

NPN型 小功率 贴片开关三极管 NPN Switching Transistor SMD	HMBT3904 HMBT3904LT1 NPN, BEC General Purpose Transistors 对应其他工业型号 MMBT3904 MMBT3904LT1 HMMBT3904LT1
■ Excellent hFE linearity ■ Low noise ■ Transistor Polarity: NPN ■ Transistor pinout: BEC ■ SOT-23 Package ■ Marking Code: 1AM ■ hFE: 100~200, 200~300	

Inner circuit SOT-23 内部结构	HMBT3904 SOT-23 管脚排列	元件标识 (打印) DEVICE MARKING
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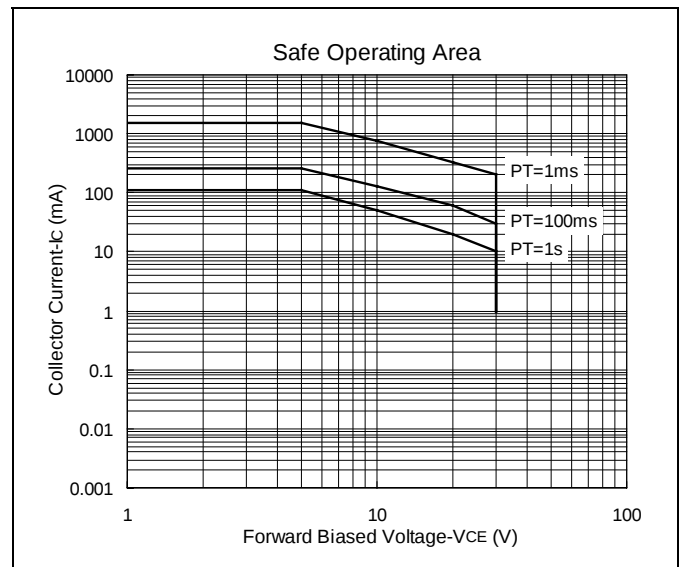
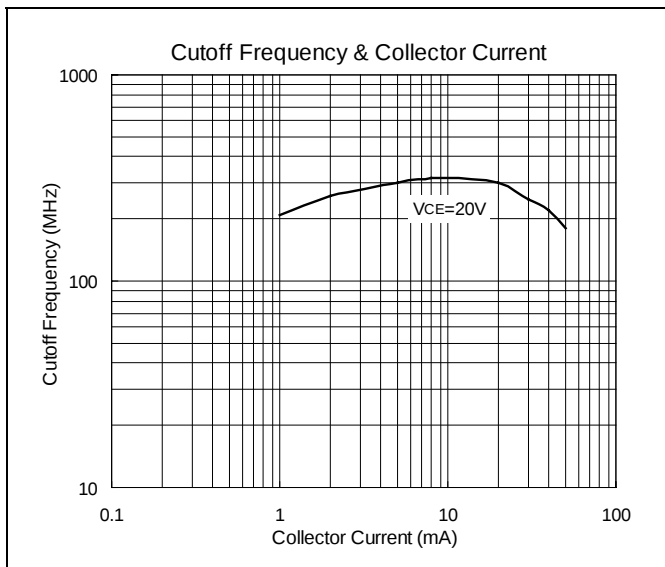
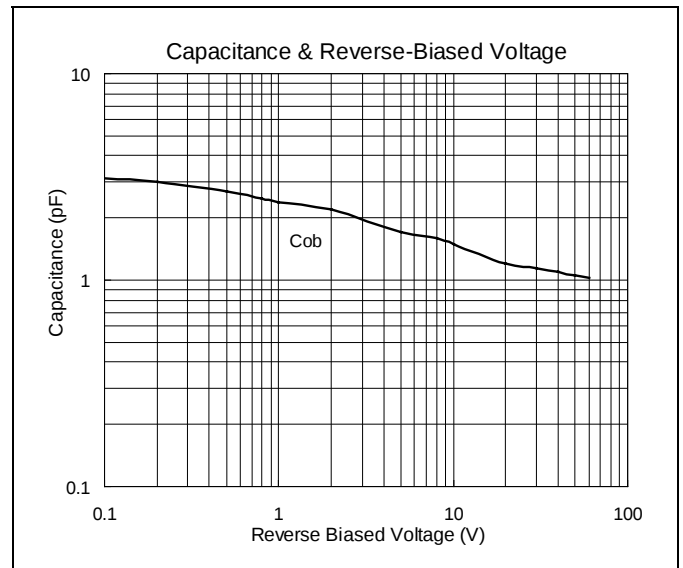
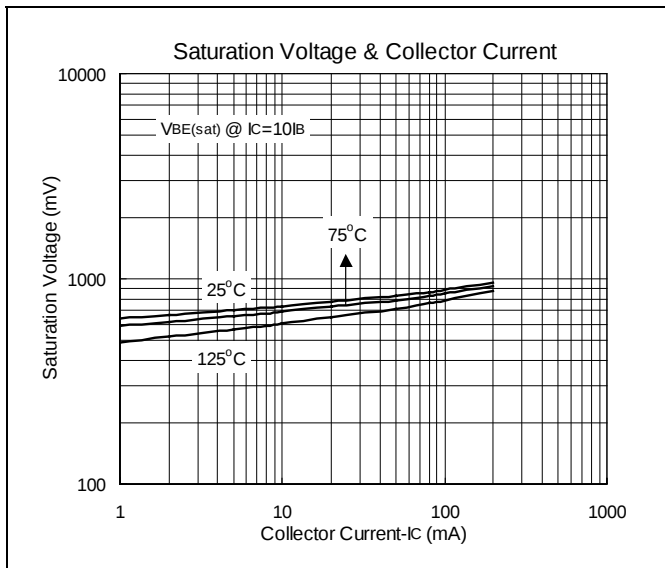
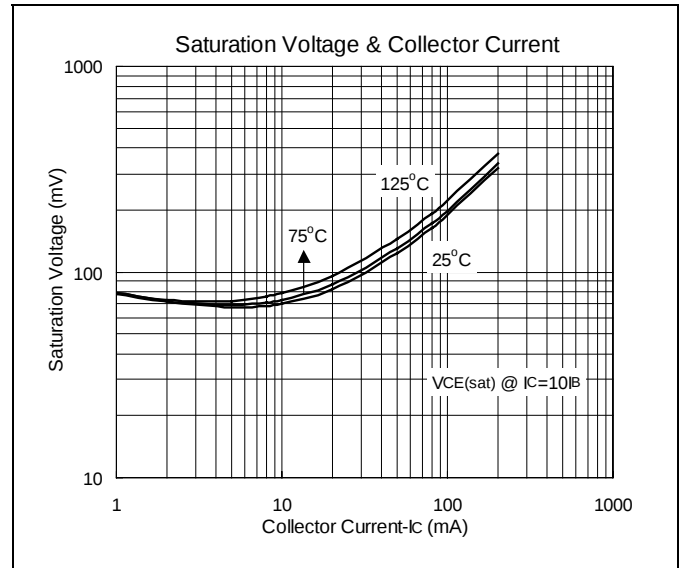
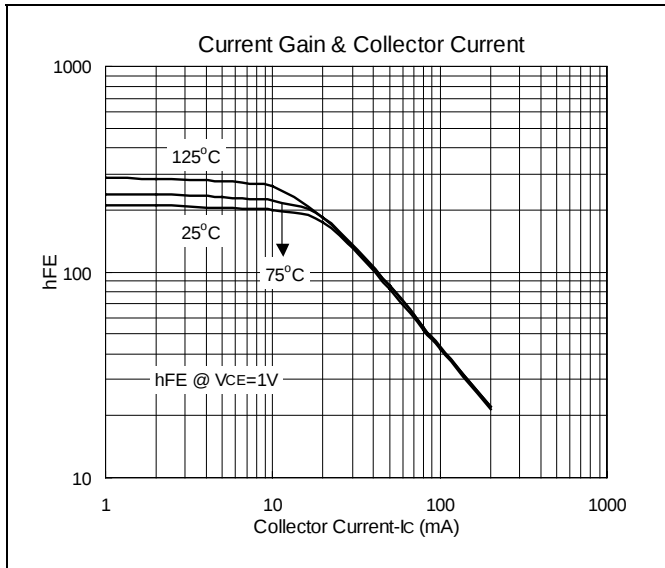
■ DEVICE MARKING 元件标识 (打印) 对应放大系数

HMBT3904	L	H
MARKING	1AM	1AM
hFE	100~200	200~300

■ MAXIMUM RATINGS 最大额定值

Characteristic 特性参数	Symbol 符号	Rating 额定值	Unit 单位
Collector-Base Voltage 集电极-基极电压	V_{CBO}	60	V
Collector-Emitter Voltage 集电极-发射极电压	V_{CEO}	40	
Emitter-Base Voltage 发射极-基极电压	V_{EBO}	6.0	
Collector Current-Continuous 集电极电流-连续	I_C	200	mA
Total Device Dissipation 总耗散功率	FR-5 Board (1)	225	mW
	Derate above 25°C 超过 25°C 递减	1.8	mW/°C
	Alumina Substrate 氧化铝衬底 (2) $T_A=25^\circ\text{C}$	300	mW
	Derate above 25°C 超过 25°C 递减	2.4	mW/°C
Thermal Resistance Junction to Ambient 热阻	$R_{\theta JA}$	417	°C/W
Junction Temperature 结温	T_J	150	°C
Storage Temperature Range 储存温度	T_{stg}	-55~+150	
Solder Temperature/Solder Time 焊接温度/焊接时间	T/t	260/10	°C/S

Characteristics Curve



■ ELECTRICAL CHARACTERISTICS 电特性 ($T_A=25^\circ\text{C}$ unless otherwise noted 如无特殊说明, 温度为 25°C)

Characteristic 特性参数	Test Condition 测试条件	Symbol 符号	Min 最小值	Typ 典型值	Max 最大值	Unit 单位
Collector-Emitter Breakdown Voltage 集电极-发射极击穿电压 (3)	$I_B=0, I_C=1\text{mA}$	$V_{(BR)CEO}$	40	--	--	V
Collector-Base Breakdown Voltage 集电极-基极击穿电压	$I_E=0, I_C=10\mu\text{A}$	$V_{(BR)CBO}$	60	--	--	
Emitter-Base Breakdown Voltage 发射极-基极击穿电压	$I_C=0, I_E=10\mu\text{A}$	$V_{(BR)EBO}$	6.0	--	--	
Base Cutoff Current 基极截止电流	$V_{CE}=30\text{V}, V_{EB}=3\text{V}$	I_{BEX}	--	--	50	nA
Collector Cutoff Current 集电极截止电流	$V_{CE}=30\text{V}, V_{EB}=3\text{V}$	I_{CEX}	--	--	50	
DC Current Gain 直流电流增益	$I_C=0.1\text{mA}, V_{CE}=1\text{V}$	hFE	40	--	--	
	$I_C=1\text{mA}, V_{CE}=1\text{V}$		70	--	--	
	$I_C=10\text{mA}, V_{CE}=1\text{V}$		100	--	300	
	$I_C=50\text{mA}, V_{CE}=1\text{V}$		60	--	--	
	$I_C=100\text{mA}, V_{CE}=1\text{V}$		30	--	300	
Collector-Emitter Saturation Voltage 集电极-发射极饱和压降	$I_C=10\text{mA}, I_B=1\text{mA}$	$V_{CE(sat)}$	--	--	0.25	V
	$I_C=50\text{mA}, I_B=5\text{mA}$		--	--	0.40	
Base-Emitter Saturation Voltage 基极-发射极饱和压降	$I_C=10\text{mA}, I_B=1\text{mA}$	$V_{BE(sat)}$	0.65	--	0.85	
	$I_C=50\text{mA}, I_B=5\text{mA}$		--	--	0.95	
Current-Gain-Bandwidth Product 电流增益-带宽乘积	$I_C=0\text{mA}, V_{CE}=20\text{V}$ $f=100\text{MHz}$	f_T	300	--	--	MHz
Collector Output Capacitance 输出电容	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$	C_{OB}	--	--	4.0	pF
Input Capacitance 输入电容	$V_{EB}=0.5\text{V}, I_C=0, f=1\text{MHz}$	C_{ibo}	--	--	8.0	
Input Impedance 输入阻抗	$I_C=1\text{mA}, V_{CE}=10\text{V}, f=1\text{kHz}$	h_{ie}	1.0	--	10	K Ω
Voltage Feedback Ratio 电压反馈系数	$I_C=1\text{mA}, V_{CE}=10\text{V}, f=1\text{kHz}$	h_{re}	0.5	--	8.0	$\times 10^{-4}$
Small-Signal Current Gain 小信号电流增益	$I_C=1\text{mA}, V_{CE}=10\text{V}, f=1\text{kHz}$	hFE	100	--	400	
Output Admittance 输出导纳	$I_C=1\text{mA}, V_{CE}=10\text{V}, f=1\text{kHz}$	h_{oe}	1.0	--	40	$\mu\Omega$
Noise Figure 噪声系数	$I_C=100\mu\text{A}, V_{CE}=5\text{V}, R_s=1\text{K}\Omega, f=1\text{kHz}$	NF	--	--	5.0	db

■ SWITCHING CHARACTERISTICS 開關特性

Characteristic 特性参数		Symbol 符号	Min 最小值	Max 最大值	Unit 单位
Delay Time 延迟时间	$V_{CC}=3\text{V}, V_{BE(off)}=-0.5\text{V}$ $I_C=10\text{mA}, I_B=1\text{mA}$	t_d	--	35	nS
Rise Time 上升时间		t_r	--	35	
Storage Time 储存时间	$V_{CC}=3\text{V}, I_C=10\text{mA}$ $I_{B1} = I_{B2} = 1\text{mA}$	t_s	--	225	
Fall Time 下降时间		t_f	--	75	

1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.

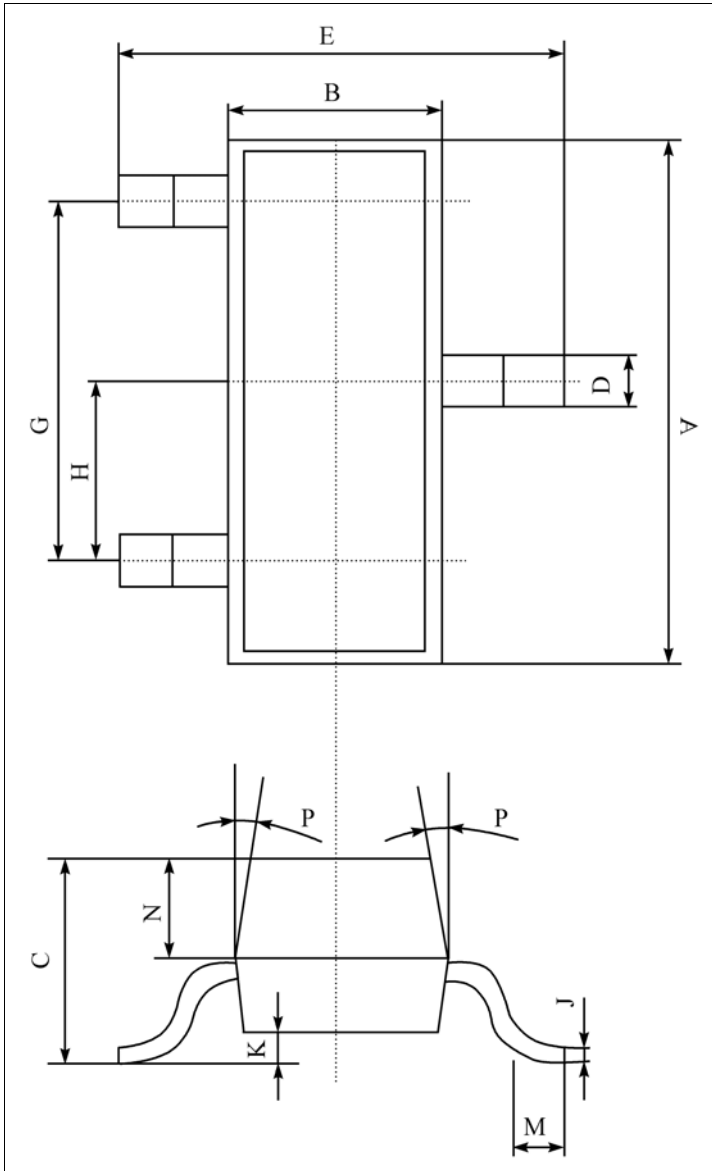
2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.

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

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

■ DIMENSION 外形封装尺寸数据

单位 (UNIT) : mm



序号	数值及公差
A	2.90±0.10
B	1.30±0.10
C	1.00±0.10
D	0.40±0.10
E	2.40±0.20
G	1.90±0.10
H	0.95±0.05
J	0.13±0.05
K	0.00-0.10
M	≥0.20
N	0.60±0.10
P	7±2°

Packing

SOT-23 包装规格

SMD片式表面贴封装

包装方式: 载带卷盘包装

Tape & Reel, 3Kpcs/Reel

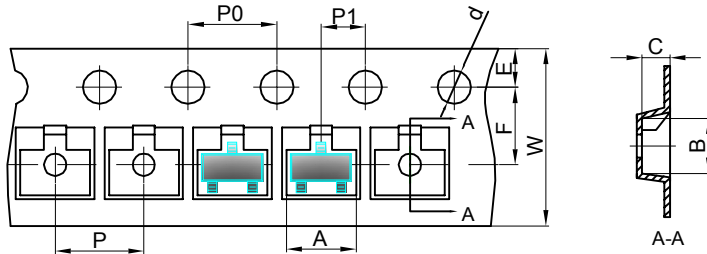
每卷数量3000只 (3Kpcs/Reel)

每盒数量45000只 (45Kpcs/BOX)

每箱数量180000只 (180Kpcs/Cartons)

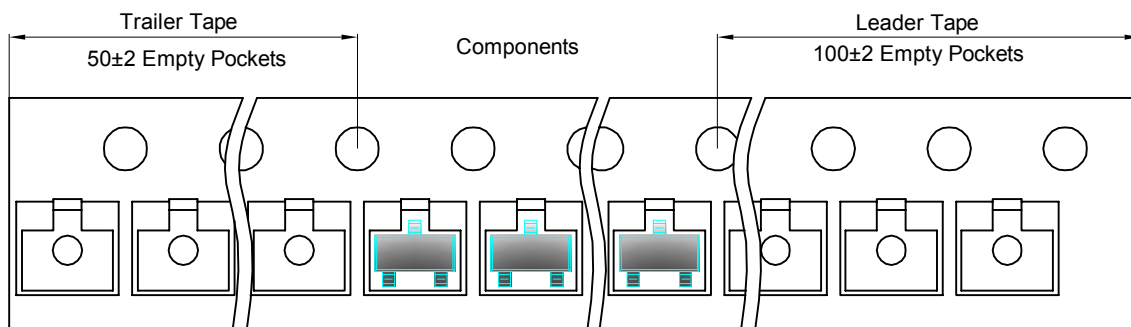
SOT-23 Tape and reel

SOT-23 Embossed Carrier Tape

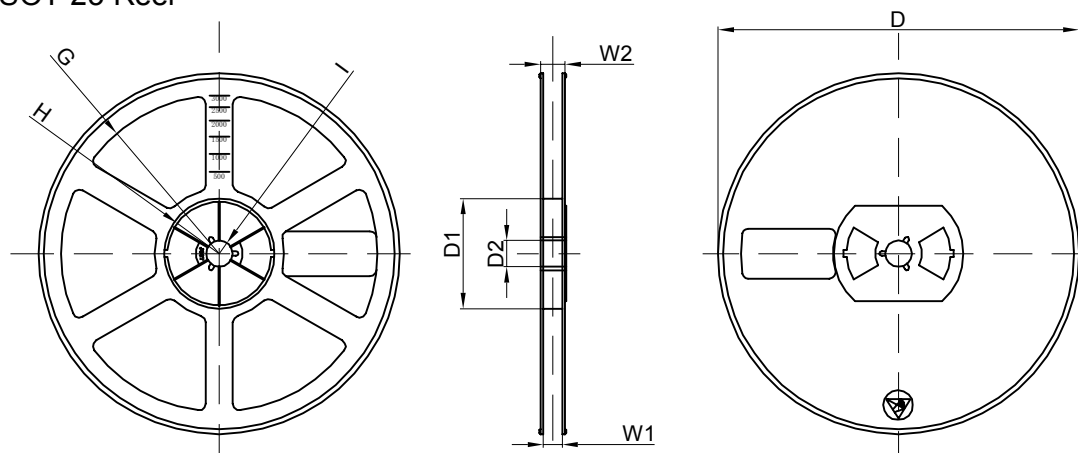


Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23 Tape Leader and Trailer



SOT-23 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	30,000 pcs	203×203×195	120,000 pcs	438×438×220	