

## Current Regulator Diodes

Field-effect current regulator diodes are circuit elements that provide a current essentially independent of voltage. These diodes are especially designed for maximum impedance over the operating range. These devices may be used in parallel to obtain higher currents.

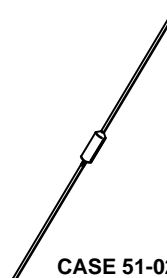
### Manufacturing Locations:

**WAFER FAB:** Phoenix, Arizona

**ASSEMBLY/TEST:** Phoenix, Arizona

**1N5283**  
**through**  
**1N5314**

**CURRENT**  
**REGULATOR**  
**DIODES**



### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Operating Voltage ( $T_J = -55^{\circ}\text{C}$ to $+200^{\circ}\text{C}$ )	POV	100	Volts
Steady State Power Dissipation @ $T_L = 75^{\circ}\text{C}$ Derate above $T_L = 75^{\circ}\text{C}$ Lead Length = 3/8" (Forward or Reverse Bias)	$P_D$	600 4.8	mW mW/ $^{\circ}\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +200	$^{\circ}\text{C}$

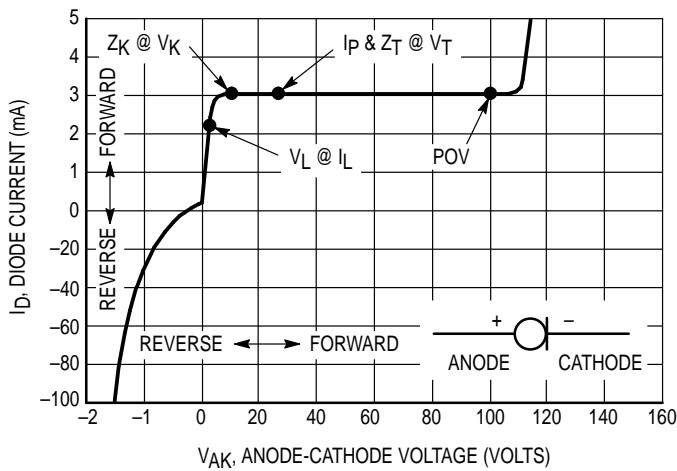
# 1N5283 through 1N5314

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

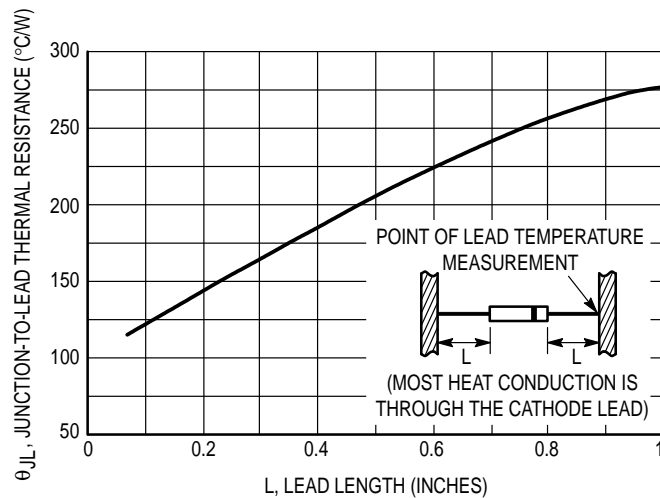
Type No.	Regulator Current $I_P$ (mA) @ $V_T = 25\text{ V}$			Minimum Dynamic Impedance @ $V_T = 25\text{ V}$ $Z_T$ (M $\Omega$ )	Minimum Knee Impedance @ $V_K = 6.0\text{ V}$ $Z_K$ (M $\Omega$ )	Maximum Limiting Voltage @ $I_L = 0.8 I_P$ (min) $V_L$ (Volts)
	Nom	Min	Max			
<b>1N5283</b>	0.22	0.198	0.242	25.0	2.75	1.00
1N5284	0.24	0.216	0.264	19.0	2.35	1.00
1N5285	0.27	0.243	0.297	14.0	1.95	1.00
1N5286	0.30	0.270	0.330	9.00	1.60	1.00
<b>1N5287</b>	0.33	0.297	0.363	6.60	1.35	1.00
1N5288	0.39	0.351	0.429	4.10	1.00	1.05
1N5289	0.43	0.387	0.473	3.30	0.870	1.05
<b>1N5290</b>	0.47	0.423	0.517	2.70	0.750	1.05
<b>1N5291</b>	0.56	0.504	0.616	1.90	0.560	1.10
1N5292	0.62	0.558	0.682	1.55	0.470	1.13
1N5293	0.68	0.612	0.748	1.35	0.400	1.15
1N5294	0.75	0.675	0.825	1.15	0.335	1.20
1N5295	0.82	0.738	0.902	1.00	0.290	1.25
1N5296	0.91	0.819	1.001	0.880	0.240	1.29
<b>1N5297</b>	1.00	0.900	1.100	0.800	0.205	1.35
<b>1N5298</b>	1.10	0.990	1.21	0.700	0.180	1.40
<b>1N5299</b>	1.20	1.08	1.32	0.640	0.155	1.45
1N5300	1.30	1.17	1.43	0.580	0.135	1.50
1N5301	1.40	1.26	1.54	0.540	0.115	1.55
<b>1N5302</b>	1.50	1.35	1.65	0.510	0.105	1.60
1N5303	1.60	1.44	1.76	0.475	0.092	1.65
1N5304	1.80	1.62	1.98	0.420	0.074	1.75
<b>1N5305</b>	2.00	1.80	2.20	0.395	0.061	1.85
<b>1N5306</b>	2.20	1.98	2.42	0.370	0.052	1.95
<b>1N5307</b>	2.40	2.16	2.64	0.345	0.044	2.00
1N5308	2.70	2.43	2.97	0.320	0.035	2.15
<b>1N5309</b>	3.00	2.70	3.30	0.300	0.029	2.25
1N5310	3.30	2.97	3.63	0.280	0.024	2.35
1N5311	3.60	3.24	3.96	0.265	0.020	2.50
<b>1N5312</b>	3.90	3.51	4.29	0.255	0.017	2.60
<b>1N5313</b>	4.30	3.87	4.73	0.245	0.014	2.75
<b>1N5314</b>	4.70	4.23	5.17	0.235	0.012	2.90

Devices listed in bold, italic are Motorola preferred devices.

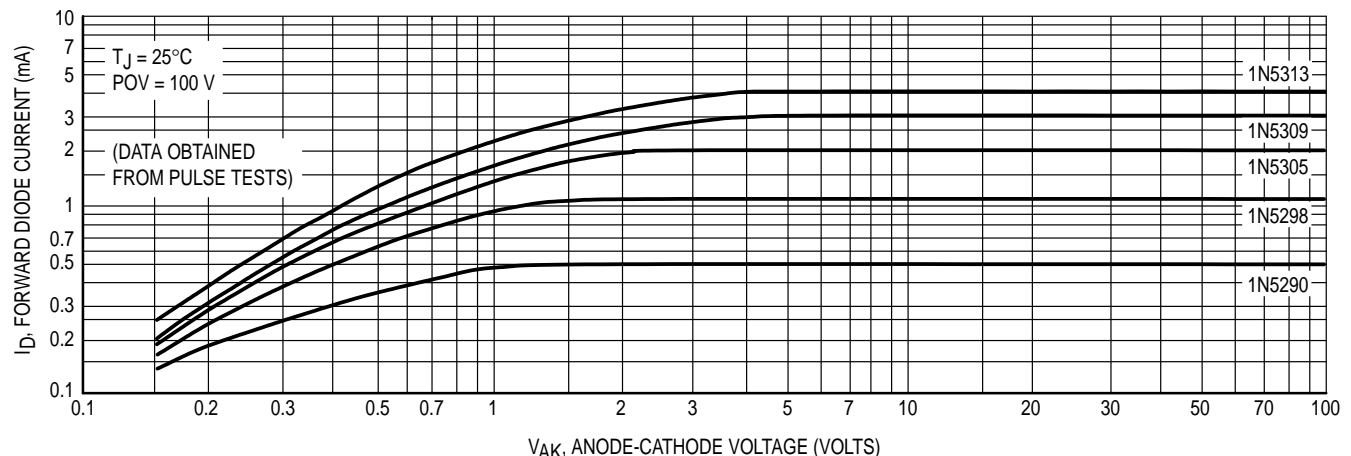
# 1N5283 through 1N5314



**Figure 1. Typical Current Regulator Characteristics**



**Figure 2. Typical Thermal Resistance**



**Figure 3. Typical Forward Characteristics**

## SYMBOLS AND DEFINITIONS

- $I_D$  — Diode Current.
- $I_L$  — Limiting Current: 80% of  $I_p$  minimum used to determine Limiting voltage,  $V_L$ .
- $I_p$  — Pinch-off Current: Regulator current at specified Test Voltage,  $V_T$ .
- POV — Peak Operating Voltage: Maximum voltage to be applied to device.
- $\theta_I$  — Current Temperature Coefficient.
- $V_{AK}$  — Anode-to-cathode Voltage.
- $V_K$  — Knee Impedance Test Voltage: Specified voltage used to establish Knee Impedance,  $Z_K$ .
- $V_L$  — Limiting Voltage: Measured at  $I_L$ ,  $V_L$ , together with Knee AC Impedance,  $Z_K$ , indicates the Knee characteristics of the device.
- $V_T$  — Test Voltage: Voltage at which  $I_p$  and  $Z_T$  are specified.
- $Z_K$  — Knee AC Impedance at Test Voltage: To test for  $Z_K$ , a 90 Hz signal  $V_K$  with RMS value equal to 10% of test voltage,  $V_K$ , is superimposed on  $V_K$ :  

$$Z_K = V_K / i_K$$
 where  $i_K$  is the resultant ac current due to  $V_K$ .  
 To provide the most constant current from the diode,  $Z_K$  should be as high as possible; therefore, a minimum value of  $Z_K$  is specified.
- $Z_T$  — AC Impedance at Test Voltage: Specified as a minimum value. To test for  $Z_T$ , a 90 Hz signal with RMS value equal to 10% of Test Voltage  $V_T$ , is superimposed on  $V_T$ .

## APPLICATION NOTE

As the current available from the diode is temperature dependent, it is necessary to determine junction temperature,  $T_J$ , under specific operating conditions to calculate the value of the diode current. The following procedure is recommended:

Lead Temperature,  $T_L$ , shall be determined from:

$$T_L = \theta_{LA} P_D + T_A$$

where  $\theta_{LA}$  is lead-to-ambient thermal resistance and  $P_D$  is power dissipation.

$\theta_{LA}$  is generally 30–40°C/W for the various clips and tie points in common use, and for printed circuit-board wiring.

Junction Temperature,  $T_J$ , shall be calculated from:

$$T_J = T_L + \theta_{JL} P_D$$

where  $\theta_{JL}$  is taken from Figure 2.

For circuit design limits of  $V_{AK}$ , limits of  $P_D$  may be estimated and extremes of  $T_J$  may be computed. Using the information on Figures 4 and 5, changes in current may be found. To improve current regulation, keep  $V_{AK}$  low to reduce  $P_D$  and keep the leads short, especially the cathode lead, to reduce  $\theta_{JL}$ .

# 1N5283 through 1N5314

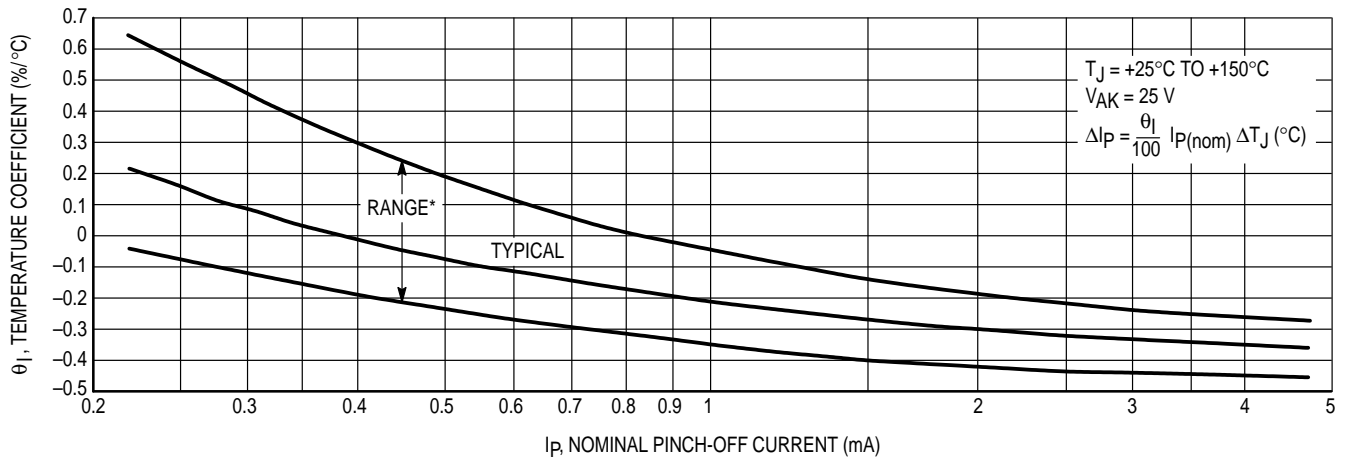


Figure 4. Temperature Coefficient

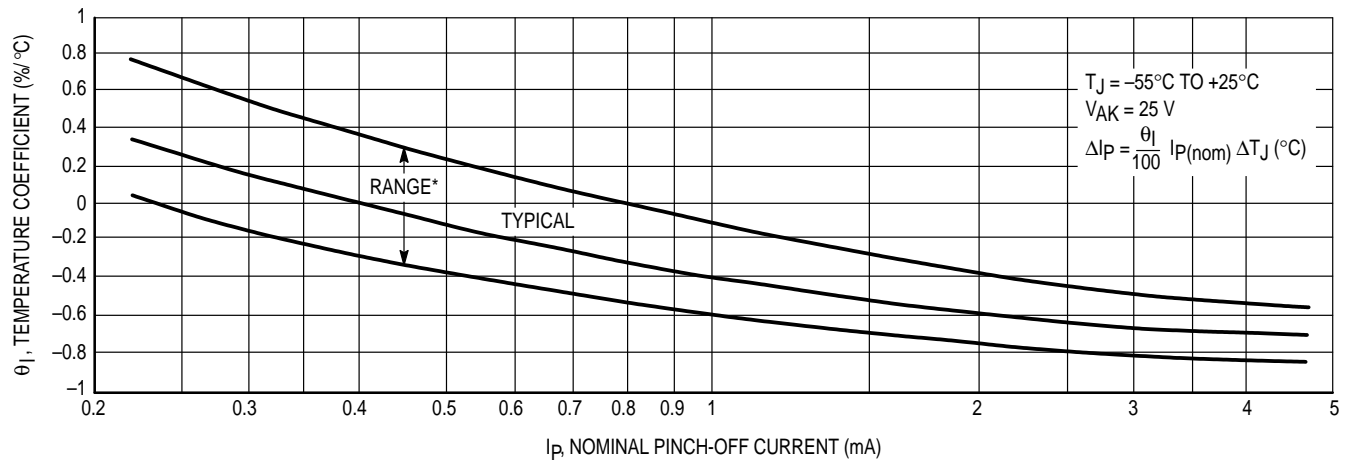
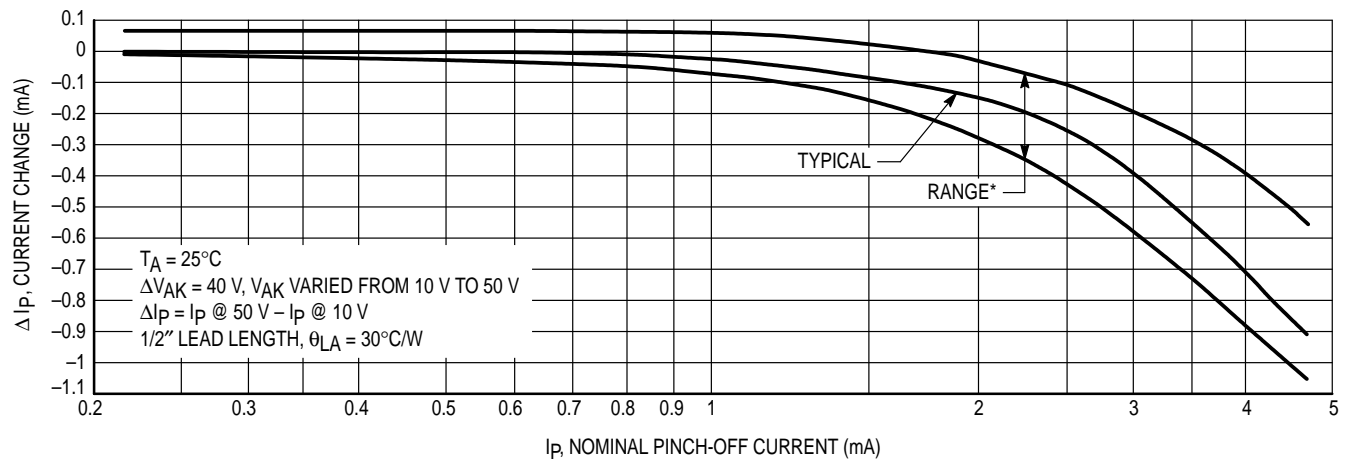


Figure 5. Temperature Coefficient

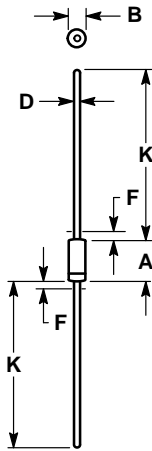


\*90% of the units will be in the ranges shown.

Figure 6. Current Regulation Factor

# Current Regulator Diodes — Axial Leaded

## 1.5 Watt DC Power



### 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 ZONES 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	2.16	2.72	0.085	0.107
D	0.46	0.56	0.018	0.022
F	—	1.27	—	0.050
K	25.40	38.10	1.000	1.500

All JEDEC dimensions and notes apply


**CASE 51-02  
DO-204AA  
GLASS**

(Refer to Section 10 for Surface Mount, Thermal Data and Footprint Information.)

### MULTIPLE PACKAGE QUANTITY (MPQ) REQUIREMENTS

Package Option	Type No. Suffix	MPQ (Units)
Tape and Reel	RL	2.5K
Bulk	(None)	500

(Refer to Section 10 for more information on Packaging Specifications.)

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