

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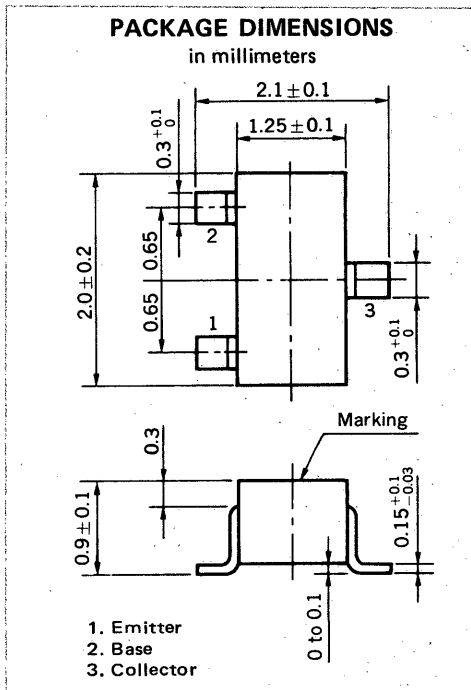
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(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

NPN SILICON EPTAXIAL TRANSISTOR
AUDIO FREQUENCY AMPLIFIER

DESCRIPTION

The 2SD2228 is designed for general-purpose applications requiring High DC Current and Low Collector Saturation Voltage. This is suitable for appliances including VCR cameras and headphone stereos.



FEATURES

- High DC Current.
 $I_{C(DC)} \approx 500 \text{ mA MAX.}$
- Low Collector Saturation Voltage.
 $V_{CE(sat)} = 0.1 \text{ V MAX. (@ } I_C = 100 \text{ mA, } I_B = 10 \text{ mA)}$

QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

ABSOLUTE MAXIMUM RATINGS

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

Collector to Base Voltage	V_{CB0}	25	V
Collector to Emitter Voltage	V_{CE0}	16	V
Emitter to Base Voltage	V_{EB0}	6	V
Collector to Base Voltage	I_C	500	mA
Maximum Power Dissipation			
Total Power Dissipation at 25°C Ambient Temperature	P_T	150	mW
Maximum Temperatures			
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$

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

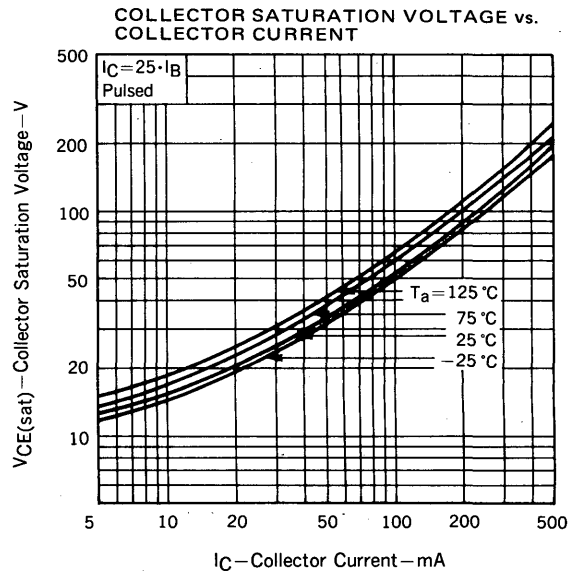
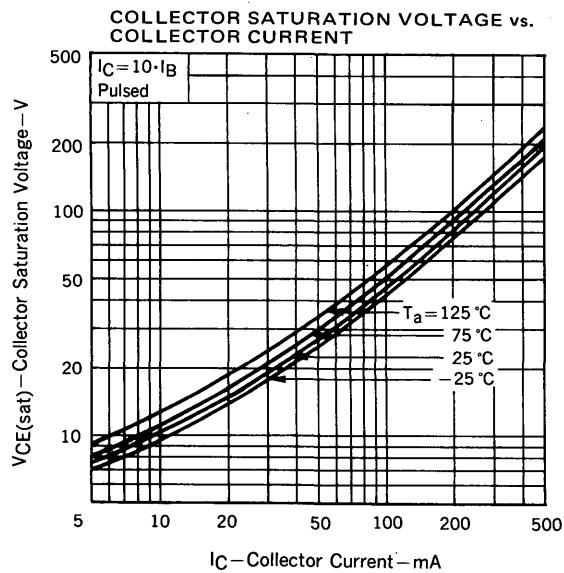
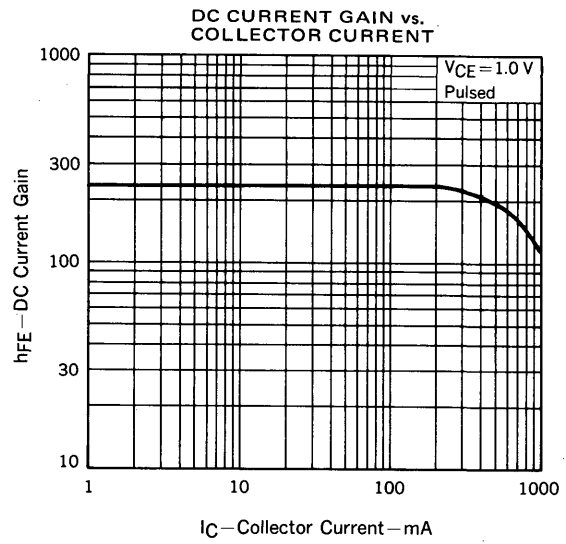
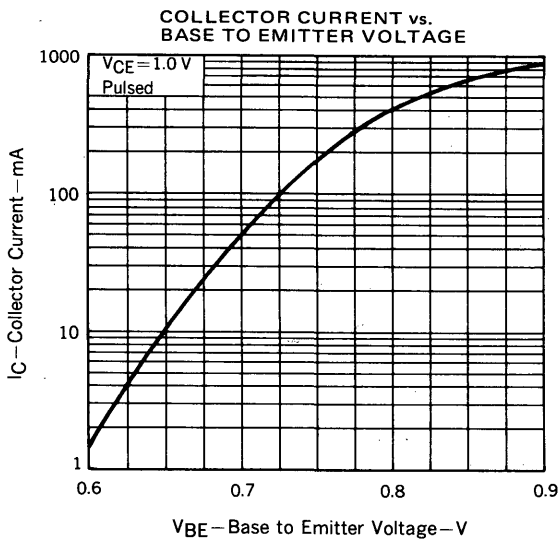
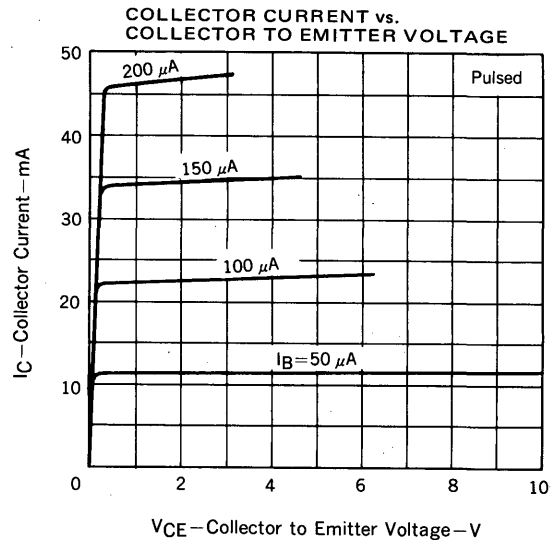
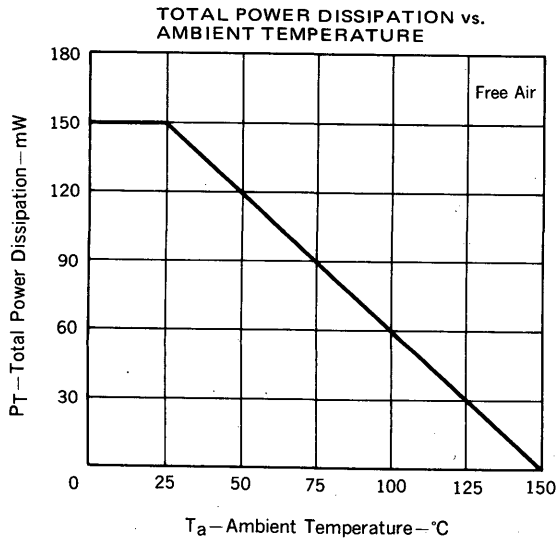
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CB0}			100	nA	$V_{CB} = 16 \text{ V, } I_E = 0$
Emitter Cutoff Current	I_{EB0}			100	nA	$V_{EB} = 6.0 \text{ V, } I_C = 0$
DC Current Gain	h_{FE1}^*	110	200	600	-	$V_{CE} = 1.0 \text{ V, } I_C = 100 \text{ mA}$
DC Current Gain	h_{FE2}^*	100			-	$V_{CE} = 1.0 \text{ V, } I_C = 500 \text{ mA}$
Collector Saturation Voltage	$V_{CE(sat)1}^*$		45	100	mV	$I_C = 100 \text{ mA, } I_B = 10 \text{ mA}$
Collector Saturation Voltage	$V_{CE(sat)2}^*$		200	300	mV	$I_C = 500 \text{ mA, } I_B = 20 \text{ mA}$
Base to Emitter Voltage	V_{BE}^*	600	650	700	mV	$V_{CE} = 1.0 \text{ V, } I_C = 10 \text{ mA}$
Gain Bandwidth Product	f_T	50			MHz	$V_{CE} = 3.0 \text{ V, } I_E = -100 \text{ mA}$
Output Capacitance	C_{ob}			15	pF	$V_{CB} = 10 \text{ V, } I_E = 0, f = 1.0 \text{ MHz}$

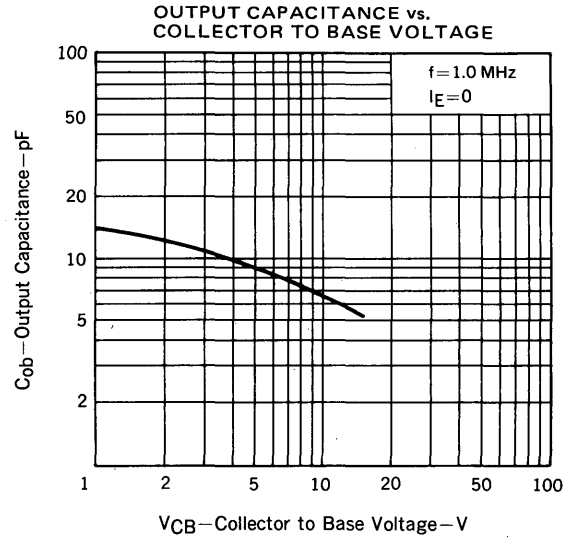
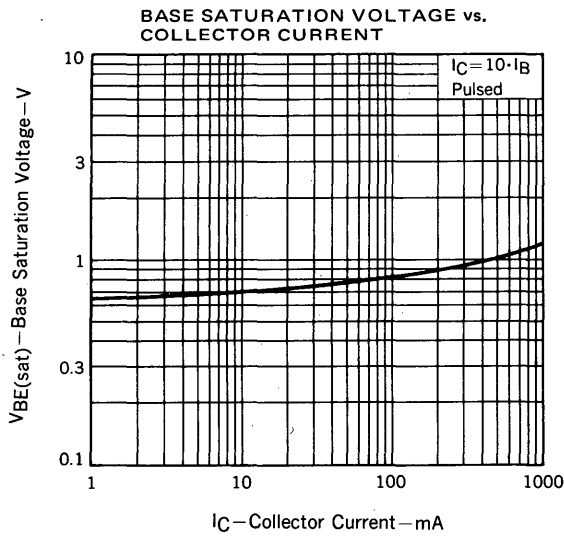
* Pulsed: $PW \leq 350 \mu\text{s, Duty Cycle} \leq 2\%$

h_{FE} Classification

MARKING	D42	D43	D44	D45
h_{FE}	110 to 240	190 to 320	270 to 400	350 to 600

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





RECOMMENDED SOLDERING CONDITIONS

Mounting of this product by soldering should be done under the following conditions.
Please consult our representatives about soldering methods and conditions other than these.

SURFACE MOUNT TYPE

For details of the recommended soldering conditions, see the information document "SMT MANUAL" (IEI-1207).

Soldering Method	Soldering Conditions	Symbol for Recommended Conditions
Infrared Reflow	Package peak temp.: 230 °C Soldering time: within 30 sec (above 210 °C) Soldering times: 1, Days limitation: none*	IR30-00
Vapor Phase Soldering	Package peak temp.: 215 °C Soldering time: within 40 sec (above 200 °C) Soldering times: 1, Days limitation: none*	VP15-00
Wave Soldering	Soldering bath temp.: below 260 °C Soldering time: within 10 sec Soldering times: 1, Days limitation: none*	WS60-00

*: Stored days under storage conditions at 25 °C and below 65 % R.H. after the dry-pack has been opened.

Note 1 Combination of soldering methods should be avoided.

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Application examples recommended by NEC Corporation

Standard: Data processing and office equipment, Communication equipment (terminal, mobile), Test and Measurement equipment, Audio and Video equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Communication equipment (trunk line), Train and Traffic control devices, industrial robots, Burning control systems, antidisaster systems, anticrime systems etc.