

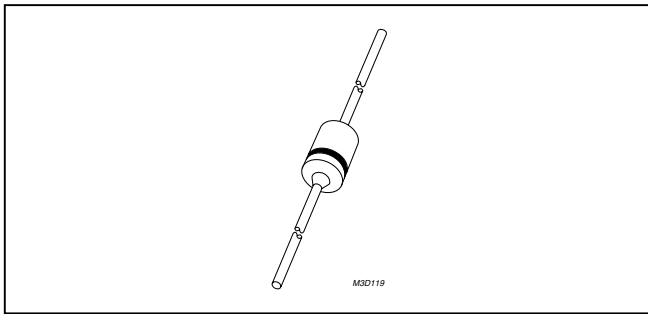
High-quality glass-passivated diodes (Implotec)

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

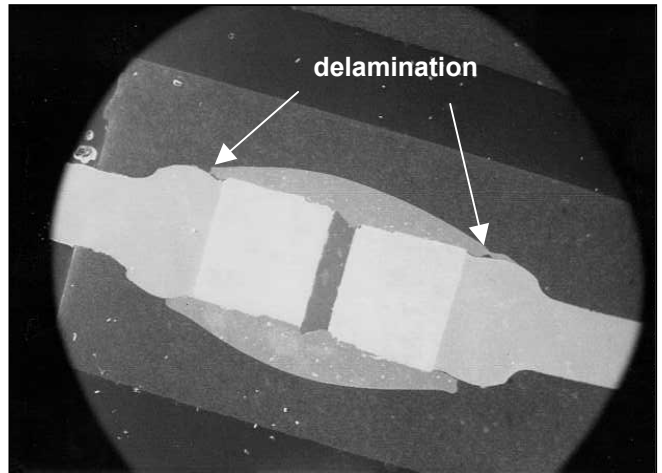
of the Philips technology, including high reliability and excellent thermal performance with no tendency toward delamination at the lead-package interfaces.

Philips' BYD33J	Comparable competitor I	Comparable competitor II
Package		
• Glass Implotec SOD8I	• Plastic DO-4I	• Glass plastic DO-4I
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

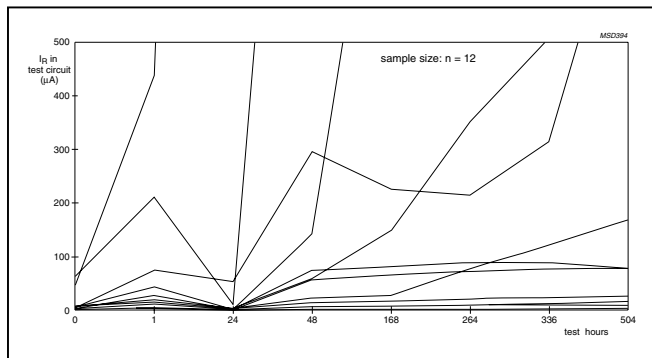


The SOD81 Impletec package

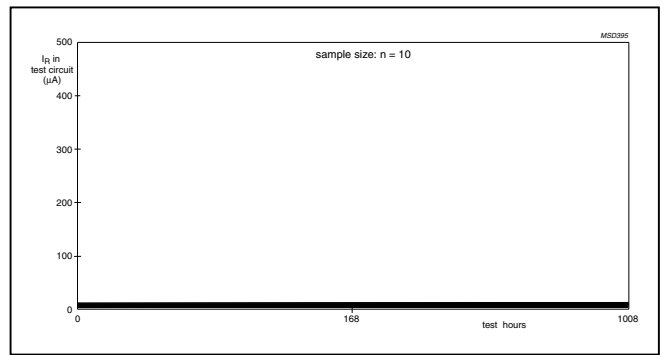
The graphs below show the difference in performance between Philips' BYD33J and a competitor type. The comparison shows reverse leakage current (I_R) degradation during high-temperature reverse-bias reliability testing. The delamination, shown in the picture, leads to contamination across the junction 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;
 $V_r = 600\text{ V}$, $T_a = 150\text{ }^\circ\text{C}$*

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