



# 2N3904

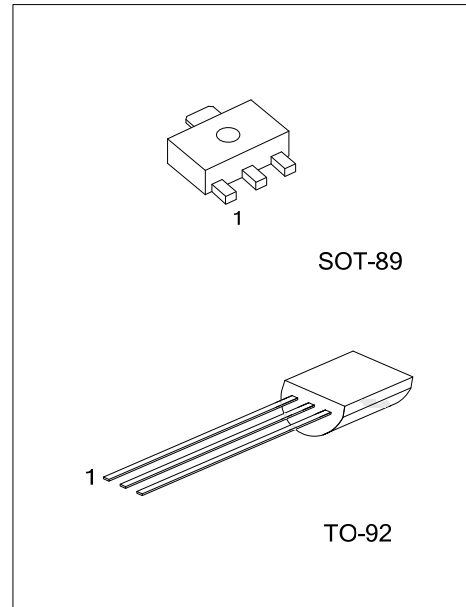
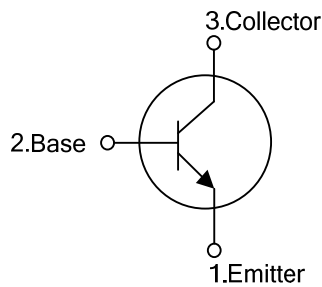
## NPN SILICON TRANSISTOR

### NPN GENERAL PURPOSE AMPLIFIER

■ FEATURES

- \* Collector-Emitter Voltage:  $V_{CE0}=40V$
- \* Complementary to 2N3906

■ FEATURES



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N3904L-AB3-R	2N3904G-AB3-R	SOT-89	B	C	E	Tape Reel
2N3904L-T92-B	2N3904G-T92-B	TO-92	E	B	C	Tape Box
2N3904L-T92-K	2N3904G-T92-K	TO-92	E	B	C	Bulk

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

<p>2N3904G-AB3-R</p>	<p>(1) B: Tape Box, K: Bulk, R: Tape Reel                  (2) AB3: SOT-89, T92: TO-92                  (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

SOT-89	TO-92

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

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Base Voltage		$V_{CBO}$	60	V
Collector-Emitter Voltage		$V_{CEO}$	40	V
Emitter-Base Voltage		$V_{EBO}$	6	V
Collector Current		$I_C$	200	mA
Collector Dissipation	SOT-89	$P_C$	500	mW
	TO-92		625	
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Operating and 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 DATA

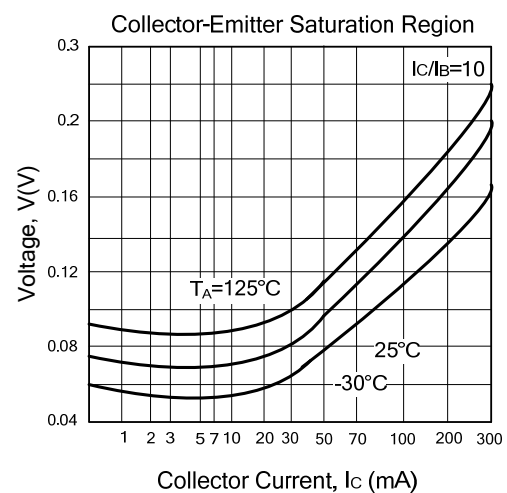
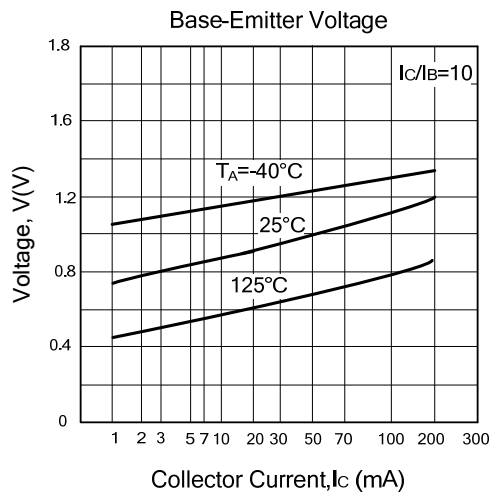
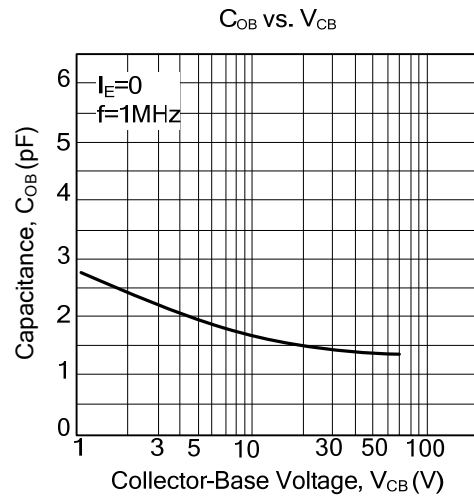
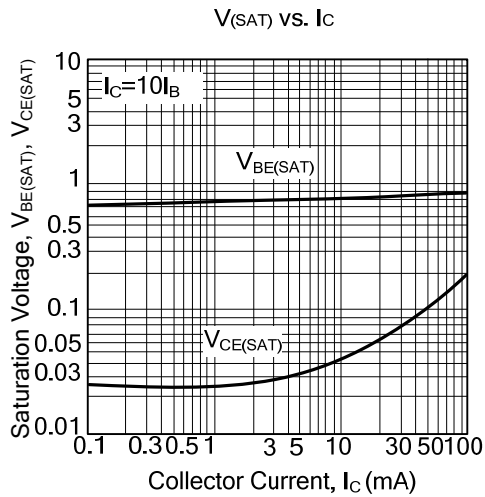
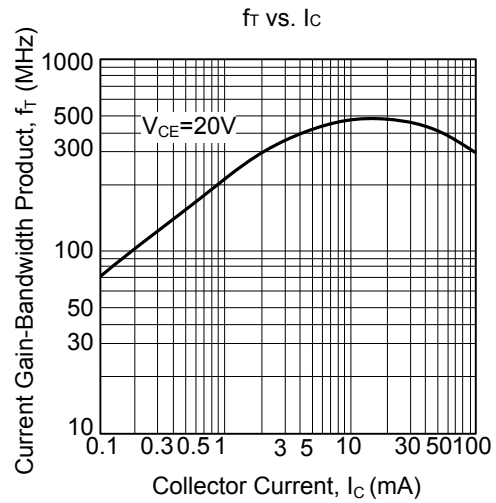
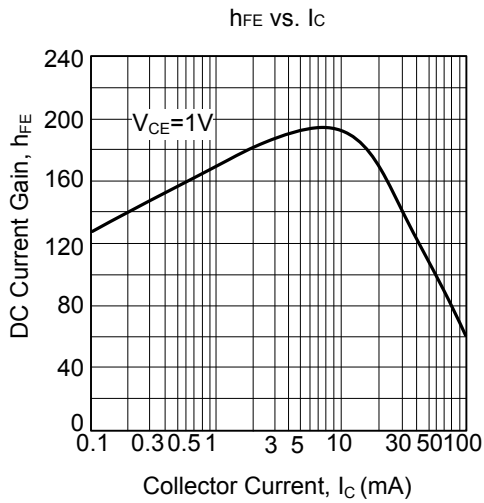
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-89	$\theta_{JA}$	220	$^\circ\text{C/W}$
	TO-92		200	$^\circ\text{C/W}$
Junction to Case	SOT-89	$\theta_{JC}$	38	$^\circ\text{C/W}$
	TO-92		83.3	$^\circ\text{C/W}$

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

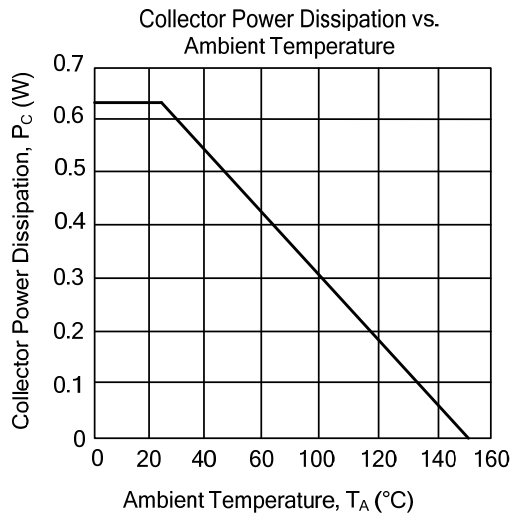
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector-Base Breakdown Voltage	$BV_{CBO}$	$I_C=10\mu\text{A}, I_E=0$	60			V
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	$I_C=1\text{mA}, I_B=0$ (Note)	40			V
Emitter-Base Breakdown Voltage	$BV_{EBO}$	$I_E=10\mu\text{A}, I_C=0$	6			V
Collector-Emitter Saturation Voltage (Note)	$V_{CE(SAT)1}$	$I_C=10\text{mA}, I_B=1\text{mA}$			0.2	V
	$V_{CE(SAT)2}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.3	V
Base-Emitter Saturation Voltage (Note)	$V_{BE(SAT)1}$	$I_C=10\text{mA}, I_B=1\text{mA}$	0.65		0.85	V
	$V_{BE(SAT)2}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.95	V
Collector Cut-off Current	$I_{CBO}$	$V_{CE}=30\text{V}, V_{EB}=3\text{V}$			50	nA
Base Cut-off Current	$I_{BL}$	$V_{CE}=30\text{V}, V_{EB}=3\text{V}$			50	nA
DC Current Gain (note)	$h_{FE1}$	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$	40			
	$h_{FE2}$	$V_{CE}=1\text{V}, I_C=1\text{mA}$	70			
	$h_{FE3}$	$V_{CE}=1\text{V}, I_C=10\text{mA}$	100		300	
	$h_{FE4}$	$V_{CE}=1\text{V}, I_C=50\text{mA}$	60			
	$h_{FE5}$	$V_{CE}=1\text{V}, I_C=100\text{mA}$	30			
Current Gain Bandwidth Product	$f_T$	$V_{CE}=20\text{V}, I_C=10\text{mA}, f=100\text{MHz}$	300			MHz
Output Capacitance	$C_{OB}$	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$			4	pF
Turn on Time	$t_{ON}$	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V}, I_C=10\text{mA}, I_{B1}=1\text{mA}$			70	ns
Turn off Time	$t_{OFF}$	$I_{B1}=1\text{mA}, I_{B2}=1\text{mA}$			250	ns

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

## TYPICAL CHARACTERISTICS



### ■ TYPICAL CHARACTERISTICS(Cont.)



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