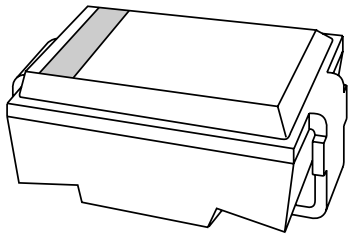
DATA SHEET



US1 series
SMA ultra fast low-loss controlled avalanche rectifiers

Product specification

2000 Feb 14

Philips Semiconductors

PHILIPS

SMA ultra fast low-loss controlled avalanche rectifiers

US1 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.

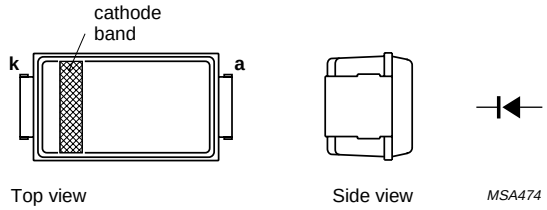


Fig.1 Simplified outline (DO-214AC) and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	US1A		–	50	V
	US1B		–	100	V
	US1D		–	200	V
	US1G		–	400	V
	US1J		–	600	V
V_R	continuous reverse voltage				
	US1A		–	50	V
	US1B		–	100	V
	US1D		–	200	V
	US1G		–	400	V
	US1J		–	600	V
V_{RMS}	root mean square voltage				
	US1A		–	35	V
	US1B		–	70	V
	US1D		–	140	V
	US1G		–	280	V
	US1J		–	420	V
$I_{F(AV)}$	average forward current	averaged over any 20 ms period; T_{tp} = 110 °C; see Fig.2	–	1	A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{FSM}	non-repetitive peak forward current	t = 8.3 ms half sine wave; T_j = 25 °C prior to surge; $V_R = V_{RRMmax}$	–	25	A
T_{stg}	storage temperature		–65	+175	°C
T_j	junction temperature	See Fig.3	–65	+175	°C

ELECTRICAL CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_F	forward voltage	I_F = 1 A;			
	US1A to US1G	see Fig.4	–	1.1	V
	US1J	see Fig.5	–	1.4	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Figs 6 and 7	–	10	µA
		$V_R = V_{RRMmax}$; T_j = 165 °C; see Figs 6 and 7	–	50	µA
t_{rr}	reverse recovery time	when switched from I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25 A; see Fig.12	–	50	ns
C_d	diode capacitance	V_R = 4 V; f = 1 MHz;			
	US1A to US1G	see Fig.8	14	–	pF
	US1J	see Fig.9	10	–	pF

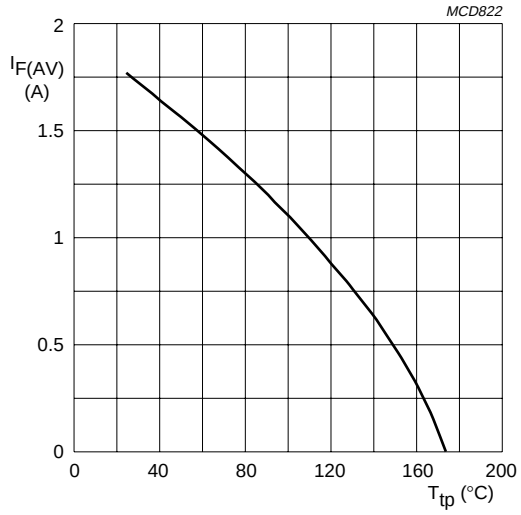
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point; see Fig.10		27	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	100	K/W
		note 2	150	K/W

Notes

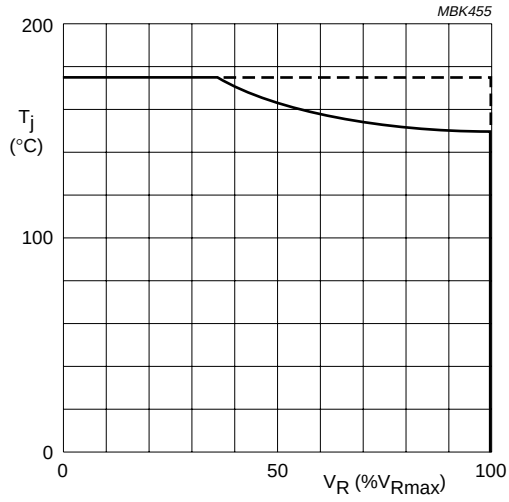
1. Device mounted on Al_2O_3 printed-circuit board, 0.7 mm thick; thickness of copper ≥35 µm.
2. Device mounted on epoxy-glass printed-circuit board, 1.5 mm thick; thickness of copper ≥40 µm. For more information please refer to the *'General Part of associated Handbook'*.

GRAPHICAL DATA



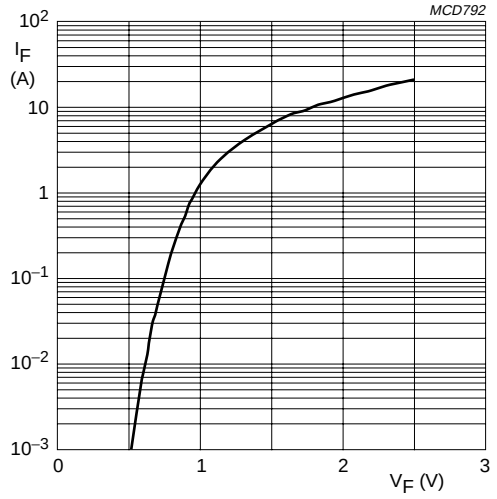
$V_R = V_{RRMmax}$; $\delta = 0.5$; $a = 1.57$.

Fig.2 Maximum permissible average forward current as a function of tie-point temperature (including losses due to reverse leakage).



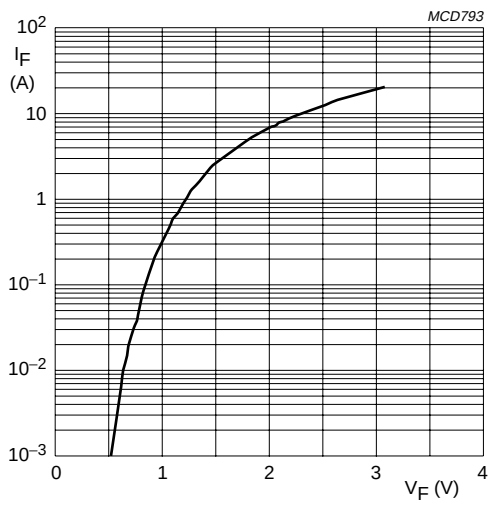
Device mounted as shown in Fig.11.
Solid line: Al_2O_3 printed-circuit board.
Dotted line: epoxy printed-circuit board.

Fig.3 Maximum permissible junction temperature as a function of reverse voltage.



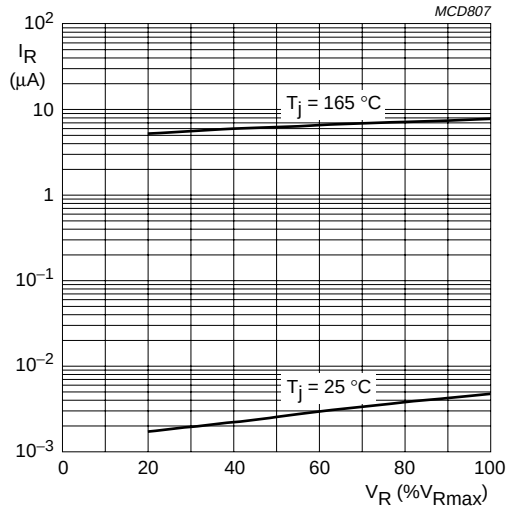
US1A to G
$T_j = 25$ °C.

Fig.4 Forward current as a function of forward voltage; typical values.



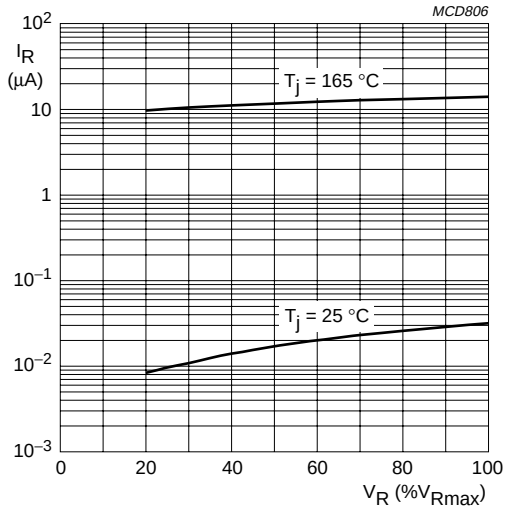
US1J
$T_j = 25$ °C.

Fig.5 Forward current as a function of forward voltage; typical values.



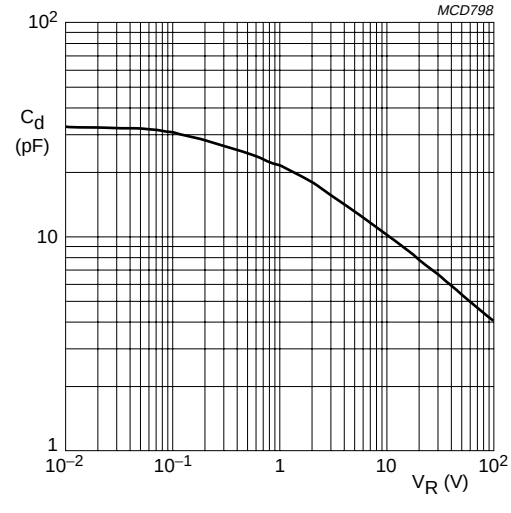
US1A to G
f = 1 MHz; T_j = 25 °C.

Fig.6 Reverse current as a function of reverse voltage; typical values.



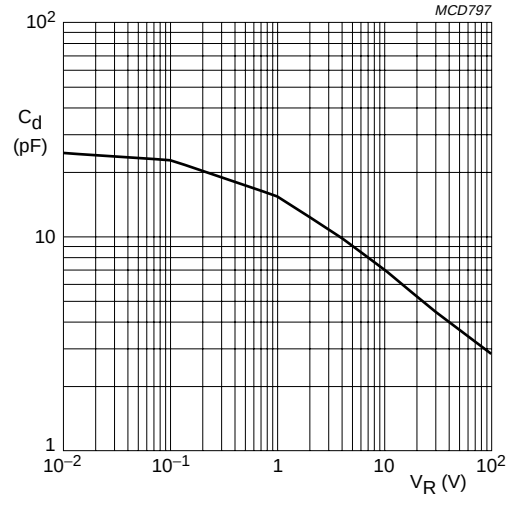
US1J
f = 1 MHz; T_j = 25 °C.

Fig.7 Reverse current as a function of reverse voltage; typical values.



US1 A to G
f = 1 MHz; T_j = 25 °C.

Fig.8 Diode capacitance as a function of reverse voltage; typical values.



US1J
f = 1 MHz; T_j = 25 °C.

Fig.9 Diode capacitance as a function of reverse voltage; typical values.

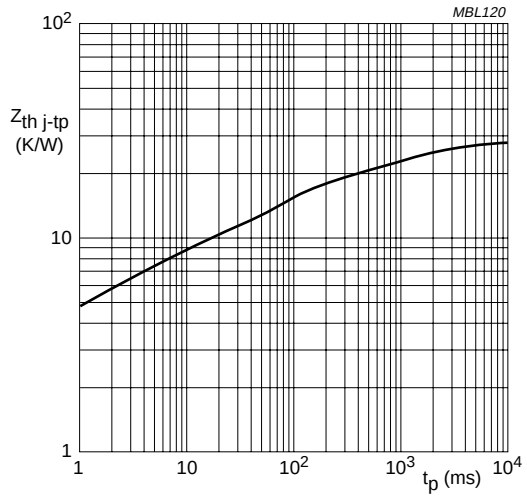
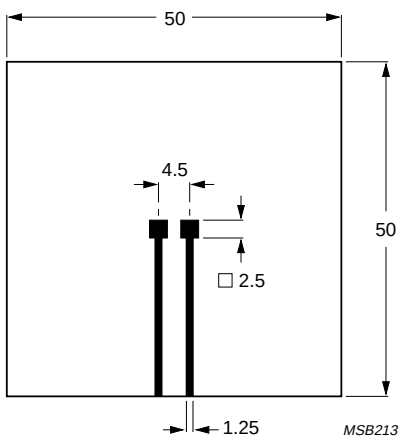
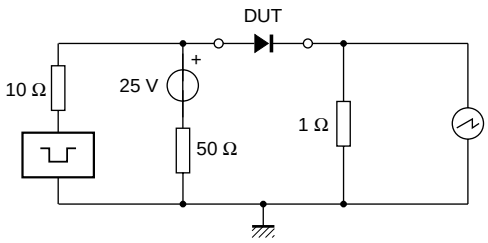


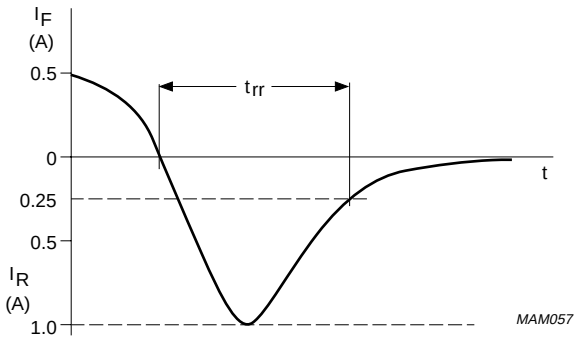
Fig.10 Transient thermal impedance as a function of pulse width.



Dimensions in mm.
Material: Al_2O_3 or epoxy-glass.

Fig.11 Printed-circuit board for surface mounting.



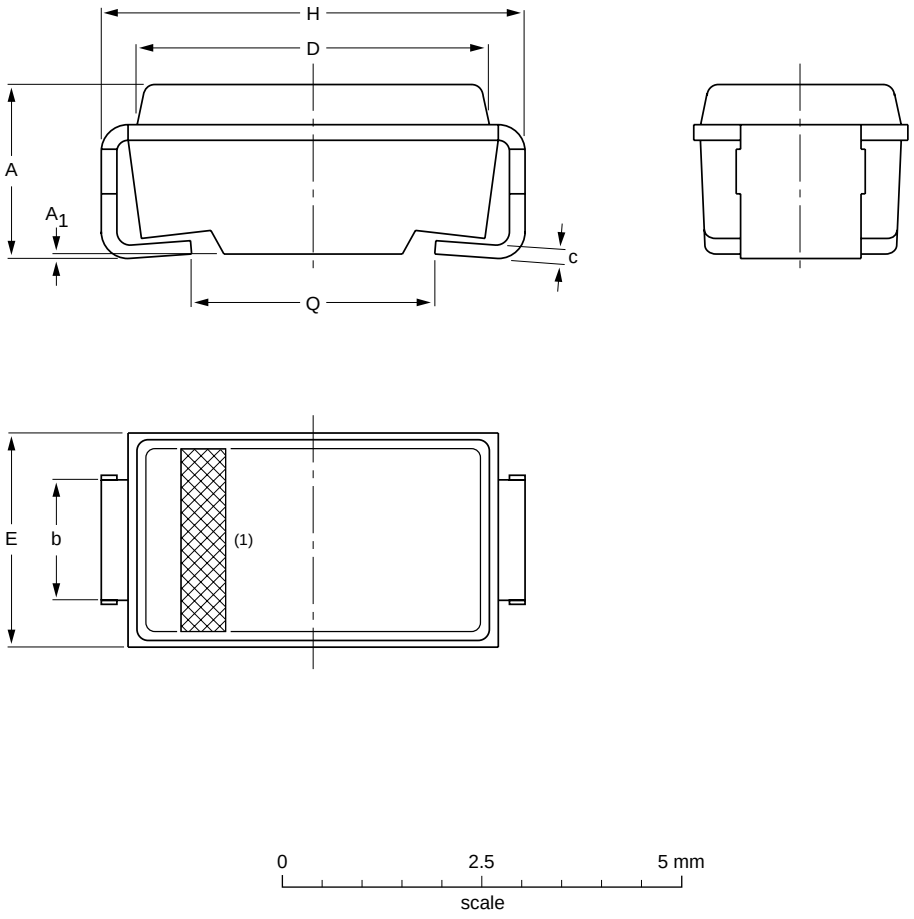


Input impedance oscilloscope: 1 MΩ, 22 pF; $t_r \leq 7$ ns.
Source impedance: 50 Ω; $t_r \leq 15$ ns.

Fig.12 Test circuit and reverse recovery time waveform and definition.

PACKAGE OUTLINE

Transfer-moulded thermo-setting plastic small rectangular surface mounted package; 2 connectors **SOD124**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D	E	H	Q
mm	2.3 2.0	0.05	1.6 1.4	0.2	4.5 4.3	2.8 2.4	5.5 5.1	3.3 2.7

Note

1. The marking band indicates the cathode.

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

DEFINITIONS

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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NOTES

NOTES

NOTES

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