

HMBT3904

General Purpose Transistor NPN Silicon

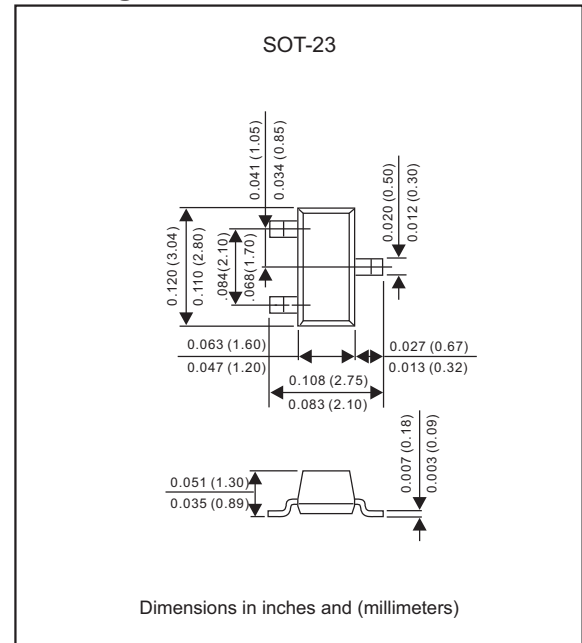
Features

- High collector-emitter breakdown voltage
- Small load switch transistor with high gain and low saturation voltage, is designed for general purpose amplifier and switching applications at collector current
- Capable of 225mW power dissipation
- Lead-free parts meet RoHS requirements
- Suffix "-H" indicates Halogen free part, ex. HMBT3904-H

Mechanical data

- Epoxy: UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.008 gram

Package outline



Maximum ratings (AT $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CB0}	60	V
Collector-emitter voltage	V_{CEO}	40	V
Emitter-base voltage	V_{EBO}	6.0	V
Collector current - continuous	I_C	200	mA

Thermal characteristics

Parameter	Symbol	Limits	Unit
Total device dissipation FR-5 board (Note 1) @ $T_A=25^\circ\text{C}$	P_D	225	mW
Derate above 25°C		1.8	mW/ $^\circ\text{C}$
Thermal resistance junction to ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Thermal resistance junction to case	$R_{\theta JC}$	300	$^\circ\text{C}/\text{W}$
Operating junction temperature range	T_J	-55 to +150	$^\circ\text{C}$
Storage temperature range	T_{STG}	-55 to +150	$^\circ\text{C}$

Note 1: FR-5 = 1.0 X 0.75 X 0.062 in.

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Electrical characteristics (AT $T_A=25^\circ\text{C}$ unless otherwise noted)

Off characteristics

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
Collector-base breakdown voltage	$I_C = 10\mu\text{A}$, $I_E = 0$	$V_{(BR)CBO}$	60			V
Collector-emitter breakdown voltage	$I_C = 1.0\text{mA}$, $I_B = 0$	$V_{(BR)CEO}$	40			V
Emitter-base breakdown voltage	$I_E = 10\mu\text{A}$, $I_C = 0$	$V_{(BR)EBO}$	6.0			V
Base cutoff current	$V_{CE} = 30\text{V}$, $V_{EB} = 3.0\text{V}$	I_{BL}			50	nA
Collector cutoff current	$V_{CE} = 30\text{V}$, $V_{EB} = 3.0\text{V}$	I_{CEX}			50	nA

On characteristics(2)

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
DC current gain	$I_C = 0.1\text{mA}$, $V_{CE} = 1.0\text{V}$	h_{FE}	40			
	$I_C = 1.0\text{mA}$, $V_{CE} = 1.0\text{V}$		70			
	$I_C = 10\text{mA}$, $V_{CE} = 1.0\text{V}$		100		300	
	$I_C = 50\text{mA}$, $V_{CE} = 1.0\text{V}$		60			
	$I_C = 100\text{mA}$, $V_{CE} = 1.0\text{V}$		30			
Collector-emitter saturation voltage	$I_C = 10\text{mA}$, $I_B = 1.0\text{mA}$	$V_{CE(sat)}$			0.2	V
	$I_C = 50\text{mA}$, $I_B = 5.0\text{mA}$				0.3	
Base-emitter saturation voltage	$I_C = 10\text{mA}$, $I_B = 1.0\text{mA}$	$V_{BE(sat)}$			0.85	V
	$I_C = 50\text{mA}$, $I_B = 5.0\text{mA}$				0.95	

2. Pulse test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2.0\%$.

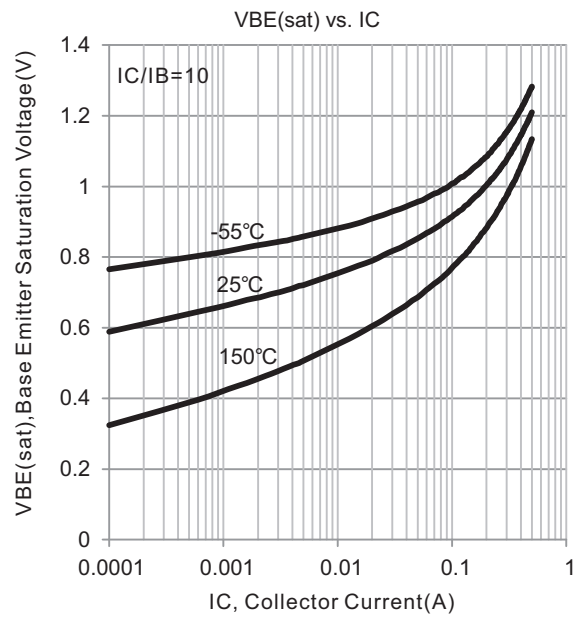
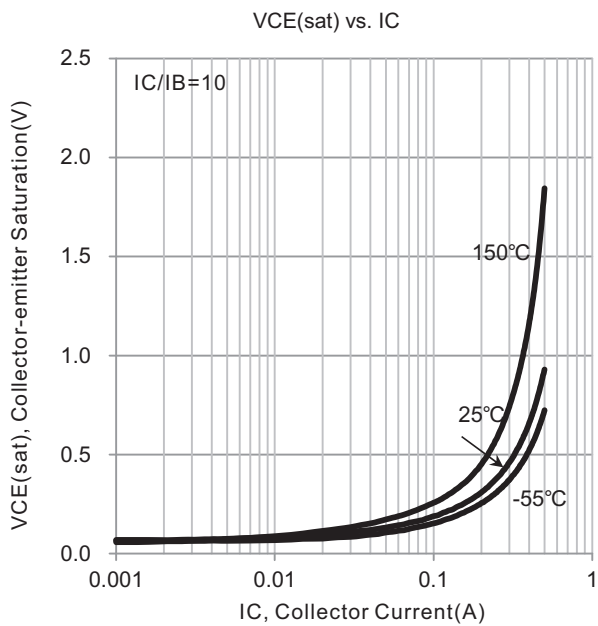
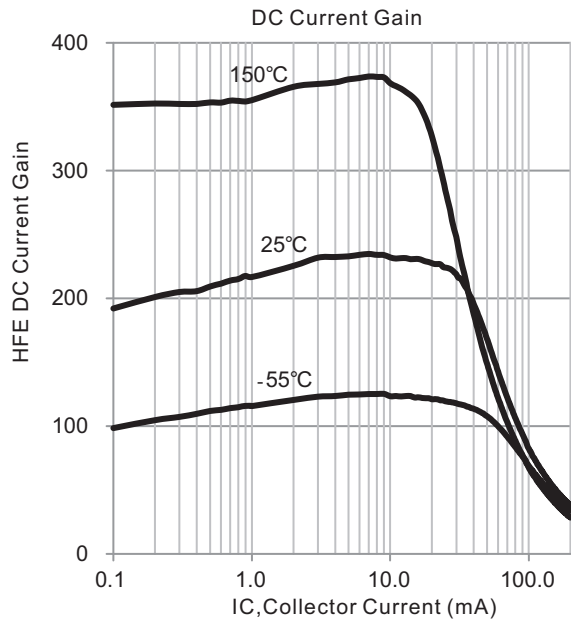
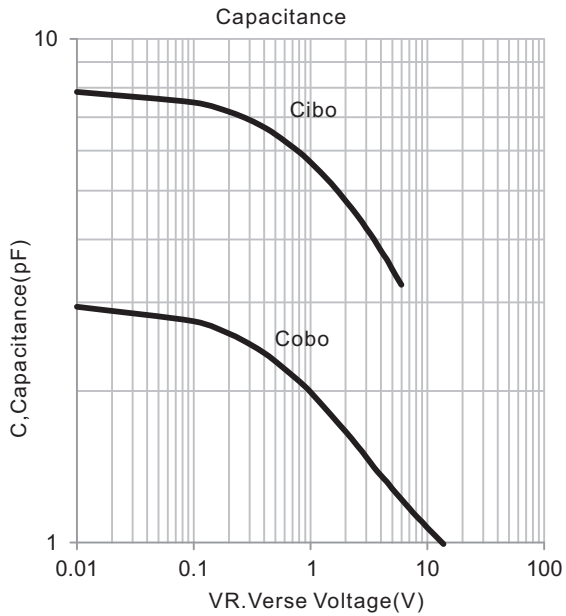
Small-signal characteristics

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
Current-gain-bandwidth product	$I_C = 10\text{mA}$, $V_{CE} = 20\text{V}$, $f = 100\text{MHz}$	f_T	300			MHz
Output capacitance	$V_{CB} = 5.0\text{V}$, $I_E = 0$, $f = 1.0\text{MHz}$	C_{obo}			4.0	pF
Input capacitance	$V_{EB} = 0.5\text{V}$, $I_C = 0$, $f = 1.0\text{MHz}$	C_{ibo}			8.0	pF

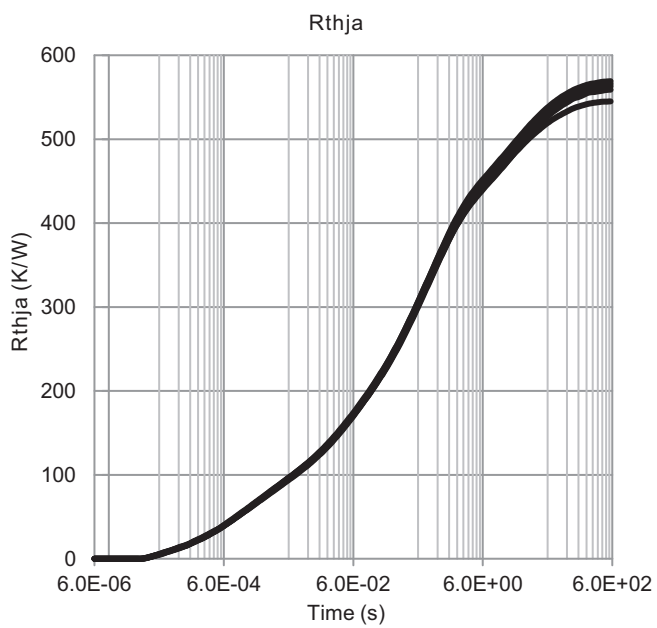
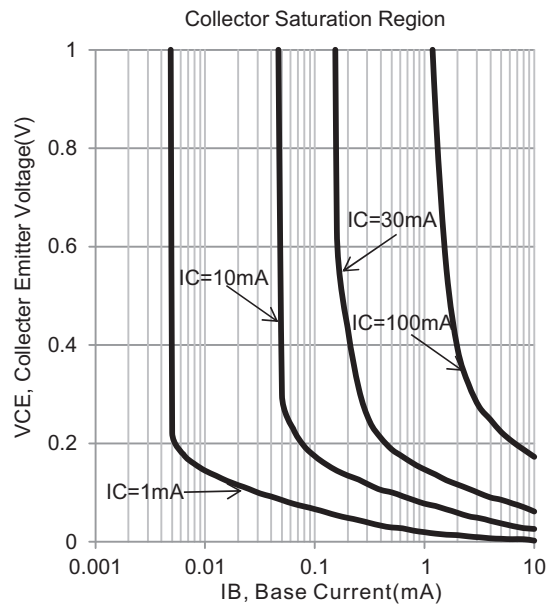
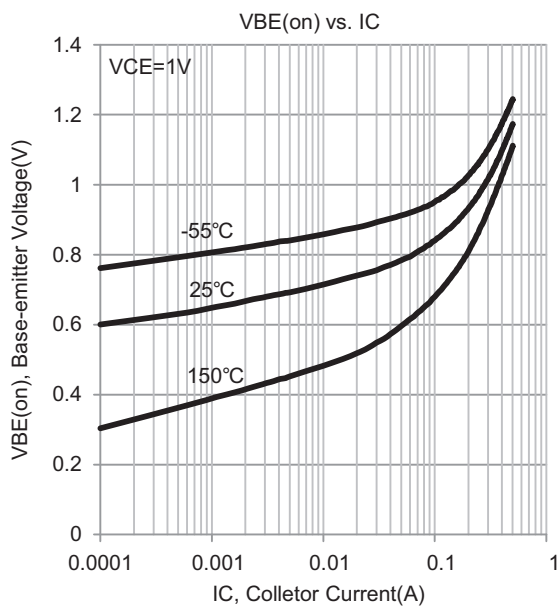
Switching characteristics

Parameter	Conditions	Symbol	MIN.	TYP.	MAX.	Unit
Delay time	$V_{CC} = 3.0\text{V}$, $V_{BE} = -0.5\text{V}$, $I_C = 10\text{mA}$, $I_{B1} = 1.0\text{mA}$	t_d			35	ns
Rise time		t_r			35	
Storage time	$V_{CC} = 3.0\text{V}$, $I_C = 10\text{mA}$, $I_{B1} = I_{B2} = 1.0\text{mA}$	t_s			200	
Fall time		t_f			50	

Rating and characteristic curves (HMBT3904)

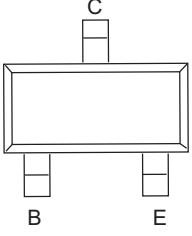
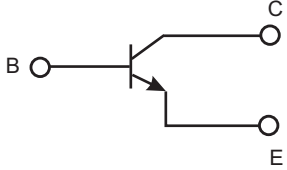


Rating and characteristic curves (HMBT3904)



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Pinning information

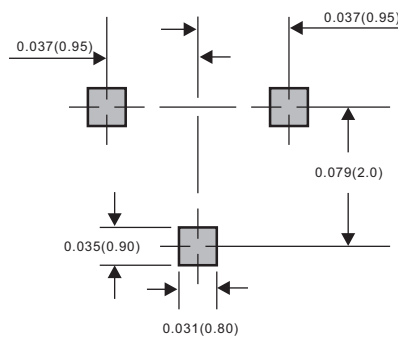
Pin	Simplified outline	Symbol
PinB Base PinC Collector PinE Emitter		

Marking

Type number	Marking code
HMBT3904	1AM

Suggested solder pad layout

SOT-23



Dimensions in inches and (millimeters)