

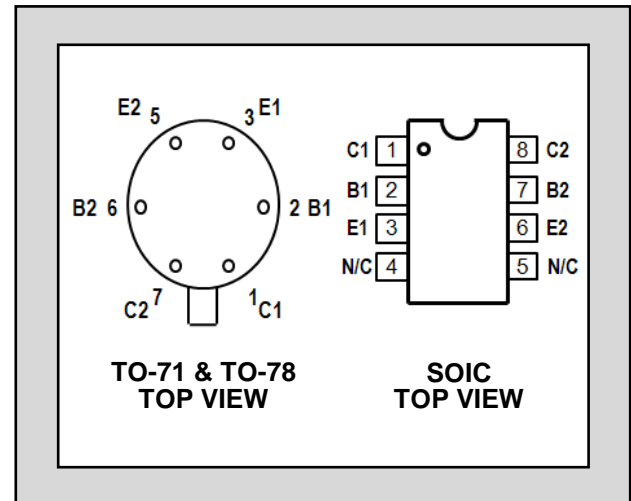
# LINEAR SYSTEMS

Twenty-Five Years Of Quality Through Innovation

## LS301 LS302 LS303

HIGH VOLTAGE  
SUPER-BETA MONOLITHIC DUAL  
NPN TRANSISTORS

| FEATURES                               |                                    |                                   |
|--|------------------------------------|-----------------------------------|
| VERY HIGH GAIN                         | $h_{FE}$ 2000 @ 1.0 $\mu$ A TYP.   |                                   |
| LOW OUTPUT CAPACITANCE                 | $C_{OBO}$ 2.0pF                    |                                   |
| TIGHT $V_{BE}$ MATCHING                | $ V_{BE1} - V_{BE2}  = 0.2mV$ TYP. |                                   |
| HIGH $f_T$                             | 100 MHz                            |                                   |
| ABSOLUTE MAXIMUM RATINGS <u>NOTE 1</u> |                                    |                                   |
| @ 25 °C (unless otherwise stated)      |                                    |                                   |
| $I_C$                                  | Collector Current                  | 5mA                               |
| Maximum Temperatures                   |                                    |                                   |
| Storage Temperature                    |                                    | -55 to +150 °C                    |
| Operating Junction Temperature         |                                    | -55 to +150 °C                    |
| Maximum Power Dissipation              |                                    | <b>ONE SIDE</b> <b>BOTH SIDES</b> |
| Device Dissipation @ Free Air          |                                    | 250mW    500mW                    |
| Linear Derating Factor                 |                                    | 2.3mW/°C    4.3mW/°C              |

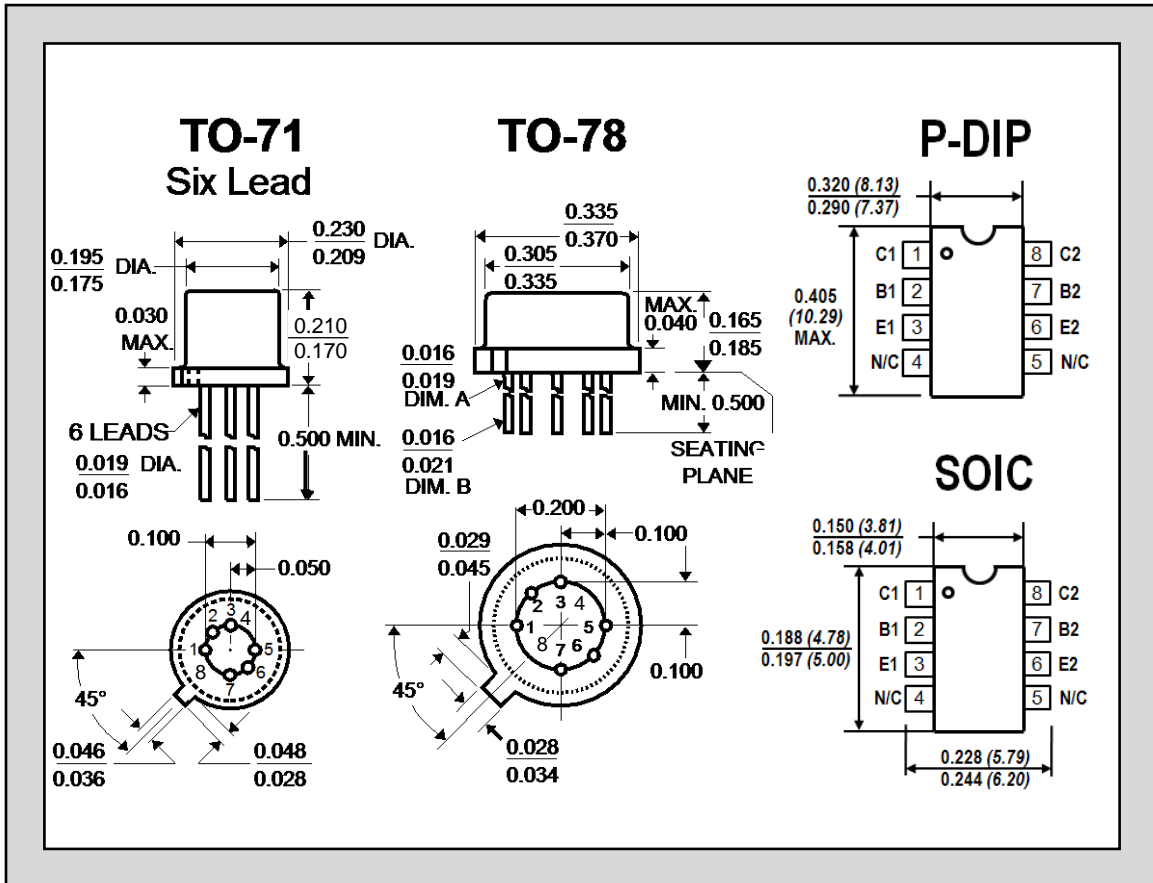


### ELECTRICAL CHARACTERISTICS @ 25 °C (unless otherwise stated)

| SYMBOL        | CHARACTERISTIC                         | LS301 | LS302 | LS303 |      | UNITS   | CONDITIONS  |
|---------------|--|-------|-------|-------|------|---------|---|
| $BV_{CBO}$    | Collector to Base Voltage              | 18    | 35    | 10    | MIN. | V       | $I_C = 10\mu A$ $I_E = 0$   |
| $BV_{CEO}$    | Collector to Emitter Voltage           | 18    | 35    | 10    | MIN. | V       | $I_C = 1mA$ $I_B = 0$   |
| $BV_{EBO}$    | Emitter-Base Breakdown Voltage         | 6.0   | 6.0   | 6.0   | MIN. | V       | $I_E = 10\mu A$ $I_C = 0$ <u>NOTE 2</u>                                 |
| $BV_{CCO}$    | Collector To Collector Voltage         | 80    | 80    | 20    | MIN. | V       | $I_C = 1\mu A$ $I_E = I_B = 0$  |
| $h_{FE}$      | DC Current Gain                        | 2000  | 1000  | 2000  | TYP. |         | $I_C = 1\mu A$ $V_{CE} = 5V$  |
| $h_{FE}$      | DC Current Gain                        | 2000  | 1000  | 2000  | MIN. |         | $I_C = 10\mu A$ $V_{CE} = 5V$   |
| $h_{FE}$      | DC Current Gain                        | 2000  | 1000  | 2000  | TYP. |         | $I_C = 500\mu A$ $V_{CE} = 5V$  |
| $V_{CE(SAT)}$ | Collector Saturation Voltage           | 0.5   | 0.5   | 0.5   | MAX. | V       | $I_C = 1mA$ $I_B = 0.1mA$   |
| $I_{CBO}$     | Collector Cutoff Current               | 100   | 100   | 100   | MAX. | pA      | $I_E = 0$ $V_{CB} = \text{NOTE 3}$                                      |
| $I_{EBO}$     | Emitter Cutoff Current                 | 0.2   | 0.2   | 0.2   | MAX. | pA      | $I_E = 0$ $V_{EB} = 3V$   |
| $C_{OBO}$     | Output Capacitance                     | 2     | 2     | 2     | MAX. | pF      | $I_E = 0$ $V_{CB} = 1V$   |
| $C_{C1C2}$    | Collector to Collector Capacitance     | 2     | 2     | 2     | MAX. | pF      | $V_{CC} = 0$  |
| $I_{C1C2}$    | Collector to Collector Leakage Current | 1.0   | 1.0   | 1.0   | MAX. | $\mu A$ | $V_{CC} = \text{NOTE 4}$ , $I_E = I_B = 0$                              |
| $f_T$         | Current Gain Bandwidth Product         | 100   | 100   | 100   | MIN. | MHz     | $I_C = 200\mu A$ $V_{CE} = 5V$  |
| NF            | Narrow Band Noise Figure               | 3     | 3     | 3     | MAX. | dB      | $I_C = 10\mu A$ $V_{CE} = 3V$<br>$BW = 200Hz$ $R_G = 10K$<br>$f = 1KHz$ |

## MATCHING CHARACTERISTICS

| SYMBOL                          | CHARACTERISTIC  | LS301 | LS302 | LS303 |      | UNITS            | CONDITIONS  |
|---------------------------------|---|-------|-------|-------|------|------------------|---|
| $V_{BE1} - V_{BE2}$             | Base Emitter Voltage Differential                         | 0.2   | 0.2   | 0.2   | TYP. | mV               | $I_C = 10\mu A$ $V_{CE} = 5V$                                       |
|                                 |   | 1     | 1     | 1     | MAX. | mV               |   |
| $I(V_{BE1} - V_{BE2})/^\circ C$ | Base Emitter Voltage Differential Change with Temperature | 1     | 1     | 1     | TYP. | $\mu V/^\circ C$ | $I_C = 10\mu A$ $V_{CE} = 5V$<br>$T = 55^\circ C$ to $+125^\circ C$ |
|                                 |   | 5     | 5     | 5     | MAX. | $\mu V/^\circ C$ |   |
| $I_{B1} - I_{B2}$               | Base Current Differential                                 | 0.5   | 1     | 0.5   | TYP. | nA               | $I_C = 10\mu A$ $V_{CE} = 1V$                                       |
|                                 |   | 1     | 5     | 1.5   | MAX. | nA               |   |
| $h_{FE1}/h_{FE2}$               | DC Current Gain Differential                              | 5     | 5     | 5     | TYP. | %                | $I_C = 10\mu A$ $V_{CE} = 5V$                                       |



## NOTES:

1. These ratings are limiting values above which the serviceability of any semiconductor may be impaired
2. The reverse base-to-emitter voltage must never exceed 6.0 volts; the reverse base-to-emitter current must never exceed 10  $\mu A$ mps.
3. For LS301 & LS302:  $V_{CB} = 10V$ ; for LS303:  $V_{CB} = 5V$
4. For LS301 & LS302:  $V_{CC} = \pm 80V$ ; for LS303:  $V_{CC} = \pm 20V$

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