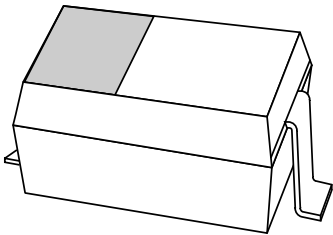


DATA SHEET



BZX399 series Voltage regulator diodes

Product specification

1999 Jun 04

Voltage regulator diodes

BZX399 series

FEATURES

- Total power dissipation: max. 300 mW
- Tolerance: $\pm 5\%$
- Working voltage range: nom. 1.8 to 43 V (E24 range)
- Improved I_Z/V_Z characteristic at low currents ($I_Z = 50 \mu A$). This results in a noise free and sharp breakdown knee.

APPLICATIONS

- General regulation functions, where low noise at low currents is required
- Low power consumption applications (e.g. hand-held applications).

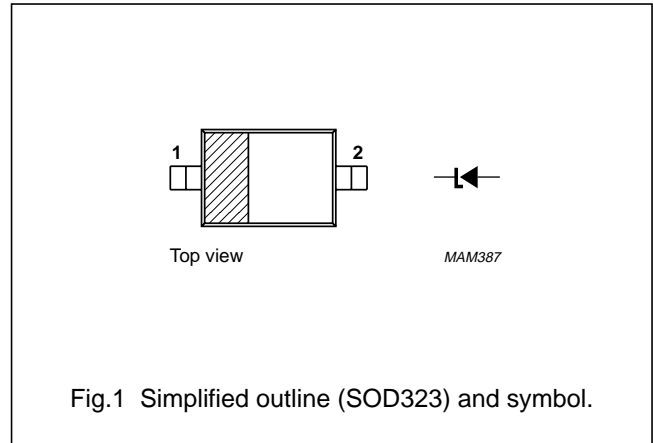
DESCRIPTION

Low-power low noise voltage regulator diodes in SOD323 plastic SMD package.

The diodes are available in the normalized E24 $\pm 5\%$ tolerance range. The series consists of 34 types with nominal working voltages from 1.8 to 43 V.

PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | cathode |
| 2 | anode |



MARKING

| TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE |
|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| BZX399-C1V8 | B1 | BZX399-C4V3 | B0 | BZX399-C10 | BJ | BZX399-C24 | BT |
| BZX399-C2V0 | B2 | BZX399-C4V7 | BA | BZX399-C11 | BK | BZX399-C27 | BU |
| BZX399-C2V2 | B3 | BZX399-C5V1 | BB | BZX399-C12 | BL | BZX399-C30 | BV |
| BZX399-C2V4 | B4 | BZX399-C5V6 | BC | BZX399-C13 | BM | BZX399-C33 | BW |
| BZX399-C2V7 | B5 | BZX399-C6V2 | BD | BZX399-C15 | BN | BZX399-C36 | BX |
| BZX399-C3V0 | B6 | BZX399-C6V8 | BE | BZX399-C16 | BP | BZX399-C39 | BY |
| BZX399-C3V3 | B7 | BZX399-C7V5 | BF | BZX399-C18 | BQ | BZX399-C43 | BZ |
| BZX399-C3V6 | B8 | BZX399-C8V2 | BG | BZX399-C20 | BR | | |
| BZX399-C3V9 | B9 | BZX399-C9V1 | BH | BZX399-C22 | BS | | |

Voltage regulator diodes

BZX399 series

LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------------|-------------------------------------|---|--------------------|------|------------------|
| I_F | continuous forward current | | – | 250 | mA |
| I_{ZSM} | non-repetitive peak reverse current | $t_p = 100 \mu\text{s}$; square wave; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ prior to surge | see Tables 1 and 2 | | |
| P_{tot} | total power dissipation | $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; note 1 | – | 300 | mW |
| T_{stg} | storage temperature | | –65 | +150 | $^\circ\text{C}$ |
| T_j | junction temperature | | – | 150 | $^\circ\text{C}$ |

Note

1. Device mounted on a FR4 printed circuit-board.

ELECTRICAL CHARACTERISTICS**Total BZX399-C series**

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

| SYMBOL | PARAMETER | CONDITIONS | MAX. | UNIT |
|------------------|----------------------------|------------------------------------|---------------|---------------|
| V_F | forward voltage | $I_F = 10 \text{ mA}$; see Fig.5 | 0.9 | V |
| | | $I_F = 100 \text{ mA}$; see Fig.5 | 1.0 | V |
| I_R | reverse current | | | |
| | BZX399-C1V8 | $V_R = 1 \text{ V}$ | 2 | μA |
| | BZX399-C2V0 | $V_R = 1 \text{ V}$ | 1 | μA |
| | BZX399-C2V2 | $V_R = 1 \text{ V}$ | 0.5 | μA |
| | BZX399-C2V4 | $V_R = 1 \text{ V}$ | 0.2 | μA |
| | BZX399-C2V7 | $V_R = 1 \text{ V}$ | 0.05 | μA |
| | BZX399-C3V0 | $V_R = 1 \text{ V}$ | 0.02 | μA |
| | BZX399-C3V3 | $V_R = 2 \text{ V}$ | 2 | μA |
| | BZX399-C3V6 | $V_R = 2 \text{ V}$ | 1 | μA |
| | BZX399-C3V9 | $V_R = 2 \text{ V}$ | 0.5 | μA |
| | BZX399-C4V3 | $V_R = 2 \text{ V}$ | 0.1 | μA |
| | BZX399-C4V7 | $V_R = 3 \text{ V}$ | 2 | μA |
| | BZX399-C5V1 | $V_R = 3 \text{ V}$ | 1 | μA |
| | BZX399-C5V6 | $V_R = 4 \text{ V}$ | 1 | μA |
| | BZX399-C6V2 | $V_R = 5 \text{ V}$ | 0.1 | μA |
| | BZX399-C6V8 | $V_R = 5 \text{ V}$ | 0.01 | μA |
| | BZX399-C7V5 | $V_R = 5 \text{ V}$ | 0.1 | μA |
| | BZX399-C8V2 | $V_R = 6 \text{ V}$ | 0.2 | μA |
| | BZX399-C9V1 | $V_R = 7 \text{ V}$ | 0.1 | μA |
| | BZX399-C10 | $V_R = 7 \text{ V}$ | 0.1 | μA |
| BZX399-C11 | $V_R = 8 \text{ V}$ | 0.05 | μA | |
| BZX399-C12 | $V_R = 9 \text{ V}$ | 0.05 | μA | |
| BZX399-C13 | $V_R = 10 \text{ V}$ | 0.05 | μA | |
| BZX399-C15 to 43 | $V_R = 0.7V_{Z\text{nom}}$ | 0.01 | μA | |

Voltage regulator diodes

BZX399 series

Table 1 Per type BZX399-C1V8 to C15 $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX399-C XXX | WORKING VOLTAGE V_Z (V) $I_Z = 50\ \mu\text{A}$ | | VOLTAGE CHANGE ΔV_Z (V) (note 1) | TEMP. COEFF. S_Z (mV/K) $I_Z = 50\ \mu\text{A}$ (see Figs 2, 3 and 4) | DIODE CAP. C_d (pF) at $f = 1\ \text{MHz}$; $V_R = 0\ \text{V}$ | NON-REPETITIVE PEAK REVERSE CURRENT I_{ZSM} (A) at $t_p = 100\ \mu\text{s}$; $T_{amb} = 25\text{ °C}$ |
|-----------------|--|-------|---|--|---|---|
| | Tol. $\pm 5\%$ | | | | | |
| | MIN. | MAX. | MAX. | TYP. | MAX. | MAX. |
| 1V8 | 1.71 | 1.89 | 0.65 | -0.85 | 425 | 6.0 |
| 2V0 | 1.90 | 2.10 | 0.70 | -0.95 | 410 | 6.0 |
| 2V2 | 2.09 | 2.31 | 0.75 | -1.05 | 390 | 6.0 |
| 2V4 | 2.28 | 2.52 | 0.80 | -1.15 | 370 | 6.0 |
| 2V7 | 2.57 | 2.84 | 0.85 | -1.35 | 350 | 6.0 |
| 3V0 | 2.85 | 3.15 | 0.90 | -1.50 | 325 | 6.0 |
| 3V3 | 3.14 | 3.47 | 0.93 | -1.65 | 310 | 6.0 |
| 3V6 | 3.42 | 3.78 | 0.95 | -1.80 | 300 | 6.0 |
| 3V9 | 3.71 | 4.10 | 0.97 | -1.95 | 290 | 6.0 |
| 4V3 | 4.09 | 4.52 | 0.99 | -2.05 | 280 | 6.0 |
| 4V7 | 4.47 | 4.94 | 0.97 | -1.90 | 275 | 6.0 |
| 5V1 | 4.85 | 5.36 | 0.60 | 0.15 | 300 | 5.0 |
| 5V6 | 5.32 | 5.88 | 0.20 | 1.75 | 275 | 4.0 |
| 6V2 | 5.89 | 6.51 | 0.10 | 2.35 | 250 | 3.0 |
| 6V8 | 6.46 | 7.14 | 0.10 | 3.00 | 215 | 3.0 |
| 7V5 | 7.13 | 7.88 | 0.15 | 3.60 | 170 | 3.0 |
| 8V2 | 7.79 | 8.61 | 0.15 | 4.25 | 150 | 3.0 |
| 9V1 | 8.65 | 9.56 | 0.10 | 5.00 | 120 | 3.0 |
| 10 | 9.50 | 10.50 | 0.10 | 5.80 | 110 | 3.0 |
| 11 | 10.45 | 11.55 | 0.11 | 6.70 | 110 | 2.5 |
| 12 | 11.40 | 12.60 | 0.12 | 7.65 | 105 | 2.5 |
| 13 | 12.35 | 13.65 | 0.13 | 8.60 | 105 | 2.5 |
| 15 | 14.25 | 15.75 | 0.15 | 10.50 | 100 | 2.0 |

Note1. $\Delta V_Z = V_Z$ at $100\ \mu\text{A}$ minus V_Z at $10\ \mu\text{A}$.

Voltage regulator diodes

BZX399 series

Table 2 Per type BZX399-C16 to C43 $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified.

| BZX399- C XXX | WORKING VOLTAGE V_Z (V) $I_Z = 50\ \mu\text{A}$ | | VOLTAGE CHANGE ΔV_Z (V) (note 1) | TEMP. COEFF. S_Z (mV/K) $I_Z = 50\ \mu\text{A}$ (see Fig.4) | DIODE CAP. C_d (pF) at $f = 1\ \text{MHz}$; $V_R = 0\ \text{V}$ | NON-REPETITIVE PEAK REVERSE CURRENT I_{ZSM} (A) at $t_p = 100\ \mu\text{s}$; $T_{amb} = 25\text{ }^\circ\text{C}$ |
|------------------|--|-------|---|--|---|---|
| | Tol. $\pm 5\%$ | | | | | |
| | MIN. | MAX. | MAX. | TYP. | MAX. | MAX. |
| 16 | 15.20 | 16.80 | 0.16 | 11.4 | 95 | 1.5 |
| 18 | 17.10 | 18.90 | 0.18 | 13.3 | 95 | 1.5 |
| 20 | 19.00 | 21.00 | 0.20 | 15.3 | 90 | 1.5 |
| 22 | 20.90 | 23.10 | 0.22 | 17.2 | 85 | 1.25 |
| 24 | 22.80 | 25.20 | 0.24 | 19.2 | 80 | 1.25 |
| 27 | 25.65 | 28.35 | 0.27 | 22.0 | 75 | 1.0 |
| 30 | 28.50 | 31.50 | 0.30 | 25.2 | 65 | 1.0 |
| 33 | 31.35 | 34.65 | 0.30 | 28.5 | 60 | 0.9 |
| 36 | 34.20 | 37.80 | 0.30 | 32.0 | 60 | 0.8 |
| 39 | 37.05 | 40.95 | 0.30 | 35.1 | 60 | 0.7 |
| 43 | 40.85 | 45.15 | 0.30 | 39.4 | 55 | 0.6 |

Note

- $\Delta V_Z = V_Z$ at $100\ \mu\text{A}$ minus V_Z at $10\ \mu\text{A}$.

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | note 1 | 415 | K/W |
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | note 2 | 110 | K/W |

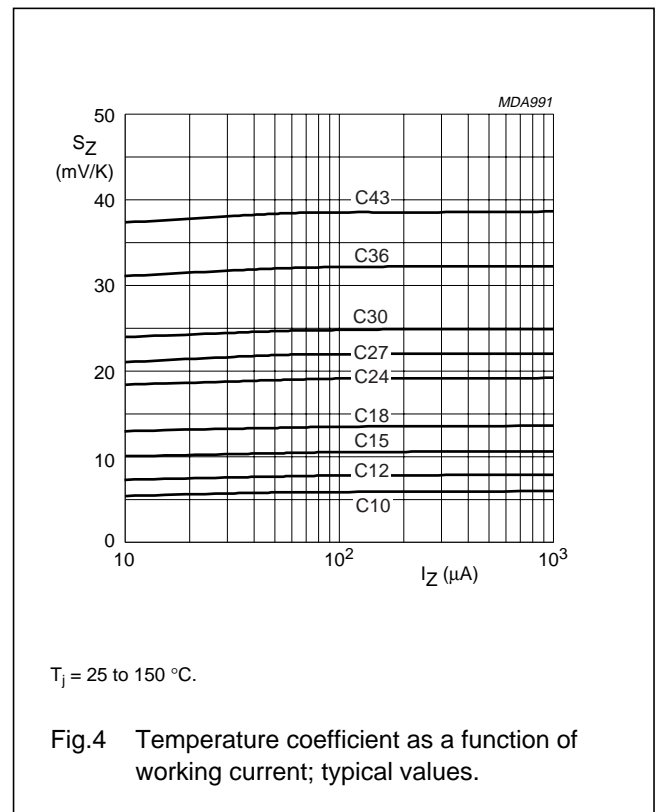
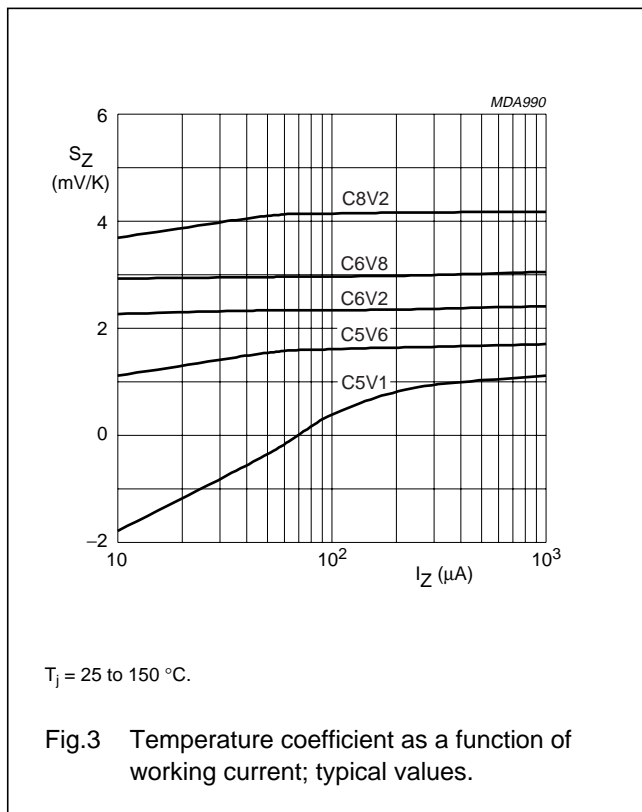
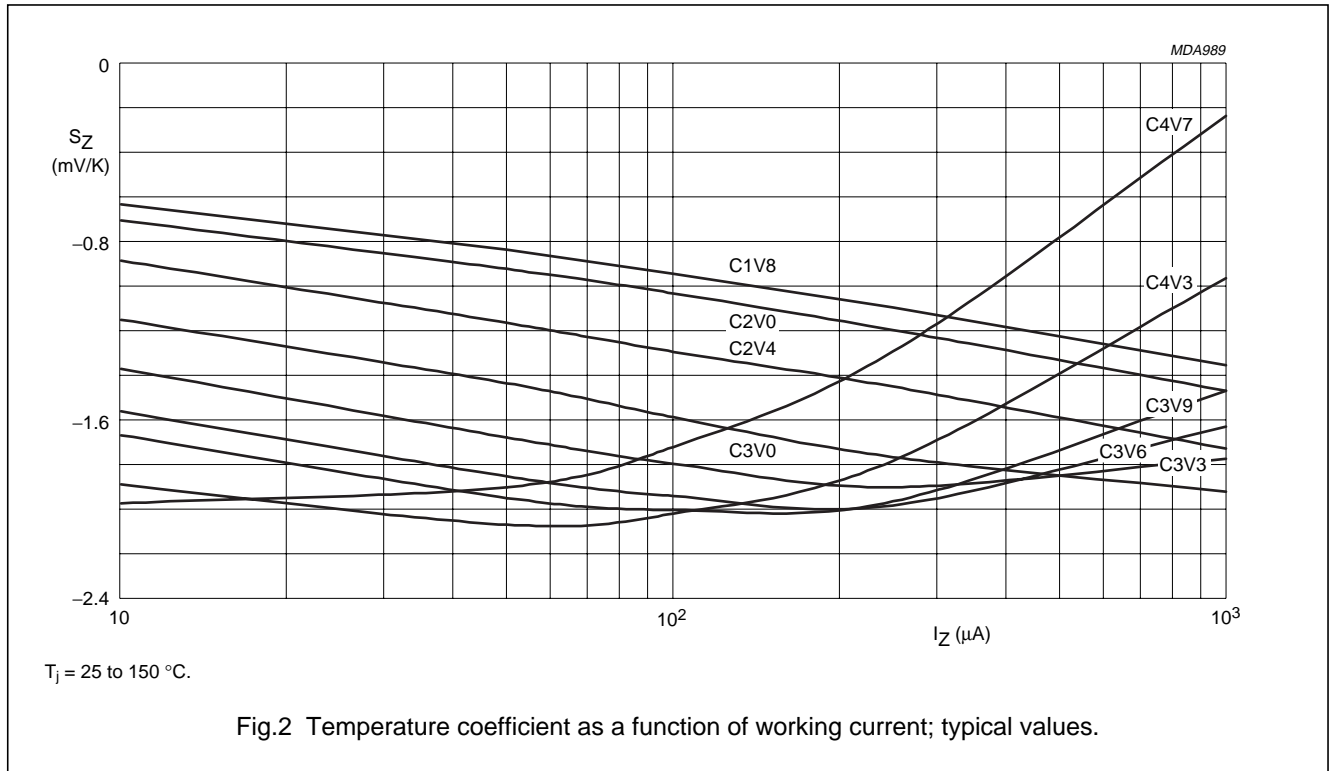
Notes

- Device mounted on a FR4 printed circuit-board.
- Soldering point of the cathode tab.

Voltage regulator diodes

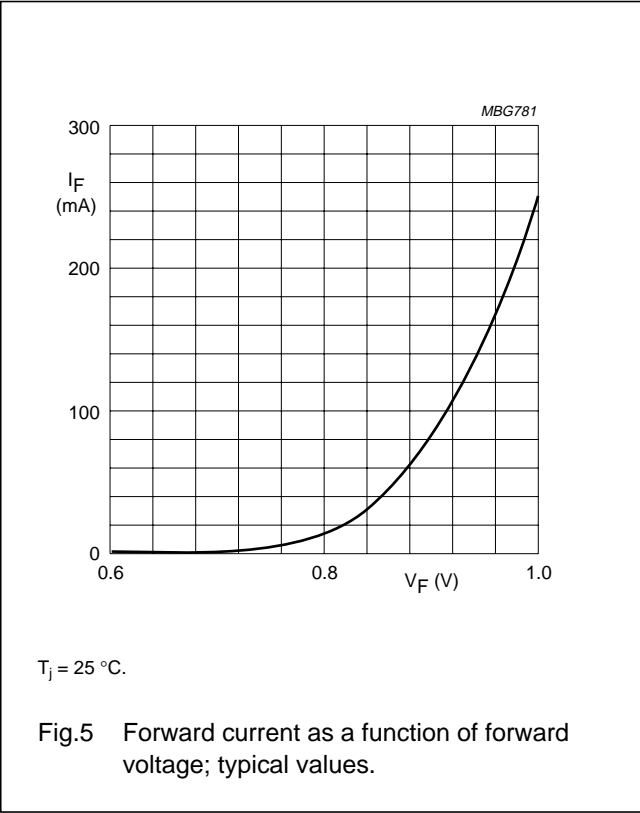
BZX399 series

GRAPHICAL DATA



Voltage regulator diodes

BZX399 series



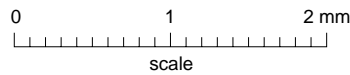
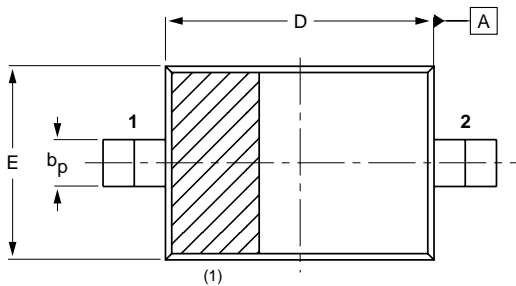
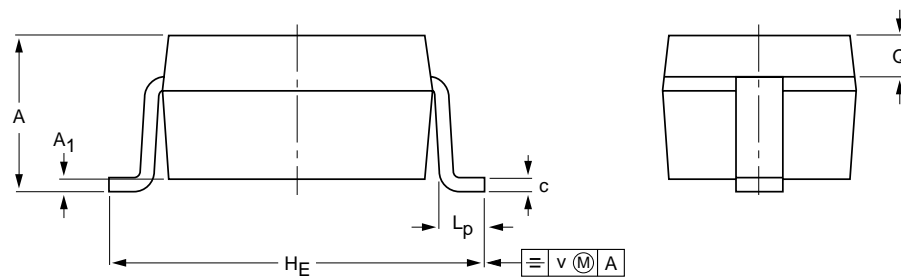
Voltage regulator diodes

BZX399 series

PACKAGE OUTLINE

Plastic surface mounted package; 2 leads

SOD323



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ max. | b _p | c | D | E | H _E | L _p | Q | v |
|------|------------|------------------------|----------------|--------------|------------|--------------|----------------|----------------|--------------|-----|
| mm | 1.1 0.8 | +0.05 -0.05 | 0.40 0.25 | 0.25 0.10 | 1.8 1.6 | 1.35 1.15 | 2.7 2.3 | 0.45 0.15 | 0.25 0.15 | 0.2 |

Note

1. The marking bar indicates the cathode.

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|------|------------------------|------------|
| | IEC | JEDEC | EIAJ | | |
| SOD323 | | | | | 98-09-14 |

Voltage regulator diodes

BZX399 series

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. | |

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Voltage regulator diodes

BZX399 series

NOTES

Voltage regulator diodes

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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 1 60 101 1248, Fax. +43 1 60 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 20 0733, Fax. +375 172 20 0773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 68 9211, Fax. +359 2 68 9102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381, Fax. +1 800 943 0087

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: Sydhavnsgade 23, 1780 COPENHAGEN V,
Tel. +45 33 29 3333, Fax. +45 33 29 3905

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615 800, Fax. +358 9 6158 0920

France: 51 Rue Carnot, BP317, 92156 SURESNES Cedex,
Tel. +33 1 4099 6161, Fax. +33 1 4099 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 2353 60, Fax. +49 40 2353 6300

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: PT Philips Development Corporation, Semiconductors Division,
Gedung Philips, Jl. Buncit Raya Kav.99-100, JAKARTA 12510,
Tel. +62 21 794 0040 ext. 2501, Fax. +62 21 794 0080

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 02 67 52 2531, Fax. +39 02 67 52 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,
TOKYO 108-8507, Tel. +81 3 3740 5130, Fax. +81 3 3740 5057

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, Fax +9-5 800 943 0087

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

Pakistan: see Singapore

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 319762,
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 58088 Newville 2114,
Tel. +27 11 471 5401, Fax. +27 11 471 5398

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 93 301 6312, Fax. +34 93 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 5985 2000, Fax. +46 8 5985 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2741 Fax. +41 1 488 3263

Taiwan: Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,
TAIPEI, Taiwan Tel. +886 2 2134 2886, 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: Yukari Dudullu, Org. San. Blg., 2.Cad. Nr. 28 81260 Umraniye,
ISTANBUL, Tel. +90 216 522 1500, Fax. +90 216 522 1813

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, Fax. +1 800 943 0087

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 62 5344, Fax.+381 11 63 5777

For all other countries apply to: Philips Semiconductors,
International Marketing & Sales Communications, Building BE-p, P.O. Box 218,
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