

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.

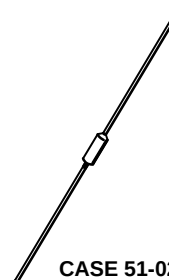
Manufacturing Locations:

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 Ω)	Minimum Knee Impedance @ $V_K = 6.0\text{ V}$ Z_K (M Ω)	Maximum Limiting Voltage @ $I_L = 0.8 I_P$ (min) V_L (Volts)
	Nom	Min	Max			
1N5283	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
1N5287	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
1N5290	0.47	0.423	0.517	2.70	0.750	1.05
1N5291	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
1N5297	1.00	0.900	1.100	0.800	0.205	1.35
1N5298	1.10	0.990	1.21	0.700	0.180	1.40
1N5299	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
1N5302	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
1N5305	2.00	1.80	2.20	0.395	0.061	1.85
1N5306	2.20	1.98	2.42	0.370	0.052	1.95
1N5307	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
1N5309	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
1N5312	3.90	3.51	4.29	0.255	0.017	2.60
1N5313	4.30	3.87	4.73	0.245	0.014	2.75
1N5314	4.70	4.23	5.17	0.235	0.012	2.90

Devices listed in bold, italic are Motorola preferred devices.

1N5283 through 1N5314

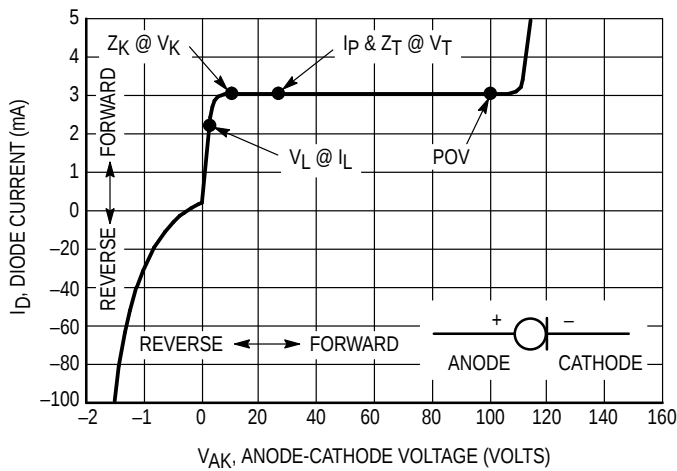


Figure 1. Typical Current Regulator Characteristics

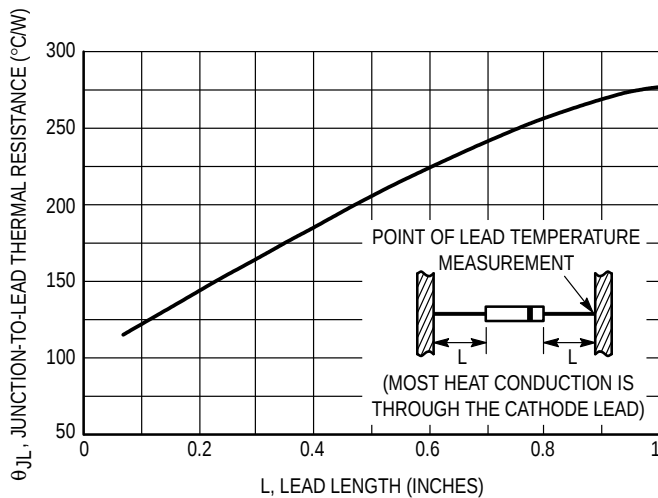


Figure 2. Typical Thermal Resistance

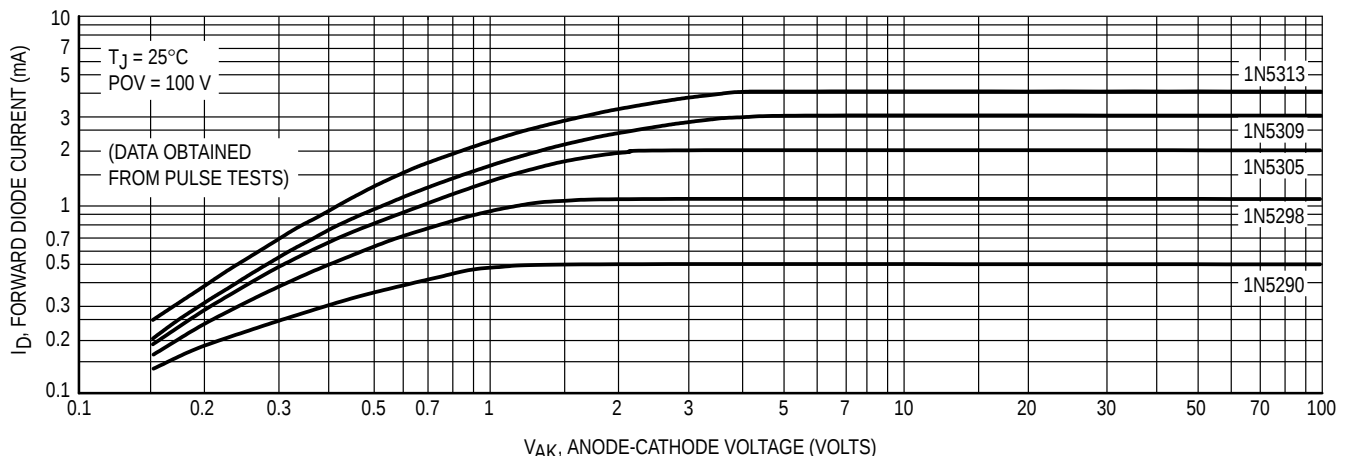


Figure 3. Typical Forward Characteristics

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.
- θ_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 θ_{LA} is lead-to-ambient thermal resistance and P_D is power dissipation.

θ_{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 θ_{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 θ_{JL} .

1N5283 through 1N5314

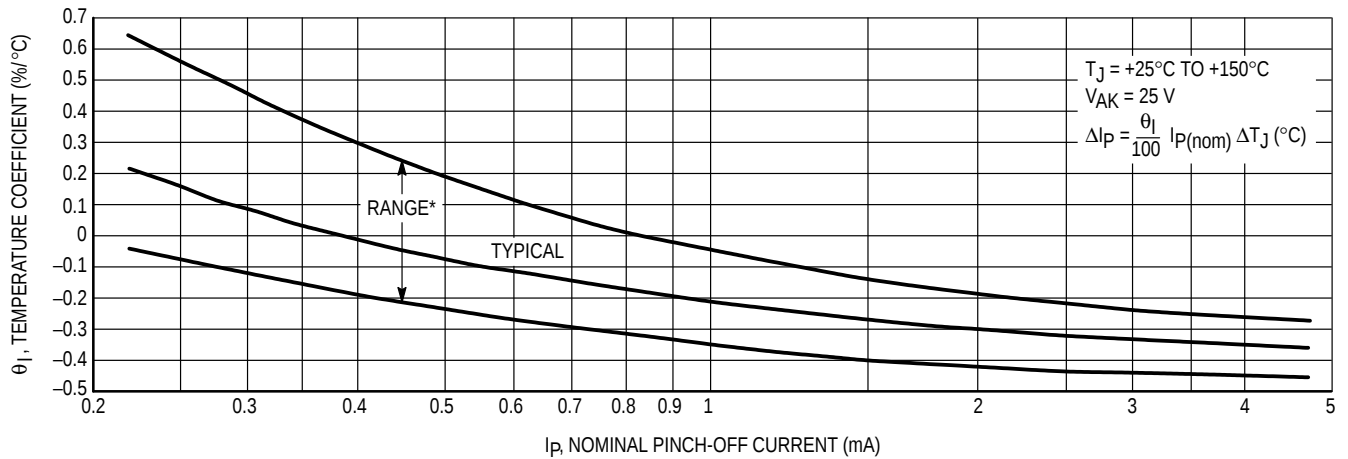


Figure 4. Temperature Coefficient

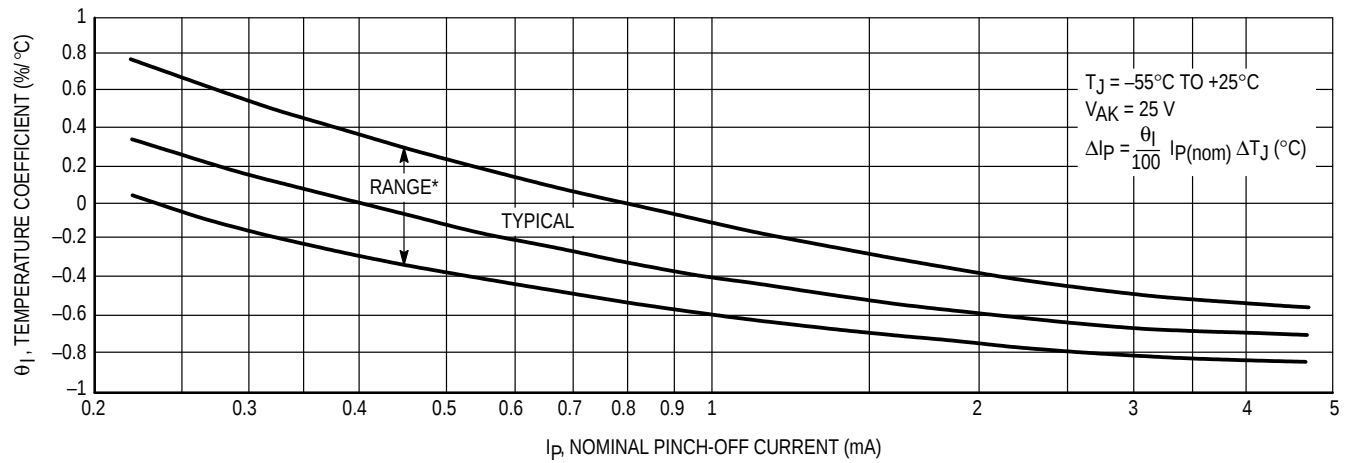
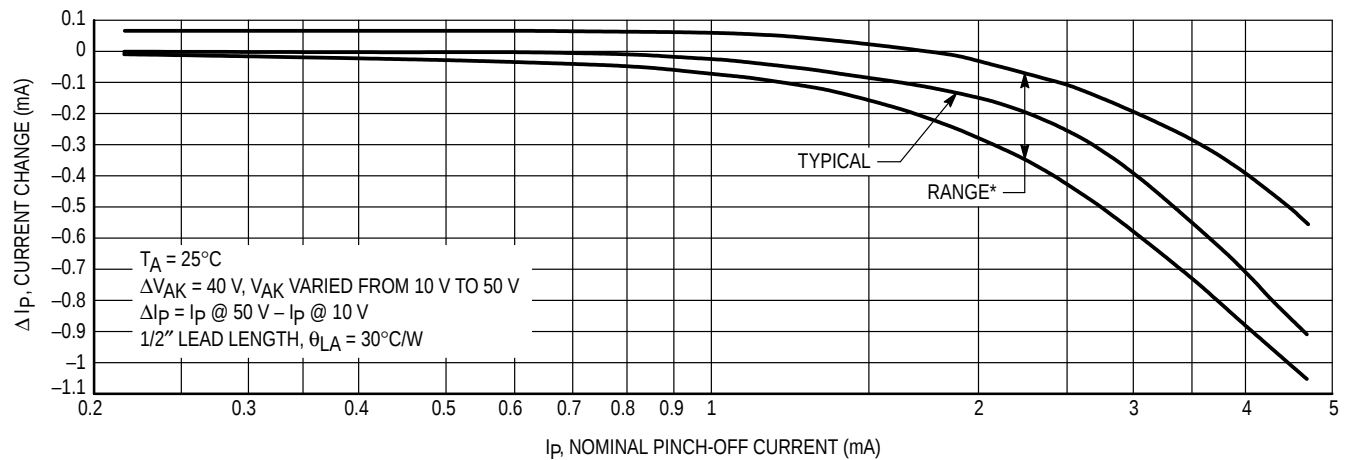


Figure 5. Temperature Coefficient

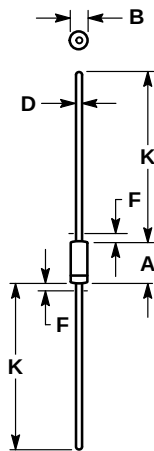


*90% of the units will be in the ranges shown.

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.)

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.