



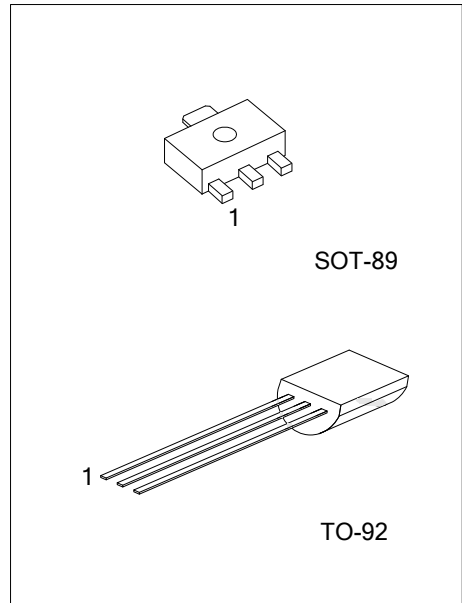
PN2222A

NPN SILICON TRANSISTOR

NPN GENERAL PURPOSE AMPLIFIER

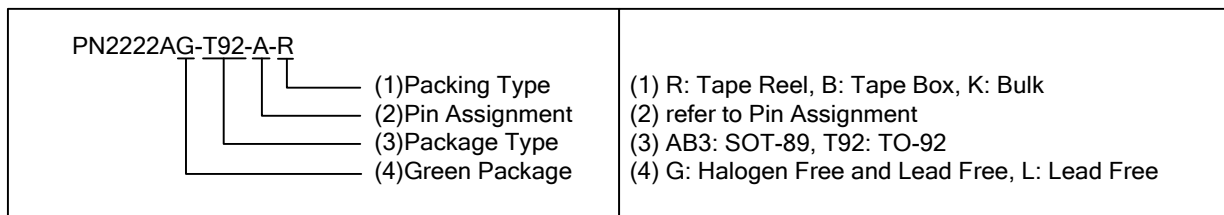
FEATURES

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

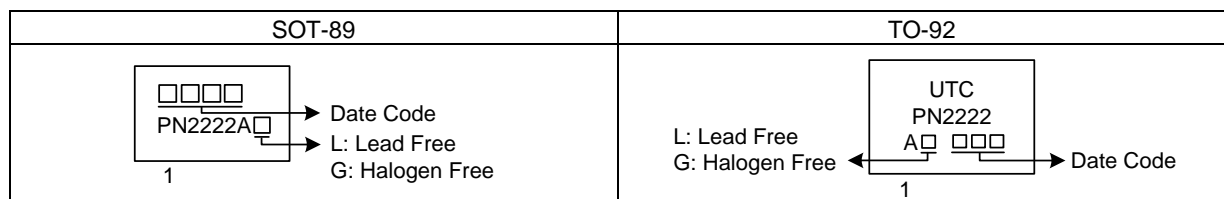


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
PN2222AL-AB3-R	PN2222AG-AB3-R	SOT-89	B	C	E	Tape Reel
PN2222AL-T92-R	PN2222AG-T92-R	TO-92	E	B	C	Tape Reel
PN2222AL-T92-B	PN2222AG-T92-B	TO-92	E	B	C	Tape Box
PN2222AL-T92-K	PN2222AG-T92-K	TO-92	E	B	C	Bulk
PN2222AL-T92-A-R	PN2222AG-T92-A-R	TO-92	E	C	B	Tape Reel
PN2222AL-T92-A-B	PN2222AG-T92-A-B	TO-92	E	C	B	Tape Box
PN2222AL-T92-A-K	PN2222AG-T92-A-K	TO-92	E	C	B	Bulk



MARKING



■ **ABSOLUTE MAXIMUM RATING** ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Base Voltage		V_{CBO}	75	V
Collector-Emitter Voltage		V_{CEO}	40	V
Emitter-Base Voltage		V_{EBO}	6	V
Collector Current		I_C	0.6	A
Total Device Dissipation	SOT-89	P_C	1.2	W
	TO-92		0.6	
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^{\circ}\text{C}$

Note: 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.

■ **THERMAL CHARACTERISTICS** ($T_A=25^{\circ}\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-89	θ_{JA}	104	$^{\circ}\text{C}/\text{W}$
	TO-92		200	
Junction to Case	SOT-89	θ_{JC}	38	$^{\circ}\text{C}/\text{W}$
	TO-92		80	

■ **ELECTRICAL CHARACTERISTICS** ($T_A=25^\circ\text{C}$, unless otherwise specified)

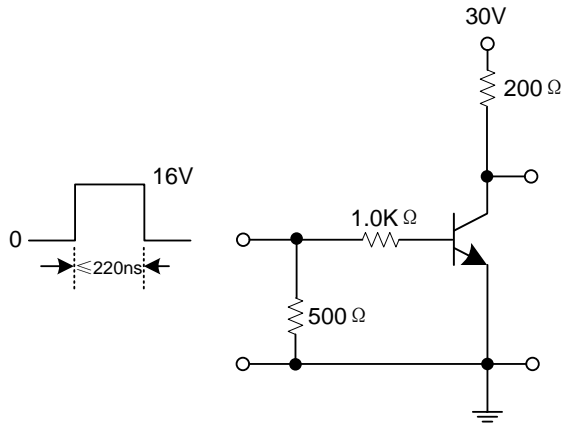
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	$I_C=10\mu\text{A}, I_E=0$	75			V
Collector-Emitter Breakdown Voltage	BV_{CEO}	$I_C=10\text{mA}, I_B=0$	40			V
Emitter-Base Breakdown Voltage	BV_{EBO}	$I_E=10\mu\text{A}, I_C=0$	6			V
Collector Cut-off Current	I_{CEO}	$V_{CE}=60\text{V}, V_{EB(OFF)}=3.0\text{V}$			10	nA
Collector Cut-Off Current	I_{CBO}	$V_{CB}=60\text{V}, I_E=0$			0.01	μA
Emitter Cut-Off Current	I_{EBO}	$V_{EB}=3.0\text{V}, I_C=0$			10	nA
Base Cut-Off Current	I_{BL}	$V_{CE}=60\text{V}, V_{EB(OFF)}=3.0\text{V}$			20	nA
ON CHARACTERISTICS						
DC Current Gain	h_{FE}	$I_C=0.1\text{mA}, V_{CE}=10\text{V}$	35			
		$I_C=1.0\text{mA}, V_{CE}=10\text{V}$	50			
		$I_C=10\text{mA}, V_{CE}=10\text{V}$	75			
		$I_C=150\text{mA}, V_{CE}=10\text{V}$ (Note)	100		300	
		$I_C=150\text{mA}, V_{CE}=1.0\text{V}$ (Note)	50			
		$I_C=500\text{mA}, V_{CE}=10\text{V}$ (Note)	40			
Collector-Emitter Saturation Voltage (Note)	$V_{CE(SAT)}$	$I_C=150\text{mA}, I_B=15\text{mA}$			0.3	V
		$I_C=500\text{mA}, I_B=50\text{mA}$			1.0	
Base-Emitter Saturation Voltage (Note)	$V_{BE(SAT)}$	$I_C=150\text{mA}, I_B=15\text{mA}$	0.6		1.2	V
		$I_C=500\text{mA}, I_B=50\text{mA}$			2.0	
SMALL SIGNAL CHARACTERISTICS						
Transition Frequency	f_T	$I_C=20\text{mA}, V_{CE}=20\text{V}, f=100\text{MHz}$	300			MHz
Output Capacitance	C_{ob}	$V_{CB}=10\text{V}, I_E=0, f=100\text{kHz}$			8.0	pF
Input Capacitance	C_{ib}	$V_{EB}=0.5\text{V}, I_C=0, f=100\text{kHz}$			25	pF
Collector Base Time Constant	τ_{cb}	$I_C=20\text{mA}, V_{CB}=20\text{V}, f=31.8\text{MHz}$			150	pS
Noise Figure	NF	$I_C=100\mu\text{A}, V_{CE}=10\text{V}, R_S=1.0\text{k}\Omega, f=1.0\text{kHz}$			4.0	dB
Real Part of Common-Emitter High Frequency Input Impedance	$\text{Re}(h_{iE})$	$I_C=20\text{mA}, V_{CB}=20\text{V}, f=300\text{MHz}$			60	Ω
SWITCHING CHARACTERISTICS						
Delay time	t_D	$V_{CC}=30\text{V}, V_{BE(OFF)}=0.5\text{V}$			10	ns
Rise time	t_R	$I_C=150\text{mA}, I_{B1}=15\text{mA}$			25	ns
Storage time	t_S	$V_{CC}=30\text{V}, I_C=150\text{mA}$			225	ns
Fall time	t_F	$I_{B1}=I_{B2}=15\text{mA}$			60	ns

Note: Pulse test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$

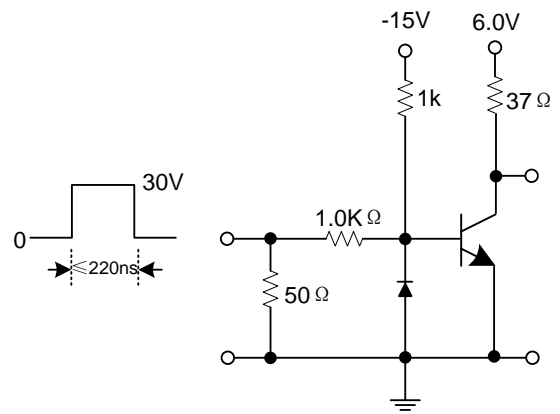
PN2222A

NPN SILICON TRANSISTOR

■ TEST CIRCUIT



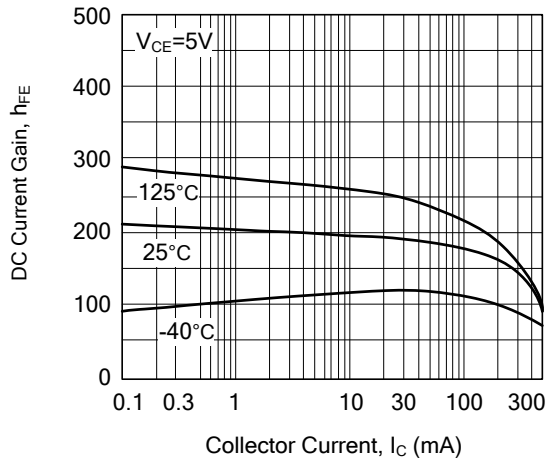
Saturated Turn-On Switching Time



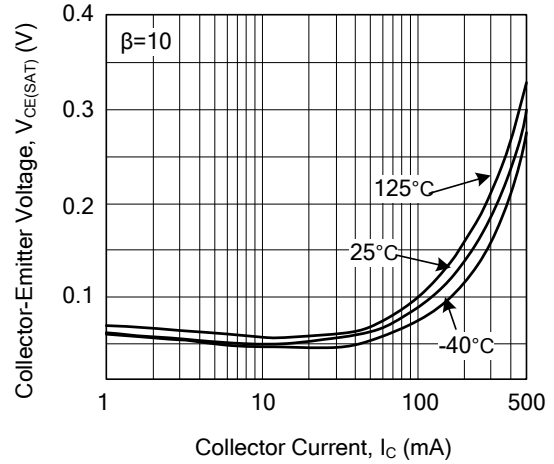
Saturated Turn-Off Switching Time

TYPICAL CHARACTERISTICS

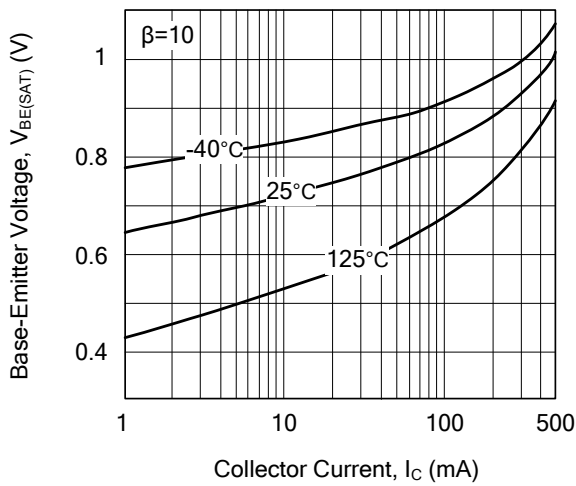
DC Current Gain vs. Collector Current



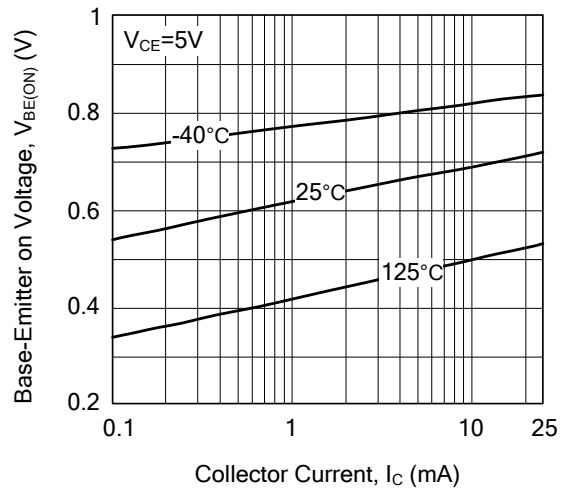
Collector-Emitter Saturation Voltage vs. Collector Current



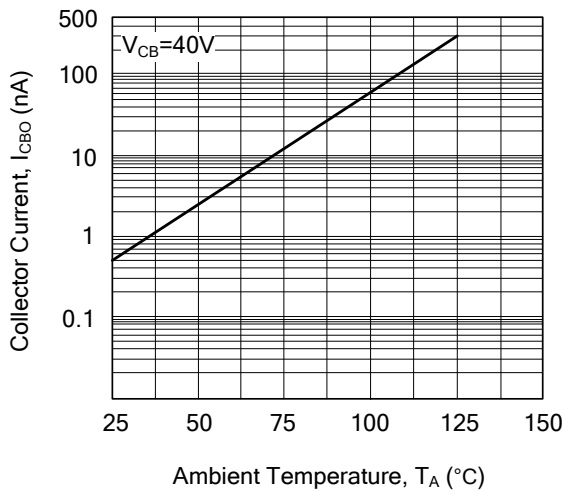
Base-Emitter Saturation Voltage vs. Collector Current



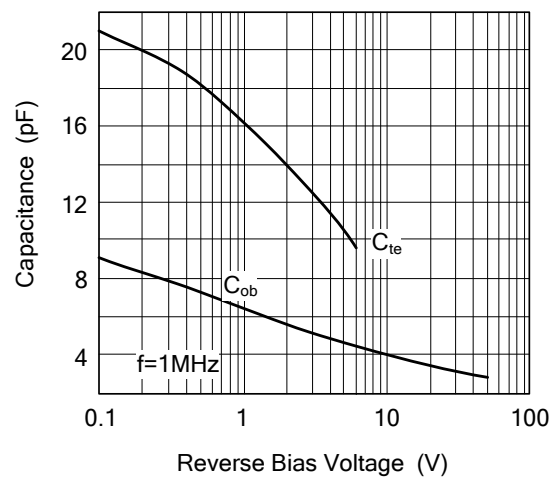
Base-Emitter on Voltage vs. Collector Current



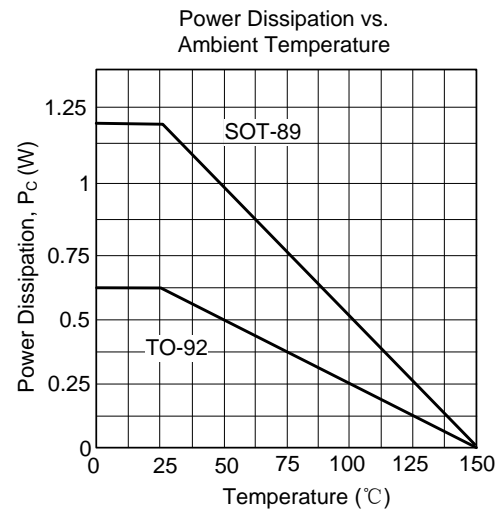
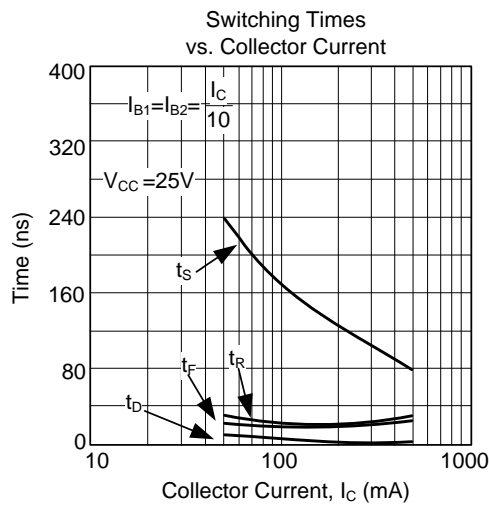
Base-Emitter Saturation Voltage vs. Collector Current



Emitter Transition and Output Capacitance vs. Reverse Bias Voltage



■ TYPICAL CHARACTERISTICS (Cont.)



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