

# SILICON POWER TRANSISTORS 2SC4331, 2SC4331-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  
 $V_{CE(sat)} = 0.3 \text{ V MAX. (@ } I_c = 3 \text{ A)}$
- Fast switching speed:  
 $t_f \leq 0.4 \mu\text{s MAX. (@ } I_c = 3 \text{ A)}$
- High DC current gain and excellent linearity

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

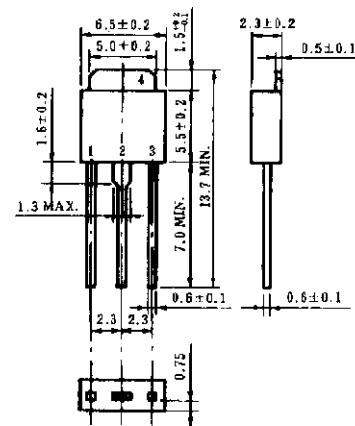
Parameter	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	150	V
Collector to emitter voltage	$V_{CEO}$	100	V
Base to emitter voltage	$V_{EBO}$	7.0	V
Collector current (DC)	$I_{C(DC)}$	5.0	A
Collector current (pulse)	$I_{C(pulse)^*}$	10	A
Base current (DC)	$I_{B(DC)}$	2.5	A
Total power dissipation	$P_T (T_C = 25^\circ\text{C})$	15	W
Total power dissipation	$P_T (T_A = 25^\circ\text{C})$	1.0**, 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  $\leq 50\%$

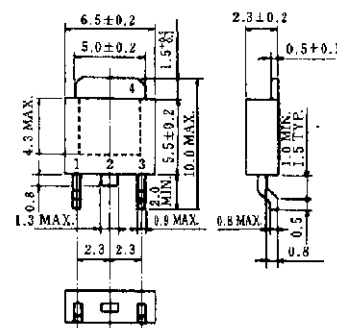
\*\* Printing board mounted

\*\*\*  $7.5 \text{ mm}^2 \times 0.7 \text{ mm}$ , ceramic board mounted

#### PACKAGE DRAWING (UNIT: mm)



MP-3



MP-3Z

#### Electrode Connection

1. Base
2. Collector
3. Emitter
4. Fin (collector)

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

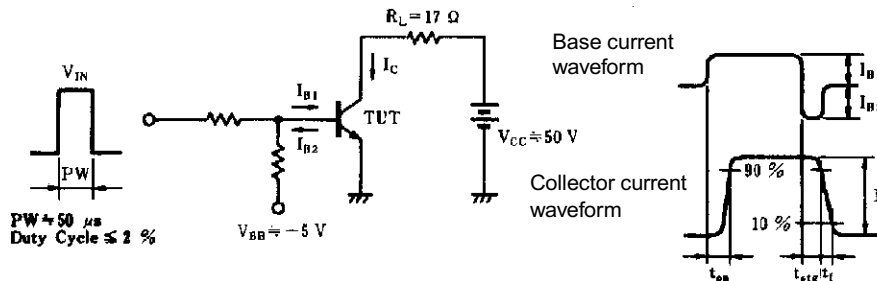
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector to emitter voltage	V <sub>CEO(SUS)</sub>	I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 0.25 A, L = 1 mH	100			V
Collector to emitter voltage	V <sub>CEx(SUS)</sub>	I <sub>C</sub> = 2.5 A, I <sub>B1</sub> = -I <sub>B2</sub> = 0.25 A, V <sub>BE(OFF)</sub> = -1.5 V, L = 180 μH, clamped	100			V
Collector cutoff current	I <sub>CBO</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	h <sub>FE1</sub> *	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 0.5 A	100			
DC current gain	h <sub>FE2</sub> *	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 1.0 A	100	200	400	
DC current gain	h <sub>FE3</sub> *	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 3.0 A	60			
Collector saturation voltage	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	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	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	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>T</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

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

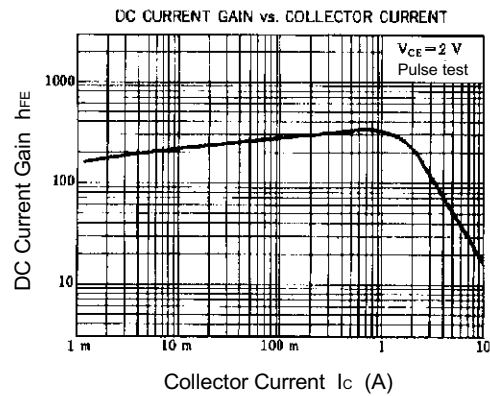
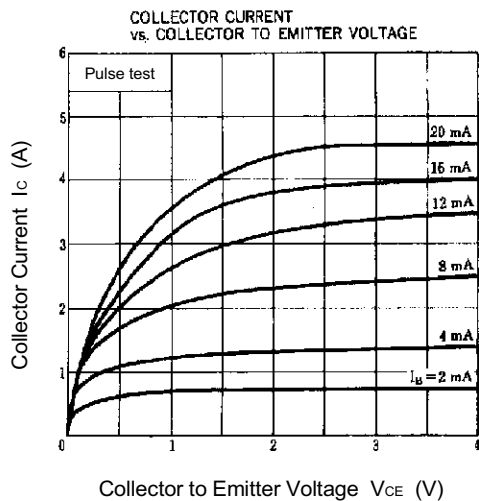
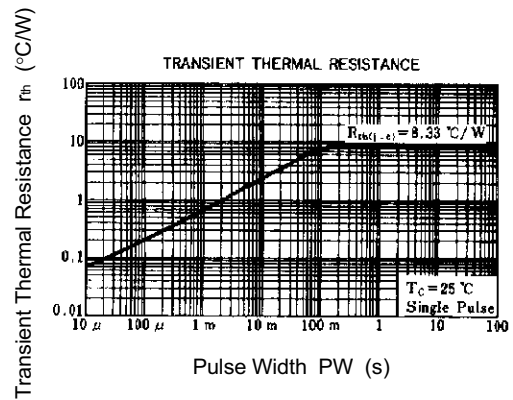
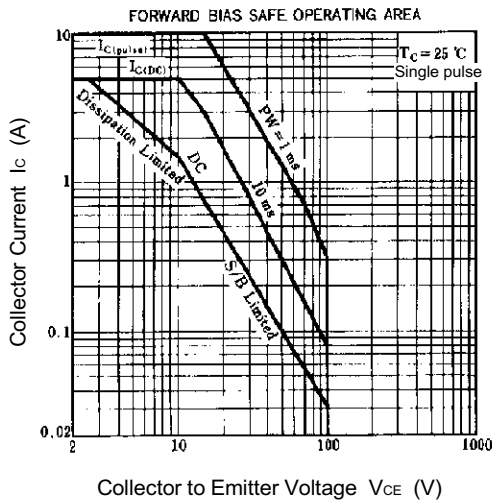
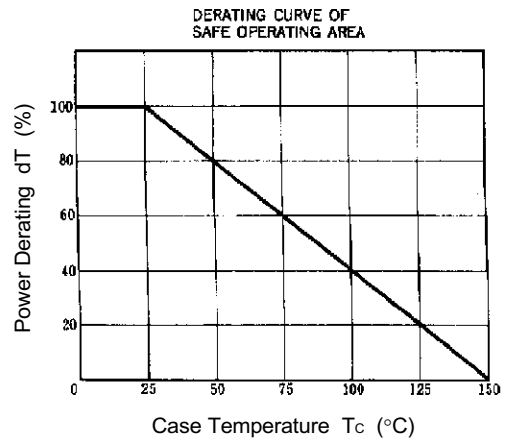
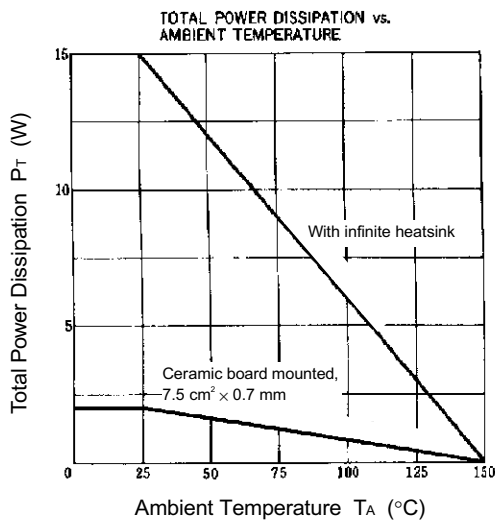
**h<sub>FE</sub> CLASSIFICATION**

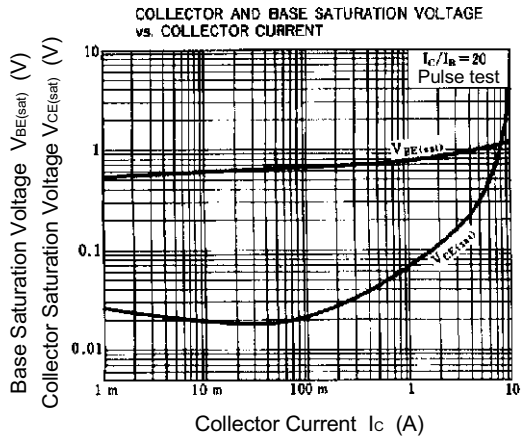
Marking	M	L	K
h <sub>FE2</sub>	100 to 200	150 to 300	200 to 400

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



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





[MEMO]

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