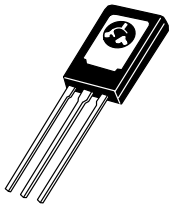
Plastic Darlington Complementary Silicon Power Transistors

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

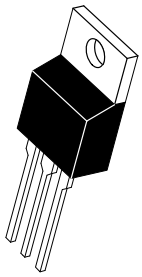
- High DC Current Gain —
  h_{FE} = 2000 (Typ) @ I_C = 2.0 Adc
- Monolithic Construction with Built–in Base–Emitter Resistors to Limit Leakage Multiplication
- Choice of Packages —
  MJE700 and MJE800 series
  T0220AB, MJE700T and MJE800T

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

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
		CASE 77	TO–220	
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	40 0.32	50 0.40	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +150		°C

THERMAL CHARACTERISTICS

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

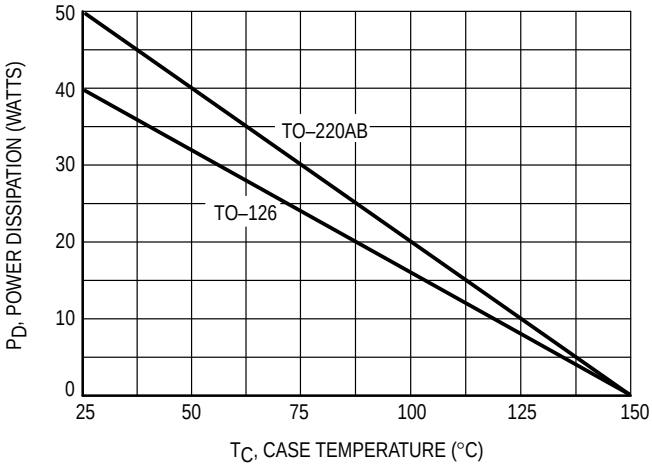


Figure 1. Power Derating

REV 3

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (1) (I_C = 50 mAdc, I_B = 0)	MJE700,T, MJE800,T	$V_{(BR)CEO}$	60	—	Vdc
	MJE702, MJE703, MJE802, MJE803		80	—	
Collector Cutoff Current		I_{CEO}			µAdc
(V_{CE} = 60 Vdc, I_B = 0)	MJE700,T, MJE800,T		—	100	
(V_{CE} = 80 Vdc, I_B = 0)	MJE702, MJE703, MJE802, MJE803		—	100	
Collector Cutoff Current (V_{CB} = Rated BV_{CEO}, I_E = 0)		I_{CBO}	—	100	µAdc
(V_{CB} = Rated BV_{CEO}, I_E = 0, T_C = 100°C)			—	500	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	2.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (1)		h_{FE}			—
(I_C = 1.5 Adc, V_{CE} = 3.0 Vdc)	MJE700,T, MJE702, MJE800,T, MJE802		750	—	
(I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)	MJE703, MJE803		750	—	
(I_C = 4.0 Adc, V_{CE} = 3.0 Vdc)	All devices		100	—	
Collector–Emitter Saturation Voltage (1)		$V_{CE(sat)}$			Vdc
(I_C = 1.5 Adc, I_B = 30 mAdc)	MJE700,T, MJE702, MJE800,T, MJE802		—	2.5	
(I_C = 2.0 Adc, I_B = 40 mAdc)	MJE703, MJE803		—	2.8	
(I_C = 4.0 Adc, I_B = 40 mAdc)	All devices		—	3.0	
Base–Emitter On Voltage (1)		$V_{BE(on)}$			Vdc
(I_C = 1.5 Adc, V_{CE} = 3.0 Vdc)	MJE700,T, MJE702, MJE800,T, MJE802		—	2.5	
(I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)	MJE703, MJE803		—	2.5	
(I_C = 4.0 Adc, V_{CE} = 3.0 Vdc)	All devices		—	3.0	
DYNAMIC CHARACTERISTICS					
Small–Signal Current Gain (I_C = 1.5 Adc, V_{CE} = 3.0 Vdc, f = 1.0 MHz)		h_{fe}	1.0	—	—

(1) Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%.

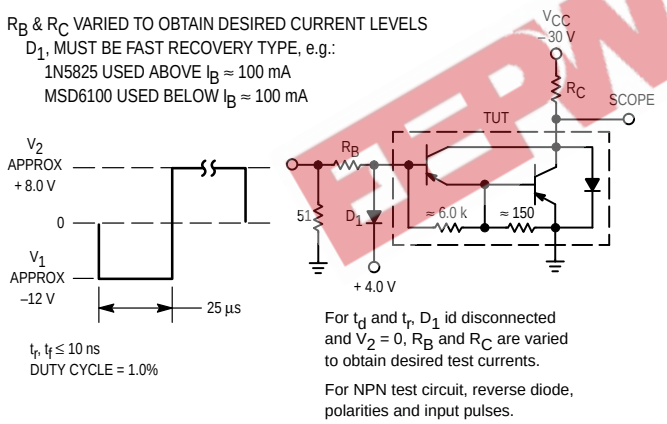


Figure 2. Switching Times Test Circuit

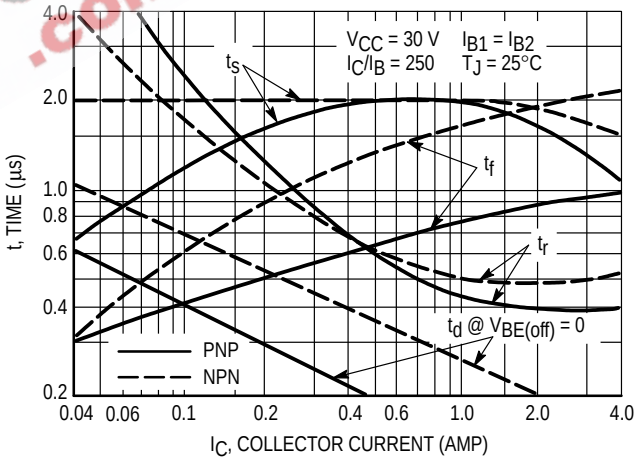


Figure 3. Switching Times

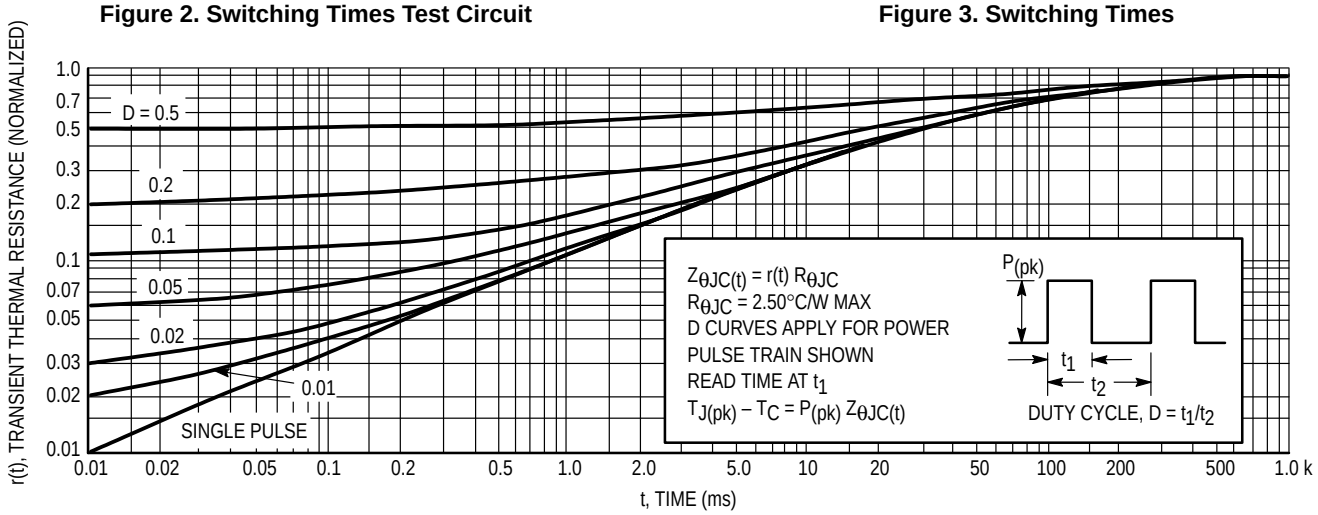


Figure 4. Thermal Response (MJE700T, 800T Series)

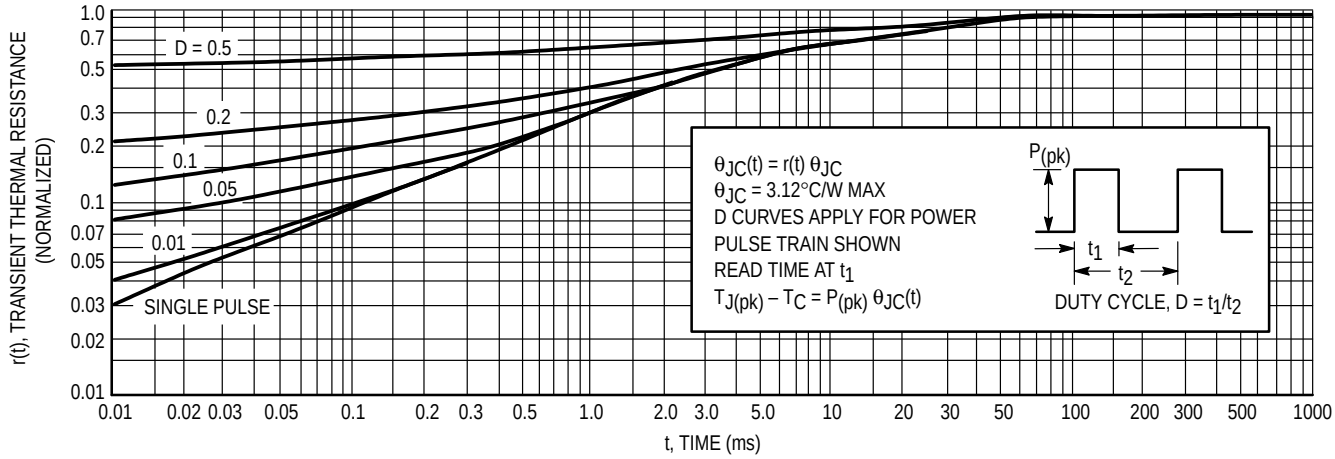


Figure 5. Thermal Response (MJE700, 800 Series)

ACTIVE–REGION SAFE–OPERATING AREA

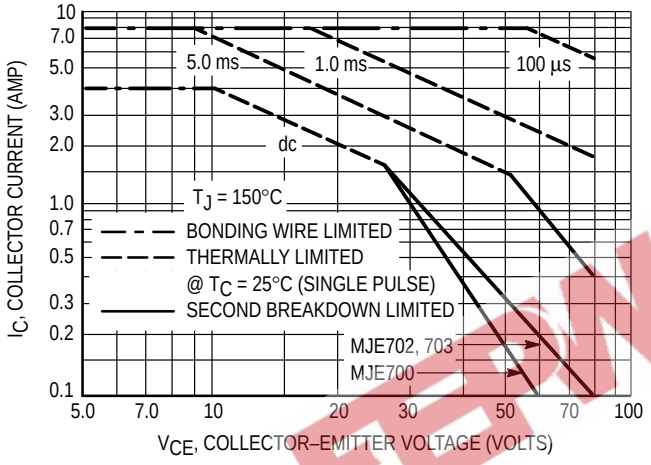


Figure 6. MJE700 Series

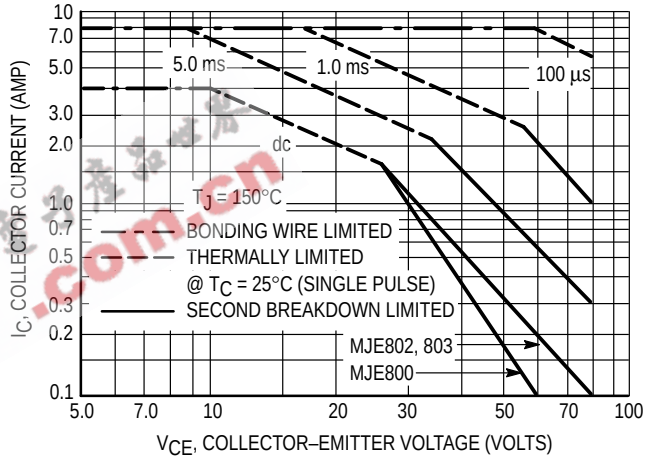


Figure 7. MJE800 Series

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 $T_{J(pk)} = 150°C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ 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.

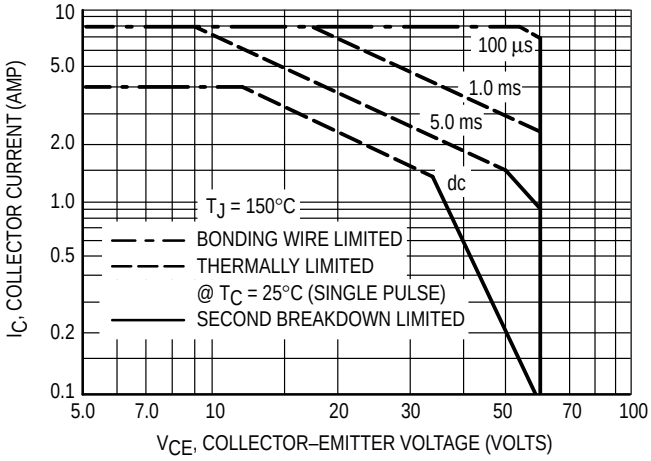


Figure 8. MJE700T

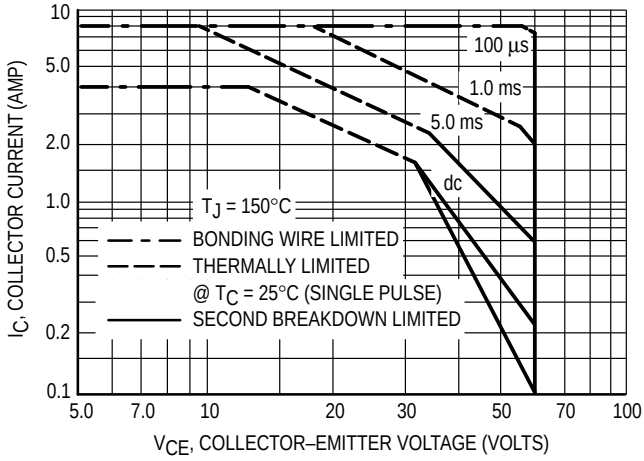
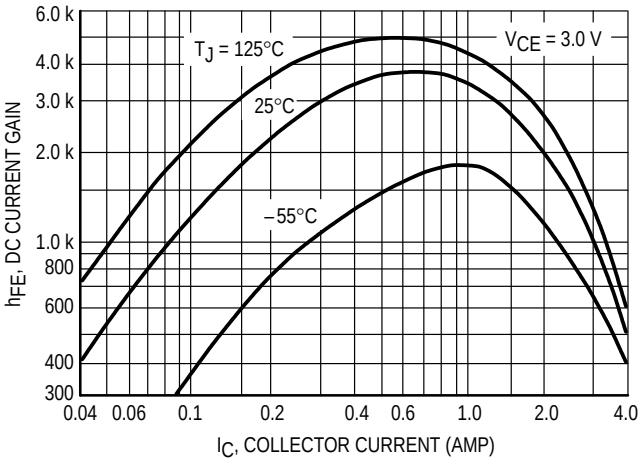


Figure 9. MJE800T

PNP
MJE700, T Series



NPN
MJE800, T Series

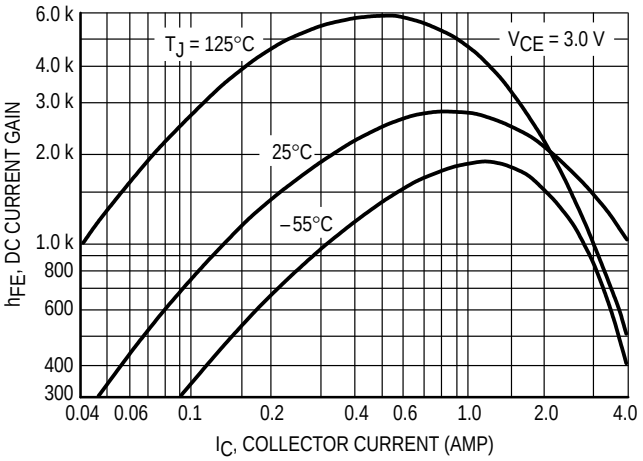
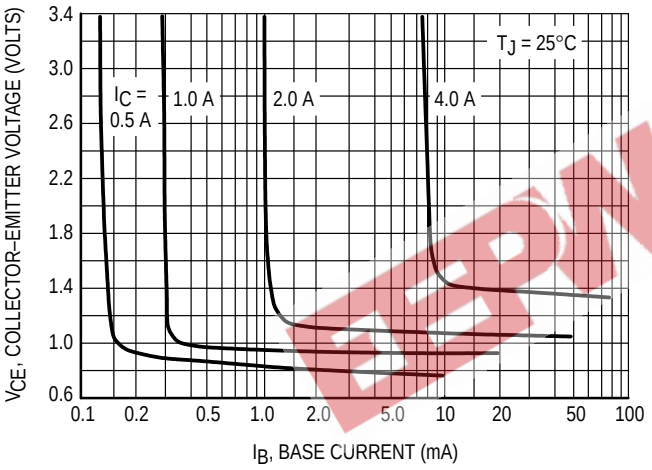


Figure 10. DC Current Gain



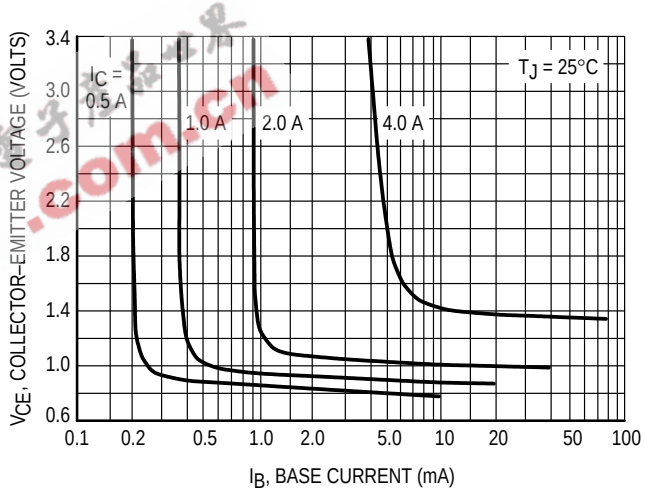
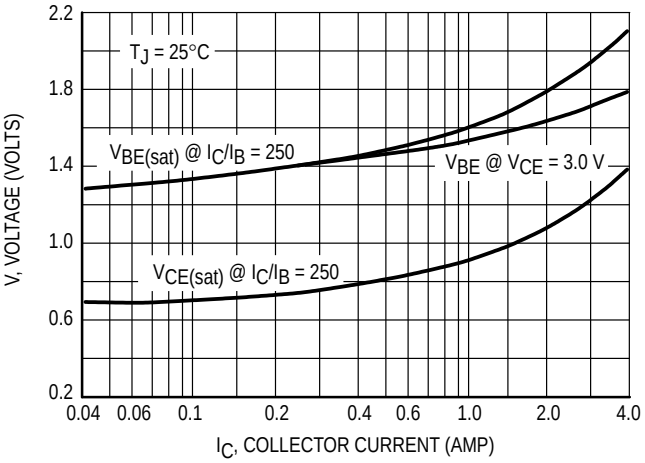


Figure 11. Collector Saturation Region



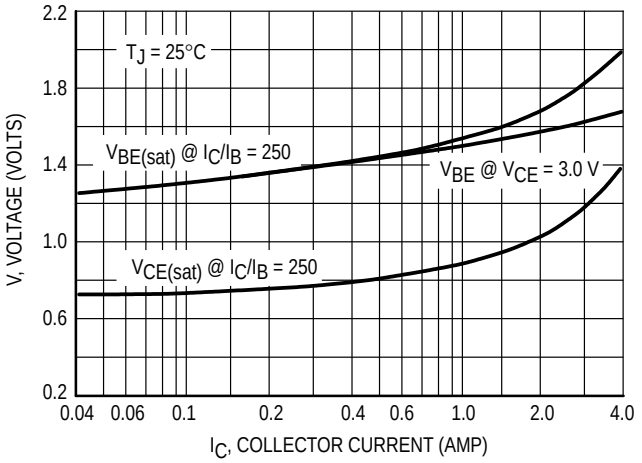
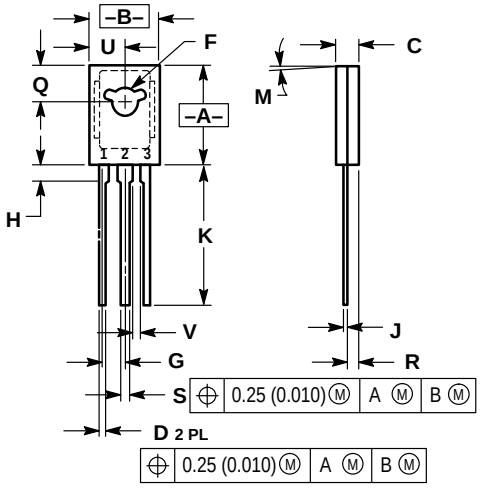


Figure 12. “On” Voltages

PACKAGE DIMENSIONS



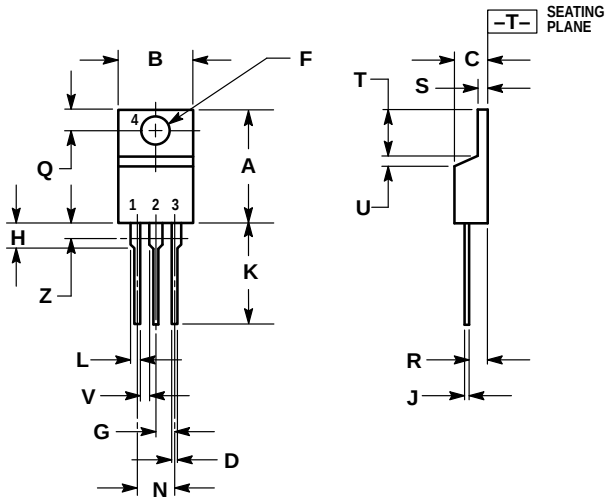
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	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

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.

	INCHES		MILLIMETERS	
DIM	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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