Microsemi LAWRENCE

**TECHNICAL DATA**

# LOW POWER NPN SILICON TRANSISTOR

***Qualified per MIL-PRF-19500/391***

| ***Devices*** | | | ***Qualified Level*** |
|---|---|---|---|
| **2N3019** | **2N3057A** | **2N3700** | **JAN** |
| **2N3019S** | | **2N3700S** | **JANTX** |
| | | | **JANTXV** |
| | | | **JANS** |

**MAXIMUM RATINGS**

| Ratings | Symbol | Value | Units |
|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 80 | Vdc |
| Collector-Base Voltage | $V_{CBO}$ | 140 | Vdc |
| Emitter-Base Voltage | $V_{EBO}$ | 7.0 | Vdc |
| Collector Current | $I_C$ | 1.0 | Adc |
| Total Power Dissipation @ $T_A = +25^0C$[1] | $P_T$ | | W |
| 2N3019; 2N3019S | | 0.8 | |
| 2N3057A | | 0.4 | |
| 2N3700 | | 0.5 | |
| 2N3700UB | | 0.4 | |
| @ $T_C = +25^0C$[2] | | | W |
| 2N3019; 2N3019S | | 5.0 | |
| 2N3057A | | 1.8 | |
| 2N3700 | | 1.8 | |
| 2N3700UB | | 1.16 | |
| Operating & Storage Jct Temp Range | $T_J$, $T_{stg}$ | -55 to +175 | $^0C$ |

1) Derate linearly 4.6 mW/$^0$C for type 2N3019 and 2N3019S; 2.3 mW/$^0$C for type 2N3057A; 2.85 mW/$^0$C for type 2N3700; 6.6 mW/$^0$C for type 2N3700UB for $T_A \geq +25^0C$.
2) Derate linearly 28.6 mW/$^0$C for type 2N3019 and 2N3019S; 10.3 mW/$^0$C for types 2N3057A, 2N3700, & 2N3700UB for $T_C \geq +25^0C$.

TO-39* (TO-205AD)
2N3019, 2N3019S

TO- 18* (TO-206AA)
2N3700

TO-46* (TO-206AB)
2N3057A

3 PIN SURFACE MOUNT*
2N3700UB

*See appendix A for package outline

**ELECTRICAL CHARACTERISTICS ($T_A = 25^0C$ unless otherwise noted)**

| Characteristics | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector-Base Breakdown Voltage $I_C$ = 100 µAdc | $V_{(BR)CBO}$ | 140 | | Vdc |
| Emitter-Base Breakdown Voltage $I_E$ = 100 µAdc | $V_{(BR)EBO}$ | 7.0 | | Vdc |
| Collector-Emitter Breakdown Current $I_C$ = 30 mAdc | $V_{(BR)CEO}$ | 80 | | Vdc |

**ELECTRICAL CHARACTERISTICS (con't)**

| Characteristics | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS (con't)** | | | | |
| Collector-Emitter Cutoff Current<br>$V_{CE}$ = 90 Vdc | $I_{CES}$ | | 10 | ηAdc |
| Emitter-Base Cutoff Current<br>$V_{EB}$ = 5.0 Vdc | $I_{EBO}$ | | 10 | ηAdc |
| **ON CHARACTERISTICS (1)** | | | | |
| Forward-Current Transfer Ratio<br>$I_C$ = 150 mAdc, $V_{CE}$ = 10 Vdc<br>$I_C$ = 0.1 mAdc, $V_{CE}$ = 10 Vdc<br>$I_C$ = 10 mAdc, $V_{CE}$ = 10 Vdc<br>$I_C$ = 500 mAdc, $V_{CE}$ = 10 Vdc<br>$I_C$ = 1.0 Adc, $V_{CE}$ = 10 Vdc | $h_{FE}$ | <br>100<br>50<br>90<br>50<br>15 | <br>300<br>200<br><br>200<br> | |
| Collector-Emitter Saturation Voltage<br>$I_C$ = 150 mAdc, $I_B$ = 15 mAdc<br>$I_C$ = 500 mAdc, $I_B$ = 50 mAdc | $V_{CE(sat)}$ | | <br>0.2<br>0.5 | Vdc |
| Base-Emitter Saturation Voltage<br>$I_C$ = 150 mAdc, $I_B$ = 15 mAdc | $V_{BE(sat)}$ | | 1.1 | Vdc |
| **DYNAMIC CHARACTERISTICS** | | | | |
| Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C$ = 1.0 mAdc, $V_{CE}$ = 5.0 Vdc, f = 1.0 kHz | $h_{fe}$ | 80 | 400 | |
| Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C$ = 50 mAdc, $V_{CE}$ = 10 Vdc, f = 20 MHz | $\lvert h_{fe} \rvert$ | 5.0 | 20 | |
| Output Capacitance<br>$V_{CB}$ = 10 Vdc, $I_E$ = 0, 100 kHz ≤ f ≤ 1.0 MHz | $C_{obo}$ | | 12 | $p^f$ |
| Input Capacitance<br>$V_{EB}$ = 0.5 Vdc, $I_C$ = 0, 100 kHz ≤ f ≤ 1.0 MHz | $C_{ibo}$ | | 60 | pF |

**SAFE OPERATING AREA**

**DC Tests**

$T_C = 25^0$C, 1 Cycle, t = 10 ms

| | |
|---|---|
| **Test 1** | $V_{CE}$ = 10 Vdc |
| 2N3019, 2N3019S | $I_C$ = 500 mAdc |
| 2N3057A, 2N3700, 2N3700UB | $I_C$ = 180 mAdc |
| **Test 2** | $V_{CE}$ = 40 Vdc |
| 2N3019, 2N3019S | $I_C$ = 125 mAdc |
| 2N3057A, 2N3700, 2N3700UB | $I_C$ = 45 mAdc |
| **Test 3** | $V_{CE}$ = 80 Vdc |
| 2N3019, 2N3019S | $I_C$ = 60 mAdc |
| 2N3057A, 2N3700, 2N3700UB | $I_C$ = 22.5 mAdc |

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