

2N4029, 2N4033

Small Signal Switching Transistor

PNP Silicon

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 @ $T_A = 25^\circ\text{C}$ 2N4029 2N4033	P_T	0.5 0.8	W
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ 2N4029 2N4033	P_T	1.0 4.0	W
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

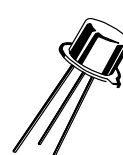
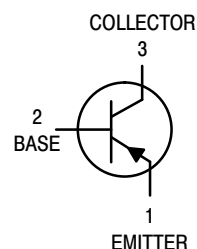
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Ambient 2N4029 2N4033	$R_{\theta JA}$	325 195	$^\circ\text{C/W}$
Thermal Resistance, Junction–to–Case 2N4029 2N4033	$R_{\theta JC}$	150 40	$^\circ\text{C/W}$

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.

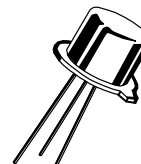


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TO-18
CASE 206AA
STYLE 1
2N4029



TO-39
CASE 205AB
STYLE 1
2N4033

ORDERING INFORMATION

Level	Device	Package	Shipping
JAN	2N4029	TO-18	Bulk
JANTX	2N4033	TO-39	Bulk
JANTXV			

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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage ($I_C = -10\text{ mAdc}$)	$V_{(BR)CEO}$	-80	–	Vdc
Collector–Emitter Cutoff Current ($V_{CE} = -60\text{ Vdc}$)	I_{CES}	–	-25	nAdc
Collector–Base Cutoff Current ($V_{CB} = -80\text{ Vdc}$, $I_E = 0$) ($V_{CB} = -60\text{ Vdc}$, $I_E = 0$)	I_{CBO}	– –	-10 -10	μA nA
Emitter–Base Cutoff Current ($V_{EB} = -5\text{ Vdc}$) ($V_{EB} = -3\text{ Vdc}$)	I_{EBO}	– –	-10 -25	μA nA

ON CHARACTERISTICS (Note 1)

DC Current Gain ($I_C = -0.1\text{ mAdc}$, $V_{CE} = -5\text{ Vdc}$) ($I_C = -100\text{ mAdc}$, $V_{CE} = -5\text{ Vdc}$) ($I_C = -500\text{ mAdc}$, $V_{CE} = -5\text{ Vdc}$) ($I_C = -1\text{ Adc}$, $V_{CE} = -5\text{ Vdc}$)	h_{FE}	50 100 70 25	– 300 – –	–
Collector–Emitter Saturation Voltage ($I_C = -150\text{ mAdc}$, $I_B = -15\text{ mAdc}$) ($I_C = -500\text{ mAdc}$, $I_B = -50\text{ mAdc}$) ($I_C = -1\text{ Adc}$, $I_B = -100\text{ mAdc}$)	$V_{CE(sat)}$	– – –	-0.15 -0.5 -1.0	Vdc
Base–Emitter Saturation Voltage ($I_C = -150\text{ mAdc}$, $I_B = -15\text{ mAdc}$) ($I_C = -500\text{ mAdc}$, $I_B = -50\text{ mAdc}$)	$V_{BE(sat)}$	– –	-0.9 -1.2	Vdc

SMALL–SIGNAL CHARACTERISTICS

Magnitude of Small–Signal Current Gain ($I_C = -50\text{ mAdc}$, $V_{CE} = -10\text{ Vdc}$, $f = 100\text{ MHz}$)	$ h_{fe} $	1.5	6.0	–
Output Capacitance ($V_{CB} = -10\text{ Vdc}$, $I_E = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$)	C_{obo}	–	20	pF
Input Capacitance ($V_{EB} = -0.5\text{ Vdc}$, $I_C = 0$, $100\text{ kHz} \leq f \leq 1.0\text{ MHz}$)	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 $\leq 2.0\%$.

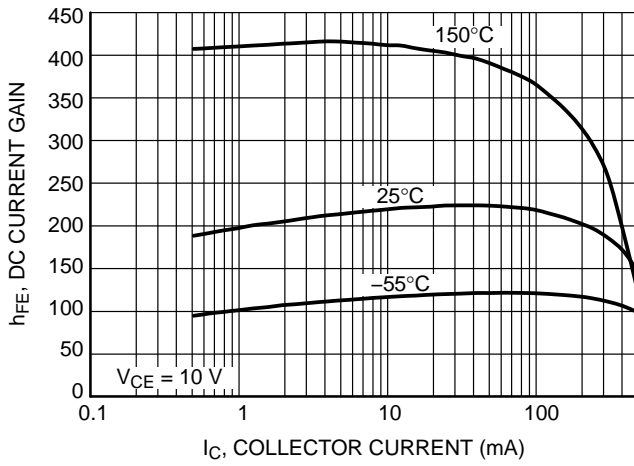


Figure 1. DC Current Gain

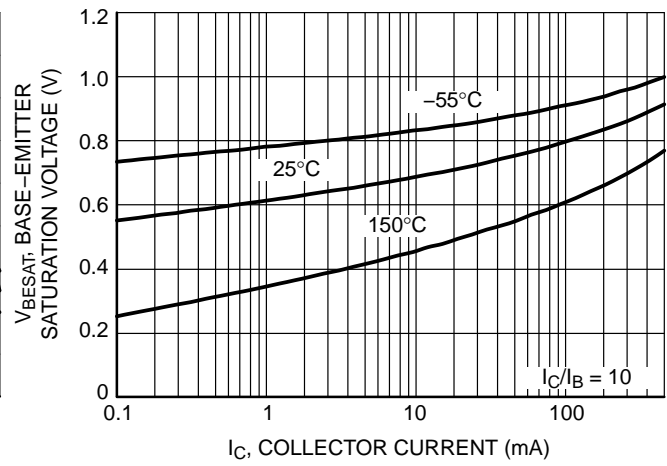


Figure 2. Base-Emitter Saturation Voltage

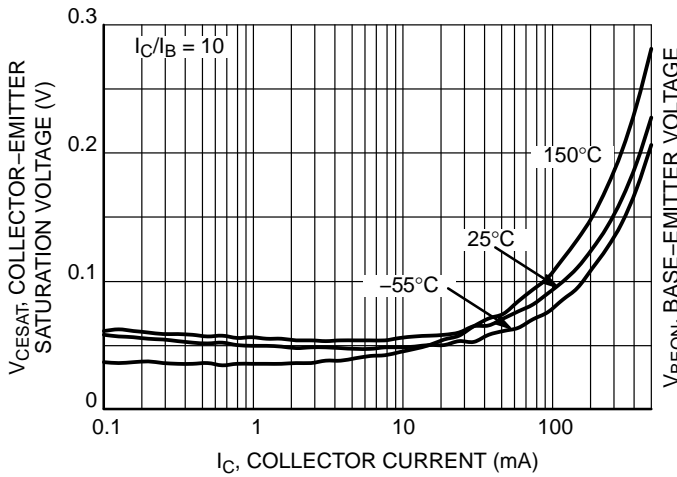


Figure 3. Collector-Emitter Saturation Voltage

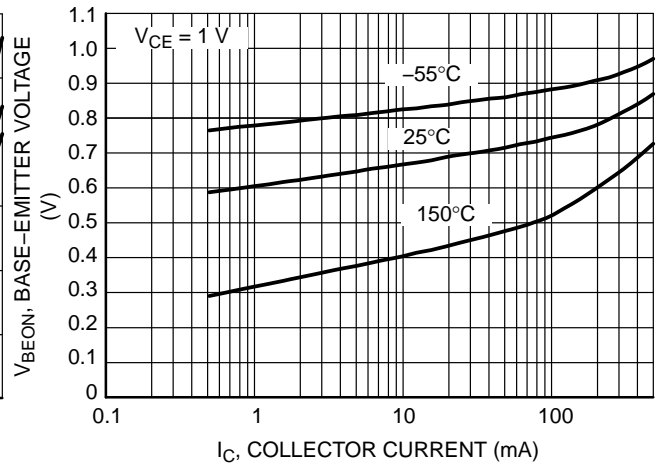


Figure 4. Base-Emitter Voltage

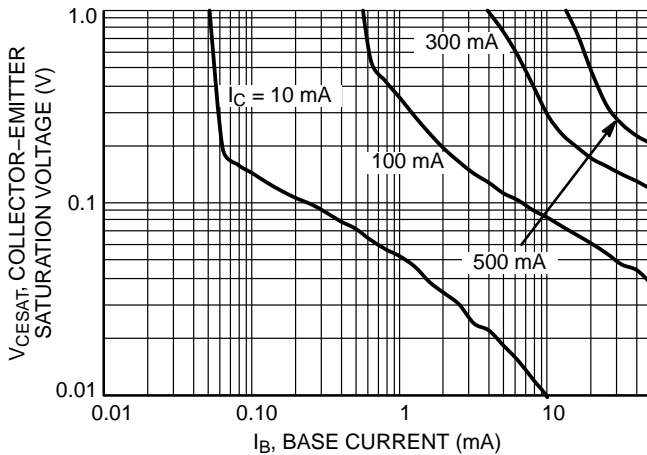


Figure 5. Collector Saturation Region

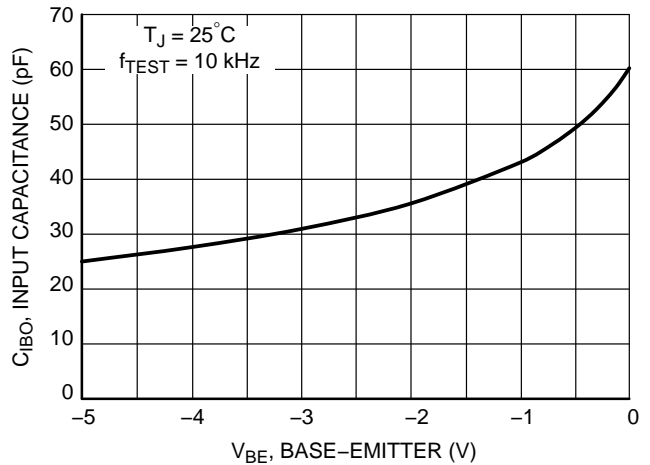


Figure 6. Input Capacitance

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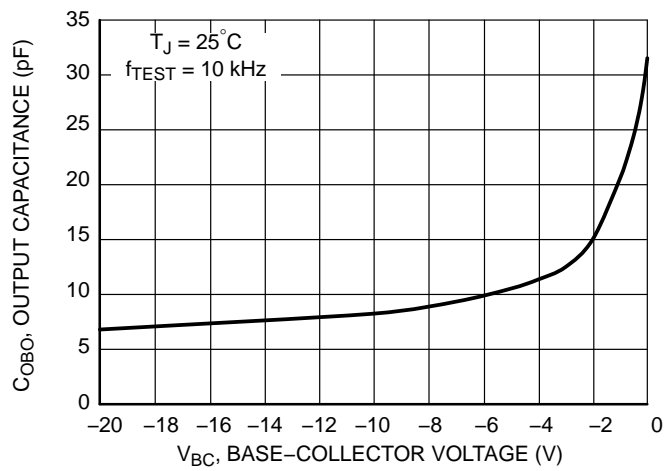


Figure 7. Output Capacitance

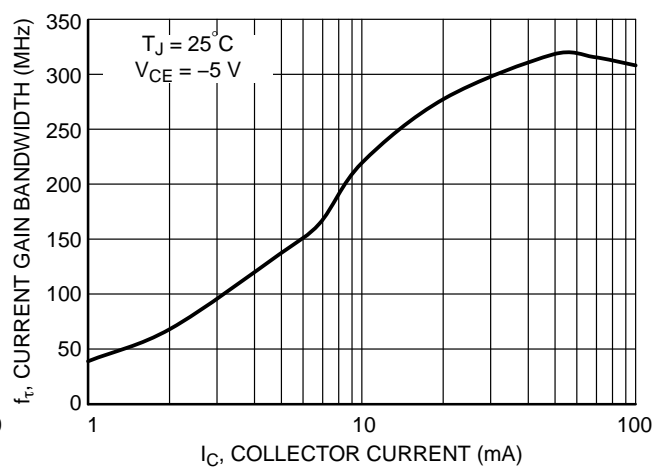
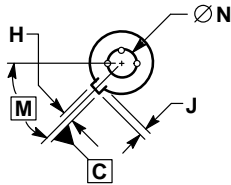
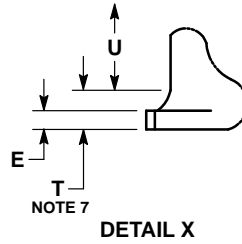
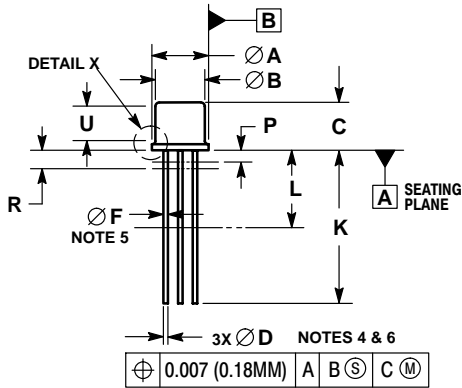


Figure 8. Current Gain Bandwidth Product

2N4029, 2N4033

PACKAGE DIMENSIONS

TO-18 3
CASE 206AA
ISSUE A



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 GAUGE 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.

DIM	MILLIMETERS		INCHES	
	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	---

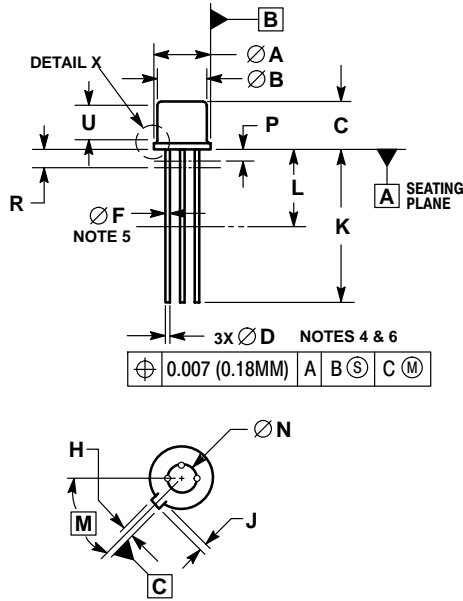
STYLE 1:

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

2N4029, 2N4033

PACKAGE DIMENSIONS

TO-39 3-Lead CASE 205AB ISSUE A



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 GAUGE 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.
8. DIMENSION B SHALL NOT VARY MORE THAN 0.010 IN ZONE P.

DIM	MILLIMETERS		INCHES	
	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:

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

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