

MJE1123

Bipolar Power PNP Low Dropout Regulator Transistor

The MJE1123 is an applications specific device designed to provide low-dropout linear regulation for switching-regulator post regulators, battery powered systems and other applications. The MJE1123 is fully specified in the saturation region and exhibits the following main features:

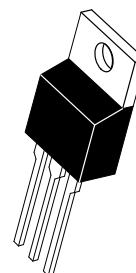
- High Gain Limits Base-Drive Losses to only 1–2% of Circuit Output Current
- Gain is 100 Minimum at $I_C = 1.0$ Amp, $V_{CE} = 7.0$ Volts
- Excellent Saturation Voltage Characteristic, 0.2 Volts Maximum at 1.0 Amp

MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ Unless Otherwise Noted.)

Rating	Symbol	Value	Unit
Collector-Emitter Sustaining Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CB}	50	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current — Continuous	I_C	4.0	Adc
— Peak	I_{CM}	8.0	
Base Current — Continuous	I_B	4.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	75 0.6	Watts W/ $^\circ\text{C}$
Operating and Storage Temperature	T_J, T_{stg}	– 65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case	$R_{\theta JC}$	1.67	$^\circ\text{C/W}$
— Junction to Ambient	$R_{\theta JA}$	70	
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 seconds	T_L	275	$^\circ\text{C}$



CASE 221A-06
TO-220AB

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ Unless Otherwise Noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS*

Collector-Emitter Sustaining Voltage ($I_C = 1.0$ mA, $I = 0$)	$V_{CEO(sus)}$	40	65	—	Vdc
Emitter-Base Voltage ($I_E = 100$ μA)	V_{EBO}	7.0	11	—	Vdc
Collector Cutoff Current ($V_{CE} = 7.0$ Vdc, $I_B = 0$) ($V_{CE} = 20$ Vdc, $I_B = 0$)	I_{CEO}	— —	— —	100 250	μAdc

ON CHARACTERISTICS*

Collector-Emitter Saturation Voltage ($I_C = 1.0$ Adc, $I_B = 20$ mAdc) ($I_C = 1.0$ Adc, $I_B = 50$ mAdc) ($I_C = 1.0$ Adc, $I_B = 120$ mAdc) ($I_C = 2.0$ Adc, $I_B = 50$ mAdc) ($I_C = 2.0$ Adc, $I_B = 120$ mAdc) ($I_C = 4.0$ Adc, $I_B = 120$ mAdc)	$V_{CE(sat)}$	— — — — — —	0.16 0.13 0.10 0.25 0.20 0.45	0.30 0.25 0.20 0.40 0.35 0.75	Vdc
---	---------------	----------------------------	--	--	-----

* Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.

(continued)

ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ Unless Otherwise Noted)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS* (continued)					
Base-Emitter Saturation Voltage ($I_C = 1.0\text{ Adc}$, $I_B = 20\text{ mAdc}$) ($I_C = 2.0\text{ Adc}$, $I_B = 50\text{ mAdc}$) ($I_C = 4.0\text{ Adc}$, $I_B = 120\text{ mAdc}$)	$V_{BE(sat)}$	— — —	0.77 0.87 1.00	0.95 1.20 1.40	Vdc
DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 7.0\text{ Vdc}$) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 7.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 7.0\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$)	h_{FE}	100 100 75 80 45 45	170 180 120 140 75 79	225 225 170 180 100 100	—
Base-Emitter On Voltage ($I_C = 1.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$)	$V_{BE(on)}$	— — —	0.75 0.84 0.90	0.90 1.00 1.20	Vdc
DYNAMIC CHARACTERISTICS					
Current-Gain — Bandwidth Product ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	f_T	5.0	11.5	—	MHz

* Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.

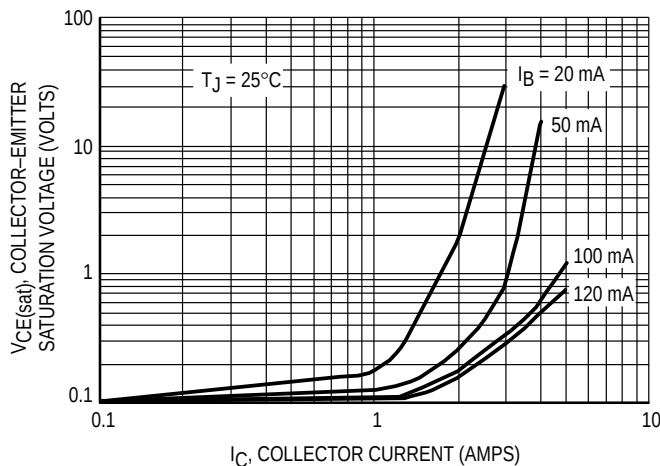


Figure 1. Saturation Voltage versus Collector Current as a Function of Base Drive

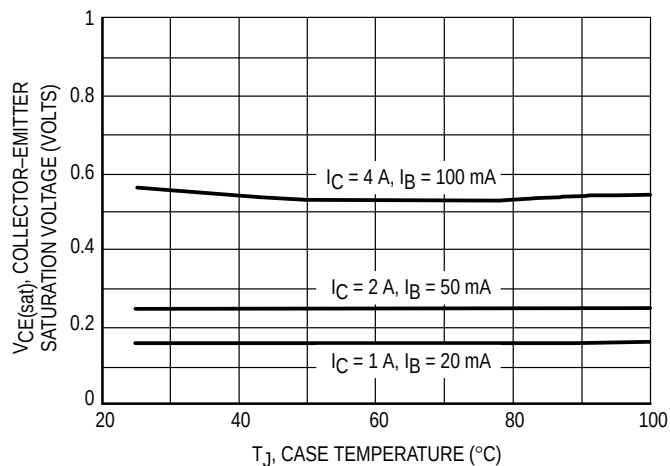


Figure 2. Saturation Voltage versus Temperature

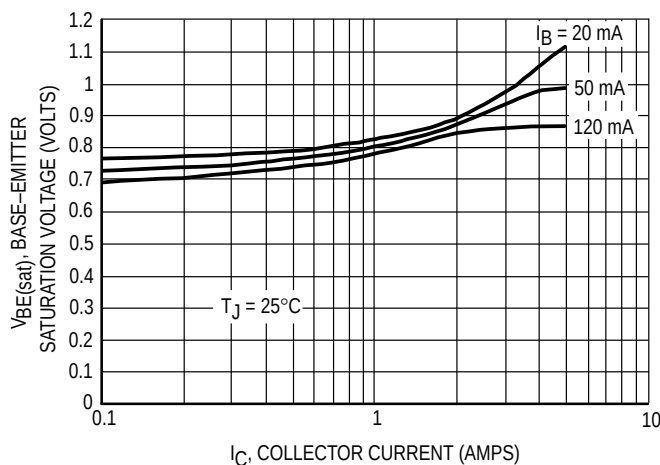


Figure 3. Base-Emitter Saturation Voltage

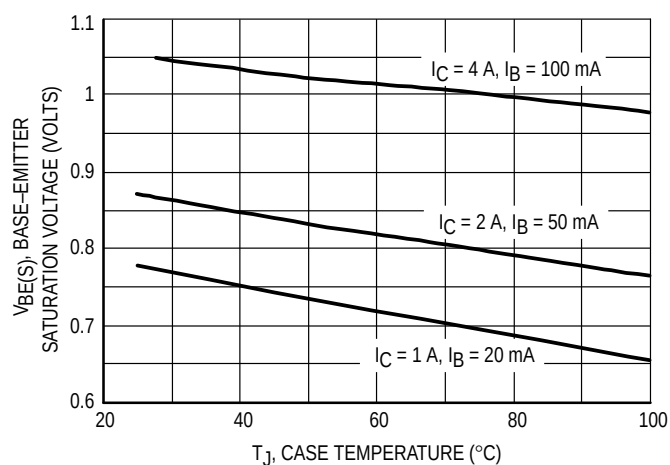


Figure 4. Base-Emitter Saturation Voltage versus Temperature

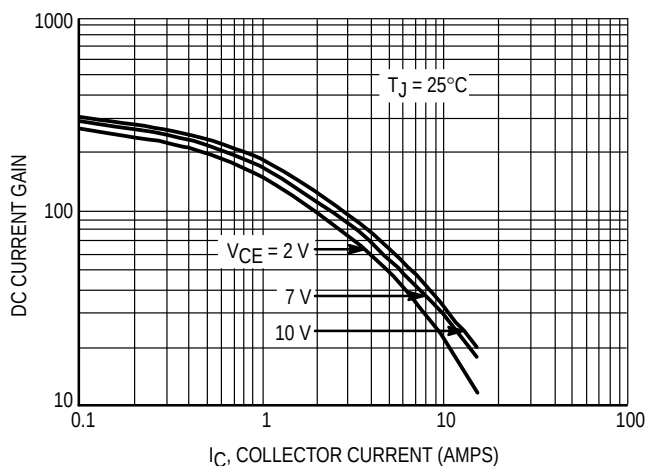


Figure 5. DC Current Gain

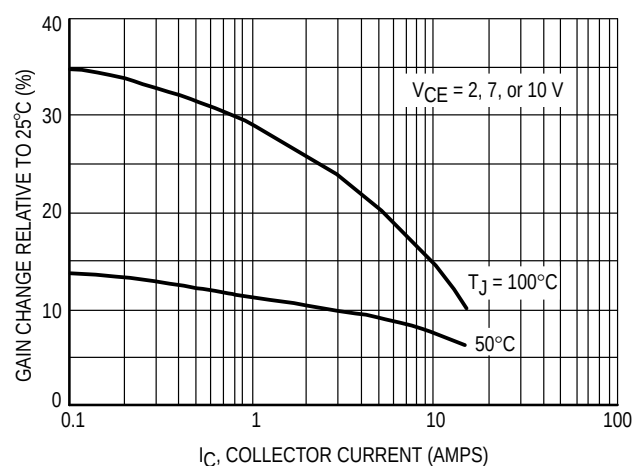


Figure 6. DC Current Gain Variation

TYPICAL LOW PASS TRANSISTOR APPLICATION

The MJE1123 was designed to operate as a low pass transistor in conjunction with the LT1123 offered by Linear Technology Corporation. Together they provide several excellent advantages:

- A dropout voltage below 50 mV at 1.0 amp, increasing to only 225 mV at 4.0 amps, typically.
- Line and load regulation are within 5.0 mV.
- Initial output accuracy is better than 1 percent.
- Full short circuit protection is included.
- Base drive loss is less than 2% of output current . . . even at 4.0 full amps output.
- The high gain and excellent collector-emitter saturation voltage make the combination better than monolithic devices.

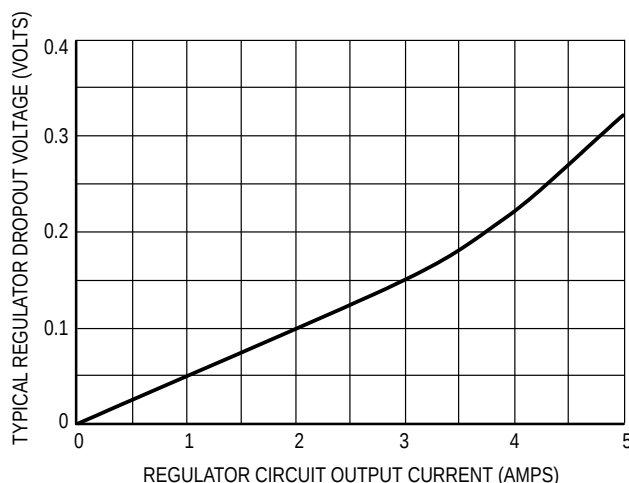
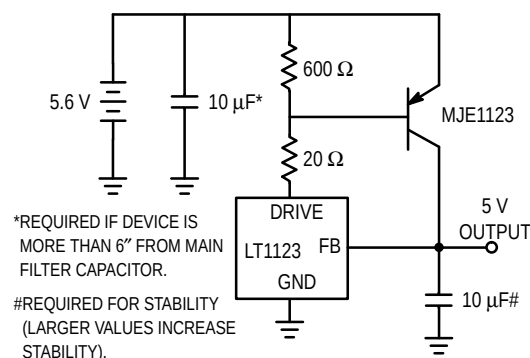


Figure 7. Typical Dropout Voltage of a MJE1123 and LT1123 Circuit

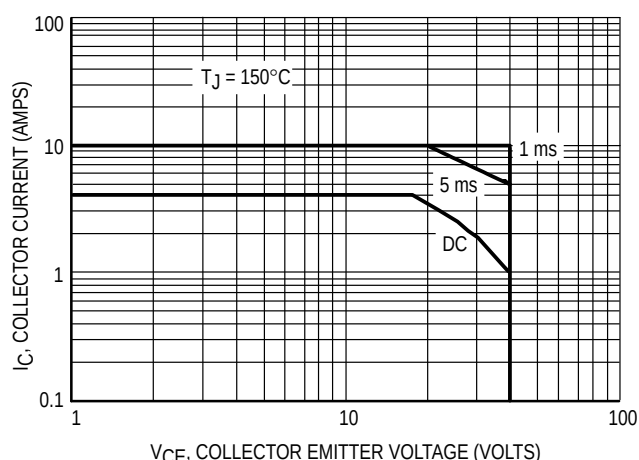


Figure 8. Maximum Forward Bias Safe Operating Area

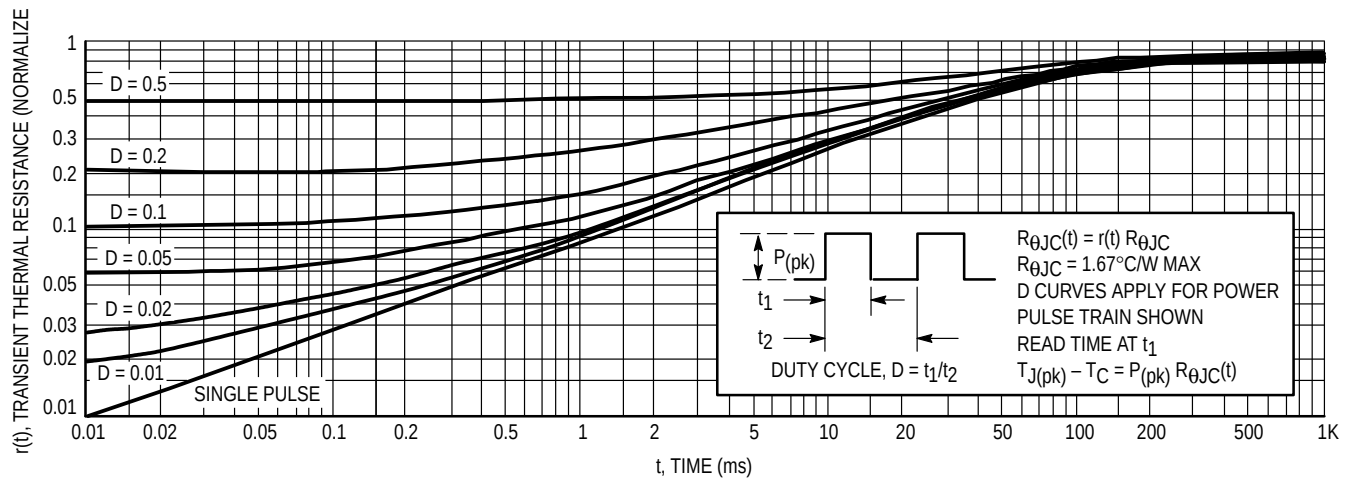
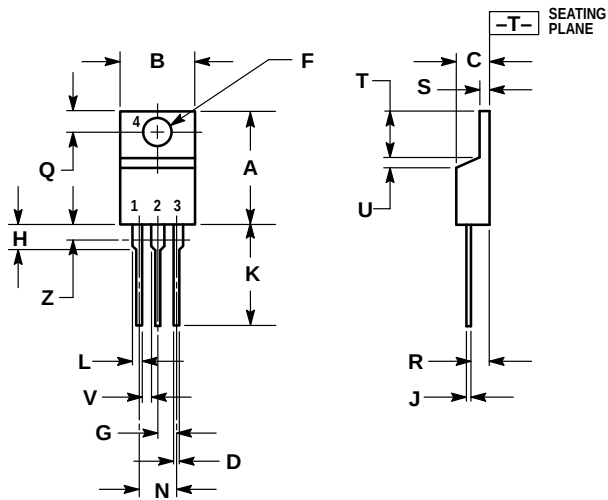


Figure 9. Typical Thermal Response

PACKAGE DIMENSIONS



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

STYLE 1:

- PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

CASE 221A-06
TO-220AB
ISSUE Y

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.

How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244-6609
INTERNET: <http://Design-NET.com>

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

**MOTOROLA****MJE1123/D**