

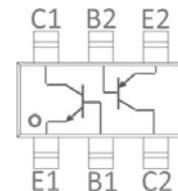


## Features

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



Pin 1  
SOT-363



Pin 1

## Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
MBT3946DW1T1G	SOT-363	K46	3000

## Maximum Ratings (Ta=25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
V <sub>CBO</sub>	Collector-Base Voltage	60	V
V <sub>CEO</sub>	Collector-Emitter Voltage	40	V
V <sub>EBO</sub>	Emitter-Base Voltage	5	V
I <sub>C</sub>	Collector Current	200	mA
P <sub>C</sub>	Collector Power Dissipation	200	mW
R <sub>θJA</sub>	Thermal Resistance From Junction To Ambient	625	°C/W
T <sub>J</sub> , T <sub>stg</sub>	Operation Junction And Storage Temperature Range	-55~+150	°C

## NPN Electrical Characteristics (Ta=25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Min	Max	Unit
V <sub>(BR)CBO</sub>	Collector-base breakdown voltage	I <sub>C</sub> =10μA, I <sub>E</sub> =0	60		V
V <sub>(BR)CEO</sub>	Collector-emitter breakdown voltage	I <sub>C</sub> =1mA, I <sub>B</sub> =0	40		V
V <sub>(BR)EBO</sub>	Emitter-base breakdown voltage	I <sub>E</sub> =10μA, I <sub>C</sub> =0	5		V
I <sub>CEO</sub>	Collector cut-off current	V <sub>CE</sub> =30V, I <sub>B</sub> =0		50	nA
I <sub>CBO</sub>	Collector cut-off current	V <sub>CB</sub> =30V, I <sub>E</sub> =0		50	nA
I <sub>EBO</sub>	Emitter cut-off current	V <sub>EB</sub> =5V, I <sub>C</sub> =0		50	nA
h <sub>FE(1)</sub>	DC current gain(1)	V <sub>CE</sub> =1V, I <sub>C</sub> =100μA	40		
h <sub>FE(2)</sub>	DC current gain(2)	V <sub>CE</sub> =1V, I <sub>C</sub> =1mA	70		
h <sub>FE(3)</sub>	DC current gain(3)	V <sub>CE</sub> =1V, I <sub>C</sub> =10mA	100	300	
h <sub>FE(4)</sub>	DC current gain(4)	V <sub>CE</sub> =1V, I <sub>C</sub> =50mA	60		
h <sub>FE(5)</sub>	DC current gain(5)	V <sub>CE</sub> =1V, I <sub>C</sub> =100mA	30		
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA		0.2	V
		I <sub>C</sub> =50mA, I <sub>B</sub> =5mA		0.3	V
V <sub>BE(sat)</sub>	Base-emitter saturation voltage	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA	0.65	0.85	V
		I <sub>C</sub> =50mA, I <sub>B</sub> =5mA		0.95	V
f <sub>T</sub>	Transition frequency	V <sub>CE</sub> =20V, I <sub>C</sub> =10mA, f=100MHz	300		MHz
C <sub>ob</sub>	Collector output capacitance	V <sub>CB</sub> =5V, I <sub>E</sub> =0, f=1MHz		4	pF
NF	Noise figure	V <sub>CE</sub> =5V, I <sub>C</sub> =0.1mA, f=1kHz, R <sub>g</sub> =1KΩ		5	dB
t <sub>d</sub>	Delay time	V <sub>CC</sub> =3V, V <sub>BE(off)</sub> =0.5V, I <sub>C</sub> =10mA, I <sub>B1</sub> =I <sub>B2</sub> =1mA		35	ns
t <sub>r</sub>	Rise time			35	ns
t <sub>s</sub>	Storage time	V <sub>CC</sub> =3V, I <sub>C</sub> =10mA, I <sub>B1</sub> =I <sub>B2</sub> =1mA		225	ns
t <sub>f</sub>	Fall time			75	ns



**Maximum Ratings (Ta=25°C unless otherwise noted)**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage	-40	V
$V_{CEO}$	Collector-Emitter Voltage	-40	V
$V_{EBO}$	Emitter-Base Voltage	-5	V
$I_C$	Collector Current	-200	mA
$P_C$	Collector Power Dissipation	200	mW
$R_{\theta JA}$	Thermal Resistance From Junction To Ambient	625	°C/W
$T_J, T_{stg}$	Operation Junction And Storage Temperature Range	-55~+150	°C

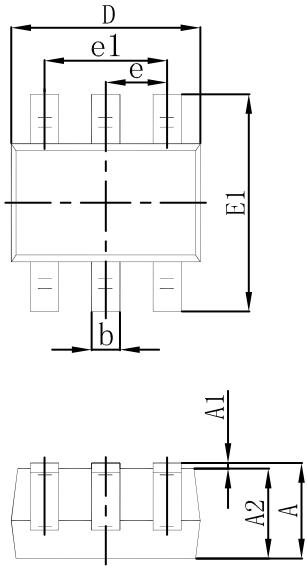
**PNP Electrical Characteristics (Ta=25°C unless otherwise noted)**

Symbol	Parameter	Test 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	$V_{CE}=-30V, V_{EB(off)}=-3V$		-50	nA
$I_{CBO}$	Collector cut-off current	$V_{CB}=-30V, I_E=0$		-50	nA
$I_{EBO}$	Base cut-off current	$V_{EB}=-5V, I_E=0$		-50	nA
$h_{FE(1)}^*$	DC current gain(1)	$V_{CE}=-1V, I_C=-100\mu A$	60		
$h_{FE(2)}^*$	DC current gain(2)	$V_{CE}=-1V, I_C=-1mA$	80		
$h_{FE(3)}^*$	DC current gain(3)	$V_{CE}=-1V, I_C=-10mA$	100	300	
$h_{FE(4)}^*$	DC current gain(4)	$V_{CE}=-1V, I_C=-50mA$	60		
$h_{FE(5)}^*$	DC current gain(5)	$V_{CE}=-1V, I_C=-100mA$	30		
$V_{CE(sat)}^*$	Collector-emitter saturation voltage	$I_C=-10mA, I_B=-1mA$		-0.25	V
		$I_C=-50mA, I_B=-5mA$		-0.4	V
$V_{BE(sat)}^*$	Base-emitter saturation voltage	$I_C=-10mA, I_B=-1mA$	-0.65	-0.85	V
		$I_C=-50mA, I_B=-5mA$		-0.95	V
$f_T$	Transition frequency	$V_{CE}=-20V, I_C=-10mA, f=100MHz$	250		MHz
$C_{ob}$	Collector output capacitance	$V_{CB}=-5V, I_E=0, f=1MHz$		4.5	pF
$NF$	Noise figure	$V_{CE}=-5V, I_C=-0.1mA, f=1kHz, R_g=1K\Omega$		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

\*Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2.0\%$ .

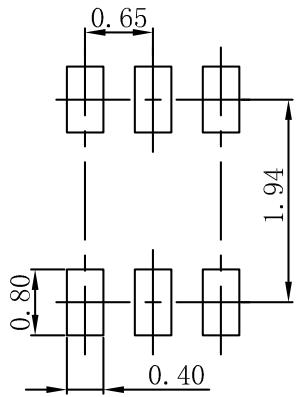


### SOT-363 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.100	0.150	0.004	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.400	0.085	0.094
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

### SOT-363 Suggested Pad Layout



#### Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05$ mm.
3. The pad layout is for reference purposes only.



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