PNP
MJE700, T thru MJE703, T
NPN
MJE800, T thru MJE803, T

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 Muliplication
- Choice of Packages —
  TO126, MJE700 and MJE800 series
  TO220AB, MJE700T and MJE800T series

4.0 AMPERE

DARLINGTON
POWER TRANSISTORS
COMPLEMENTARY SILICON

40 WATT — TO-126
50 WATT — TO-220AB

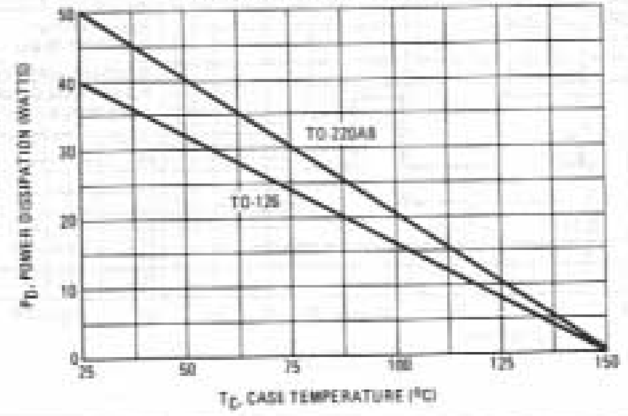
MAXIMUM RATINGS

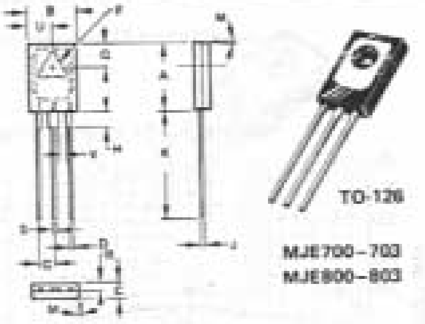
Rating	Symbol	MJE700,T MJE701,T MJE800,T MJE801,T	MJE702,T MJE703,T MJE802,T MJE803,T	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	Vdc
Collector-Base Voltage	V_{CB}	60	80	Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current	I_C	4.0		Adc
Base Current	I_B	0.1		Adc
		TO-126	TO-220	
Total Power Dissipation @ 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 TO-126 TO-220	$R_{\theta JC}$	 3.13 2.50	°C/W

FIGURE 1 — POWER DERATING





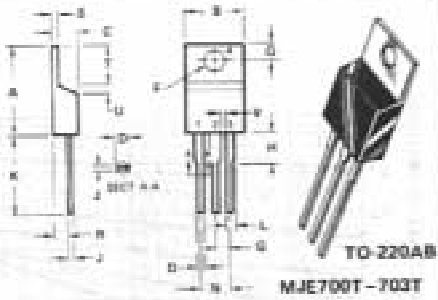
MJE700—703
MJE800—803

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	10.80	11.04	0.425	0.435
B	7.50	7.74	0.295	0.305
C	2.41	2.67	0.095	0.105
D	0.51	0.66	0.020	0.026
F	2.92	3.18	0.115	0.125
G	2.31	2.46	0.091	0.097
H	1.27	2.41	0.050	0.095
J	0.38	0.64	0.015	0.025
K	15.11	16.64	0.595	0.655
M	3° TYP		3° TYP	
Q	3.76	4.01	0.148	0.158
R	1.14	1.40	0.045	0.055
S	0.64	0.89	0.025	0.035
U	3.68	3.94	0.145	0.155
V	1.02	–	0.040	–

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

NOTES:
1. MT = MAIN TERMINAL
2. LEADS, TRUE POSITIONED WITHIN 0.25 mm (0.010) DIA TO DIM. "A" & "B" AT MAXIMUM MATERIAL CONDITION.

CASE 77-04



MJE700T—703T
MJE800T—803T

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	15.11	15.75	0.595	0.620
B	9.65	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.41	2.67	0.095	0.105
H	2.79	3.30	0.110	0.130
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.14	1.27	0.045	0.050
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
T	5.97	6.48	0.235	0.255
U	0.76	1.27	0.030	0.050
V	1.14	–	0.045	–

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

NOTE:
1. DIM. L & H APPLIES TO ALL LEADS.

CASE 221A-02

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (1)		BV_{CEO}			Vdc
(I_C = 50 mAdc, I_B = 0)	MJE700,T, MJE701,T, MJE800,T, MJE801,T		60	–	
	MJE702,T, MJE703,T, MJE802,T, MJE803,T		80	–	
Collector Cutoff Current		I_{CEO}			µAdc
(V_{CE} = 60 Vdc, I_B = 0)	MJE700,T, MJE701,T, MJE800,T, MJE801,T		–	100	
(V_{CE} = 80 Vdc, I_B = 0)	MJE702,T, MJE703,T, MJE802,T, MJE803,T		–	100	
Collector Cutoff Current		I_{CBO}			µAdc
(V_{CB} = Rated BV_{CEO}, I_E = 0)			–	100	
(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,T, MJE800,T, MJE802,T		750	–	
(I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)	MJE701,T, MJE703,T, MJE801,T, MJE803,T		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,T, MJE800,T, MJE802,T		–	2.5	
(I_C = 2.0 Adc, I_B = 40 mAdc)	MJE701,T, MJE703,T, MJE801,T, MJE803,T		–	2.8	
(I_C = 4.0 Adc, I_B = 40 mAdc)	All Device		–	3.0	
Base-Emitter On Voltage (1)		$V_{BE(on)}$			Vdc
(I_C = 1.5 Adc, V_{CE} = 3.0 Vdc)	MJE700,T, MJE702,T, MJE800,T, MJE802,T		–	2.5	
(I_C = 2.0 Adc, V_{CE} = 3.0 Vdc)	MJE701,T, MJE703,T, MJE801,T, MJE803,T		–	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

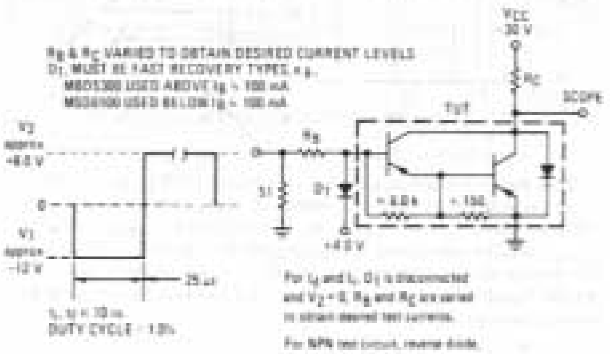


FIGURE 3 – SWITCHING TIMES

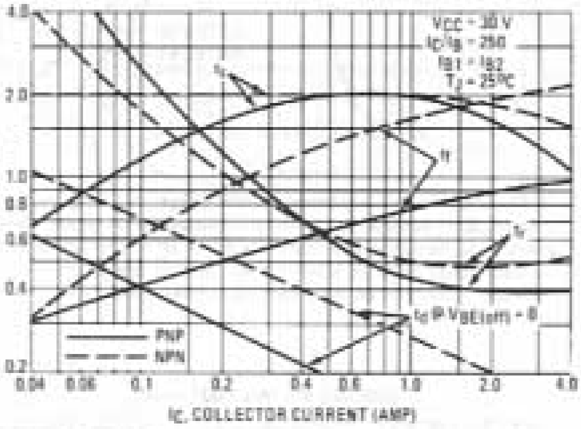


FIGURE 4 – THERMAL RESPONSE (MJE700T, 800T series)

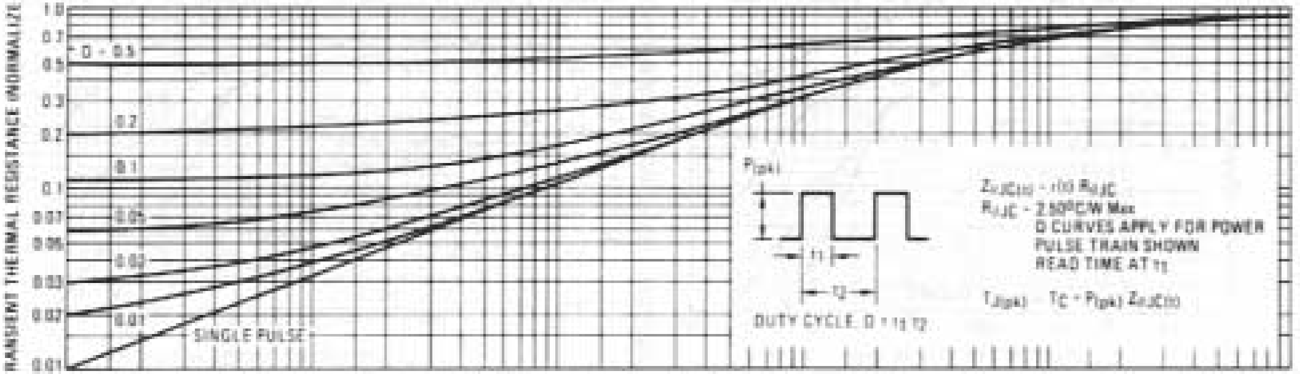
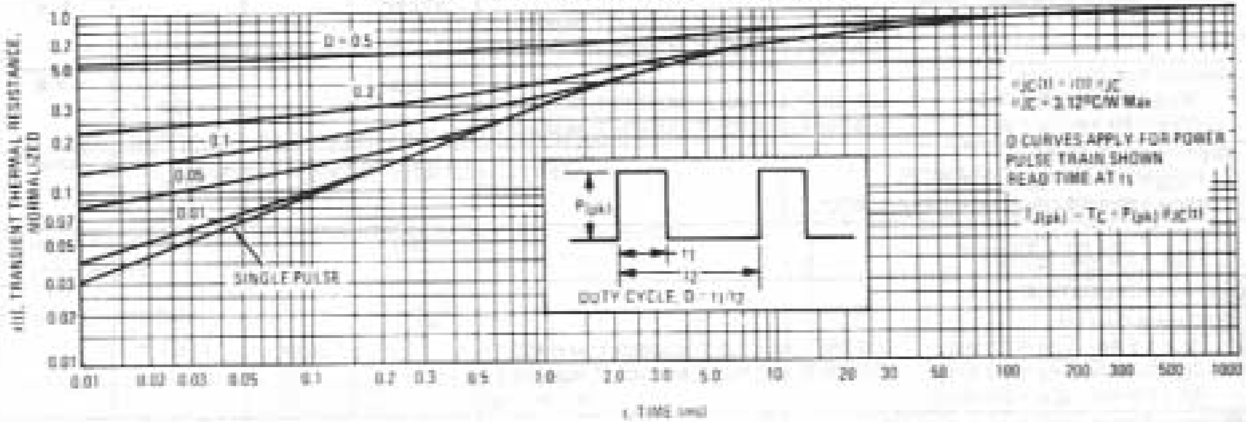


FIGURE 5 – THERMAL RESPONSE (MJE700, 800 series)



ACTIVE-REGION SAFE-OPERATING AREA

FIGURE 6 – MJE700 series

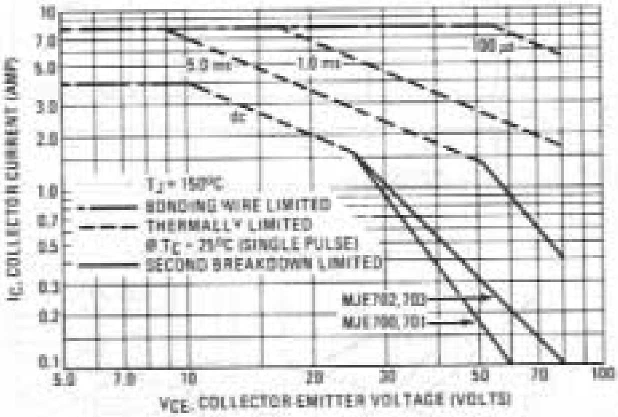
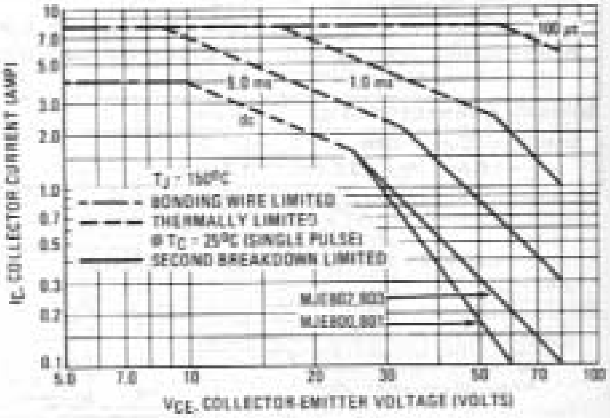


FIGURE 7 – MJE800 series



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 series

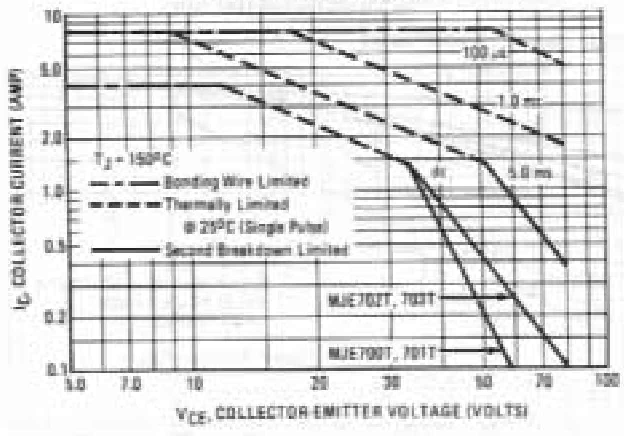


FIGURE 9 – MJE800T series

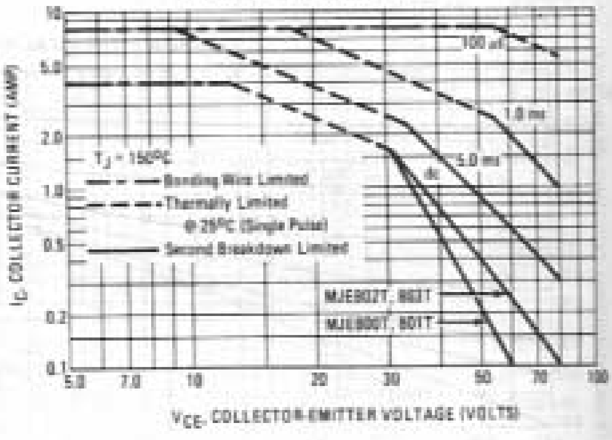


FIGURE 10 – DC CURRENT GAIN

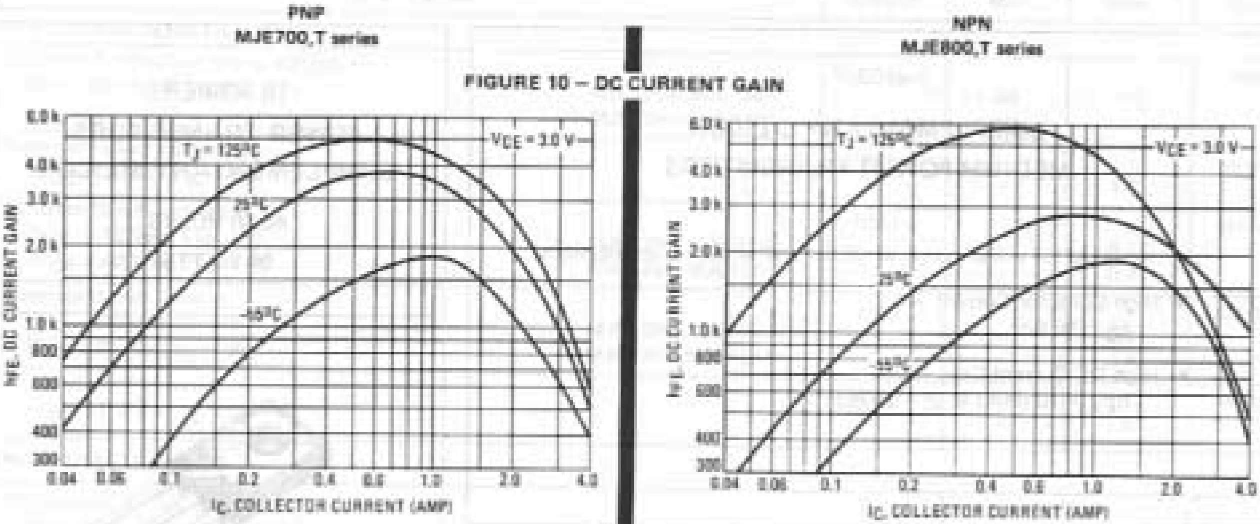


FIGURE 11 – COLLECTOR SATURATION REGION

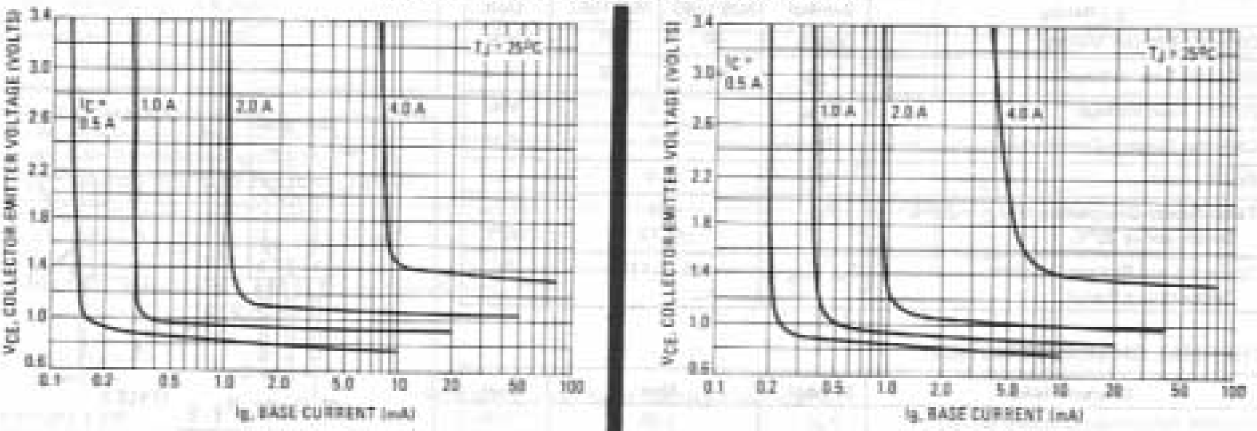


FIGURE 12 – "ON" VOLTAGES