

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

April 1st, 2010
Renesas Electronics Corporation

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

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

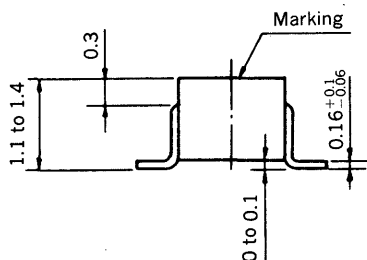
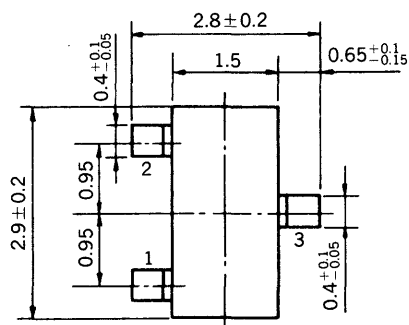
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(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

MEDIUM SPEED SWITCHING
RESISTOR BUILT-IN TYPE NPN TRANSISTOR
MINI MOLD

PACKAGE DIMENSIONS
in millimeters

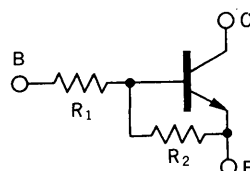


- 1. Emitter
- 2. Base
- 3. Collector

Marking: L33

FEATURES

- Resistors Built-in TYPE



$R_1 = 22 \text{ k}\Omega$
 $R_2 = 22 \text{ k}\Omega$

- Complementary to FN1F4M

ABSOLUTE MAXIMUM RATINGS

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

Collector to Base Voltage	V_{CB0}	60	V
Collector to Emitter Voltage	V_{CEO}	50	V
Emitter to Base Voltage	V_{EBO}	10	V
Collector Current (DC)	I_C	100	mA
Collector Current (Pulse)	I_C	200	mA

Maximum Power Dissipation

Total Power Dissipation at 25°C Ambient Temperature	P_T	200	mW
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Maximum Temperatures

Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$

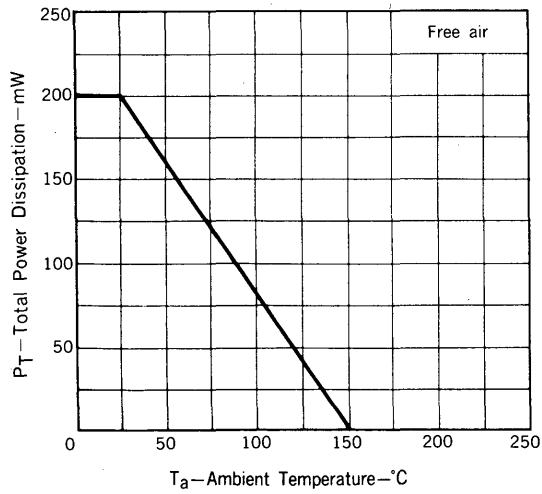
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CBO}			100	nA	$V_{CB} = 50 \text{ V}, I_E = 0$
DC Current Gain	h_{FE1}^*	60	120	195		$V_{CE} = 5.0 \text{ V}, I_C = 5.0 \text{ mA}$
DC Current Gain	h_{FE2}^*	90	400			$V_{CE} = 5.0 \text{ V}, I_C = 50 \text{ mA}$
Collector Saturation Voltage	$V_{CE(sat)}^*$		0.04	0.2	V	$I_C = 50 \text{ mA}, I_B = 0.25 \text{ mA}$
Low-Level Input Voltage	V_{IL}^*		1.05	0.8	V	$V_{CE} = 5.0 \text{ V}, I_C = 100 \mu\text{A}$
High-Level Input Voltage	V_{IH}^*	4.0	1.6		V	$V_{CE} = 0.2 \text{ V}, I_C = 5.0 \text{ mA}$
Input Resistor	R_1	15.4	22.0	28.6	$\text{k}\Omega$	
Resistor Ratio	R_1/R_2	0.9	1.0	1.1		
Turn-on Time	t_{on}		0.11	0.4	μs	$V_{CC} = 5 \text{ V}, V_{in} = 5 \text{ V}$
Storage Time	t_{stg}		2.3	5.0	μs	$R_L = 1 \text{ k}\Omega$
Turn-off Time	t_{off}		2.6	6.0	μs	$PW = 2 \mu\text{s}, \text{Duty Cycle} \leq 2\%$

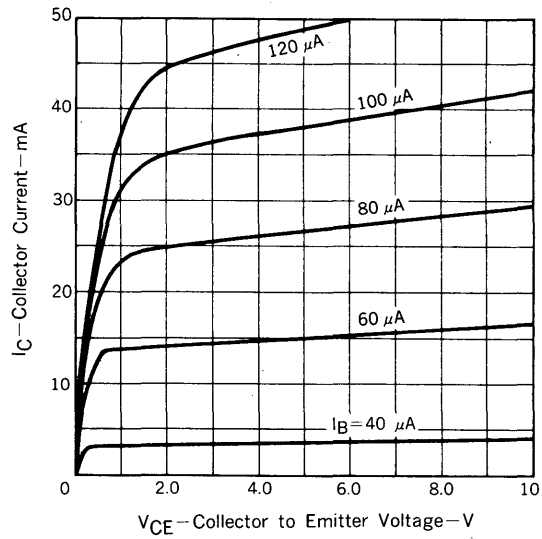
* Pulsed: $PW \leq 350 \mu\text{s}, \text{Duty Cycle} \leq 2\%$

TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

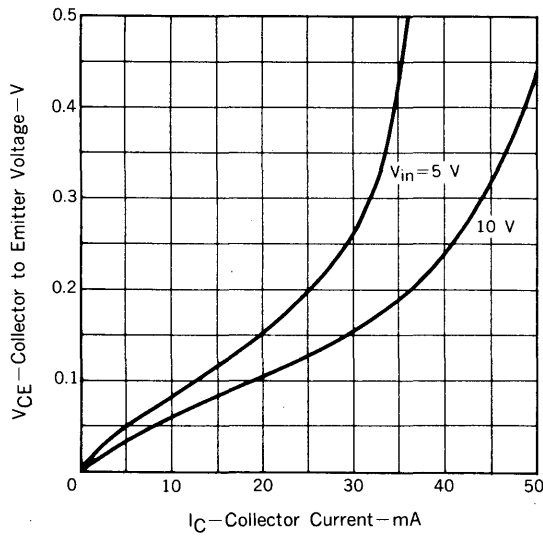
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



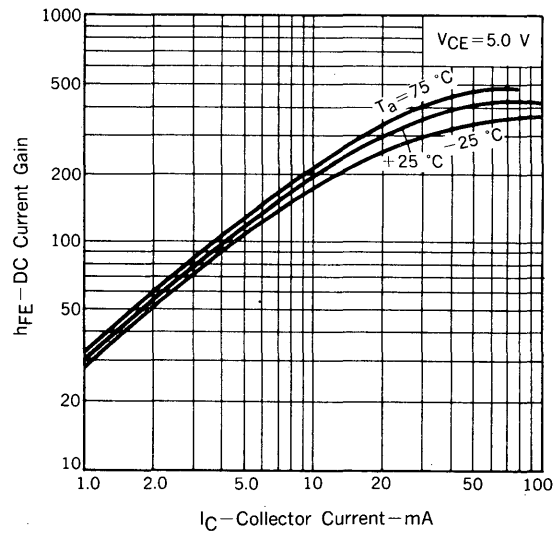
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



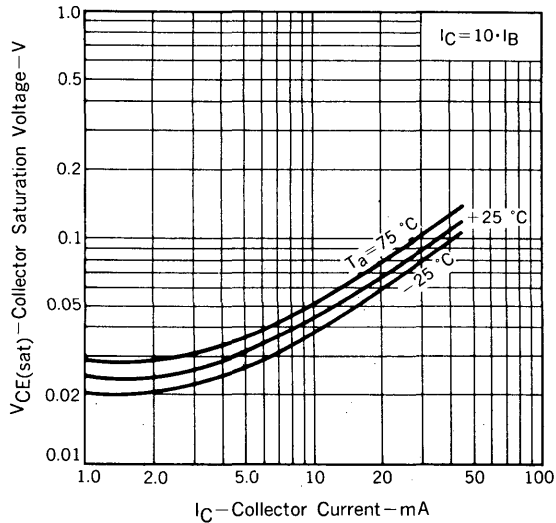
COLLECTOR TO EMITTER VOLTAGE vs. COLLECTOR CURRENT



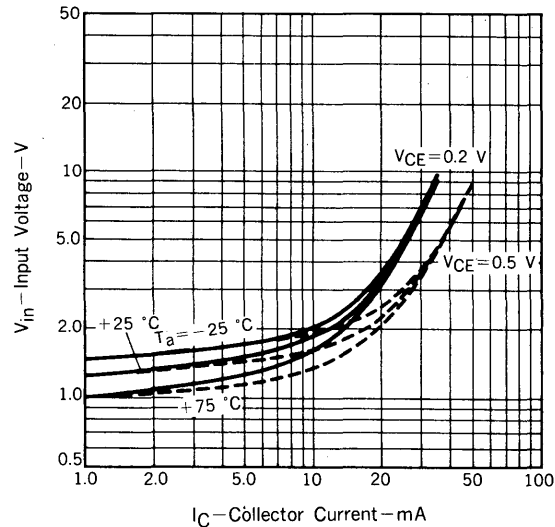
DC CURRENT GAIN vs. COLLECTOR CURRENT



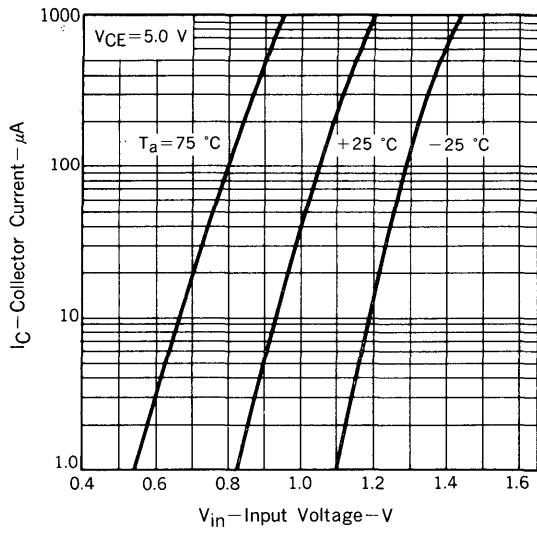
COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



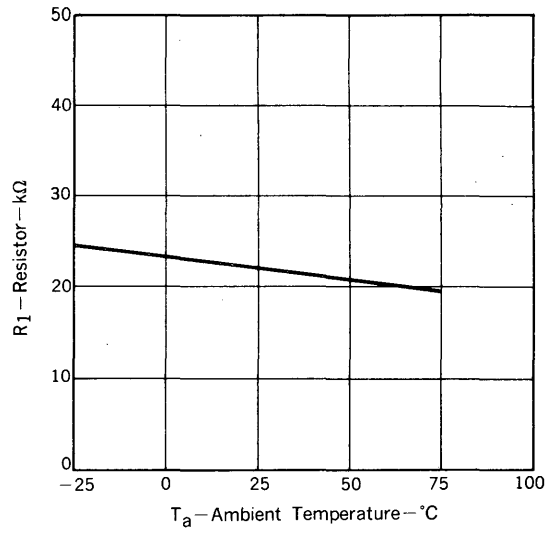
INPUT VOLTAGE vs. COLLECTOR CURRENT



COLLECTOR CURRENT vs. INPUT VOLTAGE



RESISTOR vs. AMBIENT TEMPERATURE



SWITCHING TIME vs. COLLECTOR CURRENT

