

T-11-09

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA
1N4370 thru 1N4372
See Page 4-4
1N4549 thru 1N4564
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1N4565 thru 1N4584
1N4765 thru 1N4784
REFERENCE DIODES
LOW LEVEL
TEMPERATURE-COMPENSATED
ZENER
LOW-LEVEL TEMPERATURE-COMPENSATED
ZENER REFERENCE DIODES

Highly reliable reference sources utilizing a nitride/oxide-passivated junction for long-term voltage stability. Glass construction provides a rugged, hermetically sealed structure.

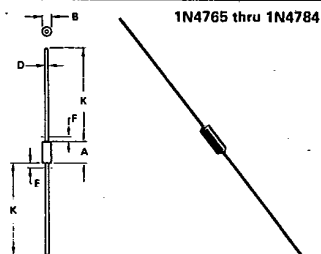
- Low Power Drain Devices Specified @ 0.5 mA, 1.0 mA, 2.0 mA, and 4.0 mA
- Maximum Voltage Change Specified over Test Temperature Range
- Temperature Compensation Guaranteed over Two Standard Operating Temperature Ranges:
0 to 75°C
-55 to 100°C

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
DC Power Dissipation @ $T_A = 50^\circ\text{C}$ Derate above 50°C	P_D	400 3.2	mW mW/°C
Junction and Storage Temperature Range	T_J, T_{stg}	-65 to +175	°C

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed, all-glass.
DIMENSIONS: See outline drawing.
FINISH: All external surfaces are corrosion resistant and leads are readily solderable and weldable.
POLARITY: Cathode indicated by polarity band.
WEIGHT: 0.2 gram (approx.)
MOUNTING POSITION: Any

**NOTES**

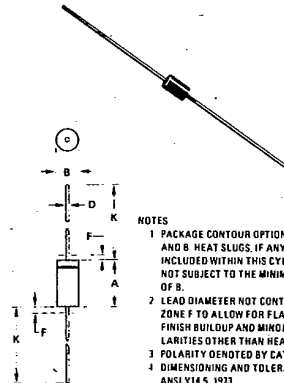
- 1 PACKAGE CONTOUR OPTIONAL WITHIN DIA B AND LENGTH A. HEAT SLUGS, IF ANY, SHALL BE INCLUDED WITHIN THIS CYLINDER, BUT SHALL NOT BE SUBJECT TO THE MIN LIMIT OF DIA B.
- 2 LEAD DIA NOT CONTROLLED IN ZONE F TO ALLOW FOR FLASH, LEAD FINISH BUILDUP, AND MINOR IRREGULARITIES OTHER THAN HEAT SLUGS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.84	7.62	0.230	0.300
B	2.15	2.72	0.085	0.107
D	0.45	0.56	0.018	0.022
F	-	1.27	-	0.050
K	25.40	38.10	1.000	1.500

CASE 51-02
DO-204AA
GLASS

All JEDEC dimensions and notes apply.

1N4565 thru 1N4584

**NOTES**

- 1 PACKAGE CONTOUR OPTIONAL WITHIN A AND B. HEAT SLUGS, IF ANY, SHALL BE INCLUDED WITHIN THIS CYLINDER, BUT NOT SUBJECT TO THE MINIMUM LIMIT OF B.
- 2 LEAD DIAMETER NOT CONTROLLED IN ZONE F TO ALLOW FOR FLASH, LEAD FINISH BUILDUP AND MINOR IRREGULARITIES OTHER THAN HEAT SLUGS.
- 3 POLARITY DENOTED BY CATHODE BAND.
- 4 DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	3.05	5.08	0.120	0.200
B	1.32	2.29	0.050	0.090
D	0.45	0.56	0.018	0.022
F	-	1.27	-	0.050
K	25.40	38.10	1.000	1.500

CASE 299-02
DO-204AH
GLASS

All JEDEC dimensions and notes apply.

1N4565 thru 1N4584, 1N4775 thru 1N4784, 1N4765 thru 1N4774

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TYPE	ΔV_Z @ Test (Note 1) Temperature		Temperature Coefficient for Reference %/°C (Note 1)	Dynamic Imped. Ohms Max (Note 2)
	Volts Max	°C		
$V_Z = 6.4 \text{ Volts} \pm 5\% (I_{ZT} = 0.5 \text{ mA})$				
1N4565	0.048	0, +25, +75	0.01	200
1N4566	0.024		0.005	
1N4567	0.010		0.002	
1N4568	0.005		0.001	
1N4569	0.002		0.0005	
1N4565A	0.099	-55, 0, +25, +75, +100	0.01	200
1N4568A	0.050		0.005	
1N4567A	0.020		0.002	
1N4568A	0.010		0.001	
1N4569A	0.005		0.005	
$V_Z = 6.4 \text{ Volts} \pm 5\% (I_{ZT} = 1.0 \text{ mA})$				
1N4570	0.048	0, +25, +75	0.01	100
1N4571	0.024		0.005	
1N4572	0.010		0.002	
1N4573	0.005		0.001	
1N4574	0.002		0.0005	
1N4570A	0.099	-55, 0, +25, +75, +100	0.01	100
1N4571A	0.050		0.005	
1N4572A	0.020		0.002	
1N4573A	0.010		0.001	
1N4574A	0.005		0.0005	
$V_Z = 6.4 \text{ Volts} \pm 5\% (I_{ZT} = 2.0 \text{ mA})$				
1N4575	0.048	0, +25, +75	0.01	50
1N4576	0.024		0.005	
1N4577	0.010		0.002	
1N4578	0.005		0.001	
1N4579	0.002		0.0005	
1N4575A	0.099	-55, 0, +25, +75, +100	0.01	50
1N4576A	0.050		0.005	
1N4577A	0.020		0.002	
1N4578A	0.010		0.001	
1N4579A	0.005		0.0005	
$V_Z = 6.4 \text{ Volts} \pm 5\% (I_{ZT} = 4.0 \text{ mA})$				
1N4580	0.048	0, +25, +75	0.01	25
1N4581	0.024		0.005	
1N4582	0.010		0.002	
1N4583	0.005		0.001	
1N4584	0.002		0.0005	
1N4580A	0.099	-55, 0, +25, +75, +100	0.01	25
1N4581A	0.050		0.005	
1N4582A	0.020		0.002	
1N4583A	0.010		0.001	
1N4584A	0.005		0.0005	

TYPE	ΔV_Z @ Test (Note 1) Temperature		Temperature Coefficient for Reference %/°C (Note 1)	Dynamic Imped. Ohms Max (Note 2)
	Volts Max	°C		
$V_Z = 8.5 \text{ Volts} \pm 5\% (I_{ZT} = 0.5 \text{ mA})$				
1N4775	0.064	0, +25, +75	0.01	200
1N4776	0.032		0.005	
1N4777	0.013		0.002	
1N4778	0.006		0.001	
1N4779	0.003		0.0005	
1N4775A	0.132	-55, 0, +25, +75, +100	0.01	200
1N4776A	0.066		0.005	
1N4777A	0.026		0.002	
1N4778A	0.013		0.001	
1N4779A	0.007		0.0005	
$V_Z = 8.5 \text{ Volts} \pm 5\% (I_{ZT} = 1.0 \text{ mA})$				
1N4780	0.064	0, +25, +75	0.01	100
1N4781	0.032		0.005	
1N4782	0.013		0.002	
1N4783	0.006		0.001	
1N4784	0.003		0.0005	
1N4780A	0.132	-55, 0, +25, +75, +100	0.01	100
1N4781A	0.066		0.005	
1N4782A	0.026		0.002	
1N4783A	0.013		0.001	
1N4784A	0.007		0.0005	
$V_Z = 9.1 \text{ Volts} \pm 5\% (I_{ZT} = 0.5 \text{ mA})$				
1N4765	0.068	0, +25, +75	0.01	350
1N4766	0.034		0.005	
1N4767	0.014		0.002	
1N4768	0.007		0.001	
1N4769	0.003		0.0005	
1N4765A	0.141	-55, 0, +25, +75, +100	0.01	350
1N4766A	0.070		0.005	
1N4767A	0.028		0.002	
1N4768A	0.014		0.001	
1N4769A	0.007		0.0005	
$V_Z = 9.1 \text{ Volts} \pm 5\% (I_{ZT} = 1.0 \text{ mA})$				
1N4770	0.068	0, +25, +75	0.01	200
1N4771	0.034		0.005	
1N4772	0.014		0.002	
1N4773	0.007		0.001	
1N4774	0.003		0.0005	
1N4770A	0.141	-55, 0, +25, +75, +100	0.01	200
1N4771A	0.070		0.005	
1N4772A	0.028		0.002	
1N4773A	0.014		0.001	
1N4774A	0.007		0.0005	

NOTE 1: Voltage Variation (ΔV_Z) and Temperature Coefficient.

All reference diodes are characterized by the "box method". This guarantees a maximum voltage variation (ΔV_Z) over the specified temperature range, at the specified test current (I_{ZT}), verified by tests at indicated temperature points within the range. This method of indicating voltage stability is now used for JEDEC registration as well as for military qualification. The former method of indicating voltage stability—by means of temperature coefficient—accurately reflects the voltage deviation at the temperature extremes, but is not necessarily accurate within the temperature range because reference diodes have a nonlinear temperature relationship. The temperature coefficient, therefore, is given only as a reference.

NOTE 2:

The dynamic zener impedance, Z_{ZT} , is derived from the 60 Hz ac voltage drop which results when an ac current with an rms value equal to 10% of the dc zener current, I_{ZT} , is superimposed on I_{ZT} . A cathode-ray tube curve-trace test on a sample basis is used to ensure that the zener has a sharp and stable knee region.