

# 2N5400, 2N5401

Preferred Device

## Amplifier Transistors

### PNP Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating	Symbol	2N5400	2N5401	Unit
Collector – Emitter Voltage	$V_{CEO}$	120	150	Vdc
Collector – Base Voltage	$V_{CBO}$	130	160	Vdc
Emitter – Base Voltage	$V_{EBO}$	5.0		Vdc
Collector Current – Continuous	$I_C$	600		mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625	5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5	12	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–55 to +150		$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

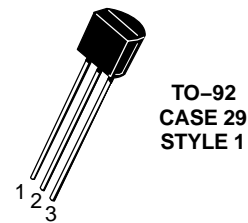
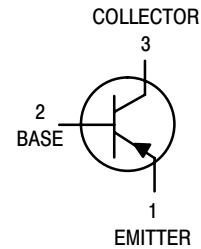
#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

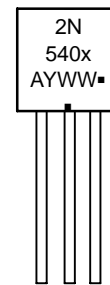


ON Semiconductor®

<http://onsemi.com>



#### MARKING DIAGRAM



- A = Assembly Location
  - Y = Year
  - WW = Work Week
  - = Pb-Free Package
- (Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

**Preferred** devices are recommended choices for future use and best overall value.

## 2N5400, 2N5401

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

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage <sup>(1)</sup> ( $I_C = 1.0\text{ mA}$ , $I_B = 0$ )	2N5400 2N5401	$V_{(BR)CEO}$	120 150	– –	Vdc
Collector–Base Breakdown Voltage ( $I_C = 100\text{ }\mu\text{A}$ , $I_E = 0$ )	2N5400 2N5401	$V_{(BR)CBO}$	130 160	– –	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )		$V_{(BR)EBO}$	5.0	–	Vdc
Collector Cutoff Current ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ ) ( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ )	2N5400 2N5401 2N5400 2N5401	$I_{CBO}$	– – – –	100 50 100 50	nAdc   $\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = 3.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	–	50	nAdc
<b>ON CHARACTERISTICS (Note 1)</b>					
DC Current Gain ( $I_C = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )  ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )  ( $I_C = 50\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )	2N5400 2N5401 2N5400 2N5401 2N5400 2N5401	$h_{FE}$	30 50 40 60 40 50	– – 180 240 – –	–
Collector–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ ) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )		$V_{CE(sat)}$	– –	0.2 0.5	Vdc
Base–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ ) ( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )		$V_{BE(sat)}$	– –	1.0 1.0	Vdc
<b>SMALL–SIGNAL CHARACTERISTICS</b>					
Current–Gain — Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 100\text{ MHz}$ )	2N5400 2N5401	$f_T$	100 100	400 300	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )		$C_{obo}$	–	6.0	pF
Small–Signal Current Gain ( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	2N5400 2N5401	$h_{fe}$	30 40	200 200	–
Noise Figure ( $I_C = 250\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )		NF	–	8.0	dB

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

# 2N5400, 2N5401

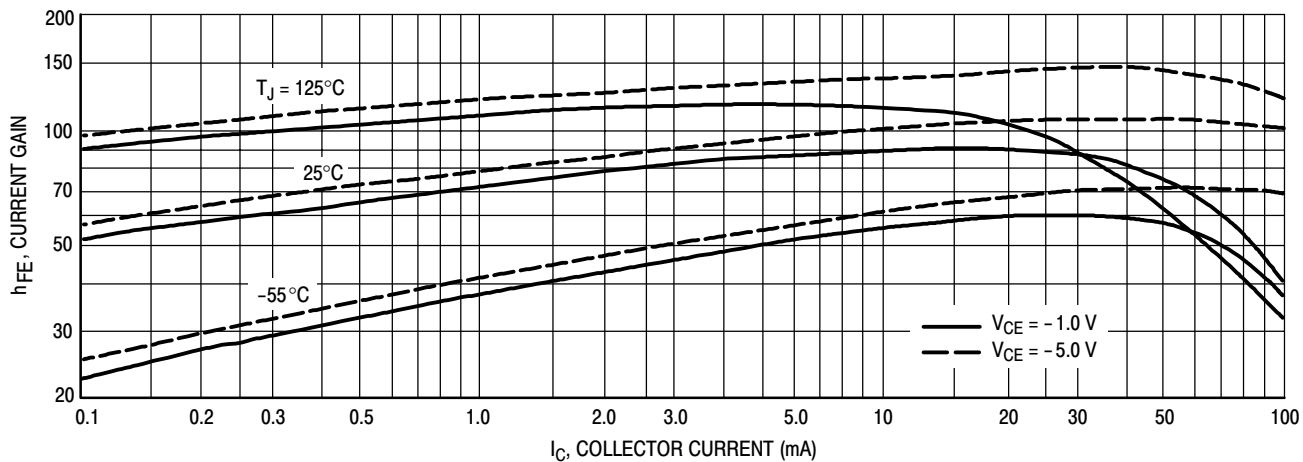


Figure 1. DC Current Gain

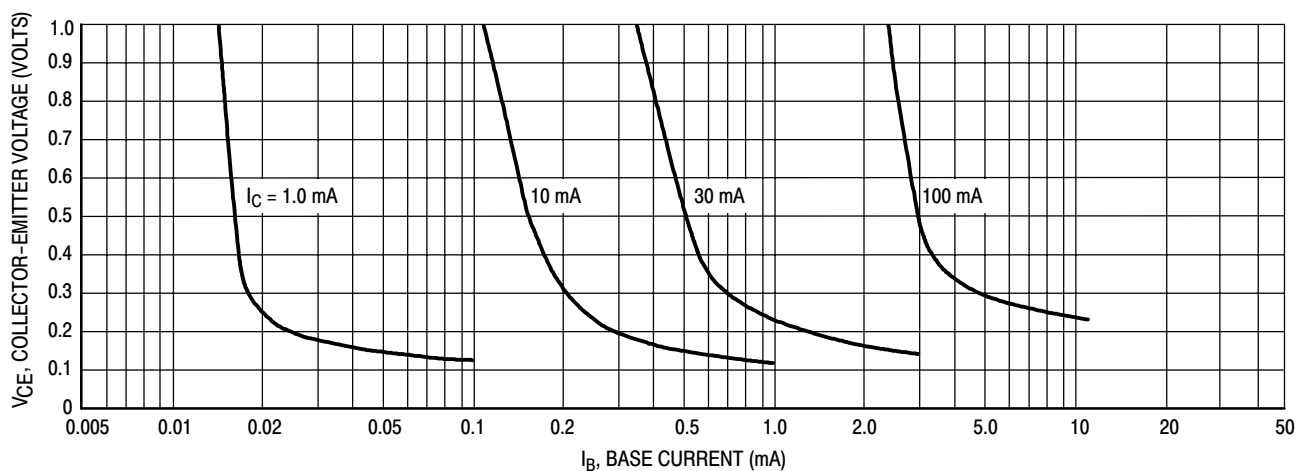


Figure 2. Collector Saturation Region

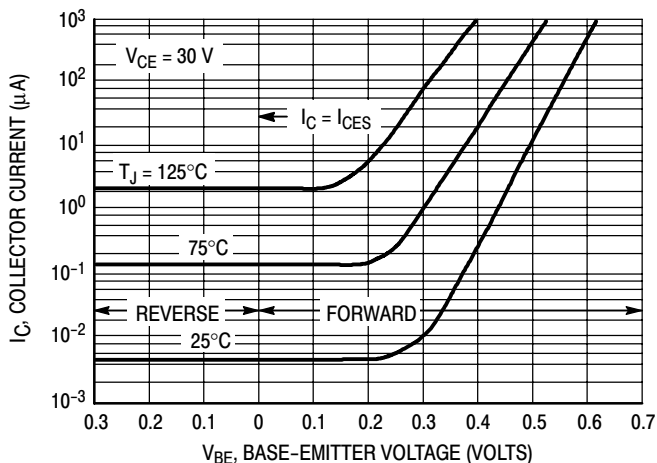


Figure 3. Collector Cut-Off Region

# 2N5400, 2N5401

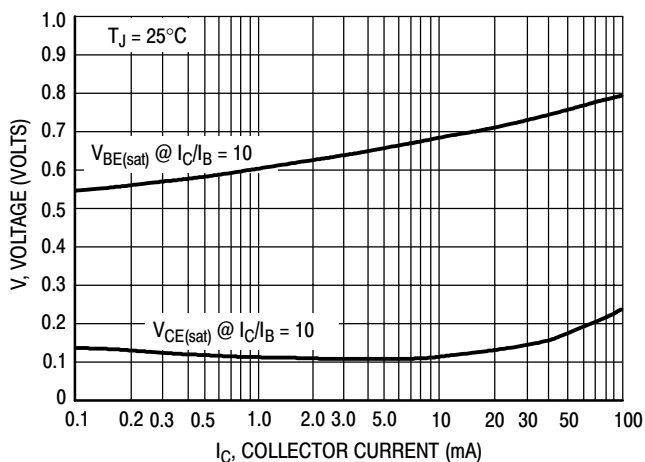


Figure 4. "On" Voltages

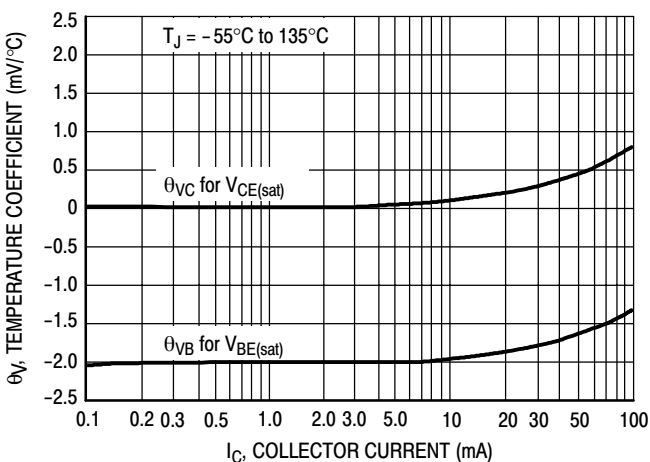
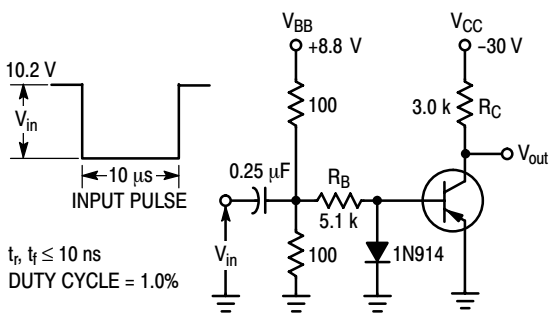


Figure 5. Temperature Coefficients



Values Shown are for  $I_C @ 10 \text{ mA}$

Figure 6. Switching Time Test Circuit

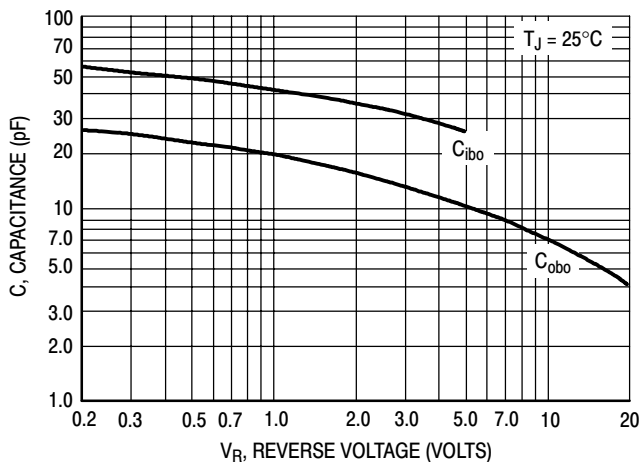


Figure 7. Capacitances

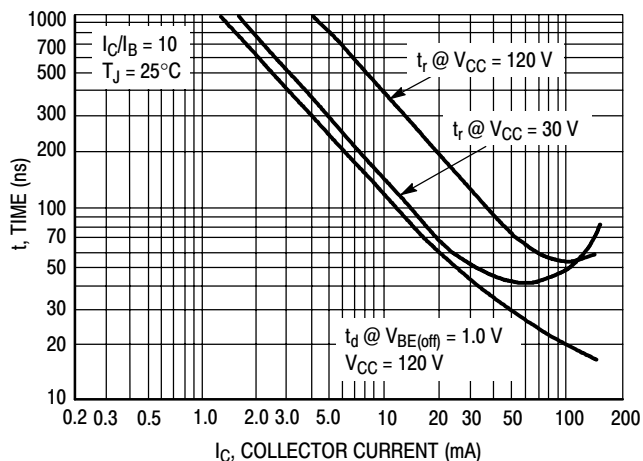


Figure 8. Turn-On Time

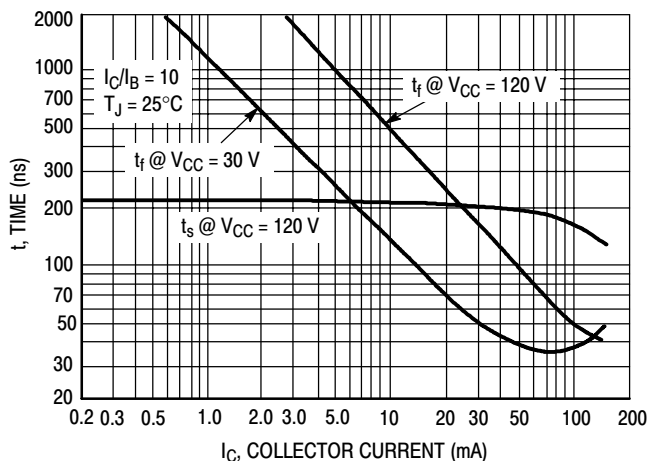


Figure 9. Turn-Off Time

## 2N5400, 2N5401

### ORDERING INFORMATION

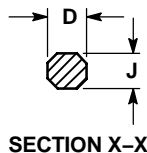
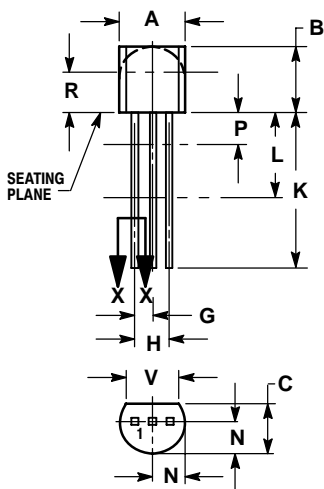
Device	Package	Shipping†
2N5400	TO-92	5000 Unit / Bulk
2N5400G	TO-92 (Pb-Free)	5000 Unit / Bulk
2N5400RLRP	TO-92	2000 Tape & Reel
2N5400RLRPG	TO-92 (Pb-Free)	2000 Tape & Reel
2N5401	TO-92	5000 Unit / Bulk
2N5401G	TO-92 (Pb-Free)	5000 Unit / Bulk
2N5401RL1	TO-92	2000 Tape & Reel
2N5401RL1G	TO-92 (Pb-Free)	2000 Tape & Reel
2N5401RLRA	TO-92	2000 Tape & Reel
2N5401RLRAG	TO-92 (Pb-Free)	2000 Tape & Reel
2N5401RLRM	TO-92	2000 Tape & Ammo Box
2N5401RLRMG	TO-92 (Pb-Free)	2000 Tape & Ammo Box
2N5401ZL1	TO-92	2000 Tape & Ammo Box
2N5401ZL1G	TO-92 (Pb-Free)	2000 Tape & Ammo Box

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

# 2N5400, 2N5401

## PACKAGE DIMENSIONS

TO-92  
CASE 29-11  
ISSUE AL



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 1:

1. EMITTER
2. BASE
3. COLLECTOR

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