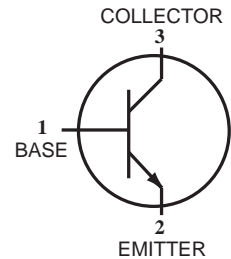
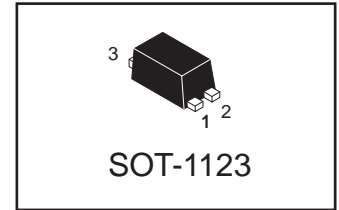


NPN General Purpose Transistor

(Pb) Lead(Pb)-Free

The MMBT3904E device is a spin-off of our popular SOT-23/SOT-323/SOT-563/SOT-963 three-leaded device. It is designed for general purpose amplifier applications and is housed in the SOT-1123 surface mount package. This device is ideal for low-power surface mount applications where board space is at a premium.



FEATURES :

- h_{FE} 100-300
- LOW $V_{CE(sat)} \leq 0.4V$
- Reduces Board Space

Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CBO}	60	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current-Continuous	I_C	600	mAdc

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Total Device Dissipation (1) $T_a=25^\circ C$	P_D	290	mW
Derate above $25^\circ C$		2.3	mW/ $^\circ C$
Thermal Resistance,Junction to Ambient	$R_{\theta JA}$	432	$^\circ C/W$
Total Device Dissipation (2) $T_a=25^\circ C$	P_D	347	mW
Derate above $25^\circ C$		2.8	mW/ $^\circ C$
Thermal Resistance,Junction to Ambient	$R_{\theta JA}$	360	$^\circ C/W$
Thermal Resistance,Junction to Lead3 (2)	$R_{\psi JL}$	143	$^\circ C/W$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ C$

1.100mm² 1 oz, copper traces.

2.500mm² 1 oz, copper traces.

Device Marking

MMBT3904E=2

Electrical Characteristics ($T_a=25^\circ C$ Unless Otherwise noted)

Characteristics	Symbol	Min	Max	Unit
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Off Characteristics

Collector-Emitter Breakdown Voltage ⁽³⁾ ($I_C=1.0mAdc, I_E=0$)	$V_{(BR)CEO}$	40	-	Vdc
Collector-Base Breakdown Voltage ($I_C=10\mu Adc, I_E=0$)	$V_{(BR)CBO}$	60	-	Vdc
Emitter-Base Breakdown Voltage ($I_E=10\mu Adc, I_C=0$)	$V_{(BR)EBO}$	6.0	-	Vdc
Collector Cutoff Current ($V_{CE}=30Vdc, V_{EB}=3.0Vdc$)	I_{CEX}	-	50	nAdc

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

Characteristics	Symbol	Min	Max	Unit
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On Characteristics (3)

DC Current Gain ($I_C = 0.1\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 1.0\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 10\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 50\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 100\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$)	h_{FE}	40 70 100 60 30	- - 300 - -	-
Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) ($I_C = 50\text{ mA}$, $I_B = 5.0\text{ mA}$)	$V_{CE(sat)}$	- -	0.2 0.3	Vdc
Base-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) ($I_C = 50\text{ mA}$, $I_B = 5.0\text{ mA}$)	$V_{BE(sat)}$	0.65 -	0.85 1.0	Vdc

Small-signal Characteristics

Current-Gain-Bandwidth Product ($I_C = 10\text{ mA}$, $V_{CE} = 20\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	200	-	MHz
Output Capacitance ($V_{CB} = 5.0\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	-	4.0	pF
Input Capacitance ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	-	8.0	pF
Noise Figure ($V_{CE} = 5.0\text{ Vdc}$, $I_C = 100\text{ }\mu\text{A}$, $R_S = 1.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$)	NF	1.0	5.0	dB

Switching Characteristics

Delay Time	(Vcc= 3.0 Vdc, VBE= -0.5 Vdc Ic= 10 mA, IB1= 1.0 mA)	t_d	-	35	ns
Rise Time		t_r	-	35	
Storage Time	(Vcc= 3.0Vdc, Ic= 10 mA IB1=IB2= 1.0 mA)	t_s	-	275	ns
Fall Time		t_f	-	50	

3.Pulse Test:Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

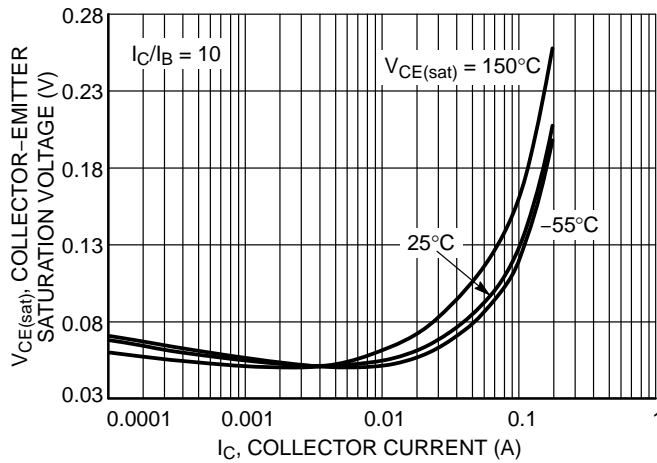


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

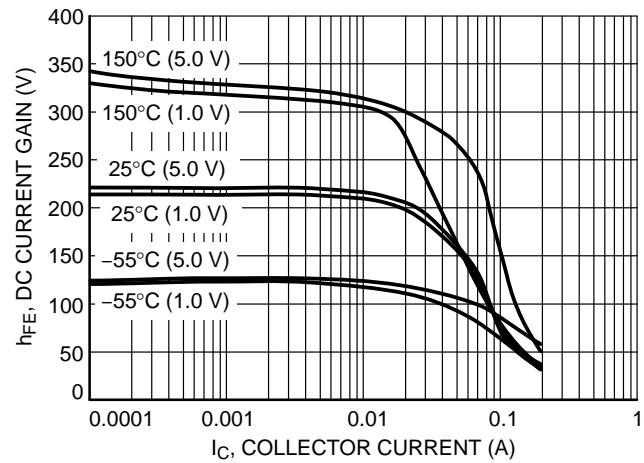


Figure 2. DC Current Gain vs. Collector Current

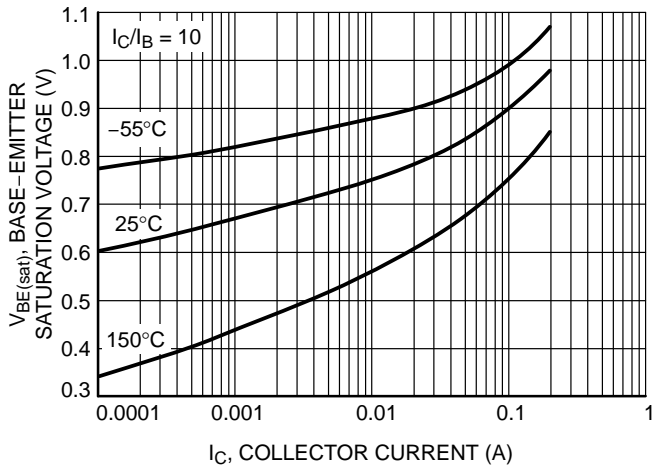


Figure 3. Base Emitter Saturation Voltage vs. Collector Current

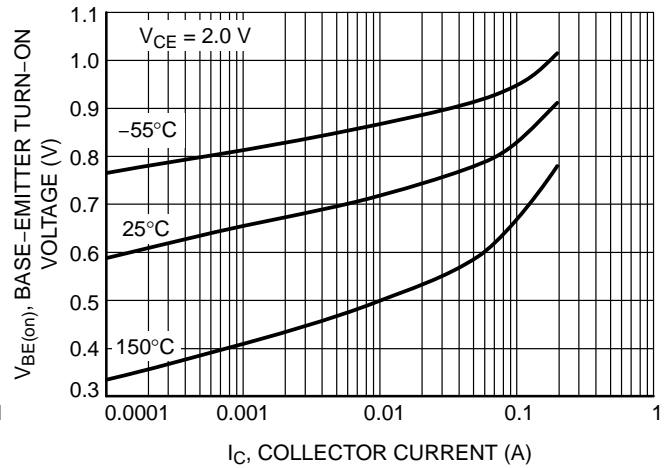


Figure 4. Base Emitter Turn-On Voltage vs. Collector Current

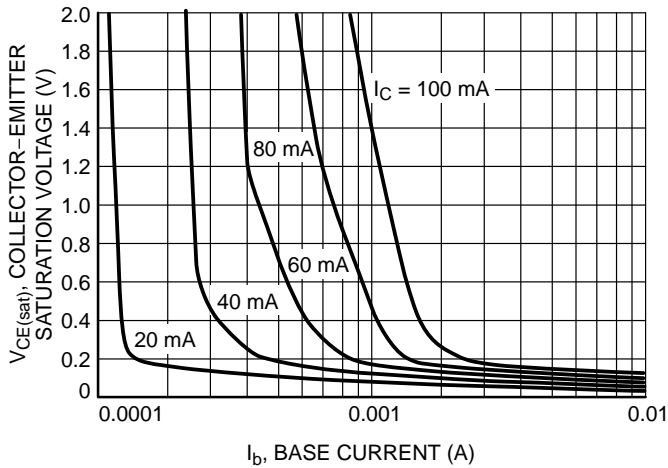


Figure 5. Saturation Region

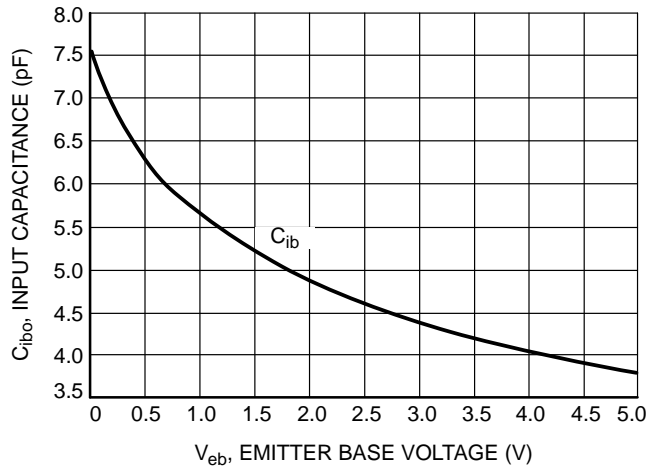


Figure 6. Input Capacitance

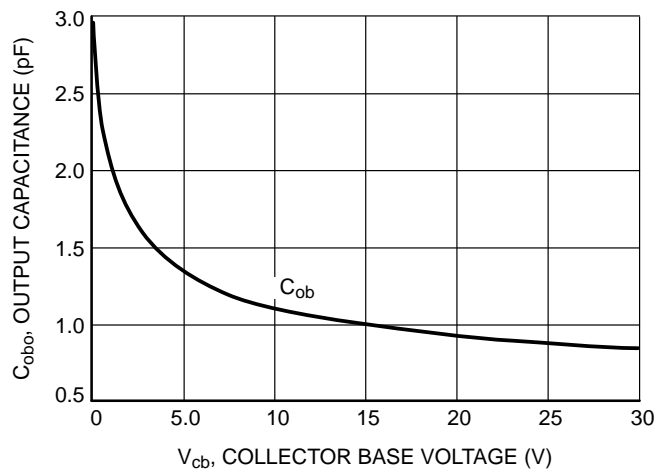
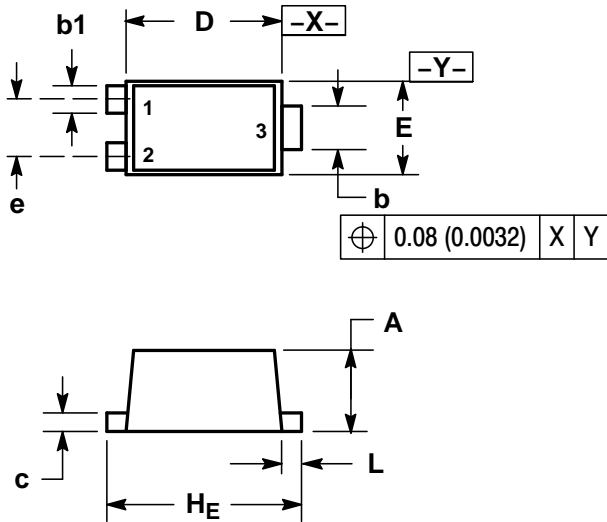


Figure 7. Output Capacitance

SOT-1123 Package Outline Dimensions

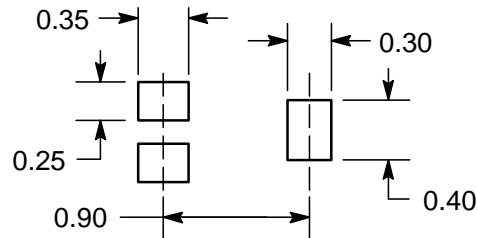


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.34	0.37	0.40	0.013	0.015	0.016
b	0.15	0.20	0.25	0.006	0.008	0.010
b1	0.10	0.15	0.20	0.004	0.006	0.008
c	0.07	0.12	0.17	0.003	0.005	0.007
D	0.75	0.80	0.85	0.030	0.031	0.033
E	0.55	0.60	0.65	0.022	0.024	0.026
e	0.35			0.014		
HE	0.95	1.00	1.05	0.037	0.039	0.041
L	0.05	0.10	0.15	0.002	0.004	0.006

- STYLE 1:
 PIN 1. BASE
 2. EMITTER
 3. COLLECTOR

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS