



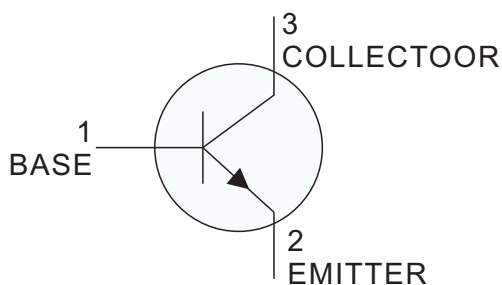
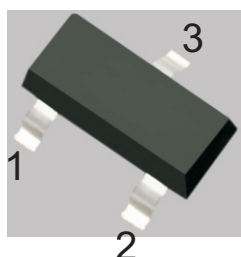
General Purpose Transistor

NPN Silicon

FEATURES

- High Collector Current.
- Complementary to S9012.
- Excellent hFE Linearity.

SOT-23



DEVICE MARKING  
S9013 = J3

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	25	Vdc
Collector–Base Voltage	$V_{CBO}$	40	Vdc
Emitter–Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current — Continuous	$I_C$	500	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR– 5 Board, (1) $T_A = 25^\circ\text{C}$	$P_D$	300	mW
Junction and Storage Temperature	$T_J, T_{stg}$	- 55 to +150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted.)

OFF CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Collector–Emitter Breakdown Voltage(3) ( $I_C = 1.0 \text{ mAdc}, I_E = 0$ )	$V_{(BR)CEO}$	25	–	Vdc
Collector–Base Breakdown Voltage ( $I_C = 100 \mu\text{Adc}, I_E = 0$ )	$V_{(BR)CBO}$	40	–	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 100 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	5.0	–	Vdc
Collector cut-off current ( $V_{CB} = 40 \text{ Vdc}, I_E = 0$ )	$I_{CBO}$	–	0.1	$\mu\text{Adc}$
Collector cut-off current ( $V_{CE} = 20 \text{ Vdc}, I_B = 0$ )	$I_{CEO}$	–	0.1	$\mu\text{Adc}$
Emitter cut-off current ( $V_{EB} = 5 \text{ Vdc}, I_C = 0$ )	$I_{EBO}$	–	0.1	$\mu\text{Adc}$

1. FR–5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.
3. Pulse Test: Pulse Width <300  $\mu\text{s}$ , Duty Cycle <2.0%.



**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted) (Continued)  
ON CHARACTERISTICS (3)**

Characteristic	Symbol	Min	Max	Unit
DC Current Gain	h <sub>FE</sub>			—
(I <sub>C</sub> = 50 mA, V <sub>CE</sub> = 1 V)		120	400	
(I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 1 V)		40	—	
Collector–Emitter Saturation Voltage	V <sub>CE(sat)</sub>			V <sub>dc</sub>
(I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA)(3)		—	0.6	
Base–Emitter Saturation Voltage(3)	V <sub>BE(sat)</sub>			V <sub>dc</sub>
(I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA)		—	1.2	
Base-emitter voltage (V <sub>CB</sub> =1V, I <sub>C</sub> =10mA)	V <sub>BE</sub>	—	0.7	

**SMALL–SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product (I <sub>C</sub> = 20mA, V <sub>CE</sub> = 6.0V, f = 30MHz)	f <sub>T</sub>	150	—	MHz
Collector output capacitance (V <sub>CB</sub> = 6.0V, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob</sub>	—	8.0	pF

**CLASSIFICATION OF h<sub>FE</sub>**

Rank	L	H	J
Range	120-200	200-350	300-400

3. Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.



### TYPICAL CHARACTERISTICS

Fig.1 Power Derating Curve

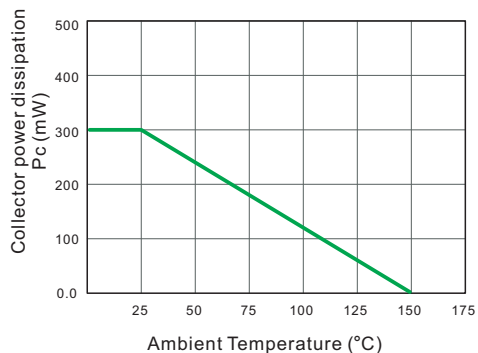


Fig.2 Static characteristics

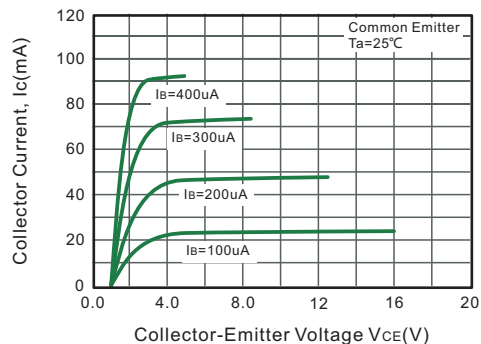


Fig.3 hFE--Ic

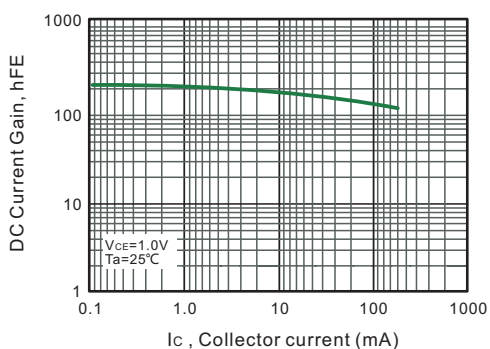


Fig.4 Ic--VBE

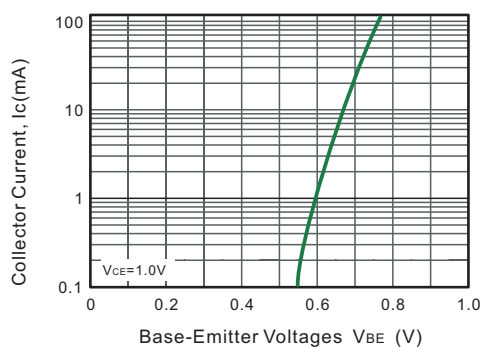


Fig.5 VBEsat--Ic

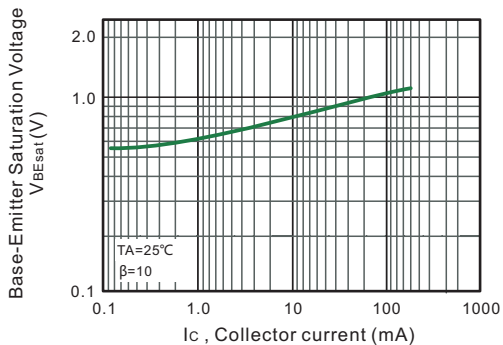


Fig.6 VCEsat--Ic

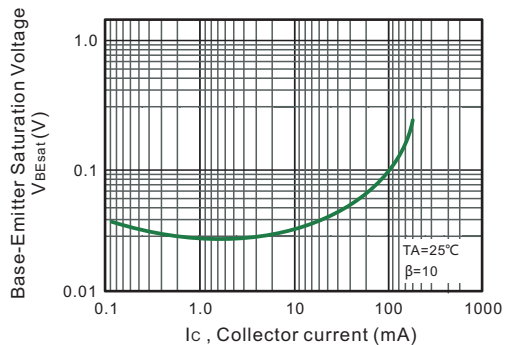


Fig.7 ft--Ic

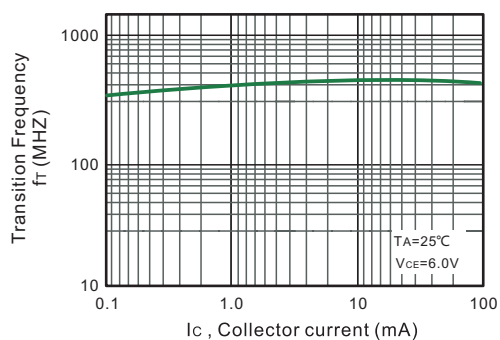
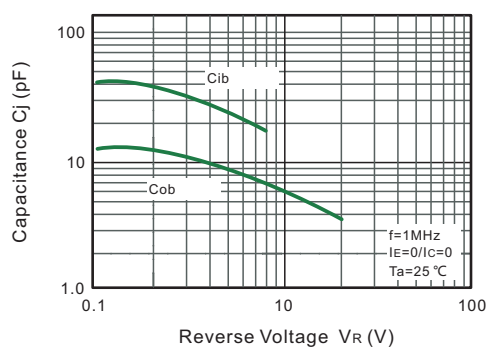
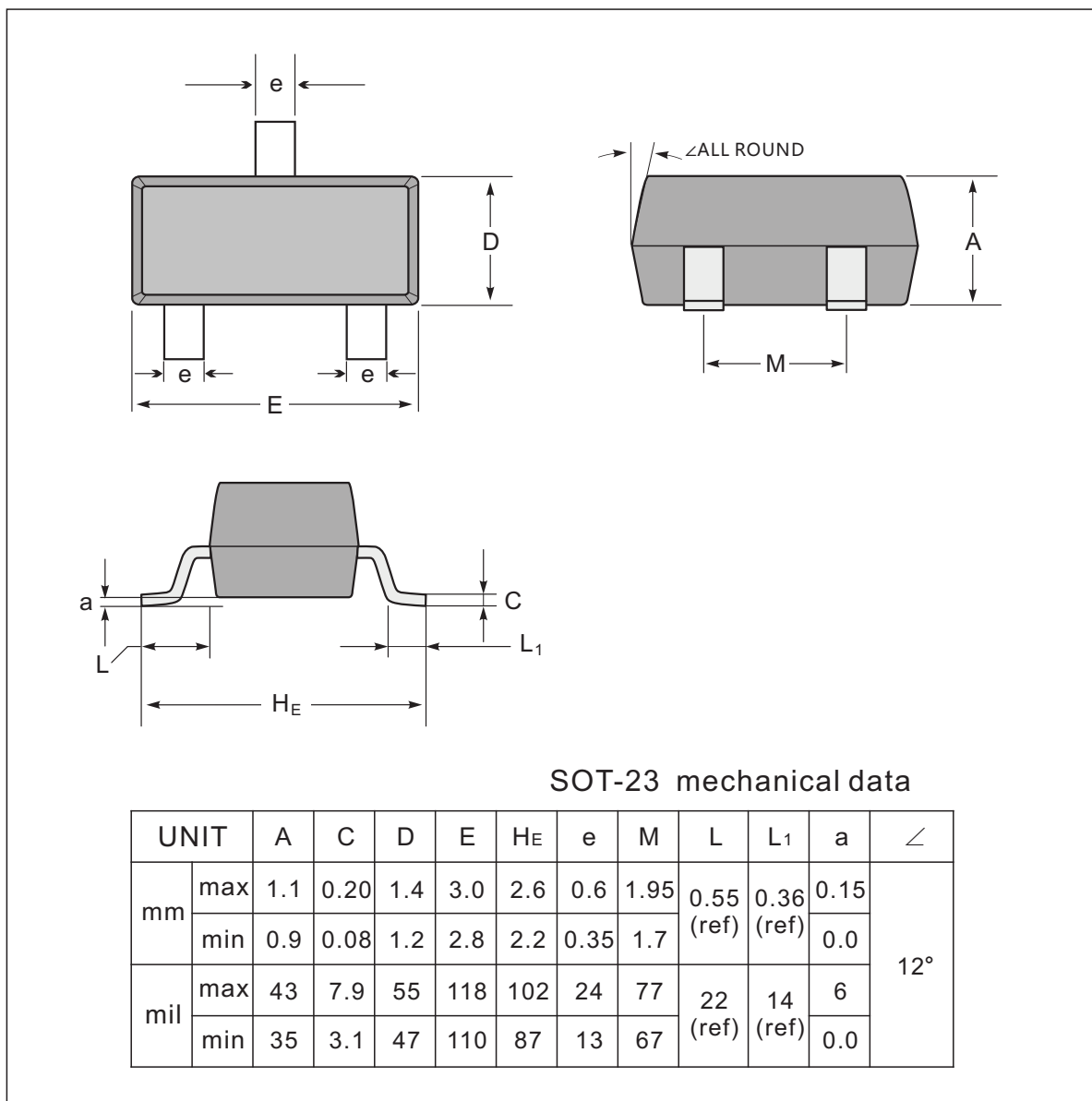


Fig.8 Cob/Cib--VCR/VEB

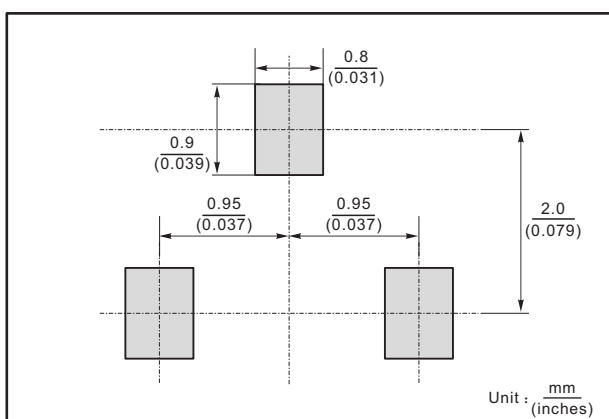




### SOT-23 Package Outline Dimensions



#### The recommended mounting pad size



#### Marking

Type number	Marking code
S9013	J3