Plastic Medium-Power Silicon Transistors

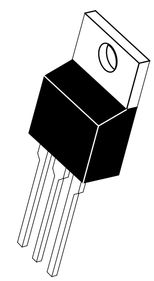
2N6387
2N6388*

*Motorola Preferred Device

. . . 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
  $V_{CEO(sus)}$ = 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

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



CASE 221A–06
TO–220AB

*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 Peak	I_C	10 15	10 15	Adc
Base Current	I_B	250		mAdc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	65 0.52		Watts W/°C
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	2.0 0.016		Watts W/°C
Operating and Storage Junction, Temperature Range	T_J, T_{stg}	–65 to +150		°C

THERMAL CHARACTERISTICS

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

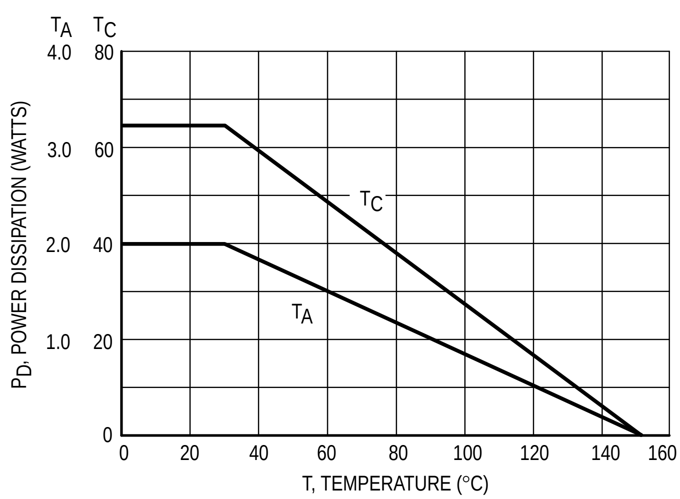


Figure 1. Power Derating

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

REV 7

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (1)		$V_{CEO(sus)}$			Vdc
(I_C = 200 mAdc, I_B = 0)	2N6387		60	—	
	2N6388		80	—	
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 60 Vdc, I_B = 0)	2N6387		—	1.0	
(V_{CE} = 80 Vdc, I_B = 0)	2N6388		—	1.0	
Collector Cutoff Current		I_{CEX}			µAdc
(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N6387		—	300	
(V_{CE} – 80 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N6388		—	300	
(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)	2N6387		—	3.0	mAdc
(V_{CE} = 80 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)	2N6388		—	3.0	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	5.0	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain		h_{FE}			—
(I_C = 5.0 Adc, V_{CE} = 3.0 Vdc)	2N6387, 2N6388		1000	20,000	
(I_C = 1 0 Adc, V_{CE} = 3.0 Vdc)	2N6387, 2N6388		100	—	
Collector–Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 5.0 Adc, I_B = 0.01 Adc)	2N6387, 2N6388		—	2.0	
(I_C = 10 Adc, I_B = 0.1 Adc)	2N6387, 2N6388		—	3.0	
Base–Emitter On Voltage		$V_{BE(on)}$			Vdc
(I_C = 5.0 Adc, V_{CE} = 3.0 Vdc)	2N6387, 2N6388		—	2.8	
(I_C = 10 Adc, V_{CE} = 3.0 Vdc)	2N6387, 2N6388		—	4.5	
DYNAMIC CHARACTERISTICS					
Small–Signal Current Gain (I_C = 1.0 Adc, 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	pF
Small–Signal Current Gain (I_C = 1.0 Adc, 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%.

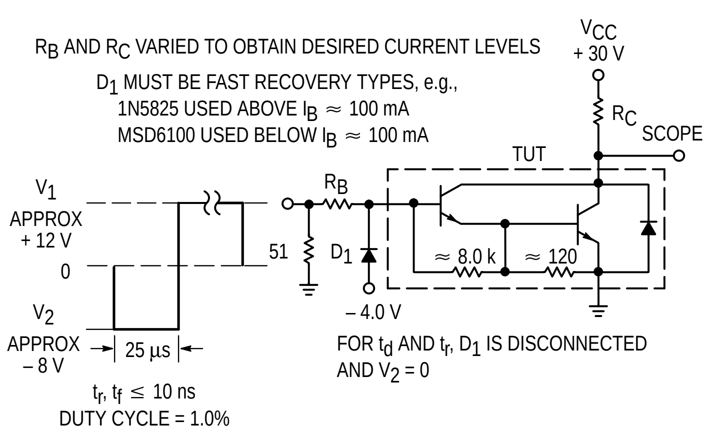


Figure 2. Switching Times Test Circuit

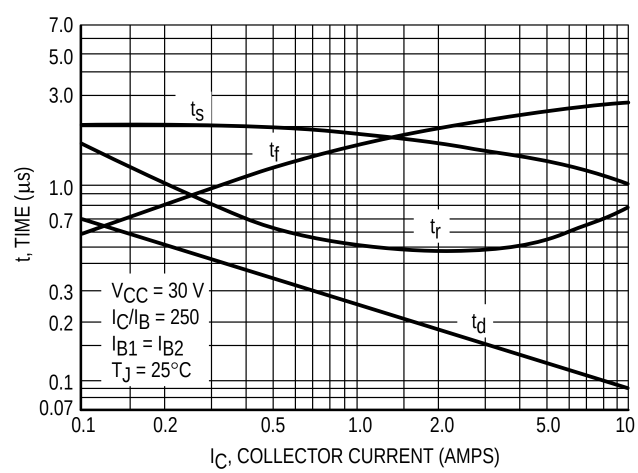


Figure 3. Switching Times

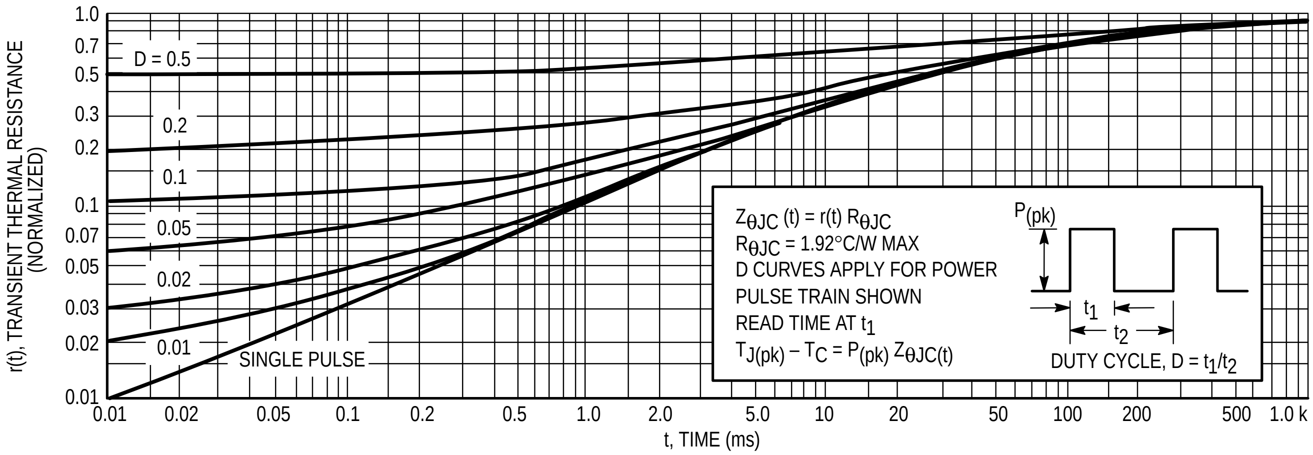


Figure 4. Thermal Response

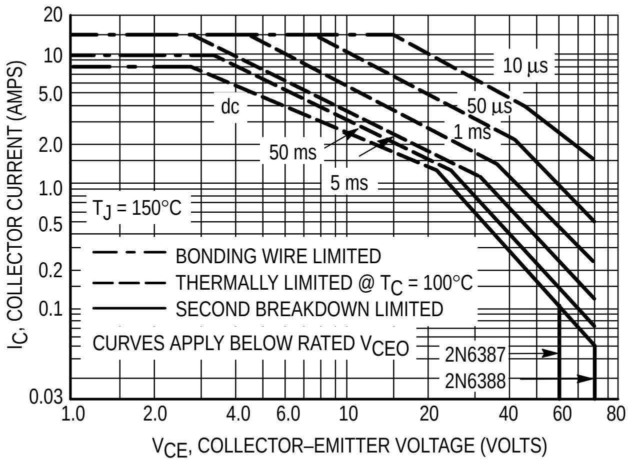


Figure 5. Active-Region Safe Operating Area

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 $T_{J(pk)} = 150°C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ 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

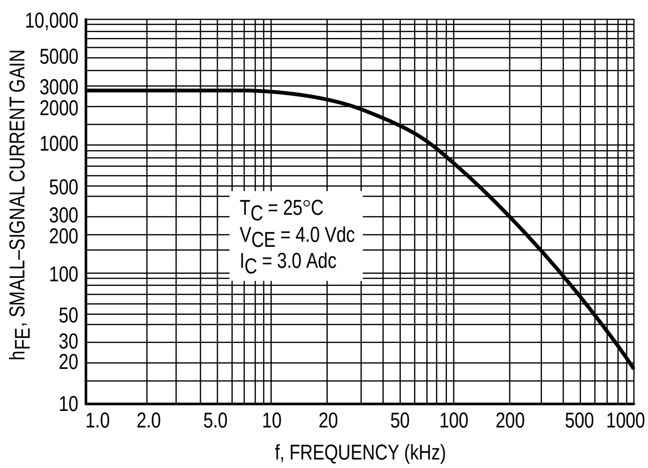


Figure 6. Small–Signal Current Gain

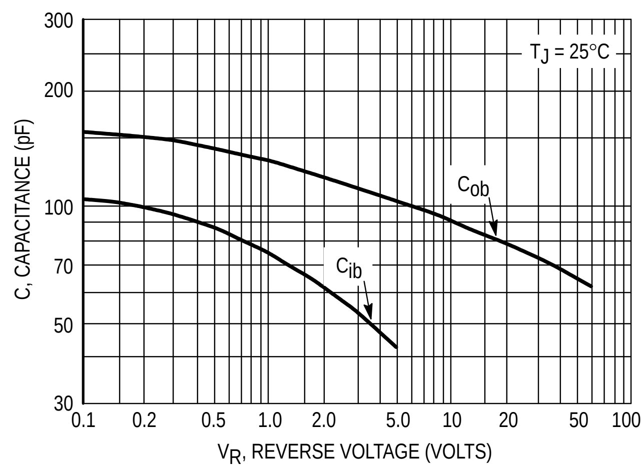


Figure 7. Capacitance

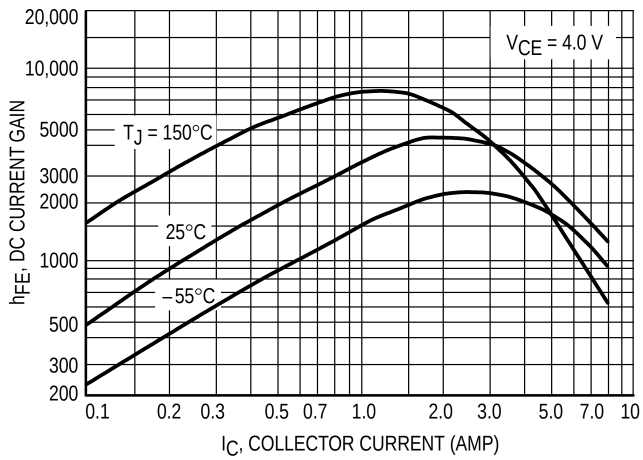


Figure 8. DC Current Gain

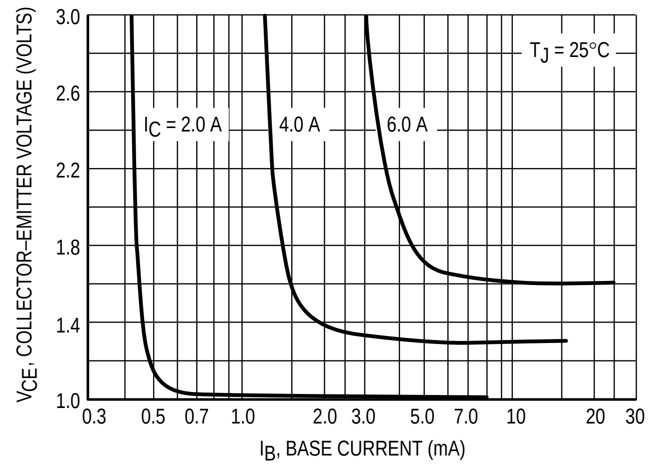


Figure 9. Collector Saturation Region

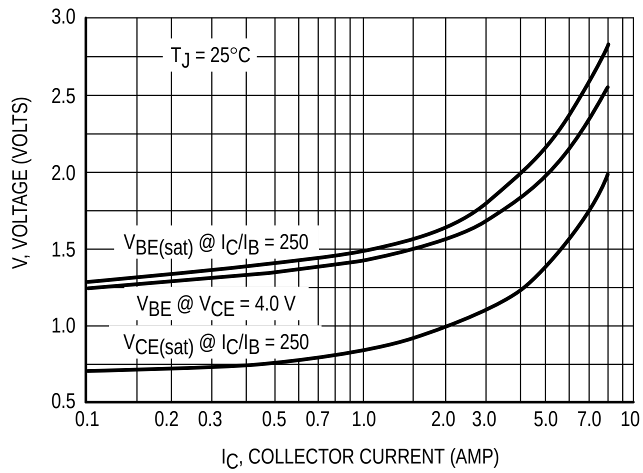


Figure 10. "On" Voltages

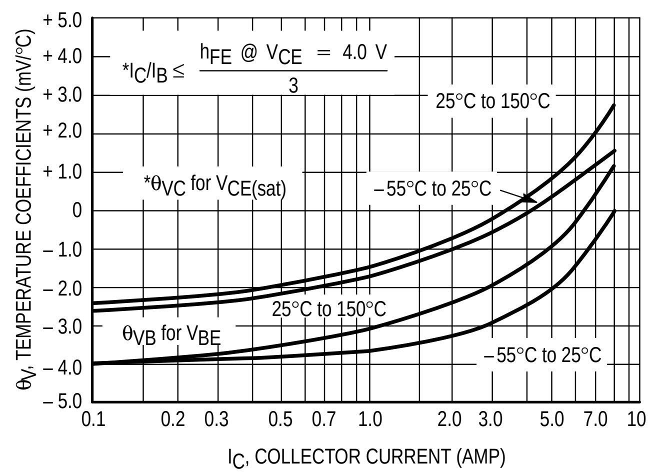


Figure 11. Temperature Coefficients

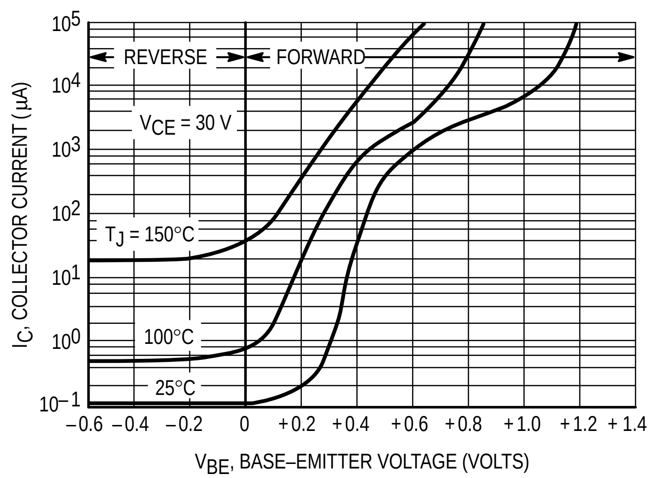


Figure 12. Collector Cut–Off Region

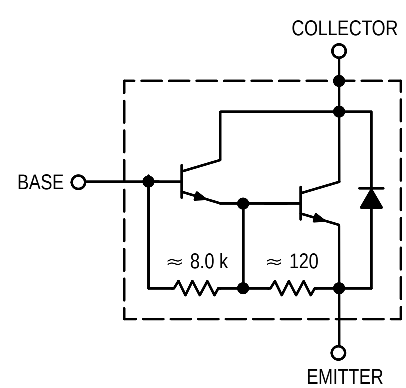
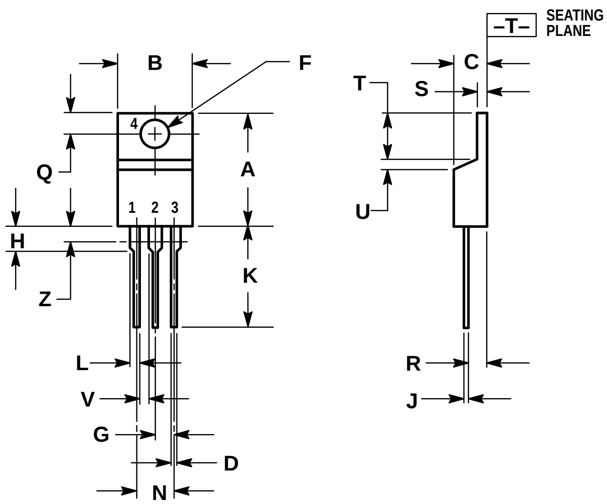


Figure 13. Darlington Schematic

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.

	INCHES		MILLIMETERS	
DIM	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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