Elektronische Bauelemente

MMDT3946

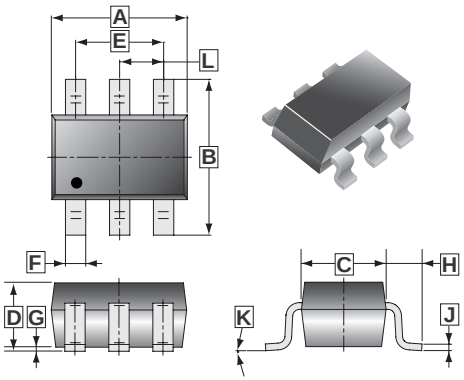
NPN / PNP
Multi-Chip Transistor

RoHS Compliant Product
A suffix of "-C" indicates halogen-free.

FEATURE

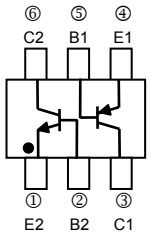
- Complementary Pair
- One 3904-Type NPN
  One 3906-Type PNP
- Epitaxial Planer Die Construction
- Ideal for Low Power Amplification and Switching

SOT-363



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.00	2.20	G	0.100 REF.	
B	2.15	2.45	H	0.525 REF.	
C	1.15	1.35	J	0.08	0.15
D	0.90	1.10	K	8°	
E	1.20	1.40	L	0.650 TYP.	
F	0.15	0.35			

MARKING



E1, B1, C1 = PNP3906
E2, B2, C2 = NPN3904

ABSOLUTE MAXIMUM RATINGS OF NPN3904 at Ta = 25°C

PARAMETER	SYMBOL	VALUE	UNITS
Collector to Base Voltage	V_{CBO}	60	V
Collector to Emitter Voltage	V_{CEO}	40	V
Emitter to Base Voltage	V_{EBO}	5	V
Collector Currrent – Continuous	I_C	0.2	A
Collector Power Dissipation	P_C	0.2	W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55~150	℃

ELECTRICAL CHARACTERISTICS OF NPN 3904 at Ta = 25°C

CHARACTERISTIC	TEST CONDITION	SYMBOL	MIN.	MAX.	UNIT
Collector-Base Breakdown Voltage	I_C=10μA, I_E=0	$V_{(BR)CBO}$	60		V
Collector-Emitter Breakdown Voltage	I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	40		V
Emitter-Base Breakdown Voltage	I_E=10μA, I_C=0	$V_{(BR)EBO}$	5		V
Collector Cutoff Current	V_{CB}=30V, I_E=0	I_{CBO}		0.05	μA
Collector Cutoff Current	V_{EB}=30V, I_B=0	I_{CEO}		0.5	μA
Emitter Cutoff Current	V_{EB}=5V, I_C=0	I_{EBO}		0.05	μA
DC Current Gain	V_{CE}=1V, I_C=0.1mA	$h_{FE(1)}$	40		
	V_{CE}=1V, I_C=1mA	$h_{FE(2)}$	70		
	V_{CE}=1V, I_C=10mA	$h_{FE(3)}$	100	300	
	V_{CE}=1V, I_C=50mA	$h_{FE(4)}$	60		
	V_{CE}=1V, I_C=100mA	$h_{FE(5)}$	30		
Collector-emitter Saturation Voltage	I_C=10mA, I_B=1mA	$V_{CE(sat)1}$		0.2	V
	I_C=50mA, I_B=5mA	$V_{CE(sat)2}$		0.3	V
Base-Emitter Saturation Voltage	I_C=10mA, I_B=1mA	$V_{BE(sat)1}$	0.65	0.85	V
	I_C=50mA, I_B=5mA	$V_{BE(sat)2}$		0.95	V
Output Capacitance	V_{CB}=5V, I_E=0, f=1MHz	C_{ob}		4	pF
Transition Frequency	V_{CE}=20V, I_C=20mA, f=100MHz	f_T	300		MHz
Noise Figure	V_{CE}=5V, I_C=0.1mA, f=1kHz Rg=1KΩ,	NF		5	dB
Delay TIme	V_{CC}=3V, V_{BE}=0.5V, I_C=10mA, I_{B1}=- I_{B2} = 1mA	T_d		35	nS
Rise Time		T_r		35	nS
Storage Time	V_{CC}=3V, I_C=10mA, I_{B1}=- I_{B2} = 1mA	T_s		200	nS
Fall Time		T_f		50	nS

ABSOLUTE MAXIMUM RATINGS OF PNP 3906 at Ta = 25°C

PARAMETER	SYMBOL	VALUE	UNITS
Collector to Base Voltage	V_{CBO}	-40	V
Collector to Emitter Voltage	V_{CEO}	-40	V
Emitter to Base Voltage	V_{EBO}	-5	V
Collector Currrent – Continuous	I_C	-0.2	A
Collector Power Dissipation	P_C	0.2	W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55~150	℃

ELECTRICAL CHARACTERISTICS OF PNP 3906 at Ta = 25°C

CHARACTERISTIC	TEST CONDITION	SYMBOL	MIN.	MAX.	UNIT
Collector-Base Breakdown Voltage	I_C=-10μA, I_E=0	$V_{(BR)CBO}$	-40		V
Collector-Emitter Breakdown Voltage	I_C = -1mA, I_B = 0	$V_{(BR)CEO}$	-40		V
Emitter-Base Breakdown Voltage	I_E=-10μA, I_C=0	$V_{(BR)EBO}$	-5		V
Collector Cutoff Current	V_{CB}=-30V, I_E=0	I_{CBO}		-0.05	μA
Emitter Cutoff Current	V_{EB}=-5V, I_C=0	I_{EBO}		-0.05	μA
DC Current Gain	V_{CE}=-1V, I_C=-0.1mA	$h_{FE(1)}$	60		
	V_{CE}=-1V, I_C=-1mA	$h_{FE(2)}$	80		
	V_{CE}=-1V, I_C=-10mA	$h_{FE(3)}$	100	300	
	V_{CE}=-1V, I_C=-50mA	$h_{FE(4)}$	60		
	V_{CE}=-1V, I_C=-100mA	$h_{FE(5)}$	30		
Collector-emitter Saturation Voltage	I_C=-10mA, I_B=-1mA	$V_{CE(sat)1}$		-0.25	V
	I_C=-50mA, I_B=-5mA	$V_{CE(sat)2}$		-0.4	V
Base-Emitter Saturation Voltage	I_C=-10mA, I_B=-1mA	$V_{BE(sat)1}$	-0.65	-0.85	V
	I_C=-50mA, I_B=-5mA	$V_{BE(sat)2}$		-0.95	V
Collector Output Capacitance	V_{CB}=-5V, I_E=0, f=1MHz	C_{ob}		4.5	pF
Transition Frequency	V_{CE}=-20V, I_C=-10mA, f=100MHz	f_T	250		MHz
Noise Figure	V_{CE}=-5V, I_C=-0.1mA, f=1kHz Rg=1KΩ,	NF		4	dB
Delay TIme	V_{CC}=-3V, V_{BE}=-0.5V, I_C=-10mA, I_{B1}=- I_{B2} = -1mA	T_d		35	nS
Rise Time		T_r		35	nS
Storage Time	V_{CC}=-3V, I_C=-10mA, I_{B1}=- I_{B2} = -1mA	T_s		225	nS
Fall Time		T_f		75	nS

CHARACTERISTIC CURVES

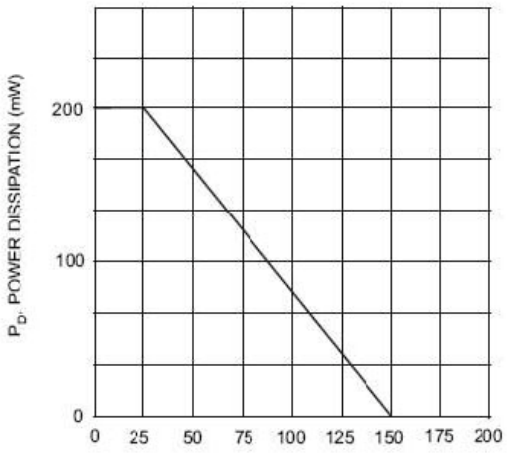


Fig. 1, Max Power Dissipation vs Ambient Temperature (Total Device)

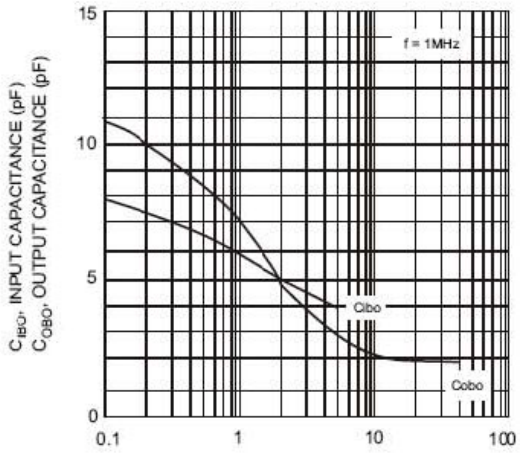


Fig. 2, Input and Output Capacitance vs. Collector-Ease Voltage (NPN-3904)

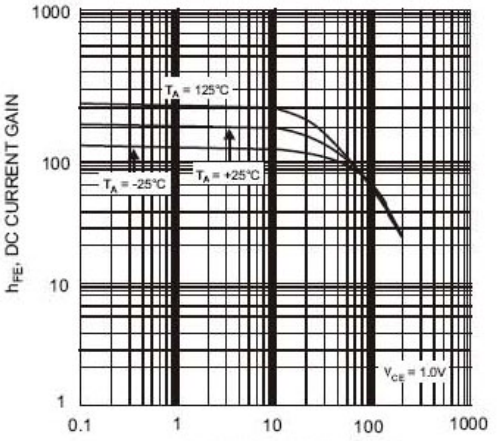


Fig. 3, Typical DC Current Gain vs Collector Current (NPN-3904)

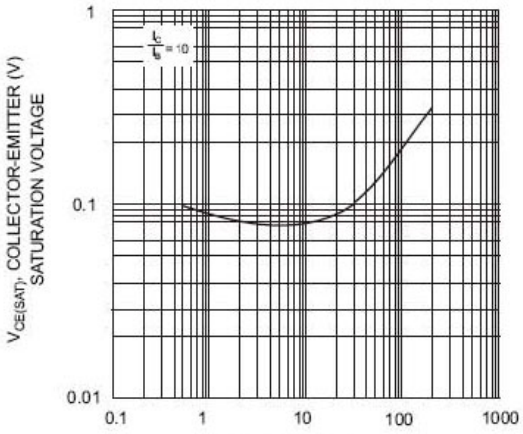


Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

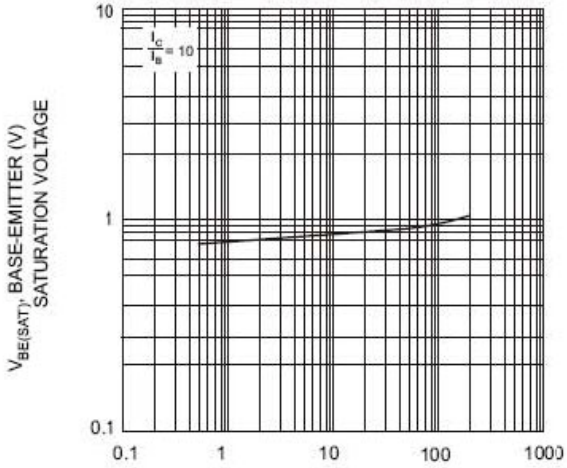


Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

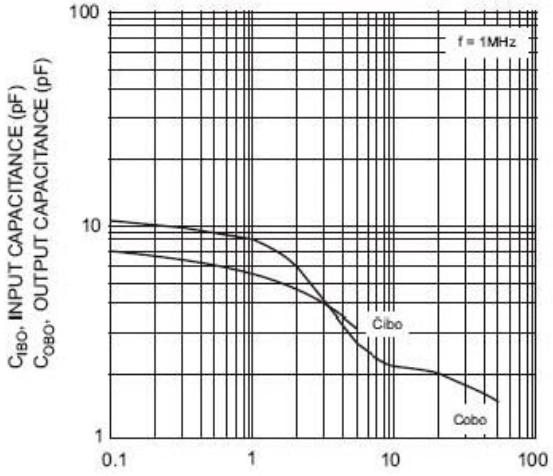


Fig. 6, Input and Output Capacitance vs. Collector-Base Voltage (PNP-3906)

CHARACTERISTIC CURVES

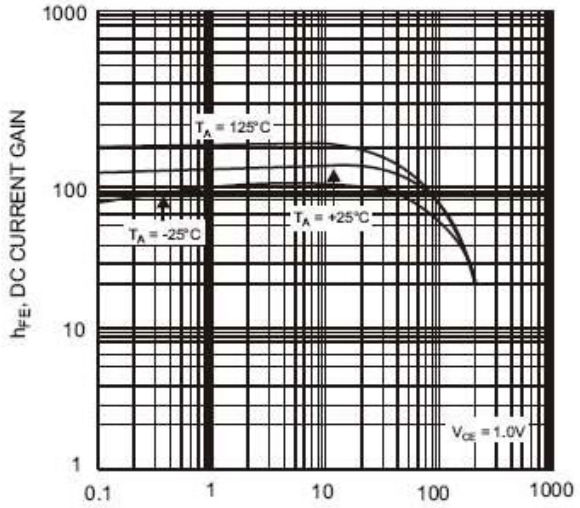


Fig. 7, Typical DC Current Gain vs Collector Current (PNP-3906)

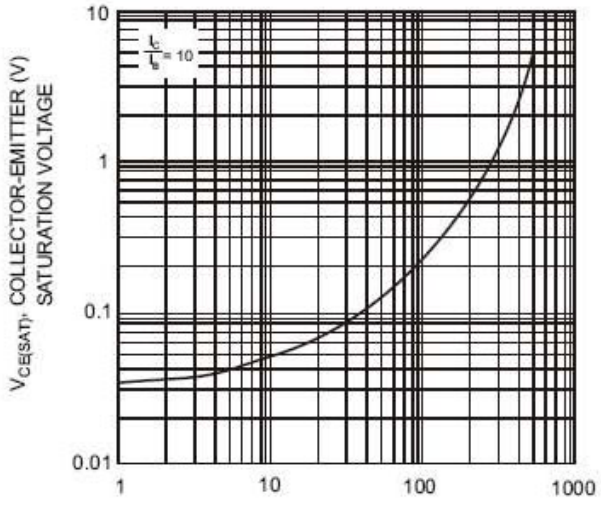


Fig. 8, Typical Collector-Emitter Saturation Voltage vs. Collector Current (PNP-3906)

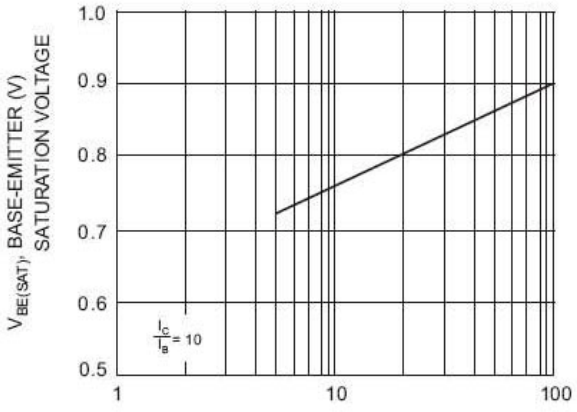


Fig. 9, Typical Base-Emitter Saturation Voltage vs. Collector Current (PNP-3906)