

## NPN SILICON DUAL TRANSISTOR

Qualified per MIL-PRF-19500 /355

### DEVICES

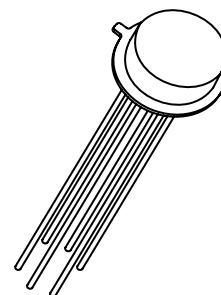
|               |                |                |
|---------------|----------------|----------------|
| <b>2N2919</b> | <b>2N2919L</b> | <b>2N2919U</b> |
| <b>2N2920</b> | <b>2N2920L</b> | <b>2N2920U</b> |

### LEVELS

**JAN**  
**JANTX**  
**JANTV**  
**JANS**

### ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$ unless otherwise noted)

| Parameters / Test Conditions                        | Symbol         | Value                    |                            | Unit             |
|---|----------------|--------------------------|----------------------------|------------------|
| Collector-Emitter Voltage                           | $V_{CEO}$      | 60                       |                            | Vdc              |
| Collector-Base Voltage                              | $V_{CBO}$      | 70                       |                            | Vdc              |
| Emitter-Base Voltage                                | $V_{EBO}$      | 6.0                      |                            | Vdc              |
| Collector Current                                   | $I_C$          | 30                       |                            | mAdc             |
|   |                | One Section <sup>1</sup> | Both Sections <sup>2</sup> |                  |
| Total Power Dissipation @ $T_A = +25^\circ\text{C}$ | $P_T$          | 200                      | 350                        | mW               |
| Operating & Storage Junction Temperature Range      | $T_J, T_{stg}$ | -65 to +200              |                            | $^\circ\text{C}$ |



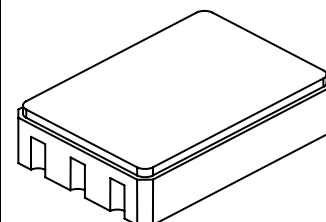
**TO-78**

### NOTES:

- Derate linearly 1.143mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$  (one section)
- Derate linearly 2.000mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$  (both sections)

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

| Parameters / Test Conditions  | Symbol        | Min. | Max.      | Unit                                |
|---|---------------|------|-----------|-------------------------------------|
| <b>OFF CHARACTERISTICS</b>  |               |      |           |                                     |
| Collector-Emitter Breakdown Voltage<br>$I_C = 10\text{mAdc}$ ; Pulsed               | $V_{(BR)CEO}$ | 60   |           | Vdc                                 |
| Collector-Base Cutoff Current<br>$V_{CB} = 45\text{Vdc}$<br>$V_{CB} = 70\text{Vdc}$ | $I_{CBO}$     |      | 2.0<br>10 | $\eta\text{Adc}$<br>$\mu\text{Adc}$ |
| Emitter-Base Cutoff Current<br>$V_{EB} = 5.0\text{Vdc}$<br>$V_{EB} = 6.0\text{Vdc}$ | $I_{EBO}$     |      | 2.0<br>10 | $\eta\text{Adc}$<br>$\mu\text{Adc}$ |



**U - Package**



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# TECHNICAL DATA SHEET

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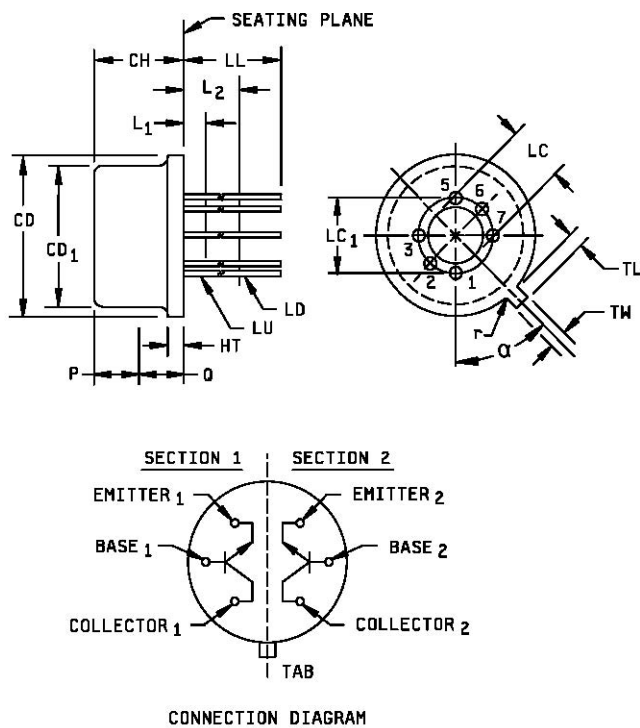
## ELECTRICAL CHARACTERISTICS (con't)

| Parameters / Test Conditions  | Symbol        | Min.              | Max.               | Unit |
|---|---------------|-------------------|--------------------|------|
| <b>ON CHARACTERISTICS</b>   |               |                   |                    |      |
| Forward-Current Transfer Ratio<br>$I_C = 10\mu\text{A dc}, V_{CE} = 5.0\text{V dc}$<br>$I_C = 100\mu\text{A dc}, V_{CE} = 5.0\text{V dc}$<br>$I_C = 1.0\text{mA dc}, V_{CE} = 5.0\text{V dc}$<br>2N2919, 2N2919L, 2N2919U | $h_{FE}$      | 60<br>100<br>150  | 240<br>325<br>600  |      |
| $I_C = 10\mu\text{A dc}, V_{CE} = 5.0\text{V dc}$<br>$I_C = 100\mu\text{A dc}, V_{CE} = 5.0\text{V dc}$<br>$I_C = 1.0\text{mA dc}, V_{CE} = 5.0\text{V dc}$<br>2N2920, 2N2920L, 2N2920U                                   | $h_{FE}$      | 175<br>235<br>300 | 600<br>800<br>1000 |      |
| Collector-Emitter Saturation Voltage<br>$I_C = 1.0\text{mA dc}, I_B = 100\mu\text{A dc}$  | $V_{CE(sat)}$ |                   | 0.3                | Vdc  |
| Base-Emitter Saturation Voltage<br>$I_C = 1.0\text{mA dc}, I_B = 100\mu\text{A dc}$   | $V_{BE(sat)}$ | 0.5               | 1.0                | Vdc  |

## DYNAMIC CHARACTERISTICS

| Parameters / Test Conditions   | Symbol                  | Min. | Max.              | Unit             |
|--|-------------------------|------|-------------------|------------------|
| Forward Current Transfer Ratio, Magnitude<br>$I_C = 0.5\text{mA dc}, V_{CE} = 5.0\text{V dc}, f = 20\text{MHz}$  | $ h_{fe} $              | 3.0  | 20                |                  |
| Small-Signal Short Circuit Input Impedance<br>$I_C = 1.0\text{mA dc}, V_{CE} = 5\text{V dc}, f = 1.0\text{kHz}$  | $h_{je}$                | 3.0  | 30                | k $\Omega$       |
| Small-Signal Short Circuit Output Admittance<br>$I_C = 1.0\text{mA dc}, V_{CE} = 5\text{V dc}, f = 1.0\text{kHz}$  | $h_{oe}$                |      | 60                | $\mu\text{mhos}$ |
| Output Capacitance<br>$V_{CB} = 5.0\text{V dc}, I_E = 0, 100\text{kHz} \leq f \leq 1.0\text{MHz}$  | $C_{obo}$               |      | 5.0               | pF               |
| Noise Figure<br>$I_C = 10\mu\text{A dc}, V_{CE} = 5\text{V dc}, f = 100\text{Hz}, R_G = 10\text{k}\Omega$<br>$I_C = 10\mu\text{A dc}, V_{CE} = 5\text{V dc}, f = 1.0\text{kHz}, R_G = 10\text{k}\Omega$<br>$I_C = 10\mu\text{A dc}, V_{CE} = 5\text{V dc}, f = 10\text{kHz}, R_G = 10\text{k}\Omega$ | $F_1$<br>$F_2$<br>$F_3$ |      | 5.0<br>3.0<br>3.0 | dB               |

## PACKAGE DIMENSIONS

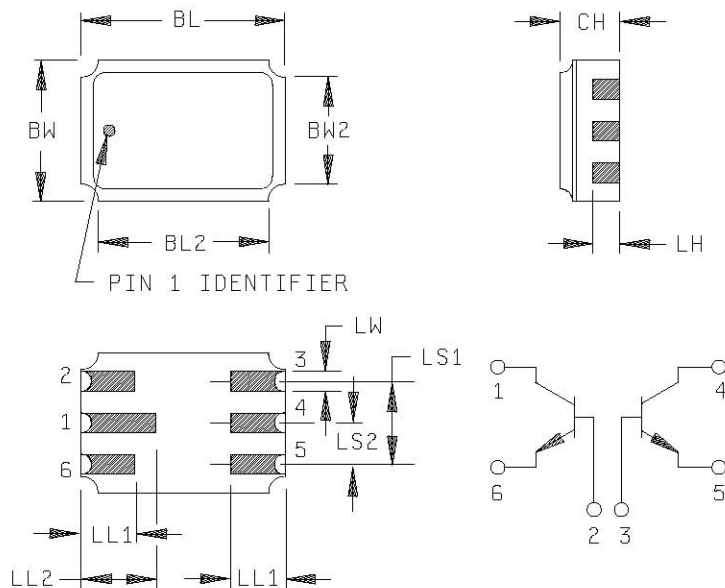


| Symbol | DIMENSIONS              |      |             |      | Notes |
|--------|-------------------------|------|-------------|------|-------|
|        | Inches                  |      | Millimeters |      |       |
|        | Min                     | Max  | Min         | Max  |       |
| CD     | .335                    | .370 | 8.51        | 9.40 |       |
| CD1    | .305                    | .335 | 7.75        | 8.51 |       |
| CH     | .140                    | .260 | 3.56        | 6.60 |       |
| HT     | .009                    | .041 | 0.23        | 1.04 |       |
| LC     | .140                    | .160 | 3.56        | 4.06 |       |
| LC1    | .200 TP                 |      | 5.08 TP     |      | 9     |
| LD     | .016                    | .021 | .041        | 0.53 | 10    |
| LL     | See notes 10, 11 and 12 |      |             |      |       |
| LU     | .016                    | .019 | .041        | 0.48 | 10    |
| L1     |                         | .050 |             | 1.27 | 10    |
| L2     | .250                    |      | 6.35        |      | 10    |
| P      | .100                    |      | 2.54        |      | 8     |
| Q      |                         | .050 |             | 1.27 | 7     |
| TL     | .029                    | .045 | 0.74        | 1.14 | 5, 6  |
| TW     | .028                    | .034 | 0.71        | 0.86 | 4, 5  |
| r      |                         | .010 |             | 0.25 |       |
| α      | 45°TP                   |      | 45°TP       |      | 9     |

### NOTES:

- 1 Dimensions are in inches.
- 2 Millimeters are given for general information only.
- 3 Tab Shown omitted.
- 4 Lead number 4 and 8 omitted on this variation.
- 5 Beyond r maximum, TW shall be held to a minimum length of .21 inch (5.33 mm)
- 6 TL shall be measured from maximum CD.
- 7 Details of outline in this zone are optional.
- 8 CD1 shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
- 9 Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedures described on gauge drawing GS-1.
- 10 LU applies between L1 and L2. LD applies between L2 and LL minimum. Diameter is uncontrolled in L1 and beyond LL minimum.
- 11 For transistor types 2N2919 and 2N2920, LL is .500 inch (12.70 mm) minimum and .750 inch (19.05 mm) maximum.
- 12 For transistor type 2N2919L and 2N2920L, LL is 1.500 inches (38.10 mm) minimum and 1.750 inches (44.45 mm) maximum.
- 13 In accordance with ASME Y14.5M, diameters are equivalent to  $\phi$ x symbology.

**FIGURE 1.** Physical dimensions 2N2919, 2N2919L, 2N2920, and 2N2920L (TO-78).



| Symbol | Dimensions |      |             |      |
|--------|------------|------|-------------|------|
|        | Inches     |      | Millimeters |      |
|        | Min        | Max  | Min         | Max  |
| BL     | .240       | .250 | 6.10        | 6.35 |
| BL2    |            | .250 |             | 6.35 |
| BW     | .165       | .175 | 4.19        | 4.44 |
| BW2    |            | .175 |             | 4.44 |
| CH     | .044       | .080 | 1.12        | 2.03 |
| LH     | .026       | .039 | 0.66        | 0.99 |
| LL1    | .060       | .070 | 1.52        | 1.78 |
| LL2    | .082       | .098 | 2.08        | 2.49 |
| LS1    | .095       | .105 | 2.41        | 2.67 |
| LS2    | .045       | .055 | 1.14        | 1.39 |
| LW     | .022       | .028 | 0.56        | 0.71 |

| Pin no. | Transistor      |
|---------|-----------------|
| 1       | Collector no. 1 |
| 2       | Base no. 1      |
| 3       | Base no. 2      |
| 4       | Collector no. 2 |
| 5       | Emitter no. 2   |
| 6       | Emitter no. 1   |

**NOTES:**

- 1 Dimensions are in inches.
- 2 Millimeters are given for general information only.
- 3 In accordance with AMSE Y14.5M, diameters are equivalent to  $\phi$ x symbology.

**FIGURE 2.** Physical dimensions (2N2919U and 2N2920U) Surface mount.



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