

### 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

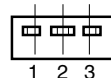
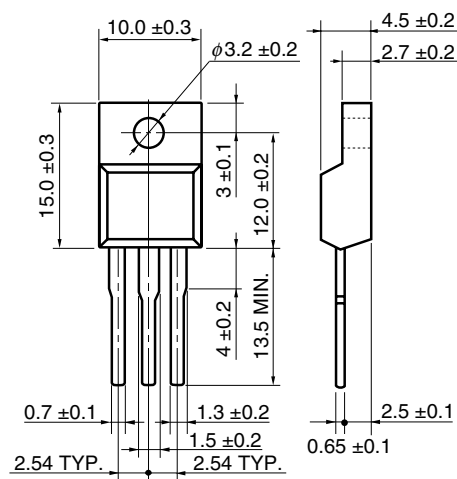
- High  $h_{FE}$  and low  $V_{CE(sat)}$ :  
 $h_{FE} \cong 1,300$  TYP. ( $V_{CE} = 5.0$  V,  $I_C = 1.0$  A)  
 $V_{CE(sat)} \cong 0.3$  V TYP. ( $I_C = 3.0$  A,  $I_B = 30$  mA)
- Mold package that does not require an insulating board or insulation bushing

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

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 <sup>Note</sup>	A
Base current (DC)	$I_{B(DC)}$	1.0	A
Total power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_T$	30	W
Total power dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	2.0	W
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Note**  $PW \leq 300 \mu\text{s}$ , duty cycle  $\leq 10\%$

#### PACKAGE DRAWING (UNIT: mm)



Electrode Connection  
 1. Base  
 2. Collector  
 3. Emitter

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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

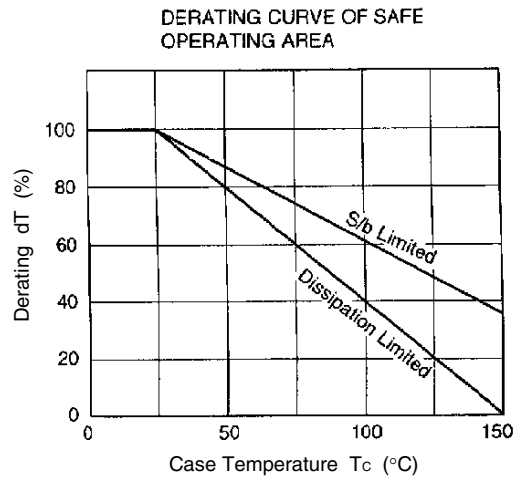
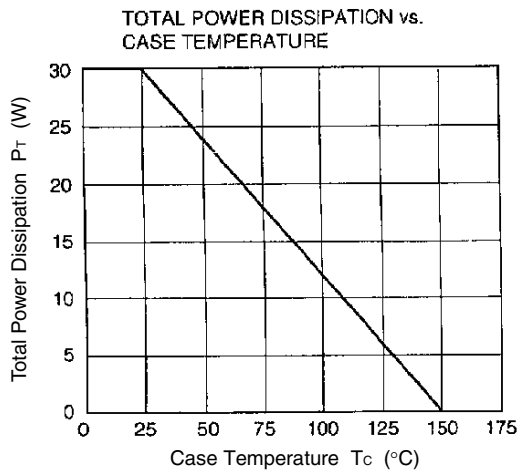
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I <sub>CB0</sub>	V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0 A			10	μA
Emitter cutoff current	I <sub>EB0</sub>	V <sub>EB</sub> = 7.0 V, I <sub>C</sub> = 0 A			10	μA
DC current gain	h <sub>FE1</sub>	V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 1.0 A <sup>Note</sup>	800	1,300	3,200	
DC current gain	h <sub>FE2</sub>	V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 3.0 A <sup>Note</sup>	500	1,000		
★ Collector saturation voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 3.0 A, I <sub>B</sub> = 30 mA <sup>Note</sup>		0.3	1.0	V
Base saturation voltage	V <sub>BE(sat)</sub>	I <sub>C</sub> = 3.0 A, I <sub>B</sub> = 30 mA <sup>Note</sup>			1.2	V
Gain bandwidth product	f <sub>T</sub>	V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 0.1 A		110		MHz
Collector capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 A, f = 1.0 MHz		50		pF

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

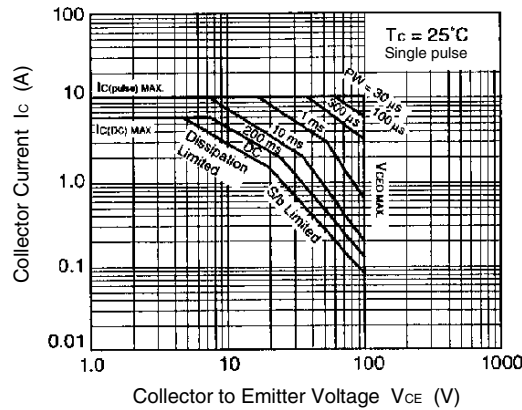
**h<sub>FE1</sub> CLASSIFICATION**

Marking	M	L	K
h <sub>FE1</sub>	800 to 1,600	1,000 to 2,000	1,600 to 3,200

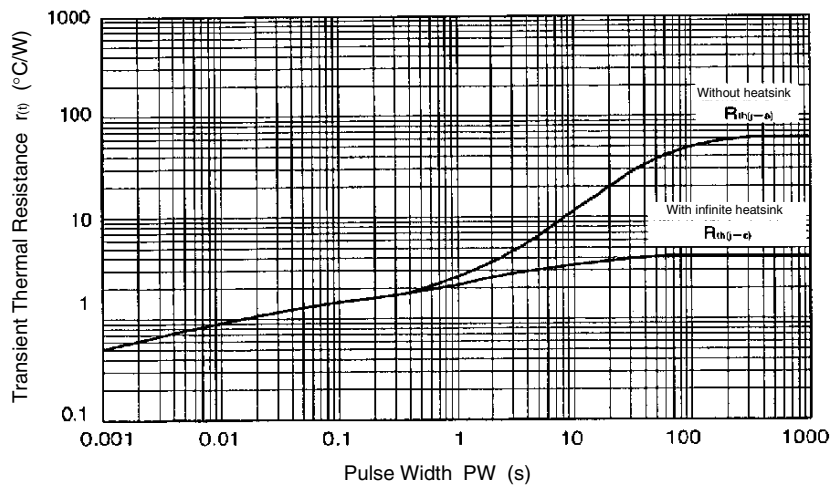
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



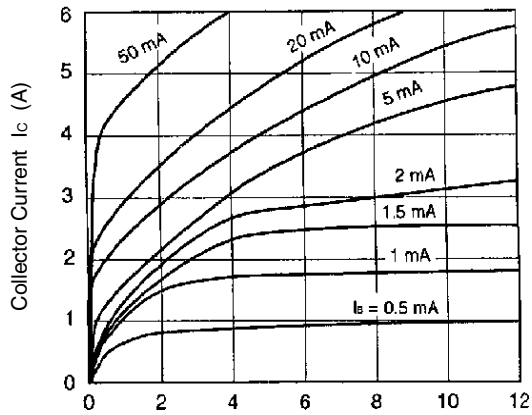
FORWARD BIAS SAFE OPERATING AREA



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

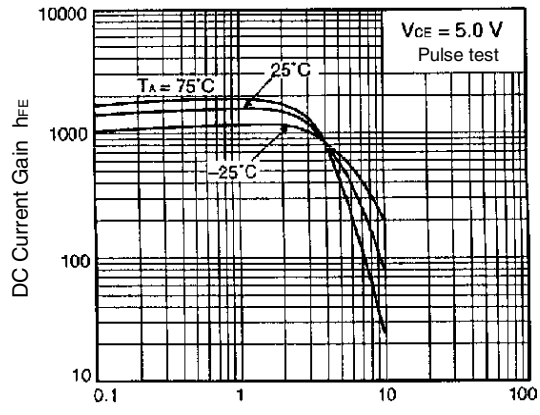


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



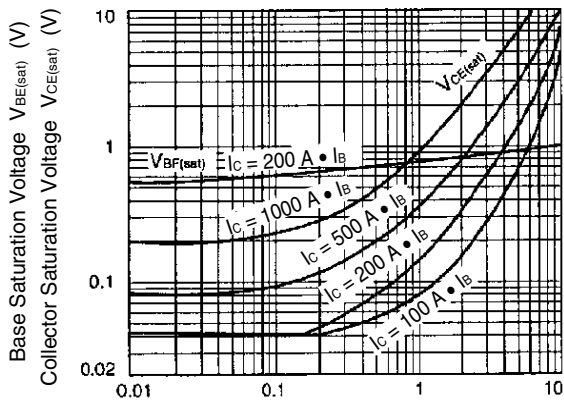
Collector to Emitter Voltage  $V_{CE}$  (V)

DC CURRENT GAIN vs. COLLECTOR CURRENT



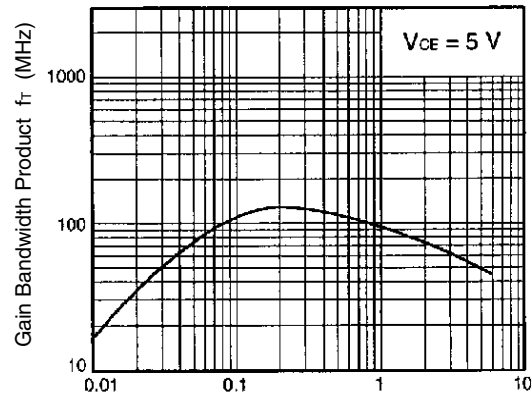
Collector Current  $I_C$  (A)

COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



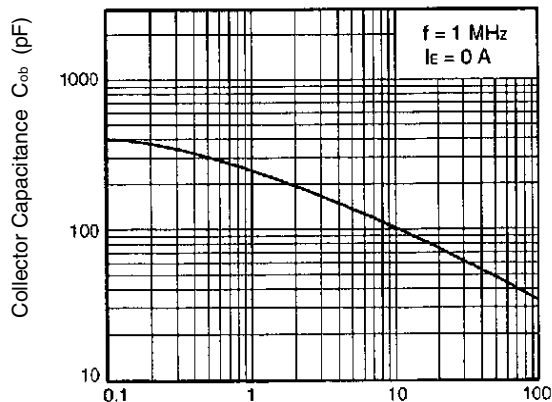
Collector Current  $I_C$  (A)

GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



Collector Current  $I_C$  (A)

OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



Collector to Base Voltage  $V_{CB}$  (V)

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