

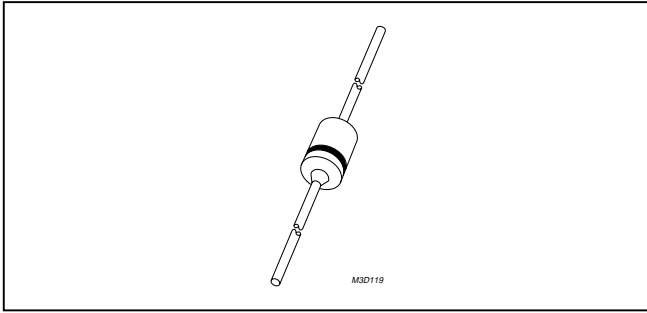
High-quality glass-passivated diodes (Implotec)

BYD33J competitor investigation

This publication offers a direct comparison between Philips Semiconductors' glass-passivated BYD33J diode family (based on the company's proprietary Implotec technology) and two major competitor products. The comparison highlights major advantages

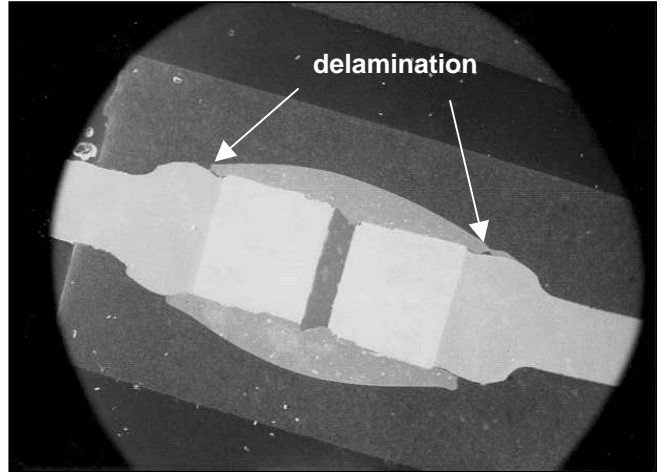
of the Philips technology, including high reliability and excellent thermal performance with no tendency toward delamination at the lead-package interfaces.

Philips' BYD33J	Comparable competitor I	Comparable competitor II
Package		
• Glass Implotec SOD81	• Plastic DO-41	• Glass plastic DO-41
Electrical		
• Glass passivated	• Silicon rubber passivation	• Glass bead moulded in plastic or passivated chip
• High maximum operating temperature ($T_{jmax} = 175\text{ }^{\circ}\text{C}$)	• Low max operating temperature ($T_{jmax} = 125\text{ }^{\circ}\text{C}$)	• Lower max operating temperature ($T_{jmax} = 150\text{ }^{\circ}\text{C}$)
• Low leakage current (typ. $I_R = 8.0\text{ }\mu\text{A}$, $T_a = 150\text{ }^{\circ}\text{C}$)	• Higher leakage current due to passivation (typ. $I_R = 275\text{ }\mu\text{A}$, $T_a = 150\text{ }^{\circ}\text{C}$)	• Comparable leakage current (typ. $I_R = 10\text{ }\mu\text{A}$, $T_a = 150\text{ }^{\circ}\text{C}$)
• Excellent stability (zero defects in 259k device hours)	• Poor stability although level of instability is just acceptable	• Stability is acceptable
• Guaranteed avalanche energy absorption capability (E_{RSM} to destruction = 16 mJ)	• Lower capability to withstand reverse energy (E_{RSM} to destruction = 2 mJ)	• Lower capability to withstand reverse energy (E_{RSM} to destruction = 10 mJ)
Mechanical		
• Excellent pressure contacts due to Implotec technology	• Low temperature soldering construction	• Low temperature soldering construction
• Not sensitive to moisture, hermetically sealed — no rejects on humidity tests	• Sensitive to moisture, plastic is hygroscopic, delamination after moulding	• Glass-plastic is still sensitive to moisture
• Fatigue free because coefficients of expansion of all used parts are matched	• Plastic coefficient of expansion does not match with the other parts, resulting in delamination	• With glass-plastic, delaminations are still seen
• Excellent thermal-fatigue performance — no rejects in fatigue tests	• Often rejects, chip cracks due to coefficients of expansion	• Better than just plastic but not as good as glass Implotec

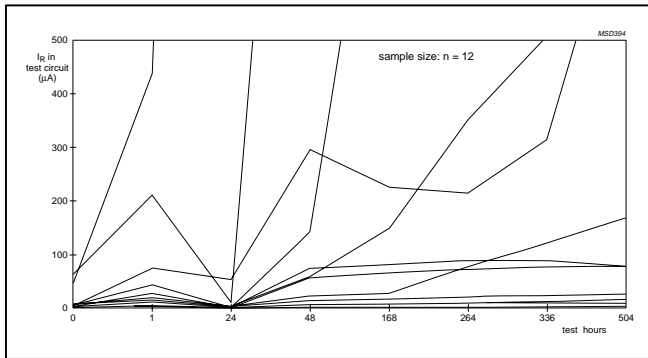


The SOD81 Implet package

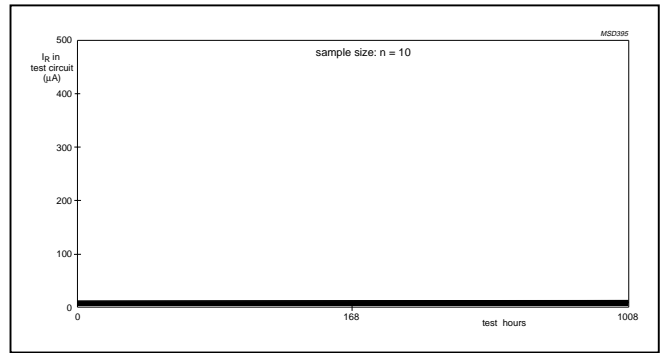
The graphs below show the difference in performance between Philips' BYD33J and a competitor type. The comparison shows reverse leakage current (I_R) degradation during high-temperature reverse-bias reliability testing. The delamination, shown in the picture, leads to contamination across the junction resulting in severe degradation of I_R .



Competitor product showing delamination where lead enters the plastic encapsulation



High-temperature reverse bias — competitor type;
 $V_r = 600\text{ V}$, $T_a = 125\text{ }^\circ\text{C}$



High-temperature reverse bias — BYD33J;
 $V_r = 600\text{ V}$, $T_a = 150\text{ }^\circ\text{C}$

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 3 Figtree Drive, HOMEBUSH, NSW 2140, Tel. +61 2 9704 8141, Fax. +61 2 9704 8139

Austria: Computexstr. 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., Energoexport, 15th floor, 51 James Bourcher 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: Sydhavnsvej 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: RAPAEC Electronics, 7 Khativa Saronki St, PO Box 18053, TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Via Casati, 23 - 20052 MONZA (MI), Tel. +39 039 203 6838, Fax. +39 039 203 6800

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 Wagoner 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: Al. Jerozolimskie 195 B, 02-222 WARSAW, Tel. +48 22 5710 000, Fax. +48 22 5710 001

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Ustacheva 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 Sangpavuth-Bangna Road Prakanong, BANGKOK 10260, Tel. +66 2 745 4090, Fax. +66 2 338 0793

Turkey: Yukari Dudullu, Org. San. Bldg., 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 UB8 3BX, Tel. +44 208 730 5000, Fax. +44 208 754 8421

United States: 811 East Anques Avenue, SUNNYSVALE, 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 3341 299, Fax. +381 11 3342 553

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. 2000

SCL 69

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

Date of release: January 2000

Document order number: 9397 750 06322

Let's make things better.



PHILIPS