



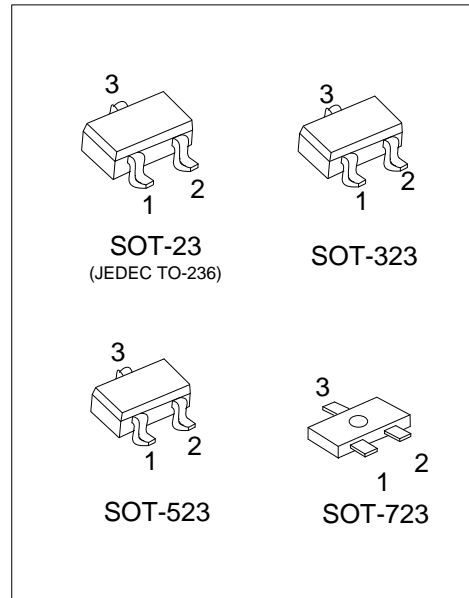
## MMBT3904

## NPN EPITAXIAL SILICON TRANSISTOR

### GENERAL PURPOSE APPLICATION

#### FEATURES

- \* Collector-Emitter Voltage:  $V_{CE0}=40V$
- \* Complementary to UTC MMBT3906



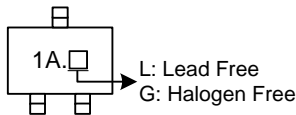
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
MMBT3904L-AE3-R	MMBT3904G-AE3-R	SOT-23	B	E	C	Tape Reel
MMBT3904L-AL3-R	MMBT3904G-AL3-R	SOT-323	B	E	C	Tape Reel
MMBT3904L-AN3-R	MMBT3904G-AN3-R	SOT-523	B	E	C	Tape Reel
MMBT3904L-AQ3-R	MMBT3904G-AQ3-R	SOT-723	B	E	C	Tape Reel

Note: Pin Assignment: B: Base E: Emitter C: Collector

<p>MMBT3904G-AE3-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AE3: SOT-23, AL3: SOT-323, AN3: SOT-523 AQ3: SOT-723 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



# MMBT3904

## NPN EPITAXIAL SILICON TRANSISTOR

### ■ ABSOLUTE MAXIMUM RATING ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Base Voltage		$V_{CBO}$	60	V
Collector-Emitter Voltage		$V_{CEO}$	40	V
Emitter-Base Voltage		$V_{EBO}$	6	V
Collector Current		$I_C$	200	mA
Collector Dissipation	SOT-23	$P_C$	0.35	W
	SOT-323		0.3	W
	SOT-523		0.27	W
	SOT-723		0.13	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature		$T_{STG}$	-55 ~ +150	$^{\circ}\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-23	$\theta_{JA}$	360	$^{\circ}\text{C/W}$
	SOT-323		420	$^{\circ}\text{C/W}$
	SOT-523		450	$^{\circ}\text{C/W}$
	SOT-723		470	$^{\circ}\text{C/W}$

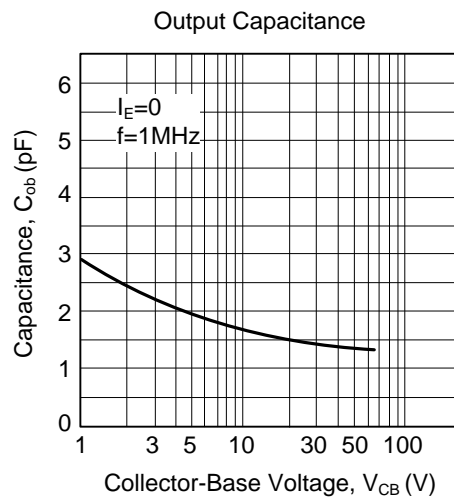
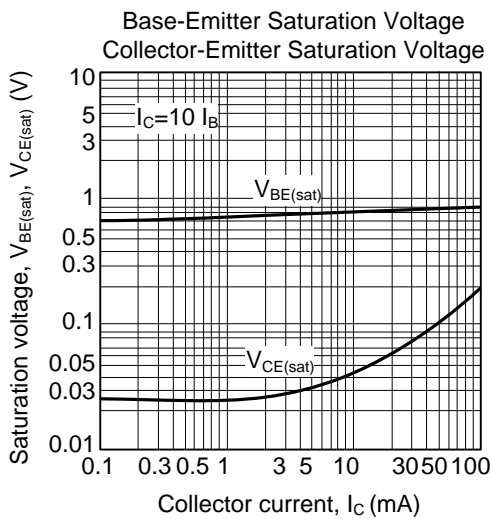
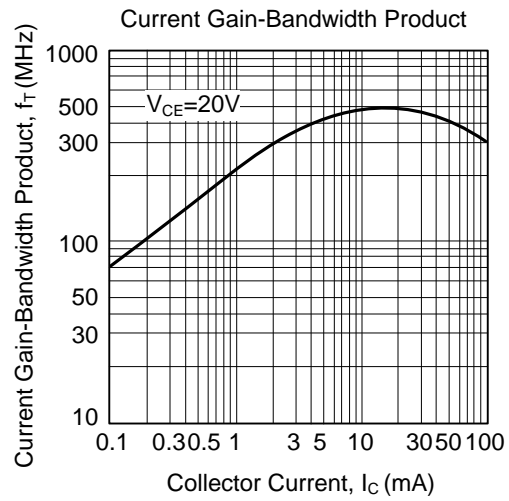
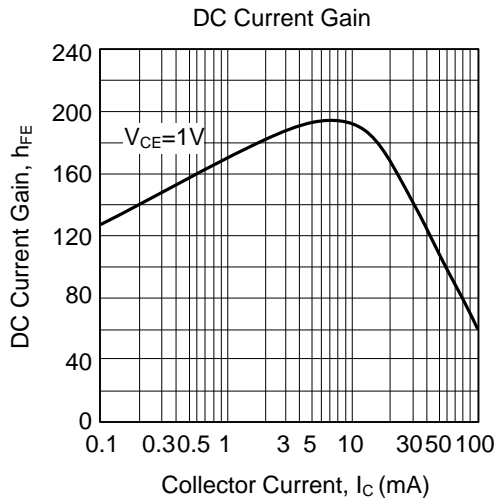
Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

### ■ ELECTRICAL CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector-Base Breakdown Voltage	$V_{CBO}$	$I_C=10\mu\text{A}, I_E=0$	60			V
Collector-Emitter Breakdown Voltage	$V_{CEO}$	$I_C=1\text{mA}, I_B=0$ (Note)	40			V
Emitter-Base Breakdown Voltage	$V_{EBO}$	$I_E=10\mu\text{A}, I_C=0$	6			V
Collector-Emitter Saturation Voltage (Note)	$V_{CE(SAT)1}$	$I_C=10\text{mA}, I_B=1\text{mA}$			0.2	V
	$V_{CE(SAT)2}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.3	V
Base-Emitter Saturation Voltage (Note)	$V_{BE(SAT)1}$	$I_C=10\text{mA}, I_B=1\text{mA}$	0.65		0.85	V
	$V_{BE(SAT)2}$	$I_C=50\text{mA}, I_B=5\text{mA}$			0.95	V
Collector Cut-Off Current	$I_{CEX}$	$V_{CE}=30\text{V}, V_{EB}=3\text{V}$			50	nA
Base Cut-Off Current	$I_{BL}$	$V_{CE}=30\text{V}, V_{EB}=3\text{V}$			50	nA
DC Current Gain (Note)	$h_{FE1}$	$V_{CE}=1\text{V}, I_C=0.1\text{mA}$	40			
	$h_{FE2}$	$V_{CE}=1\text{V}, I_C=1\text{mA}$	70			
	$h_{FE3}$	$V_{CE}=1\text{V}, I_C=10\text{mA}$	100		300	
	$h_{FE4}$	$V_{CE}=1\text{V}, I_C=50\text{mA}$	60			
	$h_{FE5}$	$V_{CE}=1\text{V}, I_C=100\text{mA}$	30			
Current Gain Bandwidth Product	$f_T$	$V_{CE}=20\text{V}, I_C=10\text{mA}, f=100\text{MHz}$	300			MHz
Output Capacitance	$C_{OB}$	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$			4	pF
Turn On Time	$t_{ON}$	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V}, I_C=10\text{mA}, I_{B1}=1\text{mA}$			70	ns
Turn Off Time	$t_{OFF}$	$I_{B1}=I_{B2}=1\text{mA}$			250	ns

Note: Pulse test:  $P_W \leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

## ■ TYPICAL CHARACTERISTICS



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