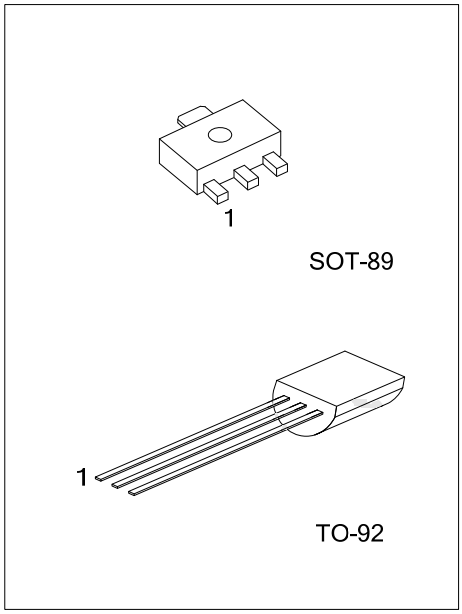
PN2222A

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

Note: Pin Assignment: B: Base C: Collector E: Emitter

PN2222AG-T92-A-R (1)Packing Type (2)Pin Assignment (3)Package Type (4)Green Package	(1) R: Tape Reel, B: Tape Box, K: Bulk (2) refer to Pin Assignment (3) AB3: SOT-89, T92: TO-92 (4) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

SOT-89	TO-92
□□□□ PN2222A□ 1 Date Code L: Lead Free G: Halogen Free	L: Lead Free G: Halogen Free UTC PN2222 A□ □□□ 1 Date Code

■ ABSOLUTE MAXIMUM RATING (T_A=25°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	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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°C, unless otherwise noted)

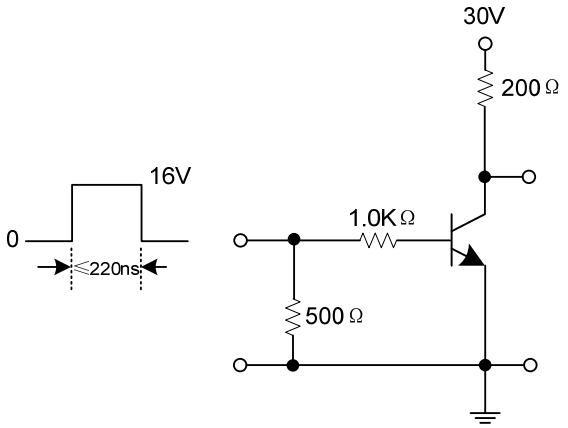
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-89	θ_{JA}	104	°C/W
	TO-92		200	
Junction to Case	SOT-89	θ_{JC}	38	°C/W
	TO-92		80	

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

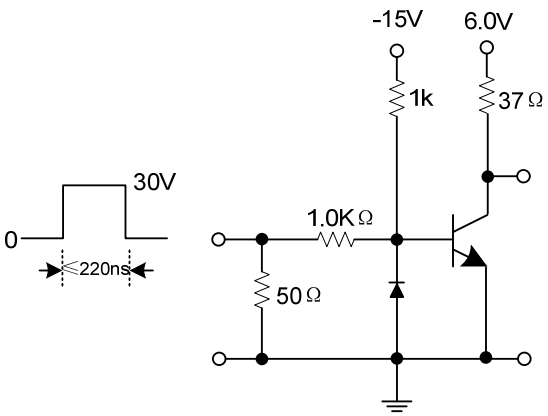
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	I_C=10μA, I_E=0	75			V
Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=10mA, I_B=0	40			V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E=10μA, I_C=0	6			V
Collector Cut-off Current	I_{CEX}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

Note: Pulse test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%

■ TEST CIRCUIT



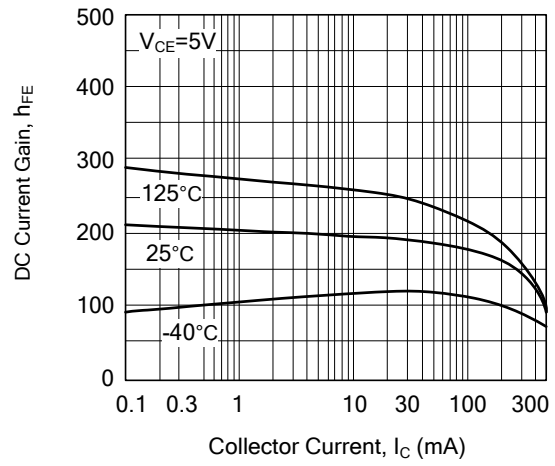
Saturated Turn-On Switching Time



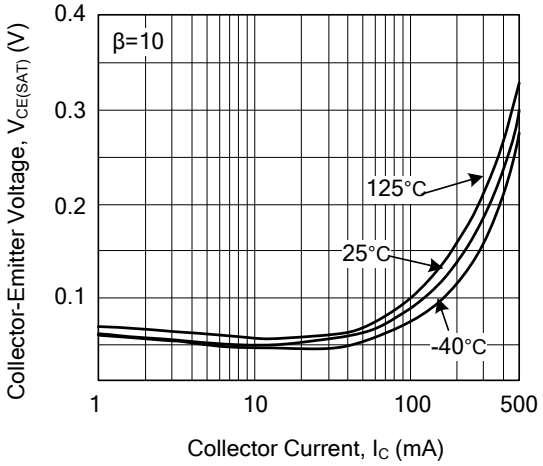
Saturated Turn-Off Switching Time

■ TYPICAL CHARACTERISTICS

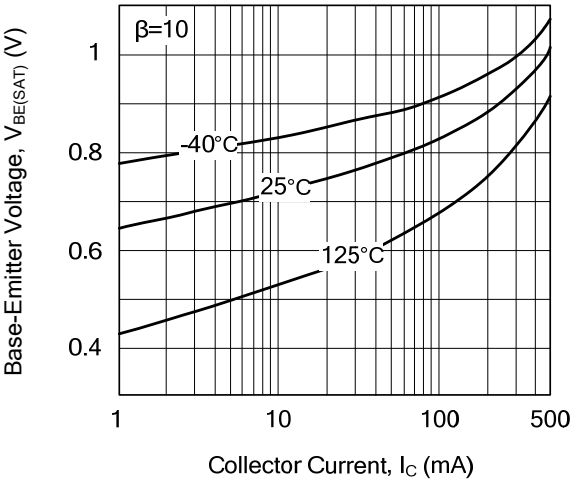
DC Current Gain vs. Collector Current



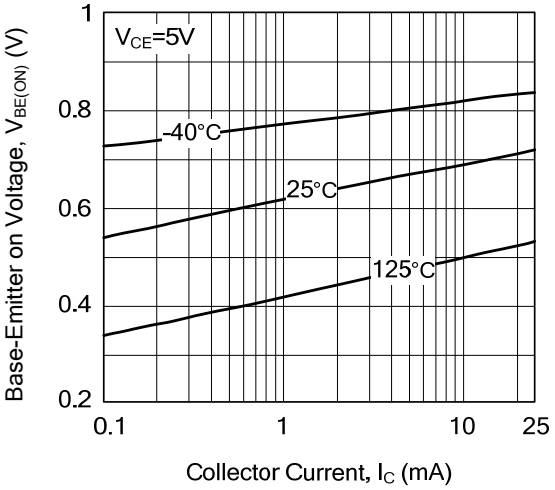
Collector-Emitter Saturation Voltage vs. Collector Current



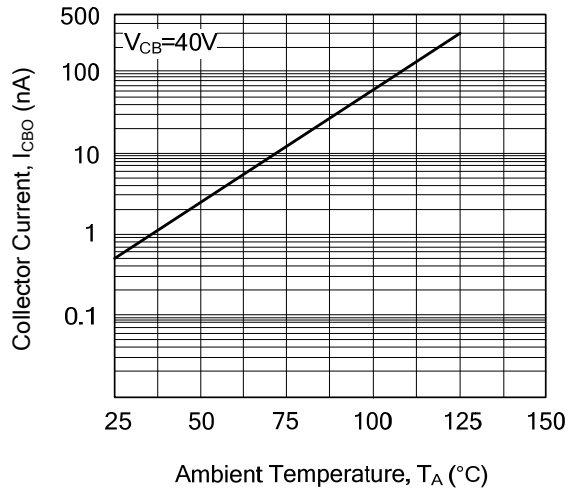
Base-Emitter Saturation Voltage vs. Collector Current



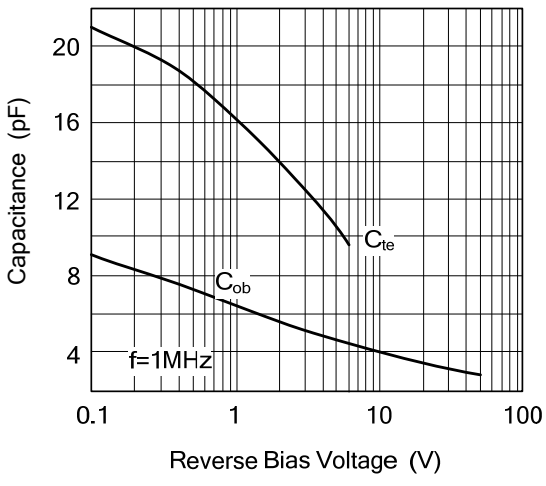
Base-Emitter on Voltage vs. Collector Current



Base-Emitter Saturation Voltage vs. Collector Current



Emitter Transition and Output Capacitance vs. Reverse Bias Voltage



■ TYPICAL CHARACTERISTICS (Cont.)