



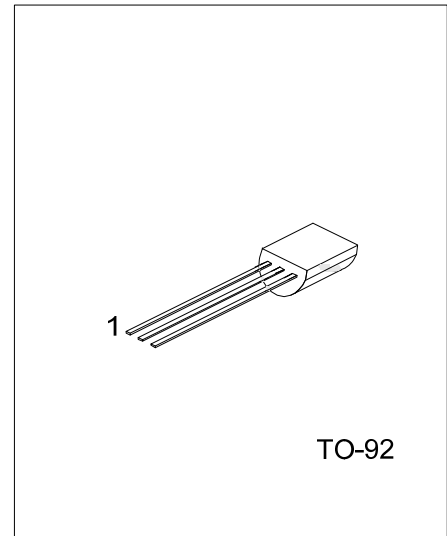
## 2N3904

## NPN SILICON TRANSISTOR

### NPN GENERAL PURPOSE AMPLIFIER

#### ■ FEATURES

- \* Collector-Emitter Voltage:  $V_{CEO}=40V$
- \* Collector Dissipation:  $P_{C(MAX)}=625mW$
- \* Complementary to 2N3906



Lead-free: 2N3904L

Halogen-free: 2N3904G

#### ■ ORDERING INFORMATION

Ordering Number			Package	Pin Assignment			Packing
Normal	Lead Free Plating	Halogen Free		1	2	3	
2N3904-T92-B	2N3904L-T92-B	2N3904G-T92-B	TO-92	E	B	C	Tape Box
2N3904-T92-K	2N3904L-T92-K	2N3904G-T92-K	TO-92	E	B	C	Bulk

<p>2N3904L-T92-B</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p>		<p>(1) B: Tape Box, K: Bulk (2) T92: TO-92 (3) G: Halogen Free, L: Lead Free, Blank: Pb/Sn</p>
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■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

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	$P_C$	625	mW
Junction Temperature	$T_J$	150	°C
Operating and Storage Temperature	$T_{STG}$	-55 ~ +150	°C

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

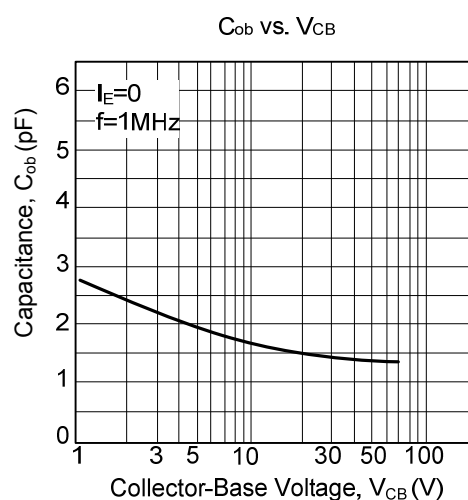
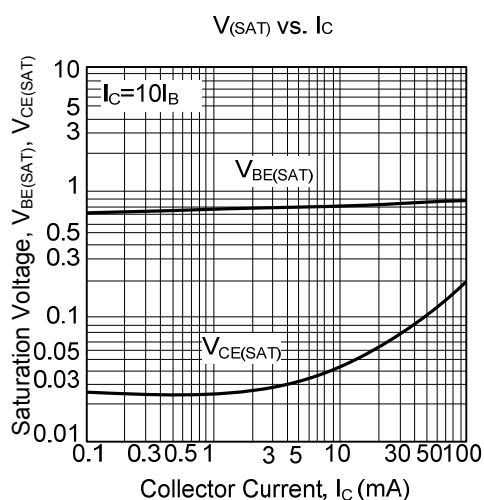
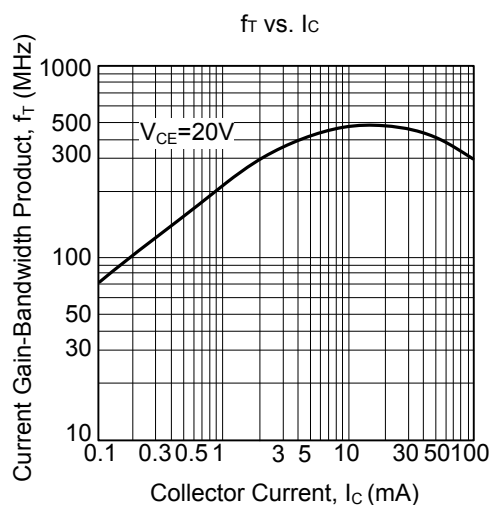
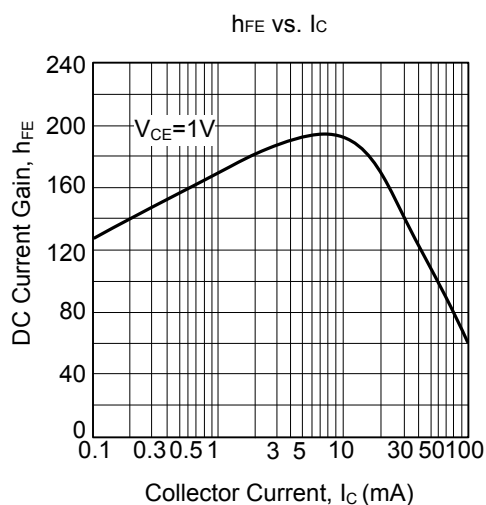
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector-Base Breakdown Voltage	$BV_{CBO}$	$I_C=10\mu A, I_E=0$	60			V
Collector-Emitter Breakdown Voltage (note)	$BV_{CEO}$	$I_C=1mA, I_B=0$	40			V
Emitter-Base Breakdown Voltage	$BV_{EBO}$	$I_E=10\mu A, I_C=0$	6			V
Collector-Emitter Saturation Voltage (note)	$V_{CE(SAT)1}$	$I_C=10mA, I_B=1mA$			0.2	V
	$V_{CE(SAT)2}$	$I_C=50mA, I_B=5mA$			0.3	V
Base-Emitter Saturation Voltage (note)	$V_{BE(SAT)1}$	$I_C=10mA, I_B=1mA$	0.65		0.85	V
	$V_{BE(SAT)2}$	$I_C=50mA, I_B=5mA$			0.95	V
Collector Cut-off Current	$I_{CBO}$	$V_{CE}=30V, V_{EB}=3V$			50	nA
Base Cut-off Current	$I_{BL}$	$V_{CE}=30V, V_{EB}=3V$			50	nA
DC Current Gain (note)	$h_{FE1}$	$V_{CE}=1V, I_C=0.1mA$	40			
	$h_{FE2}$	$V_{CE}=1V, I_C=1mA$	70			
	$h_{FE3}$	$V_{CE}=1V, I_C=10mA$	100		300	
	$h_{FE4}$	$V_{CE}=1V, I_C=50mA$	60			
	$h_{FE5}$	$V_{CE}=1V, I_C=100mA$	30			
Current Gain Bandwidth Product	$f_T$	$V_{CE}=20V, I_C=10mA, f=100MHz$	300			MHz
Output Capacitance	$C_{ob}$	$V_{CB}=5V, I_E=0, f=1MHz$			4	pF
Turn on Time	$t_{ON}$	$V_{CC}=3V, V_{BE}=0.5V, I_C=10mA, I_B1=1mA$			70	ns
Turn off Time	$t_{OFF}$	$I_B1=I_B2=1mA$			250	ns

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

■ TYPICAL CHARACTERISTICS



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