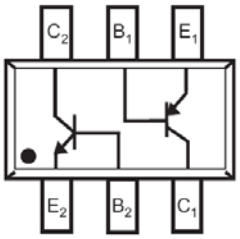
MMDT3946

Small Surface Mount Transistor

FEATURES

- Complementary pair.
- One 3904-Type NPN.
  One 3906-Type PNP.
- Ideal for low power amplification and switching.
- Ultra-Small surface mount package.
- Expitaxial planar die construction.



SOT-363

APPLICATIONS

- General switching and amplification.

MAXIMUM RATIPN Section

@ Ta=25℃ unless otherwise specified

SYMBOL	PARAMETER	VALUE	UNIT
V_{CBO}	collector-base voltage	60	V
V_{CEO}	collector-emitter voltage	40	V
V_{EBO}	emitter-base voltage	6	V
I_C	collector current -continuous	0.2	A
P_D	Power dissipation	0.2	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	625	℃/W

MAXIMUM RATING PNP 3946 Section

@ Ta=25℃ unless otherwise specified

SYMBOL	PARAMETER	VALUE	UNIT
V_{CBO}	collector-base voltage	-40	V
V_{CEO}	collector-emitter voltage	-40	V
V_{EBO}	emitter-base voltage	-5.0	V
I_C	collector current -continuous	-0.2	A
P_D	Power dissipation	0.2	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	625	℃/W

ELECTRICAL CHARACTERISTICS NPN 3946 Section @ Ta=25℃ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	I_C=10μA,I_E=0	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C=1mA,I_B=0	40		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	I_E=10μA,I_C=0	5		V
I_{CEX}	collector cut-off current	V_{CE}= 30V $V_{EB(OFF)}$= 3.0V	-	50	nA
I_{BL}	Base cut-off current	V_{CE}= 30V $V_{EB(OFF)}$= 3.0V	-	50	nA
h_{FE}	DC current gain	V_{CE}=1V,I_C= 0.1mA V_{CE}=1V,I_C=1mA V_{CE}=1V,I_C=10mA V_{CE}=1V,I_C=50mA V_{CE}=1V,I_C=100mA	40 70 100 60 30	- - 300 - -	
$V_{CE(sat)}$	collector-emitter saturation voltage	I_C=10mA,I_B =1.0mA	-	200	mV
		I_C=50mA,I_B =5mA	-	300	mV
$V_{BE(sat)}$	base-emitter saturation voltage	I_C=10mA,I_B =1mA	650	850	mV
		I_C=50mA, I_B =5mA	-	950	mV
C_{obo}	Output capacitance	I_E =0, V_{CB} =5V; f =1MHz	-	4	pF
C_{obi}	Input capacitance	I_C=0, V_{EB} =0.5V; f =1MHz	-	8	pF
f_T	transition frequency	I_C=20mA,V_{CE}=20V,f=100MHz	300	-	MHz
NF	noise figure	I_C=0.1mA,V_{CE} =5V,R_S=1kΩ, f = 1kHz	-	5	dB
t_d	delay time	V_{CC}=3V,$V_{BE(off)}$=-0.5V I_C=10mA,I_{B1}=I_{B2}=1mA	-	35	ns
t_r	rise time		-	35	ns
t_s	storage time	V_{CC}=3V,I_C=10mA I_{B1}=I_{B2}=1mA	-	200	ns
t_f	fall time		-	50	ns

ELECTRICAL CHARACTERISTICS PNP 3946 Section @ Ta=25℃ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	I_C=-10μA,I_E=0	-40		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C=-1mA,I_B=0	-40		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	I_E=-10μA,I_C=0	-5		V
I_{CEX}	collector cut-off current	V_{CE}=-30V,$V_{EB(OFF)}$=-3.0V	-	-0.05	μA
I_{BL}	Base cut-off current	V_{CE}=-30V,$V_{EB(OFF)}$=-3.0V	-	-0.05	μA
h_{FE}	DC current gain	V_{CE} =-1V,I_C= -0.1mA V_{CE} =-1V,I_C =-1mA V_{CE} =-1V,I_C =-10mA V_{CE} =-1V,I_C =-50mA V_{CE} =-1V,I_C =-100mA	60 80 100 60 30	- - 300 - -	
$V_{CE(sat)}$	collector-emitter saturation voltage	I_C =-10mA,I_B =-1mA	-	-250	mV
		I_C =-50mA,I_B =-5mA	-	-400	mV
$V_{BE(sat)}$	base-emitter saturation voltage	I_C =-10mA,I_B =-1mA	-650	-850	mV
		I_C =-50mA, I_B =-5mA	-	-950	mV
C_{obo}	Output capacitance	I_E=0, V_{CB}=-5V; f =1MHz	-	4.5	pF
C_{obi}	Input capacitance	I_C=0, V_{EB}=-0.5V; f =1MHz		10	pF
f_T	transition frequency	I_C=-10mA,V_{CE}=-20V,f=100MHz	250	-	MHz
NF	noise figure	I_C=-0.1mA,V_{CE}=-5V,R_S=1.0KΩ f=1.0kHz	-	4	dB
t_d	delay time	V_{CC}=-3V,$V_{BE(off)}$=0.5V I_C=-10mA I_{B1}=-I_{B2}=-1mA	-	35	ns
t_r	rise time		-	35	ns
t_s	storage time	V_{CC}=-3V,I_C=-10mA I_{B1}=I_{B2}=-1mA	-	225	ns
t_f	fall time		-	75	ns

TYPICAL CHARACTERISTICS @ Ta=25℃ unless otherwise specified

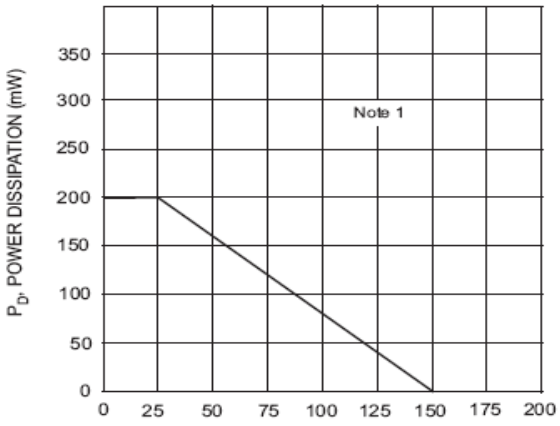


Fig. 1, Max Power Dissipation vs Ambient Temperature (Total Device)

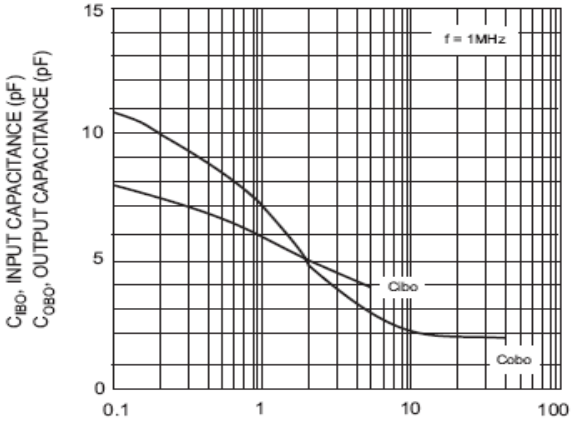


Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage (NPN-3904)

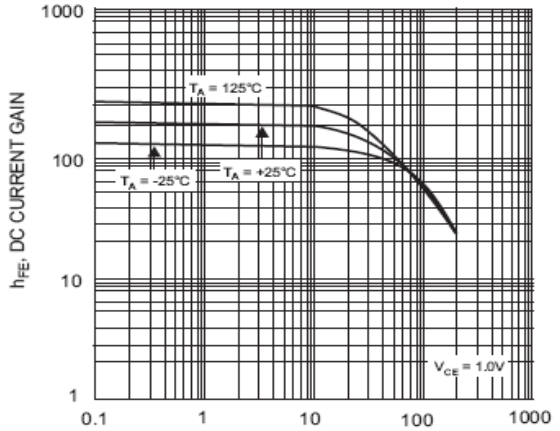


Fig. 3, Typical DC Current Gain vs Collector Current (NPN-3904)

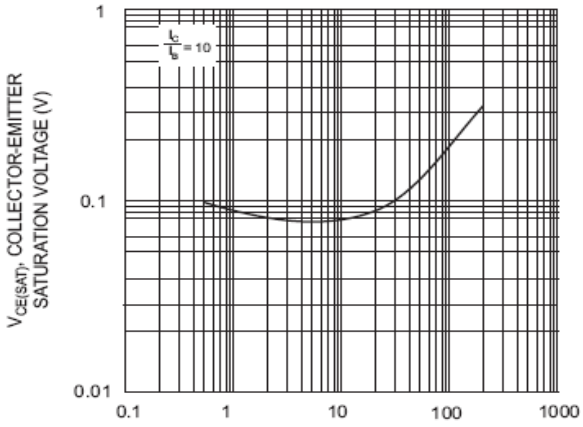


Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

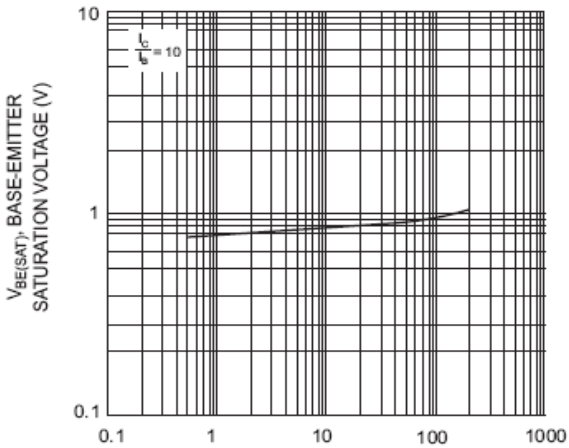


Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

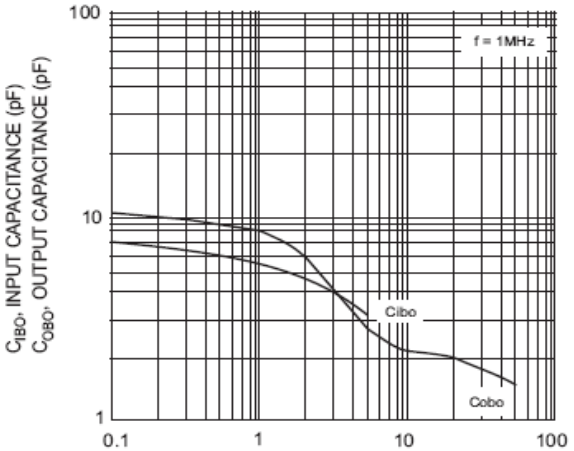
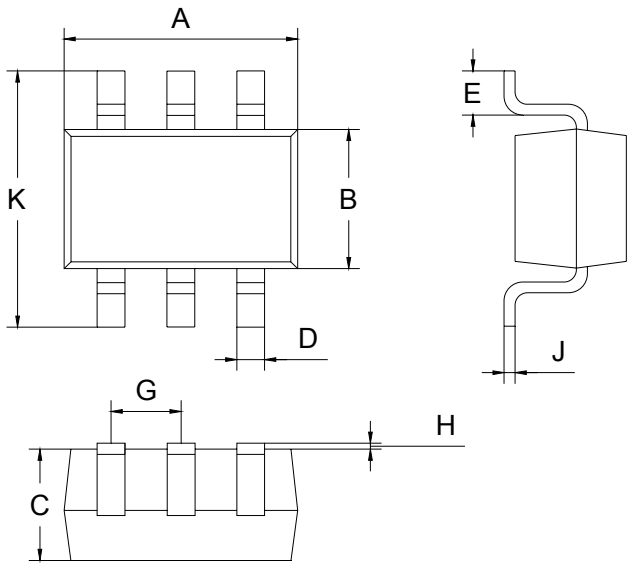


Fig. 6, Input and Output Capacitance vs. Collector-Base Voltage (PNP-3906)

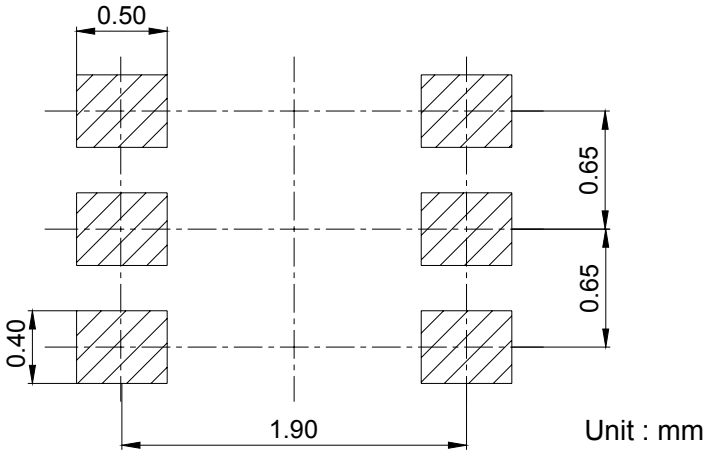
PACKAGE OUTLINE

Plastic surface mounted package SOT-363



SOT-363		
Dim	Min	Max
A	2.00	2.20
B	1.15	1.35
C	0.95 Typical	
D	0.25 Typical	
E	0.25	0.40
G	0.60	0.70
H	0.02	0.10
J	0.10 Typical	
K	2.2	2.4
All Dimensions in mm		

SOLDERING FOOTPRINT



Unit : mm

PACKAGE INFORMATION

Device	Package	Shipping
MMDT3946	SOT-363	3000/Tape&Reel