



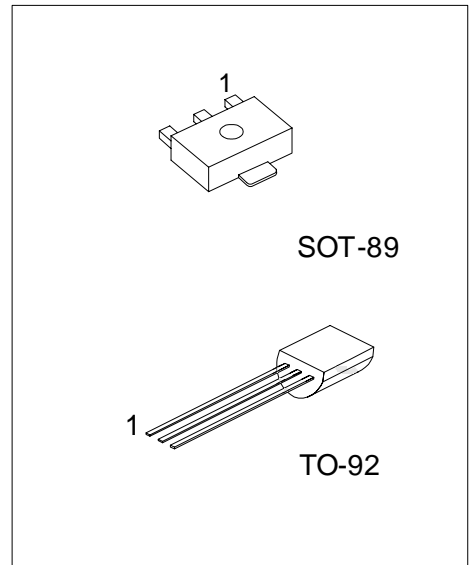
## PN2222A

## NPN SILICON TRANSISTOR

### NPN GENERAL PURPOSE AMPLIFIER

#### FEATURES

\* This device is for use as a medium power amplifier and switch requiring collector currents up to 500mA.



\*Pb-free plating product number: PN2222AL

#### ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
PN2222A-AB3-R	PN2222AL-AB3-R	SOT-89	B	C	E	Tape Reel
PN2222A-AB3-T	PN2222AL-AB3-T	SOT-89	B	C	E	Tube
PN2222A-T92-B	PN2222AL-T92-B	TO-92	E	B	C	Tape Box
PN2222A-T92-K	PN2222AL-T92-K	TO-92	E	B	C	Bulk

<p>PN2222AL-AB3-R</p> <p>(1)Packing Type (2)Package Type (3)Lead Plating</p>	<p>(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube (2) AB3: SOT-89, T92: TO-92 (3) L: Lead Free Plating, Blank: Pb/Sn</p>
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■ ABSOLUTE MAXIMUM RATING (Ta=25 , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector-Base Voltage	V <sub>CBO</sub>	75	V
Collector-Emitter Voltage	V <sub>CEO</sub>	40	V
Emitter-Base Voltage	V <sub>EBO</sub>	6	V
Collector Current	I <sub>C</sub>	0.6	A
Total Device Dissipation	SOT-89	1.2	W
	TO-92	625	mW
Junction Temperature	T <sub>J</sub>	+150	
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	

Note 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

■ THERMAL DATA (Ta=25 , unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT
Thermal resistance, junction to Ambient	SOT-89	104	/W
	TO-92	200	/W

■ ELECTRICAL CHARACTERISTICS (Ta=25 , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	I <sub>C</sub> =10μA, I <sub>E</sub> =0	75			V
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =0	40			V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	I <sub>E</sub> =10μA, I <sub>C</sub> =0	6			V
Collector Cut-off Current	I <sub>CEO</sub>	V <sub>CE</sub> =60V, V <sub>EB(OFF)</sub> =3.0V			10	nA
Collector Cut-Off Current	I <sub>CBO</sub>	V <sub>CB</sub> =60V, I <sub>E</sub> =0			0.01	μA
		V <sub>CB</sub> =60V, I <sub>E</sub> =0, Ta=150			10	μA
Emitter Cut-Off Current	I <sub>EBO</sub>	V <sub>EB</sub> =3.0V, I <sub>C</sub> =0			10	nA
Base Cut-Off Current	I <sub>BL</sub>	V <sub>CE</sub> =60V, V <sub>EB(OFF)</sub> =3.0V			20	nA
<b>ON CHARACTERISTICS</b>						
DC Current Gain	h <sub>FE</sub>	I <sub>C</sub> =0.1mA, V <sub>CE</sub> =10V	35			
		I <sub>C</sub> =1.0mA, V <sub>CE</sub> =10V	50			
		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V	75			
		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V, Ta=-55	35			
		I <sub>C</sub> =150mA, V <sub>CE</sub> =10V*	100		300	
		I <sub>C</sub> =150mA, V <sub>CE</sub> =1.0V*	50			
		I <sub>C</sub> =500mA, V <sub>CE</sub> =10V*	40			
Collector-Emitter Saturation Voltage*	V <sub>CE(SAT)</sub>	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA			0.3	V
		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA			1.0	V
Base-Emitter Saturation Voltage*	V <sub>BE(SAT)</sub>	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA	0.6		1.2	V
		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA			2.0	V
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Transition Frequency	f <sub>T</sub>	I <sub>C</sub> =20mA, V <sub>CE</sub> =20V, f=100MHz	300			MHz
Output Capacitance	C <sub>obo</sub>	V <sub>CB</sub> =10V, I <sub>E</sub> =0, f=100kHz			8.0	pF
Input Capacitance	C <sub>ibo</sub>	V <sub>EB</sub> =0.5V, I <sub>C</sub> =0, f=100kHz			25	pF
Collector Base Time Constant	rb'Cc	I <sub>C</sub> =20mA, V <sub>CB</sub> =20V, f=31.8MHz			150	pS
Noise Figure	NF	I <sub>C</sub> =100μA, V <sub>CE</sub> =10V, R <sub>S</sub> =1.0kΩ, f=1.0kHz			4.0	dB
Real Part of Common-Emitter High Frequency Input Impedance	Re(h <sub>je</sub> )	I <sub>C</sub> =20mA, V <sub>CB</sub> =20V, f=300MHz			60	Ω

■ ELECTRICAL CHARACTERISTICS (Ta=25 , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SWITCHING CHARACTERISTICS						
Delay time	t <sub>D</sub>	V <sub>CC</sub> =30V, V <sub>BE(OFF)</sub> =0.5V,			10	ns
Rise time	t <sub>R</sub>	I <sub>C</sub> =150mA, I <sub>B1</sub> =15mA			25	ns
Storage time	t <sub>S</sub>	V <sub>CC</sub> =30V, I <sub>C</sub> =150mA,			225	ns
Fall time	t <sub>F</sub>	I <sub>B1</sub> = I <sub>B2</sub> =15mA			60	ns

Note 1. \*Pulse test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%

## ■ TEST CIRCUIT

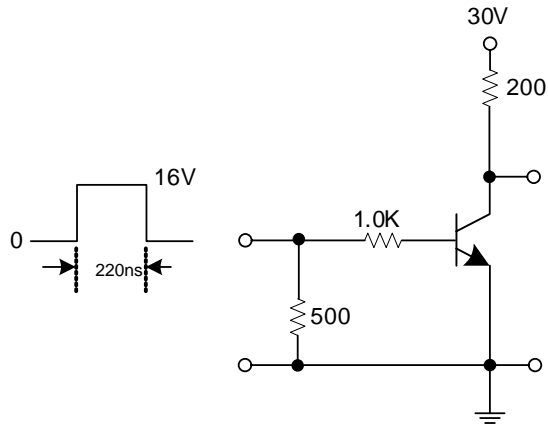


Fig 1. Saturated Turn-On Switching Time

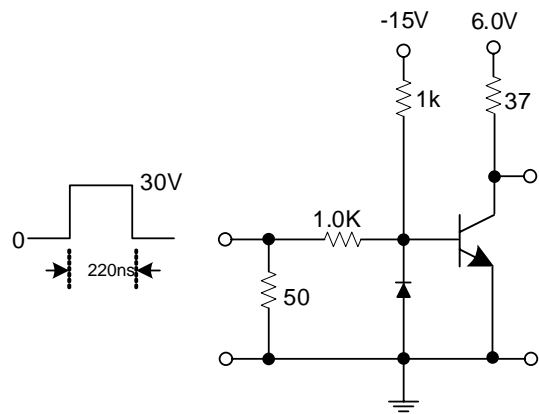
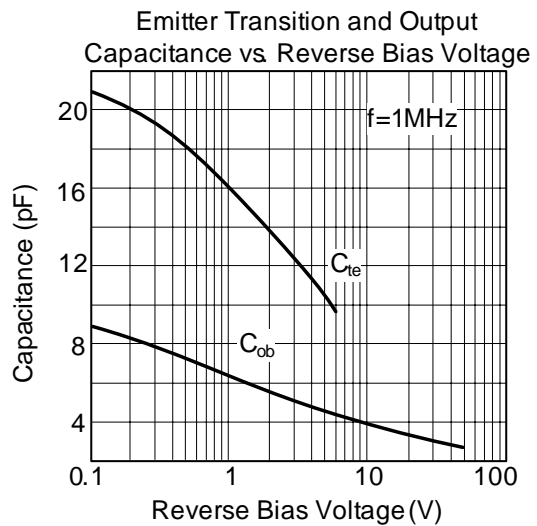
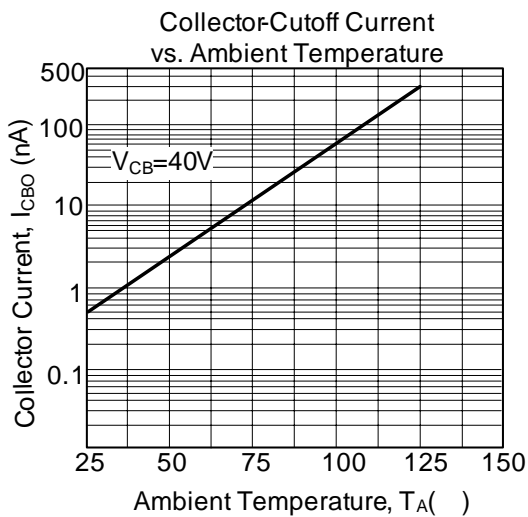
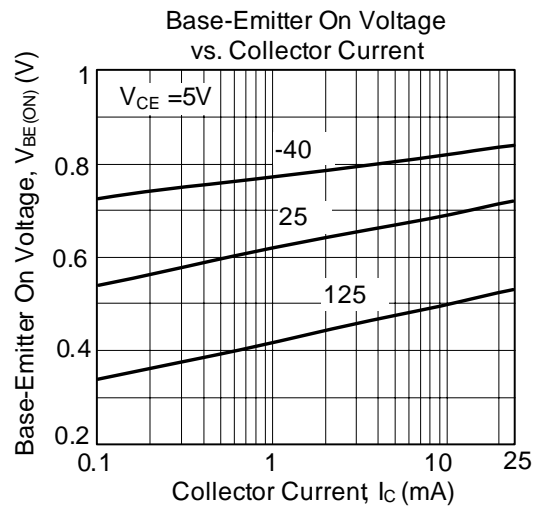
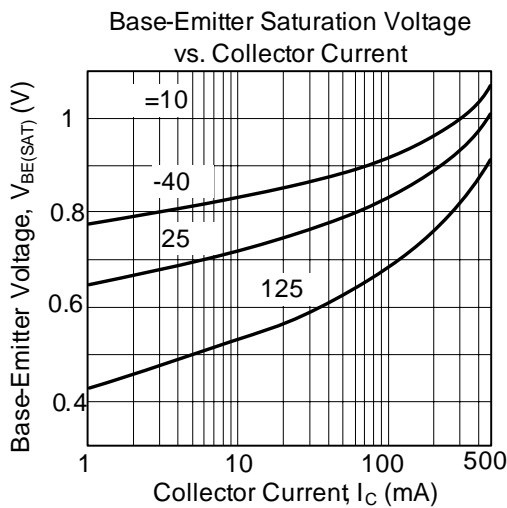
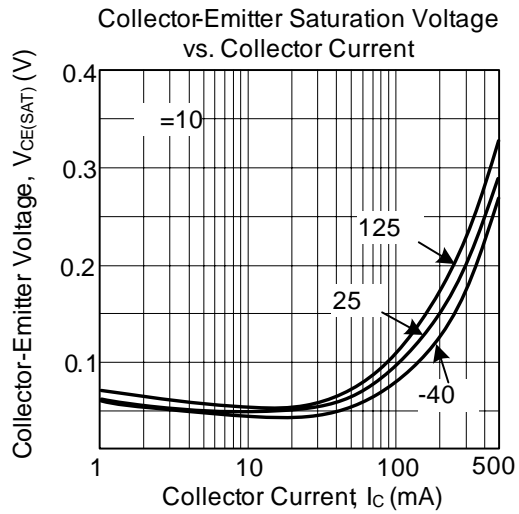
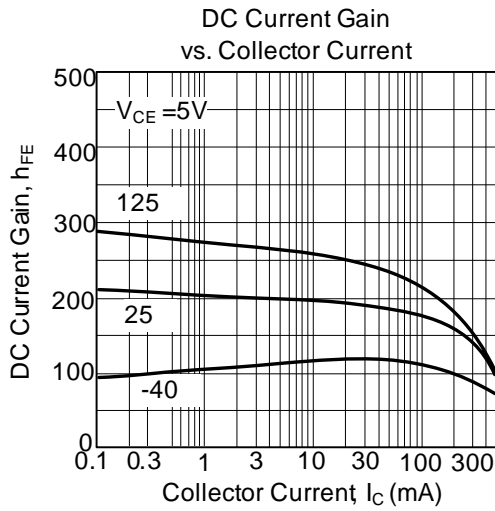
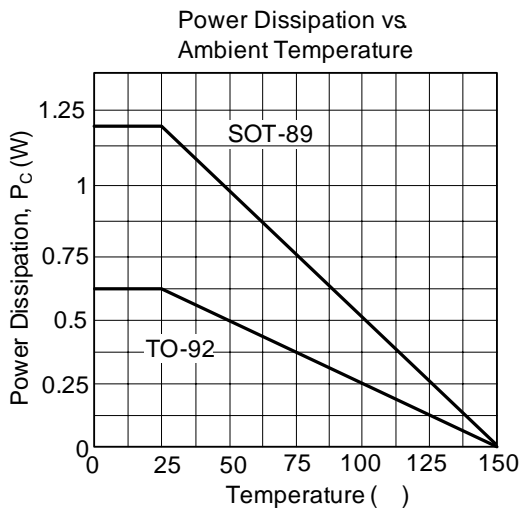
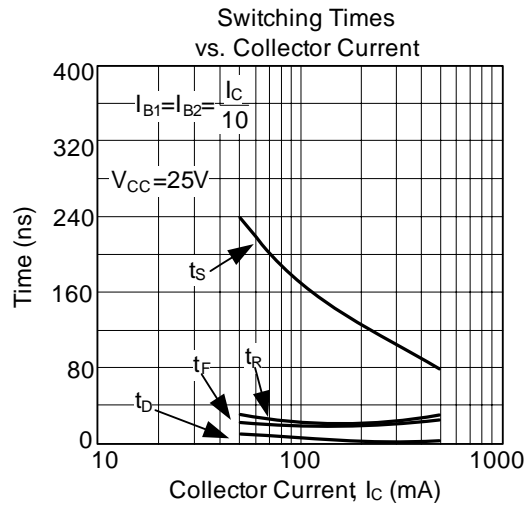
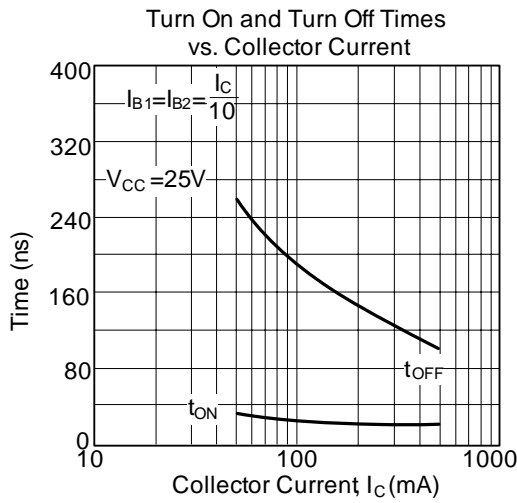


Fig 2. Saturated Turn-Off Switching Time

## TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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