

2N3904

NPN GENERAL PURPOSE SWITCHING TRANSISTOR

VOLTAGE

40 Volts

POWER

625 mWatts

TO-92

Unit: inch (mm)

FEATURES

- NPN epitaxial silicon, planar design
- Collector-emitter voltage $V_{CE} = 40V$
- Collector current $I_C = 200mA$
- Complimentary (PNP) device: 2N3906
- Pb free product are available :99% Sn above can meet RoHS environment substance directive request

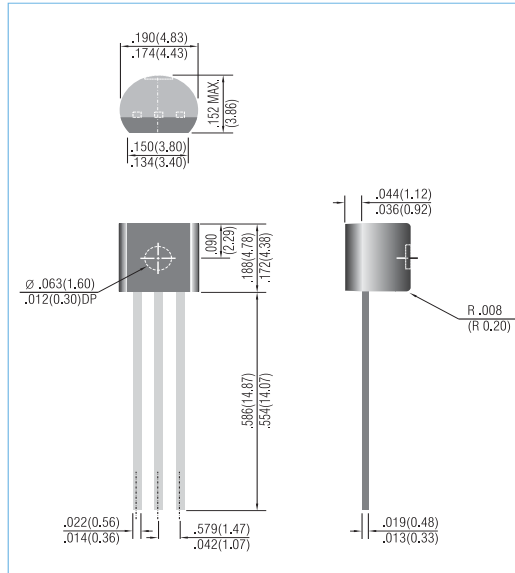
MECHANICAL DATA

Case: TO-92

Terminals: Solderable per MIL-STD-202, Method 208

Approx Weight : 0.02grams

Marking : 3904



ABSOLUTE MAXIMUM RATINGS

PARAMETER	Symbol	Value	Units
Collector - Emitter Voltage	V_{CEO}	40	V
Collector - Base Voltage	V_{CBO}	60	V
Emitter - Base Voltage	V_{EBO}	6.0	V
Collector Current - Continuous	I_C	200	mA

THERMAL CHARACTERISTICS

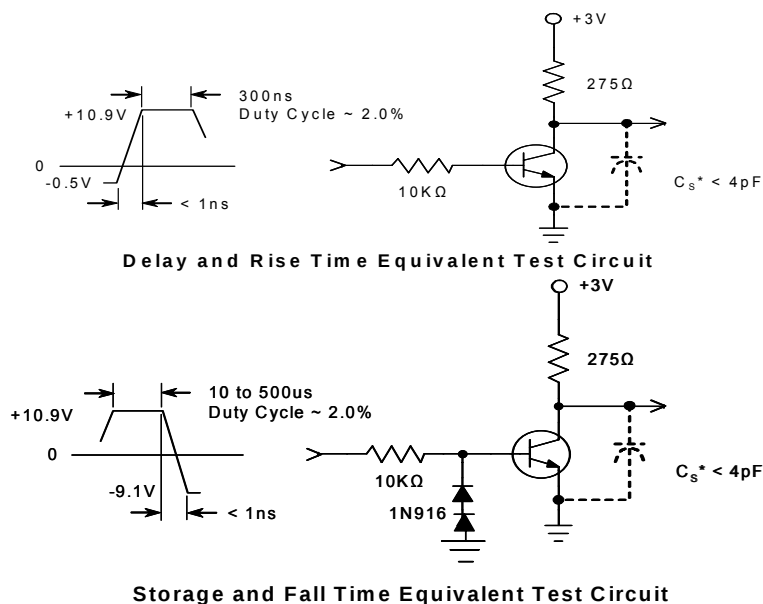
PARAMETER	Symbol	Value	Units
Max Power Dissipation	P_{TOT}	625	mW
Storage Temperature	T_{STG}	-55 to 150	°C
Junction Temperature	T_J	-55 to 150	°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W

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ELECTRICAL CHARACTERISTICS ($T_J=25^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	Symbol	Test Condition	MIN.	TYP.	MAX.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=1.0\text{mA}$, $I_B=0$	40	-	-	V
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=10\mu\text{A}$, $I_E=0$	60	-	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=10\mu\text{A}$, $I_C=0$	6.0	-	-	V
Base Cutoff Current	I_{BEV}	$V_{CE}=30\text{V}$, $V_{EB}=3.0\text{V}$	-	-	50	nA
Collector Cutoff Current	I_{CEX}	$V_{CE}=30\text{V}$, $V_{EB}=3.0\text{V}$	-	-	50	nA
DC Current Gain	h_{FE}	$I_C=0.1\text{mA}$, $V_{CE}=1.0\text{V}$ $I_C=1.0\text{mA}$, $V_{CE}=1.0\text{V}$ $I_C=10\text{mA}$, $V_{CE}=1.0\text{V}$ $I_C=50\text{mA}$, $V_{CE}=1.0\text{V}$ $I_C=100\text{mA}$, $V_{CE}=1.0\text{V}$	40 70 100 60 30	- - - - -	- - 300 - -	-
Collector - Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C=10\text{mA}$, $I_B=1.0\text{mA}$ $I_C=50\text{mA}$, $I_B=5.0\text{mA}$	- -	- -	0.2 0.3	V
Base - Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C=10\text{mA}$, $I_B=1.0\text{mA}$ $I_C=50\text{mA}$, $I_B=5.0\text{mA}$	0.65 -	- -	0.85 0.95	V
Current-Gain - Bandwidth Product	f_T	$I_C=10\text{mA}$, $V_{CE}=20\text{V}$ $f=100\text{MHz}$	300	-	-	MHz
Collector-Base Capacitance	C_{CBO}	$V_{CB}=5.0\text{V}$, $I_E=0$, $f=1\text{MHz}$	-	-	4.0	pF
Emitter - Base Capacitance	C_{EBO}	$V_{EB}=0.5\text{V}$, $I_E=0$, $f=1\text{MHz}$	-	-	8	pF
Delay Time	t_d	$V_{CC}=3\text{V}$, $V_{BE}=0.5\text{V}$, $I_C=10\text{mA}$, $I_{B1}=1\text{mA}$	-	-	35	ns
Rise Time	t_r		-	-	35	ns
Storage Time	t_s		-	-	200	ns
Fall Time	t_f	$V_{CC}=3\text{V}$, $I_C=10\text{mA}$ $I_{B1}=I_{B2}=1\text{mA}$	-	-	50	ns

SWITCHING TIME EQUIVALENT TEST CIRCUITS



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ELECTRICAL CHARACTERISTICS CURVE

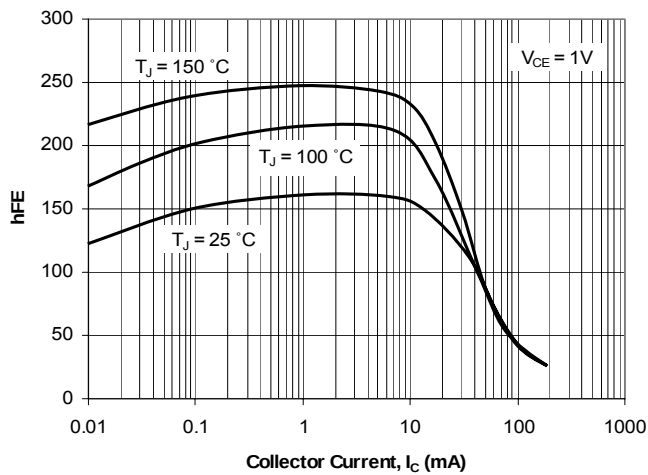


Fig. 1. Typical h_{FE} vs Collector Current

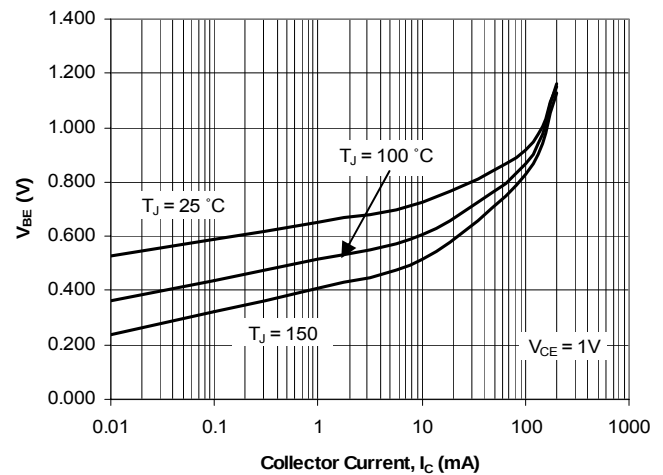


Fig. 2. Typical V_{BE} vs Collector Current

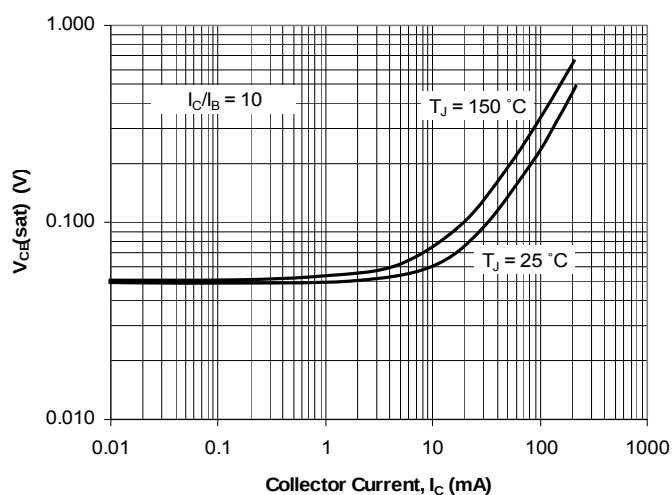


Fig. 3. Typical $V_{CE(sat)}$ vs Collector Current

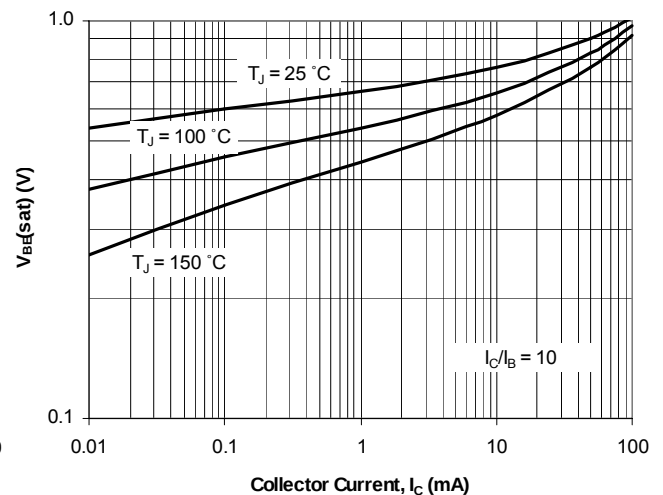


Fig. 4. Typical $V_{BE(sat)}$ vs Collector Current

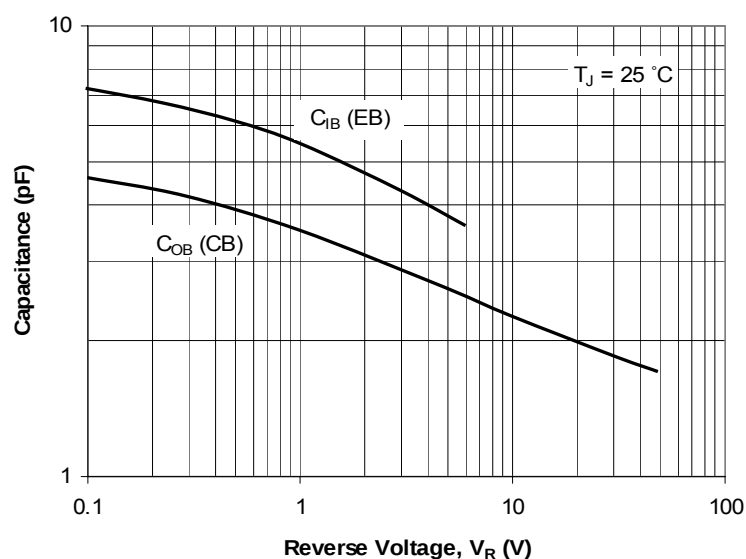
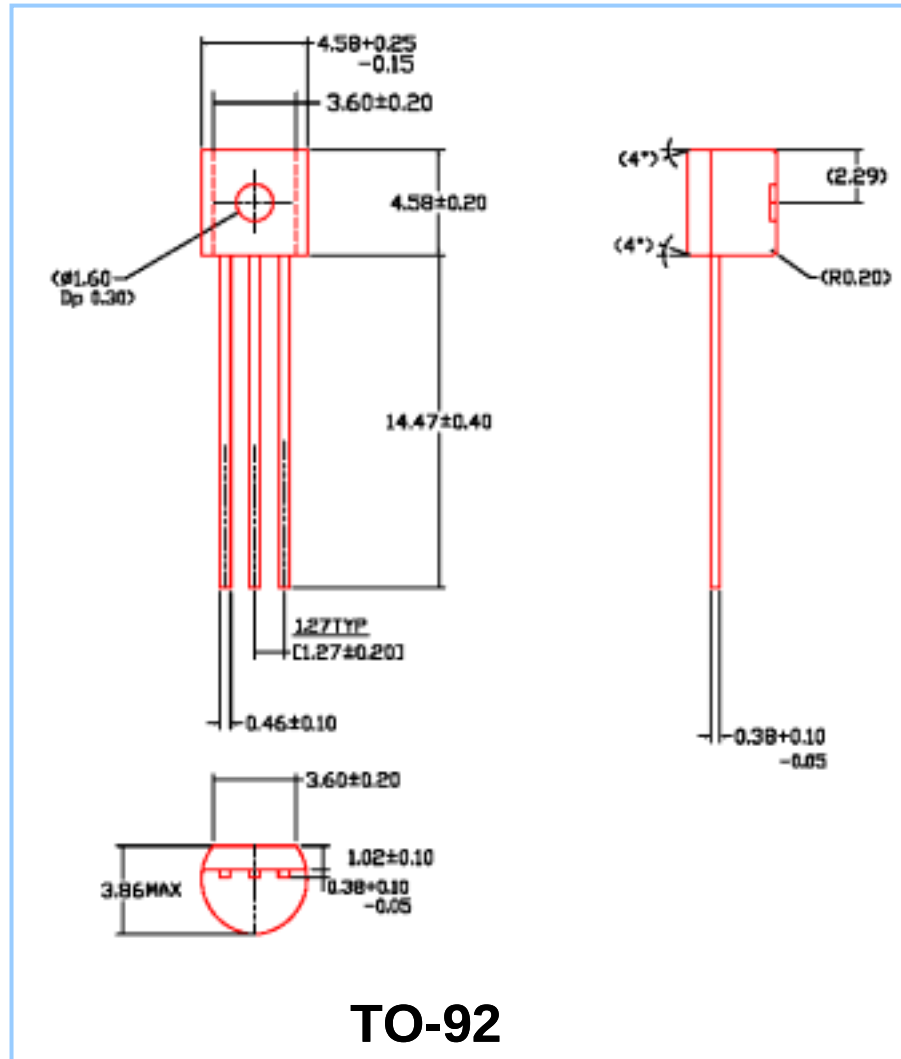


Fig. 5. Typical Capacitances vs Reverse Voltage

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TO-92 Case Outline



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