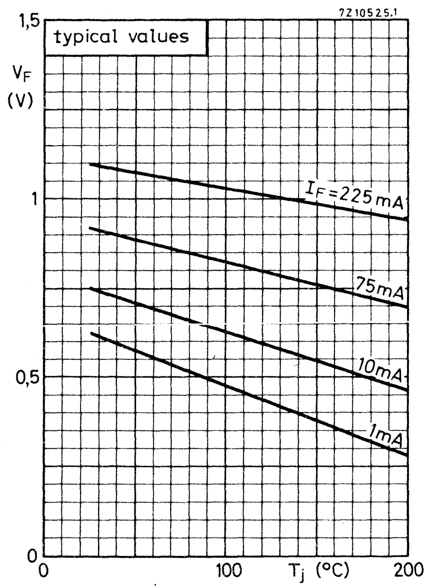

7Z72417
100
50
0
$I_{F(AV)}$
(mA)
0
0,5
1 δ
T_{amb} = 125 °C
150 °C
175 °C
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 0,5 ms
V_R up to 20 V
V_R = 75 V
maximum permissible average rectified forward current versus duty factor (for pulse operation)

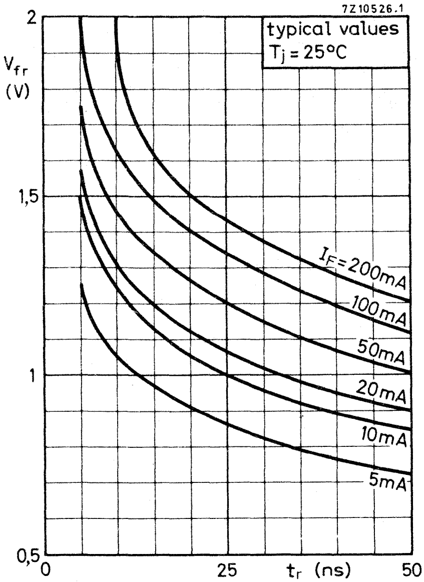

7Z72418
400
200
0
I_{FRM}
(mA)
0
0,5
1 δ
T_{amb} = 125 °C
150 °C
175 °C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 0,5 ms
V_R up to 20 V
V_R = 75 V
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

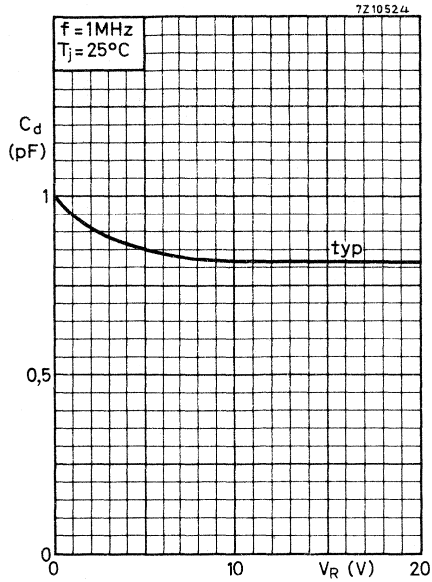

7Z72419
maximum permissible average rectified forward current versus ambient temperature
i_F
I_F(AV)
T
T ≤ 1ms
I; V_R up to 20V
II; V_R = 75V
100
I_F(AV) (mA)
50
0
II
I
0
100
T_amb (°C)
200

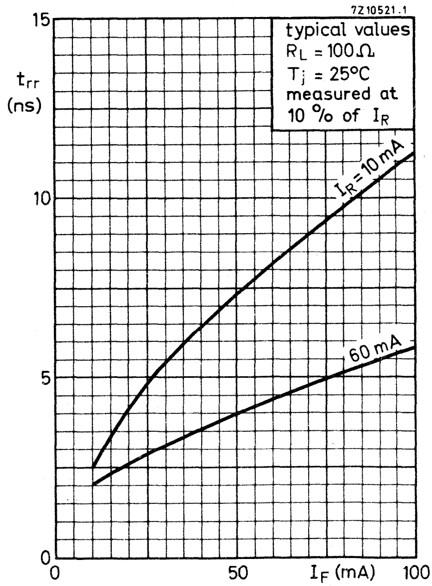

7Z72420
150
maximum permissible continuous forward current versus ambient temperature
I_F (mA)
100
50
0
0
100
T_amb (°C)
200

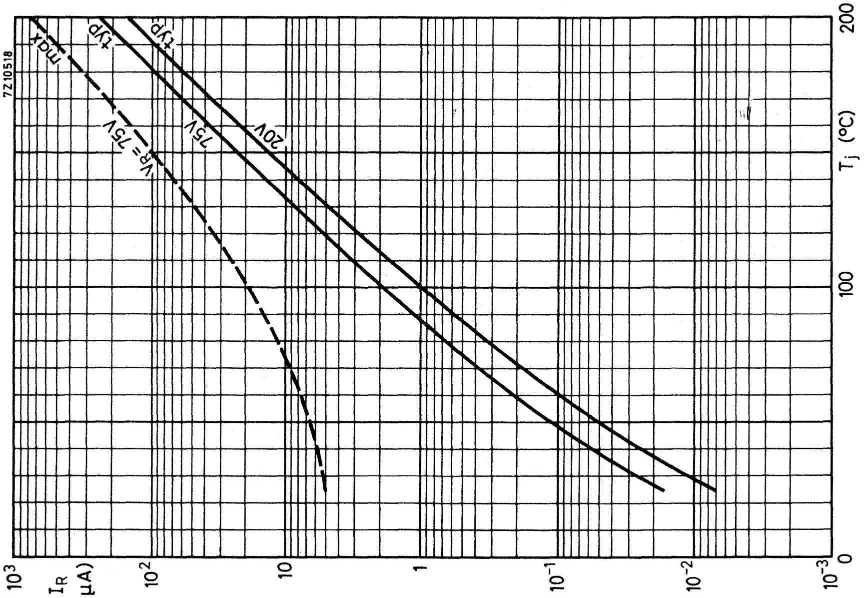

7Z10523
300
T_j = 25 °C
I_F (mA)
typ
max
200
100
0
0
1
V_F (V)
2

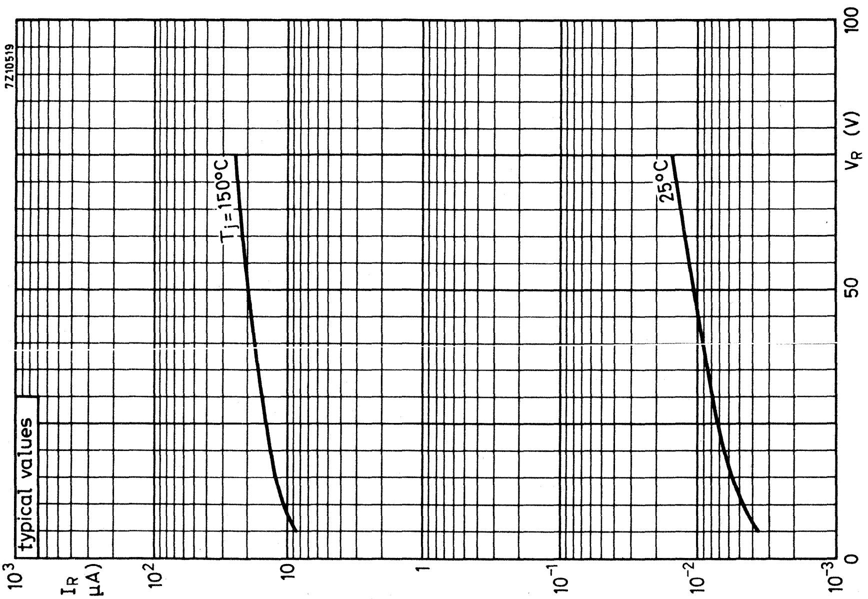

7Z10525.1
1,5
typical values
V_F (V)
1
I_F = 225 mA
75mA
10mA
0,5
1mA
0
0
100
T_j (°C)
200


7Z10526.1
typical values
T_j = 25°C
V_{fr}
(V)
2
1,5
1
0,5
0
25
50
t_r (ns)
I_F=200mA
100mA
50mA
20mA
10mA
5mA


7Z10524
f = 1MHz
T_j = 25°C
C_d
(pF)
1
0,5
0
10
20
V_R (V)
typ


7Z10521.1
typical values
R_L = 100Ω
T_j = 25°C
measured at
10 % of I_R
t_{rr}
(ns)
15
10
5
0
50
100
I_F (mA)
I_R = 10 mA
60 mA


7Z10518
max
typ
typ
V_R = 75V
75V
20V
T_j (°C)
200
100
0
I_R (µA)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}


7Z10519
typical values
T_j = 150°C
25°C
V_R (V)
100
50
0
I_R (µA)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}

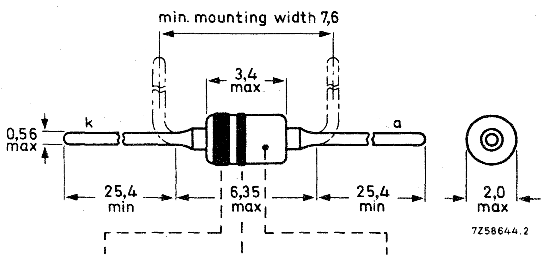
SILICON OXIDE PASSIVATED AVALANCHE DIODE

Whiskerless diffused diode in a molybdenum hard glass subminiature envelope, capable of absorbing transients repetitively. It is a fast high conductance diode, primarily intended for switching inductive loads in semi-electronic telephone exchanges.

QUICK REFERENCE DATA				
Repetitive peak forward current	I_{FRM}	max.	800	mA
Repetitive peak reverse energy $t_p \geq 250$ µs; $f \leq 20$ Hz; $T_j = 25$ °C	E_{RRM}	max.	10	mWs
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,3	°C/mW
Forward voltage at $I_F = 200$ mA	V_F	<	1,0	V
Reverse avalanche breakdown voltage $I_R = 1$ mA	$V_{(BR)R}$		120 to 175	V
Reverse current $V_R = 90$ V; $T_j = 150$ °C	I_R	<	100	µA
Reverse recovery time when switched from $I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100$ Ω; measured at $I_R = 3$ mA	t_{rr}	<	50	ns
Recovery charge when switched from $I_F = 10$ mA to $V_R = 5$ V; $R_L = 500$ Ω	Q_s	<	0,5	nC

MECHANICAL DATA Dimensions in mm

SOD-17



brown (cathode) red black

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

Voltage

Continuous reverse voltage	V_R	max.	90	V	[1]

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	400	mA
Forward current (d.c.)	I_F	max.	400	mA
Repetitive peak forward current	I_{FRM}	max.	800	mA
Non-repetitive peak forward current; t = 10 μs	I_{FSM}	max.	30	A
t = 1 s	I_{FSM}	max.	1,5	A
Repetitive peak reverse current	I_{RRM}	max.	600	mA

Reverse energy (see also page 4)

Repetitive peak reverse energy $t_p \geq 250$ μs; f ≤ 20 Hz; $T_j = 25$ °C	E_{RRM}	max.	10	mWs

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,3	°C/mW

CHARACTERISTICS $T_j = 25$ °C unless otherwise specified

Forward voltage

I_F = 10 mA	V_F	<	0,75	V
I_F = 50 mA	V_F	<	0,84	V
I_F = 100 mA	V_F	<	0,90	V
I_F = 200 mA	V_F	<	1,00	V
I_F = 400 mA	V_F	<	1,25	V

Reverse avalanche breakdown voltage at I_R = 1 mA	$V_{(BR)R}$	120 to 175	V

Reverse current

V_R = 90 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	typ.	25	pF
		<	35	pF

[1]) It is allowed to exceed this value as described on page 4. Care should be taken not to exceed the I_{RRM} rating.

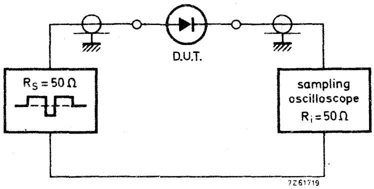
CHARACTERISTICS (continued) T_j = 25 °C

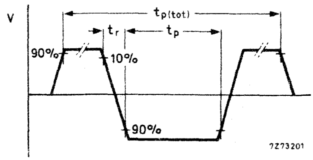
Reverse recovery time when switched from

I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω;

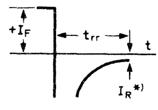
measured at I_{R1} = 1 mA	t_{rr}	typ.	37	ns
		<	60	ns
measured at I_{R2} = 3 mA	t_{rr}	typ.	30	ns
		<	50	ns

Test circuit and waveforms:





input signal



output signal

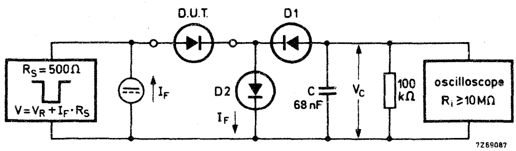
Input signal : Total pulse duration	$t_{p(tot)}$ = 2 µs	*) I_{R1} = 1 mA
Duty factor	δ = 0,0025	I_{R2} = 3 mA
Rise time of the reverse pulse	t_r = 0,6 ns	
Reverse pulse duration	t_p = 100 ns	
Oscilloscope: Rise time	t_r = 0,35 ns	

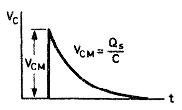
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from

I_F = 10 mA to V_R = 5 V; R_L = 500 Ω Q_s < 0,5 nC

Test circuit and waveform:



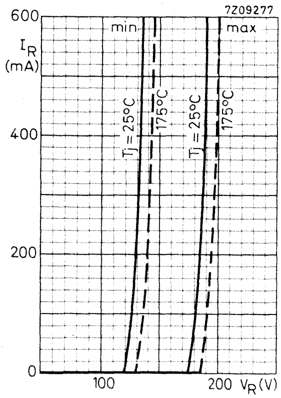


output signal

D1 = D2 = BAW62

Input signal : Rise time of the reverse pulse	t_r = 15 ns
Reverse pulse duration	t_p = 35 µs
Frequency	f = 25 kHz

Circuit capacitance C ≤ 30 pF (C = oscilloscope input capacitance + parasitic capacitance)

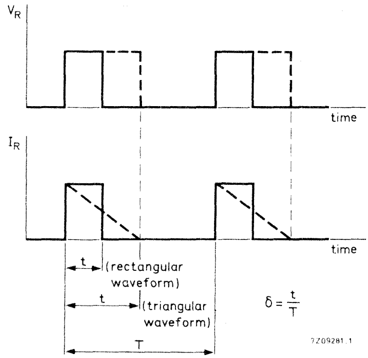


Reverse voltages higher than the V_R ratings are allowed, provided

a. the transient energy $\leq$ 10 mWs at $I_R \leq 200$ mA; $T_j = 25\ ^oC$
   the transient energy $\leq$ 5 mWs at $I_R = 600$ mA; $T_j = 25\ ^oC$ (see graph on page 5)

b. $T \geq 50$ ms; $\delta \leq 0,01$ (rectangular waveform)
   $\delta \leq 0,02$ (triangular waveform)

With increasing temperature, the maximum permissible transient energy must be decreased by 0,015 mWs/^oC.



Example for calculating the maximum permissible drive current and the max. turn-off time in a practical circuit (see Fig. 1)

1. Maximum permissible drive current
   For the circuit shown it can be calculated with $E = \frac{1}{2}LI^2$

$$I_{drive\ max.} = \sqrt{\frac{10 \times 10^{-3}}{\frac{1}{2} \times 0,5}} = 200\ mA$$

2. Maximum turn-off time
   Immediately after opening switch S the reverse current of the diode is $I_R = I_{drive}$.
   The turn-off time $t_{off} = \dfrac{E}{\frac{1}{2} \times I_R \times V_{(BR)R}}$. It will be max. for devices with minimum breakdown voltage if the maximum drive current is applied.
   Hence $t_{off\ max.} = \dfrac{10 \times 10^{-3}}{\frac{1}{2} \times 200 \times 10^{-3} \times 120} = 0,8$ ms
   For $I_{drive} = 100$ mA : $t_{off\ max.} = \dfrac{\frac{1}{2} \times 0,5 \times 10^{-2}}{\frac{1}{2} \times 100 \times 10^{-3} \times 120} = 0,4$ ms.

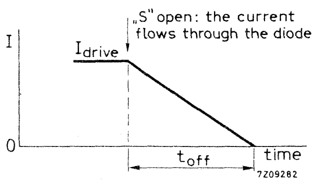


Fig. 1

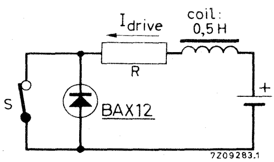
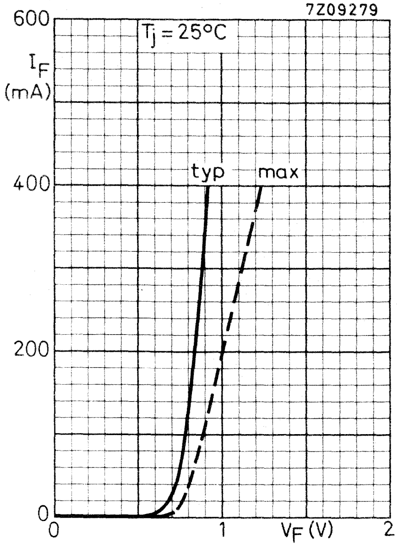
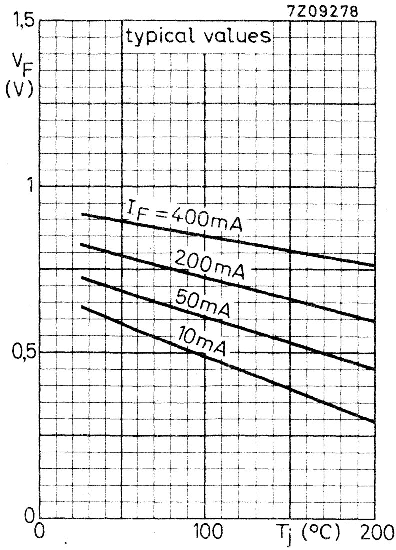
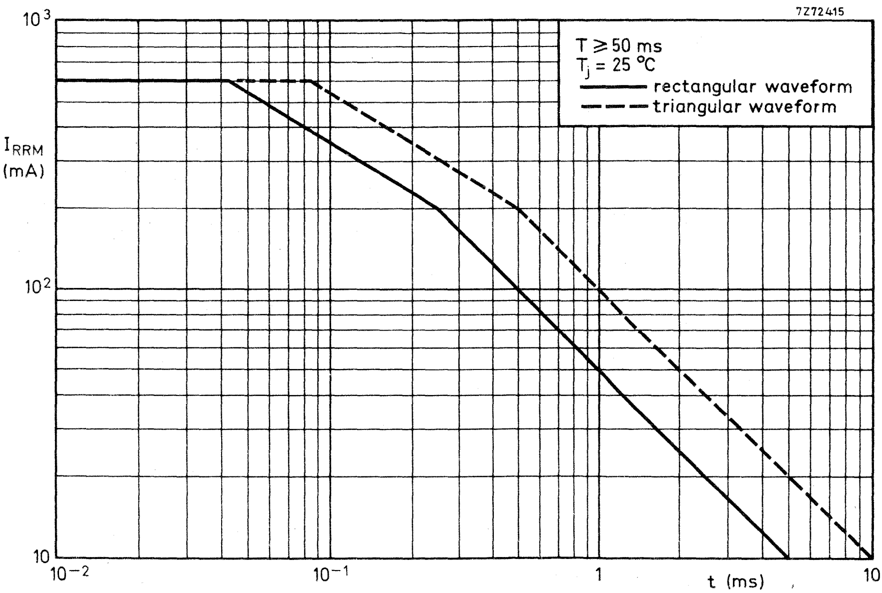


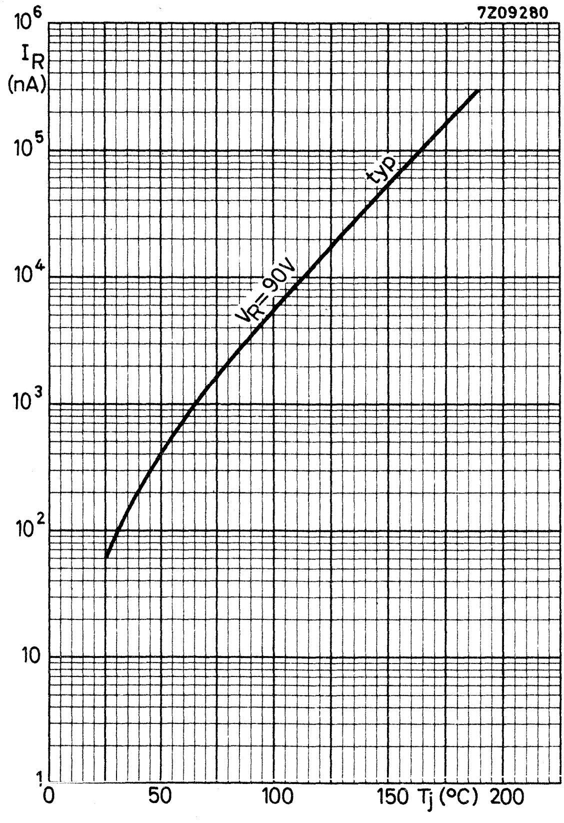
Fig. 2





maximum permissible repetitive peak reverse current versus pulse duration




7Z09280
10^6
I_R
(nA)
10^5
10^4
10^3
10^2
10
1
typ
$V_R = 90V$
0
50
100
150
T_j (°C)
200

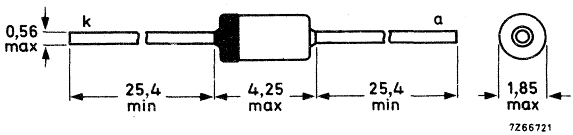
SILICON PLANAR EPITAXIAL CONTROLLED-AVALANCHE DIODE

Diode in a DO-35 envelope primarily intended for switching inductive loads in semi-electronic telephone exchanges.

QUICK REFERENCE DATA				
Repetitive peak forward current	I_{FRM}	max.	0,8	A
Repetitive peak reverse energy $t_p \geq 50\ \mu s$; $f \leq 20$ Hz; $T_j = 25\ ^oC$	E_{RRM}	max.	5,0	mWs
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	$^oC/mW$
Forward voltage at $I_F = 200$ mA	V_F	<	1,00	V
Reverse avalanche breakdown voltage $I_R = 100\ \mu A$	$V_{(BR)R}$	120 to 175		V
Reverse recovery time when switched from $I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100\ \Omega$; measured at $I_R = 3$ mA	t_{rr}	<	50	ns

MECHANICAL DATA Dimensions in mm

DO-35



The coloured end indicates the cathode

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

Voltage

Continuous reverse voltage	V_R	max.	90	V	1)

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	0,4	A
Forward current (d.c.)	I_F	max.	0,4	A
Repetitive peak forward current	I_{FRM}	max.	0,8	A
Non-repetitive peak forward current				
t = 1 µs; T_j = 25 °C prior to surge	I_{FSM}	max.	6,0	A
t = 1 s ; T_j = 25 °C prior to surge	I_{FSM}	max.	1,5	A
Repetitive peak reverse current	I_{RRM}	max.	0,6	A

Reverse energy

Repetitive peak reverse energy $t_p \geq 50$ µs; f ≤ 20 Hz; T_j = 25 °C	E_{RRM}	max.	5,0	mWs	2)

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,38	°C/mW
→ From junction to ambient in free air T_{lead} = 25 °C at 8 mm from the body	$R_{th\ j\text{-}a}$	=	0,30	°C/mW

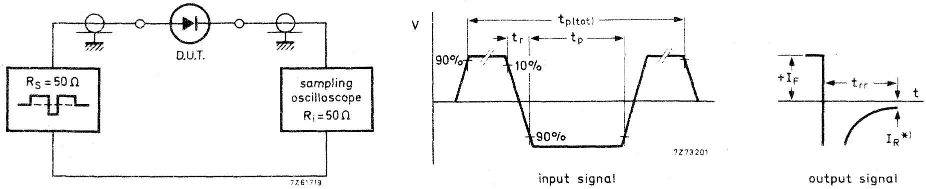
1) Reverse voltages higher than the V_R rating are allowed, provided:
a. the transient energy does not exceed 5 mWs at T_j = 25 °C;
b. T (period time) ≥ 50 ms; δ ≤ 0,01 (rectangular waveform),
δ ≤ 0,02 (triangular waveform).

2) With increasing temperature, the maximum permissible transient energy must be decreased by 0,03 mWs/°C.

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 10 mA	V_F	<	0,75	V
I_F = 50 mA	V_F	<	0,84	V
I_F = 100 mA	V_F	<	0,90	V
I_F = 200 mA	V_F	<	1,00	V
I_F = 400 mA	V_F	<	1,25	V
Reverse avalanche breakdown voltage				
I_R = 100 µA	$V_{(BR)R}$		120 to 175	V
Reverse current				
V_R = 90 V	I_R	<	100	nA
V_R = 90 V; T_j = 150 °C	I_R	<	100	µA
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	typ.	15	pF
		<	35	pF
Reverse recovery time when switched from				
I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	ns

Test circuit and waveforms :



Input signal :	Total pulse duration	$t_{p(tot)}$	= 2 µs	*) I_R = 3 mA
	Duty factor	δ	= 0,0025	
	Rise time of the reverse pulse	t_r	= 0,6 ns	
	Reverse pulse duration	t_p	= 100 ns	
Oscilloscope :	Rise time	t_r	= 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

SILICON OXIDE PASSIVATED DIODE

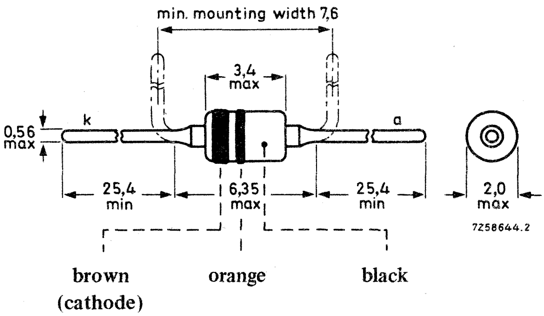
Whiskerless diode in a hard glass subminiature envelope.
The BAX13 is primarily intended for general purpose applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	50	V
Repetitive peak forward current	I_{FRM}	max.	150	mA
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 20 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45	pC

MECHANICAL DATA

Dimensions in mm

SOD-17



FOR NEW DESIGN THE SUCCESSOR TYPE BAW62 IS RECOMMENDED

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

Voltages

Continuous reverse voltage	V_R	max.	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	50	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	75	mA [1]
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current t = 1 µs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 2 mA	V_F	<	0,7	V
I_F = 10 mA; T_j = 100 °C	V_F	<	0,8	V
I_F = 20 mA	V_F	<	1,0	V [2]
I_F = 75 mA	V_F	<	1,53	V [2]

Reverse current

V_R = 10 V	I_R	<	25	nA
V_R = 10 V; T_j = 150 °C	I_R	<	10	µA
V_R = 25 V	I_R	<	50	nA
V_R = 50 V	I_R	<	200	nA
V_R = 50 V; T_j = 150 °C	I_R	<	25	µA

Diode capacitance (see also page 7)

V_R = 0; f = 1 MHz	C_d	<	3	pF

1) For sinusoidal operation see page 5.
For pulse operation see page 6.

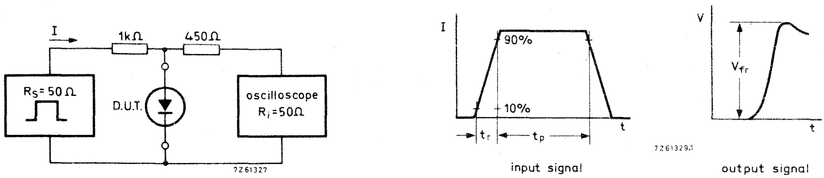
2) Measured under pulse conditions to avoid excessive dissipation.

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage (see also page 7)

At $t_r > 20$ ns, V_{fr} will not exceed V_F corresponding to $I_F = 1$ to 75 mA

Test circuit and waveforms :



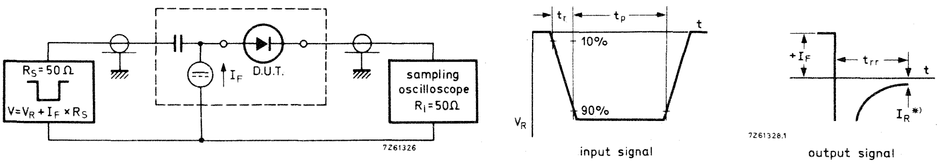
Input signal :	Rise time of the forward pulse	t_r = 20 ns
	Forward current pulse duration	t_p = 120 ns
	Duty factor	δ = 0,01
Oscilloscope :	Rise time	t_r = 0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse recovery time when switched from

I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	6 ns [1]
I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4 ns

Test circuit and waveforms :



Input signal :	Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope :	Rise time	t_r = 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

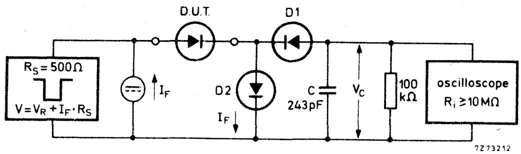
1) See also page 8.

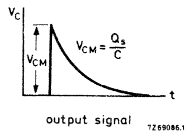
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Recovery charge when switched from

I_F = 10 mA to V_R = 5 V; R_L = 500 Ω Q_s < 45 pC

Test circuit and waveform:





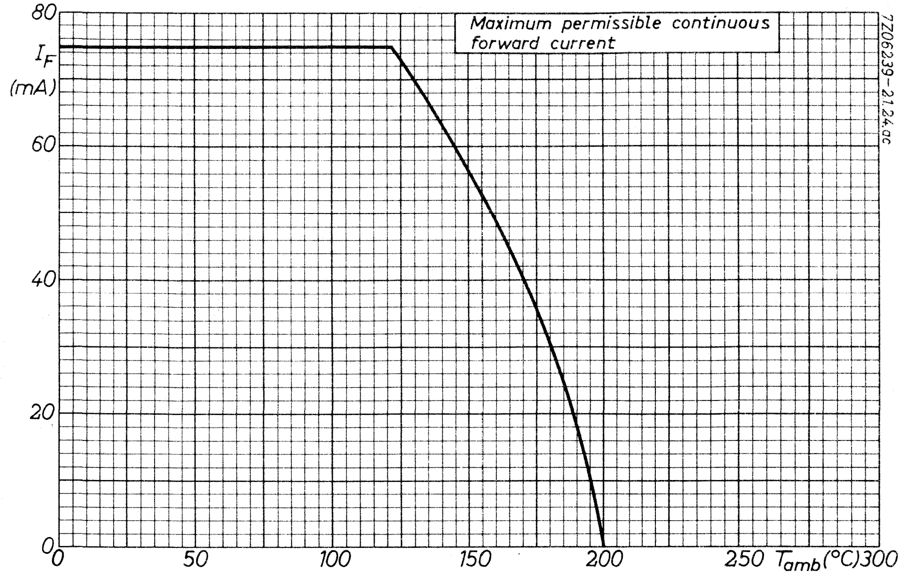
D1 = D2 = BAW62

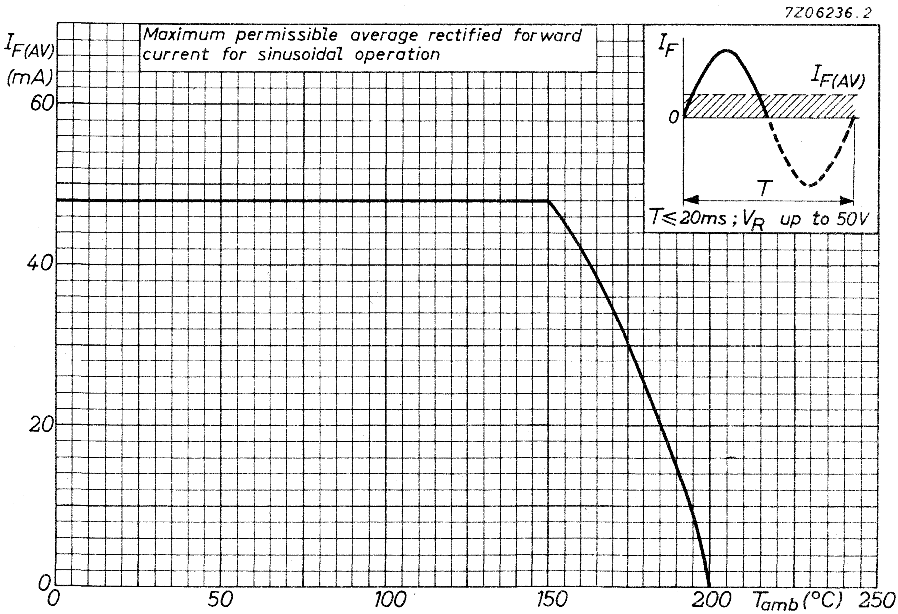
Input signal: Rise time of the reverse pulse t_r = 2 ns

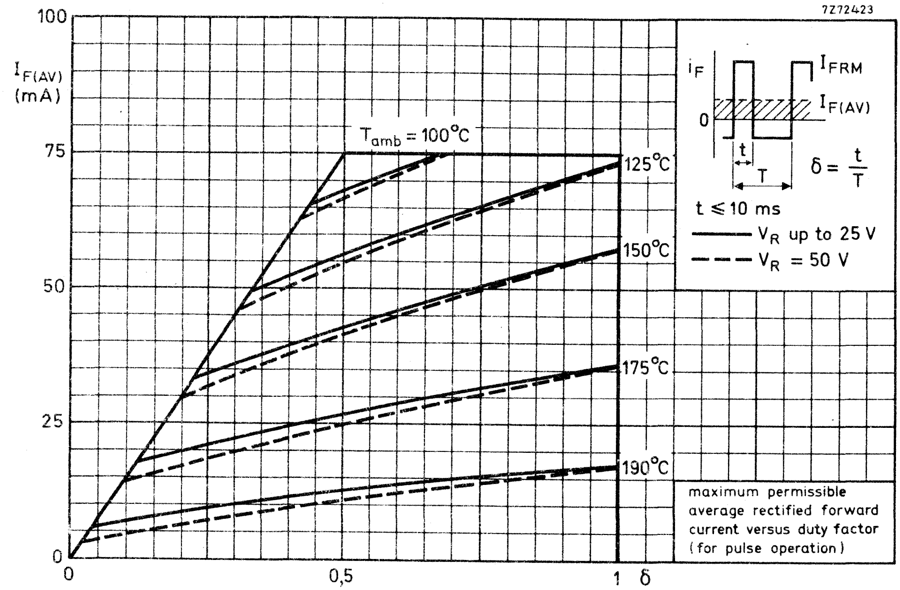
Reverse pulse duration t_p = 400 ns

Duty factor δ = 0,02

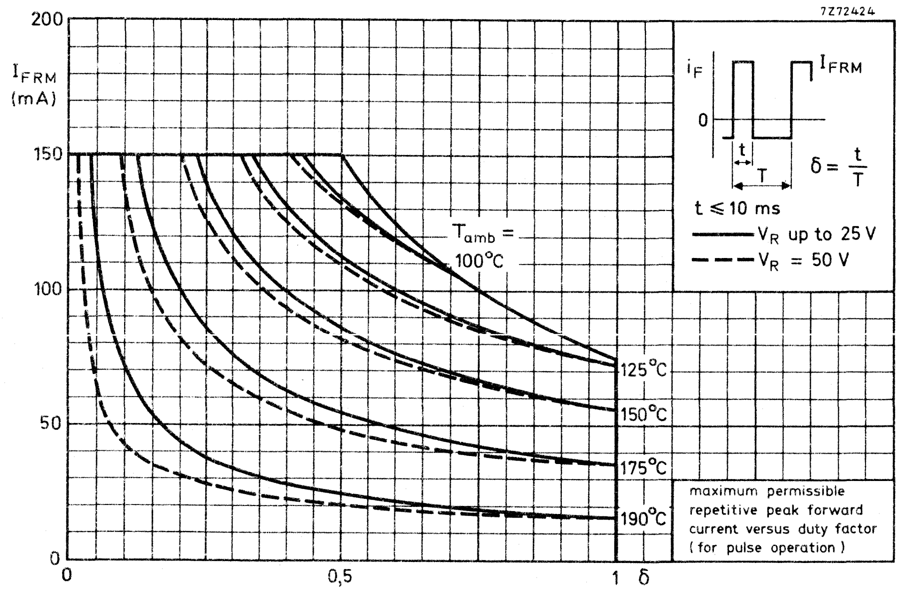
Circuit capacitance C ≤ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)


Maximum permissible continuous forward current
7Z06239-21.24.ac
80
I_F
(mA)
60
40
20
0
0
50
100
150
200
250
T_{amb} (°C)
300

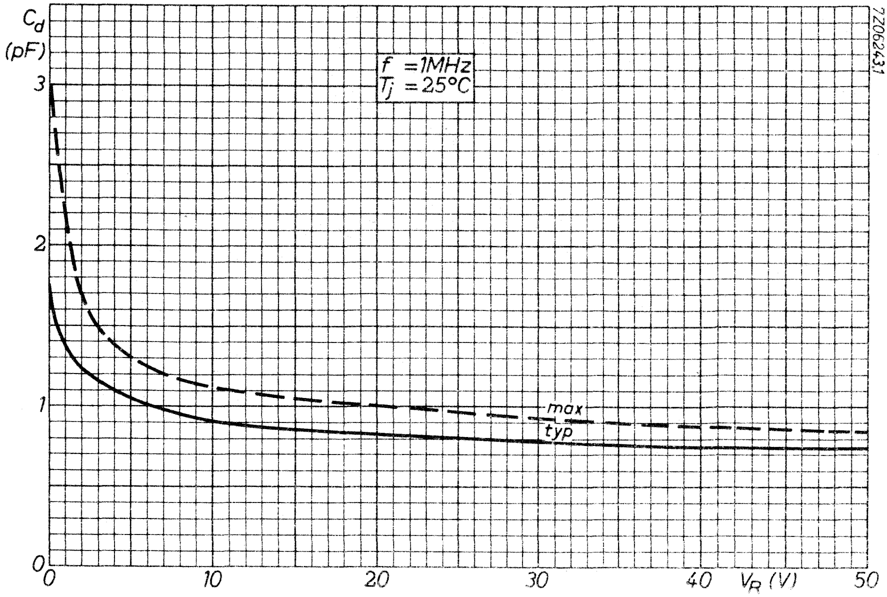

7Z06236.2
Maximum permissible average rectified forward current for sinusoidal operation
$I_{F(AV)}$
(mA)
60
40
20
0
0
50
100
150
200
T_{amb} (°C)
250
I_F
$I_{F(AV)}$
0
T
$T \leq 20ms$; V_R up to 50V



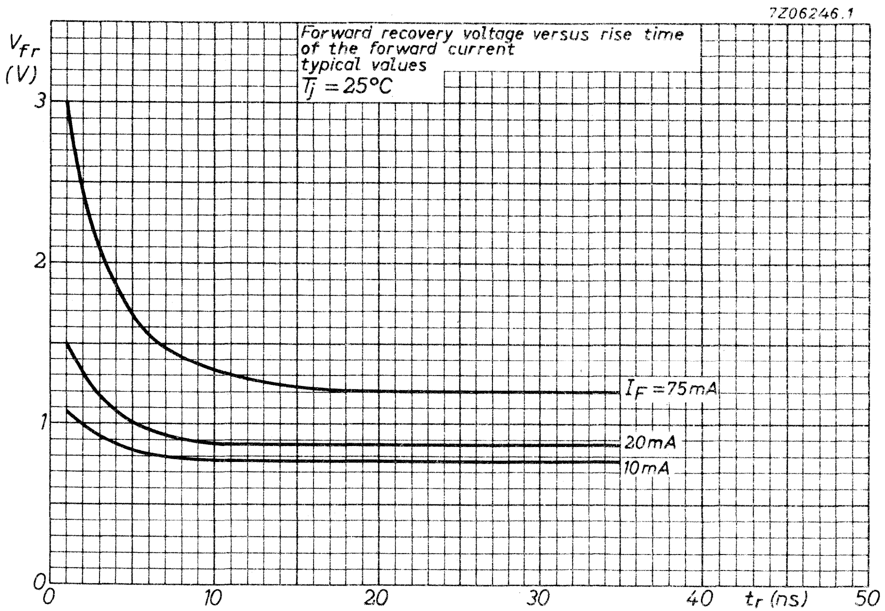
maximum permissible average rectified forward current versus duty factor (for pulse operation)



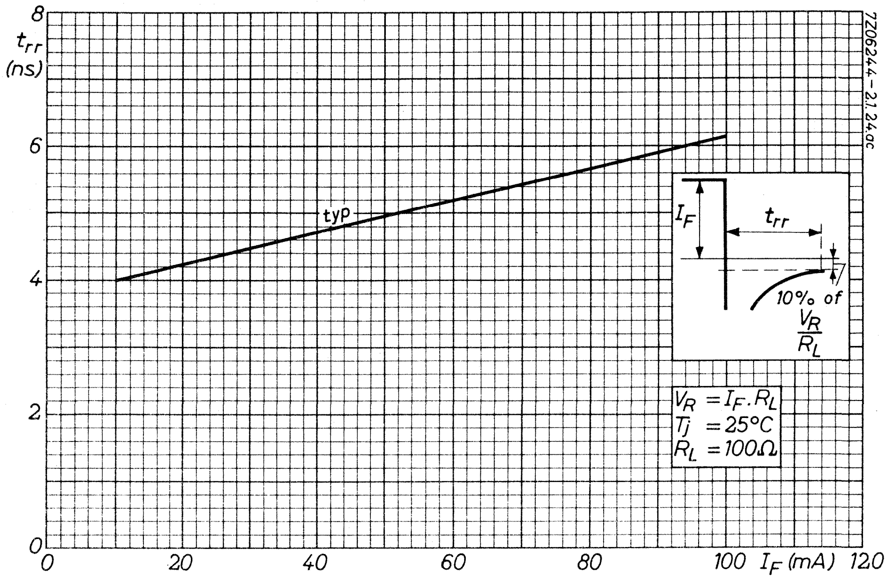
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

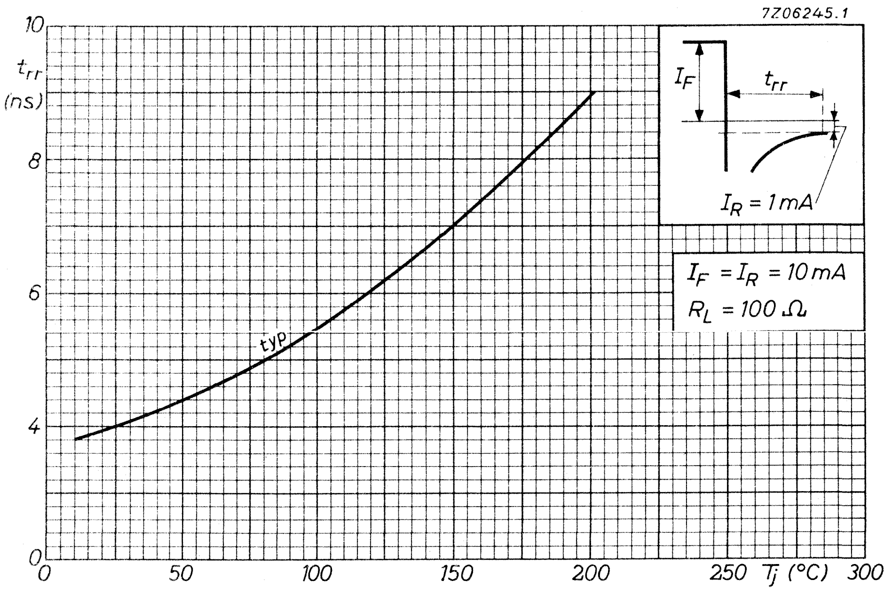


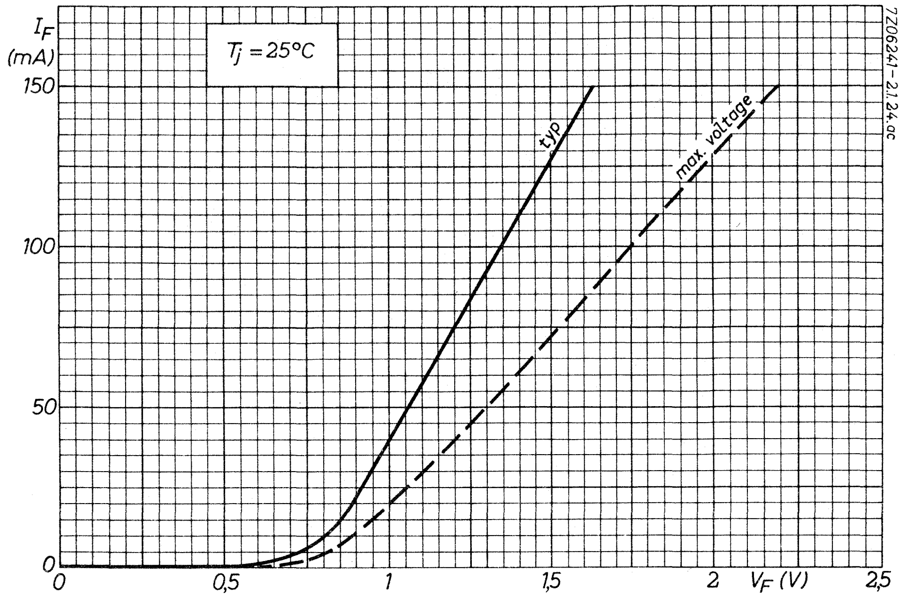
C_d (pF)
f = 1MHz
T_j = 25°C
7Z06243.1
max
typ
V_R (V)
0
1
2
3
10
20
30
40
50



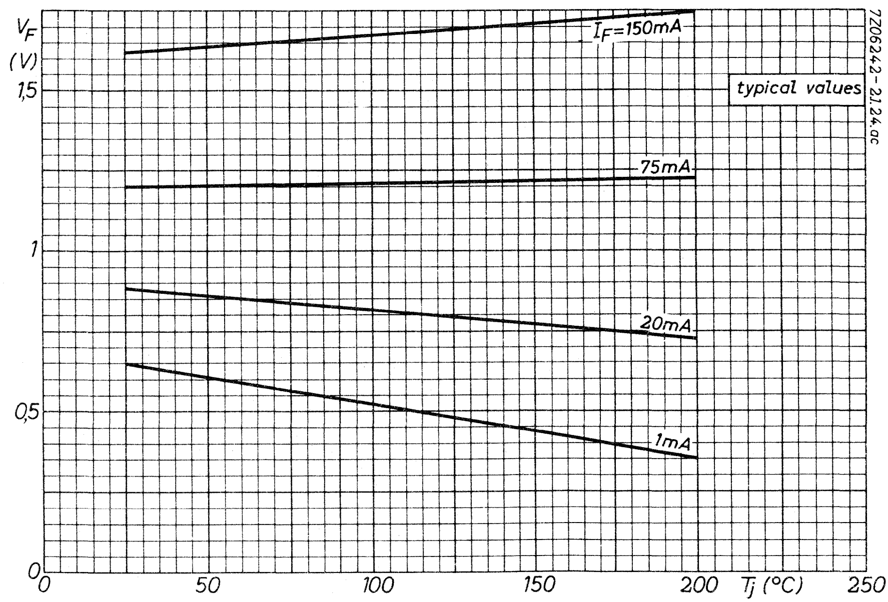
7Z06246.1
V_{fr} (V)
Forward recovery voltage versus rise time of the forward current typical values
T_j = 25°C
I_F = 75mA
20mA
10mA
t_r (ns)
0
1
2
3
10
20
30
40
50


7Z06244 - 21.24.ac
8
t_{rr}
(ns)
6
4
2
0
0
20
40
60
80
100
I_F (mA)
120
typ
I_F
t_{rr}
10% of
$\frac{V_R}{R_L}$
$V_R = I_F.R_L$
$T_j = 25°C$
$R_L = 100\Omega$

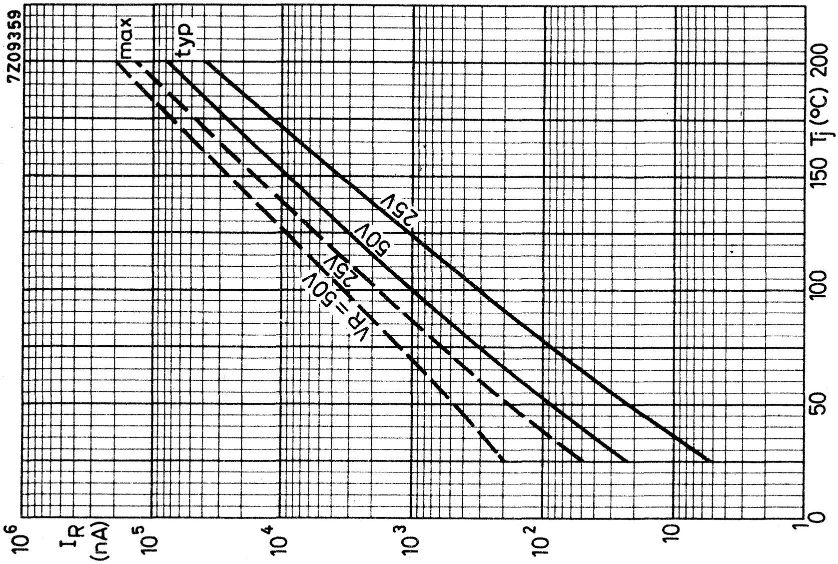

7Z06245.1
10
t_{rr}
(ns)
8
6
4
0
0
50
100
150
200
250
T_j (°C)
300
typ
I_F
t_{rr}
$I_R = 1\,mA$
$I_F = I_R = 10\,mA$
$R_L = 100\ \Omega$

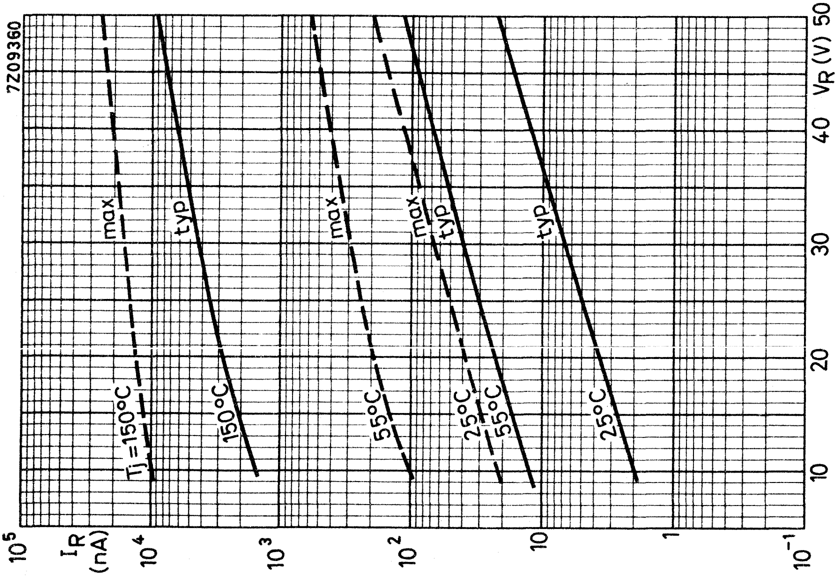


I_F (mA)
150
100
50
0
T_j = 25°C
typ
max. voltage
7Z06241-2.1.24.ac
0
0,5
1
1,5
2
V_F (V)
2,5



V_F (V)
1,5
1
0,5
0
I_F=150mA
typical values
75mA
20mA
1mA
7Z06242-2.1.24.ac
0
50
100
150
200
T_j (°C)
250


7Z09359
max
typ
25V
50V
25V
VR = 50V
Tj (°C)
0
50
100
150
200
IR (nA)
1
10
10^2
10^3
10^4
10^5
10^6


7Z09360
max
typ
Tj = 150°C
150°C
max
55°C
max
typ
25°C
55°C
typ
25°C
VR (V)
10
20
30
40
50
IR (nA)
10^-1
1
10
10^2
10^3
10^4
10^5

SILICON OXIDE PASSIVATED DIODE

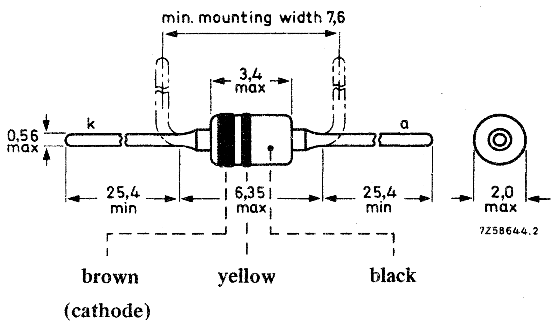
Whiskerless diffused diode in a hard glass subminiature envelope. It is a general purpose diode also intended for rectifier applications and low voltage stabilization.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	40	V
Average forward current	$I_{F(AV)}$	max.	350	mA
Non-repetitive peak forward current	I_{FSM}	max.	6,0	A
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	ns

MECHANICAL DATA

Dimensions in mm

SOD-17



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

Voltages

Repetitive peak reverse voltage	V_{RRM}	max.	40	V
Continuous reverse voltage	V_R	max.	20	V

Currents

Forward current (d.c.)	I_F	max.	500	mA
Average forward current (averaged over any 20 ms period; see also page 4)	$I_{F(AV)}$	max.	350	mA
Repetitive peak forward current	I_{FRM}	max.	2,0	A
Non-repetitive peak forward current (t = 10 ms; half sine wave) T_j = 25 °C prior to surge	I_{FSM}	max.	6,0	A

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j-a}$	=	0,3	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 1 mA	V_F	540 to 600	mV
I_F = 300 mA	V_F	800 to 1100	mV
I_F = 2000 mA; T_j = 150 °C	V_F	< 2000	mV

Reverse current

V_R = 20 V	I_R	< 100	nA
V_R = 20 V; T_j = 150 °C	I_R	< 100	µA ←

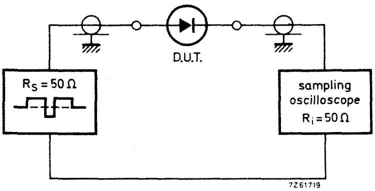
Diode capacitance

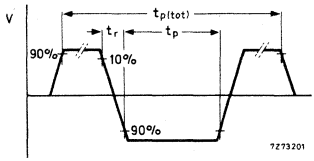
V_R = 0; f = 1 MHz	C_d	typ. 25	pF
		< 35	pF

Reverse recovery time when switched from

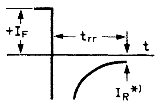
I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	< 50	ns

Test circuit and waveforms:





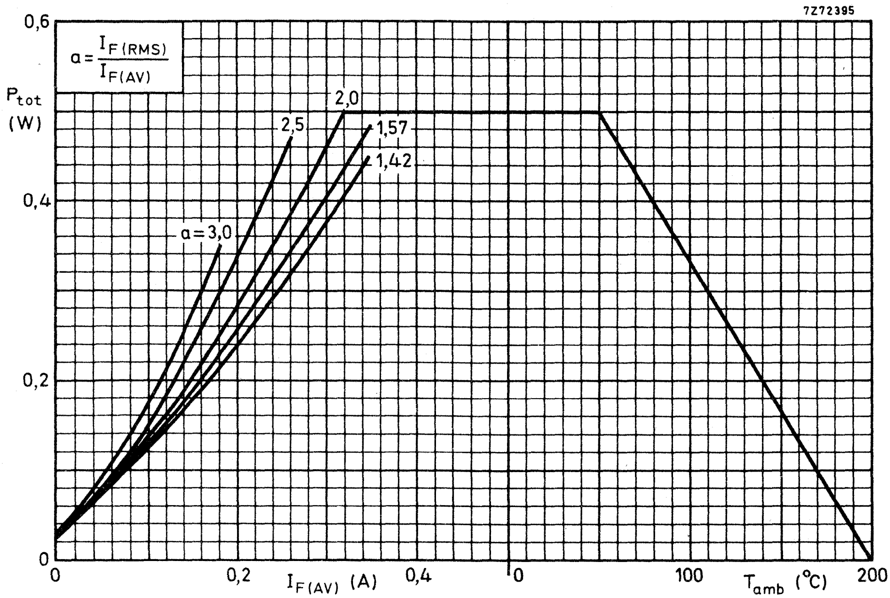
input signal



output signal

Input signal : Total pulse duration	$t_{p(tot)}$	= 2 µs	*) I_R = 3 mA
Duty factor	δ	= 0,0025	
Rise time of the reverse pulse	t_r	= 0,6 ns	
Reverse pulse duration	t_p	= 100 ns	
Oscilloscope: Rise time	t_r	= 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

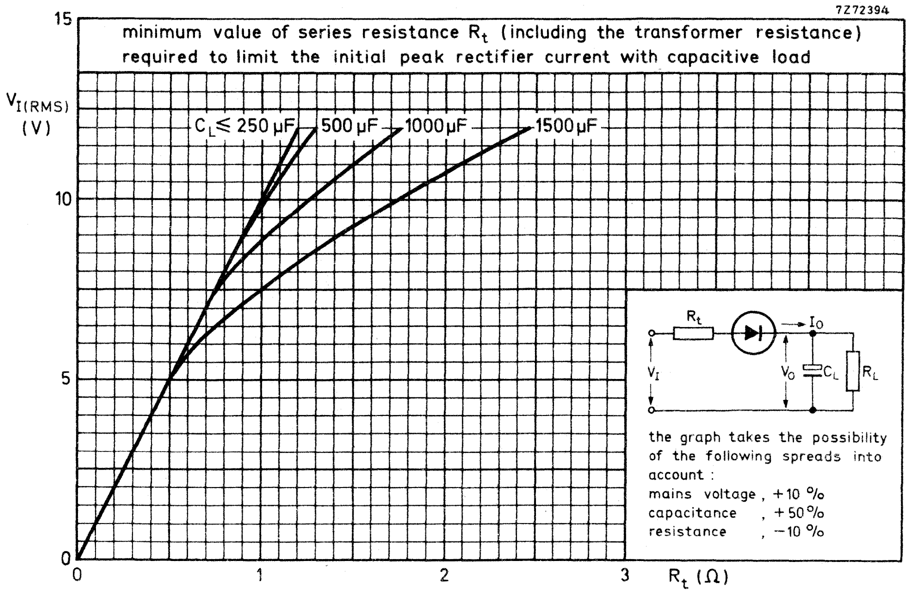


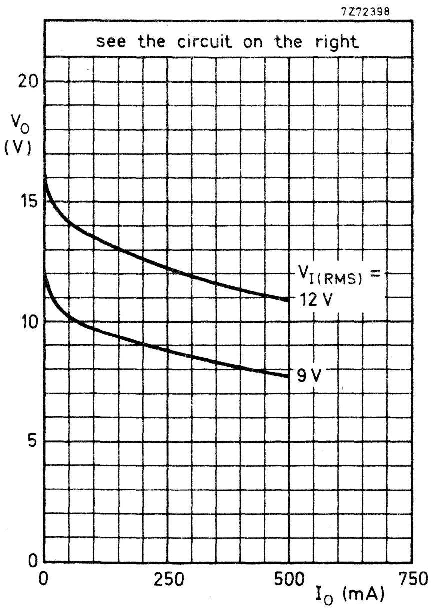
From the left-hand graph the total power dissipation can be found as a function of the average output current.

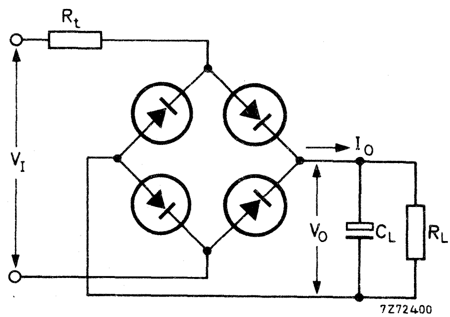
The parameter $a = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$ depends on $n\omega R_L C_L$ and $\frac{R_t + r_{diff}}{nR_L}$ and can be found from existing graphs.

See Application Book: RECTIFIER DIODES.

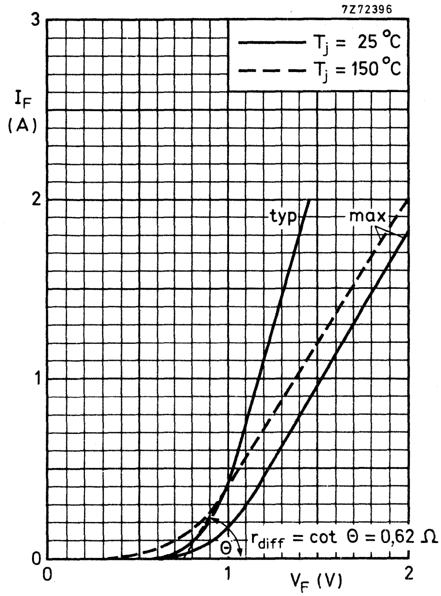
Once the power dissipation is known, the max. permissible ambient temperature follows from the right-hand graph.
For the series resistance, added to limit the initial peak rectifier current, the required minimum value can be found from the upper graph on page 5.
The value of r_{diff} can be found from the left-hand graph on page 6.

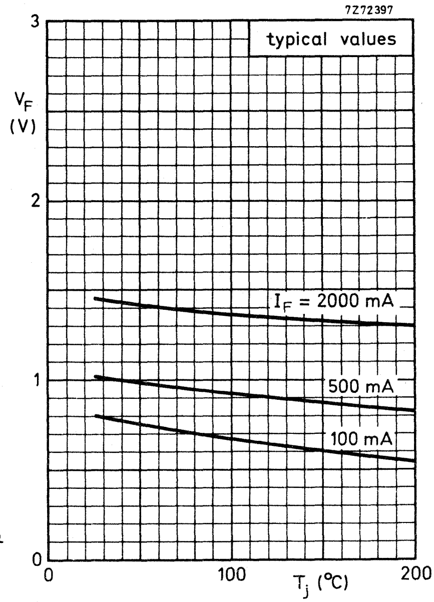


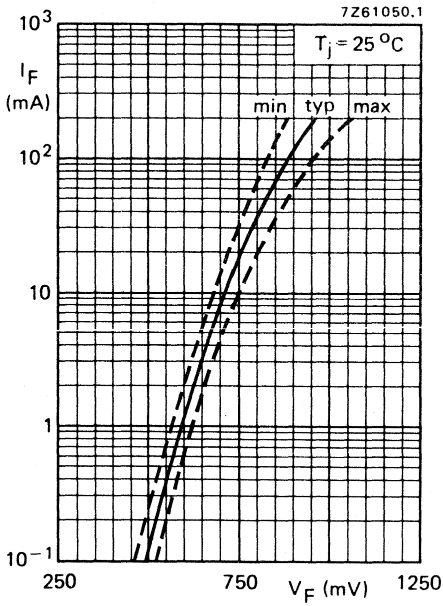




V_I (V)	R_t (Ω)	C_L (μF)
12	1, 7	1000
9	1, 1	1000


7Z72396
T_j = 25 °C
T_j = 150 °C
I_F (A)
typ
max
r_{diff} = cot Θ = 0,62 Ω
Θ
V_F (V)


7Z72397
typical values
V_F (V)
I_F = 2000 mA
500 mA
100 mA
T_j (°C)


7Z61050.1
T_j = 25 °C
I_F (mA)
min
typ
max
V_F (mV)

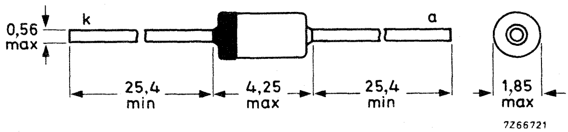
SILICON PLANAR EPITAXIAL DIODE

General purpose diode in a DO-35 envelope intended for low voltage switching applications, but owing to its steep forward voltage curve also suitable for voltage stabilizing and low voltage rectifier applications.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	40	V
Average forward current	$I_{F(AV)}$	max.	400	mA
Non-repetitive peak forward current	I_{FSM}	max.	6,0	A
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	300	ns

MECHANICAL DATA Dimensions in mm

DO-35



The coloured end indicates the cathode

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

Voltages

Repetitive peak reverse voltage	V_{RRM}	max.	40	V
Continuous reverse voltage	V_R	max.	20	V

Currents

Forward current (d.c.)	I_F	max.	500	mA
Average forward current (averaged over any 20 ms period; see also page 4)	$I_{F(AV)}$	max.	400	mA
Repetitive peak forward current	I_{FRM}	max.	2,0	A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) T_j = 25 ^oC prior to surge	I_{FSM}	max.	6,0	A

Temperatures

Storage temperature	T_{stg}	-65 to +200		^oC
Junction temperature	T_j	max.	200	^oC

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,38	^oC/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 1 mA	V_F		520 to 580	mV
I_F = 300 mA	V_F		750 to 950	mV
I_F = 2000 mA; T_j = 150 °C	V_F	<	1400	mV

Reverse current

V_R = 20 V	I_R	<	100	nA
V_R = 20 V; T_j = 150 °C	I_R	<	100	μA

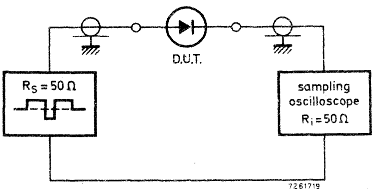
Diode capacitance

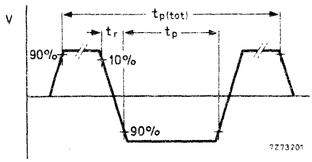
V_R = 0; f = 1 MHz	C_d	typ.	15	pF
		<	35	pF

Reverse recovery time when switched from

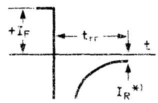
I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	300	ns

Test circuit and waveforms:





input signal

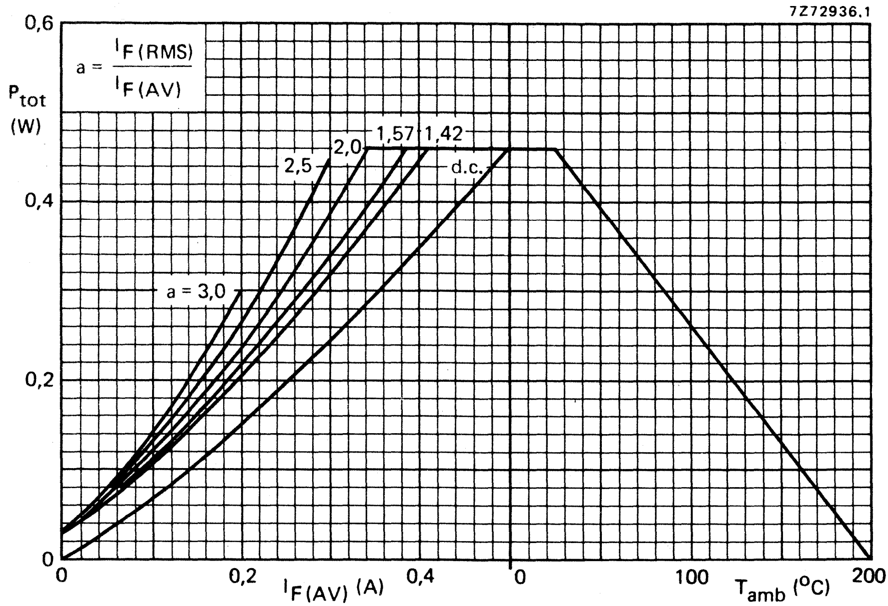


output signal

Input signal : Total pulse duration	$t_{p(tot)}$	=	10 μs
Duty factor	δ	=	0, 0025
Rise time of the reverse pulse	t_r	=	0, 6 ns
Reverse pulse duration	t_p	=	300 ns
Oscilloscope: Rise time	t_r	=	0, 35 ns

*) I_R = 3 mA

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

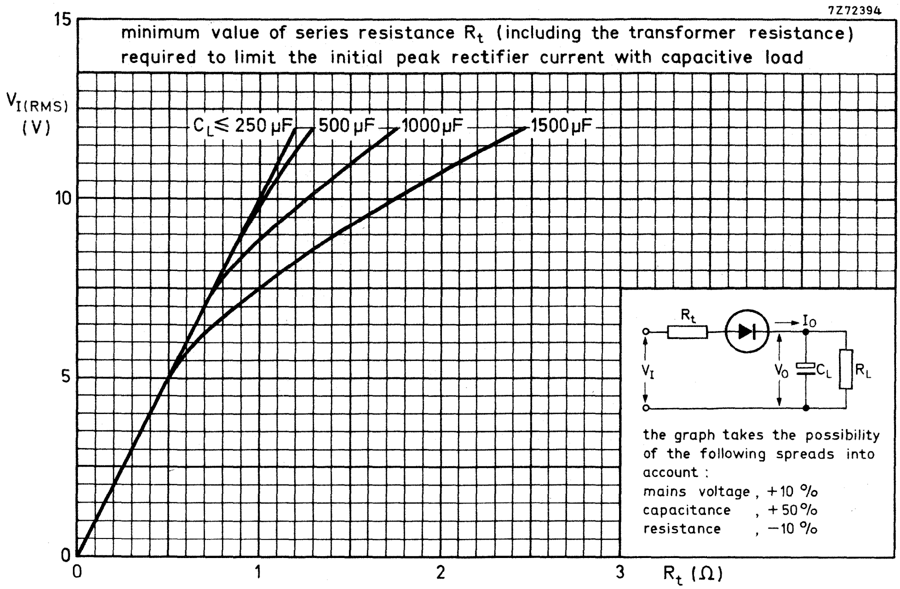


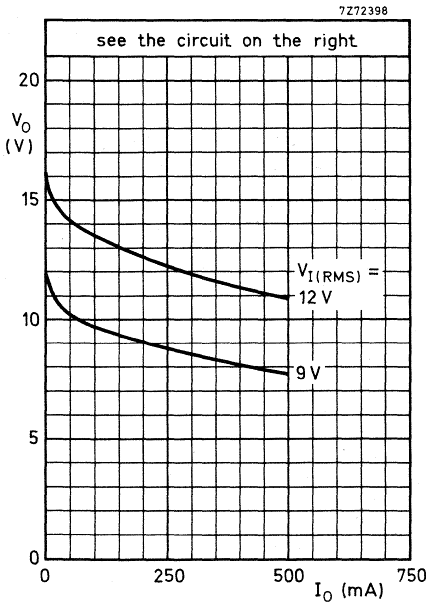
From the left-hand graph the total power dissipation can be found as a function of the average output current.

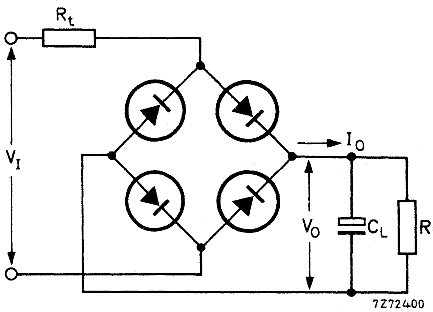
The parameter $a = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$ depends on $n\omega R_L C_L$ and $\frac{R_t + r_{diff}}{nR_L}$ and can be found from existing graphs.

For detailed explanation see Application Book: RECTIFIER DIODES.

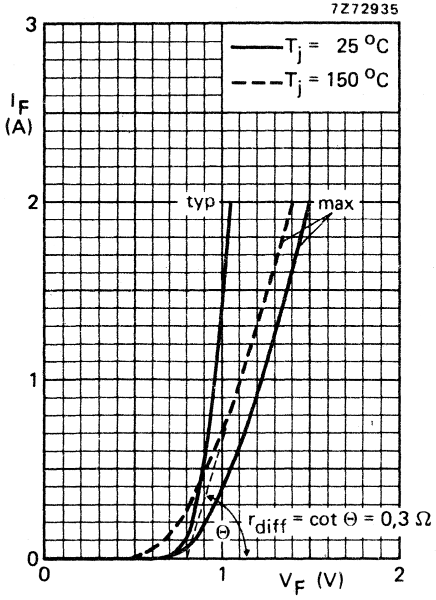
Once the power dissipation is known, the max. permissible ambient temperature follows from the right-hand graph.
For the series resistance, added to limit the initial peak rectifier current, the required minimum value can be found from the upper graph on page 5.
The value of r_{diff} can be found from the left-hand graph on page 6.

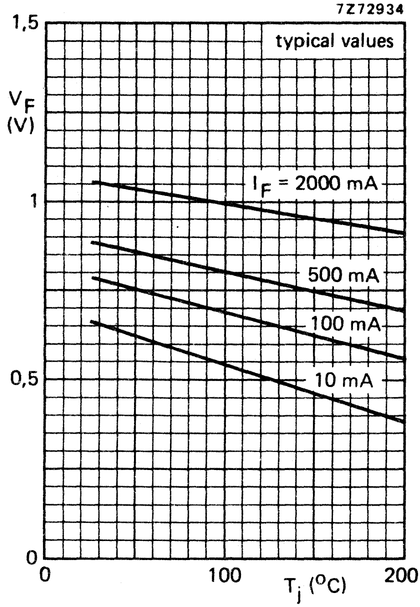


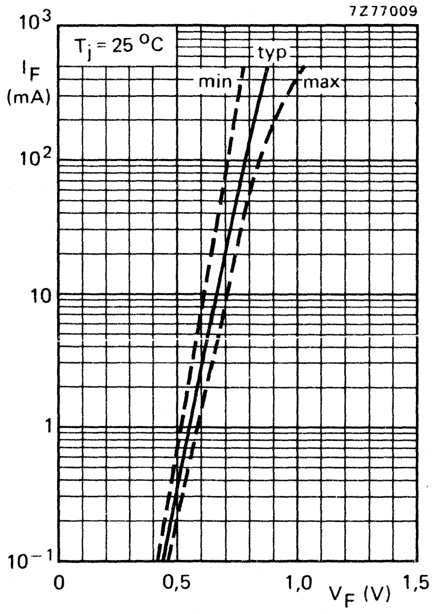




V_I (V)	R_t (Ω)	C_L (μF)
12	1, 7	1000
9	1, 1	1000


7Z72935
3
2
1
0
I_F
(A)
T_j = 25 °C
T_j = 150 °C
typ
max
r_{diff} = cot Θ = 0,3 Ω
Θ
0
1
2
V_F (V)


7Z72934
1,5
1
0,5
0
V_F
(V)
typical values
I_F = 2000 mA
500 mA
100 mA
10 mA
0
100
200
T_j (°C)


7Z77009
10^3
10^2
10
1
10^{-1}
I_F
(mA)
T_j = 25 °C
typ
min
max
0
0,5
1,0
1,5
V_F (V)

SILICON OXIDE PASSIVATED DIODE

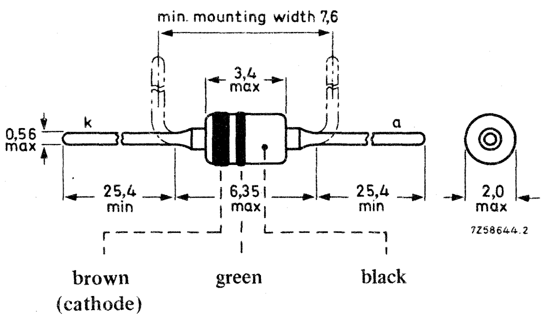
Whiskerless diode in a subminiature envelope. The BAX15 is primarily intended for general purpose industrial applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	150	V
Repetitive peak reverse voltage	V_{RRM}	max.	180	V
Repetitive peak forward current	I_{FRM}	max.	500	mA
Thermal resistance from junction to ambient	$R_{th\ j-a}$	=	0,4	$^oC/mW$
Forward voltage at I_F = 100 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	300	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	typ.	1	nC

MECHANICAL DATA

Dimensions in mm

SOD-17



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

Voltages

Continuous reverse voltage	V_R	max.	150	V
Repetitive peak reverse voltage	V_{RRM}	max.	180	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250	mA [1]
Forward current (d.c.)	I_F	max.	250	mA
Repetitive peak forward current	I_{FRM}	max.	500	mA
Non-repetitive peak forward current; t ≤ 10 μs	I_{FSM}	max.	30	A

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,4	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 100 mA	V_F	<	1,00	V
I_F = 100 mA; T_j = 100 °C	V_F	<	0,92	V
I_F = 250 mA	V_F	<	1,35	V

Reverse current

V_R = 150 V	I_R	<	200	nA
V_R = 150 V; T_j = 100 °C	I_R	<	10	μA

Diode capacitance (see also page 7)

V_R = 0; f = 1 MHz	C_d	<	20	pF

[1]) For sinusoidal operation see page 5.
For pulse operation see page 4.

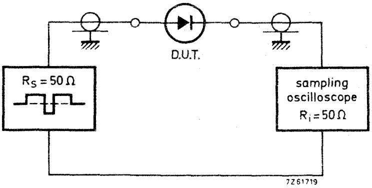
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

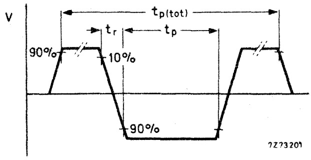
Reverse recovery time when switched from

$I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100\ \Omega$;

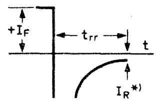
measured at $I_R = 3$ mA t_{rr} < 300 ns

Test circuit and waveforms :





input signal



output signal

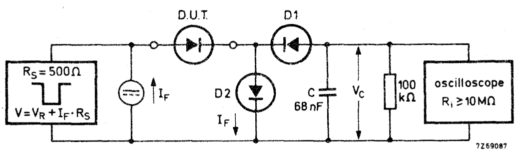
Input signal	: Total pulse duration	$t_{p(tot)}$	= 10 μs	*) $I_R = 3$ mA
	Duty factor	δ	= 0,0025	
	Rise time of the reverse pulse	t_r	= 0,6 ns	
	Reverse pulse duration	t_p	= 300 ns	
Oscilloscope	: Rise time	t_r	= 0,35 ns	

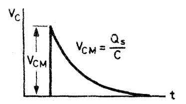
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ Q_s typ. 1 nC

Test circuit and waveform:



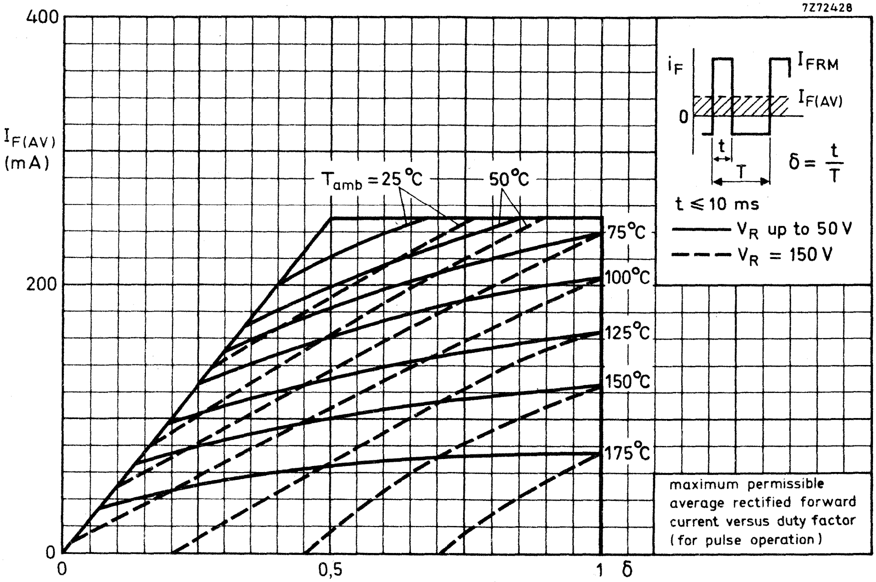


output signal

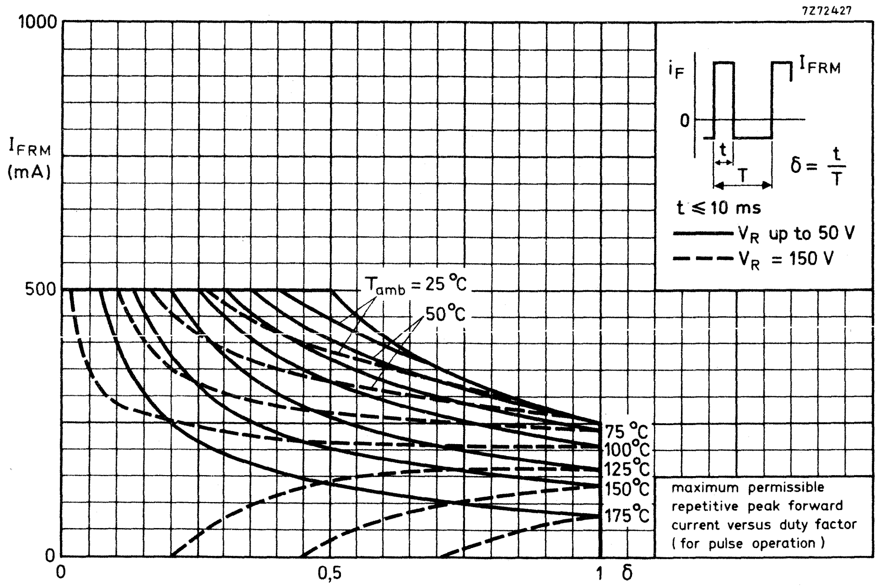
D1 = D2 = BAW62

Input signal:	Rise time of the reverse pulse	t_r	= 15 ns
	Reverse pulse duration	t_p	= 35 μs
	Frequency	f	= 25 kHz

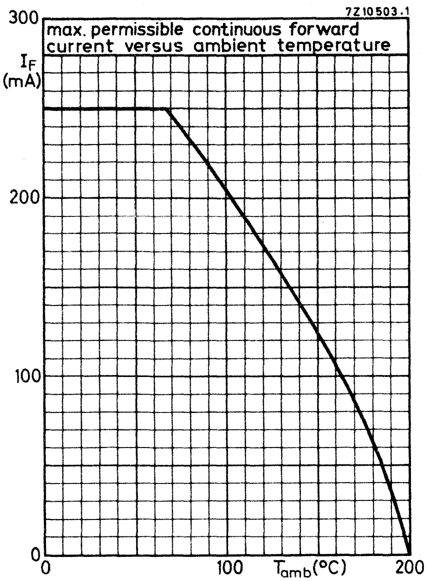
Circuit capacitance C ≤ 30 pF (C = oscilloscope input capacitance + parasitic capacitance)

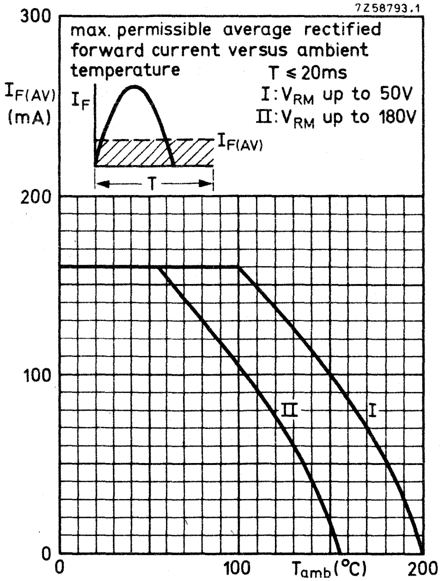


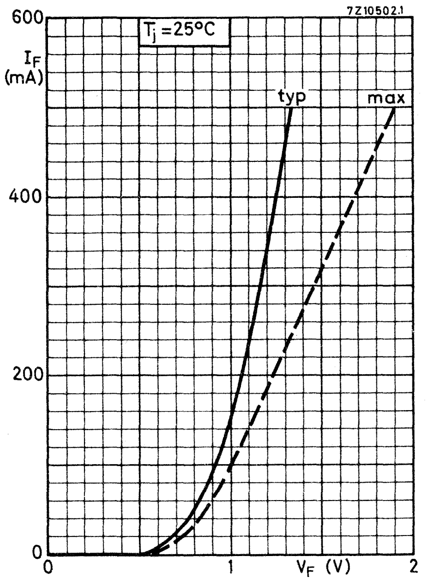
maximum permissible average rectified forward current versus duty factor (for pulse operation)

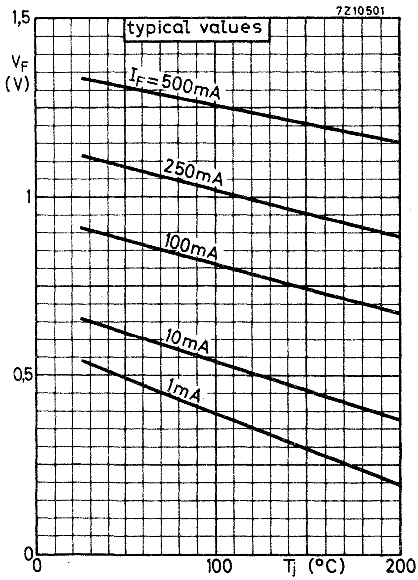


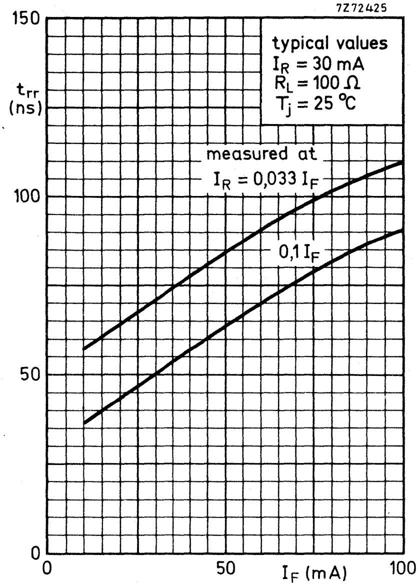
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

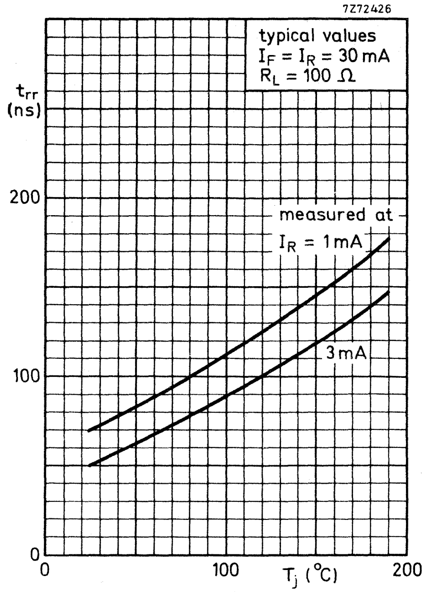

7Z10503.1
max. permissible continuous forward current versus ambient temperature
300
I_F (mA)
200
100
0
0
100
T_{amb}(°C)
200

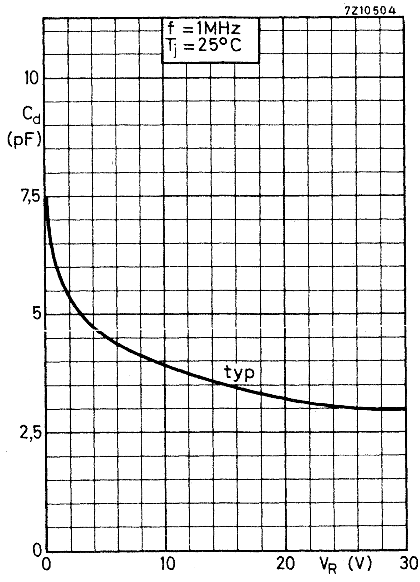

7Z58793.1
max. permissible average rectified forward current versus ambient temperature
T ≤ 20ms
I: V_{RM} up to 50V
II: V_{RM} up to 180V
I_F
$I_{F(AV)}$
T
300
$I_{F(AV)}$ (mA)
200
100
0
II
I
0
100
T_{amb}(°C)
200

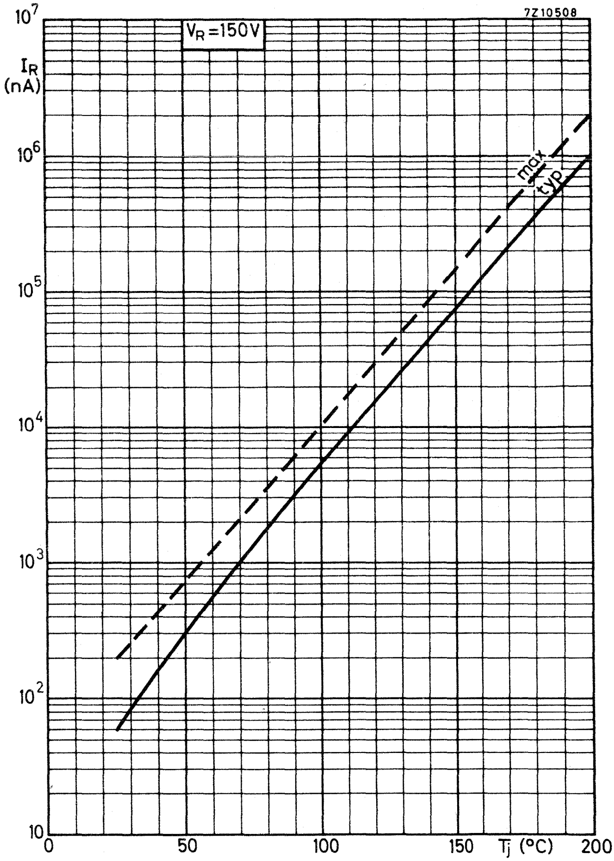

7Z10502.1
T_j = 25°C
600
I_F (mA)
400
200
0
typ
max
0
1
V_F (V)
2


7Z10501
typical values
1,5
V_F (V)
1
0,5
0
I_F = 500mA
250mA
100mA
10mA
1mA
0
100
T_j (°C)
200


7Z72425
typical values
I_R = 30 mA
R_L = 100 Ω
T_j = 25 °C
t_{rr} (ns)
measured at
I_R = 0,033 I_F
0,1 I_F
150
100
50
0
0
50
100
I_F (mA)


7Z72426
typical values
I_F = I_R = 30 mA
R_L = 100 Ω
t_{rr} (ns)
measured at
I_R = 1 mA
3 mA
200
100
0
0
100
200
T_j (°C)


7Z10504
f = 1MHz
T_j = 25°C
C_d (pF)
typ
10
7,5
5
2,5
0
0
10
20
30
V_R (V)


7Z10508
V_R = 150V
I_R (nA)
10^7
10^6
10^5
10^4
10^3
10^2
10
max
typ
0
50
100
150
200
T_j (°C)

SILICON OXIDE PASSIVATED DIODE

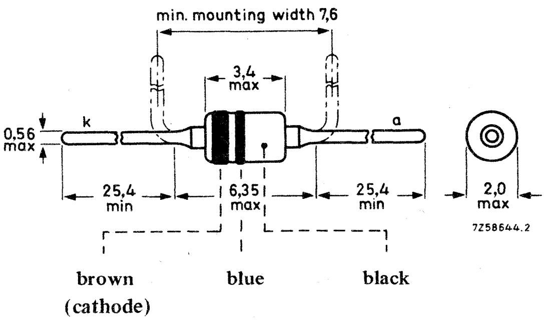
Whiskerless diffused diode in a hard glass subminiature envelope.
The BAX 16 is primarily intended for general purpose industrial applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	150	V
Repetitive peak forward current	I_{FRM}	max.	300	mA
Thermal resistance from junction to ambient	$R_{th\ j-a}$	=	0,50	°C/mW
Forward voltage at I_F = 100 mA	V_F	<	1,3	V
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	120	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	0,7	nC

MECHANICAL DATA

Dimensions in mm

SOD-17



FOR NEW DESIGN THE SUCCESSOR TYPE BAV20 IS RECOMMENDED

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

Voltages

Continuous reverse voltage	V_R	max.	150	V
Repetitive peak reverse voltage	V_{RRM}	max.	150	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	200	mA [1]
Forward current (d. c.)	I_F	max.	200	mA
Repetitive peak forward current	I_{FRM}	max.	300	mA
Non-repetitive peak forward current t = 1 µs	I_{FSM}	max.	2500	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,50	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 1 mA	V_F	<	0,65	V
I_F = 10 mA; T_j = 100 °C	V_F	<	0,85	V
I_F = 100 mA	V_F	<	1,3	V [2]
I_F = 200 mA	V_F	<	1,5	V [2]
I_F = 200 mA; T_j = 175 °C	V_F	<	1,4	V [2]

Reverse current

V_R = 50 V	I_R	<	25	nA
V_R = 50 V; T_j = 150 °C	I_R	<	25	µA
V_R = 150 V	I_R	<	100	nA
V_R = 150 V; T_j = 150 °C	I_R	<	100	µA

Diode capacitance (see also page 6)

V_R = 0; f = 1 MHz	C_d	<	10	pF

[1]) For sinusoidal operation see page 5. For pulse operation see page 4.

[2]) Measured under pulse conditions to avoid excessive dissipation.

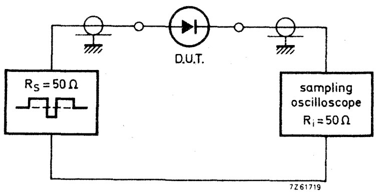
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

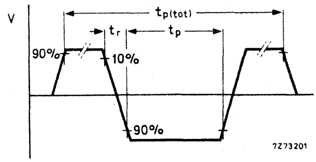
Reverse recovery time when switched from

$I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100\ \Omega$;

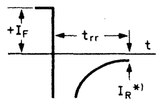
measured at $I_R = 3$ mA (see also page 6) t_{rr} typ. 70 ns; < 120 ns

Test circuit and waveforms :





input signal



output signal

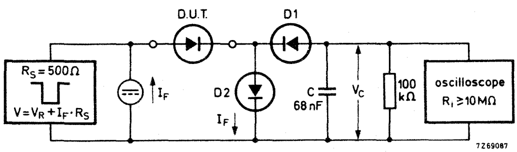
Input signal :	Total pulse duration	$t_{p(tot)}$ = 10 μs	*) I_R = 3 mA
	Duty factor	δ = 0,0025	
	Rise time of the reverse pulse	t_r = 0,6 ns	
	Reverse pulse duration	t_p = 300 ns	
Oscilloscope :	Rise time	t_r = 0,35 ns	

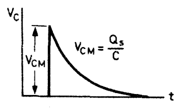
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ Q_s < 0,7 nC

Test circuit and waveform :



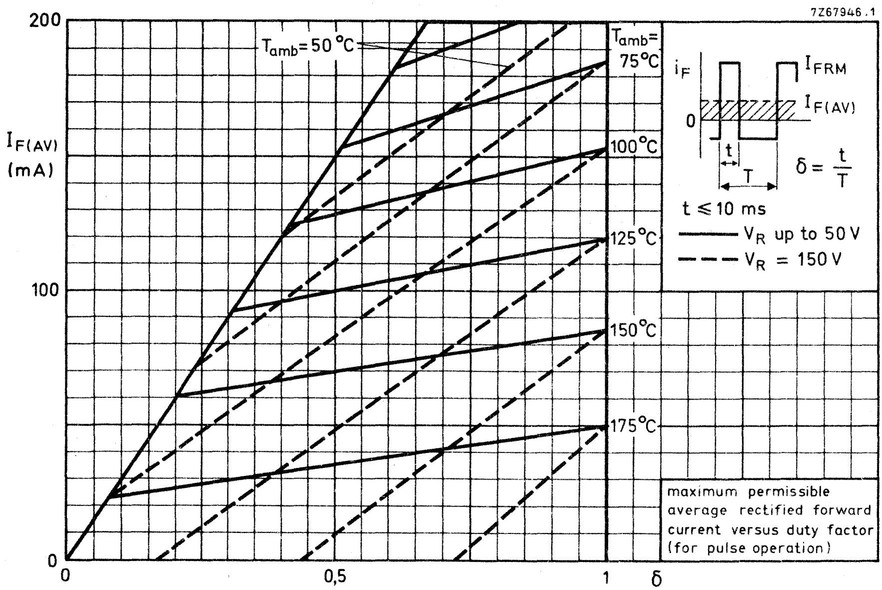


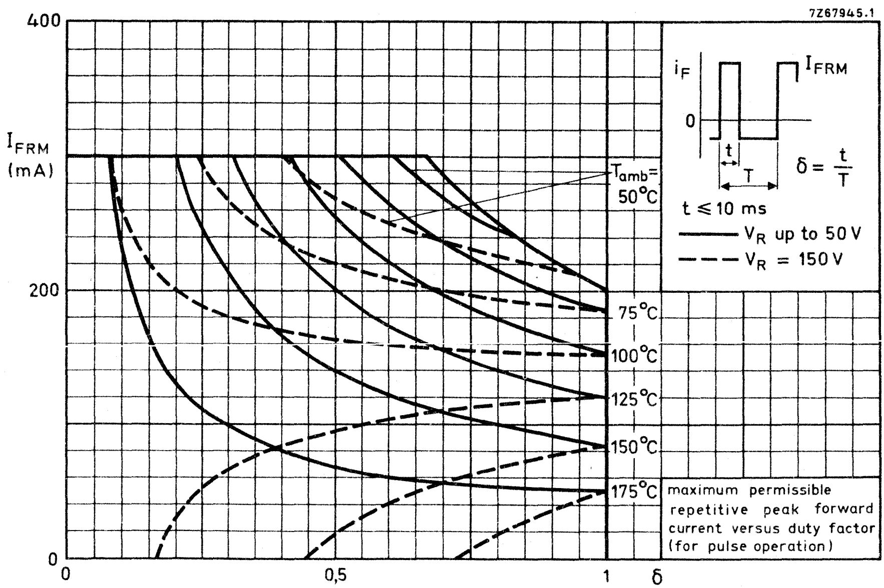
output signal 7Z69086.1

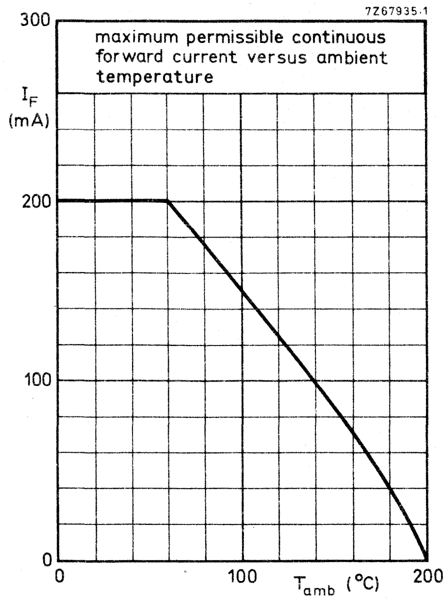
D1 = D2 = BAW62

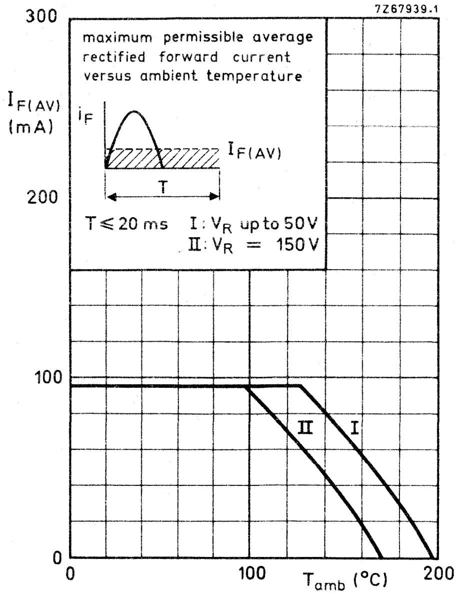
Input signal:	Rise time of the reverse pulse	t_r = 15 ns
	Reverse pulse duration	t_p = 35 μs
	Frequency	f = 25 kHz

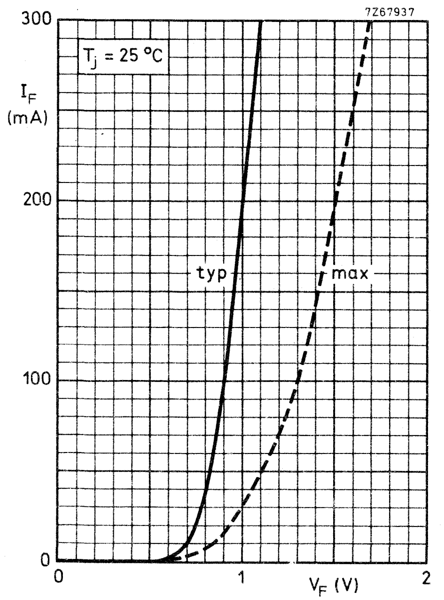
Circuit capacitance C ≤ 30 pF (C = oscilloscope input capacitance + parasitic capacitance)

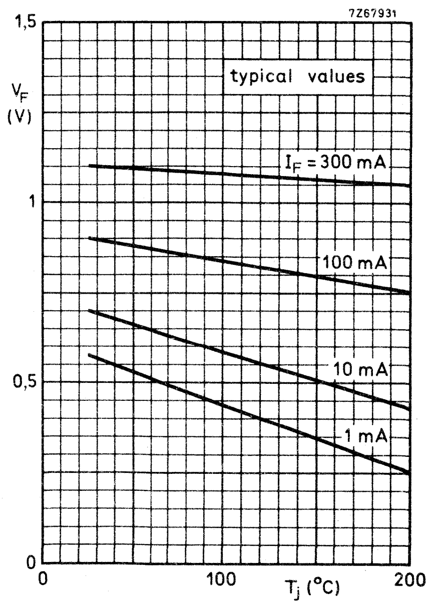

7Z67946.1
200
100
0
$I_{F(AV)}$
(mA)
0
0,5
1
δ
T_{amb} = 50 °C
T_{amb} =
75 °C
100 °C
125 °C
150 °C
175 °C
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R up to 50 V
V_R = 150 V
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

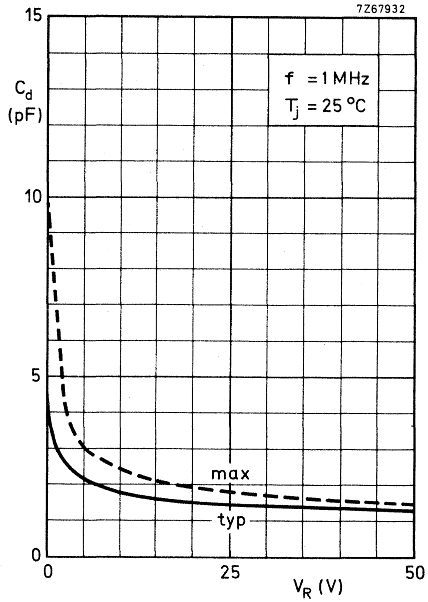

7Z67945.1
400
200
0
I_{FRM}
(mA)
0
0,5
1
δ
T_{amb} =
50 °C
75 °C
100 °C
125 °C
150 °C
175 °C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 10 ms
V_R up to 50 V
V_R = 150 V
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)

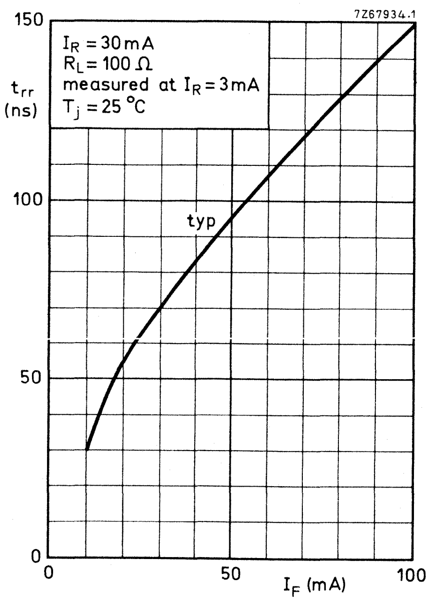

7Z67935.1
maximum permissible continuous forward current versus ambient temperature
I_F (mA)
T_{amb} (°C)
0
100
200
300

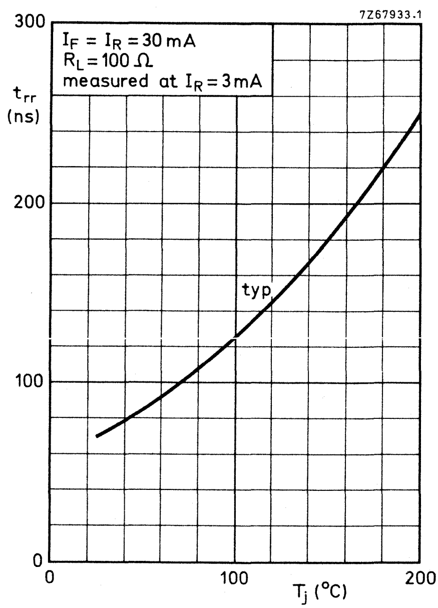

7Z67939.1
maximum permissible average rectified forward current versus ambient temperature
$I_{F(AV)}$ (mA)
i_F
$I_{F(AV)}$
T
T ≤ 20 ms I: V_R up to 50 V
II: V_R = 150 V
II
I
T_{amb} (°C)
0
100
200
300

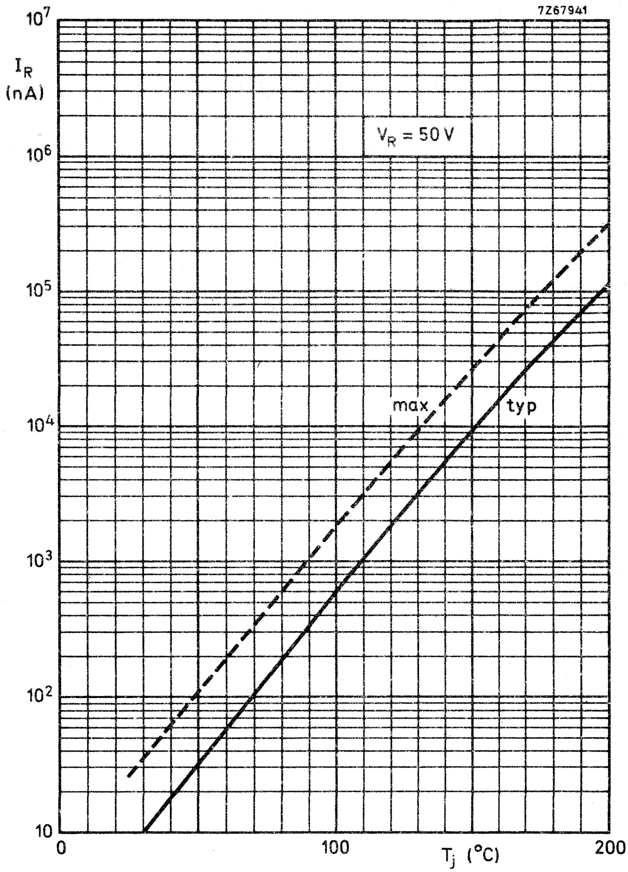

7Z67937
T_j = 25 °C
I_F (mA)
typ
max
V_F (V)
0
1
2
100
200
300

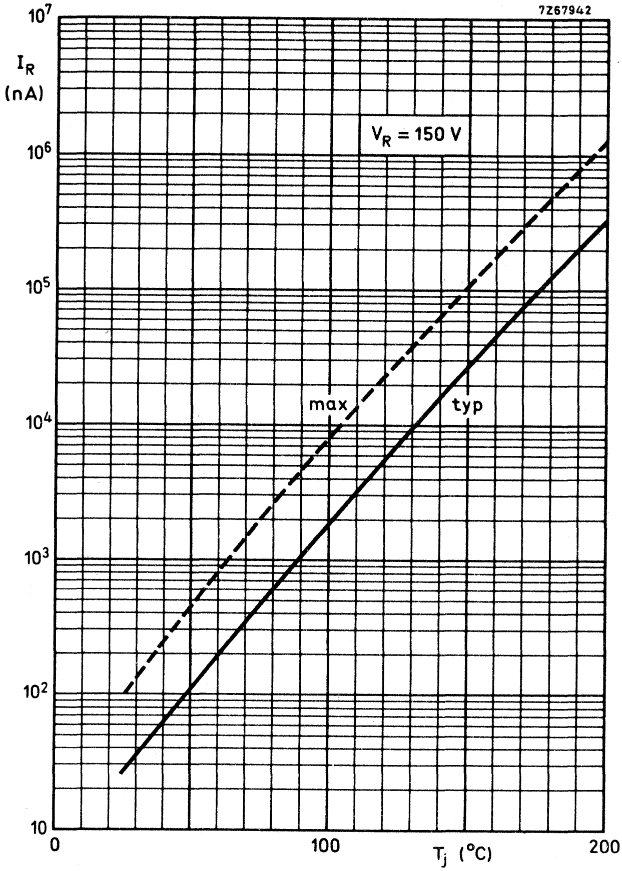

7Z67931
typical values
V_F (V)
I_F = 300 mA
100 mA
10 mA
1 mA
T_j (°C)
0
0,5
1
1,5
100
200


7Z67932
15
10
5
0
C_d (pF)
f = 1 MHz
T_j = 25 °C
max
typ
0
25
50
V_R (V)


7Z67934.1
150
100
50
0
t_{rr} (ns)
I_R = 30 mA
R_L = 100 Ω
measured at I_R = 3 mA
T_j = 25 °C
typ
0
50
100
I_F (mA)


7Z67933.1
300
200
100
0
t_{rr} (ns)
I_F = I_R = 30 mA
R_L = 100 Ω
measured at I_R = 3 mA
typ
0
100
200
T_j (°C)


7Z67941
10^7
I_R
(nA)
$V_R = 50\,V$
10^6
10^5
max
typ
10^4
10^3
10^2
10
0
100
T_j (°C)
200


7Z67942
I_R
(nA)
V_R = 150 V
max
typ
10^7
10^6
10^5
10^4
10^3
10^2
10
0
100
200
T_j (°C)

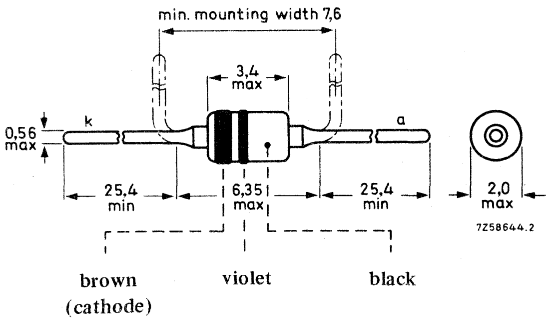
SILICON OXIDE PASSIVATED DIODE

Whiskerless diffused diode in a hard glass subminiature envelope.
The BAX17 is primarily intended for general purpose industrial applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	200	V
Repetitive peak forward current	I_{FRM}	max.	300	mA
Thermal resistance from junction to ambient	$R_{th\ j-a}$	=	0,50	$^oC/mW$
Forward voltage at I_F = 200 mA	V_F	<	1,2	V
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	120	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	0,7	nC

MECHANICAL DATA Dimensions in mm

SOD-17



FOR NEW DESIGN THE SUCCESSOR TYPE BAV21 IS RECOMMENDED

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

Voltages

Continuous reverse voltage	V_R	max.	200	V
Repetitive peak reverse voltage	V_{RRM}	max.	200	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	200	mA [1]
Forward current (d.c.)	I_F	max.	200	mA
Repetitive peak forward current	I_{FRM}	max.	300	mA
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	2500	mA
t = 1 s	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,50	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltages

I_F = 1 mA	V_F	<	0,65	V
I_F = 10 mA; T_j = 100 °C	V_F	<	0,75	V
I_F = 100 mA	V_F	<	1,1	V [2]
I_F = 200 mA	V_F	<	1,2	V [2]
I_F = 200 mA; T_j = 175 °C	V_F	<	1,2	V [2]

Reverse currents

V_R = 50 V	I_R	<	25	nA
V_R = 50 V; T_j = 150 °C	I_R	<	25	μA
V_R = 150 V	I_R	<	100	nA
V_R = 200 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance (see also page 6)

V_R = 0; f = 1 MHz	C_d	<	10	pF

[1] For sinusoidal operation see page 5. For pulse operation see page 4.

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

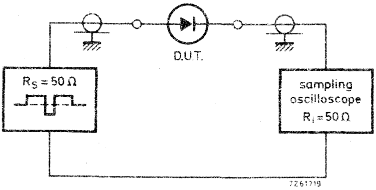
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

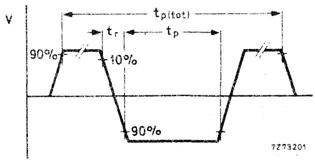
Reverse recovery time when switched from

$I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100\ \Omega$;

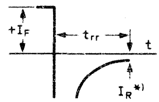
measured at $I_R = 3$ mA (see also page 6) t_{rr} typ. 70 ns; < 120 ns

Test circuit and waveforms:





input signal



output signal

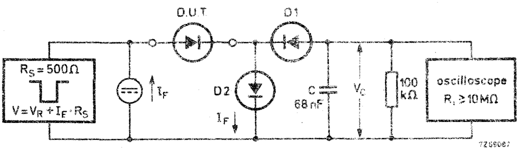
Input signal : Total pulse duration	$t_{p(tot)}$	= 10 µs	*) $I_R = 3$ mA
Duty factor	δ	= 0,0025	
Rise time of the reverse pulse	t_r	= 0,6 ns	
Reverse pulse duration	t_p	= 300 ns	
Oscilloscope: Rise time	t_r	= 0,35 ns	

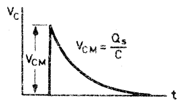
Circuit capacitance $C \leq 1$ pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ Q_s < 0,7 nC

Test circuit and waveform:



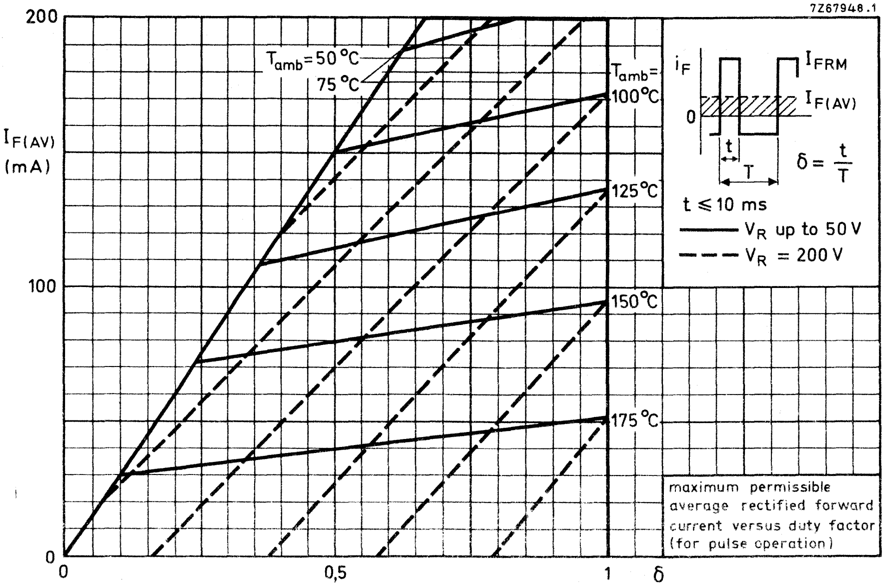


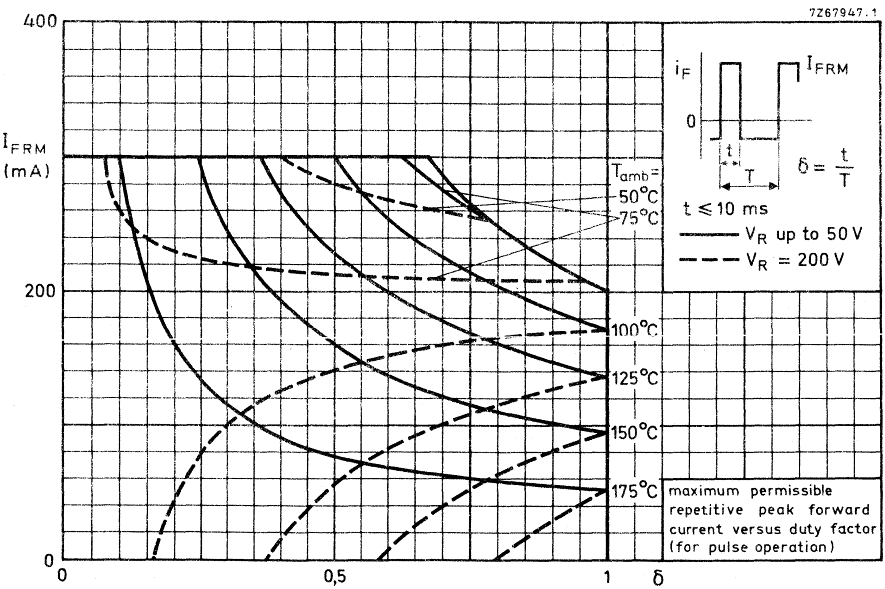
output signal

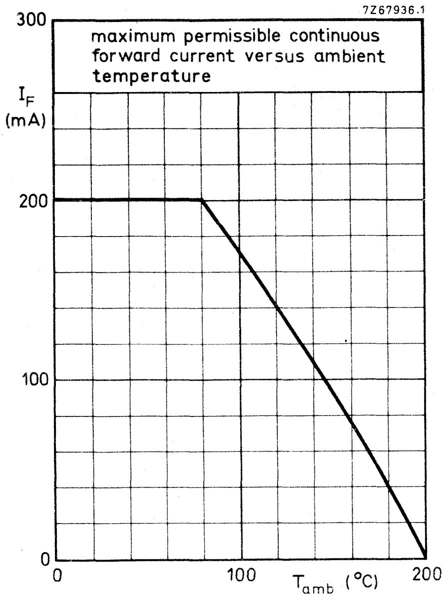
D1 = D2 = BAW62

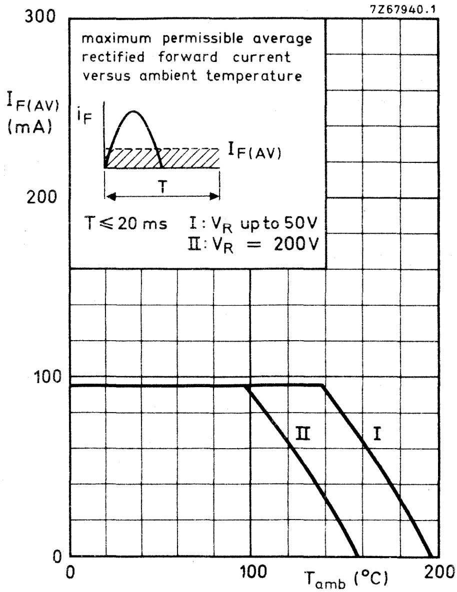
Input signal: Rise time of the reverse pulse	t_r	= 15 ns
Reverse pulse duration	t_p	= 35 µs
Frequency	f	= 25 kHz

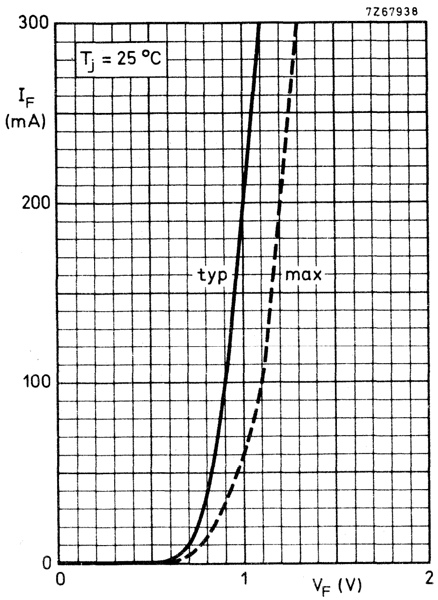
Circuit capacitance $C \leq 30$ pF (C = oscilloscope input capacitance + parasitic capacitance)

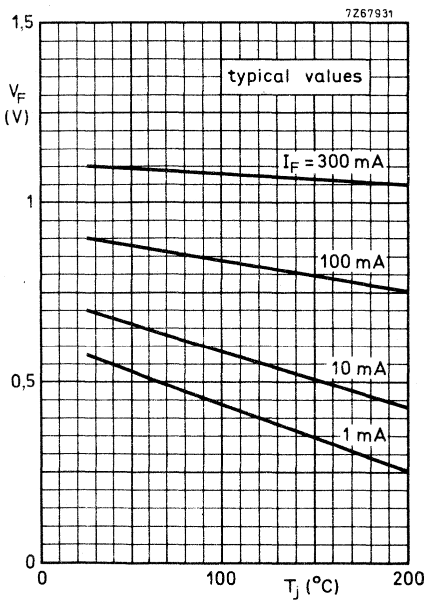

7Z67948.1
200
100
0
0
0,5
1
δ
$I_{F(AV)}$
(mA)
T_{amb} = 50 °C
75 °C
T_{amb} =
100°C
125°C
150°C
175°C
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R up to 50 V
V_R = 200 V
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

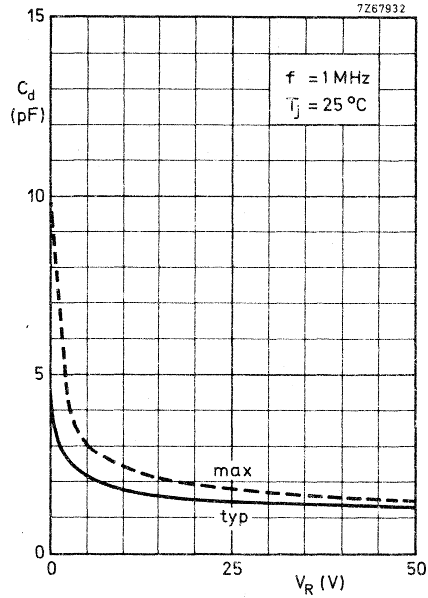

7Z67947.1
400
200
0
0
0,5
1
δ
I_{FRM}
(mA)
T_{amb} =
50°C
75°C
100°C
125°C
150°C
175°C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 10 ms
V_R up to 50 V
V_R = 200 V
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)

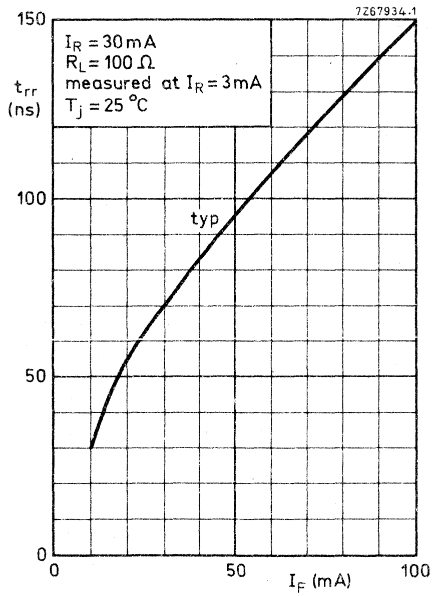

7Z67936.1
maximum permissible continuous forward current versus ambient temperature
I_F (mA)
300
200
100
0
0
100
200
T_amb (°C)

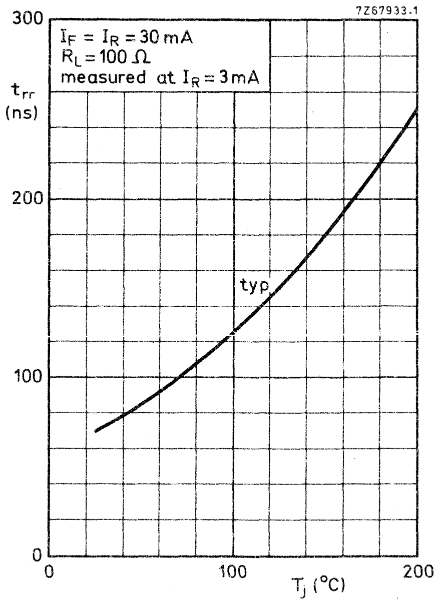

7Z67940.1
maximum permissible average rectified forward current versus ambient temperature
I_F(AV) (mA)
i_F
I_F(AV)
T
T ≤ 20 ms
I : V_R up to 50V
II : V_R = 200V
300
200
100
0
0
100
200
T_amb (°C)
II
I

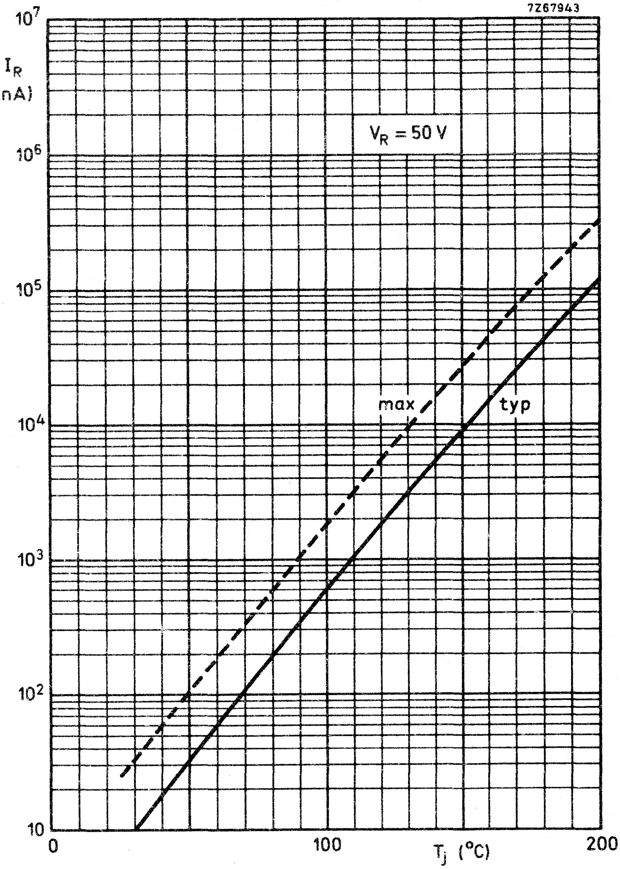

7Z67938
T_j = 25 °C
I_F (mA)
300
200
100
0
typ
max
0
1
2
V_F (V)

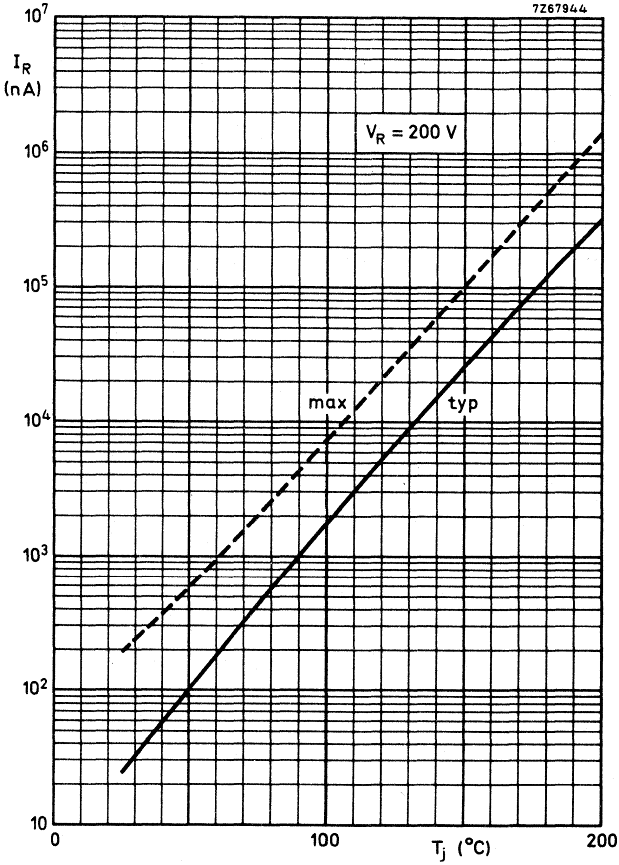

7Z67931
typical values
V_F (V)
1,5
1
0,5
0
I_F = 300 mA
100 mA
10 mA
1 mA
0
100
200
T_j (°C)


7Z67932
15
10
5
0
C_d
(pF)
f = 1 MHz
T_j = 25 °C
max
typ
0
25
50
V_R (V)


7Z67934.1
150
100
50
0
t_rr
(ns)
I_R = 30 mA
R_L = 100 Ω
measured at I_R = 3 mA
T_j = 25 °C
typ
0
50
100
I_F (mA)


7Z67933.1
300
200
100
0
t_rr
(ns)
I_F = I_R = 30 mA
R_L = 100 Ω
measured at I_R = 3 mA
typ
0
100
200
T_j (°C)


7Z67943
10^7
I_R
(nA)
$V_R = 50$ V
10^6
10^5
max
typ
10^4
10^3
10^2
10
0
100
T_j (°C)
200


7Z67944
I_R (nA)
10^7
10^6
10^5
10^4
10^3
10^2
10
V_R = 200 V
max
typ
0
100
200
T_j (°C)

SILICON OXIDE PASSIVATED DIODE

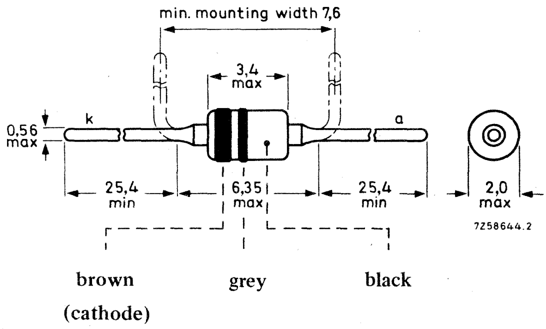
Whiskerless diffused diode in a hard glass subminiature envelope.
It is a general purpose diode primarily intended for rectifier applications.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Average forward current	$I_{F(AV)}$	max.	350	mA
Non-repetitive peak forward current	I_{FSM}	max.	6,0	A

MECHANICAL DATA

Dimensions in mm

SOD-17



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

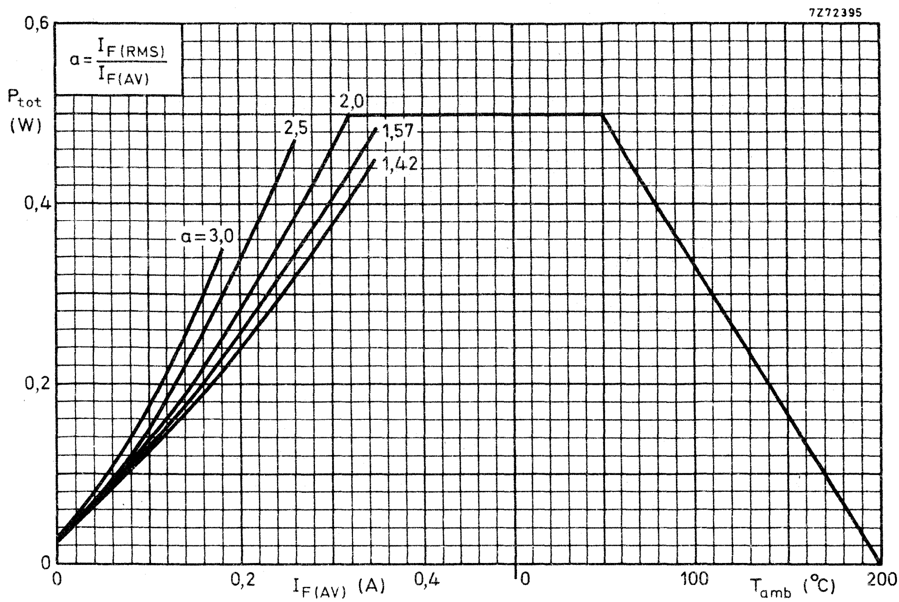
Voltages				
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Continuous reverse voltage	V_R	max.	75	V
Currents				
Forward current (d.c.)	I_F	max.	500	mA
Average forward current (averaged over any 20 ms period; see also page 3)	$I_{F(AV)}$	max.	350	mA
Repetitive peak forward current	I_{FRM}	max.	2,0	A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) T_j = 25 °C prior to surge	I_{FSM}	max.	6,0	A
Temperatures				
Storage temperature	T_{stg}	-65 to	+200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,3	°C/mW

CHARACTERISTICS

Forward voltage				
I_F = 2 A; T_j = 150 °C	V_F	<	2,0	V
Reverse current				
V_R = 75 V; T_j = 150 °C	I_R	<	100	μA
→ Diode capacitance				
V_R = 0; f = 1 MHz	C_d	typ.	25	pF
		<	35	pF

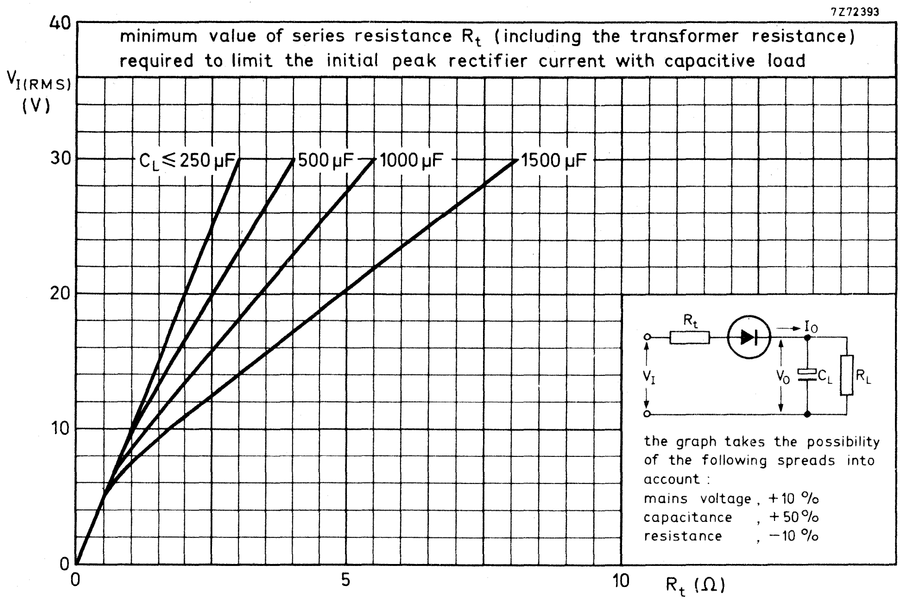


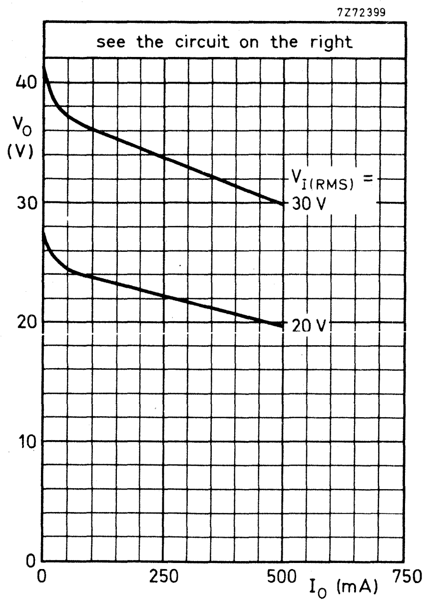
From the left-hand graph the total power dissipation can be found as a function of the average output current.

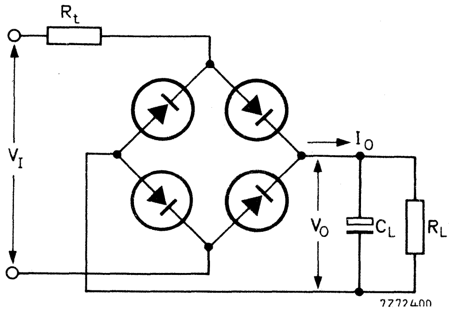
The parameter $a = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$ depends on $n\omega R_L C_L$ and $\frac{R_t + r_{diff}}{nR_L}$ and can be found from existing graphs.

See Application Book: RECTIFIER DIODES.

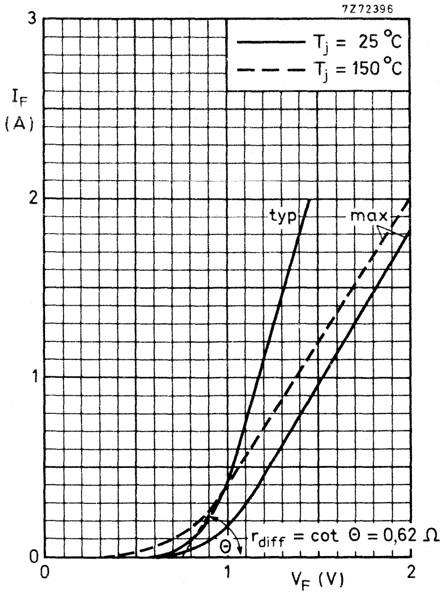
Once the power dissipation is known, the max. permissible ambient temperature follows from the right-hand graph.
For the series resistance, added to limit the initial peak rectifier current, the required minimum value can be found from the upper graph on page 4.
The value of r_{diff} can be found from the left-hand graph on page 5.

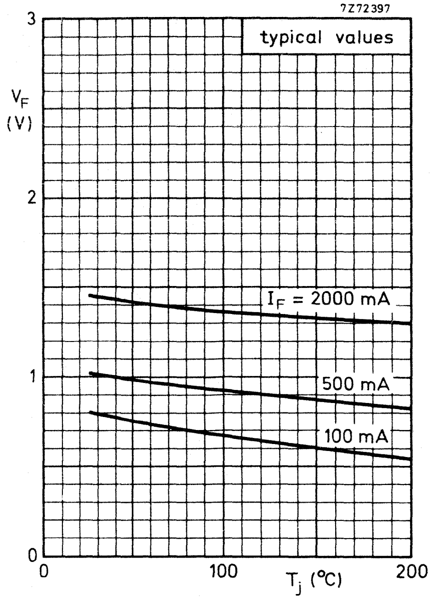


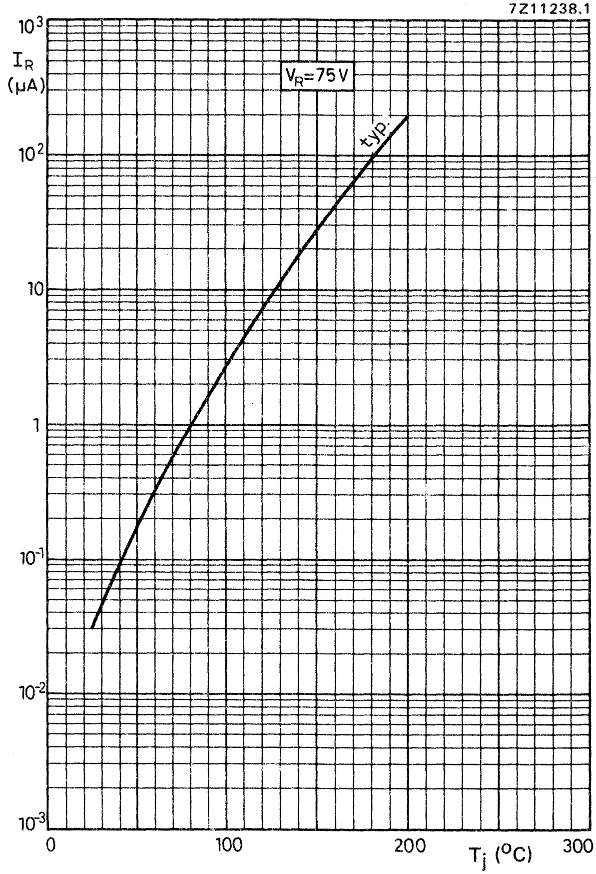




V_I (V)	R_t (Ω)	C_L (µF)
30	5, 6	1000
20	3, 4	1000


7Z72396
T_j = 25 °C
T_j = 150 °C
I_F
(A)
typ
max
r_{diff} = cot Θ = 0,62 Ω
Θ
V_F (V)
0
1
2
3


7Z72397
typical values
V_F
(V)
I_F = 2000 mA
500 mA
100 mA
T_j (°C)
0
100
200
1
2
3


7Z11238.1
I_R (μA)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
$V_R = 75$ V
typ.
0
100
200
300
T_j (°C)

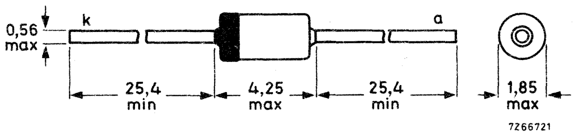
SILICON PLANAR EPITAXIAL DIODE

General purpose diode in a DO-35 envelope primarily intended for rectifier applications.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Average forward current	$I_{F(AV)}$	max.	400	mA
Non-repetitive peak forward current	I_{FSM}	max.	6,0	A

MECHANICAL DATA Dimensions in mm

DO-35



The coloured end indicates the cathode

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

Voltages

Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Continuous reverse voltage	V_R	max.	75	V

Currents

Forward current (d.c.)	I_F	max.	500	mA
Average forward current (averaged over any 20 ms period; see also page 3)	$I_{F(AV)}$	max.	400	mA
Repetitive peak forward current	I_{FRM}	max.	2,0	A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) T_j = 25 °C prior to surge	I_{FSM}	max.	6,0	A

Temperatures

Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j-a}$	=	0,38	°C/mW

CHARACTERISTICS

Forward voltage

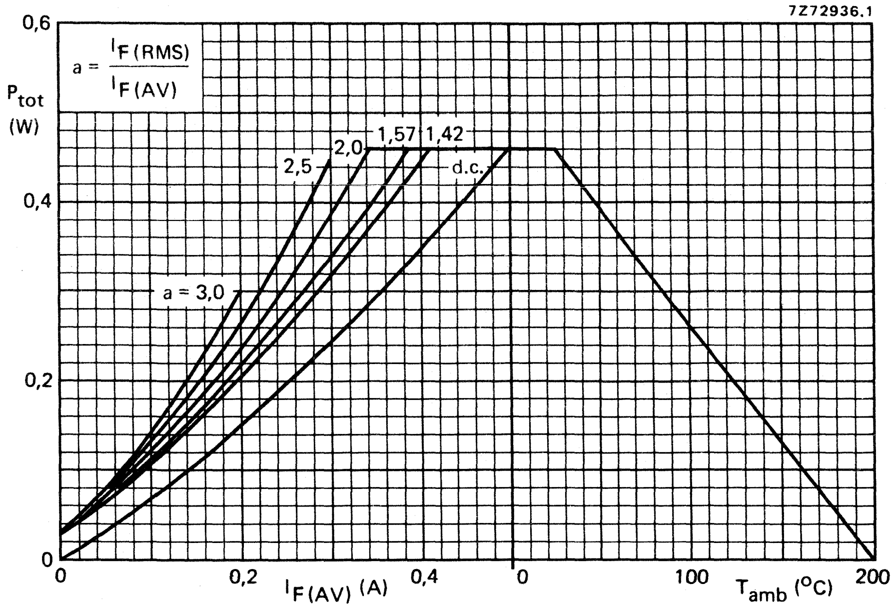
I_F = 2 A; T_j = 150 °C	V_F	<	1,4	V

Reverse current

V_R = 75 V; T_j = 150 °C	I_R	<	100	µA

→ Diode capacitance

V_R = 0; f = 1 MHz	C_d	typ.	15	pF
		<	35	pF

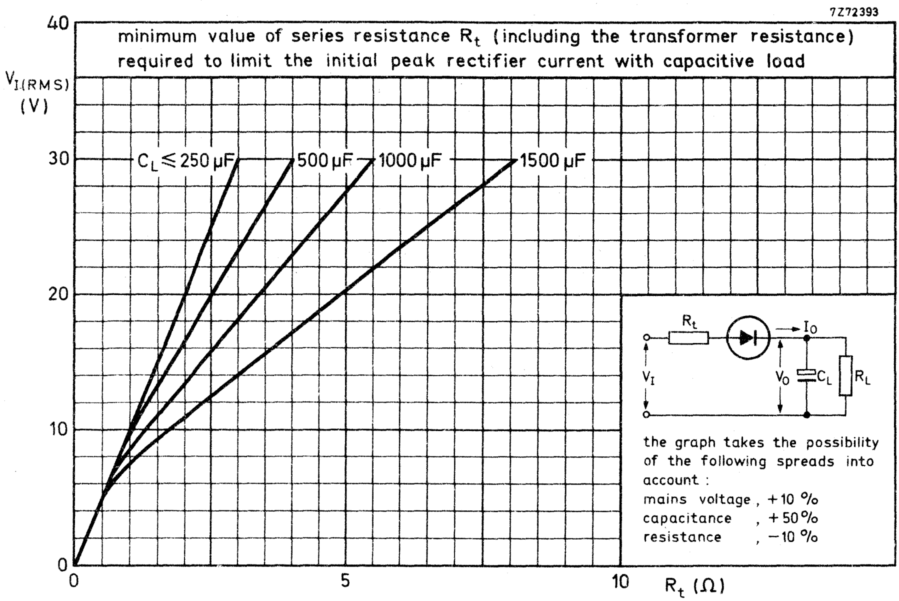


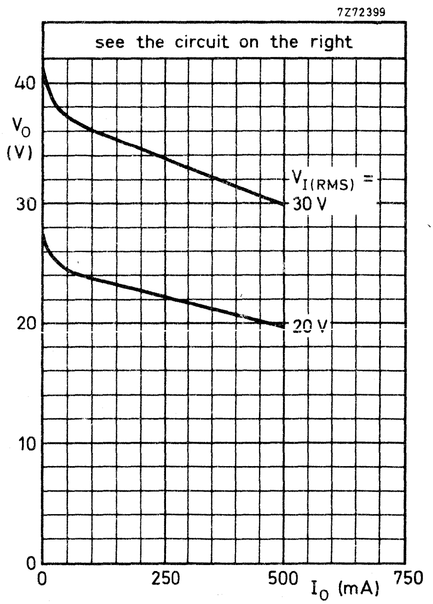
From the left-hand graph the total power dissipation can be found as a function of the average output current.

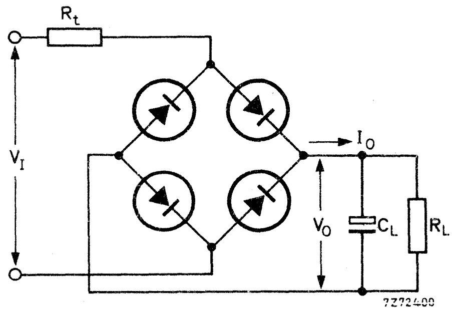
The parameter $a = \frac{I_{F(RMS)} \text{ per diode}}{I_{F(AV)} \text{ per diode}}$ depends on $n\omega R_L C_L$ and $\frac{R_t + r_{diff}}{nR_L}$ and can be found from existing graphs.

For detailed explanation see Application Book: RECTIFIER DIODES.

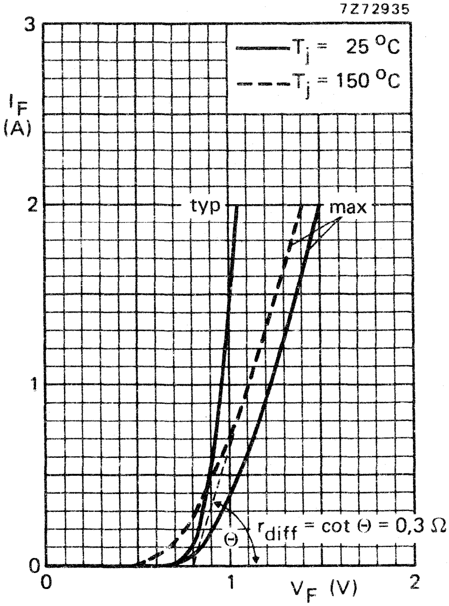
Once the power dissipation is known, the max. permissible ambient temperature follows from the right-hand graph.
For the series resistance, added to limit the initial peak rectifier current, the required minimum value can be found from the upper graph on page 4.
The value of r_{diff} can be found from the left-hand graph on page 5.

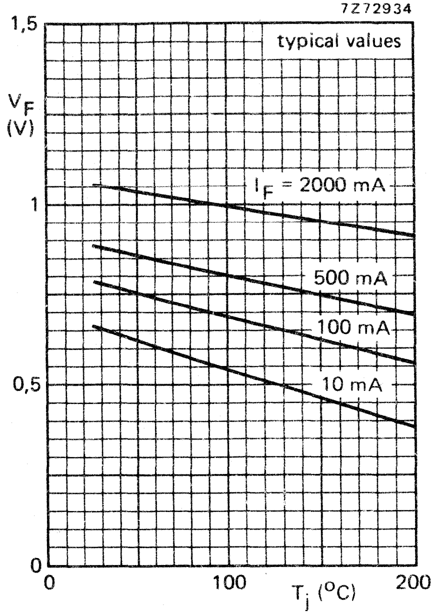


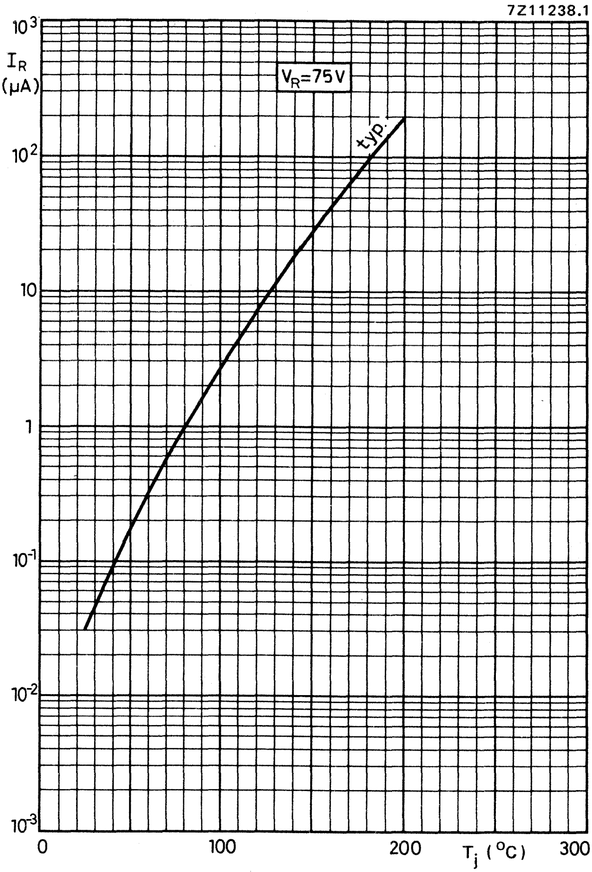




V_I (V)	R_t (Ω)	C_L (µF)
30	5,6	1000
20	3,4	1000


7Z72935
3
2
1
0
I_F
(A)
T_j = 25 °C
T_j = 150 °C
typ
max
r_{diff} = cot Θ = 0,3 Ω
Θ
0
1
2
V_F (V)


7Z72934
typical values
1,5
1
0,5
0
V_F
(V)
I_F = 2000 mA
500 mA
100 mA
10 mA
0
100
200
T_j (°C)


7Z11238.1
10^3
I_R (μA)
V_R=75 V
typ.
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
0
100
200
T_j (°C)
300

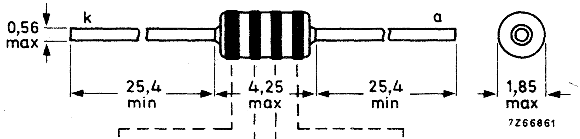
HIGH-SPEED SILICON DIODES

Planar epitaxial diodes intended for general purpose applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	V
Repetitive peak forward current	I_{FRM}	max.	225	mA
Forward voltage **1N914** : I_F = 10 mA **1N914A**: I_F = 20 mA	V_F	<	1	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA Dimensions in mm

DO-35



1N914 :	**white**	**brown**	**yellow**	**not coloured**
1N914A:	**white**	**brown**	**yellow**	**brown**
	(cathode)			

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

Voltages

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	V

Currents

Average rectified forward current (averaged over any 20 ms period) T_{amb} = 25 °C	$I_{F(AV)}$	max.	75	mA
T_{amb} = 150 °C	$I_{F(AV)}$	max.	10	mA
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	225	mA
Non-repetitive peak forward current (t = 1 s)	I_{FSM}	max.	500	mA
Total power dissipation	P_{tot}	max.	250	mW

Temperatures

Storage temperature	T_{stg}	−65 to +200	°C
Operating ambient temperature	T_{amb}	−65 to +175	°C

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltages

1N914 : I_F = 10 mA; 1N914A : I_F = 20 mA	V_F	<	1	V

Reverse avalanche breakdown voltage

I_R = 100 μA	$V_{(BR)R}$	>	100	V

Reverse currents

V_R = 20 V	I_R	<	25	nA
V_R = 75 V	I_R	<	5	μA
V_R = 20 V; T_j = 150 °C	I_R	<	50	μA

Diode capacitance

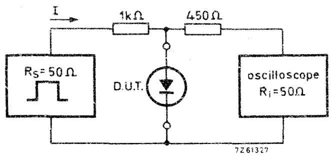
V_R = 0; f = 1 MHz	C_d	<	4	pF

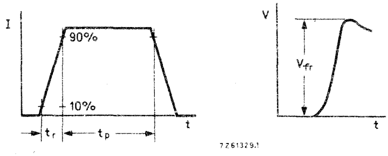
CHARACTERISTICS (continued) T_j = 25 °C

Forward recovery voltage when switched to

I_F = 50 mA; t_r = 30 ns V_{fr} < 2,5 V

Test circuit and waveforms :





input signal output signal

Input signal :	Rise time of the forward pulse	t_r = 20 ns
	Forward current pulse duration	t_p = 120 ns
	Duty factor	δ = 0,01
Oscilloscope :	Rise time	t_r = 0,35 ns

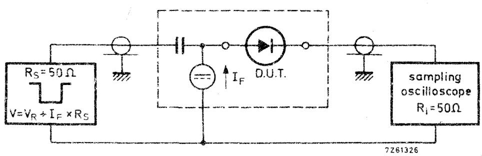
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

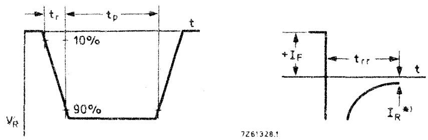
Reverse recovery time when switched from

I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA t_{rr} < 8 ns

I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA t_{rr} < 4 ns

Test circuit and waveforms :





input signal output signal

Input signal :	Rise time of the reverse pulse	t_r = 0,6 ns
	Reverse pulse duration	t_p = 100 ns
	Duty factor	δ = 0,05
Oscilloscope :	Rise time	t_r = 0,35 ns

*) I_R = 1 mA

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

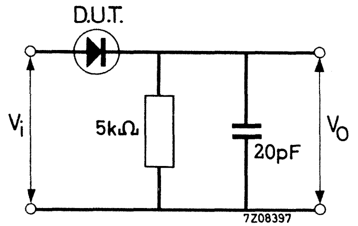
CHARACTERISTICS (continued) $T_j = 25\ ^{o}C$

Rectifying efficiency

$$\eta = \frac{V_O}{V_{i(rms)}\sqrt{2}}$$

f = 100 MHz; $V_{i(rms)}$ = 2 V η > 45 %

Test circuit:



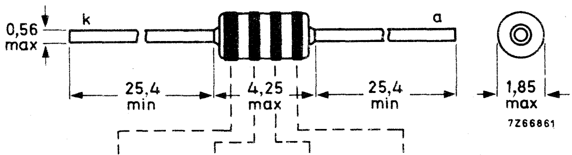
HIGH-SPEED SILICON DIODES

Planar epitaxial diodes intended for general purpose applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	V
Repetitive peak forward current	I_{FRM}	max.	225	mA
Forward voltage **1N916** : I_F = 10 mA **1N916A**: I_F = 20 mA **1N916B**: I_F = 30 mA	V_F	<	1	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA Dimensions in mm

DO-35



1N916 :	**white**	**brown**	**blue**	**not coloured**
1N916A:	**white**	**brown**	**blue**	**brown**
1N916B:	**white**	**brown**	**blue**	**red**
	(cathode)			

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

Voltages

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	V

Currents

Average rectified forward current (averaged over any 20 ms period) T_{amb} = 25 °C	$I_{F(AV)}$	max.	75	mA
T_{amb} = 150 °C	$I_{F(AV)}$	max.	10	mA
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	225	mA
Non-repetitive peak forward current (t = 1 s)	I_{FSM}	max.	500	mA
Total power dissipation	P_{tot}	max.	250	mW

Temperatures

Storage temperature	T_{stg}	−65 to +200	°C
Operating ambient temperature	T_{amb}	−65 to +175	°C

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltages

1N916 : I_F = 10 mA 1N916A : I_F = 20 mA 1N916B : I_F = 30 mA	V_F	<	1	V
1N916B : I_F = 5 mA	V_F		0,63 to 0,73	V

Reverse avalanche breakdown voltage

I_R = 100 µA	$V_{(BR)R}$	>	100	V

Reverse currents

V_R = 20 V	I_R	<	25	nA
V_R = 75 V	I_R	<	5	µA
V_R = 20 V; T_j = 150 °C	I_R	<	50	µA

Diode capacitance

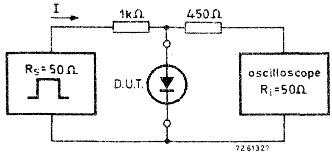
V_R = 0; f = 1 MHz	C_d	<	2	pF

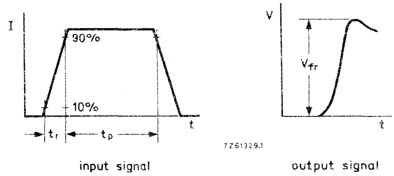
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

$I_F = 50$ mA; $t_r = 20$ ns V_{fr} < 2,5 V

Test circuit and waveforms :





Input signal : Rise time of the forward pulse t_r = 20 ns

Forward current pulse duration t_p = 120 ns

Duty factor δ = 0,01

Oscilloscope : Rise time t_r = 0,35 ns

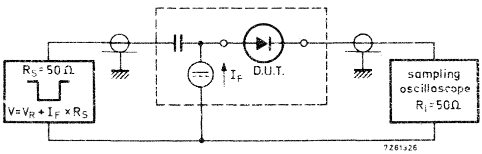
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

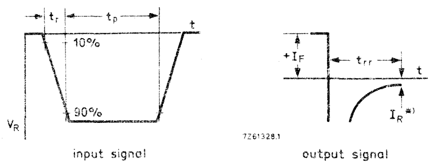
Reverse recovery time when switched from

$I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$;

measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms :





Input signal : Rise time of the reverse pulse t_r = 0,6 ns *) I_R = 1 mA

Reverse pulse duration t_p = 100 ns

Duty factor δ = 0,05

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

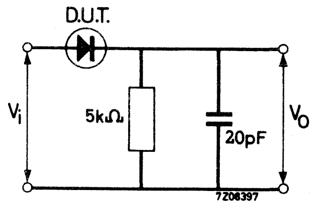
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Rectifying efficiency

$$\eta = \frac{V_O}{V_{i(rms)}\sqrt{2}}$$

$f = 100$ MHz; $V_{i(rms)} = 2$ V $\eta > 45\ \%$

Test circuit:



ULTRA HIGH-SPEED SILICON DIODE

General purpose diode for military and industrial applications.

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

<u>Voltage</u>				
Continuous reverse voltage at T_{amb} = 25 °C	V_R	max.	25	V
<u>Power dissipation</u>				
Total power dissipation at T_{amb} = 25 °C	P_{tot}	max.	250	mW
<u>Temperature</u>				
Storage temperature	T_{stg}		−65 to +200	°C

THERMAL RESISTANCE

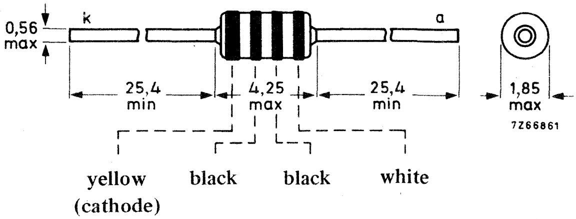
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,6	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

<u>Forward voltage</u>				
I_F = 30 mA	V_F	<	1	V
<u>Reverse avalanche breakdown voltage</u>				
I_R = 5 μA	$V_{(BR)R}$	>	35	V
<u>Reverse currents</u>				
V_R = 25 V	I_R	<	0,1	μA
V_R = 25 V; T_{amb} = 150 °C	I_R	<	100	μA
<u>Diode capacitance</u>				
V_R = 0; f = 1 MHz	C_d	<	4	pF

MECHANICAL DATA Dimensions in mm

DO-35

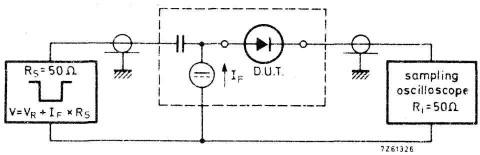


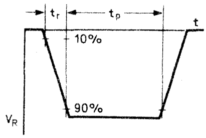
CHARACTERISTICS (continued) $T_j = 25\ ^{o}C$

Reverse recovery time when switched from

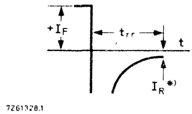
I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns
I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	2	ns

Test circuit and waveforms :





input signal



output signal

Input signal	: Rise time of the reverse pulse	$t_r \leq$ 0,5 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope	: Rise time	t_r = 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

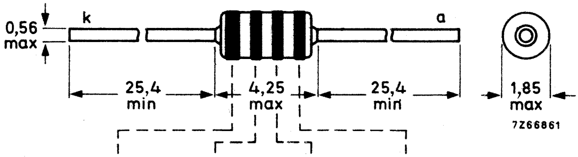
HIGH-SPEED SILICON DIODES

Whiskerless diodes in subminiature DO-35 envelopes.
These diodes are primarily intended for fast logic applications.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Repetitive peak forward current 1N4148	I_{FRM}	max.	225	mA
1N4446; 1N4448	I_{FRM}	max.	450	mA
Forward voltage				
1N4148: I_F = 10 mA; 1N4446: I_F = 20 mA; 1N4448: I_F = 100 mA	V_F	<	1	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA Dimensions in mm

DO-35



1N4148:	yellow	brown	yellow	grey
1N4446:	yellow	yellow	yellow	blue
1N4448:	yellow	yellow	yellow	grey
	(cathode)			

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

			1N4148	1N4446 1N4448	
Voltages					
Continuous reverse voltage	V_R	max.	75	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	75	75	V
Currents					
Average rectified forward current	$I_{F(AV)}$	max.	75	150	mA
Forward current (d.c.)	I_F	max.	75	200	mA
Repetitive peak forward current	I_{FRM}	max.	225	450	mA
Non-repetitive peak forward current t = 1 µs	I_{FSM}	max.	2000	2000	mA
t = 1 s	I_{FSM}	max.	500	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	500		mW
Derating factor			2,85		mW/°C
Temperatures					
Storage temperature	T_{stg}		−65 to +200		°C
Junction temperature	T_j	max.	200		°C

CHARACTERISTICS T_j = 25 °C unless otherwise specified

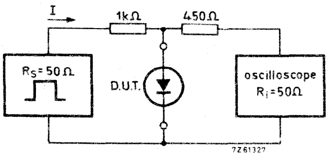
Forward voltages				
1N4148: I_F = 10 mA; 1N4446: I_F = 20 mA; 1N4448: I_F = 100 mA	V_F	<	1	V
1N4448: I_F = 5 mA	V_F		0,62 to 0,72	V
Reverse avalanche breakdown voltage				
I_R = 100 µA	$V_{(BR)R}$	>	100	V
I_R = 5 µA	$V_{(BR)R}$	>	75	V
Reverse currents				
V_R = 20 V	I_R	<	25	nA
V_R = 20 V; T_j = 100 °C (1N4448)	I_R	<	3	µA
V_R = 20 V; T_j = 150 °C	I_R	<	50	µA
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	4	pF

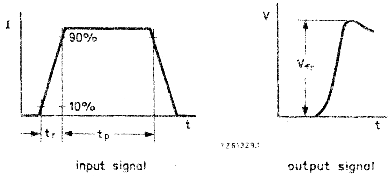
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

$I_F = 50$ mA; $t_r = 20$ ns V_{fr} < 2,5 V

Test circuit and waveforms :





Input signal :	Rise time of the forward pulse	t_r = 20 ns
	Forward current pulse duration	t_p = 120 ns
	Duty factor	δ = 0,01
Oscilloscope :	Rise time	t_r = 0,35 ns

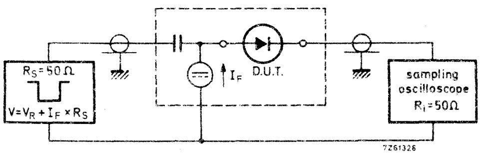
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

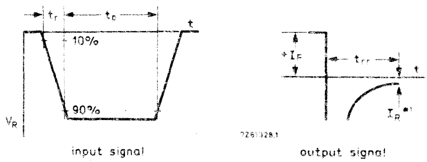
Reverse recovery time when switched from

$I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$;

measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms :





Input signal :	Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope :	Rise time	t_r = 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

ULTRA-HIGH-SPEED SILICON DIODES

Whiskerless diodes in subminiature DO-35 envelopes.
The 1N4150 is primarily intended for general purpose use in computer and industrial applications. The 1N4151 and 1N4154 are intended for military and industrial applications.

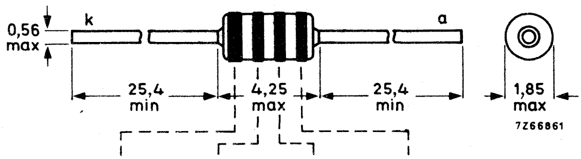
QUICK REFERENCE DATA

			1N4150	1N4151	1N4154	
Continuous reverse voltage	V_R	max.	50	50	25	V
Repetitive peak reverse voltage	V_{RRM}	max.	–	75	–	V
Repetitive peak forward current	I_{FRM}	max.	0,60	0,45	0,45	A
Non-repetitive peak forward current						
t = 1 μs	I_{FSM}	max.	4,0	–	–	A
t = 1 s	I_{FSM}	max.	0,5	–	–	A
Forward voltage						
I_F = 30 mA	V_F	<	–	–	1	V
I_F = 50 mA	V_F	<	–	1	–	V
I_F = 200 mA	V_F	<	1	–	–	V
Reverse recovery time when switched from I_F = 400 mA to I_R = 400 mA; R_L = 100 Ω; measured at I_R = 40 mA	t_{rr}	<	6	–	–	ns
I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	–	4	4	ns

MECHANICAL DATA

Dimensions in mm

DO-35



1N4150:	yellow	brown	green	black
1N4151:	yellow	brown	green	brown
1N4154:	yellow (cathode)	brown	green	yellow

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

			1N4150	1N4151	1N4154	
<u>Voltages</u>						
Continuous reverse voltage	V_R	max.	50	50	25	V
Repetitive peak reverse voltage	V_{RRM}	max.	–	75	–	V
<u>Currents</u>						
Forward current (d.c.)	I_F	max.	0,30	0,20	0,20	A
Repetitive peak forward current	I_{FRM}	max.	0,60	0,45	0,45	A
Non-repetitive peak forward current						
t = 1 μs	I_{FSM}	max.	4,0	–	–	A
t = 1 s	I_{FSM}	max.	0,5	–	–	A
<u>Total power dissipation</u> up to T_{amb} = 25 °C	P_{tot}	max.		500		mW
<u>Derating factor</u>				2,85		mW/°C
<u>Temperatures</u>						
Storage temperature	T_{stg}			–65 to +200		°C
Junction temperature	T_j	max.		200		°C

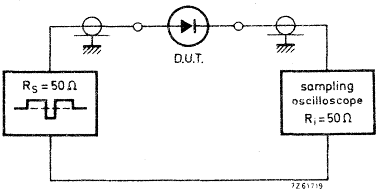
CHARACTERISTICS T_j = 25 °C unless otherwise specified

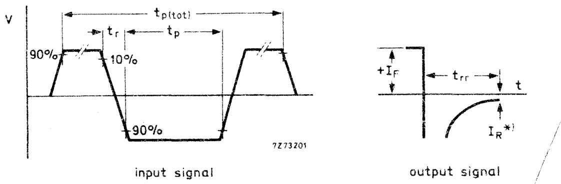
			1N4150	1N4151	1N4154	
<u>Forward voltages</u>						
I_F = 1 mA	V_F	>	0,54	–	–	V
		<	0,62	–	–	V
I_F = 10 mA	V_F	>	0,66	–	–	V
		<	0,74	–	–	V
I_F = 30 mA	V_F	<	–	–	1	V
I_F = 50 mA	V_F	>	0,76	–	–	V
		<	0,86	1	–	V
I_F = 100 mA	V_F	>	0,82	–	–	V
		<	0,92	–	–	V
I_F = 200 mA	V_F	>	0,87	–	–	V
		<	1,00	–	–	V
<u>Reverse avalanche breakdown voltage</u>						
I_R = 5 μA	$V_{(BR)R}$	>	–	75	35	V
<u>Reverse currents</u>						
V_R = 25 V	I_R	<	–	–	0,1	μA
V_R = 25 V; T_{amb} = 150 °C	I_R	<	–	–	100	μA
V_R = 50 V	I_R	<	0,1	0,05	–	μA
V_R = 50 V; T_{amb} = 150 °C	I_R	<	100	50	–	μA

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

			1N4150	1N4151	1N4154	
Diode capacitance $V_R = 0$; f = 1 MHz	C_d	<	2, 5	2	4	pF
Reverse recovery time when switched from I_F = 10 to 200 mA to I_R = 10 to 200 mA; R_L = 100 Ω; measured at I_R = 0, 1 x I_F	t_{rr}	<	4	–	–	ns
I_F = 200 to 400 mA to I_R = 200 to 400 mA; R_L = 100 Ω; measured at I_R = 0, 1 x I_F	t_{rr}	<	6	–	–	ns
I_F = 10 mA to I_R = 1 mA; R_L = 100 Ω; measured at I_R = 0, 1 mA	t_{rr}	<	6	–	–	ns
I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	–	4	4	ns
I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	–	2	2	ns

Test circuit and waveforms:



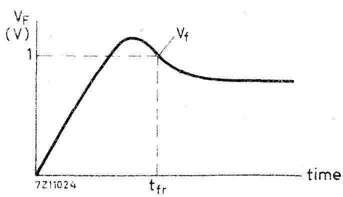


*) value at which t_{rr} is measured

Input signal :	Total pulse duration	$t_{p(tot)}$	=	0, 2 μs
	Duty factor	δ	=	0, 0025
	Rise time of the reverse pulse	t_r	=	0, 6 ns
	Reverse pulse duration	t_p	=	30 ns
Oscilloscope:	Rise time	t_r	=	0, 35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Forward recovery time when switched from I = 0 to I_F = 200 mA; t_r = 0, 4 ns; t_p = 100 ns; δ < 0, 01; measured at V_f = 1 V	1N4150	t_{fr}	<	10	ns



Special diodes

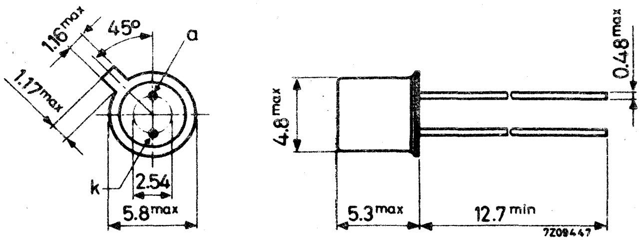
PICOAMPERE DIODE

Silicon diode in a metal envelope. It has an extremely low leakage current over a wide temperature range combined with a low capacitance and is not sensitive for light. It is intended for clamping, holding, peak follower, time delay circuits as well as for logarithmic amplifiers and protection of insulated gate field-effect transistors.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	20	V
Forward current (d.c.)	I_F	max.	50	mA
Forward voltage at I_F = 10 mA	V_F	<	1.0	V
Reverse current				
V_R = 5 V; T_j = 25 °C	I_R	<	5	pA
V_R = 20 V; T_j = 25 °C	I_R	<	10	pA
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	1.3	pF

MECHANICAL DATA Dimensions in mm

TO-18 (except for the two leads)



Handle the device with care during soldering into the circuit. The extremely low leakage current can only be guaranteed when the bottom is free from solder flux or other contaminations.

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

Voltages				
Continuous reverse voltage	V_R	max.	20	V
Repetitive peak reverse voltage	V_{RRM}	max.	35	V
Currents				
Forward current (d.c. or average)	I_F	max.	50	mA
Repetitive peak forward current	I_{FRM}	max.	100	mA
Temperatures				
Storage temperature	T_{stg}	−65 to	+125	^oC
Junction temperature	T_j	max.	125	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0.5	$^oC/mW$

CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified

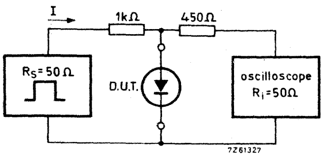
Forward voltage				
$I_F = 10$ mA	V_F	<	1.0	V
Reverse currents				
$V_R = 5$ V	I_R	<	5	pA
$V_R = 5$ V; $T_j = 80\ ^oC$	I_R	<	250	pA
$V_R = 20$ V	I_R	<	10	pA
Diode capacitance				
$V_R = 0$; f = 1 MHz	C_d	<	1.3	pF

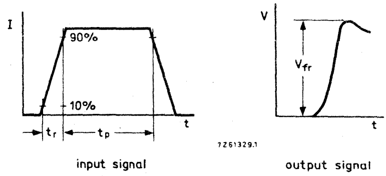
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

$I_F = 10$ mA V_{fr} < 1,25 V

Test circuit and waveforms :





Input signal : Rise time of the forward pulse $t_r \leq$ 20 ns

Forward current pulse duration $t_p =$ 300 ns

Duty factor $\delta = 0,01$

Oscilloscope : Rise time $t_r = 0,35$ ns

Input capacitance $C_i \leq$ 1 pF

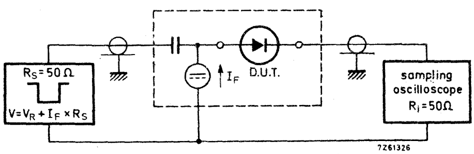
Circuit capacitance $C \leq 20$ pF ($C = C_i$ + parasitic capacitance)

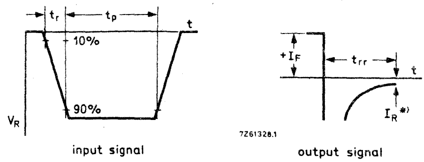
Reverse recovery time when switched from

$I_F = 10$ mA to $I_R = 10$ mA; $R_L = 100\ \Omega$;

measured at $I_R = 1$ mA t_{rr} < 350 ns

Test circuit and waveforms :





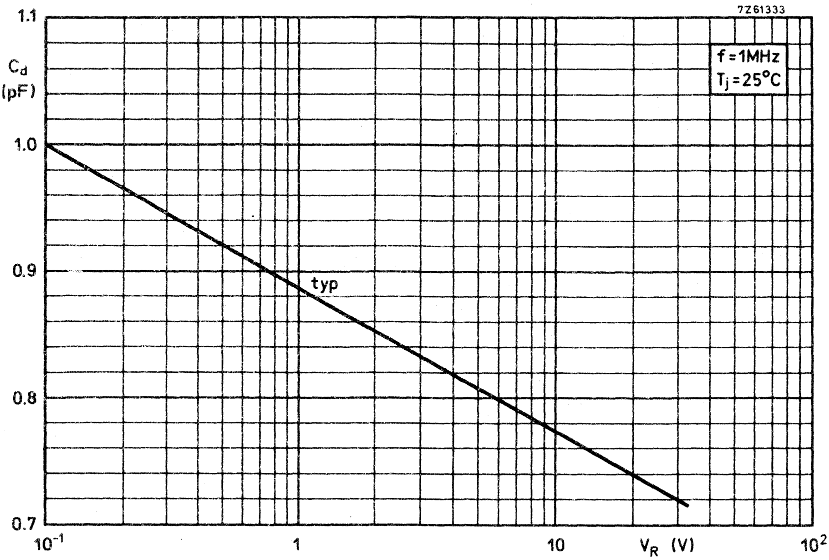
Input signal : Rise time of the reverse pulse $t_r =$ 0,6 ns *) $I_R = 1$ mA

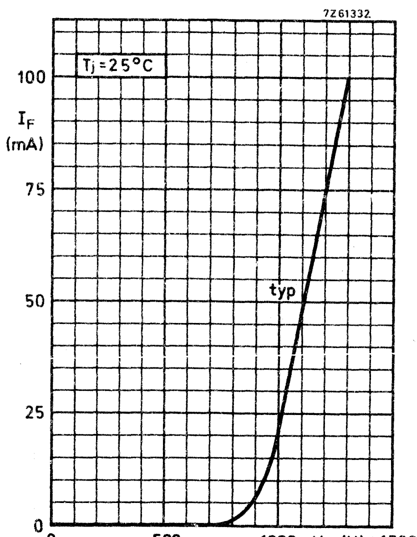
Reverse pulse duration $t_p =$ 500 ns

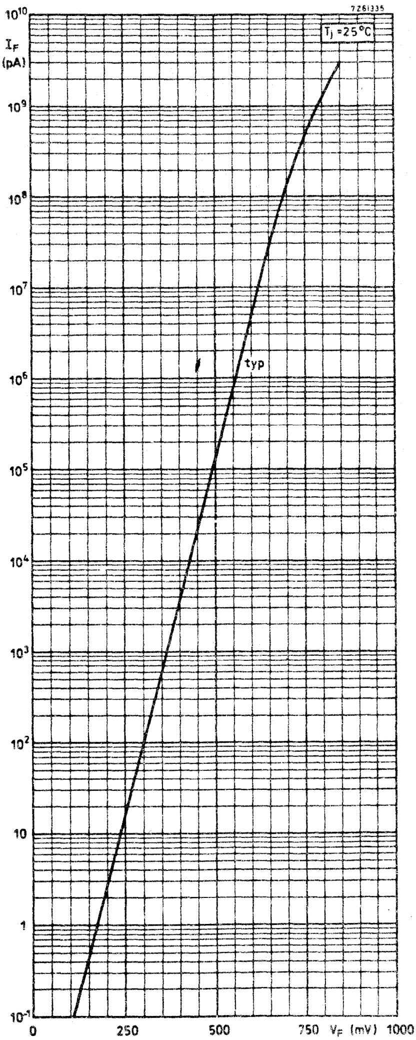
Duty factor $\delta = 0,05$

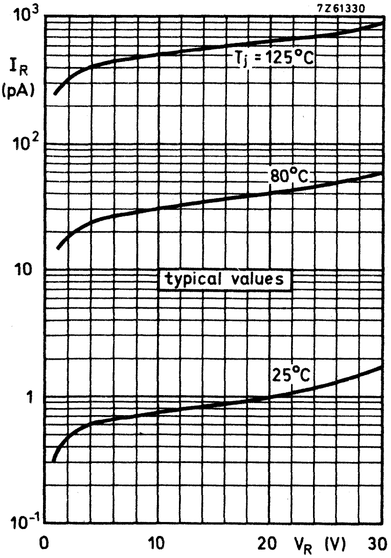
Oscilloscope : Rise time $t_r = 0,35$ ns

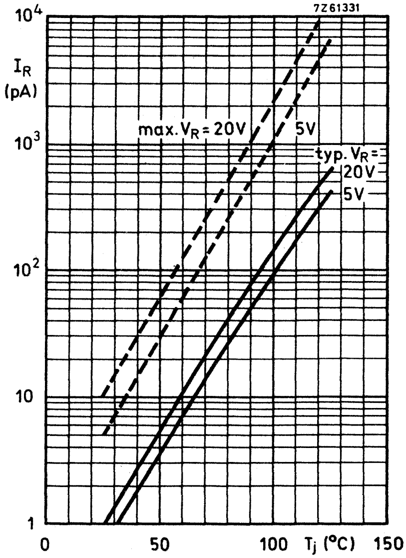
Circuit capacitance $C \leq 1$ pF (C = oscilloscope input capacitance + parasitic capacitance)


7Z61333
1.1
C_d
(pF)
1.0
0.9
0.8
0.7
10^{-1}
1
10
V_R (V)
10^2
f = 1MHz
T_j = 25°C
typ


7Z61332
T_j = 25°C
100
I_F
(mA)
75
50
25
0
0
500
1000
V_F (V)
1500
typ


7Z61335
$T_j = 25\,^\circ C$
I_F (pA)
10^{10}
10^9
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10
1
10^{-1}
typ
0
250
500
750
V_F (mV)
1000


7Z61330
I_R (pA)
T_j = 125 °C
80 °C
25 °C
typical values
10^3
10^2
10
1
10^{-1}
0
10
20
30
V_R (V)


7Z61331
I_R (pA)
max. V_R = 20V
5V
typ. V_R =
20V
5V
10^4
10^3
10^2
10
1
0
50
100
150
T_j (°C)

Voltage regulator diodes

VOLTAGE REGULATOR DIODES
in Handbook Part 1b

Nom. working or regulation voltage V_Z (V) or V_F (V)	DO-35 glass 1)	400 mW DO-7 glass 1)	400 mW DO-7 glass	500 mW DO-35 glass 2)		500 mW DO-35 glass 3)	1,3 W SOD-22 plastic	2,75 W SOD-51 glass
	BA314 BA314A							
0,7	BA315	BZX75						
1,4	BA220 BAX14	-C1V4						
2,1	BAX14A	-C2V1						
2,8		-C2V8						
3,3		–	-C3V3					
3,6		-C3V6						
3,9								
4,3								
4,7				-C4V7	-B4V7			
5,1						1N5729B		-C5V1
5,6						1N5730B		
6,2						1N5731B		
6,8						1N5732B		
7,5						1N5733B	-C7V5	
8,2						1N5734B		
9,1						1N5735B		
10			BZY88 series			1N5736B		
11						1N5737B		
12						1N5738B		
13						1N5739B		
15						1N5740B		
16						1N5741B		
18						1N5742B		
20				BZX55 series BZX79 series	BZX79 series	1N5743B	BZX61 series	BZX87 series
22						1N5744B		
24						1N5745B		
27						1N5746B		
30			-C30			1N5747B		
33						1N5748B		
36						1N5749B		
39						1N5750B		
43						1N5751B		
47						1N5752B		
51						1N5753B		
56						1N5754B		
62						1N5755B		
68						1N5756B		
75				-C75	-B75	1N5757B	-C75	-C75

1) Stabistors. (For BA220; BAX14 and BAX14A see chapter **WHISKERLESS DIODES.**)
2) For Pro Electron types: C = 5% range (E24); B = 2% range.
3) N.B.: in Jedec code B = 5% range.

VOLTAGE REGULATOR DIODES
in Handbook Part 1a

Nom. working voltage (±5%) V_Z (V)	1,5 W DO-1 metal	2,5 W plastic	10 W DO-4 metal	20 W DO-4 metal	75 W DO-5 metal
				Reverse polarity available	
4,7	-C4V7				
5,1					
5,6			BZZ14		
6,2			BZZ15		
6,8	BZY96 series		BZZ16		
7,5			BZZ17	-C7V5(R)	
8,2			BZZ18		
9,1	-C9V1		BZZ19		
10	-C10	-C10	BZZ20		-C10(R)
11			BZZ21		
12			BZZ22		
13			BZZ23		
15			BZZ24		
16			BZZ25		
18			BZZ26		
20			BZZ27		
22			BZZ28		
24			BZZ29		
27	BZY95 series	BZX70 series		BZY93 series	BZY91 series
30					
33					
36					
39					
43					
47					
51					
56					
62					
68					
75	-C75	-C75		-C75(R)	-C75(R)

VOLTAGE TOLERANCES

The following tables give the voltage tolerances that belong to a specified type.

E24 (±5%) range

nom.	min.	max.	
2,7	2,5	2,9	V
3,0	2,8	3,2	V
3,3	3,1	3,5	V
3,6	3,4	3,8	V
3,9	3,7	4,1	V
4,3	4,0	4,6	V
4,7	4,4	5,0	V
5,1	4,8	5,4	V
5,6	5,2	6,0	V
6,2	5,8	6,6	V
6,8	6,4	7,2	V
7,5	7,0	7,9	V
8,2	7,7	8,7	V
9,1	8,5	9,6	V
10,0	9,4	10,6	V
11,0	10,4	11,6	V
12,0	11,4	12,7	V
13,0	12,4	14,1	V
15,0	13,8	15,6	V
16,0	15,3	17,1	V
18,0	16,8	19,1	V
20,0	18,8	21,2	V
22,0	20,8	23,3	V
24,0	22,8	25,6	V
27,0	25,1	28,9	V

±2% range

nom.	min.	max.	
2,7	2,65	2,75	V
3,0	2,94	3,06	V
3,3	3,23	3,37	V
3,6	3,53	3,67	V
3,9	3,82	3,98	V
4,3	4,21	4,39	V
4,7	4,61	4,79	V
5,1	5,00	5,20	V
5,6	5,49	5,71	V
6,2	6,08	6,32	V
6,8	6,66	6,94	V
7,5	7,35	7,65	V
8,2	8,04	8,36	V
9,1	8,92	9,28	V
10,0	9,80	10,2	V
11,0	10,8	11,2	V
12,0	11,8	12,2	V
13,0	12,7	13,3	V
15,0	14,7	15,3	V
16,0	15,7	16,3	V
18,0	17,6	18,4	V
20,0	19,6	20,4	V
22,0	21,6	22,4	V
24,0	23,5	24,5	V
27,0	26,5	27,5	V

The values in tables above multiplied by 10 will be the values for higher voltages.

LOW VOLTAGE STABISTORS

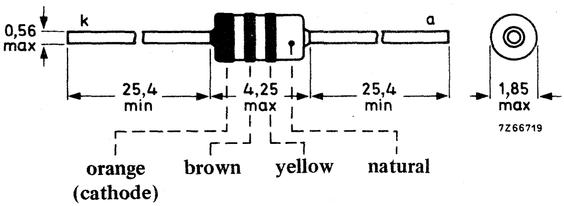
Silicon planar epitaxial diodes in DO-35 envelopes. These diodes are intended for low voltage stabilizing e.g. bias stabilizer in class-B output stages, clipping, clamping and meter protection.

QUICK REFERENCE DATA

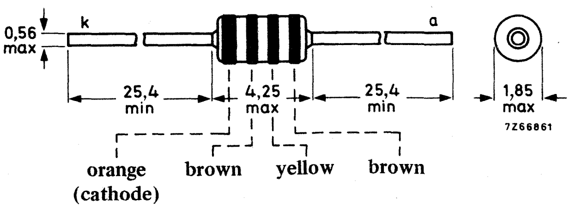
Repetitive peak forward current	I_{FRM}	max. 250			mA
Storage temperature	T_{stg}	−65 to +200			°C
Junction temperature	T_j	max. 200			°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	= 0,38			°C/mW
Forward voltage		**BA314**	**BA314A**		
I_F = 0,1 mA	V_F	610 to 690	560 to 640		mV
I_F = 1,0 mA	V_F	680 to 760	645 to 725		mV
I_F = 10 mA	V_F	750 to 830	730 to 810		mV
I_F = 100 mA	V_F	870 to 960	850 to 1000		mV
Diode capacitance V_R = 0; f = 1 MHz	C_d	< 140	110		pF

MECHANICAL DATA Dimensions in mm

DO-35



BA314



BA314A

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

Current

Repetitive peak forward current	I_{FRM}	max.	250	mA

Temperatures

Storage temperature	T_{stg}		-65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,38	°C/mW

CHARACTERISTICS $T_j = 25\ °C$

→ Forward voltage

		BA314	BA314A	
I_F = 0.1 mA	V_F	610 to 690	560 to 640	mV
I_F = 1.0 mA	V_F	680 to 760	645 to 725	mV
I_F = 5.0 mA	V_F	730 to 810	705 to 785	mV
I_F = 10 mA	V_F	750 to 830	730 to 810	mV
I_F = 100 mA	V_F	870 to 960	850 to 1000	mV

Reverse current

V_R = 4 V	I_R	<	5	μA

Temperature coefficient

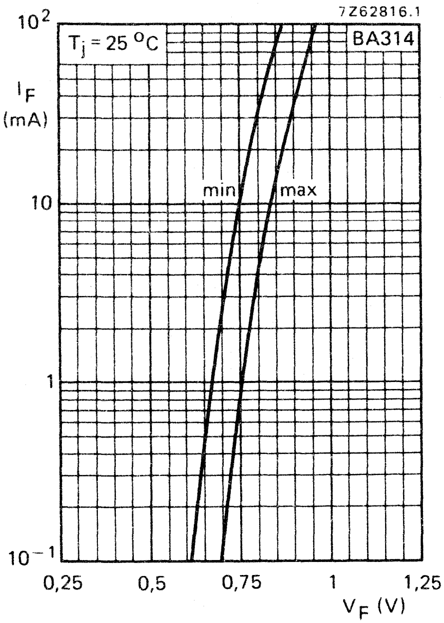
I_F = 1 mA	S_F	typ.	-1,8	mV/°C

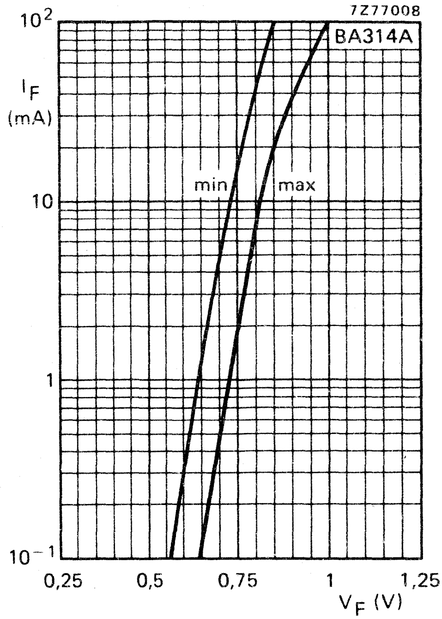
Differential resistance at f = 1 kHz

I_F = 1 mA	r_{diff}	typ.	30	Ω
I_F = 10 mA	r_{diff}	typ.	3,5	Ω
		<	6,0	Ω

→ Diode capacitance

			BA314	BA314A	
V_R = 0; f = 1 MHz	C_d	<	140	110	pF


7Z62816.1
BA314
T_j = 25 °C
I_F
(mA)
10^2
10
1
10^{-1}
min
max
0,25
0,5
0,75
1
1,25
V_F (V)


7Z77008
BA314A
I_F
(mA)
10^2
10
1
10^{-1}
min
max
0,25
0,5
0,75
1
1,25
V_F (V)

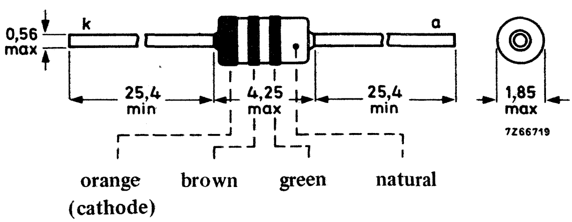
LOW VOLTAGE STABISTOR

Silicon planar epitaxial diode in a DO-35 envelope primarily intended for low voltage stabilizing.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	5	V
Repetitive peak forward current	I_{FRM}	max.	225	mA
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 0,1 mA	V_F		480 to 540	mV
I_F = 1,0 mA	V_F		590 to 660	mV
I_F = 10 mA	V_F		710 to 790	mV
I_F = 100 mA	V_F		875 to 1050	mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<	3,0	pF

MECHANICAL DATA Dimensions in mm

DO-35



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

Voltage

Repetitive peak reverse voltage	V_{RRM}	max.	5	V	

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	100	mA	1)
Forward current (d.c.)	I_F	max.	100	mA	
Repetitive peak forward current	I_{FRM}	max.	225	mA	
Non-repetitive peak forward current; t = 1 μs	I_{FSM}	max.	2000	mA	
t = 1 s	I_{FSM}	max.	500	mA	

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS $T_j = 25$ °C

Forward voltage

I_F = 0,1 mA	V_F	480 to	540	mV
I_F = 1,0 mA	V_F	590 to	660	mV
I_F = 5,0 mA	V_F	670 to	740	mV
I_F = 10 mA	V_F	710 to	790	mV
I_F = 100 mA	V_F	875 to	1050	mV

Reverse current

V_R = 5 V	I_R	<	1500	nA

Temperature coefficient at I_F = 1 mA	S_F	typ.	-2,1	mV/°C

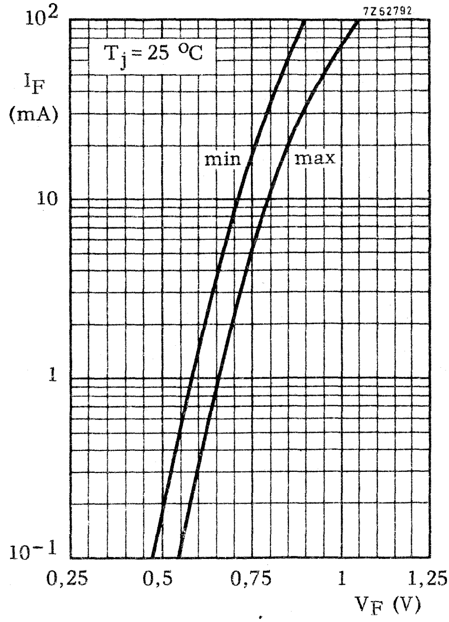
Differential resistance at f = 1 kHz

I_F = 1 mA	r_{diff}	typ.	50	Ω
I_F = 10 mA	r_{diff}	typ.	6	Ω
		<	7	Ω

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	3,0	pF

1) For sinusoidal operation $I_{F(AV)}$ = 75 mA.


7Z62792
$T_j = 25\ ^oC$
I_F
(mA)
10^2
10
1
10^{-1}
min
max
0,25
0,5
0,75
1
1,25
V_F (V)

VOLTAGE REGULATOR DIODES

Silicon planar diodes in a DO-35 envelope intended for use as low voltage stabilizers or voltage references.
The series covers the normalized range of nominal working voltages from 4,7 V to 75 V with a tolerance of ±5% (international standard E24).

QUICK REFERENCE DATA					
Working voltage range	V_Z	nom.	4,7 to 75	V	
Total power dissipation	P_{tot}	max.	400	mW	1)
		max.	500	mW	2)
Non-repetitive peak reverse power dissipation	P_{ZSM}	max.	30	W	
Junction temperature	T_j	max.	200	^oC	
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	$^oC/mW$	3)

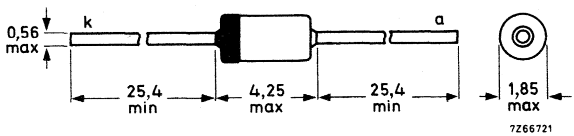
1) In still air at maximum lead length up to T_{amb} = 50 ^oC.

2) If leads are kept at T_{amb} = 25 ^oC at 8 mm from body.

3) Measured in still air at maximum lead length.

MECHANICAL DATA Dimensions in mm

DO-35



Cathode indicated by coloured band

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

Currents

Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250	mA	
Repetitive peak forward current	I_{FRM}	max.	250	mA	

Power dissipation

Total power dissipation	P_{tot}	max.	400	mW	1)
		max.	500	mW	2)
Non-repetitive peak reverse power dissipation $t = 100\ \mu s$; $T_j = 150\ ^oC$	P_{ZSM}	max.	30	W	

Temperatures

Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j-a}$	=	0,38	$^oC/mW$ 3)

CHARACTERISTICS

Forward voltage

$I_F = 100$ mA; $T_{amb} = 25\ ^oC$	V_F	<	1,0	V

Reverse current

				at T_j = 25	150	^oC
BZX55-C4V7	$V_R = 1$ V	I_R	<	500	10000	nA
C5V1	$V_R = 1$ V	I_R	<	100	2000	nA
C5V6	$V_R = 1$ V	I_R	<	100	2000	nA
C6V2	$V_R = 2$ V	I_R	<	100	2000	nA
C6V8	$V_R = 3$ V	I_R	<	100	2000	nA
C7V5	$V_R = 5$ V	I_R	<	100	2000	nA
C8V2 to C75	$V_R = 0,75\ V_{Znom}$	I_R	<	100	2000	nA

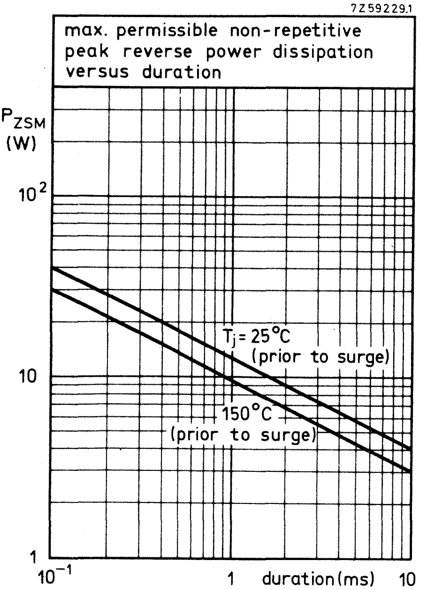
1) In still air at maximum lead length up to $T_{amb} = 50\ ^oC$.

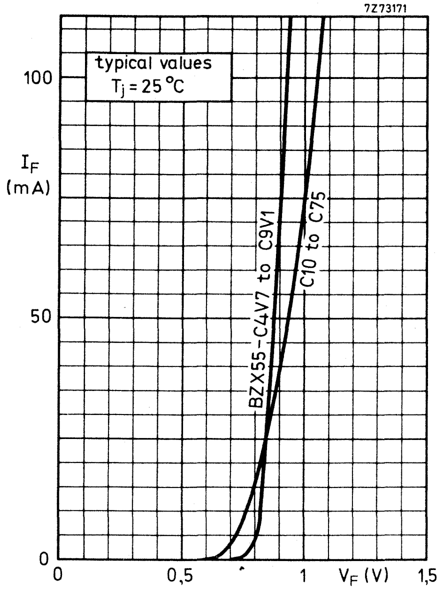
2) If leads are kept at $T_{amb} = 25\ ^oC$ at 8 mm from body.

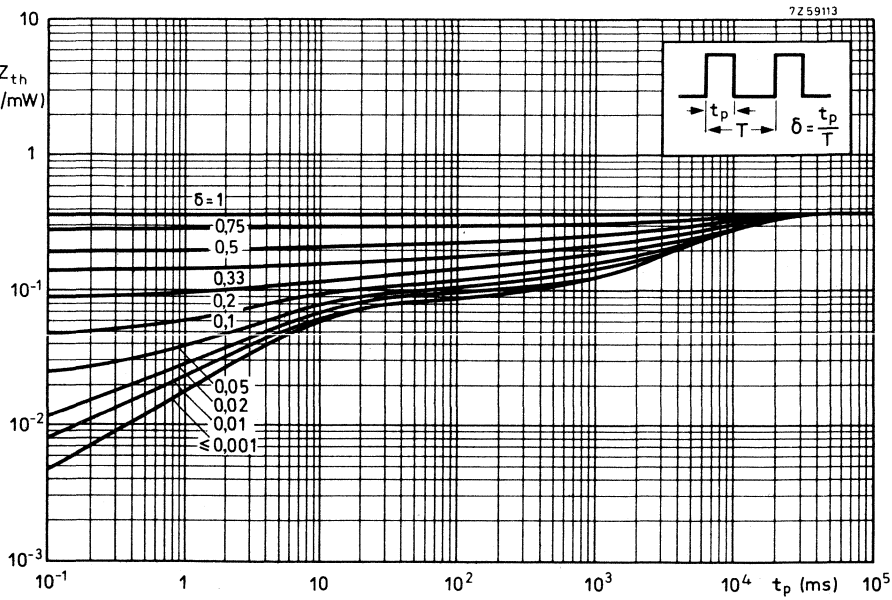
3) Measured in still air at maximum lead length.

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

BZX55-...	Working voltage V_Z (V) at I_Z = 5 mA min.	max.	Differential resistance r_{diff} (Ω) at I_Z = 5 mA max.	at I_Z = 1 mA max.	Temperature coefficient S_Z (mV/^oC) at I_Z = 5 mA typ.
C4V7	4,4	5,0	60	600	-1,2
C5V1	4,8	5,4	35	550	1,0
C5V6	5,2	6,0	25	450	1,6
C6V2	5,8	6,6	10	200	2,5
C6V8	6,4	7,2	8	150	3,0
C7V5	7,0	7,9	7	50	3,8
C8V2	7,7	8,7	7	50	4,5
C9V1	8,5	9,6	10	50	5,5
C10	9,4	10,6	15	70	6,5
C11	10,4	11,6	20	70	7,7
C12	11,4	12,7	20	90	8,4
C13	12,4	14,1	26	110	9,8
C15	13,8	15,6	30	110	11,3
C16	15,3	17,1	40	170	12,8
C18	16,8	19,1	50	170	14,4
C20	18,8	21,2	55	220	16,0
C22	20,8	23,3	55	220	18,7
C24	22,8	25,6	80	220	20,4
C27	25,1	28,9	80	220	22,9
C30	28,0	32,0	80	220	27,0
C33	31,0	35,0	80	220	29,7
C36	34,0	38,0	80	220	32,4
	at I_Z = 2,5 mA min.	max.	at I_Z = 2,5 mA max.	at I_Z = 0,5 mA max.	at I_Z = 2,5 mA typ.
C39	37,0	41,0	90	500	35,1
C43	40,0	46,0	90	600	38,7
C47	44,0	50,0	110	700	44,0
C51	48,0	54,0	125	700	49,0
C56	52,0	60,0	135	1000	55,0
C62	58,0	66,0	150	1000	62,0
C68	64,0	72,0	180	1000	70,0
C75	70,0	79,0	220	1000	78,0


7Z59229.1
max. permissible non-repetitive peak reverse power dissipation versus duration
P_ZSM (W)
10^2
10
1
10^{-1}
1
duration (ms)
10
$T_j = 25\,°C$ (prior to surge)
150 °C (prior to surge)


7Z73171
typical values
$T_j = 25\,°C$
I_F (mA)
100
50
0
0,5
1
V_F (V)
1,5
BZX55-C4V7 to C9V1
C10 to C75


7Z59113
Z_th (°C/mW)
10
1
10^{-1}
10^{-2}
10^{-3}
10^{-1}
1
10
10^2
10^3
10^4
t_p (ms)
10^5
δ = 1
0,75
0,5
0,33
0,2
0,1
0,05
0,02
0,01
≤ 0,001
t_p
T
$\delta = \frac{t_p}{T}$

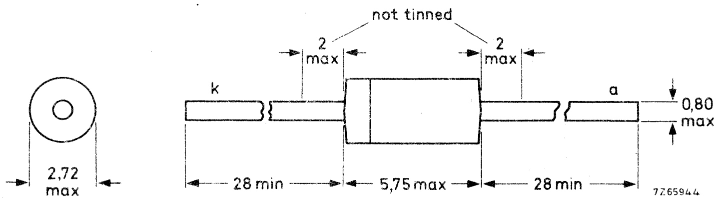
VOLTAGE REGULATOR DIODES

Silicon diodes in a SOD-22 plastic envelope intended as general purpose medium power voltage regulators.
The series consists of 25 types with nominal working voltages ranging from 7,5 V to 75 V with a tolerance of ±5% (E24).

QUICK REFERENCE DATA				
Working voltage range		nom.	7,5 to 75	V
Working voltage tolerance (E24)			±5	%
Peak working current	I_{ZM}	max.	3,0	A
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	1,3	W
Repetitive peak reverse power dissipation	P_{ZRM}	max.	6,0	W
Junction temperature	T_j	max.	175	°C

MECHANICAL DATA Dimensions in mm

SOD-22



Cathode indicated by white band

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

SOLDERING AND MOUNTING NOTES

1. Soldered joints must be at least 5 mm from the seal.
2. The maximum permissible temperature of the soldering iron or bath is 245 °C; it must be in contact with the joint for no more than 5 seconds.
3. Avoid hot spots due to handling or mounting; the body of the device must not come into contact with or be exposed to a temperature higher than 175 °C.

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

Currents

Peak working current	I_{ZM}	max.	3,0	A
Repetitive peak forward current	I_{FRM}	max.	1,0	A

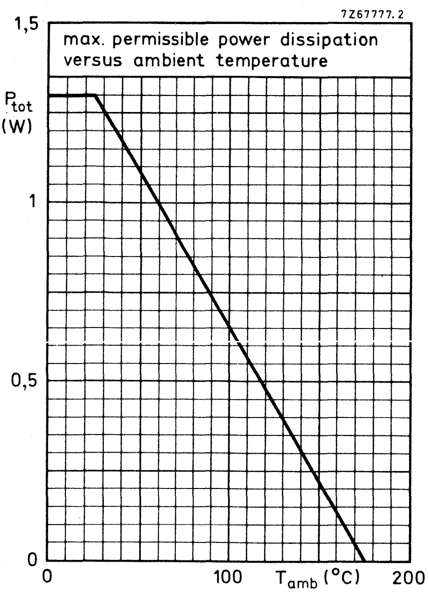
Power dissipation (see graphs on pages 2 and 3)

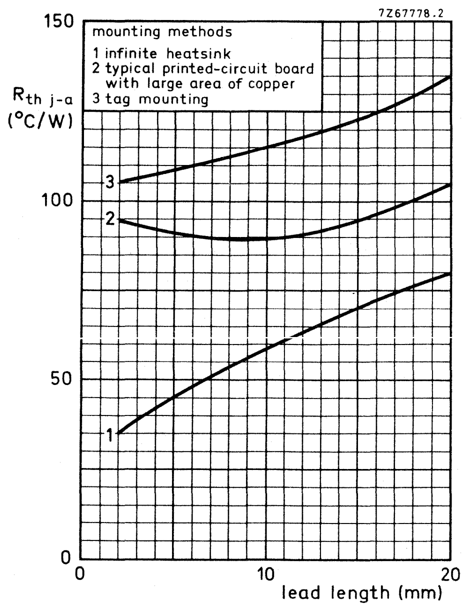
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	1,3	W
Repetitive peak reverse power dissipation	P_{ZRM}	max.	6,0	W
Non-repetitive peak reverse power dissipation t_p = 100 μs; T_{amb} = −55 to +25 °C	P_{ZSM}	max.	300	W

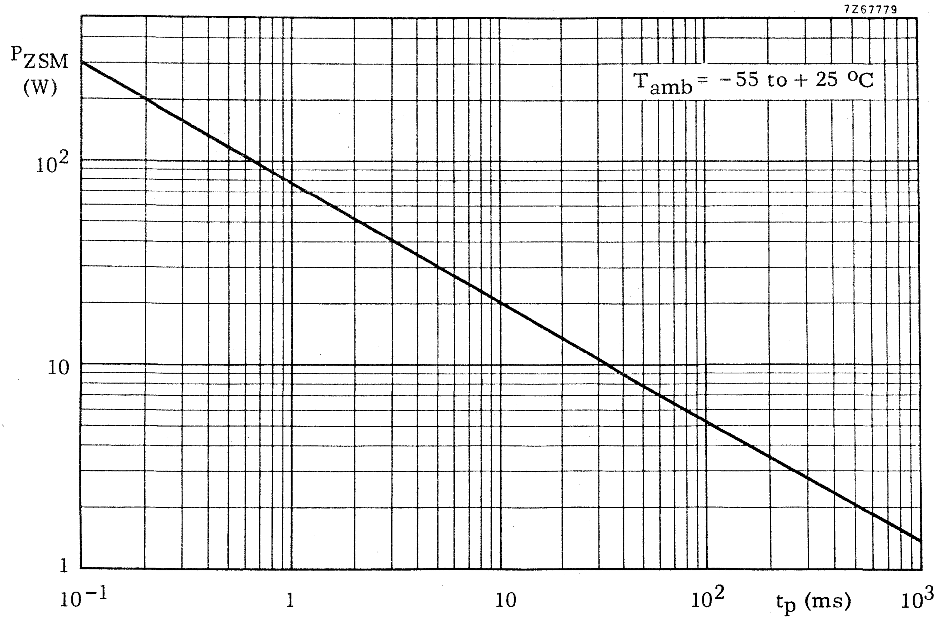
Temperatures

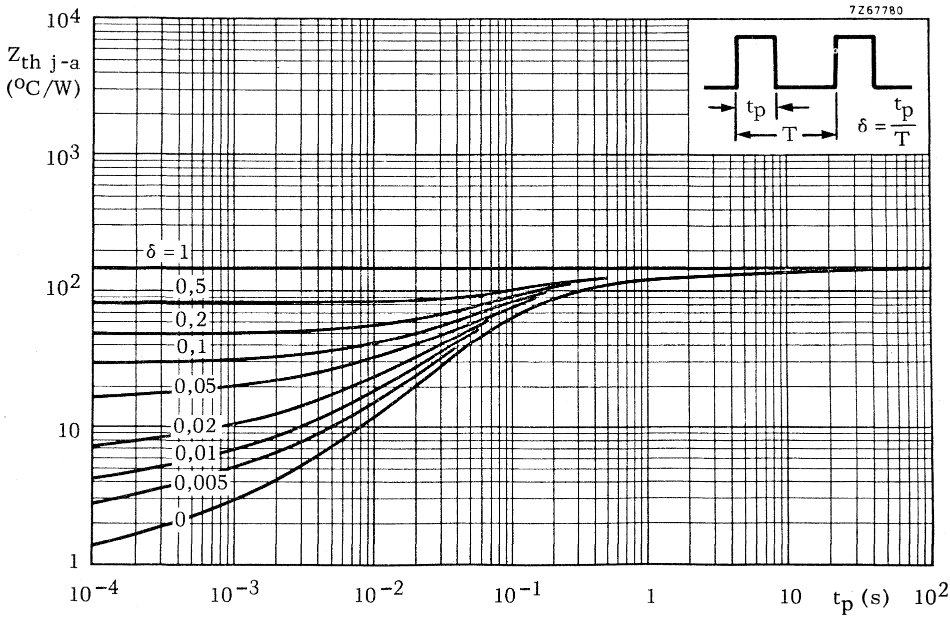
Storage temperature	T_{stg}	-65 to +175		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE see graphs on pages 2 and 3






7Z67779
P_{ZSM} (W)
T_{amb} = −55 to + 25 °C
10^2
10
1
10^{-1}
1
10
10^2
t_p (ms)
10^3


7Z67780
10^4
$Z_{th\ j\text{-}a}$ (°C/W)
10^3
10^2
10
1
δ = 1
0,5
0,2
0,1
0,05
0,02
0,01
0,005
0
t_p
T
$\delta = \frac{t_p}{T}$
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
10
t_p (s)
10^2

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 100 mA; T_{amb} = 25 °C V_F typ. 0,86 V; < 1,50 V

BZX61-...	Working voltage V_Z (V)			Temperature coefficient S_Z (mV/°C)	Differential resistance r_{diff} (Ω)	Reverse current I_R (µA)	at	Reverse voltage V_R (V)
	at I_Z = 20 mA			at I_Z = 20 mA	at I_Z = 20 mA			
	min.	nom.	max.	typ.	max.	max.		
C7V5	7,0	7,5	7,9	+3,0	5,0	5		3
C8V2	7,7	8,2	8,7	+3,3	7,5	5		3
C9V1	8,5	9,1	9,6	+4,6	8,0	5		5
C10	9,4	10,0	10,6	+5,0	8,5	5		7
C11	10,4	11,0	11,6	+5,5	9,0	5		7
C12	11,4	12,0	12,7	+6,0	9,0	5		8
C13	12,4	13,0	14,1	+6,5	10,0	5		9
C15	13,8	15,0	15,6	+9,0	14,0	5		10
	at I_Z = 10 mA			at I_Z = 10 mA	at I_Z = 10 mA			
	min.	nom.	max.	typ.	max.	max.		
C16	15,3	16	17,1	+10	16	5		11
C18	16,8	18	19,1	+11	20	5		13
C20	18,8	20	21,2	+12	22	5		14
C22	20,8	22	23,3	+13	23	5		15
C24	22,7	24	25,9	+14	25	5		17
C27	25,1	27	28,9	+16	35	5		19
C30	28	30	32	+21	40	5		21
C33	31	33	35	+23	45	5		23
C36	34	36	38	+25	50	5		25
	at I_Z = 5 mA			at I_Z = 5 mA	at I_Z = 5 mA			
C39	37	39	41	+27	60	5		27
C43	40	43	46	+30	70	5		30
C47	44	47	50	+38	80	5		33
C51	48	51	54	+41	95	5		36
C56	52	56	60	+45	105	5		39
C62	58	62	66	+50	110	5		43
C68	64	68	72	+54	120	5		48
C75	70	75	79	+60	135	5		52

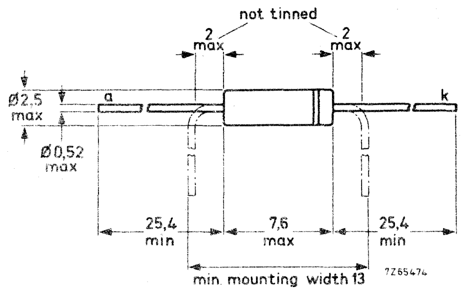
STABISTORS

Diodes with controlled conductance in a all-glass DO-7 envelope intended for low voltage regulation in circuits for clipping, coupling, clamping, meter protection, bias regulation and in many applications which require tight tolerances and low voltage levels.
The series consists of 4 types with nominal voltages ranging from 1,4 to 3,6 V with a tolerance of ±5%.

QUICK REFERENCE DATA				
Regulation voltage range	V_F	nom.	1,4 to 3,6	V
Regulation voltage tolerance			±5	%
Continuous reverse voltage	V_R	max.	10	V
Repetitive peak reverse voltage	V_{RRM}	max.	10	V
Repetitive peak forward current	I_{FRM}	max.	250	mA
Total power dissipation up to T_{amb} = 32 °C	P_{tot}	max.	400	mW
Operating junction temperature	T_j	max.	200	°C

MECHANICAL DATA Dimensions in mm

DO-7



Cathode indicated by coloured band

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

Voltages

Continuous reverse voltage	V_R	max.	10	V
Repetitive peak reverse voltage	V_{RRM}	max.	10	V

Current

Repetitive peak forward current	I_{FRM}	max.	250	mA

Power dissipation

Total power dissipation up to T_{amb} = 32 °C	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}	-65 to +175		°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0, 42	°C/mW

CHARACTERISTICS $T_j = 25\ ^oC$

BZX75-....	Regulation voltage V_F (V) at I_F = 1 mA min.	max.	Temperature coefficient S_F (mV/°C) at I_F = 1 mA typ.	Differential resistance r_{diff} (Ω); f = 1 kHz at I_F = 1 mA typ.
C1V4	1, 16	1, 34	-4	60
C2V1	1, 75	2, 05	-6	90
C2V8	2, 33	2, 70	-8	120
C3V6	3, 02	3, 45	-10	150

	at I_F = 10 mA min.	nom.	max.	at I_F = 10 mA typ.	at I_F = 10 mA typ.	max.
C1V4	1, 33	1, 40	1, 47	-3, 3	6	10
C2V1	1, 99	2, 10	2, 21	-5, 0	9	15
C2V8	2, 66	2, 80	2, 94	-6, 6	12	20
C3V6	3, 42	3, 60	3, 78	-8, 2	15	25

Reverse current

$V_R = 5$ V

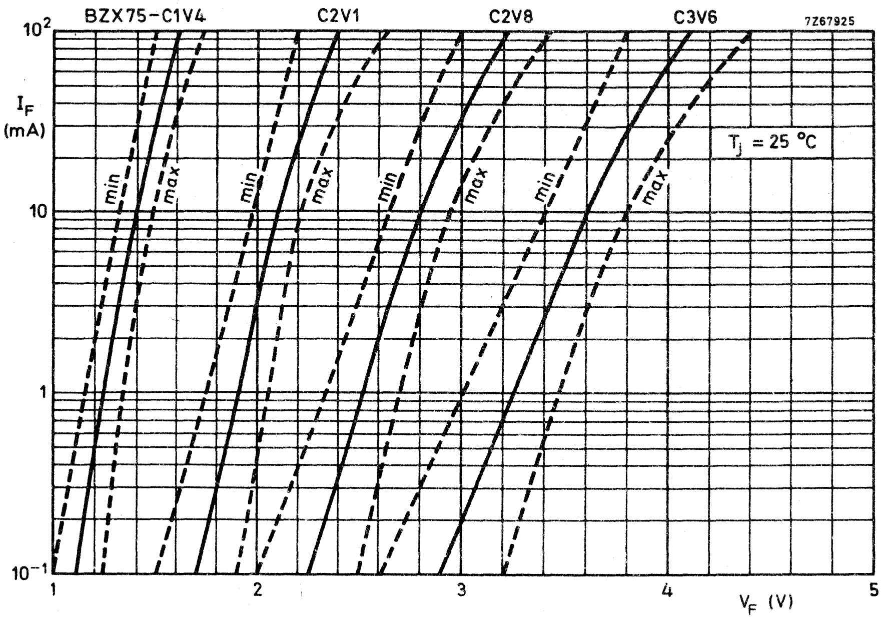
BZX75-C1V4, BZX75-C2V1	I_R	<	500	nA
BZX75-C2V8, BZX75-C3V6	I_R	<	200	nA

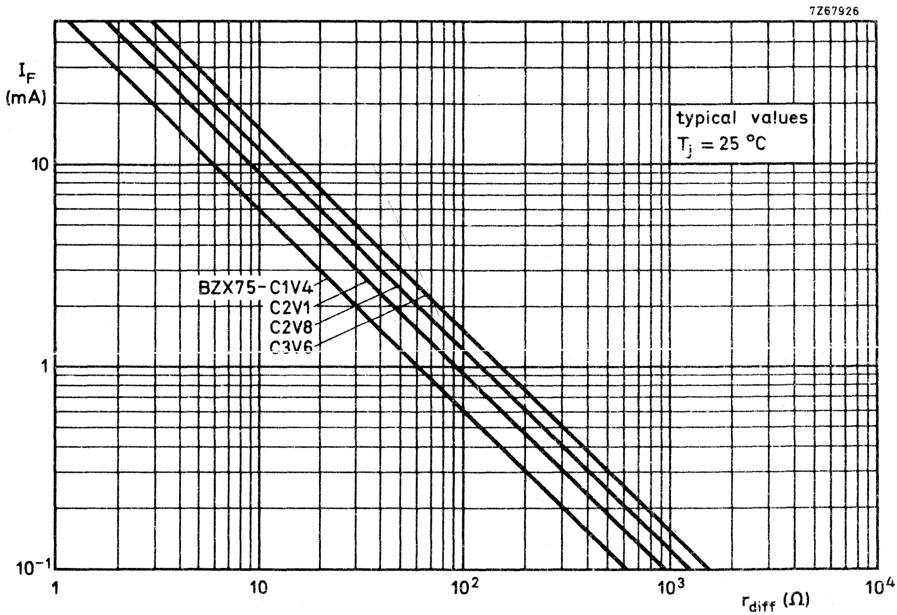
Recovered charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ Q_s > 600 pC

Diode capacitance

$V_R = 0$; f = 1 MHz C_d < 250 pF


BZX75-C1V4
C2V1
C2V8
C3V6
7Z67925
I_F (mA)
10^2
10
1
10^{-1}
min
max
T_j = 25 °C
1
2
3
4
5
V_F (V)


7Z67926
I_F (mA)
typical values
T_j = 25 °C
10
1
10^{-1}
BZX75-C1V4
C2V1
C2V8
C3V6
1
10
10^2
10^3
10^4
r_{diff} (Ω)

VOLTAGE REGULATOR DIODES

Silicon planar diodes in a DO-35 envelope intended for use as low voltage stabilisers or voltage references.
Available in two series; one to the international standardized E24 (±5%) range and the other with ±2% tolerance on working voltage.
Each series consists of 30 types with nominal working voltages ranging from 4,7 V to 75 V.

QUICK REFERENCE DATA

Working voltage range	V_Z	nom.	4,7 to 75	V	
Total power dissipation	P_{tot}	max.	400	mW	1)
		max.	500	mW	2)
Non-repetitive peak reverse power dissipation	P_{ZSM}	max.	30	W	
Junction temperature	T_j	max.	200	°C	
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	°C/mW	3)

1) In still air at maximum lead length up to T_{amb} = 50 °C

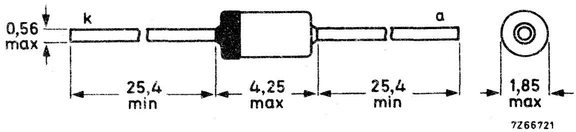
2) If leads are kept at T_{amb} = 25 °C at 8 mm from body.

3) Measured in still air at maximum lead length.

MECHANICAL DATA

Dimensions in mm

DO-35



Cathode indicated by coloured band

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

Currents

Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250	mA	
Repetitive peak forward current	I_{FRM}	max.	250	mA	

Power dissipation

Total power dissipation	P_{tot}	max.	400	mW	1)
		max.	500	mW	2)
Non-repetitive peak reverse power dissipation t = 100 µs; T_j = 150 °C	P_{ZSM}	max.	30	W	

Temperatures

Storage temperature	T_{stg}	−65 to +200		°C	
Junction temperature	T_j	max.	200	°C	

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,38	°C/mW	3)

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA; T_{amb} = 25 °C	V_F	<	0,9	V

Reverse current

BZX79-.4V7	V_R = 2 V	I_R	<	3000	nA
.5V1	V_R = 2 V	I_R	<	2000	nA
.5V6	V_R = 2 V	I_R	<	1000	nA
.6V2	V_R = 4 V	I_R	<	3000	nA
.6V8	V_R = 4 V	I_R	<	2000	nA
.7V5	V_R = 5 V	I_R	<	1000	nA
.8V2	V_R = 5 V	I_R	<	700	nA
.9V1	V_R = 6 V	I_R	<	500	nA
.10	V_R = 7 V	I_R	<	200	nA
.11 to .13	V_R = 8 V	I_R	<	100	nA
.15 to .75	V_R = 0,7 V_{Znom}	I_R	<	50	nA

. = B for 2% tolerance
. = C for E24 (5%) tolerance

1) In still air at maximum lead length up to T_{amb} = 50 °C.
2) If leads are kept at T_{amb} = 25 °C at 8 mm from body.
3) Measured in still air at maximum lead length.

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

E24 (±5%) logarithmic range (for ±2% tolerance range see page 5).

BZX79-...	Working voltage		Differential resistance		Temperature coefficient			Diode capacitance	
	V_Z (V)		r_{diff} (Ω)		S_Z (mV/^oC)			C_d (pF); f = 1 MHz	
	at I_Z = 5 mA		**at I_Z = 5 mA**		**at I_Z = 5 mA**			V_R = 0	
	min.	max.	typ.	max.	min.	typ.	max.	typ.	max.
C4V7	4,4	5,0	50	80	−3,5	−1,4	0,2	130	180
C5V1	4,8	5,4	40	60	−2,7	−0,8	1,2	110	160
C5V6	5,2	6,0	15	40	−2,0	1,2	2,5	95	140
C6V2	5,8	6,6	6	10	0,4	2,3	3,7	90	130
C6V8	6,4	7,2	6	15	1,2	3,0	4,5	85	110
C7V5	7,0	7,9	6	15	2,5	4,0	5,3	80	100
C8V2	7,7	8,7	6	15	3,2	4,6	6,2	75	95
C9V1	8,5	9,6	6	15	3,8	5,5	7,0	70	90
C10	9,4	10,6	8	20	4,5	6,4	8,0	70	90
C11	10,4	11,6	10	20	5,4	7,4	9,0	65	85
C12	11,4	12,7	10	25	6,0	8,4	10,0	65	85
C13	12,4	14,1	10	30	7,0	9,4	11,0	60	80
C15	13,8	15,6	10	30	9,2	11,4	13,0	55	75
C16	15,3	17,1	10	40	10,4	12,4	14,0	52	75
C18	16,8	19,1	10	45	12,4	14,4	16,0	47	70
C20	18,8	21,2	15	55	14,4	16,4	18,0	36	60
C22	20,8	23,3	20	55	16,4	18,4	20,0	34	60
C24	22,8	25,6	25	70	18,4	20,4	22,0	33	55
	at I_Z = 2 mA		**at I_Z = 2 mA**		**at I_Z = 2 mA**				
	min.	max.	typ.	max.	min.	typ.	max.	typ.	max.
C27	25,1	28,9	25	80	21,4	23,4	25,3	30	50
C30	28,0	32,0	30	80	24,4	26,6	29,4	27	50
C33	31,0	35,0	35	80	27,4	29,7	33,4	25	45
C36	34,0	38,0	35	90	30,4	33,0	37,4	23	45
C39	37,0	41,0	40	130	33,4	36,4	41,2	21	45
C43	40,0	46,0	45	150	37,6	41,2	46,6	21	40
C47	44,0	50,0	50	170	42,0	46,1	51,8	19	40
C51	48,0	54,0	60	180	46,6	51,0	57,2	19	40
C56	52,0	60,0	70	200	52,2	57,0	63,8	18	40
C62	58,0	66,0	80	215	58,8	64,4	71,6	17	35
C68	64,0	72,0	90	240	65,6	71,7	79,8	17	35
C75	70,0	79,0	95	255	73,4	80,2	88,6	16,5	35

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

E24 (±5%) logarithmic range (for ±2% tolerance range see page 6).

BZX79-...	Working voltage			Differential resistance		Working voltage			Differential resistance	
	V_Z (V)			r_{diff} (Ω)		V_Z (V)			r_{diff} (Ω)	
	at I_Z = 1 mA			at I_Z = 1 mA		at I_Z = 20 mA			at I_Z = 20 mA	
	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
→ C4V7	3,7	4,2	4,7	425	500	4,5	5,0	5,4	8	15
→ C5V1	4,2	4,7	5,3	400	480	5,0	5,4	5,9	6	15
→ C5V6	4,8	5,4	6,0	80	400	5,2	5,7	6,3	4	10
→ C6V2	5,6	6,1	6,6	40	150	5,8	6,3	6,8	3	6
→ C6V8	6,3	6,7	7,2	30	80	6,4	6,9	7,4	2,5	6
→ C7V5	6,9	7,4	7,9	30	80	7,0	7,6	8,0	2,5	6
→ C8V2	7,6	8,1	8,7	40	80	7,7	8,3	8,8	3	6
C9V1	8,4	9,0	9,6	40	100	8,5	9,2	9,7	4	8
C10	9,3	9,9	10,6	50	150	9,4	10,1	10,7	4	10
C11	10,2	10,9	11,6	50	150	10,4	11,1	11,8	5	10
C12	11,2	11,9	12,7	50	150	11,4	12,1	12,9	5	10
C13	12,3	12,9	14,0	50	170	12,5	13,1	14,2	5	15
C15	13,7	14,9	15,5	50	200	13,9	15,1	15,7	6	20
C16	15,2	15,9	17,0	50	200	15,4	16,1	17,2	6	20
C18	16,7	17,9	19,0	50	225	16,9	18,1	19,2	6	20
C20	18,7	19,9	21,1	60	225	18,9	20,1	21,4	7	20
C22	20,7	21,9	23,2	60	250	20,9	22,1	23,4	7	25
C24	22,7	23,9	25,5	60	250	22,9	24,1	25,7	7	25
	at I_Z = 0,1 mA			at I_Z = 0,5 mA		at I_Z = 10 mA			at I_Z = 10 mA	
	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
C27	25,0	26,9	28,9	65	300	25,2	27,1	29,3	10	45
C30	27,8	29,9	32,0	70	300	28,1	30,1	32,4	15	50
C33	30,8	32,9	35,0	75	325	31,1	33,1	35,4	20	55
C36	33,8	35,9	38,0	80	350	34,1	36,1	38,4	25	60
C39	36,7	38,9	41,0	80	350	37,1	39,1	41,5	25	70
C43	39,7	42,9	46,0	85	375	40,1	43,1	46,5	25	80
C47	43,7	46,8	50,0	85	375	44,1	47,1	50,5	30	90
C51	47,6	50,8	54,0	90	400	48,1	51,1	54,6	35	100
C56	51,5	55,7	60,0	100	425	52,1	56,1	60,8	45	110
C62	57,4	61,7	66,0	120	450	58,2	62,1	67,0	60	120
C68	63,4	67,7	72,0	150	475	64,2	68,2	73,2	75	130
C75	69,4	74,7	79,0	170	500	70,3	75,3	80,2	90	140

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

±2% tolerance range.

BZX79-...	Working voltage V_Z (V) at I_Z = 5 mA		Differential resistance r_{diff} (Ω) at I_Z = 5 mA		Temperature coefficient S_Z (mV/^{o}C) at I_Z = 5 mA	Diode capacitance C_d (pF); f = 1 MHz V_R = 0	
	min.	max.	typ.	max.	typ.	typ.	max.
B4V7	4,61	4,79	50	80	-1,4	130	180
B5V1	5,00	5,20	40	60	-0,8	110	160
B5V6	5,49	5,71	15	40	1,2	95	140
B6V2	6,08	6,32	6	10	2,3	90	130
B6V8	6,66	6,94	6	15	3,0	85	110
B7V5	7,35	7,65	6	15	4,0	80	100
B8V2	8,04	8,36	6	15	4,6	75	95
B9V1	8,92	9,28	6	15	5,5	70	90
B10	9,80	10,20	8	20	6,4	70	90
B11	10,80	11,20	10	20	7,4	65	85
B12	11,80	12,20	10	25	8,4	65	85
B13	12,70	13,30	10	30	9,4	60	80
B15	14,70	15,30	10	30	11,4	55	75
B16	15,70	16,30	10	40	12,4	52	75
B18	17,60	18,40	10	45	14,4	47	70
B20	19,60	20,40	15	55	16,4	36	60
B22	21,60	22,40	20	55	18,4	34	60
B24	23,50	24,50	25	70	20,4	33	55
	at I_Z = 2 mA		at I_Z = 2 mA		at I_Z = 2 mA		
	min.	max.		max.	typ.	typ.	max.
B27	26,50	27,50		80	23,5	30	50
B30	29,40	30,60		80	26,0	27	50
B33	32,30	33,70		80	29,0	25	45
B36	35,30	36,70		90	31,0	23	45
B39	38,20	39,80		130	34,0	21	45
B43	42,10	43,90		150	37,0	21	40
B47	46,10	47,90		170	40,0	19	40
B51	50,00	52,00		180	44,0	19	40
B56	54,90	57,10		200	47,0	18	40
B62	60,80	63,20		215	51,0	17	35
B68	66,60	69,40		240	56,0	17	35
B75	73,50	76,50		255	60,0	16,5	35

Note

Typical values on differential resistance for types B27 to B75 and min. and max. values on temperature coefficient will be supplied on request.

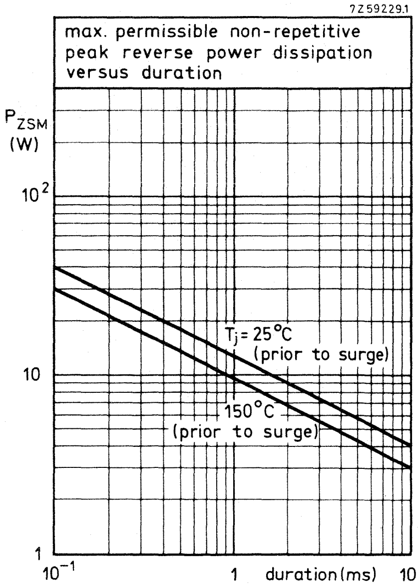
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

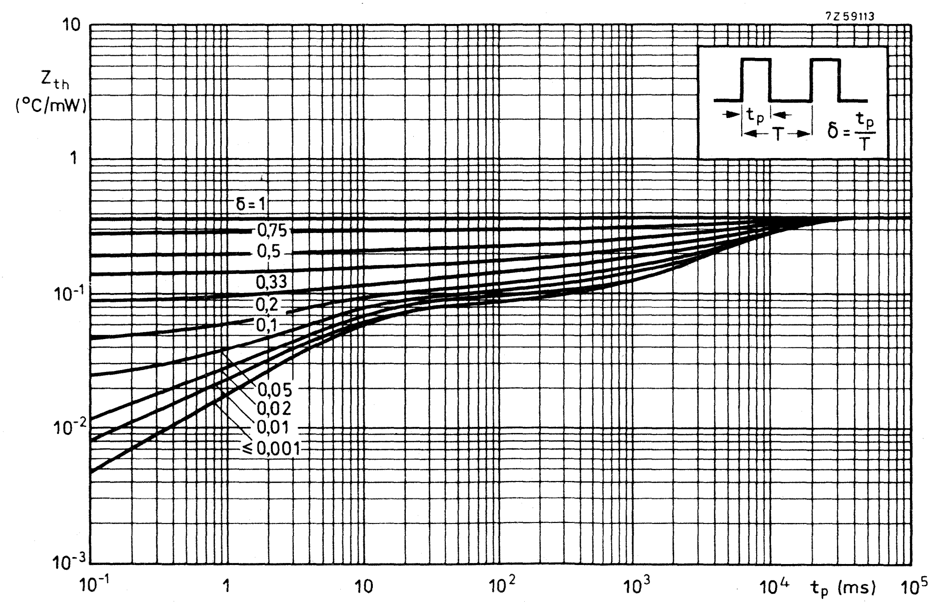
±2% tolerance range.

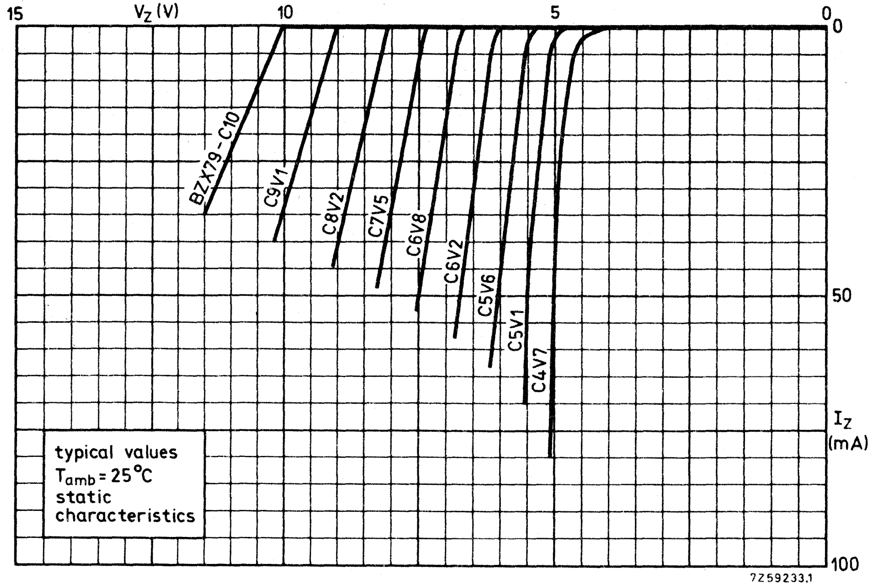
BZX79-...	Working voltage V_Z (V) at I_Z = 1 mA	Differential resistance r_{diff} (Ω) at I_Z = 1 mA		Working voltage V_Z (V) at I_Z = 20 mA	Differential resistance r_{diff} (Ω) at I_Z = 20 mA	
	nom.	typ.	max.	nom.	typ.	max.
B4V7	4,2	425	500	5,0	8	20
B5V1	4,7	400	480	5,4	6	20
B5V6	5,4	80	400	5,7	4	20
B6V2	6,1	40	150	6,3	3	10
B6V8	6,7	30	80	6,9	2,5	10
B7V5	7,4	30	80	7,6	2,5	8
B8V2	8,1	40	80	8,3	3	8
B9V1	9,0	40	100	9,2	4	8
B10	9,9	50	150	10,1	4	10
B11	10,9	50	150	11,1	5	10
B12	11,9	50	150	12,1	5	10
B13	12,9	50	170	13,1	5	15
B15	14,9	50	200	15,1	6	20
B16	15,9	50	200	16,1	6	20
B18	17,9	50	225	18,1	6	20
B20	19,9	60	225	20,1	7	20
B22	21,9	60	250	22,1	7	25
B24	23,9	60	250	24,1	7	25

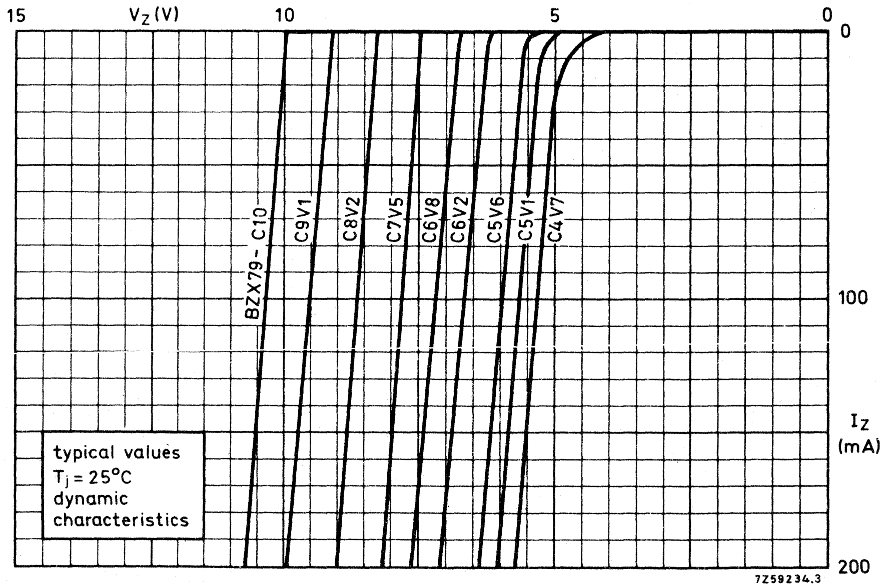
Note

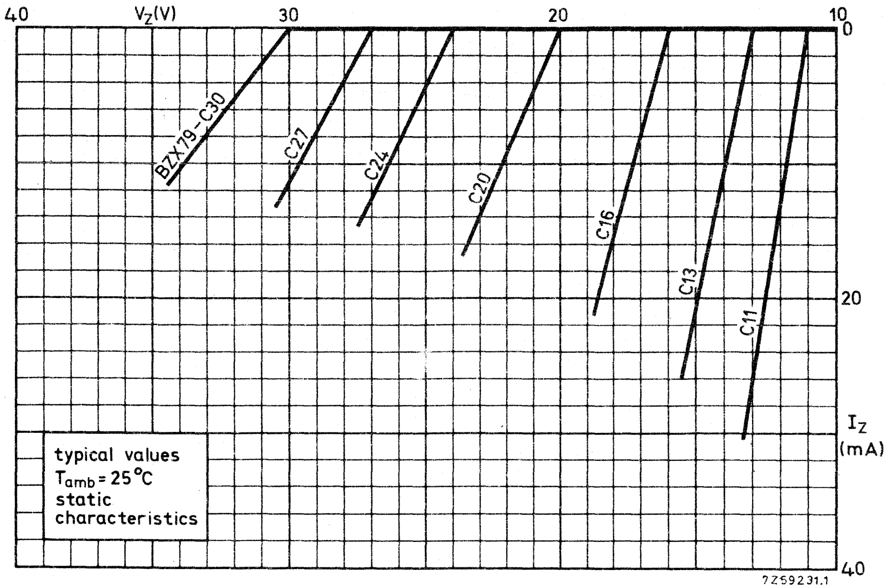
Extended information for types B27 to B75 will be supplied on request.

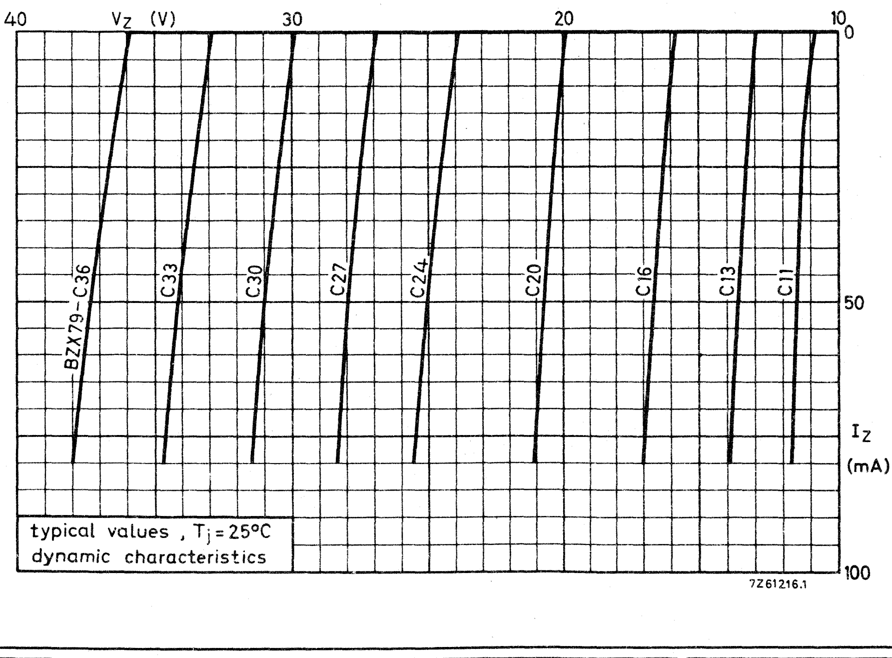

7Z59229.1
max. permissible non-repetitive
peak reverse power dissipation
versus duration
P_{ZSM}
(W)
10^2
10
1
$T_j = 25\,^\circ C$
(prior to surge)
150 °C
(prior to surge)
10^{-1}
1
duration (ms)
10

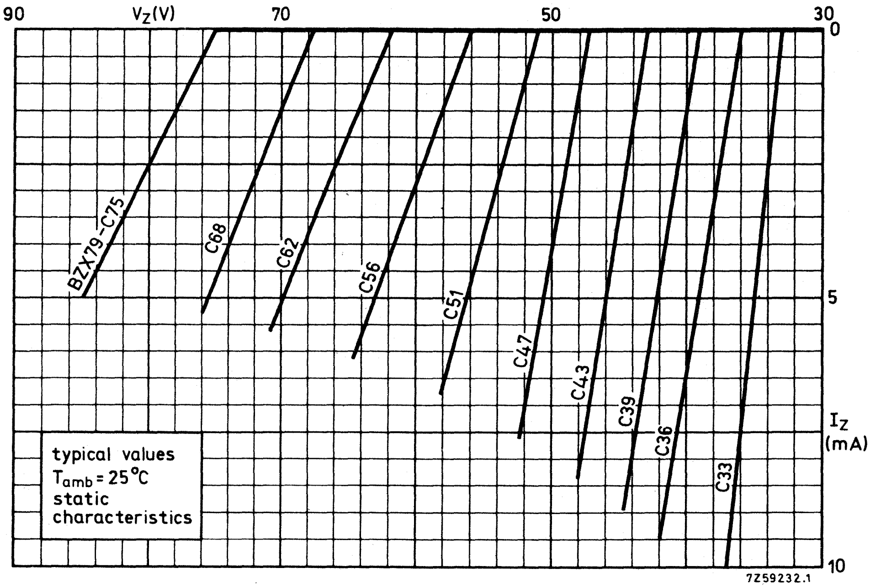

7Z59113
10
Z_{th}
(°C/mW)
1
10^{-1}
10^{-2}
10^{-3}
δ = 1
0,75
0,5
0,33
0,2
0,1
0,05
0,02
0,01
≤ 0,001
t_p
T
$\delta = \frac{t_p}{T}$
10^{-1}
1
10
10^2
10^3
10^4
t_p (ms)
10^5

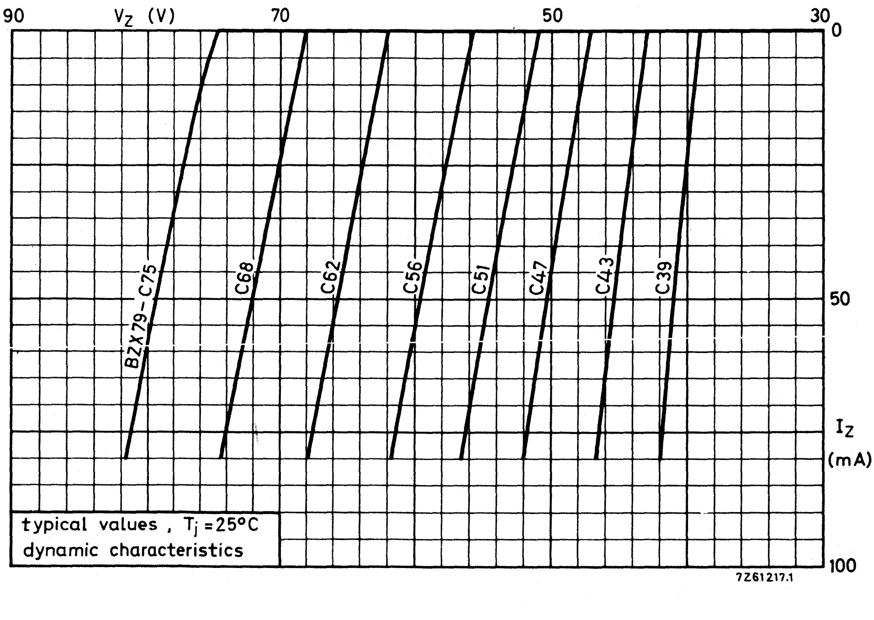

15
V_Z (V)
10
5
0
0
50
100
I_Z (mA)
BZX79-C10
C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
typical values
T_{amb} = 25°C
static
characteristics
7Z59233.1

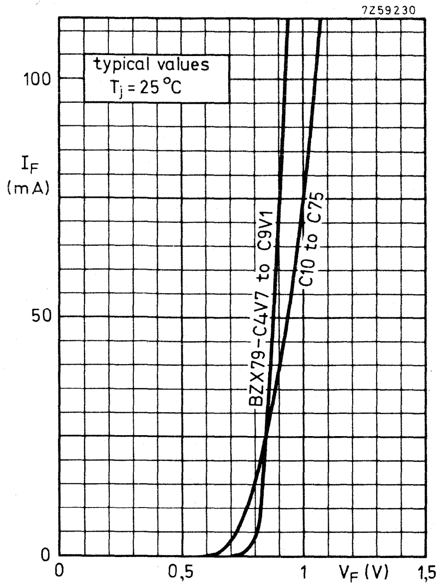

15
V_Z (V)
10
5
0
0
100
200
I_Z (mA)
BZX79- C10
C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
typical values
T_j = 25°C
dynamic
characteristics
7Z59234.3

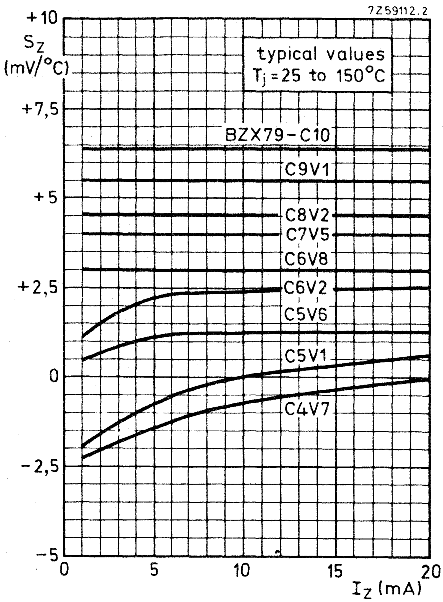

40
V_Z(V)
30
20
10
0
BZX79-C30
C27
C24
C20
C16
C13
C11
20
I_Z
(mA)
40
typical values
T_{amb} = 25 °C
static
characteristics
7Z59231.1

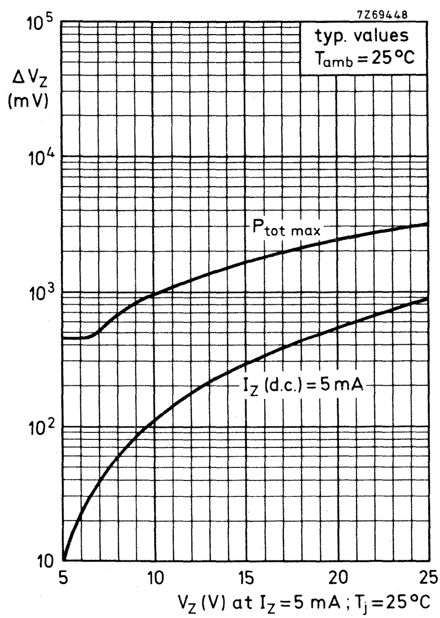

40
V_Z (V)
30
20
10
0
BZX79-C36
C33
C30
C27
C24
C20
C16
C13
C11
50
I_Z
(mA)
100
typical values , T_j = 25°C
dynamic characteristics
7Z61216.1

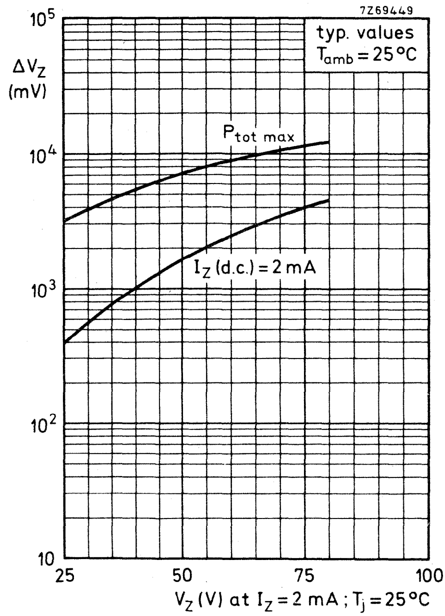

90
V_Z(V)
70
50
30
0
5
10
I_Z (mA)
BZX79-C75
C68
C62
C56
C51
C47
C43
C39
C36
C33
typical values
T_{amb} = 25 °C
static
characteristics
7Z59232.1

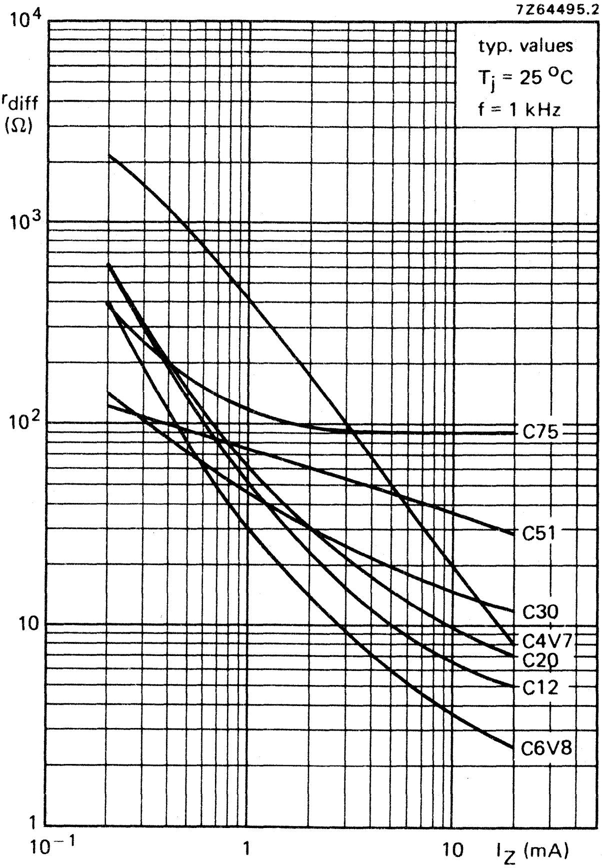

90
V_Z (V)
70
50
30
0
50
100
I_Z (mA)
BZX79-C75
C68
C62
C56
C51
C47
C43
C39
typical values , T_j = 25 °C
dynamic characteristics
7Z61217.1


7Z59230
typical values
$T_j = 25\,^{\circ}C$
100
I_F
(mA)
50
0
0
0,5
1
V_F (V)
1,5
BZX79-C4V7 to C9V1
C10 to C75


7Z59112.2
+10
S_Z
(mV/°C)
typical values
$T_j = 25$ to $150\,^{\circ}C$
+7,5
BZX79-C10
C9V1
+5
C8V2
C7V5
C6V8
+2,5
C6V2
C5V6
C5V1
0
C4V7
−2,5
−5
0
5
10
15
20
I_Z (mA)


7Z69448
10^5
ΔV_Z
(mV)
typ. values
$T_{amb} = 25\,^{\circ}C$
10^4
$P_{tot\ max}$
10^3
I_Z (d.c.) = 5 mA
10^2
10
5
10
15
20
25
V_Z (V) at $I_Z = 5$ mA ; $T_j = 25\,^{\circ}C$


7Z69449
10^5
ΔV_Z
(mV)
typ. values
$T_{amb} = 25\,^{\circ}C$
$P_{tot\ max}$
10^4
I_Z (d.c.) = 2 mA
10^3
10^2
10
25
50
75
100
V_Z (V) at $I_Z = 2$ mA ; $T_j = 25\,^{\circ}C$


7Z64495.2
typ. values
T_j = 25 °C
f = 1 kHz
r_{diff} (Ω)
10^4
10^3
10^2
10
1
10^{-1}
1
10
I_Z (mA)
C75
C51
C30
C4V7
C20
C12
C6V8

SILICON PLANAR VOLTAGE REGULATOR DIODES

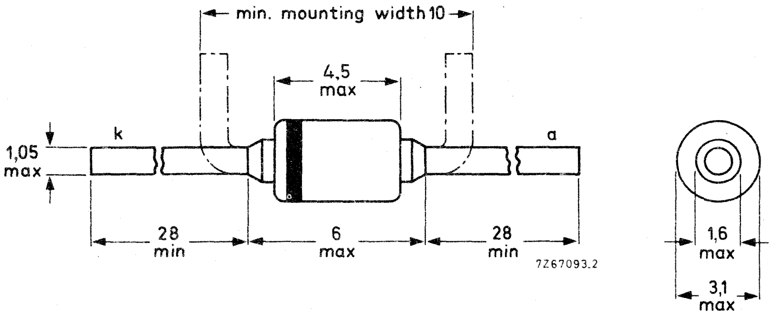
Silicon planar voltage regulator diodes in hermetically sealed glass envelopes intended for stabilization purposes.
The series covers the normalized range of nominal working voltages from 5,1 V to 75 V with a tolerance of ±5% (international standard E24).

QUICK REFERENCE DATA				
Working voltage range	V_Z	nom.	5,1 to 75	V
Working voltage tolerance (E24)			±5	%
Total power dissipation	P_{tot}	max.	2,75	W
Junction temperature	T_j	max.	200	°C

MECHANICAL DATA

Dimensions in mm

SOD-51



Cathode indicated by coloured band

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

Currents

Working current (d.c.)	I_Z	limited by $P_{tot\ max}$
Repetitive peak working current	I_{ZRM}	limited by P_{ZRMmax}
Repetitive peak forward current	I_{FRM}	max. 400 mA

→ Power dissipation (see also graphs on pages 5 and 6)

Total power dissipation	P_{tot}	max.	1,5	W	1)
		max.	2,75	W	2)
Repetitive peak reverse power dissipation up to T_{amb} = 175 °C; t_p = 100 μs; δ = 0,001	P_{ZRM}	max.	7,5	W	
Non-repetitive peak reverse power dissipation up to T_{amb} = 25 °C; t_p = 100 μs	P_{ZSM}	max.	100	W	

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

→ **THERMAL RESISTANCE** (see also graphs on pages 5 and 6)

From junction to ambient when soldered to tags at max. lead length	$R_{th\ j-a}$	max.	117	°C/W

CHARACTERISTICS

T_j = 25 °C

Forward voltage at I_F = 0,2 A	V_F	<	1	V

→ Reverse current

BZX87-C5V1	V_R = 2 V	I_R	<	10	μA
C5V6	V_R = 2 V	I_R	<	5	μA
C6V2	V_R = 2 V	I_R	<	3	μA
C6V8	V_R = 3 V	I_R	<	1,5	μA
C7V5	V_R = 3 V	I_R	<	0,6	μA
C8V2	V_R = 3 V	I_R	<	0,4	μA
C9V1	V_R = 5 V	I_R	<	0,3	μA
C10 to C75	$V_R = \frac{2}{3} V_{Znom}$	I_R	<	0,2	μA

1) Measured in still air up to T_{amb} = 25 °C and mounted to solder tags at maximum lead length.

2) If the temperature of the leads at 10 mm from the body is kept at 25 °C.

CHARACTERISTICS (continued)

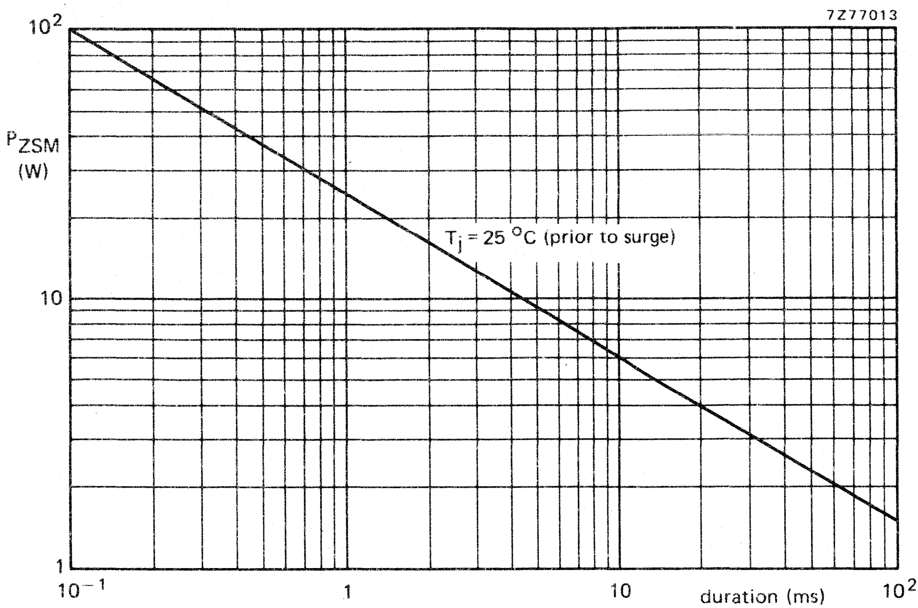
T_j = 25 °C

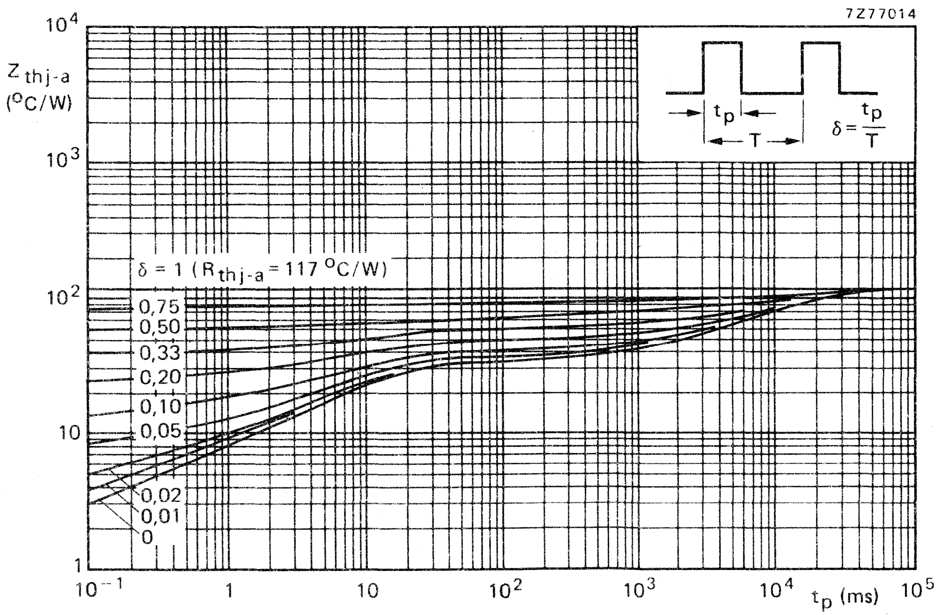
BZX87-....	Working voltage V_Z (V)		Temperature coefficient S_Z (mV/°C)			Differential resistance r_{diff} (Ω)		Diode capacitance C_d (pF) at f = 1 MHz	
	at I_Z = 50 mA		**at I_Z = 50 mA**			**at I_Z = 50 mA**		**V_R = 0**	
	min.	max.	min.	typ.	max.	typ.	max.	typ.	max.
C5V1	4,8	5,4	−1,5	0	1,5	4	10	200	250
C5V6	5,2	6,0	−0,2	1,5	2,5	2	5	180	225
C6V2	5,8	6,6	1,5	2,4	3,3	1,5	3	350	400
	at I_Z = 20 mA		**at I_Z = 20 mA**			**at I_Z = 20 mA**			
C6V8	6,4	7,2	2,2	3,1	3,9	1	3	300	350
C7V5	7,0	7,9	2,8	3,8	4,7	1	3	270	310
C8V2	7,7	8,7	3,5	4,5	5,5	1,5	4	250	280
C9V1	8,5	9,6	4,3	5,4	6,5	2	4	210	250
C10	9,4	10,6	5,2	6,3	7,5	2	5	190	230
C11	10,4	11,6	6,2	7,4	8,6	3	5	170	220
C12	11,4	12,7	7,2	8,4	9,8	3	6	165	200
C13	12,4	14,1	8,2	9,4	11,2	3	7	165	200
C15	13,8	15,6	9,6	11,4	12,8	4	10	160	190
	at I_Z = 10 mA		**at I_Z = 10 mA**			**at I_Z = 10 mA**			
C16	15,3	17,1	11,1	12,5	14,4	4	10	140	180
C18	16,8	19,1	12,6	14,5	16,6	5	15	120	160
C20	18,8	21,2	14,6	16,6	18,8	5	15	110	150
C22	20,8	23,3	16,6	18,6	20,9	5	20	100	135
C24	22,8	25,6	18,6	20,7	23,4	6	20	95	130
C27	25,1	28,9	21,0	23,8	26,8	7	25	90	120
C30	28	32	23,8	26,9	30,6	8	25	80	110
C33	31	35	26,6	30,0	34,2	10	30	75	95
C36	34	38	29,6	33,4	38,0	10	35	70	90
	at I_Z = 5 mA		**at I_Z = 5 mA**			**at I_Z = 5 mA**			
C39	37	41	32,6	37,0	41,6	15	40	65	80
C43	40	46	36,0	41,6	47,6	15	50	62	75
C47	44	50	40,4	46,1	52,6	20	60	60	75
C51	48	54	44,6	51,0	57,6	30	70	55	70
C56	52	60	49,2	56,6	64,8	35	80	52	65
C62	58	66	56,0	63,4	72,0	40	90	50	60
C68	64	72	62,4	70,4	79,2	45	110	46	58
C75	70	79	69,2	78,4	88,0	45	125	44	55

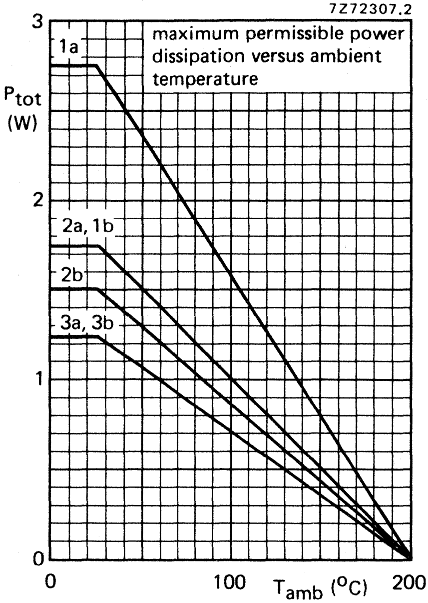
CHARACTERISTICS (continued) ←

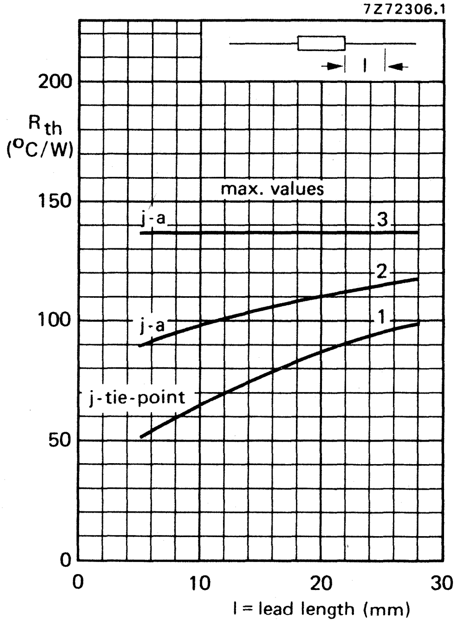
$T_j = 25\ ^oC$

	Working voltage V_Z (V) at I_Z = 1 mA			Differential resistance r_{diff} (Ω) at I_Z = 1 mA		Working voltage V_Z (V) at I_Z = 100 mA			Differential resistance r_{diff} (Ω) at I_Z = 100 mA	
BZX87-....	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
C5V1	3,3	3,8	4,3	425	500	4,9	5,2	5,5	1,2	2,5
C5V6	4,1	5,3	5,8	400	500	5,3	5,7	6,1	1,0	2,0
C6V2	5,6	6,0	6,5	40	200	5,9	6,3	6,7	0,8	2,0
C6V8	6,3	6,7	7,1	40	120	6,5	6,9	7,3	0,6	2,0
C7V5	6,9	7,4	7,8	20	100	7,1	7,6	8,0	0,5	1,5
C8V2	7,6	8,1	8,6	20	100	7,8	8,3	8,8	0,5	1,5
C9V1	8,4	9,0	9,6	25	100	8,6	9,2	9,8	0,8	2,0
C10	9,3	9,9	10,5	30	120	9,5	10,1	10,8	0,8	2,0
C11	10,3	10,9	11,5	30	120	10,5	11,1	11,8	0,8	2,0
C12	11,2	11,9	12,6	30	150	11,5	12,1	12,9	1,0	2,0
C13	12,2	12,9	14,0	30	150	12,5	13,1	14,3	1,2	2,5
C15	13,6	14,9	15,4	30	150	13,9	15,1	15,8	1,2	2,5
	at I_Z = 1 mA			at I_Z = 1 mA		at I_Z = 50 mA			at I_Z = 50 mA	
C16	15,2	15,9	17,0	30	150	15,4	16,1	17,3	1,2	3,0
C18	16,7	17,9	19,0	30	150	16,9	18,1	19,3	2,0	5,0
C20	18,7	19,9	21,1	30	150	19,0	20,2	21,5	2,5	6,0
C22	20,7	21,9	23,2	30	150	21,0	22,2	23,7	2,5	6,0
C24	22,6	23,9	25,5	30	150	23,0	24,2	26,0	3,0	8,0
C27	24,9	26,9	28,8	30	150	25,3	27,2	29,2	4,0	8,0
C30	27,8	29,9	31,9	30	150	28,2	30,2	32,5	4,0	8,0
C33	29,8	32,9	34,9	30	150	31,2	33,3	35,5	5,0	10
C36	33,8	35,9	37,9	30	150	34,2	36,3	38,5	5,0	10
C39	36,8	38,9	40,9	40	150	37,5	39,5	42,0	6,0	12
C43	39,8	42,9	45,9	50	150	40,5	43,5	47,0	8	15
C47	43,8	46,9	49,9	55	200	44,5	47,5	51,0	10	20
C51	47,8	50,9	53,8	60	200	48,5	51,8	55,5	12	25
C56	51,8	55,9	59,8	60	200	52,5	56,8	61,5	15	30
C62	57,6	61,8	65,8	70	200	58,5	62,8	67,5	16	30
C68	63,5	67,6	71,7	80	225	65,0	69,0	74,0	18	35
C75	69,3	74,5	78,6	100	250	73,0	77,5	84,0	20	35


7Z77013
10^2
P_{ZSM} (W)
T_j = 25 °C (prior to surge)
10
1
10^{-1}
1
10
duration (ms)
10^2


7Z77014
10^4
Z_{thj-a} (°C/W)
10^3
t_p
T
$\delta = \frac{t_p}{T}$
δ = 1 (R_{thj-a} = 117 °C/W)
10^2
0,75
0,50
0,33
0,20
0,10
0,05
10
0,02
0,01
0
1
10^{-1}
1
10
10^2
10^3
10^4
t_p (ms)
10^5

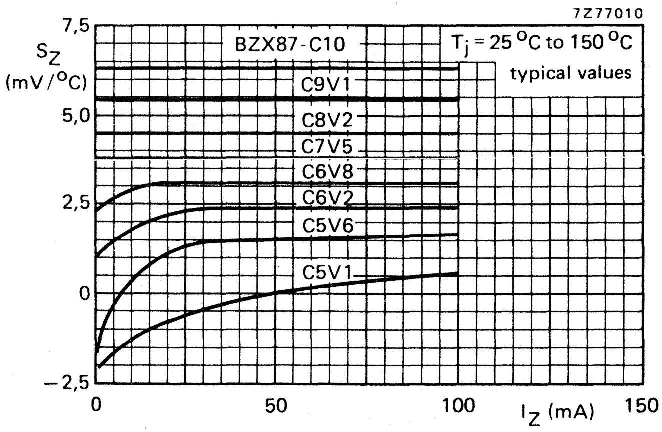


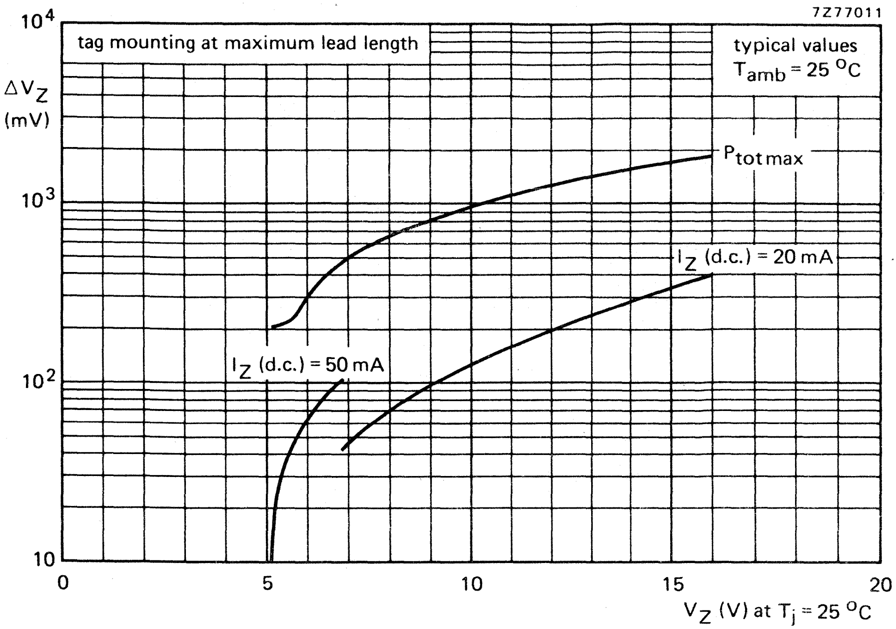


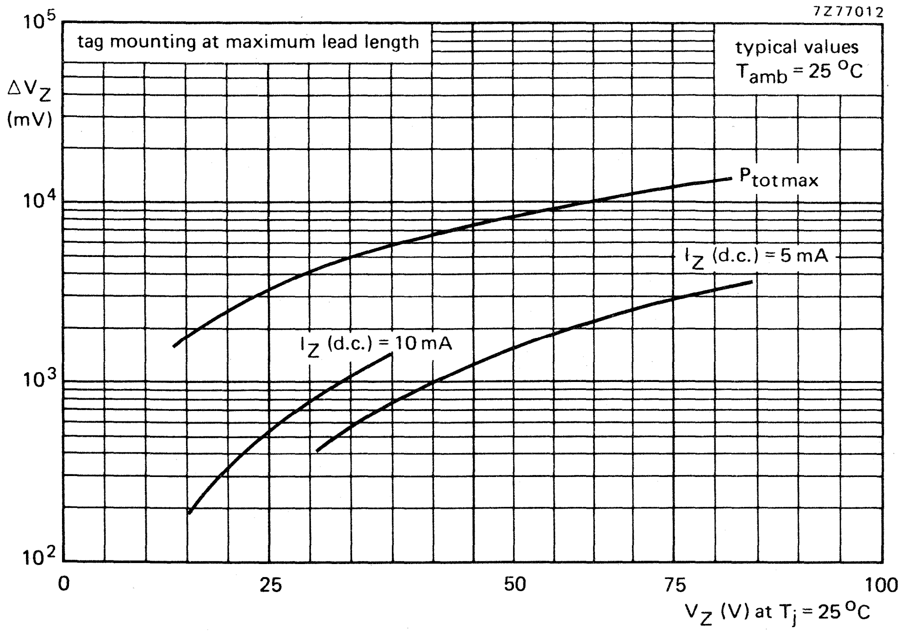
MOUNTING METHODS

1. to tie-points
2. to solder tags
3. on a printed-circuit board with minimum soldering area necessary for good electrical conductance

a. lead length = 10 mm
b. at maximum lead length




7Z77011
tag mounting at maximum lead length
typical values
T_{amb} = 25 °C
ΔV_Z (mV)
10^4
10^3
10^2
10
$P_{tot max}$
I_Z (d.c.) = 20 mA
I_Z (d.c.) = 50 mA
0
5
10
15
20
V_Z (V) at T_j = 25 °C


7Z77012
tag mounting at maximum lead length
typical values
T_{amb} = 25 °C
ΔV_Z (mV)
10^5
10^4
10^3
10^2
$P_{tot max}$
I_Z (d.c.) = 5 mA
I_Z (d.c.) = 10 mA
0
25
50
75
100
V_Z (V) at T_j = 25 °C

VOLTAGE REGULATOR DIODES

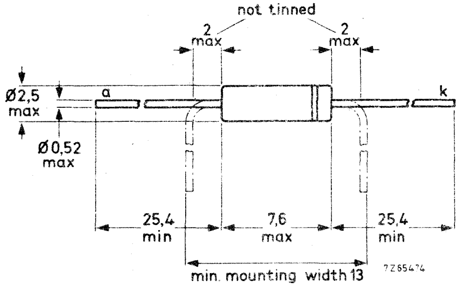
Silicon diodes in all-glass DO-7 envelope for use as low current voltage stabilizers or voltage references.
The series consists of 24 types with nominal working voltages ranging from 3,3 V to 30 V with a tolerance of ±5%.

QUICK REFERENCE DATA				
Working voltage range	V_Z	nom.	3,3 to 30	V
Working voltage tolerance			±5	%
Repetitive peak working current	I_{ZRM}	max.	250	mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW
Non-repetitive peak reverse power dissipation T_j = 150 °C; t = 100 µs	P_{ZSM}	max.	15	W
Operating junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient in free air	$R_{th\ j-a}$	=	0,37	°C/mW

MECHANICAL DATA

Dimensions in mm

DO-7



Cathode indicated by coloured band

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

Currents

Forward current (d.c.)	I_F	max.	250	mA
Repetitive peak forward current	I_{FRM}	max.	250	mA
Repetitive peak working current	I_{ZRM}	max.	250	mA

Power dissipation

Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW
Non-repetitive peak reverse power dissipation T_j = 150 °C; t = 100 µs	P_{ZSM}	max.	15	W

Temperatures

Storage temperature	T_{stg}	-65 to +175		°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,37	°C/mW

CHARACTERISTICS $T_j = 25\ ^oC$

Forward voltage

$I_F = 10$ mA V_F < 0.9 V

BZY88-...	Working voltage V_Z at $I_Z = 1$ mA				Temperature coefficient S_Z at $I_Z = 1$ mA				Differential resistance r_{diff} at $I_Z = 1$ mA			
	min.	nom.	max.		min.	typ.	max.		min.	typ.	max.	
C3V3	2.4	2.75	3.0	V	−4.5	−1.9	−0.5	mV/°C	380	410	440	Ω
C3V6	2.7	3.0	3.3	V	−4.5	−2.05	−0.5	mV/°C	380	410	430	Ω
C3V9	3.0	3.3	3.6	V	−3.5	−2.4	−0.5	mV/°C	380	410	430	Ω
C4V3	3.3	3.6	3.9	V	−2.7	−2.25	−0.5	mV/°C	340	410	430	Ω
C4V7	3.7	4.1	4.3	V	−2.5	−2.0	−0.3	mV/°C	360	390	420	Ω
C5V1	4.3	4.65	5.0	V	−2.1	−1.9	−0.3	mV/°C	300	340	370	Ω
C5V6	4.8	5.3	5.7	V	−1.8	−1.4	0	mV/°C	160	310	350	Ω
C6V2	5.7	5.9	6.5	V	0	+1.6	+3.0	mV/°C	10	100	250	Ω
C6V8	6.3	6.7	6.9	V	+2	+3.2	+3.7	mV/°C	5.0	15	70	Ω
C7V5	7.0	7.45	7.8	V	+3	+4.2	+5.9	mV/°C	4.0	8.6	20	Ω
C8V2	7.8	8.1	8.5	V	+4.3	+5.0	+6.0	mV/°C	4.0	10	20	Ω
C9V1	8.55	9.0	9.5	V	+4.5	+6.0	+7.0	mV/°C	7.0	12	24	Ω
C10	9.3	9.9	10.5	V	+6.0	+6.6	+7.0	mV/°C	5.0	20	50	Ω
C11	10.3	10.9	11.5	V	+7.1	+8.3	+9.0	mV/°C	5.0	25	70	Ω
C12	11.3	11.9	12.5	V	+7.6	+8.7	+9.2	mV/°C	10	25	80	Ω
C13	12.3	12.9	13.0	V	+9.1	+10.1	+11.1	mV/°C	10	25	90	Ω
C15	13.8	14.9	15.5	V	+11	+12.5	+13	mV/°C	19	35	95	Ω
C16	15.3	15.8	16.9	V	+12	+13	+14	mV/°C	20	45	100	Ω
C18	16.7	17.8	18.9	V	+14	+15	+16.5	mV/°C	20	50	120	Ω
C20	18.7	19.8	21.0	V	+16	+17	+18.5	mV/°C	20	60	140	Ω
C22	20.6	21.8	23.1	V	+17	+19	+21	mV/°C	25	70	150	Ω
C24	22.5	23.8	25.7	V	+19	+21	+23	mV/°C	30	85	200	Ω
C27	24.7	26.6	28.5	V	+21	+22.5	+25	mV/°C	35	90	300	Ω
C30	27.5	29.5	31.5	V	+22	+24	+29	mV/°C	50	180	350	Ω

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

BZY88-...	Working voltage V_Z at $I_Z = 5$ mA				Temperature coefficient S_Z at $I_Z = 5$ mA				Differential resistance r_{diff} at $I_Z = 5$ mA			
	min.	nom.	max.		min.	typ.	max.		min.	typ.	max.	
C3V3	3.1	3.3	3.5	V	−4.0	−2.3	−0.5	mV/^{o}C	70	83.5	110	Ω
C3V6	3.4	3.6	3.8	V	−3.5	−2.0	−0.5	mV/^{o}C	65	76	105	Ω
C3V9	3.7	3.9	4.1	V	−2.5	−2.05	−0.5	mV/^{o}C	60	76	100	Ω
C4V3	4.0	4.3	4.5	V	−2.5	−1.8	−0.5	mV/^{o}C	55	70	90	Ω
C4V7	4.4	4.7	5.0	V	−2.0	−1.55	0	mV/^{o}C	49	62	85	Ω
C5V1	4.8	5.1	5.4	V	−1.75	−1.2	0	mV/^{o}C	34	46	75	Ω
C5V6	5.3	5.6	6.0	V	−1.5	−0.2	+1.0	mV/^{o}C	10	22	55	Ω
C6V2	5.8	6.2	6.6	V	+0.5	+2.0	+3.5	mV/^{o}C	1.0	7.0	27	Ω
C6V8	6.4	6.8	7.2	V	+2.3	+3.2	+3.8	mV/^{o}C	0.5	3.0	15	Ω
C7V5	7.1	7.5	7.9	V	+3.1	+4.2	+5.9	mV/^{o}C	0.5	3.0	15	Ω
C8V2	7.8	8.2	8.7	V	+4.2	+5.0	+6.0	mV/^{o}C	0.9	3.5	20	Ω
C9V1	8.6	9.1	9.6	V	+4.8	+6.0	+7.0	mV/^{o}C	1.0	4.75	25	Ω
C10	9.4	10	10.6	V	+6.0	+7.0	+7.5	mV/^{o}C	2.0	5.0	25	Ω
C11	10.4	11	11.6	V	+7.0	+8.7	+9.1	mV/^{o}C	3.0	7.0	25	Ω
C12	11.4	12	12.6	V	+8.5	+9.0	+9.6	mV/^{o}C	4.0	8.0	35	Ω
C13	12.4	13	14.1	V	+10	+10.5	+11.5	mV/^{o}C	4.0	10	35	Ω
C15	13.9	15	15.6	V	+12	+12.5	+14	mV/^{o}C	4.0	15	35	Ω
C16	15.4	16	17.1	V	+12	+13	+14	mV/^{o}C	5.0	20	40	Ω
C18	16.9	18	19.1	V	+14	+15	+18	mV/^{o}C	7.0	25	45	Ω
C20	18.9	20	21.2	V	+16	+17	+19	mV/^{o}C	10	30	50	Ω
C22	20.8	22	23.3	V	+17	+19	+21	mV/^{o}C	15	35	60	Ω
C24	22.7	24	25.9	V	+20	+21	+24	mV/^{o}C	20	40	75	Ω
C27	25.1	27	28.9	V	+22	+23.5	+27	mV/^{o}C	25	50	85	Ω
C30	28	30	32	V	+25	+26	+29	mV/^{o}C	30	60	95	Ω

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

BZY88-...	Working voltage V_Z at I_Z = 20 mA				Temperature coefficient S_Z at I_Z = 20 mA				Differential resistance r_{diff} at I_Z = 20 mA			
	min.	nom.	max.		min.	typ.	max.		min.	typ.	max.	
C3V3	3.5	4	4.2	V	−3.3	−2.4	−0.5	mV/°C	16.0	19.5	22	Ω
C3V6	3.9	4.2	4.4	V	−2.5	−1.55	−0.5	mV/°C	16	18	20	Ω
C3V9	4.2	4.45	4.65	V	−2.4	−1.55	−0.5	mV/°C	14	16	18	Ω
C4V3	4.45	4.7	4.95	V	−2.0	−1.5	−0.5	mV/°C	13	15	17	Ω
C4V7	4.9	5.1	5.3	V	−1.5	−0.85	0	mV/°C	12	15	17	Ω
C5V1	5.1	5.35	5.7	V	−1.5	−0.8	0	mV/°C	4.0	7.0	11	Ω
C5V6	5.45	5.75	6.1	V	−1.0	+1.0	+3.0	mV/°C	1.5	4.0	8.0	Ω
C6V2	5.95	6.4	6.7	V	+1.0	+2.2	+4.0	mV/°C	0.8	1.4	3.1	Ω
C6V8	6.6	6.9	7.25	V	+2.8	+3.2	+3.8	mV/°C	0.7	1.3	3.0	Ω
C7V5	7.2	7.65	7.95	V	+2.5	+4.2	+5.9	mV/°C	0.5	1.6	5.0	Ω
C8V2	7.9	8.4	8.75	V	+4.0	+5.0	+6.0	mV/°C	0.9	1.8	6.0	Ω
C9V1	8.7	9.4	9.7	V	+5.0	+6.0	+7.0	mV/°C	1.0	1.85	7.0	Ω
C10	9.5	10.1	10.8	V	+7.0	+7.3	+7.5	mV/°C	1.0	2.0	8.0	Ω
C11	10.5	11.1	11.8	V	+8.5	+9.1	+9.5	mV/°C	1.0	3.0	10	Ω
C12	11.6	12.2	12.8	V	+8.9	+9.6	+10.3	mV/°C	2.0	3.5	25	Ω
C13	12.6	13.2	14.3	V	+11	+11.5	+12.5	mV/°C	2.0	4.5	25	Ω
C15	14.1	15.3	15.9	V	+12	+13.5	+14.5	mV/°C	2.0	6.0	25	Ω
C16	15.6	16.3	17.4	V	+13	+14	+15	mV/°C	5.0	10	30	Ω
C18	17.2	18.4	19.6	V	+15	+16	+18	mV/°C	5.0	12	30	Ω
C20	19.3	20.5	21.9	V	+17.5	+18.5	+20.5	mV/°C	5.0	15	35	Ω
C22	21.3	22.6	24.1	V	+19	+20.5	+22.5	mV/°C	10	18	35	Ω
C24	23.3	24.7	26.7	V	+20	+23	+25	mV/°C	10	20	40	Ω
C27	25.8	28.1	30.1	V	+23	+25.5	+28	mV/°C	10	25	45	Ω
C30	29.0	31.3	33.4	V	+25	+28	+32	mV/°C	10	35	50	Ω

CHARACTERISTICS (continued) $T_j = 25\ ^oC$

BZY88-...	Diode capacitance C_d at V_R = 3 V (typ.)	Reverse current I_R at V_R =	typ.	max.
C3V3	395 pF	1 V	0.54	3.0 μA
C3V6	370 pF	1 V	0.25	3.0 μA
C3V9	335 pF	1 V	0.11	3.0 μA
C4V3	270 pF	1 V	0.1	3.0 μA
C4V7	290 pF	2 V	0.25	3.0 μA
C5V1	275 pF	2 V	0.15	1.0 μA
C5V6	260 pF	2 V	0.6	1.0 μA
C6V2	240 pF	2 V	0.1	1.0 μA
C6V8	220 pF	3 V	0.025	1.0 μA
C7V5	190 pF	3 V	15	500 nA
C8V2	150 pF	3 V	11	400 nA
C9V1	140 pF	5 V	8	400 nA
C10	110 pF	7 V	–	2.5 μA
C11	90 pF	7 V	–	2.5 μA
C12	80 pF	8 V	–	2.5 μA
C13	65 pF	9 V	–	2.5 μA
C15	60 pF	10 V	–	2.5 μA
C16	55 pF	10 V	–	2.5 μA
C18	50 pF	13 V	–	2.5 μA
C20	45 pF	14 V	–	2.5 μA
C22	43 pF	15 V	–	2.5 μA
C24	42 pF	17 V	–	2.5 μA
C27	40 pF	19 V	–	2.5 μA
C30	35 pF	21 V	–	2.5 μA

OPERATING NOTES

1. Dissipation and heatsink considerations

   a. Steady-state conditions

   The maximum allowable steady-state dissipation $P_{S\,max}$ is given by the relationship

$$P_{S\,max} = \frac{T_{j\,max} - T_{amb}}{R_{th\,j\text{-}a}}$$

   where $T_{j\,max}$ is the maximum permissible operating junction temperature,
   T_{amb} is the ambient temperature,
   $R_{th\,j\text{-}a}$ is the total thermal resistance from junction to ambient

   b. Pulse conditions (see fig. below)

   The maximum allowable additional pulse power $P_{m\,max}$ is given by the formula

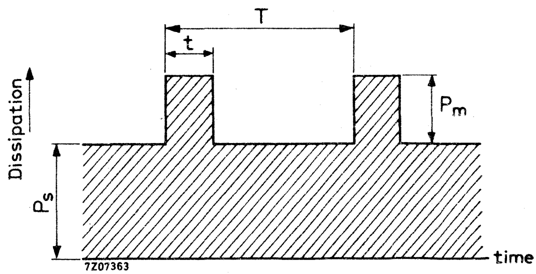
$$P_{m\,max} = \frac{(T_{j\,max} - T_{amb}) - (P_S \cdot R_{th\,j\text{-}a})}{Z_{th}}$$

   where P_S is the steady-state dissipation, excluding that in the pulses,

   Z_{th} is the effective transient thermal resistance of the device from junction to ambient. It is a function of the pulse duration t and duty cycle δ (see page 11, lower figure).

   δ is the duty cycle and is equal to the pulse duration t divided by the period duration T.

The steady-state power P_S when biased in the zener direction at a given zener current can be found from page 15, upper figure. With the additional pulsed power dissipation $P_{m\,max}$ calculated from the above expression, the total repetitive peak zener power dissipation $P_{ZRM} = P_S + P_{m\,max}$. From page 15, upper figure the corresponding maximum repetitive peak zener current at P_{ZRM} can now be read. This repetitive peak zener current is subject to the absolute maximum rating. For pulse durations longer than the temperature stabilization time of the diode t_{stab}, the maximum allowable repetitive peak dissipation P_{ZRM} is equal to the maximum steady-state power $P_{S\,max}$. The temperature stabilization time for the BZY88 series is 100 s (see page 11, lower figure).



OPERATING NOTES (continued)

Example

The following example illustrates how to calculate the maximum permissible repetitive peak zener current of a BZY88-C7V5 zener diode mounted in free air at a maximum ambient temperature of 60 °C. The steady-state zener current is 10 mA, the duty cycle $\delta = 0.1$ and the pulse duration t = 1 ms.

The steady-state dissipation P_S at a zener current of 10 mA (from page 15, upper figure) = 76 mW.
The thermal resistance from junction to ambient $R_{th\ j\text{-}a} = 0.31\ ^{o}C/mW$.
The thermal impedance Z_{th} with a duty cycle $\delta = 0.1$ and a pulse duration t = 1 ms (from page 11, lower figure).

$$Z_{th} = 41.5\ ^{o}C/W$$

The maximum additional pulse power dissipation

$$P_{m\,max} = \frac{(T_{j\,max} - T_{amb}) - P_S \cdot R_{th\ j\text{-}a}}{Z_{th}}$$

If $P_S = 76$ mW, $Z_{th} = 41.5\ ^{o}C/W$,

$$P_{m\,max} = \frac{(175-60)-(0.076 \times 310)}{41.5} = 2.2\,W$$

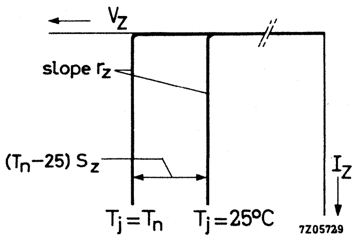
therefore, the total repetitive peak power dissiaption,

$$P_{ZRM} = 0.076 + 2.2 = 2.28\,W$$

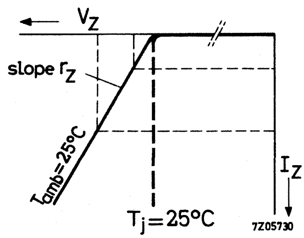
From page 15, upper figure, the corresponding repetitive peak zener current is 250 mA. This is within the rating of the BZY88-C7V5 and is therefore permissible.

2. Zener characteristics

The basic characteristic of a zener diode is the dynamic zener characteristic, that is, the variation of zener voltage when a current pulse is applied in the reverse direction. The slope of this characteristic is r_Z. Typical dynamic characteristics at T_j = 25 and 150 °C are given on pages 12 and 13 for each type of diode. Because of the temperature sensitivity of the zener characteristics, the dynamic characteristics at any other operating temperature will be displaced from those at T_j = 25 °C by a voltage corresponding to $S_Z \times (T_n - 25)$ °C, where S_Z is the temperature coefficient of the diode and T_n is a nominal operating temperature. This is illustrated below.



Dynamic characteristics



Static characteristic

OPERATING NOTES (continued)

The static characteristic of the diode is obtained by connecting the steady-state zener voltages at various direct zener currents and may, therefore, be used to determine the operating point at any zener current. This is shown above. The slope of the static characteristic will depend on

(1) the differential resistance, r_z

(2) the rise in junction temperature due to internal dissipation and the thermal resistance from junction to ambient, $V_Z . I_Z . R_{th\ j\text{-}a}$

(3) the temperature coefficient of the diode, S_Z

From the above, the static slope resistance r_Z is found to be

$$r_Z = r_z + V_Z . R_{th\ j\text{-}a} . S_Z$$

where r_z is the differential resistance, V_Z is the steady-state zener voltage and is equal to

$$\frac{V_Z'}{1 - I_Z . R_{th\ j\text{-}a} . S_Z}$$

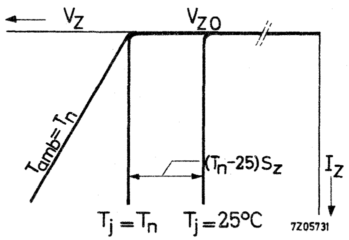
V_Z' being the zener voltage at $T_j = T_n$ at the working current I_Z.

The position of this static characteristic in relation to the dynamic characteristic at $T_j = 25\ ^oC$ is dependent on the ambient temperature and the temperature coefficient, the low-current voltage being displaced by

$$S_Z \times (T_n - 25)\ ^oC$$

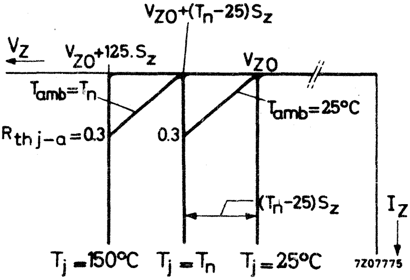
from the low current voltage, V_{ZO} on the dynamic characteristic at $T_j = 25\ ^oC$ (See figure below)

Example for positive S_Z



OPERATING NOTES (continued)

Next figure shows typical dynamic characteristics at T_j = 25, 150 and a nominal temperature, T_n °C. It also shows static characteristics at ambient temperatures of 25 and T_n °C.



Example for positive S_Z

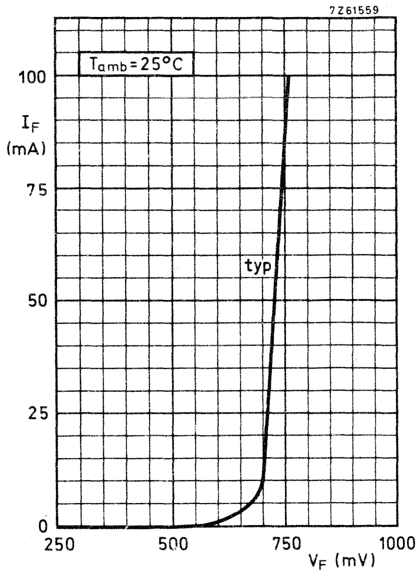
Typical static characteristics for each type of diode are given on page 14. These curves were obtained with the device mounted in free air at an ambient temperature of 25 °C.

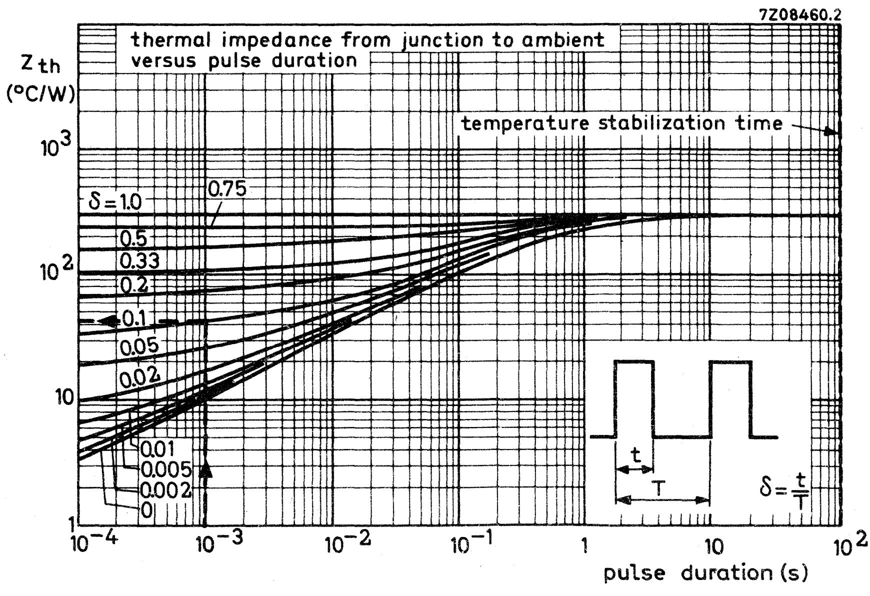
The slope resistance for pulse operation can be calculated by incorporating the thermal impedance Z_{th} into the formula for r_Z. Curves of Z_{th} plotted against pulse duration and duty cycle are given in the lower figure on page 11.

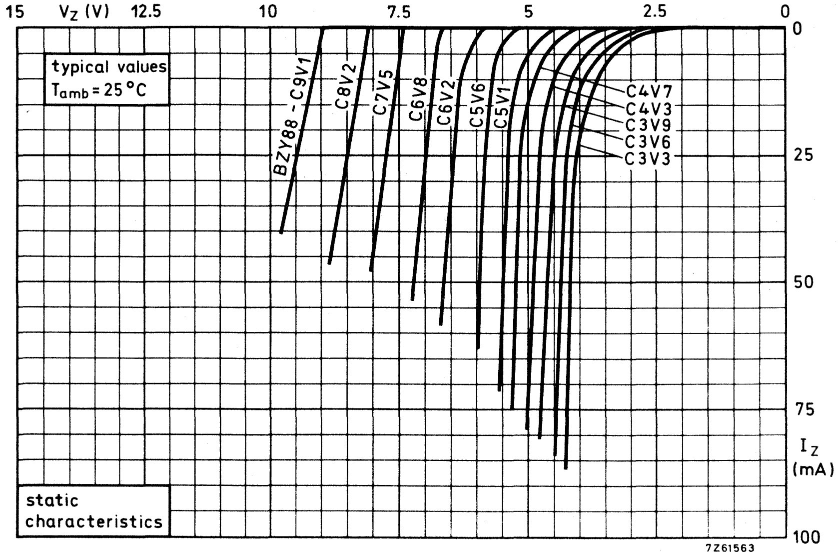
3. When using a soldering iron, the diode may be soldered directly into a circuit, but heat conducted to the junction should be kept to a minimum by use of a thermal shunt.

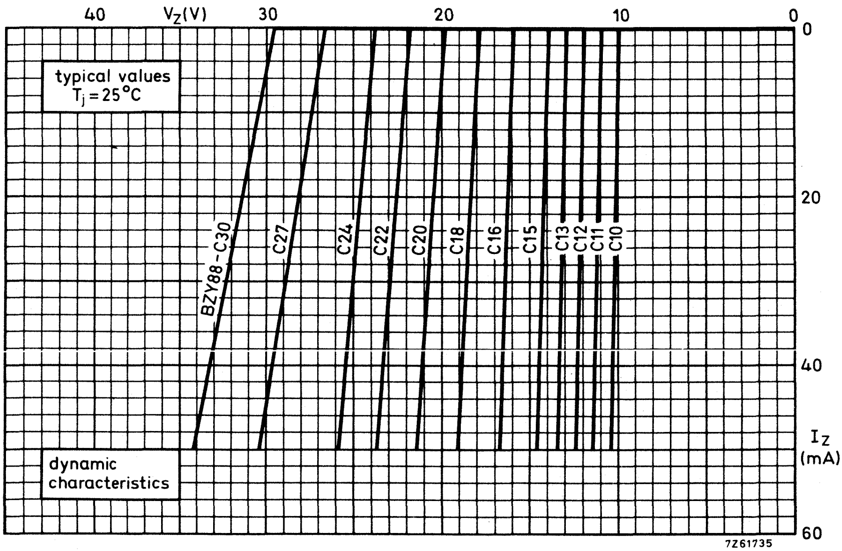
4. Diodes may be dip soldered at a solder temperature of 245 °C for a maximum soldering time of 5 seconds. The case temperature during dip soldering must not at any time exceed the maximum storage temperature. These recommendations apply to a diode with the anode end mounted flush on the board with punched-through holes. For mounting the cathode end onto the board the diode must be spaced 5 mm from the underside of the printed circuit board in the case of punched-through holes or 5 mm from the top of the board for plated-through holes.

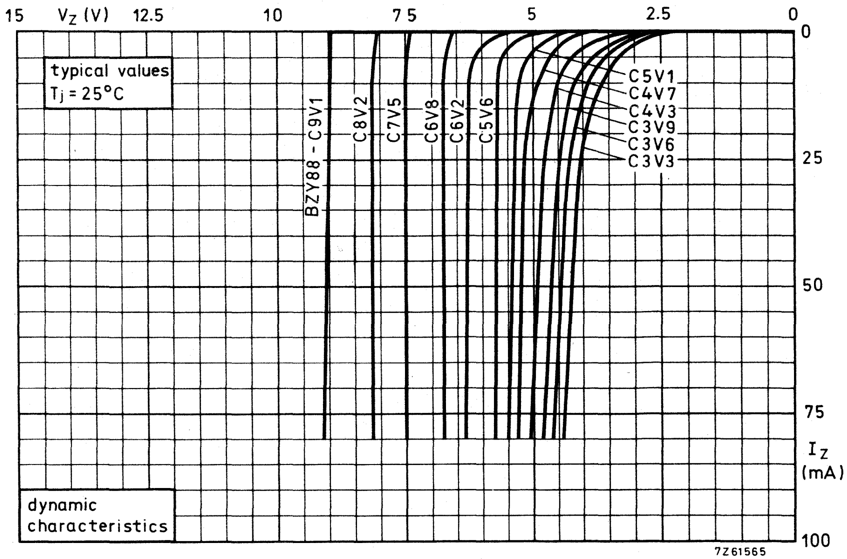
5. Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

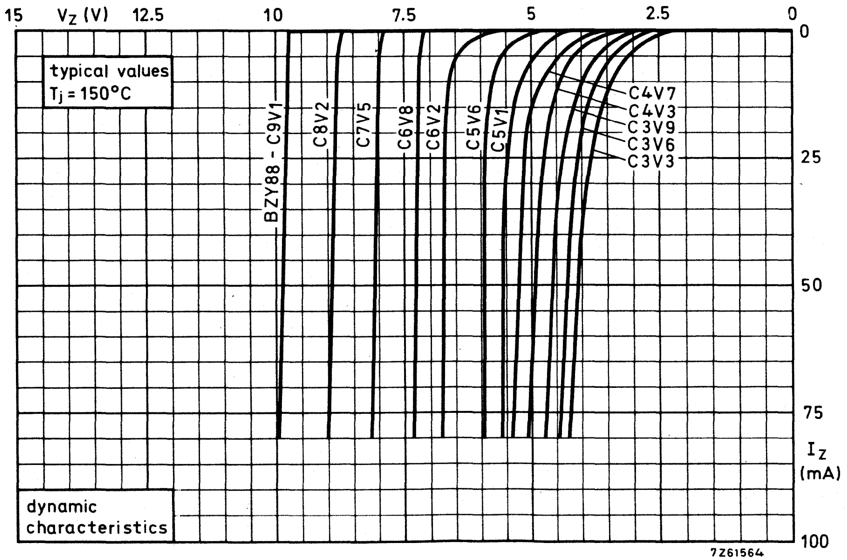

7Z61559
T_{amb} = 25°C
I_F (mA)
100
75
50
25
0
typ
250
500
750
1000
V_F (mV)

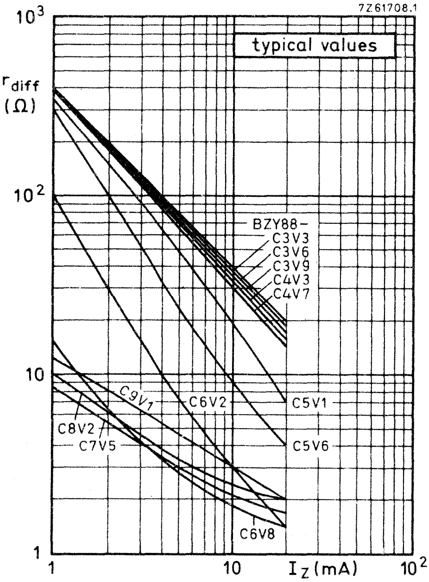

7Z08460.2
thermal impedance from junction to ambient versus pulse duration
Z_{th} (°C/W)
temperature stabilization time
10^3
10^2
10
1
δ = 1.0
0.75
0.5
0.33
0.2
0.1
0.05
0.02
0.01
0.005
0.002
0
t
T
δ = $\frac{t}{T}$
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
10
10^2
pulse duration (s)

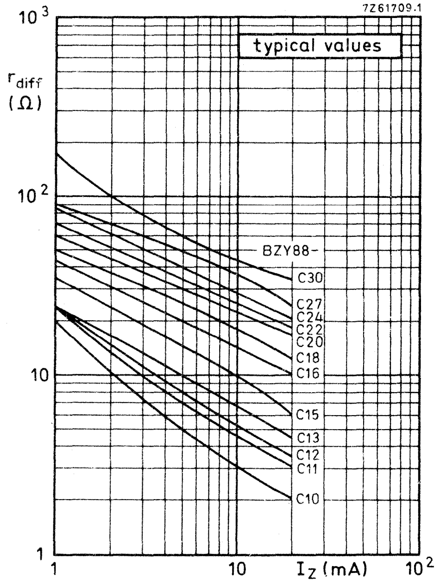

15
V_Z (V)
12.5
10
7.5
5
2.5
0
typical values
T_{amb} = 25 °C
BZY88 - C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V9
C3V6
C3V3
25
50
75
I_Z
(mA)
100
static
characteristics
7Z61563

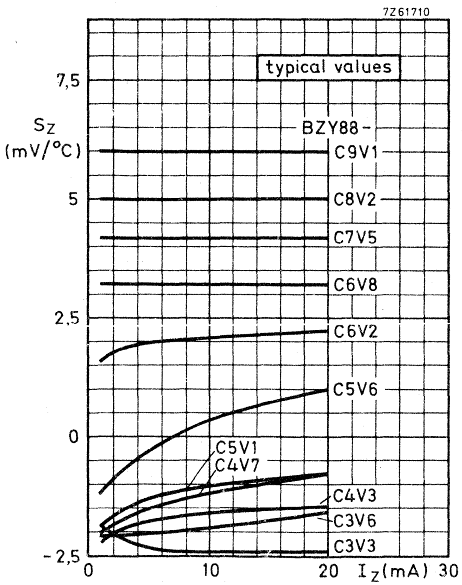

40
V_Z(V)
30
20
10
0
typical values
T_j = 25°C
BZY88-C30
C27
C24
C22
C20
C18
C16
C15
C13
C12
C11
C10
20
40
I_Z
(mA)
60
dynamic
characteristics
7Z61735

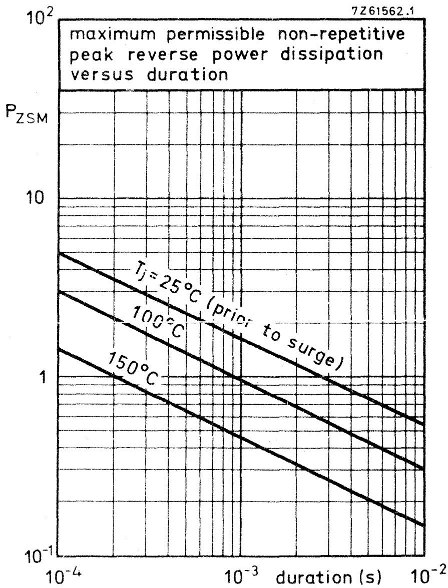

15
V_Z (V)
12.5
10
7.5
5
2.5
0
typical values
T_j = 25°C
BZY88 - C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V9
C3V6
C3V3
25
50
75
I_Z (mA)
100
dynamic characteristics
7Z61565

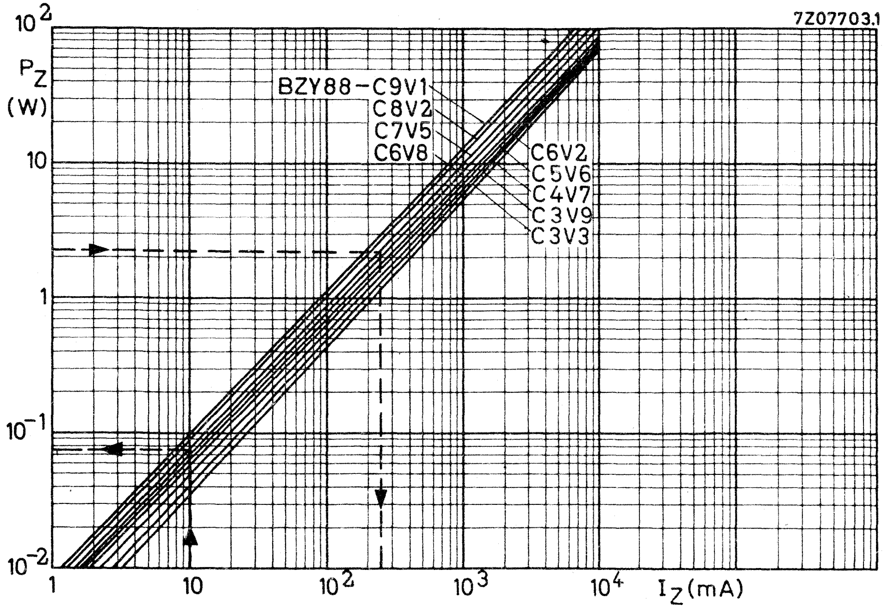

15
V_Z (V)
12.5
10
7.5
5
2.5
0
typical values
T_j = 150°C
BZY88 - C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V9
C3V6
C3V3
25
50
75
I_Z (mA)
100
dynamic characteristics
7Z61564

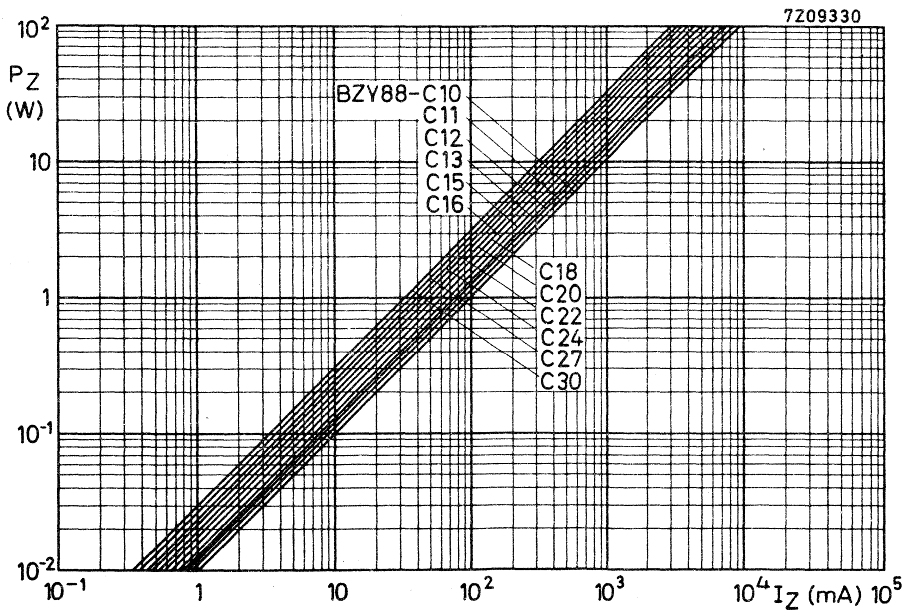

7Z61708.1
typical values
r_{diff} (Ω)
BZY88-
C3V3
C3V6
C3V9
C4V3
C4V7
C5V1
C5V6
C6V2
C6V8
C7V5
C8V2
C9V1
I_Z (mA)


7Z61709.1
typical values
r_{diff} (Ω)
BZY88-
C30
C27
C24
C22
C20
C18
C16
C15
C13
C12
C11
C10
I_Z (mA)


7Z61710
typical values
S_Z (mV/°C)
BZY88-
C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V6
C3V3
I_Z (mA)


7Z61562.1
maximum permissible non-repetitive peak reverse power dissipation versus duration
P_{ZSM}
T_j = 25°C (prior to surge)
100°C
150°C
duration (s)


7Z07703.1
P_Z (W)
10^2
10
1
10^{-1}
10^{-2}
BZY88-C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C4V7
C3V9
C3V3
1
10
10^2
10^3
10^4
I_Z (mA)


7Z09330
P_Z (W)
10^2
10
1
10^{-1}
10^{-2}
BZY88-C10
C11
C12
C13
C15
C16
C18
C20
C22
C24
C27
C30
10^{-1}
1
10
10^2
10^3
10^4
I_Z (mA)
10^5

VOLTAGE REGULATOR DIODES

Silicon planar diodes in a DO-35 envelope intended for use as low power voltage stabilizers or voltage references.
The series consists of 29 types with nominal voltages ranging from 5,1 to 75 V with tolerances to the international standardized E24 (±5%) range.

QUICK REFERENCE DATA

Working voltage range (E24; ±5%)	V_Z	nom.	5,1 to 75	V	
Total power dissipation	P_{tot}	max.	400	mW	1)
		max.	500	mW	2)
Non-repetitive peak reverse power dissipation t = 100 µs; T_j = 150 °C	P_{ZSM}	max.	30	W	
Junction temperature	T_j	max.	200	°C	
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	°C/mW	3)

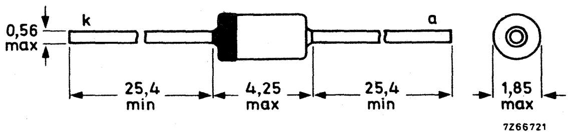
1) In still air at maximum lead length up to T_{amb} = 50 °C.

2) If leads are kept at T_{amb} = 25 °C at 8 mm from body.

3) Measured in still air at maximum lead length.

MECHANICAL DATA Dimensions in mm

DO-35



Cathode indicated by coloured band

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

Currents

Steady-state working current at T_{amb} = 25 °C					Non-repetitive peak working current			
1N5729B	I_Z	max.	65	mA	I_{ZSM}	max.	2,90	A
1N5730B	I_Z	max.	60	mA	I_{ZSM}	max.	2,60	A
1N5731B	I_Z	max.	55	mA	I_{ZSM}	max.	2,40	A
1N5732B	I_Z	max.	50	mA	I_{ZSM}	max.	2,30	A
1N5733B	I_Z	max.	45	mA	I_{ZSM}	max.	2,10	A
1N5734B	I_Z	max.	40	mA	I_{ZSM}	max.	1,95	A
1N5735B	I_Z	max.	40	mA	I_{ZSM}	max.	1,80	A
1N5736B	I_Z	max.	35	mA	I_{ZSM}	max.	1,65	A
1N5737B	I_Z	max.	30	mA	I_{ZSM}	max.	1,50	A
1N5738B	I_Z	max.	30	mA	I_{ZSM}	max.	1,40	A
1N5739B	I_Z	max.	25	mA	I_{ZSM}	max.	1,28	A
1N5740B	I_Z	max.	25	mA	I_{ZSM}	max.	1,20	A
1N5741B	I_Z	max.	20	mA	I_{ZSM}	max.	1,13	A
1N5742B	I_Z	max.	20	mA	I_{ZSM}	max.	1,05	A
1N5743B	I_Z	max.	15	mA	I_{ZSM}	max.	0,98	A
1N5744B	I_Z	max.	15	mA	I_{ZSM}	max.	0,90	A
1N5745B	I_Z	max.	15	mA	I_{ZSM}	max.	0,83	A
1N5746B	I_Z	max.	10	mA	I_{ZSM}	max.	0,75	A
1N5747B	I_Z	max.	10	mA	I_{ZSM}	max.	0,68	A
1N5748B	I_Z	max.	10	mA	I_{ZSM}	max.	0,64	A
1N5749B	I_Z	max.	10	mA	I_{ZSM}	max.	0,60	A
1N5750B	I_Z	max.	9	mA	I_{ZSM}	max.	0,57	A
1N5751B	I_Z	max.	9	mA	I_{ZSM}	max.	0,53	A
1N5752B	I_Z	max.	8	mA	I_{ZSM}	max.	0,49	A
1N5753B	I_Z	max.	7	mA	I_{ZSM}	max.	0,45	A
1N5754B	I_Z	max.	6	mA	I_{ZSM}	max.	0,42	A
1N5755B	I_Z	max.	6	mA	I_{ZSM}	max.	0,38	A
1N5756B	I_Z	max.	5	mA	I_{ZSM}	max.	0,34	A
1N5757B	I_Z	max.	5	mA	I_{ZSM}	max.	0,30	A

Power dissipation

Total power dissipation	P_{tot}	max.	400	mW	1)
		max.	500	mW	2)
Non-repetitive peak reverse power dissipation t = 100 μs; T_j = 150 °C; square wave	P_{ZSM}	max.	30	W	

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

1) In still air at maximum lead length up to T_{amb} = 50 °C
2) If leads are kept at T_{amb} = 25 °C at 8 mm from body.

THERMAL RESISTANCE

From junction to ambient in still air
at maximum lead length $R_{th\ j-a}$ = 0,38 °C/mW [1])

CHARACTERISTICS E24 (±5 %) logarithmic range T_j = 25 °C

	Working voltage V_Z (V)			Temperature coefficient S_Z (mV/°C)	Differential impedance z_{diff} (Ω)
	at I_Z = 10 mA			at I_Z = 10 mA	at I_Z = 10 mA, f = 1 kHz
	min.	nom.	max.	typ.	max.
1N5729B	4, 8	5, 1	5, 4	−0, 2	50
1N5730B	5, 2	5, 6	6, 0	+1, 2	25
1N5731B	5, 8	6, 2	6, 6	+2, 3	10
1N5732B	6, 4	6, 8	7, 2	+3, 0	10
1N5733B	7, 0	7, 5	7, 9	+4, 0	10
1N5734B	7, 7	8, 2	8, 7	+5, 0	15
1N5735B	8, 5	9, 1	9, 6	+6, 0	15
1N5736B	9, 4	10, 0	10, 6	+7, 0	20
	at I_Z = 5 mA			at I_Z = 5 mA	at I_Z = 5 mA
1N5737B	10, 4	11, 0	11, 6	+8, 0	20
1N5738B	11, 4	12, 0	12, 7	+9, 0	25
1N5739B	12, 4	13, 0	14, 1	+10, 5	30
1N5740B	13, 8	15, 0	15, 6	+12, 5	30
1N5741B	15, 3	16, 0	17, 1	+13, 0	40
1N5742B	16, 8	18, 0	19, 1	+15, 0	45
1N5743B	18, 8	20, 0	21, 2	+17, 0	55
1N5744B	20, 8	22, 0	23, 3	+19, 0	55
1N5745B	22, 8	24, 0	25, 6	+21, 0	70
	at I_Z = 2 mA			at I_Z = 2 mA	at I_Z = 2 mA
1N5746B	25, 1	27, 0	28, 9	+23, 5	80
1N5747B	28, 0	30, 0	32, 0	+26	80
1N5748B	31, 0	33, 0	35, 0	+29	90
1N5749B	34, 0	36, 0	38, 0	+31	90
1N5750B	37, 0	39, 0	41, 0	+34	130
1N5751B	40, 0	43, 0	46, 0	+37	150
1N5752B	44, 0	47, 0	50, 0	+40	170
1N5753B	48, 0	51, 0	54, 0	+44	180
1N5754B	52, 0	56, 0	60, 0	+47	200
1N5755B	58, 0	62, 0	66, 0	+51	215
1N5756B	64, 0	68, 0	72, 0	+56	240
1N5757B	70, 0	75, 0	79, 0	+60	255

[1]) Measured in still air at maximum lead length.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA; T_{amb} = 25 °C	V_F	<	0,9	V

Reverse current

1N5729B	V_R = 2 V	I_R	<	2000	nA
1N5730B	V_R = 2 V	I_R	<	1000	nA
1N5731B	V_R = 4 V	I_R	<	3000	nA
1N5732B	V_R = 4 V	I_R	<	2000	nA
1N5733B	V_R = 5 V	I_R	<	1000	nA
1N5734B	V_R = 5 V	I_R	<	700	nA
1N5735B	V_R = 6 V	I_R	<	500	nA
1N5736B	V_R = 7 V	I_R	<	200	nA
1N5737B	V_R = 8 V	I_R	<	100	nA
1N5738B to 1N5757B	V_R = 0,7 x V_{Znom}	I_R	<	50	nA

Voltage reference diodes

VOLTAGE REFERENCE DIODES

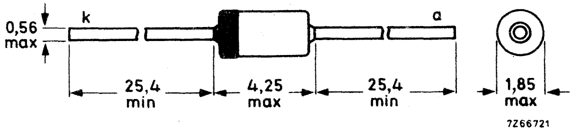
The BZV10 to 14 are temperature compensated voltage reference diodes in a DO-35 envelope. They are primarily intended for use as voltage reference sources in measuring instruments such as digital voltmeters.

QUICK REFERENCE DATA

				min.	nom.	max.	
Reference voltage at I_Z = 2,0 mA		V_{ref}		6,175	6,5	6,825	V
Reference voltage excursion at I_Z = 2,0 mA							
Ambient temperature test points: 0; +25 °C and +70 °C (see notes 1 and 2 on page 3 and the graph on page 4)	BZV10	$\|\Delta V_{ref}\|$	<		46,0		mV
	BZV11	$\|\Delta V_{ref}\|$	<		23,0		mV
	BZV12	$\|\Delta V_{ref}\|$	<		9,0		mV
	BZV13	$\|\Delta V_{ref}\|$	<		4,6		mV
	BZV14	$\|\Delta V_{ref}\|$	<		2,3		mV
Operating ambient temperature		T_{amb}			0 to +70		°C

MECHANICAL DATA Dimensions in mm

DO-35



Cathode indicated by coloured band

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

Currents

Working current (d.c.)	I_Z	max.	50	mA
Working current (peak value)	I_{ZM}	max.	50	mA

Power dissipation

Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}	−65 to +200	°C
Operating ambient temperature	T_{amb}	0 to +70	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,375	°C/mW

CHARACTERISTICS T_{amb} = 25 °C unless otherwise specified

		min.	nom.	max.	
Reference voltage at I_Z = 2,0 mA	V_{ref}	6,175	6,5	6,825	V

Reference voltage excursion at I_Z = 2,0 mA

Ambient temperature test points: 0; +25 °C and +70 °C

(see notes 1 and 2 on the next page and the graph on page 4)

BZV10	$\lvert \Delta V_{ref} \rvert$	<	46,0	mV
BZV11	$\lvert \Delta V_{ref} \rvert$	<	23,0	mV
BZV12	$\lvert \Delta V_{ref} \rvert$	<	9,0	mV
BZV13	$\lvert \Delta V_{ref} \rvert$	<	4,6	mV
BZV14	$\lvert \Delta V_{ref} \rvert$	<	2,3	mV

Temperature coefficient at I_Z = 2,0 mA

(see notes 1 and 2 on the next page and the graph on page 4)

BZV10	S_Z	±0,01	%/°C
BZV11	S_Z	±0,005	%/°C
BZV12	S_Z	±0,002	%/°C
BZV13	S_Z	±0,001	%/°C
BZV14	S_Z	±0,0005	%/°C

Differential resistance at I_Z = 2,0 mA	r_{diff}	typ.	30	Ω
		<	50	Ω

Note 1 I_Z tolerance and stability of I_Z.

The quoted values of ΔV_{ref} are based on a constant current I_Z. Two factors can cause V_{ref} to change, namely the differential resistance r_{diff} and the temperature coefficient S_Z.

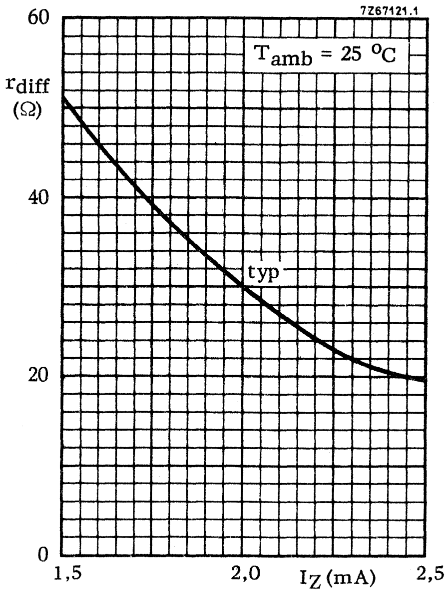
a As the max. r_{diff} of the device can be 50 Ω, a change of 0,01 mA in the current through the reference diode will result in a ΔV_{ref} of 0,01 mA x 50 Ω = 0,5 mV. This level of ΔV_{ref} is not significant on a BZV10 ($\Delta V_{ref} < 46$ mV), it is however very significant on a BZV14 ($\Delta V_{ref} < 2,3$ mV).

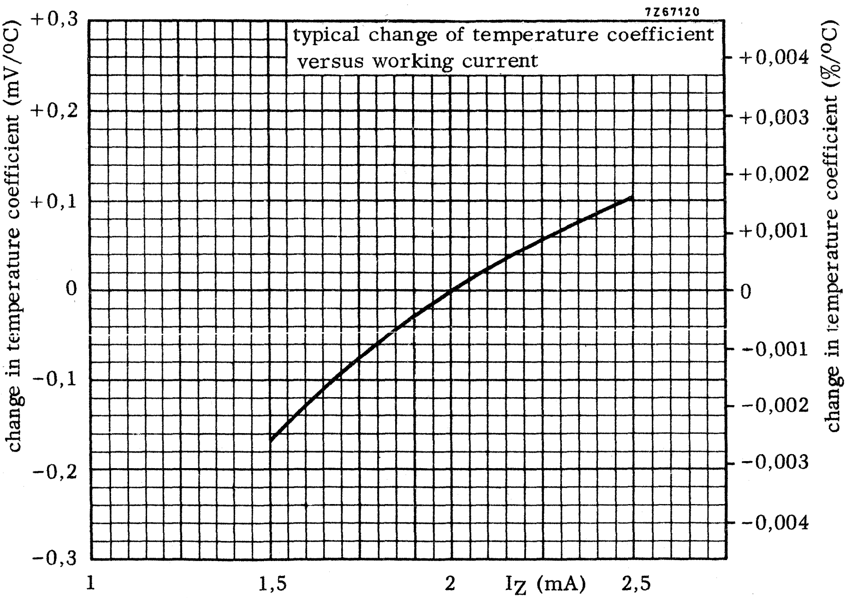
b The temperature coefficient of the reference voltage S_Z is a function of I_Z. Reference diodes are classified at the specified test current and the S_Z of the reference diode will be different at different levels of I_Z. The absolute value of I_Z is important, however, the stability of I_Z, once the level has been set, is far more significant. This applies particularly to the BZV13 and BZV14. The effect of I_Z stability on S_Z is shown in the graph on page 4.

Note 2 Voltage excursion (ΔV_{ref} and temperature coefficient).

All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion (ΔV_{ref}) over the specified temperature range, at the specified test current (I_Z), verified by tests at indicated temperature points within the range. V_Z is measured and recorded at each temperature specified. The ΔV_{ref} between the highest and lowest values must not exceed the maximum ΔV_{ref} given. The temperature coefficient, therefore is given only as a reference; but may be derived from:

$$S_Z = \frac{(V_{ref\,1} - V_{ref\,2}) \times 100}{(T_{amb\,2} - T_{amb\,1}) \times V_{ref\,nom}} \ \%/^{o}C$$


7Z67121.1
T_{amb} = 25 °C
r_{diff} (Ω)
60
40
20
0
typ
1,5
2,0
I_Z (mA)
2,5


7Z67120
typical change of temperature coefficient versus working current
change in temperature coefficient (mV/°C)
+0,3
+0,2
+0,1
0
−0,1
−0,2
−0,3
change in temperature coefficient (%/°C)
+0,004
+0,003
+0,002
+0,001
0
−0,001
−0,002
−0,003
−0,004
1
1,5
2
I_Z (mA)
2,5

VOLTAGE REFERENCE DIODE

The BZV38 is a temperature-compensated voltage reference diode in a DO-35 envelope, primarily intended for use as the stabilizing element for the TCA750 integrated multi-stabilizer in radio and television receivers with variable capacitance diode tuning systems.

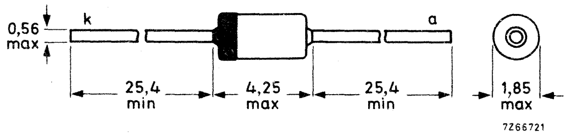
QUICK REFERENCE DATA

		min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA	V_{ref}	6,08	6,40	6,72	V
Reference voltage excursion at I_Z = 7,5 mA (see also note 1 on page 2)	$\lvert\Delta V_{ref}\rvert$	<	20		mV
Operating ambient temperature	T_{amb}	+10 to +60			^oC

MECHANICAL DATA

Dimensions in mm

DO-35



The coloured band indicates the cathode

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

Currents

Working current (d.c.)	I_Z	max.	50	mA
Working current (peak value)	I_{ZM}	max.	50	mA

Temperatures

Storage temperature	T_{stg}	-65 to +200	°C
Operating ambient temperature	T_{amb}	+10 to +60	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,4	°C/mW

CHARACTERISTICS T_{amb} = 25 °C unless otherwise specified

		min.	nom.	max.		
Reference voltage at I_Z = 7,5 mA	V_{ref}	6,08	6,40	6,72	V	
Reference voltage excursion at I_Z = 7,5 mA in the temperature range +10 to +60 °C	$\lvert \Delta V_{ref} \rvert$	<	20		mV	1)
Differential resistance at I_Z = 7,5 mA	r_{diff}	<	20		Ω	2)
Stabilizing time	t_{stab}	<	1		s	3)
Noise voltage at I_Z = 7,5 mA f = 0,1 Hz to 15 kHz	$V_{n\ (p-p)}$	<	20		μV	

1) The maximum absolute change of the diode voltage over the stated temperature range, at a constant working current setting of I_Z = 7,5 mA ±2% .

2) Measured by superimposing a 1 kHz current on the specified working current. The r.m.s. value of the 1 kHz current is 10% of the specified working current.

3) Stabilizing time is the time it takes the voltage to approach within 3 mV of the specified reference voltage.

VOLTAGE REFERENCE DIODES

Voltage reference diodes in a DO-35 envelope. They have a very low temperature coefficient and are primarily intended for use as reference sources.

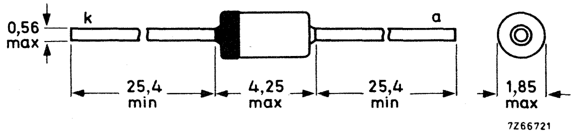
QUICK REFERENCE DATA

			min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA		V_{ref}	6,2	6,5	6,8	V
Temperature coefficient at I_Z = 7,5 mA [1]						
	BZX90:	$\lvert S_Z \rvert$	<	0,01		%/°C
	BZX91:	$\lvert S_Z \rvert$	<	0,005		%/°C
	BZX92:	$\lvert S_Z \rvert$	<	0,002		%/°C
	BZX93:	$\lvert S_Z \rvert$	<	0,001		%/°C
Operating ambient temperature		T_{amb}	−55 to +100			°C

MECHANICAL DATA

Dimensions in mm

DO-35



Cathode indicated by coloured band

[1] For accuracy of I_Z see graphs on page 5.

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

Currents

Working current (d.c.)	I_Z	max.	50	mA
Working current (peak value)	I_{ZM}	max.	50	mA

Power dissipation

Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}	−65 to +200	°C
Operating ambient temperature	T_{amb}	−55 to +100	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,375	°C/mW

CHARACTERISTICS T_{amb} = 25 °C unless otherwise specified

		min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA	V_{ref}	6,2	6,5	6,8	V

Reference voltage excursion at I_Z = 7,5 mA [1])

T_{amb} = −55 to +25 °C	BZX90:	$\|\Delta V_{ref}\|$	<	52	mV
	BZX91:	$\|\Delta V_{ref}\|$	<	26	mV
	BZX92:	$\|\Delta V_{ref}\|$	<	10,4	mV
	BZX93:	$\|\Delta V_{ref}\|$	<	5,2	mV
T_{amb} = +25 to +100 °C	BZX90:	$\|\Delta V_{ref}\|$	<	48	mV
	BZX91:	$\|\Delta V_{ref}\|$	<	24	mV
	BZX92:	$\|\Delta V_{ref}\|$	<	9,6	mV
	BZX93:	$\|\Delta V_{ref}\|$	<	4,8	mV

Temperature coefficient at I_Z = 7,5 mA [1])

T_{amb} = −55 to +100 °C	BZX90:	$\|S_Z\|$	<	0,01	%/°C
	BZX91:	$\|S_Z\|$	<	0,005	%/°C
	BZX92:	$\|S_Z\|$	<	0,002	%/°C
	BZX93:	$\|S_Z\|$	<	0,001	%/°C

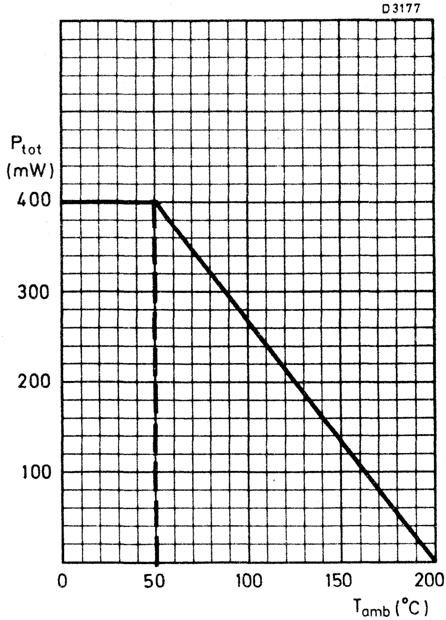
Differential resistance at I_Z = 7,5 mA	r_{diff}	<	15	Ω

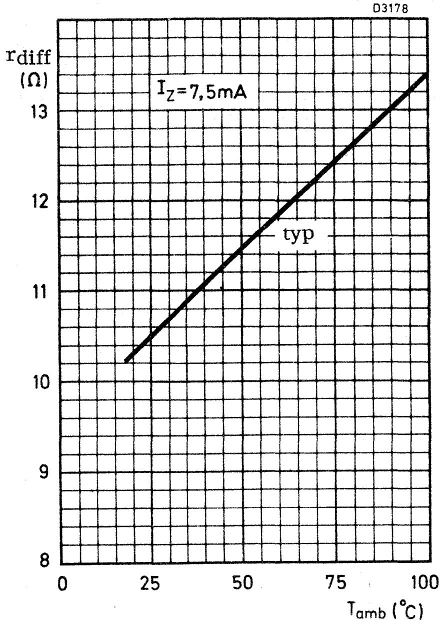
[1]) For accuracy of I_Z see graphs on page 5.

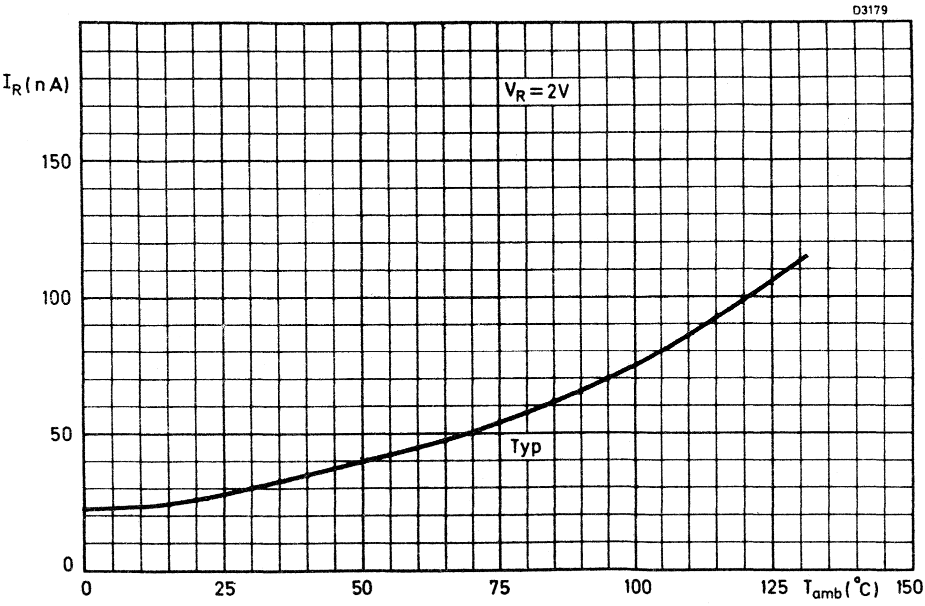
NOTE

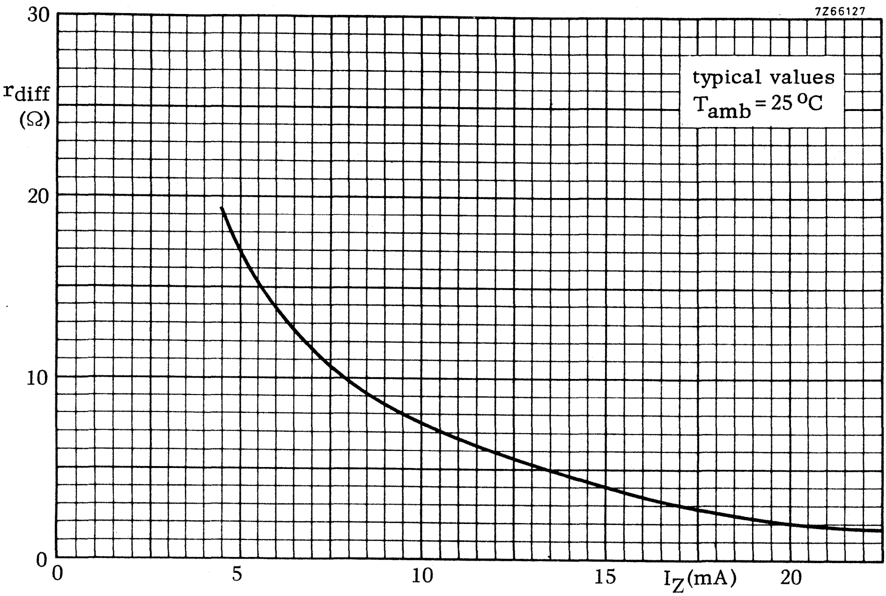
The temperature coefficient (S_Z) of the reference voltage (V_{ref}) is obtained from the following equation:

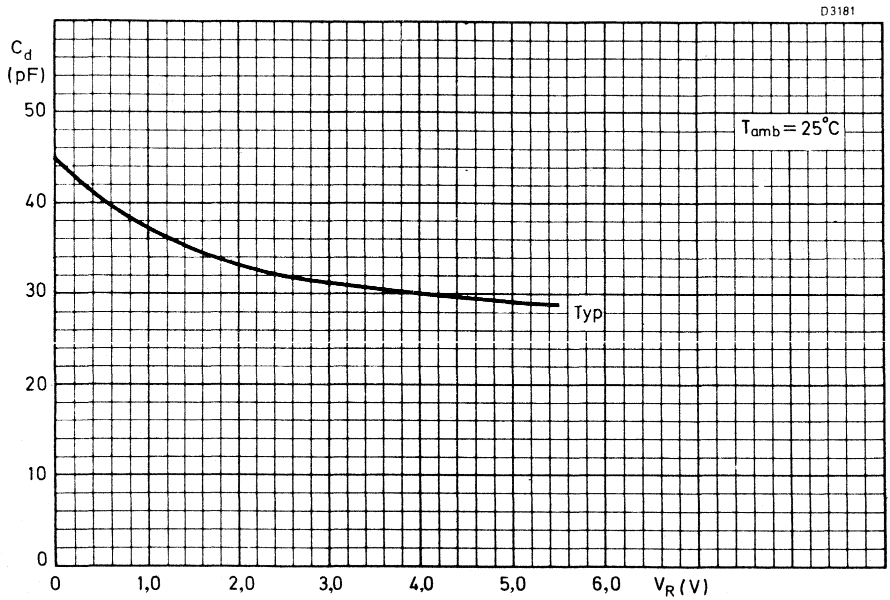
$$S_Z = \frac{V_{ref1} - V_{ref2}}{(T_{amb2} - T_{amb1}) \times V_{ref\,nom}} \times 100\ \%/^{\circ}C$$

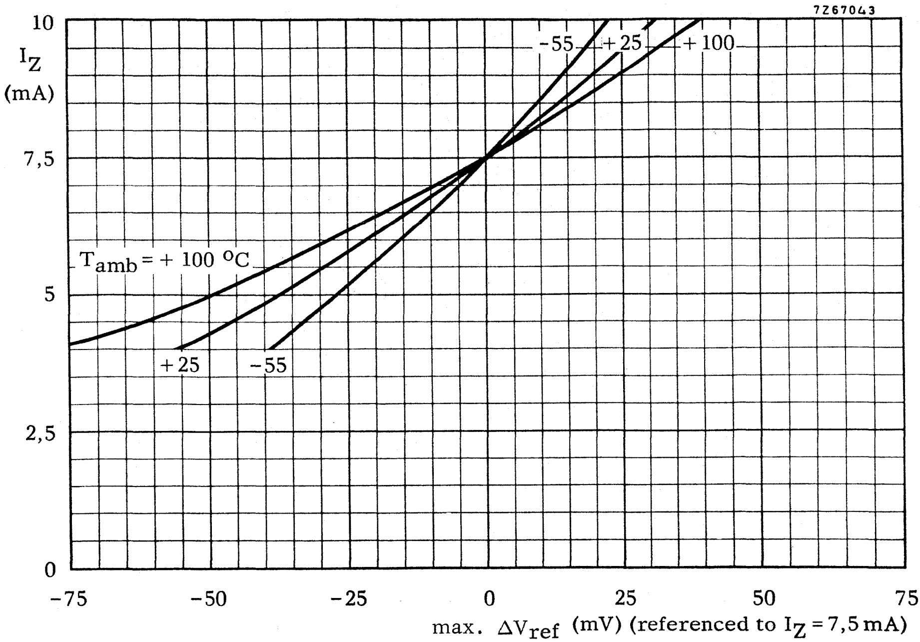

D3177
P_{tot} (mW)
400
300
200
100
0
50
100
150
200
T_{amb} (°C)

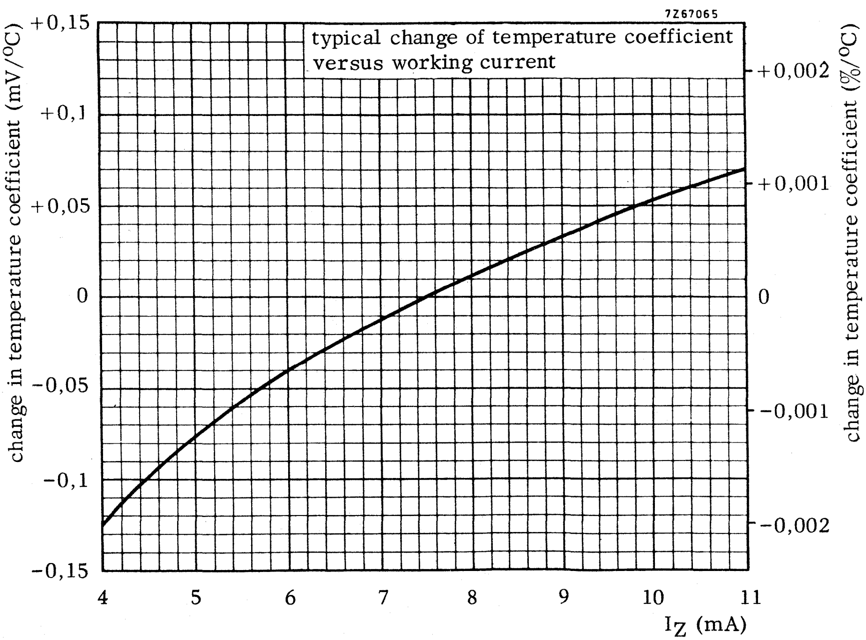

D3178
r_{diff} (Ω)
I_Z=7,5mA
13
12
typ
11
10
9
8
0
25
50
75
100
T_{amb} (°C)


D3179
I_R (nA)
V_R = 2V
150
100
50
Typ
0
0
25
50
75
100
125
T_{amb} (°C)
150


7Z66127
typical values
Tamb = 25 °C
rdiff
(Ω)
30
20
10
0
0
5
10
15
IZ(mA)
20


D3181
Cd
(pF)
50
40
30
20
10
0
Tamb = 25°C
Typ
0
1,0
2,0
3,0
4,0
5,0
6,0
VR (V)


7Z67043
10
I_Z
(mA)
7,5
5
2,5
0
−75
−50
−25
0
25
50
75
−55
+25
+100
T_{amb} = + 100 °C
+25
−55
max. ΔV_{ref} (mV) (referenced to I_Z = 7,5 mA)


7Z67065
typical change of temperature coefficient
versus working current
change in temperature coefficient (mV/°C)
+0,15
+0,1
+0,05
0
−0,05
−0,1
−0,15
change in temperature coefficient (%/°C)
+0,002
+0,001
0
−0,001
−0,002
4
5
6
7
8
9
10
11
I_Z (mA)

VOLTAGE REFERENCE DIODE

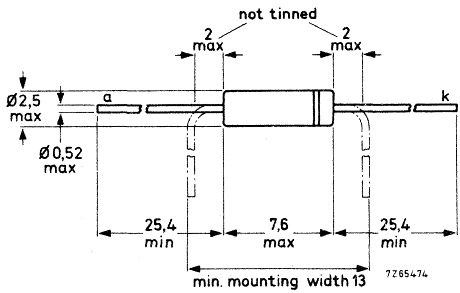
Silicon diode in a DO-7 envelope intended for use as a voltage reference diode in general industrial applications.
The BZY78 has an extremely high voltage stability (±1% at a working current of 11,5 mA).

QUICK REFERENCE DATA

Working voltage at I_Z = 11,5 mA	V_Z	nom.	5,3	V
			5,1 to 5,6	V
Voltage stability at T_{amb} from −50 to 100 °C I_Z = 11,5 mA (±10%)	$\frac{\Delta V_Z}{V_Z}$		−1 to +1	%
Repetitive peak working current	I_{ZRM}	max.	25	mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW
Operating junction temperature	T_j	max.	200	°C
Thermal resistance	$R_{th\ j-a}$	=	0,37	°C/mW

MECHANICAL DATA Dimensions in mm

DO-7



Cathode indicated by coloured band

FOR NEW DESIGN THE SUCCESSOR TYPES BZV10 AND BZX90 to 93 ARE RECOMMENDED

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

Currents

Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	50	mA
Repetitive peak forward current	I_{FRM}	max.	50	mA
Working current (d.c. or averaged over any 20 ms period)	I_Z	max.	25	mA
Repetitive peak working current	I_{ZRM}	max.	25	mA

Power dissipation

Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}		-65 to +175	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

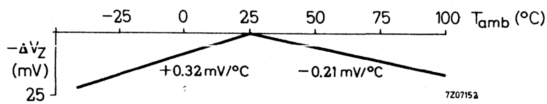
From junction to ambient	$R_{th\ j-a}$	=	0,37	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Working voltage at I_Z = 11,5 mA	V_Z	nom.	5,3	V
			5,1 to 5,6	V
Forward voltage at I_F = 1 mA	V_F		0,65 to 0,75	V
Reverse current at V_R = 2 V	I_R	<	1,0	μA

Temperature coefficient

I_Z = 11,5 mA (±10%); T_j = −40 to +25 °C	S_Z	typ.	+0,32	mV/°C
T_j = +25 to +100 °C	S_Z	typ.	−0,21	mV/°C



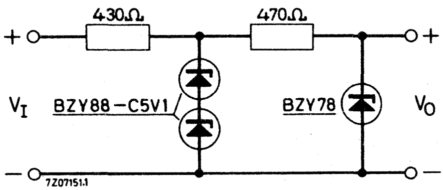
Differential resistance at I_Z = 11,5 mA	r_{diff}	typ.	18	Ω
			15 to 20	Ω
Voltage stability at T_{amb} = −50 to +100 °C, I_Z = 11,5 mA (±10%)	$\frac{\Delta V_Z}{V_Z}$		−1 to +1	%

MOUNTING INSTRUCTIONS

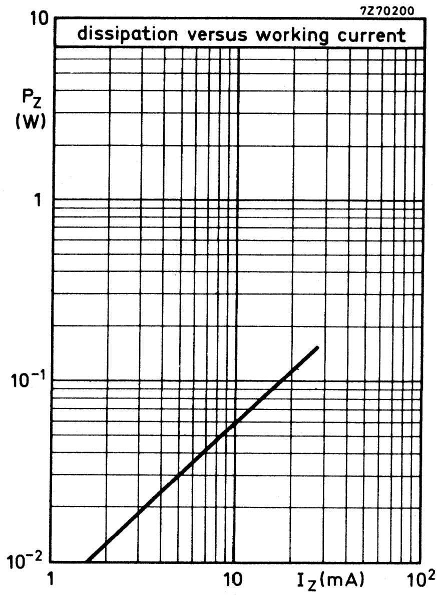
1. When using a soldering iron, the diode may be soldered directly into a circuit, but heat conducted to the junction should be kept to a minimum by use of a thermal shunt.
2. Diodes may be dip soldered at a solder temperature of 245 °C for a maximum soldering time of 5 seconds. The case temperature during dip soldering may exceed the maximum storage temperature for a period not greater than 2 minutes, provided that it at no time exceeds 115 °C. These recommendations apply to a diode with the anode end mounted flush on the board with punched-through holes or spaced at least 1.5 mm above a board with plated-through holes. For mounting the cathode end onto the board the diode must be spaced at least 5 mm from the underside of the printed circuit board in the case of punched-through holes or 5 mm from the top of the board for plated-through holes.
3. Care should be taken not to bend the leads nearer than 1.5 mm from the seals.

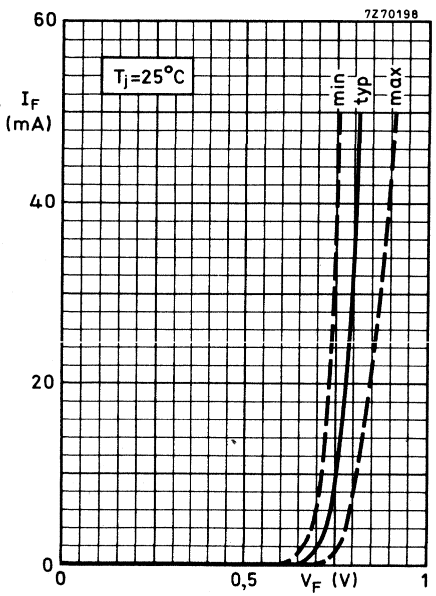
APPLICATION INFORMATION

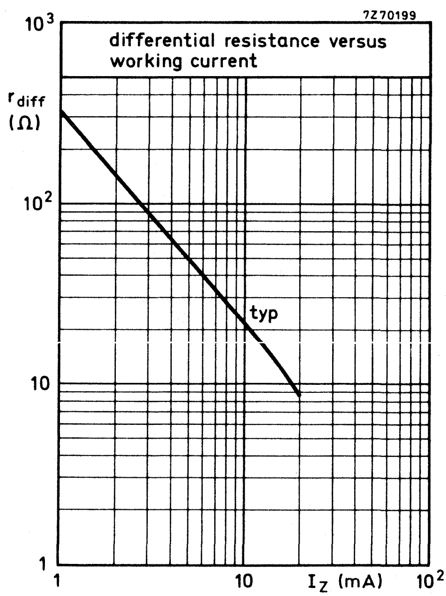
Typical reference-voltage circuit



Temperature range	T_{amb}	0 to +50 °C	
Input voltage	V_I	24 V	± 10%
Output voltage	V_O	5.1 to 5.6 V	±0.3%


7Z70200
dissipation versus working current
P_Z (W)
10
1
10^{-1}
10^{-2}
1
10
I_Z (mA)
10^2


7Z70198
T_j=25°C
I_F (mA)
min
typ
max
60
40
20
0
0
0,5
V_F (V)
1


7Z70199
differential resistance versus working current
r_{diff} (Ω)
typ
10^3
10^2
10
1
1
10
I_Z (mA)
10^2

VOLTAGE REFERENCE DIODES

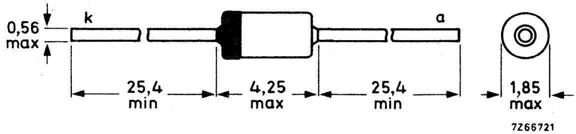
Voltage reference diodes in a DO-35 envelope. They have a very low temperature coefficient and are primarily intended for use as voltage reference sources in measuring instruments such as digital voltmeters.

QUICK REFERENCE DATA

			min.	nom.	max.	
Reference voltage at I_Z = 7, 5 mA		V_{ref}	5, 89	6, 20	6, 51	V
Reference voltage excursion at I_Z = 7, 5 mA [1])						
(see notes 1 and 2 on page 3 and the graphs on pages 4 and 5)	1N821	$\lvert \Delta V_{ref} \rvert$	<	96		mV
	1N823	$\lvert \Delta V_{ref} \rvert$	<	48		mV
	1N825	$\lvert \Delta V_{ref} \rvert$	<	19		mV
	1N827	$\lvert \Delta V_{ref} \rvert$	<	9		mV
	1N829	$\lvert \Delta V_{ref} \rvert$	<	5		mV
Operating ambient temperature		T_{amb}	-55 to +100			°C

MECHANICAL DATA Dimensions in mm

DO-35



Cathode indicated by coloured band

1) For accuracy of I_Z see graphs on pages 4 and 5.

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

Currents

Working current (d.c.)	I_Z	max.	50	mA
Working current (peak value)	I_{ZM}	max.	50	mA

Power dissipation

Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}	−65 to +200	°C
Operating ambient temperature	T_{amb}	−55 to +100	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,375	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

		min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA	V_{ref}	5,89	6,20	6,51	V

Reference voltage excursion at I_Z = 7,5 mA [1)]

ambient temperature test points: −55; +25; +75; +100 °C (see notes 1 and 2 on the next page and the graphs on pages 4 and 5)

1N821	$\|\Delta V_{ref}\|$ <	96	mV
1N823	$\|\Delta V_{ref}\|$ <	48	mV
1N825	$\|\Delta V_{ref}\|$ <	19	mV
1N827	$\|\Delta V_{ref}\|$ <	9	mV
1N829	$\|\Delta V_{ref}\|$ <	5	mV

Effective temperature coefficient at I_Z = 7,5 mA [1)]

(see notes 1 and 2 on the next page and the graphs on pages 4 and 5)

1N821	S_Z	±0,01	%/°C
1N823	S_Z	±0,005	%/°C
1N825	S_Z	±0,002	%/°C
1N827	S_Z	±0,001	%/°C
1N829	S_Z	±0,0005	%/°C

Differential resistance at I_Z = 7,5 mA	r_{diff}	<	15	Ω

1) For accuracy of I_Z see graphs on pages 4 and 5.

Note 1 I_Z tolerance and stability of I_Z.

The quoted values of ΔV_{ref} are based on a constant current I_Z. Two factors can cause V_{ref} to change, namely the differential resistance r_{diff} and the temperature coefficient S_Z.

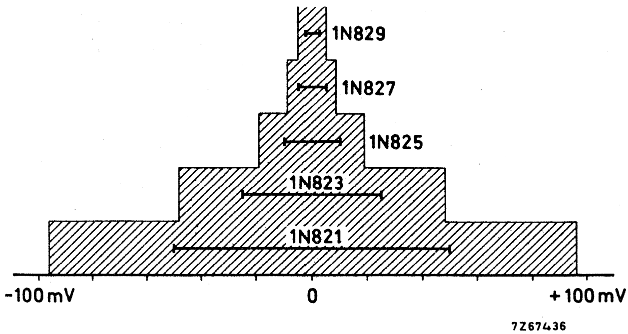
a As the max. r_{diff} of the device can be 15 Ω, a change of 0,01 mA in the current through the reference diode will result in a ΔV_{ref} of 0,01 mA x 15 Ω = 0,15 mV. This level of ΔV_{ref} is not significant on a 1N821 ($\Delta V_{ref} < 96$ mV), it is however very significant on a 1N829 ($\Delta V_{ref} < 5$ mV).

b The temperature coefficient of the reference voltage S_Z is a function of I_Z. Reference diodes are classified at the specified test current and the S_Z of the reference diode will be different at different levels of I_Z. The absolute value of I_Z is important, however, the stability of I_Z, once the level has been set, is far more significant. This applies particularly to the 1N829.
The effect of I_Z stability on S_Z is shown in the graph on page 5.

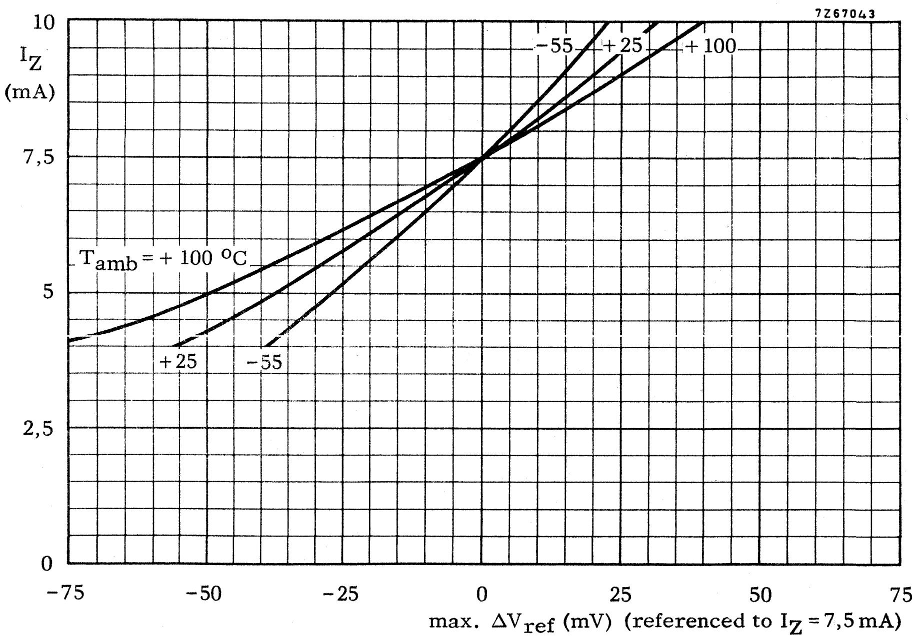
Note 2 Voltage excursion (ΔV_{ref} and temperature coefficient).

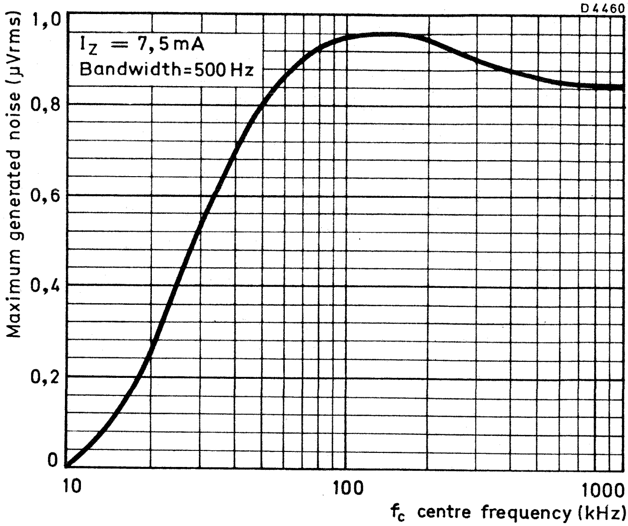
All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion (ΔV_{ref}) over the specified temperature range, at the specified test current (I_Z), verified by tests at indicated temperature points within the range. V_Z is measured and recorded at each temperature specified. The ΔV_{ref} between the highest and lowest values must not exceed the maximum ΔV_{ref} given. The temperature coefficient, therefore is given only as a reference; but may be derived from:

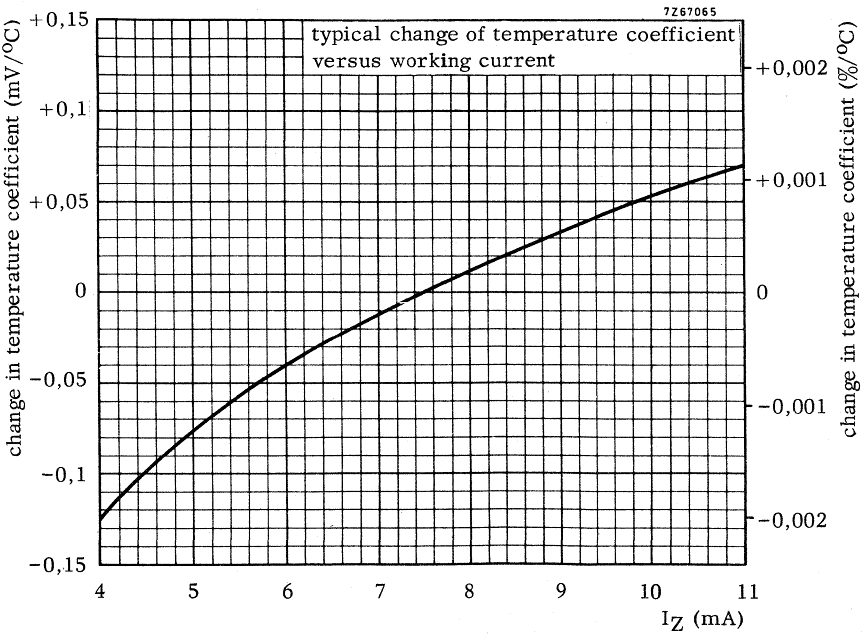
$$S_Z = \frac{(V_{ref\ 1} - V_{ref\ 2}) \times 100}{(T_{amb\ 2} - T_{amb\ 1}) \times V_{ref\ nom}} \ \%/^{o}C$$

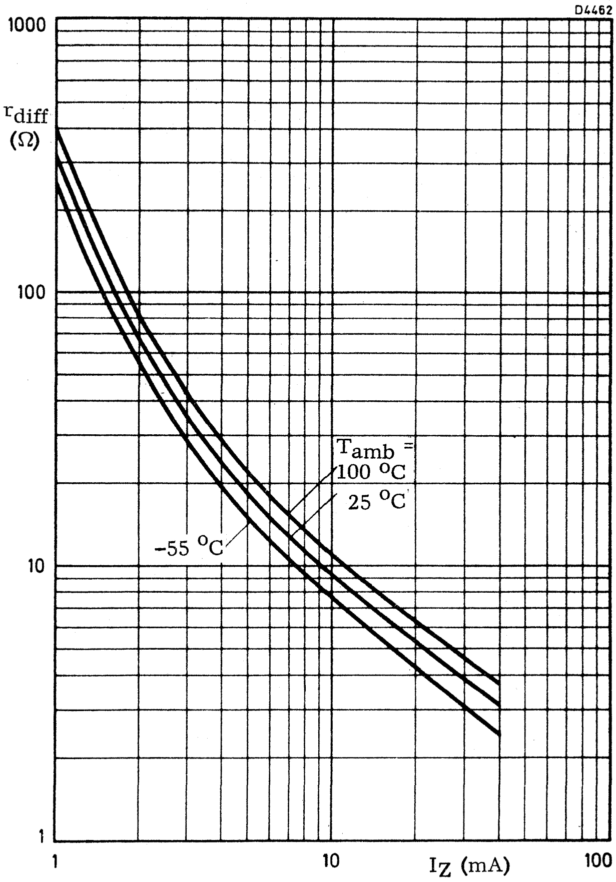


Maximum reference voltage variation (line section) caused by temperature variations within the range from −55 °C to +100 °C at a constant working current of 7,5 mA. The voltage variations may shift horizontally within the shaded area. The zero point may vary from 5890 mV to 6510 mV and differs from diode to diode.




D4460
Maximum generated noise (μVrms)
1,0
0,8
0,6
0,4
0,2
0
I_Z = 7,5 mA
Bandwidth=500 Hz
10
100
1000
f_c centre frequency (kHz)


7Z67065
typical change of temperature coefficient versus working current
change in temperature coefficient (mV/°C)
+0,15
+0,1
+0,05
0
−0,05
−0,1
−0,15
change in temperature coefficient (%/°C)
+0,002
+0,001
0
−0,001
−0,002
4
5
6
7
8
9
10
11
I_Z (mA)


D4462
1000
r_{diff}
(Ω)
100
10
1
1
10
100
I_Z (mA)
T_{amb} =
100 °C
25 °C
−55 °C

Tuner diodes

Variable capacitance diodes
Band switching diodes

TUNER DIODES

Variable capacitance diodes	type	envelope	V_R (V)	C_d at (pF)	V_R (V)	C_d ratio at V_R	(.V/..V)
a.f.c.	BA102	DO-7	20	20 - 45	4	> 1,4	4/10
	BB117	SOD-23	20	2,2-4,0	15	> 2,0	4/15
→	BB119	DO-35	15	20 - 25	15	> 1,3	4/10
radio f.m. band II	BB204B	TO-92	30	37 - 42	3	= 2,65	3/30
	BB204G	TO-92	30	34 - 39	3	= 2,65	3/30
	BB110B	SOD-23	30	29 - 33	3	= 2,65	3/30
	BB110G	SOD-23	30	27 - 31	3	= 2,65	3/30
television v.h.f. band I to 88 MHz band III to 230 MHz	BB106	SOD-23	28	4,0-5,6	25	> 4,5	3/25
band I to 88 MHz	BB105G	SOD-23	28	1,8-2,8	25	> 4,0	3/25
band III to 230 MHz	BB205G	SOD-23	28	1,8-2,6	25	> 4,3	3/25
television u.h.f. band IV and V to 790 MHz	BB105A	SOD-23	28	2,3-2,8	25	> 4,0	3/25
	BB205A	SOD-23	28	2,0-2,5	25	> 4,3	3/25
band IV and V to 860 MHz	BB105B	SOD-23	28	2,0-2,3	25	> 4,5	3/25
	BB205B	SOD-23	28	1,9-2,2	25	> 5,0	3/25
Band switching diodes						r_D (Ω) at	I_F (mA)
switching	BA182	SOD-23	35	< 1,0	20	< 0,7	5
switching	BA243	DO-35	20	< 2,0	15	< 1,0	10
switching	BA244	DO-35	20	< 2,0	15	< 0,5	10
→ **V.H.F. - U.H.F. mixer diode**	BA280	SOD-23	4	< 1,0	0	< 15	5
Attenuator (p-i-n diode)	BA379	–	30	= 0,3	0	< 6,5	10

Note:

BB105A; BB105B; BB105G; BB106; BB205A; BB205B; BB205G will be supplied in matched sets.

Over the voltage range 0,5 V to 28 V the diodes in a unit are capacitance matched to within 3%: BB105A, BB105B; BB106; BB205A; BB205B; BB205G
6%: BB105G

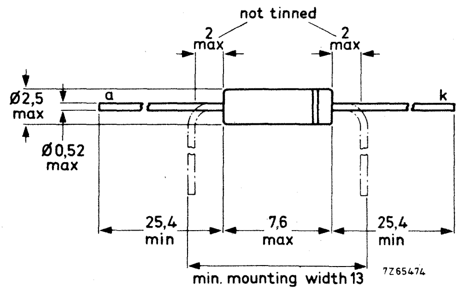
SILICON VARIABLE CAPACITANCE DIODE

Diode in all-glass DO-7 envelope intended for automatic frequency control

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	20	V
Reverse current at V_R = 20 V; T_j = 80 °C	I_R	<	5	μA
Junction temperature	T_j	max.	90	°C
Diode capacitance at f = 0,5 MHz; V_R = 4 V (for selections see page 2)	C_d		20 to 45	pF
Capacitance ratio at f < 300 MHz	$\frac{C_d (V_R = 4\ V)}{C_d (V_R = 10\ V)}$	>	1,4	
Series resistance at V_R = 4 V	r_D	<	3	Ω

MECHANICAL DATA Dimensions in mm

DO-7



Cathode indicated by white band

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

Voltage

Continuous reverse voltage	V_R	max. 20	V

Current

Forward current (d.c.)	I_F	max. 50	mA

Temperatures

Storage temperature	T_{stg}	−55 to +90	°C
Junction temperature	T_j	max. 90	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	= 0,5	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Reverse current at T_j = 80 °C

V_R = 20 V	I_R	< 5	μA

Diode capacitance at f = 0,5 MHz

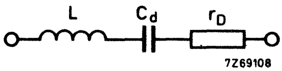
V_R = 4 V	BA102	C_d	20 to 45	pF
Selections:	BA102A (white)	C_d	20 to 25	pF
	BA102B (yellow)	C_d	23 to 31	pF
	BA102C (blue)	C_d	29 to 38	pF
	BA102D (green)	C_d	36 to 45	pF

Capacitance ratio at f < 300 MHz $\frac{C_d (V_R = 4\ V)}{C_d (V_R = 10\ V)}$ > 1,4

Series resistance

V_R = 4 V	r_D	typ. 1,7	Ω
		< 3	Ω

Simplified equivalent circuit:



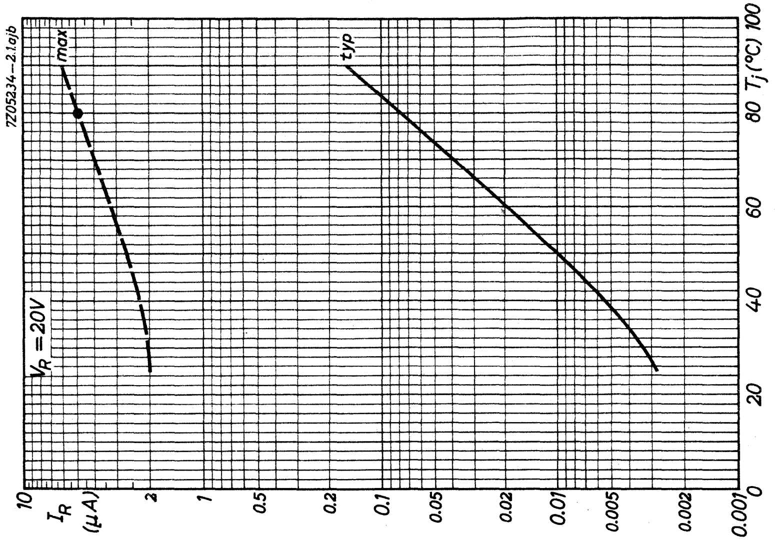
L = lead inductance ≈ 6 nH
r_D = series resistance
C_d = diode capacitance (see page 3)

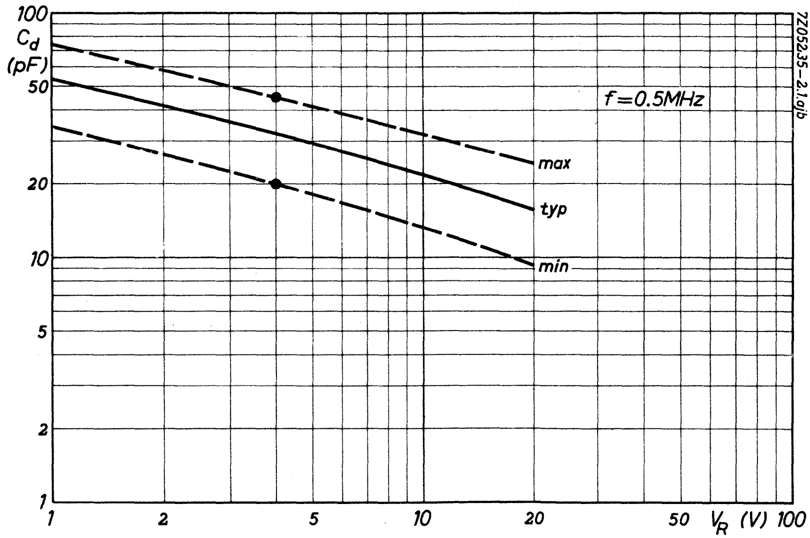
frequency independent up to f = 300 MHz

These data apply for a distance of 10 mm between the two measuring points.

APPLICATION INFORMATION

Application information available on request.


7Z05234-2.1.ojb
max
typ
V_R = 20V
T_j (°C)
100
80
60
40
20
0
10
I_R (μA)
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0.005
0.002
0.001


7Z05235-2.1.ojb
100
C_d (pF)
50
20
10
5
2
1
f = 0.5MHz
max
typ
min
1
2
5
10
20
50
V_R (V)
100

SILICON PLANAR DIODE

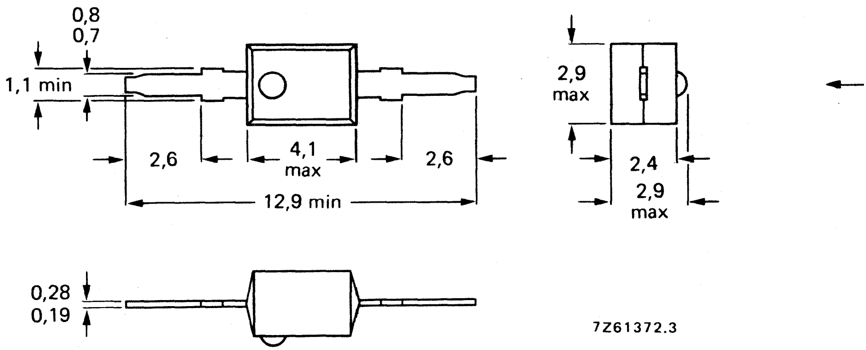
The BA182 is a switching diode in a plastic envelope. It is intended for band switching in v.h.f. television tuners.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	35	V
Forward current (d.c.)	I_F	max.	100	mA
Junction temperature	T_j	max.	100	^oC
Diode capacitance at f = 1 MHz V_R = 20 V	C_d	typ. <	0,8 1,0	pF pF
Series resistance at f = 200 MHz I_F = 5 mA	r_D	typ. <	0,5 0,7	Ω Ω

MECHANICAL DATA

Dimensions in mm

SOD-23



The blue band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68 - 2 (test D, severity IV, 6 cycles).

RATINGS (Limiting values) [1])

Voltage

Continuous reverse voltage	V_R	max.	35	V

Current

Forward current (d.c.)	I_F	max.	100	mA

Temperatures

Storage temperature	T_{stg}	-55 to +100		^oC
Junction temperature	T_j	max.	100	^oC

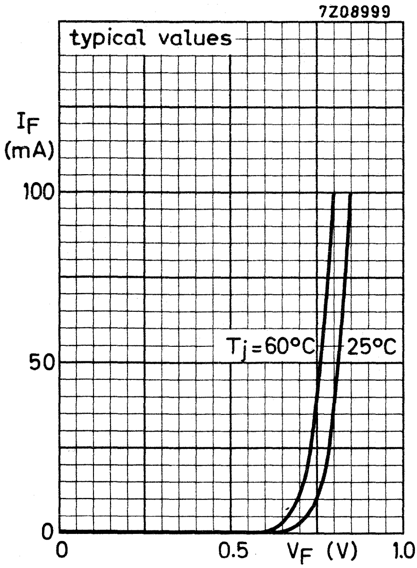
THERMAL RESISTANCE

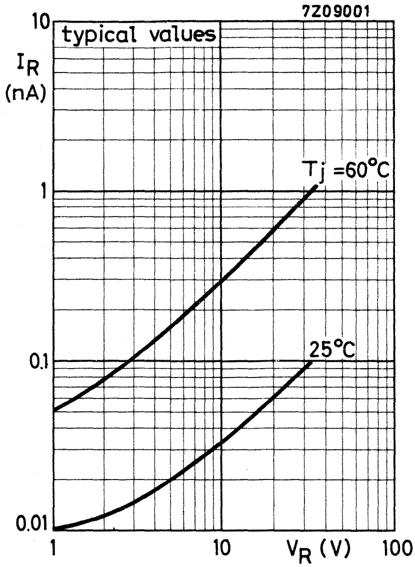
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0.4	$^oC/mW$

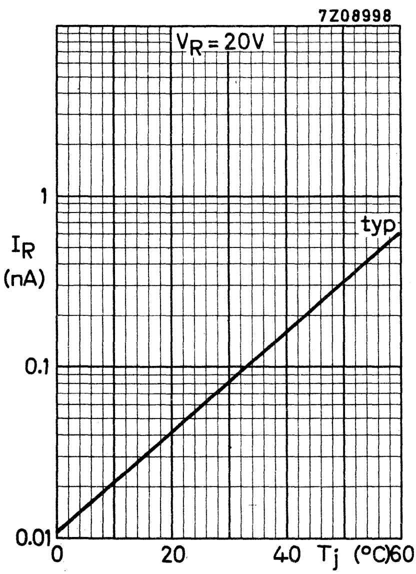
CHARACTERISTICS

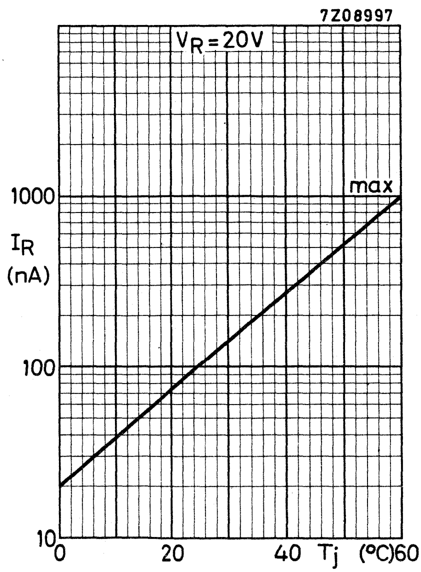
Forward voltage at I_F = 100 mA	V_F	<	1.2	V
Reverse current				
V_R = 20 V	I_R	<	100	nA
V_R = 20 V; T_j = 60 ^oC	I_R	<	1	μA
Diode capacitance at f = 1 MHz				
V_R = 20 V	C_d	typ.	0.8	pF
		<	1	pF
Series resistance at f = 200 MHz				
I_F = 5 mA	r_D	typ.	0.5	Ω
		<	0.7	Ω

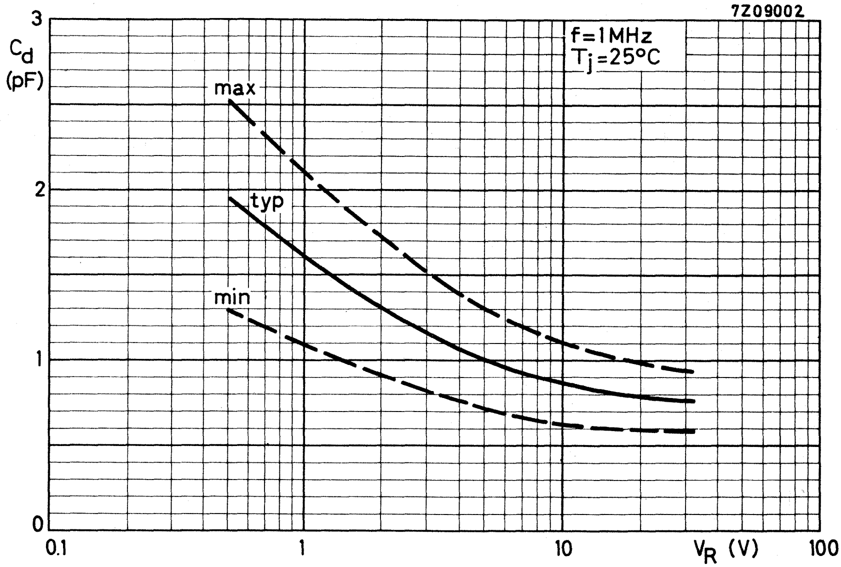
[1]) Limiting values according to the Absolute Maximum System as defined in IEC publication 134.

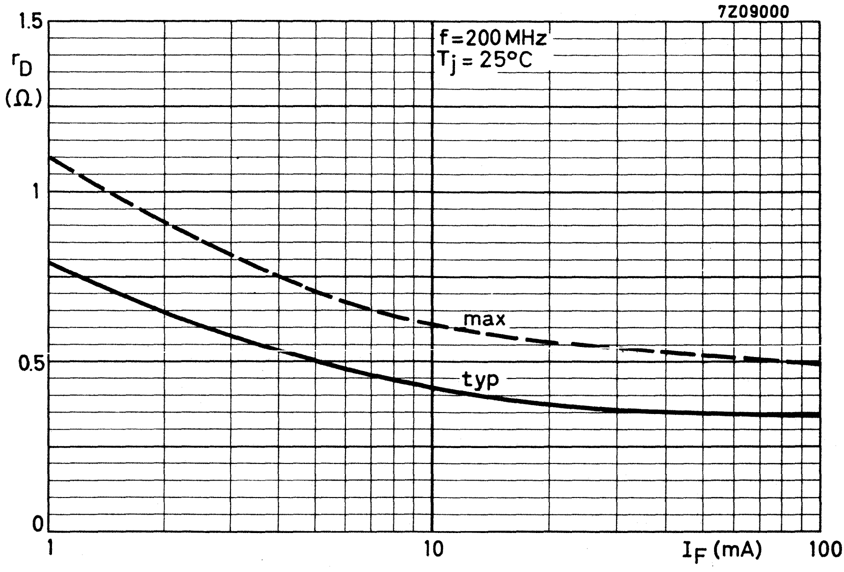

7Z08999
typical values
I_F (mA)
100
50
0
T_j = 60 °C
25 °C
0
0.5
V_F (V)
1.0


7Z09001
typical values
I_R (nA)
10
1
0.1
0.01
T_j = 60 °C
25 °C
1
10
V_R (V)
100


7Z08998
V_R = 20 V
I_R (nA)
1
0.1
0.01
typ
0
20
40
T_j (°C)
60


7Z08997
V_R = 20 V
I_R (nA)
1000
100
10
max
0
20
40
T_j (°C)
60


7Z09002
f=1MHz
Tj=25°C
Cd
(pF)
max
typ
min
3
2
1
0
0.1
1
10
VR (V)
100


7Z09000
f=200MHz
Tj=25°C
rD
(Ω)
max
typ
1.5
1
0.5
0
1
10
IF (mA)
100

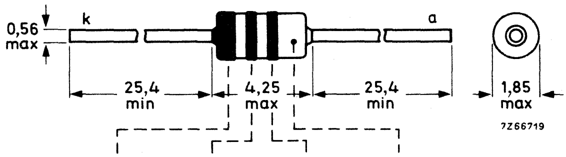
SILICON PLANAR DIODES

Switching diodes in a DO-35 envelope, intended for band switching in v.h.f. television tuners.

QUICK REFERENCE DATA						
Continuous reverse voltage	V_R		max.	20		V
Forward current (d.c.)	I_F		max.	100		mA
Junction temperature	T_j		max.	150		^oC
Diode capacitance at f = 1 to 100 MHz V_R = 15 V	C_d		typ. <	1,1 2		pF pF
			BA243	BA244		
Series resistance at f = 200 MHz I_F = 10 mA	r_D	typ <	0,7 1	0,4 0,5		Ω Ω

MECHANICAL DATA Dimensions in mm

DO-35



BA243:	red (cathode)	yellow	orange	natural
BA244:	red (cathode)	yellow	yellow	natural

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

Voltage				
Continuous reverse voltage	V_R	max.	20	V
Current				
Forward current (d.c.)	I_F	max.	100	mA
Temperatures				
Storage temperature	T_{stg}		−55 to +150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

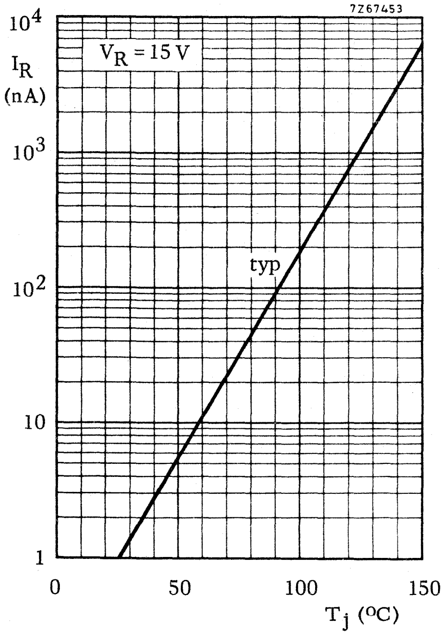
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,6	°C/mW

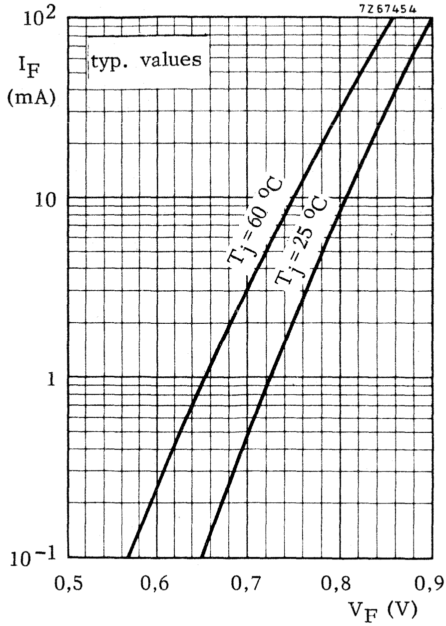
CHARACTERISTICS T_j = 25 °C unless otherwise specified

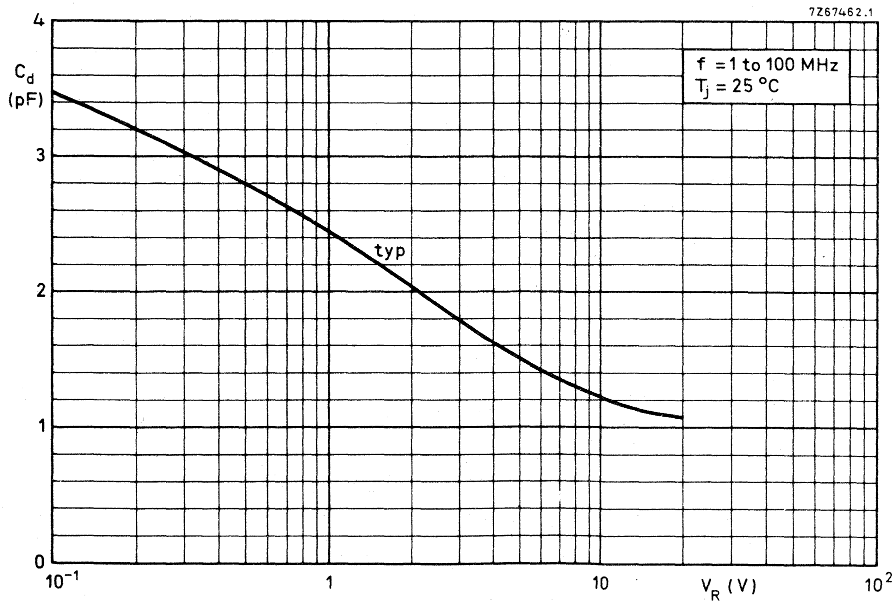
Forward voltage at I_F = 100 mA	V_F	<	1	V
Reverse current at V_R = 15 V	I_R	<	100	nA
V_R = 15 V; T_{amb} = 60 °C	I_R	<	1	μA
Diode capacitance at f = 1 to 100 MHz, V_R = 15 V	C_d	typ.	1,1	pF
		<	2	pF
Relative capacitance variation due to reverse voltage variation at V_R = 7 to 20 V; f = 1 to 100 MHz related to V_R = 7 V	$\frac{\Delta C_d}{C_d \cdot \Delta V_R}$	typ.	1	%/V

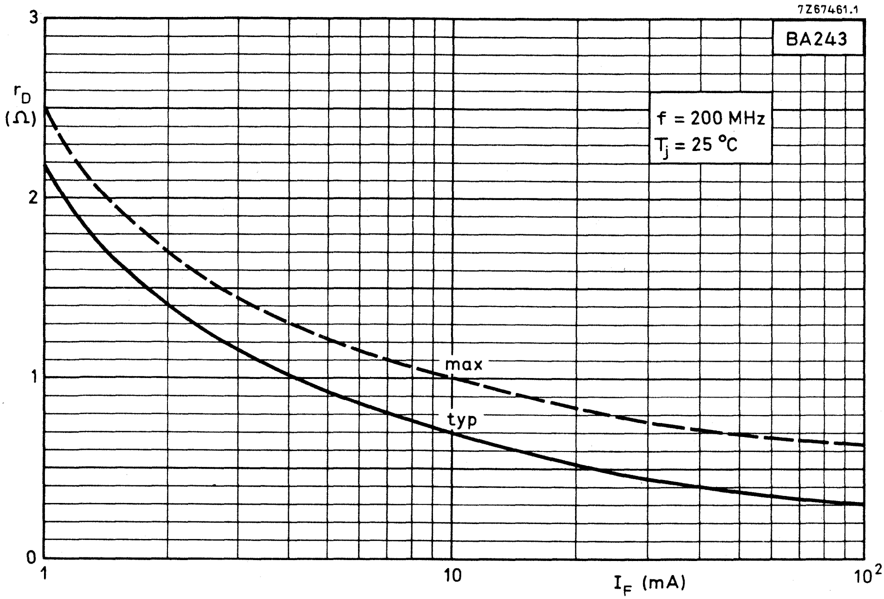
Series resistance at f = 200 MHz			BA243	BA244	
I_F = 10 mA	r_D	typ.	0,7	0,4	Ω
		<	1	0,5	Ω

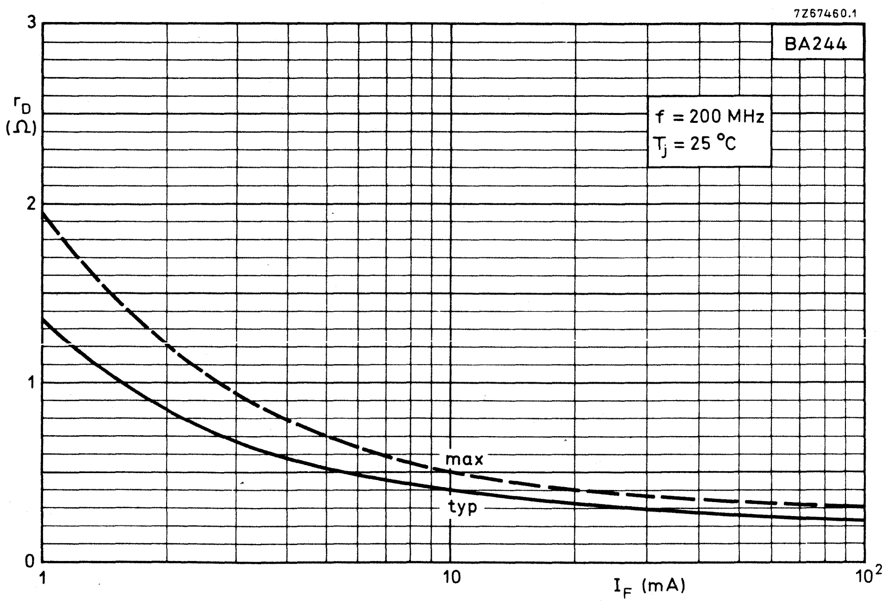
Relative series resistance variation due to forward current variation at I_F = 2 to 40 mA; f = 200 MHz related to I_F = 2 mA	$\frac{\Delta r_D}{r_D \cdot \Delta I_F}$	typ.	2	%/mA
Series inductance (measured on envelope)	L_s	typ.	2,5	nH


7Z67453
10^4
I_R
(nA)
$V_R = 15$ V
10^3
typ
10^2
10
1
0
50
100
150
T_j (°C)


7Z67454
10^2
I_F
(mA)
typ. values
10
$T_j = 60$ °C
$T_j = 25$ °C
1
10^{-1}
0,5
0,6
0,7
0,8
0,9
V_F (V)


7Z67462.1
4
C_d
(pF)
f = 1 to 100 MHz
T_j = 25 °C
3
typ
2
1
0
10^{-1}
1
10
V_R (V)
10^2


7Z67461.1
BA243
r_D (Ω)
f = 200 MHz
T_j = 25 °C
max
typ
0
1
2
3
1
10
10^2
I_F (mA)


7Z67460.1
BA244
r_D (Ω)
f = 200 MHz
T_j = 25 °C
max
typ
0
1
2
3
1
10
10^2
I_F (mA)

U.H.F. MIXER DIODE

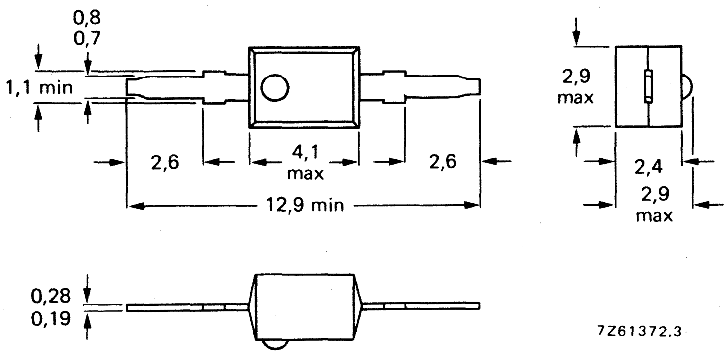
Silicon epitaxial Schottky barrier diode in a plastic envelope intended for mixer applications in u.h.f. tuners.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	4	V
Forward current (d.c.)	I_F	max.	30	mA
Junction temperature	T_j	max.	100	°C
Noise figure at f = 900 MHz	F	<	8	dB

MECHANICAL DATA

Dimensions in mm

SOD-23



The orange band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

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

Voltage				
Continuous reverse voltage	V_R	max.	4	V
Current				
Forward current (d.c.)	I_F	max.	30	mA
Temperatures				
Storage temperature	T_{stg}	-65 to +100		^oC
Junction temperature	T_j	max.	100	^oC

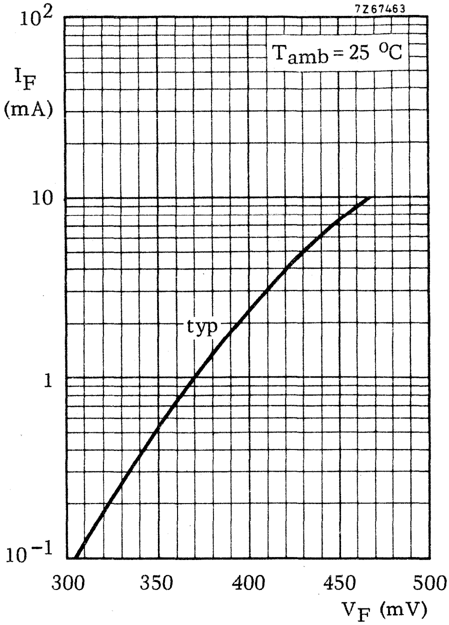
THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,25	^oC/mW

CHARACTERISTICS T_{amb} = 25 ^oC unless otherwise specified

Reverse current					
V_R = 3 V	I_R	<	0,25	μA	
V_R = 3 V; T_{amb} = 60 ^oC	I_R	<	1,25	μA	
Forward voltage					
I_F = 10 mA	V_F	<	600	mV	
Series resistance at f = 1 kHz					
I_F = 5 mA	r_D	<	15	Ω	
Diode capacitance					
V_R = 0; f = 1 MHz	C_d	<	1,0	pF	
Noise figure at f = 900 MHz	F	<	8	dB	1)

1) The local oscillator is adjusted for a diode current of 2 mA.
I.F. amplifier noise F_{if} = 1,5 dB; f = 35 MHz.


7Z67463
10^2
I_F
(mA)
$T_{amb} = 25\ ^oC$
10
typ
1
10^{-1}
300
350
400
450
500
V_F (mV)

SILICON P-I-N DIODE

Primarily for use in controlled attenuators in v.h.f. and u.h.f. television tuners.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	30	V
Forward current (d.c.)	I_F	max.	20	mA
Operating ambient temperature	T_{amb}	max.	60	°C
Diode capacitance $V_R = 0$; f = 900 MHz	C_d	typ.	0,3	pF
R.F. forward resistance $I_F = 10\ \mu A$; f = 35 MHz	r_D	typ.	1,7	kΩ
$I_F = 10$ mA; f = 35 MHz	r_D	typ.	4,5	Ω

MECHANICAL DATA Dimensions in mm

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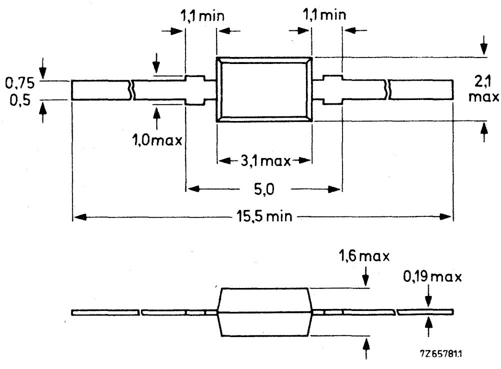


The coloured end indicates the cathode

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

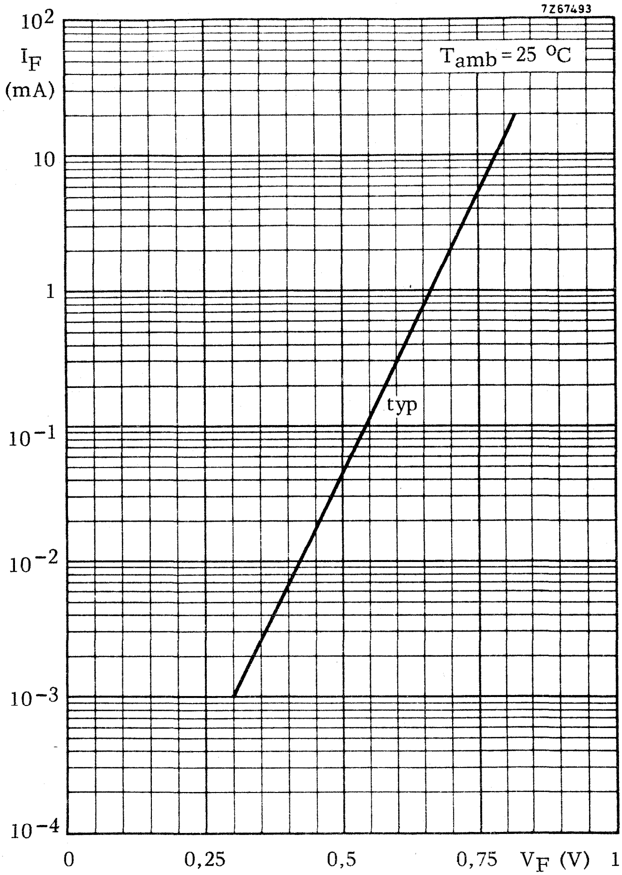
Voltage				
Continuous reverse voltage	V_R	max.	30	V
Current				
Forward current (d.c.)	I_F	max.	20	mA
Temperatures				
Storage temperature	T_{stg}	-55 to +100		°C
Operating ambient temperature	T_{amb}	max.	60	°C

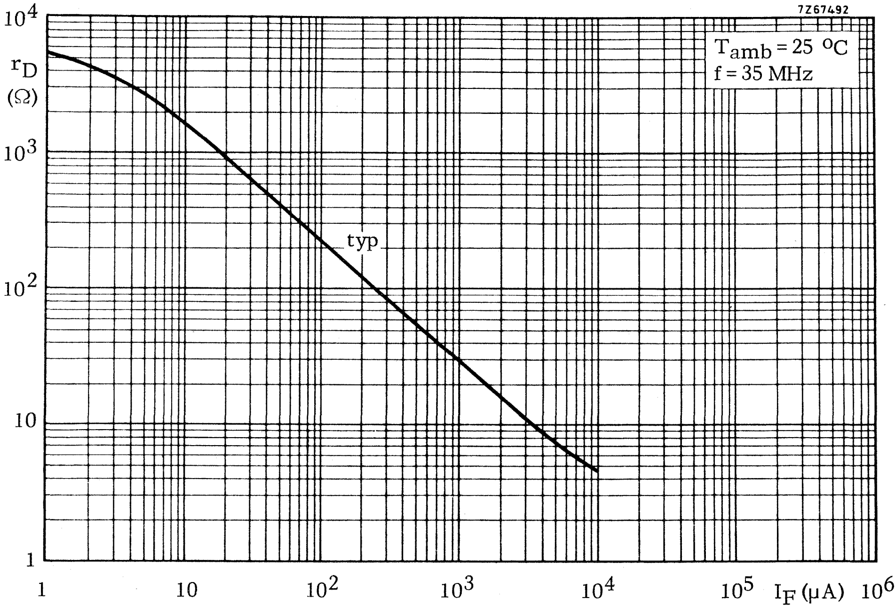
CHARACTERISTICS at T_{amb} = 25 °C

Forward voltage				
I_F = 20 mA	V_F	<	1	V
Reverse current				
V_R = 10 V	I_R	<	1	μA
Diode capacitance				
V_R = 1 V; f = 100 MHz	C_d	typ.	0,34	pF
V_R = 0 ; f = 900 MHz	C_d	typ.	0,30	pF
R.F. forward resistance				
I_F = 10 μA ; f = 35 MHz	r_D	typ.	1,7	kΩ
I_F = 10 mA; f = 35 MHz	r_D	typ.	4,5	Ω
		<	6,5	Ω
Series inductance 1)	L_s	typ.	2	nH
Cross modulation 2)				
f_o = 55 MHz; f_{int} = 50 MHz				
I_F = 50 μA	V_{int}	typ.	0,5	V

1) Measured directly to the envelope.

2) Cross modulation is defined as the interfering voltage with 80 % modulation depth over the p-i-n diode, causing 0,8 % modulation depth on the wanted signal. (K = 1%)


7Z67493
10^2
I_F
(mA)
$T_{amb} = 25\ ^oC$
10
1
typ
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
0,25
0,5
0,75
V_F (V)
1


7Z67492
T_{amb} = 25 °C
f = 35 MHz
r_D
(Ω)
10^4
10^3
10^2
10
1
typ
1
10
10^2
10^3
10^4
10^5
I_F (μA)
10^6

SILICON PLANAR VARIABLE CAPACITANCE DIODES

The BB105A, BB105B and BB105G are variable capacitance diodes in plastic envelopes.
The BB105A is intended for use in u.h.f. tuners up to frequencies of 790 MHz.
The BB105B is meant for u.h.f. tuners up to frequencies of 860 MHz.
The BB105G is meant for v.h.f. tuners.
Diodes will be supplied in matched sets.
The capacitance difference between any two diodes in one set is less than 3% for the BB105A and BB105B, and less than 6% for the BB105G, over the voltage range from 0,5 V to 28 V.

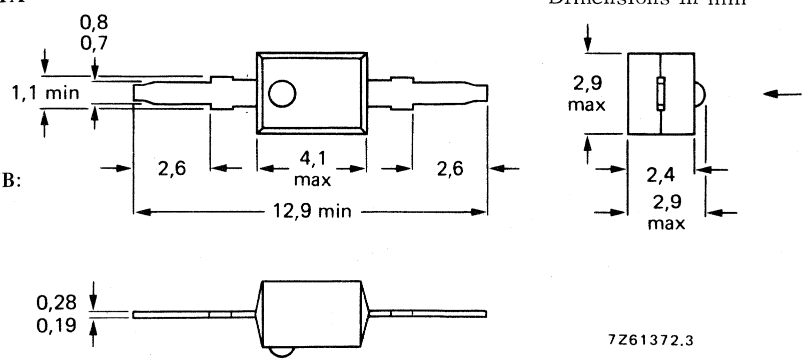
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.		28		V
Reverse current at V_R = 28 V	I_R	<		50		nA
			BB105A	BB105B	BB105G	
Diode capacitance at f = 1 MHz V_R = 25 V	C_d	> <	2,3 2,8	2,0 2,3	1,8 2,8	pF pF
Capacitance ratio at f = 1 MHz	$\frac{C_d (V_R = 3\ V)}{C_d (V_R = 25\ V)}$	> <	4 5	4,5 6,0	4 6	
Series resistance at f = 470 MHz V_R is that value at which C_d = 9 pF	r_D	typ. <	0,6 0,8	0,7 0,8	0,9 1,2	Ω Ω

MECHANICAL DATA

Dimensions in mm

SOD-23



BB105A and BB105B: marked on packing

BB105G: green dot on the envelope

The white band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

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

Voltages

Continuous reverse voltage	V_R	max.	28	V
Reverse voltage (peak value)	V_{RM}	max.	30	V

Current

Forward current (d.c.)	I_F	max.	20	mA

Temperatures

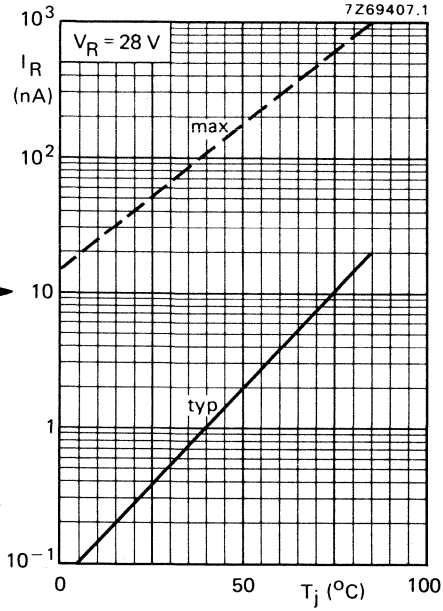
Storage temperature	T_{stg}		−55 to +100	°C
→ Operating junction temperature	T_j	max.	85	°C

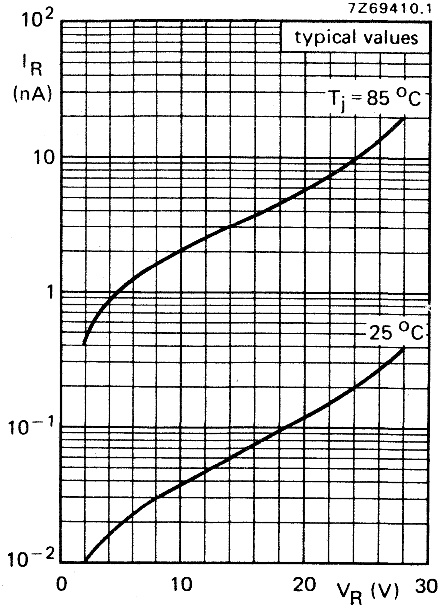
THERMAL RESISTANCE

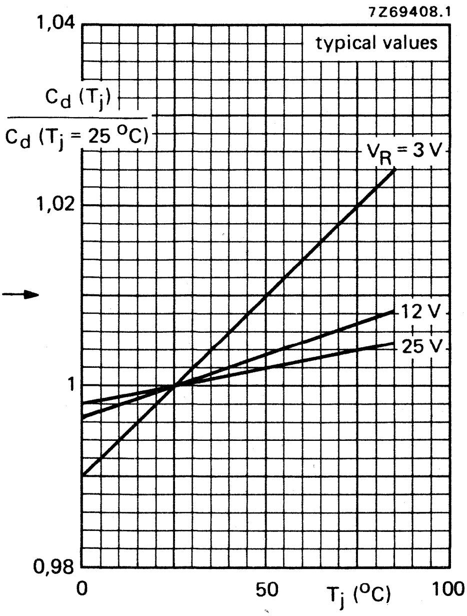
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,4	°C/mW

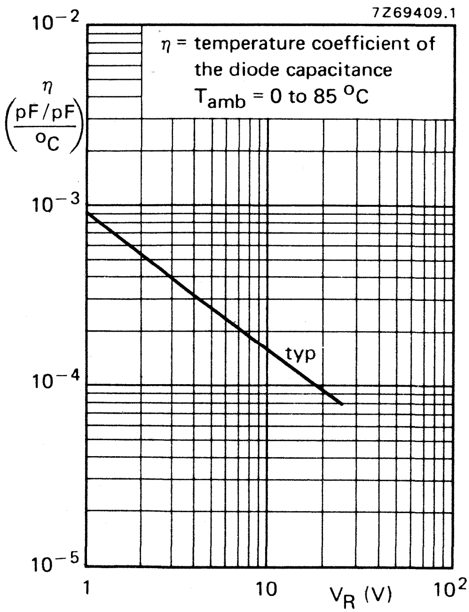
CHARACTERISTICS T_j = 25 °C unless otherwise specified

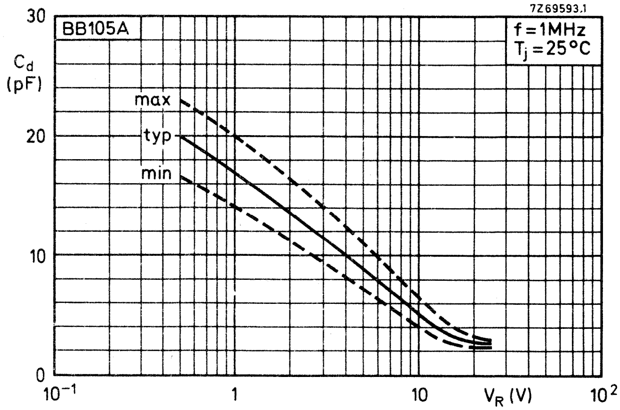
			BB105A	BB105B	BB105G	
Reverse current						
V_R = 28 V	I_R	<	50	50	50	nA
→ V_R = 28 V; T_{amb} = 85 °C	I_R	<	1000	1000	1000	nA
Diode capacitance at f = 1 MHz						
V_R = 1 V	C_d	typ.	17,0	17,5	17,5	pF
V_R = 3 V	C_d	typ.	11,5	11,5	11,5	pF
V_R = 25 V	C_d	>	2,3	2,0	1,8	pF
		<	2,8	2,3	2,8	pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	>	4	4,5	4	
		<	5	6,0	6	
Series resistance						
at f = 470 MHz and at that value of V_R at which C_d = 9 pF	r_D	typ.	0,6	0,7	0,9	Ω
		<	0,8	0,8	1,2	Ω
at f = 200 MHz and I_F = 5 mA	r_D	typ.	0,4	0,4	0,4	Ω

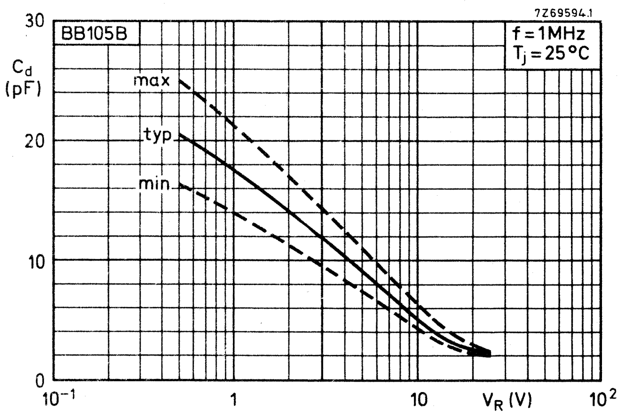

7Z69407.1
10^3
I_R
(nA)
V_R = 28 V
max
10^2
10
typ
1
10^{-1}
0
50
T_j (°C)
100

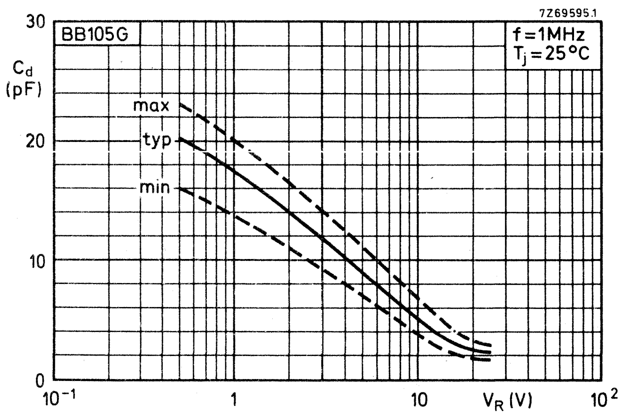

7Z69410.1
10^2
I_R
(nA)
typical values
T_j = 85 °C
10
1
25 °C
10^{-1}
10^{-2}
0
10
20
V_R (V)
30


7Z69408.1
1,04
typical values
C_d (T_j)
C_d (T_j = 25 °C)
V_R = 3 V
1,02
12 V
25 V
1
0,98
0
50
T_j (°C)
100


7Z69409.1
10^{-2}
η = temperature coefficient of
the diode capacitance
T_{amb} = 0 to 85 °C
η
(pF/pF / °C)
10^{-3}
typ
10^{-4}
10^{-5}
1
10
V_R (V)
10^2


7Z69593.1
BB105A
f = 1MHz
T_j = 25 °C
C_d (pF)
30
20
10
0
max
typ
min
10^{-1}
1
10
V_R (V)
10^2


7Z69594.1
BB105B
f = 1MHz
T_j = 25 °C
C_d (pF)
30
20
10
0
max
typ
min
10^{-1}
1
10
V_R (V)
10^2


7Z69595.1
BB105G
f = 1MHz
T_j = 25 °C
C_d (pF)
30
20
10
0
max
typ
min
10^{-1}
1
10
V_R (V)
10^2

SILICON PLANAR VARIABLE CAPACITANCE DIODE

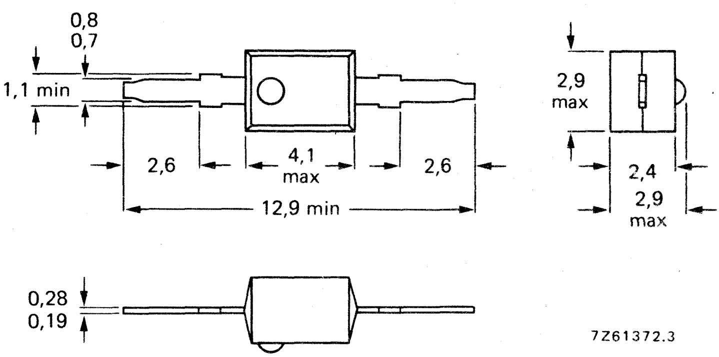
The BB106 is a variable capacitance diode in a plastic envelope intended for electronic tuning in v.h.f. tuners with extended band I (FCC norm).
Diodes will be supplied in matched sets.
The capacitance difference between any two diodes in one set is less than 3% over the voltage range from 0,5 V to 28 V.

QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	28	V
Reverse current at V_R = 28 V	I_R	<	50	nA
Diode capacitance at f = 500 kHz				
V_R = 3 V	C_d	>	20	pF
V_R = 25 V	C_d	4,0 to	5,6	pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	4,5 to	6,0	
Series resistance at f = 200 MHz		typ.	0,4	Ω
V_R is that value at which C_d = 25 pF	r_D	<	0,6	Ω

MECHANICAL DATA Dimensions in mm

SOD-23



The red band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

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

Voltages

Continuous reverse voltage	V_R	max.	28	V
Reverse voltage (peak value)	V_{RM}	max.	30	V

Current

Forward current (d.c.)	I_F	max.	20	mA

Temperatures

Storage temperature	T_{stg}		−55 to +100	^oC
→ Operating junction temperature	T_j	max.	85	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,4	$^oC/mW$

CHARACTERISTICS T_{amb} = 25 ^oC unless otherwise specified

Reverse current

V_R = 28 V	I_R	<	50	nA
→ V_R = 28 V; T_{amb} = 85 ^oC	I_R	<	1000	nA

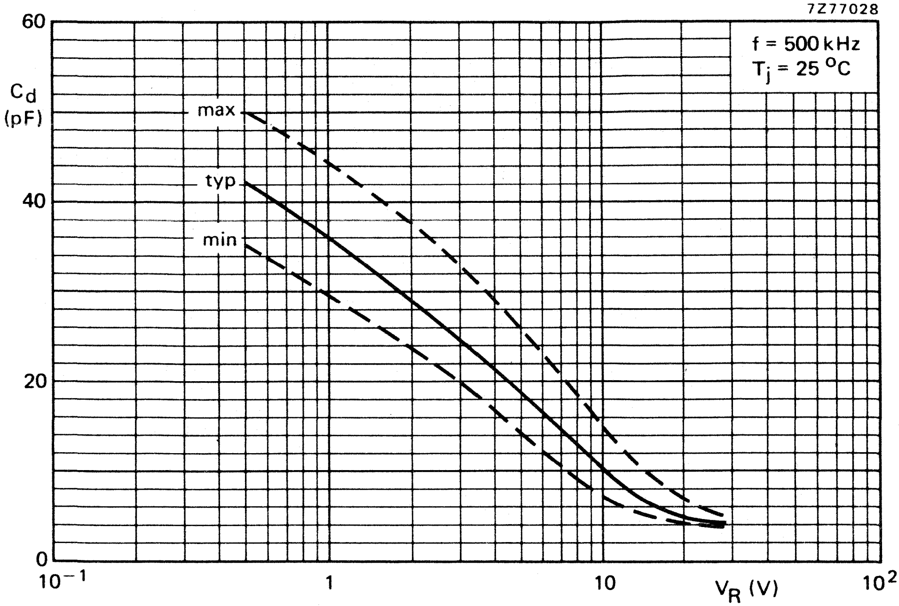
Diode capacitance at f = 500 kHz

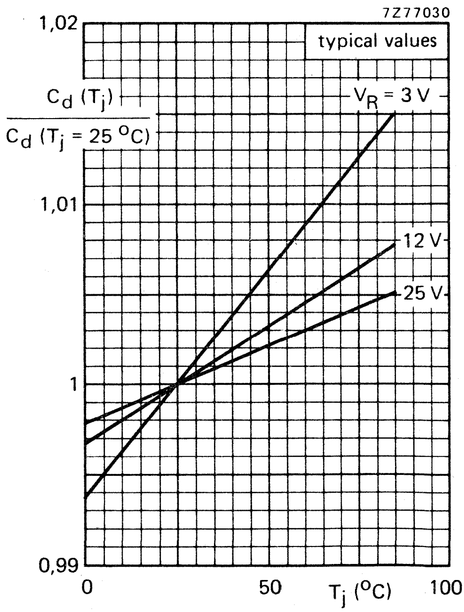
V_R = 3 V	C_d	>	20	pF
V_R = 25 V	C_d		4,0 to 5,6	pF

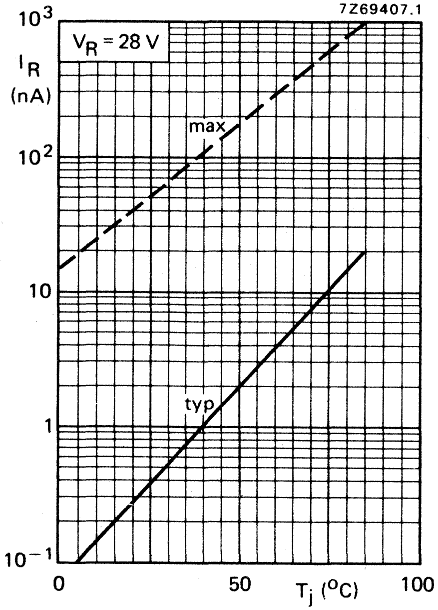
Capacitance ratio at f = 500 kHz $\frac{C_d(V_R = 3\ V)}{C_d(V_R = 25\ V)}$ 4,5 to 6,0

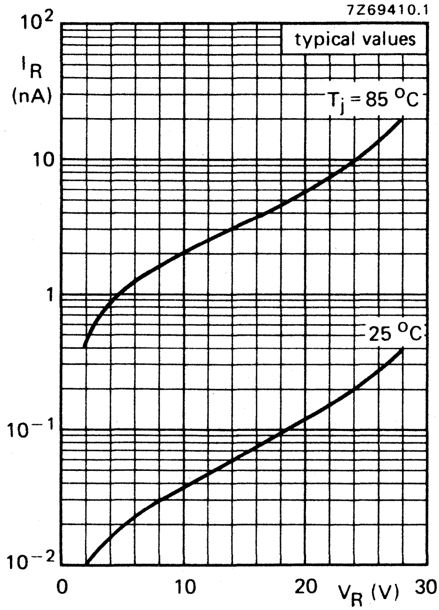
Series resistance at f = 200 MHz

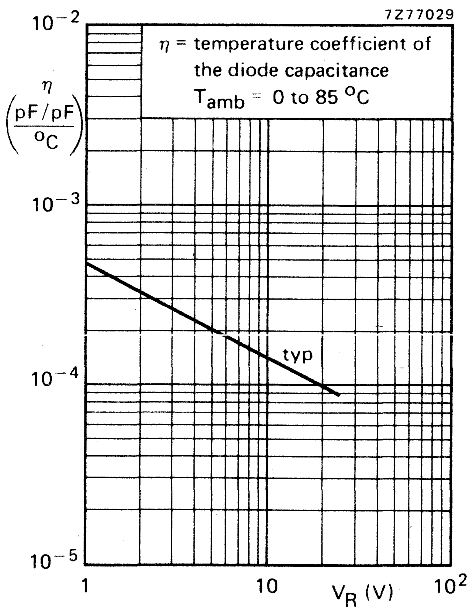
V_R is that value at which C_d = 25 pF	r_D	typ.	0,4	Ω
		<	0,6	Ω


7Z77028
f = 500 kHz
Tj = 25 °C
Cd
(pF)
max
typ
min
60
40
20
0
10−1
1
10
VR (V)
10²


7Z77030
typical values
Cd (Tj)
Cd (Tj = 25 °C)
VR = 3 V
12 V
25 V
1,02
1,01
1
0,99
0
50
Tj (°C)
100


7Z69407.1
V_R = 28 V
I_R (nA)
max
typ
T_j (°C)


7Z69410.1
typical values
I_R (nA)
T_j = 85 °C
25 °C
V_R (V)


7Z77029
η = temperature coefficient of the diode capacitance
T_{amb} = 0 to 85 °C
η (pF/pF / °C)
typ
V_R (V)

SILICON PLANAR VARIABLE CAPACITANCE DIODES

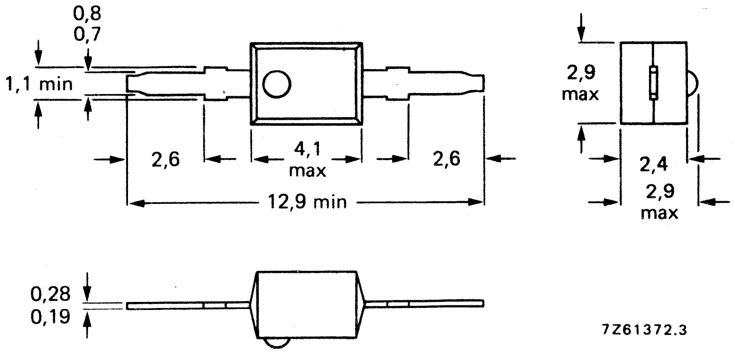
The BB110B and BB110G are variable capacitance diodes in a plastic envelope primarily intended for electronic tuning in band II (f.m.). They are recommended for r.f. and interstage circuits.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	30	V
Junction temperature	T_j	max.	100	°C
Reverse current at V_R = 30 V	I_R	<	20	nA
Diode capacitance at f = 1 MHz V_R = 3 V	C_d		BB110G: 27 - 31 BB110B: 29 - 33	pF
Capacitance ratio	$\frac{C_d (V_R = 3\ V)}{C_d (V_R = 30\ V)}$	typ.	2,65	
Series resistance at f = 100 MHz V_R is that value at which C_d = 30 pF	r_D	typ. <	0,3 0,4	Ω Ω

MECHANICAL DATA — Dimensions in mm

SOD-23

BB110B: blue dot
BB110G: green dot



The yellow band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

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

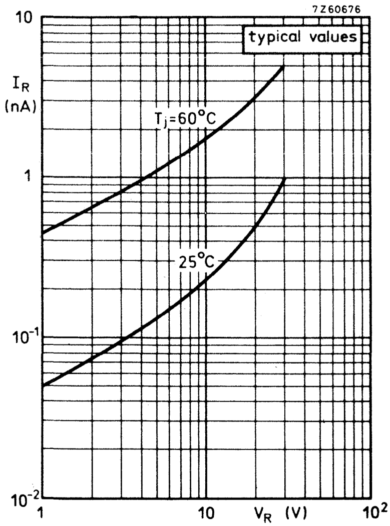
Voltage				
Continuous reverse voltage	V_R	max.	30	V
Current				
Forward current (d.c.)	I_F	max.	100	mA
Temperatures				
Storage temperature	T_{stg}		− 55 to +100	°C
Junction temperature	T_j	max.	100	°C

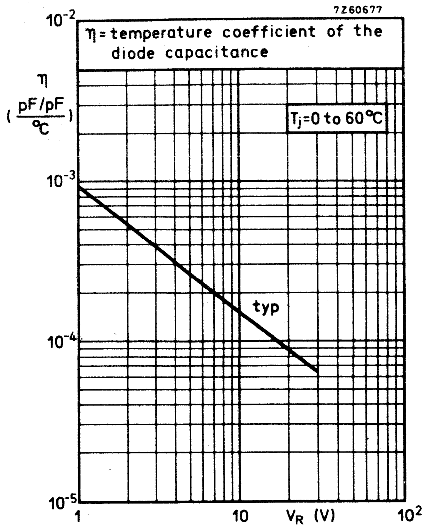
THERMAL RESISTANCE

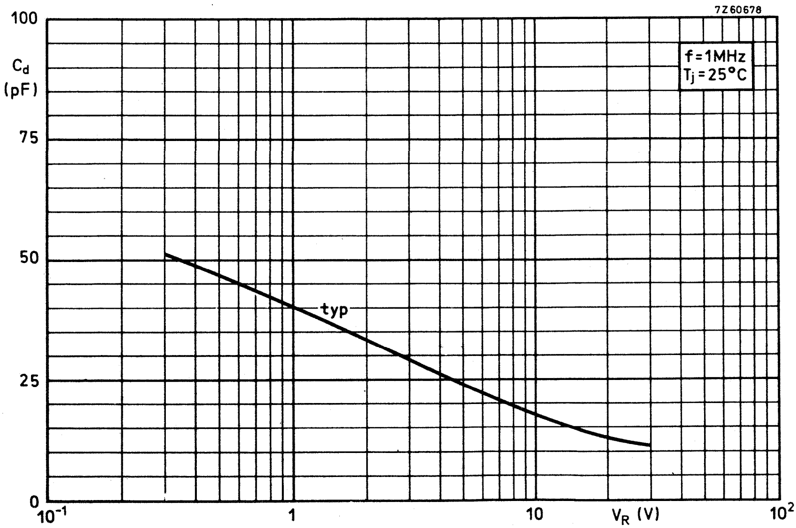
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0, 4	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Reverse current at V_R = 30 V	I_R	typ.	1		nA
		<	20		nA
V_R = 30 V; T_j = 60 °C	I_R	typ.	5		nA
		<	200		nA
Diode capacitance at f = 1 MHz			BB110G	BB110B	
V_R = 3 V	C_d		27-31	29-33	pF
V_R = 30 V	C_d	typ.	11		pF
Capacitance ratio at f = 1 MHz	$\frac{C_d(V_R = 3\ V)}{C_d(V_R = 30\ V)}$	typ.	2, 65		
Series resistance at f = 100 MHz					
V_R is that value at which C_d = 30 pF	r_D	typ.	0, 3		Ω
		<	0, 4		Ω
Temperature coefficient of the diode capacitance					
→ V_R = 3 V	η	typ.	0, 04		%/°C


7Z60676
typical values
I_R (nA)
T_j=60°C
25°C
V_R (V)
10
1
10^{-1}
10^{-2}
1
10
10^2


7Z60677
η = temperature coefficient of the diode capacitance
η (pF/pF / °C)
T_j=0 to 60°C
typ
V_R (V)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
1
10
10^2


7Z60678
C_d (pF)
f = 1MHz
T_j = 25°C
typ
V_R (V)
100
75
50
25
0
10^{-1}
1
10
10^2

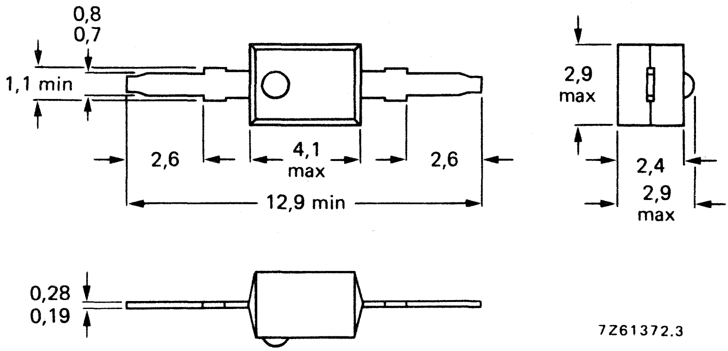
SILICON PLANAR VARIABLE CAPACITANCE DIODE

The BB117 is a variable capacitance diode in a plastic envelope. The diode is primarily intended for automatic frequency control in television receivers.

QUICK REFERENCE DATA				
Reverse voltage	V_R	max.	20	V
Reverse current at V_R = 20 V	I_R	<	100	nA
Diode capacitance at f = 0,5 MHz V_R = 15 V	C_d		2,2 to 4,0	pF
Capacitance ratio	$\frac{C_d(V_R = 4\ V)}{C_d(V_R = 15\ V)}$		2,0 to 5,0	
Series resistance at f = 470 MHz V_R is that value at which C_d = 9 pF	r_D	<	1,2	Ω

MECHANICAL DATA Dimensions in mm

SOD-23



The white band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

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

Continuous reverse voltage	V_R	max.	20	V
Forward current (d.c.)	I_F	max.	20	mA
Storage temperature	T_{stg}		−55 to + 100	°C
Operating junction temperature	T_j	max.	60	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0, 4	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Reverse current				
V_R = 20 V	I_R	<	100	nA
V_R = 20 V; T_j = 60 °C	I_R	<	500	nA
Diode capacitance at f = 0, 5 MHz				
V_R = 4 V	C_d		8 to 11	pF
V_R = 15 V	C_d		2, 2 to 4, 0	pF
Capacitance ratio at f = 0, 5 MHz	$\frac{C_d(V_R = 4\ V)}{C_d(V_R = 15\ V)}$		2, 0 to 5, 0	
Series resistance at f = 470 MHz V_R is that value at which C_d = 9 pF	r_D	<	1, 2	Ω

SILICON VARIABLE CAPACITANCE DIODE

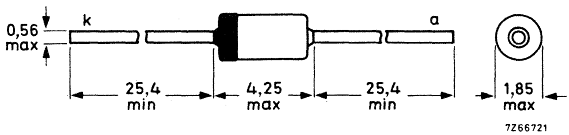
Planar-diffused diode in a DO-35 envelope intended for automatic frequency control in radio and television receivers.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	15	V
Junction temperature	T_j	max.	200	°C
Reverse current at V_R = 15 V; T_j = 150 °C	I_R	<	2,0	μA
Diode capacitance at f = 1 MHz V_R = 4 V	C_d		20 to 25	pF
Capacitance ratio at f < 300 MHz	$\frac{C_d\ (V_R = 4\ V)}{C_d\ (V_R = 10\ V)}$	≥	1,3	
Series resistance at V_R = 4 V; f = 200 MHz	r_D	<	1,5	Ω

MECHANICAL DATA

Dimensions in mm

DO-35



The coloured band indicates the cathode

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

Voltage				
Continuous reverse voltage	V_R	max.	15	V
Current				
Forward current (d.c.)	I_F	max.	200	mA
Temperatures				
Storage temperature	T_{stg}	-65 to +200		^oC
Junction temperature	T_j	max.	200	^oC

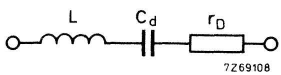
THERMAL RESISTANCE

From junction to ambient in free air

CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified

Reverse current				
$V_R = 15$ V; $T_j = 150\ ^oC$	I_R	<	2,0	μA
Forward voltage				
$I_F = 100$ mA	V_F	<	950	mV
Diode capacitance at f = 1 MHz				
$V_R = 4$ V	C_d		20 to 25	pF
Capacitance ratio at f < 300 MHz	$\frac{C_d\ (V_R = 4\ V)}{C_d\ (V_R = 10\ V)}$	≥	1,3	
Series resistance at f = 200 MHz				
$V_R = 4$ V	r_D	typ.	0,9	Ω
		<	1,5	Ω

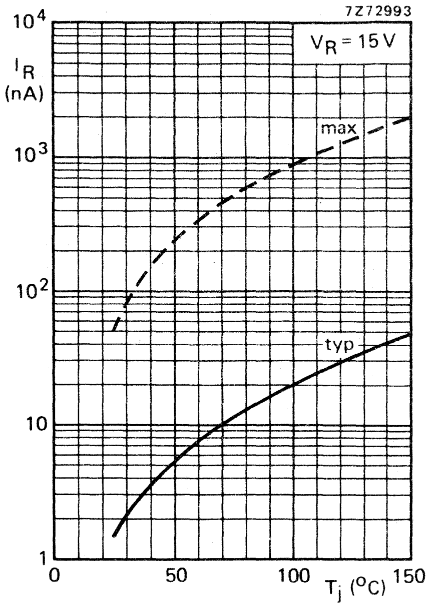
Simplified equivalent circuit:

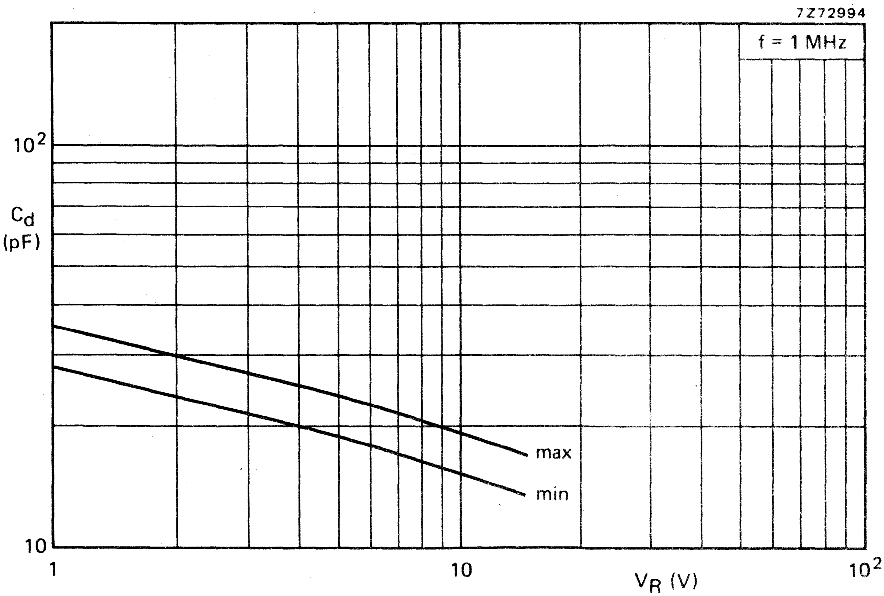


L = lead inductance ≈ 6 nH
r_D = series resistance
C_d = diode capacitance (see page 3)

frequency independent up to f = 300 MHz

These data apply for a distance of 10 mm between the two measuring points.


7Z72993
10^4
I_R
(nA)
V_R = 15 V
max
10^3
10^2
typ
10
1
0
50
100
T_j (°C)
150


7Z72994
f = 1 MHz
10^2
C_d
(pF)
max
min
10
1
10
V_R (V)
10^2

SILICON PLANAR
VARIABLE CAPACITANCE DOUBLE DIODES

The BB204B and BB204G are double diodes with common cathode in a plastic TO-92 variant, primarily intended for electronic tuning in band II (f.m.).
They are recommended for stages where large signals occur (e.g. oscillator circuits).

QUICK REFERENCE DATA

For each diode:

Continuous reverse voltage	V_R	max.	30	V
Junction temperature	T_j	max.	100	^oC
Reverse current at V_R = 30 V	I_R	<	50	nA
Diode capacitance at f = 1 MHz; V_R = 3 V	C_d		BB204G: 34 - 39; BB204B: 37 - 42	pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 30\ V)}$	typ.	2,65	
Series resistance at f = 100 MHz; V_R is that value at which C_d = 38 pF	r_D	typ.	0,2	Ω
		<	0,4	Ω

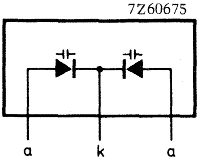
MECHANICAL DATA

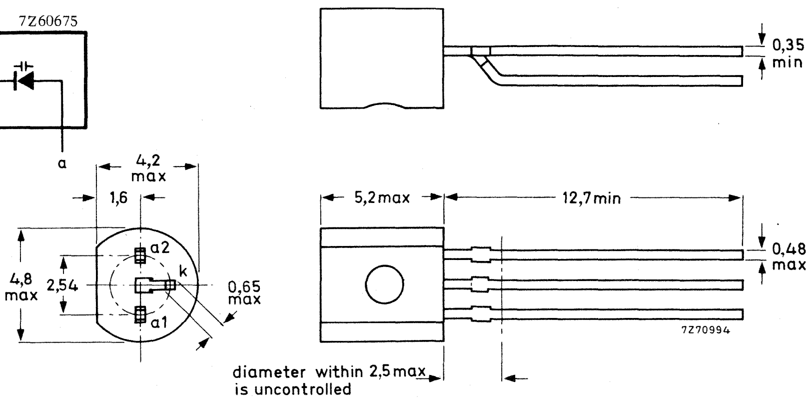
Dimensions in mm

TO-92 variant

BB204B: blue type marking
BB204G: green type marking

7Z60675





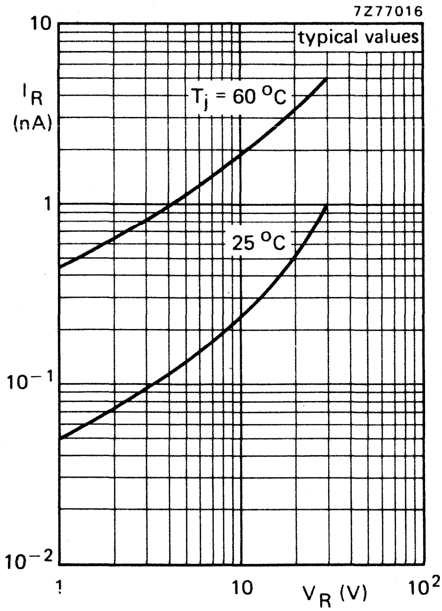
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

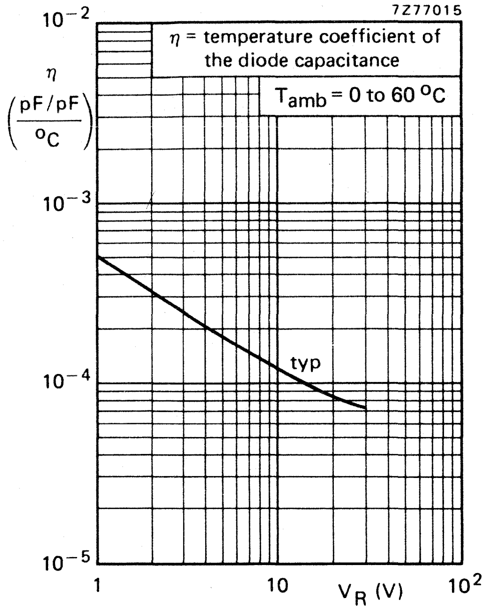
For each diode:

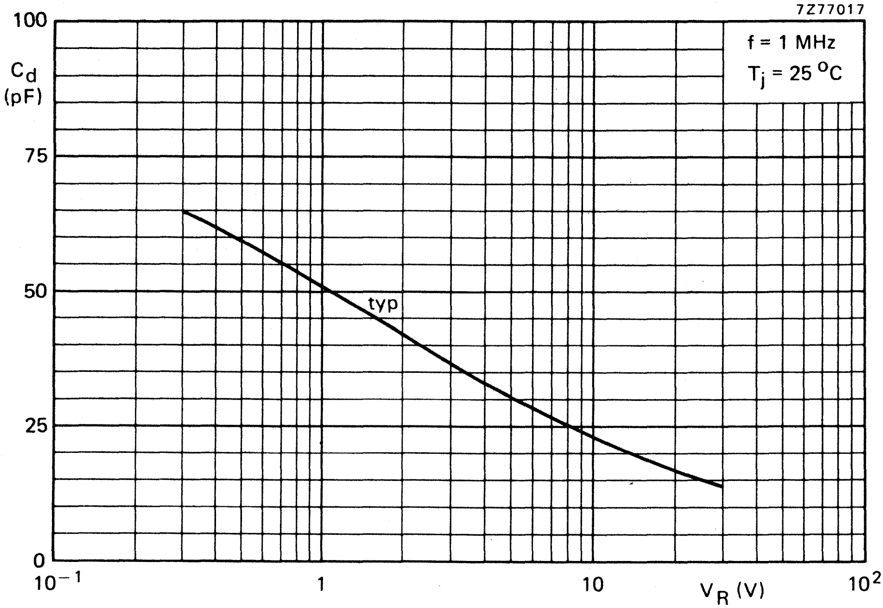
Voltage				
Continuous reverse voltage	V_R	max.	30	V
Current				
Forward current (d.c.)	I_F	max.	100	mA
Temperatures				
Storage temperature	T_{stg}	−55 to +100		°C
Junction temperature	T_j	max.	100	°C

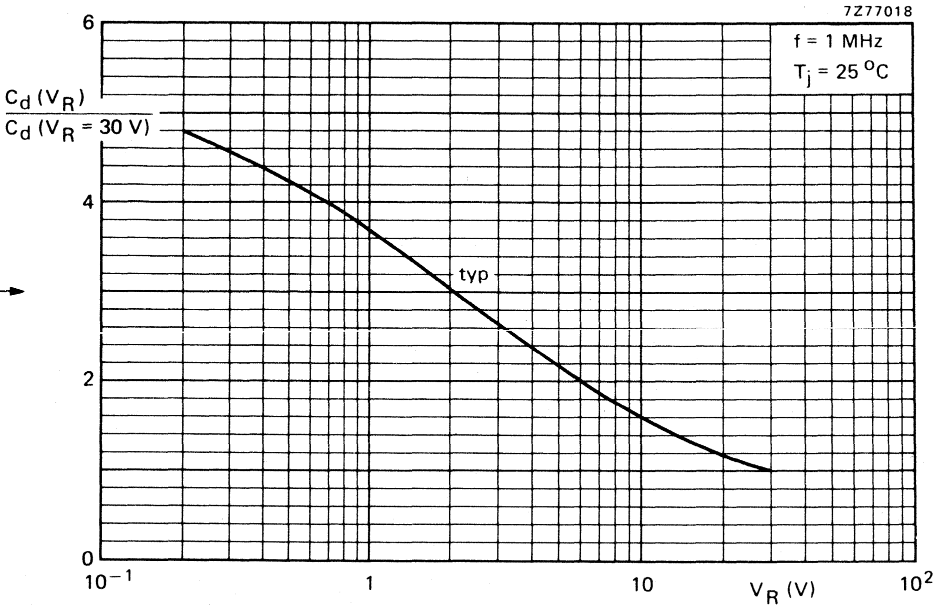
CHARACTERISTICS (for each diode) → T_j = 25 °C

Reverse current at V_R = 30 V	I_R	<	50		nA
Diode capacitance at f = 1 MHz		BB204G	BB204B		
V_R = 3 V	C_d	34 - 39	37 - 42		pF
V_R = 30 V	C_d	typ.	14		pF
Capacitance ratio at f = 1 MHz	$\frac{C_d (V_R = 3\ V)}{C_d (V_R = 30\ V)}$	typ.	2,65		
Series resistance at f = 100 MHz; V_R is that value at which C_d = 38 pF	r_D	typ.	0,2		Ω
		<	0,4		Ω


7Z77016
typical values
I_R
(nA)
10
1
10^{-1}
10^{-2}
T_j = 60 °C
25 °C
1
10
V_R (V)
10^2


7Z77015
η = temperature coefficient of
the diode capacitance
T_{amb} = 0 to 60 °C
η
(pF/pF / °C)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
typ
1
10
V_R (V)
10^2


7Z77017
100
Cd
(pF)
75
50
25
0
typ
f = 1 MHz
Tj = 25 °C
10−1
1
10
VR (V)
10²


7Z77018
6
Cd (VR)
Cd (VR = 30 V)
4
2
0
typ
f = 1 MHz
Tj = 25 °C
10−1
1
10
VR (V)
10²

SILICON PLANAR VARIABLE CAPACITANCE DIODES

The BB205A is intended for use in u.h.f. tuners up to frequencies of 790 MHz.
The BB205B is meant for u.h.f. tuners up to frequencies of 860 MHz.
The BB205G is meant for v.h.f. tuners.
Diodes will be supplied in matched sets.
The capacitance difference between any diode in one set is less than 3% over the voltage range from 0,5 V to 28 V.

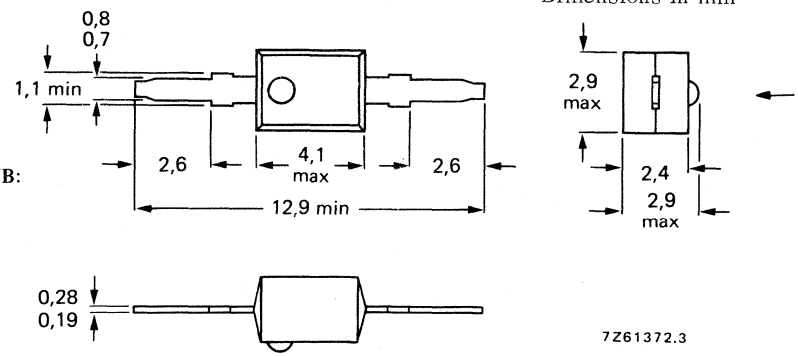
QUICK REFERENCE DATA

			BB205A	BB205B	BB205G	
Continuous reverse voltage	V_R	max.	28			V
Reverse current at T_j = 25 °C; V_R = 28 V	I_R	<	50			nA
Diode capacitance at f = 500 kHz; V_R = 25 V	C_d	>	2,1	1,9	1,8	pF
		<	2,5	2,2	2,6	pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	>	4,3	5,0	4,3	
		<	5,3	6,0	6,0	
Series resistance at f = 470 MHz; V_R is that value at which C_d = 9 pF	r_D	typ.	0,6	0,7	0,9	Ω
		<	0,8	0,8	1,2	Ω

MECHANICAL DATA

Dimensions in mm

SOD-23



BB205A and BB205B: marked on packing

BB205G: green dot on the envelope

The white band indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

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

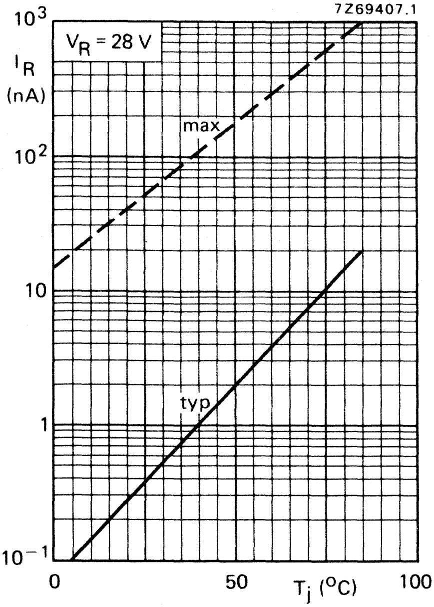
Continuous reverse voltage	V_R	max.	28	V
Reverse voltage (peak value)	V_{RM}	max.	30	V
Forward current (d.c.)	I_F	max.	20	mA
Storage temperature	T_{stg}		−55 to + 100	°C
→ Operating junction temperature	T_j	max.	85	°C

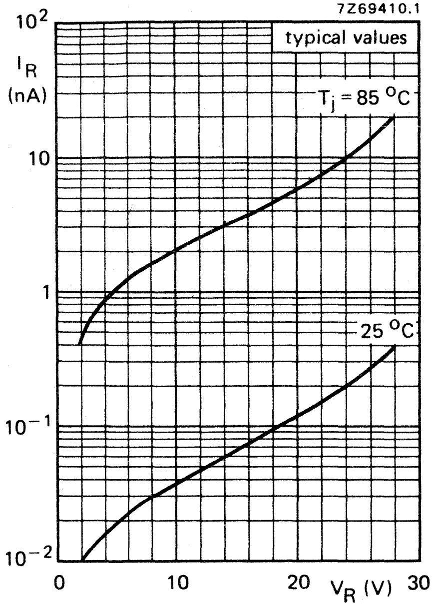
THERMAL RESISTANCE

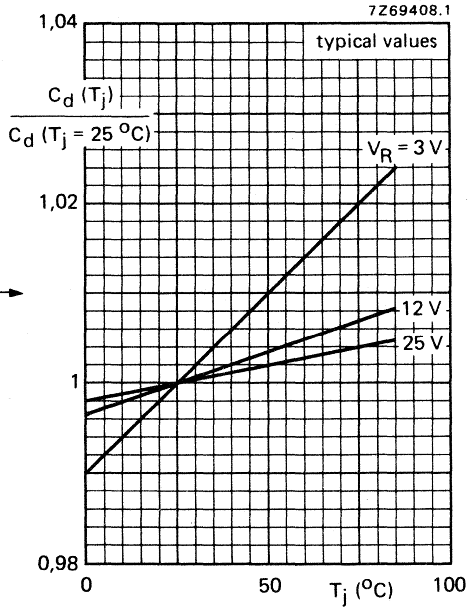
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,4	°C/mW

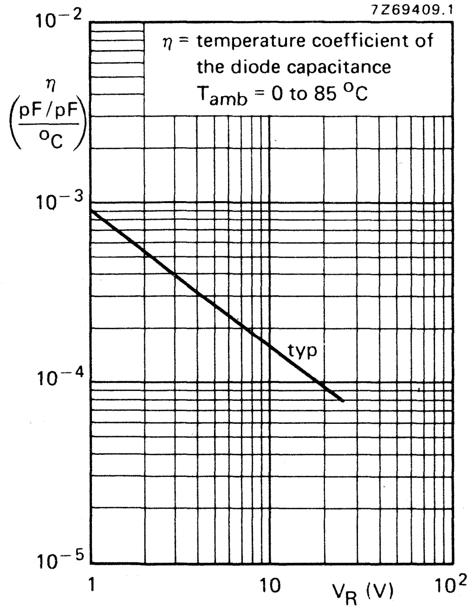
CHARACTERISTICS T_j = 25 °C unless otherwise specified

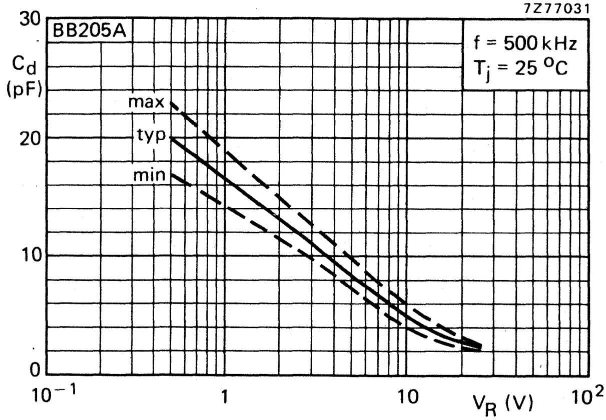
			BB205A	BB205B	BB205G	
Reverse current						
V_R = 28 V	I_R	<	50	50	50	nA
→ V_R = 28 V; T_{amb} = 85 °C	I_R	<	1000	1000	1000	nA
Diode capacitance at f = 500 kHz						
V_R = 1 V	C_d	typ.	17	17	17	pF
V_R = 3 V	C_d	typ.	11	11	11	pF
V_R = 25 V	C_d	>	2,1	1,9	1,8	pF
		<	2,5	2,2	2,6	pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	>	4,3	5,0	4,3	
		<	5,3	6,0	6,0	
Series resistance						
at f = 470 MHz and at that value of V_R at which C_d = 9 pF	r_D	typ.	0,6	0,7	0,9	Ω
		<	0,8	0,8	1,2	Ω
at f = 200 MHz and I_F = 5 mA	r_D	typ.	0,4	0,4	0,4	Ω

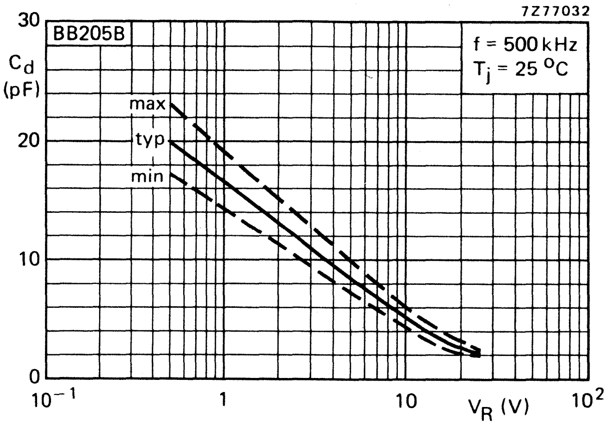

7Z69407.1
10^3
I_R
(nA)
V_R = 28 V
max
10^2
10
typ
1
10^{-1}
0
50
T_j (°C)
100

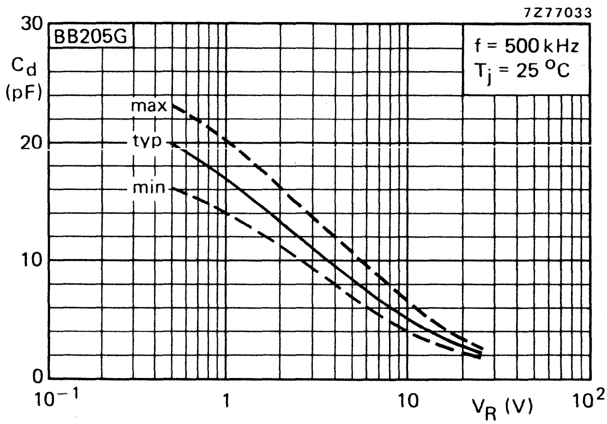

7Z69410.1
10^2
I_R
(nA)
typical values
T_j = 85 °C
10
1
25 °C
10^{-1}
10^{-2}
0
10
20
V_R (V)
30


7Z69408.1
1,04
typical values
C_d (T_j)
C_d (T_j = 25 °C)
V_R = 3 V
1,02
12 V
25 V
1
0,98
0
50
T_j (°C)
100


7Z69409.1
10^{-2}
η = temperature coefficient of
the diode capacitance
T_{amb} = 0 to 85 °C
η
(pF/pF / °C)
10^{-3}
typ
10^{-4}
10^{-5}
1
10
V_R (V)
10^2


7Z77031
BB205A
f = 500 kHz
T_j = 25 °C
C_d (pF)
max
typ
min
30
20
10
0
10^{-1}
1
10
10^2
V_R (V)


7Z77032
BB205B
f = 500 kHz
T_j = 25 °C
C_d (pF)
max
typ
min
30
20
10
0
10^{-1}
1
10
10^2
V_R (V)


7Z77033
BB205G
f = 500 kHz
T_j = 25 °C
C_d (pF)
max
typ
min
30
20
10
0
10^{-1}
1
10
10^2
V_R (V)

INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	part	section	type no.	part	section	type no.	part	section
AA119	1b	PC	ASY74	3	Sw	BAV19	1b	WD
AAZ15	1b	GB	ASY75	3	Sw	BAV20	1b	WD
AAZ17	1b	GB	ASZ15	2	P	BAV21	1b	WD
AAZ18	1b	GB	ASZ16	2	P	BAV45	1b	Sp
AC125	2	LF	ASZ17	2	P	BAV70	4a	Mm
AC126	2	LF	ASZ18	2	P	BAV99	4a	Mm
AC127	2	LF	BA100	1b	AD	BAW21A	1b	WD
AC128	2	LF	BA102	1b	T	BAW21B	1b	WD
AC128/01	2	LF	BA145	1a	R	BAW56	4a	Mm
AC132	2	LF	BA148	1a	R	BAW62	1b	WD
AC187	2	LF	BA182	1b	T	BAX12	1b	WD
AC187/01	2	LF	BA216	1b	WD	BAX12A	1b	WD
AC188	2	LF	BA217	1b	WD	BAX13	1b	WD
AC188/01	2	LF	BA218	1b	WD	BAX14	1b	WD
AD161	2	P	BA219	1b	WD	BAX14A	1b	WD
AD162	2	P	BA220	1b	WD	BAX15	1b	WD
AF124	3	HF	BA221	1b	WD	BAX16	1b	WD
AF125	3	HF	BA222	1b	WD	BAX17	1b	WD
AF126	3	HF	BA243	1b	T	BAX18	1b	WD
AF127	3	HF	BA244	1b	T	BAX18A	1b	WD
AF139	3	HF	BA280	1b	T	BB105A	1b	T
AF239	3	HF	BA314	1b	Vrg	BB105B	1b	T
AF239S	3	HF	BA314A	1b	Vrg	BB105G	1b	T
AF367	3	HF	BA315	1b	Vrg	BB106	1b	T
AF369	3	HF	BA316	1b	WD	BB110B	1b	T
ASY26	3	Sw	BA317	1b	WD	BB110G	1b	T
ASY27	3	Sw	BA318	1b	WD	BB117	1b	T
ASY28	3	Sw	BA379	1b	T	BB119	1b	T
ASY29	3	Sw	BAV10	1b	WD	BB204B	1b	T
ASY73	3	Sw	BAV18	1b	WD	BB204G	1b	T

AD = Silicon alloyed diodes
GB = Germanium gold bonded diodes
HF = High-frequency transistors
LF = Low frequency transistors
Mm = Microminiature devices for thick and thin-film circuits
P = Low-frequency power transistors
PC = Germanium point contact diodes
R = Rectifier diodes
Sp = Special diodes
Sw = Switching transistors
T = Tuner diodes
Vrg = Voltage regulator diodes
WD = Silicon whiskerless diodes

type no.	part	section	type no.	part	section	type no.	part	section
BB205A	1b	T	BC557	2	LF	BD131	2	P
BB205B	1b	T	BC558	2	LF	BD132	2	P
BB205G	1b	T	BC559	2	LF	BD133	2	P
BBY31	4a	Mm	BC560	2	LF	BD135	2	P
BC107	2	LF	BC635	2	LF	BD136	2	P
BC108	2	LF	BC636	2	LF	BD137	2	P
BC109	2	LF	BC637	2	LF	BD138	2	P
BC146	2	LF	BC638	2	LF	BD139	2	P
BC147	2	LF	BC639	2	LF	BD140	2	P
BC148	2	LF	BC640	2	LF	BD181	2	P
BC149	2	LF	BCW29	4a	Mm	BD182	2	P
BC157	2	LF	BCW30	4a	Mm	BD183	2	P
BC158	2	LF	BCW31	4a	Mm	BD201	2	P
BC159	2	LF	BCW32	4a	Mm	BD202	2	P
BC177	2	LF	BCW33	4a	Mm	BD203	2	P
BC178	2	LF	BCW69	4a	Mm	BD204	2	P
BC179	2	LF	BCW70	4a	Mm	BD226	2	P
BC200	2	LF	BCW71	4a	Mm	BD227	2	P
BC264A	4a	FET	BCW72	4a	Mm	BD228	2	P
BC264B	4a	FET	BCX17	4a	Mm	BD229	2	P
BC264C	4a	FET	BCX18	4a	Mm	BD230	2	P
BC264D	4a	FET	BCX19	4a	Mm	BD231	2	P
BC327	2	LF	BCX20	4a	Mm	BD232	2	P
BC328	2	LF	BCY30A	2	LF	BD233	2	P
BC337	2	LF	BCY31A	2	LF	BD234	2	P
BC338	2	LF	BCY32A	2	LF	BD235	2	P
BC368	2	LF	BCY33A	2	LF	BD236	2	P
BC369	2	LF	BCY34A	2	LF	BD237	2	P
BC407	2	LF	BCY55	4a	DT	BD238	2	P
BC408	2	LF	BCY56	2	LF	BD262	2	P
BC409	2	LF	BCY57	2	LF	BD262A	2	P
BC417	2	LF	BCY58	2	LF	BD262B	2	P
BC418	2	LF	BCY59	2	LF	BD263	2	P
BC419	2	LF	BCY70	2	LF	BD263A	2	P
BC546	2	LF	BCY71	2	LF	BD263B	2	P
BC547	2	LF	BCY72	2	LF	BD291	2	P
BC548	2	LF	BCY87	4a	DT	BD292	2	P
BC549	2	LF	BCY88	4a	DT	BD293	2	P
BC550	2	LF	BCY89	4a	DT	BD294	2	P
BC556	2	LF	BD115	2	P	BD329	2	P

DT = Dual transistors
FET = Field-effect transistors
LF = Low-frequency transistors
Mm = Microminiature devices for thick and thin-film circuits
P = Low-frequency power transistors
T = Tuner diodes

type no.	part	section	type no.	part	section	type no.	part	section
BD330	2	P	BDX66A	2	P	BF240	3	HF
BD331	2	P	BDX66B	2	P	BF241	3	HF
BD332	2	P	BDX67	2	P	BF244A	4a	FET
BD333	2	P	BDX67A	2	P	BF244B	4a	FET
BD334	2	P	BDX67B	2	P	BF244C	4a	FET
BD335	2	P	BDX77	2	P	BF245A	4a	FET
BD336	2	P	BDX78	2	P	BF245B	4a	FET
BD433	2	P	BDX91	2	P	BF245C	4a	FET
BD434	2	P	BDX92	2	P	BF256A	4a	FET
BD435	2	P	BDX93	2	P	BF256B	4a	FET
BD436	2	P	BDX94	2	P	BF256C	4a	FET
BD437	2	P	BDX95	2	P	BF324	3	HF
BD438	2	P	BDX96	2	P	BF336	3	HF
BD645	2	P	BDY20	2	P	BF337	3	HF
BD646	2	P	BDY90	2	P	BF338	3	HF
BD647	2	P	BDY91	2	P	BF362	3	HF
BD648	2	P	BDY92	2	P	BF363	3	HF
BD649	2	P	BDY93	2	P	BF422	3	HF
BD650	2	P	BDY94	2	P	BF423	3	HF
BD675	2	P	BDY96	2	P	BF450	3	HF
BD676	2	P	BDY97	2	P	BF451	3	HF
BD677	2	P	BF115	3	HF	BF457	3	HF
BD678	2	P	BF167	3	HF	BF458	3	HF
BD679	2	P	BF173	3	HF	BF459	3	HF
BD680	2	P	BF177	3	HF	BF480	3	HF
BD681	2	P	BF178	3	HF	BF494	3	HF
BD682	2	P	BF179	3	HF	BF495	3	HF
BDX62	2	P	BF180	3	HF	BFQ10	4a	FET
BDX62A	2	P	BF181	3	HF	BFQ11	4a	FET
BDX62B	2	P	BF182	3	HF	BFQ12	4a	FET
BDX63	2	P	BF183	3	HF	BFQ13	4a	FET
BDX63A	2	P	BF184	3	HF	BFQ14	4a	FET
BDX63B	2	P	BF185	3	HF	BFQ15	4a	FET
BDX64	2	P	BF194	3	HF	BFQ16	4a	FET
BDX64A	2	P	BF195	3	HF	BFR29	4a	FET
BDX64B	2	P	BF196	3	HF	BFR30	4a	Mm
BDX65	2	P	BF197	3	HF	BFR31	4a	Mm
BDX65A	2	P	BF198	3	HF	BFR53	4a	Mm
BDX65B	2	P	BF199	3	HF	BFR64	3	HF
BDX66	2	P	BF200	3	HF	BFR65	3	HF

FET = Field-effect transistors
HF = High-frequency transistors

Mm = Microminiature devices for thick and thin-film circuits
P = Low-frequency power transistors

type no.	part	section	type no.	part	section	type no.	part	section
BFR84	4a	FET	BG1895-641	1a	R	BRY39	1a	Th
BFR90	3	HF	BLW60	4a	Tra	BRY39(SCS)	3	Sw
BFR91	3	HF	BLW64	4a	Tra	BRY39(PUT)	3	Sw
BFR92	4a	Mm	BLW75	4a	Tra	BSS38	3	Sw
BFR93	4a	Mm	BLX13	4a	Tra	BSS40	3	Sw
BFR94	3	HF	BLX14	4a	Tra	BSS41	3	Sw
BFS17	4a	Mm	BLX15	4a	Tra	BSS50	3	Sw
BFS18	4a	Mm	BLX65	4a	Tra	BSS51	3	Sw
BFS19	4a	Mm	BLX66	4a	Tra	BSS52	3	Sw
BFS20	4a	Mm	BLX67	4a	Tra	BSS68	3	Sw
BFS21	4a	FET	BLX68	4a	Tra	BSV15	3	Sw
BFS21A	4a	FET	BLX69A	4a	Tra	BSV16	3	Sw
BFS22A	4a	Tra	BLX91A	4a	Tra	BSV17	3	Sw
BFS23A	4a	Tra	BLX92A	4a	Tra	BSV52	4a	Mm
BFS28	4a	FET	BLX93A	4a	Tra	BSV64	3	Sw
BFS92	3	HF	BLX94A	4a	Tra	BSV78	4a	FET
BFS93	3	HF	BLX95	4a	Tra	BSV79	4a	FET
BFS94	3	HF	BLX96	4a	Tra	BSV80	4a	FET
BFS95	3	HF	BLX97	4a	Tra	BSV81	4a	FET
BFT24	3	HF	BLX98	4a	Tra	BSW41	3	Sw
BFT25	4a	Mm	BLY87A	4a	Tra	BSW66	3	Sw
BFW10	4a	FET	BLY88A	4a	Tra	BSW67	3	Sw
BFW11	4a	FET	BLY89A	4a	Tra	BSW68	3	Sw
BFW12	4a	FET	BLY90	4a	Tra	BSX19	3	Sw
BFW13	4a	FET	BLY91A	4a	Tra	BSX20	3	Sw
BFW16A	3	HF	BLY92A	4a	Tra	BSX21	3	Sw
BFW17A	3	HF	BLY93A	4a	Tra	BSX59	3	Sw
BFW30	3	HF	BLY94	4a	Tra	BSX60	3	Sw
BFW45	3	HF	BPW22	4b	PDT	BSX61	3	Sw
BFW61	4a	FET	BPX25; 29	4b	PDT	BT126	1a	Th
BFW92	3	HF	BPX40	4b	PDT	BT128 series	1a	Th
BFW93	3	HF	BPX41	4b	PDT	BT129 series	1a	Th
BFX34	3	Sw	BPX42	4b	PDT	BTW23 series	1a	Th
BFX89	3	HF	BPX70	4b	PDT	BTW24 series	1a	Th
BFY50	3	HF	BPX71	4b	PDT	BTW30 series	1a	Th
BFY51	3	HF	BPX72	4b	PDT	BTW31 series	1a	Th
BFY52	3	HF	BPX94	4b	PDT	BTW32 series	1a	Th
BFY55	3	HF	BPX95	4b	PDT	BTW33 series	1a	Th
BFY90	3	HF	BR100	1a	Th	BTW34 series	1a	Tri
BG1895-541	1a	R	BR101	3	Sw	BTW38 series	1a	Th

FET = Field-effect transistors
HF = High-frequency transistors
Mm = Microminiature devices for thick and thin-film circuits
PDT = Photodiodes or transistors

R = Rectifier diodes
Sw = Switching transistors
Th = Thyristors, diacs
Tra = Transmitting transistors
Tri = Triacs

type no.	part	section	type no.	part	section	type no.	part	section
BTW40 series	1a	Th	BYX25 series	1a	R	BZX84 series	4a	Mm
BTW42 series	1a	Th	BYX29 series	1a	R	BZX87 series	1b	Vrg
BTW43 series	1a	Tri	BYX30 series	1a	R	BZX90	1b	Vrf
BTW45 series	1a	Th	BYX32 series	1a	R	BZX91	1b	Vrf
BTW47 series	1a	Th	BYX35	1a	R	BZX92	1b	Vrf
BTW92 series	1a	Th	BYX36 series	1a	R	BZX93	1b	Vrf
BTX18 series	1a	Th	BYX38 series	1a	R	BZY78	1b	Vrf
BTX94 series	1a	Tri	BYX39 series	1a	R	BZY88 series	1b	Vrg
BTX95 series	1a	Th	BYX42 series	1a	R	BZY91 series	1a	Vrg
BTY79 series	1a	Th	BYX45 series	1a	R	BZY93 series	1a	Vrg
BTY87 series	1a	Th	BYX46 series	1a	R	BZY95 series	1a	Vrg
BTY91 series	1a	Th	BYX48 series	1a	R	BZY96 series	1a	Vrg
BU105	2	P	BYX49 series	1a	R	BZZ14	1a	Vrg
BU108	2	P	BYX50 series	1a	R	BZZ15	1a	Vrg
BU126	2	P	BYX52 series	1a	R	BZZ16	1a	Vrg
BU132	2	P	BYX55 series	1a	R	BZZ17	1a	Vrg
BU133	2	P	BYX56 series	1a	R	BZZ18	1a	Vrg
BU204	2	P	BYX71 series	1a	R	BZZ19	1a	Vrg
BU205	2	P	BYX90	1a	R	BZZ20	1a	Vrg
BU206	2	P	BYX91 series	1a	R	BZZ21	1a	Vrg
BU207A	2	P	BYX96 series	1a	R	BZZ22	1a	Vrg
BU208A	2	P	BYX97 series	1a	R	BZZ23	1a	Vrg
BU209A	2	P	BYX98 series	1a	R	BZZ24	1a	Vrg
BY126	1a	R	BYX99 series	1a	R	BZZ25	1a	Vrg
BY127	1a	R	BZV10	1b	Vrf	BZZ26	1a	Vrg
BY164	1a	R	BZV11	1b	Vrf	BZZ27	1a	Vrg
BY176	1a	R	BZV12	1b	Vrf	BZZ28	1a	Vrg
BY179	1a	R	BZV13	1b	Vrf	BZZ29	1a	Vrg
BY184	1a	R	BZV14	1b	Vrf	CNY22	4b	PhC
BY187	1a	R	BZV15 series	1a	Vrg	CNY23	4b	PhC
BY188 series	1a	R	BZV38	1b	Vrf	CNY42	4b	PhC
BY206	1a	R	BZW70 series	1a	TS	CNY43	4b	PhC
BY207	1a	R	BZW86 series	1a	TS	CNY44	4b	PhC
BY208 series	1a	R	BZW91 series	1a	TS	CNY46	4b	PhC
BY209	1a	R	BZW93 series	1a	TS	CNY47	4b	PhC
BY223	1a	R	BZX55 series	1b	Vrg	CNY47A	4b	PhC
BY409	1a	R	BZX61 series	1b	Vrg	CNY48	4b	PhC
BY476	1a	R	BZX70 series	1a	Vrg	CQY11B	4b	LED
BYX10	1a	R	BZX75 series	1b	Vrg	CQY11C	4b	LED
BYX22 series	1a	R	BZX79 series	1b	Vrg	CQY24A	4b	LED

LED = Light emitting diodes
Mm = Microminiature devices for thick and thin-film circuits
P = Low-frequency power transistors
PhC = Photocouplers
R = Rectifier diodes
Th = Thyristors, diacs
Tri = Triacs
TS = Transient suppressor diodes
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes

type no.	part	section	type no.	part	section	type no.	part	section
CQY46	4b	LED	OSS9310	1a	St	1N5739B	1b	Vrg
CQY47	4b	LED	OSS9410	1a	St	1N5740B	1b	Vrg
CQY49B	4b	LED	RPY18	4b	Ph	1N5741B	1b	Vrg
CQY49C	4b	LED	RPY19	4b	Ph	1N5742B	1b	Vrg
CQY50	4b	LED	RPY20	4b	Ph	1N5743B	1b	Vrg
CQY52	4b	LED	RPY33	4b	Ph	1N5744B	1b	Vrg
CQY53	4b	LED	RPY55	4b	Ph	1N5745B	1b	Vrg
CQY54	4b	LED	RPY58A	4b	Ph	1N5746B	1b	Vrg
CQY58	4b	LED	RPY71	4b	Ph	1N5747B	1b	Vrg
CQY79	4b	LED	RPY76A	4b	I	1N5748B	1b	Vrg
CQY81	4b	D	RPY82	4b	Ph	1N5749B	1b	Vrg
CQY81A	4b	D	RPY84	4b	Ph	1N5750B	1b	Vrg
CQY84	4b	D	RPY85	4b	Ph	1N5751B	1b	Vrg
CQY88	4b	LED	1N821	1b	Vrf	1N5752B	1b	Vrg
OA47	1b	GB	1N823	1b	Vrf	1N5753B	1b	Vrg
OA90	1b	PC	1N825	1b	Vrf	1N5754B	1b	Vrg
OA91	1b	PC	1N827	1b	Vrf	1N5755B	1b	Vrg
OA95	1b	PC	1N829	1b	Vrf	1N5756B	1b	Vrg
OA200	1b	AD	1N914	1b	WD	1N5757B	1b	Vrg
OA202	1b	AD	1N914A	1b	WD	2N918	3	HF
ORP10	4b	I	1N916	1b	WD	2N929	2	LF
ORP13	4b	I	1N916A	1b	WD	2N930	2	LF
ORP23	4b	Ph	1N916B	1b	WD	2N1302	3	Sw
ORP52	4b	Ph	1N4009	1b	WD	2N1303	3	Sw
ORP60	4b	Ph	1N4148	1b	WD	2N1304	3	Sw
ORP61	4b	Ph	1N4150	1b	WD	2N1305	3	Sw
ORP62	4b	Ph	1N4151	1b	WD	2N1306	3	Sw
ORP66	4b	Ph	1N4154	1b	WD	2N1307	3	Sw
ORP68	4b	Ph	1N4446	1b	WD	2N1308	3	Sw
ORP69	4b	Ph	1N4448	1b	WD	2N1309	3	Sw
OSB9110	1a	St	1N5729B	1b	Vrg	2N1613	3	HF
OSB9210	1a	St	1N5730B	1b	Vrg	2N1711	3	HF
OSB9310	1a	St	1N5731B	1b	Vrg	2N1893	3	HF
OSB9410	1a	St	1N5732B	1b	Vrg	2N2218	3	Sw
OSM9110	1a	St	1N5733B	1b	Vrg	2N2218A	3	Sw
OSM9210	1a	St	1N5734B	1b	Vrg	2N2219	3	Sw
OSM9310	1a	St	1N5735B	1b	Vrg	2N2219A	3	Sw
OSM9410	1a	St	1N5736B	1b	Vrg	2N2221	3	Sw
OSS9110	1a	St	1N5737B	1b	Vrg	2N2221A	3	Sw
OSS9210	1a	St	1N5738B	1b	Vrg	2N2222	3	Sw

AD = Silicon alloyed diodes
D = Display
GB = Germanium gold bonded diodes
HF = High-frequency transistors
I = Infrared devices
LED = Light emitting diodes
LF = Low-frequency transistors

PC = Germanium point contact diodes
Ph = Photoconductive devices
St = Rectifier stacks
Sw = Switching transistors
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes
WD = Silicon whiskerless diodes

type no.	part	section	type no.	part	section	type no.	part	section
2N2222A	3	Sw	2N4347	2	P	56268	1a	DH
2N2297	3	HF	2N4391	4a	FET	56271	1a	DH
2N2368	3	Sw	2N4392	4a	FET	56278	1a	DH
2N2369	3	Sw	2N4393	4a	FET	56280	1a	DH
2N2369A	3	Sw	2N4427	4a	Tra	56290	1a	HE
2N2483	3	HF	2N4856	4a	FET	56293	1a	HE
2N2484	3	HF	2N4857	4a	FET	56295	1a	A
2N2894	3	Sw	2N4858	4a	FET	56299	1a	A
2N2894A	3	Sw	2N4859	4a	FET	56309B	1a	A
2N2904	3	Sw	2N4860	4a	FET	56309R	1a	A
2N2904A	3	Sw	2N4861	4a	FET	56312	1a	DH
2N2905	3	Sw	61SV	4b	I	56313	1a	DH
2N2905A	3	Sw	40809	2	LF	56314	1a	DH
2N2906	3	Sw	40820	3	HF	56315	1a	DH
2N2906A	3	Sw	40835	3	HF	56316	1a	A
2N2907	3	Sw	40838	3	HF	56318	1a	DH
2N2907A	3	Sw	56200	2,3,4a	A	56319	1a	DH
2N3019	3	Sw	56201	2	A	56326	2,3	A
2N3020	3	Sw	56201c	2	A	56333	2,3	A
2N3055	2	P	56201d	2	A	56334	1a	DH
2N3375	4a	Tra	56203	2	A	56337	1a	A
2N3442	2	P	56218	2,3,4a	A	56339	2	A
2N3553	4a	Tra	56230	1a	HE	56348	1a	DH
2N3632	4a	Tra	56231	1a	HE	56349	1a	DH
2N3819	4a	FET	56233	1a	A	56350	1a	DH
2N3823	4a	FET	56234	1a	A	56351	2	A
2N3866	4a	Tra	56239	2	A	56352	2	A
2N3924	4a	Tra	56245	2,3,4a	A	56353	2	A
2N3926	4a	Tra	56246	1a to 4a	A	56354	2	A
2N3927	4a	Tra	56253	1a	DH	56356	2,3	A
2N3966	4a	FET	56256	1a	DH	56359	2	A
2N4036	3	Sw	56261	2	A	56360	2	A
2N4091	4a	FET	56262A	1a	A			
2N4092	4a	FET	56263	1a to 4a	A			
2N4093	4a	FET	56264A	1a	A			

A = Accessories
DH = Diecast heatsinks
FET = Field-effect transistors
HE = Heatsink extrusions
HF = High-frequency transistors
I = Infrared devices
LF = Low-frequency transistors
P = Low-frequency power transistors
Sw = Switching transistors
Tra = Transmitting transistors

MAINTENANCE TYPE LIST

The type numbers listed below are included in this handbook.
Detailed information will be supplied on request.

BA100; BA222; OA200; OA202

General		
Germanium	small signal diodes	(point contact)
		(gold bonded)
Silicon	small signal diodes	(alloyed)
		(whiskerless)
	special diodes	
	voltage regulator diodes	
	voltage reference diodes	
	tuner diodes	
Index and maintenance type list		

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