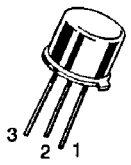
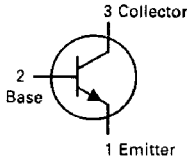
2N3019★
2N3020

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.

MAXIMUM RATINGS

Rating	Symbol	2N3019 2N3020	2N3700	Unit
Collector-Emitter Voltage	V_{CEO}	80	80	Vdc
Collector-Base Voltage	V_{CBO}	140	140	Vdc
Emitter-Base Voltage	V_{EBO}	7.0	7.0	Vdc
Collector Current — Continuous	I_C	1.0	1.0	Adc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	0.8 4.6	0.5 2.85	Watts mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6	1.8 10.6	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	2N3019 2N3020	2N3700	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	217	350	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	35	97	°C/W

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

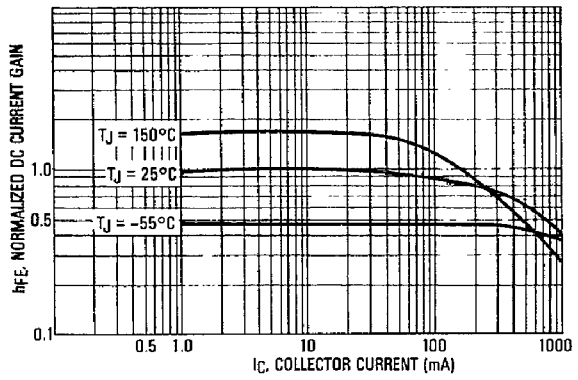
Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(1) (I_C = 30 mAdc, I_B = 0)		$V_{(BR)CEO}$	80	—	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)		$V_{(BR)CBO}$	140	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)		$V_{(BR)EBO}$	7.0	—	Vdc
Collector Cutoff Current (V_{CB} = 90 Vdc, I_E = 0) (V_{CB} = 90 Vdc, I_E = 0, T_A = +150°C)		I_{CBO}	— —	0.01 10	μAdc
Emitter Cutoff Current (V_{EB} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	0.010	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.1 mAdc, V_{CE} = 10 Vdc)	2N3700, 2N3019 2N3020	h_{FE}	50 30	— 100	—
(I_C = 10 mAdc, V_{CE} = 10 Vdc)(1)	2N3700, 2N3019 2N3020		90 40	— 120	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)(1)	2N3700, 2N3019 2N3020		100 40	300 120	
(I_C = 150 mAdc, V_{CE} = 10 Vdc, T_C = −55°C)(1)	2N3700, 2N3019		40	—	
(I_C = 500 mAdc, V_{CE} = 10 Vdc)(1)	2N3700, 2N3019 2N3020		50 30	— 100	
(I_C = 1.0 Adc, V_{CE} = 10 Vdc)(1)	All Types		15	—	
Collector-Emitter Saturation Voltage(1) (I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)		$V_{CE(sat)}$	— —	0.2 0.5	Vdc
Base-Emitter Saturation Voltage(1) (I_C = 150 mAdc, I_B = 15 mAdc)		$V_{BE(sat)}$	—	1.1	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 50 mAdc, V_{CE} = 10 Vdc, f = 20 MHz)	2N3020 2N3019, 2N3700	f_T	80 100	— 400	MHz

ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

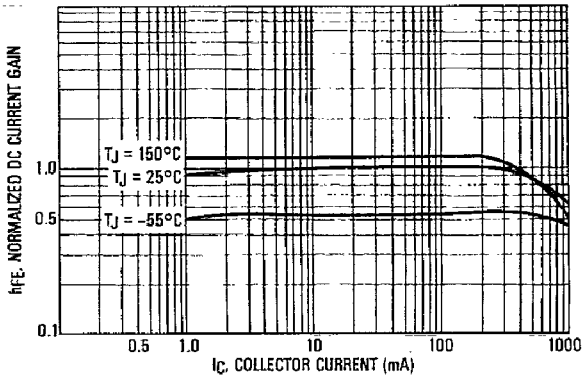
Characteristic		Symbol	Min	Max	Unit
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{obo}	—	12	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz		C_{ibo}	—	60	pF
Small-Signal Current Gain (I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	2N3700, 2N3019 2N3020	h_{fe}	80 30	400 200	—
Collector Base Time Constant (I_E = 10 mAdc, V_{CB} = 10 Vdc, f = 79.8 MHz)	2N3019, 2N3020 2N3700	$rb'C_c$	— 15	400 400	ps
Noise Figure (I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 1.0 k ohms, f = 1.0 kHz)	2N3019, 2N3700	NF	—	4	dB

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 1.0%.

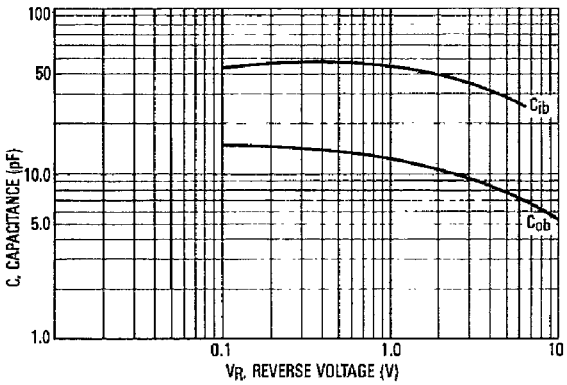
DC CURRENT GAIN
2N3019, 2N3700



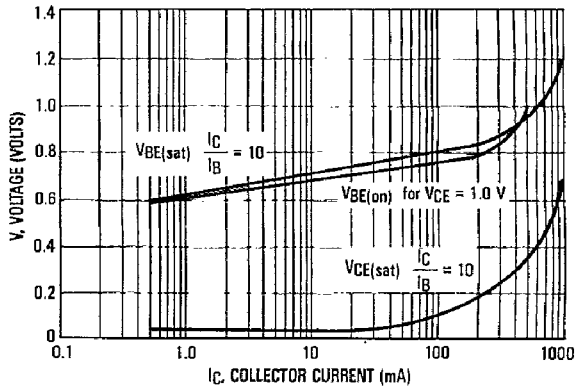
DC CURRENT GAIN
2N3020



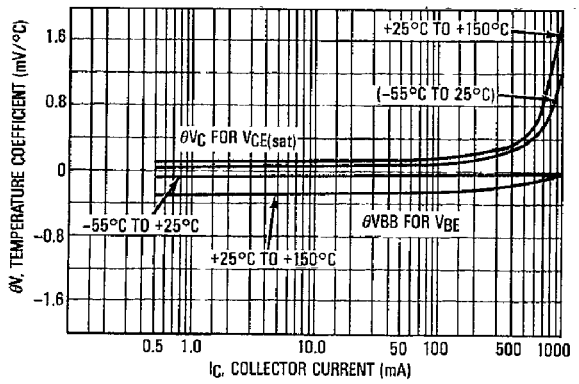
CAPACITANCE



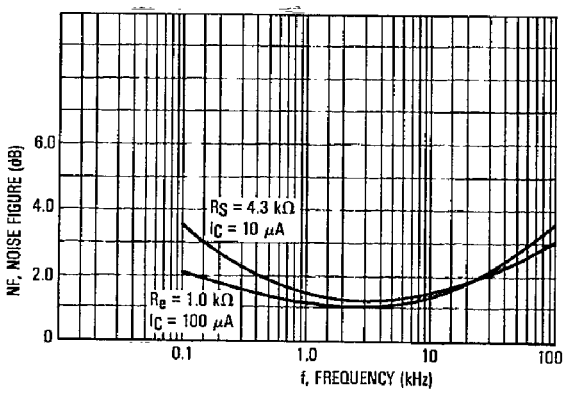
"ON" VOLTAGES



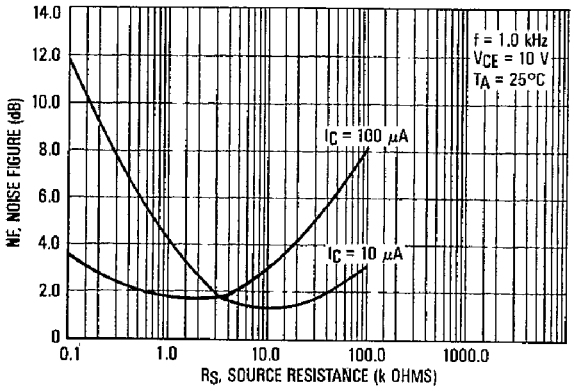
TEMPERATURE COEFFICIENTS



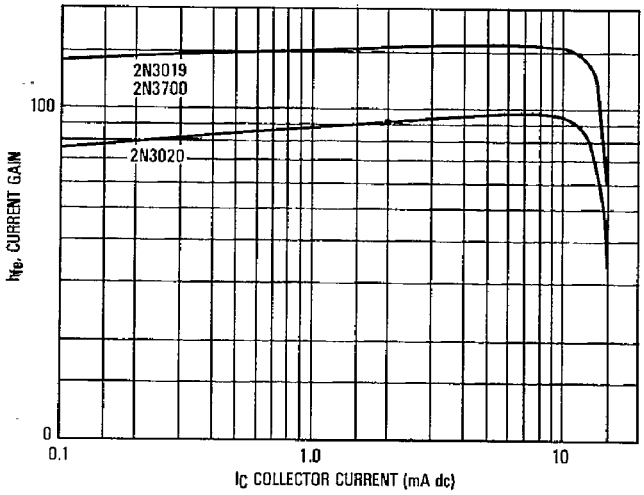
FREQUENCY EFFECTS



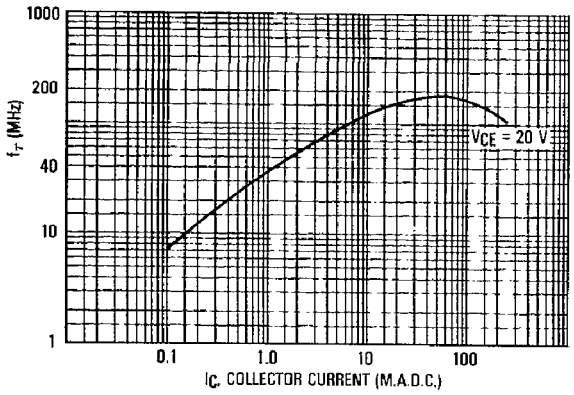
SOURCE RESISTANCE EFFECTS



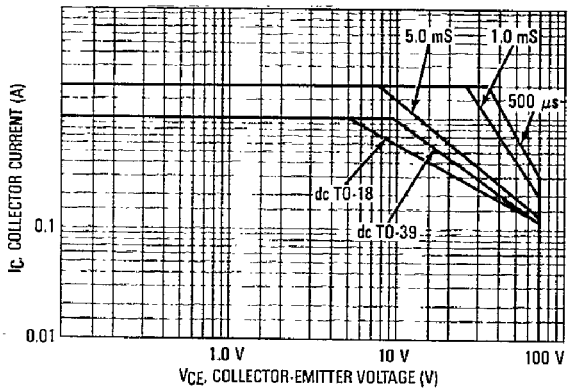
CURRENT GAIN BANDWIDTH PRODUCT versus COLLECTOR CURRENT — 1 kHz h_{fe}



CURRENT GAIN — BANDWIDTH PRODUCT

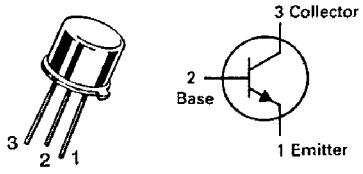


ACTIVE REGION SAFE OPERATING AREA



2N3053, A

CASE 79-04, STYLE 1
TO-39 (TO-205AD)



GENERAL PURPOSE TRANSISTORS
NPN SILICON

Refer to 2N3019 for graphs.

MAXIMUM RATINGS

Rating	Symbol	2N3053	2N3053A	Unit
Collector-Emitter Voltage(1)	V_{CEO}	40	60	Vdc
Collector-Base Voltage	V_{CBO}	60	80	Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current — Continuous	I_C	700		mAdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6		Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	35	°C/W

(1) Applicable 0 to 100 mA (Pulsed):
Pulse Width ≤ 300 μsec., Duty Cycle ≤ 2.0%.
0 to 700 mA; Pulse Width ≤ 10 μsec., Duty Cycle ≤ 2.0%.

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 100 μAdc, I_B = 0)	2N3053 2N3053A	$V_{(BR)CEO}$	 40 60	 — —	Vdc
Collector-Emitter Breakdown Voltage(2) (I_C = 100 mAdc, R_{BE} = 10 ohms)	2N3053 2N3053A	$V_{(BR)CER}$	 50 70	 — —	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	2N3053 2N3053A	$V_{(BR)CBO}$	 60 80	 — —	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)		$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current (V_{CE} = 30 Vdc, $V_{EB(off)}$ = 1.5 Vdc) (V_{CE} = 60 Vdc, $V_{EB(OFF)}$ = 1.5 Vdc)	2N3053 2N3053A	I_{CEX}	—	0.25	μAdc
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0)	2N3053	I_{EBO}	—	0.25	μAdc
Base Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N3053 2N3053A	I_{BL}	—	0.25	μAdc
ON CHARACTERISTICS(2)					
DC Current Gain (I_C = 150 mAdc, V_{CE} = 2.5 Vdc) (I_C = 150 mAdc, V_{CE} = 10 Vdc)		h_{FE}	25 50	— 250	—
Collector-Emitter Saturation Voltage (I_C = 150 mAdc, I_B = 15 mAdc)	2N3053 2N3053A	$V_{CE(sat)}$	 — —	 1.4 0.3	Vdc
Base-Emitter Saturation Voltage (I_C = 150 mAdc, I_B = 15 mAdc)	2N3053 2N3053A	$V_{BE(sat)}$	 — 0.6	 1.7 1.0	Vdc
Base-Emitter On Voltage (I_C = 150 mAdc, V_{CE} = 2.5 Vdc)	2N3053 2N3053A	$V_{BE(on)}$	 — —	 1.7 1.0	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 50 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)		f_T	100	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{obo}	—	15	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)		C_{ibo}	—	80	pF

(2) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.