



**PN2222A**

## SMALL SIGNAL NPN TRANSISTOR

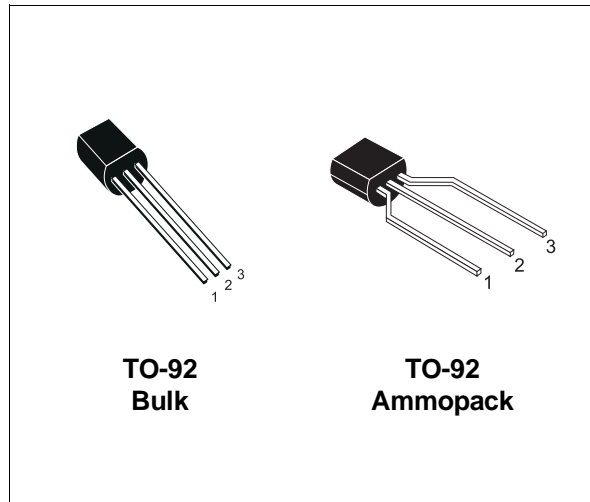
PRELIMINARY DATA

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

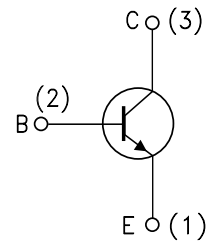
- SILICON EPITAXIAL PLANAR NPN TRANSISTOR
- TO-92 PACKAGE SUITABLE FOR THROUGH-HOLE PCB ASSEMBLY
- THE PNP COMPLEMENTARY TYPE IS PN2907A

### APPLICATIONS

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



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Emitter Voltage ( $I_E = 0$ )	75	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	40	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	6	V
$I_C$	Collector Current	0.6	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	0.8	A
$P_{tot}$	Total Dissipation at $T_{amb} = 25$ °C	500	mW
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	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<sub>case</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	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
I <sub>CBO</sub>	Collector Cut-off Current (I <sub>E</sub> = 0)	V <sub>CB</sub> = 75 V V <sub>CB</sub> = 75 V			10 10	nA μA
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)	I <sub>C</sub> = 10 μA	75			V
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 10 μA	6			V
V <sub>CE(sat)</sub> *	Collector-Emitter Saturation Voltage	I <sub>C</sub> = 150 mA I <sub>B</sub> = 15 mA I <sub>C</sub> = 500 mA I <sub>B</sub> = 50 mA			0.3 1	V V
V <sub>BE(sat)</sub> *	Collector-Base Saturation Voltage	I <sub>C</sub> = 150 mA I <sub>B</sub> = 15 mA I <sub>C</sub> = 500 mA I <sub>B</sub> = 50 mA	0.6		1.2 2	V V
h <sub>FE</sub> *	DC Current Gain	I <sub>C</sub> = 0.1 mA V <sub>CE</sub> = 10 V I <sub>C</sub> = 1 mA V <sub>CE</sub> = 10 V I <sub>C</sub> = 10 mA V <sub>CE</sub> = 10 V I <sub>C</sub> = 150 mA V <sub>CE</sub> = 10 V I <sub>C</sub> = 150 mA V <sub>CE</sub> = 1 V I <sub>C</sub> = 500 mA V <sub>CE</sub> = 10 V	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
C <sub>CB0</sub>	Collector-Base Capacitance	I <sub>E</sub> = 0 V <sub>CB</sub> = 10 V f = 1 MHz		4	8	pF
C <sub>EBO</sub>	Emitter-Base Capacitance	I <sub>C</sub> = 0 V <sub>EB</sub> = 0.5 V f = 1MHz		20	25	pF
NF	Noise Figure	I <sub>C</sub> = 0.1 mA V <sub>CE</sub> = 10 V f = 1 KHz Δf = 200 Hz R <sub>G</sub> = 1 KΩ		4		dB
h <sub>ie</sub> *	Input Impedance	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	2 0.25		8 1.25	KΩ KΩ
h <sub>re</sub> *	Reverse Voltage Ratio	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			8 4	10 <sup>-4</sup> 10 <sup>-4</sup>
h <sub>fe</sub> *	Small Signal Current Gain	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	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

\* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

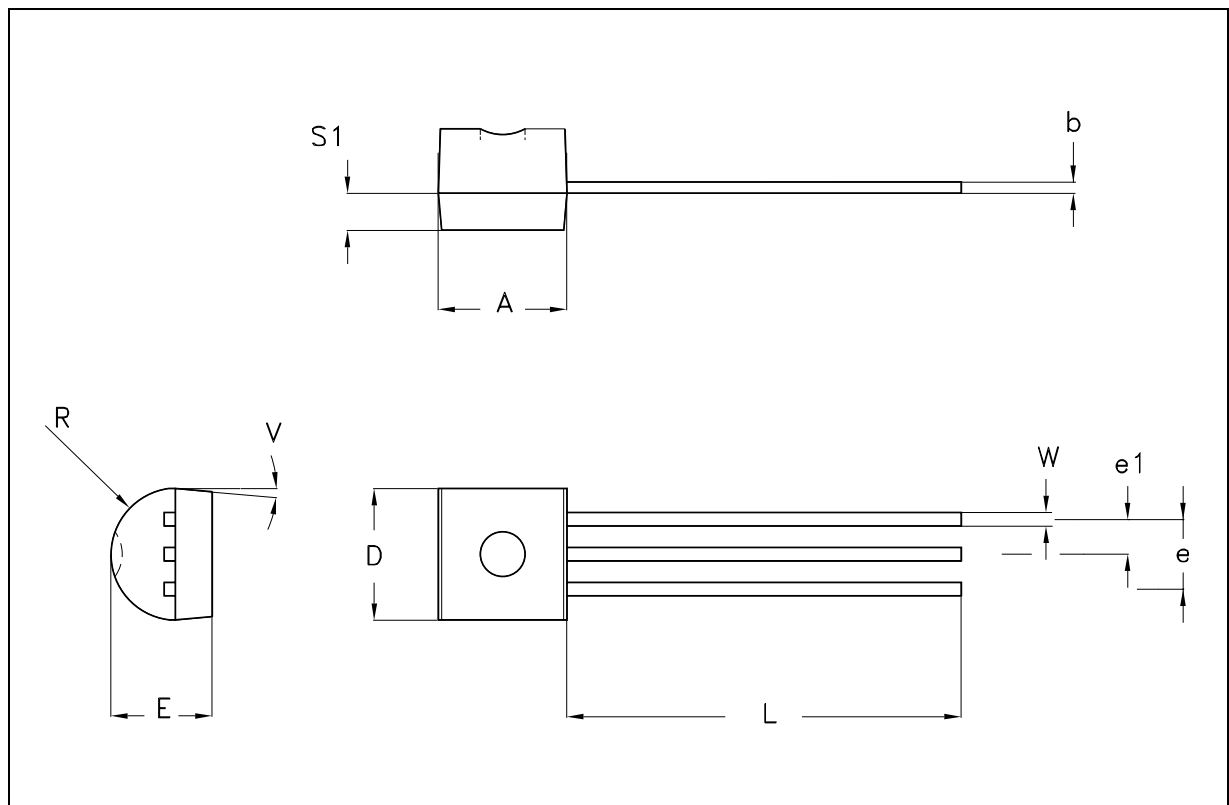
**ELECTRICAL CHARACTERISTICS** (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_d$	Delay Time	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$		5	10	ns
$t_r$	Rise Time	$V_{CC} = 30 \text{ V}$		12	25	ns
$t_s$	Storage Time	$I_C = 150 \text{ mA}$ $I_{B1} = - I_{B2} = 15 \text{ mA}$		185	225	ns
$t_f$	Fall Time	$V_{CC} = 30 \text{ V}$		24	60	ns

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2 \%$

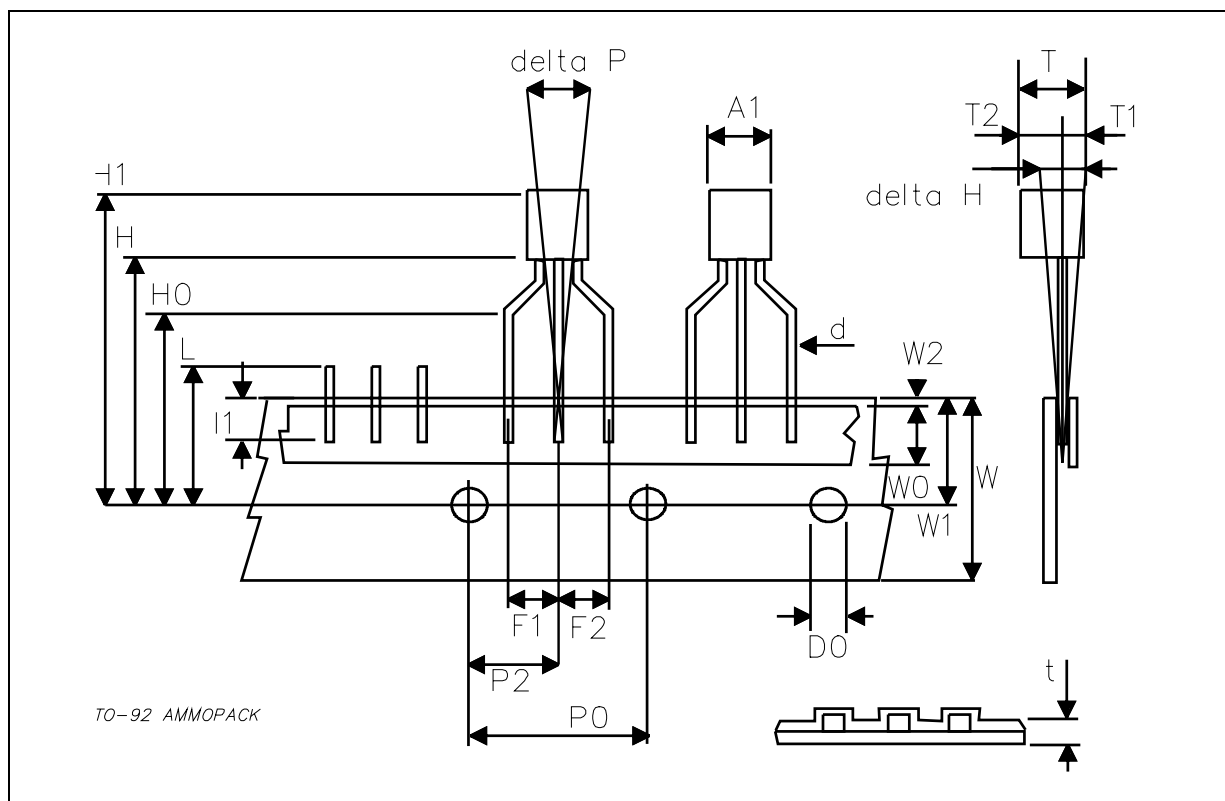
**TO-92 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	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
E	3.30		3.94	0.130		0.155
e	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



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

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A1			4.80			0.189
T			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
H	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
I1	3.00			0.118		
delta P	-1.00		1.00	-0.039		0.039



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