



# LOW POWER NPN SILICON TRANSISTOR

*Qualified per MIL-PRF-19500/391*

Qualified Levels:  
JAN, JANTX,  
JANTXV, and JANS

## DESCRIPTION

This 2N3057A NPN leaded silicon transistor device is military qualified for high-reliability applications. Microsemi also offers numerous other transistor products to meet higher and lower power ratings with various switching speed requirements in both through-hole and surface-mount packages.

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

## FEATURES

- JEDEC registered 2N3057 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.  
(For RHA datasheet see [JANS D2N3057A](#).)
- RoHS compliant by design.

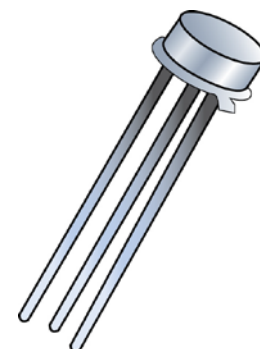
## APPLICATIONS / BENEFITS

- Low profile metal TO-46 leaded package.
- Light weight.
- General-purpose switching and amplifier applications.
- Military and high-reliability applications.

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

| Parameters/Test Conditions            | Symbol                                   | Value          | Unit |   |
|---------------------------------------|------------------------------------------|----------------|------|---|
| Junction and Storage Temperature      | T <sub>J</sub> and T <sub>STG</sub>      | -65 to +200    | °C   |   |
| Thermal Impedance Junction-to-Ambient | R <sub>θJA</sub>                         | 325            | °C/W |   |
| Thermal Impedance Junction-to-Case    | R <sub>θJC</sub>                         | 80             | °C/W |   |
| Collector-Emitter Voltage             | V <sub>CEO</sub>                         | 80             | V    |   |
| Collector-Base Voltage                | V <sub>CBO</sub>                         | 140            | V    |   |
| Emitter-Base Voltage                  | V <sub>EBO</sub>                         | 7.0            | V    |   |
| Collector Current                     | I <sub>C</sub>                           | 1.0            | A    |   |
| Total Power Dissipation:              | @ T <sub>A</sub> = +25 °C <sup>(1)</sup> | P <sub>D</sub> | 0.5  | W |
|                                       | @ T <sub>C</sub> = +25 °C <sup>(2)</sup> |                | 1.8  |   |

**Notes:** 1. Derate linearly 2.3 mW/ $^\circ\text{C}$  for  $T_A \geq +25^\circ\text{C}$ .  
2. Derate linearly 10.3 mW/ $^\circ\text{C}$  for  $T_C \geq +25^\circ\text{C}$ .



**TO-46 (TO-206AB)  
Package**

Also available in:

**TO-39 (TO-205AD)**  
(short-leaded)  
 [2N3019S](#)

**TO-5 package**  
(long-leaded)  
 [2N3019](#)

**TO-18 (TO-206AA)**  
(leaded)  
 [2N3700](#)

**UB package**  
(surface mount)  
 [2N3700UB](#)

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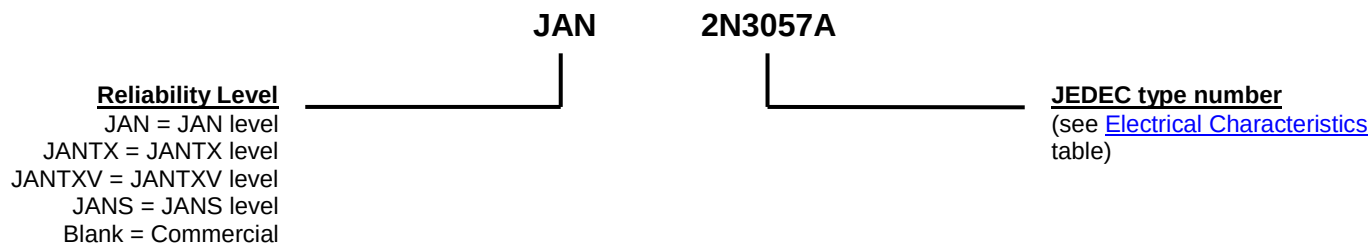
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**MECHANICAL and PACKAGING**

- CASE: Low profile nickel cap.
- TERMINALS: Gold over nickel plated kovar leads. Solder dip (Sn63/Pb37) available upon request. NOTE: Solder dip will eliminate RoHS compliance.
- MARKING: Part number, date code, manufacturer's ID and serial number.
- WEIGHT: Approximately 0.234 grams.
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE****SYMBOLS & DEFINITIONS**

| Symbol          | Definition                        |
|-----------------|-----------------------------------|
| f               | Frequency                         |
| I <sub>B</sub>  | Base current (dc)                 |
| I <sub>E</sub>  | Emitter current (dc)              |
| T <sub>A</sub>  | Ambient temperature               |
| T <sub>C</sub>  | Case temperature                  |
| V <sub>CB</sub> | Collector to base voltage (dc)    |
| V <sub>CE</sub> | Collector to emitter voltage (dc) |
| V <sub>EB</sub> | Emitter to base voltage (dc)      |

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

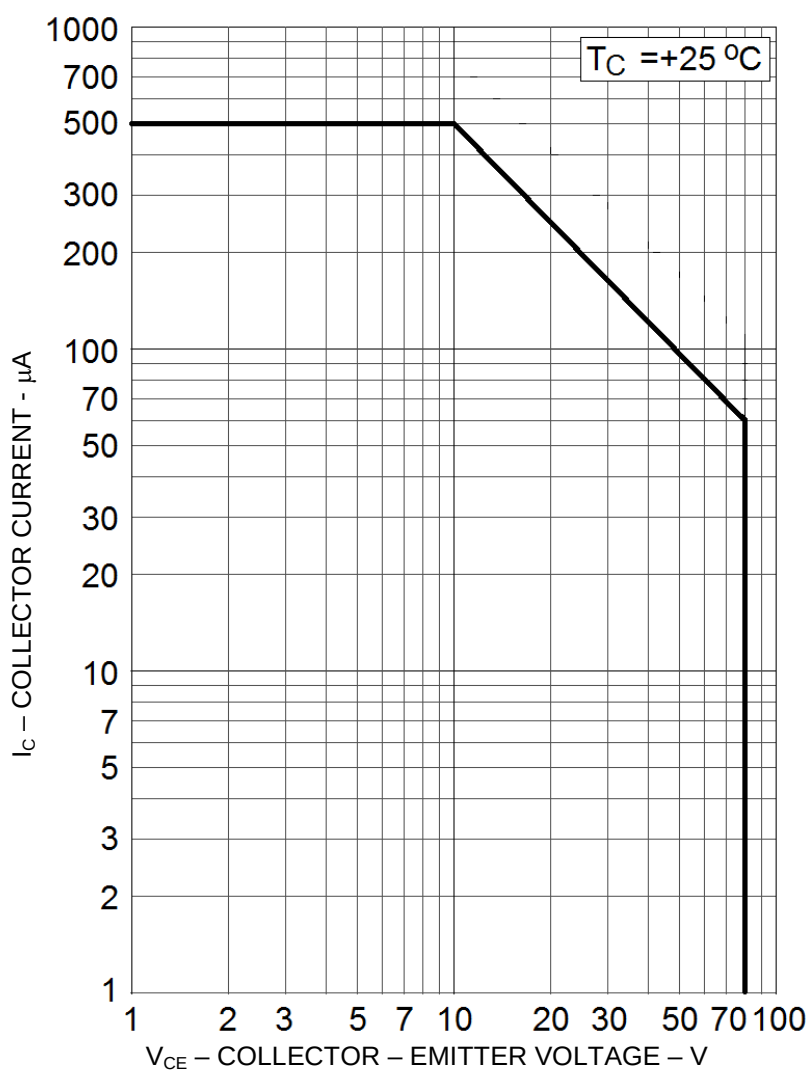
| Parameters / Test Conditions                                                                                                                                                                                                                                            | Symbol        | Min.            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

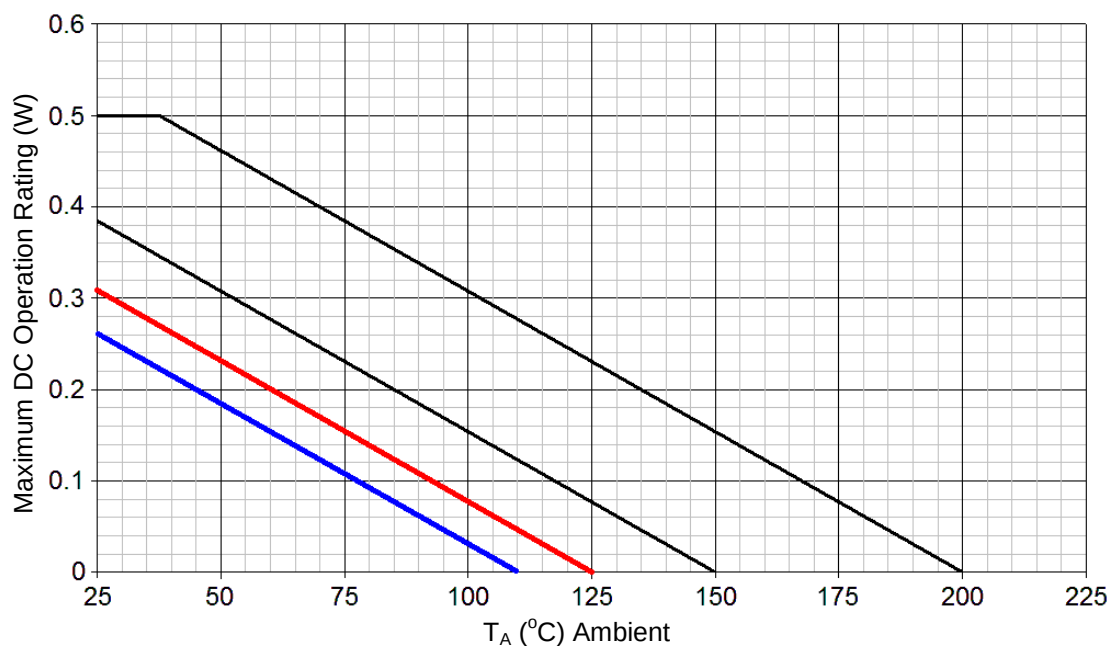
**DYNAMIC CHARACTERISTICS**

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

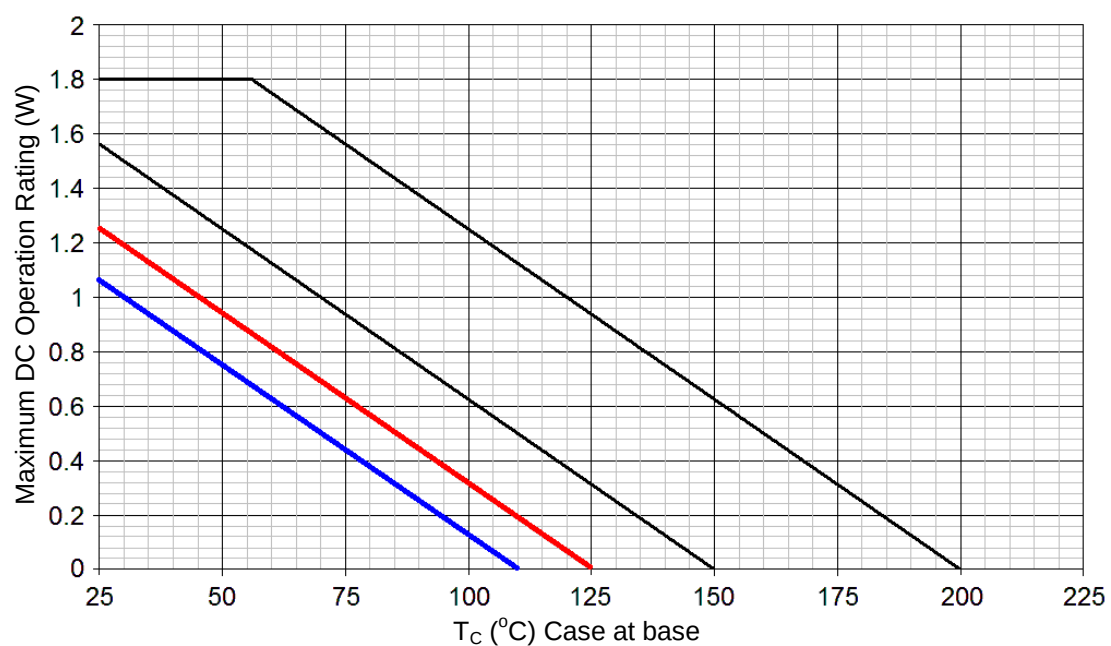
**ELECTRICAL CHARACTERISTICS @  $T_A = +25\text{ }^{\circ}\text{C}$ , unless otherwise noted (continued)**
**SAFE OPERATION AREA** (See SOA graph below and [MIL-STD-750, method 3053](#))

**DC Tests**
 $T_C = 25\text{ }^{\circ}\text{C}$ , 1 cycle,  $t = 10\text{ ms}$ 
**Test 1**
 $V_{CE} = 10\text{ V}$ 
 $I_C = 180\text{ mA}$ 
**Test 2**
 $V_{CE} = 40\text{ V}$ 
 $I_C = 45\text{ mA}$ 
**Test 3**
 $V_{CE} = 80\text{ V}$ 
 $I_C = 22.5\text{ mA}$ 

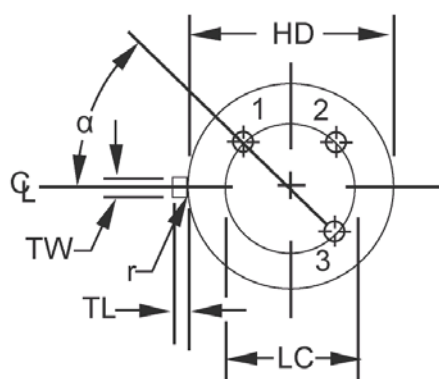
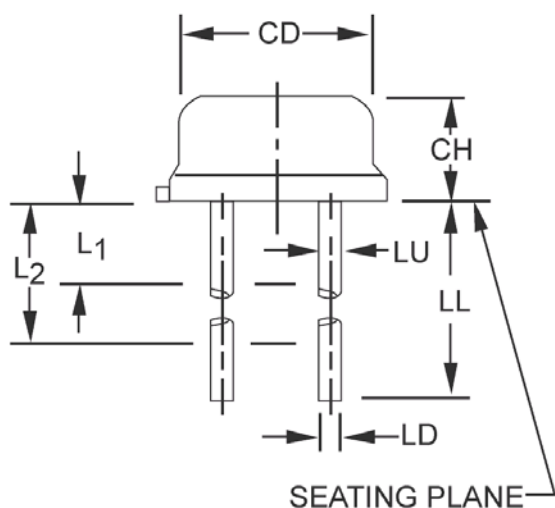
(1) Pulse Test: Pulse Width =  $300\text{ }\mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

Maximum Safe Operating Area

**GRAPHS**


**FIGURE 1**  
Temperature-Power Derating ( $R_{\theta JA}$ )  
 Leads = .125 inch (3.175mm)



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

**PACKAGE DIMENSIONS**


| Symbol | Dimensions |       |             |       | Note   |
|--------|------------|-------|-------------|-------|--------|
|        | Inches     |       | Millimeters |       |        |
|        | Min        | Max   | Min         | Max   |        |
| CD     | .178       | .195  | 4.52        | 4.95  |        |
| CH     | .065       | .085  | 1.65        | 2.16  |        |
| HD     | .209       | .230  | 5.31        | 5.84  |        |
| LC     | .100 TP    |       | 2.54 TP     |       | 6      |
| LD     | .016       | .021  | 0.41        | 0.53  | 7      |
| LL     | .500       | 1.750 | 12.70       | 44.45 | 7      |
| LU     | .016       | .019  | 0.41        | 0.48  | 7      |
| L1     |            | .050  |             | 1.27  | 7      |
| L2     | .250       |       | 6.35        |       | 7      |
| TL     | .028       | .048  | 0.71        | 1.22  | 3      |
| TW     | .036       | .046  | 0.91        | 1.17  | 2      |
| r      | -          | .007  | -           | 0.18  | 10, 11 |
| α      | 45° TP     |       | 45° TP      |       | 6      |

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
4. Dimension TL measured from maximum HD.
5. 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.
6. Dimension LU applies between L<sub>1</sub> and L<sub>2</sub>. Dimension LD applies between L<sub>2</sub> and LL minimum. Diameter is uncontrolled in L<sub>1</sub> and beyond LL minimum.
7. All three leads.
8. The collector shall be internally connected to the case.
9. Dimension r (radius) applies to both inside corners of tab.
10. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.
11. Lead 1 = emitter, lead 2 = base, lead 3 = collector.