

# 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 2N6111, 2N6288 2N6109 2N6107, 2N6292	$V_{CEO}$	30 50 70	Vdc
Collector–Base Voltage 2N6111, 2N6288 2N6109 2N6107, 2N6292	$V_{CB}$	40 60 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 @ $T_C = 25^\circ\text{C}$ 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	$^\circ\text{C}$

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.

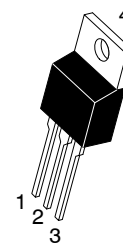
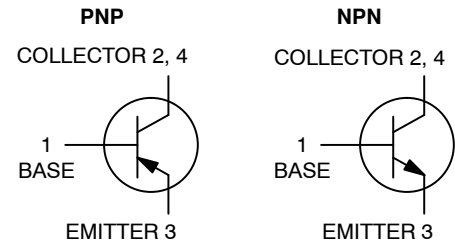
1. Indicates JEDEC Registered Data.

### THERMAL CHARACTERISTICS

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

\*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) ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ ) 2N6111, 2N6288 2N6109 2N6107, 2N6292	$V_{CE(sus)}$	30 50 70	- - -	Vdc
Collector Cutoff Current ( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ ) 2N6111, 2N6288 ( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ ) 2N6109 ( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ ) 2N6107, 2N6292	$I_{CEO}$	- - -	1.0 1.0 1.0	mAdc
Collector Cutoff Current ( $V_{CE} = 40\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ ) 2N6111, 2N6288 ( $V_{CE} = 60\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ ) 2N6109 ( $V_{CE} = 80\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ ) 2N6107, 2N6292 ( $V_{CE} = 30\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) 2N6111, 2N6288 ( $V_{CE} = 50\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) 2N6109 ( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) 2N6107, 2N6292	$I_{CEX}$	- - - - - -	100 100 100 2.0 2.0 2.0	$\mu\text{Adc}$    mAdc
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	-	1.0	mAdc

### ON CHARACTERISTICS (Note 3)

DC Current Gain ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) 2N6107, 2N6292 ( $I_C = 2.5\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) 2N6109 ( $I_C = 3.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) 2N6111, 2N6288 ( $I_C = 7.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) 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 (Note 4) ( $I_C = 500\text{ mAdc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ ) 2N6288, 2N6292 2N6107, 2N6109, 2N6111	$f_T$	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	-	-

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  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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

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

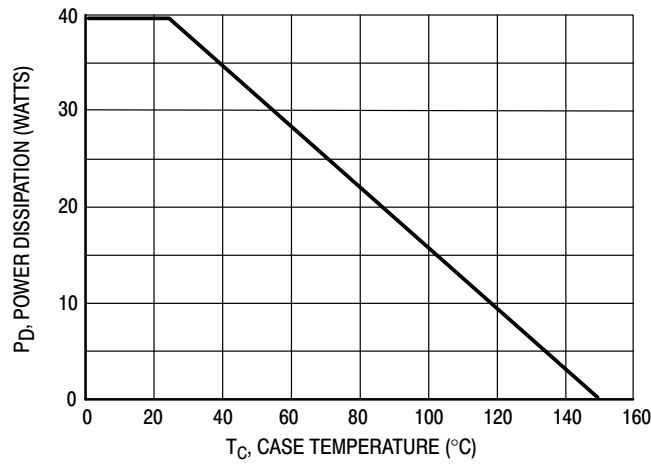


Figure 1. Power Derating

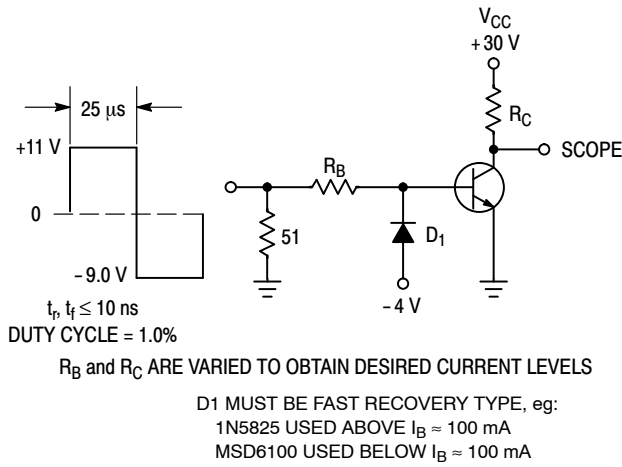


Figure 2. Switching Time Test Circuit

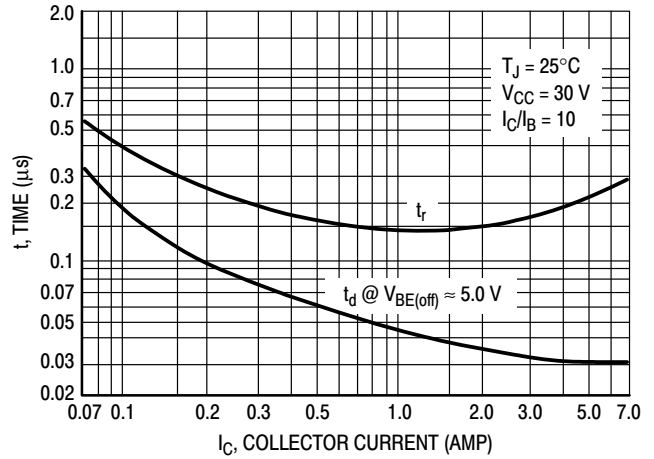


Figure 3. Turn-On Time

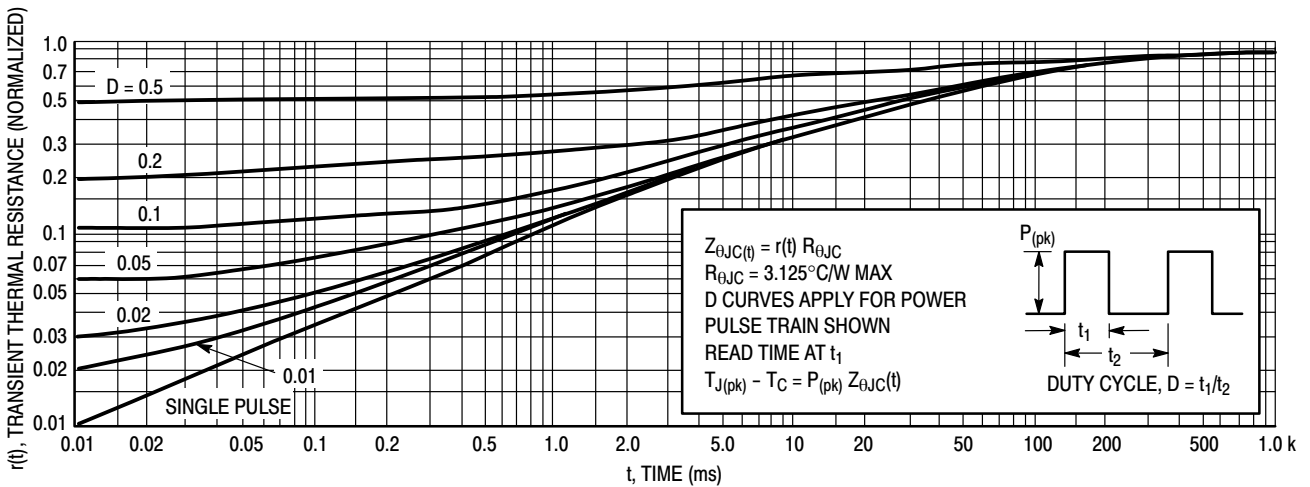
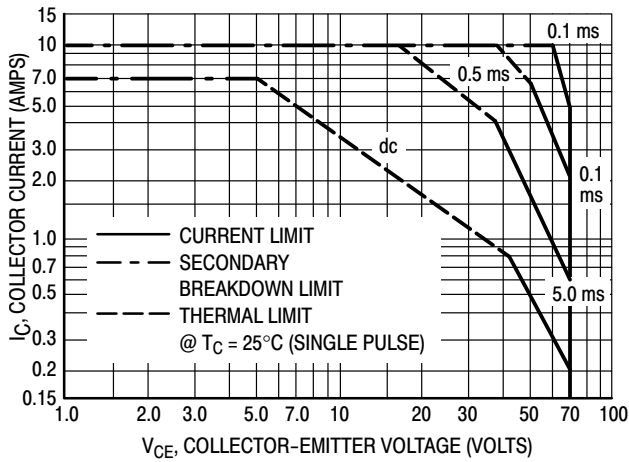


Figure 4. Thermal Response

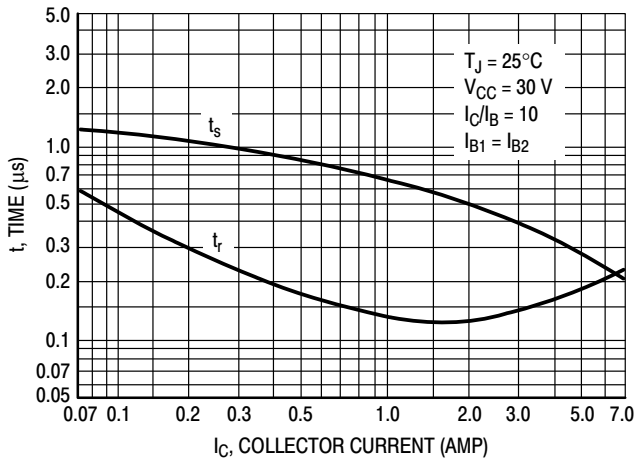
## 2N6107, 2N6109, 2N6111 (PNP), 2N6288, 2N6292 (NPN)



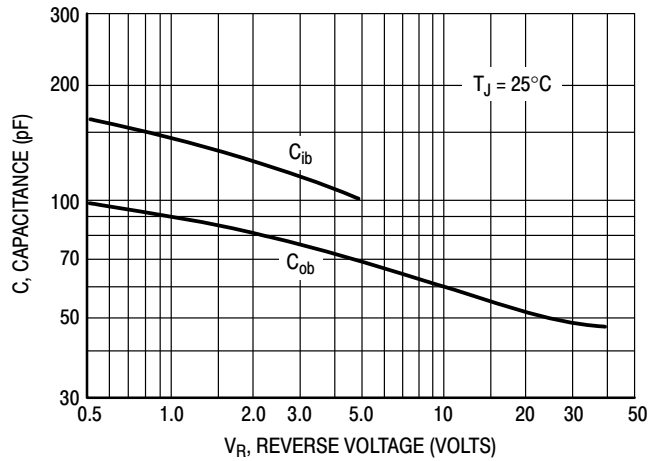
**Figure 5. Active-Region Safe Operating Area**

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
2N6292G	2N6292	TO-220 (Pb-Free)	50 Units / Rail

### DISCONTINUED (Note 5)

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