

Small Signal Surface Mount Transistor

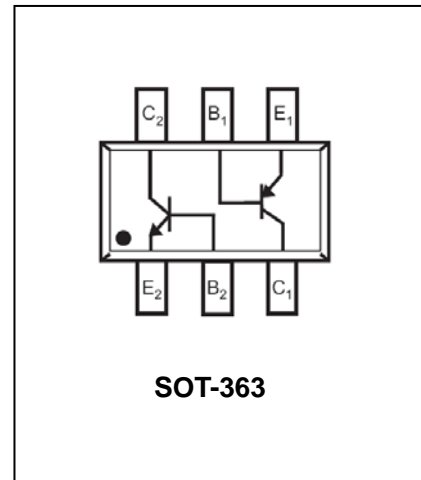
MMDT3946

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.



Lead-free



APPLICATIONS

- General switching and amplification

ORDERING INFORMATION

Type No.	Marking	Package Code
MMDT3946	YM	SOT-23

MAXIMUM RATING NPN 3904 Section @ Ta=25°C 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 _{θJA}	Thermal Resistance, Junction to Ambient	625	°C/W

MAXIMUM RATING PNP 3906 Section @ Ta=25°C unless otherwise specified

Small Signal Surface Mount Transistor

MMDT3946

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	°C/W

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C=10\mu\text{A}, I_E=0$	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C=1\text{mA}, I_B=0$	40		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	$I_E=10\mu\text{A}, I_C=0$	5		V
I_{CEX}	collector cut-off current	$V_{CE}=30\text{V}, V_{EB(OFF)}=3.0\text{V}$	-	50	nA
I_{EBO}	Base cut-off current	$V_{CE}=30\text{V}, V_{EB(OFF)}=3.0\text{V}$	-	50	nA
h_{FE}	DC current gain	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$ $V_{CE}=1\text{V}, I_C=1\text{mA}$ $V_{CE}=1\text{V}, I_C=10\text{mA}$ $V_{CE}=1\text{V}, I_C=50\text{mA}$ $V_{CE}=1\text{V}, I_C=100\text{mA}$	40 70 100 60 30	- - 300 - -	
$V_{CE(sat)}$	collector-emitter saturation voltage	$I_C=10\text{mA}, I_B=1\text{mA}$ $I_C=50\text{mA}, I_B=5\text{mA}$	- -	200 300	mV
$V_{BE(sat)}$	base-emitter saturation voltage	$I_C=10\text{mA}, I_B=1\text{mA}$ $I_C=50\text{mA}, I_B=5\text{mA}$	650 -	850 950	mV
C_{obo}	Output capacitance	$I_E=0, V_{CB}=5\text{V}; f=1\text{MHz}$	-	4	pF
C_{obi}	Input capacitance	$I_C=0, V_{EB}=5\text{V}; f=1\text{MHz}$	-	8	pF
f_T	transition frequency	$I_C=20\text{mA}, V_{CE}=20\text{V}, f=100\text{MHz}$	300	-	MHz
NF	noise figure	$I_C=0.1\text{mA}, V_{CE}=5\text{V}, R_S=1\text{k}\Omega,$ $f=1\text{kHz}$	-	5	dB
Switching times (between 10% and 90% levels);					
t_d	delay time	$V_{CC}=3\text{V}, V_{BE(off)}=-0.5\text{V}$	-	35	ns
t_r	rise time	$I_C=10\text{mA}, I_{B1}=I_{B2}=1\text{mA}$	-	35	ns
t_s	storage time	$V_{CC}=3\text{V}, I_C=10\text{mA}$	-	200	ns
t_f	fall time	$I_{B1}=I_{B2}=1\text{mA}$	-	50	ns

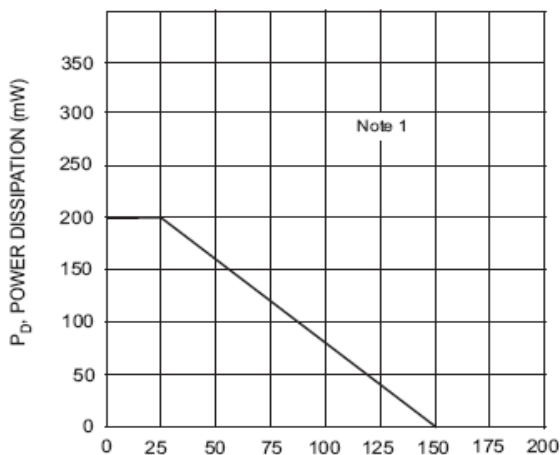
ELECTRICAL CHARACTERISTICS PNP 3906 Section @ $T_a=25^\circ\text{C}$ unless otherwise specified

Small Signal Surface Mount Transistor

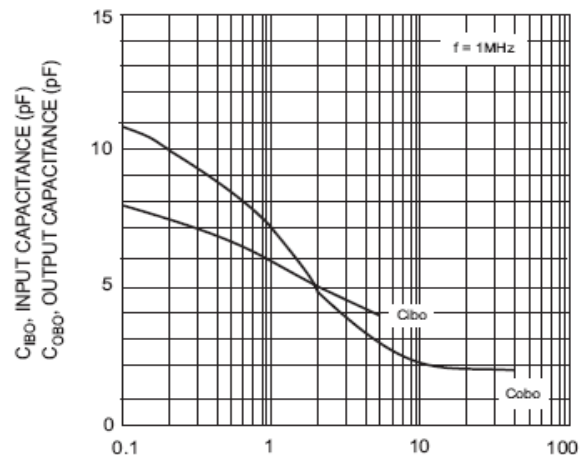
MMDT3946

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C = -10\mu A, I_E = 0$	-40		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C = -1mA, I_B = 0$	-40		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	$I_E = -10\mu A, I_C = 0$	-5		V
I_{CEX}	collector cut-off current	$I_E = 0, V_{CB} = -30V$	-	-0.05	μA
I_{BL}	Base cut-off current	$I_C = 0, V_{EB} = -3V$	-	-0.05	μA
h_{FE}	DC current gain	$V_{CE} = -1V, I_C = -0.1mA$	60	-	
		$V_{CE} = -1V, I_C = -1mA$	80	-	
		$V_{CE} = -1V, I_C = -10mA$	100	300	
		$V_{CE} = -1V, I_C = -50mA$	60	-	
		$V_{CE} = -1V, I_C = -100mA$	30	-	
$V_{CE(sat)}$	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	$I_C = -0.1mA, V_{CE} = -5V$	-	4	dB
t_d	delay time	$V_{CC} = -3V, V_{BE(off)} = 0.5V$	-	35	ns
t_r	rise time	$I_C = -10mA, I_{B1} = -I_{B2} = -1mA$	-	35	ns
t_s	storage time	$V_{CC} = -3V, I_C = -10mA$	-	225	ns
t_f	fall time	$I_{B1} = I_{B2} = -1mA$	-	75	ns

TYPICAL CHARACTERISTICS @ $T_a = 25^\circ C$ unless otherwise specified



T_A , AMBIENT TEMPERATURE ($^\circ C$)
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)

Small Signal Surface Mount Transistor

MMDT3946

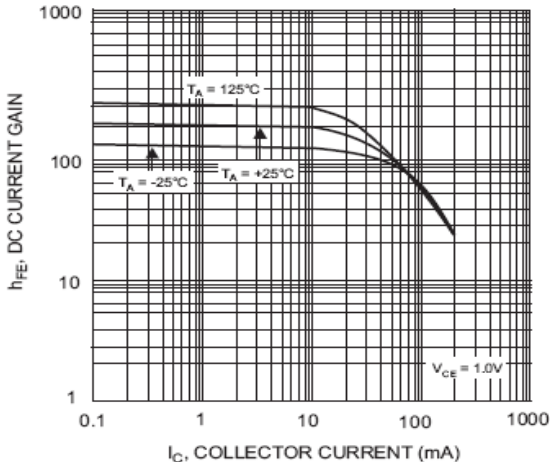


Fig. 3. Typical DC Current Gain vs Collector Current (NPN-3904)

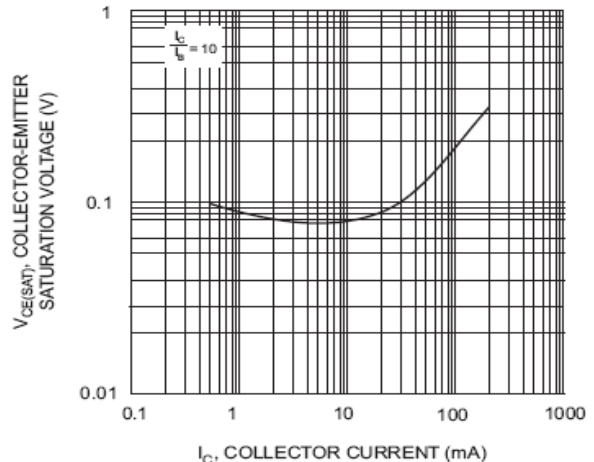


Fig. 4. Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

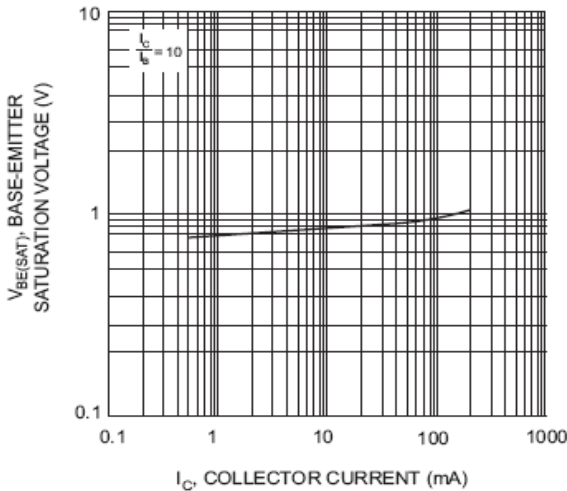


Fig. 5. Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

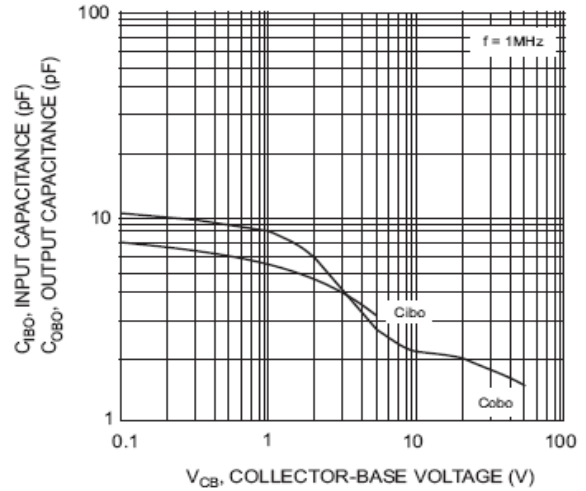


Fig. 6. Input and Output Capacitance vs. Collector-Base Voltage (PNP-3906)

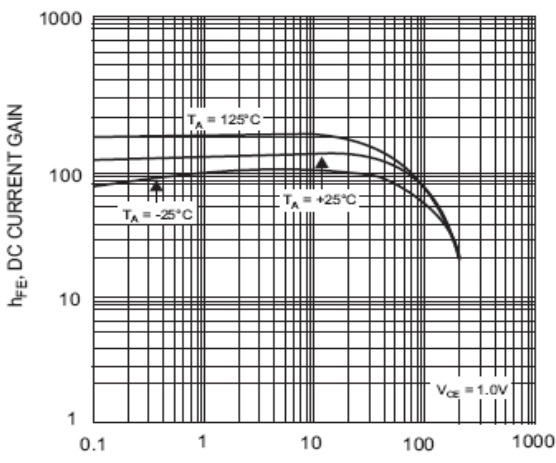


Fig. 7. Typical DC Current Gain vs Collector Current (PNP-3906)

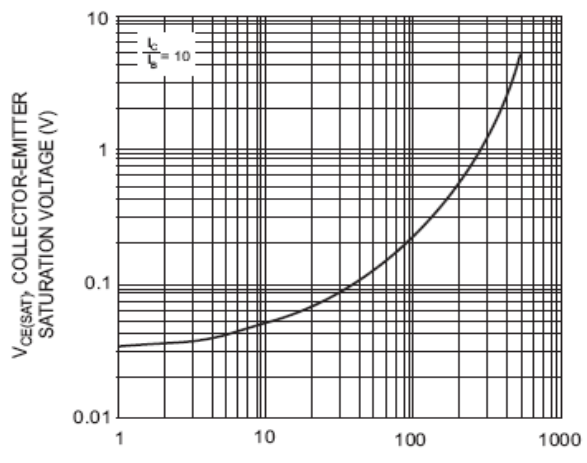


Fig. 8. Typical Collector-Emitter Saturation Voltage vs. Collector Current (PNP-3906)

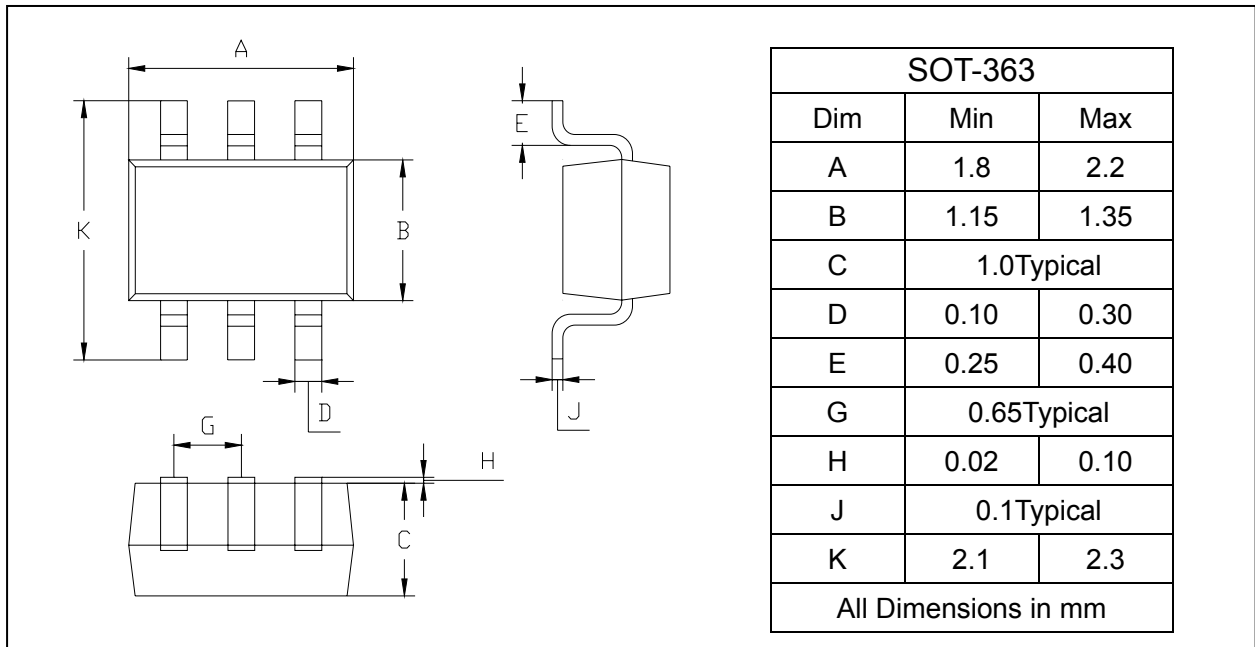
Small Signal Surface Mount Transistor

MMDT3946

PACKAGE OUTLINE

Plastic surface mounted package

SOT-363



PACKAGE INFORMATION

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