

Small Surface Mount Transistor

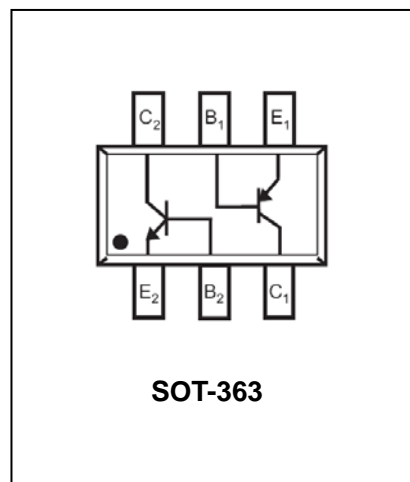
MMDT3946

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	K46	SOT-363

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

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 _{θJA}	Thermal Resistance, Junction to Ambient	625	°C/W



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ELECTRICAL CHARACTERISTICS NPN 3904 Section @ Ta=25°C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C=10\mu A, I_E=0$	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C=1mA, I_B=0$	40		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	$I_E=10\mu A, I_C=0$	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	$V_{CE}=1V, I_C=0.1mA$	40	-	
		$V_{CE}=1V, I_C=1mA$	70	-	
		$V_{CE}=1V, I_C=10mA$	100	300	
		$V_{CE}=1V, I_C=50mA$	60	-	
		$V_{CE}=1V, I_C=100mA$	30	-	
$V_{CE(sat)}$	collector-emitter saturation voltage	$I_C=10mA, I_B=1.0mA$	-	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	$I_C=0.1mA, V_{CE}=5V, R_S=1k\Omega, f=1kHz$	-	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



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ELECTRICAL CHARACTERISTICS PNP 3906 Section @ Ta=25°C unless otherwise specified

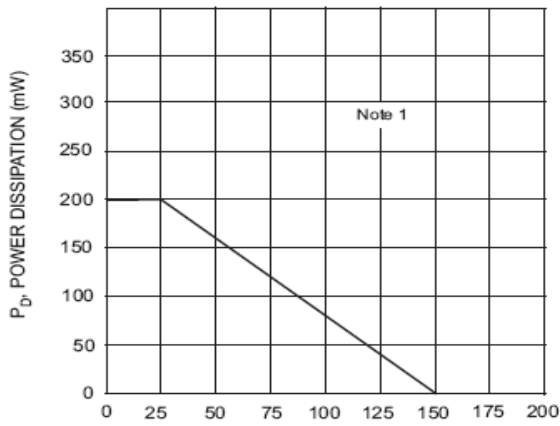
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C = -10\mu A, I_E = 0$	-40		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C = -1mA, I_B = 0$	-40		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	$I_E = -10\mu A, I_C = 0$	-5		V
I_{CEX}	collector cut-off current	$V_{CE} = -30V, V_{EB(OFF)} = -3.0V$	-	-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	$V_{CE} = -1V, I_C = -0.1mA$	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	$I_C = -0.1mA, V_{CE} = -5V, R_S = 1.0K\Omega$ $f = 1.0kHz$	-	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



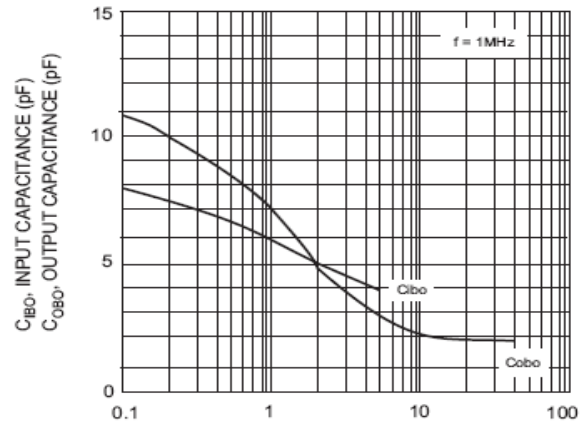
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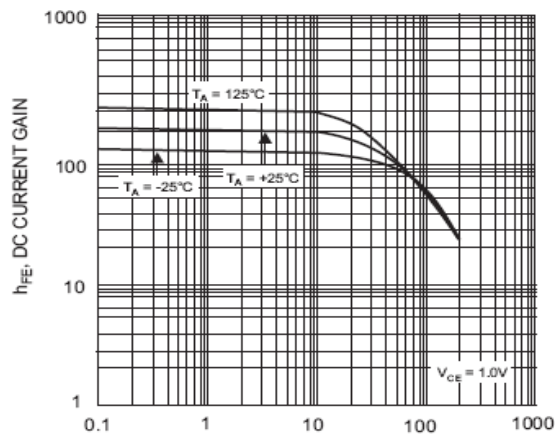
TYPICAL CHARACTERISTICS @ $T_a=25^\circ\text{C}$ unless otherwise specified



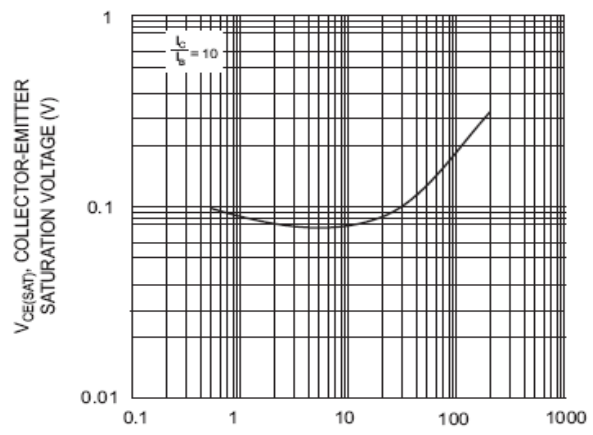
T_A , AMBIENT TEMPERATURE ($^\circ\text{C}$)
Fig. 1, Max Power Dissipation vs Ambient Temperature (Total Device)



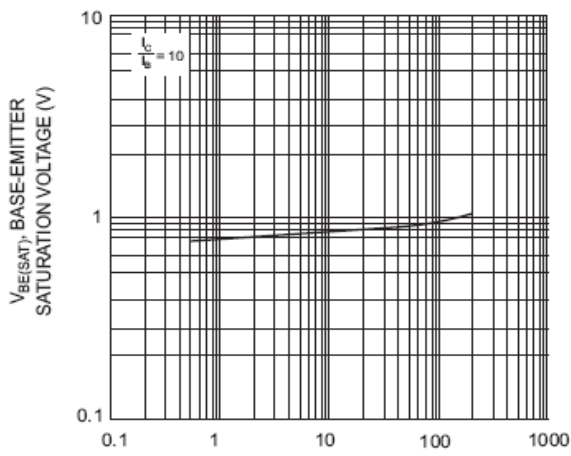
V_{CB} , COLLECTOR-BASE VOLTAGE (V)
Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage (NPN-3904)



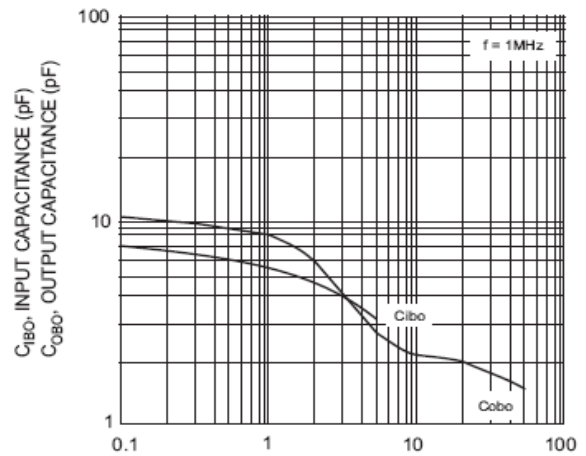
I_C , COLLECTOR CURRENT (mA)
Fig. 3, Typical DC Current Gain vs Collector Current (NPN-3904)



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)

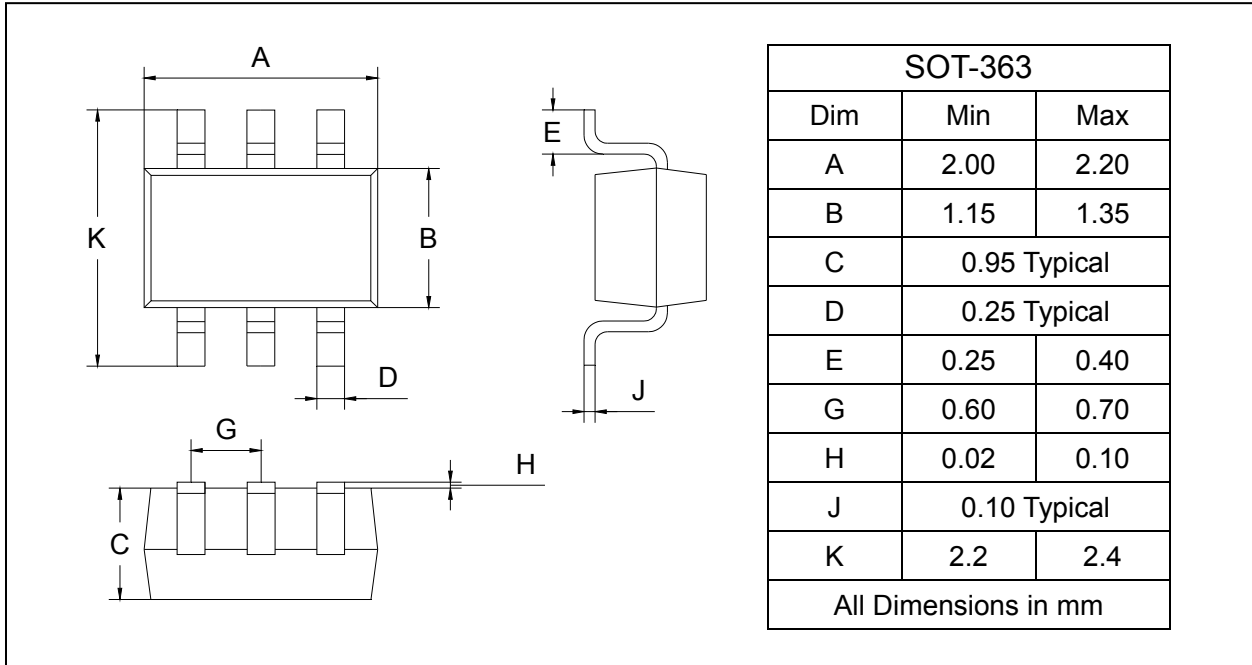
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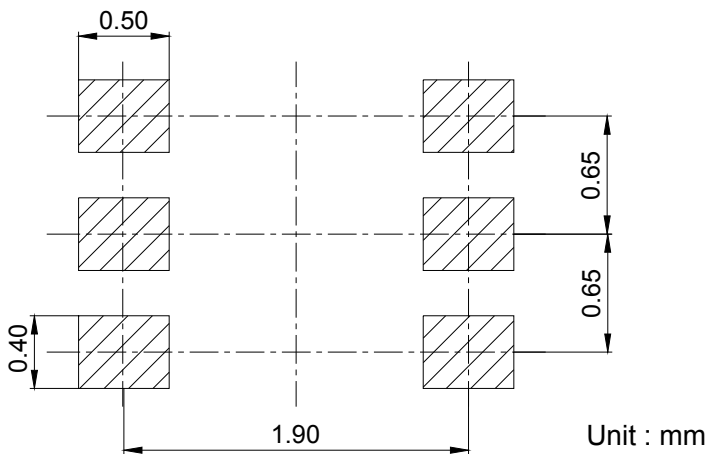
PACKAGE OUTLINE

Plastic surface mounted package

SOT-363



SOLDERING FOOTPRINT



PACKAGE INFORMATION

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