NEC

# NPN SILICON TRANSISTOR

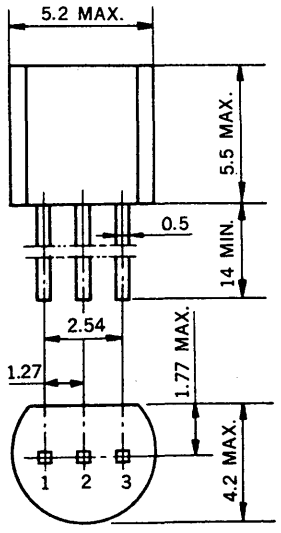
# 2SC3616

**DESCRIPTION** The 2SC3616 is designed for general-purpose applications requiring High DC Current Gain.
This is suitable for all kind of driving, instead of Darlington Transistor, or muting.

**FEATURES**

- High DC Current Gain.
  $h_{FE}$ = 800 to 3200 (@ $V_{CE}$ = 2.0 V, $I_C$ = 300 mA)
- Low Collector Saturation Voltage.
  $V_{CE(sat)}$ = 0.14 V TYP. (@ $I_C/I_B$ = 300 mA/3.0 mA)
- High $V_{EBO}$ : $V_{EBO}$ = 15V
- Large Current : $I_{C(DC)}$ = 700 mA, $I_{C(pulse)}$ = 1.0 A
- High Total Power Dissipation. : $P_T$ = 0.75 W ($T_a$ = 25 °C)

**PACKAGE DIMENSIONS**
in millimeters (inches)




1. Emitter
2. Collector
3. Base

EIAJ : SC-43B
JEDEC : TO-92
IEC : PA33

**ABSOLUTE MAXIMUM RATINGS**

Maximum Temperatures
- Storage Temperature . . . . . −55 to +150 °C
- Junction Temperature . . . . . 150 °C Maximum

Maximum Power Dissipation ($T_a$ = 25 °C)
- Total Power Dissipation . . . . . 0.75 W

Maximum Voltages and Currents ($T_a$ = 25 °C)

| | | | |
|---|---|---|---|
| $V_{CBO}$ | Collector to Base Voltage . . . . . | 25 | V |
| $V_{CEO}$ | Collector to Emitter Voltage . . . . . | 25 | V |
| $V_{EBO}$ | Emitter to Base Voltage . . . . . | 15 | V |
| $I_C$ | Collector Current (DC) . . . . . | 700 | mA |
| $I_C$ | Collector Current (pulse)* . . . . . | 1.0 | A |

*PW ≦ 10 ms, Duty Cycle ≦ 50 %

**ELECTRICAL CHARACTERISTICS ($T_a$ = 25 °C)**

| SYMBOL | CHARACTERISTIC | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $h_{FE1}$** | DC Current Gain | 800 | | 3200 | — | $V_{CE}$ = 2.0 V, $I_C$ = 300 mA |
| $h_{FE2}$** | DC Current Gain | 640 | | | — | $V_{CE}$ = 2.0 V, $I_C$ = 500 mA |
| $f_T$ | Gain Bandwidth Product | 150 | 250 | | MHz | $V_{CE}$ = 5.0 V, $I_E$ = −300 mA |
| $C_{ob}$ | Output Capacitance | | 10 | | pF | $V_{CB}$ = 10 V, $I_E$ = 0, f = 1.0 MHz |
| $I_{CBO}$ | Collector Cutoff Current | | | 100 | nA | $V_{CB}$ = 25 V, $I_E$ = 0 |
| $I_{EBO}$ | Emitter Cutoff Current | | | 100 | nA | $V_{EB}$ = 10 V, $I_C$ = 0 |
| $V_{BE}$** | Base to Emitter Voltage | 600 | | 700 | mV | $V_{CE}$ = 2.0 V, $I_C$ = 50 mA |
| $V_{CE(sat)}$** | Collector Saturation Voltage | | 0.14 | 0.3 | V | $I_C$ = 300 mA, $I_B$ = 3.0 mA |
| $V_{BE(sat)}$** | Base Saturation Voltage | | 0.77 | 1.2 | V | $I_C$ = 300 mA, $I_B$ = 3.0 mA |
| $t_{on}$ | Turn-On Time | | 0.13 | | μs | $V_{CC}$ = 10 V, $V_{BE(off)}$ ≒ −2.7 V<br>$I_C$ = 200 mA<br>$I_{B1}$ = −$I_{B2}$ = 4.0 mA |
| $t_{stg}$ | Storage Time | | 0.90 | | μs | |
| $t_{off}$ | Turn-Off Time | | 1.1 | | μs | |

**Pulsed PW ≦ 350 μs, Duty Cycle ≦ 2 %

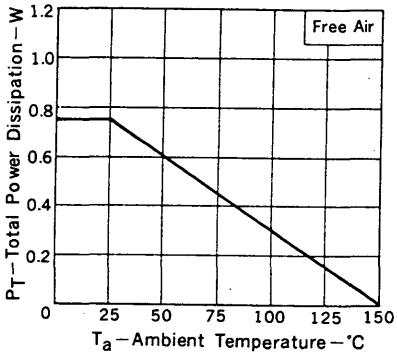
Classification of $h_{FE1}$

| Rank | M | L | K |
|---|---|---|---|
| Range | 800 to 1600 | 1200 to 2400 | 2000 to 3200 |

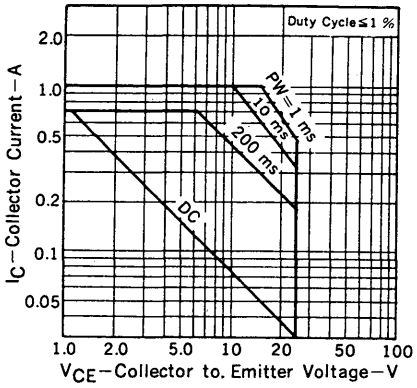
Test Conditions: $V_{CE}$ = 2.0 V, $I_C$ = 300 mA

## TYPICAL CHARACTERISTICS ($T_a$ = 25 °C)

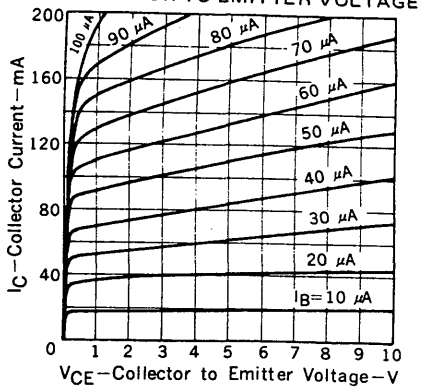
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



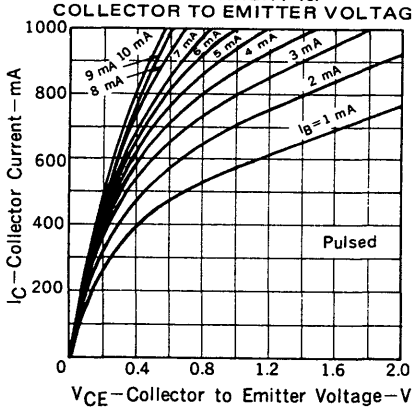

SAFE OPERATING AREAS (TRANSIENT THERMAL RESISTANCE METHOD)



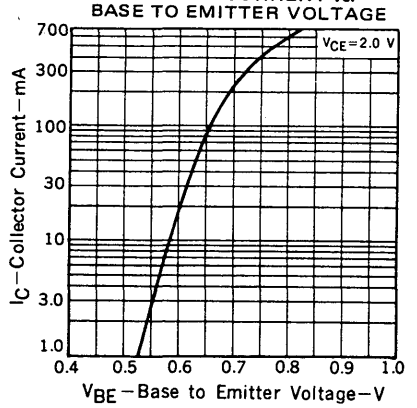

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



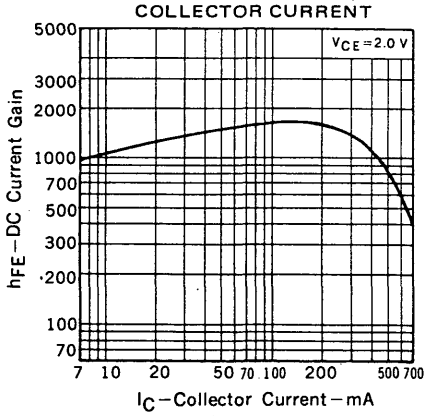

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



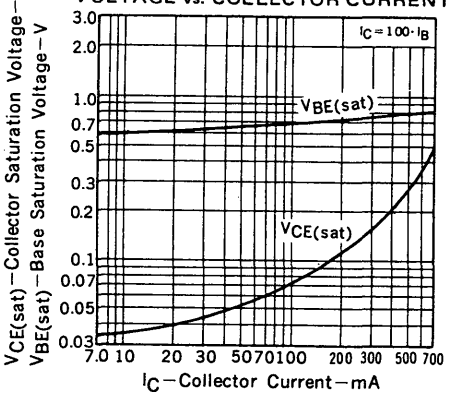

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



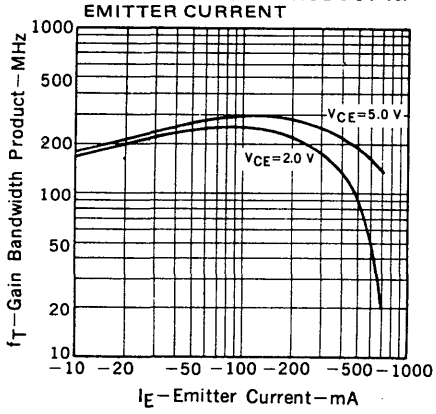

DC CURRENT GAIN vs. COLLECTOR CURRENT



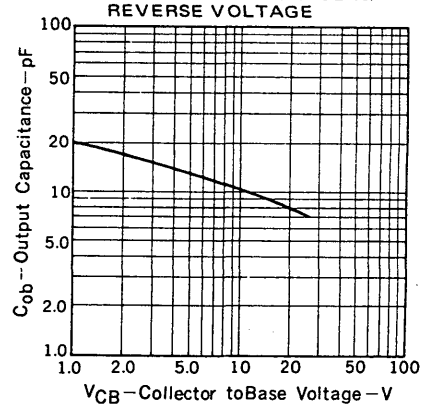

BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT




GAIN BANDWIDTH PRODUCT vs. EMITTER CURRENT




OUTPUT CAPACITANCE vs. REVERSE VOLTAGE



SWITCHING TIME vs.
COLLECTOR CURRENT