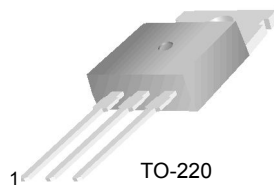**FAIRCHILD**
**SEMICONDUCTOR®**

October 2008

# KSC5021
# NPN Silicon Transistor

• High Voltage and High Reliability

• High Speed Switching : $t_F$ = 0.1$\mu$s (Typ.)

• Wide SOA

TO-220

1.Base    2.Collector    3.Emitter

## Absolute Maximum Ratings  $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Value | Units |
|--------|-----------|-------|-------|
| $V_{CBO}$ | Collector-Base Voltage | 800 | V |
| $V_{CEO}$ | Collector-Emitter Voltage | 500 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 7 | V |
| $I_C$ | Collector Current (DC) | 5 | A |
| $I_{CP}$ | Collector Current (Pulse) | 10 | A |
| $I_B$ | Base Current | 2 | A |
| $P_C$ | Collector Dissipation ($T_C$=25°C) | 50 | W |
| $T_J$ | Junction Temperature | 150 | °C |
| $T_{STG}$ | Storage Temperature | - 55 ~ 150 | °C |

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## Electrical Characteristics $T_C = 25°C$ unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max | Units |
|--------|-----------|------------|------|------|-----|-------|
| $BV_{CBO}$ | Collector-Base Breakdown Voltage | $I_C = 1mA$, $I_E = 0$ | 800 | | | V |
| $BV_{CEO}$ | Collector-Emitter Breakdown Voltage | $I_C = 5mA$, $I_B = 0$ | 500 | | | V |
| $BV_{EBO}$ | Emitter-Base Breakdown Voltage | $I_E = 1mA$, $I_C = 0$ | 7 | | | V |
| $V_{CEX}(sus)$ | Collector-Emitter Sustaining Voltage | $I_C = 2.5A$, $I_{B1} = -I_{B2} = 1A$ <br> $L = 1mH$, Clamped | 500 | | | V |
| $I_{CBO}$ | Collector Cut-off Current | $V_{CB} = 500V$, $I_E = 0$ | | | 10 | μA |
| $I_{EBO}$ | Emitter Cut-off Current | $V_{EB} = 5V$, $I_C = 0$ | | | 10 | μA |
| $h_{FE1}$ <br> $h_{FE2}$ | DC Current Gain | $V_{CE} = 5V$, $I_C = 0.6A$ <br> $V_{CE} = 5V$, $I_C = 3A$ | 15 <br> 8 | | 50 | |
| $V_{CE}(sat)$ | Collector-Emitter Saturation Voltage | $I_C = 3A$, $I_B = 0.6A$ | | | 1 | V |
| $V_{BE}(sat)$ | Base-Emitter Saturation Voltage | $I_C = 3A$, $I_B = 0.6A$ | | | 1.5 | V |
| $C_{ob}$ | Output Capacitance | $V_{CB} = 10V$, $I_E = 0$, $f=1MHz$ | | 80 | | pF |
| $f_T$ | Current Gain Bandwidth Product | $V_{CE} = 10V$, $I_C = 0.6A$ | | 18 | | MHz |
| $t_{ON}$ | Turn On Time | $V_{CC} = 200V$ <br> $I_C = 5I_{B1} = -2.5I_{B2} = 4A$ <br> $R_L = 50Ω$ | | | 0.5 | μs |
| $t_{STG}$ | Storage Time | | | | 3 | μs |
| $t_F$ | Fall Time | | | | 0.3 | μs |

* Pulse Test: PW ≤ 300μs, Duty Cycle ≤ 2%

## $h_{FE}$ Classification
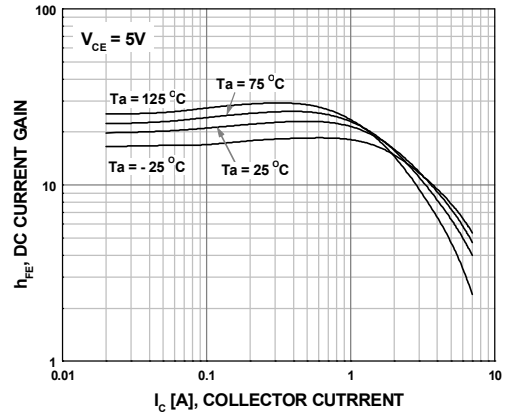
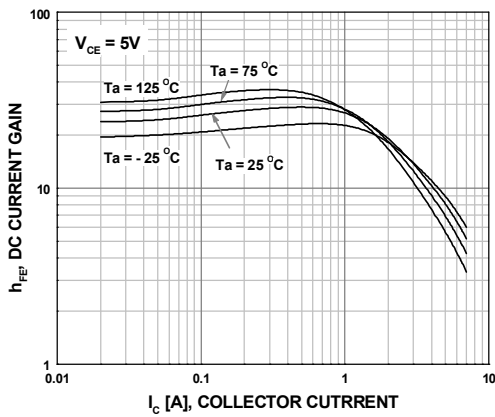| Classification | R | O | Y |
|----------------|---|---|---|
| $h_{FE1}$ | 15 ~ 30 | 20 ~ 40 | 30 ~ 50 |

# Typical Performance Characteristics
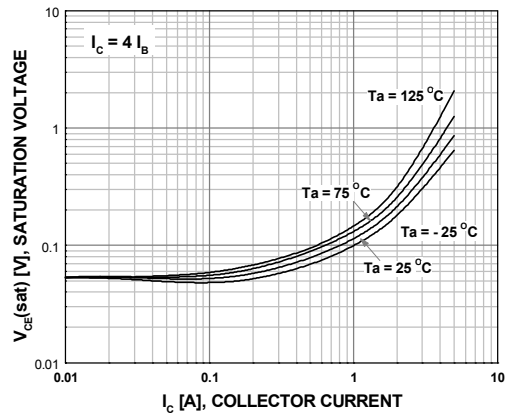
### Figure 1. Static Characteristic
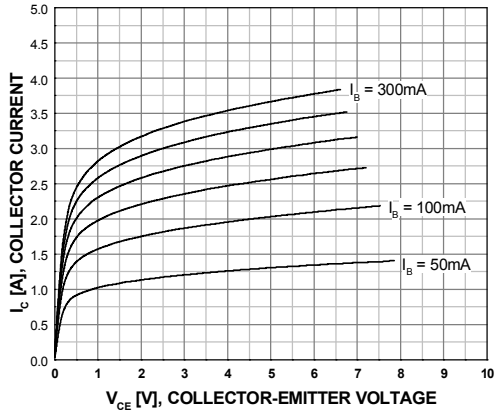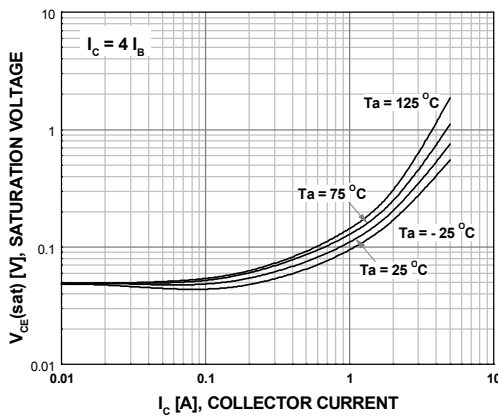


### Figure 2. DC Current Gain (R-Grade)



### Figure 3. DC Current Gain (O-Grade)



### Figure 4. Saturation Voltage (R-Grade)



### Figure 5. Saturatin Voltage (O-Grade)



### Figure 6. Saturation Voltage (R-Grade)

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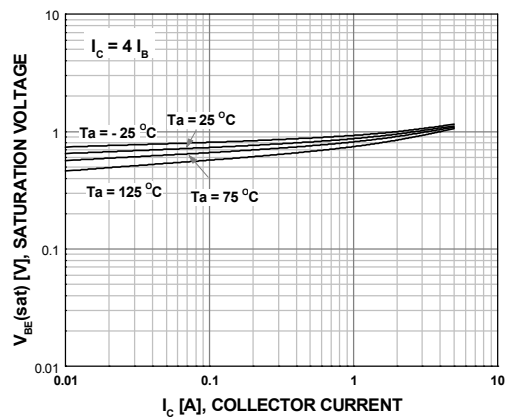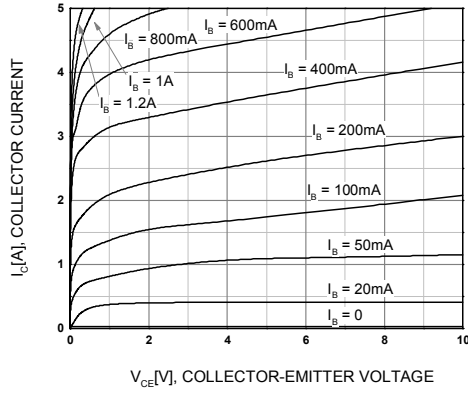
# Typical Characteristics



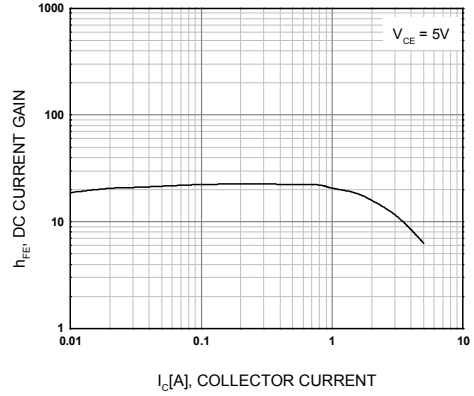**Figure 1. Static Characteristic**



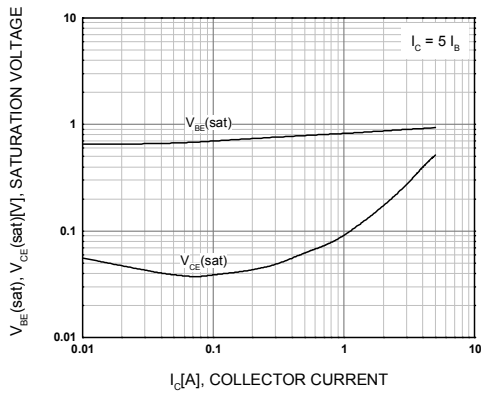**Figure 2. DC current Gain**



**Figure 3. Base-Emitter Saturation Voltage**
**Collector-Emitter Saturation Voltage**



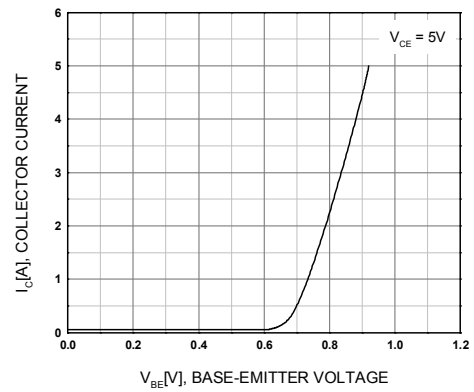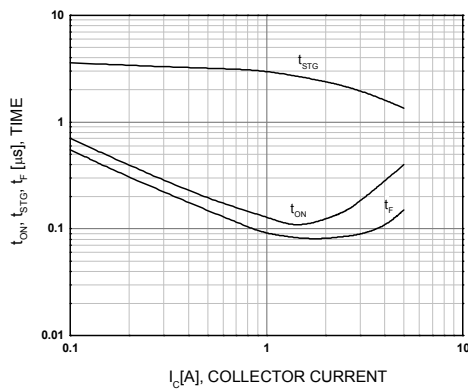**Figure 4. Base-Emitter On Voltage**



**Figure 5. Switching Time**
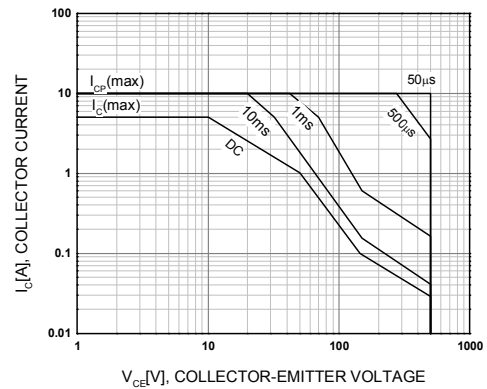


**Figure 6. Safe Operating Area**

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## Typical Characteristics (Continued)
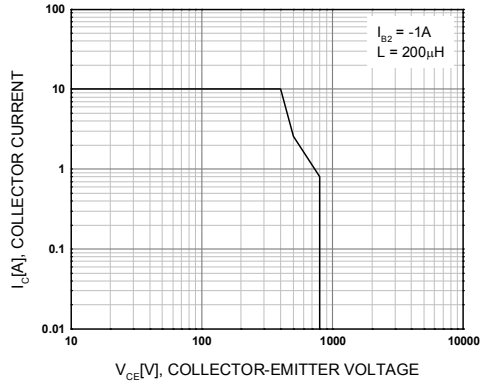


**Figure 7. Reverse Bias Safe Operating Area**
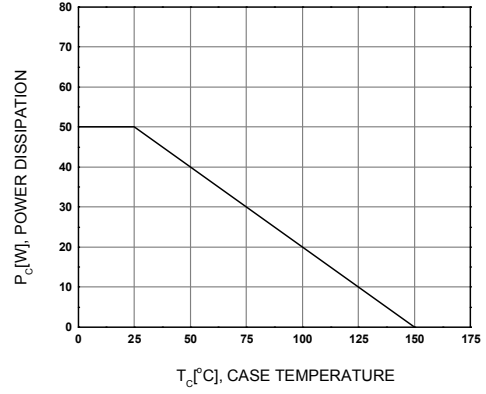


**Figure 8. Power Derating**

## Package Dimension

TO-220

Dimensions are in mm



NOTES: UNLESS OTHERWISE SPECIFIED
A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1973
D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
E) DOES NOT COMPLY JEDEC STANDARD VALUE.
F) "A1" DIMENSIONS REPRESENT LIKE BELOW;
   SINGLE GAUGE = 0.51 - 0.61
   DUAL GAUGE   = 1.14 - 1.40
G) DRAWING FILE NAME: TO220B03REV6

Dimensions in Millimeters

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