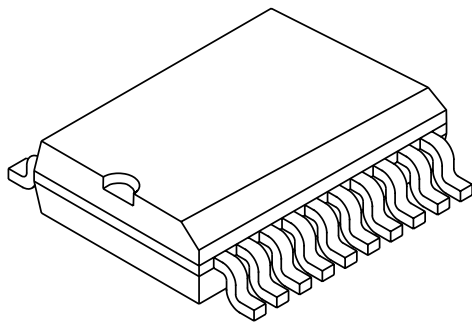


DATA SHEET



BZA109 9-fold ESD transient voltage suppressor

Product specification
Supersedes data of 1997 Oct 27
File under Discrete Semiconductors, SC01

1997 Dec 01

9-fold ESD transient voltage suppressor

BZA109

FEATURES

- ESD rating >8 kV, according to IEC1000-4-2
- SOT163-1 surface mount package
- Common anode configuration
- Non-clamping range 0.5 to 6.8 V
- Maximum non-repetitive peak reverse power dissipation: 25 W at $t_p = 1$ ms
- Maximum clamping voltage at peak pulse current: 10 V at $I_{ZSM} = 2.5$ A.

APPLICATIONS

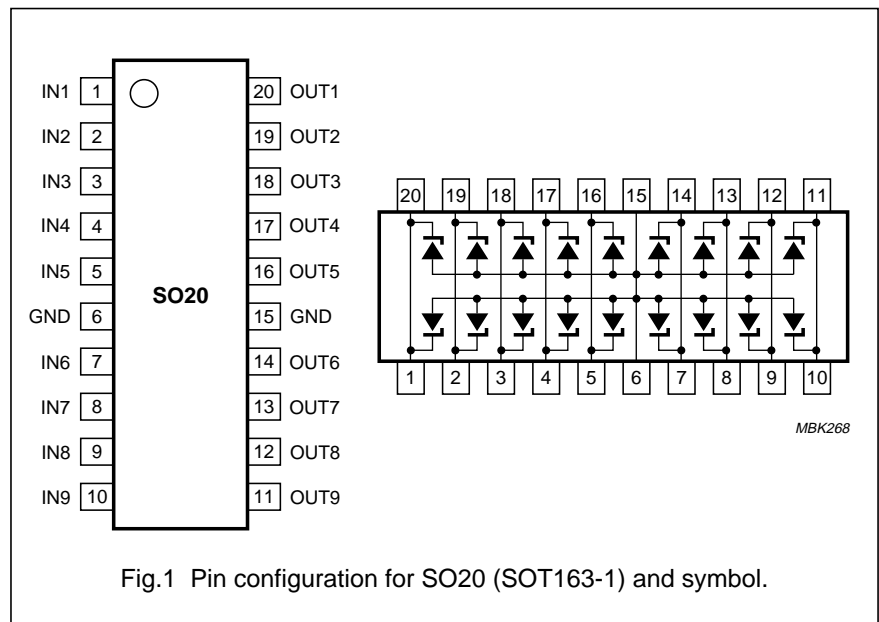
- For 9-bit wide undershoot/overshoot clamping and fast ESD transient suppression in:
 - Computers and peripherals
 - Audio and video equipment
 - Business machines
 - Communication systems
 - Medical equipment.

DESCRIPTION

9-fold monolithic transient voltage suppressor in an SO20; SOT163-1 surface mount package. The device is ideal in situations where board space is a premium.

PINNING

PIN	DESCRIPTION
1 to 5	input (IN1 to IN5)
6 and 15	common anode (GND)
7 to 10	input (IN6 to IN9)
11 to 14	output (OUT9 to OUT6)
16 to 20	output (OUT5 to OUT1)



LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per diode					
I_Z	working current	$T_{amb} = 25$ °C	–	20	mA
I_F	continuous forward current	$T_{amb} = 25$ °C	–	100	mA
I_{FT}	feed-through current	$T_{amb} = 25$ °C; note 1	–	100	mA
I_{FSM}	non-repetitive peak forward current	$t_p = 1$ ms; square pulse	–	4.5	A
I_{ZSM}	non-repetitive peak reverse current	$t_p = 1$ ms; square pulse; see Fig.2	–	2.5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C; note 2; see Fig.3	–	1.25	W
P_{ZSM}	non-repetitive peak reverse power dissipation	$t_p = 1$ ms; square pulse; see Fig.4	–	25	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–65	+150	°C

Notes

1. Current is flowing from input to corresponding output.
2. One or more diodes loaded.

9-fold ESD transient voltage suppressor

BZA109

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	one or more diodes loaded	100	K/W

ELECTRICAL CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Per diode						
V_Z	working voltage	$I_Z = 250\ \mu\text{A}$	6.4	6.8	7.2	V
V_F	forward voltage	$I_F = 100\ \text{mA}$	–	–	1.1	V
V_{ZSM}	non-repetitive peak reverse voltage	$I_{ZSM} = 2.5\ \text{A}; t_p = 1\ \text{ms}$	–	–	10	V
I_H	input high current	$V_{IN} = 5.25\ \text{V}$	–	–	0.5	μA
r_{dif}	differential resistance	$I_Z = 250\ \mu\text{A}$	–	–	100	Ω
S_Z	temperature coefficient of working voltage	$I_Z = 5\ \text{mA}$	–	3	–	mV/K
C_d	diode capacitance	see Fig.5 $V_R = 0; f = 1\ \text{MHz}$	–	–	200	pF
		$V_R = 5.25\ \text{V}; f = 1\ \text{MHz}$	–	–	100	pF

9-fold ESD transient voltage suppressor

BZA109

GRAPHICAL DATA

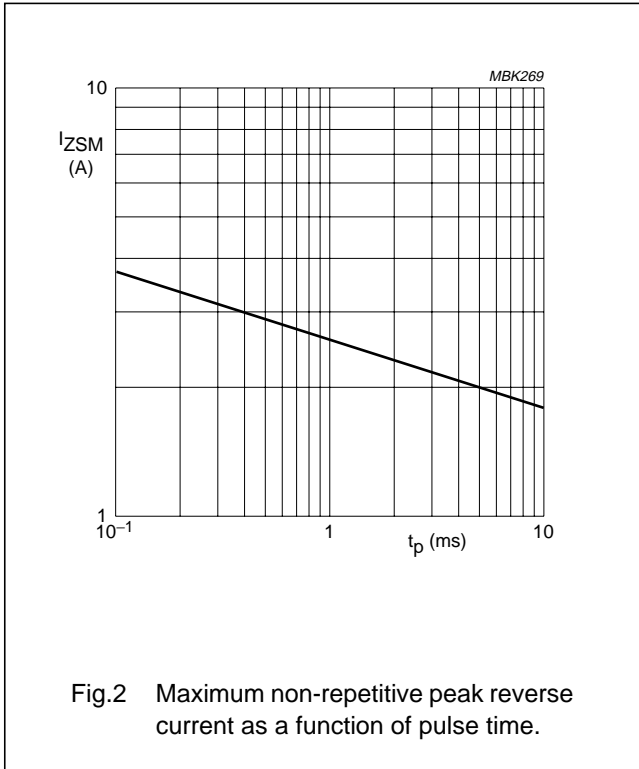
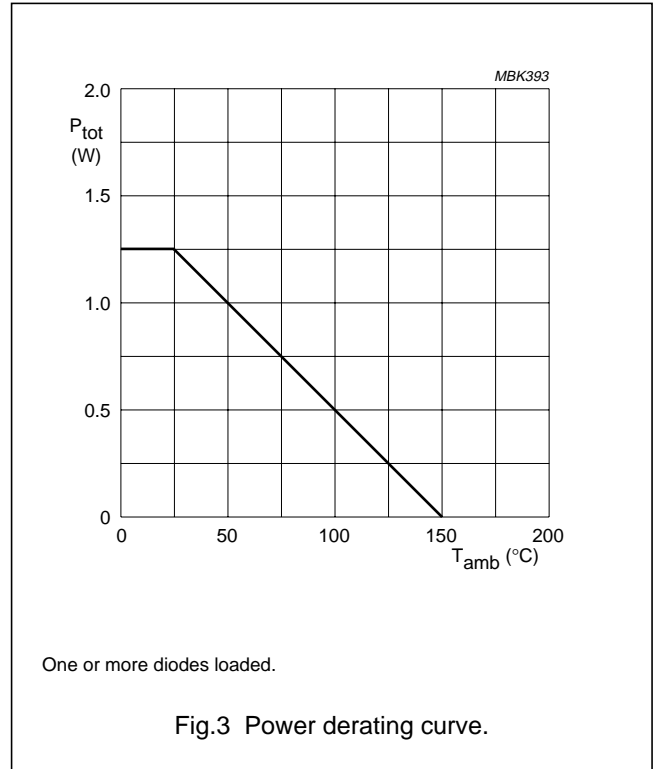


Fig.2 Maximum non-repetitive peak reverse current as a function of pulse time.



One or more diodes loaded.

Fig.3 Power derating curve.

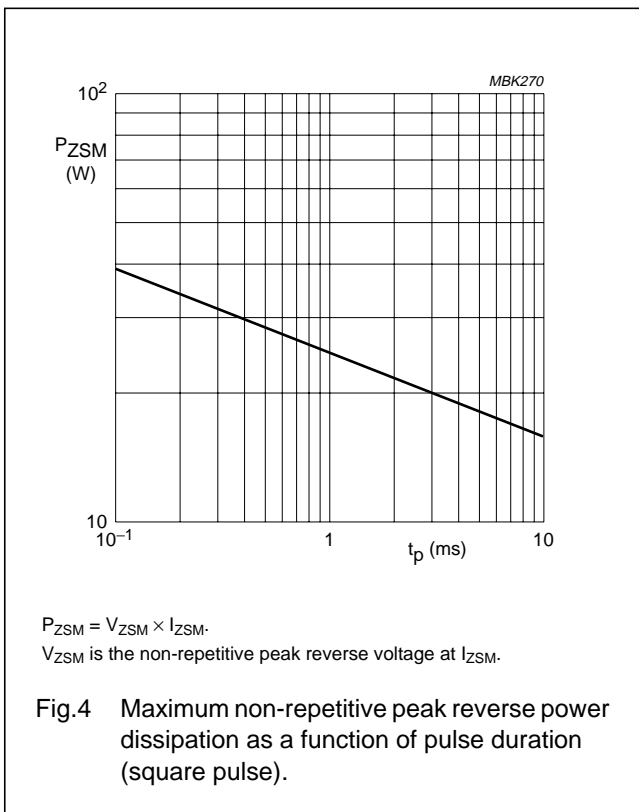


Fig.4 Maximum non-repetitive peak reverse power dissipation as a function of pulse duration (square pulse).

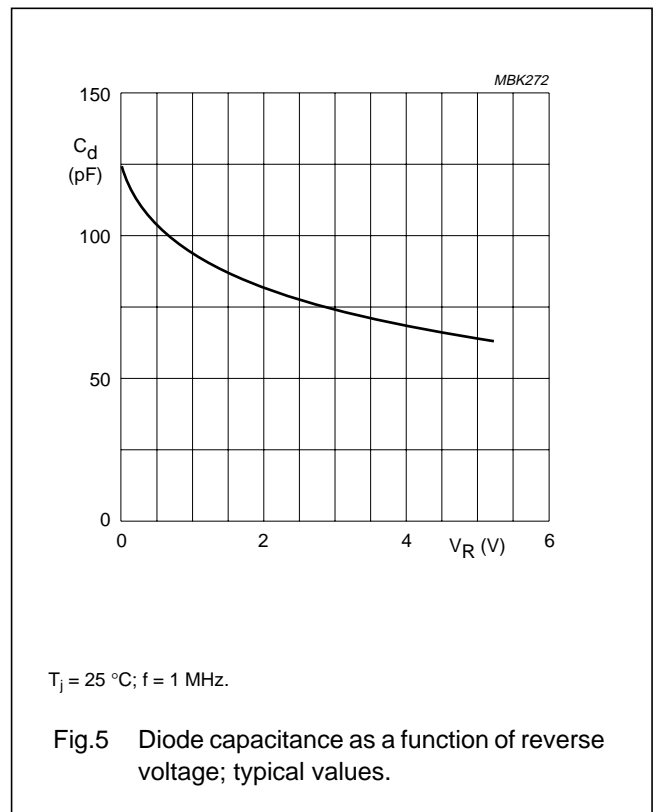
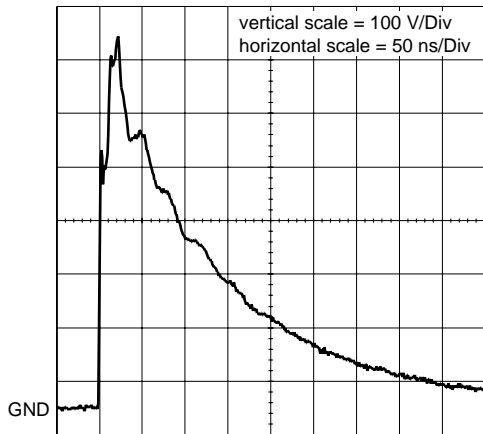
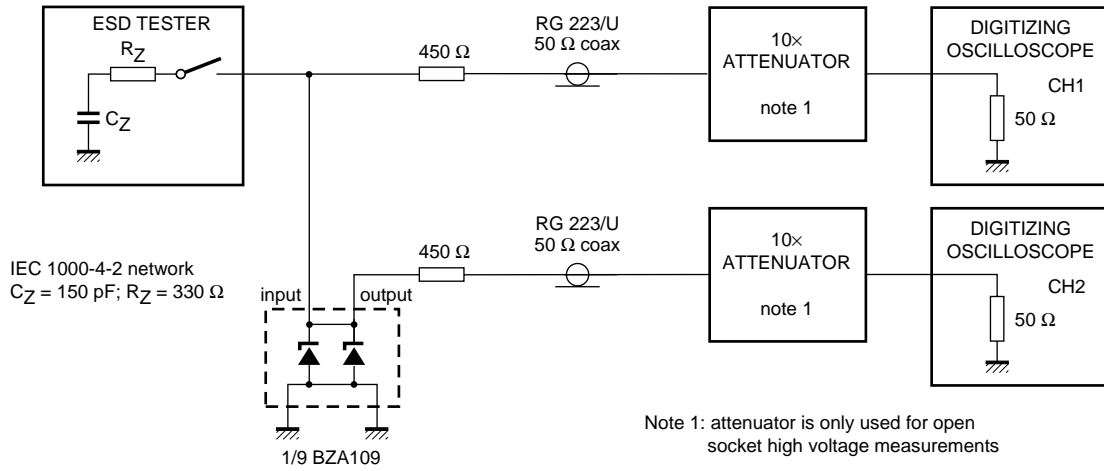


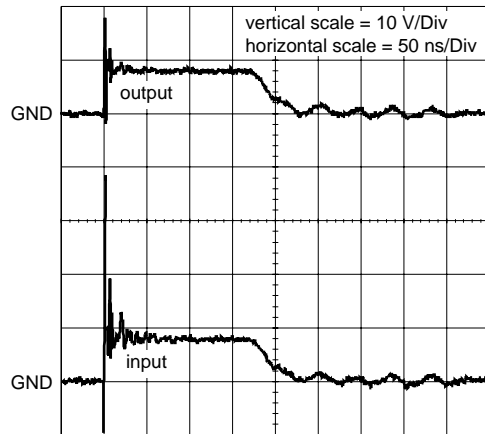
Fig.5 Diode capacitance as a function of reverse voltage; typical values.

9-fold ESD transient voltage suppressor

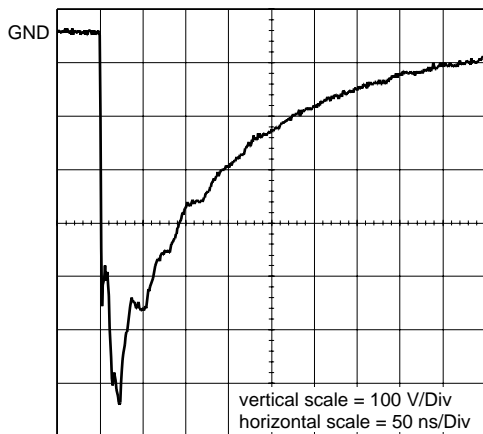
BZA109



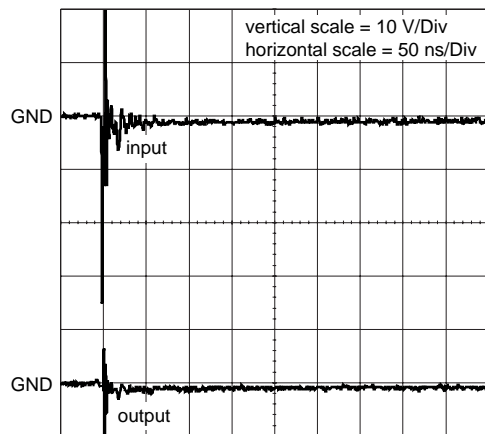
unclamped +1 kV ESD voltage waveform (IEC1000-4-2 network)



clamped +1 kV ESD voltage waveform (IEC1000-4-2 network)



unclamped -1 kV ESD voltage waveform (IEC1000-4-2 network)



clamped -1 kV ESD voltage waveform (IEC1000-4-2 network)

MBK273

Fig.6 ESD clamping test set-up and waveforms.

9-fold ESD transient voltage suppressor

BZA109

APPLICATION INFORMATION

Typical common anode application

A 9-fold transient suppressor in an SO20; SOT163-1 package makes it possible to protect nine separate lines using only one package. Two simplified examples are shown in Figs 7 and 8.

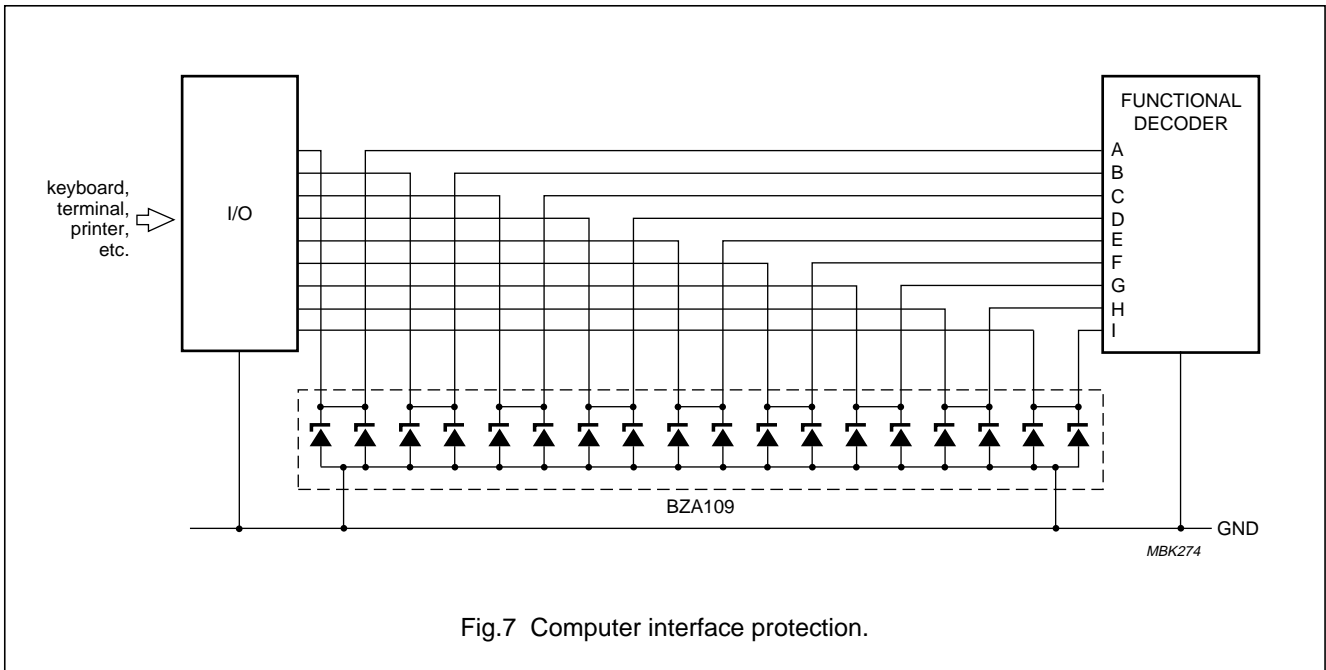


Fig.7 Computer interface protection.

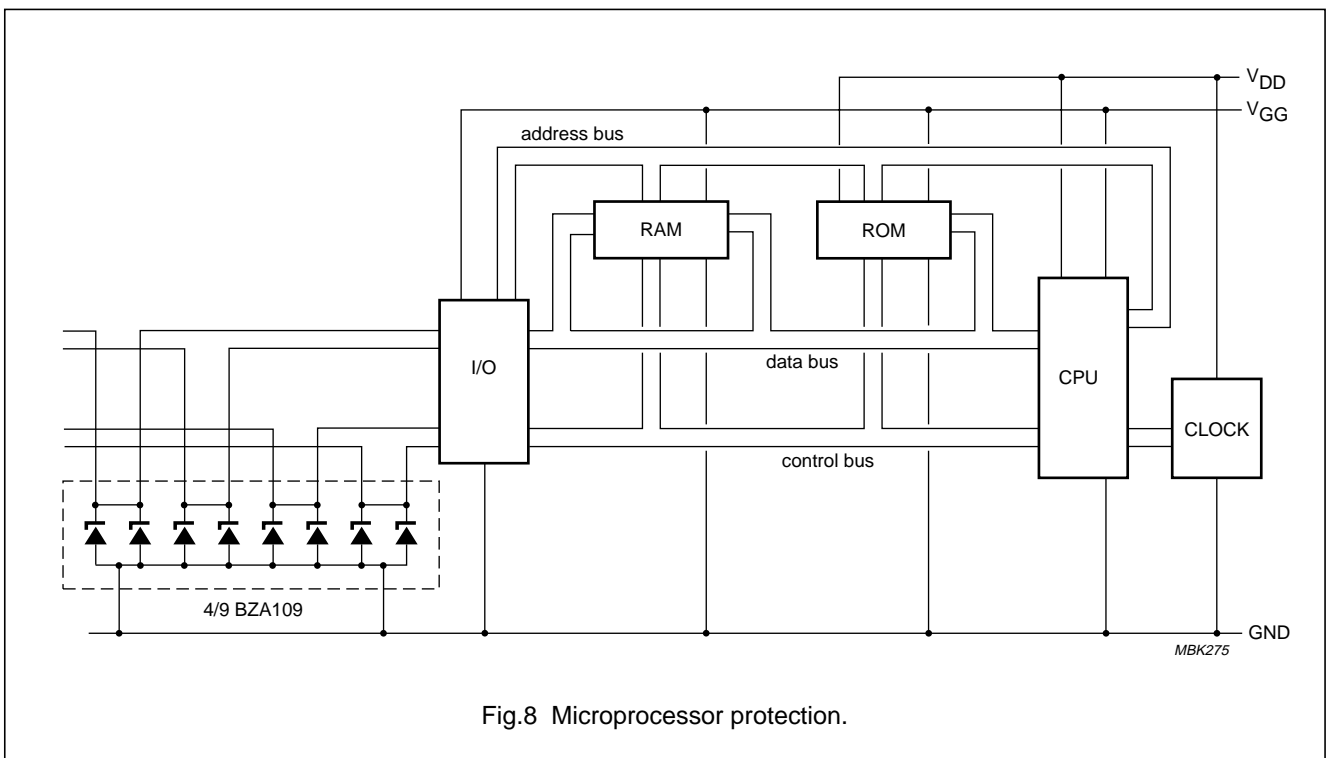


Fig.8 Microprocessor protection.

9-fold ESD transient voltage suppressor

BZA109

Device placement and printed-circuit board layout

Circuit board layout is of extreme importance in the suppression of transients. The clamping voltage of the BZA109 is determined by the peak transient current and the rate of rise of that current (di/dt). Since parasitic inductances can further add to the clamping voltage ($V = L di/dt$) the series conductor lengths on the printed-circuit board should be kept to a minimum. This includes the lead length of the suppression element.

In addition to minimizing conductor length the following printed-circuit board layout guidelines are recommended:

1. Place the suppression element close to the input terminals or connectors.
2. Keep parallel signal paths to a minimum.
3. Avoid running protection conductors in parallel with unprotected conductors.
4. Minimize all printed-circuit board loop areas including power and ground loops.
5. Minimize the length of the transient return path to ground.
6. Avoid using shared transient return paths to a common ground point.

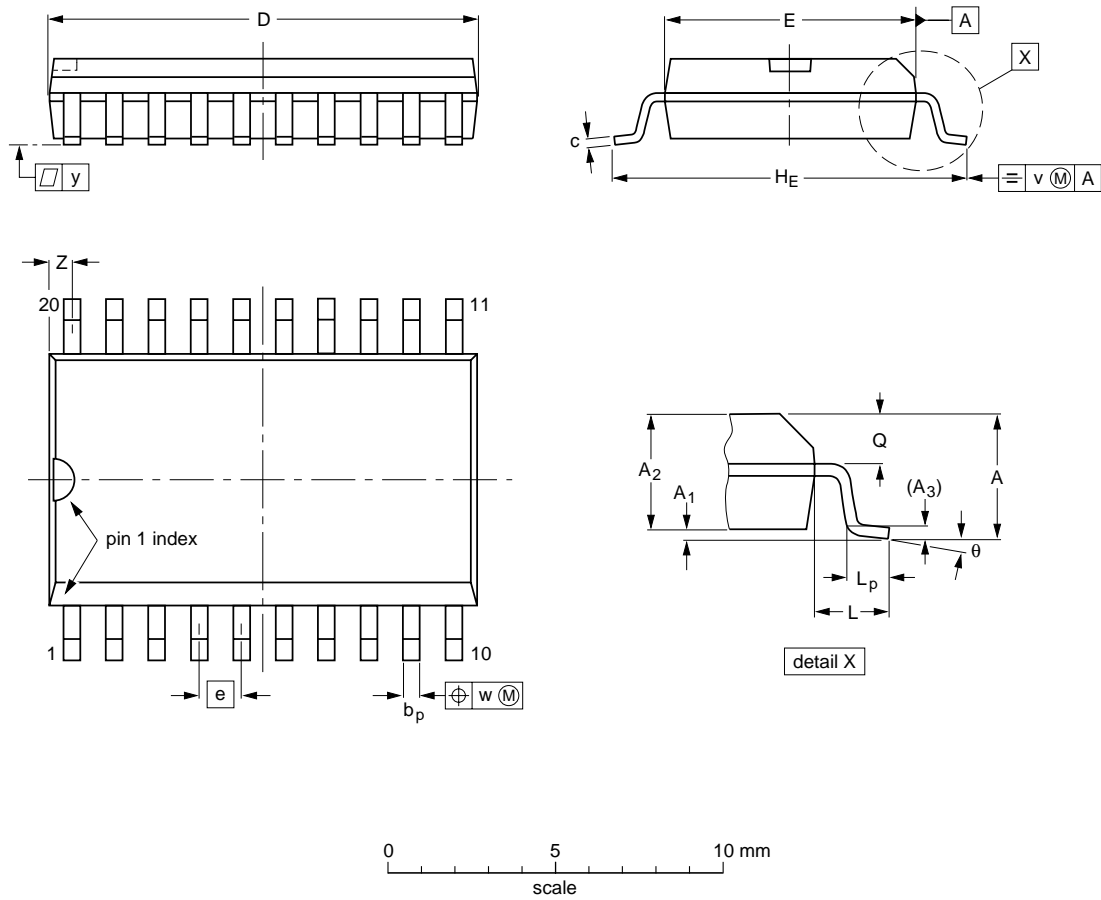
9-fold ESD transient voltage suppressor

BZA109

PACKAGE OUTLINE

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT163-1	075E04	MS-013AC			95-01-24 97-05-22

9-fold ESD transient voltage suppressor

BZA109

DEFINITIONS

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

LIFE SUPPORT APPLICATIONS

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

9-fold ESD transient voltage suppressor

BZA109

NOTES

9-fold ESD transient voltage suppressor

BZA109

NOTES

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213, Tel. +43 160 1010,
Fax. +43 160 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 0044

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615800, Fax. +358 9 61580920

France: 51 Rue Carnot, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Band Box Building, 2nd floor,
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,
Tel. +91 22 493 8541, Fax. +91 22 493 0966

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 755 6918, Fax. +7 095 755 6919

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231,
Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Al. Vicente Pinzon, 173, 6th floor,
04547-130 SÃO PAULO, SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 821 2382

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2686, Fax. +41 1 481 7730

Taiwan: Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,
TAIPEI, Taiwan Tel. +886 2 2134 2865, Fax. +886 2 2134 2874

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 625 344, Fax. +381 11 635 777

For all other countries apply to: Philips Semiconductors,
International Marketing & Sales Communications, Building BE-p,
P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: <http://www.semiconductors.philips.com>

© Philips Electronics N.V. 1997

SCA56

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

117027/00/03/pp12

Date of release: 1997 Dec 01

Document order number: 9397 750 03108

Let's make things better.

**Philips
Semiconductors**



PHILIPS