RADIATION HARDENED LOW POWER NPN SILICON TRANSISTOR

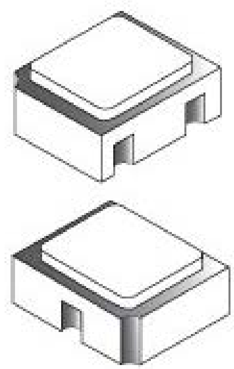
Qualified per MIL-PRF-19500/391

Qualified Levels:
JANSM, JANSD, 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.



UB Package

FEATURES

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

APPLICATIONS / BENEFITS

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

Also available in:

TO-18 (TO-206AA)
(leaded)
JANS_2N3700

TO-39 (TO-205AD)
(leaded)
JANS_2N3019, 2N3019S

TO-46 (TO-206AB)
(leaded)
JANS_2N3057A

MAXIMUM RATINGS @ T_A = +25 ^oC unless otherwise noted.

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	T_J and T_{STG}	-65 to +200	^oC
Thermal Impedance Junction-to-Ambient	$R_{\Theta JA}$	325	$^oC/W$
Thermal Impedance Junction-to-Case	$R_{\Theta JSP}$	90	$^oC/W$
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 ^oC (1)	P_D	0.5	W

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

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www.microsemi.com

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)
JANSM = 3K Rads (Si)
JANSD = 10K Rads (Si)
JANSP = 30K Rads (Si)
JANSL = 50K Rads (Si)
JANSR = 100K Rads (Si)

JEDEC type number (2N3700)

Surface Mount package (UB)

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 °C, unless otherwise noted

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERTICS				
Collector-Emitter Breakdown Current I_C = 30 mA	$V_{(BR)CEO}$	80		V
Collector-Base Cutoff Current V_{CB} = 140 V	I_{CBO}		10	µA
Emitter-Base Cutoff Current V_{EB} = 7 V	I_{EBO1}		10	µA
Collector-Emitter Cutoff Current V_{CE} = 90 V	I_{CES}		10	ηA
Emitter-Base Cutoff Current V_{EB} = 5.0 V	I_{EBO2}		10	ηA
ON CHARACTERISTICS (1)				
Forward-Current Transfer Ratio I_C = 150 mA, V_{CE} = 10 V I_C = 0.1 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 10 V I_C = 1.0 A, V_{CE} = 10 V	h_{FE}	 100 50 90 50 15	 300 300 300 	
Collector-Emitter Saturation Voltage I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	$V_{CE(sat)}$		 0.2 0.5	V
Base-Emitter Saturation Voltage I_C = 150 mA, I_B = 15 mA	$V_{BE(sat)}$		1.1	V

DYNAMIC CHARACTERISTICS

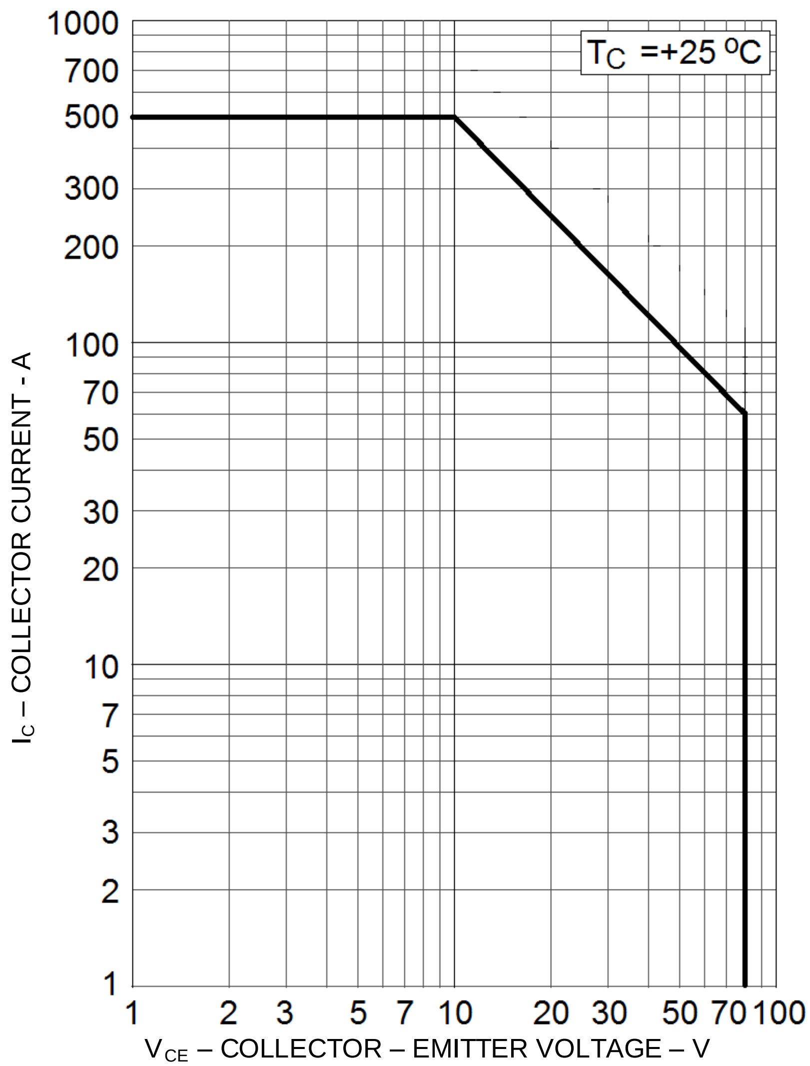
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Small-Signal Short-Circuit Forward Current Transfer Ratio I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz	h_{fe}	80	400	
Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	$\|h_{fe}\|$	5.0	20	
Output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

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

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 2N3700UB	V_{CE} = 10 V I_C = 180 mA
Test 2 2N3700UB	V_{CE} = 40 V I_C = 45 mA
Test 3 2N3700UB	V_{CE} = 80 V I_C = 22.5 mA



Maximum Safe Operating Area

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

POST RADIATION ELECTRICAL CHARACTERISTICS

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

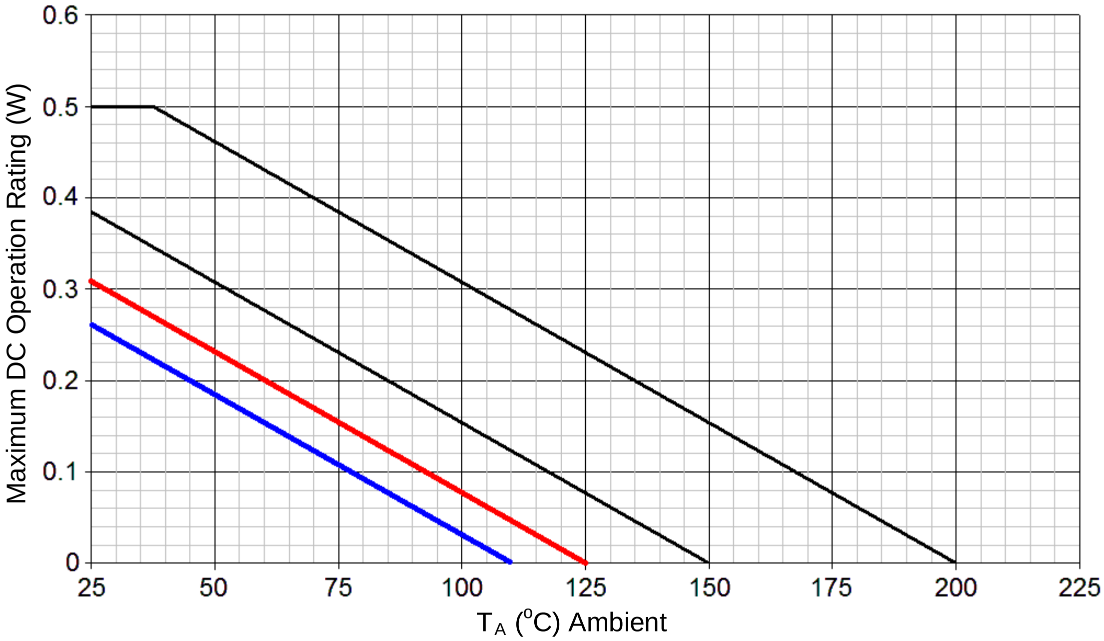


FIGURE 1
Temperature-Power Derating ($R_{\Theta JA}$)

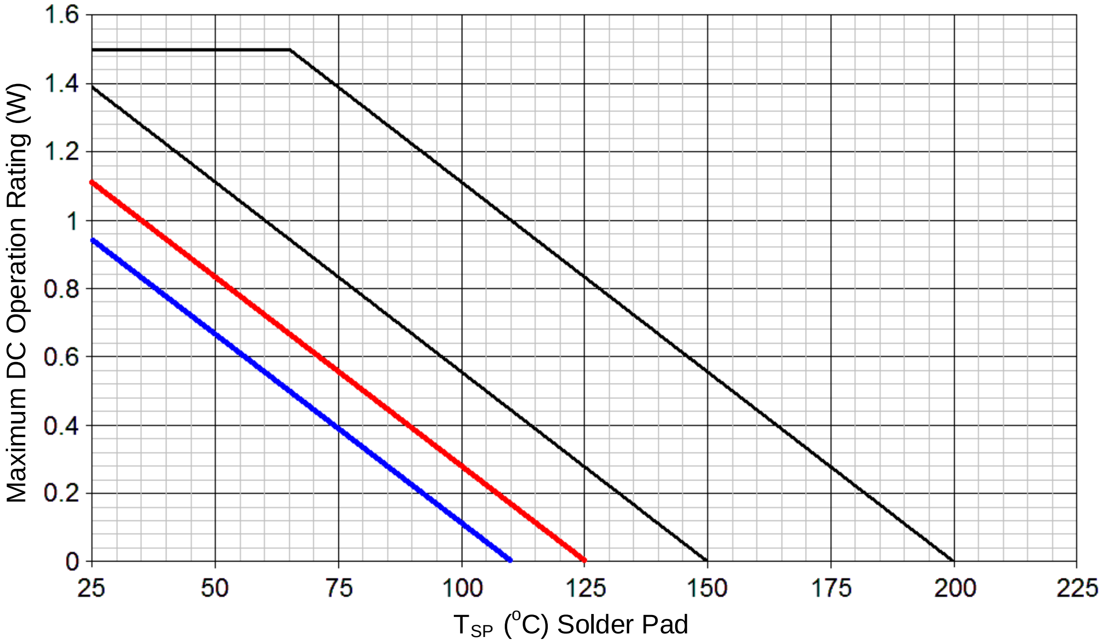
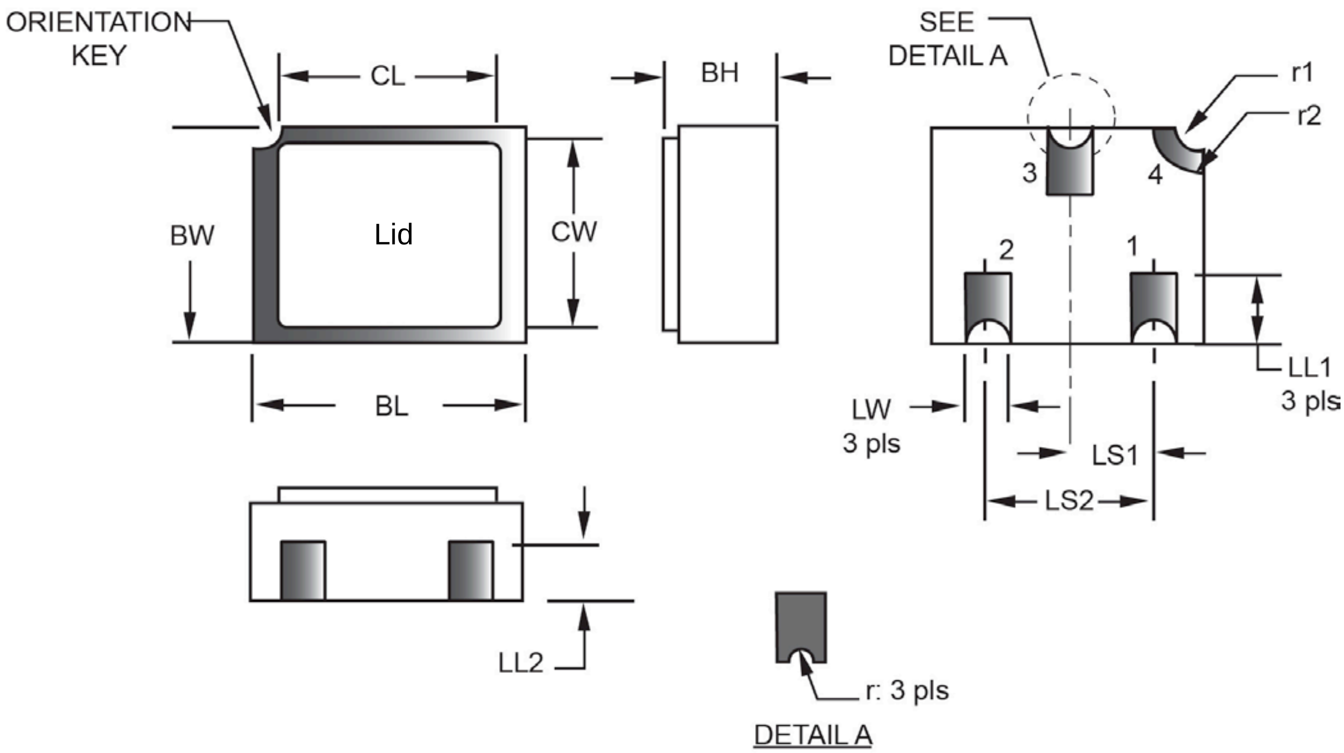


FIGURE 2
Temperature-Power Derating ($R_{\Theta JSP}$)

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 Φx symbology.

