

**SEMICONDUCTOR
TECHNICAL DATA**

**2N3019SJAN, JTX, JTXV, JANS
2N3057AJAN, JTX, JTXV, JANS
2N3700JAN, JTX, JTXV, JANS**

Processed per MIL-S-19500/391

**NPN Silicon
Small-Signal Transistors**

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

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Datasheet.Live

| 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 |
| @ $T_A = 25^\circ\text{C}$ | | 0.8 | 0.4 | 0.5 | Watts |
| Derate above 25°C | | 4.6 | 2.3 | 2.65 | mW/°C |
| @ $T_C = 25^\circ\text{C}$ | | 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 ($T_C = 25^\circ\text{C}$ unless otherwise noted.) | | | | | |
|---|---------------|-----|-----|-----------------|--|
| Characteristic | Symbol | Min | Max | Unit | |
| OFF CHARACTERISTICS | | | | | |
| Collector-Emitter Breakdown Voltage ⁽¹⁾ ($I_C = 30\text{ mAdc}$) | $V_{(BR)CEO}$ | 80 | — | Vdc | |
| Emitter-Base Breakdown Voltage ($I_E = 100\ \mu\text{Adc}$) | $V_{(BR)EBO}$ | 7.0 | — | Vdc | |
| Collector-Base Breakdown Voltage ($I_C = 100\ \mu\text{Adc}$) | $V_{(BR)CBO}$ | 140 | — | Vdc | |
| Collector Cutoff Current ($V_{CE} = 90\text{ Vdc}$) ($V_{CE} = 90\text{ Vdc}, T_A = 150^\circ\text{C}$) | I_{CES} | — | 10 | nAdc | |
| | | — | 10 | μAdc | |
| Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$) | I_{EBO} | — | 10 | nAdc | |



2N3019S
CASE 79-04, STYLE 1
TO-205AD (TO-39)



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



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

(continued)

| ELECTRICAL CHARACTERISTICS — continued (T _C = 25°C unless otherwise noted.) | | | | |
|--|------------------------------------|-----------------------------------|----------------------------------|------|
| Characteristic | Symbol | Min | Max | Unit |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (V _{CE} = 10 Vdc, I _C = 150 mAdc) ⁽¹⁾ (V _{CE} = 10 Vdc, I _C = 0.1 mAdc) (V _{CE} = 10 Vdc, I _C = 10 mAdc) ⁽¹⁾ (V _{CE} = 10 Vdc, I _C = 500 mAdc) ⁽¹⁾ (V _{CE} = 10 Vdc, I _C = 1.0 mAdc) (V _{CE} = 10 Vdc, I _C = 150 mAdc, T _A = -65°C) ⁽¹⁾ | h _{FE} | 100 50 90 50 15 40 | 300 200 — 200 — — | — |
| 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 | | | | |
| Small-Signal Current Gain (V _{CE} = 5.0 Vdc, I _C = 1.0 mAdc, f = 1.0 kHz) (V _{CE} = 10 Vdc, I _C = 50 mAdc, f = 20 MHz) | h _{fe} | 80 5.0 | 400 20 | — |
| Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 0.1 to 1.0 MHz) | C _{ibo} | — | 60 | pF |
| Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 0.1 to 1.0 MHz) | C _{obo} | — | 12 | pF |
| Noise Figure (V _{CE} = 10 Vdc, I _C = 100 μA, f = 1.0 kHz R _G = 1.0 kohm, P _{wr} , B.W. = 200 Hz) | NF | — | 4.0 | dB |
| Collector Base Time Constant (V _{CB} = 10 Vdc, I _C = 10 mAdc, f = 79.6 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°C, t ≥ 10 ms, one cycle) | | | | |
| Test 1 (I _C = 500 mA, V _{CE} = 10 Vdc) 2N3019 (I _C = 180 mA, V _{CE} = 10 Vdc) 2N3700, 2N3057A | | | | |
| Test 2 (I _C = 125 mA, V _{CE} = 40 Vdc) 2N3019 (I _C = 45 mA, V _{CE} = 40 Vdc) 2N3700, 2N3057A | | | | |
| Test 3 (I _C = 60 mA, V _{CE} = 80 Vdc) 2N3019 (I _C = 22.5 mA, V _{CE} = 80 Vdc) 2N3700, 2N3057A | | | | |
| END POINT ELECTRICAL MEASUREMENTS | | | | |
| Collector-Emitter Cutoff Current (V _{CE} = 90 Vdc) (Relaxed Limit) | I _{CES} | — | 20 | nA |
| Collector-Base Saturation Voltage ⁽¹⁾ (I _C = 150 mA, I _B = 15 mA) | V _{CE(sat)} | — | 0.2 | Vdc |
| DC Current Gain ⁽¹⁾ (V _{CE} = 10 Vdc, I _C = 150 mA) | h _{FE} | 100 | 300 | — |

⁽¹⁾ Pulsed Pulse With 250 to 200 μs, Duty Cycle 1:1 to 2:1.

| ASSURANCE TESTING (Pre-Post Burn-In) | | | | |
|--|-------------------|------------------------------|---|--------------------------|
| Burn-In Conditions: T _A = 25 ± 5°C, V _{CB} = 80 Vdc, 10 Vdc JANS P _T = 600 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 Vdc) | I _{CES} | — | 10 | nA |
| DC Current Gain ⁽¹⁾ (V _{CE} = 10 Vdc, I _C = 150 mA) | h _{FE} | 100 | 300 | — |
| Delta from Pre-Burn-In Measured Values | | Min | Max | % of Initial Value nA |
| Delta Collector Cutoff Current | ΔI _{CES} | — | ±100 or ±5.0 whichever is greater | |
| Delta DC Current Gain ⁽¹⁾ | Δh _{FE} | — | ±15 | % of Initial Value |