



# WBFBP-03A Plastic-Encapsulate Transistors

## MMBT2222AE TRANSISTOR

### DESCRIPTION

NPN Epitaxial planar Silicon Transistor

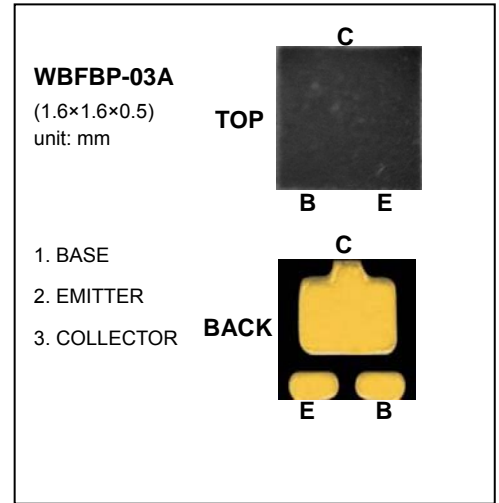
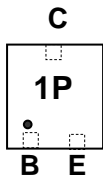
### FEATURES

Complementary PNP Type available (MMBT2907AE)

### APPLICATION

general purpose amplifier, switching.  
For portable equipment:(i.e. Mobile phone,MP3, MD,CD-ROM, DVD-ROM, Note book PC, etc.)

### MARKING:1P



### MAXIMUM RATINGS $T_A=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
$V_{CBO}$	Collector-Base Voltage	75	V
$V_{CEO}$	Collector-Emitter Voltage	40	V
$V_{EBO}$	Emitter-Base Voltage	6	V
$I_C$	Collector Current -Continuous	600	mA
$P_C$	Collector Dissipation	150	mW
$T_J$	Junction Temperature	150	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature	-55to+150	$^{\circ}\text{C}$

### ELECTRICAL CHARACTERISTICS ( $T_{amb}=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=10\mu\text{A}, I_E=0$	75			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=10\text{mA}, I_B=0$	40			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=10\mu\text{A}, I_C=0$	6			V
Collector cut-off current	$I_{CBO}$	$V_{CB}=70\text{V}, I_E=0$			0.1	$\mu\text{A}$
Collector cut-off current	$I_{CEX}$	$V_{CE}=60\text{V}, V_{BE(off)}=3\text{V}$			0.1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB}=3\text{V}, I_C=0$			0.1	$\mu\text{A}$
DC current gain	$h_{FE(1)}$	$V_{CE}=10\text{V}, I_C=0.1\text{mA}$	35			
	$h_{FE(2)}$	$V_{CE}=10\text{V}, I_C=1\text{mA}$	50			
	$h_{FE(3)}$	$V_{CE}=10\text{V}, I_C=10\text{mA}$	75			
	$h_{FE(4)}$	$V_{CE}=10\text{V}, I_C=150\text{mA}$	100		400	
	$h_{FE(5)}$	$V_{CE}=10\text{V}, I_C=500\text{mA}$	40			
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=500\text{mA}, I_B=50\text{mA}$ $I_C=150\text{mA}, I_B=15\text{mA}$			1 0.3	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C=500\text{mA}, I_B=50\text{mA}$ $I_C=150\text{mA}, I_B=15\text{mA}$			2 1.2	V
Transition frequency	$f_T$	$V_{CE}=20\text{V}, I_C=20\text{mA}$ $f=100\text{MHz}$	300			MHz
Collector output capacitance	$C_{ob}$	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$			8	pF
Noise figure	NF	$V_{CB}=10\text{V}, I_C=0.1\text{mA}$ , $f=1\text{KHz}, R_s=1\text{K}\Omega$			4	dB

**ELECTRICAL CHARACTERISTICS (Tamb=25°C unless otherwise specified)**

Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Delay time	$t_d$	$V_{CC}=30V, V_{BE(off)}=-0.5V$			10	nS
Rise time	$t_r$	$I_C=150mA, I_{B1}=15mA$			25	nS
Storage time	$t_S$	$V_{CC}=30V, I_C=150mA$			225	nS
Fall time	$t_f$	$I_{B1}=-I_{B2}=15mA$			60	nS

**Typical Characteristics**

**MMBT2222AE**

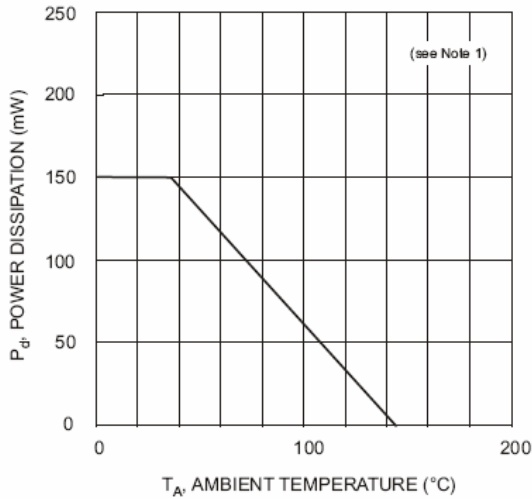


Fig. 1, Power Derating Curve

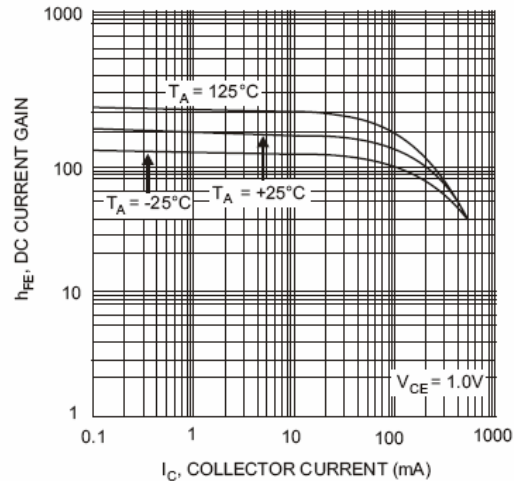


Fig. 2 Typical DC Current Gain vs Collector Current

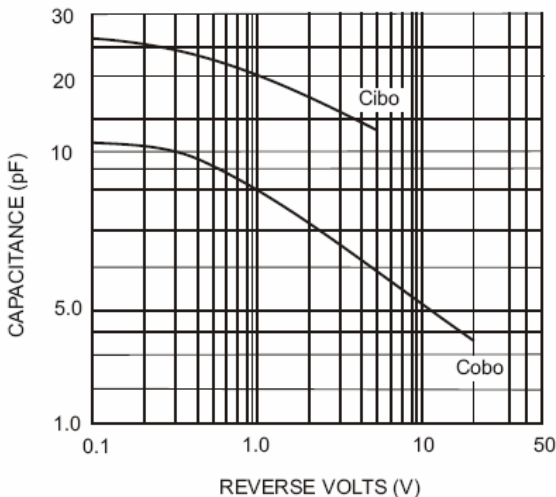


Fig. 3 Typical Capacitance

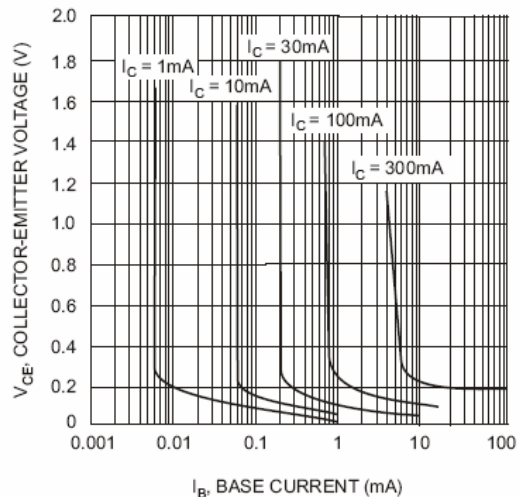


Fig. 4 Typical Collector Saturation Region

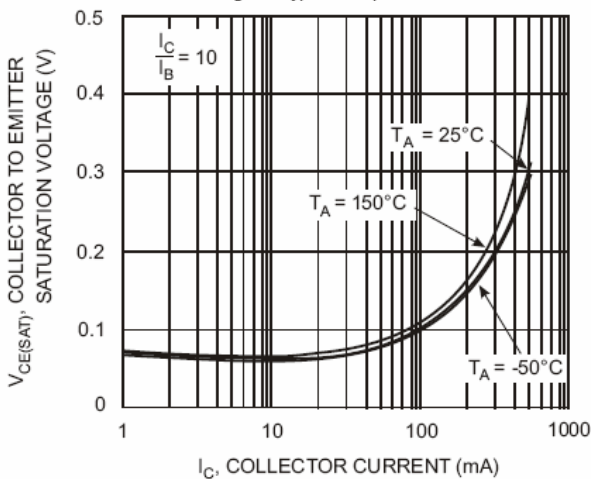


Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

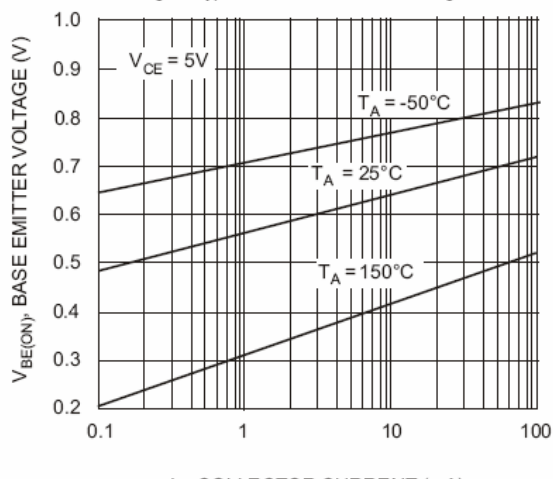


Fig. 6 Base Emitter Voltage vs. Collector Current

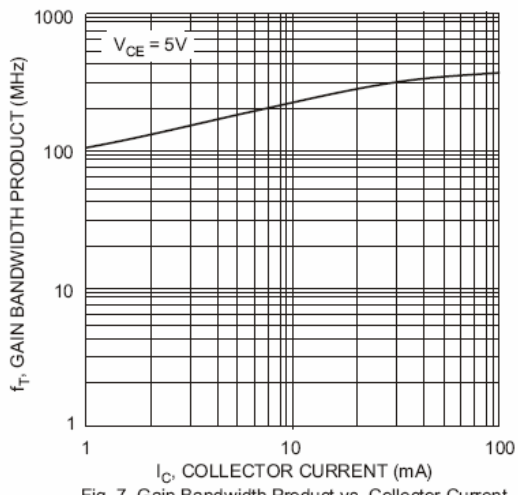
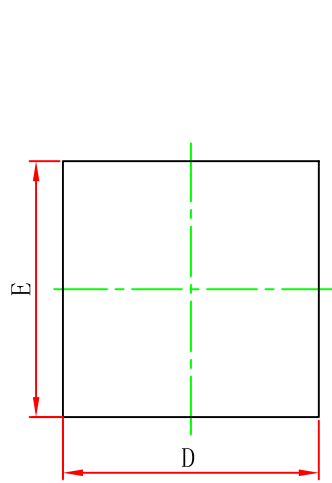
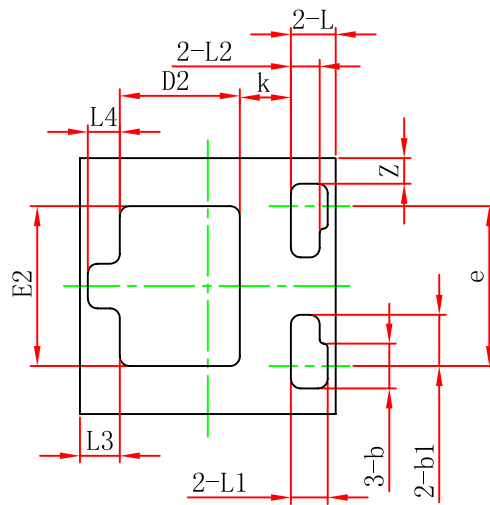


Fig. 7 Gain Bandwidth Product vs. Collector Current

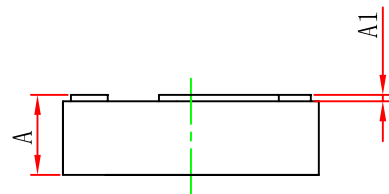
# WBFBP-03A(1.6×1.6×0.5) PACKAGE OUTLINE DIMENSIONS



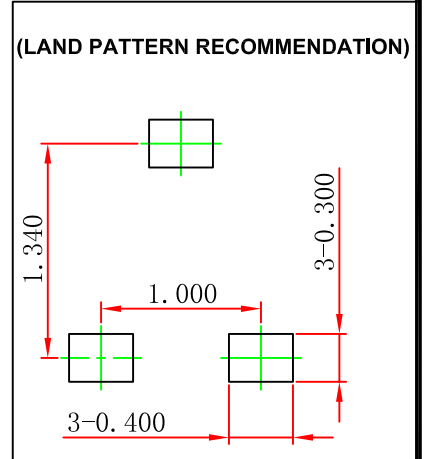
TOP VIEW



BOTTOM VIEW



SIDE VIEW



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.450	0.550	0.018	0.022
A1	0.010	0.090	0.000	0.004
b	0.230	0.330	0.009	0.013
b1	0.320 REF.		0.013 REF.	
D	1.550	1.650	0.061	0.065
E	1.550	1.650	0.061	0.065
D2	0.750 REF.		0.030 REF.	
E2	1.000 REF.		0.040 REF.	
e	1.000 TYP.		0.040 TYP.	
L	0.280 REF.		0.011 REF.	
L1	0.230 REF.		0.009 REF.	
L2	0.180 REF.		0.007 REF.	
L3	0.250 REF.		0.010 REF.	
L4	0.200 REF.		0.008 REF.	
k	0.320 REF.		0.013 REF.	
z	0.160 REF.		0.006 REF.	