2N6040 thru 2N6042 PNP (SILICON)
2N6043 thru 2N6045 NPN
MJE6040 thru MJE6042 PNP
MJE6043 thru MJE6045 NPN

PLASTIC MEDIUM-POWER COMPLEMENTARY SILICON TRANSISTORS

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

- High DC Current Gain –
  h_{FE} = 2500 (Typ) @ I_C = 4.0 Adc
- Collector-Emitter Sustaining Voltage – @ 100 mAdc (1)
  $V_{CEO(sus)}$ = 60 Vdc (Min) – 2N6040, 2N6043
  = 80 Vdc (Min) – 2N6041, 2N6044
  = 100 Vdc (Min) – 2N6042, 2N6045
- Low Collector-Emitter Saturation Voltage – (1)
  $V_{CE(sat)}$ = 2.0 Vdc (Max) @ I_C = 4.0 Adc – 2N6040,41,2N6043,44
  = 2.0 Vdc (Max) @ I_C = 3.0 Adc – 2N6042, 2N6045
- Monolithic Construction with Built-In Base-Emitter Shunt Resistors
- Thermopad High Efficiency Compact Package

(1) Applies to corresponding in-house part numbers also.

DARLINGTON 8 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS

60-80-100 VOLTS
75 WATTS

***MAXIMUM RATINGS**

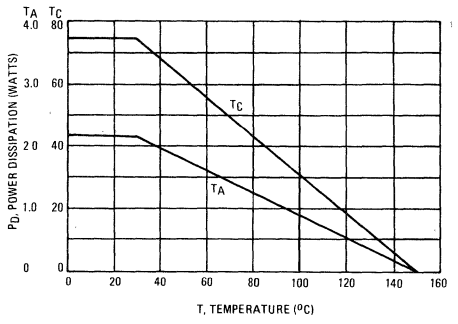
Rating	Symbol	2N6040 2N6043 MJE6040 MJE6043	2N6041 2N6044 MJE6041 MJE6044	2N6042 2N6045 MJE6042 MJE6045	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	100	Vdc
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	← 5.0 →			Vdc
Collector Current – Continuous Peak	I_C	← 8.0 → ← 16 →			Adc
Base Current	I_B	← 120 →			mAdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	← 75 → ← 0.60 →			Watts W/°C
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	← 2.2 → ← 0.0175 →			Watts W/°C
Operating and Storage Junction, Temperature Range	T_J, T_{stg}	← -65 to +150 →			°C

THERMAL CHARACTERISTICS

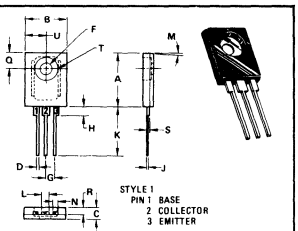
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.67	°C/W
Thermal Resistance, Junction to Ambient	θ_{JA}	57	°C/W

*Indicates JEDEC Registered Data.

FIGURE 1 – POWER DERATING



2N6040 thru 2N6045



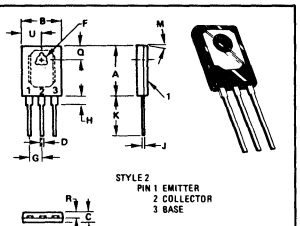
STYLE 1
PIN 1 BASE
2 COLLECTOR
3 EMITTER

DIM	MILLIMETERS MIN	MAX	INCHES 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	3° TYP		3° 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

CASE 199-04

MJE6040 thru MJE6045



STYLE 2
PIN 1 EMITTER
2 COLLECTOR
3 BASE

DIM	MILLIMETERS MIN	MAX	INCHES 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	15.11	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

CASE 90-05

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	2N6040, 2N6043, MJE6040, MJE6043	$V_{CEO(sus)}$	60	–	Vdc
	2N6041, 2N6044, MJE6041, MJE6044		80	–	
	2N6042, 2N6045, MJE6042, MJE6045		100	–	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 30 Vdc, I_B = 0)	2N6040, 2N6043, MJE6040, MJE6043		–	0.5	
(V_{CE} = 40 Vdc, I_B = 0)	2N6041, 2N6044, MJE6041, MJE6044		–	0.5	
(V_{CE} = 50 Vdc, I_B = 0)	2N6042, 2N6045, MJE6042, MJE6045		–	0.5	
Collector Cutoff Current		I_{CEX}			mAdc
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N6040, 2N6043, MJE6040, MJE6043		–	0.5	
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N6041, 2N6044, MJE6041, MJE6044		–	0.5	
(V_{CE} = 100 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N6042, 2N6045, MJE6042, MJE6045		–	0.5	
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)	2N6040, 2N6043, MJE6040, MJE6043		–	5.0	
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)	2N6041, 2N6044, MJE6041, MJE6044		–	5.0	
(V_{CE} = 100 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)	2N6042, 2N6045, MJE6042, MJE6045		–	5.0	
Collector Cutoff Current		I_{CBO}			mAdc
(V_{CB} = 60 Vdc, I_E = 0)	2N6040, 2N6043, MJE6040, MJE6043		–	0.5	
(V_{CB} = 80 Vdc, I_E = 0)	2N6041, 2N6044, MJE6041, MJE6044		–	0.5	
(V_{CB} = 100 Vdc, I_E = 0)	2N6042, 2N6045, MJE6042, MJE6045		–	0.5	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	–	2.0	mAdc
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			–
(I_C = 4.0 Adc, V_{CE} = 4.0 Vdc)	2N6040,41, 2N6043,44, MJE6040,41, MJE6043,44		1000	20,000	
(I_C = 3.0 Adc, V_{CE} = 4.0 Vdc)	2N6042, 2N6045, MJE6042, MJE6045		1000	20,000	
(I_C = 8.0 Adc, V_{CE} = 4.0 Vdc)	All Types		100	–	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 4.0 Adc, I_B = 16 mAdc)	2N6040,41,2N6043,44,MJE6040,41,MJE6043,44		–	2.0	
(I_C = 3.0 Adc, I_B = 12 mAdc)	2N6042,2N6045,MJE6042,MJE6045		–	2.0	
(I_C = 8.0 Adc, I_B = 80 mAdc)	All Types		–	4.0	
Base-Emitter Saturation Voltage (I_C = 8.0 Adc, I_B = 80 mAdc)		$V_{BE(sat)}$	–	4.5	Vdc
Base-Emitter On Voltage (I_C = 4.0 Adc, V_{CE} = 4.0 Vdc)		$V_{BE(on)}$	–	2.8	Vdc
DYNAMIC CHARACTERISTICS					
Current-Gain – Bandwidth Product (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc, f = 1.0 MHz)		$\|h_{fe}\|$	4.0	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	2N6040/2N6042, MJE6040/MJE6042	C_{ob}	–	300	pF
	2N6043/2N6045, MJE6043/MJE6045		–	200	
Small-Signal Current Gain (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc, f = 1.0 kHz)		h_{fe}	300	–	–

*Indicates JEDEC Registered Data

FIGURE 2 – SWITCHING TIMES TEST CIRCUIT

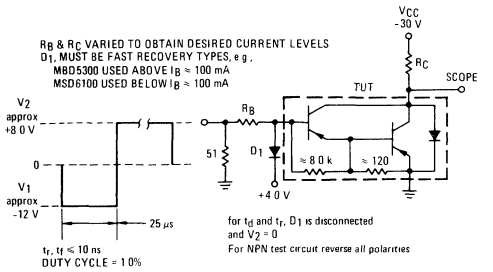


FIGURE 3 – SWITCHING TIMES

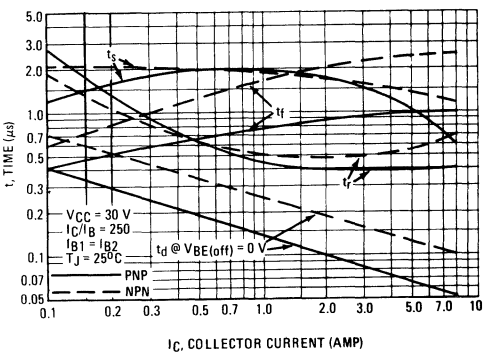


FIGURE 4 – THERMAL RESPONSE

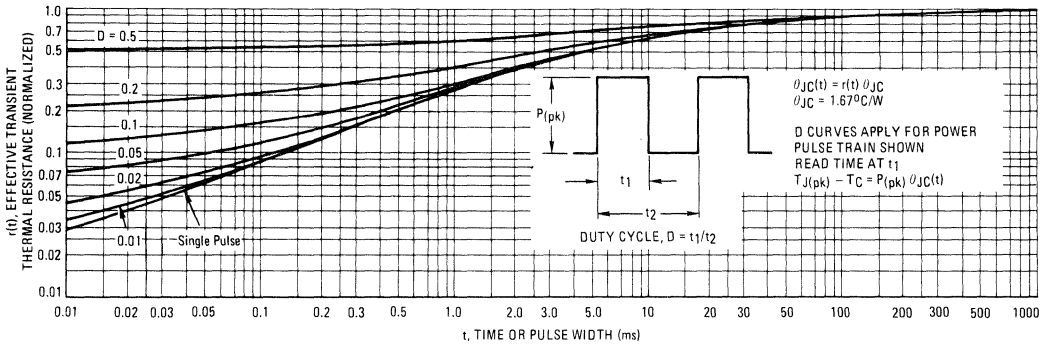
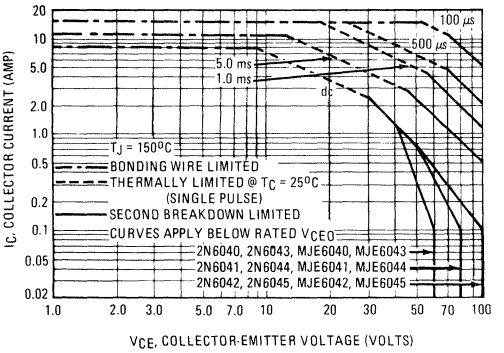


FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA



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 Figure 5 is based on $T_{J(pk)} = 150^oC$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150^oC$. $T_{J(pk)}$ 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. (See AN-415).

FIGURE 6 – SMALL-SIGNAL CURRENT GAIN

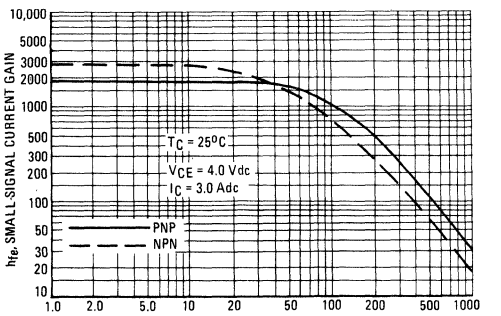
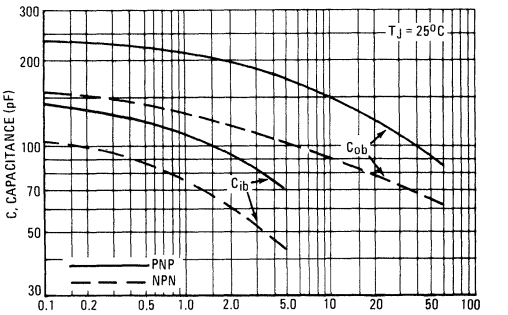


FIGURE 7 – CAPACITANCE



PNP
2N6040, 2N6041, 2N6042
MJE6040, MJE6041, MJE6042

NPN
2N6043, 2N6044, 2N6045
MJE6043, MJE6044, MJE6045

FIGURE 8 – DC CURRENT GAIN

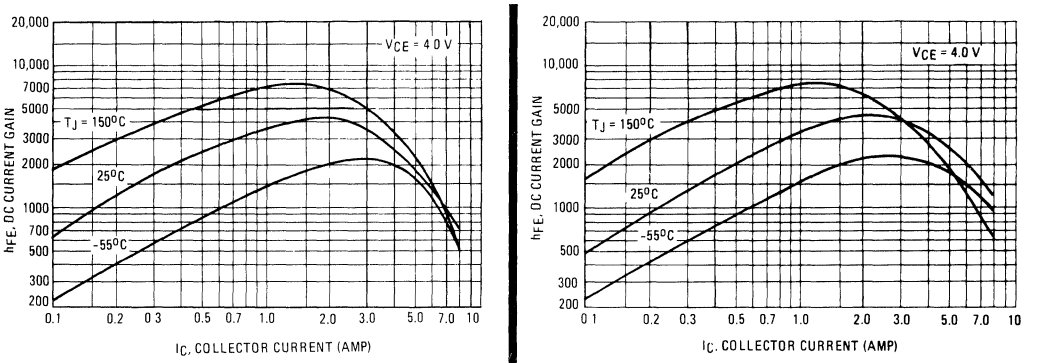


FIGURE 9 – COLLECTOR SATURATION REGION

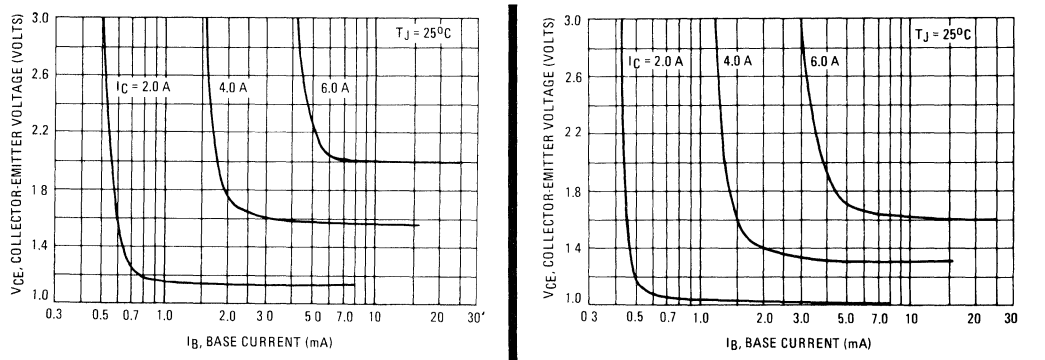
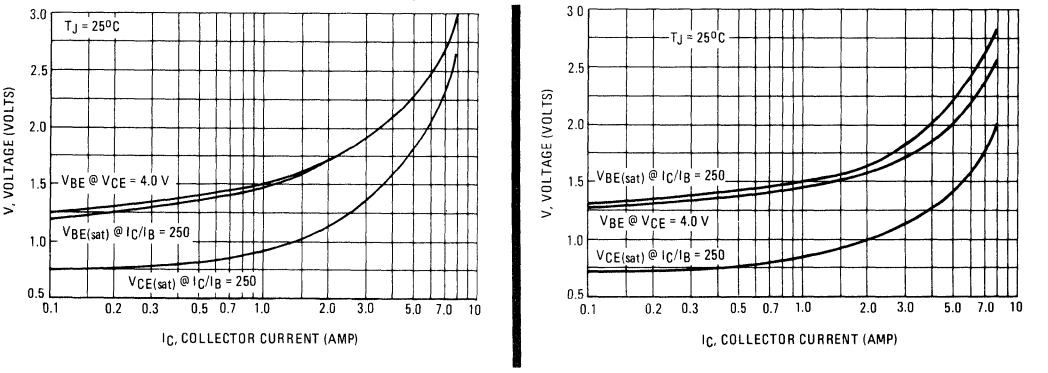


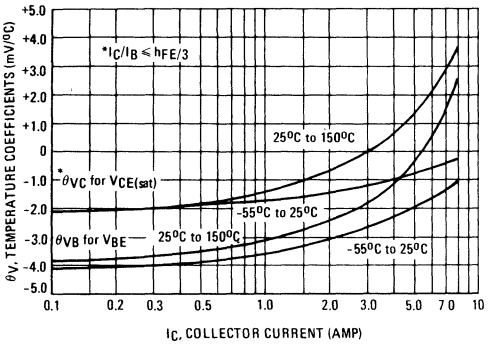
FIGURE 10 – "ON" VOLTAGES



PNP
2N6040, 2N6041, 2N6042
MJE6040, MJE6041, MJE6042

NPN
2N6043, 2N6044, 2N6045
MJE6043, MJE6044, MJE6045

FIGURE 11 – TEMPERATURE COEFFICIENTS



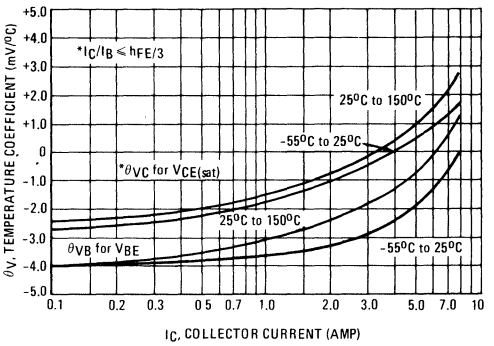
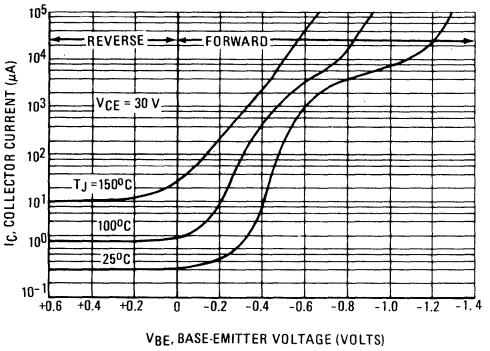


FIGURE 12 – COLLECTOR CUT-OFF REGION



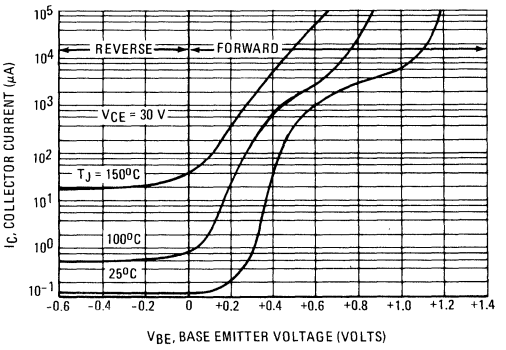


FIGURE 13 – DARLINGTON SCHEMATIC