# P2N2907A

# Amplifier Transistor

## PNP Silicon

**ON Semiconductor**®

### Features

- Pb−Free Packages are Available*

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector – Emitter Voltage | $V_{CEO}$ | −60 | Vdc |
| Collector – Base Voltage | $V_{CBO}$ | −60 | Vdc |
| Emitter – Base Voltage | $V_{EBO}$ | −5.0 | Vdc |
| Collector Current – Continuous | $I_C$ | −600 | mAdc |
| Total Device Dissipation @ $T_A$ = 25°C<br>    Derate above 25°C | $P_D$ | 625<br>5.0 | mW<br>mW/°C |
| Total Device Dissipation @ $T_C$ = 25°C<br>    Derate above 25°C | $P_D$ | 1.5<br>12 | W<br>mW/°C |
| Operating and Storage Junction<br>    Temperature Range | $T_J$, $T_{stg}$ | −55 to<br>+150 | °C |

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 200 | °C/W |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 83.3 | °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.
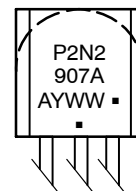
COLLECTOR
1

2
BASE

3
EMITTER
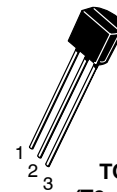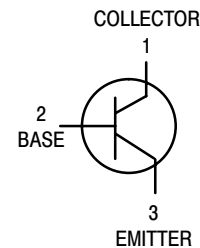


TO−92
(T0−226AA)
CASE 29−11
STYLE 17

**MARKING DIAGRAM**

P2N2
907A
AYWW ▪

P2N2 = Device Code
907A = Specific Device
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device | Package | Shipping[†] |
|---|---|---|
| P2N2907A | TO−92 | 5000 Units / Bulk |
| P2N2907AG | TO−92<br>(Pb−Free) | 5000 Units / Bulk |
| P2N2907ARL1 | TO−92 | 2000 / Tape & Reel |
| P2N2907ARL1G | TO−92<br>(Pb−Free) | 2000 / Tape & Reel |
| P2N2907AZL1 | TO−92 | 2000 / Tape & Ammo |
| P2N2907AZL1G | TO−92<br>(Pb−Free) | 2000 / Tape & Ammo |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector – Emitter Breakdown Voltage (Note 1) <br> ($I_C$ = −10 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | −60 | – | Vdc |
| Collector – Base Breakdown Voltage <br> ($I_C$ = −10 μAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | −60 | – | Vdc |
| Emitter – Base Breakdown Voltage <br> ($I_E$ = −10 μAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | −5.0 | – | Vdc |
| Collector Cutoff Current <br> ($V_{CE}$ = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc) | $I_{CEX}$ | – | −50 | nAdc |
| Collector Cutoff Current <br> ($V_{CB}$ = −50 Vdc, $I_E$ = 0) <br> ($V_{CB}$ = −50 Vdc, $I_E$ = 0, $T_A$ = 150°C) | $I_{CBO}$ | – <br> – | −0.01 <br> −10 | μAdc |
| Emitter Cutoff Current <br> ($V_{EB}$ = −3.0 Vdc) | $I_{EBO}$ | – | −10 | nAdc |
| Collector Cutoff Current <br> ($V_{CE}$ = −10 V) | $I_{CEO}$ | – | −10 | nAdc |
| Base Cutoff Current <br> ($V_{CE}$ = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc) | $I_{BEX}$ | – | −50 | nAdc |
| **ON CHARACTERISTICS** | | | | |
| DC Current Gain <br> ($I_C$ = −0.1 mAdc, $V_{CE}$ = −10 Vdc) <br> ($I_C$ = −1.0 mAdc, $V_{CE}$ = −10 Vdc) <br> ($I_C$ = −10 mAdc, $V_{CE}$ = −10 Vdc) <br> ($I_C$ = −150 mAdc, $V_{CE}$ = −10 Vdc) (Note 1) <br> ($I_C$ = −500 mAdc, $V_{CE}$ = −10 Vdc) (Note 1) | $h_{FE}$ | 75 <br> 100 <br> 100 <br> 100 <br> 50 | – <br> – <br> – <br> 300 <br> – | – |
| Collector – Emitter Saturation Voltage (Note 1) <br> ($I_C$ = −150 mAdc, $I_B$ = −15 mAdc) <br> ($I_C$ = −500 mAdc, $I_B$ = −50 mAdc) | $V_{CE(sat)}$ | – <br> – | −0.4 <br> −1.6 | Vdc |
| Base – Emitter Saturation Voltage (Note 1) <br> ($I_C$ = −150 mAdc, $I_B$ = −15 mAdc) <br> ($I_C$ = −500 mAdc, $I_B$ = −50 mAdc) | $V_{BE(sat)}$ | – <br> – | −1.3 <br> −2.6 | Vdc |
| **SMALL – SIGNAL CHARACTERISTICS** | | | | |
| Current – Gain – Bandwidth Product (Notes 1 and 2) <br> ($I_C$ = −50 mAdc, $V_{CE}$ = −20 Vdc, f = 100 MHz) | $f_T$ | 200 | – | MHz |
| Output Capacitance <br> ($V_{CB}$ = −10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{obo}$ | – | 8.0 | pF |
| Input Capacitance <br> ($V_{EB}$ = −2.0 Vdc, $I_C$ = 0, f = 1.0 MHz) | $C_{ibo}$ | – | 30 | pF |

### SWITCHING CHARACTERISTICS

| | | | Min | Max | Unit |
|---|---|---|---|---|---|
| Turn−On Time | ($V_{CC}$ = −30 Vdc, $I_C$ = −150 mAdc, $I_{B1}$ = −15 mAdc) (Figures 1 and 5) | $t_{on}$ | – | 50 | ns |
| Delay Time | | $t_d$ | – | 10 | ns |
| Rise Time | | $t_r$ | – | 40 | ns |
| Turn−Off Time | ($V_{CC}$ = −6.0 Vdc, $I_C$ = −150 mAdc, $I_{B1}$ = $I_{B2}$ = −15 mAdc) (Figure 2) | $t_{off}$ | – | 110 | ns |
| Storage Time | | $t_s$ | – | 80 | ns |
| Fall Time | | $t_f$ | – | 30 | ns |

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
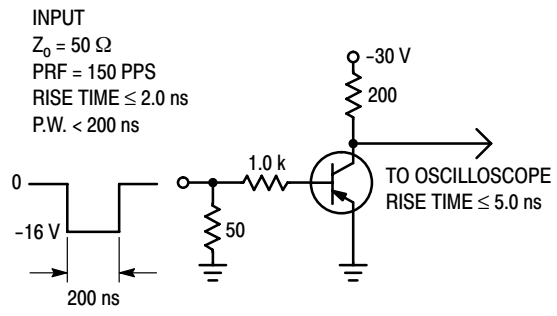2. $f_T$ is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

# P2N2907A

INPUT
$Z_0 = 50\ \Omega$
PRF = 150 PPS
RISE TIME ≤ 2.0 ns
P.W. < 200 ns

0

−16 V

200 ns

1.0 k

50

−30 V

200

TO OSCILLOSCOPE
RISE TIME ≤ 5.0 ns

**Figure 1. Delay and Rise Time Test Circuit**

INPUT
$Z_0 = 50\ \Omega$
PRF = 150 PPS
RISE TIME ≤ 2.0 ns
P.W. < 200 ns

0

−30 V

200 ns

1.0 k

50

+15 V    −6.0 V

1.0 k    37

1N916

TO OSCILLOSCOPE
RISE TIME ≤ 5.0 ns
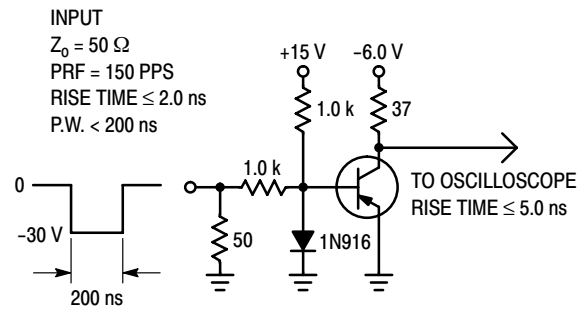
**Figure 2. Storage and Fall Time Test Circuit**

## TYPICAL CHARACTERISTICS
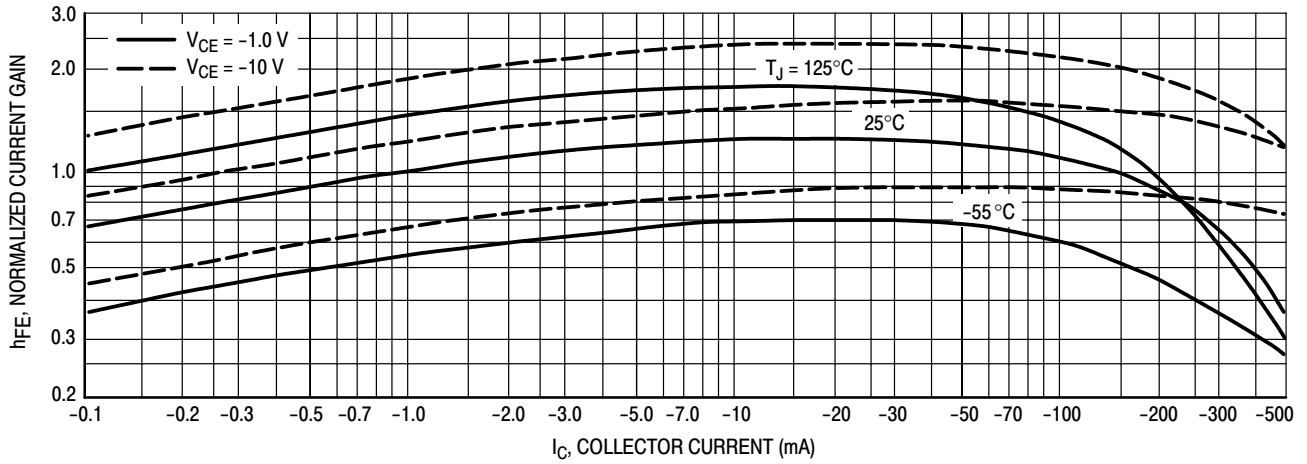


**Figure 3. DC Current Gain**
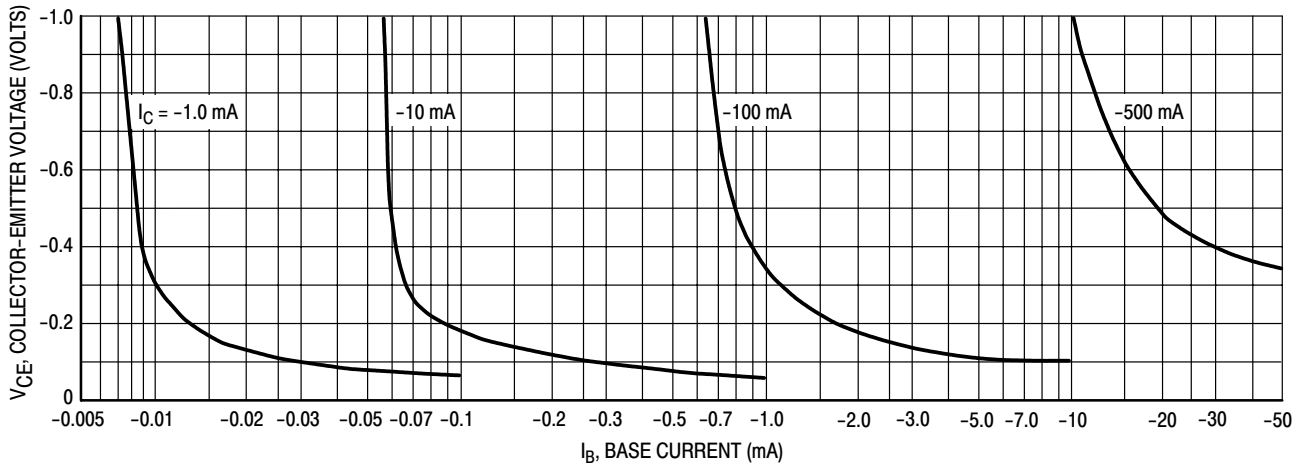


**Figure 4. Collector Saturation Region**
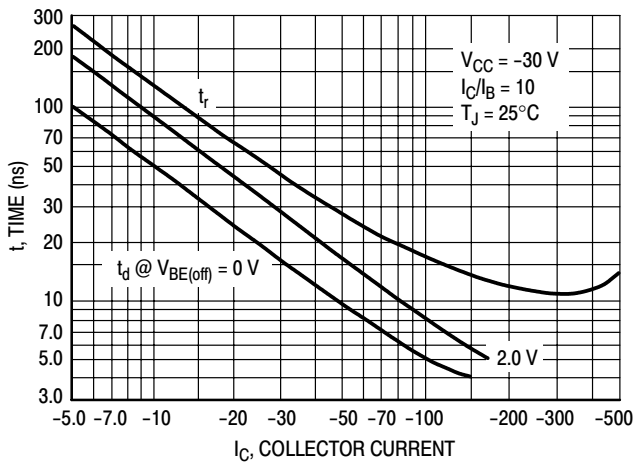


**Figure 5. Turn−On Time**
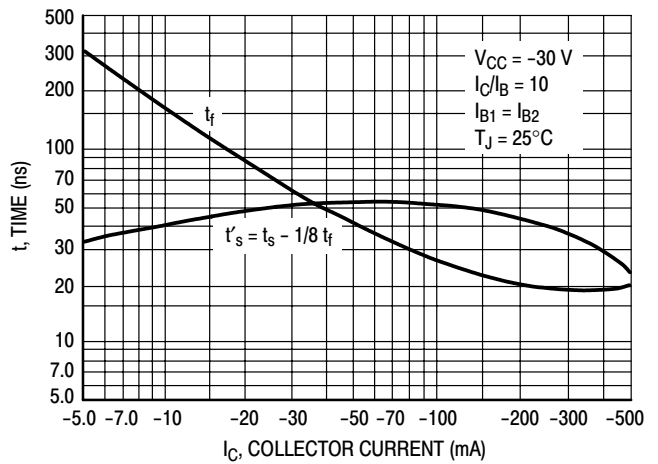


**Figure 6. Turn−Off Time**

## TYPICAL SMALL−SIGNAL CHARACTERISTICS
### NOISE FIGURE
$V_{CE}$ = 10 Vdc, $T_A$ = 25°C
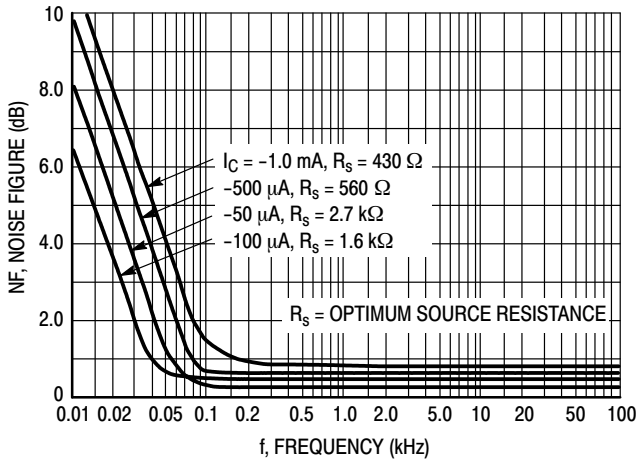


**Figure 7. Frequency Effects**
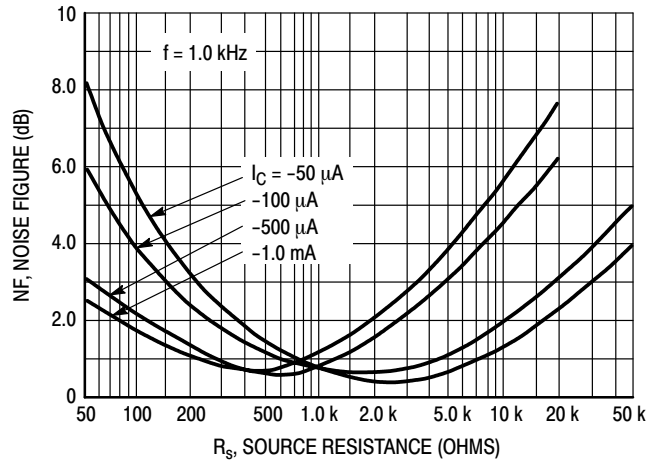


**Figure 8. Source Resistance Effects**
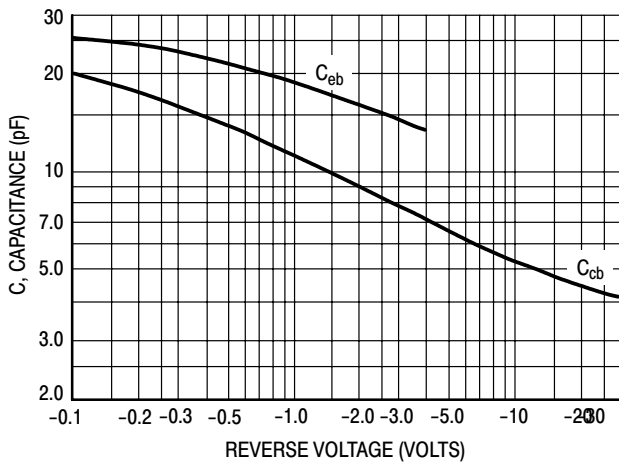


**Figure 9. Capacitances**
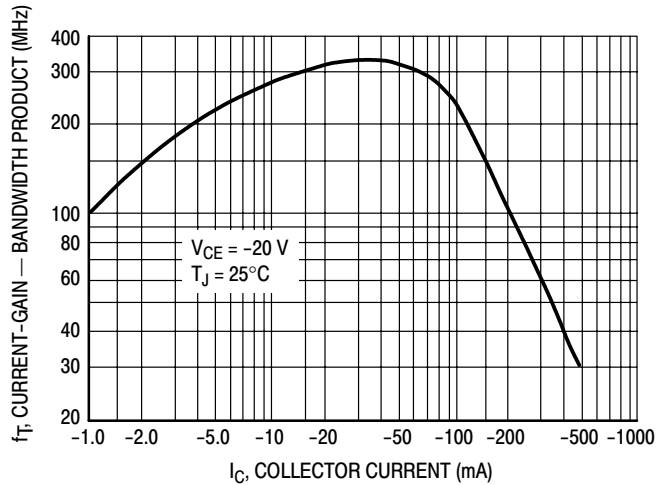


**Figure 10. Current−Gain − Bandwidth Product**
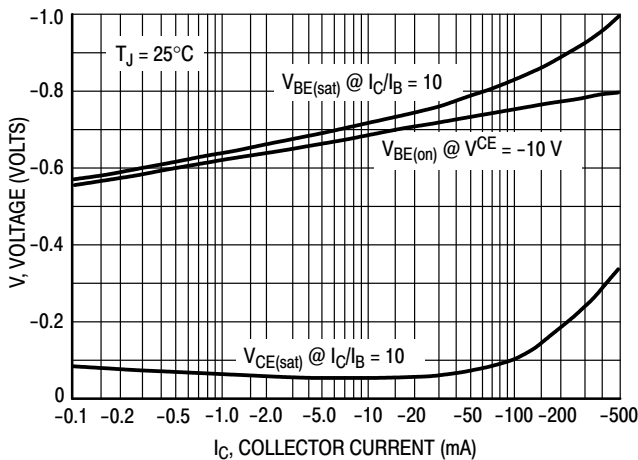


**Figure 11. "On" Voltage**
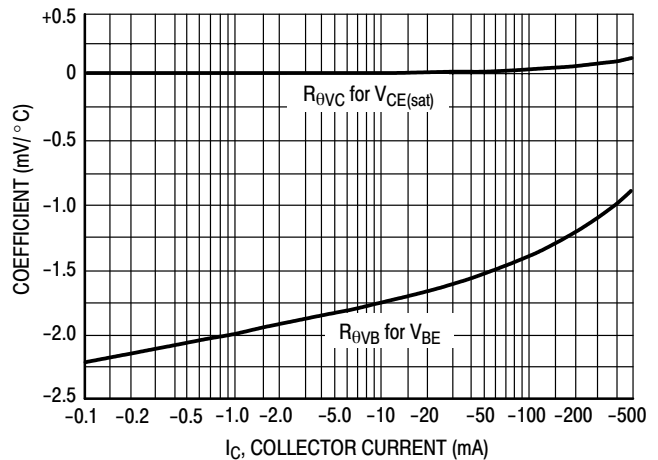


**Figure 12. Temperature Coefficients**

# P2N2907A

## PACKAGE DIMENSIONS

**TO−92 (TO−226)**
CASE 29−11
ISSUE AL



**SECTION X−X**
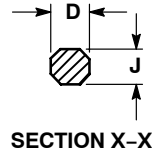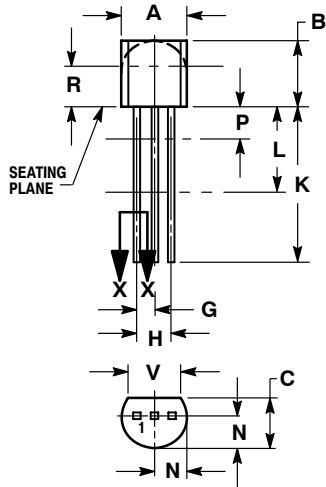
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|--------|-------------|--------|
|     | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.45 | 5.20 |
| B | 0.170 | 0.210 | 4.32 | 5.33 |
| C | 0.125 | 0.165 | 3.18 | 4.19 |
| D | 0.016 | 0.021 | 0.407 | 0.533 |
| G | 0.045 | 0.055 | 1.15 | 1.39 |
| H | 0.095 | 0.105 | 2.42 | 2.66 |
| J | 0.015 | 0.020 | 0.39 | 0.50 |
| K | 0.500 | --- | 12.70 | --- |
| L | 0.250 | --- | 6.35 | --- |
| N | 0.080 | 0.105 | 2.04 | 2.66 |
| P | --- | 0.100 | --- | 2.54 |
| R | 0.115 | --- | 2.93 | --- |
| V | 0.135 | --- | 3.43 | --- |

STYLE 17:
PIN 1.  COLLECTOR
   2.  BASE
   3.  EMITTER