



MMDT3946

NPN/PNP Small Signal Surface Mount Transistors

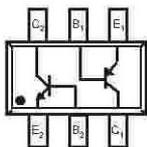
Features

- Halogen free available upon request by adding suffix "-HF"
- Lead Free Finish/RoHS Compliant ("P" Suffix designates RoHS Compliant. See ordering information)
- Complementary Pair: NPN(3904), PNP(3906)
- Ideal for Low Power Amplification and Switching
- Ultra-small Surface Mount Package
- Epitaxial Planar Die Construction
- Marking:K46
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1

Maximum Ratings @ 25°C Unless Otherwise Specified

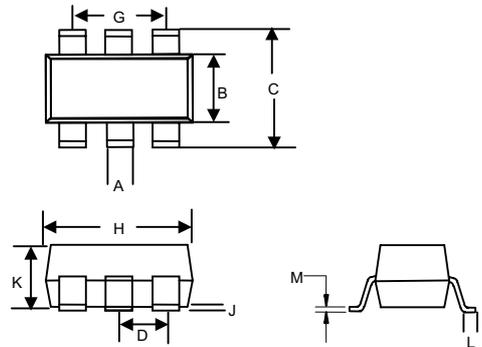
Symbol	Rating	Rating(NPN)	Unit
V _{CEO}	Collector-Emitter Voltage	40	V
V _{CBO}	Collector-Base Voltage	60	V
V _{EBO}	Emitter-Base Voltage	6	V
I _C	Collector Current-Continuous	0.2	A
P _C	Collector Dissipation	0.2	W
R _{θJA}	Thermal Resistance Junction to Ambient	625	°C/W
T _J	Operating Junction Temperature	-55 to +150	°C
T _{STG}	Storage Temperature	-55 to +150	°C

Symbol	Rating	Rating(PNP)	Unit
V _{CEO}	Collector-Emitter Voltage	-40	V
V _{CBO}	Collector-Base Voltage	-40	V
V _{EBO}	Emitter-Base Voltage	-5	V
I _C	Collector Current-Continuous	-0.2	A
P _C	Collector Dissipation	0.2	W
R _{θJA}	Thermal Resistance Junction to Ambient	625	°C/W
T _J	Operating Junction Temperature	-55 to +150	°C
T _{STG}	Storage Temperature	-55 to +150	°C



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

SOT-363



DIM	DIMENSIONS				NOTE
	INCHES		MM		
	MIN	MAX	MIN	MAX	
A	.006	.014	0.15	0.35	
B	.045	.053	1.15	1.35	
C	.085	.096	2.15	2.45	
D	.026		0.65Nominal		
G	.047	.055	1.20	1.40	
H	.071	.087	1.80	2.20	
J	---	.004	---	0.10	
K	.035	.043	0.90	1.10	
L	.010	.018	0.26	0.46	
M	.003	.006	0.08	0.15	

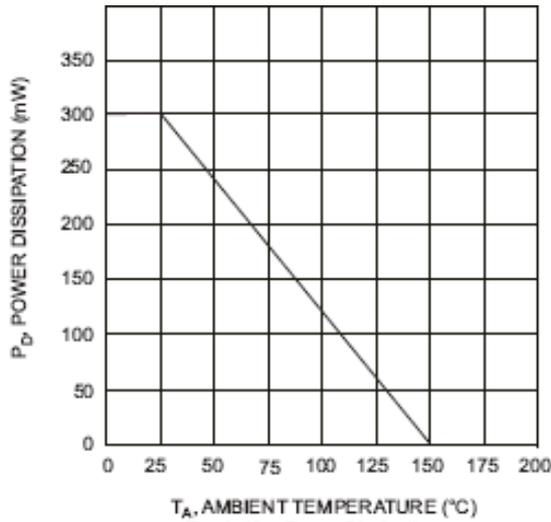
NPN 3904 Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Typ	Max	Units
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage ($I_C=1\text{mA}$, $I_B=0$)	40	---	---	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_C=10\mu\text{A}$, $I_E=0$)	60	---	---	Vdc
$V_{(BR)EBO}$	Collector-Emitter Breakdown Voltage ($I_E=10\mu\text{A}$, $I_C=0$)	5	---	---	Vdc
I_{CBO}	Collector Cutoff Current ($V_{CB}=30\text{Vdc}$, $I_E=0$)	---	---	50	nAdc
I_{CEO}	Collector Cutoff Current ($V_{CE}=30\text{Vdc}$, $I_B=0$)	---	---	500	nAdc
I_{EBO}	Emitter Cutoff Current ($V_{EB}=5\text{Vdc}$, $I_C=0$)	---	---	50	nAdc
h_{FE}	DC Current Gain ($I_C=0.1\text{mA}$, $V_{CE}=1\text{Vdc}$) ($I_C=1\text{mA}$, $V_{CE}=1\text{Vdc}$) ($I_C=10\text{mA}$, $V_{CE}=1\text{Vdc}$) ($I_C=50\text{mA}$, $V_{CE}=1\text{Vdc}$) ($I_C=100\text{mA}$, $V_{CE}=1\text{Vdc}$)	40 70 100 60 30	---	---	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ($I_C=10\text{mA}$, $I_B=1\text{mA}$) ($I_C=50\text{mA}$, $I_B=5\text{mA}$)	---	---	0.2 0.3	Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage ($I_C=10\text{mA}$, $I_B=1\text{mA}$) ($I_C=50\text{mA}$, $I_B=5\text{mA}$)	0.65 ---	---	0.85 0.95	Vdc
f_T	Current Gain-Bandwidth Product ($V_{CE}=20\text{Vdc}$, $I_C=20\text{mA}$, $f=100\text{MHz}$)	300	---	---	MHz
C_{ob}	Output Capacitance ($V_{CB}=5\text{Vdc}$, $f=1.0\text{MHz}$, $I_E=0$)	---	---	4	pF
NF	Noise Figure ($V_{CE}=5\text{V}$, $I_C=0.1\text{mA}$, $f=1\text{KHz}$, $R_S=1\text{k}\Omega$)	---	---	5	dB
t_d	Delay Time	$V_{CC}=3\text{V}$, $I_C=10\text{mA}$, $V_{BE}=0.5\text{V}$, $I_{B1}=1\text{mA}$		35	ns
t_r	Rise Time			35	ns
t_s	Storage Time			200	ns
t_f	Fall Time			50	ns

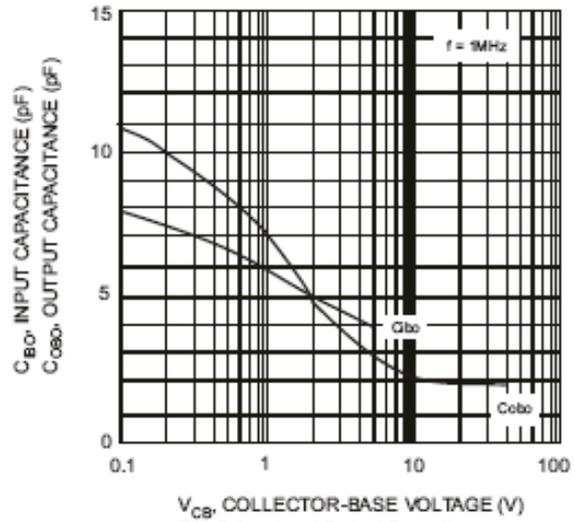
PNP 3906 Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Typ	Max	Units
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage ($I_C=-1\text{mA}$, $I_B=0$)	-40	---	---	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_C=-10\mu\text{A}$, $I_E=0$)	-40	---	---	Vdc
$V_{(BR)EBO}$	Collector-Emitter Breakdown Voltage ($I_E=-10\mu\text{A}$, $I_C=0$)	-5	---	---	Vdc
I_{CBO}	Collector Cutoff Current ($V_{CB}=-30\text{Vdc}$, $I_E=0$)	---	---	-50	nAdc
I_{EBO}	Emitter Cutoff Current ($V_{EB}=-5\text{Vdc}$, $I_C=0$)	---	---	-50	nAdc
h_{FE}	DC Current Gain ($I_C=-0.1\text{mA}$, $V_{CE}=-1\text{Vdc}$) ($I_C=-1\text{mA}$, $V_{CE}=-1\text{Vdc}$) ($I_C=-10\text{mA}$, $V_{CE}=-1\text{Vdc}$) ($I_C=-50\text{mA}$, $V_{CE}=-1\text{Vdc}$) ($I_C=-100\text{mA}$, $V_{CE}=-1\text{Vdc}$)	40 70 100 60 30	---	---	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ($I_C=-10\text{mA}$, $I_B=-1\text{mA}$) ($I_C=-50\text{mA}$, $I_B=-5\text{mA}$)	---	---	-0.25 -0.4	Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage ($I_C=-10\text{mA}$, $I_B=-1\text{mA}$) ($I_C=-50\text{mA}$, $I_B=-5\text{mA}$)	-0.65 ---	---	-0.85 -0.95	Vdc
f_T	Current Gain-Bandwidth Product ($V_{CE}=-20\text{Vdc}$, $I_C=-10\text{mA}$, $f=100\text{MHz}$)	250	---	---	MHz
C_{ob}	Output Capacitance ($V_{CB}=-5\text{Vdc}$, $f=1.0\text{MHz}$, $I_E=0$)	---	---	4.5	pF
NF	Noise Figure ($V_{CE}=-5\text{V}$, $I_C=-0.1\text{mA}$, $f=1\text{KHz}$, $R_S=1\text{k}\Omega$)	---	---	4	dB
t_d	Delay Time	$V_{CC}=-3\text{V}$, $I_C=-10\text{mA}$, $V_{BE}=-0.5\text{V}$, $I_{B1}=-I_{B2}=-1\text{mA}$		35	ns
t_r	Rise Time			35	ns
t_s	Storage Time			225	ns
t_f	Fall Time			75	ns

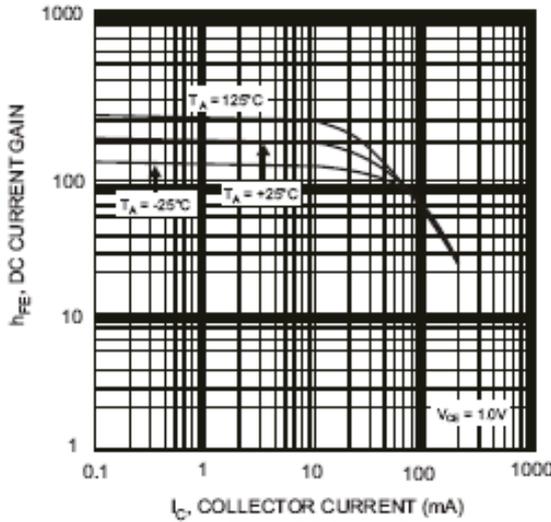
MMDT3946



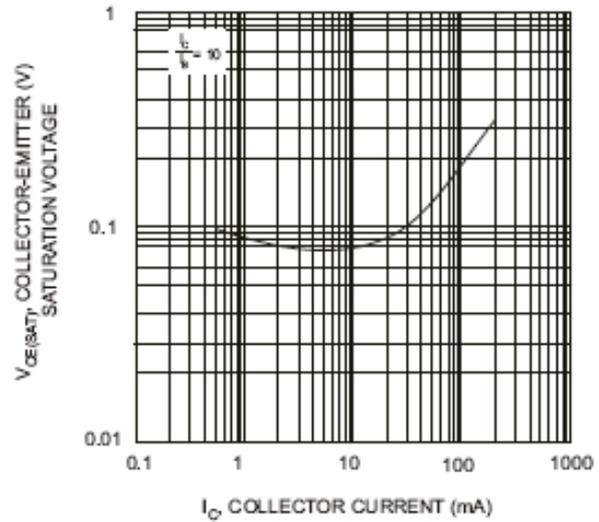
T_A , AMBIENT TEMPERATURE (°C)
Fig. 1, Max Power Dissipation vs Ambient Temperature (Total Device)



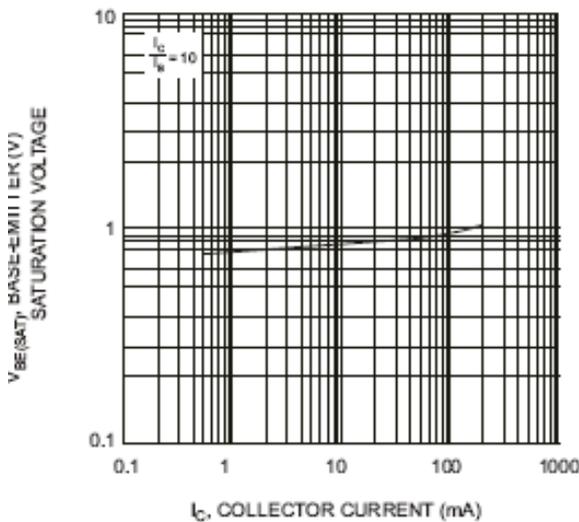
V_{CB} , COLLECTOR-BASE VOLTAGE (V)
Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage (NPN-3904)



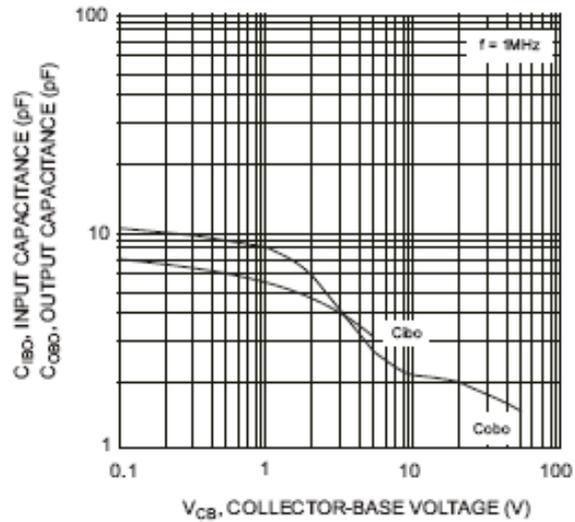
I_C , COLLECTOR CURRENT (mA)
Fig. 3, Typical DC Current Gain vs Collector Current (NPN-3904)



$V_{CE(SAT)}$, COLLECTOR-EMITTER SATURATION VOLTAGE
 I_C , COLLECTOR CURRENT (mA)
Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-3904)



$V_{BE(SAT)}$, BASE-EMITTER SATURATION VOLTAGE
 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)

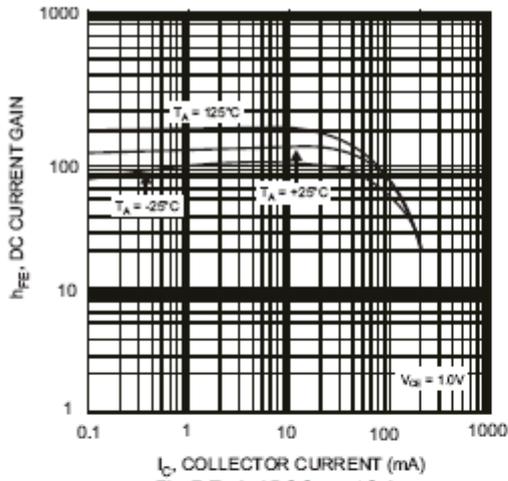


Fig. 7, Typical DC Current Gain vs Collector Current (PNP-3906)

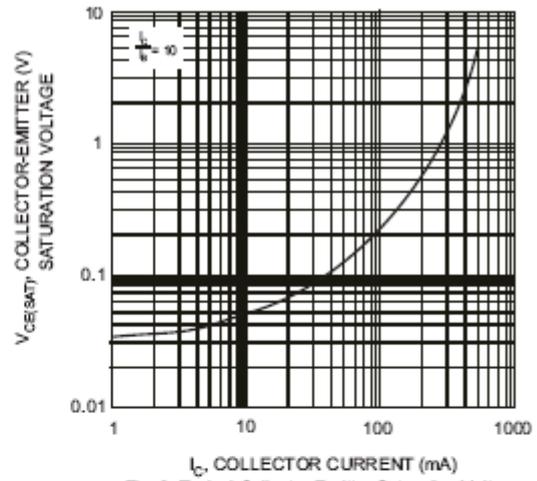


Fig. 8, Typical Collector-Emitter Saturation Voltage vs. Collector Current (PNP-3906)

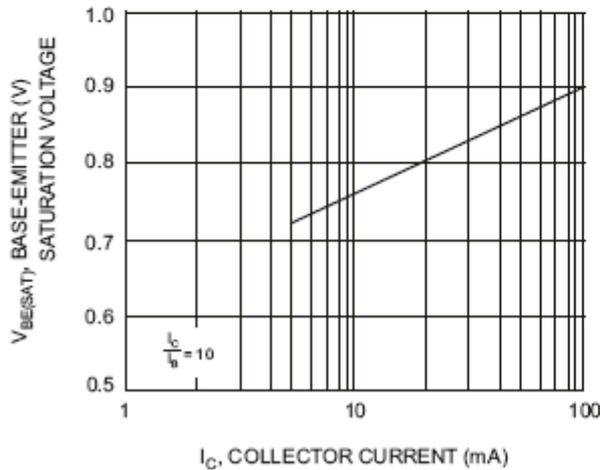


Fig. 9, Typical Base-Emitter Saturation Voltage vs. Collector Current (PNP-3906)



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Ordering Information :

Device	Packing
Part Number-TP	Tape&Reel; 3Kpcs/Reel

Note : Adding "-HF" suffix for halogen free, eg. Part Number-TP-HF

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