

**NPN SILICON EPITAXIAL TRANSISTOR**  
**MP-3****DESCRIPTION**

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  $V_{CE(sat)}$   $V_{CE(sat)} = 0.3$  V

**QUALITY GRADE**

Standard

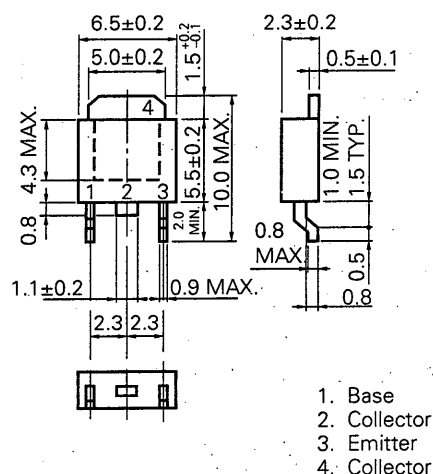
Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

**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
Emitter to Base Voltage	$V_{EBO}$	7.0	V
Collector Current (DC)	$I_C$	3.0	A
Collector Current (Pulse)	$I_{C^*}$	5.0	A
Base Current (DC)	$I_B$	0.5	A
Total Power Dissipation ( $T_a = 25^\circ\text{C}$ )	$P_{T1^{**}}$	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	$^\circ\text{C}$

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

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

**PACKAGE DIMENSIONS**  
(in millimeters)

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

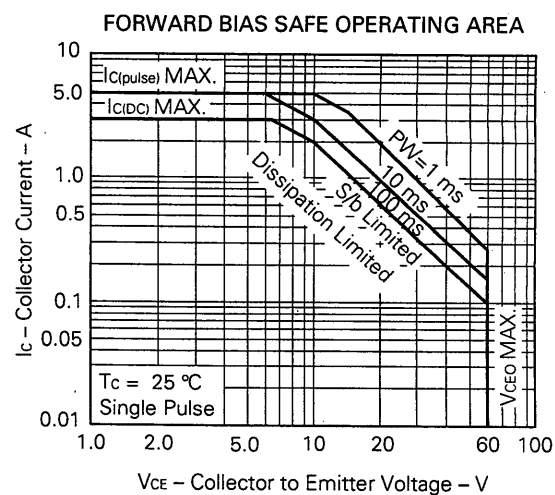
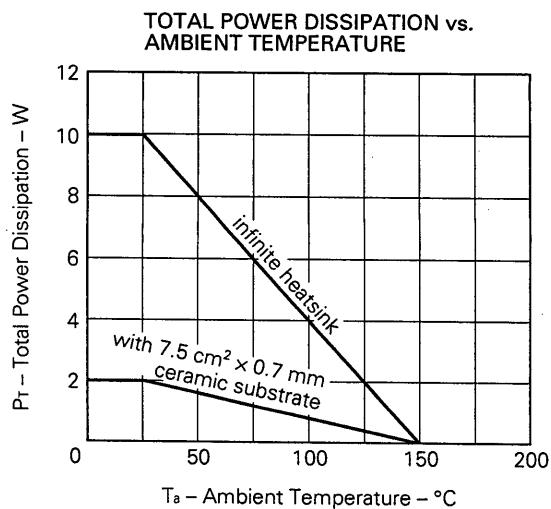
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	$I_{CBO}$			10	$\mu\text{A}$	$V_{CB} = 60\text{ V}, I_E = 0$
Emitter Cutoff Current	$I_{EBO}$			10	$\mu\text{A}$	$V_{EB} = 7.0\text{ V}, I_C = 0$
DC Current Gain	$h_{FE1}^*$	60				$V_{CE} = 2.0\text{ V}, I_C = 0.2\text{ A}$
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  $\leq 2\%$

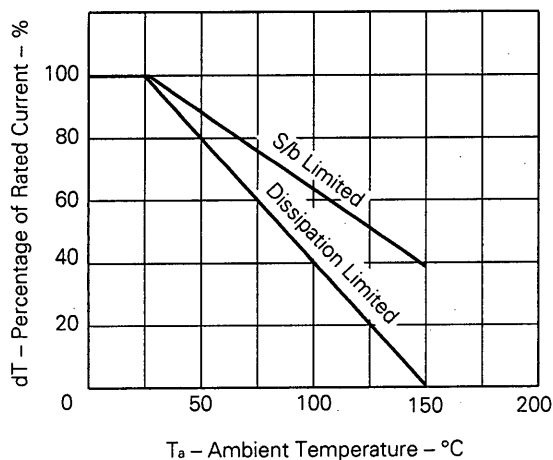
$h_{FE}$  Classification

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

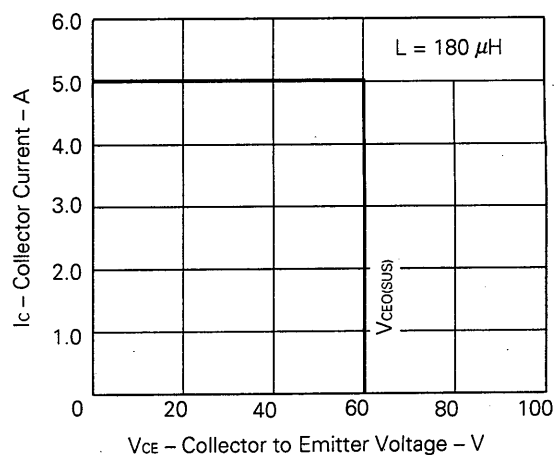
TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )



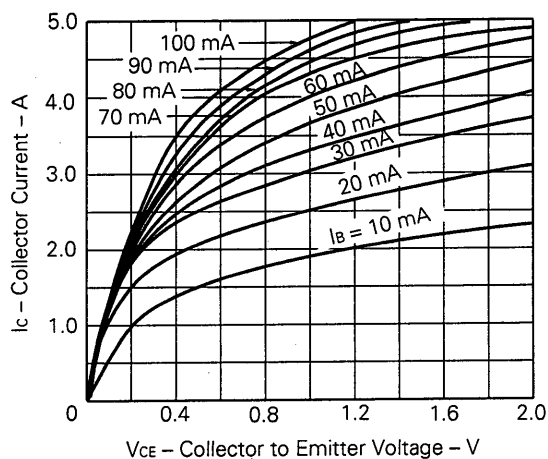
DERATING CURVE OF SAFE OPERATING AREA



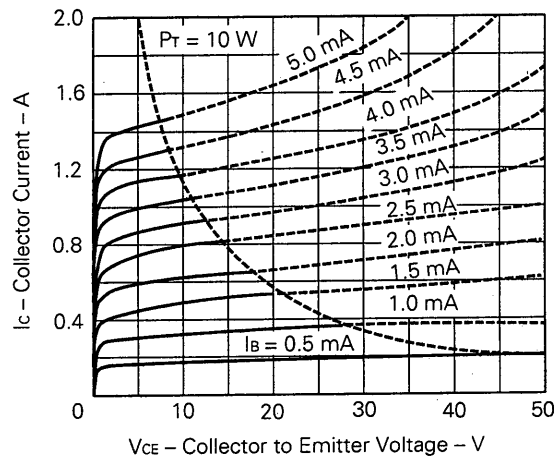
REVERSE BIAS SAFE OPERATING AREA



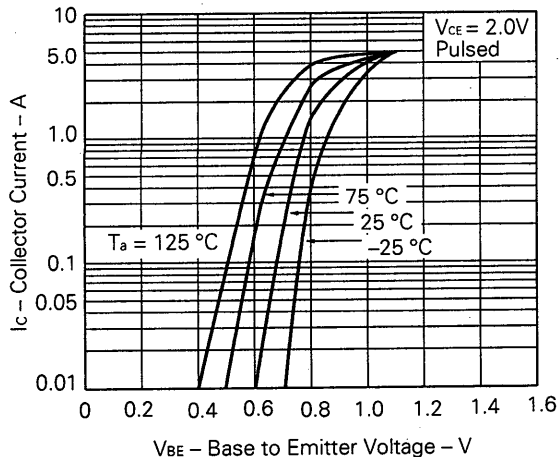
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



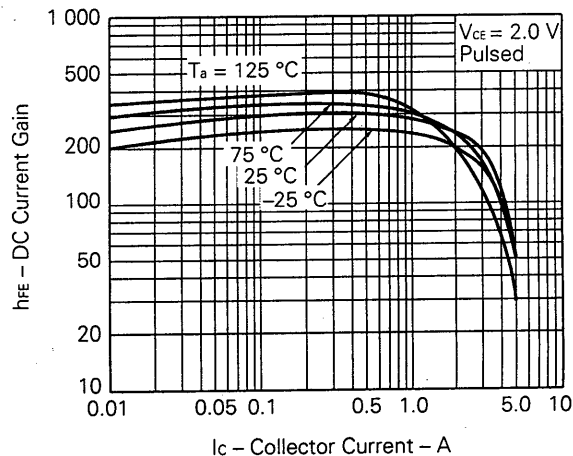
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



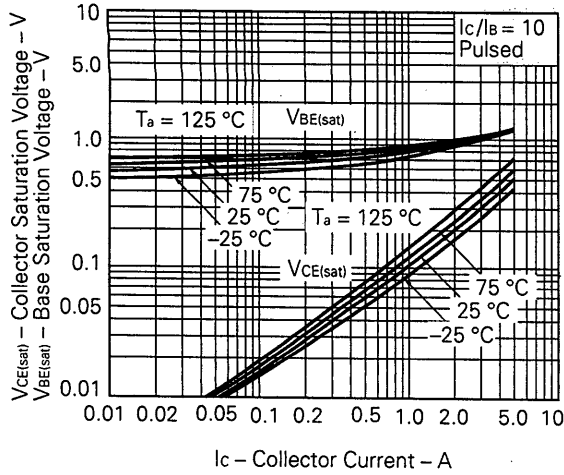
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



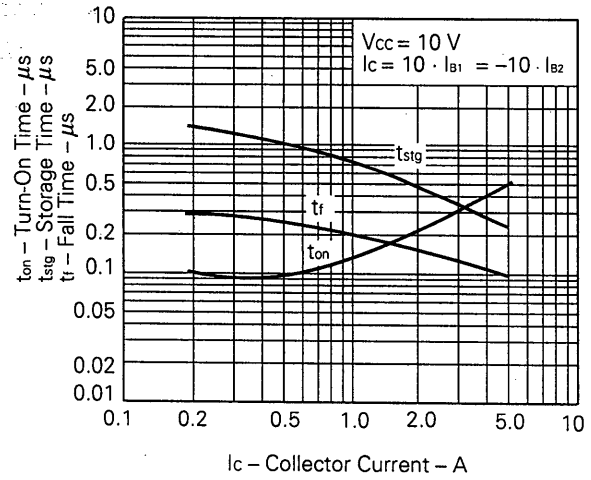
DC CURRENT GAIN vs. COLLECTOR CURRENT



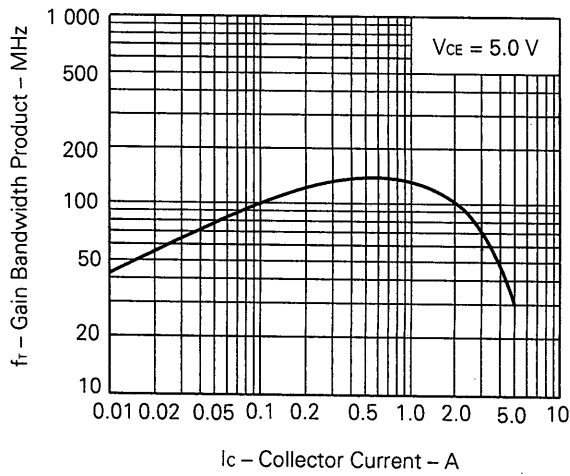
BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



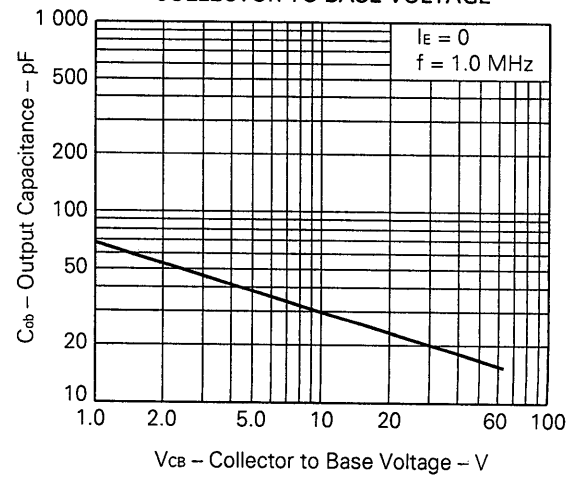
FALL, STORAGE AND TURN ON TIME vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



[MEMO]

# Reference

Application note name	No.
Quality control of NEC semiconductors devices.	TEI-1202
Quality control guide of semiconductors devices.	MEI-1202
Assembly manual of semiconductors devices.	IEI-1207
Design of Push-Pull Type Switching Regulators (Basic)	TEB-1002
Design of Push-Pull Type Switching Regulators (Applications)	TEB-1003
Optimum Base Drive Conditions of Switching Power Transistors	TEB-1014

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Application examples recommended by NEC Corporation.

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