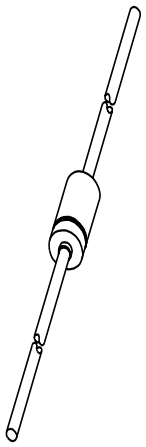
DATA SHEET



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

Product specification
Supersedes data of March 1991

1996 Mar 20

Philips
Semiconductors

PHILIPS

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.

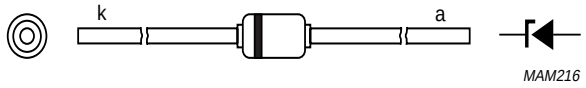


Fig.1 Simplified outline (SOD68; DO-34) and symbol.

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 °C	–	400	mW
T_{stg}	storage temperature		–65	+200	°C
T_j	junction temperature		–	200	°C
T_{amb}	operating ambient temperature		–55	+100	°C

ELECTRICAL CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

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

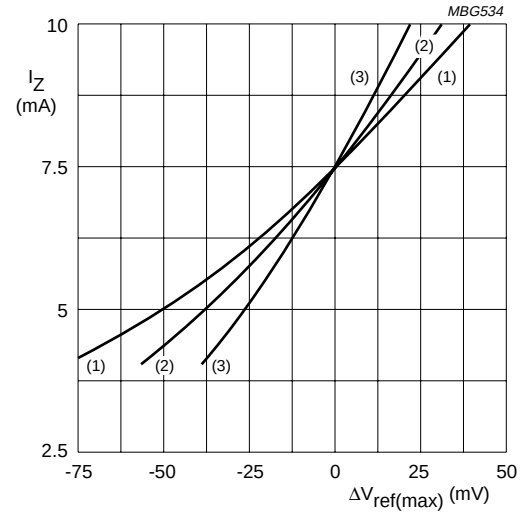
Notes

1. The quoted values of ΔV_{ref} are based on a constant current I_Z. Two factors can cause ΔV_{ref} to change, namely the differential resistance r_{dif} and the temperature coefficient S_Z.
   a) As the max. r_{dif} of the device can be 15 Ω, a change of 0.01 mA in the current through the reference diode will result in a ΔV_{ref} of 0.01 mA × 15 Ω = 0.15 mV. This level of ΔV_{ref} is not significant on a 1N821 (ΔV_{ref} < 96 mV), it is however very significant on a 1N829 (ΔV_{ref} < 5 mV).
   b) 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.
2. All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion (ΔV_{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 ΔV_{ref} between the highest and lowest values must not exceed the maximum ΔV_{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
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point	8 mm from the body	300	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	lead length 10 mm	375	K/W

GRAPHICAL DATA



Referenced to I_Z = 7.5 mA.
(1) T_j = 100 °C.
(2) T_j = 25 °C.
(3) T_j = –55 °C.

Fig.2 Working current as a function of the maximum reference voltage excursion.

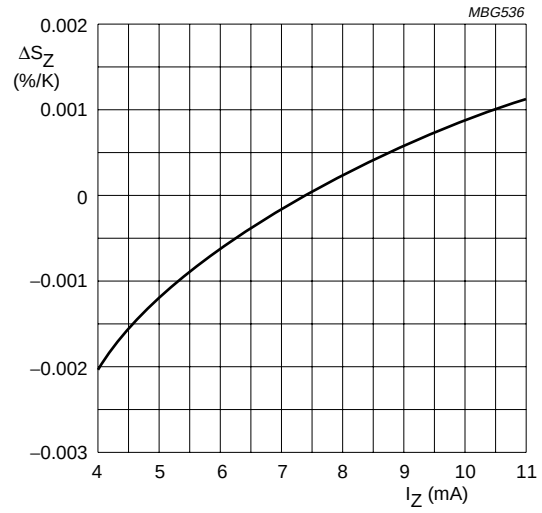
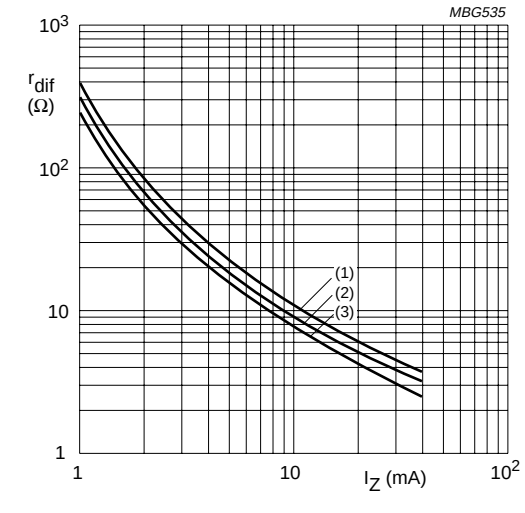


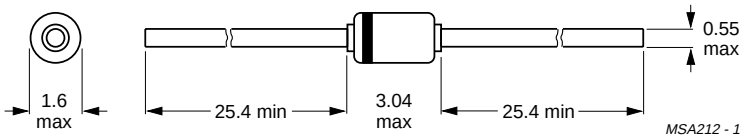
Fig.3 Temperature coefficient change as a function of working current; typical values.



(1) T_j = 100 °C.
(2) T_j = 25 °C.
(3) T_j = –55 °C.

Fig.4 Differential resistance as a function of working current; typical values.

PACKAGE OUTLINE



Dimensions in mm.
The marking band indicates the cathode.
The diodes are type branded.

Fig.5 SOD68 (DO-34).

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 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.	
Application information	
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.