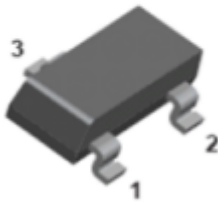
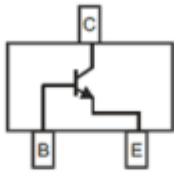


## NPN General Purpose Amplifier



**SOT-23**

### Features

- Moisture sensitivity level 1
- Halogen free and RoHS compliant
- 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<sub>a</sub>=25°C Unless otherwise specified)

Item	Symbol	Unit	Conditions	Min	Typ	Max
Collector-base breakdown voltage	V <sub>(BR)CBO</sub>	V	I <sub>C</sub> =10μA, I <sub>E</sub> =0	60		
Collector-emitter breakdown voltage	V <sub>(BR)CEO</sub>	V	I <sub>C</sub> =1mA, I <sub>B</sub> =0	40		
Emitter-base breakdown voltage	V <sub>(BR)EBO</sub>	V	I <sub>E</sub> =10μA, I <sub>C</sub> =0	6		
Collector-base cut-off current	I <sub>CBO</sub>	nA	V <sub>CB</sub> =60V			50
Collector-emitter cut-off current	I <sub>CEX</sub>	nA	V <sub>CE</sub> =30V, V <sub>BE</sub> =3V			50
DC current gain	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		
Collector-emitter saturation voltage	V <sub>CE(sat)1</sub>	V	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA			0.2
	V <sub>CE(sat)2</sub>	V	I <sub>C</sub> =50mA, I <sub>B</sub> =5mA			0.3
Base-emitter saturation voltage	V <sub>BE(sat)1</sub>	V	I <sub>C</sub> =10mA, I <sub>B</sub> =1mA	0.65		0.85
	V <sub>BE(sat)2</sub>	V	I <sub>C</sub> =50mA, I <sub>B</sub> =5mA			0.95
Transition frequency	f <sub>T</sub>	MHz	V <sub>CE</sub> =20V, I <sub>C</sub> =10mA, f=100MHz	300		
Delay time	t <sub>d</sub>	ns	V <sub>CC</sub> =3V, I <sub>C</sub> =10mA, V <sub>BE</sub> =0.5V, I <sub>B1</sub> =1mA		35	
Rise time	t <sub>r</sub>	ns			35	
Storage time	t <sub>s</sub>	ns	V <sub>CC</sub> =30V, I <sub>C</sub> =10mA, I <sub>B1</sub> =-I <sub>B2</sub> =1mA		200	
Fall time	t <sub>f</sub>	ns			50	
Collector-base output capacitance	C <sub>ob</sub>	pF	V <sub>CB</sub> =5V, I <sub>E</sub> =0, f=1MHz			4
Emitter-base input capacitance	C <sub>ib</sub>	pF	V <sub>EB</sub> =0.5V, I <sub>C</sub> =0, f=1MHz			8

## ■ Thermal Characteristics

Parameter	Symbol	Unit	Value
Thermal resistance, junction-to-ambient	R <sub>θJ-A</sub> <sup>(1)</sup>	°C/W	357
Thermal resistance, junction-to-case	R <sub>θJ-C</sub> <sup>(1)</sup>	°C/W	286

### Note:

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



■ Characteristics

Fig 1: Static Characteristics

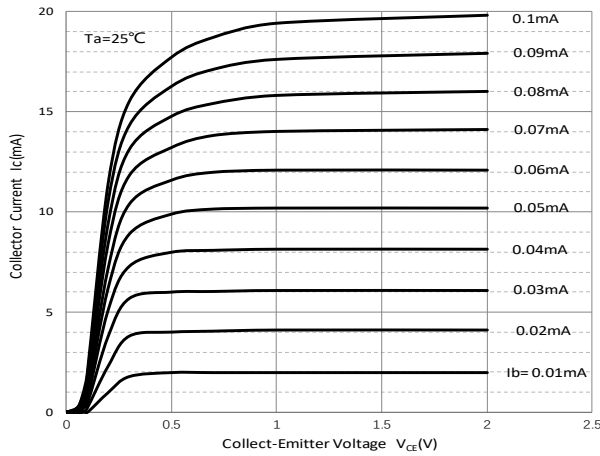


Fig 2: DC Current Gain

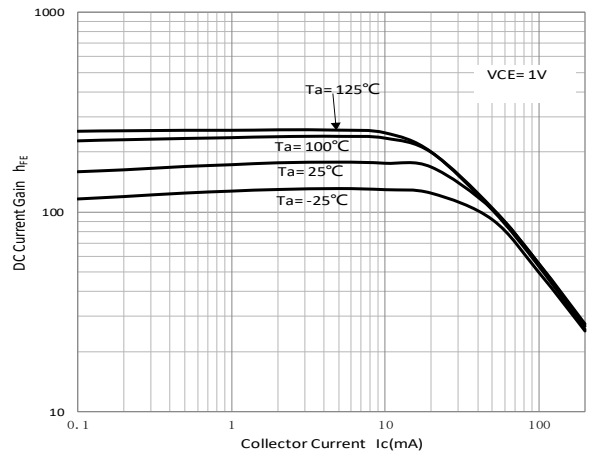


Fig 3: Collector-Emittor Saturation Voltage

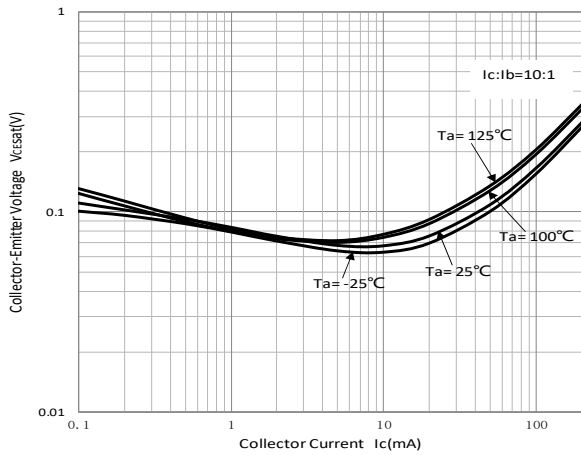


Fig 4: Base-Emittor Saturation Voltage

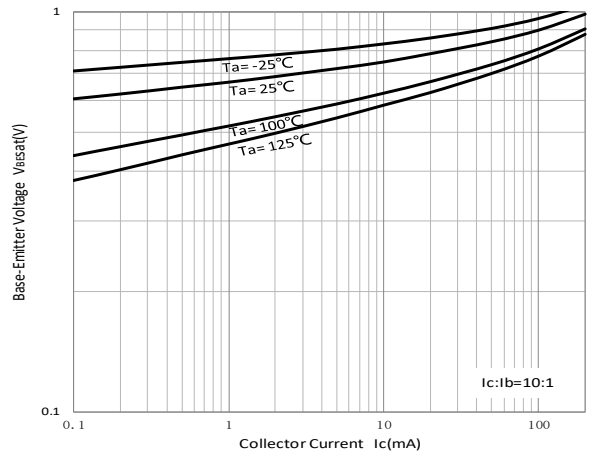


Fig 5: Base-Emittor On Voltage

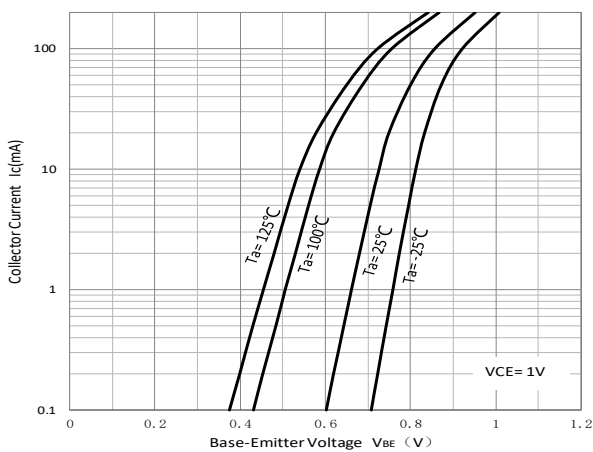
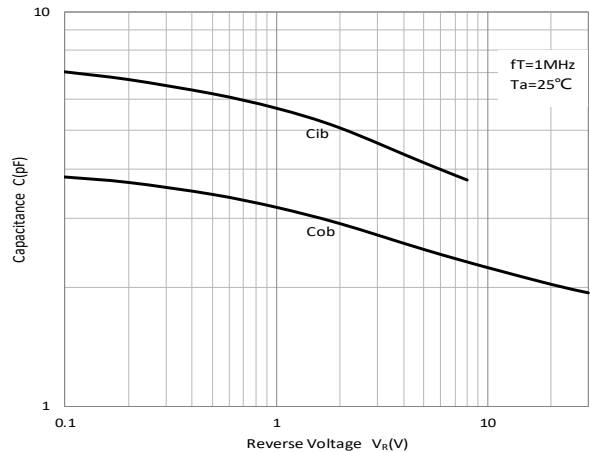


Fig 6: Cob/Cib-V<sub>CB</sub>/V<sub>EB</sub>

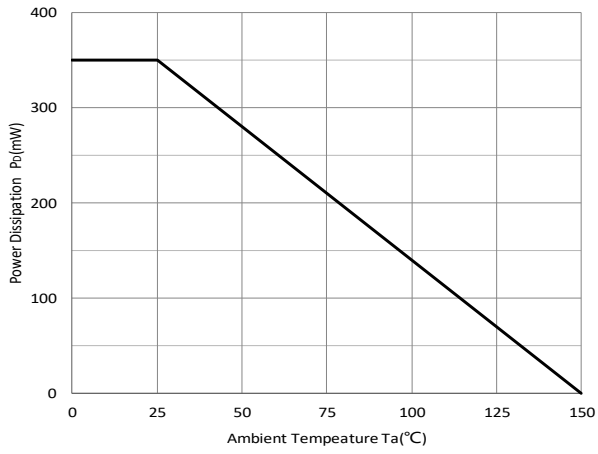




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Fig 7:  $P_D$ - $T_a$  Curve





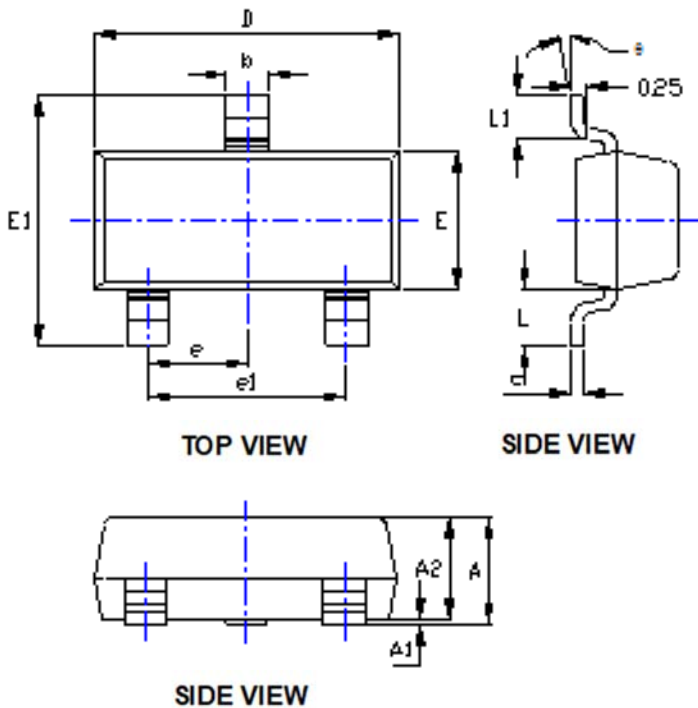
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## ■ Ordering Information

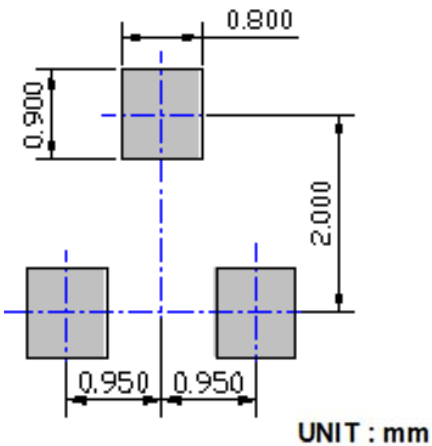
Preferred P/N	Packing code	Unit weight(g)	Minimum package(pcs)	Inner box quantity(pcs)	Outer carton quantity(pcs)	Delivery mode
MMBT3904	F2	Approximate 0.008	3000	30000	120000	7" reel
MMBT3904	F4	Approximate 0.008	10000	/	210000	13" reel

## ■ 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





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