

RADIATION HARDENED LOW POWER NPN SILICON TRANSISTOR

Qualified per MIL-PRF-19500/391

Qualified Levels:
JANSM, JANSJ,
JANSP, JANSL, and
JANSR

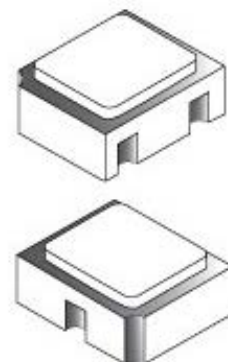
DESCRIPTION

This NPN ceramic surface mount device is RAD hard qualified for high-reliability applications. Microsemi also offers numerous other products to meet higher and lower power voltage regulation applications.

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

FEATURES

- Surface mount equivalent to JEDEC registered 2N3700.
- RHA level JAN qualifications per MIL-PRF-19500/391 (see [part nomenclature](#) for all options).



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)
(leadless)
 [JANS 2N3700](#)

TO-39 (TO-205AD)
(leadless)
 [JANS 2N3019, 2N3019S](#)

TO-46 (TO-206AB)
(leadless)
 [JANS 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-Case	$R_{\theta JSP}$	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: @ $T_A = +25^\circ\text{C}$ ⁽¹⁾	P_D	0.5	W

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

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MECHANICAL and PACKAGING

- CASE: Ceramic.
- TERMINALS: Gold plating over nickel under plate.
- MARKING: Part number, date code, manufacturer's ID, and serial number.
- TAPE & REEL option: Standard per EIA-418D. Consult factory for quantities.
- WEIGHT: < 0.04 Grams.
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE**JANSM 2N3700 UB****Reliability Level**

JANSM = 3K Rads (Si)
JANS D = 10K Rads (Si)
JANS P = 30K Rads (Si)
JANS L = 50K Rads (Si)
JANS R = 100K Rads (Si)

Surface Mount package**JEDEC type number****SYMBOLS & DEFINITIONS**

Symbol	Definition
f	frequency
I _B	Base current (dc)
I _E	Emitter current (dc)
T _A	Ambient temperature
T _C	Case temperature
V _{CB}	Collector to base voltage (dc)
V _{CE}	Collector to emitter voltage (dc)
V _{EB}	Emitter to base voltage (dc)

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Current $I_C = 30\text{ mA}$	$V_{(BR)CEO}$	80		V
Collector-Base Cutoff Current $V_{CB} = 140\text{ V}$	I_{CBO}		10	μA
Emitter-Base Cutoff Current $V_{EB} = 7\text{ V}$	I_{EBO1}		10	μA
Collector-Emitter Cutoff Current $V_{CE} = 90\text{ V}$	I_{CES}		10	ηA
Emitter-Base Cutoff Current $V_{EB} = 5.0\text{ V}$	I_{EBO2}		10	ηA
ON CHARACTERISTICS ⁽¹⁾				
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	
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

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

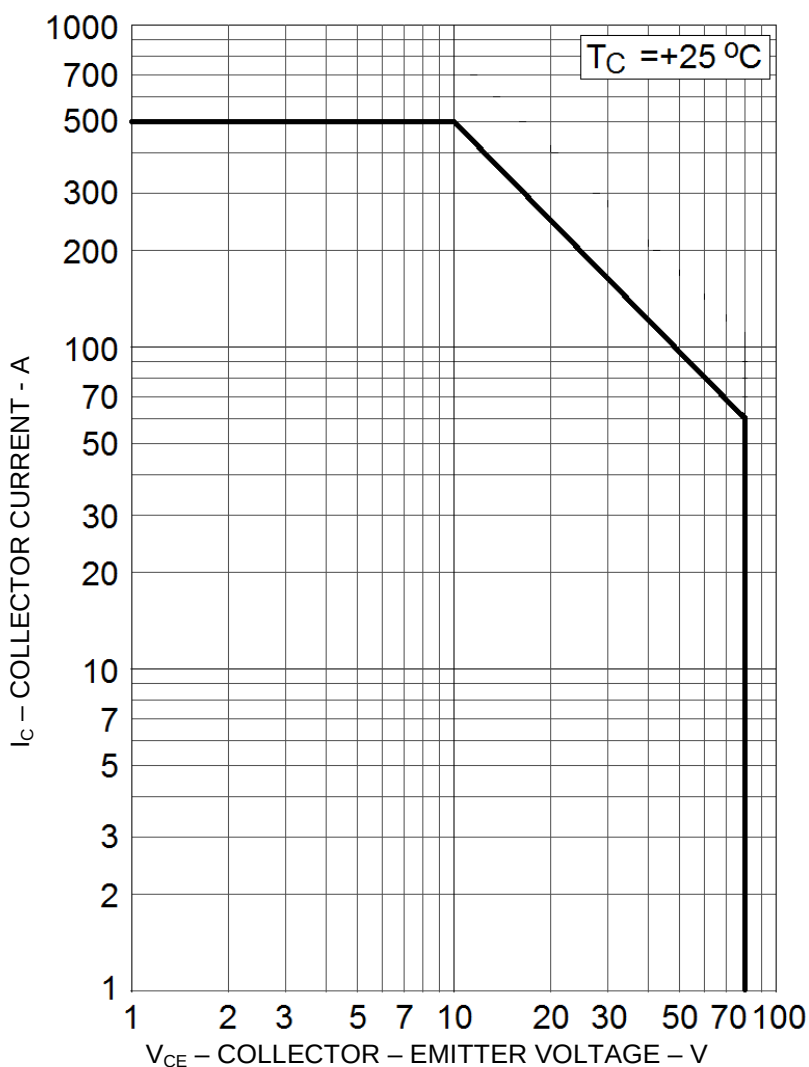
ELECTRICAL CHARACTERISTICS @ $T_A = +25\text{ }^{\circ}\text{C}$, unless otherwise noted (continued)
SAFE OPERATION AREA (See SOA graph below and [MIL-STD-750, method 3053](#))

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

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

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

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


Maximum Safe Operating Area

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Collector to Base Cutoff Current $V_{CB} = 140\text{ V}$	I_{CBO}		20	μA
Emitter to Base Cutoff Current $V_{EB} = 7\text{ V}$	I_{EBO}		20	μA
Collector to Emitter Breakdown Voltage $I_C = 30\text{ mA}$	$V_{(BR)CEO}$	80		V
Collector-Emitter Cutoff Current $V_{CE} = 90\text{ V}$	I_{CES}		20	ηA
Emitter-Base Cutoff Current $V_{EB} = 5.0\text{ V}$	I_{EBO}		20	ηA
Forward-Current Transfer Ratio ⁽²⁾ $I_C = 150\text{ mA}$, $V_{CE} = 10\text{ V}$ $I_C = 0.1\text{ mA}$, $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$, $V_{CE} = 10\text{ V}$ $I_C = 500\text{ mA}$, $V_{CE} = 10\text{ V}$ $I_C = 1\text{ A}$, $V_{CE} = 10\text{ V}$	$[h_{FE}]$	[50] [25] [45] [25] [7.5]	300 300 300	
Collector-Emitter Saturation Voltage $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$ $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	$V_{CE(sat)}$		0.23 0.58	V
Base-Emitter Saturation Voltage $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	$V_{BE(sat)}$		1.27	V

- (2) See method 1019 of MIL-STD-750 for how to determine $[h_{FE}]$ by first calculating the delta ($1/h_{FE}$) from the pre- and post-radiation h_{FE} . Notice the $[h_{FE}]$ is not the same as h_{FE} and cannot be measured directly. The $[h_{FE}]$ value can never exceed the pre-radiation minimum h_{FE} that it is based upon.

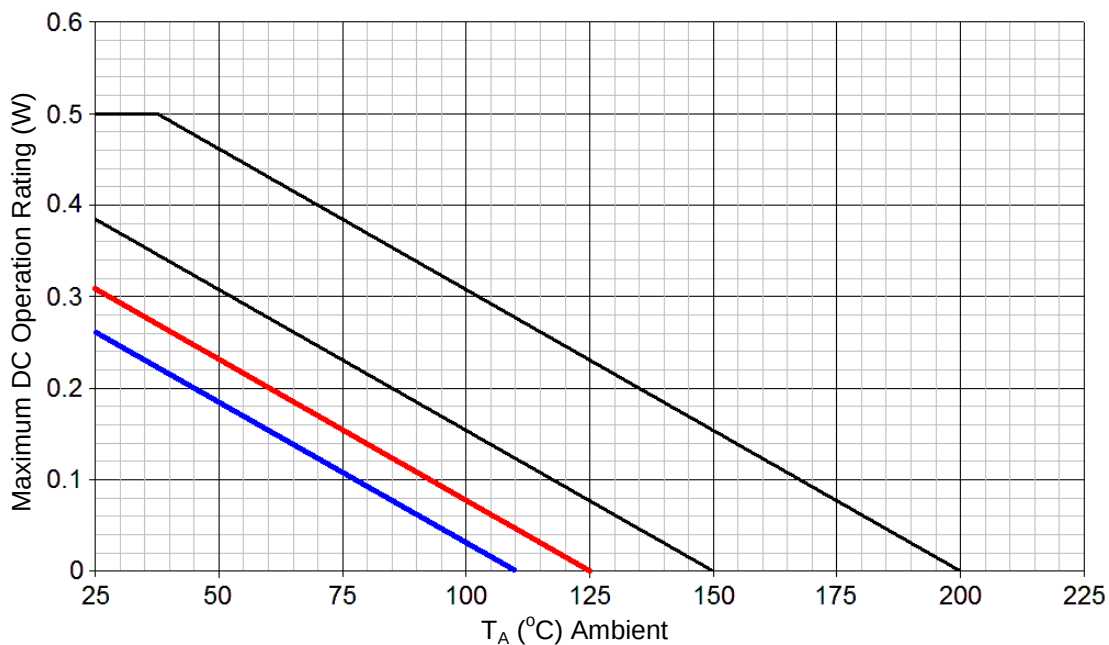
GRAPHS


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

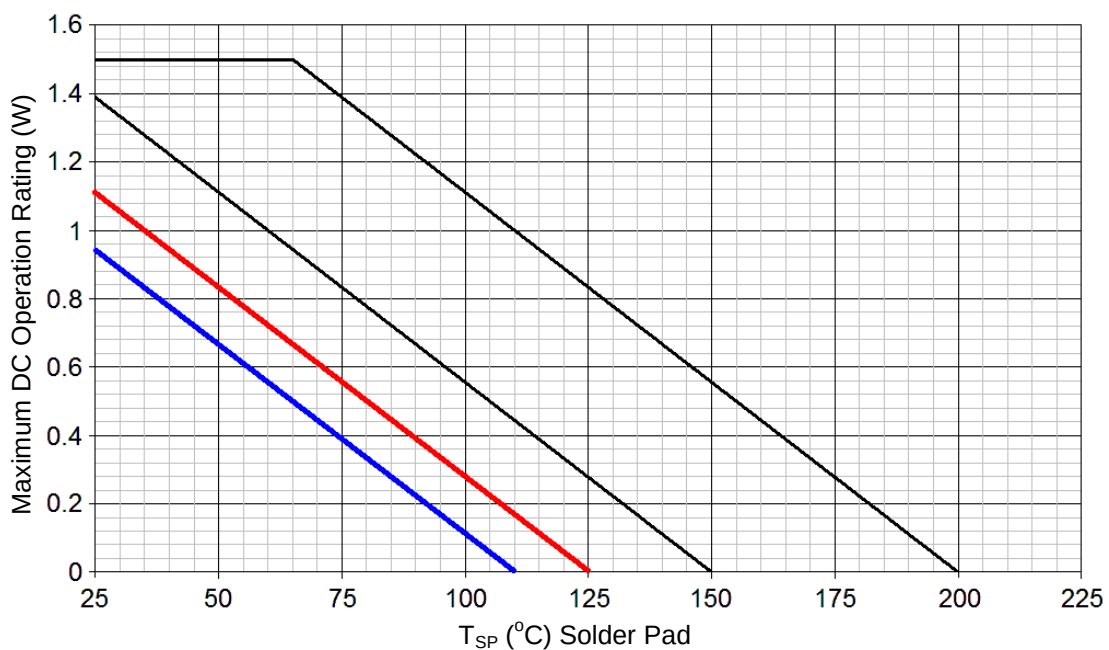
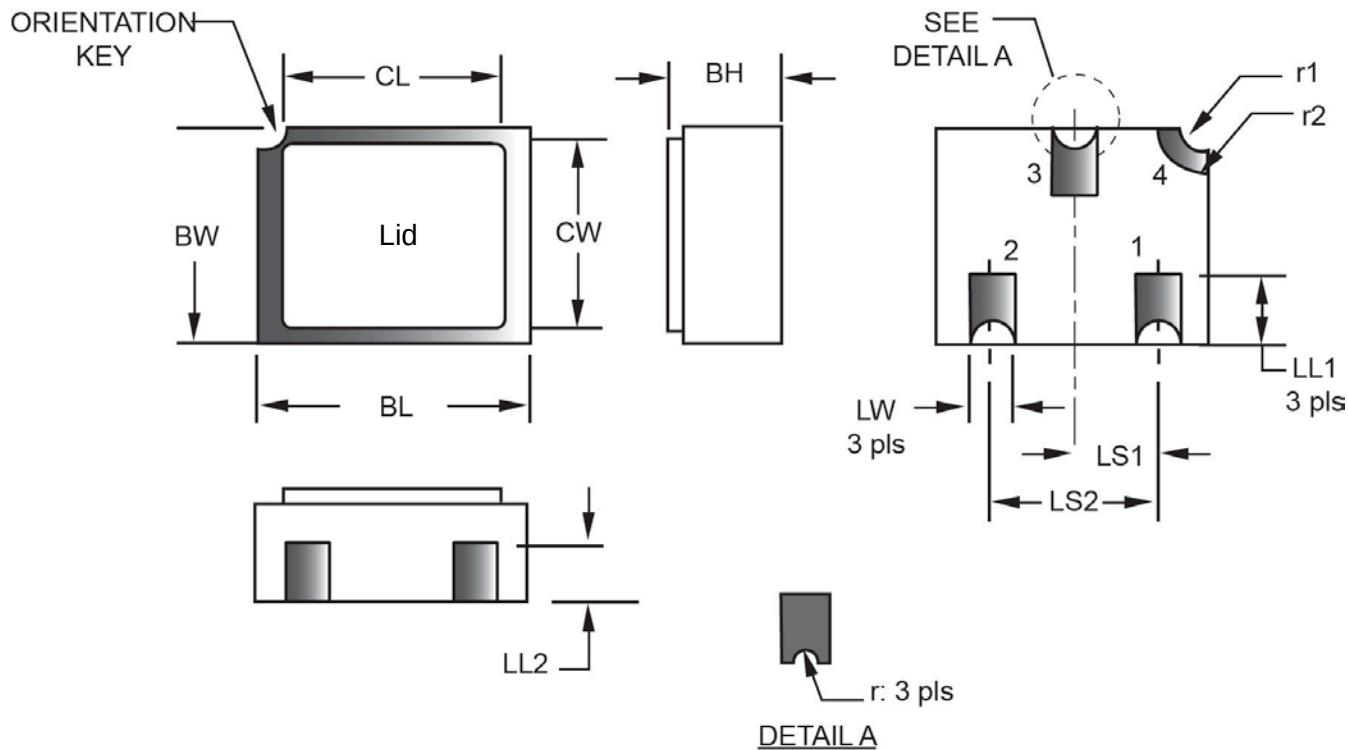


FIGURE 2
Temperature-Power Derating ($R_{\Theta JSP}$)

PACKAGE DIMENSIONS


Symbol	Dimensions				Note	Symbol	Dimensions				Note
	Inch		Millimeters				Inch		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
BH	.046	.056	1.17	1.42		LS ₁	.036	.040	.091	1.02	
BL	.115	.128	2.92	3.25		LS ₂	.071	.079	1.81	2.01	
BW	.085	.108	2.16	2.74		LW	.016	.024	0.41	0.61	
CL		.128		3.25		r		.008		.203	
CW		.108		2.74		r ₁		.012		.305	
LL ₁	.022	.038	0.56	0.96		r ₂		.022		.559	
LL ₂	.017	.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 Φ x symbology.