

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>.

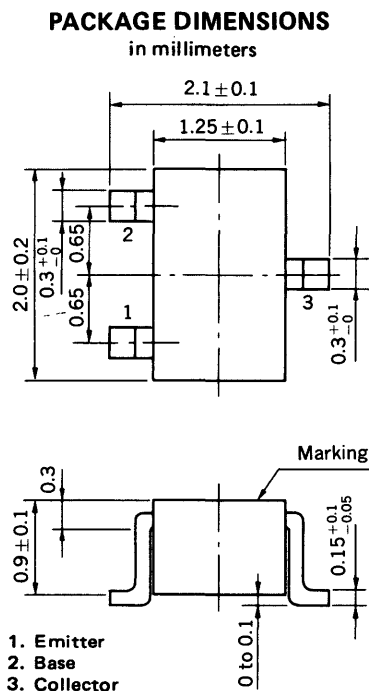
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HIGH FREQUENCY AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR



DESCRIPTION

The 2SC4178 is designed for use in small type equipments especially recommended for Hybrid Integrated Circuit and other applications.

FEATURES

- Micro package.
- High gain bandwidth product. $f_T = 600 \text{ MHz TYP. } (I_E = -1.0 \text{ mA})$
- Low output capacitance. $C_{ob} = 1.0 \text{ pF TYP. } (V_{CB} = 6.0 \text{ V})$

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

Maximum Voltages and Current

Collector to Base Voltage	V_{CBO}	30	V
Collector to Emitter Voltage	V_{CEO}	20	V
Emitter to Base Voltage	V_{EBO}	4.0	V
Collector Current	I_C	20	mA

Maximum Power Dissipation

Total Power Dissipation	P_T	150	mW
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Maximum Temperatures

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

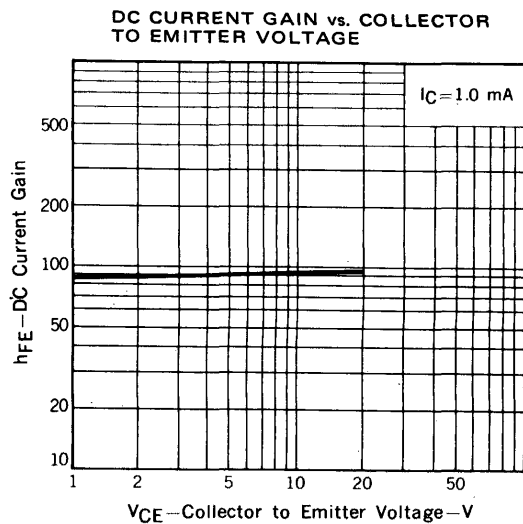
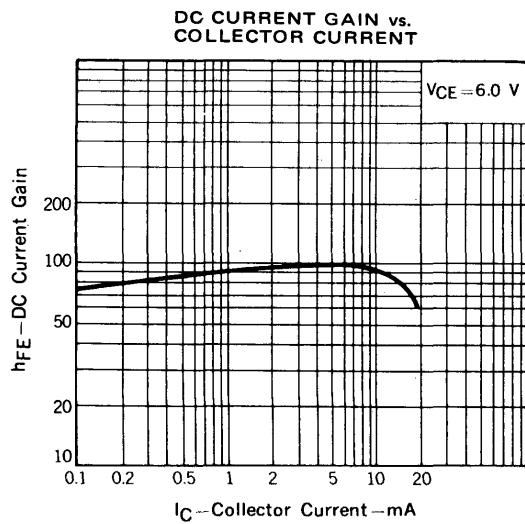
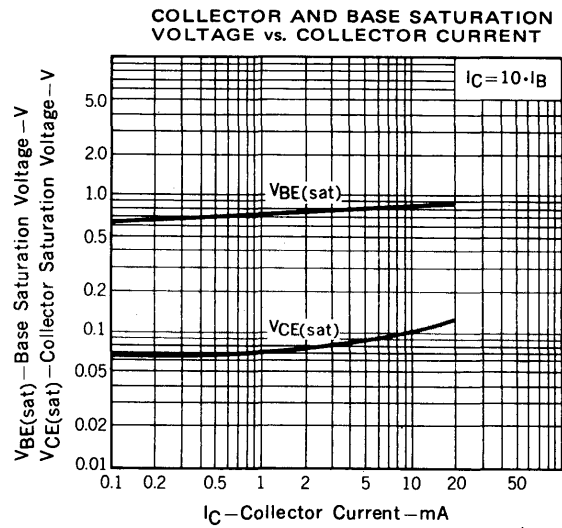
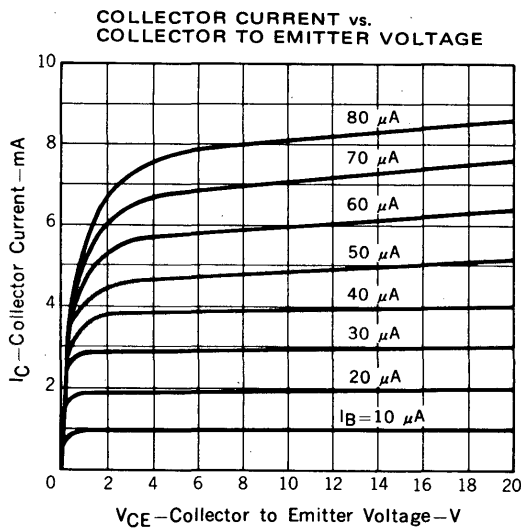
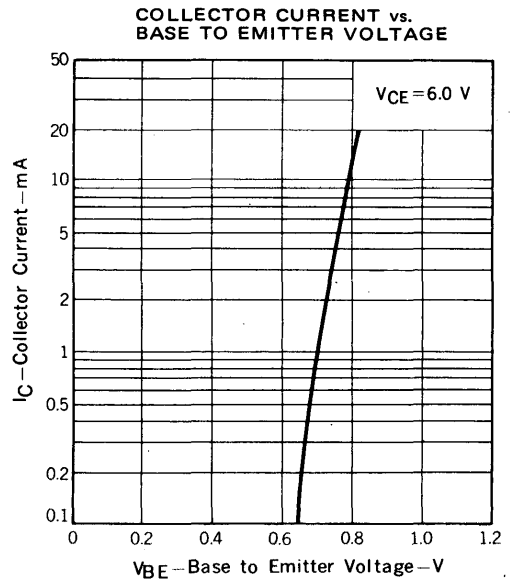
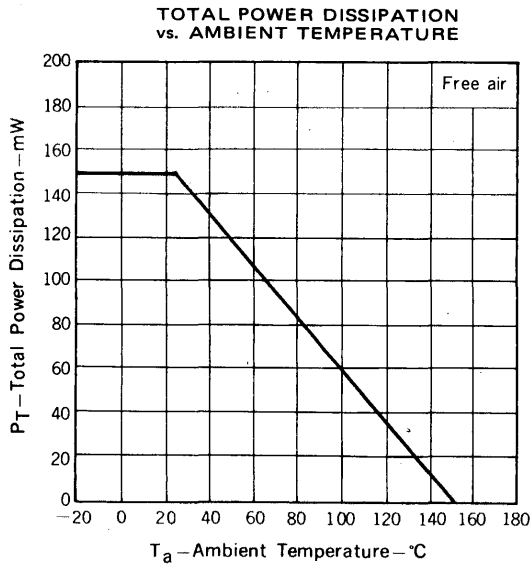
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CBO}			100	nA	$V_{CB} = 30 \text{ V, } I_E = 0$
DC Current Gain	h_{FE}	40	90	180		$V_{CE} = 6.0 \text{ V, } I_C = 1.0 \text{ mA}$
Collector Saturation Voltage	$V_{CE(sat)}$		0.1	0.3	V	$I_C = 10 \text{ mA, } I_B = 1.0 \text{ mA}$
Gain Bandwidth Product	f_T	400	600		MHz	$V_{CE} = 6.0 \text{ V, } I_E = -1.0 \text{ mA}$
Output Capacitance	C_{ob}		1.0		pF	$V_{CB} = 6.0 \text{ V, } I_E = 0, f = 1.0 \text{ MHz}$
Collector to Base Time Constant	$C_c \cdot r_{b'b}$		12		ps	$V_{CE} = 6.0 \text{ V, } I_E = -1.0 \text{ mA, } f = 31.9 \text{ MHz}$
Noise Figure	NF		3.0		dB	$V_{CE} = 6.0 \text{ V, } I_E = -1.0 \text{ mA, } R_G = 50 \Omega, f = 100 \text{ MHz}$ See Test Circuit

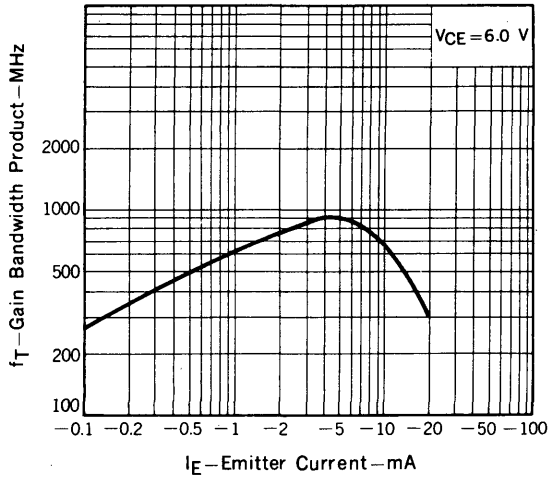
Classification of h_{FE}

Marking	F12	F13	F14
h_{FE} Range	40 to 80	60 to 120	90 to 180

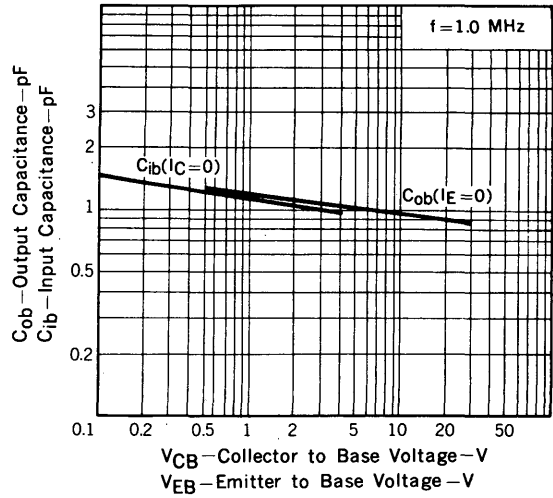
TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$ unless otherwise noted)



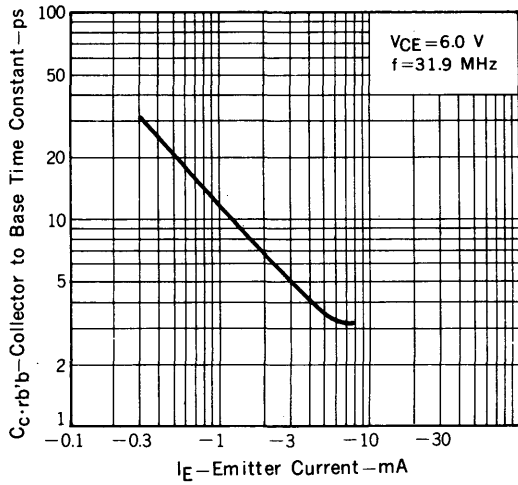
GAIN BANDWIDTH PRODUCT vs. EMITTER CURRENT



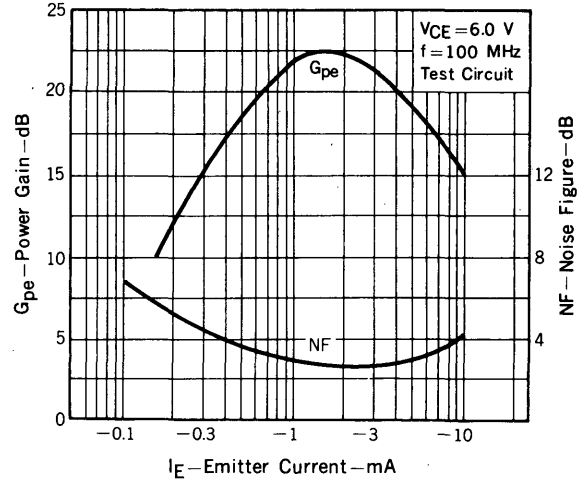
INPUT CAPACITANCE vs. EMITTER TO BASE VOLTAGE, OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



COLLECTOR TO BASE TIME CONSTANT vs. EMITTER CURRENT



POWER GAIN, NOISE FIGURE vs. EMITTER CURRENT



100 MHz G_{pe} , NF TEST CIRCUIT

