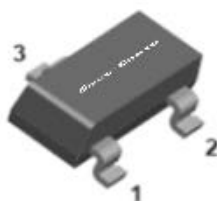
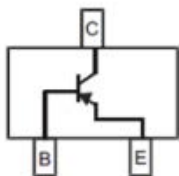


MMBT3904

NPN General Purpose Amplifier



SOT-23

Features

- Moisture sensitivity level 1
- Halogen free and
- Surface mount package ideally suited for automatic insertion

Application

- Signal amplification
- Switching circuit

Mechanical data

- **Package:** SOT-23
- **Terminals:** Tin plated leads, solderable per J-STD-002 and JESD22-B102

■ Maximum Ratings ($T_a=25^{\circ}\text{C}$ Unless otherwise specified)

Item	Symbol	Unit	Conditions	Value
Device marking code				1AM
Collector-base voltage	V_{CB0}	V	$I_C=10\mu\text{A}, I_E=0$	60
Collector-emitter voltage	V_{CE0}	V	$I_C=1\text{mA}, I_B=0$	40
Emitter-base voltage	V_{EB0}	V	$I_E=10\mu\text{A}, I_C=0$	6
Collector current	I_C	mA		200
Power dissipation	P_D	mW		350
Junction temperature	T_J	$^{\circ}\text{C}$		-55 to +150
Storage temperature	T_{STG}	$^{\circ}\text{C}$		-55 to +150

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■ Electrical Characteristics (T_a=25°C Unless otherwise specified)

Item	Symbol	Unit	Conditions	Min	Typ	Max
Collector-base breakdown voltage	V _{(BR)CBO}	V	I _C =10μA, I _E =0	60		
Collector-emitter breakdown voltage	V _{(BR)CEO}	V	I _C =1mA, I _B =0	40		
Emitter-base breakdown voltage	V _{(BR)EBO}	V	I _E =10μA, I _C =0	6		
Collector-base cut-off current	I _{CBO}	nA	V _{CB} =60V			50
Collector-emitter cut-off current	I _{CEX}	nA	V _{CE} =30V, V _{EB} =3V			50
DC current gain	h _{FE1}		V _{CE} =1V, I _C =0.1mA	40		
	h _{FE2}		V _{CE} =1V, I _C =1mA	70		
	h _{FE3}		V _{CE} =1V, I _C =10mA	100		300
	h _{FE4}		V _{CE} =1V, I _C =50mA	60		
	h _{FE5}		V _{CE} =1V, I _C =100mA	30		
Collector-emitter saturation voltage	V _{CE(sat)1}	V	I _C =10mA, I _B =1mA			0.2
	V _{CE(sat)2}	V	I _C =50mA, I _B =5mA			0.3
Base-emitter saturation voltage	V _{BE(sat)1}	V	I _C =10mA, I _B =1mA	0.65		0.85
	V _{BE(sat)2}	V	I _C =50mA, I _B =5mA			0.95
Transition frequency	f _T	MHz	V _{CE} =20V, I _C =10mA, f=100MHz	300		
Delay time	t _d	ns	V _{CC} =3V, I _C =10mA, V _{BE} =0.5V, I _{B1} =1mA		35	
Rise time	t _r	ns			35	
Storage time	t _s	ns	V _{CC} =3V, I _C =10mA, I _{B1} =-I _{B2} =1mA		200	
Fall time	t _f	ns			50	
Collector-base output capacitance	C _{ob}	pF	V _{CB} =5V, I _E =0, f=1MHz			4
Emitter-base input capacitance	C _{ib}	pF	V _{EB} =0.5V, I _C =0, f=1MHz			8

■ Thermal Characteristics

Parameter	Symbol	Unit	Value
Thermal resistance, junction-to-ambient	R _{θJA} ⁽¹⁾	°C/W	357
Thermal resistance, junction-to-case	R _{θJC} ⁽¹⁾	°C/W	286

Note:

(1) Device mounted on PCB, single-sided copper, with standard footprint

MMBT3904

■ Characteristics

Fig 1: Static Characteristics

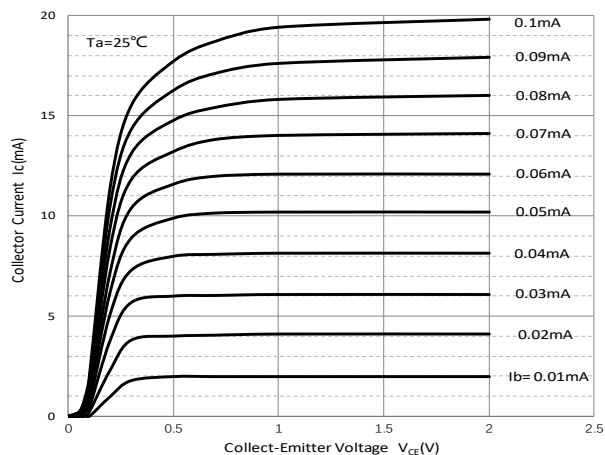


Fig 2: DC Current Gain

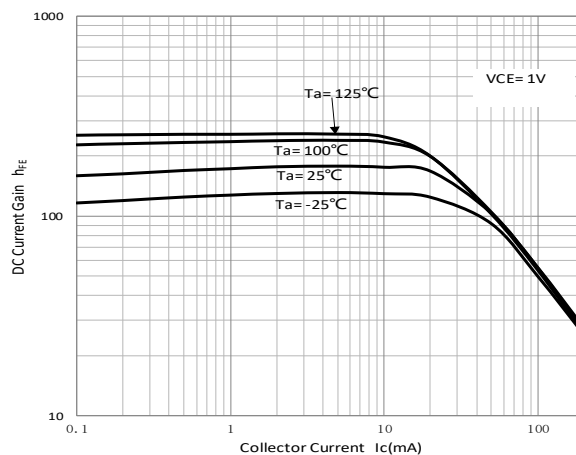


Fig 3: Collector-Emitter Saturation Voltage

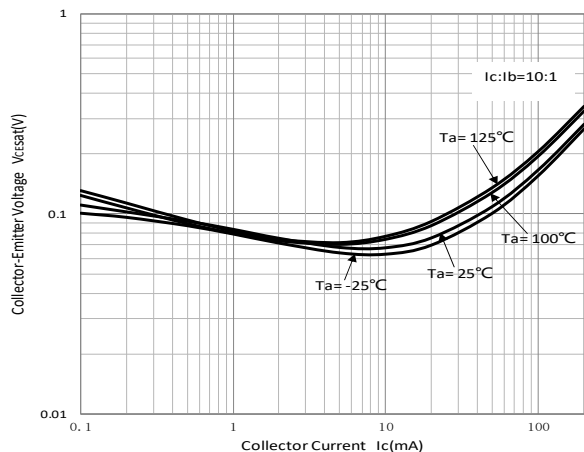


Fig 4: Base-Emitter Saturation Voltage

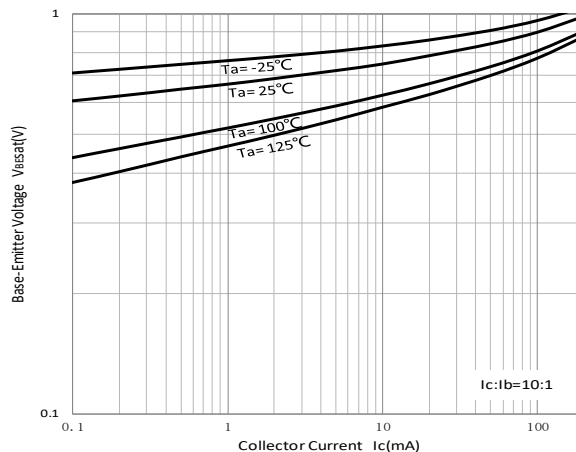


Fig 5: Base-Emitter On Voltage

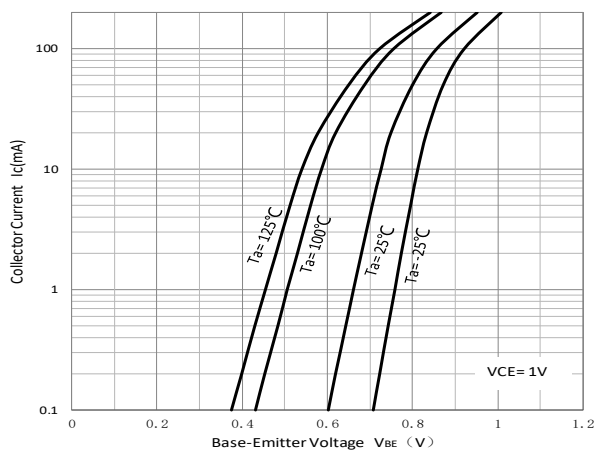
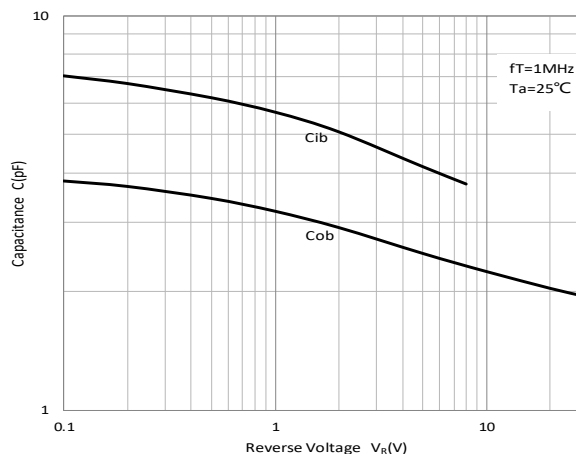
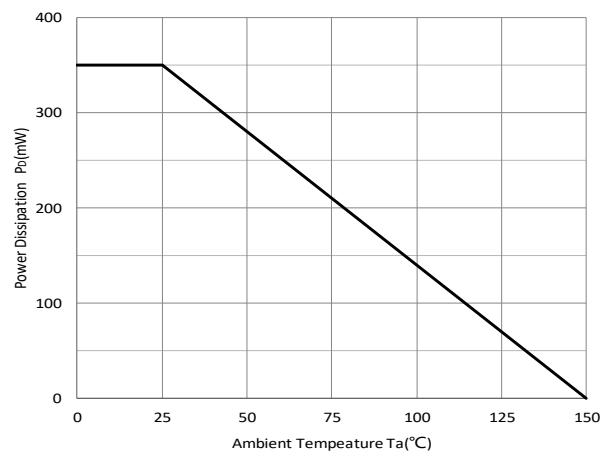


Fig 6: Cob/Cib- V_{CB}/V_{EB}



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Fig 7: P_D - T_a Curve

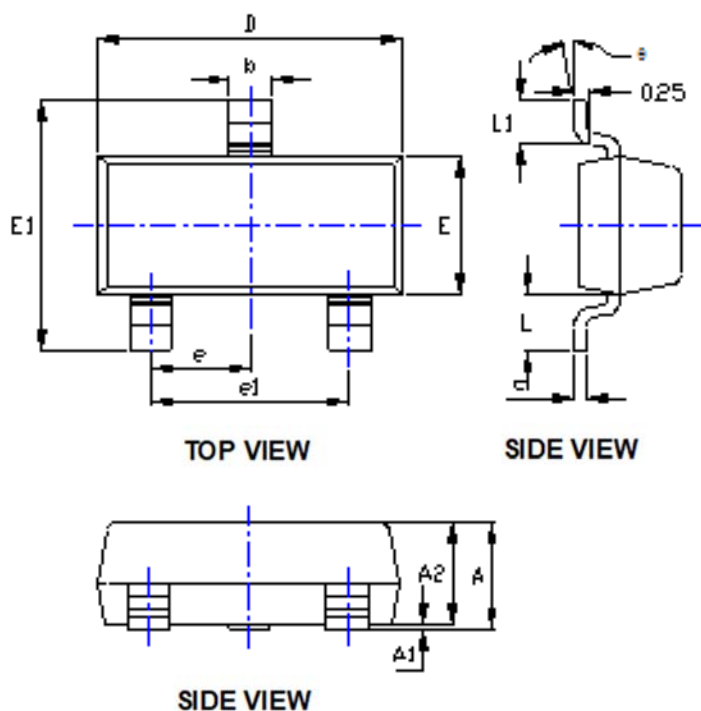


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■ Ordering Information

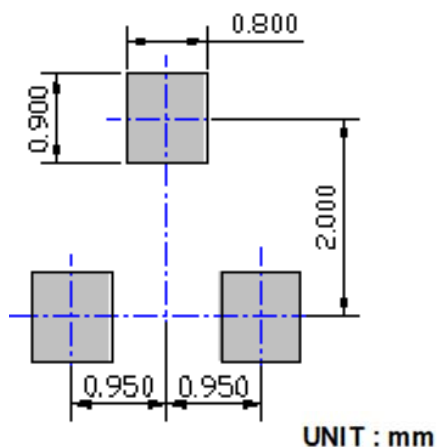
Preferred P/N	Packing code	Unit weight(g)	Minimum package(pcs)	Inner box quantity(pcs)	Outer carton quantity(pcs)	Delivery mode
MMBT3904	F2	Approximate 0.008	3000	30000	120000	7" reel
MMBT3904	F4	Approximate 0.008	10000	/	210000	13" reel

■ Outline Dimensions



SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.045	0.900	1.150
A1	0.000	0.004	0.000	0.100
A2	0.035	0.041	0.900	1.050
b	0.012	0.020	0.300	0.500
c	0.004	0.008	0.100	0.200
D	0.110	0.118	2.800	3.000
E	0.047	0.055	1.200	1.400
E1	0.089	0.100	2.250	2.550
e	0.037TYP		0.950TYP	
e1	0.071	0.079	1.800	2.000
L	0.022REF		0.550REF	
L1	0.012	0.020	0.300	0.500
θ	0°	8°	0°	8°

■ Suggested Pad Layout



MMBT3904

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