

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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SILICON POWER TRANSISTOR NTC1863

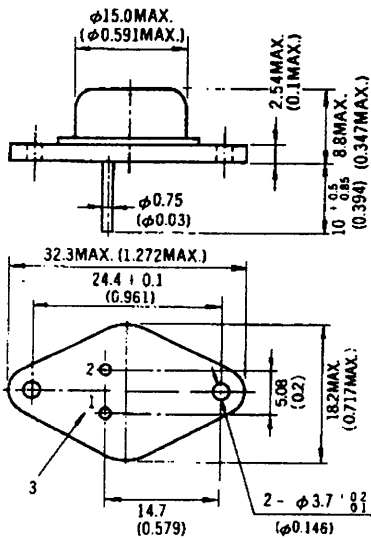
HIGH SPEED HIGH CURRENT SWITCHING NPN SILICON EPITAXIAL MESA TRANSISTOR

Industrial Use

DESCRIPTION

Suitable for switching regulator, DC-DC converter and ultrasonic appliance applications.

PACKAGE DIMENSIONS in millimeters (inches)



1. Base
2. Emitter
3. Collector (Case)

EIAJ : TC-16, TB-23
JEDEC: TO-66
IEC : C13

FEATURES

- High speed switching.
- Low collector saturation voltage.
- Specified of reverse biased S.O.A. with inductive loads.

ABSOLUTE MAXIMUM RATINGS

Maximum Voltages and Currents ($T_a = 25^\circ\text{C}$)

Collector to Emitter Voltage	V_{CEX}	150	V
Collector to Emitter Sustaining Voltage	$V_{CEO(SUS)}$	100	V
Collector to Emitter Sustaining Voltage	$V_{CEX(SUS)}$	150	V
Emitter to Base Voltage	V_{EBO}	7.0	V
Continuous Collector Current	$I_C(DC)$	7.0	A
Peak Collector Current*	$I_C(pulse)$	15	A
Continuous Base Current	$I_B(DC)$	4.0	A
Peak Base Current*	$I_B(pulse)$	8.0	A

Maximum Power Dissipations

Total Power Dissipation	$P_T(T_c=25^\circ\text{C})$	50	W
Total Power Dissipation	$P_T(T_c=100^\circ\text{C})$	29	W
Total Power Dissipation	$P_T(T_a=25^\circ\text{C})$	2.0	W

Maximum Temperatures

Junction Temperature	T_j	200	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +200	$^\circ\text{C}$
Lead Temperature 1/8 inch from case for 10 seconds	T_L	260	$^\circ\text{C}$

Thermal Resistances

Junction to Case	$R_{th(j-c)}$	3.50	$^\circ\text{C/W}$
Junction to Ambient	$R_{th(j-a)}$	87.5	$^\circ\text{C/W}$

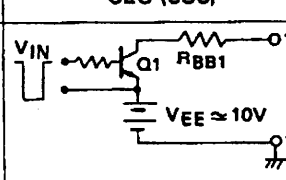
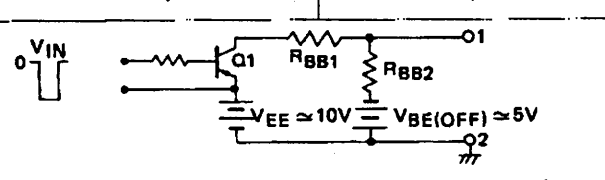
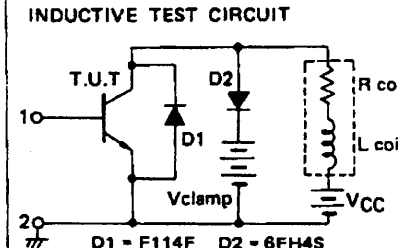
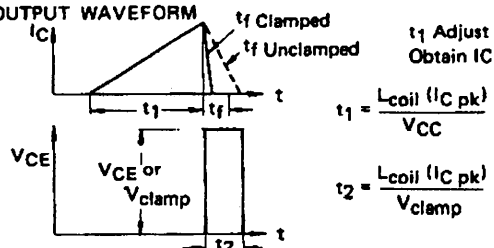
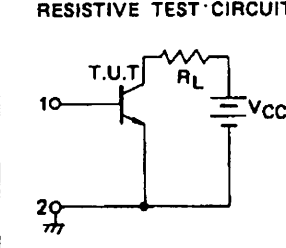
* Pulsed $PW \leq 300 \mu\text{s}$, duty cycle $\leq 10\%$

ELECTRICAL CHARACTERISTICS (Ta = 25°C unless otherwise noted)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector to Emitter Sustaining Voltage	V _{CEO(SUS)}	100			V	Table 1. I _C = 5A, I _{B1} = 0.5A, L = 100μH
	V _{CEX(SUS)1}	150			V	Table 1. I _C = 5A, I _{B1} = -I _{B2} = 0.5A V _{clamp} = Rated V _{CEX} , Ta = 125°C
	V _{CEX(SUS)2}	100			V	Table 1. I _C = 10A, I _{B1} = 1.0A, I _{B2} = -0.5A V _{clamp} = Rated V _{CEX} , Ta = 125°C
Collector Cutoff Current	I _{CER}			1.0	mA	V _{CE} = 150V, R _{BE} = 50Ω, Ta = 125°C
	I _{CEX}			100	μA	V _{CE} = 150V, V _{BE(OFF)} = -1.5V
	I _{CEX}			500	μA	V _{CE} = 150V, V _{BE(OFF)} = -1.5V Ta = 125°C
Emitter Cutoff Current	I _{EBO}			10	μA	V _{EB} = 7.0V, I _C = 0
Second Breakdown Collector Current	I _{S/B}	2.5			A	t = 1.0 s, V _{CE} = 20V, T _c = 25°C
Second Breakdown Energy	E _{S/B}	500			μJ	I _C = 5A, I _{B1} = 0.5A, V _{BE(OFF)} = -5V
DC Current Gain	h _{FE1}	20		160		V _{CE} = 5V, I _C = 3A **
	h _{FE2}	15				V _{CE} = 5V, I _C = 5A **
Collector Saturation Voltage	V _{CE(sat)}			1.0	V	I _C = 5A, I _B = 0.5A **
	V _{CE(sat)}			1.5	V	I _C = 5A, I _B = 0.5A, Ta = 125°C **
Base Saturation Voltage	V _{BE(sat)}			1.5	V	I _C = 5A, I _B = 0.5A **
	V _{BE(sat)}			1.5	V	I _C = 7A, I _B = 0.7A, Ta = 125°C **
Gain Bandwidth Product	f _T	20			MHz	V _{CE} = 10V, I _C = 50mA, f _o = 3.0MHz, T _c = 25°C
Output Capacitance	C _{ob}			300	pF	V _{CB} = 10V, f _o = 1.0 MHz
Delay Time	t _d			0.1	μs	Resistive Load (Table 1.)
Rise Time	t _r			0.7	μs	
	t _r			2.1	μs	Ta = 125°C I _C = 5A, I _{B1} = -I _{B2} = 0.5A
Storage Time	t _{stg}			1.0	μs	R _L = 10Ω, V _{CC} ≈ 50V
	t _{stg}			1.5	μs	Ta = 125°C PW ≈ 50μs, duty cycle ≤ 2%
Fall Time	t _f			3.0	μs	
	t _f			1.2	μs	Ta = 125°C

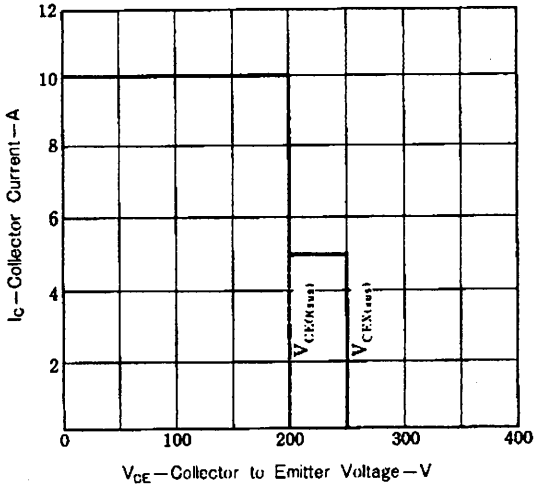
** PW ≤ 350 μs, duty cycle ≤ 2%

TABLE 1. - TEST CONDITIONS FOR DYNAMIC PERFORMANCE

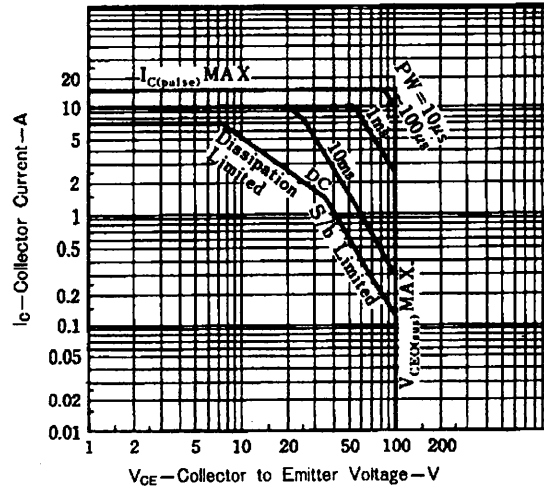
	V _{CEO} (SUS)	V _{CEX} (SUS)	E _{S/B}	RESISTIVE SWITCHING
INPUT CONDITIONS				
CIRCUIT VALUES	L _{coil} = 100μH, V _{CC} = 10V R _{coil} = 0.05Ω V _{clamp} (Unclamped)	L _{coil} = 180μH, V _{CC} = 20V R _{coil} = 0.05Ω V _{clamp} = Rated V _{CEX} Value	L _{coil} = 40μH, V _{CC} = 10V R _{coil} = 0.05Ω, R _{BB2} = 60Ω V _{clamp} (Unclamped)	R _L = 10Ω, V _{CC} ≈ 50V
TEST CIRCUITS				RESISTIVE TEST CIRCUIT
			$t_1 = \frac{L_{coil} (I_C \text{ pk})}{V_{CC}}$ $t_2 = \frac{L_{coil} (I_C \text{ pk})}{V_{clamp}}$	

TYPICAL CHARACTERISTICS (Ta=25°C)

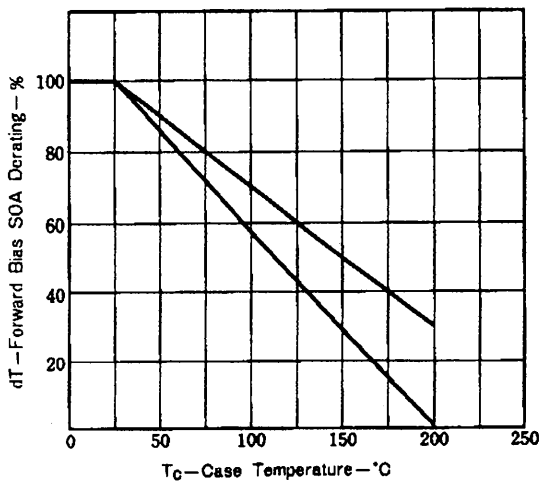
REVERSE BIAS SAFE OPERATING AREA



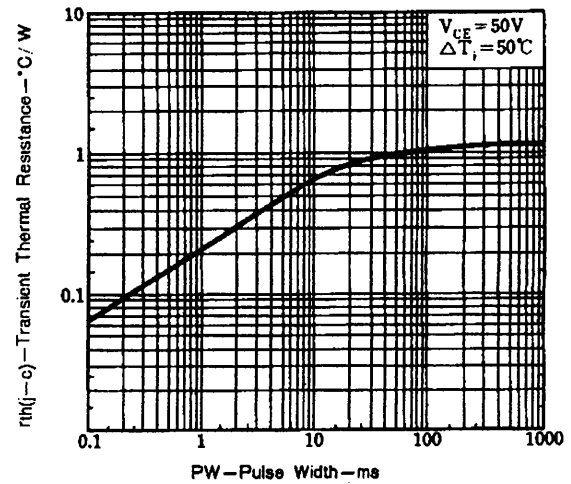
FORWARD BIAS SAFE OPERATING AREAS



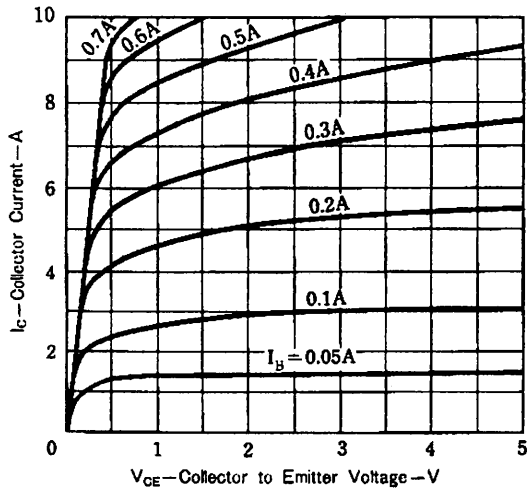
DERATING CURVE OF FORWARD BIAS SAFE OPERATING AREA



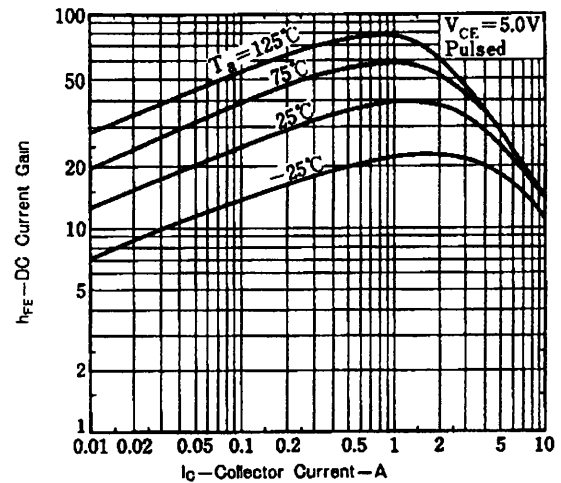
TRANSIENT THERMAL RESISTANCE



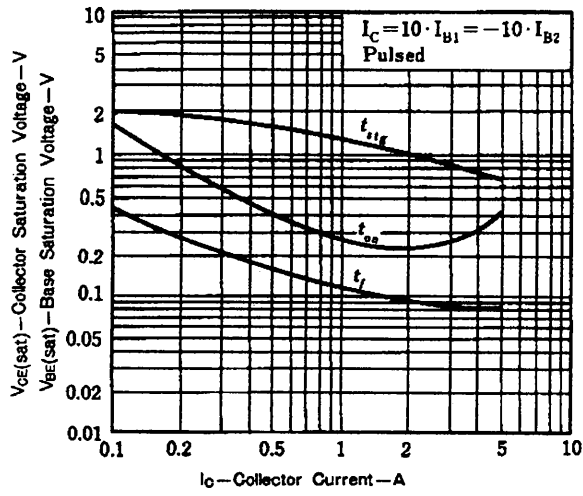
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



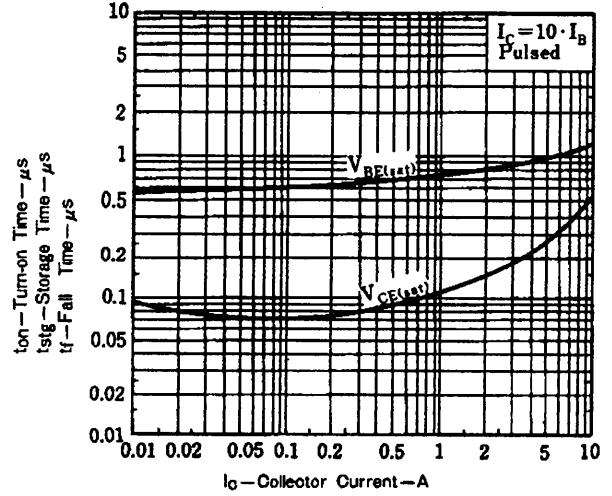
DC CURRENT GAIN vs. COLLECTOR CURRENT



BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



TURN ON TIME, STORAGE TIME AND FALL TIME vs. COLLECTOR CURRENT



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