



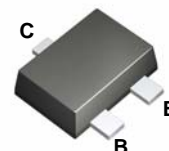
February 2008

MMBT3904T

NPN Epitaxial Silicon Transistor

Features

- General purpose amplifier transistor.
- Ultra-Small Surface Mount Package for all types.
- Suitable for general switching & amplification
- Well suited for portable application
- As complementary type, PNP MMBT3906T is recommended



Marking : A04
SOT-523F

Absolute Maximum Ratings $T_a = 25^\circ\text{C}$ unless otherwise noted

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	200	mA
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 ~ 150	$^\circ\text{C}$

- * 1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics* $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Max	Unit
P_C	Collector Power Dissipation, by $R_{\theta JA}$	250	mW
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	500	$^\circ\text{C}/\text{W}$

* Minimum land pad.

Electrical Characteristics* $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Condition	Min.	Max.	Unit
BV_{CBO}	Collector-Base Breakdown Voltage	$I_C = 10\mu\text{A}, I_E = 0$	60		V
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C = 1\text{mA}, I_B = 0$	40		V
BV_{EBO}	Emitter-Base Breakdown Voltage	$I_E = 10\mu\text{A}, I_C = 0$	6		V
I_{CEX}	Collector Cut-off Current	$V_{CE} = 60\text{V}, V_{EB(OFF)} = 3\text{V}$		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	$I_C = 10\text{mA}, I_B = 1\text{mA}$ $I_C = 50\text{mA}, I_B = 5\text{mA}$		0.2 0.3	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 10\text{mA}, I_B = 1\text{mA}$ $I_C = 50\text{mA}, I_B = 5\text{mA}$	0.65	0.85 0.95	V V
f_T	Current Gain Bandwidth Product	$V_{CE} = 20\text{V}, I_C = 10\text{mA}, f = 100\text{MHz}$	300		MHz
C_{ob}	Output Capacitance	$V_{CB} = 5\text{V}, I_E = 0, f = 1\text{MHz}$		6	pF
C_{ib}	Input Capacitance	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$		15	pF
t_d	Delay Time	$V_{CC} = 3\text{V}, I_C = 10\text{mA}$ $I_{B1} = -I_{B2} = 1\text{mA}$		35	ns
t_r	Rise Time			35	ns
t_s	Storage Time			200	ns
t_f	Fall Time			50	ns

* DC Item are tested by Pulse Test : Pulse Width \leq 300us, Duty Cycle \leq 2%

Typical Performance Characteristics

Figure 1. DC Current Gain

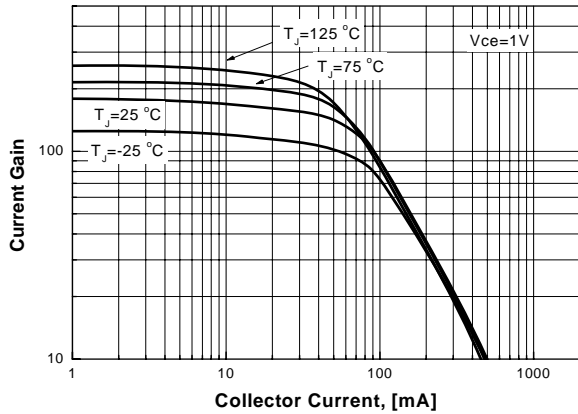


Figure 2. Collector-Emitter Saturation Voltage

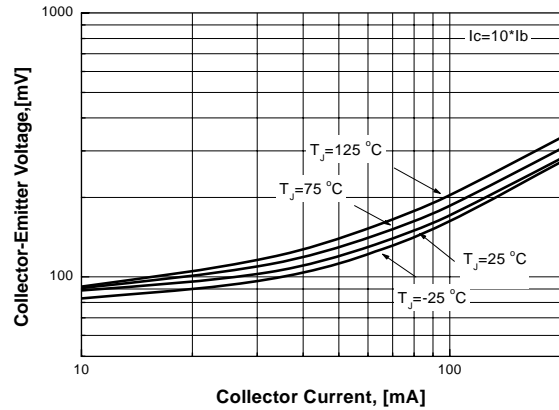


Figure 3. Base- Emitter Saturation Voltage

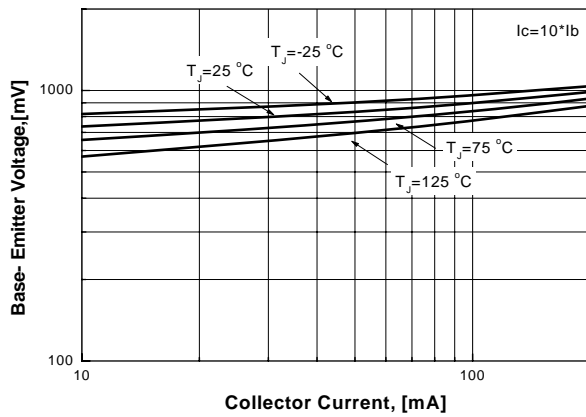


Figure 4. Collector- Base Leakage Current

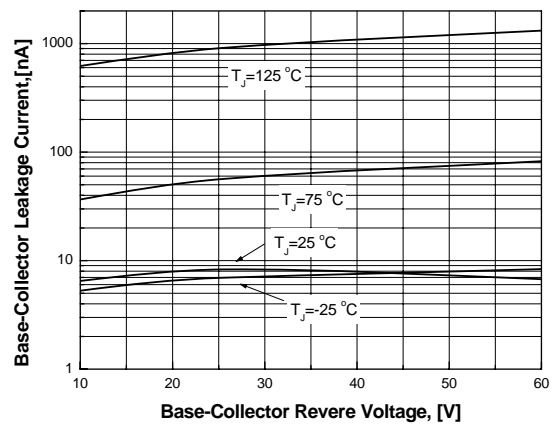


Figure 5. Collector- Base Capacitance

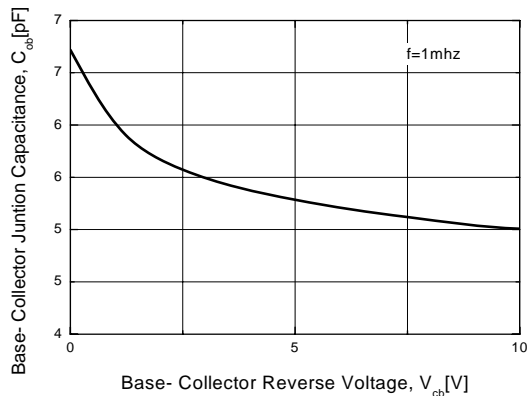
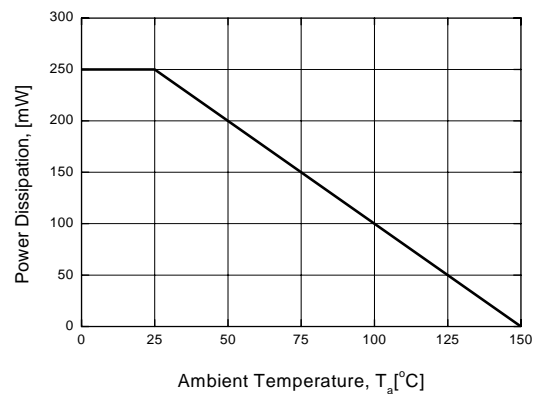


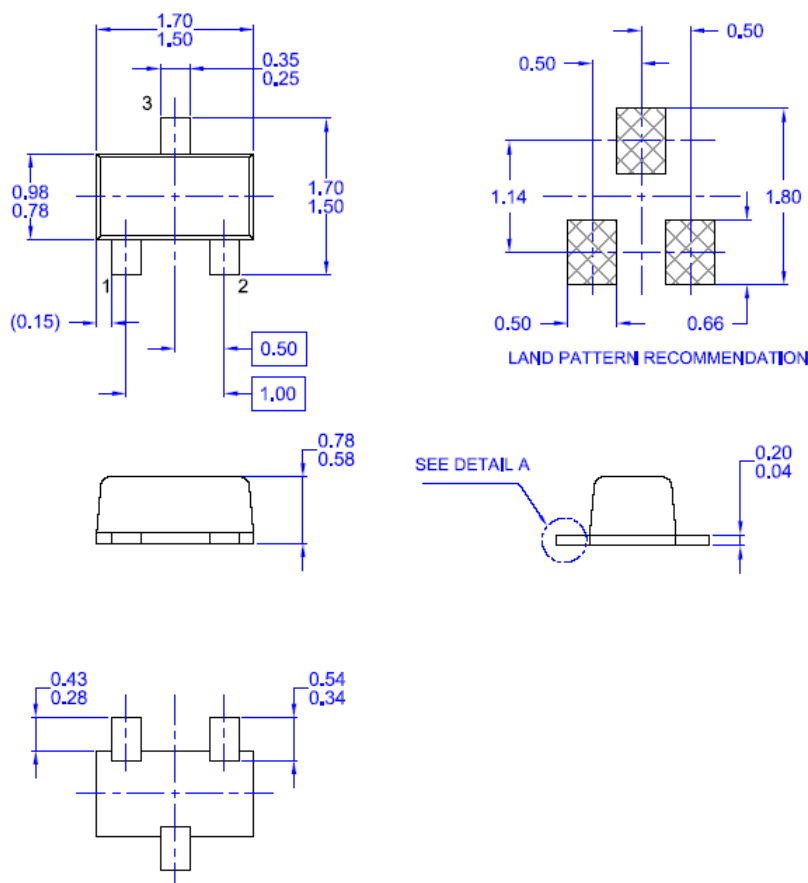
Figure 6. Power Derating



Package Dimensions

SOT-523F

- Case : SOT-523F
- Case Material(Molded Plastic): KTMC1060SC
- UL Flammability classification rating : "V0"
- Moisture Sensitivity level per JESD22-A1113B : MSL 1
- Lead terminals solderable per MIL-STD7502026 /JESD22A121
- Lead Free Plating : Pure Tin(Matte)






Dimensions in Millimeters



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