

2N2221A
2N2222A

**SILICON
NPN TRANSISTORS**



TO-18 CASE



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DESCRIPTION:

The CENTRAL SEMICONDUCTOR 2N2221A and 2N2222A are silicon NPN epitaxial planar transistors designed for small signal, general purpose switching applications.

MARKING: FULL PART NUMBER

MAXIMUM RATINGS: ($T_A=25^\circ\text{C}$)

Collector-Base Voltage	
Collector-Emitter Voltage	
Emitter-Base Voltage	
Continuous Collector Current	
Power Dissipation	
Power Dissipation ($T_C=25^\circ\text{C}$)	
Operating and Storage Junction Temperature	
Thermal Resistance	
Thermal Resistance	

SYMBOL

SYMBOL		UNITS
V_{CBO}	75	V
V_{CEO}	40	V
V_{EBO}	6.0	V
I_C	800	mA
P_D	500	mW
P_D	1.8	W
T_J, T_{stg}	-65 to +200	$^\circ\text{C}$
θ_{JA}	350	$^\circ\text{C/W}$
θ_{JC}	97	$^\circ\text{C/W}$

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

SYMBOL	TEST CONDITIONS	MIN	MAX	UNITS	
I_{CBO}	$V_{CB}=60\text{V}$		10	nA	
I_{CBO}	$V_{CB}=60\text{V}, T_A=150^\circ\text{C}$		10	μA	
I_{CEV}	$V_{CE}=60\text{V}, V_{EB}=3.0\text{V}$		10	nA	
I_{EBO}	$V_{EB}=3.0\text{V}$		10	nA	
BV_{CBO}	$I_C=10\mu\text{A}$	75		V	
BV_{CEO}	$I_C=10\text{mA}$	40		V	
BV_{EBO}	$I_E=10\mu\text{A}$	6.0		V	
$V_{CE(SAT)}$	$I_C=150\text{mA}, I_B=15\text{mA}$		0.3	V	
$V_{CE(SAT)}$	$I_C=500\text{mA}, I_B=50\text{mA}$		1.0	V	
$V_{BE(SAT)}$	$I_C=150\text{mA}, I_B=15\text{mA}$	0.6	1.2	V	
$V_{BE(SAT)}$	$I_C=500\text{mA}, I_B=50\text{mA}$		2.0	V	
		2N2221A		2N2222A	
		MIN	MAX	MIN	MAX
h_{FE}	$V_{CE}=10\text{V}, I_C=0.1\text{mA}$	20	-	35	-
h_{FE}	$V_{CE}=10\text{V}, I_C=1.0\text{mA}$	25	-	50	-
h_{FE}	$V_{CE}=10\text{V}, I_C=10\text{mA}$	35	-	75	-
h_{FE}	$V_{CE}=10\text{V}, I_C=10\text{mA}, T_A=-55^\circ\text{C}$	15	-	35	-
h_{FE}	$V_{CE}=10\text{V}, I_C=150\text{mA}$	40	120	100	300
h_{FE}	$V_{CE}=1.0\text{V}, I_C=150\text{mA}$	20	-	50	-
h_{FE}	$V_{CE}=10\text{V}, I_C=500\text{mA}$	25	-	40	-

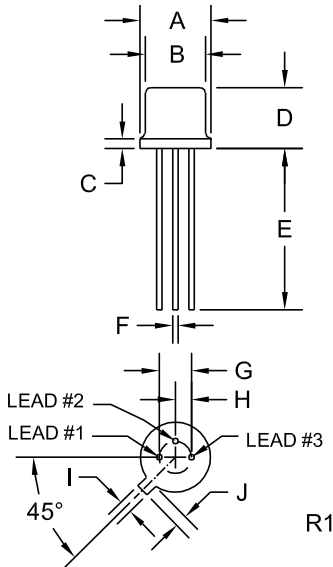
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ELECTRICAL CHARACTERISTICS - Continued: ($T_A=25^\circ\text{C}$)

SYMBOL	TEST CONDITIONS	2N2221A		2N2222A		UNITS
		MIN	MAX	MIN	MAX	
f_T	$V_{CE}=20\text{V}$, $I_C=20\text{mA}$, $f=100\text{MHz}$	250	-	300	-	MHz
C_{ob}	$V_{CB}=10\text{V}$, $I_E=0$, $f=100\text{kHz}$	-	8.0	-	8.0	pF
C_{ib}	$V_{EB}=0.5\text{V}$, $I_C=0$, $f=100\text{kHz}$	-	25	-	25	pF
h_{ie}	$V_{CE}=10\text{V}$, $I_C=1.0\text{mA}$, $f=1.0\text{kHz}$	1.0	3.5	2.0	8.0	k Ω
h_{ie}	$V_{CE}=10\text{V}$, $I_C=10\text{mA}$, $f=1.0\text{kHz}$	0.2	1.0	0.25	1.25	k Ω
h_{re}	$V_{CE}=10\text{V}$, $I_C=1.0\text{mA}$, $f=1.0\text{kHz}$	-	5.0	-	8.0	$\times 10^{-4}$
h_{re}	$V_{CE}=10\text{V}$, $I_C=10\text{mA}$, $f=1.0\text{kHz}$	-	2.5	-	4.0	$\times 10^{-4}$
h_{fe}	$V_{CE}=10\text{V}$, $I_C=1.0\text{mA}$, $f=1.0\text{kHz}$	30	150	50	300	
h_{fe}	$V_{CE}=10\text{V}$, $I_C=10\text{mA}$, $f=1.0\text{kHz}$	50	300	75	375	
h_{oe}	$V_{CE}=10\text{V}$, $I_C=1.0\text{mA}$, $f=1.0\text{kHz}$	3.0	15	5.0	35	μS
h_{oe}	$V_{CE}=10\text{V}$, $I_C=10\text{mA}$, $f=1.0\text{kHz}$	10	100	25	200	μS
$r_b C_C$	$V_{CB}=10\text{V}$, $I_E=20\text{mA}$, $f=31.8\text{MHz}$	-	150	-	150	ps
NF	$V_{CE}=10\text{V}$, $I_C=100\mu\text{A}$, $R_S=1.0\text{k}\Omega$, $f=1.0\text{kHz}$	-	-	-	4.0	dB
t_d	$V_{CC}=30\text{V}$, $V_{BE}=0.5\text{V}$, $I_C=150\text{mA}$, $I_{B1}=15\text{mA}$	-	10	-	10	ns
t_r	$V_{CC}=30\text{V}$, $V_{BE}=0.5\text{V}$, $I_C=150\text{mA}$, $I_{B1}=15\text{mA}$	-	25	-	25	ns
t_s	$V_{CC}=30\text{V}$, $I_C=150\text{mA}$, $I_{B1}=I_{B2}=15\text{mA}$	-	225	-	225	ns
t_f	$V_{CC}=30\text{V}$, $I_C=150\text{mA}$, $I_{B1}=I_{B2}=15\text{mA}$	-	60	-	60	ns

TO-18 CASE - MECHANICAL OUTLINE



SYMBOL	DIMENSIONS			
	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A (DIA)	0.209	0.230	5.31	5.84
B (DIA)	0.178	0.195	4.52	4.95
C	-	0.030	-	0.76
D	0.170	0.210	4.32	5.33
E	0.500	-	12.70	-
F (DIA)	0.016	0.019	0.41	0.48
G (DIA)	0.100		2.54	
H	0.050		1.27	
I	0.036	0.046	0.91	1.17
J	0.028	0.048	0.71	1.22

TO-18 (REV: R1)

LEAD CODE:

- 1) Emitter
- 2) Base
- 3) Collector

MARKING: FULL PART NUMBER

R5 (5-December 2013)