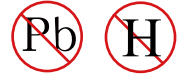


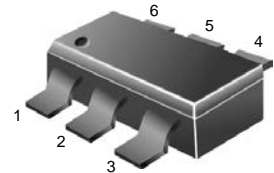


COMPLEMENTARY NPN/PNP TRANSISTOR



FEATURES

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

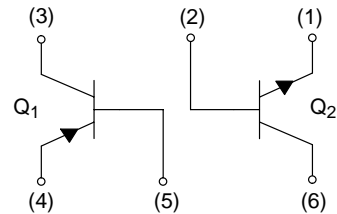


SOT-363/SC-88
CASE 419B STYLE 1

MAKING: 46

MAXIMUM RATINGS (T_A=25°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	°C
T _{stg}	Storage Temperature	-55-150	°C



NPN 3904 ELECTRICAL CHARACTERISTICS (T_{amb}=25°C unless otherwise specified)

Parameter	Symbol	Test conditions	MIN	MAX	UNIT
Collector-base breakdown voltage	V _{(BR)CBO}	I _C = 10μA, I _E =0	60		V
Collector-emitter breakdown voltage	V _{(BR)CEO}	I _C = 1mA, I _B =0	40		V
Emitter-base breakdown voltage	V _{(BR)EBO}	I _E = 10μA, I _C =0	5		V
Collector cut-off current	I _{CBO}	V _{CB} = 30 V, I _E =0		0.05	μA
Collector cut-off current	I _{CEO}	V _{CE} = 30 V, I _B =0		0.5	μA
Emitter cut-off current	I _{EBO}	V _{EB} = 5V, I _C =0		0.05	μA
DC current gain	h _{FE(1)}	V _{CE} = 1V, I _C = 0.1mA	40		
	h _{FE(2)}	V _{CE} = 1V, I _C = 1mA	70		
	h _{FE(3)}	V _{CE} = 1V, I _C = 10mA	100	300	
	h _{FE(4)}	V _{CE} = 1V, I _C = 50mA	60		
	h _{FE(5)}	V _{CE} = 1V, I _C = 100mA	30		
Collector-emitter saturation voltage	V _{CE(sat)1}	I _C =10 mA, I _B = 1mA		0.2	V
	V _{CE(sat)2}	I _C =50 mA, I _B = 5mA		0.3	V
Base-emitter saturation voltage	V _{BE(sat)1}	I _C = 10 mA, I _B = 1mA	0.65	0.85	V
	V _{BE(sat)2}	I _C = 50 mA, I _B = 5mA		0.95	V
Transition frequency	f _T	V _{CE} =20V, I _C =20mA, f=100MHz	300		MHz
Noise figure	NF	V _{CE} =5V, I _C =0.1mA, f=1KHz, R _g =1KΩ		5	dB
Output Capacitance	C _{ob}	V _{CB} =5V, I _E =0, f=1MHz		4	pF
Delay time	t _d	V _{CC} =3V, V _{BE} =0.5V		35	nS
Rise time	t _r	I _C =10mA, I _{B1} =- I _{B2} =1mA		35	nS
Storage time	t _s	V _{CC} =3V, I _C =10mA		200	nS
Fall time	t _f	I _{B1} =-I _{B2} = 1mA		50	nS

DEVICE CHARACTERISTICS

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

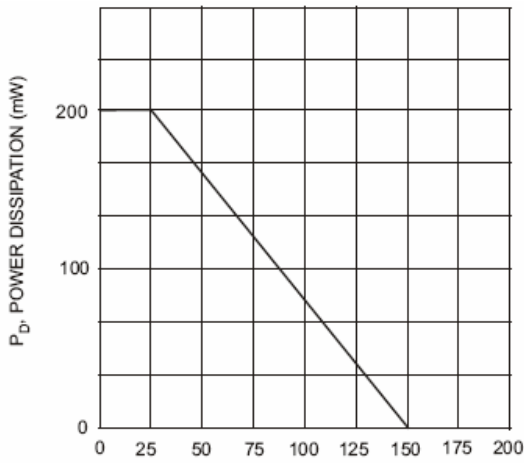
Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	-40	V
V_{CEO}	Collector-Emitter Voltage	-40	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_C	Collector Current -Continuous	-0.2	A
P_C	Collector Power Dissipation	0.2	W
T_J	Junction Temperature	150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-55-150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

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

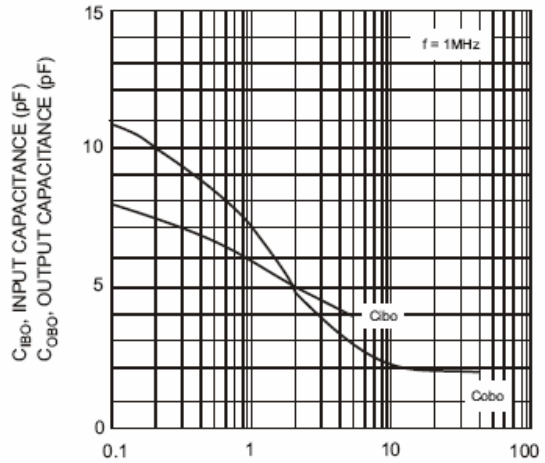
Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=-10\mu\text{A}, I_E=0$	-40			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=-1\text{mA}, I_B=0$	-40			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=-10\mu\text{A}, I_C=0$	-5			V
Collector 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

DEVICE CHARACTERISTICS

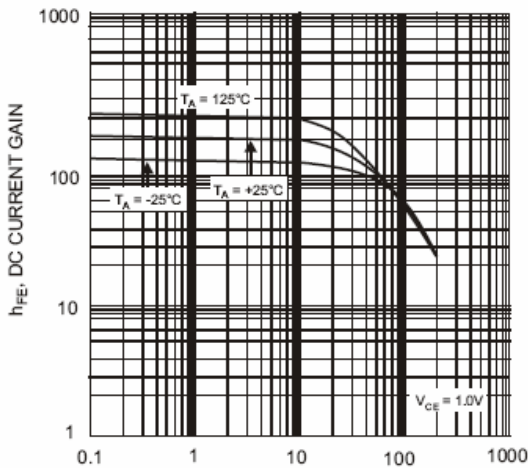
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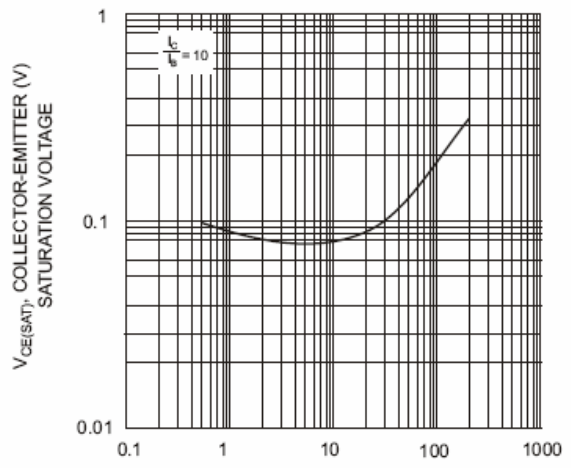
T_A , AMBIENT TEMPERATURE ($^{\circ}\text{C}$)
Fig. 1, Max Power Dissipation vs Ambient Temperature (Total Device)



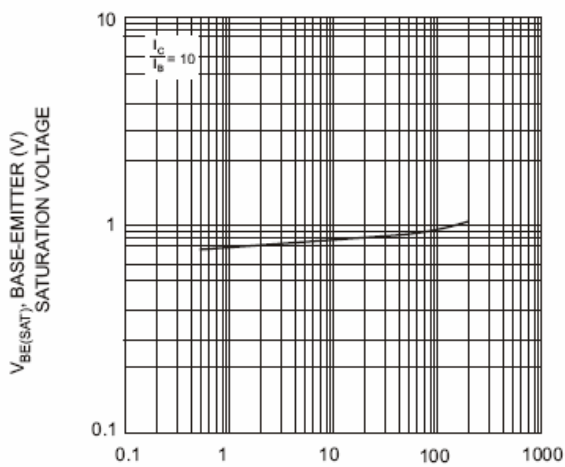
V_{CB} , COLLECTOR-BASE VOLTAGE (V)
Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage (NPN-3904)



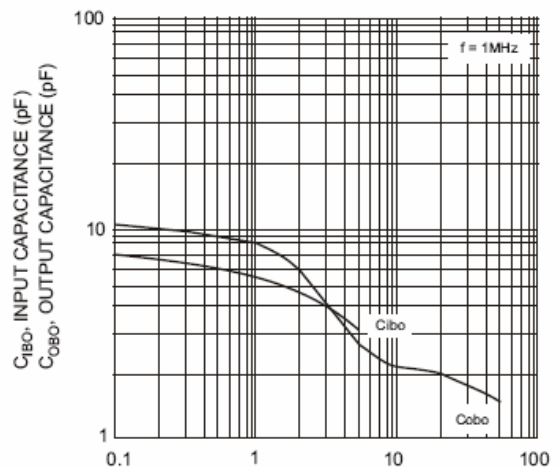
I_C , COLLECTOR CURRENT (mA)
Fig. 3, Typical DC Current Gain vs Collector Current (NPN-3904)



I_C , COLLECTOR CURRENT (mA)
Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-3904)



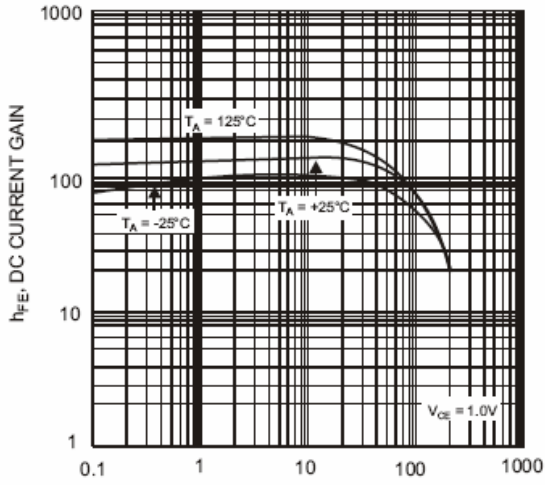
I_C , COLLECTOR CURRENT (mA)
Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-3904)



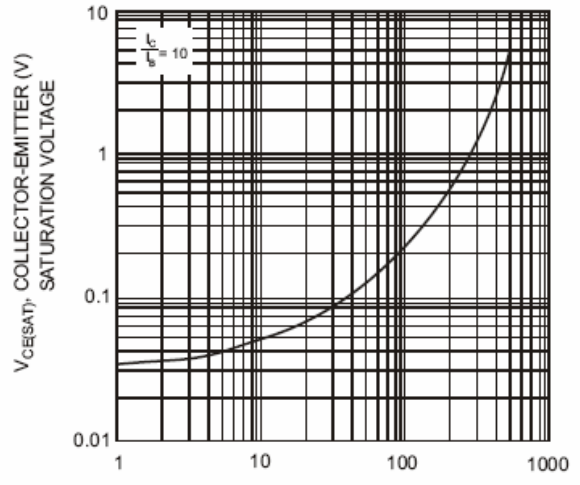
V_{CB} , COLLECTOR-BASE VOLTAGE (V)
Fig. 6, Input and Output Capacitance vs. Collector-Base Voltage (PNP-3906)

PACKAGE OUTLINE & DIMENSIONS

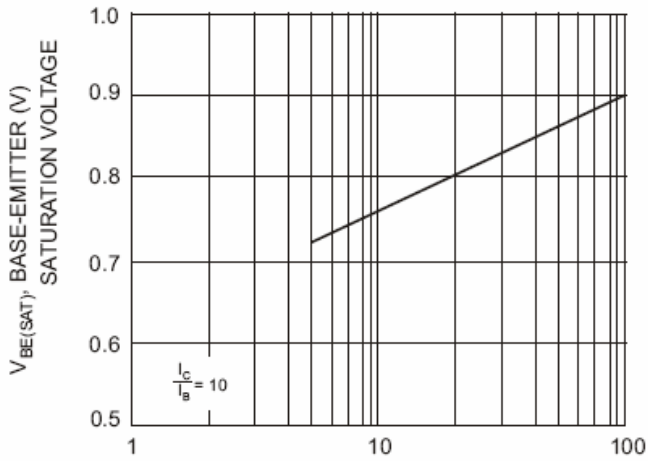
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I_C , COLLECTOR CURRENT (mA)
Fig. 7, Typical DC Current Gain vs Collector Current (PNP-3906)



I_C , COLLECTOR CURRENT (mA)
Fig. 8, Typical Collector-Emitter Saturation Voltage vs. Collector Current (PNP-3906)



I_C , COLLECTOR CURRENT (mA)
Fig. 9, Typical Base-Emitter Saturation Voltage vs. Collector Current (PNP-3906)

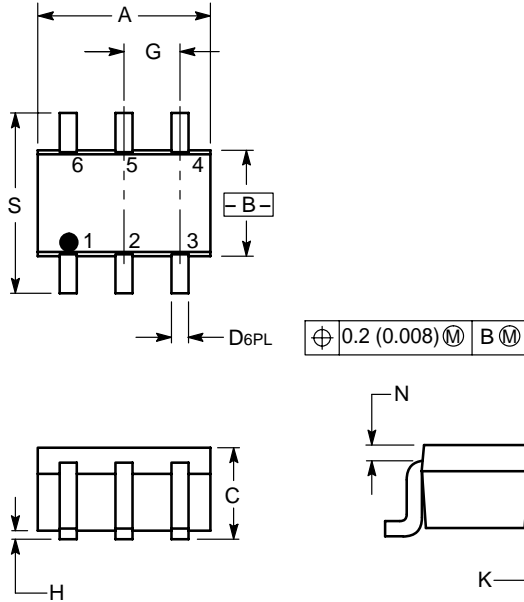
PACKAGE OUTLINE & DIMENSIONS

MMBT3946DW

SC-88/SOT-363

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

- PIN 1. EMITTER 1
 2. BASE 1
 3. COLLECTOR 2
 4. EMITTER 2
 5. BASE 2
 6. COLLECTOR 1

