

SEMICONDUCTOR TECHNICAL DATA

2N3019S
2N3057A
2N3700.

**NPN Silicon
Small-Signal Transistors**

...designed for general-purpose switching and amplifier applications.

CRYSTALONCS
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MAXIMUM RATINGS						
Rating	Symbol	2N3019S	2N3057A	2N3700	Unit	
Collector-Base Voltage	V _{CBO}		140		Vdc	
Collector-Emitter Voltage	V _{CEO}		80		Vdc	
Emitter-Base Voltage	V _{EBO}		7.0		Vdc	
Collector Current	I _C		1.0		Adc	
Device Dissipation	P _T				Watts	
@ T _A = 25 C		0.8	0.4	0.5	Watts	
Derate above 25 C		4.6	2.3	2.85	mW/ C	
@ T _C = 25 C		5.0	1.8	1.8	Watts	
Derate above 25 C		28.6	10.3	10.3	mW/ C	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-65 to 200			C	

ELECTRICAL CHARACTERISTICS (T _C = 25 C unless otherwise noted)				
Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ⁽¹⁾ (I _C = 30 mAdc)	V _{(BR)CEO}	80	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 100 μAdc)	V _{(BR)EBO}	7.0	—	Vdc
Collector-Base Breakdown Voltage (I _C = 100 μAdc)	V _{(BR)CBO}	140	—	Vdc
Collector Cutoff Current (V _{CE} = 90 Vdc)	I _{CES}	—	10	nAdc
(V _{CE} = 90 Vdc, T _A = 150 C)		—	10	μAdc
Emitter Cutoff Current (V _{BE} = 5.0 Vdc)	I _{EBO}	—	10	nAdc

(1) Pulsed Pulse Width: 25% to 45%; Duty Cycle: 10% to 20%

continued



2N3019S
CASE 79-04, STYLE 1
TO-205AD (TO-38)



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



2N3057A
CASE 26-03, STYLE 1
TO-206AB (TO-46)

2N3019S JAN, 2N3057A JAN, 2N3700JAN SERIES

ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ unless otherwise noted.)				
Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain ($V_{CE} = 10\text{ Vdc}$, $I_C = 150\text{ mAdc}$) ⁽¹⁾ ($V_{CE} = 10\text{ Vdc}$, $I_C = 0.1\text{ mAdc}$) ($V_{CE} = 10\text{ Vdc}$, $I_C = 10\text{ mAdc}$) ⁽¹⁾ ($V_{CE} = 10\text{ Vdc}$, $I_C = 500\text{ mAdc}$) ⁽¹⁾ ($V_{CE} = 10\text{ Vdc}$, $I_C = 1.0\text{ mAdc}$) ($V_{CE} = 10\text{ Vdc}$, $I_C = 150\text{ mAdc}$, $T_A = -65^\circ\text{C}$) ⁽¹⁾	h_{FE}	100 50 90 50 15 40	300 200 — 200 — —	—
Collector-Emitter Saturation Voltage ⁽¹⁾ ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	$V_{CE(sat)}$	— —	0.2 0.5	Vdc
Base-Emitter Saturation Voltage ⁽¹⁾ ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$)	$V_{BE(sat)}$	—	1.1	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Small-Signal Current Gain ($V_{CE} = 5.0\text{ Vdc}$, $I_C = 1.0\text{ mAdc}$, $f = 1.0\text{ kHz}$) ($V_{CE} = 10\text{ Vdc}$, $I_C = 50\text{ mAdc}$, $f = 20\text{ MHz}$)	h_{fe}	80 5.0	400 20	—
Input Capacitance ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 0.1$ to 1.0 MHz)	C_{ibo}	—	60	pF
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1$ to 1.0 MHz)	C_{obo}	—	12	pF
Noise Figure ($V_{CE} = 10\text{ Vdc}$, $I_C = 100\text{ }\mu\text{Adc}$, $f = 1.0\text{ kHz}$ $R_G = 1.0\text{ kohm}$, Pwr. B.W. = 200 Hz)	NF	—	4.0	dB
Collector Base Time Constant ($V_{CB} = 10\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $f = 79.8\text{ MHz}$)	$t_b' C_c$	—	400	ps
SWITCHING CHARACTERISTICS (See Figure 21)				
Turn-On + Turn-Off Time	$t_{on} + t_{off}$	—	30	ns
SAFE OPERATING AREA				
DC Tests ($T_C = 25^\circ\text{C}$, $t \geq 10\text{ ms}$, one cycle)				
Test 1 ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) 2N3019 ($I_C = 180\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) 2N3700, 2N3057A				
Test 2 ($I_C = 125\text{ mAdc}$, $V_{CE} = 40\text{ Vdc}$) 2N3019 ($I_C = 45\text{ mAdc}$, $V_{CE} = 40\text{ Vdc}$) 2N3700, 2N3057A				
Test 3 ($I_C = 60\text{ mAdc}$, $V_{CE} = 80\text{ Vdc}$) 2N3019 ($I_C = 22.5\text{ mAdc}$, $V_{CE} = 80\text{ Vdc}$) 2N3700, 2N3057A				
END POINT ELECTRICAL MEASUREMENTS				
Collector-Emitter Cutoff Current ($V_{CE} = 90\text{ Vdc}$) (Relaxed Limit)	I_{CES}	—	20	nAdc
Collector-Base Saturation Voltage ⁽¹⁾ ($I_C = 150\text{ Vdc}$, $I_B = 15\text{ mAdc}$)	$V_{CE(sat)}$	—	0.2	Vdc
DC Current Gain ⁽¹⁾ ($V_{CE} = 10\text{ Vdc}$, $I_C = 150\text{ mAdc}$)	h_{FE}	100	300	—

⁽¹⁾ Pulsed Pulse Width 250 to 350 μs Duty Cycle 1.0 to 2.0%

ASSURANCE TESTING (Pre/Post Burn-In)				
Burn-In Conditions: $T_A = 25 \pm 5^\circ\text{C}$, $V_{CB} = 60\text{ Vdc}$, 10 Vdc JANS				
$P_T = 600\text{ mW}$ 2N3019S, 400 mW 2N3057A, 500 mW 2N3700				
Characteristics Tested	Symbol	Initial and End Point Limits		Unit
		Min	Max	
Collector Cutoff Current ($V_{CE} = 90\text{ Vdc}$)	I_{CES}	—	10	nAdc
DC Current Gain ⁽¹⁾ ($V_{CE} = 10\text{ Vdc}$, $I_C = 150\text{ mAdc}$)	h_{FE}	100	300	—
Delta from Pre-Burn-In Measured Values		Min	Max	
Delta Collector Cutoff Current	ΔI_{CES}	—	± 100 or ± 5.0 whichever is greater	% of Initial Value nAdc
Delta DC Current Gain ⁽¹⁾	Δh_{FE}	—	± 15	% of Initial Value

⁽¹⁾ Pulsed Pulse Width 250 to 350 μs Duty Cycle 1.0 to 2.0%