

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# SILICON POWER TRANSISTOR 2SC4331,4331-Z

## NPN SILICON EPITAXIAL TRANSISTOR FOR HIGH-SPEED SWITCHING

The 2SC4331 and 2SC4331-Z are mold power transistors developed for high-speed switching and features a very low collector-to-emitter saturation voltage.

This transistor is ideal for use in switching regulators, DC/DC converters, motor drivers, solenoid drivers, and other low-voltage power supply devices, as well as for high-current switching.

### FEATURES

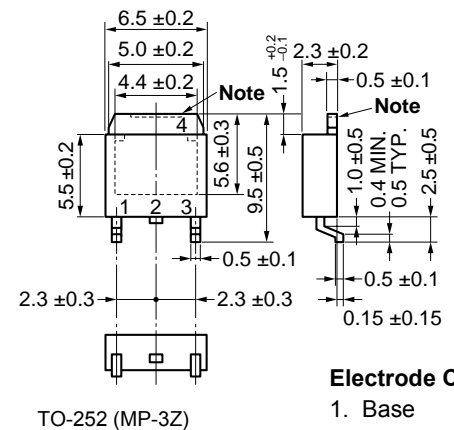
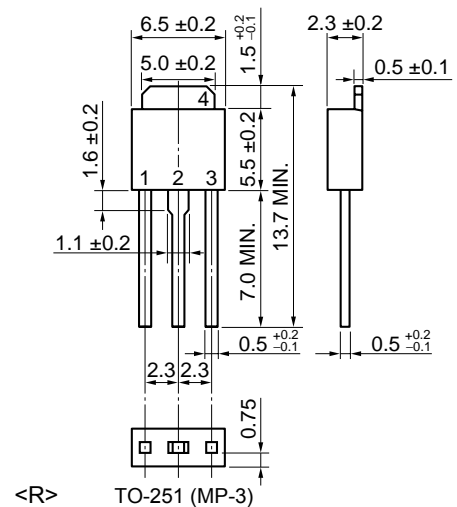
- Available for high-current control in small dimension
- Z type is a lead-processed product and is deal for mounting a hybrid IC.
- Low collector saturation voltage  
 $V_{CE(sat)} = 0.3 \text{ V MAX. (I}_c = 3.0 \text{ A)}$
- Fast switching speed:  
 $t_r \leq 0.4 \mu\text{s MAX. (I}_c = 3.0 \text{ A)}$
- High DC current gain and excellent linearity

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

Collector to Base Voltage	V <sub>CB0</sub>	150	V
Collector to Emitter Voltage	V <sub>CEO</sub>	100	V
Emitter to Base Voltage	V <sub>EB0</sub>	7.0	V
Collector Current (DC)	I <sub>C(DC)</sub>	5.0	A
Collector Current (pulse) <sup>Note 1</sup>	I <sub>C(pulse)</sub>	10	A
Base Current (DC)	I <sub>B(DC)</sub>	2.5	A
Total Power Dissipation (T <sub>c</sub> = 25°C)	P <sub>T1</sub>	15	W
Total Power Dissipation (T <sub>A</sub> = 25°C)	P <sub>T2</sub>	1.0 <sup>Note 2</sup> , 2.0 <sup>Note 3</sup>	W
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

- Notes 1.** PW ≤ 10 ms, duty cycle ≤ 50%
- 2.** Printing board mounted
- 3.** 7.5 cm<sup>2</sup> × 0.7 mm, ceramic board mounted

### PACKAGE DRAWING (Unit: mm)



### Electrode Connection

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<sub>A</sub> = 25°C)**

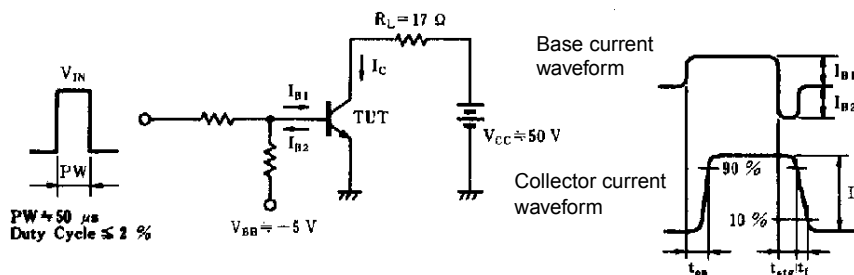
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector to emitter voltage	V <sub>CE(SUS)</sub>	I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 0.25 A, L = 1 mH	100			V
Collector to emitter voltage	V <sub>CEX(SUS)</sub>	I <sub>C</sub> = 2.5 A, I <sub>B1</sub> = -I <sub>B2</sub> = 0.25 A, V <sub>BE(OFF)</sub> = -1.5 V, L = 180 μH, clamped	100			V
Collector cutoff current	I <sub>CB0</sub>	V <sub>CE</sub> = 100 V, I <sub>E</sub> = 0			10	μA
Collector cutoff current	I <sub>CER</sub>	V <sub>CE</sub> = 100 V, R <sub>BE</sub> = 50 Ω, T <sub>A</sub> = 125°C			1.0	mA
Collector cutoff current	I <sub>CEx1</sub>	V <sub>CE</sub> = 100 V, V <sub>BE(OFF)</sub> = -1.5 V			10	μA
Collector cutoff current	I <sub>CEx2</sub>	V <sub>CE</sub> = 100 V, V <sub>BE(OFF)</sub> = -1.5 V, T <sub>A</sub> = 125°C			1.0	mA
Emitter cutoff current	I <sub>EBO</sub>	V <sub>EB</sub> = 5.0 V, I <sub>C</sub> = 0			10	μA
DC current gain <sup>Note</sup>	h <sub>FE1</sub>	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 0.5 A	100			
DC current gain <sup>Note</sup>	h <sub>FE2</sub>	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 1.0 A	100	200	400	
DC current gain <sup>Note</sup>	h <sub>FE3</sub>	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 3.0 A	60			
Collector saturation voltage <sup>Note</sup>	V <sub>CE(sat)1</sub>	I <sub>C</sub> = 3.0 A, I <sub>B</sub> = 0.15 A			0.3	V
Collector saturation voltage <sup>Note</sup>	V <sub>CE(sat)2</sub>	I <sub>C</sub> = 4.0 A, I <sub>B</sub> = 0.2 A			0.5	V
Base saturation voltage <sup>Note</sup>	V <sub>BE(sat)1</sub>	I <sub>C</sub> = 3.0 A, I <sub>B</sub> = 0.15 A			1.2	V
Base saturation voltage <sup>Note</sup>	V <sub>BE(sat)2</sub>	I <sub>C</sub> = 4.0 A, I <sub>B</sub> = 0.2 A			1.5	V
Collector capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 1.0 MHz		60		pF
Gain bandwidth product	f <sub>r</sub>	V <sub>CE</sub> = 10 V, I <sub>E</sub> = -0.5 A		150		MHz
Turn-on time	t <sub>on</sub>	I <sub>C</sub> = 3.0 A, R <sub>L</sub> = 17 Ω, I <sub>B1</sub> = -I <sub>B2</sub> = 0.15 A, V <sub>CC</sub> ≐ 50 V Refer to the test circuit.			0.3	μs
Storage time	t <sub>stg</sub>				1.5	μs
Fall time	t <sub>f</sub>				0.4	μs

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

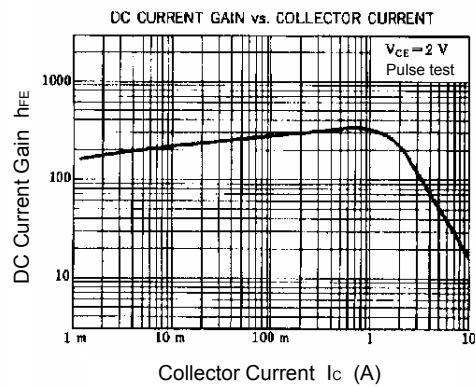
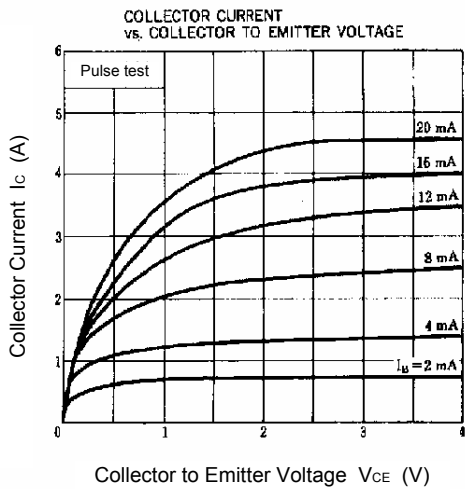
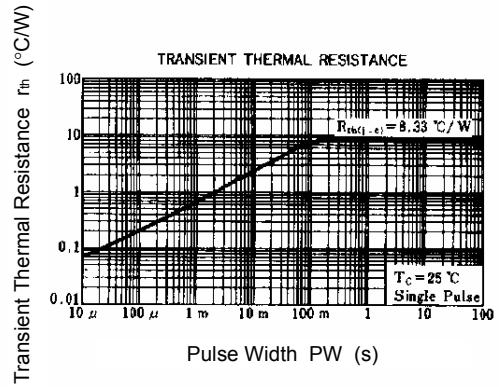
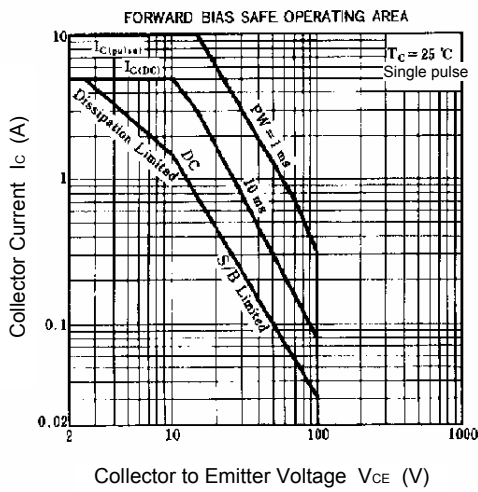
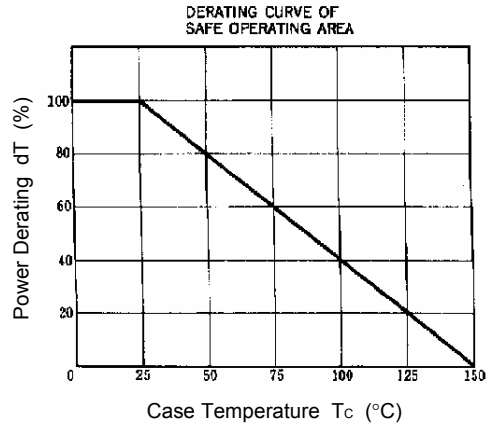
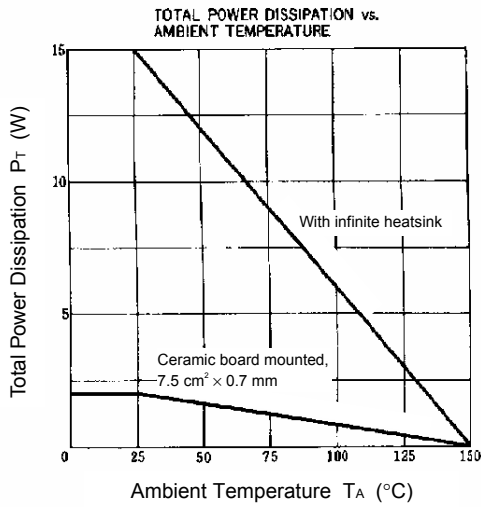
**h<sub>FE</sub> CLASSIFICATION**

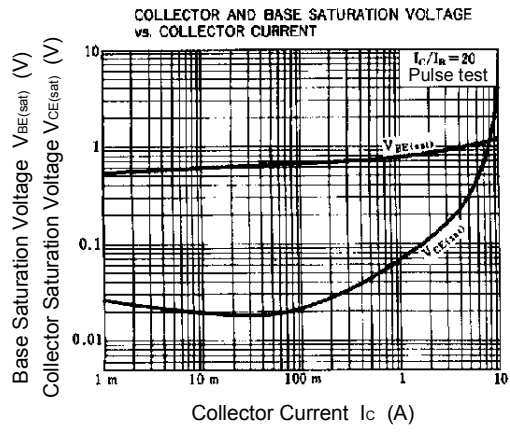
Marking	M	L	K
h <sub>FE2</sub>	100 to 200	150 to 300	200 to 400

**SWITCHING TIME (t<sub>on</sub>, t<sub>stg</sub>, t<sub>f</sub>) TEST CIRCUIT**



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





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