

20 STERN AVE.  
 SPRINGFIELD, NEW JERSEY 07081  
 U.S.A.

TELEPHONE: (973) 376-2922  
 (212) 227-6005  
 FAX: (973) 376-8960

**MJE1090 thru MJE1093 PNP (SILICON)**  
**MJE2090 thru MJE2093**  
**MJE1100 thru MJE1103 NPN**  
**MJE2100 thru MJE2103**

**PLASTIC MEDIUM-POWER  
 COMPLEMENTARY SILICON TRANSISTORS**

Designed for use in driver and output stages in complementary audio amplifier applications.

- High DC Current Gain –  
 $h_{FE} = 750$  (Min) @  $I_C = 3.0$  and  $4.0$  Adc
- True Three Lead Monolithic Construction – Emitter-Base Resistors to Prevent Leakage Multiplication are Built in.
- Available in Two Packages – Case 90 or Case 199

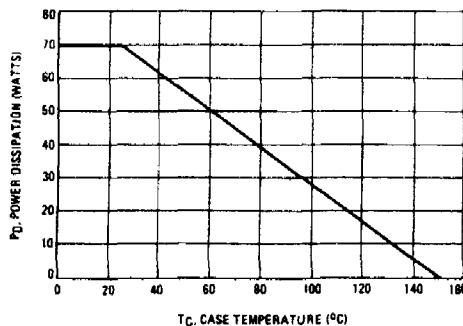
**MAXIMUM RATINGS**

Rating	Symbol	MJE1090 MJE1091 MJE1100 MJE1101 MJE2090 MJE2091 MJE2100 MJE2101	MJE1092 MJE1093 MJE1102 MJE1103 MJE2092 MJE2093 MJE2102 MJE2103	Unit
Collector-Emitter Voltage	$V_{CE0}$	60	80	Vdc
Collector-Base Voltage	$V_{CB}$	60	80	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0		Vdc
Collector Current	$I_C$	5.0		Adc
Base Current	$I_B$	0.1		Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	70	0.56	Watts W/ $^\circ\text{C}$
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	$\theta_{JC}$	1.8	$^\circ\text{C}/\text{W}$

**FIGURE 1 – POWER DERATING**



**5.0 AMPERE  
 DARLINGTON  
 POWER TRANSISTORS  
 COMPLEMENTARY SILICON**

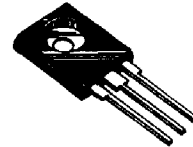
**60-80 VOLTS  
 70 WATTS**

MJE1090  
 MJE1091  
 MJE1092  
 MJE1093  
 MJE1100  
 MJE1101  
 MJE1102  
 MJE1103



**CASE 90-05**

MJE2090  
 MJE2091  
 MJE2092  
 MJE2093  
 MJE2100  
 MJE2101  
 MJE2102  
 MJE2103



**CASE 199-04**

NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.



**MJE1090 thru MJE1093 PNP/MJE1100 thru MJE1103 NPN (continued)**  
**MJE2090 thru MJE2093 PNP/MJE2100 thru MJE2103 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 <sup>(1)</sup> ( $I_C = 100 \text{ mA dc}, I_B = 0$ )	$BV_{CEO}$	60	—	Vdc
MJE1090, MJE1091, MJE1100, MJE1101 MJE2090, MJE2091, MJE2100, MJE2101		60	—	
MJE1092, MJE1093, MJE1102, MJE1103 MJE2092, MJE2093, MJE2102, MJE2103		80	—	
Collector Cutoff Current ( $V_{CE} = 30 \text{ V dc}, I_B = 0$ )	$I_{CEO}$	—	500	$\mu\text{A dc}$
MJE1090, MJE1091, MJE1100, MJE1101 MJE2090, MJE2091, MJE2100, MJE2101		—	500	
( $V_{CE} = 40 \text{ V dc}, I_B = 0$ )		—	500	
MJE1092, MJE1093, MJE1102, MJE1103 MJE2092, MJE2093, MJE2102, MJE2103		—	500	
Collector Cutoff Current ( $V_{CB} = \text{Rated } BV_{CEO}, I_E = 0$ ) ( $V_{CB} = \text{Rated } BV_{CEO}, I_E = 0, T_C = 100^\circ\text{C}$ )	$I_{CBO}$	—	0.2	$\text{mA dc}$
		—	2.0	
Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ V dc}, I_C = 0$ )	$I_{EBO}$	—	2.0	$\text{mA dc}$

**ON CHARACTERISTICS** (1)

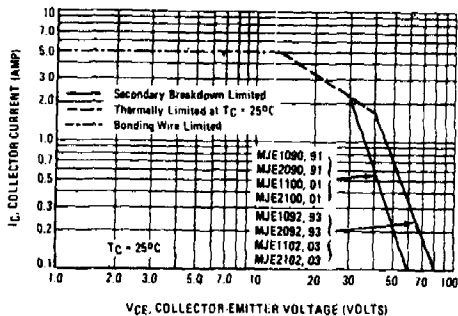
DC Current Gain ( $I_C = 3.0 \text{ A dc}, V_{CE} = 3.0 \text{ V dc}$ )	$h_{FE}$	750	—	—
MJE1090, MJE1092, MJE1100, MJE1102 MJE2090, MJE2092, MJE2100, MJE2102		750	—	
( $I_C = 4.0 \text{ A dc}, V_{CE} = 3.0 \text{ V dc}$ )		750	—	
MJE1091, MJE1093, MJE1101, MJE1103 MJE2091, MJE2093, MJE2101, MJE2103		750	—	
Collector-Emitter Saturation Voltage ( $I_C = 3.0 \text{ A dc}, I_B = 12 \text{ mA dc}$ )	$V_{CE(sat)}$	—	2.5	Vdc
MJE1090, MJE1092, MJE1100, MJE1102 MJE2090, MJE2092, MJE2100, MJE2102		—	2.5	
( $I_C = 4.0 \text{ A dc}, I_B = 16 \text{ mA dc}$ )		—	2.8	
MJE1091, MJE1093, MJE1101, MJE1103 MJE2091, MJE2093, MJE2101, MJE2103		—	2.8	
Base-Emitter On Voltage ( $I_C = 3.0 \text{ A dc}, V_{CE} = 3.0 \text{ V dc}$ )	$V_{BE(on)}$	—	2.5	Vdc
MJE1090, MJE1092, MJE1100, MJE1102 MJE2090, MJE2092, MJE2100, MJE2102		—	2.5	
( $I_C = 4.0 \text{ A dc}, V_{CE} = 3.0 \text{ V dc}$ )		—	2.5	
MJE1091, MJE1093, MJE1101, MJE1103 MJE2091, MJE2093, MJE2101, MJE2103		—	2.5	

**DYNAMIC CHARACTERISTICS**

Small-Signal Current Gain ( $I_C = 3.0 \text{ A dc}, V_{CE} = 3.0 \text{ V dc}, f = 1.0 \text{ MHz}$ )	$h_{fe}$	1.0	—	—
---	----------	-----	---	---

(1) Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

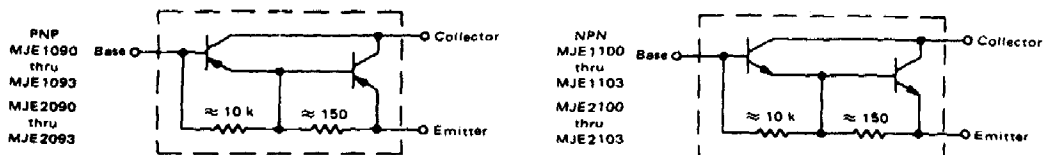
**FIGURE 2 — DC SAFE OPERATING AREA**



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

At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown. (See AN-415)

**FIGURE 3 — DARLINGTON CIRCUIT SCHEMATIC**



MJE1090 thru MJE1093 PNP/MJE1100 thru MJE1103 NPN (continued)  
MJE2090 thru MJE2093 PNP/MJE2100 thru MJE2103 NPN

MJE1090  
MJE1091  
MJE1092  
MJE1093  
MJE1100  
MJE1101  
MJE1102  
MJE1103

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	16.13	16.38	0.635	0.645
B	12.57	12.83	0.495	0.505
C	3.18	3.43	0.125	0.135
D	1.09	1.24	0.043	0.049
F	3.51	3.76	0.138	0.148
G	4.22 BSC		0.166 BSC	
H	2.67	2.92	0.105	0.115
J	0.813	0.864	0.032	0.034
K	15.13	16.38	0.595	0.645
M	90° TYP		90° TYP	
Q	4.70	4.95	0.185	0.195
R	1.91	2.16	0.075	0.085
U	6.22	6.48	0.245	0.255

NOTE  
1. LEADS WITHIN .005° RAD OF TRUE POSITION (TP) AT MMC

MJE2090  
MJE2091  
MJE2092  
MJE2093  
MJE2100  
MJE2101  
MJE2102  
MJE2103

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	16.08	16.33	0.633	0.643
B	12.57	12.83	0.495	0.505
C	3.18	3.43	0.125	0.135
D	0.51	0.76	0.020	0.030
F	3.61	3.86	0.142	0.152
G	2.54 BSC		0.100 BSC	
H	2.67	2.92	0.105	0.115
J	0.43	0.69	0.017	0.027
K	14.73	14.99	0.580	0.590
L	2.16	2.41	0.085	0.095
M	30° TYP		30° TYP	
N	1.47	1.73	0.058	0.068
Q	4.78	5.03	0.188	0.198
R	1.91	2.16	0.075	0.085
S	0.81	0.86	0.032	0.034
T	6.99	7.24	0.275	0.285
U	6.22	6.48	0.245	0.255

1. DIM "G" IS TO CENTER LINE OF LEADS.