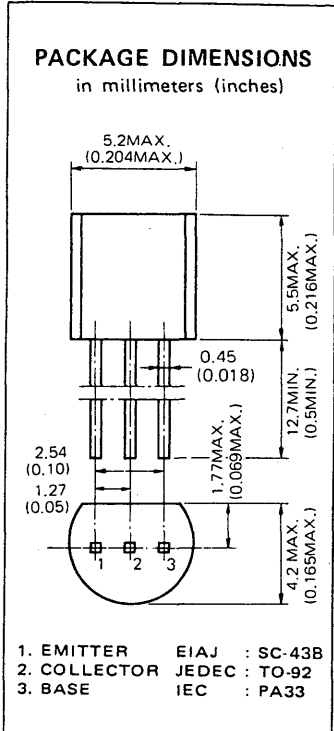


**DESCRIPTION** The 2SA990 is designed for use in driver stage of AF amplifier.

**FEATURE** • High  $h_{FE}$ .  $h_{FE} : 400 \text{ TYP. } (V_{CE} = -6.0 \text{ V, } I_C = -1.0 \text{ mA})$

**ABSOLUTE MAXIMUM RATINGS**

- Maximum Temperatures
  - Storage Temperature . . . . .  $-55 \text{ to } +125 \text{ }^\circ\text{C}$
  - Junction Temperature . . . . .  $+125 \text{ }^\circ\text{C}$  Maximum
- Maximum Power Dissipation ( $T_a = 25 \text{ }^\circ\text{C}$ )
  - Total Power Dissipation . . . . . 250 mW
- Maximum Voltages and Currents ( $T_a = 25 \text{ }^\circ\text{C}$ )
  - $V_{CBO}$  Collector to Base Voltage . . . . .  $-60 \text{ V}$
  - $V_{CEO}$  Collector to Emitter Voltage . . . . .  $-50 \text{ V}$
  - $V_{EBO}$  Emitter to Base Voltage . . . . .  $-5.0 \text{ V}$
  - $I_C$  Collector Current . . . . .  $-100 \text{ mA}$
  - $I_B$  Base Current . . . . .  $-20 \text{ mA}$



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

| SYMBOL        | CHARACTERISTIC               | MIN.  | TYP.  | MAX.  | UNIT | TEST CONDITIONS                                                                                                                                 |
|---------------|------------------------------|-------|-------|-------|------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| $h_{FE1}$     | DC Current Gain              | 150   | 380   |       | —    | $V_{CE} = -6.0 \text{ V, } I_C = -0.1 \text{ mA}$                                                                                               |
| $h_{FE2}$     | DC Current Gain              | 200   | 400   | 800   | —    | $V_{CE} = -6.0 \text{ V, } I_C = -1.0 \text{ mA}$                                                                                               |
| $f_T$         | Gain Bandwidth Product       | 50    | 180   |       | MHz  | $V_{CE} = -6.0 \text{ V, } I_E = 1.0 \text{ mA}$                                                                                                |
| $C_{ob}$      | Output Capacitance           |       | 4.5   | 6.0   | pF   | $V_{CB} = -10 \text{ V, } I_E = 0, f = 1.0 \text{ MHz}$                                                                                         |
| NV            | Noise Voltage                |       | 25    | 40    | mV   | $V_{CE} = -5.0 \text{ V, } I_C = -1.0 \text{ mA, } R_G = 100 \text{ k}\Omega,$<br>$G_V = 80 \text{ dB, } f = 10 \text{ Hz to } 1.0 \text{ kHz}$ |
| $I_{CBO}$     | Collector Cutoff Current     |       |       | -100  | nA   | $V_{CB} = -60 \text{ V, } I_E = 0$                                                                                                              |
| $I_{EBO}$     | Emitter Cutoff Current       |       |       | -100  | nA   | $V_{EB} = -5.0 \text{ V, } I_C = 0$                                                                                                             |
| $V_{BE}$      | Base to Emitter Voltage      | -0.58 | -0.62 | -0.68 | V    | $V_{CE} = -6.0 \text{ V, } I_C = -1.0 \text{ mA}$                                                                                               |
| $V_{CE(sat)}$ | Collector Saturation Voltage |       | -0.18 | -0.30 | V    | $I_C = -100 \text{ mA, } I_B = -10 \text{ mA}$                                                                                                  |

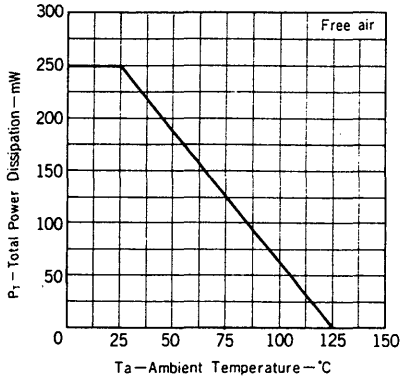
**Classification of  $h_{FE2}$**

| Rank  | P         | F         | E         |
|-------|-----------|-----------|-----------|
| Range | 200 - 400 | 300 - 600 | 400 - 800 |

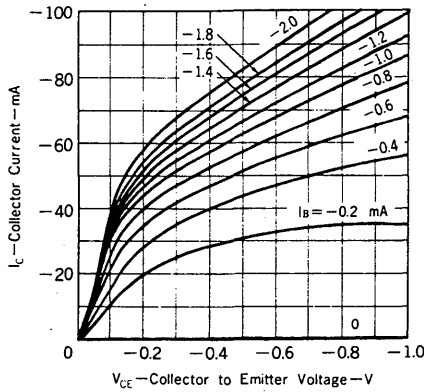
$h_{FE2}$  Test Conditions :  $V_{CE} = -6.0 \text{ V, } I_C = -1.0 \text{ mA}$

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

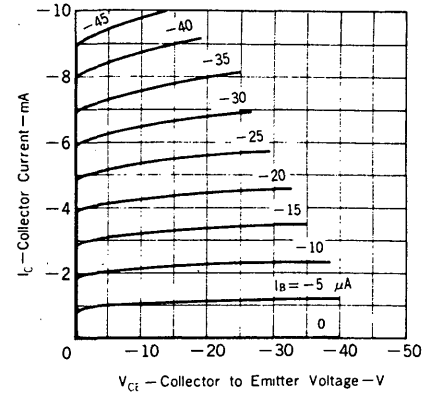
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



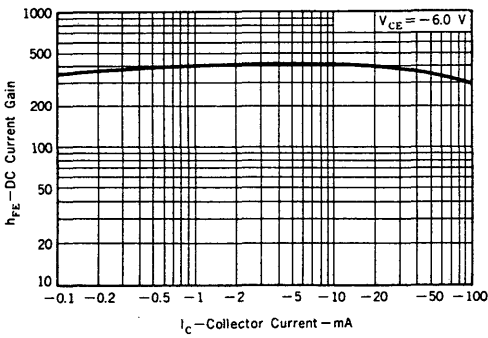
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



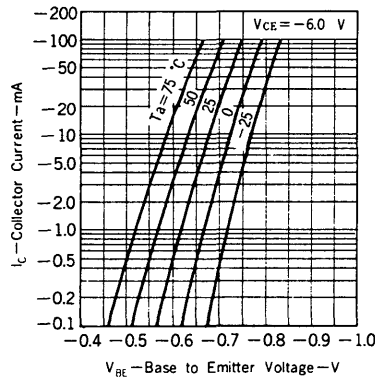
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



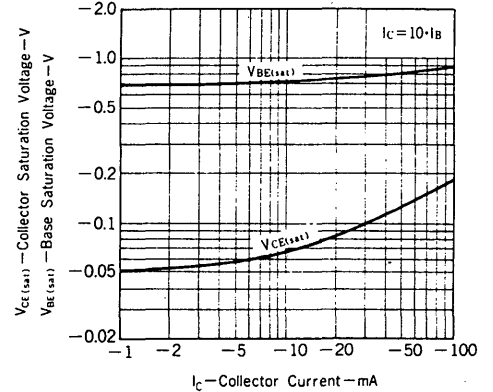
DC CURRENT GAIN vs. COLLECTOR CURRENT



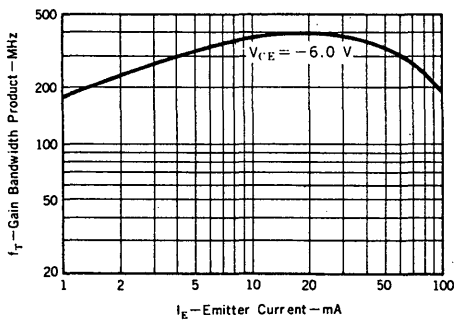
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



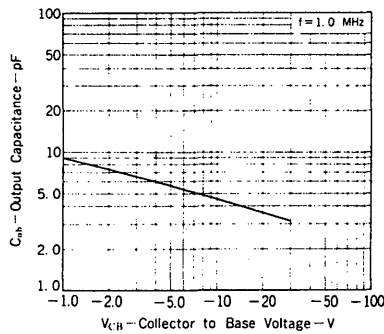
COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



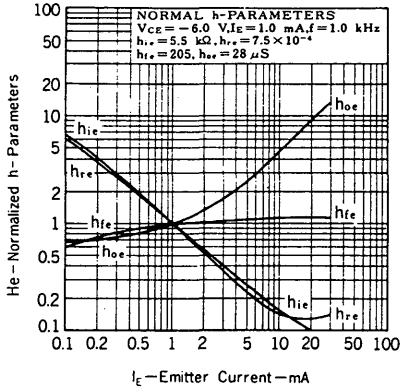
GAIN BANDWIDTH PRODUCT vs. EMITTER CURRENT



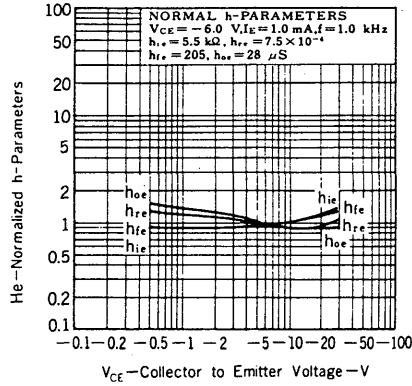
OUTPUT CAPACITANCE vs. REVERSE VOLTAGE



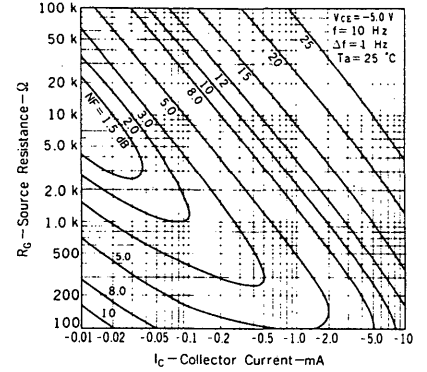
NORMALIZED h-PARAMETERS vs. EMITTER CURRENT



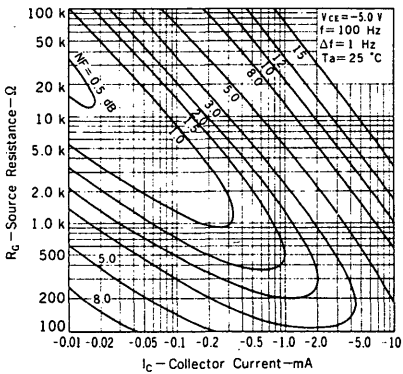
NORMALIZED h-PARAMETERS vs. COLLECTOR TO EMITTER VOLTAGE



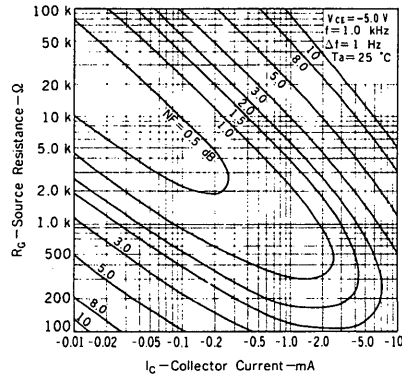
NOISE FIGURE MAP 1



NOISE FIGURE MAP 2



NOISE FIGURE MAP 3



NOISE FIGURE MAP 4

