

# PNP - 2N6107, 2N6109, 2N6111; NPN - 2N6288, 2N6292



ON Semiconductor®

<http://onsemi.com>

## Complementary Silicon Plastic Power Transistors

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

### Features

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

### MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	30 50 70	Vdc
		2N6111, 2N6288 2N6109 2N6107, 2N6292	
Collector-Base Voltage	$V_{CB}$	40 60 80	Vdc
		2N6111, 2N6288 2N6109 2N6107, 2N6292	
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 $25^\circ\text{C}$	$P_D$	40 0.32	W 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	$R_{\theta JC}$	3.125	$^\circ\text{C/W}$

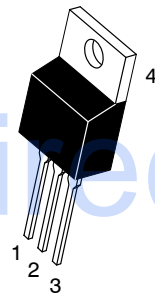
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Indicates JEDEC Registered Data.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

### MARKING DIAGRAM



TO-220AB  
CASE 221A  
STYLE 1

PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR



2N6xxx = Specific Device Code  
xxx = See Table on Page 4  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering, marking, and shipping information in the package dimensions section on page 4 of this data sheet.

PNP – 2N6107, 2N6109, 2N6111; NPN – 2N6288, 2N6292

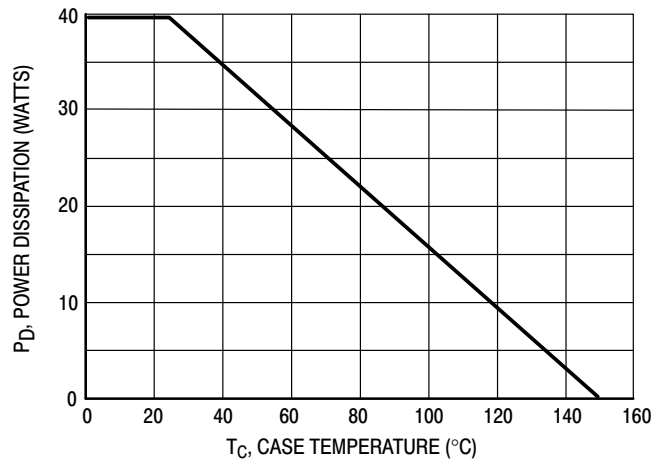


Figure 1. Power Derating

**ELECTRICAL CHARACTERISTICS** (T<sub>C</sub> = 25°C unless otherwise noted) (Note 2)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (Note 3) (I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	30	–	Vdc
2N6111, 2N6288		50	–	
2N6109		70	–	
2N6107, 2N6292				
Collector Cutoff Current (V <sub>CE</sub> = 20 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	1.0	mAdc
(V <sub>CE</sub> = 40 Vdc, I <sub>B</sub> = 0)		–	1.0	
(V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)		–	1.0	
Collector Cutoff Current (V <sub>CE</sub> = 40 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc)	I <sub>CEX</sub>	–	100	μAdc
(V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc)		–	100	
(V <sub>CE</sub> = 80 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc)		–	100	
(V <sub>CE</sub> = 30 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc, T <sub>C</sub> = 150°C)		–	2.0	mAdc
(V <sub>CE</sub> = 50 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc, T <sub>C</sub> = 150°C)		–	2.0	
(V <sub>CE</sub> = 70 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc, T <sub>C</sub> = 150°C)		–	2.0	
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	1.0	mAdc
<b>ON CHARACTERISTICS</b> (Note 3)				
DC Current Gain (I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 4.0 Vdc)	h <sub>FE</sub>	30	150	–
(I <sub>C</sub> = 2.5 Adc, V <sub>CE</sub> = 4.0 Vdc)		30	150	
(I <sub>C</sub> = 3.0 Adc, V <sub>CE</sub> = 4.0 Vdc)		30	150	
(I <sub>C</sub> = 7.0 Adc, V <sub>CE</sub> = 4.0 Vdc)		2.3	–	
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 7.0 Adc, I <sub>B</sub> = 3.0 Adc)	V <sub>CE(sat)</sub>	–	3.5	Vdc
Base–Emitter On Voltage (I <sub>C</sub> = 7.0 Adc, V <sub>CE</sub> = 4.0 Vdc)	V <sub>BE(on)</sub>	–	3.0	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Current Gain — Bandwidth Product (Note 4) (I <sub>C</sub> = 500 mAdc, V <sub>CE</sub> = 4.0 Vdc, f <sub>test</sub> = 1.0 MHz)	f <sub>T</sub>	4.0	–	MHz
2N6288, 92		10	–	
2N6107, 09, 11				
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob</sub>	–	250	pF
Small–Signal Current Gain (I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 4.0 Vdc, f = 50 kHz)	h <sub>fe</sub>	20	–	–

2. Indicates JEDEC Registered Data.

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

4. f<sub>T</sub> = |h<sub>fe</sub>| • f<sub>test</sub>

PNP – 2N6107, 2N6109, 2N6111; NPN – 2N6288, 2N6292

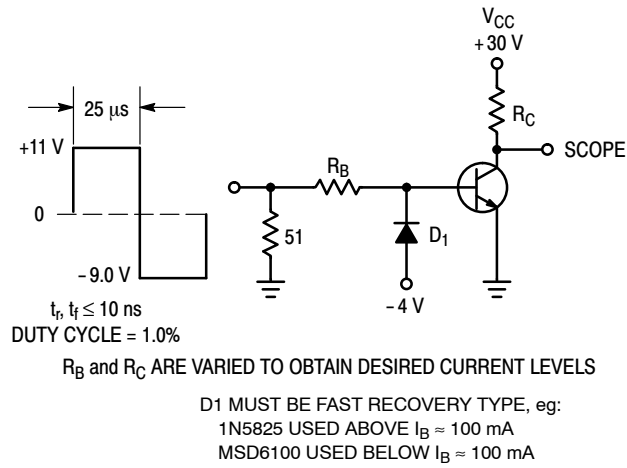


Figure 2. Switching Time Test Circuit

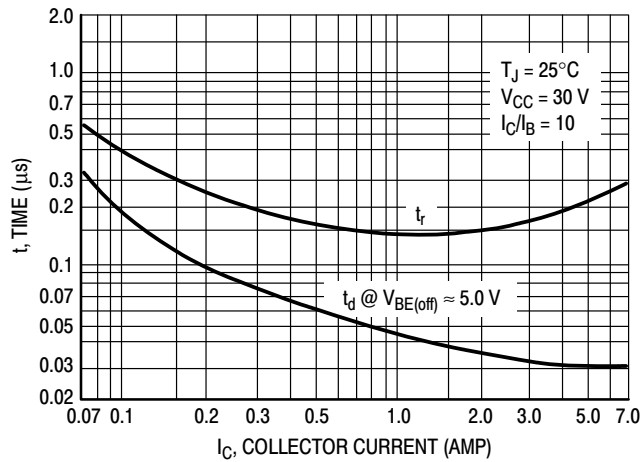


Figure 3. Turn-On Time

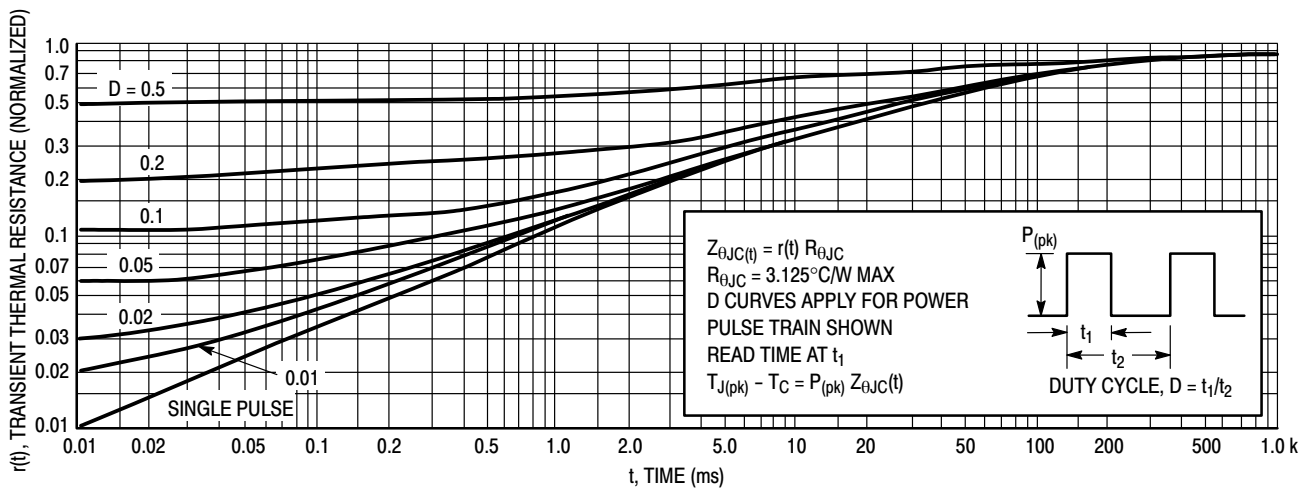
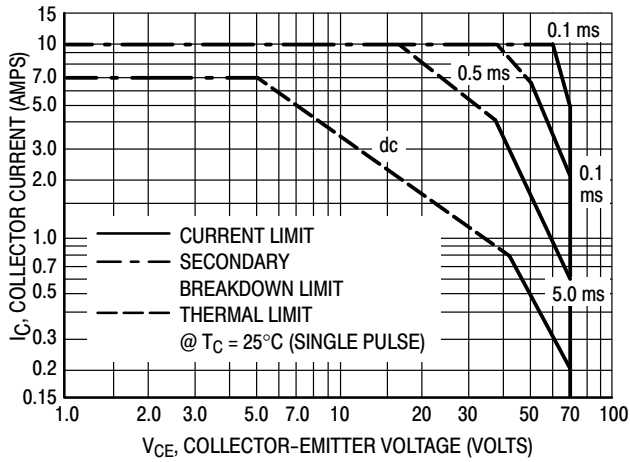


Figure 4. Thermal Response

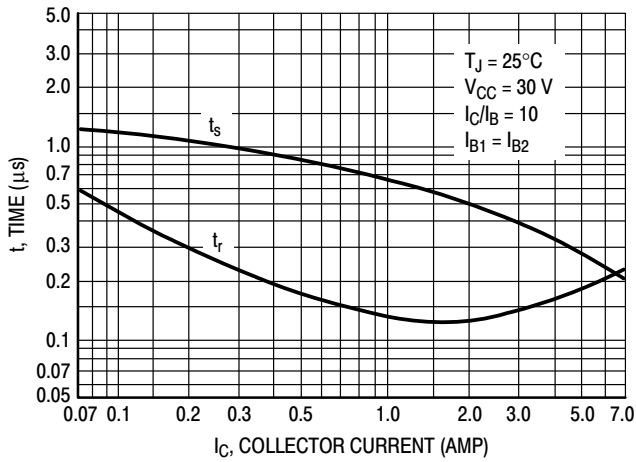
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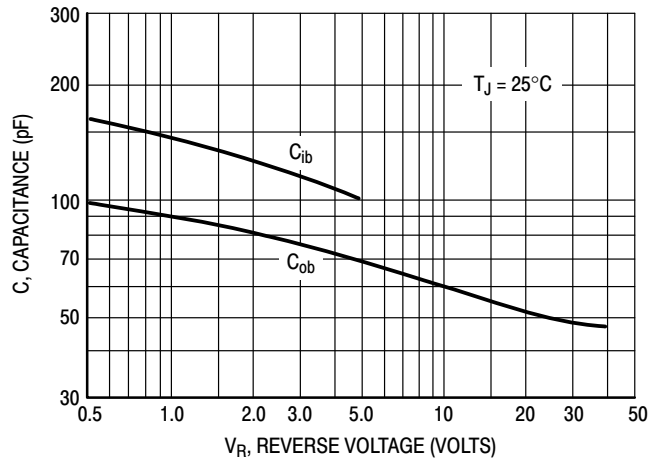
**Figure 5. Active-Region Safe Operating Area**

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**

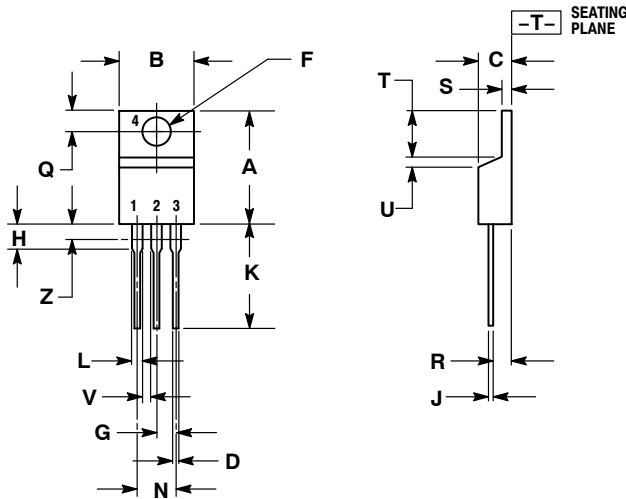
### ORDERING INFORMATION

Device	Device Marking	Package	Shipping
2N6107	2N6107	TO-220AB	50 Units / Rail
2N6107G		TO-220AB (Pb-Free)	
2N6109	2N6109	TO-220AB	50 Units / Rail
2N6109G		TO-220AB (Pb-Free)	
2N6111	2N6111	TO-220AB	50 Units / Rail
2N6111G		TO-220AB (Pb-Free)	
2N6288	2N6288	TO-220AB	50 Units / Rail
2N6288G		TO-220AB (Pb-Free)	
2N6292	2N6292	TO-220AB	50 Units / Rail
2N6292G		TO-220AB (Pb-Free)	

# PNP – 2N6107, 2N6109, 2N6111; NPN – 2N6288, 2N6292

## PACKAGE DIMENSIONS

### TO-220 CASE 221A-09 ISSUE AG



#### 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	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.025	0.36	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:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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