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April 1st, 2010
Renesas Electronics Corporation

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

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DATA SHEET



SILICON POWER TRANSISTOR 2SA1647, 1647-Z

PNP SILICON EPITAXIAL TRANSISTOR FOR HIGH-SPEED SWITCHING

DESCRIPTION

The 2SA1647 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.
- Low collector saturation voltage:
 $V_{CE(sat)1} = -0.3 \text{ V MAX. (Ic} = -3.0 \text{ A)}$
- Fast switching speed:
 $t_r = 0.4 \mu\text{s MAX. (Ic} = -3.0 \text{ A)}$
- High DC current gain and excellent linearity

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Parameter	Symbol	Rated	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)} ^{Note 1}	-10	A
Base current (DC)	I _{B(DC)}	-2.5	A
Total power dissipation (T _c = 25°C)	P _T	18	W
Total power dissipation (T _A = 25°C)	P _T	1.0 ^{Note 2} , 2.0 ^{Note 3}	W
Junction temperature	T _J	150	°C
Storage temperature	T _{stg}	-55 to +150	°C

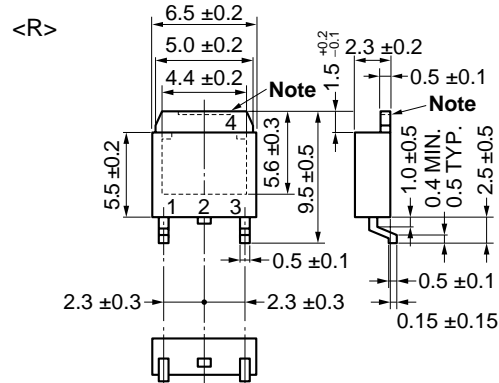
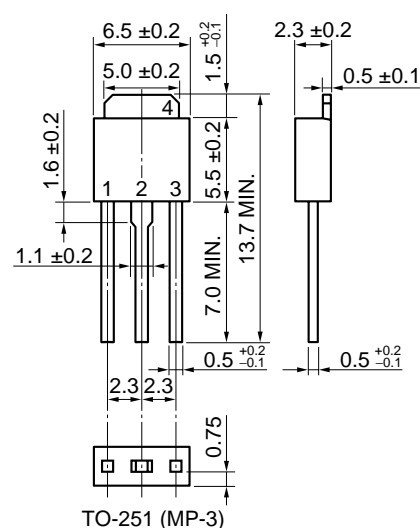
Notes 1. PW ≤ 10 ms, Duty Cycle ≤ 50%

2. Printing board mounted

3. 7.5 cm² × 0.7 mm ceramic board mounted

<R>

PACKAGE DRAWINGS (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_A = 25°C)

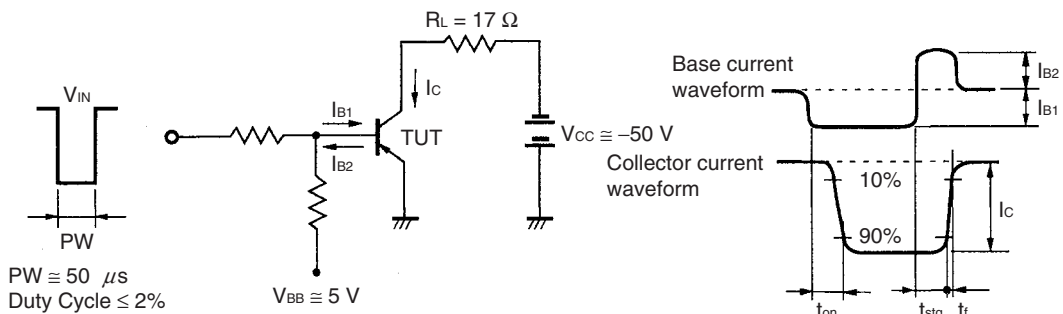
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector to emitter voltage	V _{CEO(SUS)}	I _C = -2.5 A, I _B = -0.25 A, L = 1 mH	-100			V
Collector to emitter voltage	V _{CES(SUS)}	I _C = -2.5 A, I _{B1} = -I _{B2} = -0.25 A, V _{BE(OFF)} = 1.5 V, L = 180 μH, clamped	-100			V
Collector cutoff current	I _{CBO}	V _{CE} = -100 V, I _E = 0 A			-10	μA
Collector cutoff current	I _{CER}	V _{CE} = -100 V, R _{BE} = 50 Ω, T _A = 125°C			-1.0	mA
Collector cutoff current	I _{CX1}	V _{CE} = -100 V, V _{BE(OFF)} = 1.5 V			-10	μA
Collector cutoff current	I _{CX2}	V _{CE} = -100 V, V _{BE(OFF)} = 1.5 V, T _A = 125°C			-1.0	mA
Emitter cutoff current	I _{EBO}	V _{EB(OFF)} = -5.0 V, I _C = 0 A			-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 = -1.0 A	100		400	
DC current gain	h _{FE3} ^{Note}	V _{CE} = -2.0 V, I _C = -3.0 A	60			
Collector saturation voltage	V _{CE(sat)1} ^{Note}	I _C = -3.0 A, I _B = -0.15 A			-0.3	V
Collector saturation voltage	V _{CE(sat)2} ^{Note}	I _C = -4.0 A, I _B = -0.2 A			-0.5	V
Base saturation voltage	V _{BE(sat)1} ^{Note}	I _C = -3.0 A, I _B = -0.15 A			-1.2	V
Base saturation voltage	V _{BE(sat)2} ^{Note}	I _C = -4.0 A, I _B = -0.2 A			-1.5	V
Collector capacitance	C _{ob}	V _{CE} = -10 V, I _E = 0, f = 1.0 MHz		110		pF
Gain bandwidth product	f _T	V _{CE} = -10 V, I _C = 0.5 A		90		MHz
Turn-on time	t _{on}	I _C = -3.0 A, R _L = 17 Ω, I _{B1} = -I _{B2} = -0.15 A, V _{CC} ≅ -50 V Refer to SWITCHING TIME TEST CIRCUIT.			0.3	μs
Storage time	t _{stg}				1.5	μs
Fall time	t _f				0.4	μs

Note Pulse test PW ≤ 350 μs, Duty Cycle ≤ 2%/Pulsed

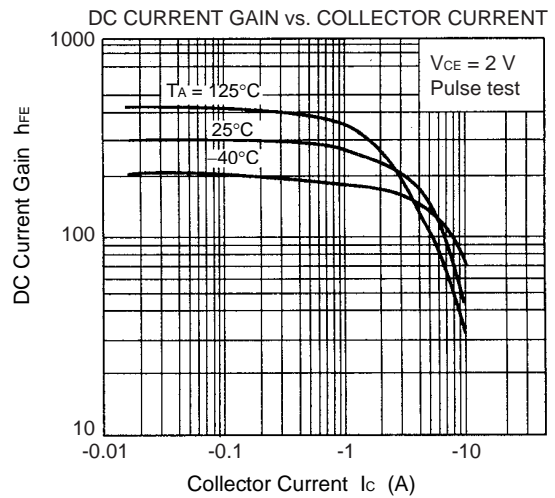
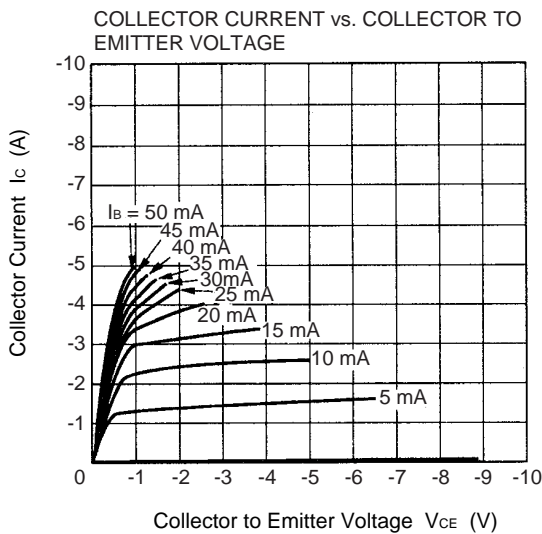
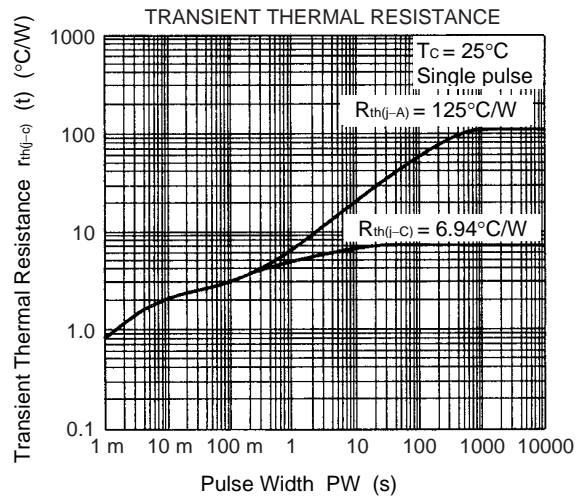
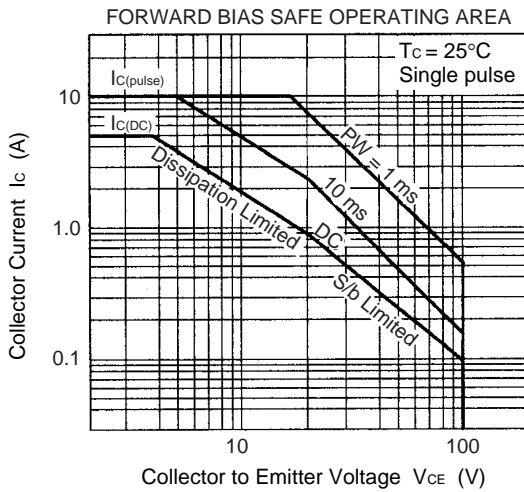
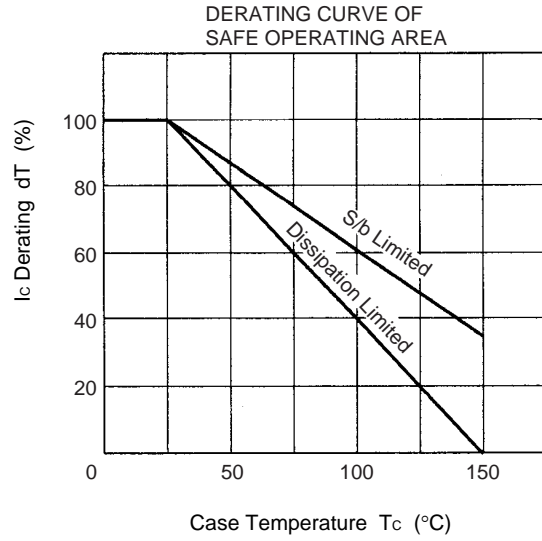
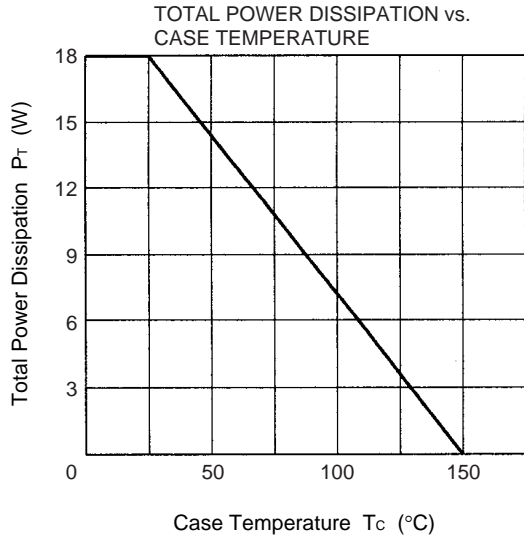
h_{FE} CLASSIFICATION

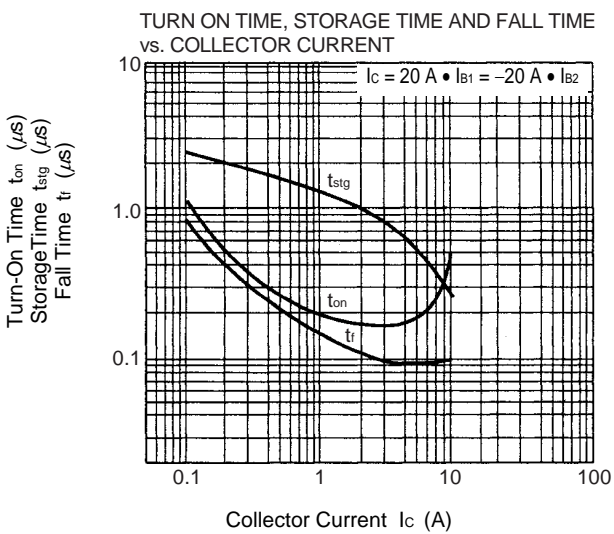
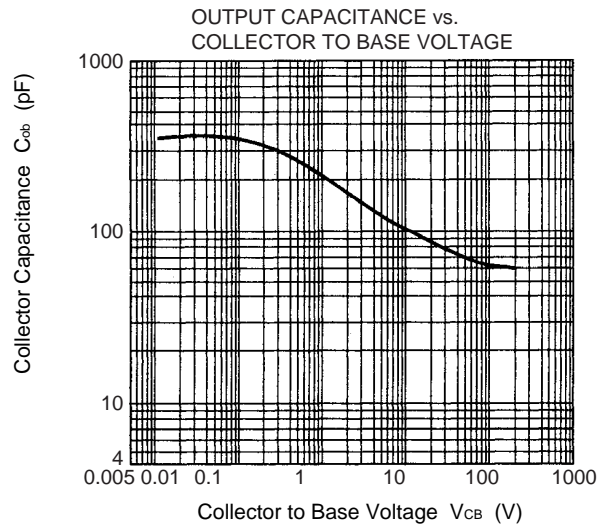
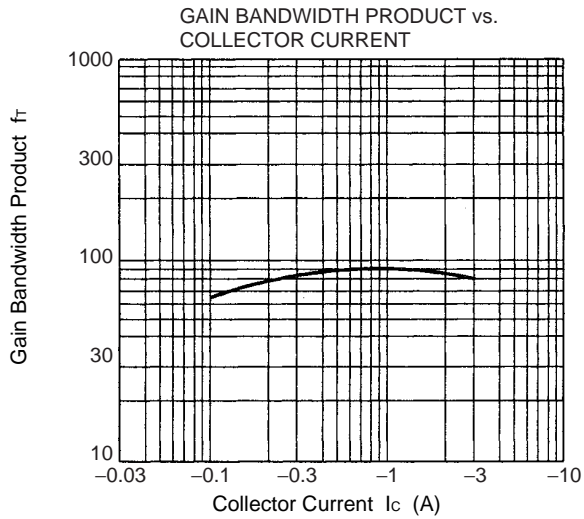
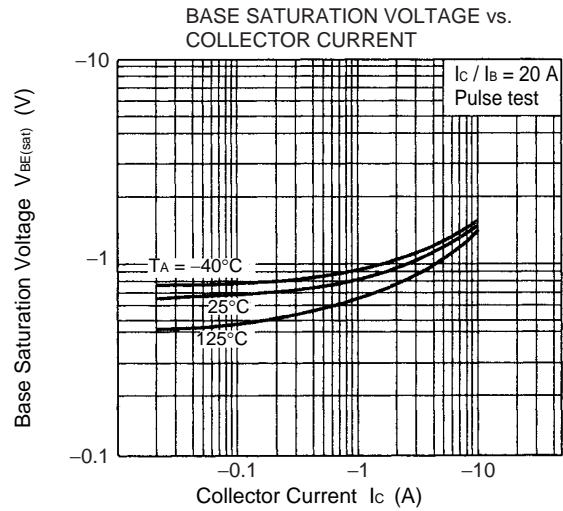
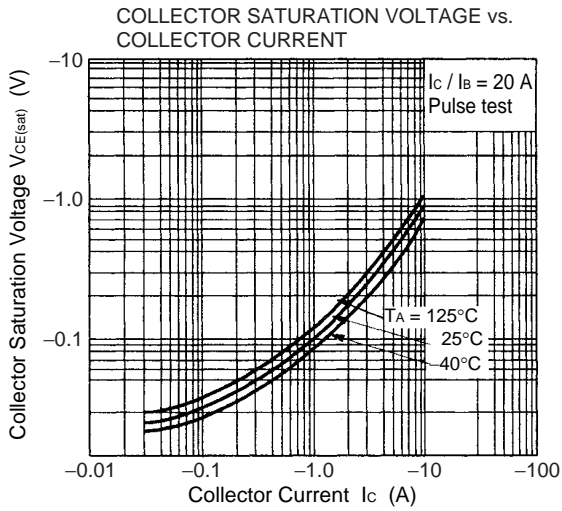
Marking	M	L	K
h _{FE2}	100 to 200	150 to 300	200 to 400

SWITCHING TIME TEST CIRCUIT



TYPICAL CHARACTERISTICS (T_A = 25°C)





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