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PN2222A

Silicon NPN Transistor Audio Amplifier, Switch TO-92 Type Package

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$, Note 1 unless otherwise specified)

Collector-Emitter Voltage, V_{CE0}	40V
Collector-Base Voltage, V_{CBO}	75V
Emitter-Base Voltage, V_{EBO}	6V
Continuous Collector Current, I_C	1A
Total Device Dissipation ($T_A = +25^\circ\text{C}$, Note 2), P_D	625mW
Derate Above 25°C	5.0mW/ $^\circ\text{C}$
Operating Junction Temperature Range, T_J	-55° to $+150^\circ\text{C}$
Storage Temperature Range, T_{stg}	-55° to $+150^\circ\text{C}$
Thermal Resistance, Junction to Case (Note 2), R_{thJC}	83.3 $^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient (Note 2), R_{thJA}	200 $^\circ\text{C}/\text{W}$

Note 1. These ratings are based on a maximum junction temperature of $+150^\circ\text{C}$.

Note 2. PCB size: FR-4 76mm x 114mm x 1.57mm (3 inch x 4.5 inch x .062 inch) with minimum land pattern size.

Electrical Characteristics: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 10\text{mA}$, $I_B = 0$, Note 3	40	-	-	V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}$, $I_E = 0$	75	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}$, $I_C = 0$	6	-	-	V
Collector Cutoff Current	I_{CEX}	$V_{CE} = 60\text{V}$, $V_{EB(off)} = 3\text{V}$	-	-	10	nA
		$V_{CE} = 60\text{V}$, $I_E = 0$	-	-	0.01	μA
		$V_{CE} = 60\text{V}$, $I_E = 0$, $T_A = +25^\circ\text{C}$	-	-	10	μA
Emitter Cutoff Current	I_{BEV}	$V_{EB} = 3\text{V}$, $I_C = 0$	-	-	10	nA
Base Cutoff Current	I_{BL}	$V_{CE} = 60\text{V}$, $V_{EB(off)} = 3\text{V}$	-	-	20	nA

Note 3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
ON Characteristics						
DC Current Gain	h_{FE}	$V_{CE} = 1\text{V}, I_C = 0.1\text{mA}$	20	-	-	
		$V_{CE} = 10\text{V}, I_C = 0.1\text{mA}$	35	-	-	
		$V_{CE} = 10\text{V}, I_C = 1\text{mA}$	50	-	-	
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}$	75	-	-	
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}, T_A = -55^\circ\text{C}$	35	-	-	
		$V_{CE} = 10\text{V}, I_C = 150\text{mA}, \text{Note 3}$	100	-	300	
		$V_{CE} = 1\text{V}, I_C = 150\text{mA}, \text{Note 3}$	50	-	-	
		$V_{CE} = 10\text{V}, I_C = 500\text{mA}, \text{Note 3}$	40	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}, \text{Note 3}$	-	-	0.3	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}, \text{Note 3}$	-	-	1.0	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}, \text{Note 3}$	0.6	-	1.2	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}, \text{Note 3}$	-	-	2.0	V
Small-Signal Characteristics						
Current Gain-Bandwidth Product	f_T	$I_C = 20\text{mA}, V_{CE} = 20\text{V}, f = 100\text{MHz}$	300	-	-	MHz
Output Capacitance	C_{obo}	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$	-	-	8	pF
Input Capacitance	C_{ibo}	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$	-	-	25	pF
Collector-Base Time Constant	$r_b'C_c$	$I_C = 20\text{mA}, V_{CB} = 20\text{V}, f = 31.8\text{MHz}$	-	-	150	pS
Noise Figure	NF	$I_C = 100\mu\text{A}, V_{CE} = 10\text{V}, R_S = 1\text{k}\Omega, f = 1\text{kHz}$	-	-	4	dB
Real Part of Common-Emitter High Frequency Input Impedance	$\text{Re}(h_{ie})$	$I_C = 20\text{mA}, V_{CE} = 20\text{V}, f = 300\text{MHz}$	-	-	60	Ω
Switching Characteristics						
Delay Time	t_d	$V_{CC} = 30\text{V}, V_{EB(off)} = 0.5\text{V}, I_C = 150\text{mA}, I_{B1} = 15\text{mA}$	-	-	10	ns
Rise Time	t_r		-	-	25	ns
Storage Time	t_s	$V_{CC} = 30\text{V}, I_C = 150\text{mA}, I_{B1} = I_{B2} = 15\text{mA}$	-	-	225	ns
Fall Time	t_f		-	-	60	ns

Note 3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

