To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

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

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RENESAS

SILICON POWER TRANSISTOR
2SA1649,1649-Z

PNP SILICON EPITAXIAL TRANSISTOR FOR HIGH-SPEED SWITCHING

DESCRIPTION

The 2SA1649 is a mold power transistor 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.
- Mold package that does not require an insulating board or insulation bushing
- Low collector saturation voltage:
  $V_{CE(sat)}$ = –0.3 V MAX. (I_C = –3 A)
- Fast switching speed:
  t_f = 0.3 μs MAX. (I_C = –3 A)
- High DC current amplifiers and excellent linearity

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

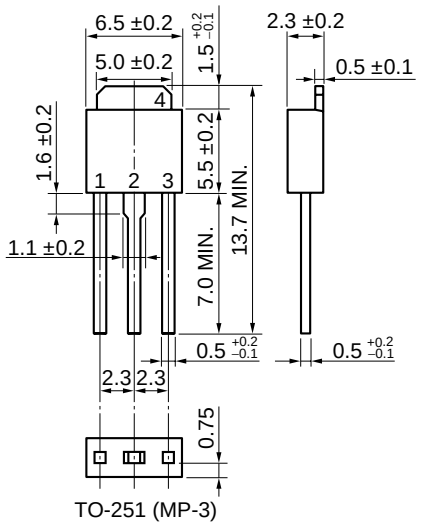
Parameter	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	–40	V
Collector to emitter voltage	V_{CEO}	–30	V
Emitter to base voltage	V_{EBO}	–7.0	V
Collector current (DC)	$I_{C(DC)}$	–10	A
Collector current (pulse)	$I_{C(pulse)}$ Note 1	–20	A
Base current (DC)	$I_{B(DC)}$	–3.5	A
Total power dissipation	P_T (Tc = 25 °C)	15	W
Total power dissipation	P_T (Ta = 25 °C)	1.0 Note 2, 2.0 Note 3	W
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	–55 to +150	°C

Notes 1. PW ≤ 300 ms, Duty Cycle ≤ 10%

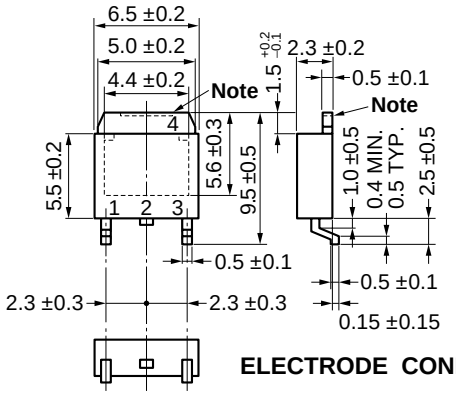
2. Printing board mounted

<R> **3.** 7.5 cm^2 × 0.7 mm ceramic board mounted

<R> **PACKAGE DRAWINGS (Unit: mm)**



TO-251 (MP-3)



TO-252 (MP-3Z)

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.

Document No. D15588EJ3V0DS00 (3rd edition)
Date Published June 2006 NS CP(K)
Printed in Japan

The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

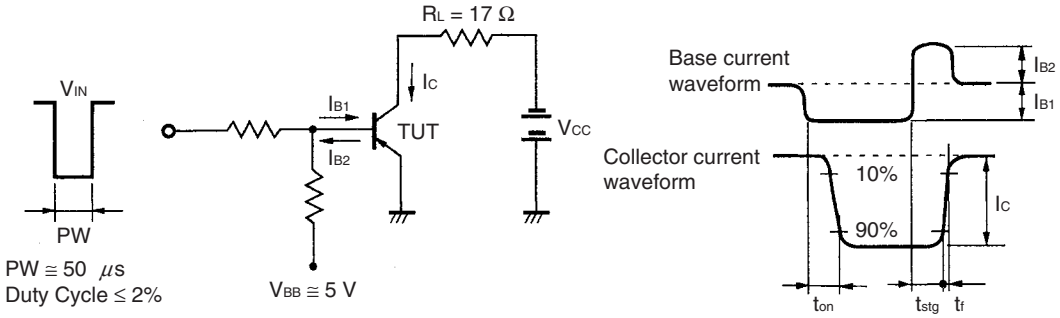
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector to emitter voltage	$V_{CEO(SUS)}$	I_C = –4.0 A, I_B = –0.4 A, L = 1 mH	–30			V
Collector to emitter voltage	$V_{CEX(SUS)}$	I_C = –4.0 A, I_{B2} = –I_{B1} = –0.4 A, $V_{BE(OFF)}$ = 1.5 V, L = 180 μH, clamped	–40			V
Collector cutoff current	I_{CBO}	V_{CE} = –30 V, I_E = 0			–10	μA
Collector cutoff current	I_{CER}	V_{CE} = –30 V, R_{BE} = 50 Ω, Ta = 125°C			–1.0	mA
Collector cutoff current	I_{CEX1}	V_{CE} = –30 V, $V_{BE(OFF)}$ = 1.5 V			–10	μA
Collector cutoff current	I_{CEX2}	V_{CE} = –30 V, $V_{BE(OFF)}$ = 1.5 V, Ta = 125°C			–1.0	mA
Emitter cutoff current	I_{EBO}	V_{EB} = –5.0 V, I_C = 0			–10	μA
DC current gain	h_{FE1} Note	V_{CE} = –2.0 V, I_C = –0.5 A	100			–
DC current gain	h_{FE2} Note	V_{CE} = –2.0 V, I_C = –2.0 A	100	200	400	–
DC current gain	h_{FE3} Note	V_{CE} = –2.0 V, I_C = –4.0 A	60			–
Collector saturation voltage	$V_{CE(sat)1}$ Note	I_C = –3.0 A, I_B = –0.2 A			–0.3	V
Collector saturation voltage	$V_{CE(sat)2}$ Note	I_C = –4.0 A, I_B = –0.3 A			–0.5	V
Base saturation voltage	$V_{BE(sat)1}$ Note	I_C = –3.0 A, I_B = –0.2 A			–1.2	V
Base saturation voltage	$V_{BE(sat)2}$ Note	I_C = –4.0 A, I_B = –0.3 A			–1.5	V
Collector capacitance	C_{ob}	V_{CB} = –10 V, I_E = 0, f = 1.0 MHz		250		pF
Gain bandwidth product	f_T	V_{CE} = –10 V, I_C = –0.5 A		120		MHz
Turn-on time	t_{on}	I_C = –4.0 A, R_L = 5 Ω, I_{B1} = –I_{B2} = –0.15 A, V_{CC} ≅ –20 V Refer to the test circuit.			0.3	μs
Storage time	t_{stg}				1.5	μs
Fall time	t_f				0.3	μs

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

h_{FE} CLASSIFICATION

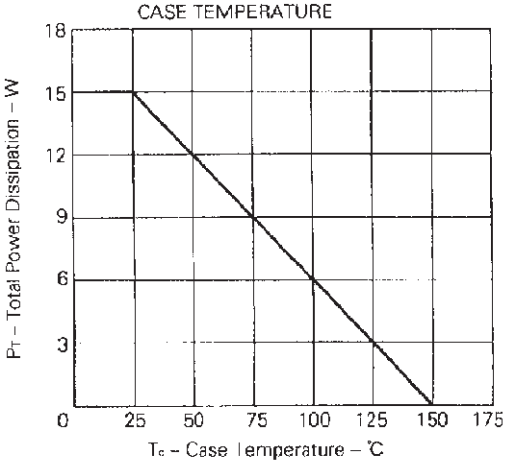
Marking	M	L	K
h_{FE2}	100 to 200	150 to 300	200 to 400

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

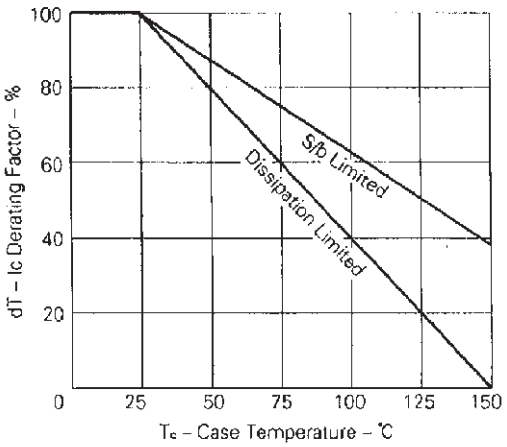


TYPICAL CHARACTERISTICS (T_A = 25°C)

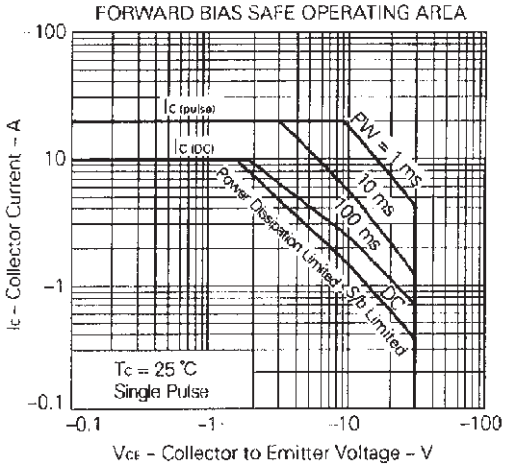
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



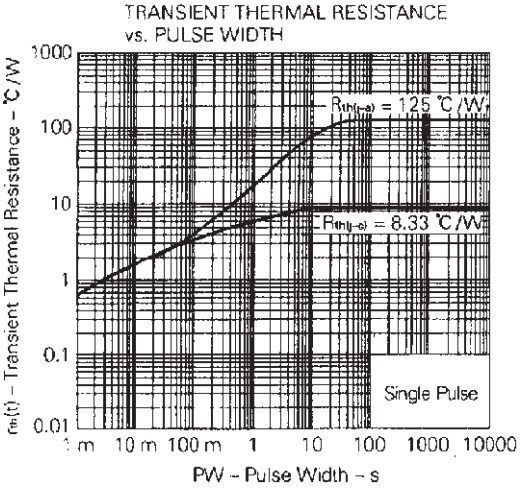
DERATING CURVE OF SAFE OPERATING AREA



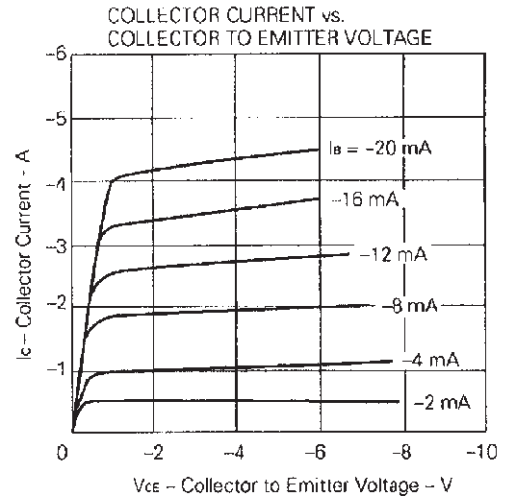
FORWARD BIAS SAFE OPERATING AREA



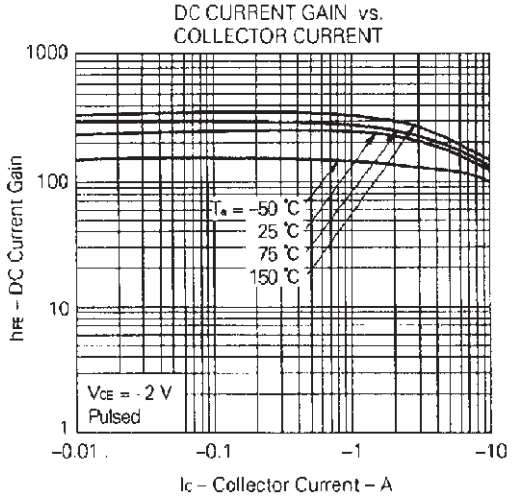
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



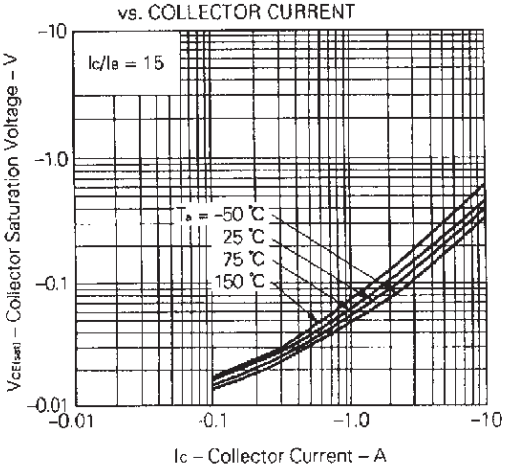
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



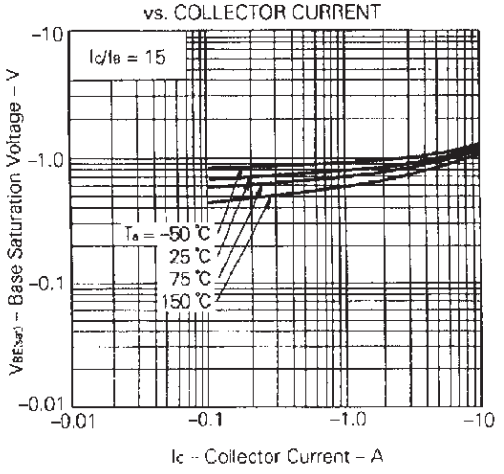
DC CURRENT GAIN vs. COLLECTOR CURRENT



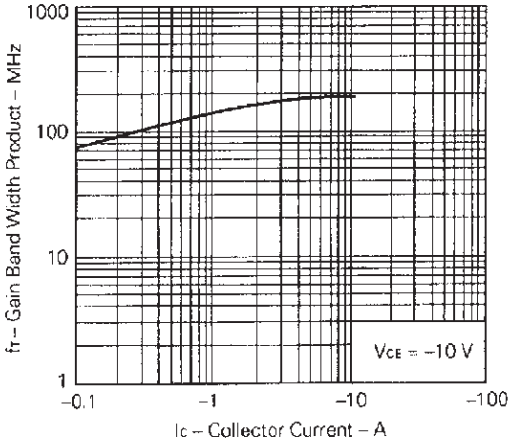
COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



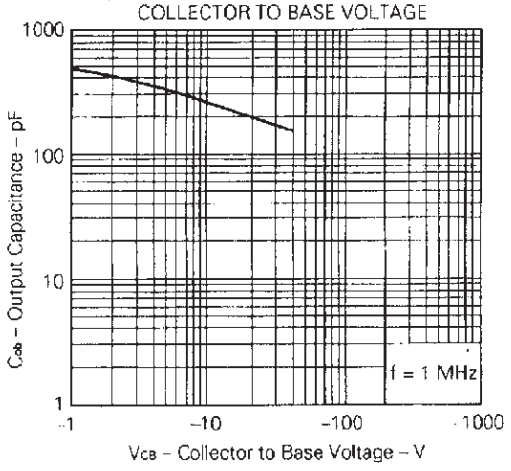
BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



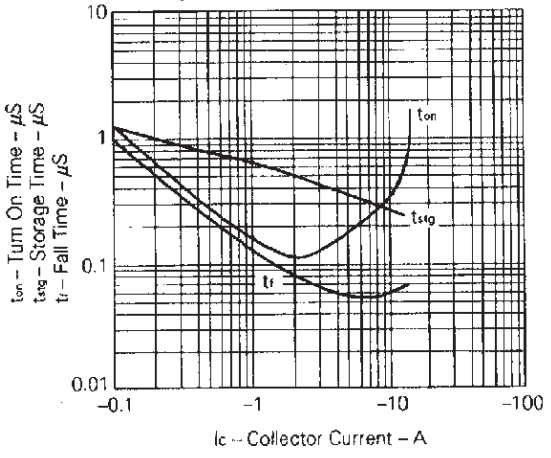
GAIN BAND WIDTH PRODUCT vs. COLLECTOR CURRENT



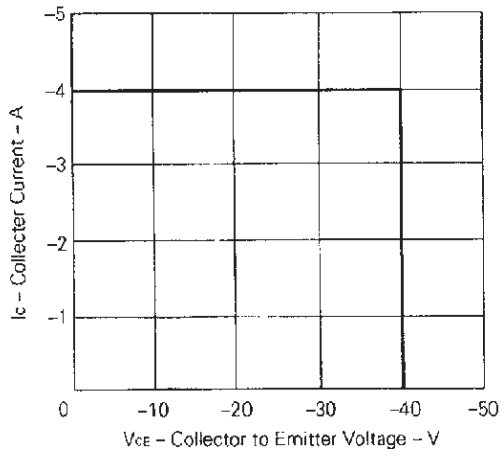
OUTPUT CAPACITANCE vs COLLECTOR TO BASE VOLTAGE



SWITCHING CHARACTERISTICS



REVERSE BIAS SAFE OPERATING AREA



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