2N4401

Preferred Device

General Purpose Transistors

NPN Silicon

ON Semiconductor®

Features

- Pb−Free Packages are Available*

MAXIMUM RATINGS

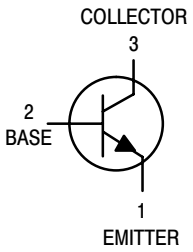
Rating	Symbol	Value	Unit
Collector − Emitter Voltage	V_{CEO}	40	Vdc
Collector − Base Voltage	V_{CBO}	60	Vdc
Emitter − Base Voltage	V_{EBO}	6.0	Vdc
Collector Current − Continuous	I_C	600	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.5 12	W mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	°C

THERMAL CHARACTERISTICS

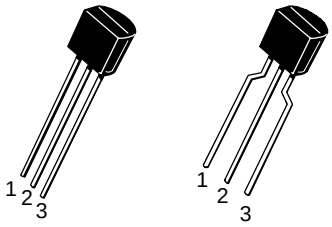
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	83.3	°C/W

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.

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



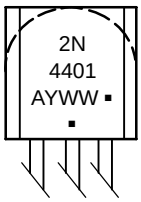
TO−92
CASE 29
STYLE 1



STRAIGHT LEAD
BULK PACK

BENT LEAD
TAPE & REEL
AMMO PACK

MARKING DIAGRAM



2N4401 = Device Code
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 2 of this data sheet.

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

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (Note 1)	(I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	40	−	Vdc
Collector−Base Breakdown Voltage	(I_C = 0.1 mAdc, I_E = 0)	$V_{(BR)CBO}$	60	−	Vdc
Emitter−Base Breakdown Voltage	(I_E = 0.1 mAdc, I_C = 0)	$V_{(BR)EBO}$	6.0	−	Vdc
Base Cutoff Current	(V_{CE} = 35 Vdc, V_{EB} = 0.4 Vdc)	I_{BEV}	−	0.1	μAdc
Collector Cutoff Current	(V_{CE} = 35 Vdc, V_{EB} = 0.4 Vdc)	I_{CEX}	−	0.1	μAdc
ON CHARACTERISTICS (Note 1)					
DC Current Gain	(I_C = 0.1 mAdc, V_{CE} = 1.0 Vdc) (I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc) (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) (I_C = 150 mAdc, V_{CE} = 1.0 Vdc) (I_C = 500 mAdc, V_{CE} = 2.0 Vdc)	h_{FE}	 20 40 80 100 40	 − − − 300 −	−
Collector−Emitter Saturation Voltage	(I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	$V_{CE(sat)}$	 −	0.4 0.75	Vdc
Base−Emitter Saturation Voltage	(I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	$V_{BE(sat)}$	0.75 −	0.95 1.2	Vdc
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product	(I_C = 20 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	f_T	250	−	MHz
Collector−Base Capacitance	(V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{cb}	−	6.5	pF
Emitter−Base Capacitance	(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{eb}	−	30	pF
Input Impedance	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{ie}	1.0	15	k Ω
Voltage Feedback Ratio	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{re}	0.1	8.0	X 10^{-4}
Small−Signal Current Gain	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{fe}	40	500	−
Output Admittance	(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{oe}	1.0	30	μmhos
SWITCHING CHARACTERISTICS					
Delay Time	(V_{CC} = 30 Vdc, V_{BE} = 2.0 Vdc, I_C = 150 mAdc, I_{B1} = 15 mAdc)	t_d	−	15	ns
Rise Time		t_r	−	20	ns
Storage Time	(V_{CC} = 30 Vdc, I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc)	t_s	−	225	ns
Fall Time		t_f	−	30	ns

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

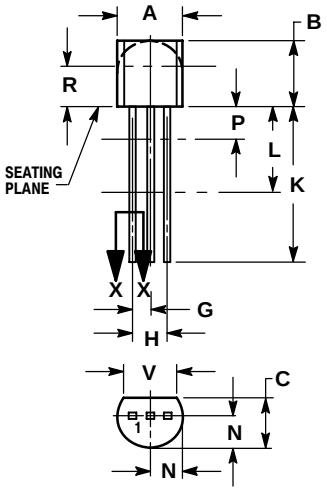
ORDERING INFORMATION

Device	Package	Shipping†
2N4401	TO−92	5000 Units / Bulk
2N4401G	TO−92 (Pb−Free)	5000 Units / Bulk
2N4401RLRA	TO−92	2000 / Tape & Reel
2N4401RLRAG	TO−92 (Pb−Free)	2000 / Tape & Reel
2N4401RLRMG	TO−92 (Pb−Free)	2000 / Ammo Pack
2N4401RLRP	TO−92	2000 / Ammo Pack
2N4401RLRPG	TO−92 (Pb−Free)	2000 / Ammo Pack

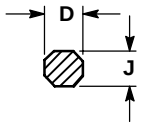
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO−92 (TO−226)
CASE 29−11
ISSUE AM



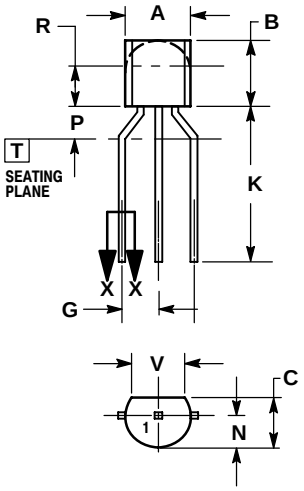
STRAIGHT LEAD
BULK PACK



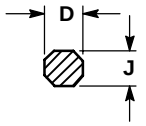
SECTION X−X

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.

	INCHES		MILLIMETERS	
DIM	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	---



BENT LEAD
TAPE & REEL
AMMO PACK



SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	MILLIMETERS	
DIM	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

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