

# Complementary Silicon Plastic Power Transistors

## 2N6107, 2N6109, 2N6111 (PNP), 2N6288, 2N6292 (NPN)

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

### Features

- High DC Current Gain
- High Current Gain – Bandwidth Product
- TO-220 Compact Package
- These Devices are Pb-Free and are RoHS Compliant\*

### 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                                                           | $I_C$          | 7.0            | Adc                      |
| Collector Current – Peak                                                                 | $I_{CM}$       | 10             | Adc                      |
| Base Current                                                                             | $I_B$          | 3.0            | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<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    | $^\circ\text{C}$         |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

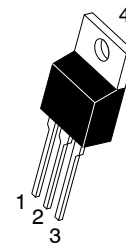
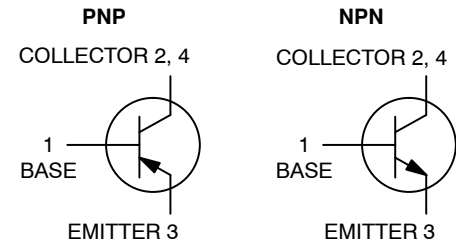
1. Indicates JEDEC Registered Data.

### THERMAL CHARACTERISTICS

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

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

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



TO-220  
CASE 221A  
STYLE 1

### MARKING DIAGRAM



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.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 4.

## 2N6107, 2N6109, 2N6111 (PNP), 2N6288, 2N6292 (NPN)

### 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>( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )<br>2N6111, 2N6288<br>2N6109<br>2N6107, 2N6292                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $V_{CEO(sus)}$ | 30<br>50<br>70                  | –<br>–<br>–                            | Vdc                                         |
| Collector Cutoff Current<br>( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ )<br>2N6111, 2N6288<br>( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )<br>2N6109<br>( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )<br>2N6107, 2N6292                                                                                                                                                                                                                                                                                                                                                                                                     | $I_{CEO}$      | –<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>2N6111, 2N6288<br>( $V_{CE} = 60\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>2N6109<br>( $V_{CE} = 80\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>2N6107, 2N6292<br>( $V_{CE} = 30\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )<br>2N6111, 2N6288<br>( $V_{CE} = 50\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )<br>2N6109<br>( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )<br>2N6107, 2N6292 | $I_{CEX}$      | –<br>–<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><br><br><br>mAdc |
| Emitter Cutoff Current<br>( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $I_{EBO}$      | –                               | 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>2N6107, 2N6292<br>( $I_C = 2.5\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>2N6109<br>( $I_C = 3.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>2N6111, 2N6288<br>( $I_C = 7.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>All Devices                                                                                                                                                                                                                                                                                           | $h_{FE}$       | 30<br>30<br>30<br>2.3           | 150<br>150<br>150<br>–                 | –                                           |
| Collector–Emitter Saturation Voltage<br>( $I_C = 7.0\text{ Adc}$ , $I_B = 3.0\text{ Adc}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $V_{CE(sat)}$  | –                               | 3.5                                    | Vdc                                         |
| Base–Emitter On Voltage<br>( $I_C = 7.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | $V_{BE(on)}$   | –                               | 3.0                                    | Vdc                                         |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                                 |                                        |                                             |
| Current Gain – Bandwidth Product (Note 4)<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ )<br>2N6288, 2N6292<br>2N6107, 2N6109, 2N6111                                                                                                                                                                                                                                                                                                                                                                                                                                 | $f_T$          | 4.0<br>10                       | –<br>–                                 | MHz                                         |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $C_{ob}$       | –                               | 250                                    | pF                                          |
| Small–Signal Current Gain<br>( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f = 50\text{ kHz}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $h_{fe}$       | 20                              | –                                      | –                                           |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Indicates JEDEC Registered Data.

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

4.  $f_T = |h_{fe}| \cdot f_{test}$

## 2N6107, 2N6109, 2N6111 (PNP), 2N6288, 2N6292 (NPN)

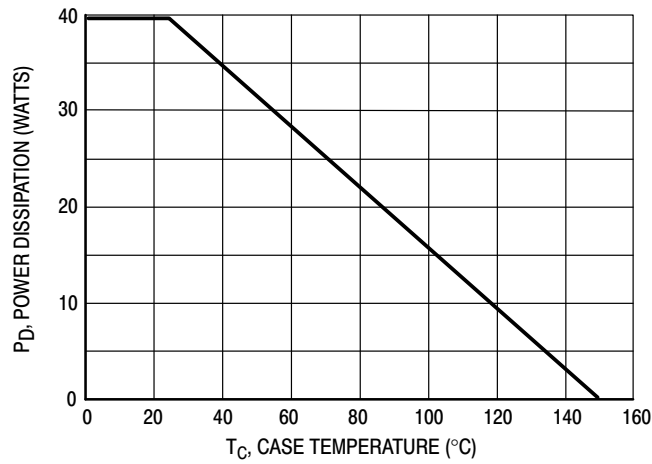


Figure 1. Power Derating

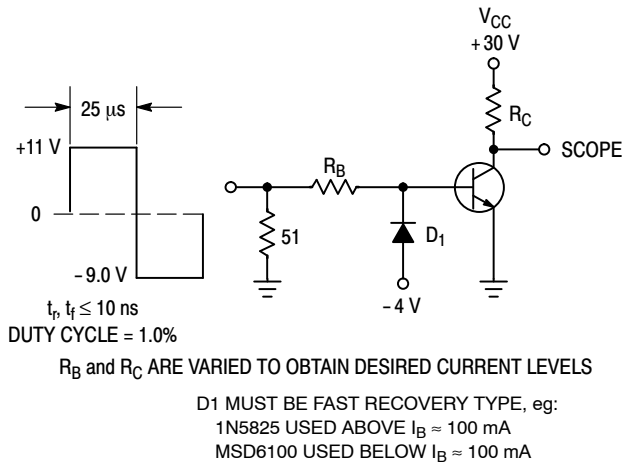


Figure 2. Switching Time Test Circuit

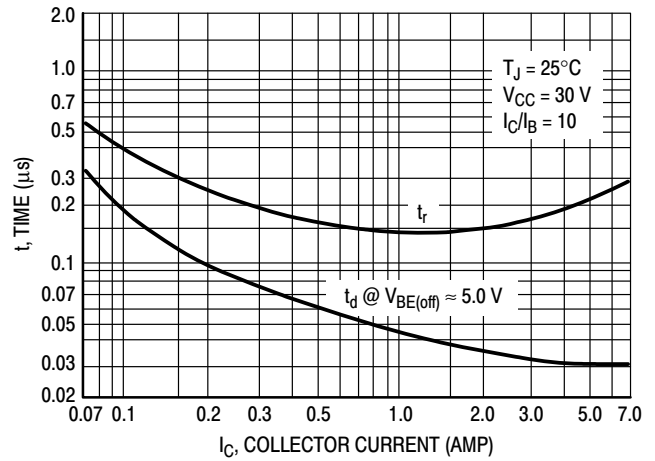


Figure 3. Turn-On Time

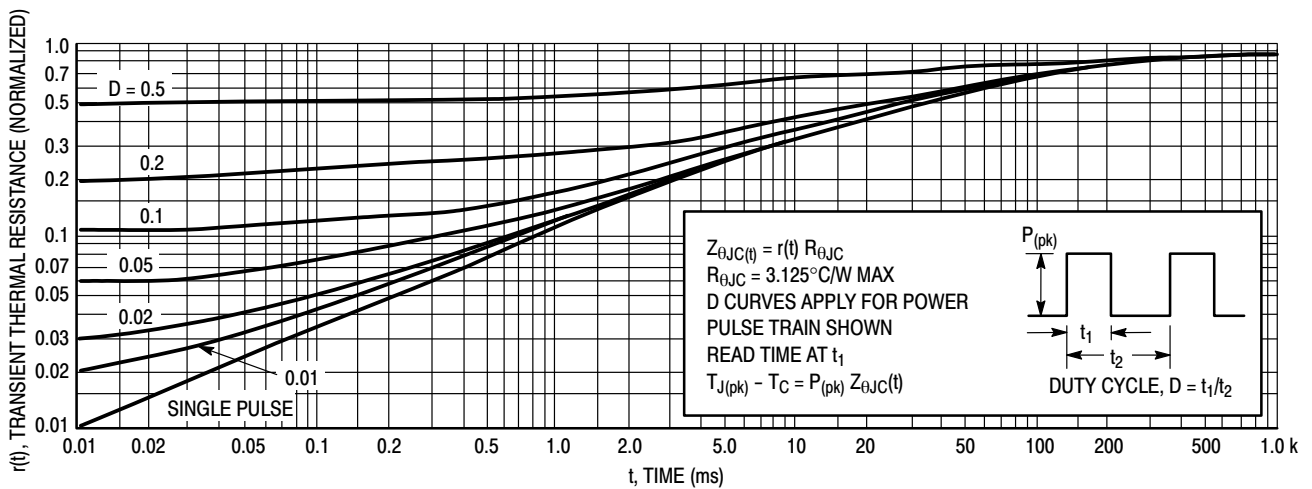


Figure 4. Thermal Response

## 2N6107, 2N6109, 2N6111 (PNP), 2N6288, 2N6292 (NPN)

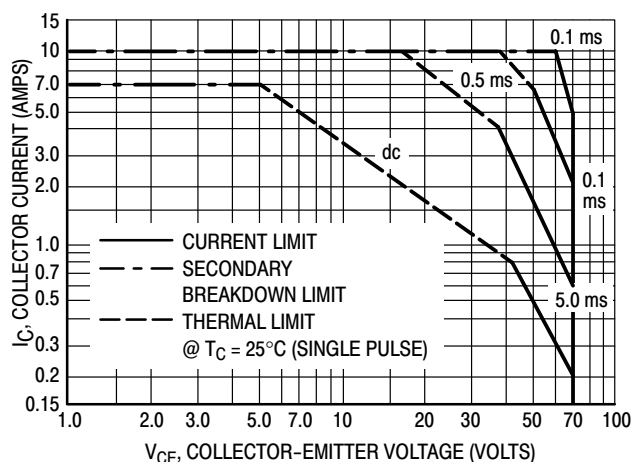


Figure 5. Active-Region Safe Operating Area

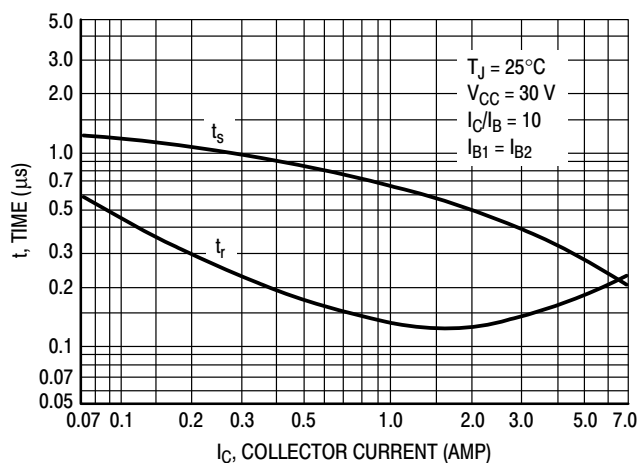


Figure 6. Turn-Off Time

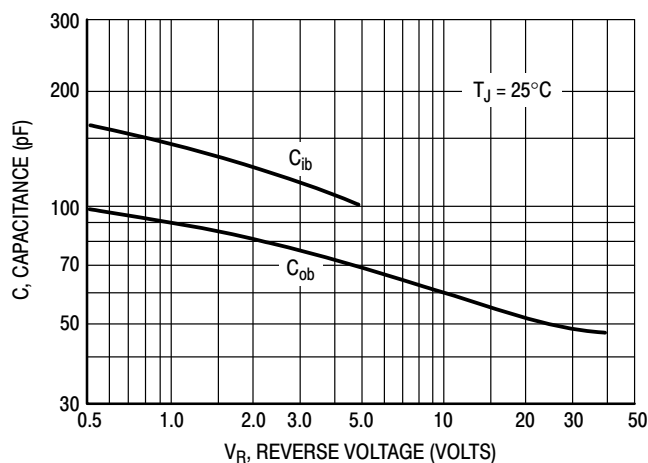


Figure 7. Capacitance

### ORDERING INFORMATION

| Device  | Device Marking | Package             | Shipping        |
|---------|----------------|---------------------|-----------------|
| 2N6292G | 2N6292         | TO-220<br>(Pb-Free) | 50 Units / Rail |

### DISCONTINUED (Note 5)

|         |        |                     |                 |
|---------|--------|---------------------|-----------------|
| 2N6107G | 2N6107 | TO-220<br>(Pb-Free) | 50 Units / Rail |
| 2N6109G | 2N6109 | TO-220<br>(Pb-Free) | 50 Units / Rail |
| 2N6111G | 2N6111 | TO-220<br>(Pb-Free) | 50 Units / Rail |
| 2N6288G | 2N6288 | TO-220<br>(Pb-Free) | 50 Units / Rail |

5. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on [www.onsemi.com](http://www.onsemi.com).

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