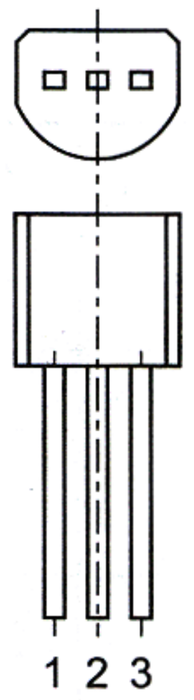
# TO-92 Plastic-Encapsulate Transistors

## S9013 TRANSISTOR(NPN)




**TO-92**

1.EMITTER

2.BASE

3.COLLECTOR

## FEATURES

**Power dissipation**

$P_{CM}$: 0.625W (Tamb=25℃)

**Collector current**

$I_{CM}$: -0.5 A

**Collector-base voltage**

$V_{(BR)CBO}$: 40 V

**Operating and storage junction temperature range**

$T_J, T_{stg}$: -55℃ to + 150℃

## ELECTRICAL CHARACTERISTICS

(Tamb=25℃ unless otherwise specified)

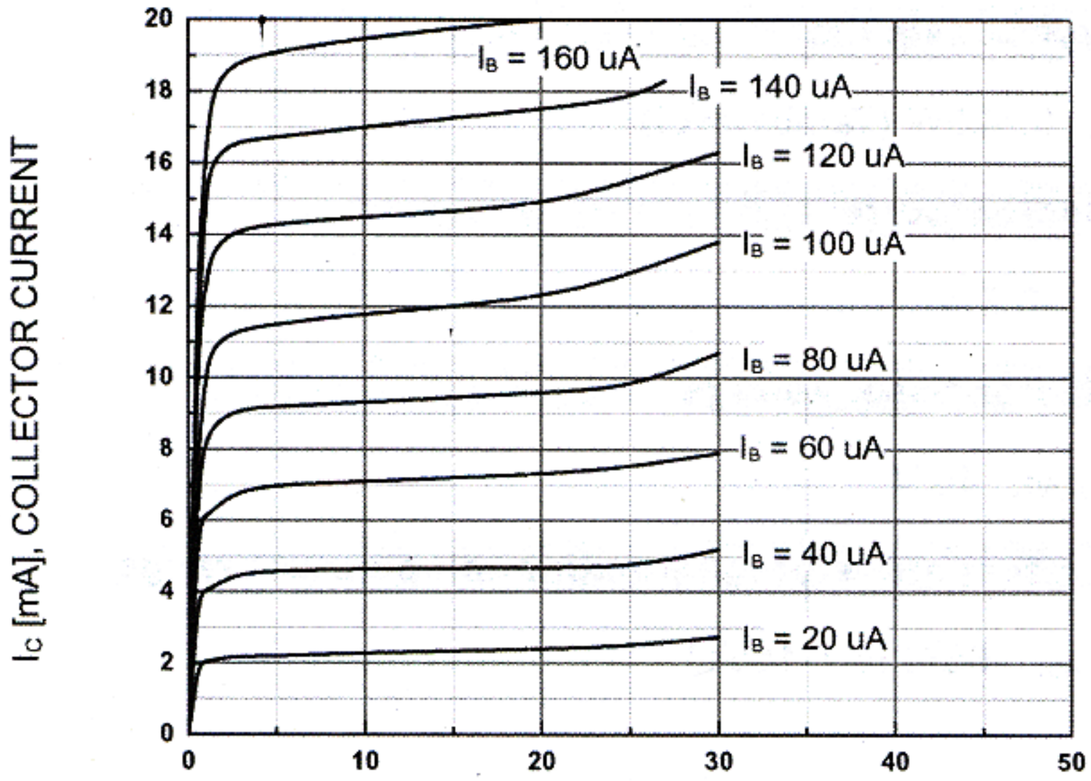
| Parameter | Symbol | Test conditions | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| Collector-base breakdown voltage | $V_{(BR)CBO}$ | $I_C$= 100 μ A, $I_E$=0 | 45 | | V |
| Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C$= 0.1 mA, $I_B$=0 | 25 | | V |
| Emitter-base breakdown voltage | $V_{(BR)EBO}$ | $I_E$= 100 μ A, $I_C$=0 | 5 | | V |
| Collector cut-off current | $I_{CBO}$ | $V_{CB}$= 40 V, $I_E$=0 | | 0.1 | μ A |
| Collector cut-off current | $I_{CEO}$ | $V_{CE}$= 20 V, $I_B$=0 | | 0.1 | μ A |
| Emitter cut-off current | $I_{EBO}$ | $V_{EB}$= 5 V, $I_C$=0 | | 0.1 | μ A |
| DC current gain | $h_{FE(1)}$ | $V_{CE}$= 1 V, $I_C$= 50 mA | 64 | 300 | |
| | $h_{FE(2)}$ | $V_{CE}$= 1 V, $I_C$= 500 mA | 40 | | |
| Collector-emitter saturation voltage | $V_{CEsat}$ | $I_C$= 500 mA, $I_B$= 50 mA | | 0.6 | V |
| Base-emitter saturation voltage | $V_{BEsat}$ | $I_C$= 500 mA, $I_B$= 50 mA | | 1.2 | V |
| Base-emitter voltage | $V_{BE}$ | $I_E$= 100mA | | 1.4 | V |
| Transition frequency | $f_T$ | $V_{CE}$= 6 V, $I_C$= -20 mA<br>f =30MHz | 150 | | MHz |

## CLASSIFICATION OF $h_{FE(1)}$

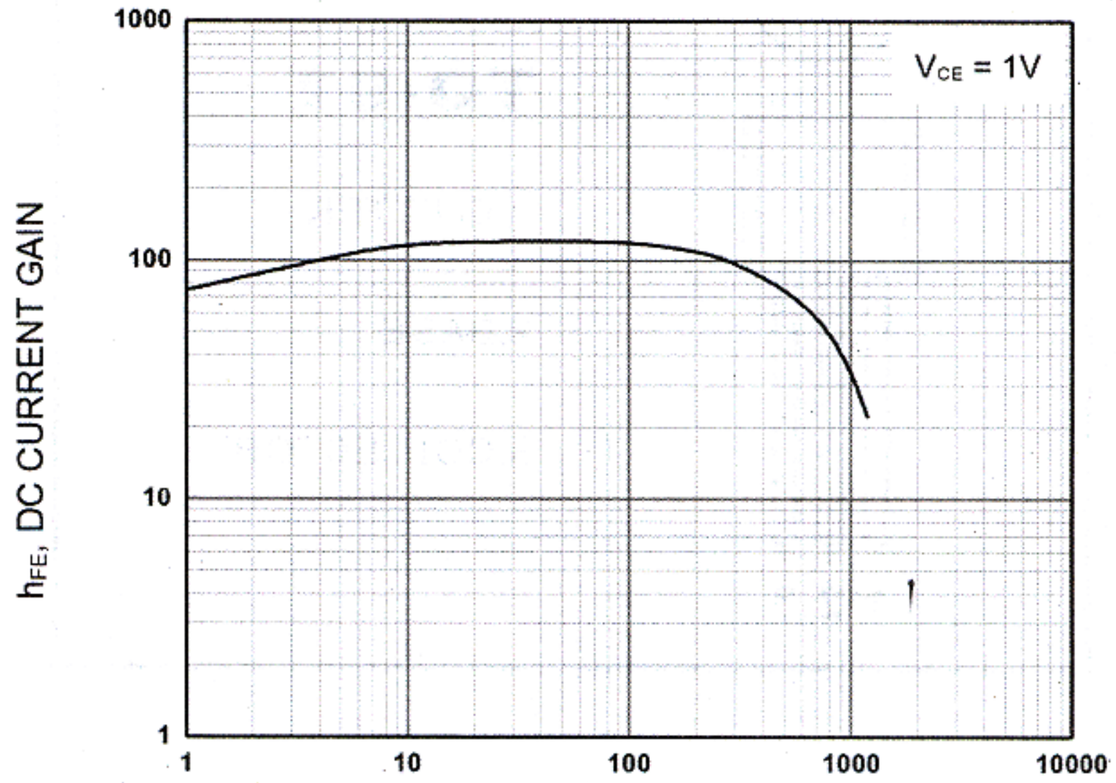
| Rank | D | E | F | G | H | I |
|---|---|---|---|---|---|---|
| Range | 64-91 | 78-112 | 96-135 | 112-166 | 144-202 | 190-300 |

# Typical Characteristics

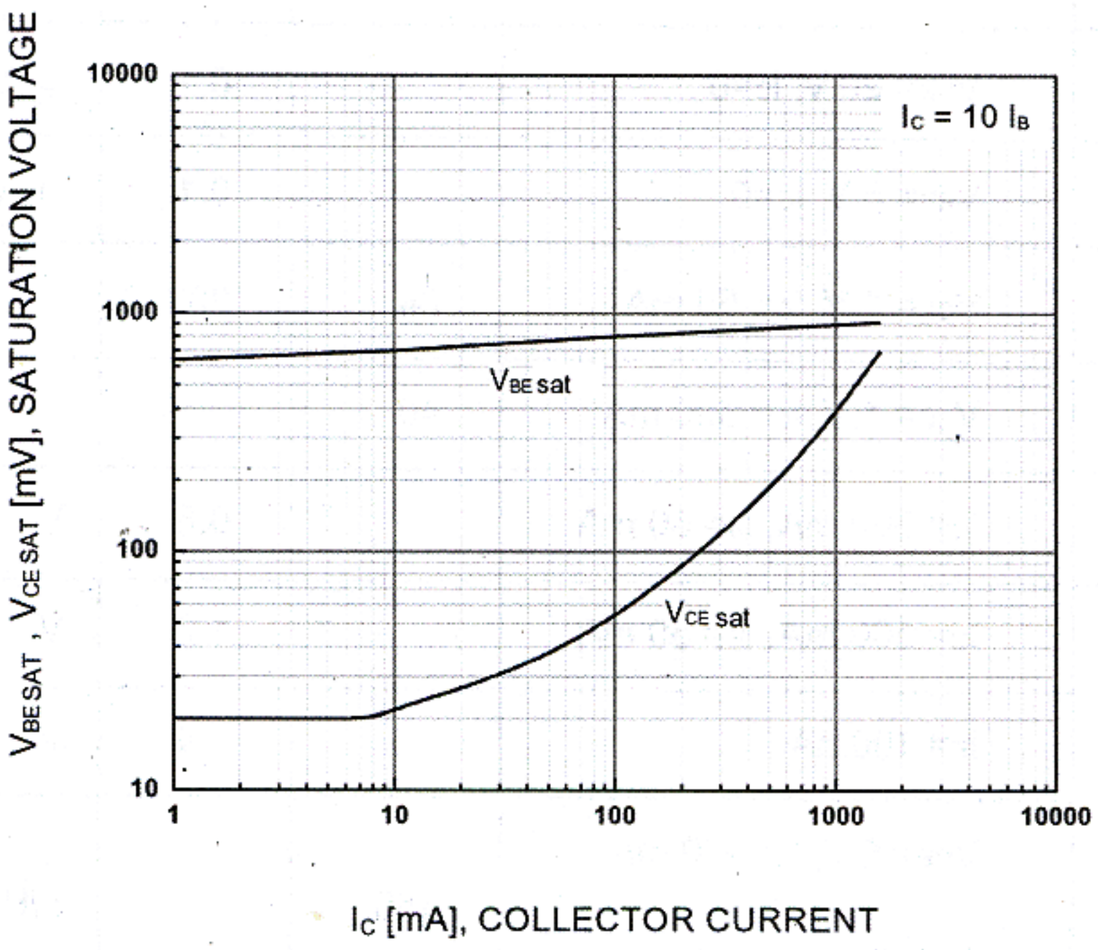




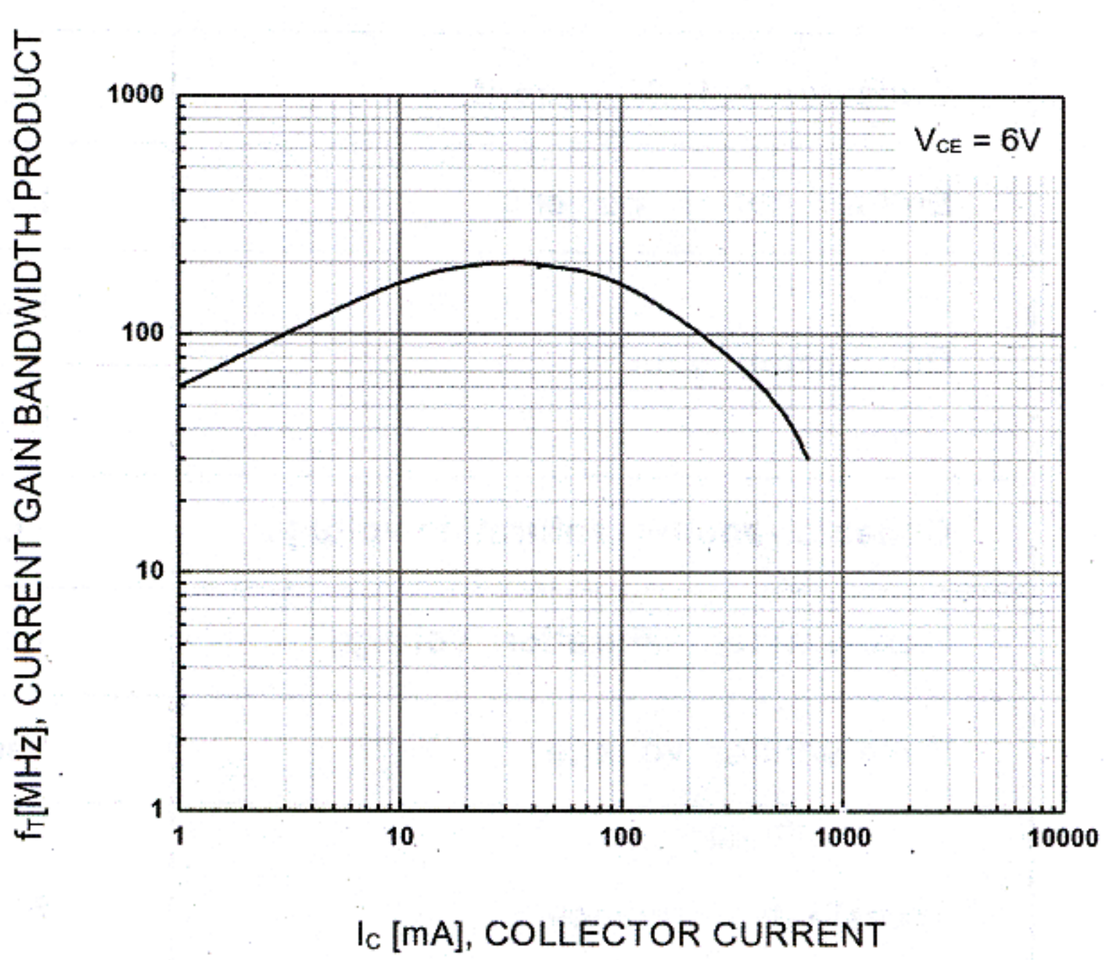

**Static Characteristic**




**DC current Gain**




**Base-Emitter Saturation Voltage**
**Collector-Emitter Saturation Voltage**




**Current Gain Bandwidth Product**