

# MJE700, MJE702, MJE703 (PNP) - MJE800, MJE802, MJE803 (NPN)

## Plastic Darlington Complementary Silicon Power Transistors

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

### Features

- 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
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage MJE700, MJE800 MJE702, MJE703, MJE802, MJE803	$V_{CEO}$	60 80	Vdc
Collector-Base Voltage MJE700, MJE800 MJE702, MJE703, MJE802, MJE803	$V_{CB}$	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 $25^\circ\text{C}$	$P_D$	40 0.32	W mW/ $^\circ\text{C}$
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	$\theta_{JC}$	6.25	$^\circ\text{C/W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

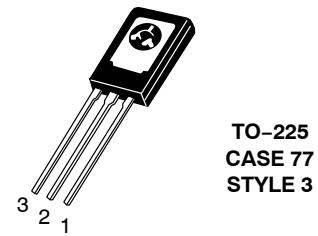
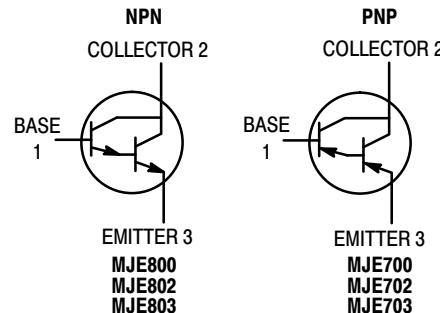
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



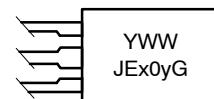
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## 4.0 AMPERE DARLINGTON POWER TRANSISTORS COMPLEMENTARY SILICON 40 WATT 50 WATT



### MARKING DIAGRAM



Y = Year  
WW = Work Week  
JEx0y = Device Code  
x = 7 or 8  
y = 0, 2, or 3  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage (Note 1) ( $I_C = 50 \text{ mA}_\text{dc}$ , $I_B = 0$ )	$V_{(\text{BR})\text{CEO}}$	60 80	–	Vdc
Collector Cutoff Current ( $V_{\text{CE}} = 60 \text{ Vdc}$ , $I_B = 0$ ) ( $V_{\text{CE}} = 80 \text{ Vdc}$ , $I_B = 0$ )	$I_{\text{CEO}}$	– –	100 100	$\mu\text{A}_\text{dc}$
Collector Cutoff Current ( $V_{\text{CB}} = \text{Rated } BV_{\text{CEO}}$ , $I_E = 0$ ) ( $V_{\text{CB}} = \text{Rated } BV_{\text{CEO}}$ , $I_E = 0$ , $T_C = 100^\circ\text{C}$ )	$I_{\text{CBO}}$	– –	100 500	$\mu\text{A}_\text{dc}$
Emitter Cutoff Current ( $V_{\text{BE}} = 5.0 \text{ Vdc}$ , $I_C = 0$ )	$I_{\text{EBO}}$	–	2.0	$\text{mA}_\text{dc}$

## ON CHARACTERISTICS

DC Current Gain (Note 1) ( $I_C = 1.5 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ ) ( $I_C = 2.0 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ ) ( $I_C = 4.0 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ )	MJE700, MJE702, MJE800, MJE802 MJE703, MJE803 All devices	$h_{\text{FE}}$	750 750 100	– – –	–
Collector-Emitter Saturation Voltage (Note 1) ( $I_C = 1.5 \text{ Adc}$ , $I_B = 30 \text{ mA}_\text{dc}$ ) ( $I_C = 2.0 \text{ Adc}$ , $I_B = 40 \text{ mA}_\text{dc}$ ) ( $I_C = 4.0 \text{ Adc}$ , $I_B = 40 \text{ mA}_\text{dc}$ )	MJE700, MJE702, MJE800, MJE802 MJE703, MJE803 All devices	$V_{\text{CE}(\text{sat})}$	– – –	2.5 2.8 3.0	Vdc
Base-Emitter On Voltage (Note 1) ( $I_C = 1.5 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ ) ( $I_C = 2.0 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ ) ( $I_C = 4.0 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ )	MJE700, MJE702, MJE800, MJE802 MJE703, MJE803 All devices	$V_{\text{BE}(\text{on})}$	– – –	2.5 2.5 3.0	Vdc

## DYNAMIC CHARACTERISTICS

Small-Signal Current Gain ( $I_C = 1.5 \text{ Adc}$ , $V_{\text{CE}} = 3.0 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$ )	$h_{\text{fe}}$	1.0	–	–
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1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

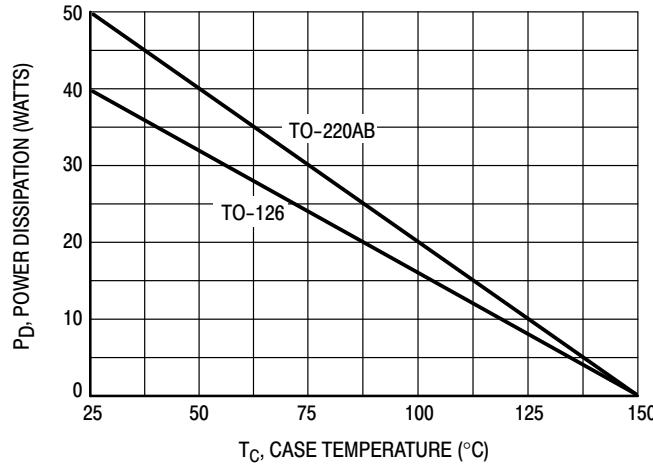


Figure 1. Power Derating

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

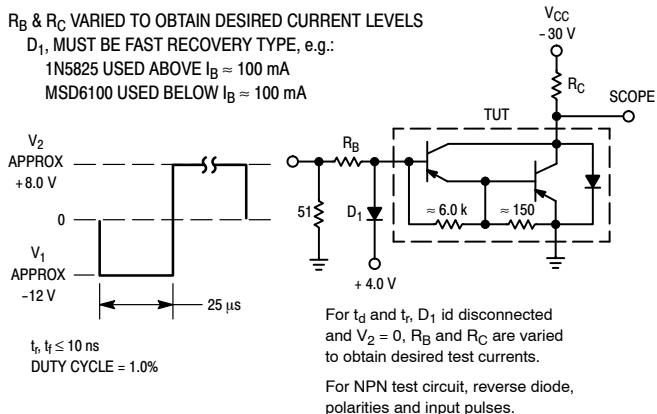


Figure 2. Switching Times Test Circuit

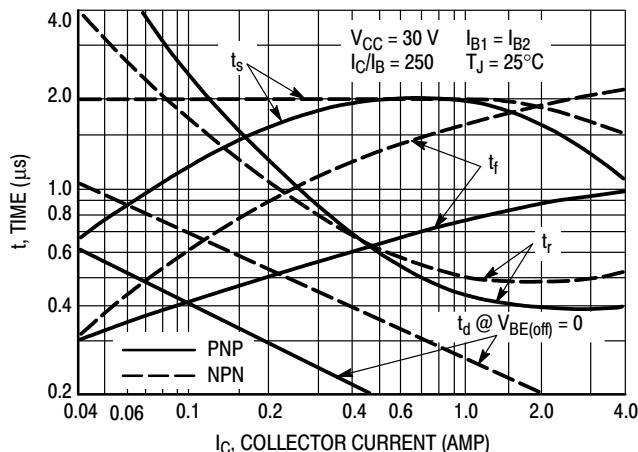


Figure 3. Switching Times

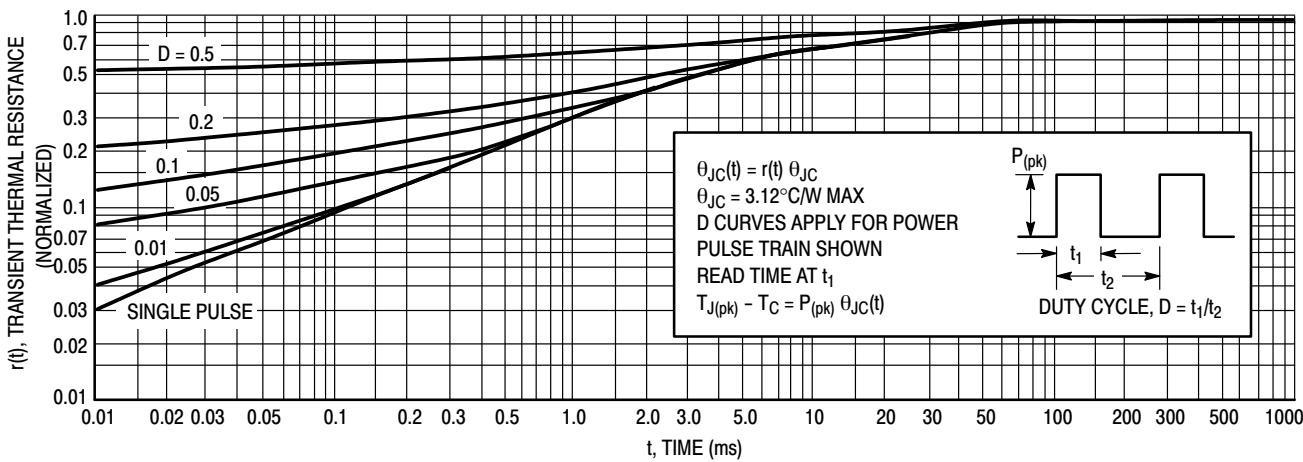


Figure 4. Thermal Response (MJE700, 800 Series)

## ACTIVE-REGION SAFE-OPERATING AREA

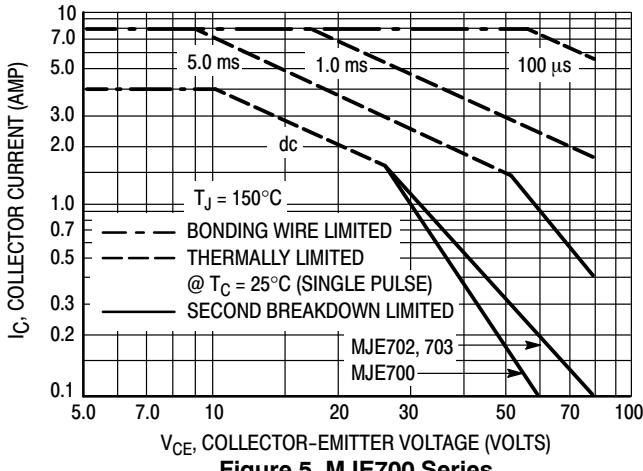


Figure 5. MJE700 Series

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.

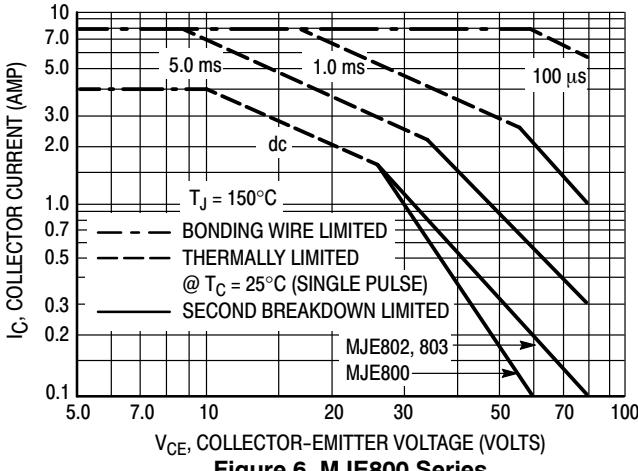


Figure 6. MJE800 Series

The data of Figures 5 and 6 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. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

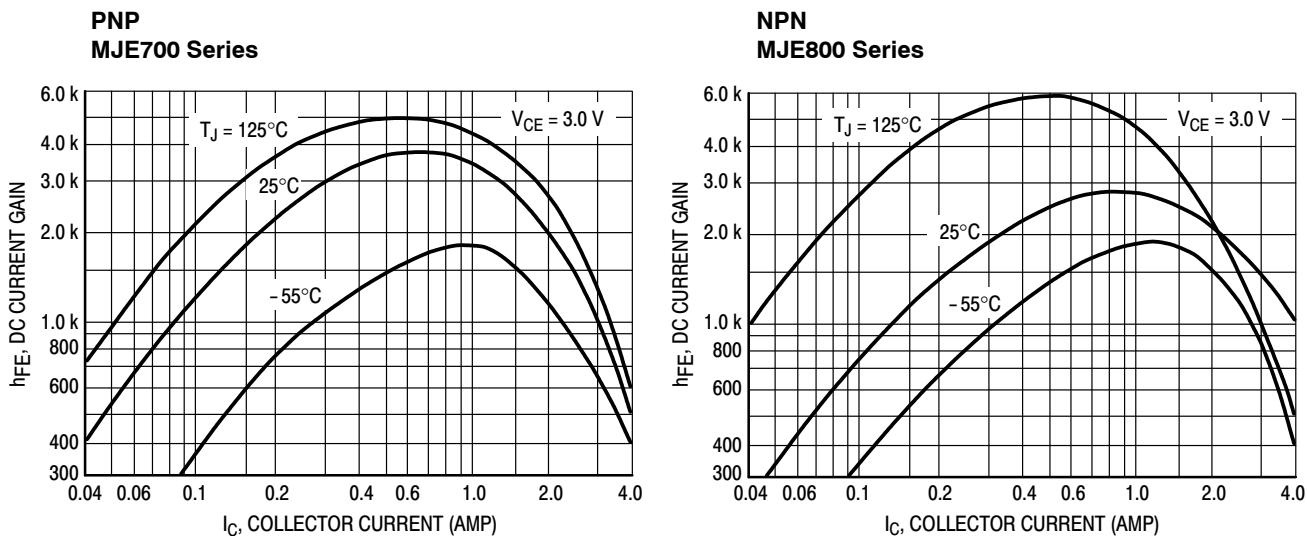


Figure 7. DC Current Gain

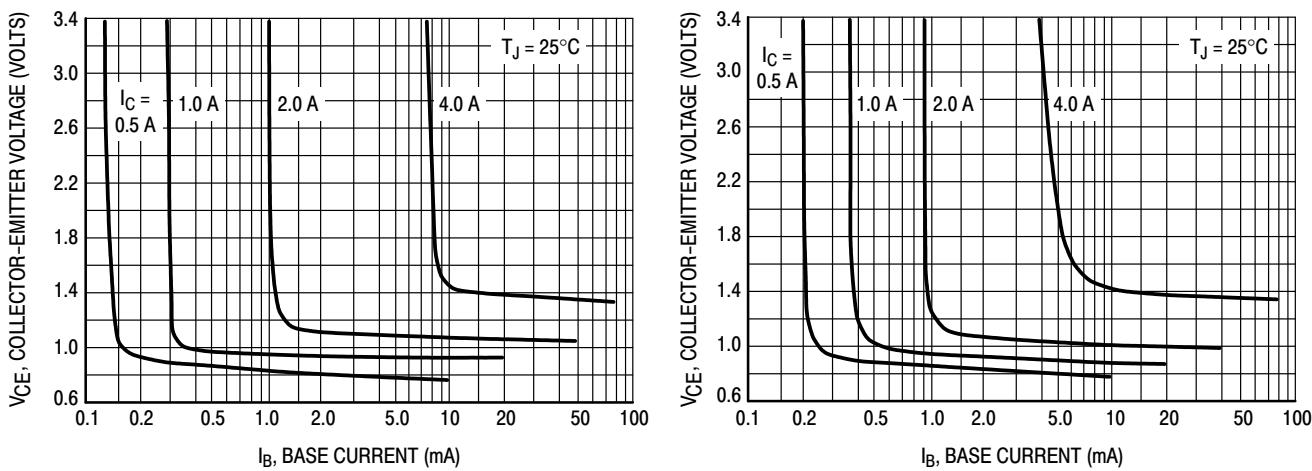


Figure 8. Collector Saturation Region

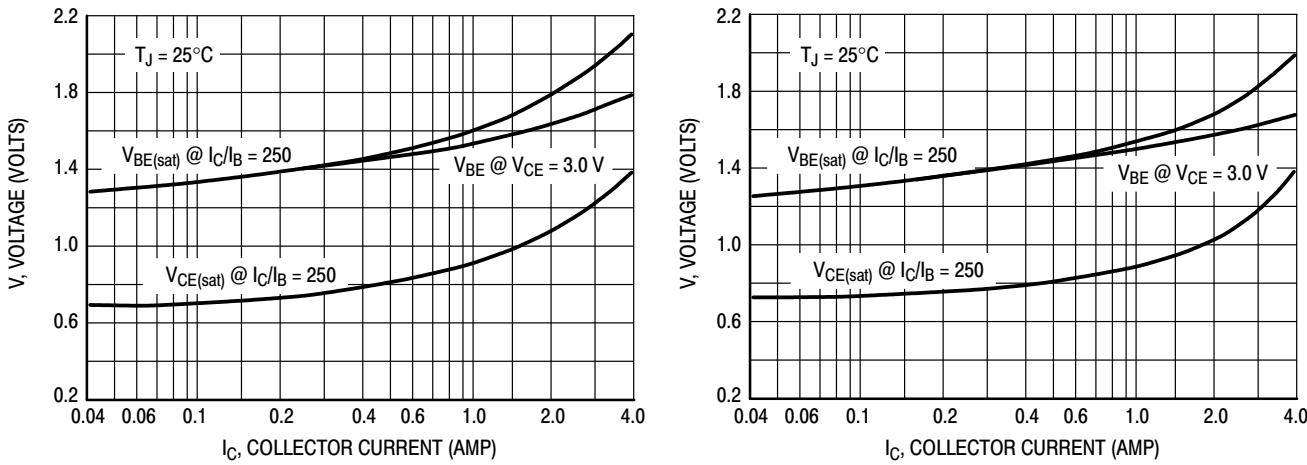


Figure 9. "On" Voltages

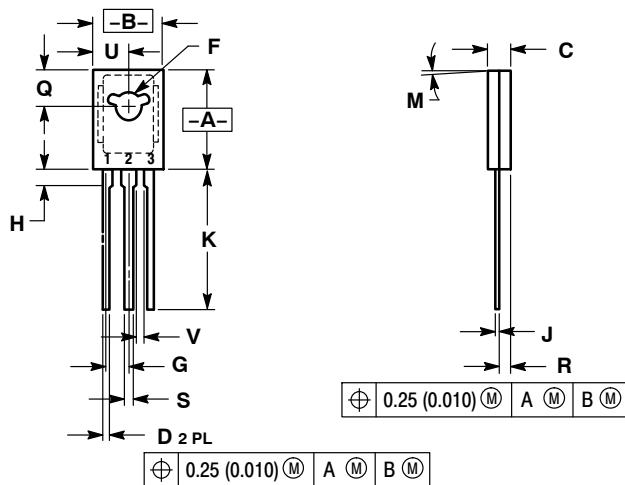
## MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

### ORDERING INFORMATION

Device	Package	Shipping
MJE700	TO-225	50 Units / Bulk
MJE700G	TO-225 (Pb-Free)	
MJE702	TO-225	
MJE702G	TO-225 (Pb-Free)	
MJE703	TO-225	
MJE703G	TO-225 (Pb-Free)	
MJE800	TO-225	
MJE800G	TO-225 (Pb-Free)	
MJE802	TO-225	
MJE802G	TO-225 (Pb-Free)	
MJE803	TO-225	
MJE803G	TO-225 (Pb-Free)	

**PACKAGE DIMENSIONS**

**TO-225**  
**CASE 77-09**  
**ISSUE Z**



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 077-01 THRU -08 OBSOLETE, NEW STANDARD 077-09.

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	5° TYP	5° TYP
Q	0.148	0.158	3.76	4.01
R	0.045	0.065	1.15	1.65
S	0.025	0.035	0.64	0.88
U	0.145	0.155	3.69	3.93
V	0.040	---	1.02	---

STYLE 3:

1. BASE
2. COLLECTOR
3. Emitter

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