

PNP SILICON TRIPLE DIFFUSED TRANSISTOR  
MP-3

DESCRIPTION

2SA1413-Z is designed for High Voltage Switching, especially in Hybrid Integrated Circuits.

FEATURES

- High Voltage :  $V_{CE0} = -600$  V
- High Speed :  $t_r \leq 1.0 \mu s$
- Complement to 2SC3632-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.

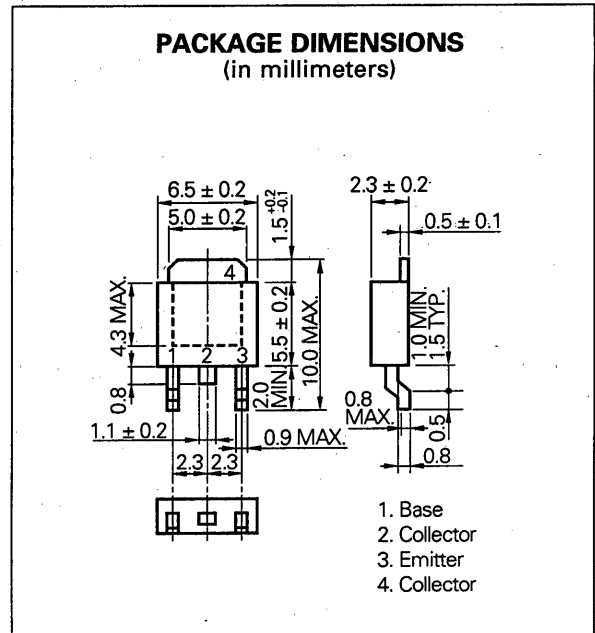
ABSOLUTE MAXIMUM RATINGS ( $T_a = 25 \text{ }^\circ\text{C}$ )

Collector to Base Voltage	$V_{CB0}$	-600	V
Collector to Emitter Voltage	$V_{CE0}$	-600	V
Emitter to Base Voltage	$V_{EB0}$	-7	V
Collector Current (DC)	$I_c$	-1.0	A
Collector Current (Pulse)*	$I_c$	-2.0	A
Total Power Dissipation ( $T_a = 25 \text{ }^\circ\text{C}$ )**	$P_T$	2.0	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

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

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

PACKAGE DIMENSIONS  
(in millimeters)



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

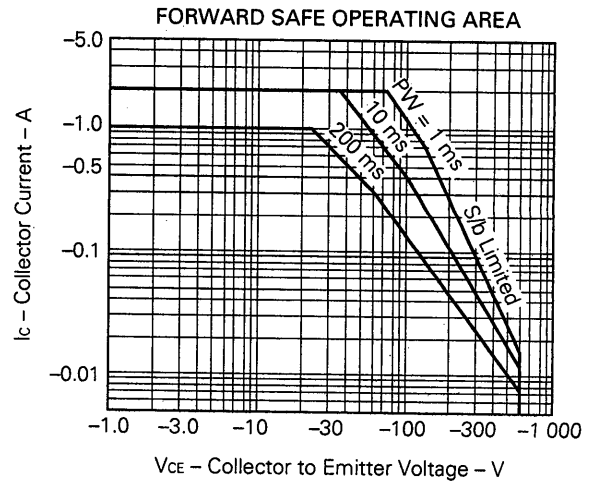
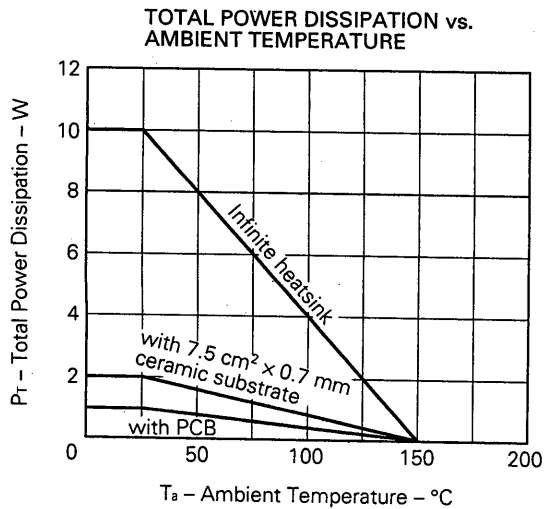
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I <sub>CB0</sub>			-10	μA	V <sub>CB</sub> = -600 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EB0</sub>			-10	μA	V <sub>EB</sub> = -7.0 V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE1</sub> ***	30	58	120		V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -0.1 A
DC Current Gain	h <sub>FE2</sub> ***	5	19			V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -0.5 A
Collector Saturation Voltage	V <sub>CE(sat)</sub> ***		-0.28	-1.0	V	I <sub>C</sub> = -0.3 A, I <sub>B</sub> = -60 mA
Base Saturation Voltage	V <sub>BE(sat)</sub> ***		-0.85	-1.2	V	I <sub>C</sub> = -0.3 A, I <sub>B</sub> = -60 mA
Gain Bandwidth Product	f <sub>T</sub>		28		MHz	V <sub>CE</sub> = -10 V, I <sub>E</sub> = 50 mA
Output Capacitance	C <sub>ob</sub>		42		pF	V <sub>CB</sub> = -10 V, I <sub>E</sub> = 0, f = 1.0 MHz
Turn-on Time	t <sub>on</sub>		0.1	0.5	μs	I <sub>C</sub> = -0.5 A, R <sub>L</sub> = 500 Ω I <sub>B1</sub> = -I <sub>B2</sub> = -0.1 A V <sub>CC</sub> = -250 V
Storage Time	t <sub>stg</sub>		3.5	5.0	μs	
Fall time	t <sub>f</sub>		0.08	0.5	μs	

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

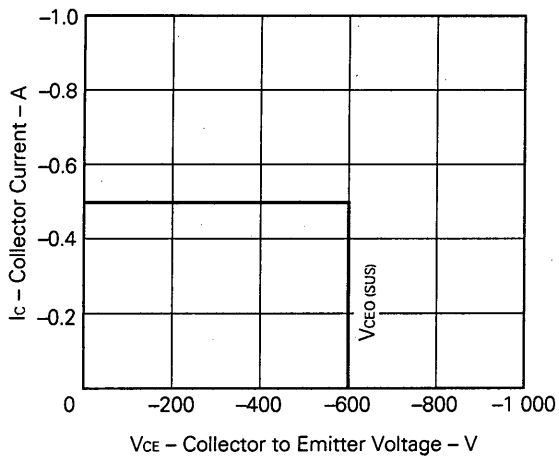
**h<sub>FE</sub> Classification**

MARKING	M	L	K
h <sub>FE1</sub>	30 to 60	40 to 80	60 to 120

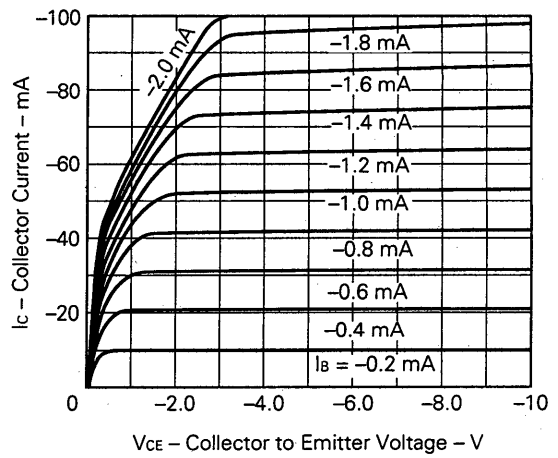
**TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)**



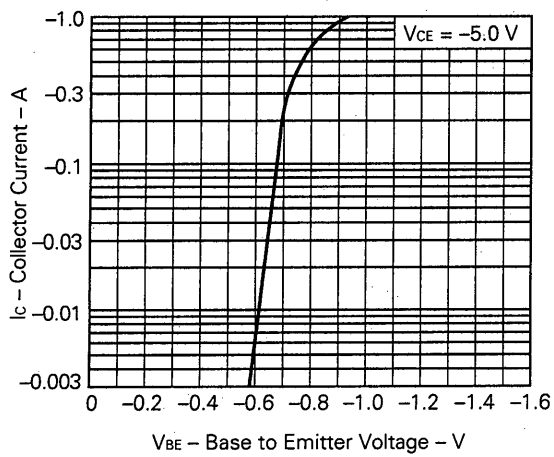
REVERSE BIAS SAFE OPERATING AREA



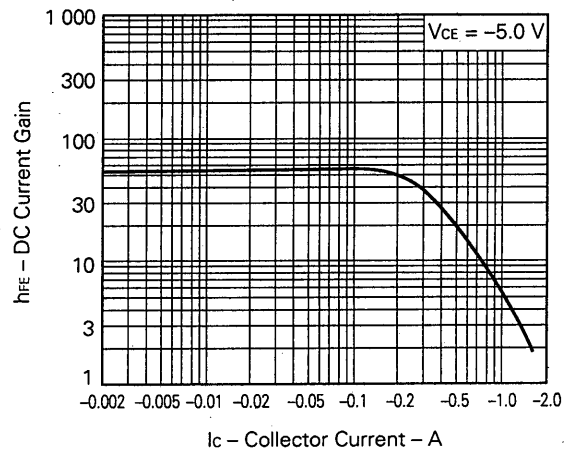
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



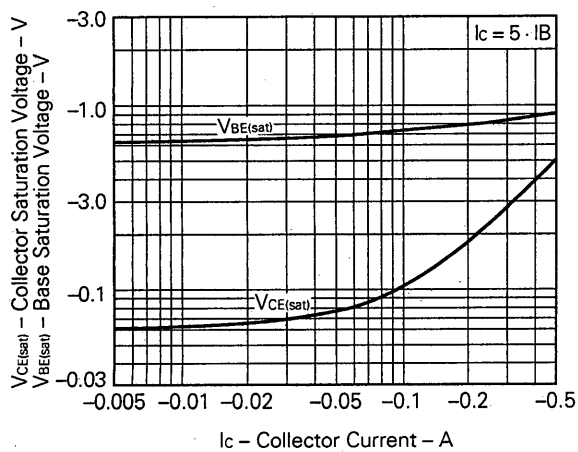
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



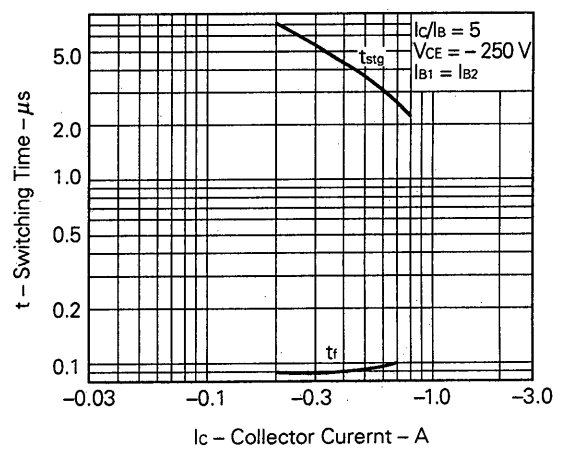
DC CURRENT GAIN vs. COLLECTOR CURRENT



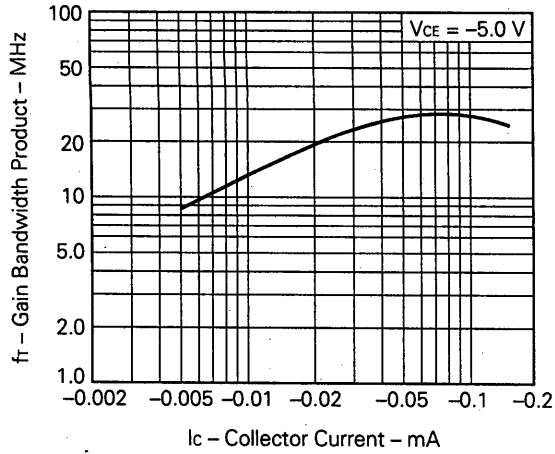
COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



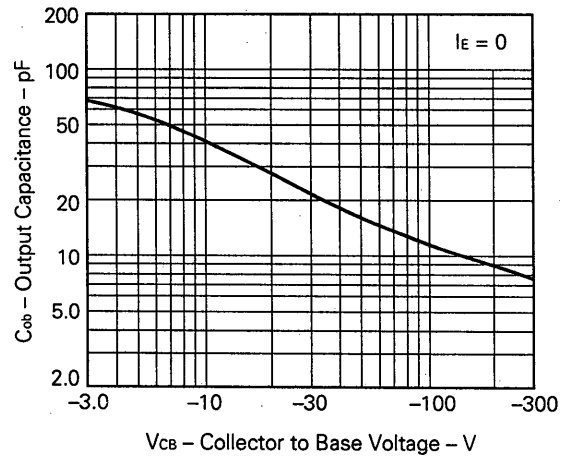
TURN OFF TIME vs. COLLECTOR CURRENT



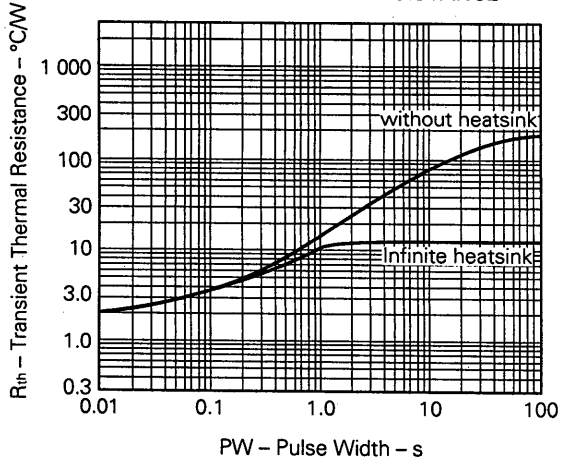
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



TRANSIENT THERMAL RESISTANCE



[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.

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.