# 2N4029, 2N4033

# Small Signal Switching Transistor

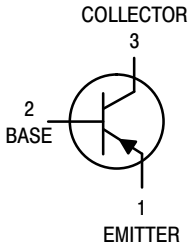
## PNP Silicon

ON Semiconductor®

http://onsemi.com

### Features

- MIL−PRF−19500/512 Qualified
- Available as JAN, JANTX, and JANTXV



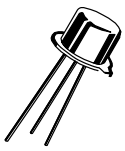

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector−Emitter Voltage | $V_{CEO}$ | −80 | Vdc |
| Collector−Base Voltage | $V_{CBO}$ | −80 | Vdc |
| Emitter−Base Voltage | $V_{EBO}$ | −5.0 | Vdc |
| Collector Current − Continuous | $I_C$ | 1 | Adc |
| Total Device Dissipation @ $T_A$ = 25°C<br>2N4029<br>2N4033 | $P_T$ | <br>0.5<br>0.8 | W |
| Total Device Dissipation @ $T_C$ = 25°C<br>2N4029<br>2N4033 | $P_T$ | <br>1.0<br>4.0 | W |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −65 to +200 | °C |

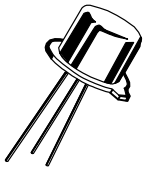
### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Ambient<br>2N4029<br>2N4033 | $R_{\theta JA}$ | <br>325<br>195 | °C/W |
| Thermal Resistance, Junction−to−Case<br>2N4029<br>2N4033 | $R_{\theta JC}$ | <br>150<br>40 | °C/W |

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.



**TO−18**
**CASE 206AA**
**STYLE 1**
**2N4029**



**TO−39**
**CASE 205AB**
**STYLE 1**
**2N4033**

### ORDERING INFORMATION

| Level | Device | Package | Shipping |
|---|---|---|---|
| JAN<br>JANTX<br>JANTXV | 2N4029 | TO−18 | Bulk |
| | 2N4033 | TO−39 | Bulk |

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector−Emitter Breakdown Voltage ($I_C$ = −10 mAdc) | $V_{(BR)CEO}$ | −80 | – | Vdc |
| Collector−Emitter Cutoff Current ($V_{CE}$ = −60 Vdc) | $I_{CES}$ | – | −25 | nAdc |
| Collector−Base Cutoff Current ($V_{CB}$ = −80 Vdc, $I_E$ = 0) ($V_{CB}$ = −60 Vdc, $I_E$ = 0) | $I_{CBO}$ | – – | −10 −10 | μA nA |
| Emitter−Base Cutoff Current ($V_{EB}$ = −5 Vdc) ($V_{EB}$ = −3 Vdc) | $I_{EBO}$ | – – | −10 −25 | μA nA |
| **ON CHARACTERISTICS** (Note 1) | | | | |
| DC Current Gain ($I_C$ = −0.1 mAdc, $V_{CE}$ = −5 Vdc) ($I_C$ = −100 mAdc, $V_{CE}$ = −5 Vdc) ($I_C$ = −500 mAdc, $V_{CE}$ = −5 Vdc) ($I_C$ = −1 Adc, $V_{CE}$ = −5 Vdc) | $h_{FE}$ | 50 100 70 25 | – 300 – – | – |
| Collector−Emitter Saturation Voltage ($I_C$ = −150 mAdc, $I_B$ = −15 mAdc) ($I_C$ = −500 mAdc, $I_B$ = −50 mAdc) ($I_C$ = −1 Adc, $I_B$ = −100 mAdc) | $V_{CE(sat)}$ | – – – | −0.15 −0.5 −1.0 | Vdc |
| Base−Emitter Saturation Voltage ($I_C$ = −150 mAdc, $I_B$ = −15 mAdc) ($I_C$ = −500 mAdc, $I_B$ = −50 mAdc) | $V_{BE(sat)}$ | – – | −0.9 −1.2 | Vdc |
| **SMALL−SIGNAL CHARACTERISTICS** | | | | |
| Magnitude of Small−Signal Current Gain ($I_C$ = −50 mAdc, $V_{CE}$ = −10 Vdc, f = 100 MHz) | $\|h_{fe}\|$ | 1.5 | 6.0 | – |
| Output Capacitance ($V_{CB}$ = −10 Vdc, $I_E$ = 0, 100 kHz ≤ f ≤ 1.0 MHz) | $C_{obo}$ | – | 20 | pF |
| Input Capacitance ($V_{EB}$ = −0.5 Vdc, $I_C$ = 0, 100 kHz ≤ f ≤ 1.0 MHz) | $C_{ibo}$ | – | 80 | pF |
| **SWITCHING CHARACTERISTICS** | | | | |
| Delay Time (Reference Figure in MIL−PRF−19500/512) | $t_d$ | – | 15 | ns |
| Rise Time (Reference Figure in MIL−PRF−19500/512) | $t_r$ | – | 25 | ns |
| Storage Time (Reference Figure in MIL−PRF−19500/512) | $t_s$ | – | 175 | ns |
| Fall Time (Reference Figure in MIL−PRF−19500/512) | $t_f$ | – | 35 | ns |

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.

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

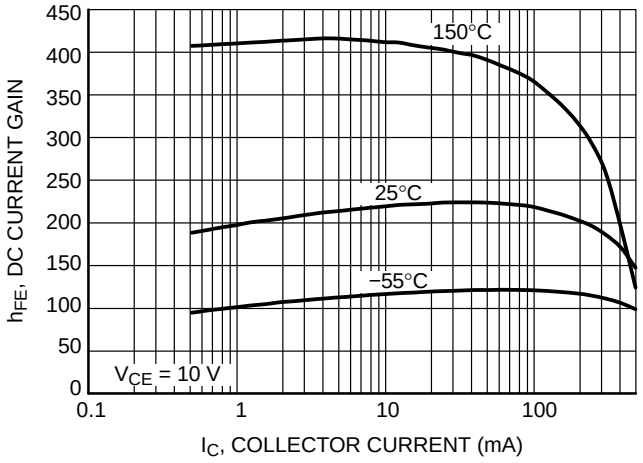



**Figure 1. DC Current Gain**

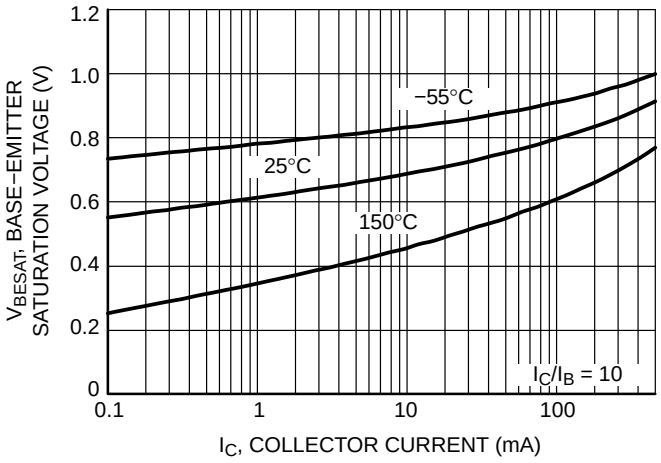



**Figure 2. Base−Emitter Saturation Voltage**

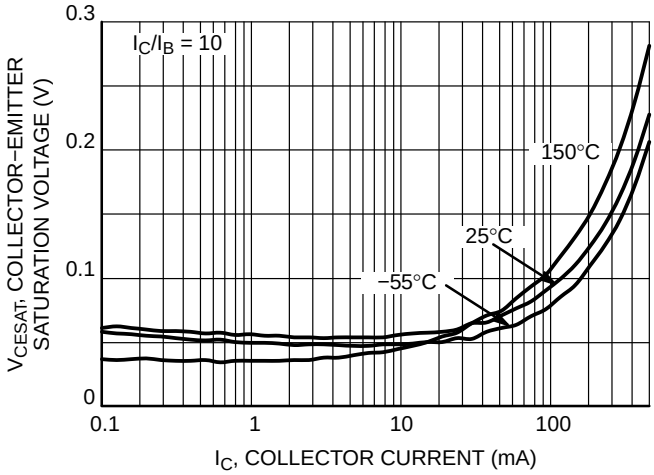



**Figure 3. Collector−Emitter Saturation Voltage**

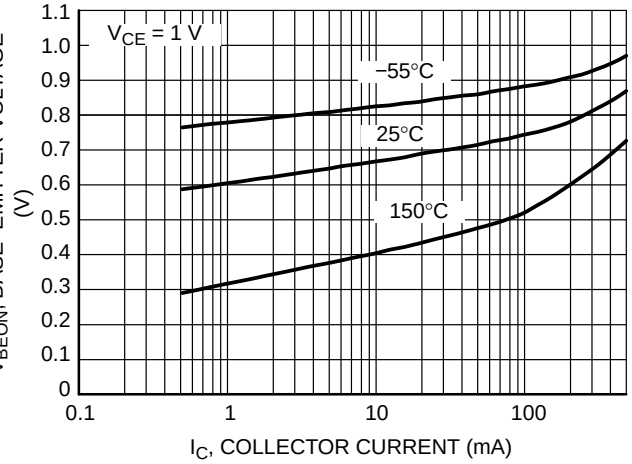



**Figure 4. Base−Emitter Voltage**

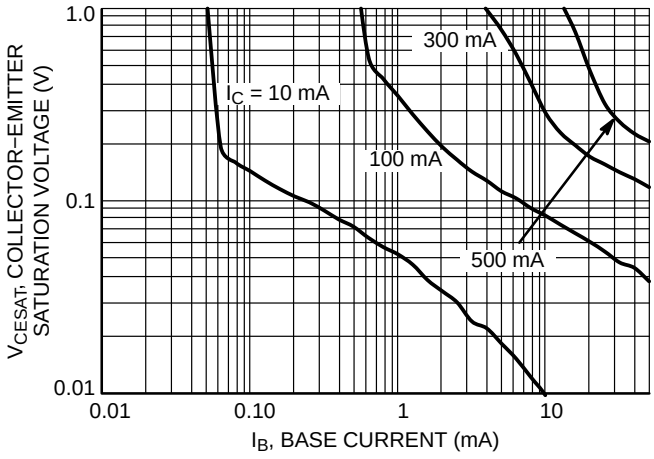



**Figure 5. Collector Saturation Region**

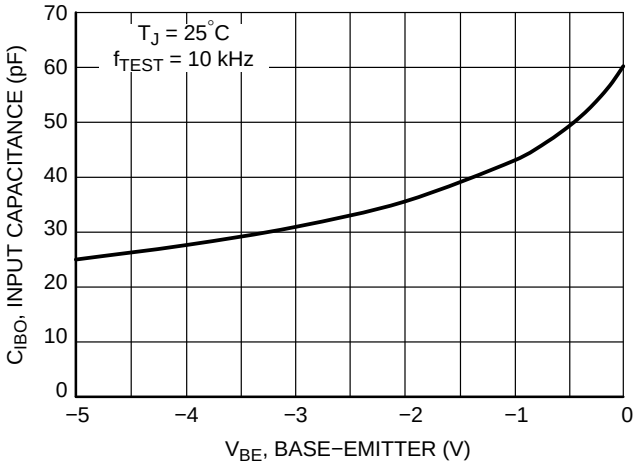



**Figure 6. Input Capacitance**

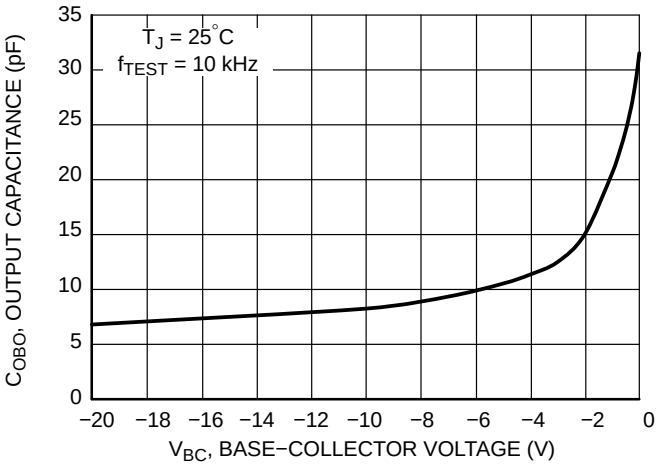



**Figure 7. Output Capacitance**

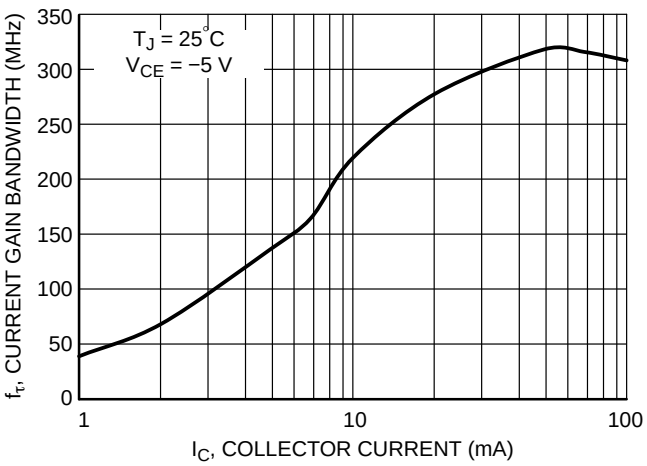
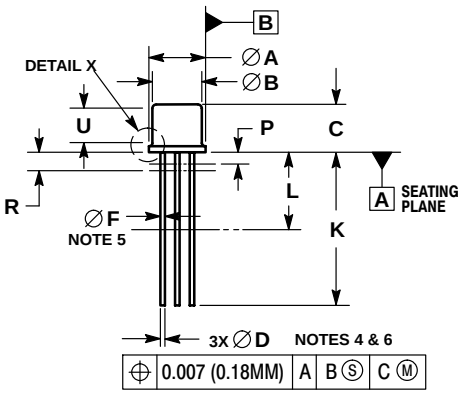
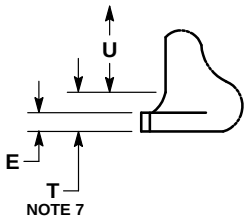



**Figure 8. Current Gain Bandwidth Product**

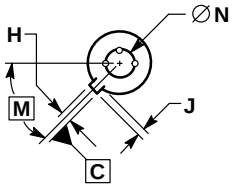
## PACKAGE DIMENSIONS

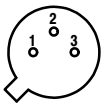
**TO−18 3**
CASE 206AA
ISSUE A




**DETAIL X**




**LEAD IDENTIFICATION DETAIL**

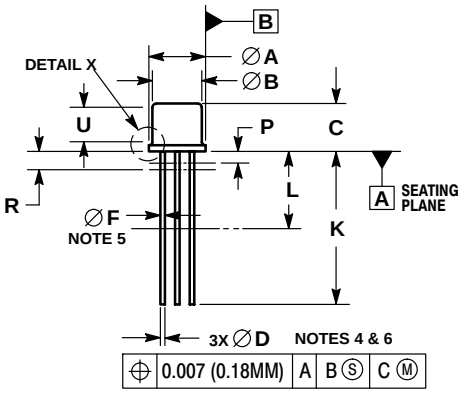
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION J MEASURED FROM DIAMETER A TO EDGE.
4. LEAD TRUE POSITION TO BE DETERMINED AT THE GUAGE PLANE DEFINED BY DIMENSION R.
5. DIMENSION F APPLIES BETWEEN DIMENSION P AND L.
6. DIMENSION D APPLIES BETWEEN DIMENSION L AND K.
7. BODY CONTOUR OPTIONAL WITHIN ZONE DEFINED BY DIMENSIONS A, B, AND T.

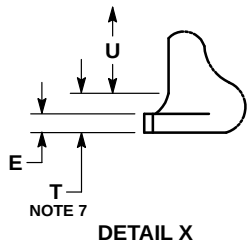
| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 5.31 | 5.84 | 0.209 | 0.230 |
| B | 4.52 | 4.95 | 0.178 | 0.195 |
| C | 4.32 | 5.33 | 0.170 | 0.210 |
| D | 0.41 | 0.53 | 0.016 | 0.021 |
| E | --- | 0.76 | --- | 0.030 |
| F | 0.41 | 0.48 | 0.016 | 0.019 |
| H | 0.91 | 1.17 | 0.036 | 0.046 |
| J | 0.71 | 1.22 | 0.028 | 0.048 |
| K | 12.70 | 19.05 | 0.500 | 0.750 |
| L | 6.35 | --- | 0.250 | --- |
| M | 45 ° BSC | | 45 ° BSC | |
| N | 2.54 BSC | | 0.100 BSC | |
| P | --- | 1.27 | --- | 0.050 |
| R | 1.37 BSC | | 0.054 BSC | |
| T | --- | 0.76 | --- | 0.030 |
| U | 2.54 | --- | 0.100 | --- |

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

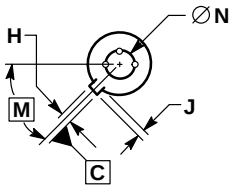
## PACKAGE DIMENSIONS

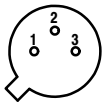
**TO−39 3−Lead**
CASE 205AB
ISSUE A




**DETAIL X**

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5. DIMENSION F APPLIES BETWEEN DIMENSION P AND L.
6. DIMENSION D APPLIES BETWEEN DIMENSION L AND K.
7. BODY CONTOUR OPTIONAL WITHIN ZONE DEFINED BY DIMENSIONS A, B, AND T.
8. DIMENSION B SHALL NOT VARY MORE THAN 0.010 IN ZONE P.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 8.89 | 9.40 | 0.350 | 0.370 |
| B | 8.00 | 8.51 | 0.315 | 0.335 |
| C | 6.10 | 6.60 | 0.240 | 0.260 |
| D | 0.41 | 0.48 | 0.016 | 0.019 |
| E | 0.23 | 3.18 | 0.009 | 0.125 |
| F | 0.41 | 0.48 | 0.016 | 0.019 |
| H | 0.71 | 0.86 | 0.028 | 0.034 |
| J | 0.73 | 1.02 | 0.029 | 0.040 |
| K | 12.70 | 14.73 | 0.500 | 0.580 |
| L | 6.35 | --- | 0.250 | --- |
| M | 45 ° BSC | | 45 ° BSC | |
| N | 5.08 BSC | | 0.200 BSC | |
| P | --- | 1.27 | --- | 0.050 |
| R | 1.37 BSC | | 0.054 BSC | |
| T | --- | 0.76 | --- | 0.030 |
| U | 2.54 | --- | 0.100 | --- |

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



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**2N4029/D**