

# Silicon Transistor

## 2N2223

absolute maximum ratings: (25°C) (unless otherwise specified)

### Voltages

Collector to Base	$V_{CBO}$	100	volts
Collector to Emitter ( $R_{BE} = 10$ ohms)	$V_{CER}$	80	volts
Collector to Emitter	$V_{CEO}$	60	volts
Emitter to Base	$V_{EBO}$	7	volts

### Temperatures

Storage	$T_{STG}$	-65 to +300	°C
Operating Junction	$T_J$	-65 to +200	°C

### Dissipation

	One Side Only	Both Sides
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Unit at 25°C Case Temperature (1)	1.6 w	3.0 w
Unit at 100°C Case Temperature (1)	.91 w	1.7 w
Unit in 25°C Ambient (2)	0.5 w	0.6 w

- (1) Derate 9.1 mw/°C (one side only) and 17.2 mw/°C (both sides) for operation above 25°C case temp.  
(2) Derate 2.86 mw/°C (one side only) and 3.43 mw/°C (both sides) for operation above 25°C ambient.

## electrical characteristics: (25°C) (unless otherwise specified)

### DC CHARACTERISTICS

Collector Base Voltage ( $I_C = 100\mu a, I_E = 0$ )	$V_{CBO}$	100	volts
Collector Emitter Voltage ( $I_C = 100\text{ma}, R_{BE} = 10$ )	$V_{CER*}$	80	volts
Collector Emitter Voltage ( $I_C = 30\text{ma}, I_B = 0$ )	$V_{CEO}$	60	volts
Emitter Base Voltage ( $I_E = 100\mu a, I_C = 0$ )	$V_{EBO}$	7	volts
Forward Current Transfer Ratio ( $I_C = 0.01\text{ma}, V_{CE} = 5\text{V}$ )	$h_{FE}$	15	
Forward Current Transfer Ratio ( $I_C = 0.1\text{ma}, V_{CE} = 5\text{V}$ )	$h_{FE}$	25	
Forward Current Transfer Ratio ( $I_C = 10\text{ma}, V_{CE} = 5\text{V}$ )	$h_{FE*}$	50	
DC Current Gain Ratio ( $I_C = 0.1\text{ma}, V_{CE} = 5\text{V}$ )	$h_{FE1}/h_{FE2}$	0.8	1.0
Collector Saturation Voltage ( $I_C = 50\text{ma}, I_B = 5\text{ma}$ )	$V_{CE(SAT)}$	1.2	volts
Base Saturation Voltage ( $I_C = 50\text{ma}, I_B = 5\text{ma}$ )	$V_{BE(SAT)}$	0.9	volts
Base Voltage Differential ( $I_C = 0.1\text{ma}, V_{CE} = 5\text{V}$ )	$V_{BE1} - V_{BE2}$	15	mv
Voltage Differential Charge $I_C = 0.1\text{ma}, V_{CE} = 5\text{V}, T_A = -55$ to $+125^\circ\text{C}$	$\Delta  V_{BE1} - V_{BE2} $	25	uv/°C

### CUTOFF CHARACTERISTICS

Collector Leakage Current ( $V_{CB} = 80\text{V}, I_E = 0$ )	$I_{CBO}$	10	$\mu a$
Collector Leakage Current ( $V_{CB} = 80\text{V}, I_E = 0, T_A = 150^\circ\text{C}$ )	$I_{CBO}$	15	$\mu a$
Emitter Leakage Current ( $V_{EB} = 5\text{V}, I_C = 0$ )	$I_{EBO}$	10	$\mu a$

### SMALL SIGNAL CHARACTERISTICS

Current Transfer Ratio ( $V_{CE} = 5\text{V}, I_C = 1\text{ma}, f = 1\text{kc}$ )	$h_{fe}$	40	200	
Input Resistance ( $V_{CB} = 5\text{V}, I_C = 1\text{ma}, f = 1\text{kc}$ )	$h_{ib}$	20	30	ohms
Output Conductance ( $V_{CB} = 5\text{V}, I_C = 1\text{ma}, f = 1\text{kc}$ )	$h_{ob}$	0.5		umho

### HIGH FREQUENCY CHARACTERISTICS

Current Transfer Ratio ( $I_C = 50\text{ma}, V_{CE} = 10\text{V}, F = 20\text{mc}$ )	$h_{fe}$	2.5	
Output Capacitance ( $V_{CB} = 10\text{V}, I_E = 0$ )	$C_{ob}$	15	pf
Input Capacitance ( $V_{EB} = 0.5\text{V}, I_E = 0$ )	$C_{ib}$	85	pf

