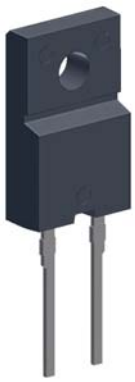
High Efficiency Snubber Diode

Features and Benefits

- High Peak Reverse Voltage, V_{RM}: 800 V
- Low Forward Voltage, V_F: 1.05 V (max.) at I_F = 1.0 A
- Peak Forward Surge Current, I_{FSM}: 30 A
- Average Forward Current, $I_{F(AV)}$: 1.0 A
- Flammability rating UL94V-0 (Equivalent)
- Pins Pb (lead) free

Package: Through Hole



Not to scale

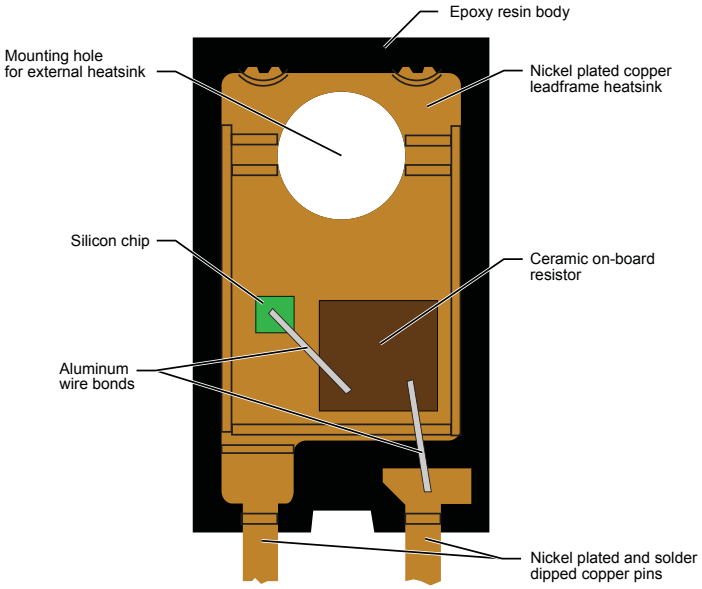
Description

The SARS10 is an 800 V silicon diode designed especially for use in high-efficiency snubber circuits. This diode can sustain a high voltage with low loss, with low-noise rectification.

Applications

- White goods appliances
- Audio-visual equipment
- Light fixtures
- Communication equipment
- Factory automation

Product Structure



Selection Guide

Part Number	Packing
SARS10	500 pieces per box, bulk

Absolute Maximum Ratings

Characteristic	Symbol	Conditions	Rating	Unit
Peak Reverse Surge Voltage	V_{RSM}		800	V
Peak Reverse Voltage	V_{RM}		800	V
Average Forward Current	$I_{F(AV)}$	Refer to figure 1	0.3	A
Peak Forward Surge Current	I_{FSM}	1 ms, square wave, one shot	1.5	A
Power Dissipation	P	Refer to figure 3	3.0	W
Junction Temperature	T_J		–20 to 125	°C
Storage Temperature	T_{stg}		–20 to 125	°C

Electrical Characteristics valid at T_A = 25°C, unless otherwise specified

Characteristic	Symbol	Test Conditions	Value	Unit
Forward Voltage	V_F	I_F = 0.5 A	13 (max)	V
Reverse Current	I_R	$V_R = V_{RM}$	10 (max)	μA
Reverse Current (High Temperature)	$I_{R(H)}$	$V_R = V_{RM}$, T_A = 125°C	100 (max)	μA
Reverse Recovery Time	t_{rr}	$I_F = I_{RP}$ = 100 mA, 90% recovery point, T_J = 25°C, refer to figure 2	1 to 9 (max)	μs
Thermal Resistance, Junction to Case	$R_{\theta JC}$	Between junction and body	15 (max)	°C/W

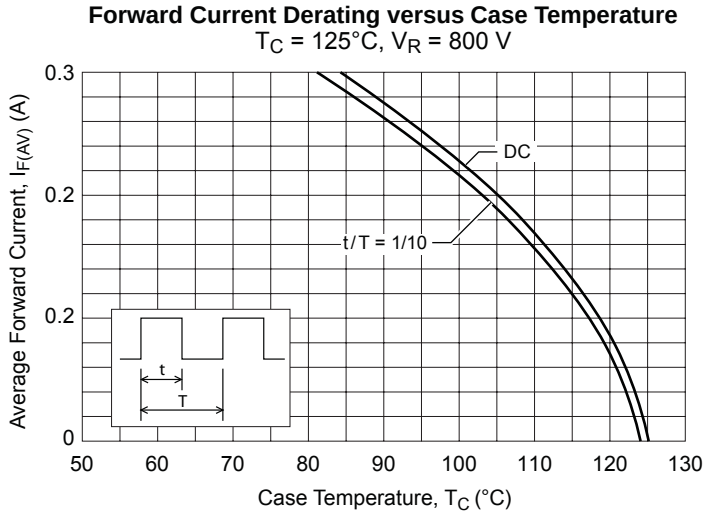


Figure 1. Derating Characteristics and Mounting Conditions

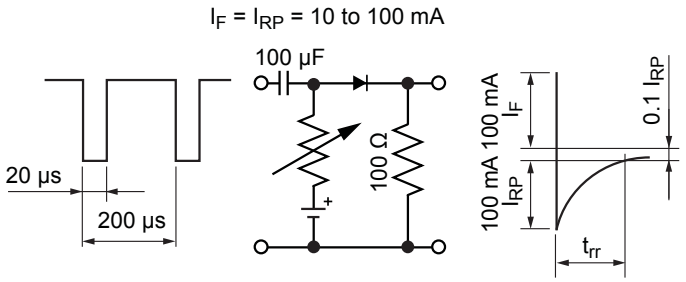


Figure 2. Definition of Peak Reverse Current, I_{RP}

Characteristic Performance

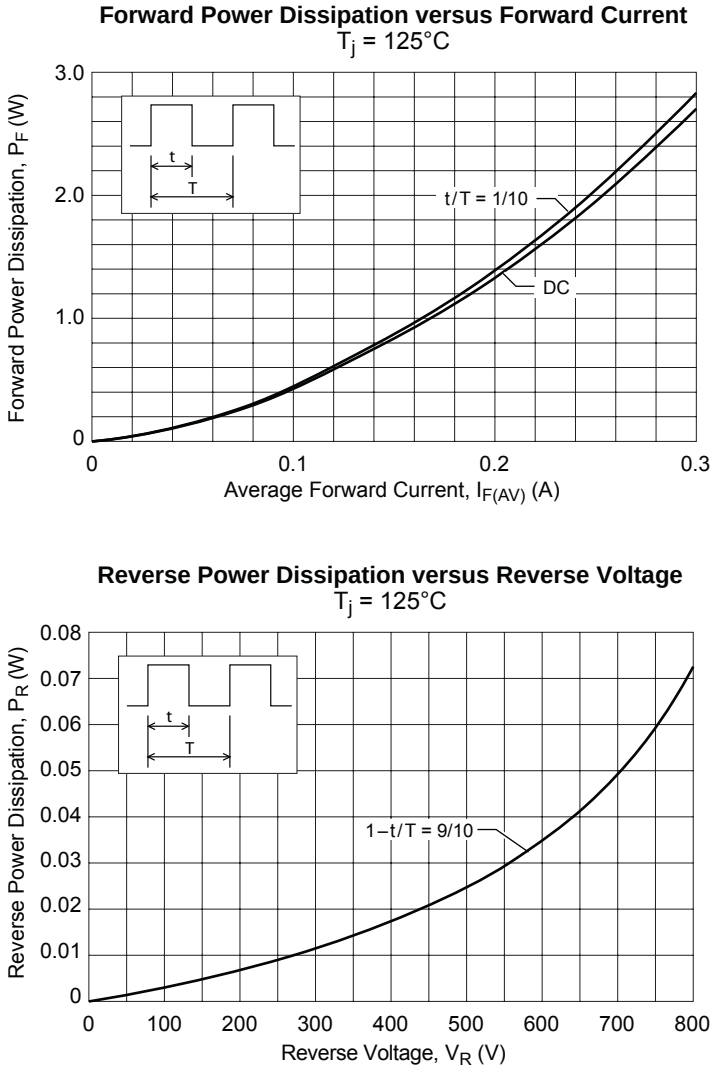
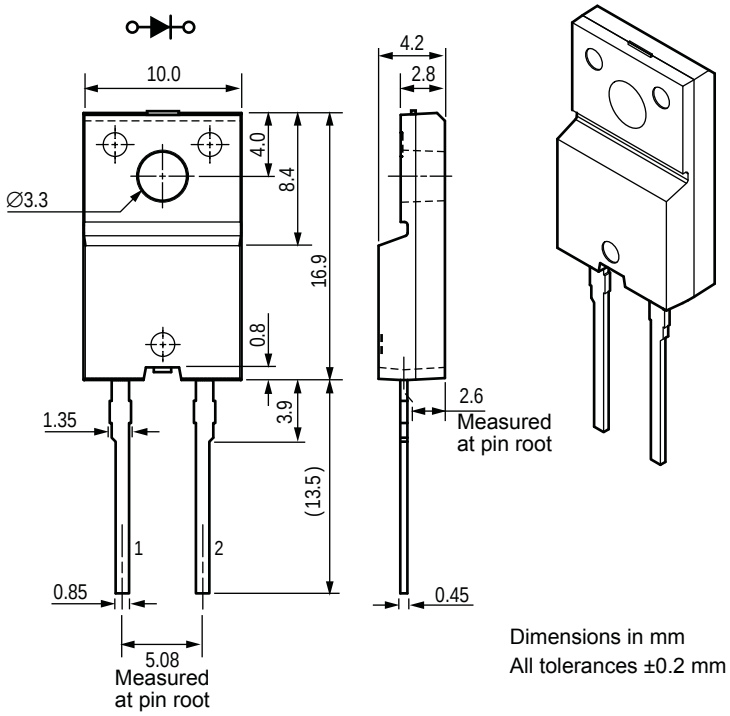


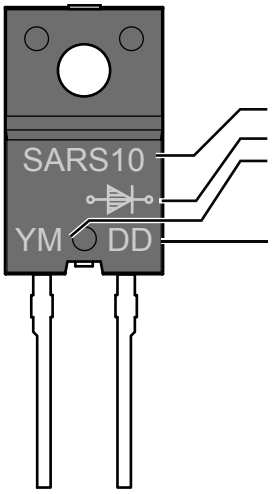
Figure 3. Power Dissipation Characteristics

Package Outline



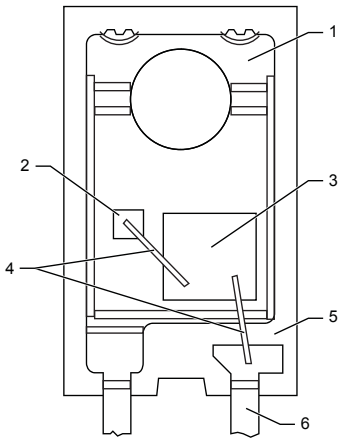
Dimensions in mm
All tolerances ±0.2 mm

Package Marking



Product Number
Polarity symbol
Lot Number, part 1
Y is the last digit of the year (0 to 9)
M is the month (1 to 9, O, N, D)
Lot Number, part 2
DD is the day (01 to 31)

Material Composition and Internal Structure



1. Leadframe: Cu with solder plating
2. Chip: Si
3. On-board Resistor: Ceramic
4. Interior Wire Bonds: Al
5. Body: Plastic epoxy resin
6. Leadframe: Cu, Ni plated and dipped in solder

Weight: Approximately 2.1 g

Pin treatment Pb-free. Device composition compliant with the RoHS directive.

Reliability Tests

Test Name	Test Conditions	Acceptance Criterion	Rating	Unit
High Temperature Reverse Bias Test	T_A = 125°C, V_R = V_{RM} (AC, half-sine wave), with external heatsink	1	1000	hour
Humidity Reverse Bias Test	T_A = 85°C, RH = 85%, V_R = V_{RM} × 0.8 (DC)	1	500	hour
High Temperature Storage Test	T_A = 125°C	1	1000	hour
Moisture Resistance Test	T_A = 85°C, RH = 85%	1	1000	hour
Thermal Shock Test	Ice water (5 minutes), then room temperature water (20 seconds), then boiling water (5 minutes)	1	100	cycle
Temperature Cycle Test	–20°C (30 minutes), then 125°C (30 minutes)	1	100	cycle
Pressure Cooker Test	2.03 ×10^5 Pa, 100% RH, unsaturated equipment	1	96	hour
Resistance to Soldering Heat Test	260±5°C, solder dip to 1.5 mm from body	1	10	second
	380±5°C, using soldering iron	1	3.5	second
Solderability Test	245±5°C, 5±0.5 seconds, using rosin flux	2	95	%
Pin Bend Test	Apply EIAJ ED-4701/401	3	2	cycle
Pin Pull Test		3	10	second
Pin Twist Test		3	2	cycle
Drop Test	Free-fall drop from 1 m height onto maple plate	3	10	cycle

NOTE:
Standard test conditions are at T_A = 25°C and RH = 60%. But it is also acceptable to perform the tests within ordinary temperature and RH operating ranges: T_A = 5 to 35 °C and RH = 45% to 85%.
Acceptance criteria as follows:
1 – Product meets all the values specified in the Electrical Characteristics table, after being exposed to normal temperature more than 2 hours and less than 24 hours.
2 – Product meets rating of the reliability test.
3 – No structural failures during reliability test, and product meets V_F and I_R specifications in the Electrical Characteristics table after completion of the reliability test.

Design Notes

Use resistors in series, and adjust so the diode saturates at junction temperature, $T_J \leq 150$°C.

Because reliability can be affected adversely by improper storage environments and handling methods, please observe the following cautions.

Cautions for Storage

- Ensure that storage conditions comply with the standard temperature (5°C to 35°C) and the standard relative humidity (around 40% to 75%); avoid storage locations that experience extreme changes in temperature or humidity.
- Avoid locations where dust or harmful gases are present and avoid direct sunlight.
- Reinspect for rust on leads and solderability of the products that have been stored for a long time.

Cautions for Testing and Handling

When tests are carried out during inspection testing and other standard test periods, protect the products from power surges from the testing device, shorts between the product pins, and wrong connections. Ensure all test parameters are within the ratings specified by Sanken for the products.

Remarks About Using Silicone Grease with a Heatsink

- When silicone grease is used in mounting the products on a heatsink, it shall be applied evenly and thinly. If more silicone grease than required is applied, it may produce excess stress.
- Volatile-type silicone greases may crack after long periods of time, resulting in reduced heat radiation effect. Silicone greases with low consistency (hard grease) may cause cracks in the mold resin when screwing the products to a heatsink.

  Our recommended silicone greases for heat radiation purposes, which will not cause any adverse effect on the product life, are indicated below:

Type	Suppliers
G746	Shin-Etsu Chemical Co., Ltd.
YG6260	Momentive Performance Materials Inc.
SC102	Dow Corning Toray Co., Ltd.

Cautions for Mounting to a Heatsink

- When the flatness around the screw hole is insufficient, such as when mounting the products to a heatsink that has an extruded (burred) screw hole, the products can be damaged, even with a lower than recommended screw torque. For mounting the products, the mounting surface flatness should be 0.05 mm or less.
- Please select suitable screws for the product shape. Do not use a flat-head machine screw because of the stress to the products. Self-tapping screws are not recommended. When using self-tapping screws, the screw may enter the hole diagonally, not vertically, depending on the conditions of hole before threading or the work situation. That may stress the products and may cause failures.
- Recommended screw torque: 0.490 to 0.686 N●m (5 to 7 kgf● cm).
- For tightening screws, if a tightening tool (such as a driver) hits the products, the package may crack, and internal stress fractures may occur, which shorten the lifetime of the electrical elements and can cause catastrophic failure. Tightening with an air driver makes a substantial impact. In addition, a screw torque higher than the set torque can be applied and the package may be damaged. Therefore, an electric driver is recommended.

  When the package is tightened at two or more places, first pre-tighten with a lower torque at all places, then tighten with the specified torque. When using a power driver, torque control is mandatory.

Soldering

- When soldering the products, please be sure to minimize the working time, within the following limits:

  260±5°C 10±1 s (Flow, 2 times)

  380±10°C 3.5±0.5 s (Soldering iron, 1 time)
- Soldering should be at a distance of at least 2.0 mm from the body of the products.

Electrostatic Discharge

- When handling the products, the operator must be grounded. Grounded wrist straps worn should have at least 1 MΩ of resistance from the operator to ground to prevent shock hazard, and it should be placed near the operator.
- Workbenches where the products are handled should be grounded and be provided with conductive table and floor mats.
- When using measuring equipment such as a curve tracer, the equipment should be grounded.
- When soldering the products, the head of soldering irons or the solder bath must be grounded in order to prevent leak voltages generated by them from being applied to the products.
- The products should always be stored and transported in Sanken shipping containers or conductive containers, or be wrapped in aluminum foil.

- The contents in this document are subject to changes, for improvement and other purposes, without notice. Make sure that this is the latest revision of the document before use.
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  In addition, it should be noted that since power devices or IC's including power devices have large self-heating value, the degree of derating of junction temperature affects the reliability significantly.
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