

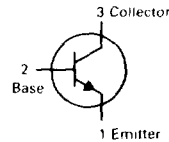
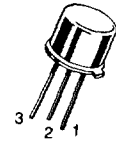
### MAXIMUM RATINGS

Rating	Symbol	2N3019 2N3020	2N3700	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	80	80	V <sub>dc</sub>
Collector-Base Voltage	V <sub>CBO</sub>	140	140	V <sub>dc</sub>
Emitter-Base Voltage	V <sub>EBO</sub>	7.0	7.0	V <sub>dc</sub>
Collector Current — Continuous	I <sub>C</sub>	1.0	1.0	A <sub>dc</sub>
Total Device Dissipation (at T <sub>A</sub> = 25°C Derate above 25°C)	P <sub>D</sub>	0.8 4.6	0.5 2.85	Watts mW/°C
Total Device Dissipation (at T <sub>C</sub> = 25°C Derate above 25°C)	P <sub>D</sub>	5.0 28.6	1.8 10.6	Watts mW/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-65 to +200		°C

### THERMAL CHARACTERISTICS

Characteristic	Symbol	2N3019 2N3020	2N3700	Unit
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	217	350	°C/W
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	35	97	°C/W

**2N3019★**  
**2N3020**  
CASE 79-04, STYLE 1  
TO-39 (TO-205AD)



**2N3700★**  
CASE 22-03, STYLE 1  
TO-18 (TO-206AA)



**GENERAL TRANSISTORS**

**NPN SILICON**

★2N3019 and 2N3700  
are Motorola designated  
preferred devices.

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage(1) (I <sub>C</sub> = 30 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	80	—	V <sub>dc</sub>
Collector-Base Breakdown Voltage (I <sub>C</sub> = 100 μA <sub>dc</sub> , I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	140	—	V <sub>dc</sub>
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μA <sub>dc</sub> , I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	7.0	—	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 90 V <sub>dc</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = 90 V <sub>dc</sub> , I <sub>E</sub> = 0, T <sub>A</sub> = +150°C)	I <sub>CBO</sub>	—	0.01 10	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>EB</sub> = 5.0 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	0.010	μA <sub>dc</sub>
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 0.1 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )	h <sub>FE</sub>	50	—	—
		30	100	
(I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )(1)		90	—	
		40	120	
(I <sub>C</sub> = 150 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )(1)		100	300	
		40	120	
(I <sub>C</sub> = 150 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , T <sub>C</sub> = -55°C)(1)	40	—		
(I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )(1)	50	—		
	30	100		
(I <sub>C</sub> = 1.0 A <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> )(1)	All Types	15	—	
Collector-Emitter Saturation Voltage(1) (I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B</sub> = 15 mA <sub>dc</sub> ) (I <sub>C</sub> = 500 mA <sub>dc</sub> , I <sub>B</sub> = 50 mA <sub>dc</sub> )	V <sub>CE(sat)</sub>	—	0.2 0.5	V <sub>dc</sub>
Base-Emitter Saturation Voltage(1) (I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B</sub> = 15 mA <sub>dc</sub> )	V <sub>BE(sat)</sub>	—	1.1	V <sub>dc</sub>
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product (I <sub>C</sub> = 50 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f = 20 MHz)	f <sub>T</sub>	80	—	MHz
		100	400	

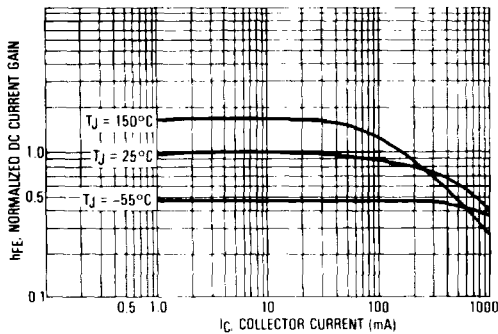
**2N3019 2N3020 2N3700**

**ELECTRICAL CHARACTERISTICS** (continued) ( $T_A = 25^\circ\text{C}$  unless otherwise noted.)

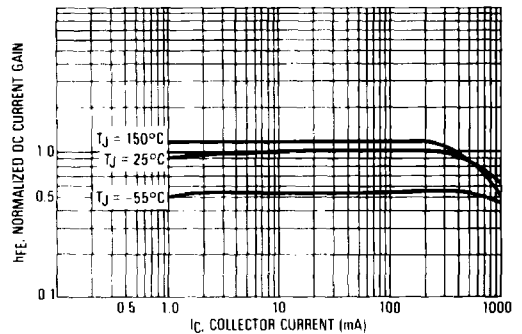
Characteristic	Symbol	Min	Max	Unit
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	—	12	pF
Input Capacitance ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	—	60	pF
Small-Signal Current Gain ( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	2N3700, 2N3019 30	2N3019 400	—
Collector Base Time Constant ( $I_E = 10\text{ mAdc}$ , $V_{CB} = 10\text{ Vdc}$ , $f = 79.8\text{ MHz}$ )	$rb'C_c$	2N3019, 2N3020 15	2N3020 400	ps
Noise Figure ( $I_C = 100\ \mu\text{Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $R_S = 1.0\text{ k ohms}$ , $f = 1.0\text{ kHz}$ )	NF	2N3019, 2N3700	4	dB

(1) Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 1.0\%$ .

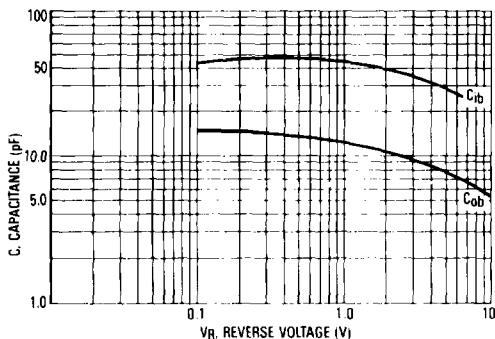
**DC CURRENT GAIN**  
2N3019, 2N3700



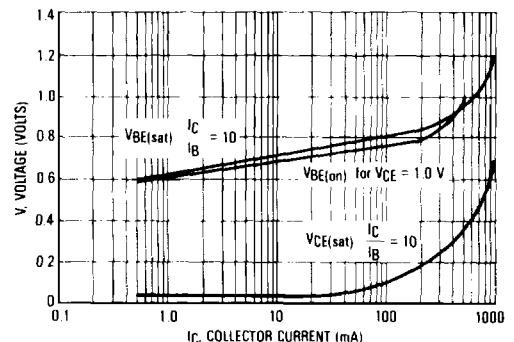
**DC CURRENT GAIN**  
2N3020



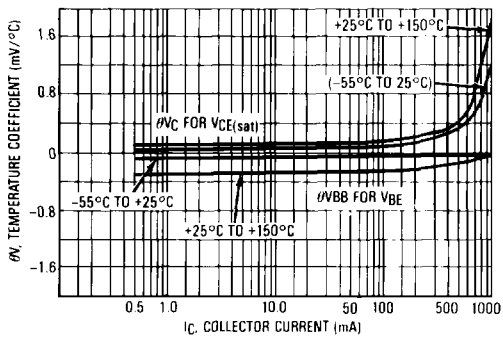
**CAPACITANCE**



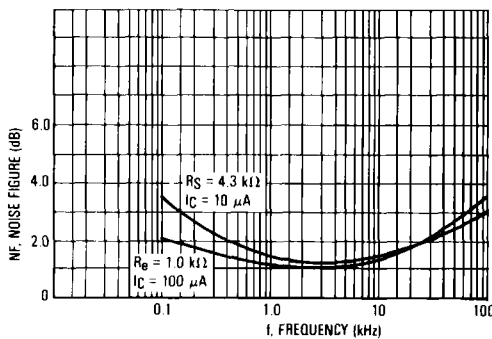
**"ON" VOLTAGES**



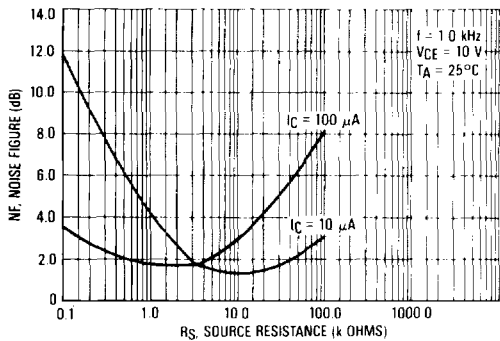
TEMPERATURE COEFFICIENTS



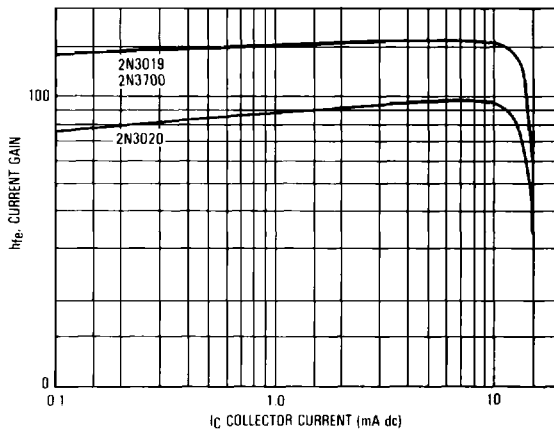
FREQUENCY EFFECTS



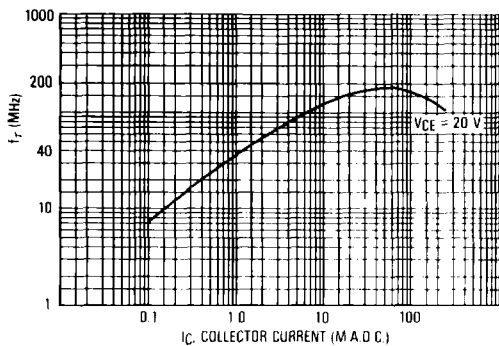
SOURCE RESISTANCE EFFECTS



CURRENT GAIN BANDWIDTH PRODUCT versus COLLECTOR CURRENT — 1 kHz  $h_{fe}$



CURRENT GAIN — BANDWIDTH PRODUCT



ACTIVE REGION SAFE OPERATING AREA

