



# Low Power NPN Silicon Transistor

Qualified per MIL-PRF-19500/391

Qualified Levels:  
JAN, JANTX,  
JANTXV, and JANS

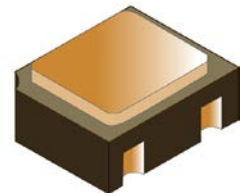
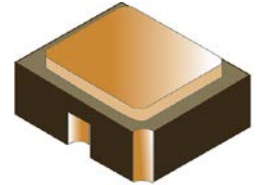
## DESCRIPTION

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).





**UB Package**


## APPLICATIONS / BENEFITS


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

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](#)

**MAXIMUM RATINGS @  $T_A = +25^\circ\text{C}$  unless otherwise noted.**

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	$T_J$ and $T_{STG}$	-65 to +200	$^\circ\text{C}$
Thermal Impedance Junction-to-Ambient	$R_{\theta JA}$	325	$^\circ\text{C/W}$
Thermal Impedance Junction-to-Solder Pad	$R_{\theta JSP}$	90	$^\circ\text{C/W}$
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:	$P_D$	0.5	W

@  $T_A = +25^\circ\text{C}$  <sup>(1)</sup>

**Notes:** 1. Derate linearly 6.6 mW/ $^\circ\text{C}$  for  $T_A \geq +25^\circ\text{C}$ .

**MSC – Lawrence**

6 Lake Street,  
Lawrence, MA 01841  
Tel: 1-800-446-1158 or  
(978) 620-2600  
Fax: (978) 689-0803

**MSC – Ireland**

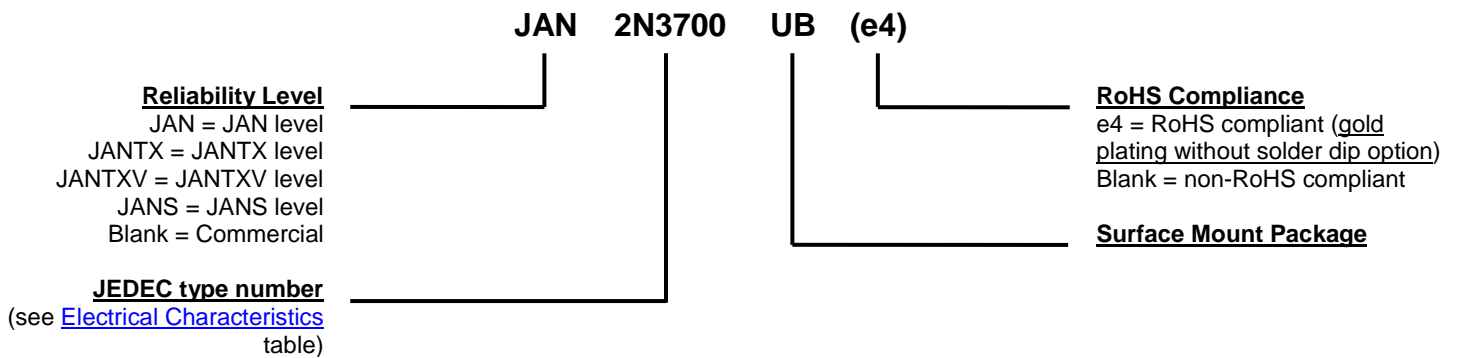
Gort Road Business Park,  
Ennis, Co. Clare, Ireland  
Tel: +353 (0) 65 6840044  
Fax: +353 (0) 65 6822298

**Website:**

[www.microsemi.com](http://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**

**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 @  $T_A = +25\text{ }^\circ\text{C}$ , unless otherwise noted**

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

**DYNAMIC CHARACTERISTICS**

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

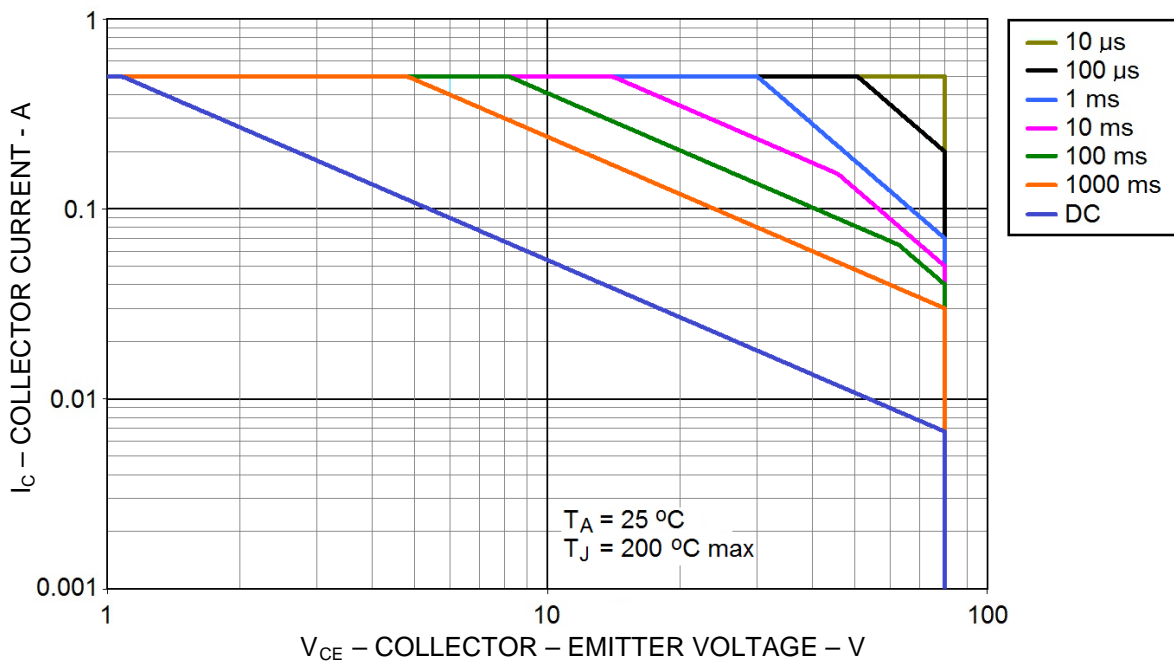
**ELECTRICAL CHARACTERISTICS @  $T_A = +25\text{ }^\circ\text{C}$  unless otherwise noted (continued)**
**SAFE OPERATION AREA** (See SOA graph below and [MIL-STD-750, method 3053](#))

**DC Tests**
 $T_C = 25\text{ }^\circ\text{C}$ , 1 cycle,  $t = 10\text{ ms}$ 

<b>Test 1</b>	$V_{CE} = 10\text{ V}$
2N3700UB	$I_C = 180\text{ mA}$

<b>Test 2</b>	$V_{CE} = 40\text{ V}$
2N3700UB	$I_C = 45\text{ mA}$

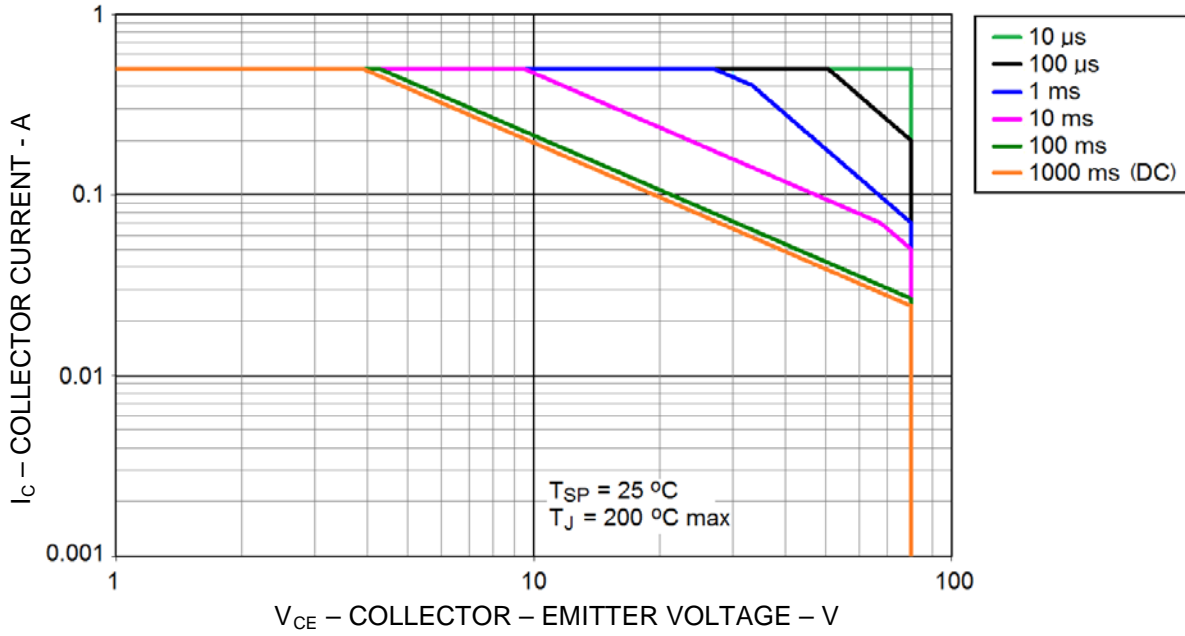
<b>Test 3</b>	$V_{CE} = 80\text{ V}$
2N3700UB	$I_C = 22.5\text{ mA}$

(1) Pulse Test: Pulse Width =  $300\text{ }\mu\text{s}$ , duty cycle  $\leq 2.0\%$ .


Maximum Safe Operating Area @  $T_A = 25\text{ }^\circ\text{C}$

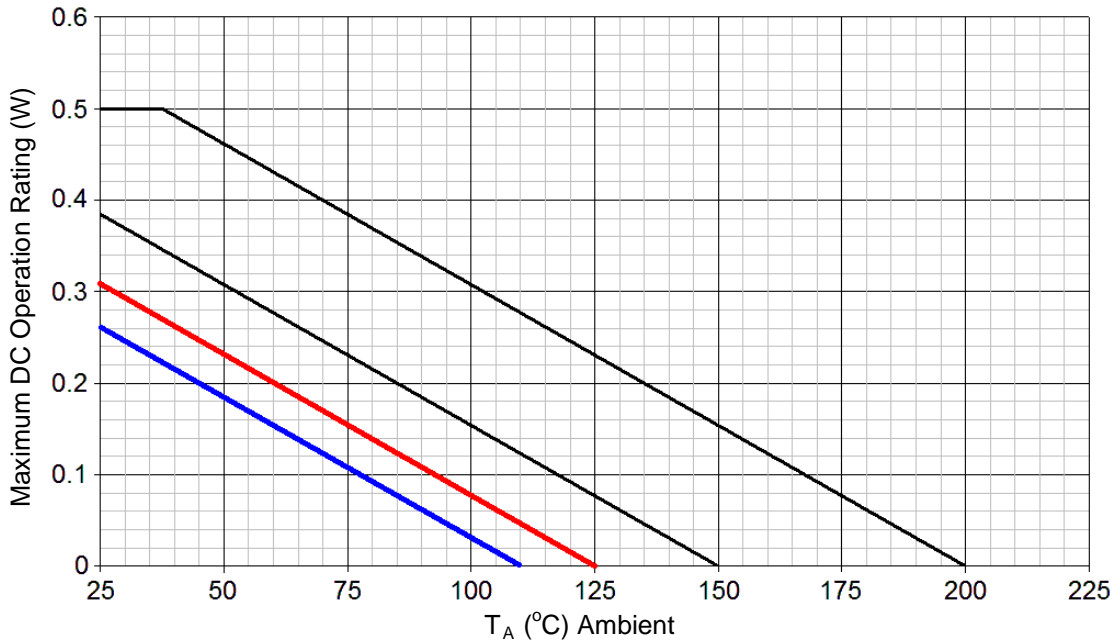
*See additional SOA graph on next page.*

**ELECTRICAL CHARACTERISTICS @  $T_A = +25\text{ }^\circ\text{C}$  unless otherwise noted (continued)**

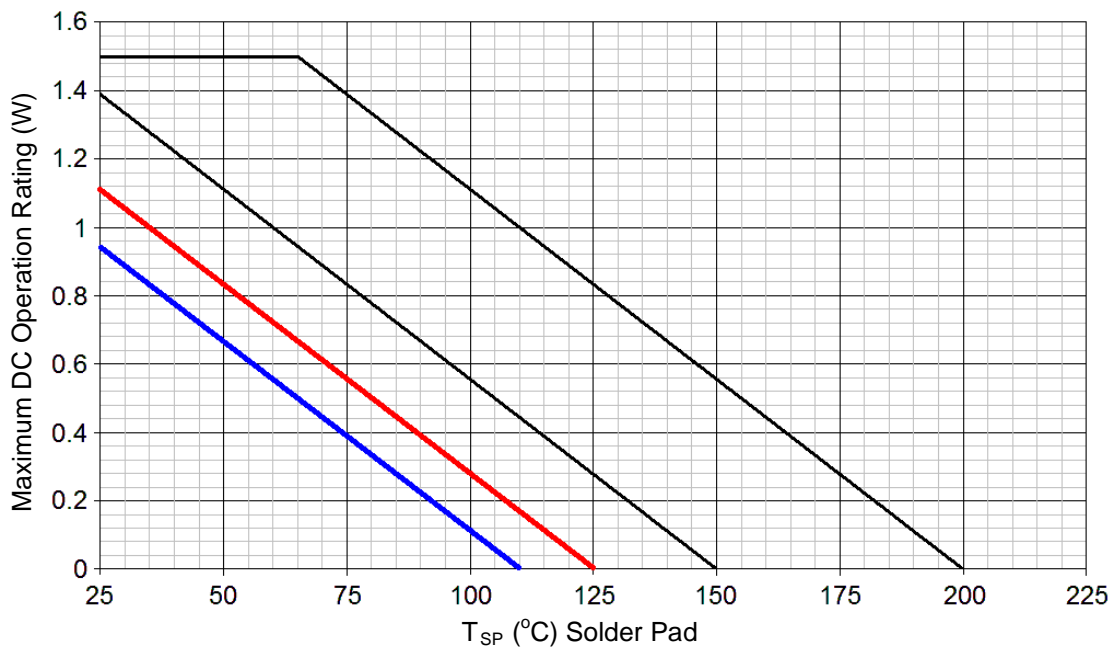


Maximum Safe Operating Area ( $T_{SP} = 25^\circ\text{C}$ )

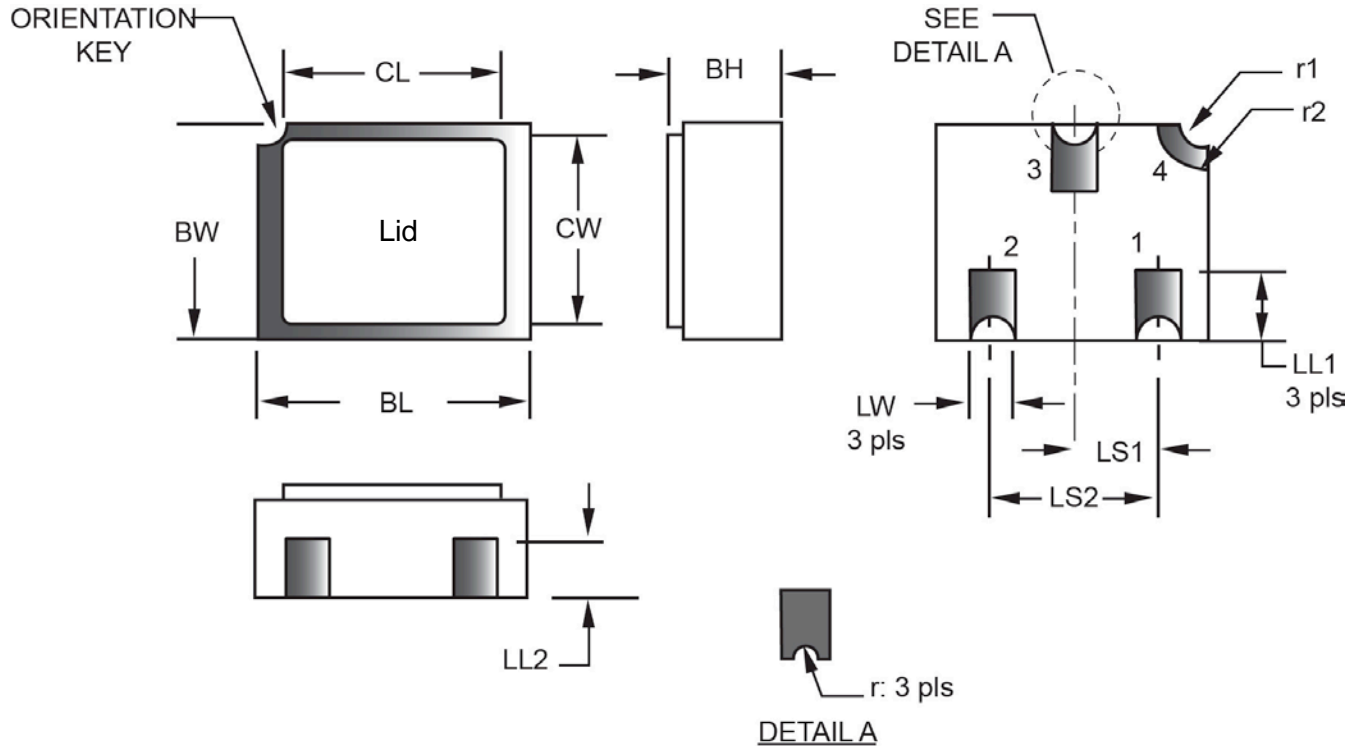
**GRAPHS**



**FIGURE 1**  
Temperature-Power Derating (R<sub>ΘJA</sub>)



**FIGURE 2**  
Temperature-Power Derating (R<sub>ΘJSP</sub>)

**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 <sub>1</sub>	0.035	0.039	0.89	0.99	
BL	0.115	0.128	2.92	3.25		LS <sub>2</sub>	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 <sub>1</sub>	-	0.012	-	0.31	
LL <sub>1</sub>	0.022	0.038	0.56	0.96		r <sub>2</sub>	-	.022	-	0.56	
LL <sub>2</sub>	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  $\Phi$ x symbology.