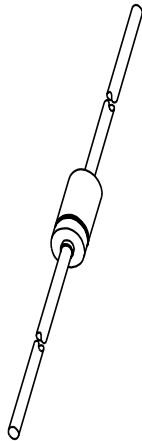


# DATA SHEET



## **1N821 to 1N829** **1N821A to 1N829A** Voltage reference diodes

Product specification  
Supersedes data of March 1991

1996 Mar 20

# Voltage reference diodes

## 1N821 to 1N829 1N821A to 1N829A

### FEATURES

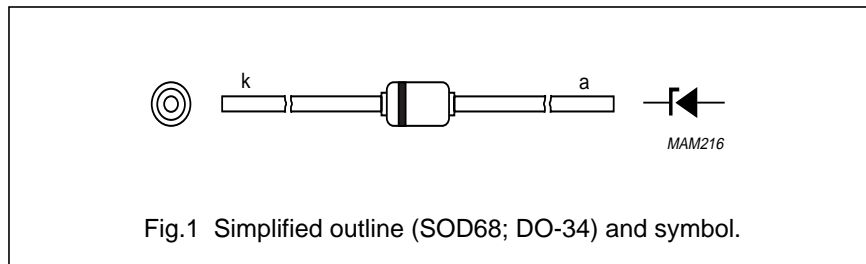
- Temperature compensated
- Reference voltage range: 5.89 to 6.51 V (typ. 6.20 V)
- Low temperature coefficient range: max. 0.0005 to 0.01 %/K.

### APPLICATION

- Voltage reference sources in measuring instruments such as digital voltmeters.

### DESCRIPTION

Voltage reference diode in a hermetically-sealed SOD68 (DO-34) glass package.



### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_z$	working current		–	50	mA
$P_{tot}$	total power dissipation	$T_{amb} = 50\text{ °C}$	–	400	mW
$T_{stg}$	storage temperature		–65	+200	°C
$T_j$	junction temperature		–	200	°C
$T_{amb}$	operating ambient temperature		–55	+100	°C

## Voltage reference diodes

1N821 to 1N829  
1N821A to 1N829A**ELECTRICAL CHARACTERISTICS** $T_j = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{ref}$	reference voltage	$I_Z = 7.5\text{ mA}$	5.89	6.20	6.51	V
$ \Delta V_{ref} $	reference voltage excursion 1N821; 1N821A 1N823; 1N823A 1N825; 1N825A 1N827; 1N827A 1N829; 1N829A	$I_Z = 7.5\text{ mA}$ ; test points for $T_{amb}: -55; +25; +75; +100\text{ °C}$ ; see Fig.2; notes 1 and 2	–	–	96 48 19 9 5	mV mV mV mV mV
$ S_Z $	temperature coefficient 1N821; 1N821A 1N823; 1N823A 1N825; 1N825A 1N827; 1N827A 1N829; 1N829A	$I_Z = 7.5\text{ mA}$ ; see Fig.3; notes 1 and 2	–	–	0.01 0.005 0.002 0.001 0.0005	%/K %/K %/K %/K %/K
$r_{dif}$	differential resistance 1N821 to 1N829 1N821A to 1N829A	$I_Z = 7.5\text{ mA}$ ; see Fig.4	–	–	15 10	$\Omega$ $\Omega$

**Notes**

- The quoted values of  $\Delta V_{ref}$  are based on a constant current  $I_Z$ . Two factors can cause  $\Delta V_{ref}$  to change, namely the differential resistance  $r_{dif}$  and the temperature coefficient  $S_Z$ .
  - As the max.  $r_{dif}$  of the device can be  $15\ \Omega$ , a change of  $0.01\text{ mA}$  in the current through the reference diode will result in a  $\Delta V_{ref}$  of  $0.01\text{ mA} \times 15\ \Omega = 0.15\text{ mV}$ . This level of  $\Delta V_{ref}$  is not significant on a 1N821 ( $\Delta V_{ref} < 96\text{ mV}$ ), it is however very significant on a 1N829 ( $\Delta V_{ref} < 5\text{ mV}$ ).
  - The temperature coefficient of the reference voltage  $S_Z$  is a function of  $I_Z$ . Reference diodes are classified at the specified test current and the  $S_Z$  of the reference diode will be different at different levels of  $I_Z$ . The absolute value of  $I_Z$  is important, however, the stability of  $I_Z$ , once the level has been set, is far more significant. This applies particularly to the 1N829. The effect of the stability of  $I_Z$  on  $S_Z$  is shown in Fig.3.
- All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion ( $\Delta V_{ref}$ ) over the specified temperature range, at the specified test current ( $I_Z$ ), verified by tests at indicated temperature points within the range.  $V_Z$  is measured and recorded at each temperature specified. The  $\Delta V_{ref}$  between the highest and lowest values must not exceed the maximum  $\Delta V_{ref}$  given. Therefore the temperature coefficient is only given as

a reference. It may be derived from: 
$$S_Z = \frac{V_{ref1} - V_{ref2}}{T_{amb2} - T_{amb1}} \times \frac{100}{V_{ref\ nom}}\ \%/K$$

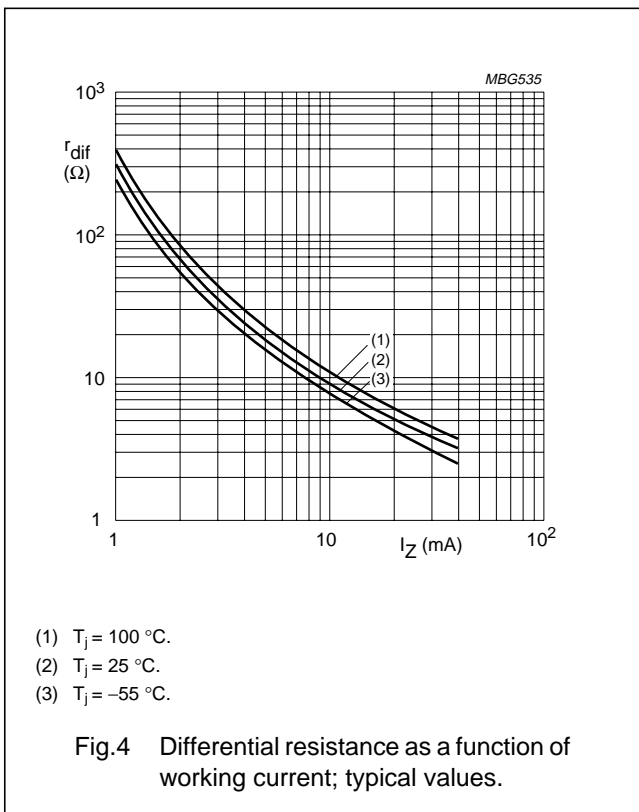
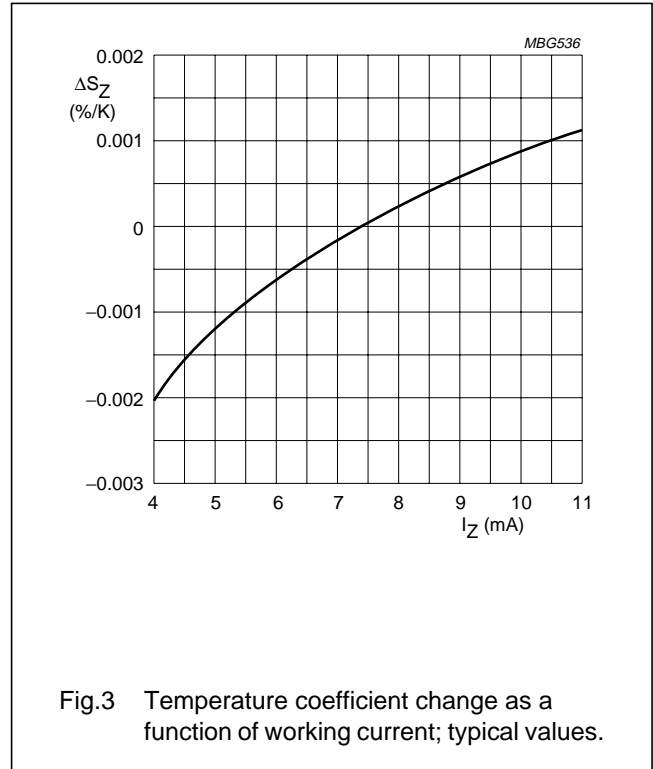
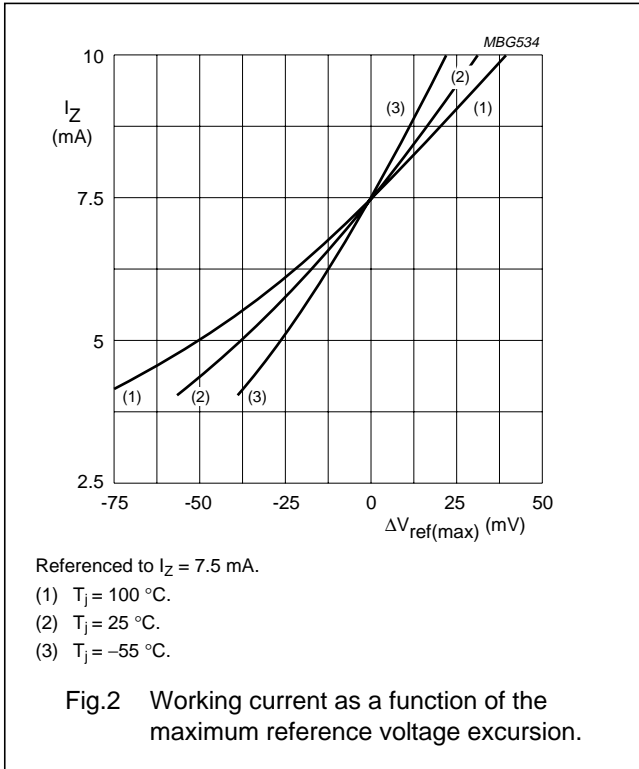
**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-tp}$	thermal resistance from junction to tie-point	8 mm from the body	300	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient	lead length 10 mm	375	K/W

Voltage reference diodes

1N821 to 1N829  
1N821A to 1N829A

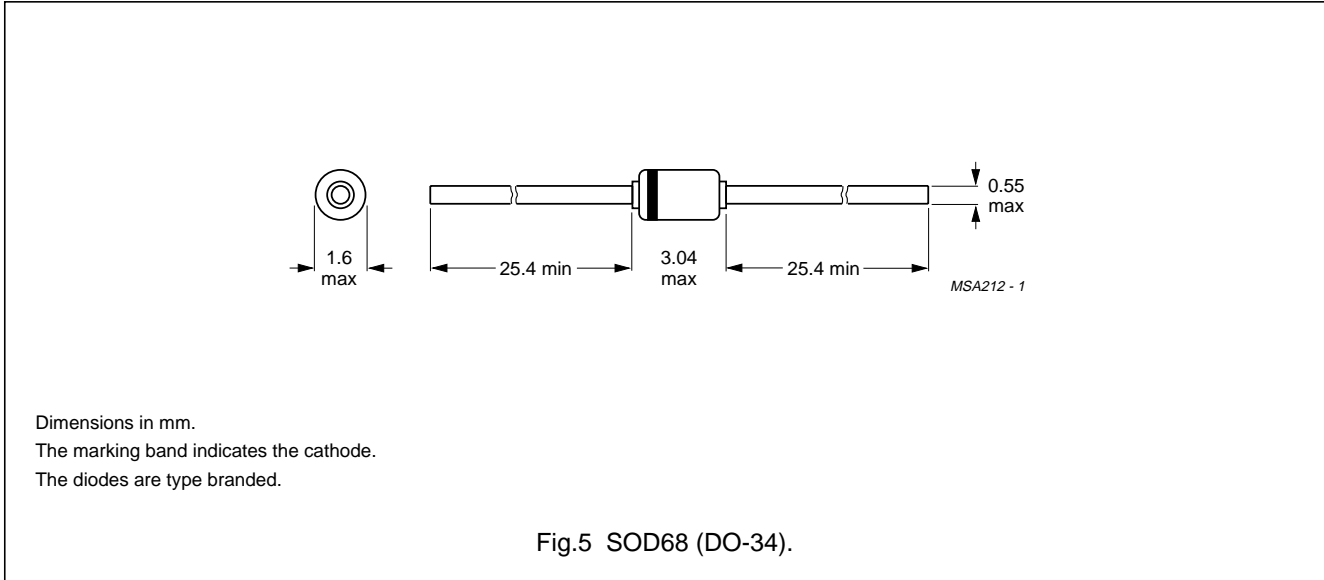
GRAPHICAL DATA



Voltage reference diodes

1N821 to 1N829  
1N821A to 1N829A

PACKAGE OUTLINE



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 134). 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.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.