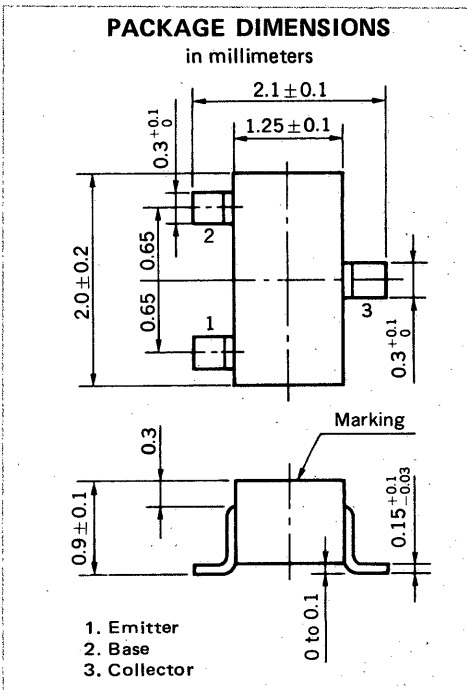


**NPN SILICON EPTAXIAL TRANSISTOR**  
**AUDIO FREQUENCY AMPLIFIER**

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

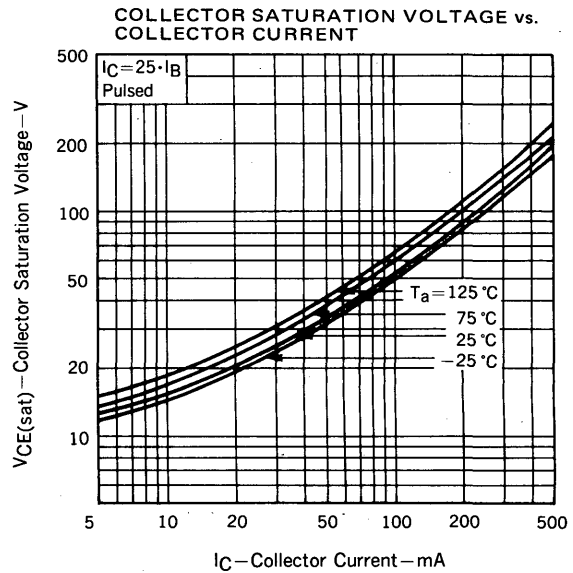
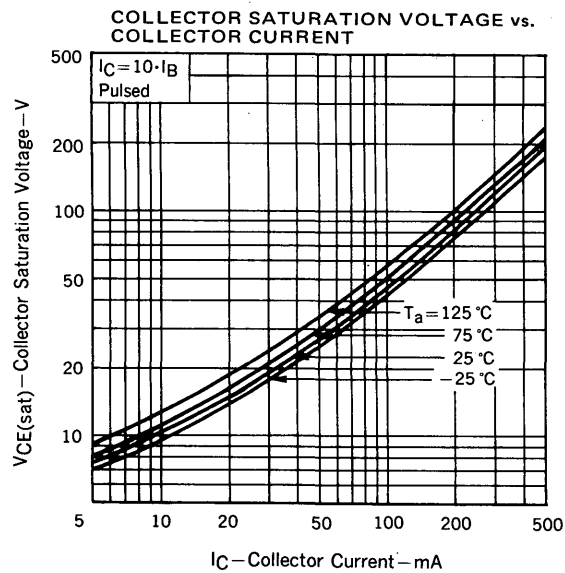
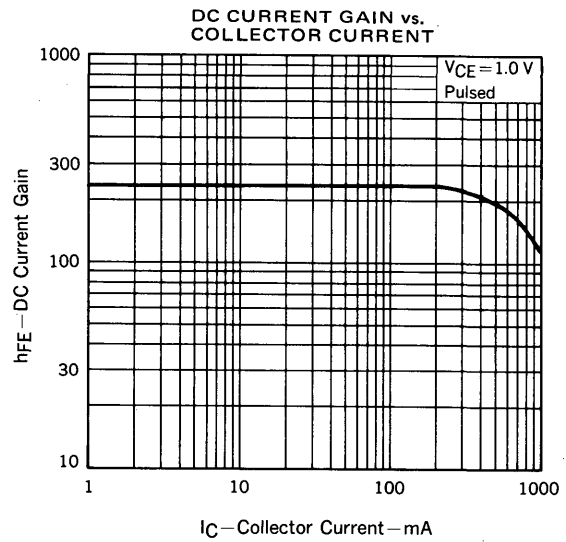
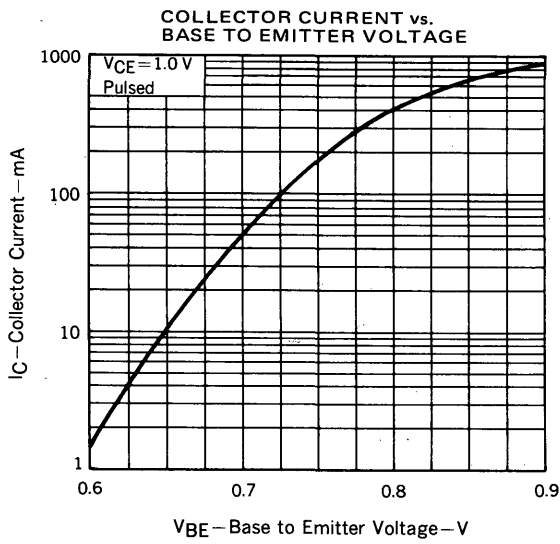
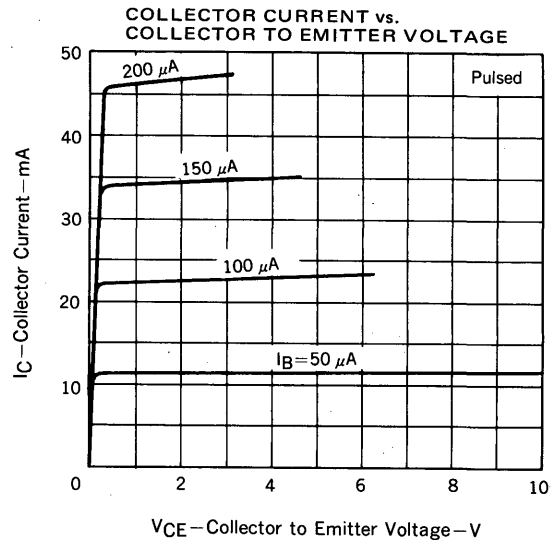
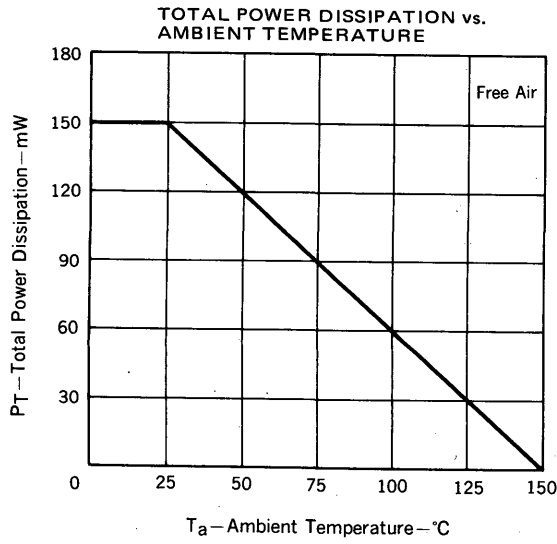
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	$I_{CB0}$			100	nA	$V_{CB} = 16 \text{ V, } I_E = 0$
Emitter Cutoff Current	$I_{EB0}$			100	nA	$V_{EB} = 6.0 \text{ V, } I_C = 0$
DC Current Gain	$h_{FE1}^*$	110	200	600	-	$V_{CE} = 1.0 \text{ V, } I_C = 100 \text{ mA}$
DC 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	$V_{CB} = 10 \text{ V, } I_E = 0, f = 1.0 \text{ MHz}$

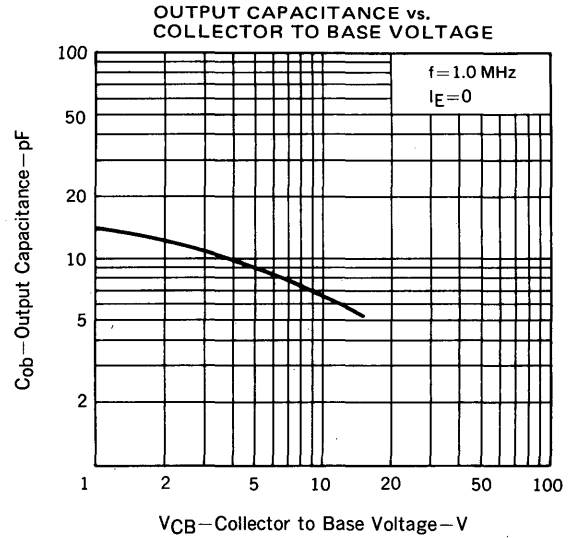
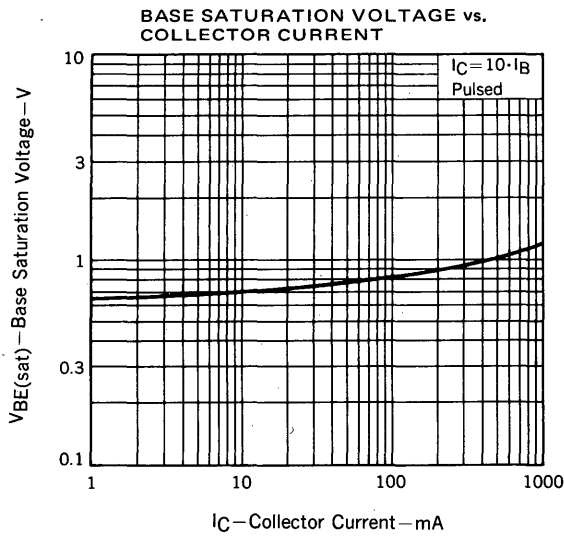
\* Pulsed:  $PW \leq 350 \mu\text{s, Duty Cycle} \leq 2\%$

**$h_{FE}$  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.

[MEMO]

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The devices listed in this document are not suitable for use in the field where very high reliability is required including, but not limited to, aerospace equipment, submarine cables, nuclear reactor control systems and life support systems. If customers intend to use NEC devices for above applications or those intended to use "Standard", or "Special" quality grade NEC devices for the applications not intended by NEC, please contact our sales people in advance.

**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.