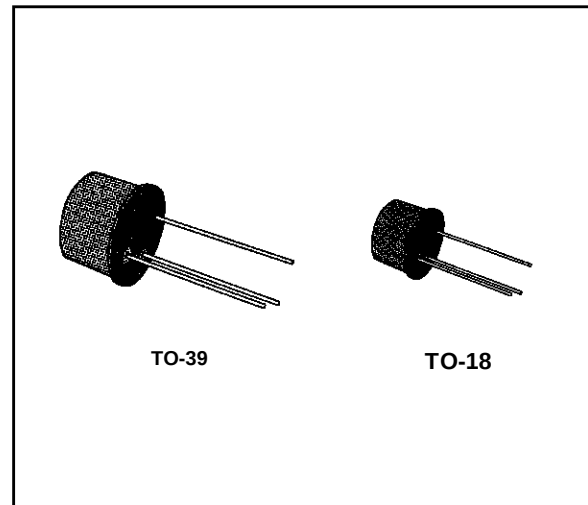


## HIGH-SPEED SWITCHES

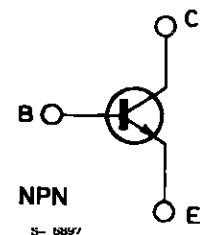
### DESCRIPTION

The 2N2218, 2N2219, 2N2221 and 2N2222 are silicon planar epitaxial NPN transistors in Jedec TO-39 (for 2N2218 and 2N2219) and in Jedec TO-18 (for 2N2221 and 2N2222) metal cases. They are designed for high-speed switching applications at collector currents up to 500 mA, and feature useful current gain over a wide range of collector current, low leakage currents and low saturation voltages.

 2N2218/2N2219 approved to CECC 50002-100, 2N2221/2N2222 approved to CECC 50002-101 available on request.



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                                                                                         | Value       | Unit             |
|-----------|---------------------------------------------------------------------------------------------------|-------------|------------------|
| $V_{CBO}$ | Collector-base Voltage ( $I_E = 0$ )                                                              | 60          | V                |
| $V_{CEO}$ | Collector-emitter Voltage ( $I_B = 0$ )                                                           | 30          | V                |
| $V_{EBO}$ | Emitter-base Voltage ( $I_C = 0$ )                                                                | 5           | V                |
| $I_C$     | Collector Current                                                                                 | 0.8         | A                |
| $P_{tot}$ | Total Power Dissipation at $T_{amb} \leq 25^\circ\text{C}$<br>for <b>2N2218</b> and <b>2N2219</b> | 0.8         | W                |
|           | for <b>2N2221</b> and <b>2N2222</b>                                                               | 0.5         | W                |
|           | at $T_{case} \leq 25^\circ\text{C}$<br>for <b>2N2218</b> and <b>2N2219</b>                        | 3           | W                |
|           | for <b>2N2221</b> and <b>2N2222</b>                                                               | 1.8         | W                |
| $T_{stg}$ | Storage Temperature                                                                               | - 65 to 200 | $^\circ\text{C}$ |
| $T_j$     | Junction Temperature                                                                              | 175         | $^\circ\text{C}$ |

## 2N2218-2N2219-2N2221-2N2222

### THERMAL DATA

|                  |                                     |     | 2N2218<br>2N2219 | 2N2221<br>2N2222 |
|------------------|-------------------------------------|-----|------------------|------------------|
| $R_{th\ j-case}$ | Thermal Resistance Junction-case    | Max | 50 °C/W          | 83.3 °C/W        |
| $R_{th\ j-amb}$  | Thermal Resistance Junction-ambient | Max | 187.5 °C/W       | 300 °C/W         |

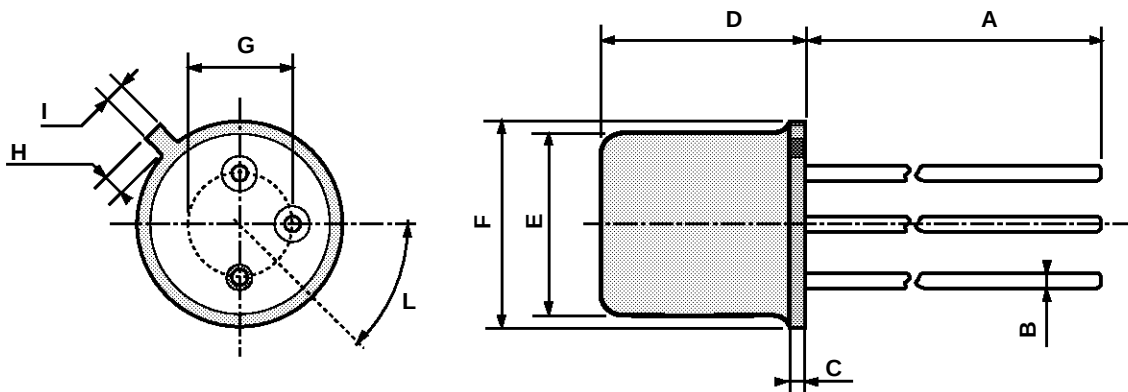
### ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ °C}$ unless otherwise specified)

| Symbol          | Parameter                                            | Test Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Min.                                                                  | Typ. | Max.           | Unit                |
|-----------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------|----------------|---------------------|
| $I_{CBO}$       | Collector Cutoff Current<br>( $I_E = 0$ )            | $V_{CB} = 50\text{ V}$<br>$V_{CB} = 50\text{ V}$ $T_{amb} = 150\text{ °C}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                       |      | 10<br>10       | nA<br>$\mu\text{A}$ |
| $I_{EBO}$       | Emitter Cutoff Current<br>( $I_C = 0$ )              | $V_{EB} = 3\text{ V}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                       |      | 10             | nA                  |
| $V_{(BR)\ CBO}$ | Collector-base Breakdown<br>Voltage ( $I_E = 0$ )    | $I_C = 10\text{ }\mu\text{A}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 60                                                                    |      |                | V                   |
| $V_{(BR)CEO}^*$ | Collector-emitter Breakdown<br>Voltage ( $I_B = 0$ ) | $I_C = 10\text{ mA}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30                                                                    |      |                | V                   |
| $V_{(BR) EBO}$  | Emittter-base Breakdown<br>Voltage ( $I_C = 0$ )     | $I_E = 10\text{ }\mu\text{A}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5                                                                     |      |                | V                   |
| $V_{CE(sat)}^*$ | Collector-emitter Saturation<br>Voltage              | $I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$<br>$I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                       |      | 0.4<br>1.6     | V<br>V              |
| $V_{BE(sat)}^*$ | Base-emitter Saturation<br>Voltage                   | $I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$<br>$I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                       |      | 1.3<br>2.6     | V<br>V              |
| $h_{FE}^*$      | DC Current Gain                                      | for <b>2N2218</b> and <b>2N2221</b><br>$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$<br>for <b>2N2219</b> and <b>2N2222</b><br>$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$<br>$I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$ | 20<br>25<br>35<br>40<br>20<br>20<br>35<br>50<br>75<br>100<br>30<br>50 |      | 120<br><br>300 |                     |
| $f_T$           | Transition Frequency                                 | $I_C = 20\text{ mA}$ $V_{CE} = 20\text{ V}$<br>$f = 100\text{ MHz}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 250                                                                   |      |                | MHz                 |
| $C_{CBO}$       | Collector-base Capacitance                           | $I_E = 0$ $V_{CB} = 10\text{ V}$<br>$f = 100\text{ kHz}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                       |      | 8              | pF                  |
| $R_{e(hie)}$    | Real Part of Input<br>Impedance                      | $I_C = 20\text{ mA}$ $V_{CE} = 20\text{ V}$<br>$f = 300\text{ MHz}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                       |      | 60             | $\Omega$            |

\* Pulsed : pulse duration = 300  $\mu\text{s}$ , duty cycle = 1 %.

## TO-18 MECHANICAL DATA

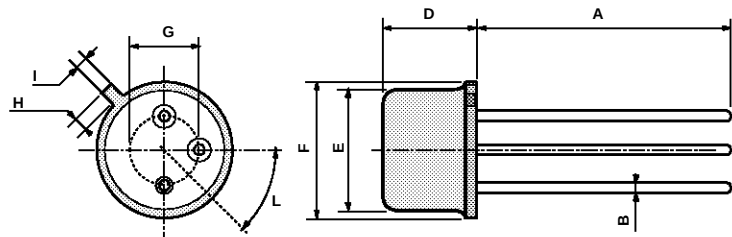
| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      | 12.7 |      |       | 0.500 |       |
| B    |      |      | 0.49 |       |       | 0.019 |
| D    |      |      | 5.3  |       |       | 0.208 |
| E    |      |      | 4.9  |       |       | 0.193 |
| F    |      |      | 5.8  |       |       | 0.228 |
| G    | 2.54 |      |      | 0.100 |       |       |
| H    |      |      | 1.2  |       |       | 0.047 |
| I    |      |      | 1.16 |       |       | 0.045 |
| L    | 45°  |      |      | 45°   |       |       |



0016043

TO39 MECHANICAL DATA

| DIM. | mm         |      |      | inch  |      |       |
|------|------------|------|------|-------|------|-------|
|      | MIN.       | TYP. | MAX. | MIN.  | TYP. | MAX.  |
| A    | 12.7       |      |      | 0.500 |      |       |
| B    |            |      | 0.49 |       |      | 0.019 |
| D    |            |      | 6.6  |       |      | 0.260 |
| E    |            |      | 8.5  |       |      | 0.334 |
| F    |            |      | 9.4  |       |      | 0.370 |
| G    | 5.08       |      |      | 0.200 |      |       |
| H    |            |      | 1.2  |       |      | 0.047 |
| I    |            |      | 0.9  |       |      | 0.035 |
| L    | 45° (typ.) |      |      |       |      |       |



P008B

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