

MOTOROLA SEMICONDUCTOR TECHNICAL DATA

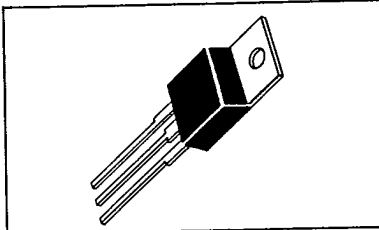
**2N6386
2N6387
2N6388**

PLASTIC MEDIUM-POWER 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
 $V_{CE(sus)} = 40$ Vdc (Min) — 2N6386
 $= 60$ Vdc (Min) — 2N6387
 $= 80$ Vdc (Min) — 2N6388
- Low Collector-Emitter Saturation Voltage —
 $V_{CE(sat)} = 2.0$ Vdc (Max) @ $I_C = 3.0$ Adc — 2N6386
 $= 2.0$ Vdc (Max) @ $I_C = 5.0$ Adc — 2N6387, 2N6388
- Monolithic Construction with Built-In Base-Emitter Shunt Resistors
- TO-220AB Compact Package
- TO-66 Leadform Also Available

**DARLINGTON
8 AND 10 AMPERE
NPN SILICON
POWER TRANSISTORS**
40-60-80 VOLTS
65 WATTS

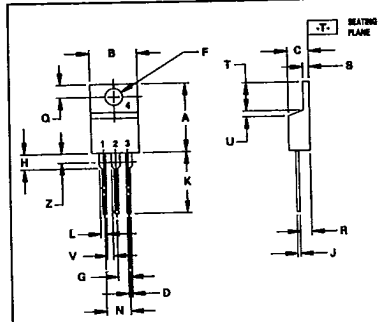
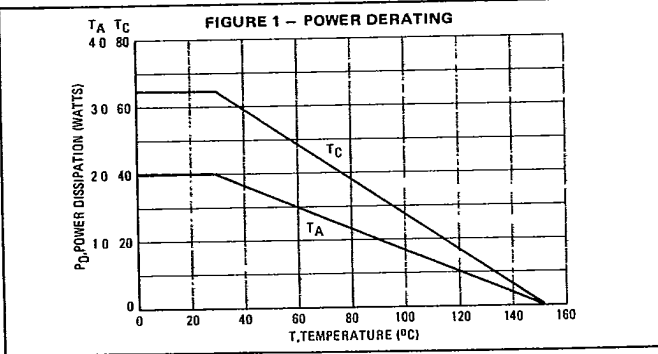


***MAXIMUM RATINGS**

Rating	Symbol	2N6386	2N6387	2N6388	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	5.0			Vdc
Collector Current — Continuous	I_C	8.0	10	10	Adc
Peak		15	15	15	
Base Current	I_B	250			mAdc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	65			Watts
Derate above 25°C		0.52			W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	2.0			Watts
Derate above 25°C		0.016			W/ $^\circ\text{C}$
Operating and Storage Junction, Temperature Range	T_J, T_{stg}	-65 to +150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.92	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.43	15.75	0.570	0.620
B	9.66	10.28	0.380	0.405
C	4.07	4.82	0.160	0.190
D	0.64	0.88	0.025	0.035
F	3.81	3.73	0.150	0.147
G	2.42	2.66	0.095	0.105
H	2.80	3.30	0.110	0.130
J	0.46	0.71	0.018	0.028
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.78	0.080	0.110
S	1.15	1.39	0.045	0.055
T	3.97	6.47	0.235	0.255
U	0.90	1.27	0.035	0.050
V	1.15	—	0.045	—
Z	—	2.04	—	0.080

CASE 221A-04
TO-220AB

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) (I _C = 200 mA, I _B = 0)	2N6386 2N6387 2N6388	V _{CEO(sus)}	40 60 80	Vdc
Collector Cutoff Current (V _{CE} = 40 Vdc, I _B = 0) (V _{CE} = 60 Vdc, I _B = 0) (V _{CE} = 80 Vdc, I _B = 0)	2N6386 2N6387 2N6388	I _{CEO}	— — —	1.0 1.0 1.0
Collector Cutoff Current (V _{CE} = 40 Vdc, V _{EB(off)} = 1.5 Vdc) (V _{CE} = 60 Vdc, V _{EB(off)} = 1.5 Vdc) (V _{CE} = 80 Vdc, V _{EB(off)} = 1.5 Vdc) (V _{CE} = 40 Vdc, V _{EB(off)} = 1.5 Vdc, T _C = 125°C) (V _{CE} = 60 Vdc, V _{EB(off)} = 1.5 Vdc, T _C = 125°C) (V _{CE} = 80 Vdc, V _{EB(off)} = 1.5 Vdc, T _C = 125°C)	2N6386 2N6387 2N6388 2N6386 2N6387 2N6388	I _{CEX}	— — — — — —	300 300 300 3.0 3.0 3.0
Emitter Cutoff Current (V _{BE} = 5.0 Vdc, I _C = 0)		I _{EBO}	—	5.0
ON CHARACTERISTICS (1)				
DC Current Gain (I _C = 3.0 A, V _{CE} = 3.0 Vdc) (I _C = 5.0 A, V _{CE} = 3.0 Vdc) (I _C = 8.0 A, V _{CE} = 3.0 Vdc) (I _C = 10 A, V _{CE} = 3.0 Vdc)	2N6386 2N6387, 2N6388 2N6386 2N6387, 2N6388	h _{FE}	1000 1000 100 100	— 20000 — —
Collector-Emitter Saturation Voltage (I _C = 3.0 A, I _B = 0.006 A) (I _C = 5.0 A, I _B = 0.01 A) (I _C = 8.0 A, I _B = 0.08 A) (I _C = 10 A, I _B = 0.1 A)	2N6386 2N6387, 2N6388 2N6386 2N6387, 2N6388	V _{CE(sat)}	— — — —	2.0 2.0 3.0 3.0
Base-Emitter On Voltage (I _C = 3.0 A, V _{CE} = 3.0 Vdc) (I _C = 5.0 A, V _{CE} = 3.0 Vdc) (I _C = 8.0 A, V _{CE} = 3.0 Vdc) (I _C = 10 A, V _{CE} = 3.0 Vdc)	2N6386 2N6387, 2N6388 2N6386 2N6387, 2N6388	V _{BE(on)}	— — — —	2.8 2.8 4.5 4.5
DYNAMIC CHARACTERISTICS				
Small-Signal Current Gain (I _C = 1.0 A, V _{CE} = 5.0 Vdc, f _{test} = 1.0 MHz)		h _{fe}	20	—
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz)		C _{ob}	—	200
Small-Signal Current Gain (I _C = 1.0 A, V _{CE} = 5.0 Vdc, f = 1.0 kHz)		h _{fe}	1000	—

* Indicates JEDEC Registered Data
(1) Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

FIGURE 2 - SWITCHING TIMES TEST CIRCUIT

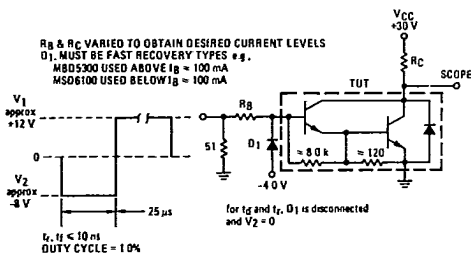


FIGURE 3 - SWITCHING TIMES

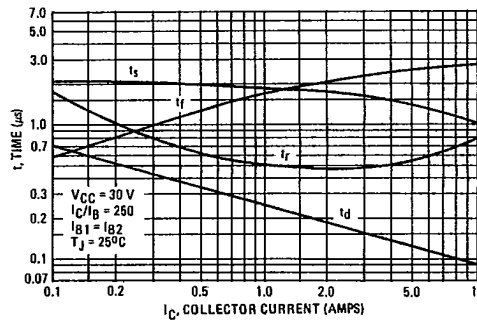


FIGURE 4 - THERMAL RESPONSE

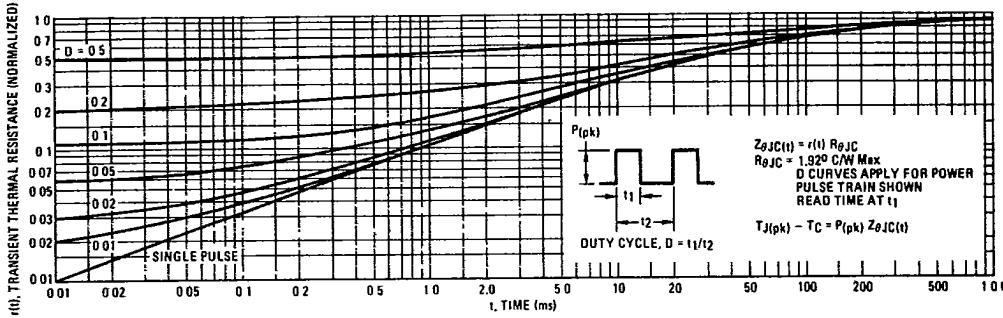
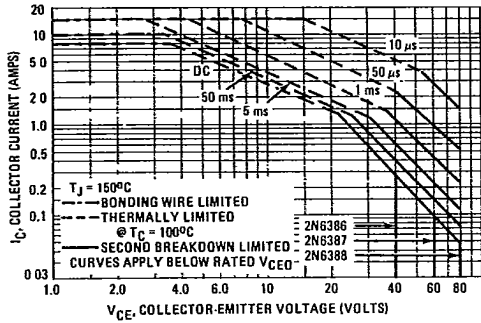


FIGURE 5 - ACTIVE-REGION SAFE OPERATING AREA



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 $T_{J(pk)} = 150^\circ\text{C}$; 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

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FIGURE 6 - SMALL-SIGNAL CURRENT GAIN

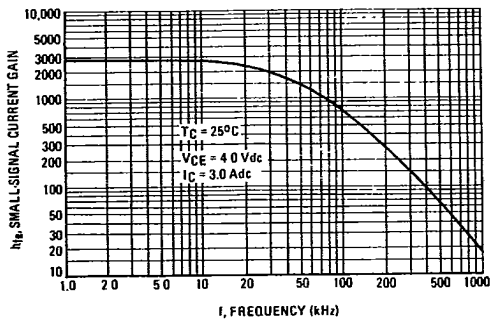


FIGURE 7 - CAPACITANCE

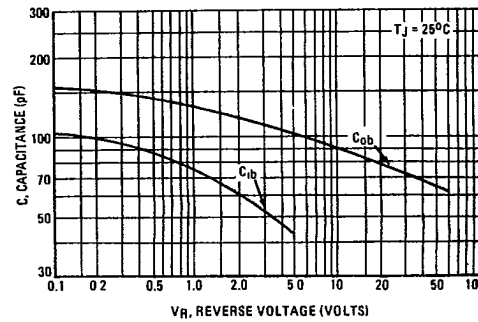


FIGURE 8 - DC CURRENT GAIN

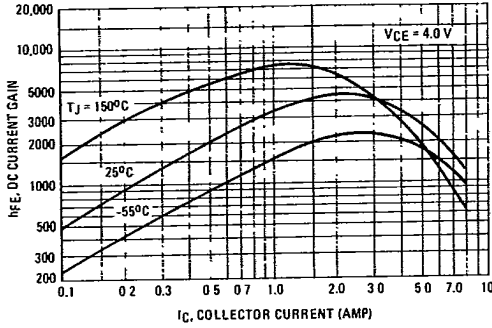


FIGURE 9 - COLLECTOR SATURATION REGION

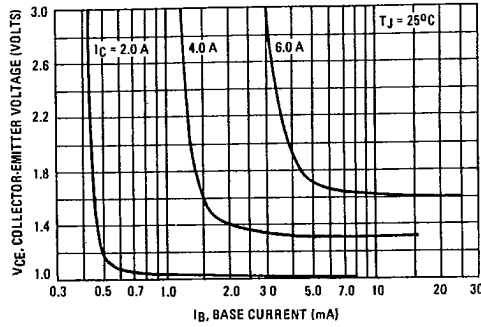


FIGURE 10 - "ON" VOLTAGES

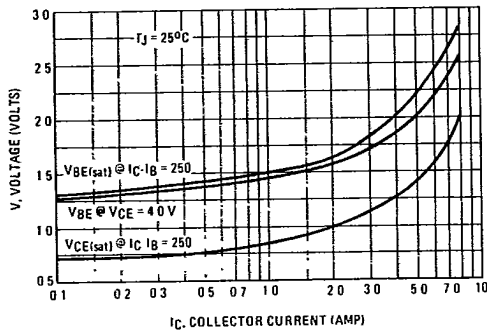


FIGURE 11 - TEMPERATURE COEFFICIENTS

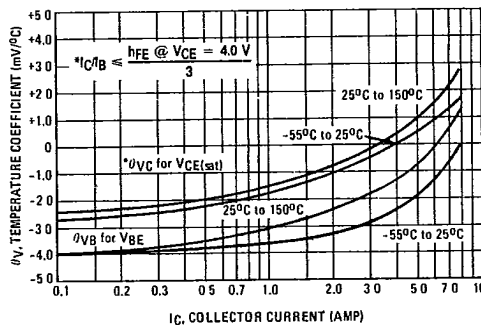


FIGURE 12 - COLLECTOR CUT-OFF REGION

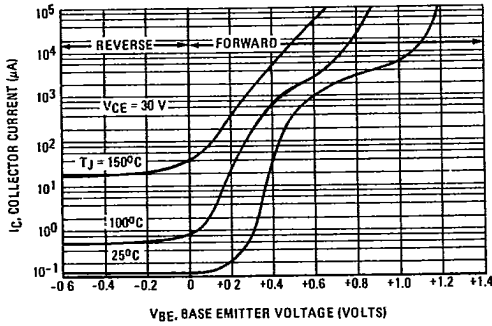


FIGURE 13 - DARLINGTON SCHEMATIC

