

2N2221  
2N2222

**SILICON  
NPN TRANSISTORS**



**TO-18 CASE**

**DESCRIPTION:**

The CENTRAL SEMICONDUCTOR 2N2221 and 2N2222 are silicon NPN epitaxial planar transistors designed for small signal, general purpose switching applications.

**MARKING: FULL PART NUMBER**

**MAXIMUM RATINGS:** ( $T_A=25^\circ\text{C}$ )

|  |                |             |                    |
|--|----------------|-------------|--------------------|
| Collector-Base Voltage                       | $V_{CBO}$      | 60          | V                  |
| Collector-Emitter Voltage                    | $V_{CEO}$      | 30          | V                  |
| Emitter-Base Voltage                         | $V_{EBO}$      | 5.0         | V                  |
| Continuous Collector Current                 | $I_C$          | 800         | mA                 |
| Power Dissipation                            | $P_D$          | 500         | mW                 |
| Power Dissipation ( $T_C=25^\circ\text{C}$ ) | $P_D$          | 1.2         | W                  |
| Operating and Storage Junction Temperature   | $T_J, T_{stg}$ | -65 to +200 | $^\circ\text{C}$   |
| Thermal Resistance                           | $\theta_{JA}$  | 350         | $^\circ\text{C/W}$ |
| Thermal Resistance                           | $\theta_{JC}$  | 146         | $^\circ\text{C/W}$ |

**SYMBOL**

| SYMBOL         | VALUE       | UNITS              |
|----------------|-------------|--------------------|
| $V_{CBO}$      | 60          | V                  |
| $V_{CEO}$      | 30          | V                  |
| $V_{EBO}$      | 5.0         | V                  |
| $I_C$          | 800         | mA                 |
| $P_D$          | 500         | mW                 |
| $P_D$          | 1.2         | W                  |
| $T_J, T_{stg}$ | -65 to +200 | $^\circ\text{C}$   |
| $\theta_{JA}$  | 350         | $^\circ\text{C/W}$ |
| $\theta_{JC}$  | 146         | $^\circ\text{C/W}$ |

**UNITS**

**ELECTRICAL CHARACTERISTICS:** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

| SYMBOL        | TEST CONDITIONS                                       | MIN | MAX | UNITS         |
|---------------|---|-----|-----|---------------|
| $I_{CBO}$     | $V_{CB}=50\text{V}$                                   | -   | 10  | nA            |
| $I_{CBO}$     | $V_{CB}=50\text{V}, T_A=150^\circ\text{C}$            | -   | 10  | $\mu\text{A}$ |
| $I_{EBO}$     | $V_{EB}=3.0\text{V}$                                  | -   | 10  | nA            |
| $BV_{CBO}$    | $I_C=10\mu\text{A}$                                   | 60  | -   | V             |
| $BV_{CEO}$    | $I_C=10\text{mA}$                                     | 30  | -   | V             |
| $BV_{EBO}$    | $I_E=10\mu\text{A}$                                   | 5.0 | -   | V             |
| $V_{CE(SAT)}$ | $I_C=150\text{mA}, I_B=15\text{mA}$                   | -   | 0.4 | V             |
| $V_{CE(SAT)}$ | $I_C=500\text{mA}, I_B=50\text{mA}$                   | -   | 1.6 | V             |
| $V_{BE(SAT)}$ | $I_C=150\text{mA}, I_B=15\text{mA}$                   | 0.6 | 1.3 | V             |
| $V_{BE(SAT)}$ | $I_C=500\text{mA}, I_B=50\text{mA}$                   | -   | 2.6 | V             |
| $f_T$         | $V_{CE}=20\text{V}, I_C=20\text{mA}, f=100\text{MHz}$ | 250 | -   | MHz           |
| $C_{ob}$      | $V_{CB}=10\text{V}, I_E=0, f=100\text{kHz}$           | -   | 8.0 | pF            |
| $C_{ib}$      | $V_{EB}=0.5\text{V}, I_C=0, f=100\text{kHz}$          | -   | 30  | pF            |

2N2221  
2N2222

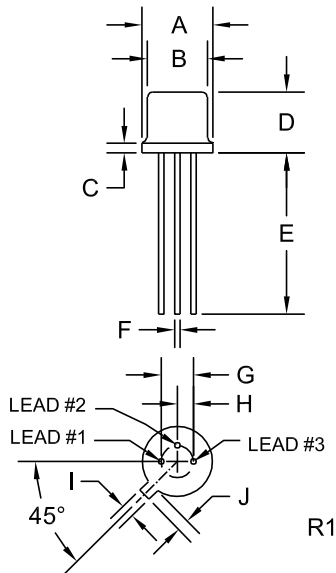
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**ELECTRICAL CHARACTERISTICS - Continued:** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

| SYMBOL   | TEST CONDITIONS   | 2N2221 |     | 2N2222 |     |
|----------|---|--------|-----|--------|-----|
|          |   | MIN    | MAX | MIN    | MAX |
| $h_{FE}$ | $V_{CE}=10\text{V}, I_C=0.1\text{mA}$                       | 20     | -   | 35     | -   |
| $h_{FE}$ | $V_{CE}=10\text{V}, I_C=1.0\text{mA}$                       | 25     | -   | 50     | -   |
| $h_{FE}$ | $V_{CE}=10\text{V}, I_C=10\text{mA}$                        | 35     | -   | 75     | -   |
| $h_{FE}$ | $V_{CE}=10\text{V}, I_C=10\text{mA}, T_A=-55^\circ\text{C}$ | 15     | -   | 35     | -   |
| $h_{FE}$ | $V_{CE}=10\text{V}, I_C=150\text{mA}$                       | 40     | 120 | 100    | 300 |
| $h_{FE}$ | $V_{CE}=1.0\text{V}, I_C=150\text{mA}$                      | 20     | -   | 50     | -   |
| $h_{FE}$ | $V_{CE}=10\text{V}, I_C=500\text{mA}$                       | 25     | -   | 40     | -   |

**TO-18 CASE - MECHANICAL OUTLINE**



| SYMBOL  | DIMENSIONS |       |             |      |
|---------|------------|-------|-------------|------|
|         | INCHES     |       | MILLIMETERS |      |
|         | MIN        | MAX   | MIN         | MAX  |
| A (DIA) | 0.209      | 0.230 | 5.31        | 5.84 |
| B (DIA) | 0.178      | 0.195 | 4.52        | 4.95 |
| C       | -          | 0.030 | -           | 0.76 |
| D       | 0.170      | 0.210 | 4.32        | 5.33 |
| E       | 0.500      | -     | 12.70       | -    |
| F (DIA) | 0.016      | 0.019 | 0.41        | 0.48 |
| G (DIA) | 0.100      |       | 2.54        |      |
| H       | 0.050      |       | 1.27        |      |
| I       | 0.036      | 0.046 | 0.91        | 1.17 |
| J       | 0.028      | 0.048 | 0.71        | 1.22 |

TO-18 (REV: R1)

**LEAD CODE:**

- 1) Emitter
- 2) Base
- 3) Collector

**MARKING: FULL PART NUMBER**

R2 (24-July 2013)