

# PRODUCT INFORMATION

JULY 12, 2005

Vol.191

## MRJ SBD Series of Schottky Barrier Diodes Developed

**With low  $V_F$ , low  $I_R$  and a guaranteed  $T_j=150^\circ\text{C}$ ,  
we have realized- high-temperature performance**

SANYO Electric Co., Ltd. has developed the MRJ SBD series of Schottky Barrier Diodes. By optimizing its unique microfabrication technology and withstand-voltage design, SANYO has achieved both a low forward voltage ( $V_F$ ) and a low leakage current ( $I_R$ ) for these diodes. We have also ensured that the diodes will operate under high temperatures by guaranteeing a junction temperature of  $150^\circ\text{C}$ . Sample shipments are scheduled to begin in July.

**SBJ100-04J, SBJ100-06J, SBJ200-04J, SBJ200-06J, SBJ300-04J, SBJ300-06J,  
SBJ400-04J, SBJ400-06J Series**

### Overview

Although the time for conserving energy is ripe as the world confronts the problem of the depletion of energy resources on a global scale, electronic products are advancing down the road toward more sophisticated functions and increased functionality, and tend to consume more, rather than less, power. The rectifying devices mounted in the power supplies, adapters, and other areas of these electronic products must meet the following requirements: a low forward voltage ( $V_F$ ), low leakage current ( $I_R$ ), high-speed switching and high-temperature guarantees, if their efficiency is to be increased.

Generally, Schottky Barrier Diodes (SBD) are widely used as rectifying devices for the secondary sides of power supplies owing to their low  $V_F$  and high-speed switching characteristics. However, regular SBDs have faced a trade-off between their  $V_F$  and  $I_R$  characteristics, and until now it has been difficult to achieve both low  $V_F$  and low  $I_R$ . Common SBDs with a low  $V_F$  have a high  $I_R$ , so when they are used in high-temperature environments, such as in adapters where high-density mounting can be expected, there is the possibility that thermal runaway may occur, and it is in environments such as these that the need for SBDs with a low  $I_R$  has arisen.

With a view to meeting the need for low  $V_F$ , low  $I_R$  and high-speed switching, SANYO has developed the MRJ SBD (Multi Refined PN Junction SBD) series of SBDs, with a new structure. With the advent of this series, SANYO has achieved the lowest  $V_F$  and  $I_R$  in the industry by optimizing its unique microfabrication technology and withstand voltage design. Compared with the company's previous SBDs, the ones in this new series feature lower  $V_F$ , equivalent switching characteristics, and a  $I_R$  that is ten times lower. These features can contribute to improving.

# PRODUCT INFORMATION

---

the efficiency of electronic equipment and conserving energy, and by guaranteeing a junction temperature ( $T_j$ ) of  $150^\circ\text{C}$  over and above the low  $I_R$  at high temperatures, these SBDs can be used in high-temperature environments. Moreover, by optimizing the guard ring structure, they can now withstand higher ESD levels.

More specifically, a comparison of the power loss between the MRJ SBD series and the company's existing products conducted on SANYO's demonstration boards has shown that the new SBDs are capable of decreasing the power loss by 6.3% in environments where the temperature ( $T_c$ ) is  $125^\circ\text{C}$  or higher a level that causes thermal runaway in the existing products.

The first model scheduled for mass production and marketing in the summer of 2005 is an SBD with a 40 V withstand voltage, 10 A rated current and TO-220ML package (TO220AB) for use in adapters. These products feature a  $V_F$  of 0.48 V typ., which is the lowest in their class, and achieve both a low  $V_F$  and a low  $I_R$  of  $8\mu\text{A}$  typ. ( $T_a=25^\circ\text{C}$ ;  $100\mu\text{A}$  for existing products), and with a low  $I_R$  at high temperatures and by guaranteeing a junction temperature ( $T_j$ ) of  $150^\circ\text{C}$ , they can be expected to operate stably in high-temperature environments.

A total of seven models with a 40 V withstand voltage and 20 A, 30 A or 40 A rated current or a 60 V withstand voltage and 10 A, 20 A, 30 A or 40 A rated current will be made available in the series, and SANYO aims to successively configure a line up of products tailored to different applications. In order to exploit fully the low  $I_R$  featured by the MRJ SBD series, the company also plans to develop an MRJ SBD series with a high withstand voltage.

In the past, SANYO Electric has expanded its high-performance SBDs with withstand voltages ranging from 5 V to 180 V and rated currents ranging from 10 mA to 35 A into many and varied packages to meet the needs of its customers. With its new MRJ SBD series, it can satisfy even further the requirements of its customers for low  $V_F$  and low  $I_R$ , high-speed switching characteristics and a high-temperature guarantee. By pushing ahead with the development of products that respond to customer needs to make products in smaller sizes and with features such as easier portability and greater energy savings, SANYO will continue to meet the expectations of its customers and win their trust.

## Features

- Low  $V_F$  and  $I_R$ , constituting the highest performance in the industry, achieved
  - In the 40 V/10 A class, SANYO's new SBDs achieve the lowest  $V_F$  of 0.48 V typ. (at  $I_F=5$  A) and  $I_R$  of  $8\mu\text{A}$  typ. (at  $V_R=40$  V). These levels are the lowest in the industry. (The figures denote the respective values per device.)
- High-temperature operation
  - The low  $I_R$  at high temperatures and  $T_j=150^\circ\text{C}$  guarantee enable the SBDs to operate in high-temperature environments.
- High-ESD tolerance
  - The MRJ structure increases the ability of the SBDs to withstand higher ESD levels.

# PRODUCT INFORMATION

## Specifications

| Type No.   | Package  | Absolute maximum ratings |                       |                        | Electrical characteristics (figures denote the respective values per device) |      |                      |     |     |                      |     |     |
|------------|----------|--------------------------|-----------------------|------------------------|--|------|----------------------|-----|-----|----------------------|-----|-----|
|            |          | V <sub>RRM</sub><br>(V)  | I <sub>O</sub><br>(A) | T <sub>j</sub><br>(°C) | V <sub>F</sub> (V) max   |      | I <sub>R1</sub> (μA) |     |     | I <sub>R2</sub> (μA) |     |     |
|            |          |                          |                       |                        | I <sub>F</sub> (A)   |      | V <sub>R</sub> (V)   | typ | max | V <sub>R</sub> (V)   | typ | max |
| SBJ100-04J | TO-220ML | 40                       | 10                    | 150                    | 5  | 0.54 | 20                   | 5   | 50  | 40                   | 8   | 100 |
| SBJ200-04J |          |                          | 20                    |                        | 10   |      |                      | 100 | 20  |                      | 200 |     |
| SBJ300-04J |          |                          | 30                    |                        | 15   |      |                      | 150 | 30  |                      | 300 |     |
| SBJ400-04J |          |                          | 40                    |                        | 20   |      |                      | 200 | 40  |                      | 400 |     |
| SBJ100-06J |          | 60                       | 10                    | 150                    | 5  | 0.6  | 30                   | 5   | 50  | 60                   | 10  | 100 |
| SBJ200-06J |          |                          | 20                    |                        | 10   |      |                      | 100 | 20  |                      | 200 |     |
| SBJ300-06J |          |                          | 30                    |                        | 15   |      |                      | 150 | 30  |                      | 300 |     |
| SBJ400-06J |          |                          | 40                    |                        | 20   |      |                      | 200 | 40  |                      | 400 |     |

## Sample Availability

The MRJ SBD series will be available in sample quantities in July 2005 and in production quantities in the third quarter of 2005.

# PRODUCT INFORMATION

---

- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.
- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.