



GENERAL DESCRIPTION

T3904 is NPN small power and high frequency transistor fabricated on the epitaxial silicon wafers. It is complimentary to T3906. It can be widely used in amplifiers and switching.

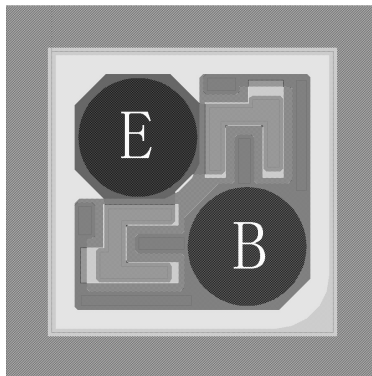
• FEATURES

- Complimentary to T3906
- Collector Current : $I_c = 100 \text{ mA}$ (Max.)
- Collector-emitter voltage: $V_{ce0} = 40\text{V}$ (Max.)

•APPLICATION AND PACKAGE

- Switching and amplification
- TO-92, SOT23 plastic package

LAYOUT



Die Size : $310 \times 310 \mu\text{m}^2$
Die Thickness: $200\mu\text{m} \pm 30\mu\text{m}$
Metallization: Top – Al Back – Au
Bonding Pad Dimension:
Emitter: $\Phi 92 \mu\text{m}$
Base: $\Phi 92 \mu\text{m}$
Coordinates of Pads' Center:
Emitter: (-52.0, 52.0)
Base: (53.0, -53.0)

ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Rating	Units
V _{CB0}	Collector-Base Voltage (open emitter)	60	V
V _{CE0}	Collector-Emitter Voltage (open base)	40	V
V _{EB0}	Emitter -Base Voltage (open collector)	6	V
I _C	Collector Current	100	mA
I _{CM}	Peak Collector Current	200	mA
I _{BM}	Peak Base Current	200	mA
P _C	Collector Power Dissipation ($T_{amb} \leq 25^\circ\text{C}$)	500	mW
T _j	Junction Temperature	150	°C
T _{STG}	Storage Temperature	-65 ~ 150	°C
T _{amb}	ambient Temperature	-65 ~ 150	°C

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
ICBO	Collector Cut-off Current	V _{CB} =30V, I _E =0			50	nA
IEBO	Emitter Cut-off Current	V _{EB} =5V, I _C =0			50	nA
h _{FE}	DC Current Gain	V _{CE} =1V (Note 1) I _C = 0.1 mA I _C = 1 mA I _C = 10 mA I _C = 50mA I _C = 100 mA	40 70 100 60 30		300	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =10mA, I _B =1mA(Note 1)			200	mV
		I _C =50mA, I _B =5mA(Note 1)			300	mV
V _{BE(sat)}	Emitter –Base Saturation Voltage	I _C =10mA, I _B =1mA(Note 1)	650		850	mV
		I _C =50mA, I _B =5mA(Note 1)			950	mV
V _{BE(on)}	Base- Emitter on Voltage	V _{CE} =1V, I _C =10mA			1.0	V
C _c	Collector Capacitance	V _{CB} =5V, I _E =0, f=100 KHZ ~ 1 MHZ			5	pF
C _e	Emitter Capacitance	V _{EB} =0.5V, I _C =0, f=100 KHZ ~ 1 MHZ			15	pF
f _T	Transition frequency	V _{CE} =20V, I _C =10mA	180			MHZ
F	Noise figure	V _{CE} =5V, I _C =100 μA, R _s =1KΩ f=10 Hz ~ 15.7 KHZ		5		dB
Switching times (see Fig. 2)						
ton	Turn-on time	I _{Con} =10mA, I _{Bon} =1mA I _{Boff} = -1mA, V _{cc} =3V, V _{BE} = -0.5V			110	nS
td	Delay time				50	nS
tr	Rise time				60	nS
tf	Fall time				1200	nS
toff	Turn-off time				1000	nS
ts	Storage time				200	nS

Note 1: Pulse test ----- tp ≤ 300 μs; δ = 0.02

h_{FE} CLASSIFICATION

Classification	A	B	C	D	E
h _{FE}	50 ~ 100	85 ~ 160	120 ~ 200	160 ~ 300	250 ~ 350