RoHS
*Available on commercial versions*

# Low Power NPN Silicon Transistor

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

*Qualified Levels:*
*JAN, JANTX, JANTXV, and JANS*

## DESCRIPTION

This 2N3700UB NPN ceramic surface mount device is military qualified for high-reliability applications.

**Important:** For the latest information, visit our website http://www.microsemi.com.

## FEATURES

- Surface mount equivalent to JEDEC registered 2N3700 number.
- JAN, JANTX, JANTXV and JANS qualifications are available per MIL-PRF-19500/391.
- Rad hard levels are also available per MIL-PRF-19500/391. (See RHA datasheet for JANS_2N3700UB.)
- RoHS compliant versions available (commercial grade only).



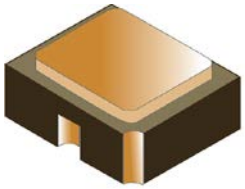
## APPLICATIONS / BENEFITS

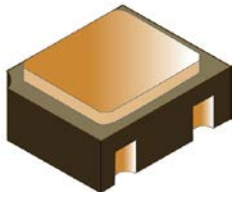
- Ceramic UB surface mount package.
- Lightweight.
- Low power.
- Military and other high-reliability applications.

## MAXIMUM RATINGS @ $T_A$ = +25 °C unless otherwise noted.

| Parameters/Test Conditions | Symbol | Value | Unit |
|---|---|---|---|
| Junction and Storage Temperature | $T_J$ and $T_{STG}$ | -65 to +200 | °C |
| Thermal Impedance Junction-to-Ambient | $R_{\Theta JA}$ | 325 | °C/W |
| Thermal Impedance Junction-to-Solder Pad | $R_{\Theta JSP}$ | 90 | °C/W |
| Collector-Emitter Voltage | $V_{CEO}$ | 80 | V |
| Collector-Base Voltage | $V_{CBO}$ | 140 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 7.0 | V |
| Collector Current | $I_C$ | 1.0 | A |
| Total Power Dissipation: @ $T_A$ = +25 °C (1) | $P_D$ | 0.5 | W |

**Notes:** 1. Derate linearly 6.6 mW/°C for $T_A \geq$ +25 °C.





**UB Package**

Also available in:

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

**TO-39 (TO-205AD)**
(leaded)
2N3019

**TO-5 package**
(leaded)
2N3019S

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

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**Website:**
www.microsemi.com

## MECHANICAL and PACKAGING

- CASE: Ceramic.
- TERMINALS: Gold plating over nickel under plate (hot solder dip optional for military).
- MARKING: Part number, date code, manufacturer's ID.
- TAPE & REEL option: Standard per EIA-481D. Consult factory for quantities.
- WEIGHT: < 0.04 grams.
- See Package Dimensions on last page.

## PART NOMENCLATURE

**JAN 2N3700 UB (e4)**

**Reliability Level**
JAN = JAN level
JANTX = JANTX level
JANTXV = JANTXV level
JANS = JANS level
Blank = Commercial

**JEDEC type number**
(see Electrical Characteristics table)

**RoHS Compliance**
e4 = RoHS compliant (gold plating without solder dip option)
Blank = non-RoHS compliant

**Surface Mount Package**

## SYMBOLS & DEFINITIONS

| Symbol | Definition |
|---|---|
| f | Frequency |
| $I_B$ | Base current (dc) |
| $I_E$ | Emitter current (dc) |
| $T_A$ | Ambient temperature |
| $T_C$ | Case temperature |
| $T_{SP}$ | Solder pad temperature |
| $V_{CB}$ | Collector to base voltage (dc) |
| $V_{CE}$ | Collector to emitter voltage (dc) |
| $V_{EB}$ | Emitter to base voltage (dc) |

## ELECTRICAL CHARACTERISTICS @ $T_A$ = +25 °C, unless otherwise noted

| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector-Emitter Breakdown Voltage<br>$I_C$ = 30 mA | $V_{(BR)CEO}$ | 80 | | V |
| Collector-Base Cutoff Current<br>$V_{CB}$ = 140 V | $I_{CBO}$ | | 10 | µA |
| Emitter-Base Cutoff Current<br>$V_{EB}$ = 7 V | $I_{EBO1}$ | | 10 | µA |
| Collector-Emitter Cutoff Current<br>$V_{CE}$ = 90 V | $I_{CES}$ | | 10 | nA |
| Emitter-Base Cutoff Current<br>$V_{EB}$ = 5.0 V | $I_{EBO2}$ | | 10 | nA |
| **ON CHARACTERISTICS** | | | | |
| Forward-Current Transfer Ratio<br>$I_C$ = 150 mA, $V_{CE}$ = 10 V<br>$I_C$ = 0.1 mA, $V_{CE}$ = 10 V<br>$I_C$ = 10 mA, $V_{CE}$ = 10 V<br>$I_C$ = 500 mA, $V_{CE}$ = 10 V<br>$I_C$ = 1.0 A, $V_{CE}$ = 10 V | $h_{FE}$ | <br>100<br>50<br>90<br>50<br>15 | <br>300<br>300<br><br>300<br> | |
| Collector-Emitter Saturation Voltage<br>$I_C$ = 150 mA, $I_B$ = 15 mA<br>$I_C$ = 500 mA, $I_B$ = 50 mA | $V_{CE(sat)}$ | | <br>0.2<br>0.5 | V |
| Base-Emitter Saturation Voltage<br>$I_C$ = 150 mA, $I_B$ = 15 mA | $V_{BE(sat)}$ | | 1.1 | V |

### DYNAMIC CHARACTERISTICS

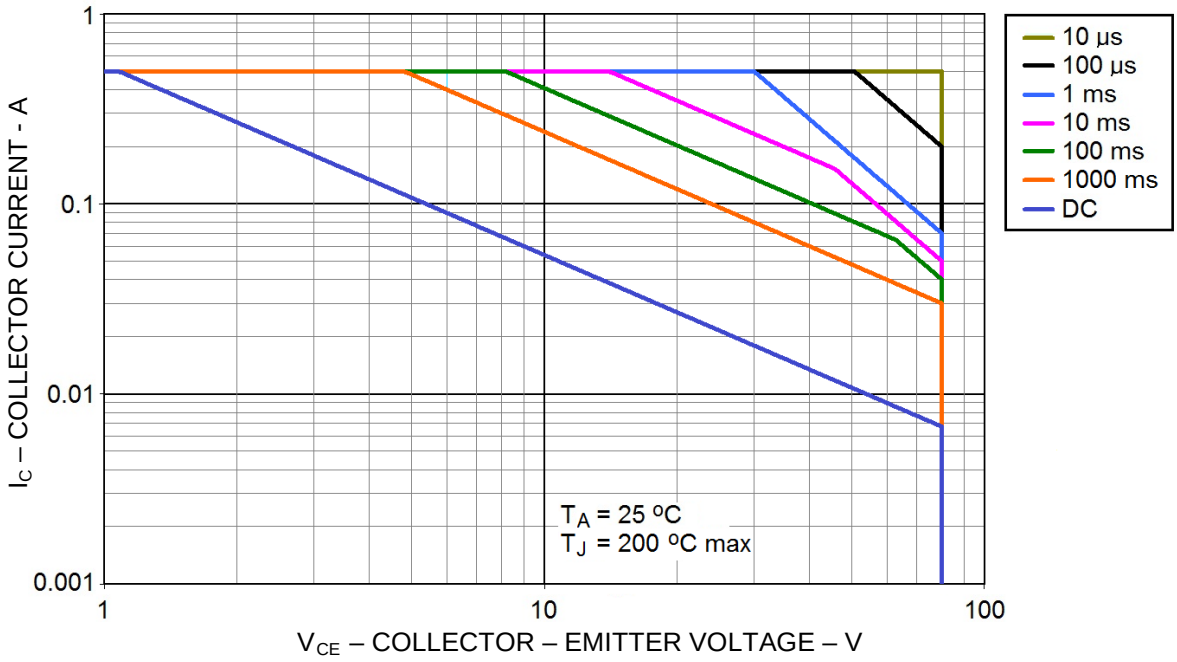
| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C$ = 1.0 mA, $V_{CE}$ = 5.0 V, f = 1.0 kHz | $h_{fe}$ | 80 | 400 | |
| Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C$ = 50 mA, $V_{CE}$ = 10 V, f = 20 MHz | $\|h_{fe}\|$ | 5.0 | 20 | |
| Output Capacitance<br>$V_{CB}$ = 10 V, $I_E$ = 0, 100 kHz ≤ f ≤ 1.0 MHz | $C_{obo}$ | | 12 | pF |
| Input Capacitance<br>$V_{EB}$ = 0.5 V, $I_C$ = 0, 100 kHz ≤ f ≤ 1.0 MHz | $C_{ibo}$ | | 60 | pF |

**ELECTRICAL CHARACTERISTICS** @ $T_A$ = +25 °C unless otherwise noted (continued)

**SAFE OPERATION AREA** (See SOA graph below and MIL-STD-750, method 3053)

| | |
|---|---|
| **DC Tests** | |
| $T_C$ = 25 °C, 1 cycle, t = 10 ms | |
| **Test 1** | $V_{CE}$ = 10 V |
| 2N3700UB | $I_C$ = 180 mA |
| **Test 2** | $V_{CE}$ = 40 V |
| 2N3700UB | $I_C$ = 45 mA |
| **Test 3** | $V_{CE}$ = 80 V |
| 2N3700UB | $I_C$ = 22.5 mA |

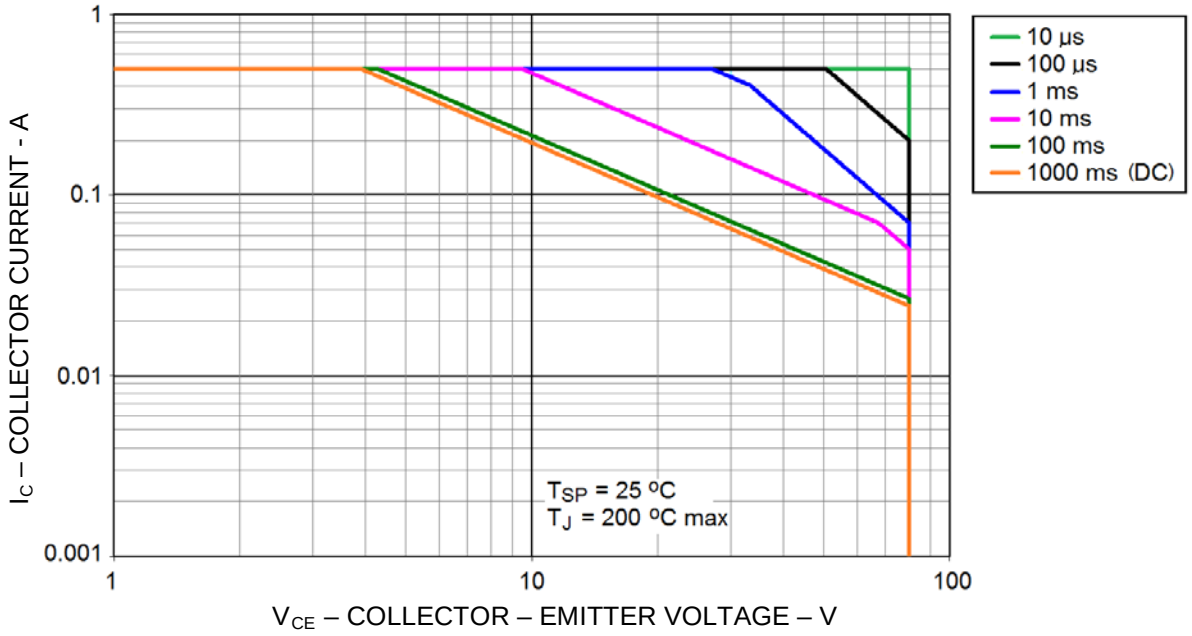
(1) Pulse Test: Pulse Width = 300 µs, duty cycle ≤ 2.0%.




Maximum Safe Operating Area @ $T_A$ = 25 °C

*See additional SOA graph on next page.*

**ELECTRICAL CHARACTERISTICS** @ $T_A$ = +25 °C unless otherwise noted (continued)




Maximum Safe Operating Area ($T_{SP}$ = 25°C)

## GRAPHS

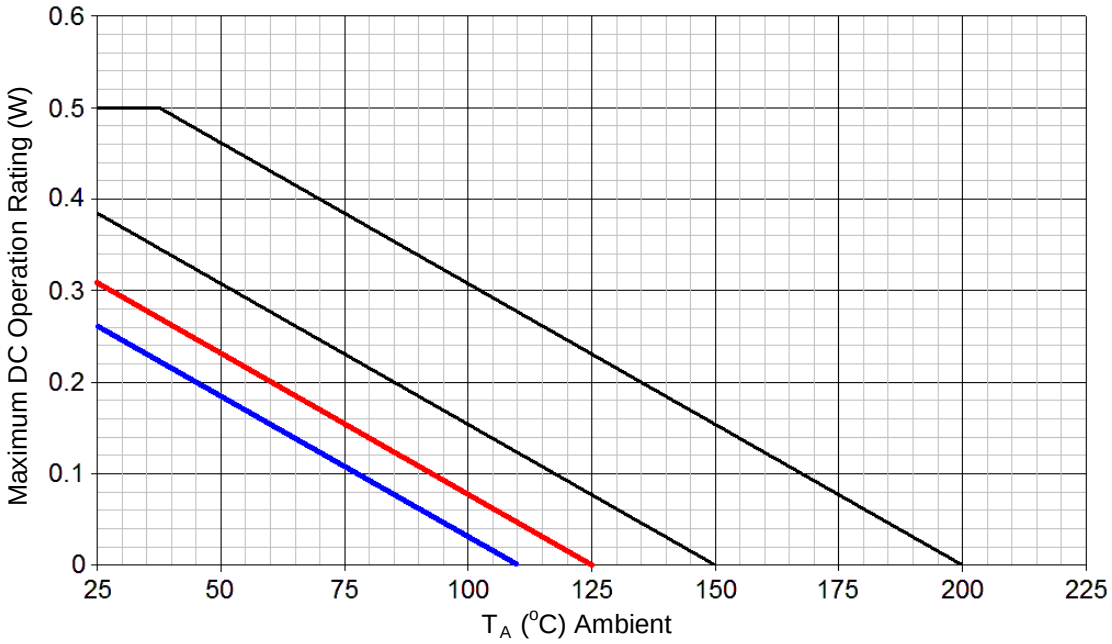



**FIGURE 1**
Temperature-Power Derating ($R_{\Theta JA}$)

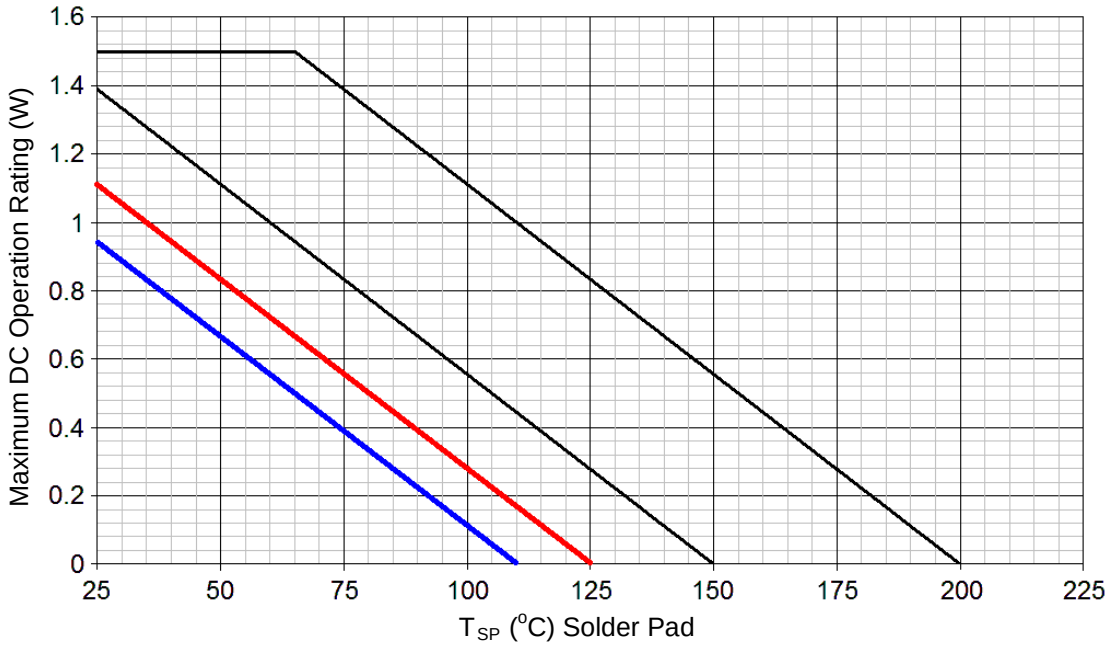
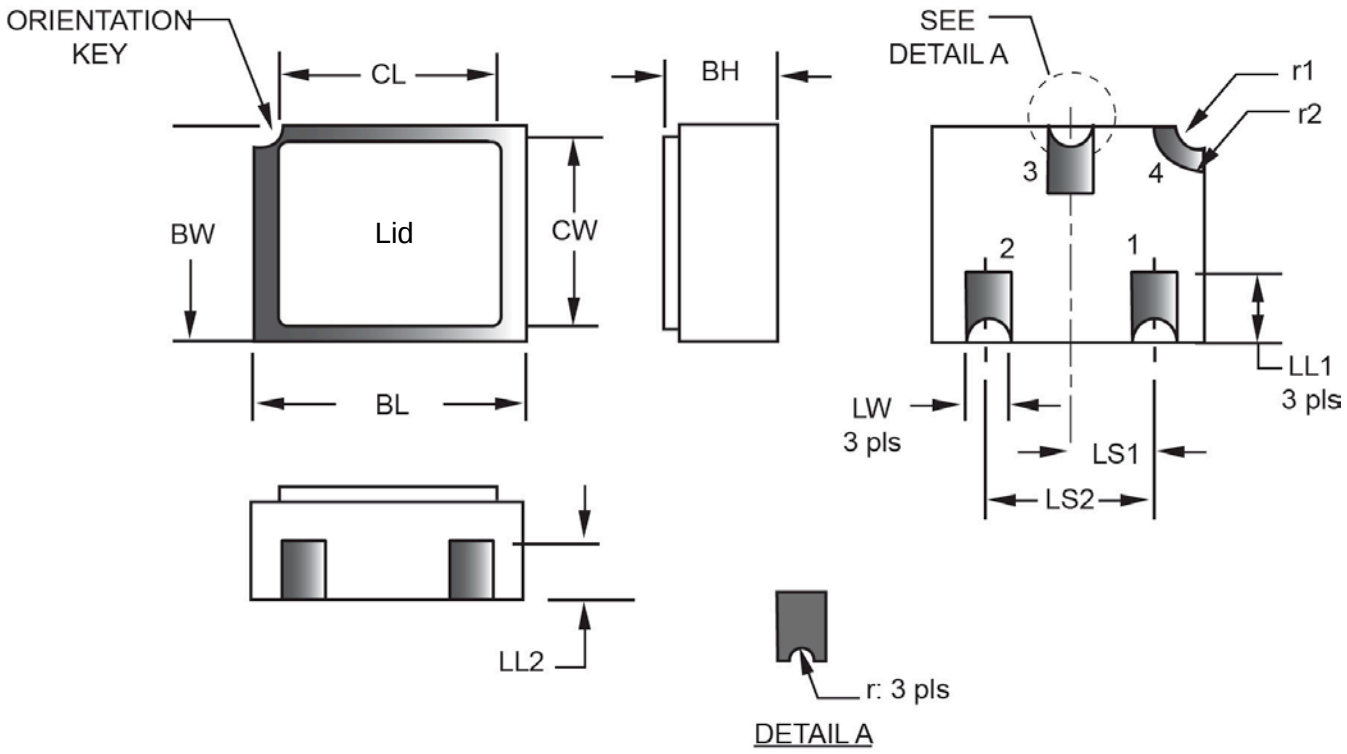



**FIGURE 2**
Temperature-Power Derating ($R_{\Theta JSP}$)

## PACKAGE DIMENSIONS




| Symbol | Dimensions | | | | Note | Symbol | Dimensions | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inch | | Millimeters | | | | Inch | | Millimeters | | |
| | Min | Max | Min | Max | | | Min | Max | Min | Max | |
| **BH** | 0.046 | 0.056 | 1.17 | 1.42 | | **$LS_1$** | 0.035 | 0.039 | 0.89 | 0.99 | |
| **BL** | 0.115 | 0.128 | 2.92 | 3.25 | | **$LS_2$** | 0.071 | 0.079 | 1.80 | 2.01 | |
| **BW** | 0.085 | 0.108 | 2.16 | 2.74 | | **LW** | 0.016 | 0.024 | 0.41 | 0.61 | |
| **CL** | - | 0.128 | - | 3.25 | | **r** | - | 0.008 | - | 0.20 | |
| **CW** | - | 0.108 | - | 2.74 | | **$r_1$** | - | 0.012 | - | 0.31 | |
| **$LL_1$** | 0.022 | 0.038 | 0.56 | 0.96 | | **$r_2$** | - | .022 | - | 0.56 | |
| **$LL_2$** | 0.017 | 0.035 | 0.43 | 0.89 | | | | | | | |

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Hatched areas on package denote metallized areas.
4. Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Shielding connected to the lid.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.