

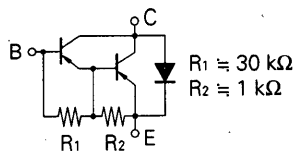
PNP SILICON EPITAXIAL DARLINGTON TRANSISTOR  
MP-3

DESCRIPTION

2SB963-Z is designed for switching, especially in Hybrid Integrated Circuits.

FEATURES

- High Gain  $h_{FE} = 2\ 000$  to  $3\ 000$
- Complement to 2SD1286-Z



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.

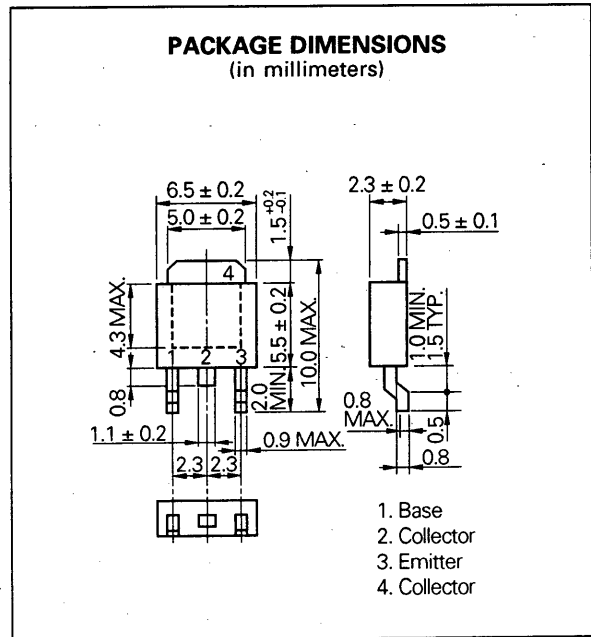
ABSOLUTE MAXIMUM RATINGS ( $T_a = 25\ ^\circ\text{C}$ )

Collector to Base Voltage	$V_{CBO}$	-60	V
Collector to Emitter Voltage	$V_{CEO}$	-60	V
Emitter to Base Voltage	$V_{EBO}$	-8	V
Collector Current (DC)	$I_{C(DC)}$	$\mp 1.0$	A
Collector Current (Pulse)*	$I_{C(pulse)}$	$\mp 2.0$	A
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	$^\circ\text{C}$

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

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

PACKAGE DIMENSIONS  
(in millimeters)



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

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

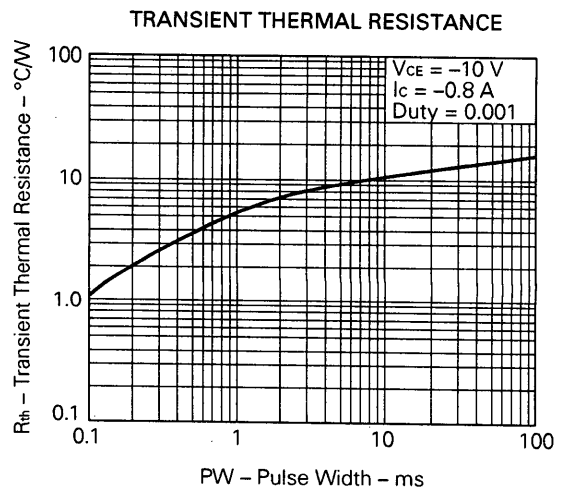
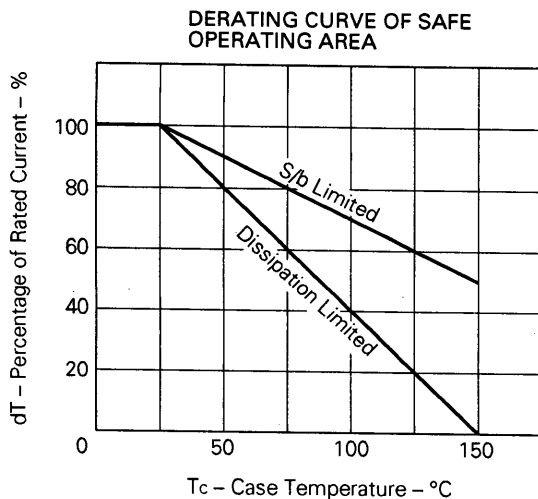
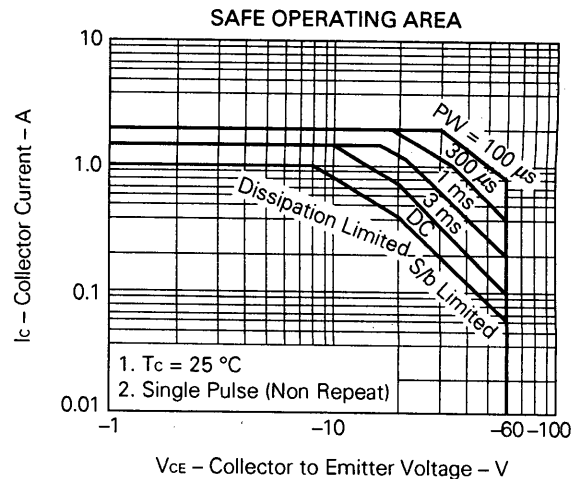
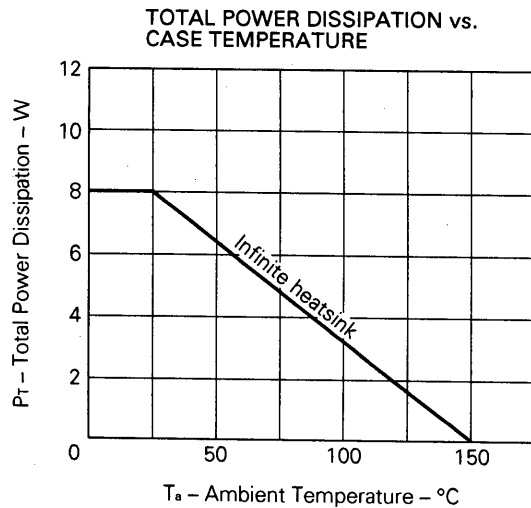
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I <sub>cBO</sub>			-10	μA	V <sub>CE</sub> = -60 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EB0</sub>			-1.0	μA	V <sub>EB</sub> = -5.0 V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE1</sub> ***	1 000				V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.2 A
DC Current Gain	h <sub>FE2</sub> ***	2 000		30 000		V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A
Collector Saturation Voltage	V <sub>CE(sat)</sub> ***			-1.5	V	I <sub>C</sub> = -0.5 A, I <sub>B</sub> = -50 mA
Base Saturation Voltage	V <sub>BE(sat)</sub> ***			-2.0	V	I <sub>C</sub> = -0.5 A, I <sub>B</sub> = -50 mA
Turn On Time	t <sub>on</sub>		0.5		μs	I <sub>C</sub> = -0.5 A, R <sub>L</sub> = 100 Ω
Storage Time	t <sub>stg</sub>		1.0		μs	I <sub>B1</sub> = -I <sub>B2</sub> = -0.1 mA
Fall Time	t <sub>r</sub>		1.0		μs	V <sub>CC</sub> = -50 V

\*\*\* Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2 %

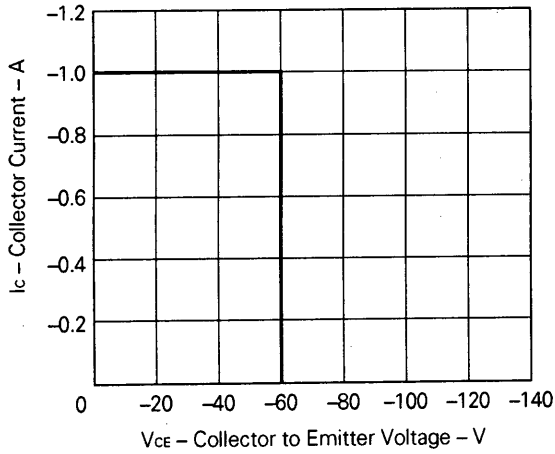
**h<sub>FE</sub> Classification**

MARKING	M	L	K
h <sub>FE2</sub>	2 000 to 5 000	4 000 to 10 000	8 000 to 30 000

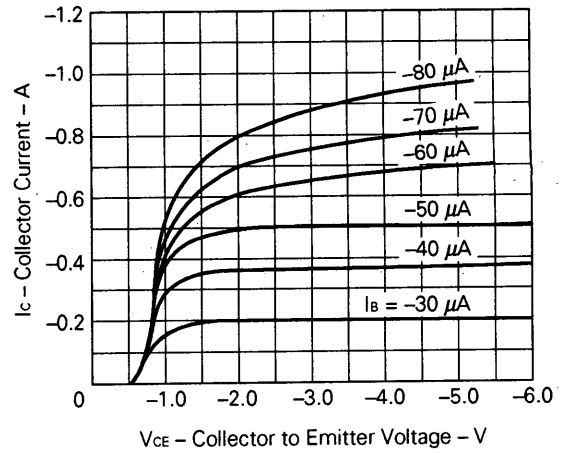
**TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)**



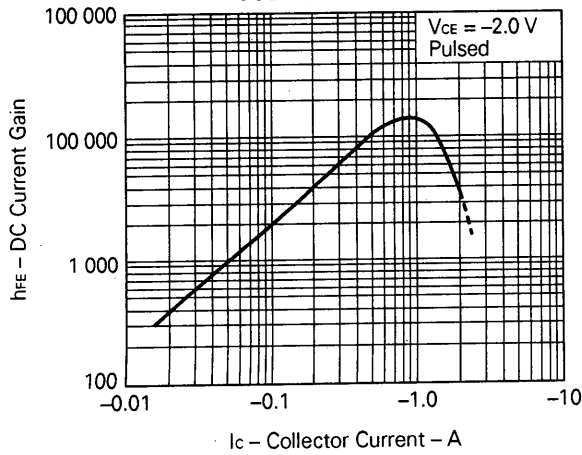
REVERSE BIAS SAFE OPERATING AREA



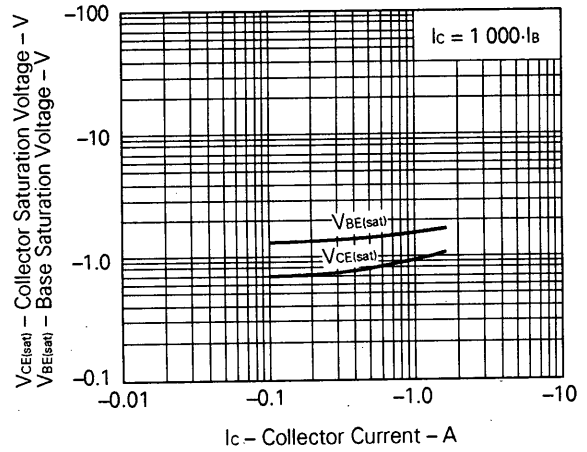
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



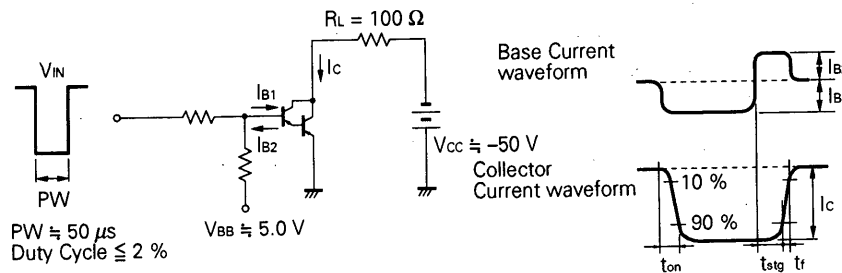
DC CURRENT GAIN vs. COLLECTOR CURRENT



BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



SWITCHING TIME ( $t_{on}$ ,  $t_{stg}$ ,  $t_f$ ) TEST CIRCUIT



**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.

Standard: Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tools, Industrial robots, Audio and Visual equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.



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