



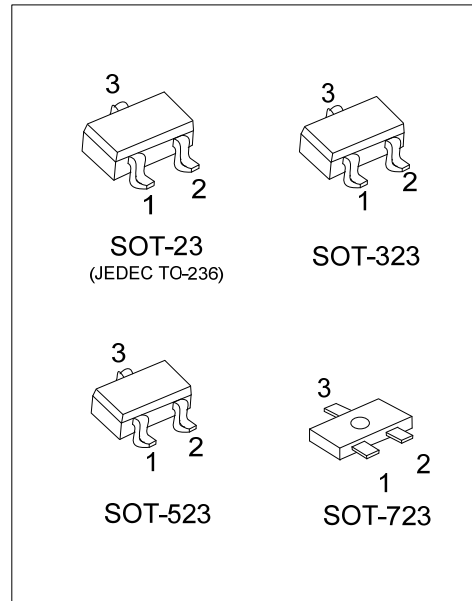
# MMBT3904

## NPN EPITAXIAL SILICON TRANSISTOR

### GENERAL PURPOSE APPLICATION

■ FEATURES

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



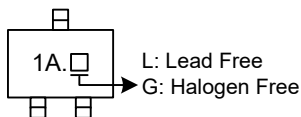
■ ORDERING INFORMATION

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



■ ABSOLUTE MAXIMUM RATING (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Base Voltage		V <sub>CBO</sub>	60	V
Collector-Emitter Voltage		V <sub>CEO</sub>	40	V
Emitter-Base Voltage		V <sub>EBO</sub>	6	V
Collector Current		I <sub>C</sub>	200	mA
Collector Dissipation	SOT-23	P <sub>C</sub>	0.35	W
	SOT-323		0.3	W
	SOT-523		0.27	W
	SOT-723		0.13	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +150	°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	θ <sub>JA</sub>	360	°C/W
	SOT-323		420	°C/W
	SOT-523		450	°C/W
	SOT-723		470	°C/W

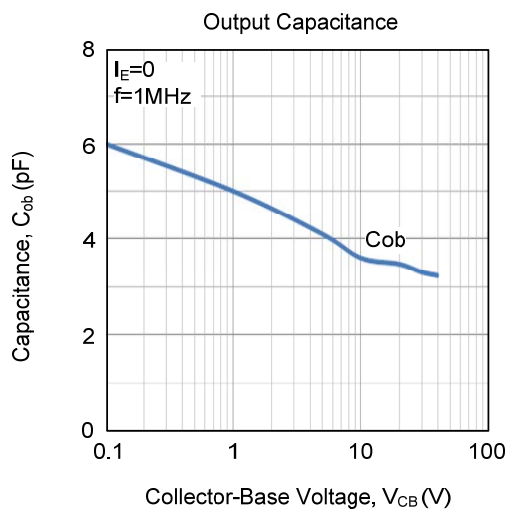
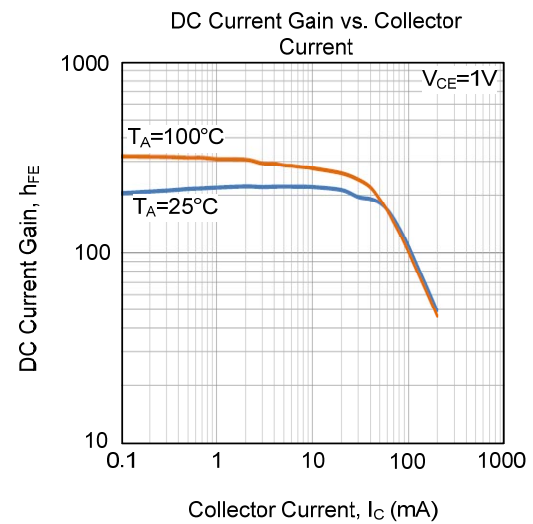
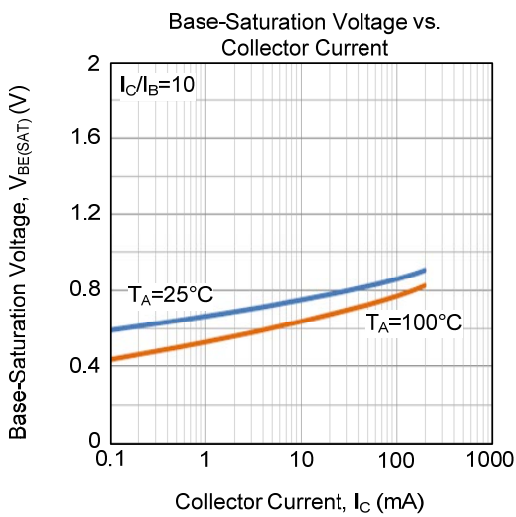
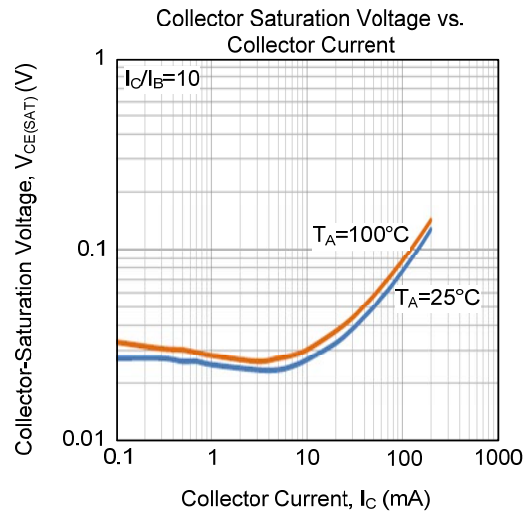
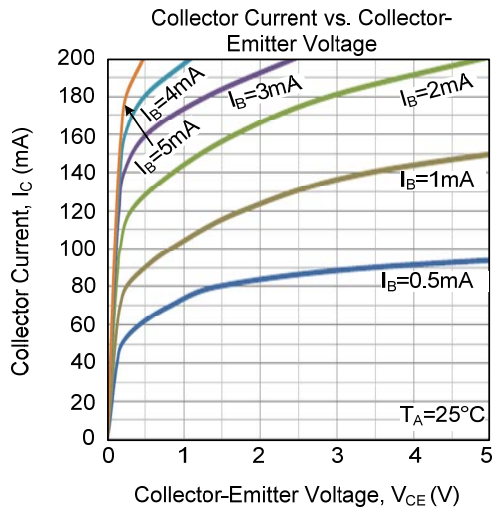
Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector-Base Breakdown Voltage	V <sub>CBO</sub>	I <sub>C</sub> =10μA, I <sub>E</sub> =0	60			V
Collector-Emitter Breakdown Voltage	V <sub>CEO</sub>	I <sub>C</sub> =1mA, I <sub>B</sub> =0 (Note)	40			V
Emitter-Base Breakdown Voltage	V <sub>EBO</sub>	I <sub>E</sub> =10μA, I <sub>C</sub> =0	6			V
Collector-Emitter Saturation Voltage (Note)	V <sub>CE(SAT)1</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA			0.2	V
	V <sub>CE(SAT)2</sub>	I <sub>C</sub> =50mA, I <sub>B</sub> =5mA			0.3	V
Base-Emitter Saturation Voltage (Note)	V <sub>BE(SAT)1</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA	0.65		0.85	V
	V <sub>BE(SAT)2</sub>	I <sub>C</sub> =50mA, I <sub>B</sub> =5mA			0.95	V
Collector Cut-Off Current	I <sub>CEX</sub>	V <sub>CE</sub> =30V, V <sub>EB</sub> =3V			50	nA
Base Cut-Off Current	I <sub>BL</sub>	V <sub>CE</sub> =30V, V <sub>EB</sub> =3V			50	nA
DC Current Gain (Note)	h <sub>FE1</sub>	V <sub>CE</sub> =1V, I <sub>C</sub> =0.1mA	40			
	h <sub>FE2</sub>	V <sub>CE</sub> =1V, I <sub>C</sub> =1mA	70			
	h <sub>FE3</sub>	V <sub>CE</sub> =1V, I <sub>C</sub> =10mA	100		300	
	h <sub>FE4</sub>	V <sub>CE</sub> =1V, I <sub>C</sub> =50mA	60			
	h <sub>FE5</sub>	V <sub>CE</sub> =1V, I <sub>C</sub> =100mA	30			
Current Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> =20V, I <sub>C</sub> =10mA, f=100MHz	300			MHz
Output Capacitance	C <sub>OB</sub>	V <sub>CB</sub> =5V, I <sub>E</sub> =0, f=1MHz			4	pF
Turn On Time	t <sub>ON</sub>	V <sub>CC</sub> =3V, V <sub>BE</sub> =0.5V, I <sub>C</sub> =10mA, I <sub>B1</sub> =1mA			70	ns
Turn Off Time	t <sub>OFF</sub>	I <sub>B1</sub> =1mA, I <sub>B2</sub> =1mA			250	ns

Note: Pulse test: P<sub>W</sub> ≤ 300μs, Duty Cycle ≤ 2%.

## ■ TYPICAL CHARACTERISTICS



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