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 2N3700 NPN transistor comes in a hermetically sealed metal TO-18 package and is military qualified for high-reliability applications.

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FEATURES

- 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_2N3700.)
- RoHS compliant versions available (commercial grade only).

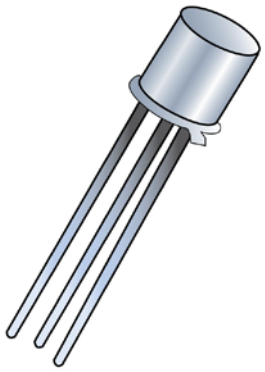
APPLICATIONS / BENEFITS

- Leaded, hermetically sealed TO-18 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-Case		$R_{\Theta JC}$	150	°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) @ T_C = +25 °C (2)	P_D	0.5 1.0	W

Notes:
1. Derate linearly 2.85 mW/°C for $T_A \geq$ +25 °C.
2. Derate linearly 10.3 mW/°C for $T_C \geq$ +25 °C.



TO-18 (TO-206AA) Package

Also available in:

UB package
(surface mount)
2N3700UB

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: Hermetically sealed, nickel plated kovar base, nickel cap.
- TERMINALS: Gold plate over nickel, kovar for JANS. Gold plate over nickel, kovar, solder dipped for JAN, JANTX, and JANTXV.
- MARKING: Part number, date code, manufacturer's ID.
- WEIGHT: Approximately 0.3 grams.
- See Package Dimensions on last page.

PART NOMENCLATURE

JAN 2N3700 (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 (without solder dip)
Blank = non-RoHS compliant

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 CHARACTERISTICS				
Collector-Emitter Breakdown Voltage 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	nA
Emitter-Base Cutoff Current V_{EB} = 5.0 V	I_{EBO2}		10	nA
ON CHARACTERISTICS				
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

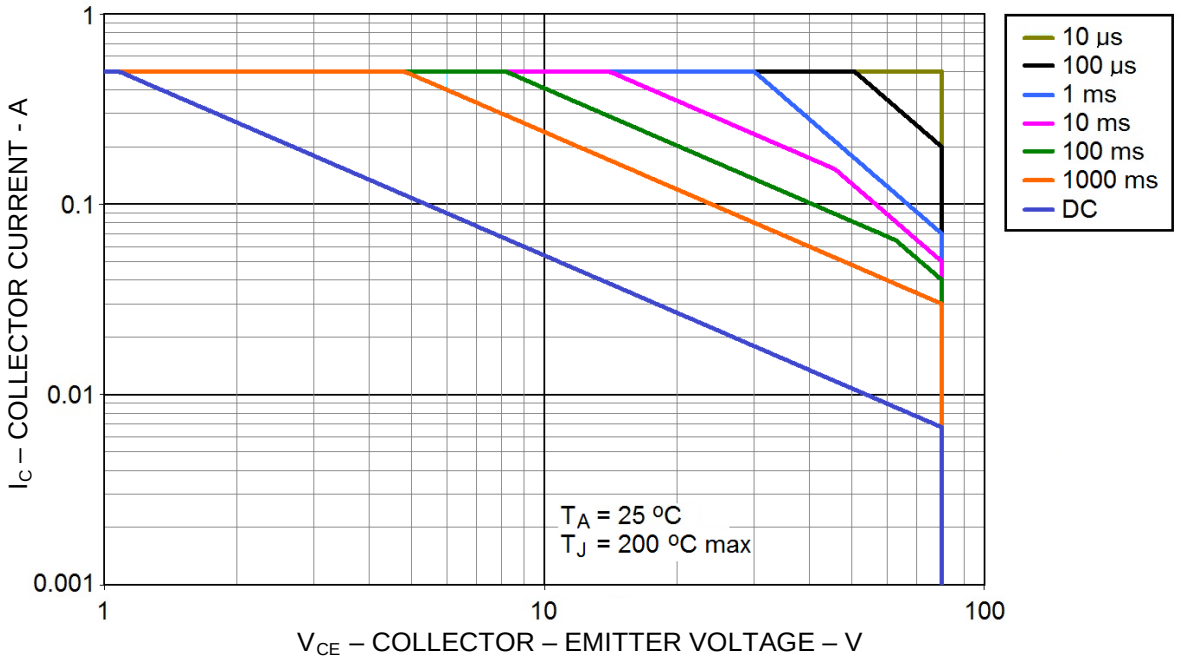
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Small-Signal Short-Circuit Forward Current Transfer Ratio I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz	h_{fe}	80	400	
Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz	$\|h_{fe}\|$	5.0	20	
Output 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

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
2N3700	I_C = 180 mA
Test 2	V_{CE} = 40 V
2N3700	I_C = 45 mA
Test 3	V_{CE} = 80 V
2N3700	I_C = 22.5 mA

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



Maximum Safe Operating Area @ T_A = 25 ºC

GRAPHS

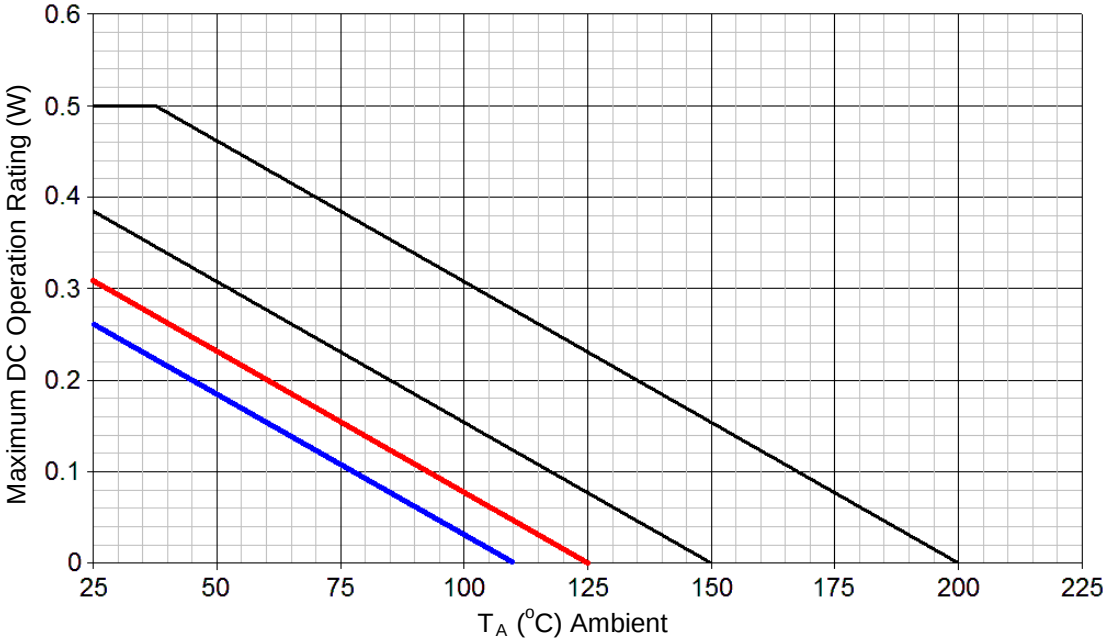


FIGURE 1
Temperature-Power Derating ($R_{\Theta JA}$)
Leads = 0.125 inch (3.175mm)

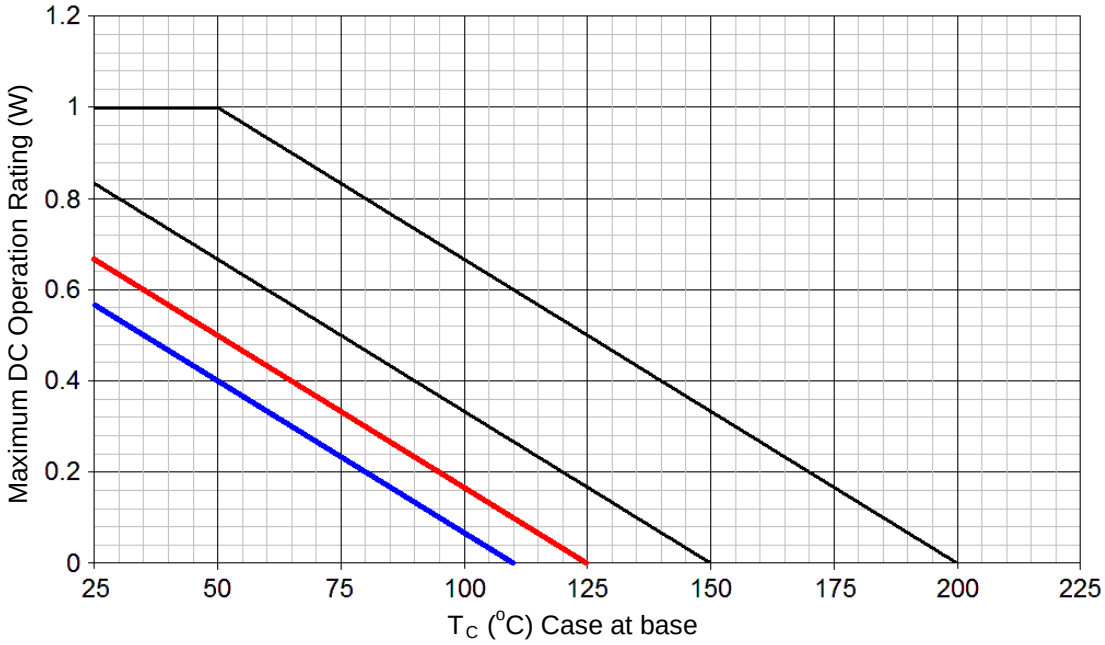
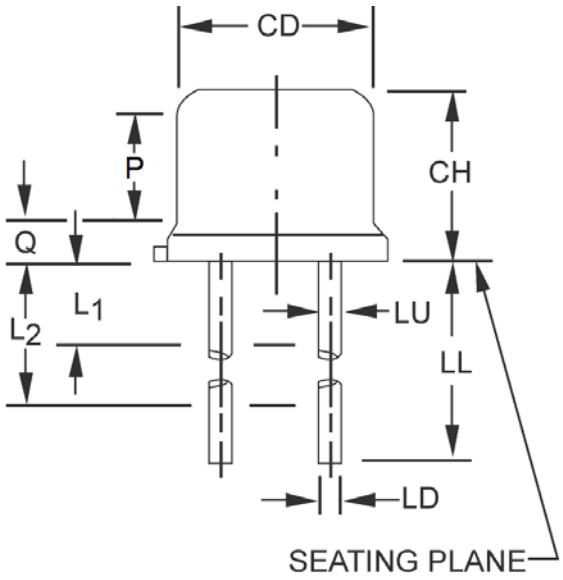
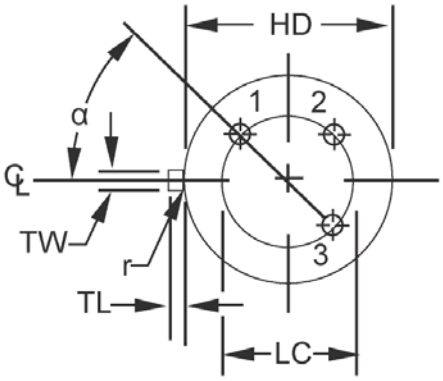


FIGURE 2
Temperature-Power Derating ($R_{\Theta JC}$)

PACKAGE DIMENSIONS





Symbol	Dimensions				Note
	Inch		Millimeters		
	Min	Max	Min	Max	
CD	0.178	0.195	4.52	4.95	
CH	0.170	0.210	4.32	5.33	
HD	0.209	0.230	5.31	5.84	
LC	0.100 TP		2.54 TP		6
LD	0.016	0.021	0.41	0.53	7,8
LL	0.500	0.750	12.70	19.05	7,8
LU	0.016	0.019	0.41	0.48	7,8
L1	-	0.050	-	1.27	7,8
L2	0.250	-	6.35	-	7,8
P	0.100	-	2.54	-	
Q	-	0.030	-	0.76	5
TL	0.028	0.048	0.71	1.22	3,4
TW	0.036	0.046	0.91	1.17	3
r	-	0.010	-	0.25	10
α	45° TP		45° TP		6
1, 2, 9, 11, 12					

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TH shall be held for a minimum length of .011 inch (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. This device may be measured by direct methods.
7. Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.
12. Lead 1 = emitter, lead 2 = base, lead 3 = collector.

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