

# 2N2222A

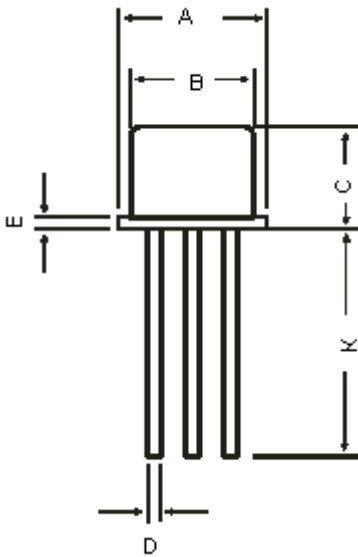
## High Speed Switching Transistor



### Features:

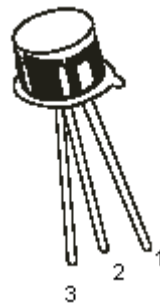
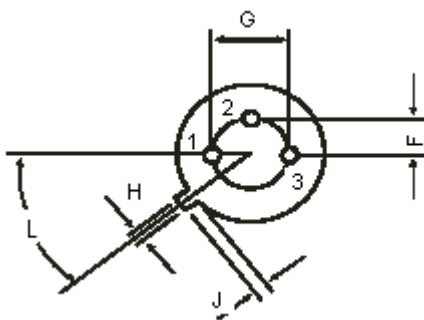
- NPN Silicon Planar Switching Transistor.
- Fast switching devices exhibiting short turn-off and low saturation voltage characteristics.
- Switching and Linear application DC and VHF Amplifier applications.

### TO-18 Metal Can Package



| Dimensions | Minimum | Maximum |
|------------|---------|---------|
| A          | 5.24    | 5.84    |
| B          | 4.52    | 4.97    |
| C          | 4.31    | 5.33    |
| D          | 0.4     | 0.53    |
| E          | —       | 0.76    |
| F          | —       | 1.27    |
| G          | —       | 2.97    |
| H          | 0.91    | 1.17    |
| J          | 0.71    | 1.21    |
| K          | 12.7    | —       |
| L          | 45°     |         |

Dimensions : Millimetres



Pin Configuration:

1. Emitter
2. Base
3. Collector



### Absolute Maximum Ratings

| Parameter  | Symbol         | Rating      | Unit        |
|--|----------------|-------------|-------------|
| Collector-Emitter Voltage  | $V_{CEO}$      | 40          | V           |
| Collector-Base Voltage   | $V_{CBO}$      | 75          |             |
| Emitter-Base Voltage   | $V_{EBO}$      | 6.0         |             |
| Collector Current Continuous   | $I_C$          | 800         | mA          |
| Power Dissipation at $T_a = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 500<br>2.28 | mW<br>mW/°C |
| Power Dissipation at $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.2<br>6.85 | W<br>mW/°C  |
| Operating and Storage Junction<br>Temperature Range                              | $T_J, T_{stg}$ | -65 to +200 | °C          |

### Electrical Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                            | Symbol         | Test Condition   | Value   |          |                     |
|--------------------------------------|----------------|--|---------|----------|---------------------|
|                                      |                |  | Minimum | Maximum  | Unit                |
| Collector-Emitter Voltage            | $V_{CEO}$      | $I_C = 10\text{mA}, I_B = 0$   | 40      | -        | V                   |
| Collector-Base Voltage               | $V_{CBO}$      | $I_C = 10\mu\text{A}, I_E = 0$   | 75      | -        |                     |
| Emitter-Base Voltage                 | $V_{EBO}$      | $I_E = 10\mu\text{A}, I_C = 0$   | 6.0     | -        |                     |
| Collector-Cut off Current            | $I_{CBO}$      | $V_{CB} = 60\text{V}, I_E = 0$   | -       | 10       | nA                  |
|                                      | $I_{CEX}$      | $T_a = 150^\circ\text{C}$<br>$V_{CB} = 60\text{V}, I_E = 0$<br>$V_{CE} = 60\text{V}, V_{EB} = 3\text{V}$ | -       | 10<br>10 | $\mu\text{A}$<br>nA |
| Emitter-Cut off Current              | $I_{EBO}$      | $V_{EB} = 3\text{V}, I_C = 0$  | -       | 10       | nA                  |
| Base-Cut off Current                 | $I_{BL}$       | $V_{CE} = 60\text{V}, V_{EB} = 3\text{V}$  | -       | 20       |                     |
| Collector Emitter Saturation Voltage | $*V_{CE(Sat)}$ | $I_C = 150\text{mA}, I_B = 15\text{mA}$  | -       | 0.3      | V                   |
|                                      |                | $I_C = 500\text{mA}, I_B = 50\text{mA}$  | -       | 1.0      |                     |
| Base Emitter Saturation Voltage      | $*V_{BE(Sat)}$ | $I_C = 150\text{mA}, I_B = 15\text{mA}$  | -       | 0.6-1.2  |                     |
|                                      |                | $I_C = 500\text{mA}, I_B = 50\text{mA}$  | -       | 2.0      |                     |

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### Electrical Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                               | Symbol       | Test Condition  | Rating               | Unit             |
|---|--------------|---|----------------------|------------------|
| DC Current Gain                         | $h_{FE}$     | $I_C = 0.1\text{mA}, V_{CE} = 10\text{V}$   | >35                  | -                |
|   |              | $I_C = 1\text{mA}, V_{CE} = 10\text{V}$   | >50                  |                  |
|   |              | $I_C = 10\text{mA}, V_{CE} = 10\text{V}$  | >75                  |                  |
|   |              | $T_a = 55^\circ\text{C}$  |                      |                  |
|   |              | $I_C = 10\text{mA}, V_{CE} = 10\text{V}$  | >35                  |                  |
|   |              | $I_C = 150\text{mA}, V_{CE} = 10\text{V}$   | 100-300              |                  |
|   |              | $I_C = 150\text{mA}, V_{CE} = 1\text{V}$  | >50                  |                  |
|   |              | $I_C = 500\text{mA}, V_{CE} = 10\text{V}$   | >40                  |                  |
| <b>Dynamic Characteristics</b>          |              |   |                      |                  |
|   |              | ALL F = 1kHz  |                      |                  |
| Small Signal Current Gain               | $h_{fe}$     | $I_C = 1\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 10\text{mA}, V_{CE} = 10\text{V}$   | 50 - 300<br>75 - 375 | -                |
| Input Impedance                         | $h_{ie}$     | $I_C = 1\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 10\text{mA}, V_{CE} = 10\text{V}$   | 2.0-8.0<br>0.25-1.25 | k $\Omega$       |
| Voltage Feedback Ratio                  | $h_{re}$     | $I_C = 1\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 10\text{mA}, V_{CE} = 10\text{V}$   | <8.0<br><4.0         | $\times 10^{-4}$ |
| Output Admittance                       | $h_{oe}$     | $I_C = 1\text{mA}, V_{CE} = 10\text{V}$<br>$I_C = 10\text{mA}, V_{CE} = 10\text{V}$   | 5.0-35<br>25-200     | umhos            |
| Collector Base Time Constant            | $r_b' C_c$   | $I_E = 20\text{mA}, V_{CB} = 20\text{V}$<br>$f = 31.8\text{MHz}$                      | <150                 | ps               |
| Real Part Common-Emitter High Frequency | $Re_{(hie)}$ | $I_C = 20\text{mA}, V_{CE} = 20\text{V}$  | <60                  | $\Omega$         |
| Input Impedance                         | -            | $f = 300\text{MHz}$   | -                    | -                |
| Noise Figure                            | $N_F$        | $I_C = 100\mu\text{A}, V_{CE} = 10\text{V}$<br>$R_s = 1\text{kohms}, f = 1\text{kHz}$ | <4.0                 | dB               |
| <b>Dynamic Characteristics</b>          |              |   |                      |                  |
| Transistors Frequency                   | $f_t$        | $I_C = 20\text{mA}, V_{CE} = 20\text{V}$<br>$f = 100\text{MHz}$                       | >300                 | MHz              |
| Output Capacitance                      | $C_{ob}$     | $V_{CB} = 10\text{V}, I_E = 0$<br>$f = 100\text{kHz}$                                 | <8.0                 | pF               |
| Input Capacitance                       | $C_{ib}$     | $V_{EB} = 0.5\text{V}, I_C = 0$<br>$f = 100\text{kHz}$                                | <25                  |                  |
| <b>Switching Time</b>                   |              |   |                      |                  |
| Delay Time                              | $t_d$        | $I_C = 150\text{mA}, I_{B1} = 15\text{mA}$  | <10                  | ns               |
| Rise Time                               | $t_r$        | $V_{CC} = 30\text{V}, V_{BE} = 0.5\text{V}$   | <25                  |                  |
| Storage Time                            | $t_s$        | $I_C = 150\text{mA}, I_{B1} =$  | <225                 |                  |
| Fall Time                               | $t_f$        | $I_{B2} = 15\text{mA}, V_{CC} = 30\text{V}$   | <60                  |                  |

\*Pulse Condition: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle = 2%

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### Specifications

| $V_{CEO}$<br>maximum<br>(V) | $I_C$<br>maximum<br>(A) | $V_{CE(sat)}$<br>maximum<br>(V)<br>at $I_C = 150mA$ | $t_{off}$<br>maximum<br>(ns)<br>at $I_C = 150mA$ | $h_{FE}$<br>minimum<br>at $I_C = 150mA$ | $P_{tot}$<br>at 25°C<br>(mW) | Package<br>and<br>Pin Out | Part Number |
|-----------------------------|-------------------------|---|--|---|------------------------------|---------------------------|-------------|
| 40                          | 0.8                     | 0.3   | 60   | 100                                     | 500                          | TO-18                     | 2N2222A     |

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## High Speed Switching Transistors

### Notes:

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