

Plastic-Encapsulate Transistors

DUAL TRANSISTOR (NPN+PNP)

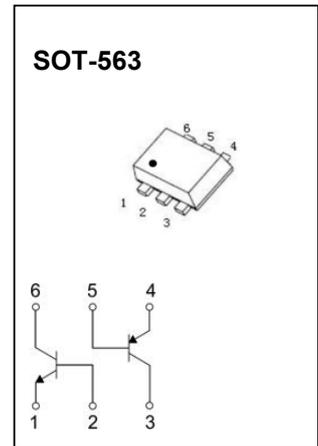
FEATURES

- Complementary Pair
- One 3904-Type NPN
One 3906-Type PNP
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching

MAKING: K46

MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CB0}	Collector-Base Voltage	60	V
V_{CEO}	Collector-Emitter Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5	V
I_c	Collector Current -Continuous	0.2	A
P_c	Collector Power Dissipation	0.2	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55-150	$^\circ\text{C}$



NPN 3904 ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_c = 10\mu\text{A}, I_E=0$	60		V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_c = 1\text{mA}, I_B=0$	40		V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}, I_C=0$	5		V
Collector cut-off current	I_{CBO}	$V_{CB}= 30\text{V}, I_E=0$		0.05	μA
Collector cut-off current	I_{CEO}	$V_{CE}= 30\text{V}, I_B=0$		0.5	μA
Emitter cut-off current	I_{EBO}	$V_{EB}= 5\text{V}, I_C=0$		0.05	μA
DC current gain	$h_{FE(1)}$	$V_{CE}= 1\text{V}, I_C= 0.1\text{mA}$	40		
	$h_{FE(2)}$	$V_{CE}= 1\text{V}, I_C= 1\text{mA}$	70		
	$h_{FE(3)}$	$V_{CE}= 1\text{V}, I_C= 10\text{mA}$	100	300	
	$h_{FE(4)}$	$V_{CE}= 1\text{V}, I_C= 50\text{mA}$	60		
	$h_{FE(5)}$	$V_{CE}= 1\text{V}, I_C= 100\text{mA}$	30		
Collector-emitter saturation voltage	$V_{CE(sat)1}$	$I_C=10\text{mA}, I_B= 1\text{mA}$		0.2	V
	$V_{CE(sat)2}$	$I_C=50\text{mA}, I_B= 5\text{mA}$		0.3	V
Base-emitter saturation voltage	$V_{BE(sat)1}$	$I_C= 10\text{mA}, I_B= 1\text{mA}$	0.65	0.85	V
	$V_{BE(sat)2}$	$I_C= 50\text{mA}, I_B= 5\text{mA}$		0.95	V
Transition frequency	f_T	$V_{CE}=20\text{V}, I_C=20\text{mA}, f=100\text{MHz}$	300		MHz
Noise figure	NF	$V_{CE}=5\text{V}, I_C=0.1\text{mA}, f=1\text{KHz}, R_g=1\text{K}\Omega$		5	dB
Output capacitance	C_{ob}	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$		4	pF
Delay time	t_d	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V}$		35	nS
Rise time	t_r	$I_C=10\text{mA}, I_{B1}=-I_{B2}=1\text{mA}$		35	nS
Storage time	t_s	$V_{CC}=3\text{V}, I_C=10\text{mA}$		200	nS
Fall time	t_f	$I_{B1}=-I_{B2}= 1\text{mA}$		50	nS

MAXIMUM RATINGS($T_a=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	-40	V
V_{CEO}	Collector-Emitter Voltage	-40	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_c	Collector Current -Continuous	-0.2	A
P_C	Collector Power Dissipation	0.2	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55-150	$^\circ\text{C}$

PNP 3906 ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=-10\mu\text{A}, I_E=0$	-40			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=-1\text{mA}, I_B=0$	-40			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=-10\mu\text{A}, I_C=0$	-5			V
Collector cut-off current	I_{CBO}	$V_{CB}=-30\text{V}, I_E=0$			-0.05	μA
Emitter cut-off current	I_{EBO}	$V_{EB}=-5\text{V}, I_C=0$			-0.05	μA
DC current gain	$h_{FE(1)}$	$V_{CE}=-1\text{V}, I_C=-0.1\text{mA}$	60			
	$h_{FE(2)}$	$V_{CE}=-1\text{V}, I_C=-1\text{mA}$	80			
	$h_{FE(3)}$	$V_{CE}=-1\text{V}, I_C=-10\text{mA}$	100		300	
	$h_{FE(4)}$	$V_{CE}=-1\text{V}, I_C=-50\text{mA}$	60			
	$h_{FE(5)}$	$V_{CE}=-1\text{V}, I_C=-100\text{mA}$	30			
Collector-emitter saturation voltage	$V_{CE(sat)1}$	$I_C=-10\text{mA}, I_B=-1\text{mA}$			-0.25	V
	$V_{CE(sat)2}$	$I_C=-50\text{mA}, I_B=-5\text{mA}$			-0.4	V
Base-emitter saturation voltage	$V_{BE(sat)1}$	$I_C=-10\text{mA}, I_B=-1\text{mA}$	-0.65		-0.85	V
	$V_{BE(sat)2}$	$I_C=-50\text{mA}, I_B=-5\text{mA}$			-0.95	V
Transition frequency	f_T	$V_{CE}=-20\text{V}, I_C=-10\text{mA}, f=100\text{MHz}$	250			MHz
Collector output capacitance	C_{ob}	$V_{CB}=-5\text{V}, I_E=0, f=1\text{MHz}$			4.5	pF
Noise figure	NF	$V_{CE}=-5\text{V}, I_C=-0.1\text{mA}, f=1\text{KHz}, R_g=1\text{K}\Omega$			4	dB
Delay time	t_d	$V_{CC}=-3\text{V}, V_{BE}=-0.5\text{V}$			35	nS
Rise time	t_r	$I_C=-10\text{mA}, I_{B1}=-I_{B2}=-1\text{mA}$			35	nS
Storage time	t_s	$V_{CC}=-3\text{V}, I_C=-10\text{mA}$			225	nS
Fall time	t_f	$I_{B1}=-I_{B2}=-1\text{mA}$			75	nS

Typical Characteristics

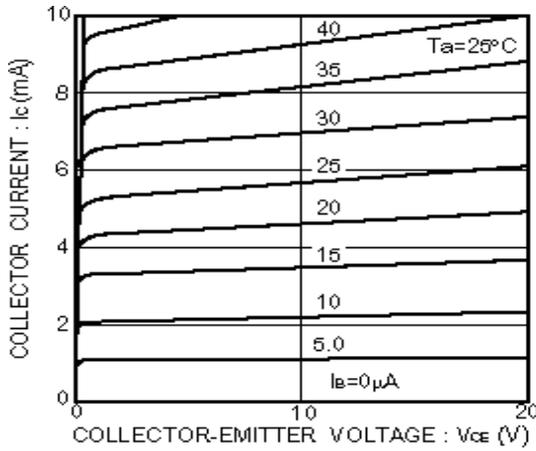


Fig.1 Grounded emitter output characteristics

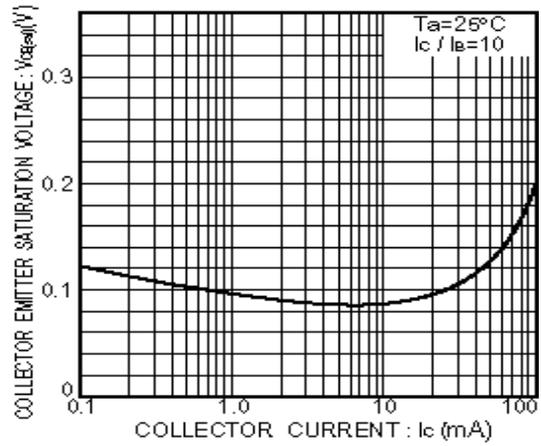


Fig.2 Collector-emitter saturation voltage vs. collector current

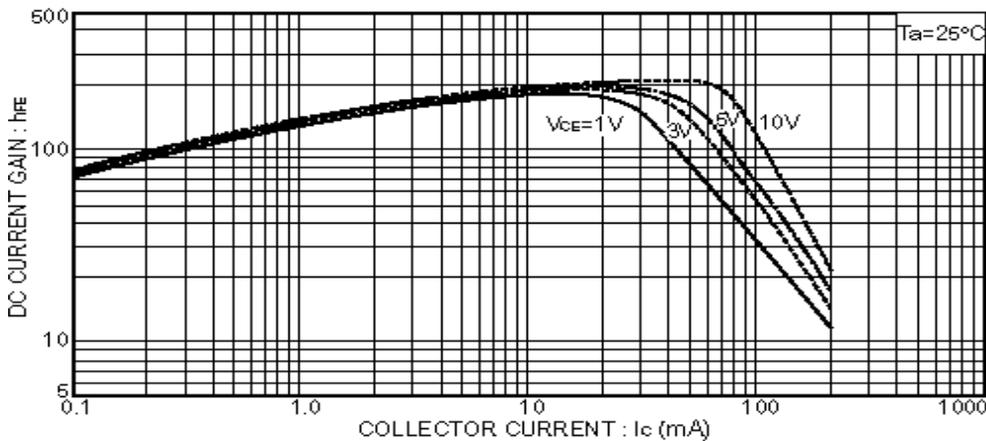


Fig.3 DC current gain vs. collector current (I)

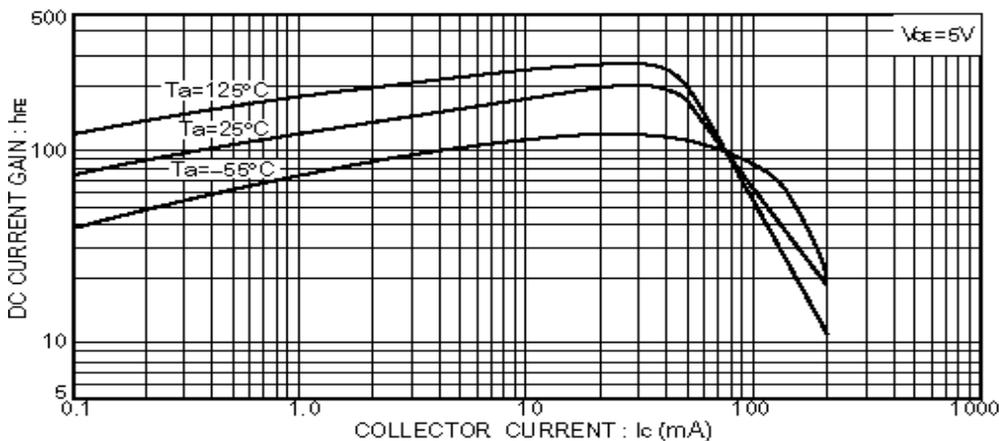


Fig.4 DC current gain vs. collector current (II)

Typical Characteristics

