

# Plastic Darlington Complementary Silicon Power Transistors

... designed for general-purpose amplifier and low-speed switching applications.

- High DC Current Gain —  
 $h_{FE} = 2000$  (Typ) @  $I_C = 2.0$  Adc
- Monolithic Construction with Built-in Base-Emitter Resistors to Limit Leakage Multiplication
- Choice of Packages —  
 MJE700 and MJE800 series  
 T0220AB, MJE700T and MJE800T

## MAXIMUM RATINGS

Rating	Symbol	MJE700,T MJE800,T	MJE702 MJE703 MJE802 MJE803	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	80	Vdc
Collector-Base Voltage	$V_{CB}$	60	80	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0		Vdc
Collector Current	$I_C$	4.0		Adc
Base Current	$I_B$	0.1		Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	CASE 77	TO-220	Watts W/ $^\circ\text{C}$
		40 0.32	50 0.40	
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150		$^\circ\text{C}$

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case CASE 77 TO-220	$R_{\theta JC}$	3.13 2.50	$^\circ\text{C}/\text{W}$

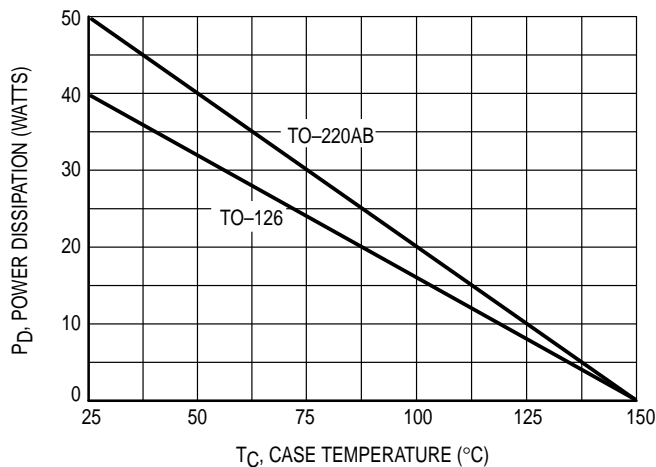
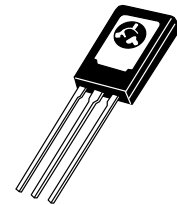


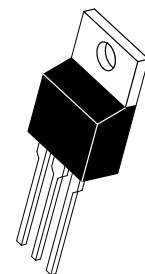
Figure 1. Power Derating

**PNP**  
**MJE700,T**  
  
**MJE702**  
  
**MJE703**  
**NPN**  
**MJE800,T**  
  
**MJE802**  
  
**MJE803**

**4.0 AMPERE**  
**DARLINGTON**  
**POWER TRANSISTORS**  
**COMPLEMENTARY**  
**SILICON**  
**40 WATT**  
**50 WATT**



CASE 77-08  
TO-225AA TYPE  
MJE700-703  
MJE800-803



CASE 221A-06  
TO-220AB  
MJE700T  
MJE800T

# MJE700,T MJE702 MJE703 MJE800,T MJE802 MJE803

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage (1) (I <sub>C</sub> = 50 mAdc, I <sub>B</sub> = 0)	MJE700,T, MJE800,T MJE702, MJE703, MJE802, MJE803	V <sub>(BR)CEO</sub>	60 80	— —	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0) (V <sub>CE</sub> = 80 Vdc, I <sub>B</sub> = 0)	MJE700,T, MJE800,T MJE702, MJE703, MJE802, MJE803	I <sub>CEO</sub>	— —	100 100	μAdc
Collector Cutoff Current (V <sub>CB</sub> = Rated BV <sub>CEO</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = Rated BV <sub>CEO</sub> , I <sub>E</sub> = 0, T <sub>C</sub> = 100°C)		I <sub>CBO</sub>	— —	100 500	μAdc
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 Vdc, I <sub>C</sub> = 0)		I <sub>EBO</sub>	—	2.0	mAdc

## ON CHARACTERISTICS

DC Current Gain (1) (I <sub>C</sub> = 1.5 Adc, V <sub>CE</sub> = 3.0 Vdc) (I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 3.0 Vdc) (I <sub>C</sub> = 4.0 Adc, V <sub>CE</sub> = 3.0 Vdc)	MJE700,T, MJE702, MJE800,T, MJE802 MJE703, MJE803 All devices	h <sub>FE</sub>	750 750 100	— — —	—
Collector–Emitter Saturation Voltage (1) (I <sub>C</sub> = 1.5 Adc, I <sub>B</sub> = 30 mAdc) (I <sub>C</sub> = 2.0 Adc, I <sub>B</sub> = 40 mAdc) (I <sub>C</sub> = 4.0 Adc, I <sub>B</sub> = 40 mAdc)	MJE700,T, MJE702, MJE800,T, MJE802 MJE703, MJE803 All devices	V <sub>CE(sat)</sub>	— — —	2.5 2.8 3.0	Vdc
Base–Emitter On Voltage (1) (I <sub>C</sub> = 1.5 Adc, V <sub>CE</sub> = 3.0 Vdc) (I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 3.0 Vdc) (I <sub>C</sub> = 4.0 Adc, V <sub>CE</sub> = 3.0 Vdc)	MJE700,T, MJE702, MJE800,T, MJE802 MJE703, MJE803 All devices	V <sub>BE(on)</sub>	— — —	2.5 2.5 3.0	Vdc

## DYNAMIC CHARACTERISTICS

Small–Signal Current Gain (I <sub>C</sub> = 1.5 Adc, V <sub>CE</sub> = 3.0 Vdc, f = 1.0 MHz)	h <sub>fe</sub>	1.0	—	—
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(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

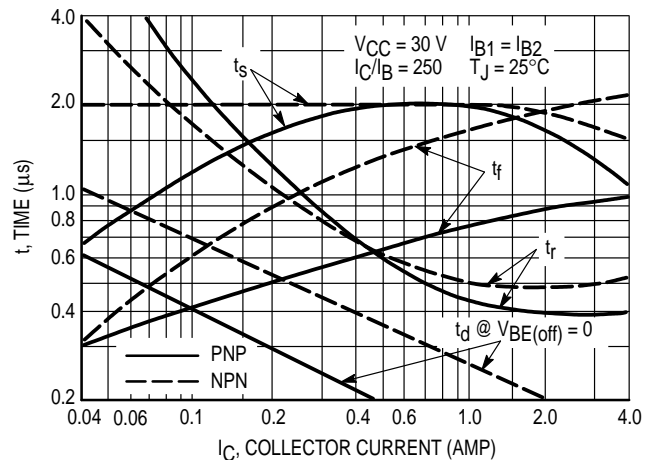
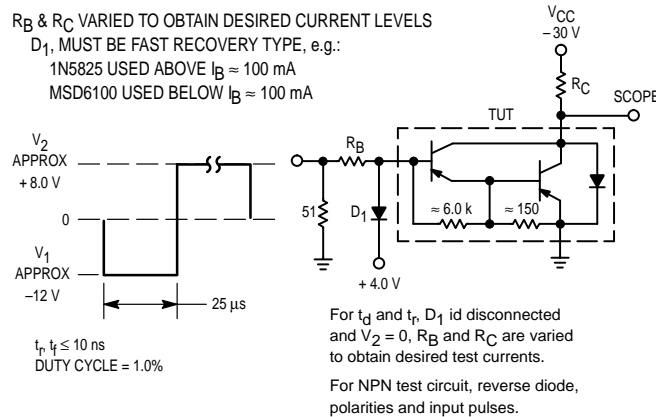


Figure 2. Switching Times Test Circuit

Figure 3. Switching Times

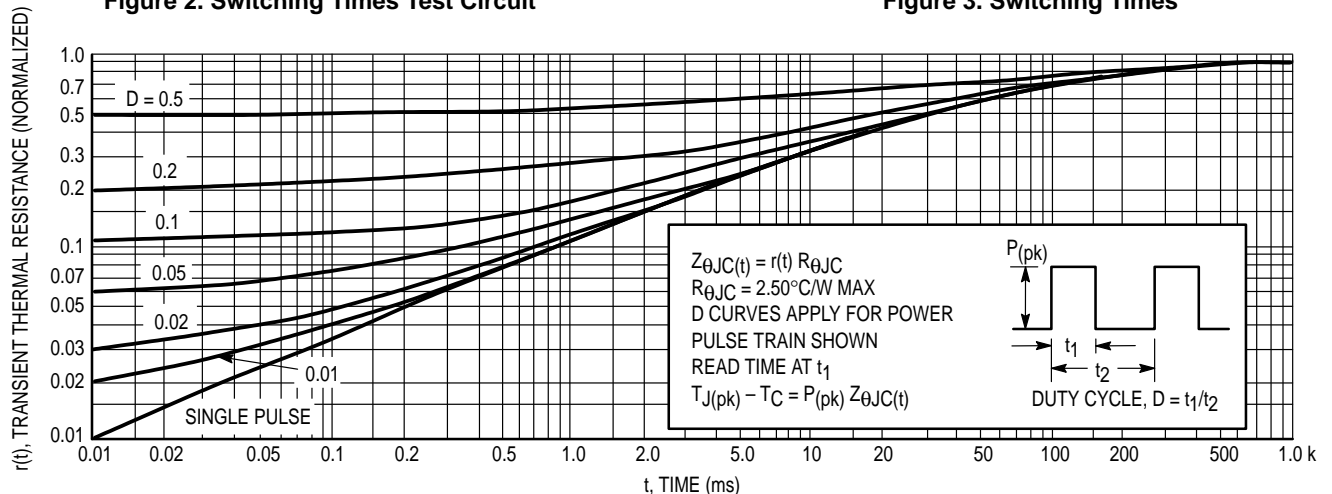


Figure 4. Thermal Response (MJE700T, 800T Series)

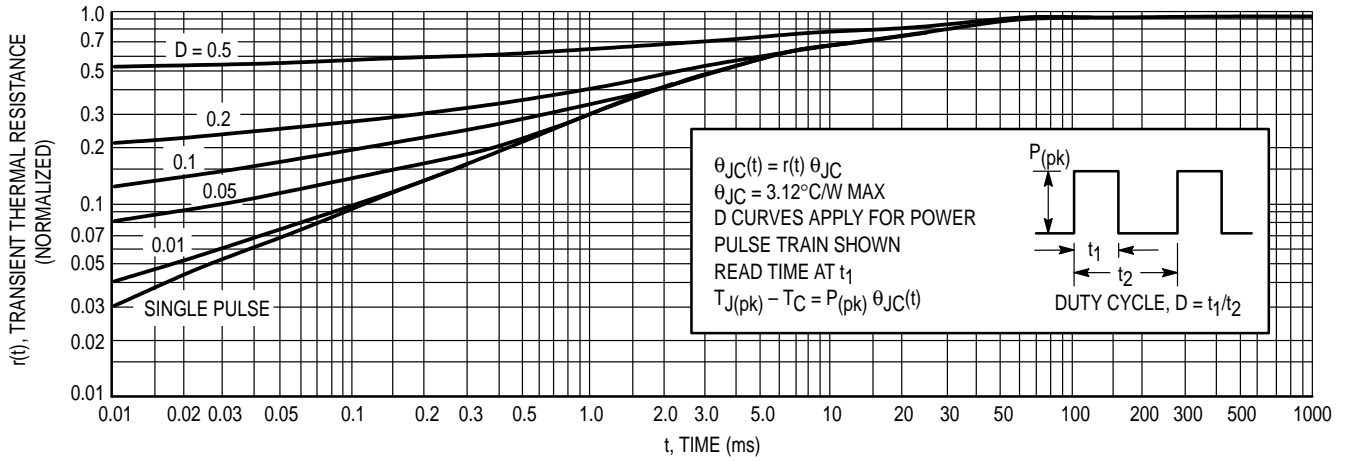


Figure 5. Thermal Response (MJE700, 800 Series)

ACTIVE-REGION SAFE-OPERATING AREA

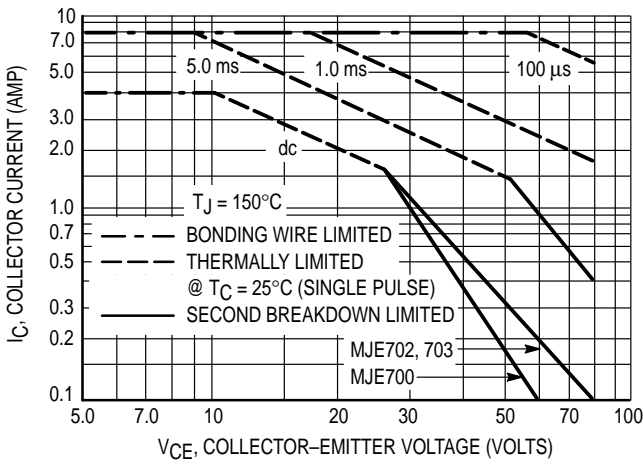


Figure 6. MJE700 Series

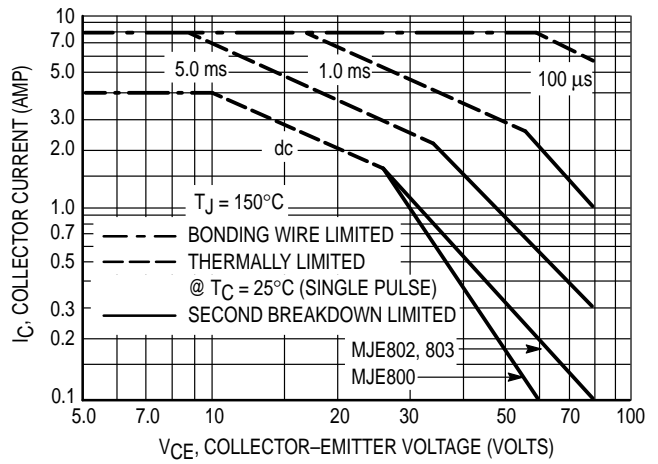


Figure 7. MJE800 Series

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figures 6 and 7 are based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 4 or 5. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

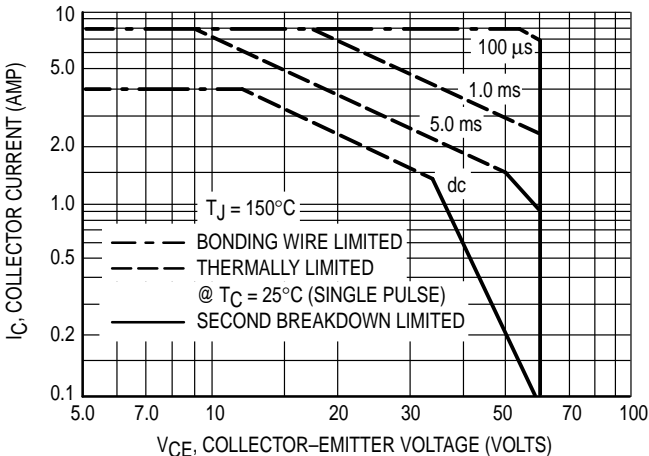


Figure 8. MJE700T

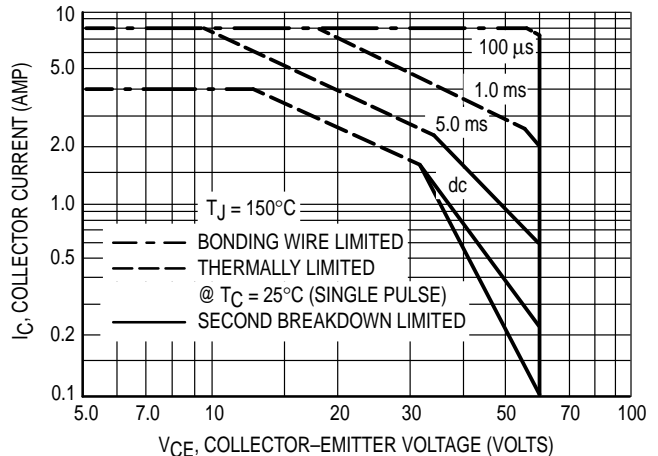


Figure 9. MJE800T

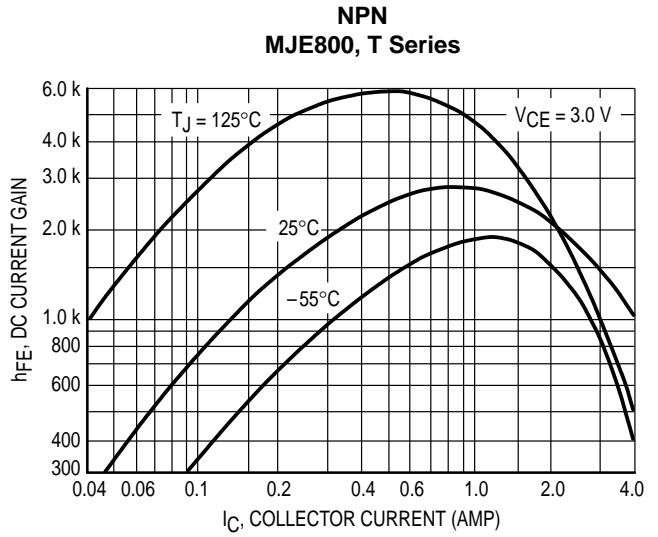
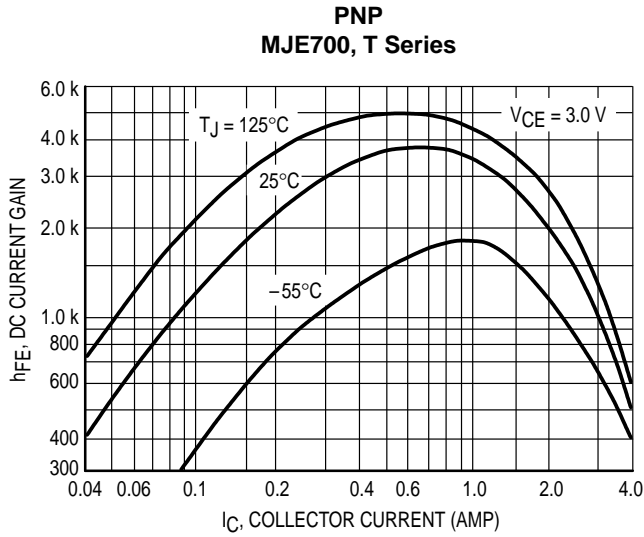


Figure 10. DC Current Gain

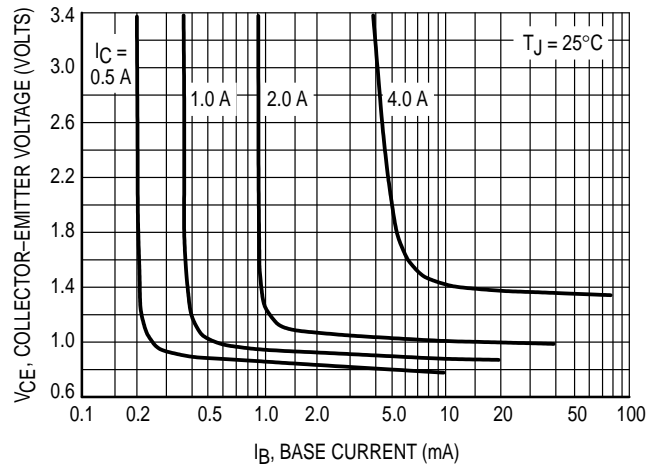
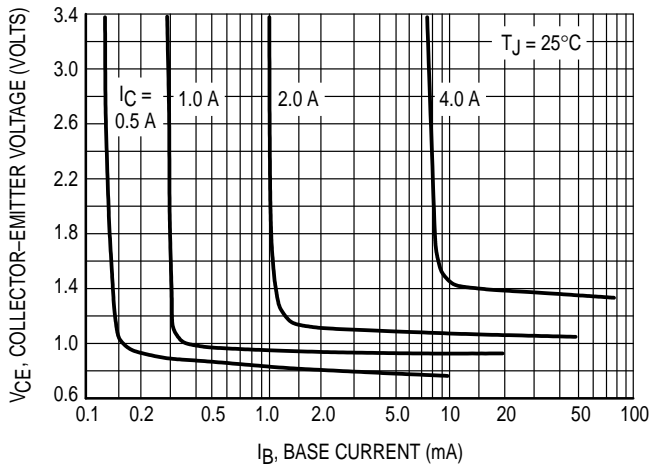


Figure 11. Collector Saturation Region

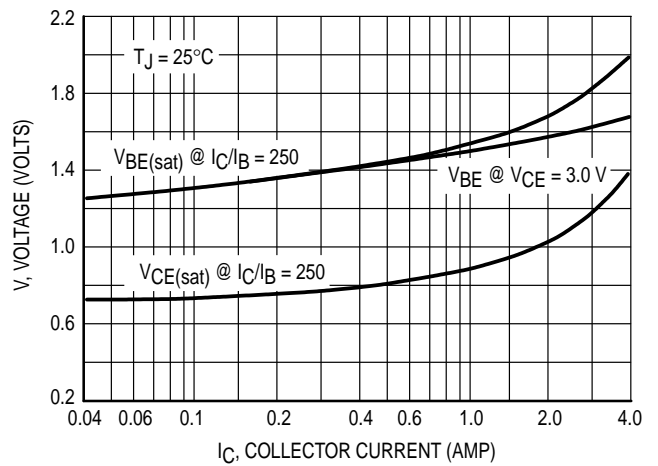
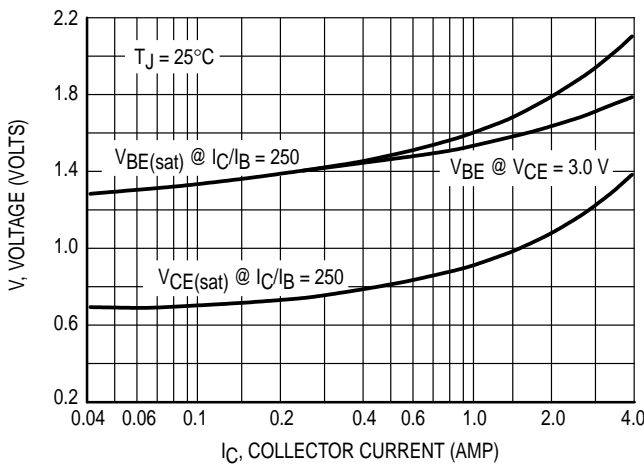
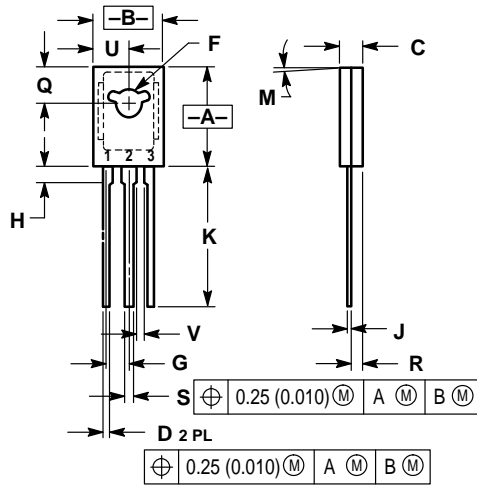


Figure 12. "On" Voltages

**MJE700,T MJE702 MJE703 MJE800,T MJE802 MJE803**  
**PACKAGE DIMENSIONS**



- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

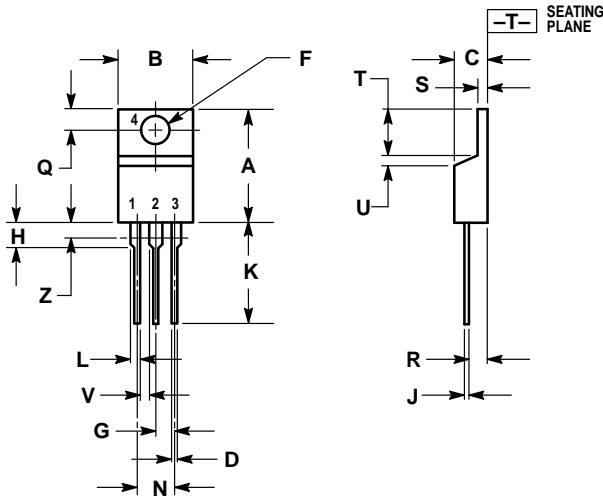
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.425	0.435	10.80	11.04
B	0.295	0.305	7.50	7.74
C	0.095	0.105	2.42	2.66
D	0.020	0.026	0.51	0.66
F	0.115	0.130	2.93	3.30
G	0.094 BSC		2.39 BSC	
H	0.050	0.095	1.27	2.41
J	0.015	0.025	0.39	0.63
K	0.575	0.655	14.61	16.63
M	5° TYP		5° TYP	
Q	0.148	0.158	3.76	4.01
R	0.045	0.055	1.15	1.39
S	0.025	0.035	0.64	0.88
U	0.145	0.155	3.69	3.93
V	0.040	—	1.02	—

- STYLE 1:  
 PIN 1. EMITTER  
 2. COLLECTOR  
 3. BASE

**CASE 77-08**  
**TO-225AA TYPE**  
**ISSUE V**

MJE700,T MJE702 MJE703 MJE800,T MJE802 MJE803

PACKAGE DIMENSIONS — CONTINUED



- 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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