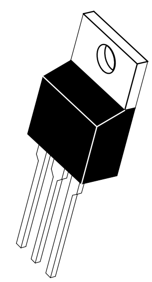
MJE1123

Bipolar Power PNP Low Dropout Regulator Transistor

PNP LOW DROPOUT TRANSISTOR
4.0 AMPERES
40 VOLTS

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



CASE 221A–06
TO–220AB

MAXIMUM RATINGS (T_C = 25°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 — Peak	I_C I_{CM}	4.0 8.0	Adc
Base Current — Continuous	I_B	4.0	Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	75 0.6	Watts W/°C
Operating and Storage Temperature	T_J, T_{stg}	– 65 to +150	°C

THERMAL CHARACTERISTICS

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

ELECTRICAL CHARACTERISTICS (T_C = 25°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°C Unless Otherwise Noted)

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

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

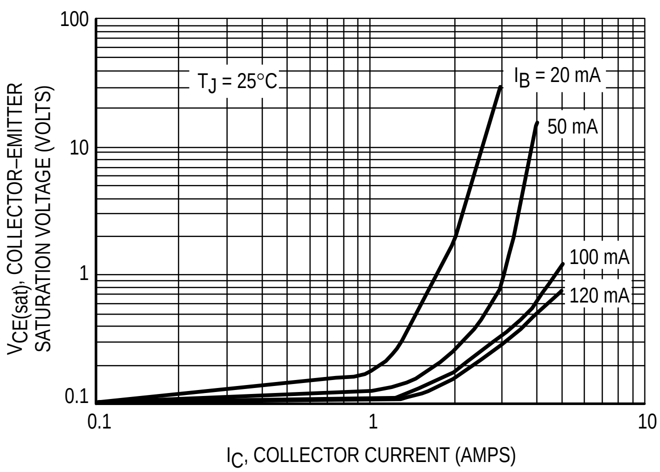


Figure 1. Saturation Voltage versus Collector Current as a Function of Base Drive

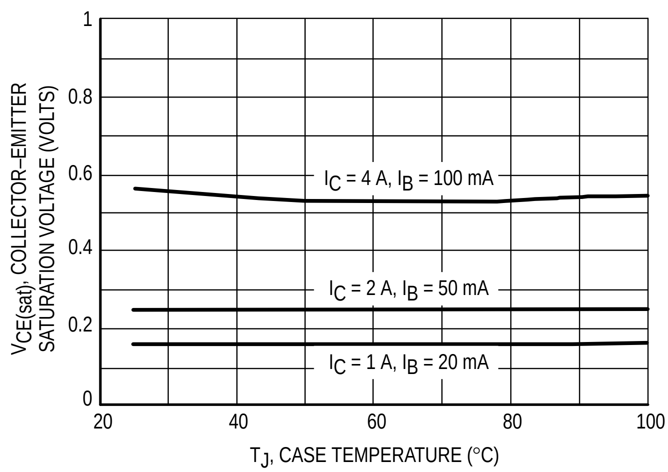


Figure 2. Saturation Voltage versus Temperature

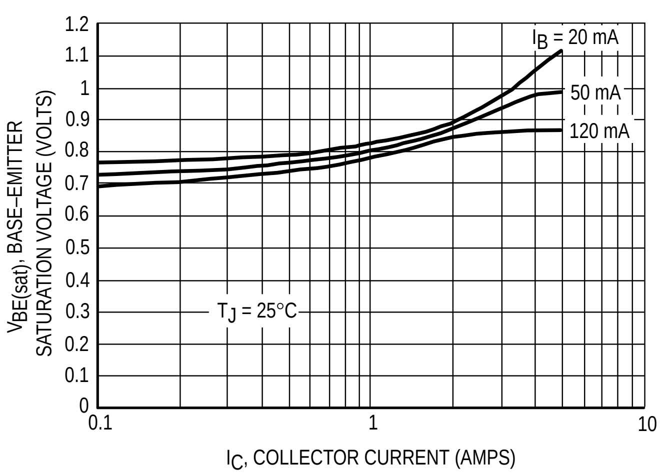


Figure 3. Base–Emitter Saturation Voltage

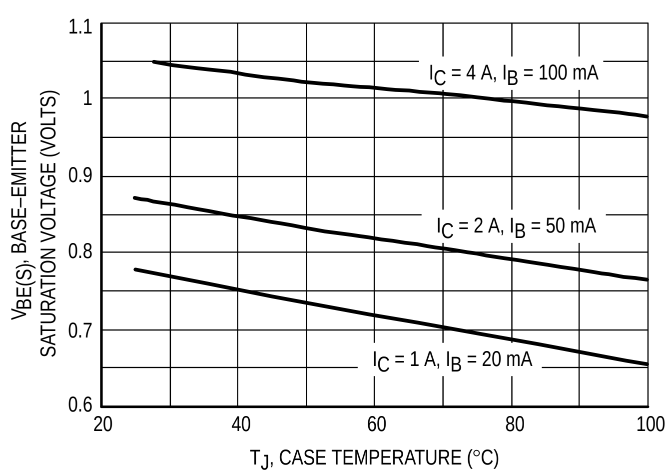


Figure 4. Base–Emitter Saturation Voltage versus Temperature

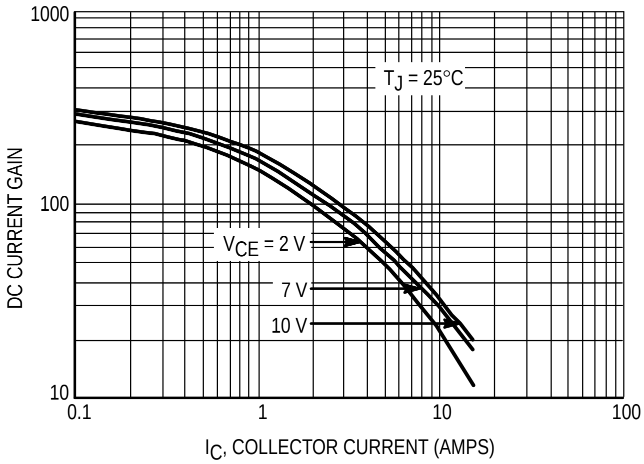


Figure 5. DC Current Gain

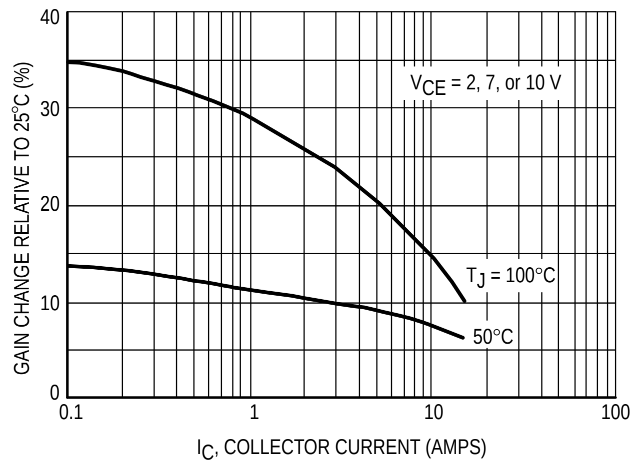
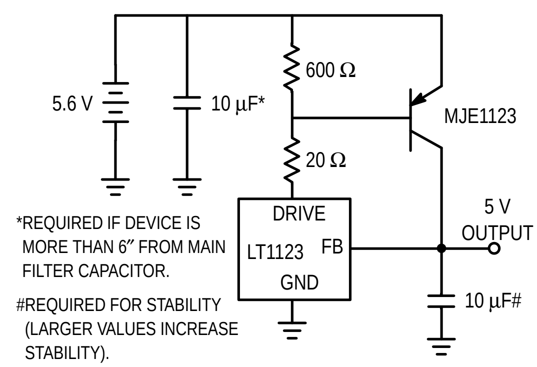


Figure 6. DC Current Gain Variation

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.



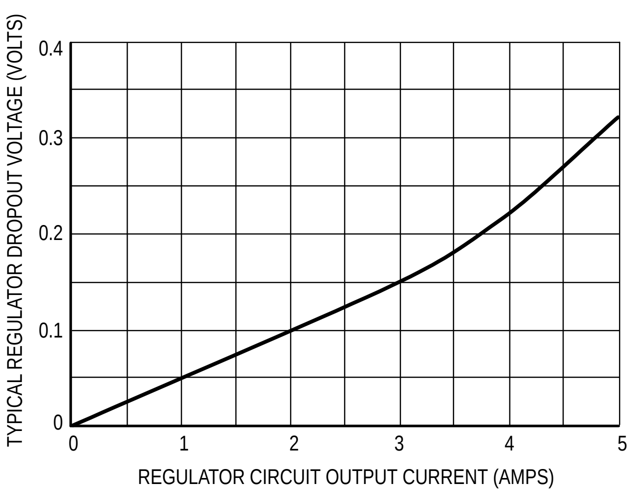


Figure 7. Typical Dropout Voltage of a MJE1123 and LT1123 Circuit

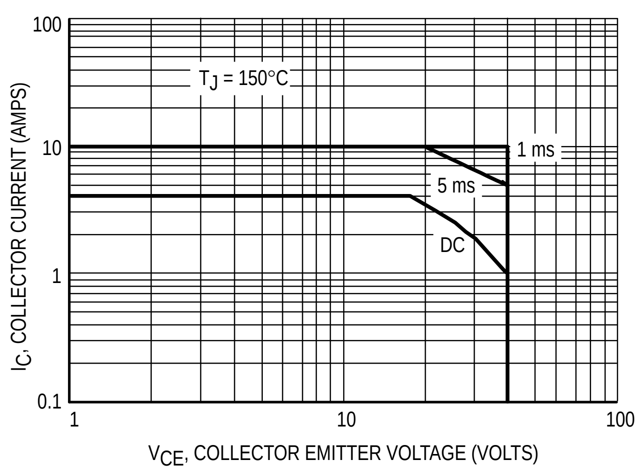


Figure 8. Maximum Forward Bias Safe Operating Area

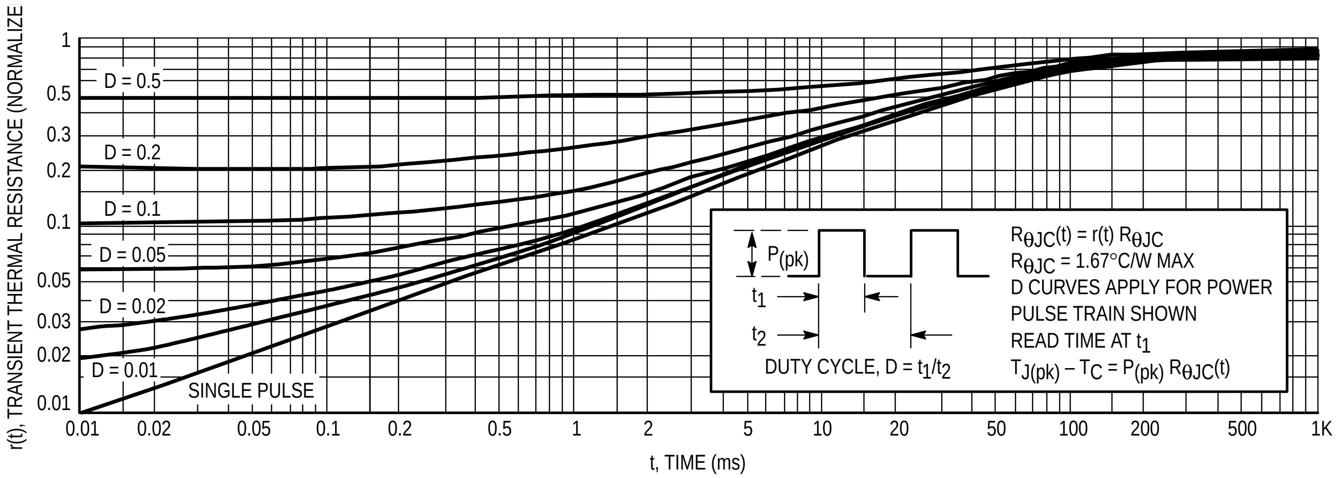
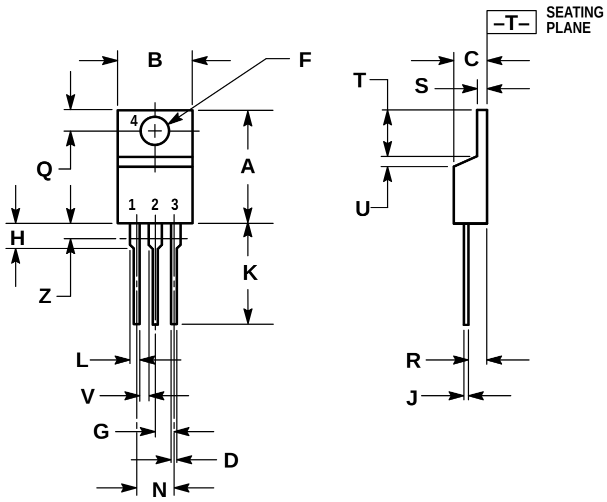


Figure 9. Typical Thermal Response

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 MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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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