

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

2N6109 and 2N6292 are Preferred Devices

## 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<br>2N6111, 2N6288<br>2N6109<br>2N6107, 2N6292               | $V_{CEO}$      | 30<br>50<br>70 | Vdc                      |
| Collector-Base Voltage<br>2N6111, 2N6288<br>2N6109<br>2N6107, 2N6292                  | $V_{CB}$       | 40<br>60<br>80 | Vdc                      |
| Emitter-Base Voltage  | $V_{EB}$       | 5.0            | Vdc                      |
| Collector Current – Continuous<br>– Peak  | $I_C$          | 7.0<br>10      | Adc                      |
| Base Current  | $I_B$          | 3.0            | Adc                      |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 40<br>0.32     | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>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.

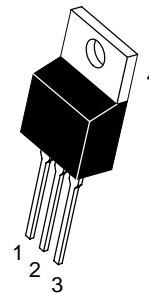


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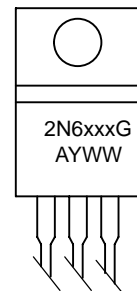
<http://onsemi.com>

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

### MARKING DIAGRAM



TO-220AB  
CASE 221A  
STYLE 1



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.

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

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

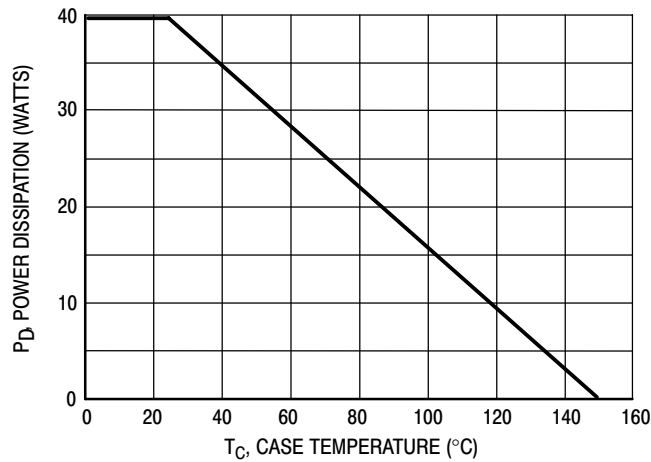


Figure 1. Power Derating

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted) (Note 2)

| Characteristic   | Symbol         | Min                        | Max                                    | Unit                            |
|--|----------------|----------------------------|--|---------------------------------|
| <b>OFF CHARACTERISTICS</b>   |                |                            |  |                                 |
| Collector–Emitter Sustaining Voltage (Note 3)<br>( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )   | $V_{CEO(sus)}$ | 30<br>50<br>70             | –<br>–<br>–                            | Vdc                             |
| Collector Cutoff Current<br>( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )   | $I_{CEO}$      | –<br>–<br>–                | 1.0<br>1.0<br>1.0                      | mAdc                            |
| Collector Cutoff Current<br>( $V_{CE} = 40\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = 60\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = 80\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = 30\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )<br>( $V_{CE} = 50\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )<br>( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) | $I_{CEX}$      | –<br>–<br>–<br>–<br>–<br>– | 100<br>100<br>100<br>2.0<br>2.0<br>2.0 | $\mu\text{Adc}$<br><br><br>mAdc |
| Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )   | $I_{EBO}$      | –                          | 1.0                                    | mAdc                            |
| <b>ON CHARACTERISTICS</b> (Note 3)   |                |                            |  |                                 |
| DC Current Gain<br>( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_C = 2.5\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_C = 3.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_C = 7.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )  | $h_{FE}$       | 30<br>30<br>30<br>2.3      | 150<br>150<br>150<br>–                 | –                               |
| 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                             |
| <b>DYNAMIC CHARACTERISTICS</b>   |                |                            |  |                                 |
| Current Gain — Bandwidth Product (Note 4)<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ )   | $f_T$          | 4.0<br>10                  | –<br>–                                 | 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                         | –                                      | –                               |

2. Indicates JEDEC Registered Data.
3. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .
4.  $f_T = |h_{fe}| \cdot f_{test}$

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

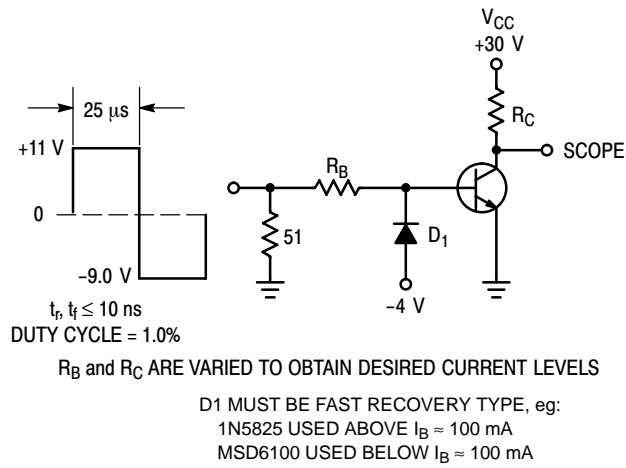


Figure 2. Switching Time Test Circuit

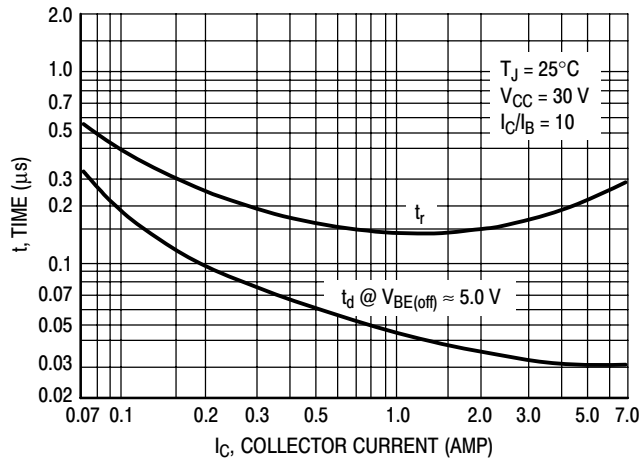


Figure 3. Turn-On Time

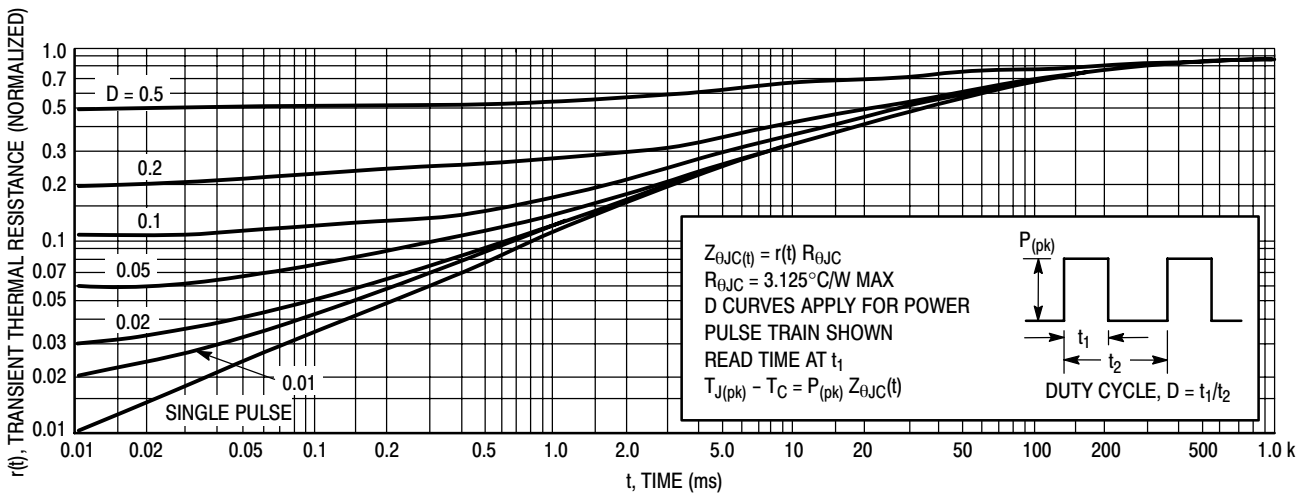
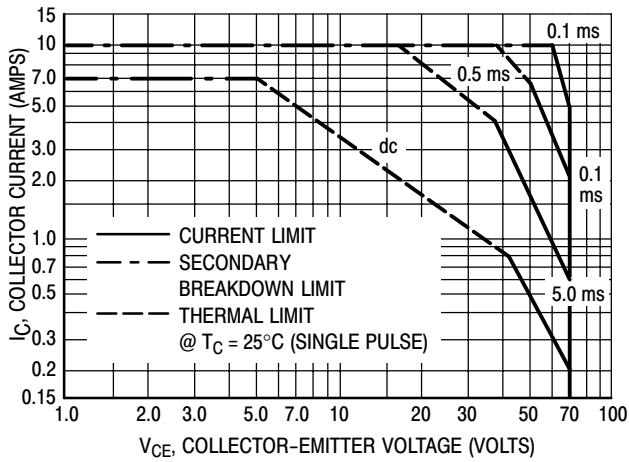


Figure 4. Thermal Response

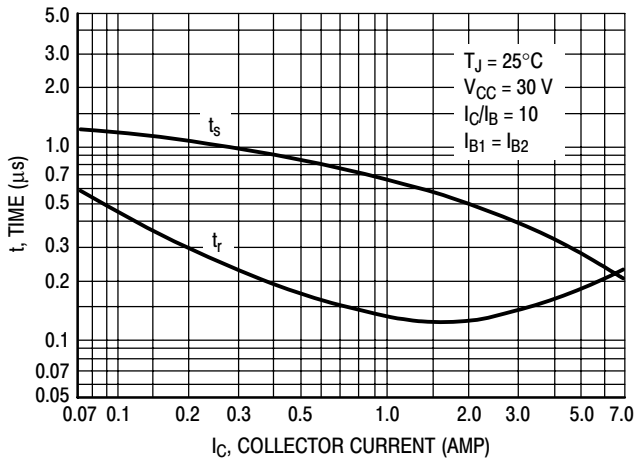
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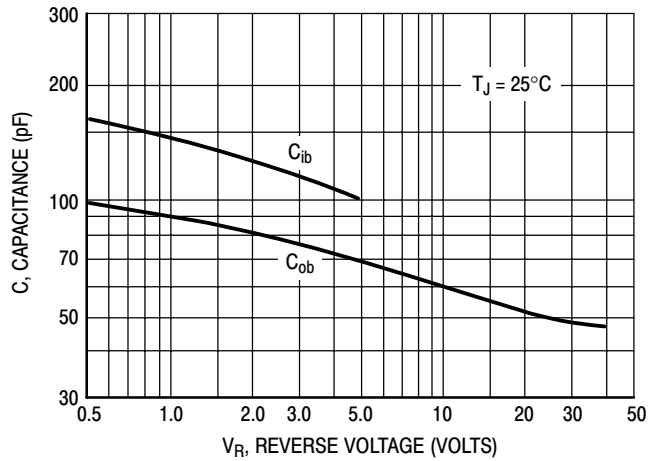
**Figure 5. Active-Region Safe Operating Area**

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**

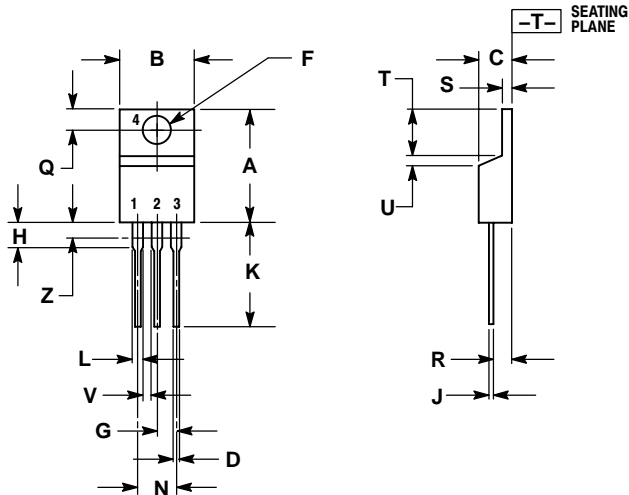
### ORDERING INFORMATION

| 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-220AB  
CASE 221A-09  
ISSUE AD



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

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