NEC

# SILICON POWER TRANSISTOR
# 2SD2165

## NPN SILICON EPITAXIAL TRANSISTOR
## FOR LOW-FREQUENCY POWER AMPLIFIERS AND LOW-SPEED SWITCHING

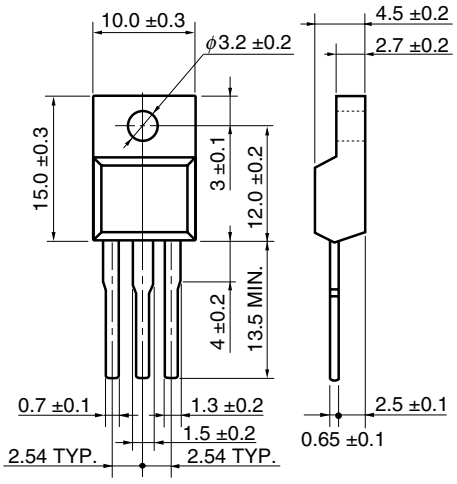
The 2SD2165 is a single power transistor developed especially for high $h_{FE}$. This transistor is ideal for simplifying drive circuits and reducing power dissipation because its $h_{FE}$ is as high as that of Darlington transistors, but it is a single transistor.

In addition, this transistor features a small resin-molded insulation package, thus contributing to high-density mounting and mounting cost reduction.

### FEATURES

- High $h_{FE}$ and low $V_{CE(sat)}$:
  $h_{FE} \cong$ 1,300 TYP. ($V_{CE}$ = 5.0 V, $I_C$ = 1.0 A)
  $V_{CE(SAT)} \cong$ 0.3 V TYP. ($I_C$ = 3.0 A, $I_B$ = 30 mA)
- Mold package that does not require an insulating board or insulation bushing

### PACKAGE DRAWING (UNIT: mm)




Electrode Connection
1. Base
2. Collector
3. Emitter

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | 100 | V |
| Collector to emitter voltage | $V_{CEO}$ | 100 | V |
| Emitter to base voltage | $V_{EBO}$ | 7.0 | V |
| Collector current (DC) | $I_{C(DC)}$ | 6.0 | A |
| Collector current (pulse) | $I_{C(pulse)}$ | 10[Note] | A |
| Base current (DC) | $I_{B(DC)}$ | 1.0 | A |
| Total power dissipation ($T_C$ = 25°C) | $P_T$ | 30 | W |
| Total power dissipation ($T_A$ = 25°C) | $P_T$ | 2.0 | W |
| Junction temperature | $T_j$ | 150 | °C |
| Storage temperature | $T_{stg}$ | –55 to +150 | °C |

**Note** PW ≤ 300 μs, duty cycle ≤ 10%



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**The mark ★ shows major revised points.**

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Collector cutoff current | $I_{CBO}$ | $V_{CB}$ = 60 V, $I_E$ = 0 A | | | 10 | μA |
| Emitter cutoff current | $I_{EBO}$ | $V_{EB}$ = 7.0 V, $I_C$ = 0 A | | | 10 | μA |
| DC current gain | $h_{FE1}$ | $V_{CE}$ = 5.0 V, $I_C$ = 1.0 A[Note] | 800 | 1,300 | 3,200 | |
| DC current gain | $h_{FE2}$ | $V_{CE}$ = 5.0 V, $I_C$ = 3.0 A[Note] | 500 | 1,000 | | |
| ★ Collector saturation voltage | $V_{CE(sat)}$ | $I_C$ = 3.0 A, $I_B$ = 30 mA[Note] | | 0.3 | 1.0 | V |
| Base saturation voltage | $V_{BE(sat)}$ | $I_C$ = 3.0 A, $I_B$ = 30 mA[Note] | | | 1.2 | V |
| Gain bandwidth product | $f_T$ | $V_{CE}$ = 5.0 V, $I_C$ = 0.1 A | | 110 | | MHz |
| Collector capacitance | $C_{ob}$ | $V_{CB}$ = 10 V, $I_E$ = 0 A, f = 1.0 MHz | | 50 | | pF |

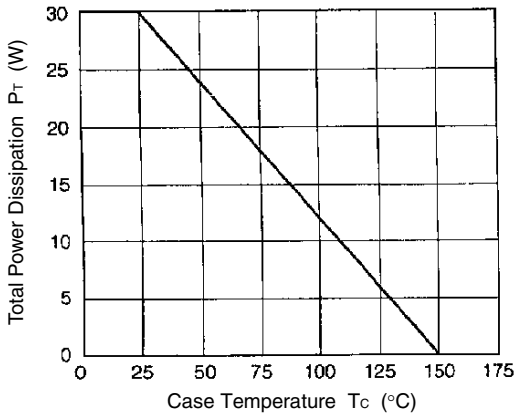
**Note** Pulse test PW ≤ 350 μs, duty cycle ≤ 2%

## $h_{FE1}$ CLASSIFICATION

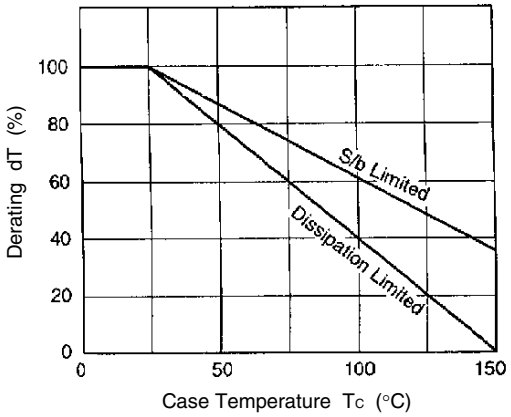
| Marking | M | L | K |
|---|---|---|---|
| $h_{FE1}$ | 800 to 1,600 | 1,000 to 2,000 | 1,600 to 3,200 |

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

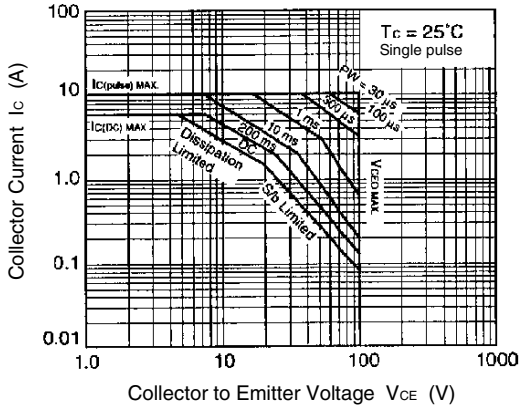
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



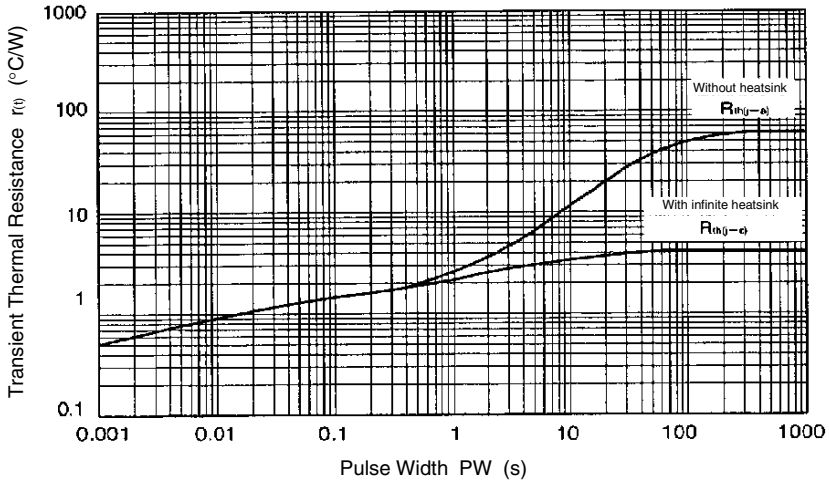

DERATING CURVE OF SAFE OPERATING AREA



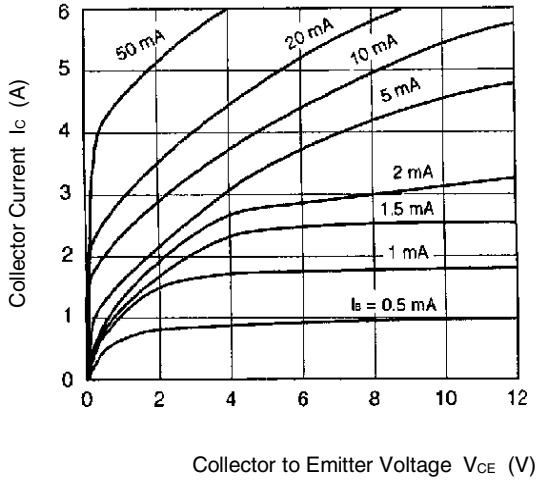

FORWARD BIAS SAFE OPERATING AREA



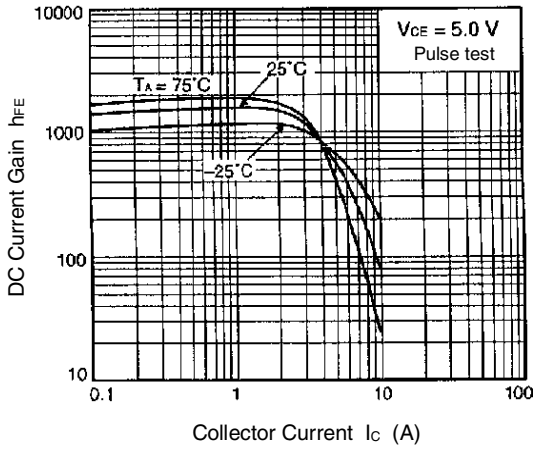

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



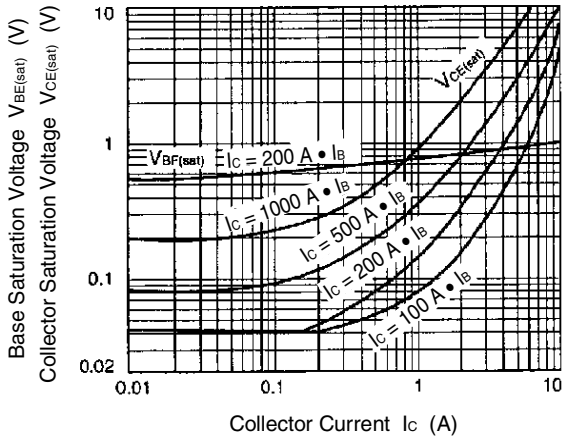
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



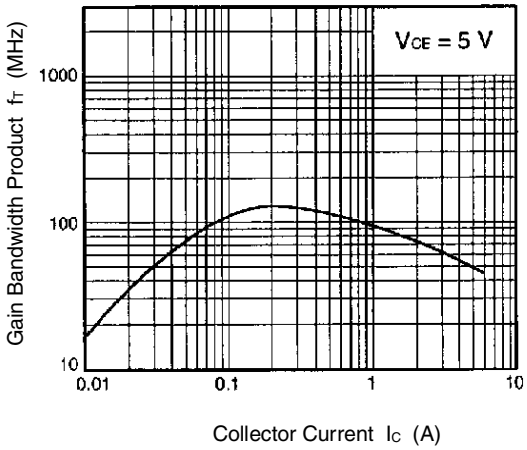

DC CURRENT GAIN vs. COLLECTOR CURRENT



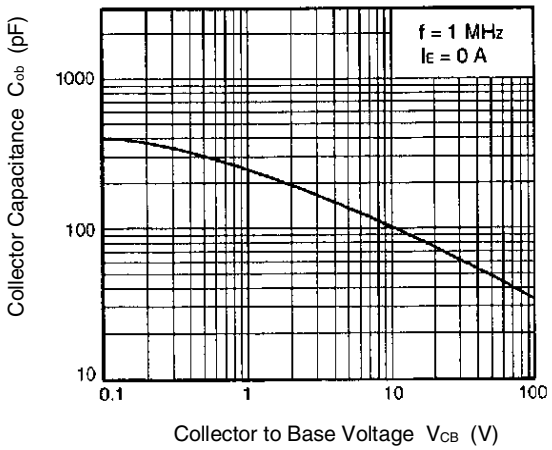

COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT




GAIN BANDWIDTH PROFDUCT vs. COLLECTOR CURRENT




OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



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