

To our customers,

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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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PNP SILICON EPITAXIAL TRANSISTOR
FOR HIGH-SPEED SWITCHING

DESCRIPTION

The 2SA1648 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

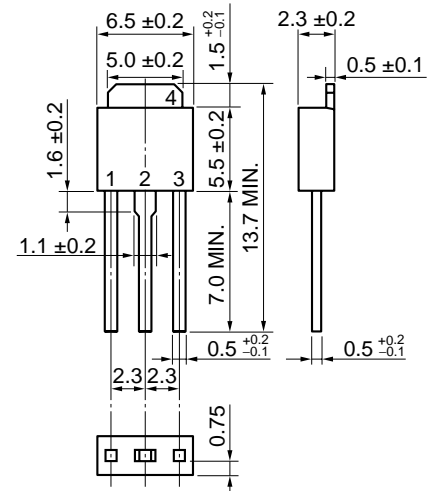
- Available for high-current control in small dimension
- Z type is a lead processed product and is deal for mounting a hybrid IC.
- Mold package that does not require an insulating board or insulation bushing.
- Low collector saturation voltage:
 $V_{CE(sat)1} = -0.3 \text{ V MAX. (Ic} = -3.0 \text{ A)}$
- Fast switching speed:
 $t_f = 0.3 \mu\text{s MAX. (Ic} = -3.0 \text{ A)}$
- High DC current gain and excellent linearity

ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Parameter	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	-100	V
Collector to emitter voltage	V_{CEO}	-60	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 (Tc = 25°C)	P_T	18	W
Total power dissipation (TA = 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

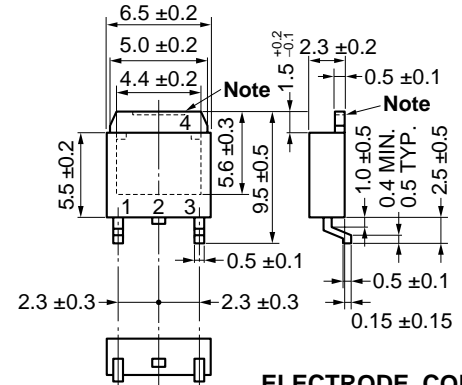
- Notes 1. $PW \leq 300 \mu\text{s}$, Duty Cycle $\leq 10\%$
 2. Printing board mounted
 3. $7.5 \text{ cm}^2 \times 0.7 \text{ mm}$ ceramic board mounted

PACKAGE DRAWINGS (Unit: mm)



TO-251 (MP-3)

<R>



ELECTRODE CONNECTION

- TO-252 (MP-3Z)
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)

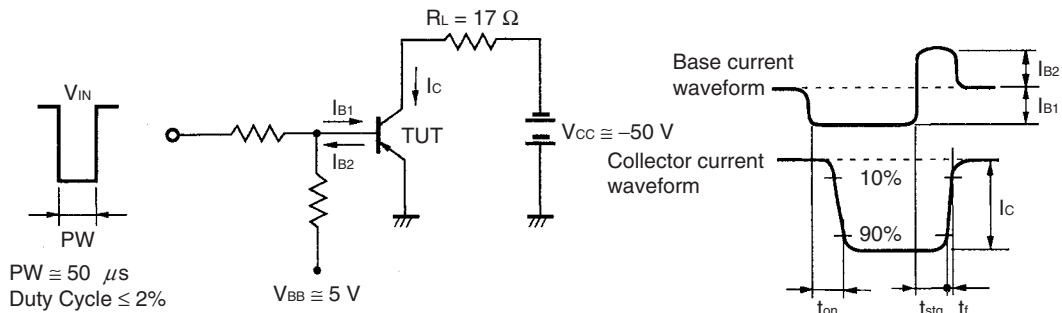
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector to emitter voltage	V _{CE0(SUS)}	I _C = -3.0 A, I _B = -0.3 A, L = 1 mH	-60			V
Collector to emitter voltage	V _{CEx(SUS)}	I _C = -3.0 A, I _{B2} = -I _{B1} = -0.3 A, V _{BE(OFF)} = 1.5 V, L = 180 μH, clamped	-60			V
Collector cutoff current	I _{CBO}	V _{CE} = -60 V, I _E = 0 A			-10	μA
Collector cutoff current	I _{CER}	V _{CE} = -60 V, R _{BE} = 50 Ω, T _A = 125°C			-1.0	mA
Collector cutoff current	I _{CEx1}	V _{CE} = -60 V, V _{BE(OFF)} = 1.5 V			-10	μA
Collector cutoff current	I _{CEx2}	V _{CE} = -60 V, V _{BE(OFF)} = 1.5 V, T _A = 125°C			-1.0	mA
Emitter cutoff current	I _{EBO}	V _{EB} = -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	200	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 _{CB} = -10 V, I _E = 0 A, f = 1.0 MHz		80		pF
Gain bandwidth product	f _r	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				0.3	μs

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

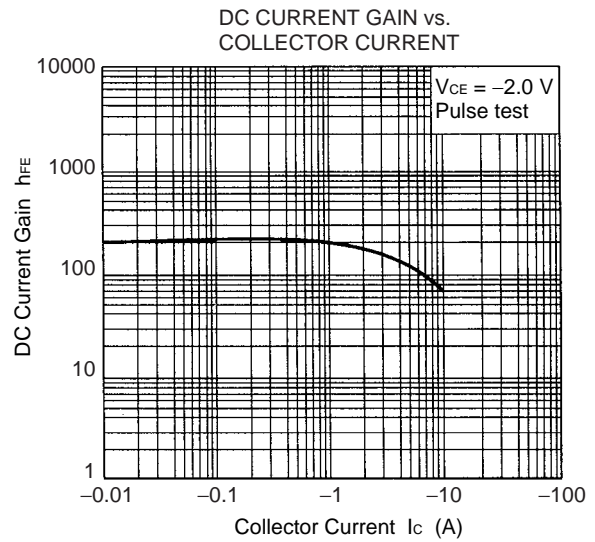
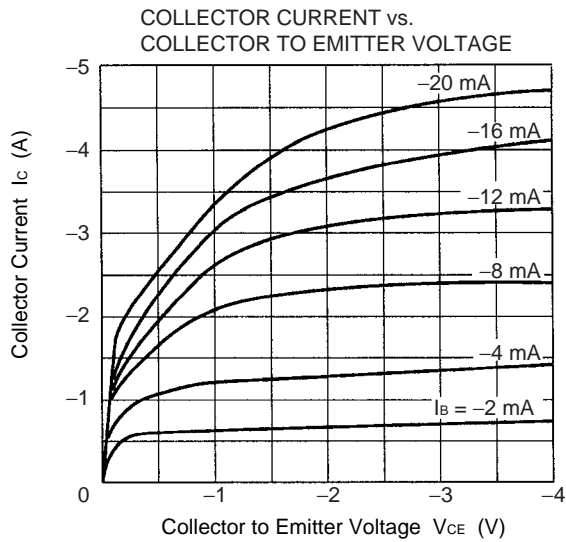
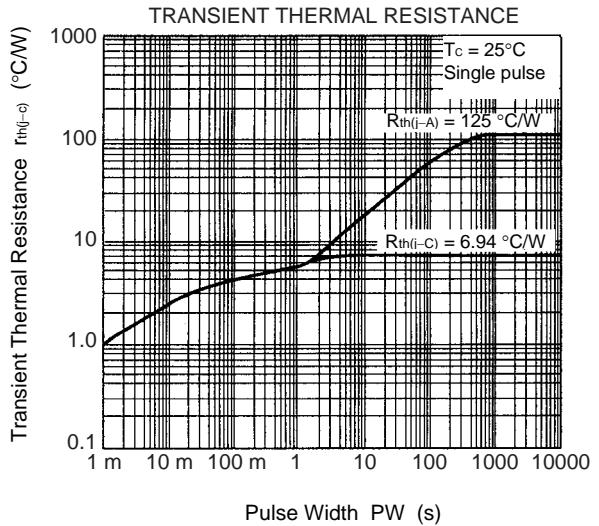
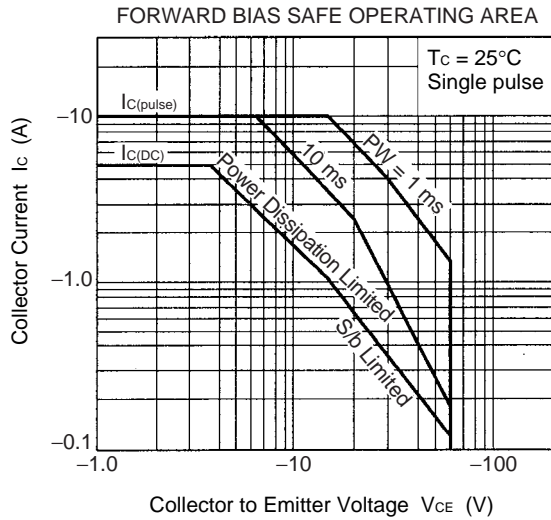
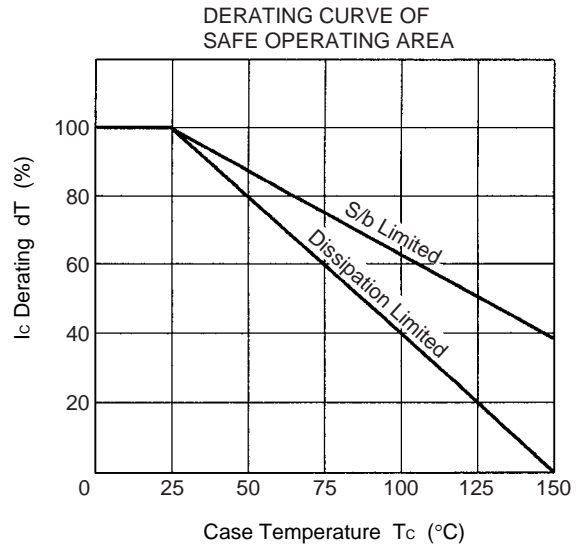
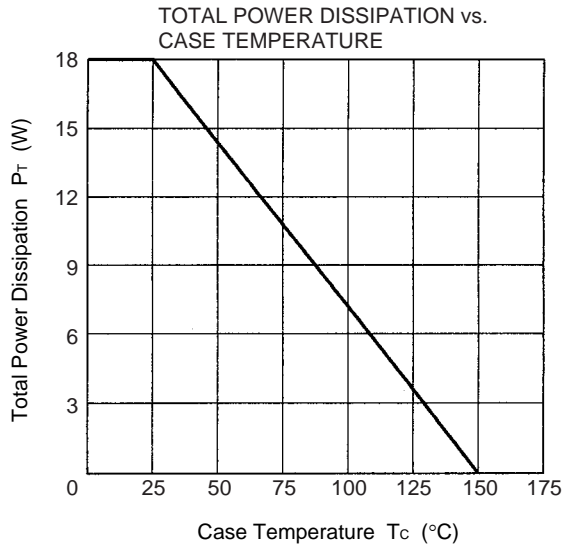
h_{FE} CLASSIFICATION

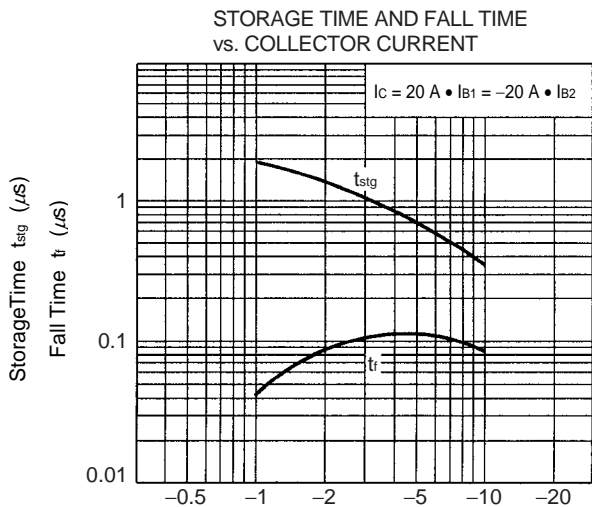
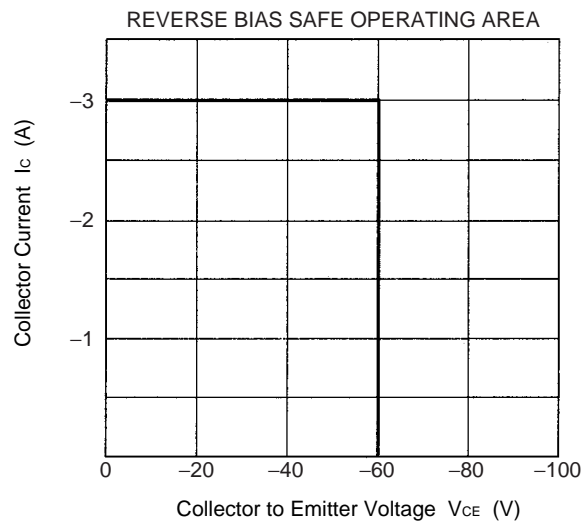
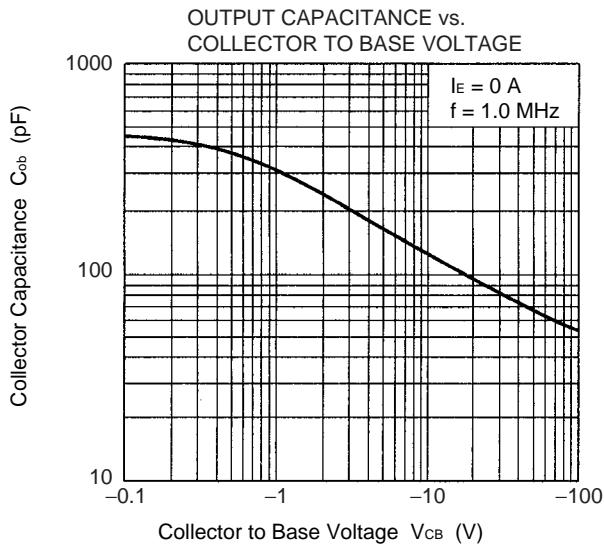
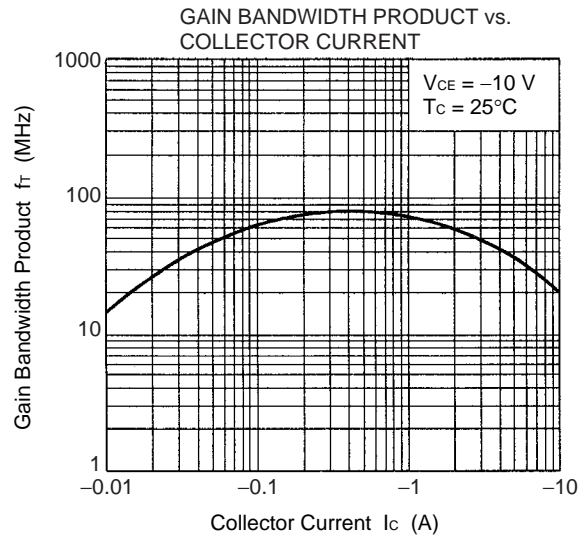
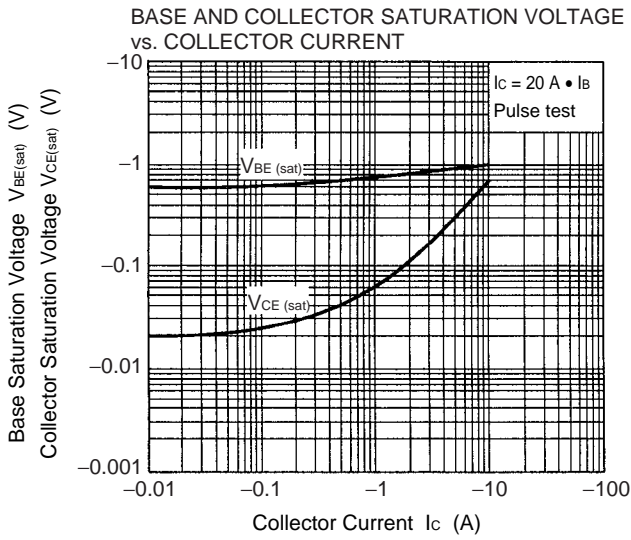
Marking	M	L	K
h _{FE2}	100 to 200	150 to 300	200 to 400

SWITCHING TIME TEST CIRCUIT



TYPICAL CHARACTERISTICS (T_A = 25°C)





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