



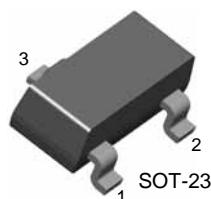
# THE DATASHEET OF MMBT3904K



# MMBT3904K

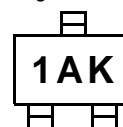
## NPN Epitaxial Silicon Transistor

### General Purpose Transistor



1. Base 2. Emitter 3. Collector

Marking



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

Symbol	Parameter	Value	Units
$V_{CBO}$	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
$P_C$	Collector Power Dissipation	350	mW
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 ~ 150	$^\circ\text{C}$

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

Symbol	Parameter	Test Condition	Min.	Max.	Units
$BV_{CBO}$	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	$V_{CE} = 30\text{V}, V_{EB} = 3\text{V}$		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
$C_{ob}$	Output Capacitance	$V_{CB} = 5\text{V}, I_E = 0, f = 1\text{MHz}$		4	pF
$f_T$	Current Gain-Bandwidth Product	$V_{CE} = 20\text{V}, I_C = 10\text{mA}, f = 100\text{MHz}$	300		MHz
NF	Noise Figure	$I_C = 100\mu\text{A}, V_{CE} = 5\text{V}, R_S = 1\text{K}\Omega$ $f = 10\text{Hz to } 15.7\text{KHz}$		5	dB
$t_{ON}$	Turn On Time	$V_{CC} = 3\text{V}, V_{BE} = 0.5\text{V}$ $I_C = 10\text{mA}, I_{B1} = 1\text{mA}$		70	ns
$t_{OFF}$	Turn Off Time	$V_{CC} = 3\text{V}, I_C = 10\text{mA}, I_{B1} = I_{B2} = 1\text{mA}$		250	ns

\* Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$

## Typical Performance Characteristics

Figure 1. DC current Gain

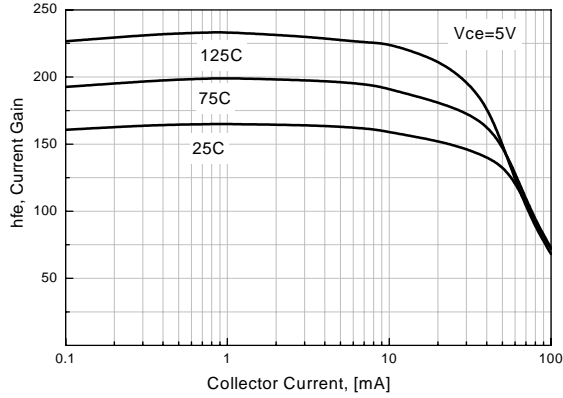


Figure 2. Collector-Emitter Saturation Voltage

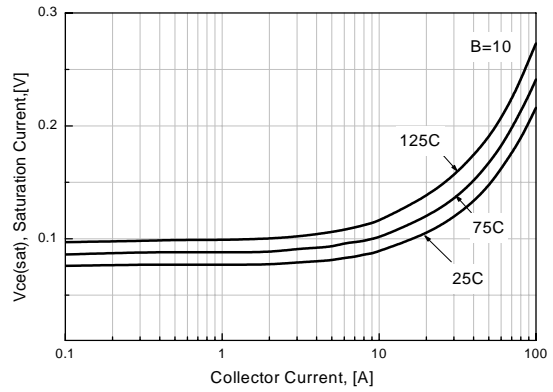


Figure 3. Base-Emitter Saturation Voltage

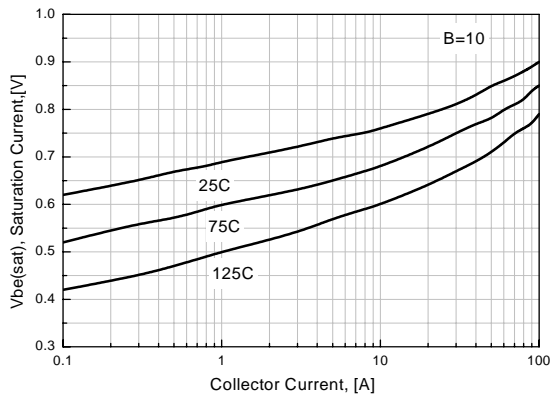


Figure 4. Collector - Base Leakage Current

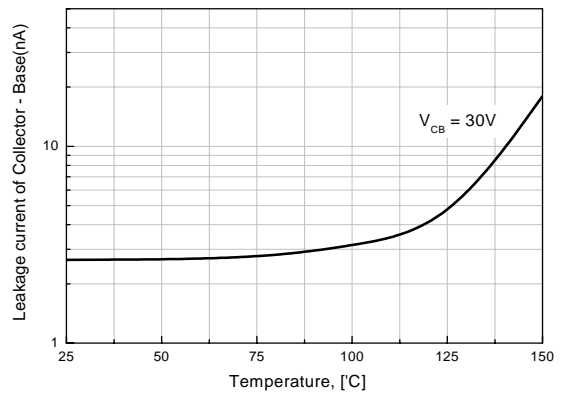


Figure 5. Output Capacitance

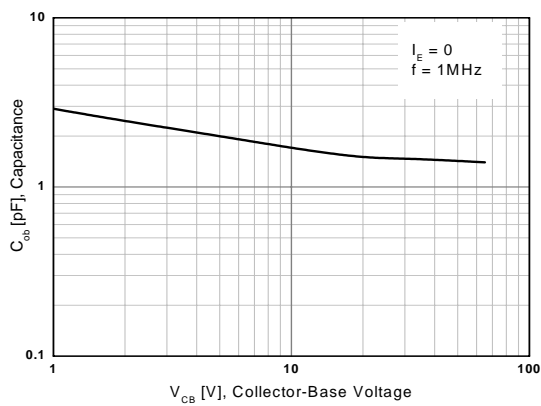
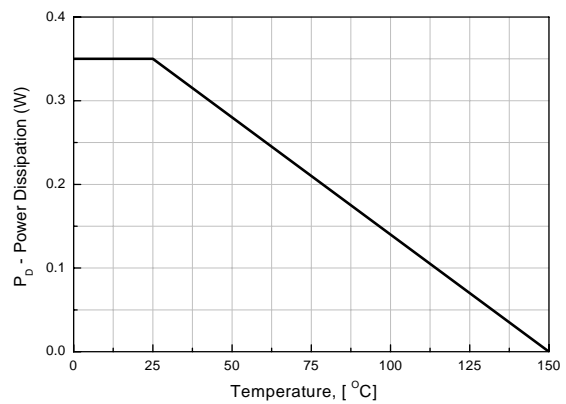
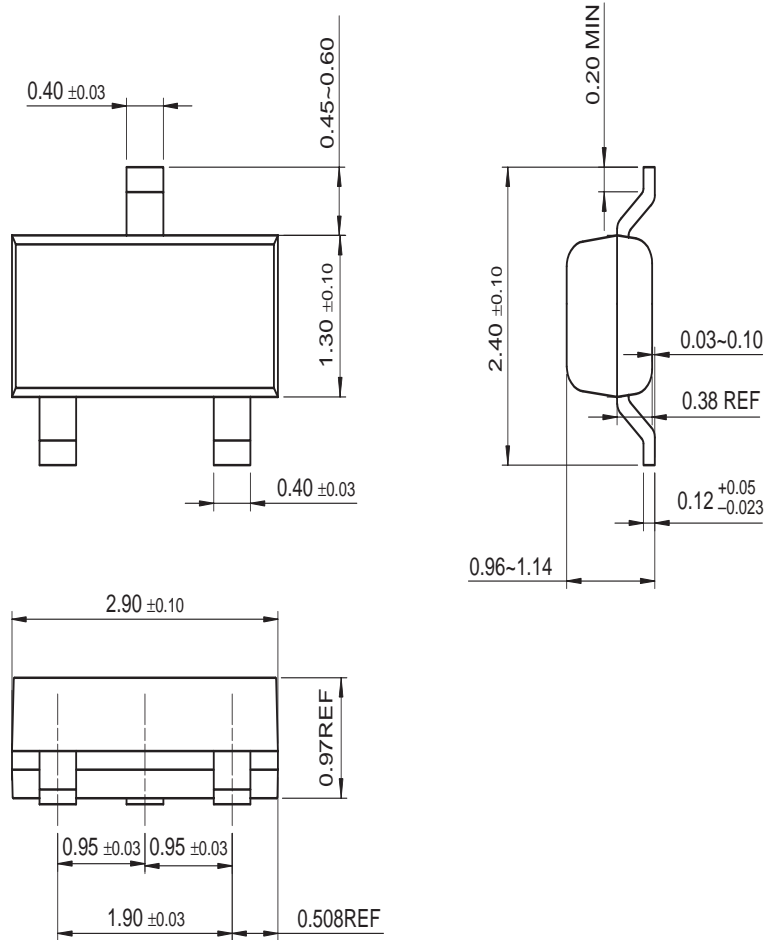


Figure 6. Power Dissipation vs Ambient Temperature



Mechanical Dimensions

SOT-23



Dimensions in Millimeters

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