

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

***MAXIMUM RATINGS**

Rating	Symbol	2N6387	2N6388	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 — Continuous	I_C	10	10	Adc
Peak		15	15	
Base Current	I_B	250		mAdc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	65		Watts W/ $^\circ\text{C}$
		0.52		
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	2.0		Watts W/ $^\circ\text{C}$
		0.016		
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	$^\circ\text{C/W}$

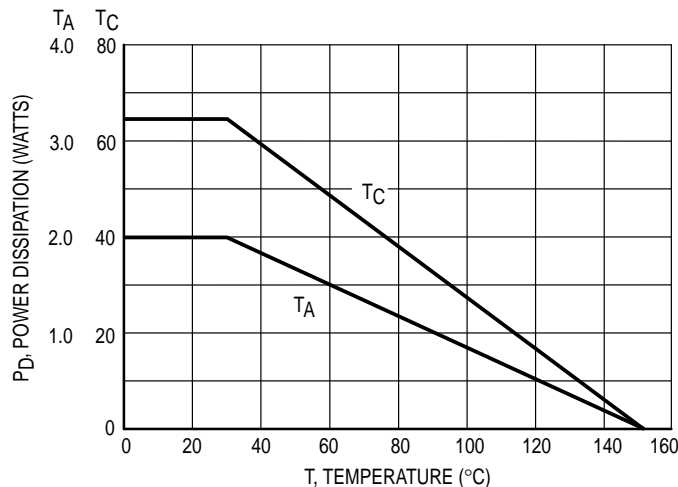


Figure 1. Power Derating

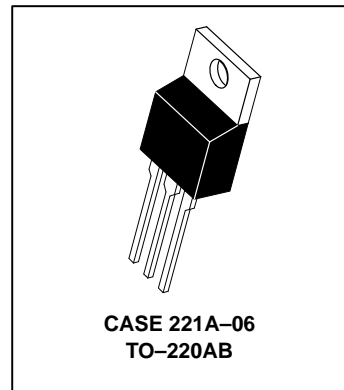
Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

2N6387
2N6388*

*Motorola Preferred Device

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



2N6387 2N6388

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1) ($I_C = 200 \text{ mAdc}$, $I_B = 0$)	$V_{CEO(sus)}$	60 80	—	Vdc
Collector Cutoff Current ($V_{CE} = 60 \text{ Vdc}$, $I_B = 0$) ($V_{CE} = 80 \text{ Vdc}$, $I_B = 0$)	I_{CEO}	— —	1.0 1.0	mAdc
Collector Cutoff Current ($V_{CE} = 60 \text{ Vdc}$, $V_{EB(off)} = 1.5 \text{ Vdc}$) ($V_{CE} = 80 \text{ Vdc}$, $V_{EB(off)} = 1.5 \text{ Vdc}$) ($V_{CE} = 60 \text{ Vdc}$, $V_{EB(off)} = 1.5 \text{ Vdc}$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 80 \text{ Vdc}$, $V_{EB(off)} = 1.5 \text{ Vdc}$, $T_C = 125^\circ\text{C}$)	I_{CEX}	— — — —	300 300 3.0 3.0	μAdc mAdc
Emitter Cutoff Current ($V_{BE} = 5.0 \text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	5.0	mAdc

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 5.0 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$) ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$)	h_{FE}	1000 100	20,000 —	—
Collector–Emitter Saturation Voltage ($I_C = 5.0 \text{ Adc}$, $I_B = 0.01 \text{ Adc}$) ($I_C = 10 \text{ Adc}$, $I_B = 0.1 \text{ Adc}$)	$V_{CE(sat)}$	— —	2.0 3.0	Vdc
Base–Emitter On Voltage ($I_C = 5.0 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$) ($I_C = 10 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$)	$V_{BE(on)}$	— —	2.8 4.5	Vdc

DYNAMIC CHARACTERISTICS

Small–Signal Current Gain ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$, $f_{test} = 1.0 \text{ MHz}$)	$ h_{fe} $	20	—	—
Output Capacitance ($V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{ob}	—	200	pF
Small–Signal Current Gain ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)	h_{fe}	1000	—	—

* Indicates JEDEC Registered Data

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

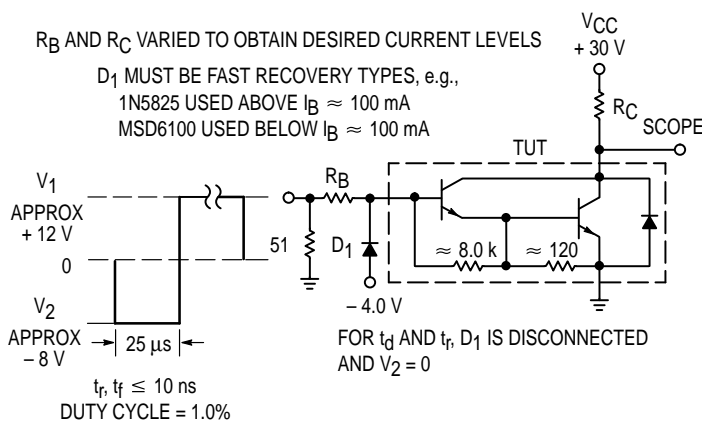


Figure 2. Switching Times Test Circuit

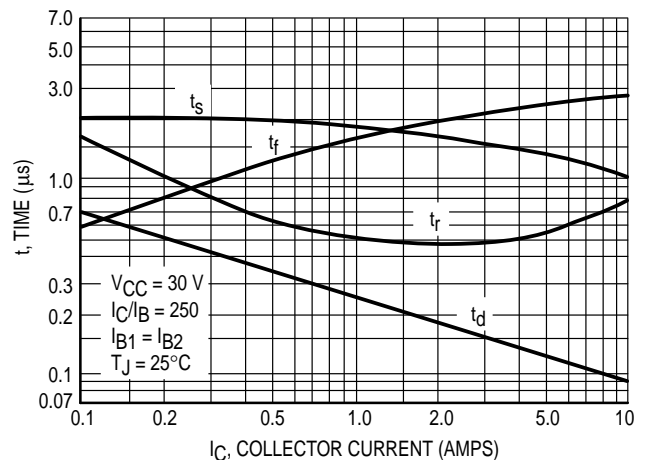


Figure 3. Switching Times

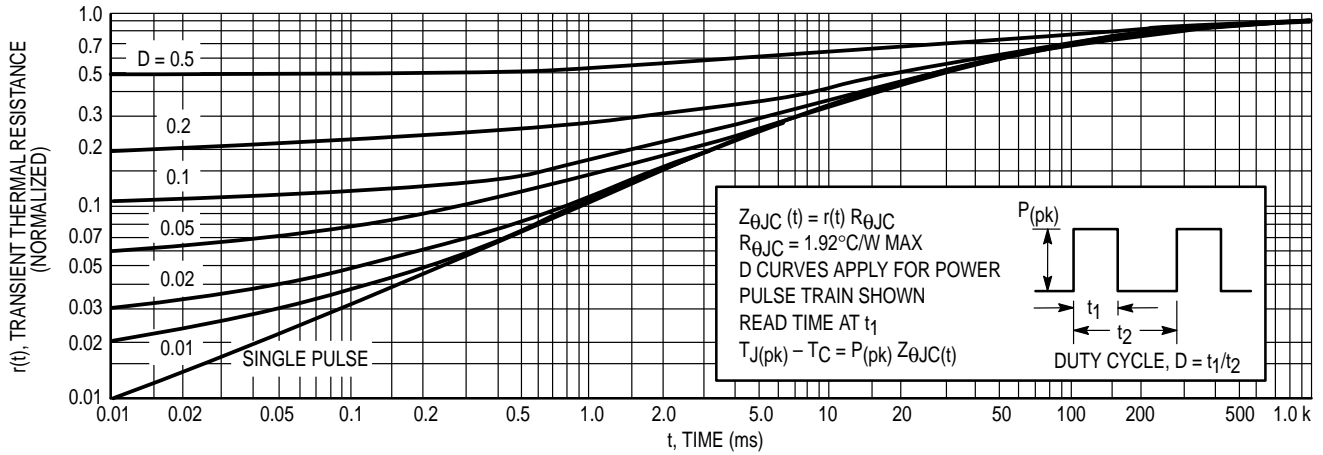


Figure 4. Thermal Response

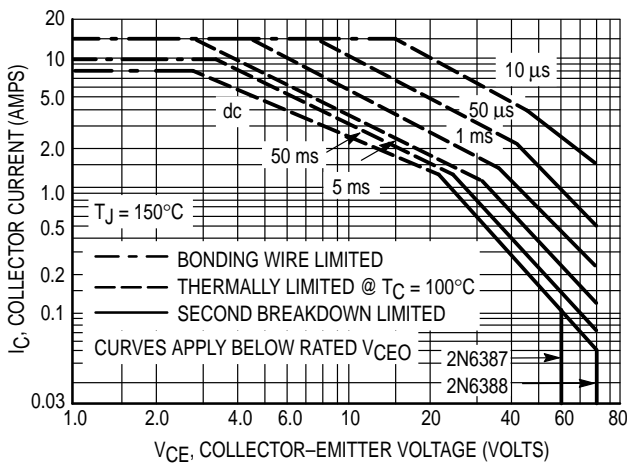


Figure 5. Active-Region Safe Operating Area

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

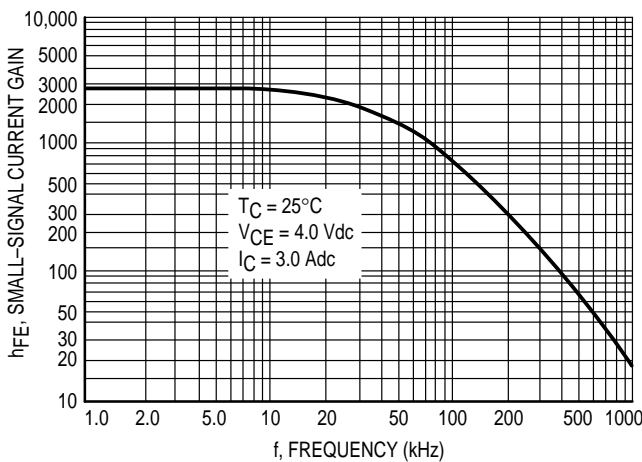


Figure 6. Small-Signal Current Gain

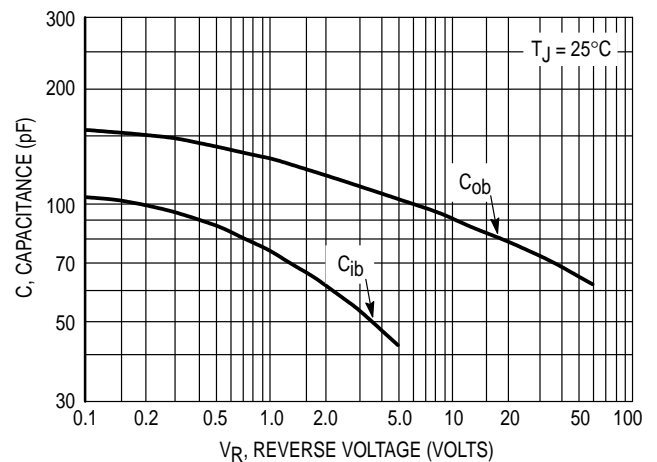


Figure 7. Capacitance

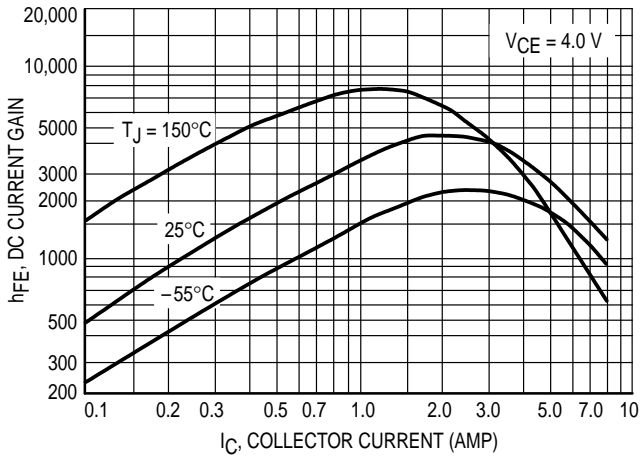


Figure 8. DC Current Gain

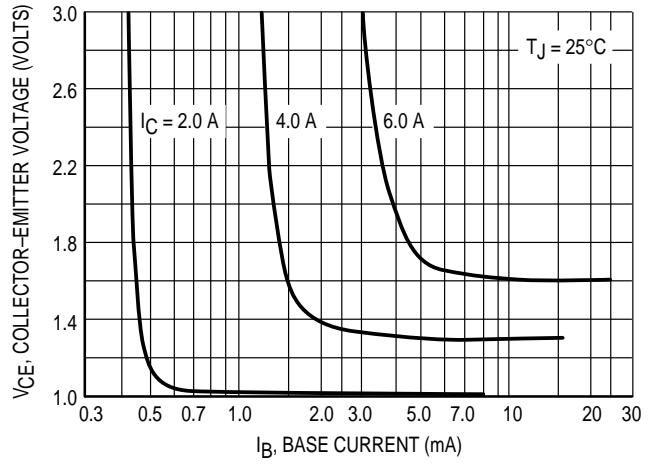


Figure 9. Collector Saturation Region

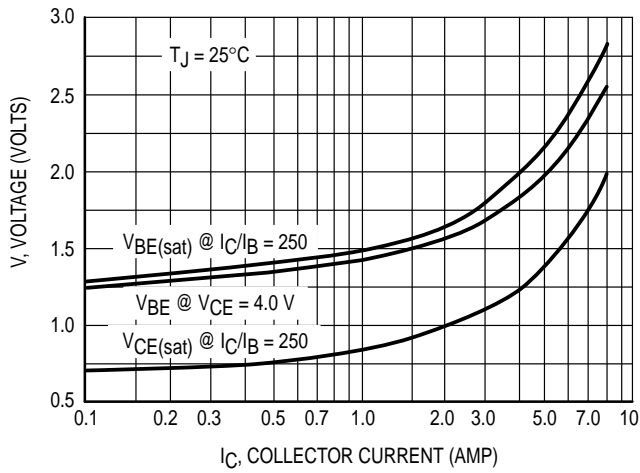


Figure 10. "On" Voltages

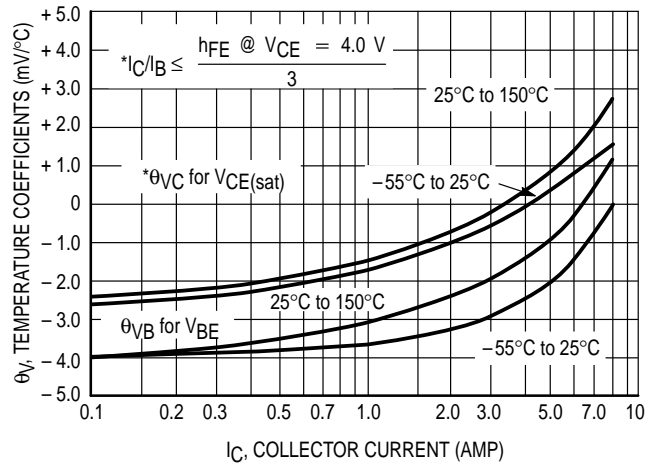


Figure 11. Temperature Coefficients

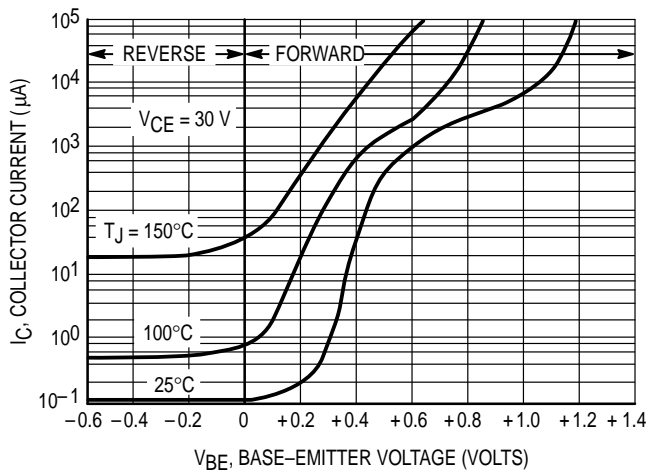


Figure 12. Collector Cut-Off Region

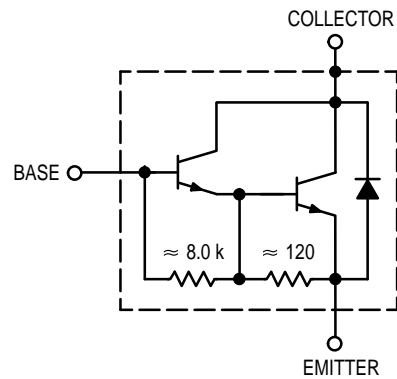
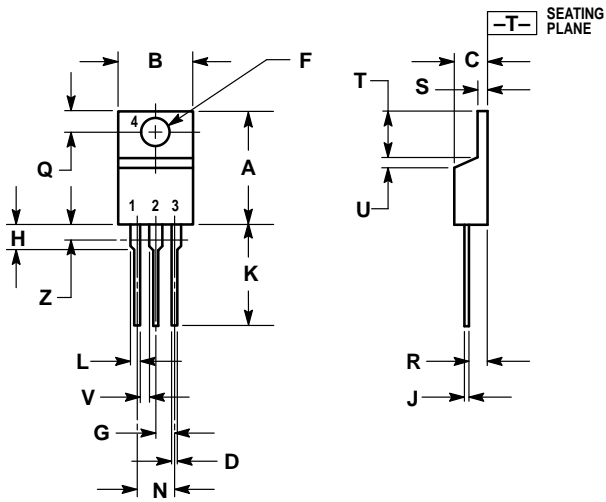


Figure 13. Darlington Schematic

PACKAGE DIMENSIONS




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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

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

CASE 221A-06
TO-220AB
ISSUE Y

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