

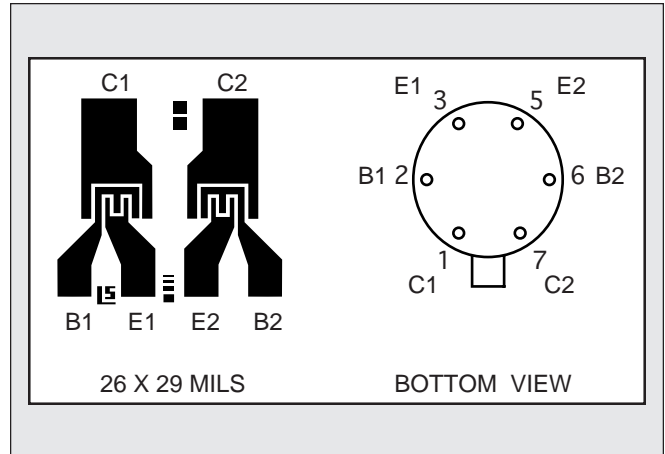
# LINEAR SYSTEMS

*Linear Integrated Systems*

## LS301 LS302 LS303

### HIGH VOLTAGE SUPER-BETA MONOLITHIC DUAL NPN TRANSISTORS

| FEATURES  |                                       |                |            |
|---|---------------------------------------|----------------|------------|
| VERY HIGH GAIN  | $h_{FE} \geq 2000$ @ 1.0 $\mu$ A TYP. |                |            |
| LOW OUTPUT CAPACITANCE  | $C_{OBO} \leq 2.0$ pF                 |                |            |
| TIGHT $V_{BE}$ MATCHING   | $ V_{BE1} - V_{BE2}  = 0.2$ mV TYP.   |                |            |
| HIGH $f_T$  | 100MHz                                |                |            |
| ABSOLUTE MAXIMUM RATINGS <u>NOTE 1</u><br>@ 25°C (unless otherwise noted) |                                       |                |            |
| $I_C$   | Collector Current                     | 5mA            |            |
| Maximum Temperatures  |                                       |                |            |
| Storage Temperature   |                                       | -65° to +200°C |            |
| Operating Junction Temperature  |                                       | +150°C         |            |
| Maximum Power Dissipation   |                                       | ONE SIDE       | BOTH SIDES |
| Device Dissipation @ Free Air   |                                       | 250mW          | 500mW      |
| Linear Derating Factor  |                                       | 2.3mW/°C       | 4.3mW/°C   |



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

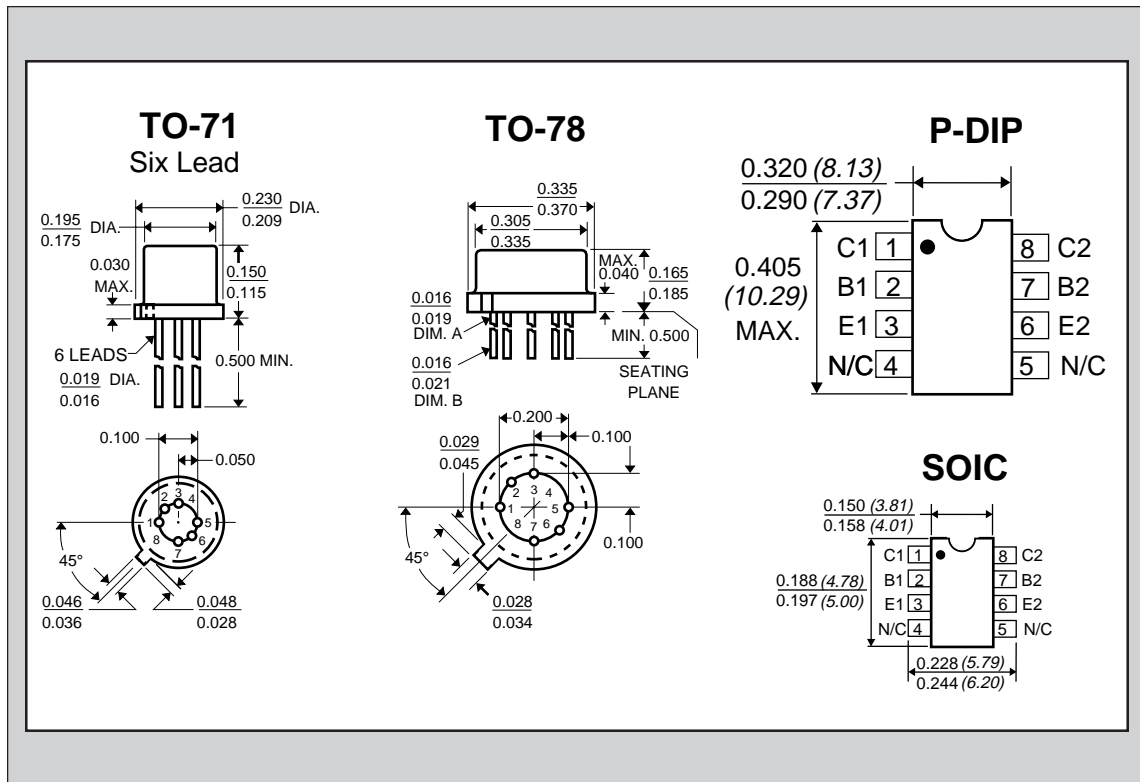
| SYMBOL        | CHARACTERISTICS                        | LS301 | LS302 | LS303 |      | UNITS | CONDITIONS   |
|---------------|--|-------|-------|-------|------|-------|--|
| $BV_{CBO}$    | Collector to Base Voltage              | 18    | 35    | 10    | MIN. | V     | $I_C = 10\mu A$ $I_E = 0$  |
| $BV_{CEO}$    | Collector to Emitter Voltage           | 18    | 35    | 10    | MIN. | V     | $I_C = 10\mu A$ $I_B = 0$  |
| $BV_{EBO}$    | Emitter-Base Breakdown Voltage         | 6.2   | 6.2   | 6.2   | MIN. | V     | $I_E = 10\mu A$ $I_C = 0$ NOTE 2   |
| $BV_{CCO}$    | Collector to Collector Voltage         | 100   | 100   | 100   | MIN. | V     | $I_C = 10\mu A$ $I_E = 0$  |
| $h_{FE}$      | 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 | 0.5   | 0.5   | 0.5   | MAX. | nA    | $V_{CC} = \text{NOTE 4}$   |
| $f_T$         | 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 $R_G = 10 K\Omega$<br>f = 1KHz |

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# MATCHING CHARACTERISTICS

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



## 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 6.2 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:  $V_{CC} = \pm 20V$ .