# 2N3783 thru 2N3785
## (GERMANIUM)

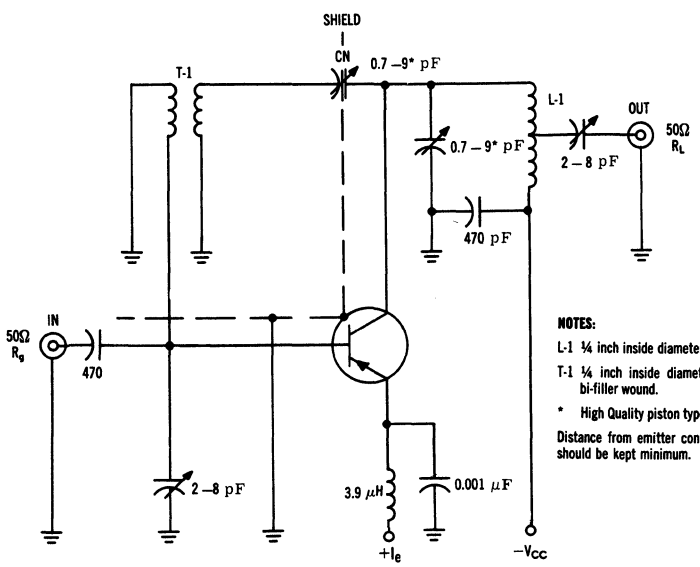
**CASE 20**
(TO-72)

PNP germanium epitaxial mesa transistors for high-gain, low-noise amplifier, oscillator and frequency multiplier applications.

MAXIMUM RATINGS

| Rating | Symbol | 2N3783 2N3784 | 2N3785 | Unit |
|---|---|---|---|---|
| Collector-Base Voltage | $V_{CB}$ | 30 | 15 | Vdc |
| Collector-Emitter Voltage | $V_{CES}$ | 30 | 15 | Vdc |
| Collector-Emitter Voltage | $V_{CEO}$ | 20 | 12 | Vdc |
| Emitter-Base Voltage | $V_{EB}$ | 0.5 | | Vdc |
| Collector Current | $I_C$ | 20 | | mAdc |
| Total Device Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 150<br>2.0 | | mW<br>mW/°C |
| Junction Operating & Storage Temperature Range | $T_J$, $T_{stg}$ | -65 to +100 | | °C |

**FIGURE 1 — 200 MHz TEST CIRCUIT: POWER GAIN & NOISE FIGURE**




**NOTES:**

L-1 ¼ inch inside diameter, ½ inch length, 4 turns #20 solid copper wire, center tapped.

T-1 ¼ inch inside diameter, close wound, 3 turns #26 solid copper wire. 1:1 ratio bi-filler wound.

* High Quality piston type capacitor.

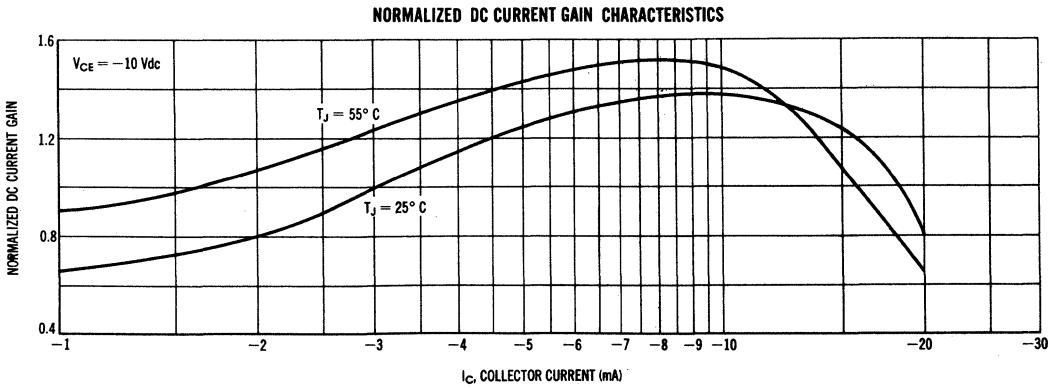
Distance from emitter contact of transistor to ground side of bypass capacitor should be kept minimum.

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | $I_C$ = 100 μAdc, $I_E$ = 0 | 2N3783, 2N3784<br>2N3785 | 30<br>15 | —<br>— | —<br>— | Vdc |
| Collector-Emitter Breakdown Voltage | $BV_{CES}$ | $I_C$ = 100 μAdc, $V_{EB}$ = 0 | 2N3783, 2N3784<br>2N3785 | 30<br>15 | —<br>— | —<br>— | Vdc |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | $I_C$ = 2 mAdc, $I_B$ = 0 | 2N3783, 2N3784<br>2N3785 | 20<br>12 | —<br>— | —<br>— | Vdc |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | $I_E$ = 100 μAdc, $I_C$ = 0 | All Types | 0.5 | — | — | Vdc |
| Collector Cutoff Current | $I_{CBO}$ | $V_{CB}$ = 10 Vdc, $I_E$ = 0<br>$V_{CB}$ = 10 Vdc, $I_E$ = 0, $T_A$ = +55°C | All Types<br>2N3783, 2N3784 | —<br>— | —<br>— | 5.0<br>50 | μAdc |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$ = 0.5 Vdc, $I_C$ = 0 | All Types | — | — | 100 | μAdc |
| DC Forward Current Transfer Ratio | $h_{FE}$ | $V_{CE}$ = 10 Vdc, $I_C$ = 3 mAdc | 2N3783, 2N3784<br>2N3785 | 20<br>15 | —<br>— | 200<br>200 | — |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 5.0 mAdc, $I_B$ = 1.0 mAdc | 2N3783, 2N3784<br>2N3785 | —<br>— | —<br>— | 0.25<br>0.35 | Vdc |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | $I_C$ = 5.0 mAdc, $I_B$ = 1.0 mAdc | 2N3783, 2N3784<br>2N3785 | —<br>— | —<br>— | 0.55<br>0.65 | Vdc |
| Small-Signal Forward Current Transfer Ratio | $h_{fe}$ | $I_C$ = 3 mAdc, $V_{CE}$ = 10 Vdc, f = 1 kHz | 2N3783, 2N3784<br>2N3785 | 20<br>15 | —<br>— | 200<br>200 | — |
| Current Gain - Bandwidth Product | $f_T$ | $I_C$ = 3 mAdc, $V_{CE}$ = 10 Vdc, f = 200 MHz | 2N3783<br>2N3784, 2N3785 | 800<br>700 | —<br>— | 1600<br>1600 | MHz |
| Collector-Base Time Constant | $r'_bC_c$ | $V_{CB}$ = 10 Vdc, $I_E$ = 3 mAdc, f = 31.8 MHz | 2N3783, 2N3784<br>2N3785 | 1.0<br>1.0 | —<br>— | 6.0<br>10 | ps |
| Collector-Base Capacitance | $C_{ob}$ | $V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 100 kHz | 2N3783, 2N3784<br>2N3785 | —<br>— | —<br>— | 1.0<br>1.2 | pF |
| Power Gain | $G_e$ | $V_{CE}$ = 10 Vdc, $I_C$ = 3 mAdc, f = 200 MHz | 2N3783, 2N3784<br>2N3785 | 20<br>18 | —<br>— | 33<br>33 | dB |
| Noise Figure | NF | $V_{CE}$ = 10 Vdc, $I_C$ = 3 mAdc, f = 200 MHz<br>$R_G$ = 50 ohms | 2N3783<br>2N3784<br>2N3785 | —<br>—<br>— | —<br>—<br>— | 2.2<br>2.5<br>2.9 | dB |
| Power Gain (AGC) Note 1 | $G_e$(AGC) | $V_{CE}$ = 10 Vdc, $I_C$ = 15 mAdc, f = 200 MHz | 2N3783<br>2N3784, 2N3785 | —<br>— | —<br>0 | 0<br>— | dB |
| Noise Figure | NF | $V_{CE}$ = 10 Vdc, $I_C$ = 3 mAdc, f = 1000 MHz<br>$R_G$ = 50 ohms (Note 2) | 2N3783<br>2N3784<br>2N3785 | —<br>—<br>— | —<br>7.0<br>7.5 | 6.5<br>—<br>— | dB |

NOTE 1: AGC is obtained by increasing $I_C$. The circuit remains adjusted for $V_{CE}$ = 10 Vdc and $I_C$ = 3 mAdc.

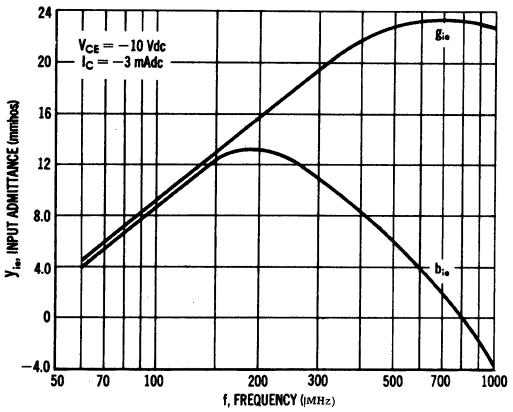
NOTE 2: This Noise Figure was obtained using Hewlett-Packard Type 342A Noise Figure Meter and Type 349A Noise Source.



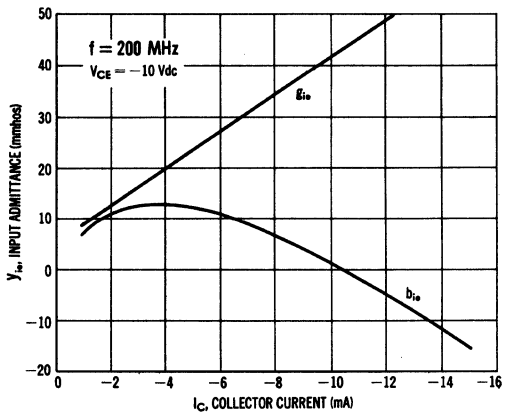
## $y_{ie}$, INPUT ADMITTANCE CHARACTERISTICS

($T_A$ = 25° C unless otherwise noted)

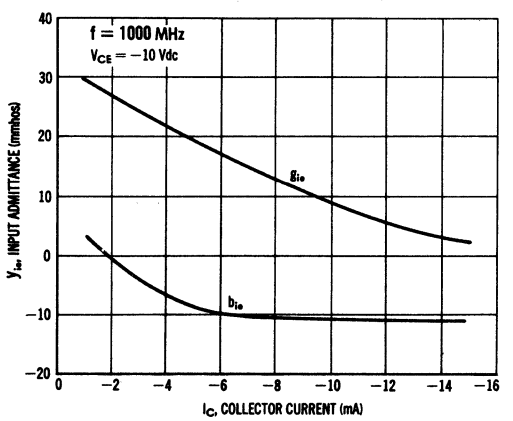
### INPUT ADMITTANCE versus FREQUENCY




### INPUT ADMITTANCE versus COLLECTOR CURRENT



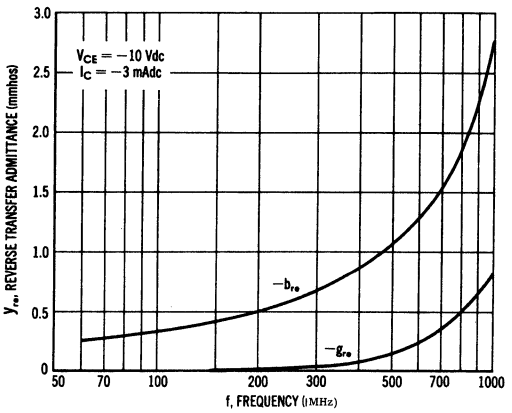

### INPUT ADMITTANCE versus COLLECTOR CURRENT



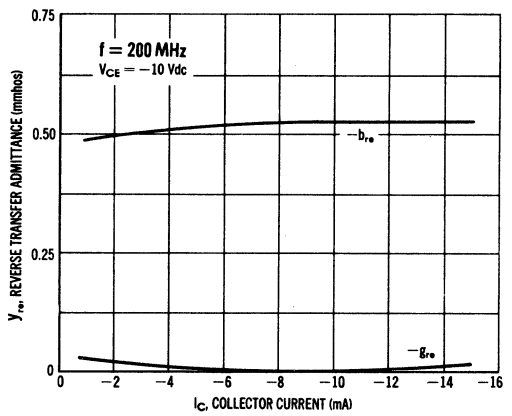

## $y_{re}$, REVERSE TRANSFER ADMITTANCE CHARACTERISTICS

($T_A$ = 25° C unless otherwise noted)

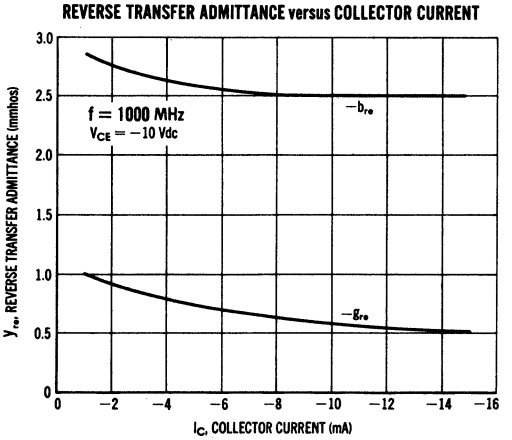
### REVERSE TRANSFER ADMITTANCE versus FREQUENCY




### REVERSE TRANSFER ADMITTANCE versus COLLECTOR CURRENT



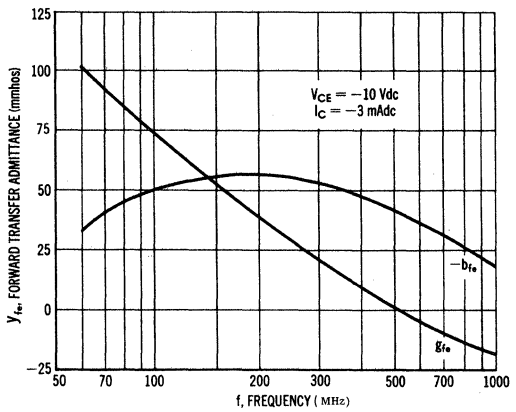

### REVERSE TRANSFER ADMITTANCE versus COLLECTOR CURRENT



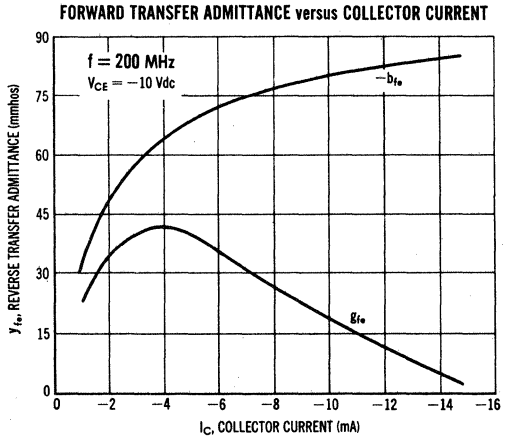
## $y_{fe}$, FORWARD TRANSFER ADMITTANCE CHARACTERISTICS

($T_A$ = 25° C unless otherwise noted)

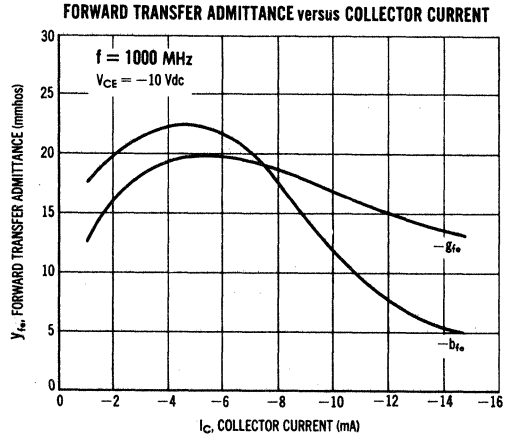
**FORWARD TRANSFER ADMITTANCE versus FREQUENCY**




**FORWARD TRANSFER ADMITTANCE versus COLLECTOR CURRENT**



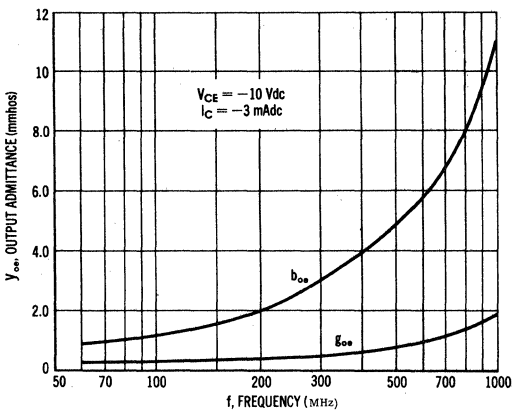

**FORWARD TRANSFER ADMITTANCE versus COLLECTOR CURRENT**



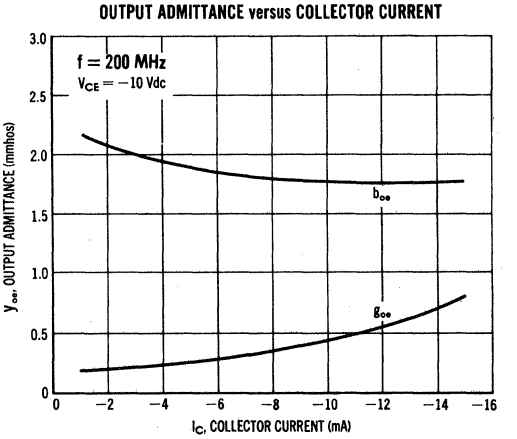

## $y_{oe}$, OUTPUT ADMITTANCE CHARACTERISTICS

($T_A$ = 25° C unless otherwise noted)

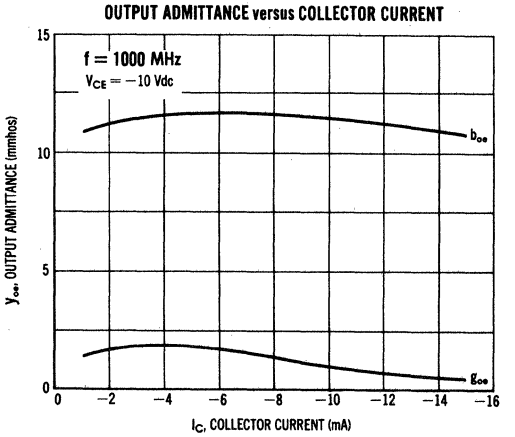
**OUTPUT ADMITTANCE versus FREQUENCY**



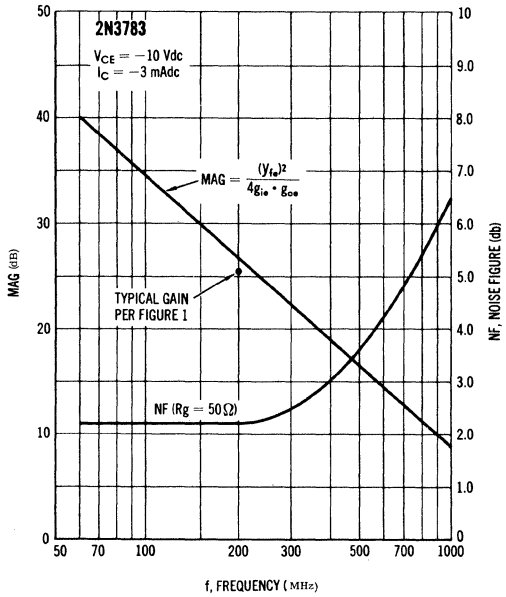

**OUTPUT ADMITTANCE versus COLLECTOR CURRENT**



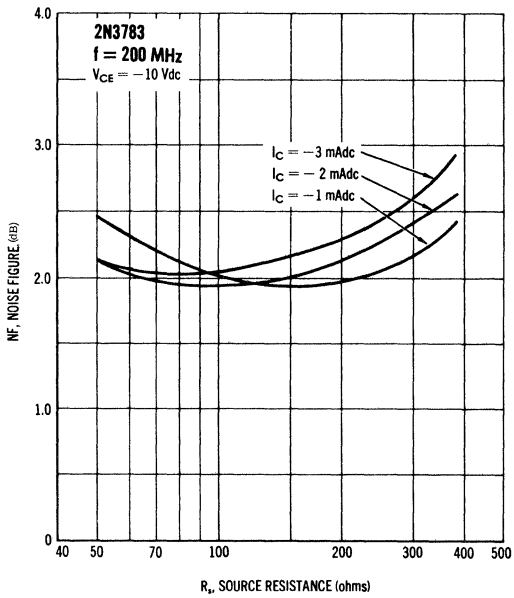

**OUTPUT ADMITTANCE versus COLLECTOR CURRENT**



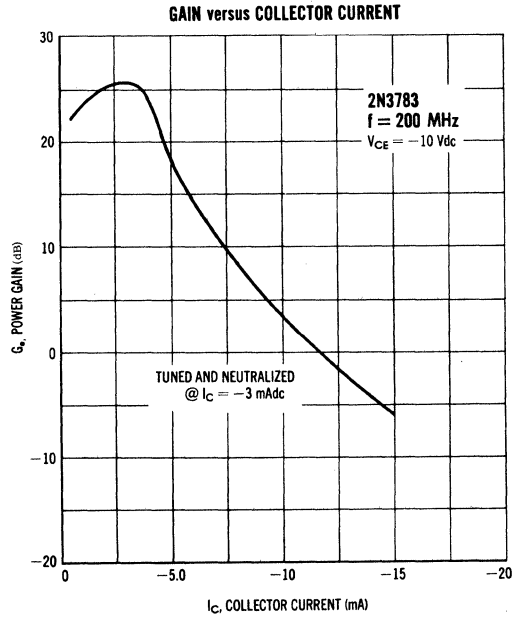
**MAG & MAXIMUM NF versus FREQUENCY**




**NOISE FIGURE versus SOURCE RESISTANCE**




**GAIN versus COLLECTOR CURRENT**




**CONTOURS OF CURRENT-GAIN — BANDWIDTH PRODUCT — $f_T$**