

# SMALL SIGNAL NPN TRANSISTOR

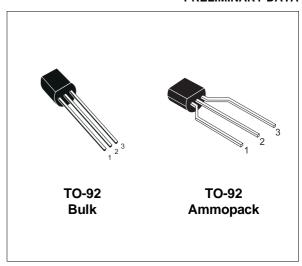
#### **PRELIMINARY DATA**

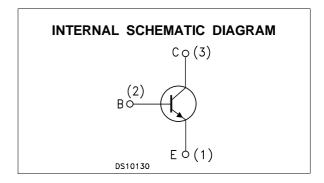
Ordering Code	Marking	Package / Shipment
PN2222A	PN2222A	TO-92 / Bulk
PN2222A-AP	PN2222A	TO-92 / Ammopack

- SILICON EPITAXIAL PLANAR NPN TRANSISTOR
- TO-92 PACKAGE SUITABLE FOR THROUGH-HOLE PCB ASSEMBLY
- THE PNP COMPLEMENTARY TYPE IS PN2907A

#### **APPLICATIONS**

- WELL SUITABLE FOR TV AND HOME APPLIANCE EQUIPMENT
- SMALL LOAD SWITCH TRANSISTOR WITH HIGH GAIN AND LOW SATURATION VOLTAGE





### **ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CBO</sub>	Collector-Emitter Voltage (I <sub>E</sub> = 0)	75	V
V <sub>CEO</sub>	Collector-Emitter Voltage (I <sub>B</sub> = 0)	40	V
$V_{EBO}$	Emitter-Base Voltage (I <sub>C</sub> = 0)	6	V
Ic	Collector Current	0.6	А
I <sub>CM</sub>	Collector Peak Current (t <sub>p</sub> < 5 ms)	0.8	А
P <sub>tot</sub>	Total Dissipation at T <sub>amb</sub> = 25 °C	500	mW
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
Tj	Max. Operating Junction Temperature	150	°C

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### THERMAL DATA

R <sub>thj-amb</sub> •	Thermal Resistance	Junction-Ambient	Max	250	°C/W
R <sub>thj-case</sub> •	Thermal Resistance	Junction-Case	Max	83.3	°C/W

# **ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25$ $^{o}C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I <sub>CEX</sub>	Collector Cut-off Current (V <sub>BE</sub> = -3 V)	V <sub>CE</sub> = 60 V			10	nA
I <sub>BEX</sub>	Base Cut-off Current (V <sub>BE</sub> = -3 V)	V <sub>CE</sub> = 60 V			20	nA
Ісво	Collector Cut-off Current (I <sub>E</sub> = 0)	$V_{CB} = 75 \text{ V}$ $V_{CB} = 75 \text{ V}$ $T_j = 150 ^{\circ}\text{C}$			10 10	nΑ μΑ
I <sub>EBO</sub>	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 3 V			15	nA
V <sub>(BR)CEO*</sub>	Collector-Emitter Breakdown Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 10 mA	40			V
V <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage (I <sub>E</sub> = 0)	Ic = 10 μA	75			V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)	ΙΕ = 10 μΑ	6			V
V <sub>CE(sat)*</sub>	Collector-Emitter Saturation Voltage	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}$ $I_B = 50 \text{ mA}$			0.3 1	V V
V <sub>BE(sat)*</sub>	Collector-Base Saturation Voltage	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}$ $I_B = 50 \text{ mA}$	0.6		1.2 2	V V
h <sub>FE</sub> *	DC Current Gain	$\begin{array}{llllllllllllllllllllllllllllllllllll$	35 50 75 100 50 40		300	
f <sub>T</sub>	Transition Frequency	I <sub>C</sub> = 20 mA V <sub>CE</sub> = 20V f = 100MHz		270		MHz
С <sub>СВО</sub>	Collector-Base Capacitance	I <sub>E</sub> = 0 V <sub>CB</sub> = 10 V f = 1 MHz		4	8	pF
СЕВО	Emitter-Base Capacitance	I <sub>C</sub> = 0 V <sub>EB</sub> = 0.5 V f = 1MHz		20	25	pF
NF	Noise Figure	$I_C = 0.1 \text{ mA}$ $V_{CE} = 10 \text{ V}$ $f = 1 \text{ KHz}$ $\Delta f = 200 \text{ Hz}$ $R_G = 1 \text{ K}\Omega$		4		dB
h <sub>ie</sub> *	Input Impedance	$V_{CE} = 10 \text{ V}$ $I_{C} = 1 \text{ mA}$ $f = 1 \text{ KHz}$ $V_{CE} = 10 \text{ V}$ $I_{C} = 10 \text{ mA}$ $f = 1 \text{ KHz}$	2 0.25		8 1.25	ΚΩ ΚΩ
h <sub>re</sub> *	Reverse Voltage Ratio	$V_{CE} = 10 \text{ V}$ $I_{C} = 1 \text{ mA}$ $f = 1 \text{ KHz}$ $V_{CE} = 10 \text{ V}$ $I_{C} = 10 \text{ mA}$ $f = 1 \text{ KHz}$			8 4	10 <sup>-4</sup> 10 <sup>-4</sup>
h <sub>fe</sub> *	Small Signal Current Gain	$V_{CE} = 10 \text{ V}$ $I_{C} = 1 \text{ mA}$ $f = 1 \text{ KHz}$ $V_{CE} = 10 \text{ V}$ $I_{C} = 10 \text{ mA}$ $f = 1 \text{ KHz}$	50 75		300 375	
h <sub>oe</sub> *	Output Admittance	V <sub>CE</sub> = 10 V I <sub>C</sub> = 1 mA f = 1 KHz V <sub>CE</sub> = 10 V I <sub>C</sub> = 10 mA f = 1 KHz	5 25		35 200	μS μS

<sup>\*</sup> Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

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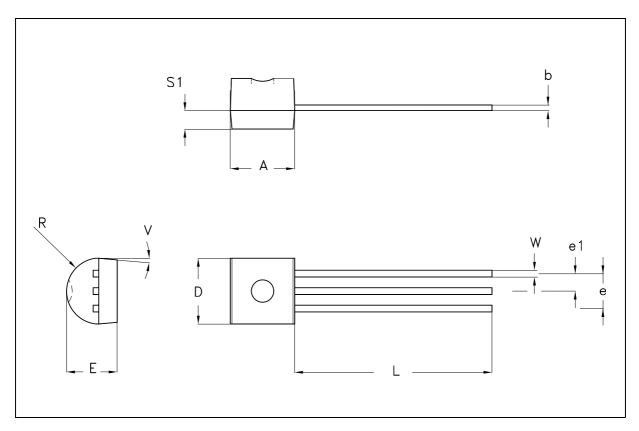
## **ELECTRICAL CHARACTERISTICS** (Continued)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t <sub>d</sub>	Delay Time	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$		5	10	ns
t <sub>r</sub>	Rise Time	Vcc = 30 V		12	25	ns
ts	Storage Time	I <sub>C</sub> = 150 mA I <sub>B1</sub> = - I <sub>B2</sub> = 15 mA		185	225	ns
t <sub>f</sub>	Fall Time	V <sub>CC</sub> = 30 V		24	60	ns

<sup>\*</sup> Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

## **TO-92 MECHANICAL DATA**

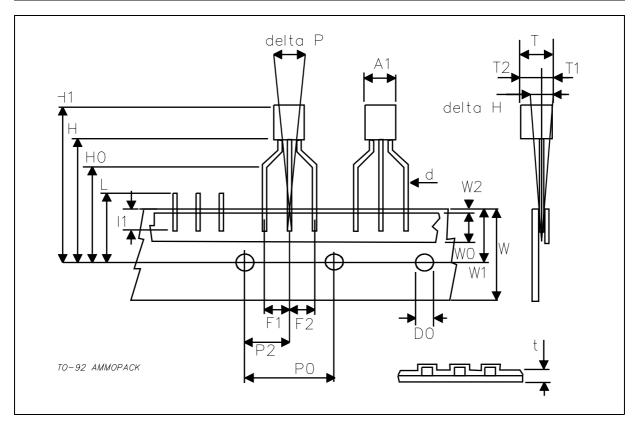
DIM.	mm			inch			
<b>5</b>	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
А	4.32		4.95	0.170		0.195	
b	0.36		0.51	0.014		0.020	
D	4.45		4.95	0.175		0.194	
Е	3.30		3.94	0.130		0.155	
е	2.41		2.67	0.095		0.105	
e1	1.14		1.40	0.045		0.055	
L	12.70		15.49	0.500		0.609	
R	2.16		2.41	0.085		0.094	
S1	1.14		1.52	0.045		0.059	
W	0.41		0.56	0.016		0.022	
V	4 degree		6 degree	4 degree		6 degree	



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# TO-92 AMMOPACK SHIPMENT (Suffix"-AP") MECHANICAL DATA

DIM.		mm			inch			
DIN.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
A1			4.80			0.189		
Т			3.80			0.150		
T1			1.60			0.063		
T2			2.30			0.091		
d			0.48			0.019		
P0	12.50	12.70	12.90	0.492	0.500	0.508		
P2	5.65	6.35	7.05	0.222	0.250	0.278		
F1,F2	2.44	2.54	2.94	0.096	0.100	0.116		
delta H	-2.00		2.00	-0.079		0.079		
W	17.50	18.00	19.00	0.689	0.709	0.748		
W0	5.70	6.00	6.30	0.224	0.236	0.248		
W1	8.50	9.00	9.25	0.335	0.354	0.364		
W2			0.50			0.020		
Н	18.50		20.50	0.728		0.807		
H0	15.50	16.00	16.50	0.610	0.630	0.650		
H1			25.00			0.984		
D0	3.80	4.00	4.20	0.150	0.157	0.165		
t			0.90			0.035		
L			11.00			0.433		
l1	3.00			0.118				
delta P	-1.00		1.00	-0.039		0.039		



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