

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

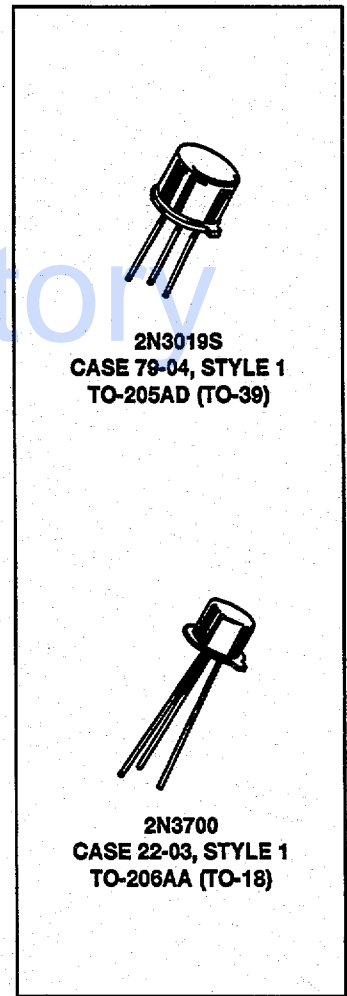
Processed per MIL-S-19500/391

**NPN Silicon**  
**Small-Signal Transistors**

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



| MAXIMUM RATINGS  |                                   |                           |                            |                                  |
|--|-----------------------------------|---------------------------|----------------------------|----------------------------------|
| Rating   | Symbol                            | 2N3019S                   | 2N3700                     | Unit                             |
| Collector-Base Voltage   | V <sub>CBO</sub>                  | 140                       |                            | V <sub>dc</sub>                  |
| Collector-Emitter Voltage  | V <sub>CEO</sub>                  | 80                        |                            | V <sub>dc</sub>                  |
| Emitter-Base Voltage   | V <sub>EBO</sub>                  | 7.0                       |                            | V <sub>dc</sub>                  |
| Collector Current  | I <sub>C</sub>                    | 1.0                       |                            | A <sub>dc</sub>                  |
| Device Dissipation<br>@ T <sub>A</sub> = 25°C<br>Derate above 25°C<br>@ T <sub>C</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 0.8<br>4.6<br>5.0<br>28.6 | 0.5<br>2.85<br>1.8<br>10.3 | Watts<br>mW/°C<br>Watts<br>mW/°C |
| Operating Junction and Storage<br>Temperature Range  | T <sub>J</sub> , T <sub>stg</sub> | - 65 to 200               |                            | °C                               |



| ELECTRICAL CHARACTERISTICS (T <sub>C</sub> = 25°C unless otherwise noted.)   |                      |     |          |                                      |
|--|----------------------|-----|----------|--------------------------------------|
| Characteristic   | Symbol               | Min | Max      | Unit                                 |
| <b>OFF CHARACTERISTICS</b>   |                      |     |          |                                      |
| Collector-Emitter Breakdown Voltage <sup>(1)</sup><br>(I <sub>C</sub> = 30 mA <sub>dc</sub> )  | V <sub>(BR)CEO</sub> | 80  | —        | V <sub>dc</sub>                      |
| Emitter-Base Breakdown Voltage<br>(I <sub>E</sub> = 100 μA <sub>dc</sub> )   | V <sub>(BR)EBO</sub> | 7.0 | —        | V <sub>dc</sub>                      |
| Collector-Base Breakdown Voltage<br>(I <sub>C</sub> = 100 μA <sub>dc</sub> )   | V <sub>(BR)CBO</sub> | 140 | —        | V <sub>dc</sub>                      |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 90 V <sub>dc</sub> )<br>(V <sub>CE</sub> = 90 V <sub>dc</sub> , T <sub>A</sub> = 150°C) | I <sub>CES</sub>     | —   | 10<br>10 | nA <sub>dc</sub><br>μA <sub>dc</sub> |
| Emitter Cutoff Current<br>(V <sub>BE</sub> = 5.0 V <sub>dc</sub> )   | I <sub>EBO</sub>     | —   | 10       | nA <sub>dc</sub>                     |

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

(continued)



**2N3019S and 2N3700 SERIES**

| <b>ELECTRICAL CHARACTERISTICS — continued</b> ( $T_C = 25^\circ\text{C}$ unless otherwise noted.)   |                    |                                   |                                  |      |
|---|--------------------|-----------------------------------|----------------------------------|------|
| Characteristic  | Symbol             | Min                               | Max                              | Unit |
| <b>ON CHARACTERISTICS</b>   |                    |                                   |                                  |      |
| DC Current Gain<br>( $V_{CE} = 10\text{ Vdc}, I_C = 150\text{ mAdc}$ ) <sup>(1)</sup><br>( $V_{CE} = 10\text{ Vdc}, I_C = 0.1\text{ mAdc}$ )<br>( $V_{CE} = 10\text{ Vdc}, I_C = 10\text{ mAdc}$ ) <sup>(1)</sup><br>( $V_{CE} = 10\text{ Vdc}, I_C = 500\text{ mAdc}$ ) <sup>(1)</sup><br>( $V_{CE} = 10\text{ Vdc}, I_C = 1.0\text{ mAdc}$ )<br>( $V_{CE} = 10\text{ Vdc}, I_C = 150\text{ mAdc}, T_A = -65^\circ\text{C}$ ) <sup>(1)</sup> | $h_{FE}$           | 100<br>50<br>90<br>50<br>15<br>40 | 300<br>200<br>—<br>200<br>—<br>— | —    |
| Collector-Emitter Saturation Voltage <sup>(1)</sup><br>( $I_C = 150\text{ mAdc}, I_B = 15\text{ mAdc}$ )<br>( $I_C = 500\text{ mAdc}, I_B = 50\text{ mAdc}$ )   | $V_{CE(sat)}$      | —<br>—                            | 0.2<br>0.5                       | Vdc  |
| Base-Emitter Saturation Voltage <sup>(1)</sup><br>( $I_C = 150\text{ mAdc}, I_B = 15\text{ mAdc}$ )   | $V_{BE(sat)}$      | —                                 | 1.1                              | Vdc  |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>   |                    |                                   |                                  |      |
| Small-Signal Current Gain<br>( $V_{CE} = 5.0\text{ Vdc}, I_C = 1.0\text{ mAdc}, f = 1.0\text{ kHz}$ )<br>( $V_{CE} = 10\text{ Vdc}, I_C = 50\text{ mAdc}, f = 20\text{ MHz}$ )  | $h_{fe}$           | 80<br>5.0                         | 400<br>20                        | —    |
| Input Capacitance<br>( $V_{EB} = 0.5\text{ Vdc}, I_C = 0, f = 0.1\text{ to }1.0\text{ MHz}$ )   | $C_{ibo}$          | —                                 | 60                               | pF   |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}, I_E = 0, f = 0.1\text{ to }1.0\text{ MHz}$ )   | $C_{obo}$          | —                                 | 12                               | pF   |
| Noise Figure<br>( $V_{CE} = 10\text{ Vdc}, I_C = 100\text{ }\mu\text{Adc}, f = 1.0\text{ kHz}$<br>$R_G = 1.0\text{ kohm}, P_{wr. B.W.} = 200\text{ Hz}$ )   | NF                 | —                                 | 4.0                              | dB   |
| Collector Base Time Constant<br>( $V_{CB} = 10\text{ Vdc}, I_C = 10\text{ mAdc}, f = 79.8\text{ MHz}$ )   | $\tau_b C_c$       | —                                 | 400                              | ps   |
| <b>SWITCHING CHARACTERISTICS</b> (See Section 4, Figure 9)  |                    |                                   |                                  |      |
| Turn-On + Turn-Off Time   | $t_{on} + t_{off}$ | —                                 | 30                               | ns   |

(1) Pulsed. Pulse Width 250 to 350  $\mu\text{s}$ , Duty Cycle 1.0 to 2.0%.

| <b>ASSURANCE TESTING (Pre/Post Burn-In)</b><br>Burn-In Conditions: $T_A = 25 \pm 5^\circ\text{C}, V_{CB} = 60\text{ Vdc}$ (10 Vdc JANS), $P_D = 600\text{ mW}$ 2N3019S, 500 mW 2N3700 |           |                              |     |      |
|---|-----------|------------------------------|-----|------|
| Characteristics Tested  | Symbol    | Initial and End Point Limits |     | Unit |
|   |           | Min                          | Max |      |
| Collector Cutoff Current<br>( $V_{CE} = 90\text{ Vdc}$ )  | $I_{CES}$ | —                            | 10  | nAdc |
| DC Current Gain <sup>(1)</sup><br>( $V_{CE} = 10\text{ Vdc}, I_C = 150\text{ mAdc}$ )   | $h_{FE}$  | 100                          | 300 | —    |

| Delta from Pre-Burn-In Measured Values |                  | Min | Max   |                            |
|--|------------------|-----|---|----------------------------|
| Delta Collector Cutoff Current         | $\Delta I_{CES}$ | —   | $\pm 100$<br>or $\pm 5.0$<br>whichever is greater | % of Initial Value<br>nAdc |
| Delta DC Current Gain <sup>(1)</sup>   | $\Delta h_{FE}$  | —   | $\pm 15$  | % of Initial Value         |

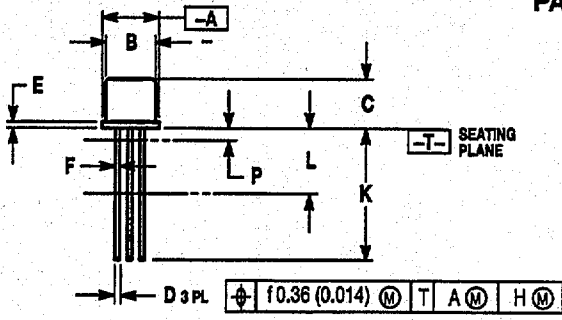
(1) Pulsed. Pulse Width 250 to 350  $\mu\text{s}$ , Duty Cycle 1.0 to 2.0%.

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# 2N3019S and 2N3700 SERIES

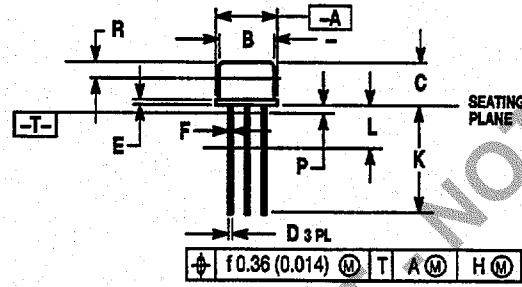
## PACKAGE DIMENSIONS



CASE 22-03  
TO-206AA  
(TO-18)

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIM J MEASURED FROM DIM A MAXIMUM.
  4. DIM F APPLIES BETWEEN DIM P AND L. DIM D APPLIES BETWEEN DIM L AND K MINIMUM. LEAD DIAMETER IS UNCONTROLLED IN DIM P AND BEYOND DIM K MINIMUM.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 5.31        | 5.84  | 0.209     | 0.230 |
| B   | 4.52        | 4.95  | 0.178     | 0.195 |
| C   | 4.32        | 5.33  | 0.170     | 0.210 |
| D   | 0.406       | 0.533 | 0.016     | 0.021 |
| E   | -           | 0.762 | -         | 0.030 |
| F   | 0.406       | 0.483 | 0.016     | 0.019 |
| G   | 2.54 BSC    | -     | 0.100 BSC | -     |
| H   | 0.914       | 1.17  | 0.036     | 0.046 |
| J   | 0.711       | 1.22  | 0.028     | 0.048 |
| K   | 12.70       | -     | 0.500     | -     |
| L   | 6.35        | -     | 0.250     | -     |
| M   | 45° BSC     | -     | 45° BSC   | -     |
| N   | 1.27        | -     | 0.050 BSC | -     |
| P   | -           | 1.27  | -         | 0.050 |



CASE 79-04  
TO-205AD  
(TO-39)

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION J MEASURED FROM DIMENSION A MAXIMUM.
  4. DIMENSION B SHALL NOT VARY MORE THAN 0.25 (0.010) IN ZONE R. THIS ZONE CONTROLLED FOR AUTOMATIC HANDLING.
  5. DIMENSION F APPLIES BETWEEN DIMENSION P AND L. DIMENSION D APPLIES BETWEEN DIMENSION L AND K MINIMUM. LEAD DIAMETER IS UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 8.51        | 9.39  | 0.335     | 0.370 |
| B   | 7.76        | 8.50  | 0.305     | 0.335 |
| C   | 6.10        | 6.60  | 0.240     | 0.260 |
| D   | 0.41        | 0.53  | 0.016     | 0.021 |
| E   | 0.23        | 1.04  | 0.009     | 0.041 |
| F   | 0.41        | 0.48  | 0.016     | 0.019 |
| G   | 5.08 BSC    | -     | 0.200 BSC | -     |
| H   | 0.72        | 0.86  | 0.028     | 0.034 |
| J   | 0.74        | 1.14  | 0.029     | 0.045 |
| K   | 12.70       | 19.05 | 0.500     | 0.750 |
| L   | 6.35        | -     | 0.250     | -     |
| M   | 45° BSC     | -     | 45° BSC   | -     |
| P   | -           | 1.27  | -         | 0.050 |
| R   | 2.54        | -     | 0.100     | -     |

- STYLE 1:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR
- STYLE 2:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

- STYLE 3:  
PIN 1. CATHODE  
2. GATE  
3. ANODE
- STYLE 4:  
PIN 1. MAIN TERM. 1  
2. GATE  
3. MAIN TERM. 2
- STYLE 5:  
PIN 1. COLLECTOR  
2. BASE  
3. EMITTER

- STYLE 6:  
PIN 1. SOURCE  
2. GATE  
3. DRAIN (CASE)
- STYLE 7:  
PIN 1. DRAIN  
2. GATE  
3. SOURCE
- STYLE 8:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

- STYLE 9:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE
- STYLE 10:  
PIN 1. COLLECTOR  
2. DRAIN  
3. BASE
- STYLE 11:  
PIN 1. ANODE  
2. OPEN  
3. CATHODE

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