

MOTOROLA

SEMICONDUCTOR TECHNICAL DATA

Complementary Silicon Plastic Power Transistors

... designed for use in general-purpose amplifier and switching applications.

- DC Current Gain Specified to 7.0 Amperes
 $h_{FE} = 30-150$ @ $I_C = 3.0$ Adc — 2N6111, 2N6288
 $= 2.3$ (Min) @ $I_C = 7.0$ Adc — All Devices
- Collector-Emitter Sustaining Voltage —
 $V_{CEO(sus)} = 30$ Vdc (Min) — 2N6111, 2N6288
 $= 50$ Vdc (Min) — 2N6109
 $= 70$ Vdc (Min) — 2N6107, 2N6292
- High Current Gain — Bandwidth Product
 $f_T = 4.0$ MHz (Min) @ $I_C = 500$ mAdc — 2N6288, 90, 92
 $= 10$ MHz (Min) @ $I_C = 500$ mAdc — 2N6107, 09, 11
- TO-220AB Compact Package

*MAXIMUM RATINGS

Rating	Symbol	2N6111 2N6288	2N6109	2N6107 2N6292	Unit
Collector-Emitter Voltage	V_{CEO}	30	50	70	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	5.0			Vdc
Collector Current — Continuous Peak	I_C	7.0 10			Adc
Base Current	I_B	3.0			Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	40 0.32			Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.125	$^\circ\text{C/W}$

* Indicates JEDEC Registered Data.

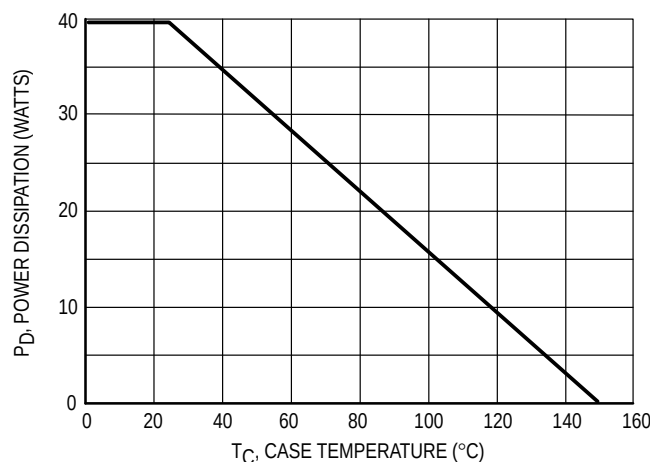


Figure 1. Power Derating

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

REV 2

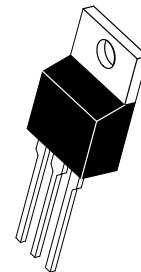
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2N6057 thru 2N6059
(See 2N6050)

PNP
2N6107
2N6109*
2N6111
NPN
2N6288
2N6292*

*Motorola Preferred Device

7 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
30-50-70 VOLTS
40 WATTS



CASE 221A-06
TO-220AB



MOTOROLA

2N6107 2N6109 2N6111 2N6288 2N6292

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1) ($I_C = 100\text{ mAdc}$, $I_B = 0$)	$V_{CE(sus)}$	30 50 70	— — —	Vdc
Collector Cutoff Current ($V_{CE} = 20\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$)	I_{CEO}	— — —	1.0 1.0 1.0	mAdc
Collector Cutoff Current ($V_{CE} = 40\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 30\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 50\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 70\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$)	I_{CEX}	— — — — — —	100 100 100 2.0 2.0 2.0	μAdc mAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	1.0	mAdc

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 2.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 2.5\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 7.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)	2N6107, 2N6292 2N6109 2N6111, 2N6288 All Devices	h_{FE}	30 30 30 2.3	150 150 150 —	—
Collector–Emitter Saturation Voltage ($I_C = 7.0\text{ Adc}$, $I_B = 3.0\text{ Adc}$)		$V_{CE(sat)}$	—	3.5	Vdc
Base–Emitter On Voltage ($I_C = 7.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)		$V_{BE(on)}$	—	3.0	Vdc

DYNAMIC CHARACTERISTICS

Current Gain — Bandwidth Product (2) ($I_C = 500\text{ mAdc}$, $V_{CE} = 4.0\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$)	2N6288, 92 2N6107, 09, 11	f_T	4.0 10	— —	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)		C_{ob}	—	250	pF
Small–Signal Current Gain ($I_C = 0.5\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 50\text{ kHz}$)		h_{fe}	20	—	—

* Indicates JEDEC Registered Data.

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

(2) $f_T = |h_{fe}| \cdot f_{test}$.

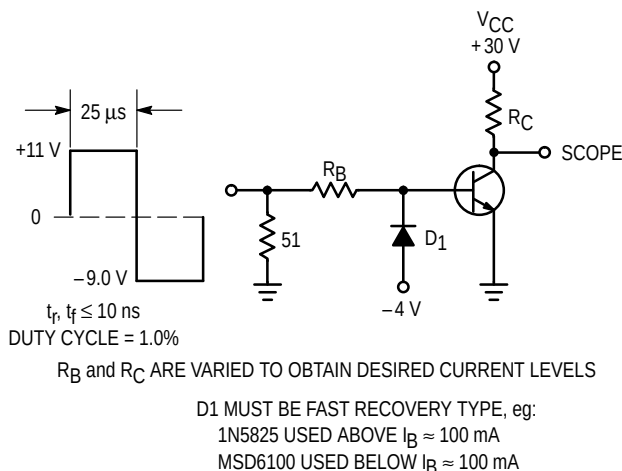


Figure 2. Switching Time Test Circuit

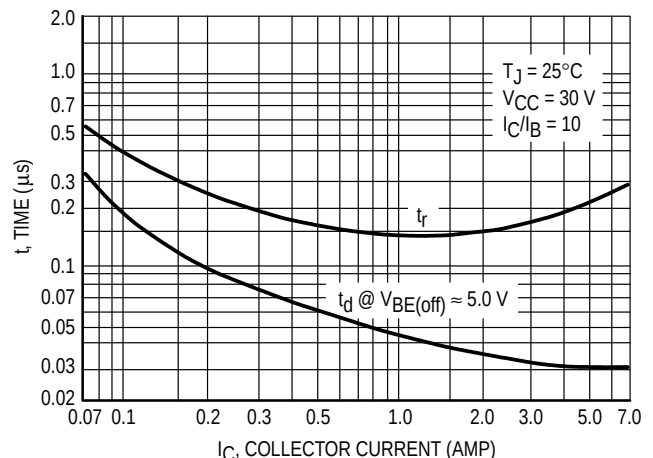


Figure 3. Turn–On Time

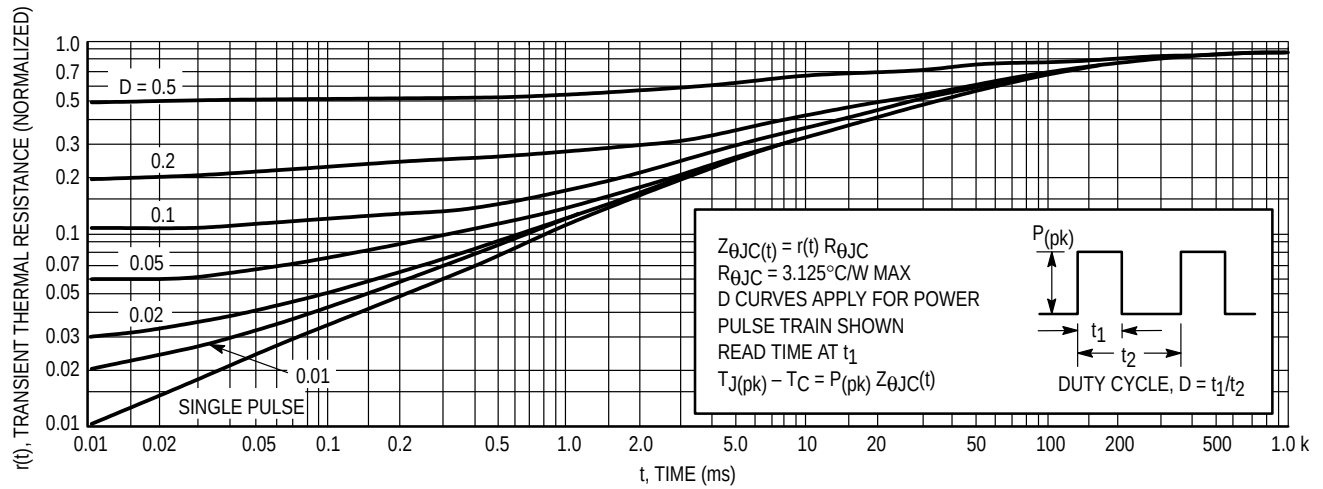


Figure 4. Thermal Response

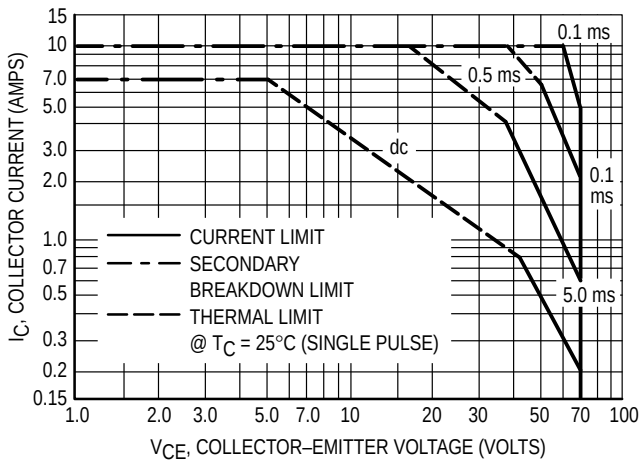


Figure 5. Active-Region Safe Operating Area

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 $T_J(pk) \leq 150^\circ\text{C}$. $T_J(pk)$ 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.

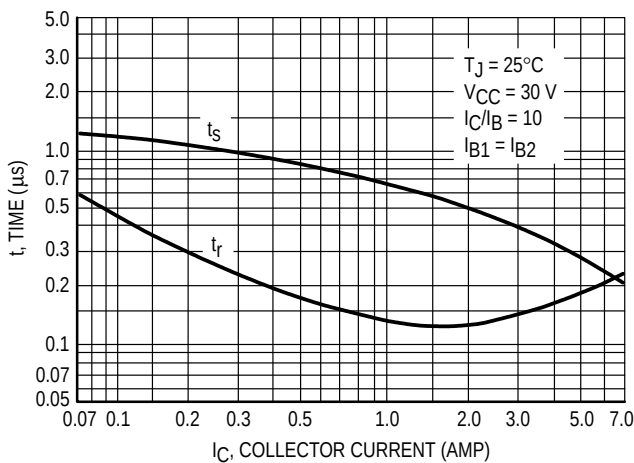


Figure 6. Turn-Off Time

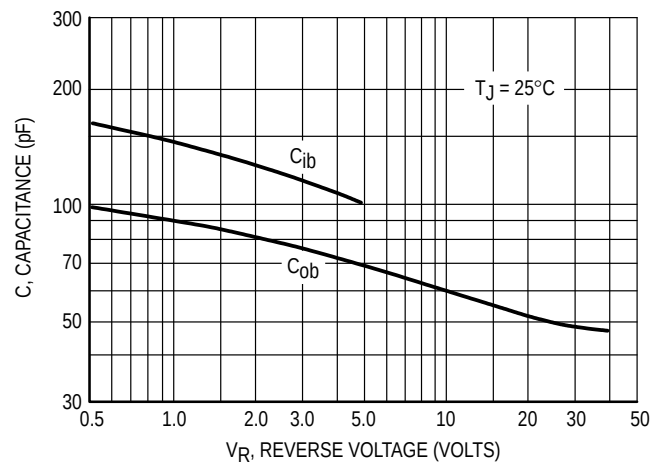
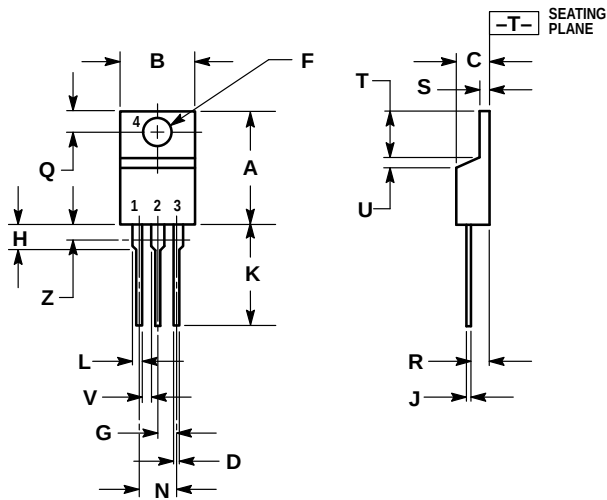


Figure 7. Capacitance

2N6107 2N6109 2N6111 2N6288 2N6292

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
E	0.142	0.147	3.61	3.73
F	0.095	0.105	2.42	2.66
G	0.110	0.155	2.80	3.93
H	0.018	0.025	0.46	0.64
I	0.500	0.562	12.70	14.27
J	0.045	0.060	1.15	1.52
K	0.190	0.210	4.83	5.33
L	0.100	0.120	2.54	3.04
M	0.080	0.110	2.04	2.79
N	0.045	0.055	1.15	1.39
O	0.235	0.255	5.97	6.47
P	0.000	0.050	0.00	1.27
Q	0.045	—	1.15	—
R	—	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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