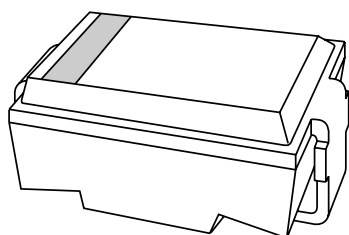


# DATA SHEET



## **RS1 series** SMA fast soft-recovery controlled avalanche rectifiers

Product specification

2000 Feb 14

## SMA fast soft-recovery controlled avalanche rectifiers

## RS1 series

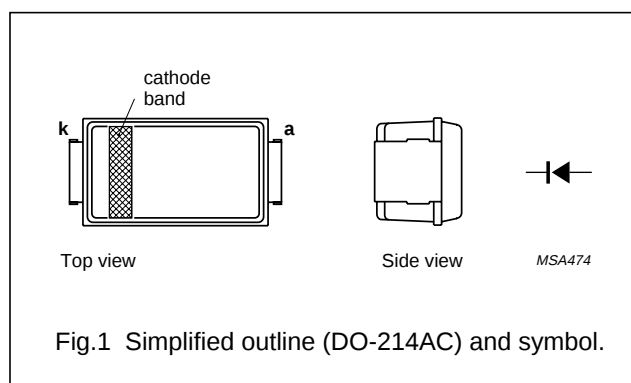
### FEATURES

- Glass passivated
- High maximum operating temperature
- Ideal for surface mount automotive applications
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- UL 94V-O classified plastic package
- Shipped in 12 mm embossed tape
- Marking: cathode, date code, type code
- Easy pick and place.

### DESCRIPTION

DO-214AC surface mountable package with glass passivated chip.

The well-defined void-free case is of a transfer-moulded thermo-setting plastic. The small rectangular package has two J bent leads.



### LIMITING VALUES

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

| SYMBOL    | PARAMETER                       | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|---------------------------------|------------|------|------|------|
| $V_{RRM}$ | repetitive peak reverse voltage |            |      |      |      |
|           | RS1A                            |            | —    | 50   | V    |
|           | RS1B                            |            | —    | 100  | V    |
|           | RS1D                            |            | —    | 200  | V    |
|           | RS1G                            |            | —    | 400  | V    |
|           | RS1J                            |            | —    | 600  | V    |
|           | RS1K                            |            | —    | 800  | V    |
|           | RS1M                            |            | —    | 1000 | V    |
| $V_R$     | continuous reverse voltage      |            |      |      |      |
|           | RS1A                            |            | —    | 50   | V    |
|           | RS1B                            |            | —    | 100  | V    |
|           | RS1D                            |            | —    | 200  | V    |
|           | RS1G                            |            | —    | 400  | V    |
|           | RS1J                            |            | —    | 600  | V    |
|           | RS1K                            |            | —    | 800  | V    |
|           | RS1M                            |            | —    | 1000 | V    |

# SMA fast soft-recovery controlled avalanche rectifiers

## RS1 series

| SYMBOL      | PARAMETER                           | CONDITIONS                                                                                        | MIN. | MAX. | UNIT |
|-------------|-------------------------------------|---------------------------------------------------------------------------------------------------|------|------|------|
| $V_{RMS}$   | root mean square voltage            |                                                                                                   |      |      |      |
|             | RS1A                                |                                                                                                   | –    | 35   | V    |
|             | RS1B                                |                                                                                                   | –    | 70   | V    |
|             | RS1D                                |                                                                                                   | –    | 140  | V    |
|             | RS1G                                |                                                                                                   | –    | 280  | V    |
|             | RS1J                                |                                                                                                   | –    | 420  | V    |
|             | RS1K                                |                                                                                                   | –    | 560  | V    |
|             | RS1M                                |                                                                                                   | –    | 700  | V    |
| $I_{F(AV)}$ | average forward current             | averaged over any 20 ms period;<br>$T_{ip} = 110\text{ °C}$ ; see Fig.2                           | –    | 1    | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t = 8.3\text{ ms}$ half sine wave;<br>$T_j = 25\text{ °C}$ prior to surge;<br>$V_R = V_{RRMmax}$ | –    | 25   | A    |
| $T_{stg}$   | storage temperature                 |                                                                                                   | –65  | +175 | °C   |
| $T_j$       | junction temperature                | See Fig.3                                                                                         | –65  | +175 | °C   |

### ELECTRICAL CHARACTERISTICS

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

| SYMBOL   | PARAMETER             | CONDITIONS                                                                                                       | TYP. | MAX. | UNIT          |
|----------|-----------------------|------------------------------------------------------------------------------------------------------------------|------|------|---------------|
| $V_F$    | forward voltage       | $I_F = 1\text{ A}$ ; see Fig.4                                                                                   | –    | 1.3  | V             |
| $I_R$    | reverse current       | $V_R = V_{RRMmax}$ ; see Fig.5                                                                                   | –    | 5    | $\mu\text{A}$ |
|          |                       | $V_R = V_{RRMmax}$ ; $T_j = 165\text{ °C}$ ; see Fig.5                                                           | –    | 50   | $\mu\text{A}$ |
| $t_{rr}$ | reverse recovery time | when switched from $I_F = 0.5\text{ A}$ to $I_R = 1\text{ A}$ ;<br>measured at $I_R = 0.25\text{ A}$ ; see Fig.9 | –    | 250  | ns            |
|          | RS1A to RS1J          |                                                                                                                  | –    | 300  | ns            |
|          | RS1K and RS1M         |                                                                                                                  | –    | 300  | ns            |
| $C_d$    | diode capacitance     | $V_R = 4\text{ V}$ ; $f = 1\text{ MHz}$ ; see Fig.6                                                              | 7    | –    | pF            |

### THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER                                                | CONDITIONS | VALUE | UNIT |
|----------------|----------------------------------------------------------|------------|-------|------|
| $R_{th\ j-tp}$ | thermal resistance from junction to tie-point; see Fig.7 |            | 27    | K/W  |
| $R_{th\ j-a}$  | thermal resistance from junction to ambient              | note 1     | 100   | K/W  |
|                |                                                          | note 2     | 150   | K/W  |

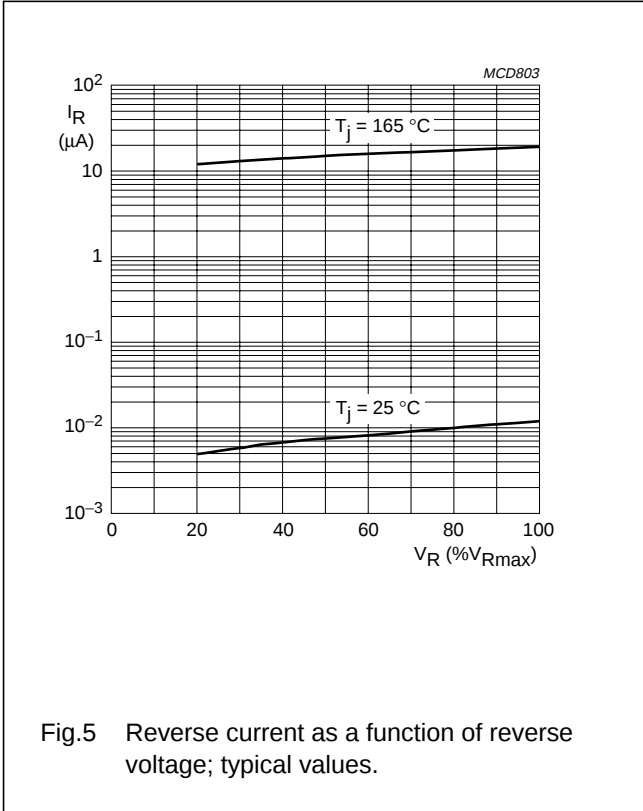
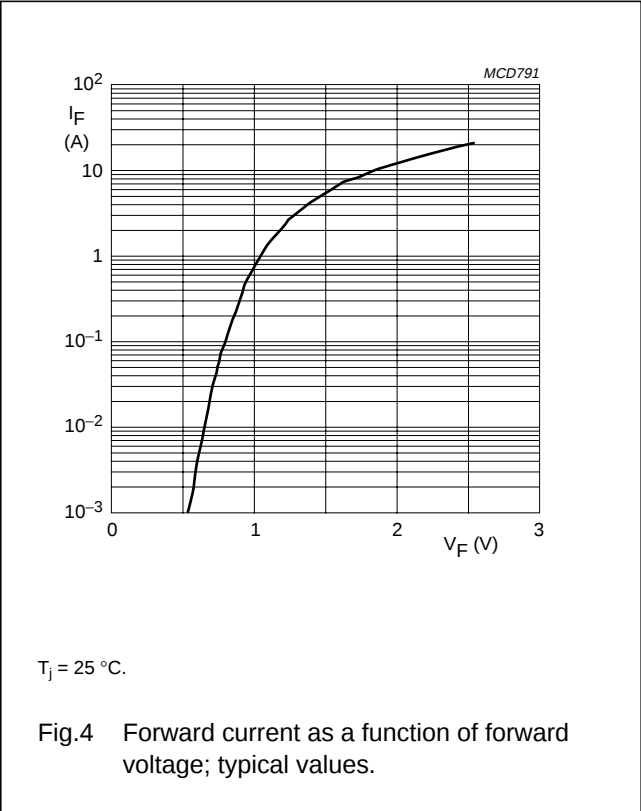
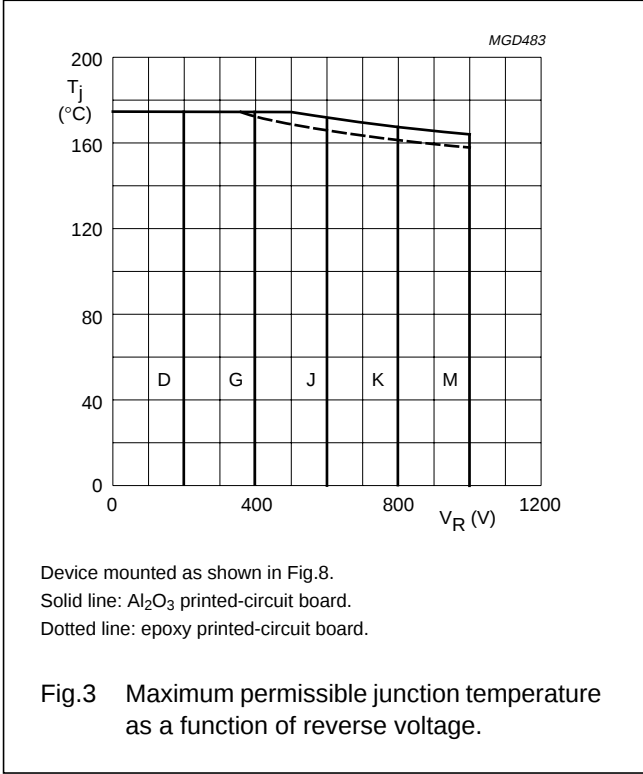
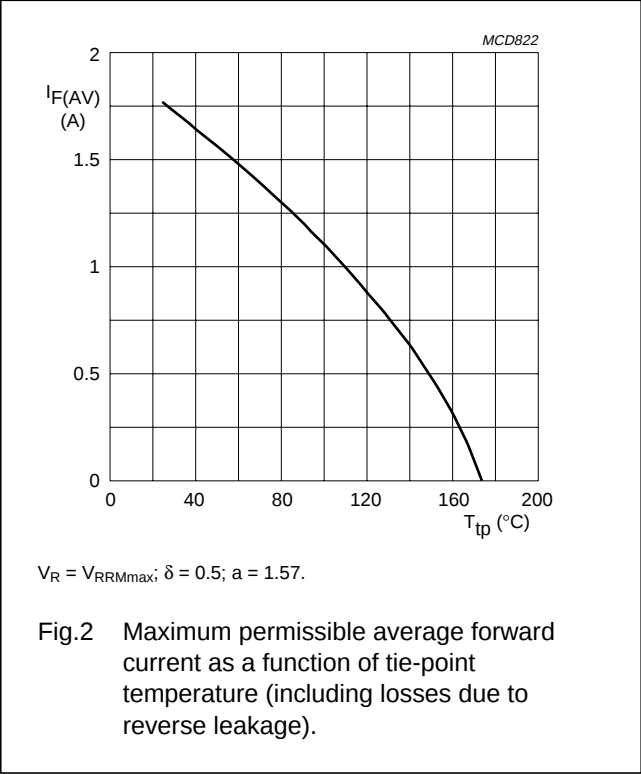
### Notes

- Device mounted on  $\text{Al}_2\text{O}_3$  printed-circuit board, 0.7 mm thick; thickness of copper  $\geq 35\text{ }\mu\text{m}$ .
- Device mounted on epoxy-glass printed-circuit board, 1.5 mm thick; thickness of copper  $\geq 40\text{ }\mu\text{m}$ . For more information please refer to the 'General Part of associated Handbook'.

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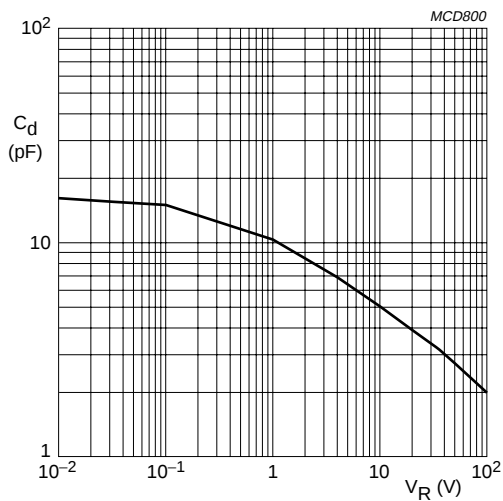
RS1 series

GRAPHICAL DATA



SMA fast soft-recovery  
controlled avalanche rectifiers

RS1 series



$f = 1\text{ MHz}$ ;  $T_j = 25\text{ }^\circ\text{C}$ .

Fig.6 Diode capacitance as a function of reverse voltage; typical values.

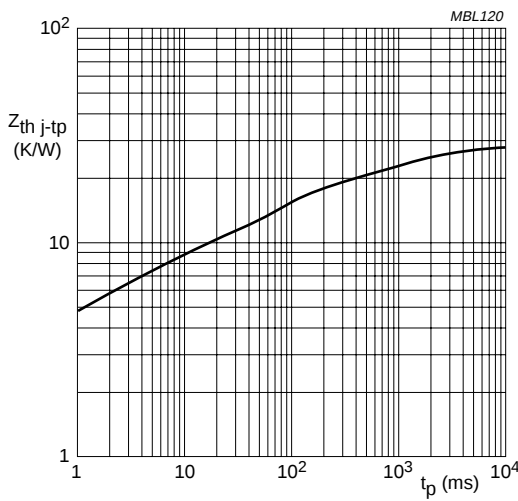
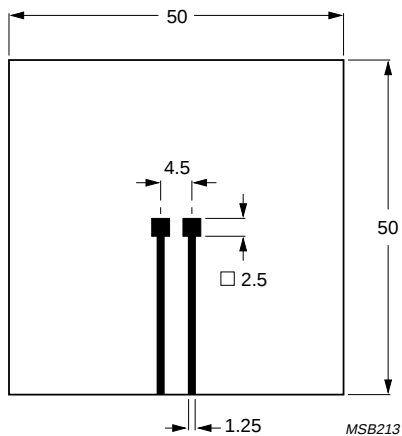


Fig.7 Transient thermal impedance as a function of pulse width.

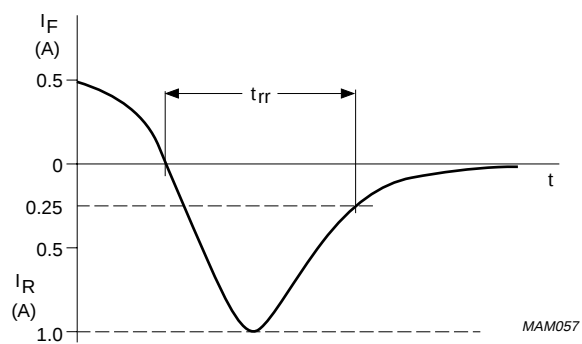
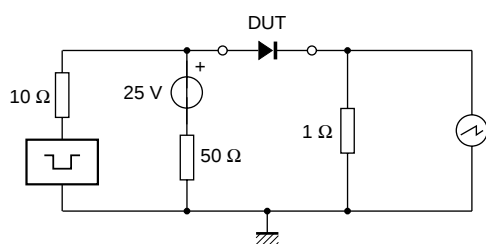


Dimensions in mm.  
Material:  $\text{Al}_2\text{O}_3$  or epoxy-glass.

Fig.8 Printed-circuit board for surface mounting.

# SMA fast soft-recovery controlled avalanche rectifiers

## RS1 series



Input impedance oscilloscope:  $1\text{ M}\Omega$ ,  $22\text{ pF}$ ;  $t_r \leq 7\text{ ns}$ .

Source impedance:  $50\text{ }\Omega$ ;  $t_r \leq 15\text{ ns}$ .

Fig.9 Test circuit and reverse recovery time waveform and definition.

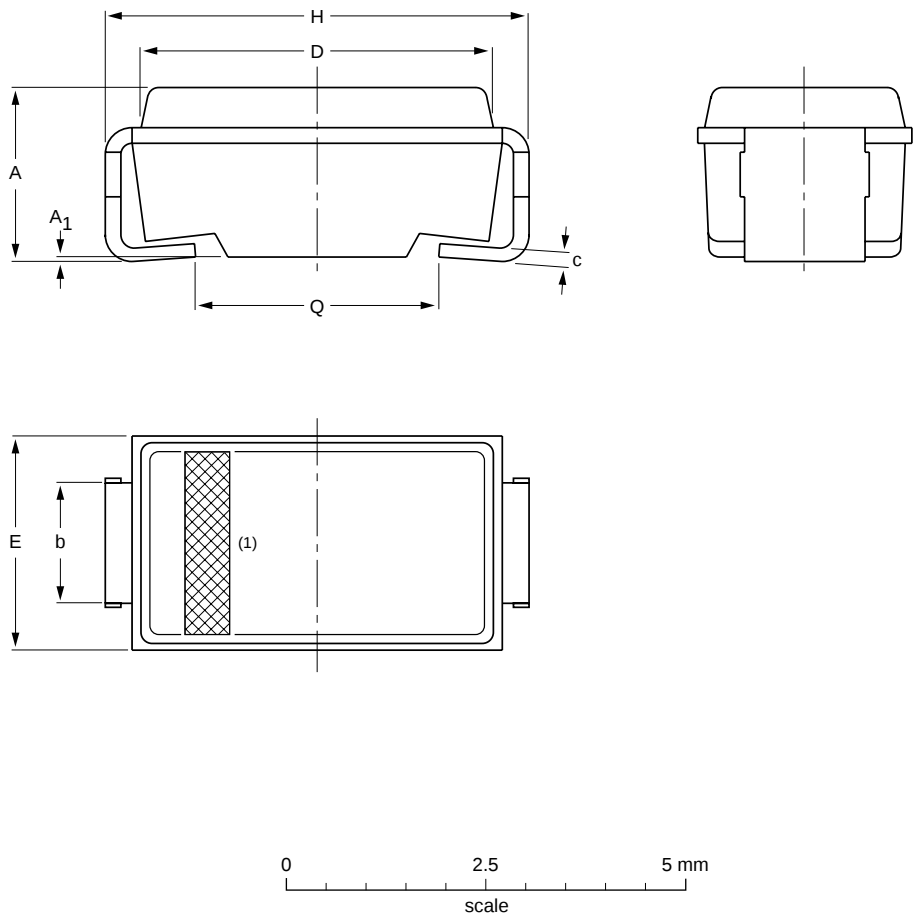
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RS1 series

PACKAGE OUTLINE

Transfer-moulded thermo-setting plastic small rectangular surface mounted package;  
2 connectors

SOD124



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub> | b          | c   | D          | E          | H          | Q          |
|------|------------|----------------|------------|-----|------------|------------|------------|------------|
| mm   | 2.3<br>2.0 | 0.05           | 1.6<br>1.4 | 0.2 | 4.5<br>4.3 | 2.8<br>2.4 | 5.5<br>5.1 | 3.3<br>2.7 |

Note

1. The marking band indicates the cathode.

| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE |
|--------------------|------------|----------|------|--|---------------------------------------------------------------------------------------|------------|
|                    | IEC        | JEDEC    | EIAJ |  |                                                                                       |            |
| SOD124             |            | DO-214AC |      |  |  | 99-10-22   |

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**SMA fast soft-recovery  
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**RS1 series****DEFINITIONS**

| <b>Data sheet status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 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.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                       |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                         |                                                                                       |

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