

**MJE1123**

**PNP LOW DROPOUT  
TRANSISTOR  
4.0 AMPERES  
40 VOLTS**

**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:

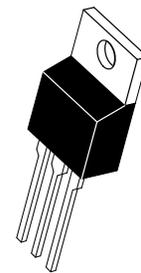
- High Gain Limits Base-Drive Losses to only 1-2% of Circuit Output Current
- Gain is 100 Minimum at  $I_C = 1.0$  Amp,  $V_{CE} = 7.0$  Volts
- Excellent Saturation Voltage Characteristic, 0.2 Volts Maximum at 1.0 Amp

**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 $25^\circ\text{C}$	$P_D$	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
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**OFF CHARACTERISTICS\***

Collector-Emitter Sustaining Voltage ( $I_C = 1.0$ mA, $I = 0$ )	$V_{CEO(sus)}$	40	65	—	Vdc
Emitter-Base Voltage ( $I_E = 100$ $\mu\text{A}$ )	$V_{EBO}$	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	$\mu\text{Adc}$

**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
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\* Indicates Pulse Test: Pulse Width = 300  $\mu\text{s}$  max, Duty Cycle = 2%.

(continued)

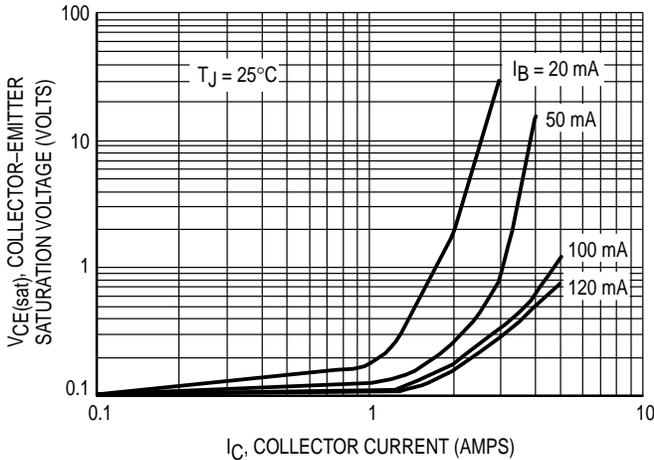
**ELECTRICAL CHARACTERISTICS — continued** ( $T_C = 25^\circ\text{C}$  Unless Otherwise Noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS* (continued)</b>					
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

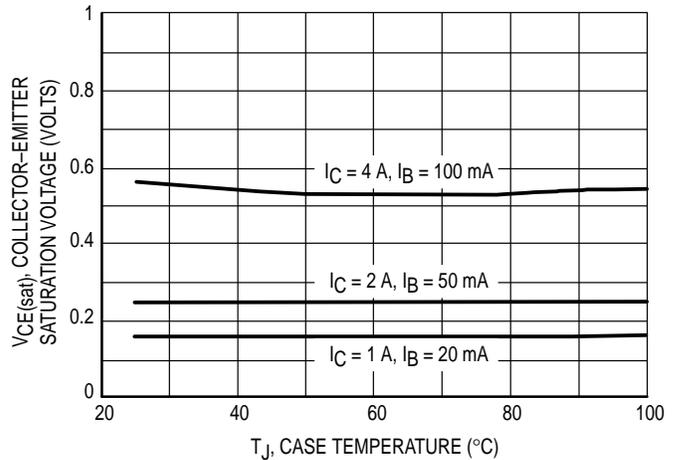
**DYNAMIC CHARACTERISTICS**

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
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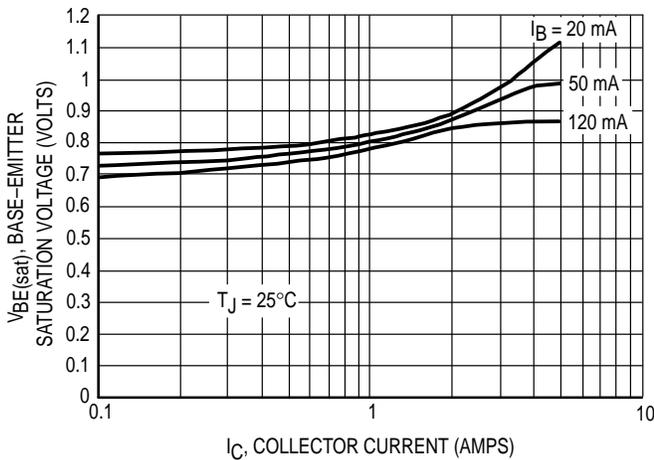
\* Indicates Pulse Test: Pulse Width = 300  $\mu\text{s}$  max, Duty Cycle = 2%.



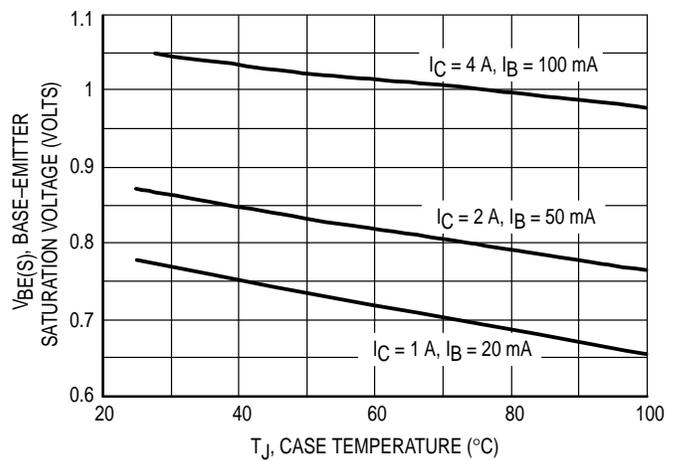
**Figure 1. Saturation Voltage versus Collector Current as a Function of Base Drive**



**Figure 2. Saturation Voltage versus Temperature**



**Figure 3. Base-Emitter Saturation Voltage versus Collector Current as a Function of Base Drive**



**Figure 4. Base-Emitter Saturation Voltage versus Temperature**

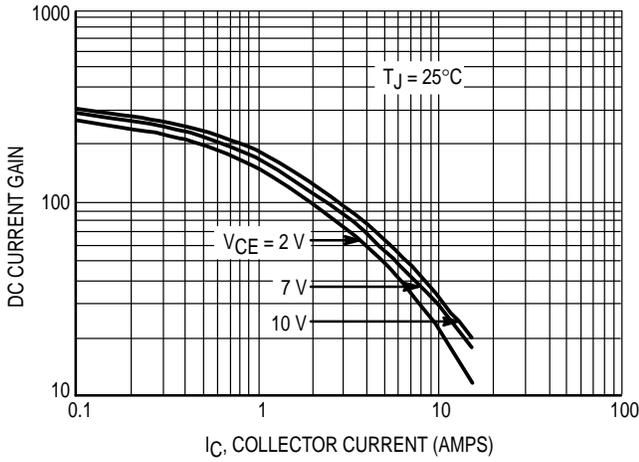


Figure 5. DC Current Gain

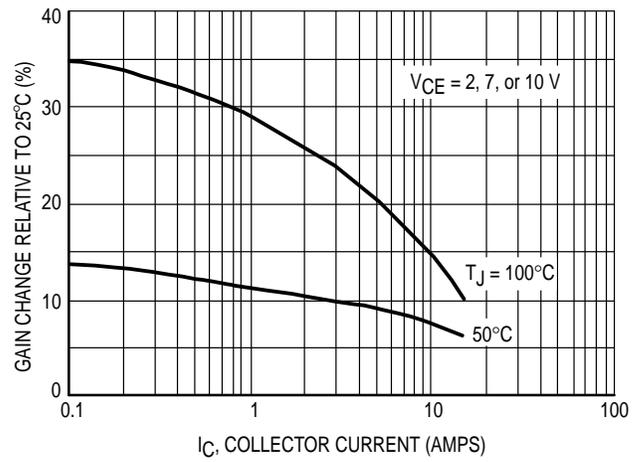
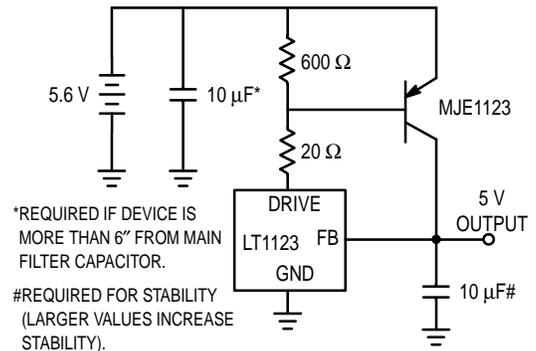


Figure 6. DC Current Gain Variation

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.



\*REQUIRED IF DEVICE IS MORE THAN 6" FROM MAIN FILTER CAPACITOR.

#REQUIRED FOR STABILITY (LARGER VALUES INCREASE STABILITY).

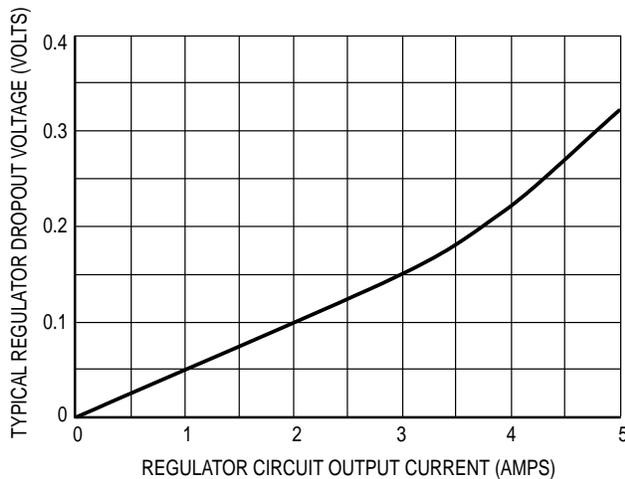


Figure 7. Typical Dropout Voltage of a MJE1123 and LT1123 Circuit

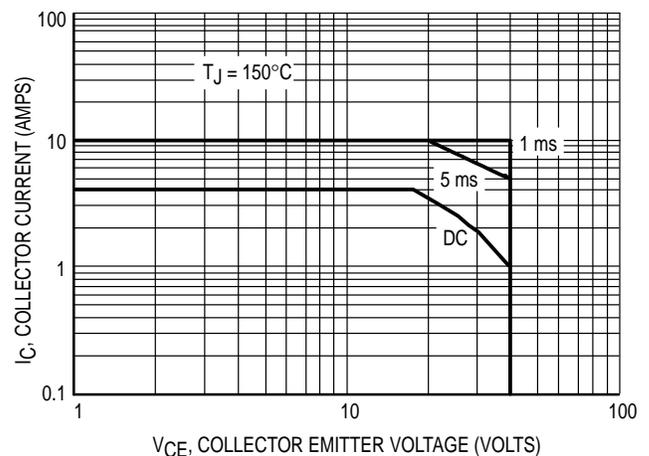


Figure 8. Maximum Forward Bias Safe Operating Area

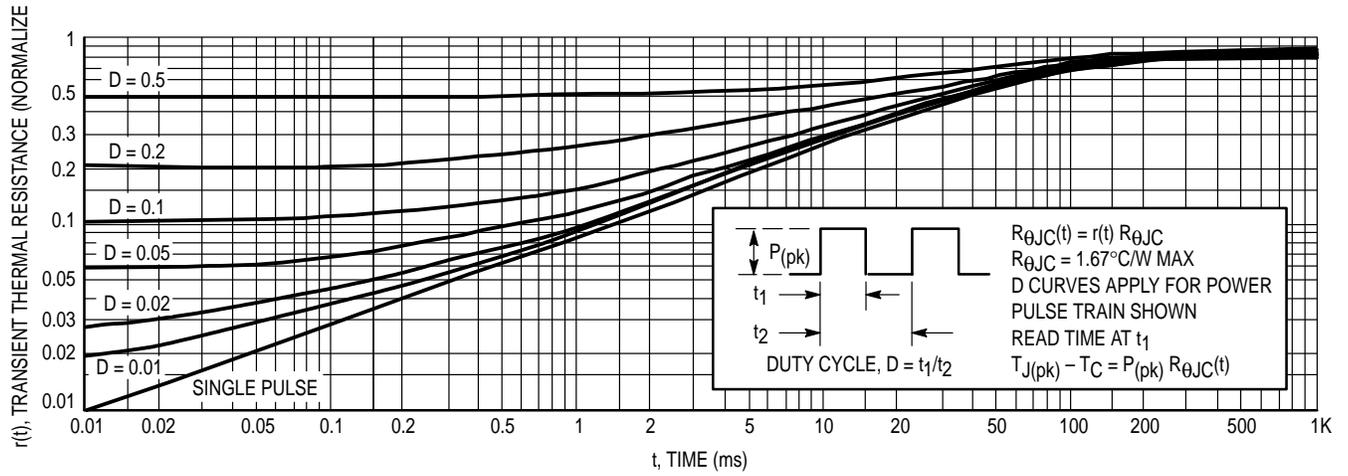
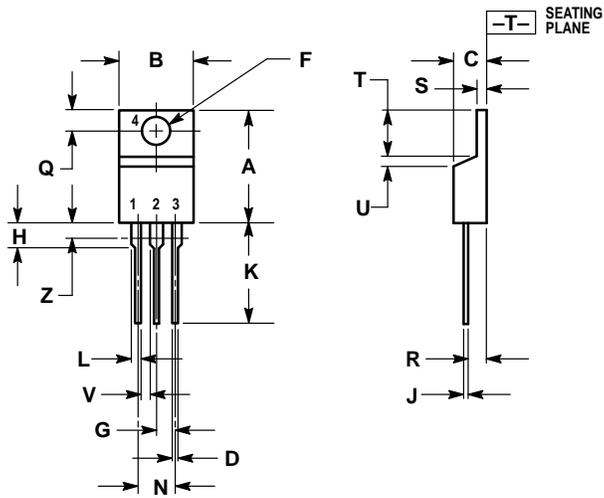


Figure 9. Typical Thermal Response

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

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