

## PNP SILICON DUAL TRANSISTOR

Qualified per MIL-PRF-19500 /336

### DEVICES

2N3810      2N3811  
2N3810L    2N3811L  
2N3810U    2N3811U

### LEVELS

JAN  
JANTX  
JANTV  
JANS

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

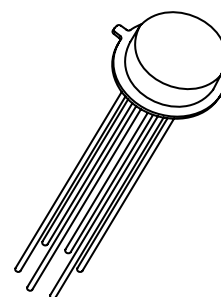
| Parameters / Test Conditions                        | Symbol         | Value                    |                            | Unit             |
|-----------------------------------------------------|----------------|--------------------------|----------------------------|------------------|
| Collector-Emitter Voltage                           | $V_{CEO}$      | 60                       |                            | Vdc              |
| Collector-Base Voltage                              | $V_{CBO}$      | 60                       |                            | Vdc              |
| Emitter-Base Voltage                                | $V_{EBO}$      | 5.0                      |                            | Vdc              |
| Collector Current                                   | $I_C$          | 50                       |                            | 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              |                            | $^\circ\text{C}$ |

### NOTES:

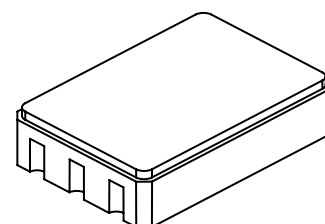
- Derate linearly 1.143mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$  (one section)
- Derate linearly 2.000mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$  (both sections)

### 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>$I_C = 100\mu\text{Adc}$                     | $V_{(BR)CEO}$ | 60   |          | Vdc                                 |
| Collector-Base Cutoff Current<br>$V_{CB} = 50\text{Vdc}$<br>$V_{CB} = 60\text{Vdc}$ | $I_{CBO}$     |      | 10<br>10 | $\eta\text{Adc}$<br>$\mu\text{Adc}$ |
| Emitter-Base Cutoff Current<br>$V_{EB} = 4.0\text{Vdc}$<br>$V_{EB} = 5.0\text{Vdc}$ | $I_{EBO}$     |      | 10<br>10 | $\eta\text{Adc}$<br>$\mu\text{Adc}$ |



TO-78



U - Package



6 Lake Street, Lawrence, MA 01841  
1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803  
Website: <http://www.microsemi.com>

# 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>$I_C = 10\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$ 2N3810, 2N3810L, 2N3810U<br>$I_C = 100\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$<br>$I_C = 1.0\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$<br>$I_C = 10\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$                    | $h_{FE}$      | 100<br>150<br>150<br>125       | 450<br>450  |      |
| $I_C = 1.0\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$ 2N3811, 2N3811L, 2N3811U<br>$I_C = 10\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$<br>$I_C = 100\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$<br>$I_C = 1.0\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$<br>$I_C = 10\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ | $h_{FE}$      | 75<br>225<br>300<br>300<br>250 | 900<br>900  |      |
| Collector-Emitter Saturation Voltage<br>$I_C = 100\mu\text{A}$ , $I_B = 10\mu\text{A}$<br>$I_C = 1.0\text{mA}$ , $I_B = 100\mu\text{A}$                                                                                                                                                  | $V_{CE(sat)}$ |                                | 0.2<br>0.25 | Vdc  |
| Base-Emitter Saturation Voltage<br>$I_C = 100\mu\text{A}$ , $I_B = 10\mu\text{A}$<br>$I_C = 1.0\text{mA}$ , $I_B = 100\mu\text{A}$                                                                                                                                                       | $V_{BE(sat)}$ |                                | 0.7<br>0.8  | Vdc  |
| Base-Emitter Non-Saturation Voltage<br>$V_{CE} = 5.0\text{Vdc}$ , $I_C = 100\mu\text{A}$                                                                                                                                                                                                 | $V_{BE}$      |                                | 0.7         | Vdc  |

## DYNAMIC CHARACTERISTICS

|                                                                                                                                                                                              |            |            |            |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------------|
| Forward Current Transfer Ratio, Magnitude<br>$I_C = 500\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$ , $f = 30\text{MHz}$<br>$I_C = 1.0\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ , $f = 100\text{MHz}$ | $ h_{fe} $ | 1.0<br>1.0 | 5.0        |                  |
| Small-Signal Short Circuit Forward Current Transfer Ratio<br>$I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ 2N3810, 2N3810L, 2N3810U<br>2N3811, 2N3811L, 2N3811U       | $h_{fe}$   | 150<br>300 | 600<br>900 |                  |
| Small-Signal Short Circuit Input Impedance<br>$I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ 2N3810, 2N3810L, 2N3810U<br>2N3811, 2N3811L, 2N3811U                      | $h_{je}$   | 3.0<br>3.0 | 30<br>40   | k $\Omega$       |
| Small-Signal Short Circuit Output Admittance<br>$I_C = 1.0\text{mA}$ , $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ 2N3810, 2N3810L, 2N3810U<br>2N3811, 2N3811L, 2N3811U                    | $h_{oe}$   | 5.0        | 60         | $\mu\text{mhos}$ |



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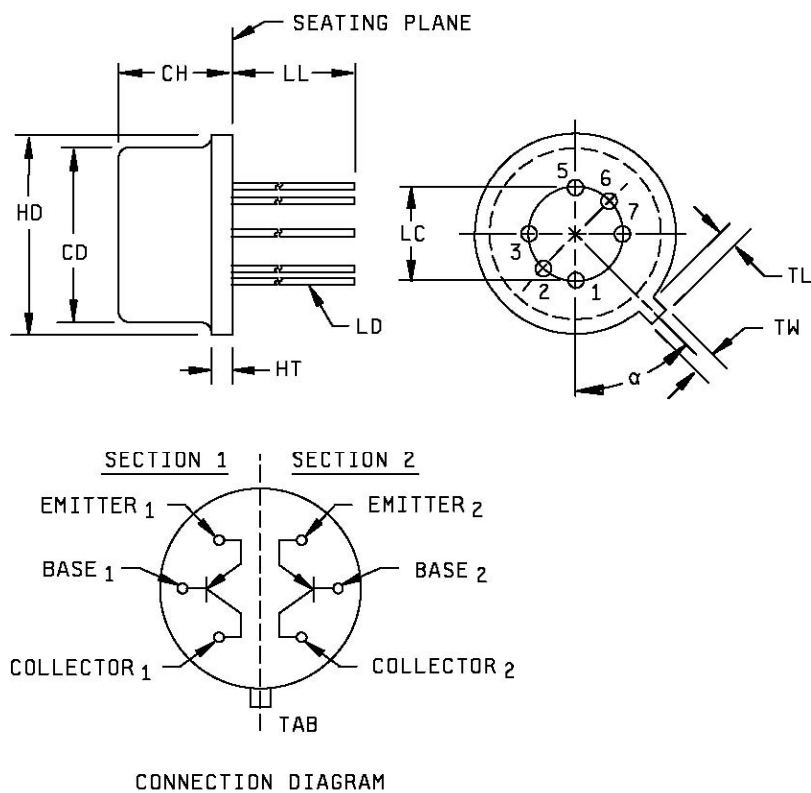
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## DYNAMIC CHARACTERISTICS (cont.)

| Parameters / Test Conditions                                                                                                       | Symbol    | Min. | Max. | Unit |
|------------------------------------------------------------------------------------------------------------------------------------|-----------|------|------|------|
| Output Capacitance<br>$V_{CB} = 5.0\text{Vdc}$ , $I_E = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$                             | $C_{obo}$ |      | 5.0  | pF   |
| Input Capacitance<br>$V_{EB} = 5.0\text{Vdc}$ , $I_C = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$                              | $C_{ibo}$ |      | 8.0  | pF   |
| Noise Figure                                                                                                                       |           |      |      |      |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 100\text{Hz}$ , $R_G = 3.0\text{k}\Omega$ 2N3810, L, U                   | $F_1$     |      | 7.0  | dB   |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ , $R_G = 3.0\text{k}\Omega$ 2N3810, L, U                  | $F_2$     |      | 3.0  |      |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 10\text{kHz}$ , $R_G = 3.0\text{k}\Omega$ 2N3810, L, U                   | $F_3$     |      | 2.5  |      |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 10\text{Hz to } 15.7\text{kHz}$ , $R_G = 3.0\text{k}\Omega$ 2N3810, L, U | $F_4$     |      | 3.5  |      |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 100\text{Hz}$ , $R_G = 3.0\text{k}\Omega$ 2N3811, L, U                   | $F_1$     |      | 4.0  | dB   |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 1.0\text{kHz}$ , $R_G = 3.0\text{k}\Omega$ 2N3811, L, U                  | $F_2$     |      | 1.5  |      |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 10\text{kHz}$ , $R_G = 3.0\text{k}\Omega$ 2N3811, L, U                   | $F_3$     |      | 2.0  |      |
| $I_C = 100\mu\text{A}$ dc, $V_{CE} = 10\text{Vdc}$ , $f = 10\text{Hz to } 15.7\text{kHz}$ , $R_G = 3.0\text{k}\Omega$ 2N3811, L, U | $F_4$     |      | 2.5  |      |

## PACKAGE DIMENSIONS

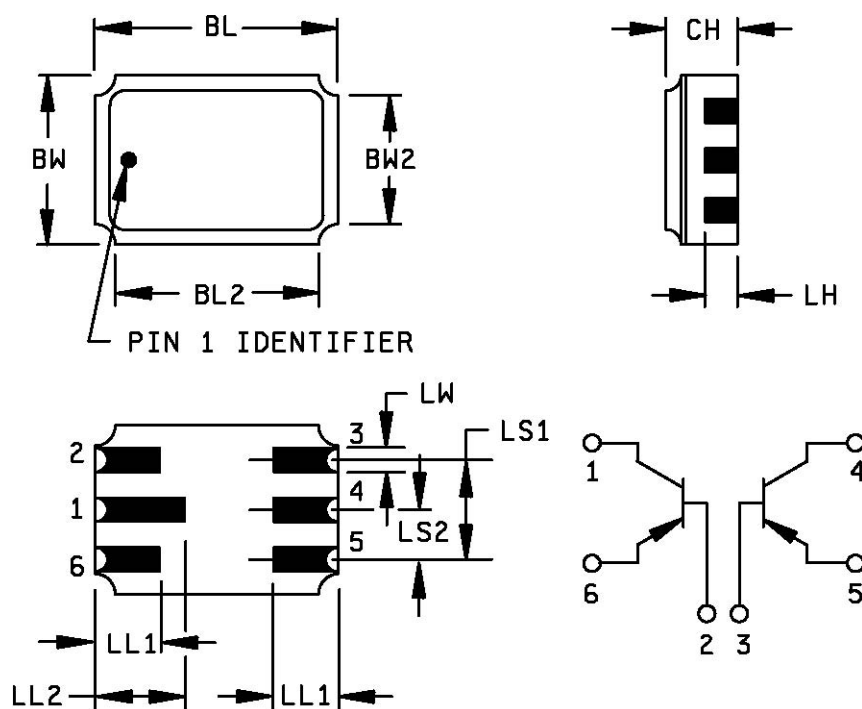


| Ltr      | DIMENSIONS               |      |             |      | Notes |
|----------|--------------------------|------|-------------|------|-------|
|          | Inches                   |      | Millimeters |      |       |
|          | Min                      | Max  | Min         | Max  |       |
| CD       | .305                     | .335 | 7.75        | 8.51 |       |
| CH       | .150                     | .185 | 3.81        | 4.70 |       |
| HD       | .335                     | .370 | 8.51        | 9.40 |       |
| HT       | .009                     | .041 | 0.23        | 1.04 |       |
| LC       | .200 BSC                 |      | 5.08 BSC    |      |       |
| LD       | .016                     | .021 | 0.41        | 0.53 | 10    |
| LL       | See notes 10, 11, and 13 |      |             |      |       |
| $\alpha$ | 45°TP                    |      | 45°TP       |      | 9     |
| TL       | .029                     | .045 | 0.74        | 1.14 | 5, 6  |
| TW       | .028                     | .034 | 0.71        | 0.86 | 4, 5  |

### NOTES:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Refer to rules for dimensioning Semiconductor Product Outlines included in Publication No. 95.
- Lead number 4 and 8 omitted on this variation.
- TW must be held to a minimum length of .021 inch (0.53 mm).
- LL measured from maximum HD.
- Details of outline in this zone optional.
- CD shall not vary more than .010 inch (0.25mm) in zone P. This zone is controlled for automatic handling.
- Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 (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 procedure described on gauge drawing GS-1.
- LD applies to LL minimum.
- r (radius) applies to both inside corners of tab.
- For transistor types 2N3810 and 2N3811, LL is .500 inch (12.70 mm) minimum, and .750 inch (19.05 mm) maximum. (TO-78).
- For transistor types 2N3810L and 2N3811L, LL is 1.500 inches (38.10 mm) minimum, and 1.750 inches (44.45 mm) maximum.
- In accordance with AMSE Y14.5M, diameters are equivalent to  $\phi$ x symbology.
- Leads 3 and 5 = emitter, leads 2 and 6 = base, leads 1 and 7 = collector.

**FIGURE 1.** Physical dimensions (similar to 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        | 4.45 |
| BW2    |            | .175 |             | 4.45 |
| 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        | 1.40 |
| 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 (2N3810U and 2N3811U).