

# SILICON POWER TRANSISTOR

## 2SD1899-Z

### NPN SILICON EPITAXIAL TRANSISTOR

#### DESCRIPTION

The 2SD1899-Z is designed for Audio Frequency Amplifier and Switching, especially in Hybrid Integrated Circuits.

#### FEATURES

- High  $h_{FE}$ :  $h_{FE} = 100$  to 400
- Low  $V_{CE(sat)}$ :  $V_{CE(sat)} \leq 0.25$  V

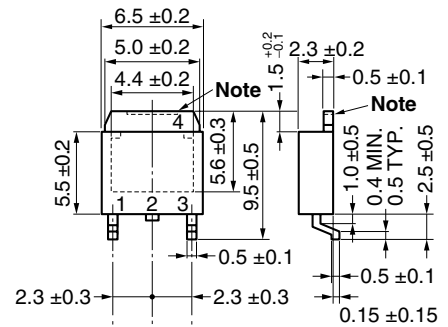
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Collector to Base Voltage	$V_{CBO}$	60	V
Collector to Emitter Voltage	$V_{CEO}$	60	V
Base to Emitter Voltage	$V_{EBO}$	7.0	V
Collector Current (DC)	$I_{C(DC)}$	3.0	A
Collector Current (pulse) <sup>Note 1</sup>	$I_{C(pulse)}$	5.0	A
Base Current (DC)	$I_{B(DC)}$	0.5	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>Note 2</sup>	$P_{T1}$	2.0	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T2}$	10	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Notes 1.**  $PW \leq 10$  ms, Duty Cycle  $\leq 50\%$

**2.** When mounted on ceramic substrate of  $7.5\text{ cm}^2 \times 0.7\text{ mm}$

#### PACKAGE DRAWING (Unit: mm)



1. Base
2. Collector
3. Emitter
4. Collector Fin

**Note** The depth of notch at the top of the fin is from 0 to 0.2 mm.

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ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

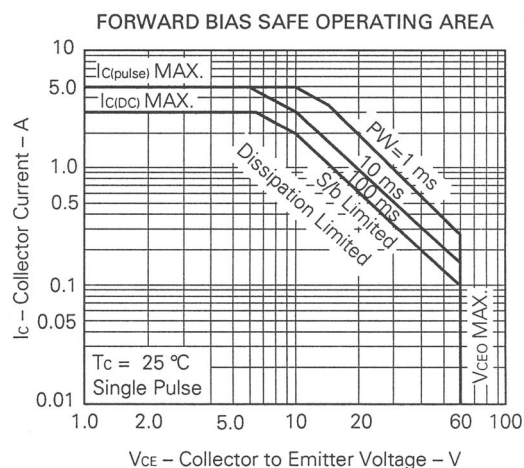
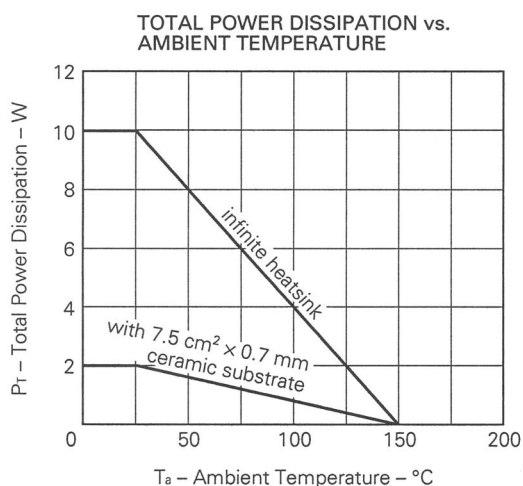
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	$I_{CBO}$			10	$\mu\text{A}$	$V_{CB} = 60\text{ V}, I_E = 0$
Emitter Cutoff Current	$I_{EBO}$			10	$\mu\text{A}$	$V_{EB} = 7.0\text{ V}, I_C = 0$
DC Current Gain	$h_{FE1}^*$	60				$V_{CE} = 2.0\text{ V}, I_C = 0.2\text{ A}$
DC Current Gain	$h_{FE2}^*$	100		400		$V_{CE} = 2.0\text{ V}, I_C = 0.6\text{ A}$
DC Current Gain	$h_{FE3}^*$	50				$V_{CE} = 2.0\text{ V}, I_C = 2.0\text{ A}$
Collector Saturation Voltage	$V_{CE(sat)}^*$		0.14	0.25	V	$I_C = 1.5\text{ A}, I_B = 0.15\text{ A}$
Base Saturation Voltage	$V_{BE(sat)}^*$		0.93	1.2	V	$I_C = 1.5\text{ A}, I_B = 0.15\text{ A}$
Gain Bandwidth Product	$f_T$		120		MHz	$V_{CE} = 5.0\text{ V}, I_E = -1.5\text{ A}$
Output Capacitance	$C_{ob}$		30		pF	$V_{CB} = 10\text{ V}, I_E = 0, f = 1.0\text{ MHz}$
Turn-on Time	$t_{on}$		0.15	0.5	$\mu\text{s}$	$I_C = 1\text{ A}, V_{CC} = 10\text{ V}, R_L = 10\ \Omega$ $I_{B1} = -I_{B2} = 0.1\text{ A}$
Storage Time	$t_{stg}$		0.75	2.0	$\mu\text{s}$	
Fall Time	$t_f$		0.2	0.5	$\mu\text{s}$	

\* Pulsed:  $PW \leq 350\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$

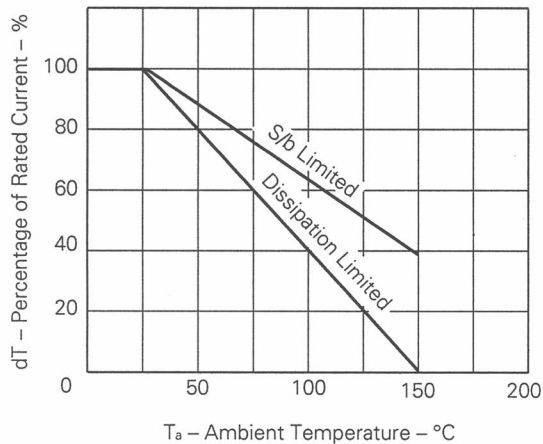
$h_{FE}$  Classification

MARKING	M	L	K
$h_{FE2}$	100 to 200	160 to 320	200 to 400

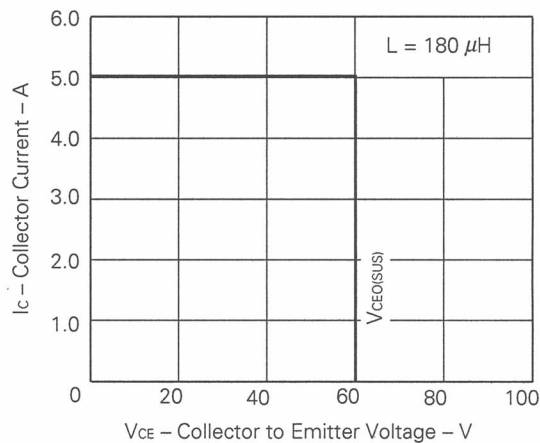
TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )



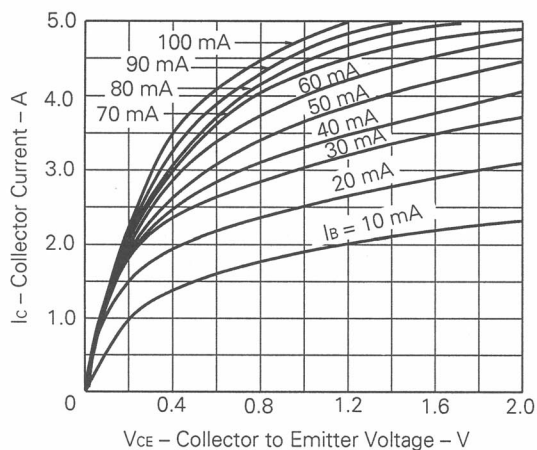
DERATING CURVE OF SAFE OPERATING AREA



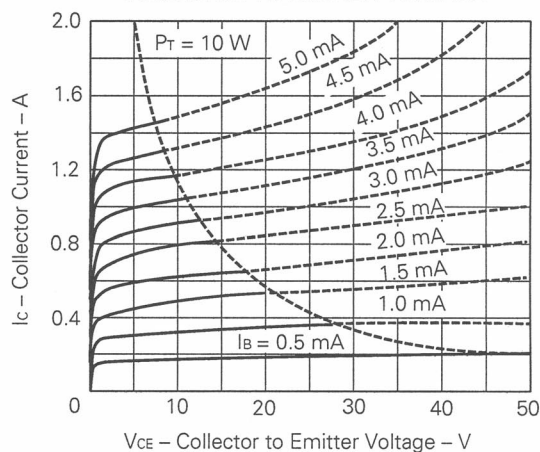
REVERSE BIAS SAFE OPERATING AREA



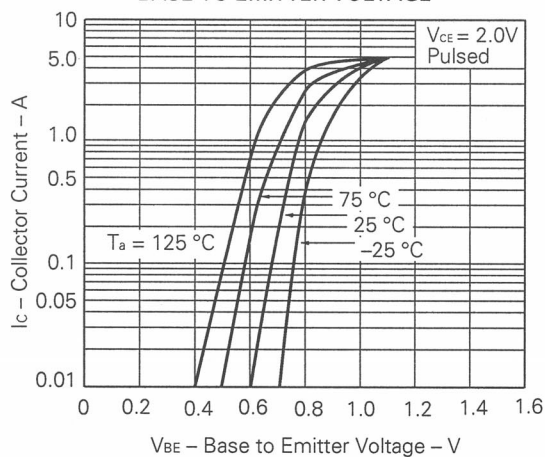
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



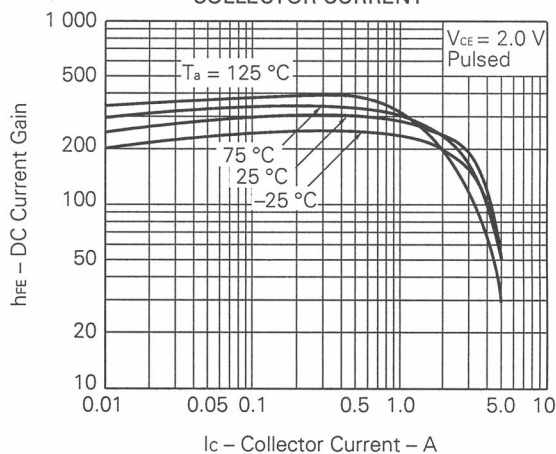
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



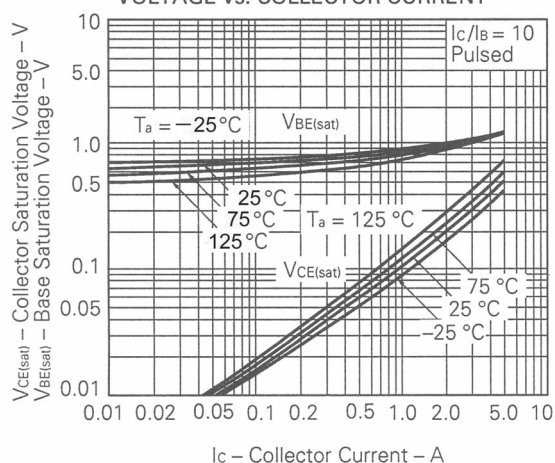
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



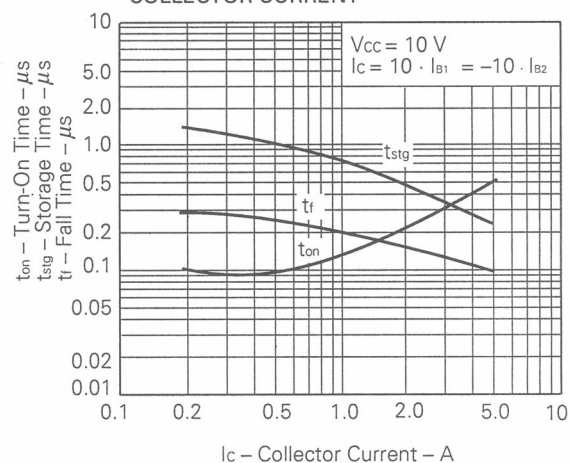
DC CURRENT GAIN vs. COLLECTOR CURRENT



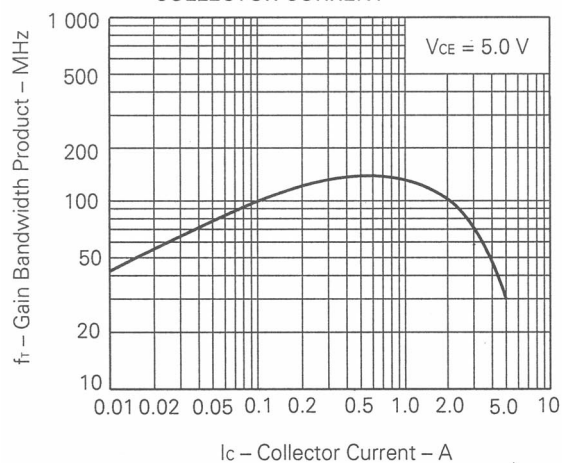
<R> BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



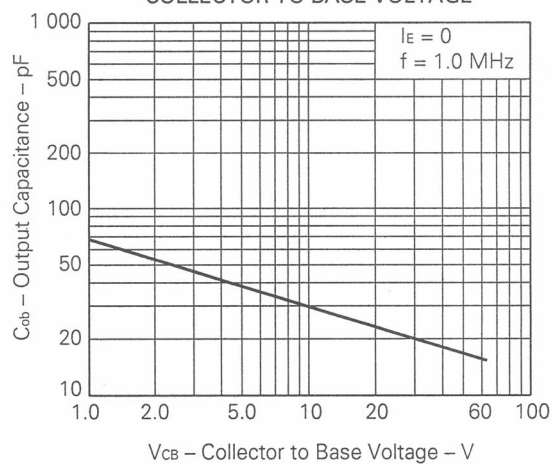
FALL, STORAGE AND TURN ON TIME vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



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