



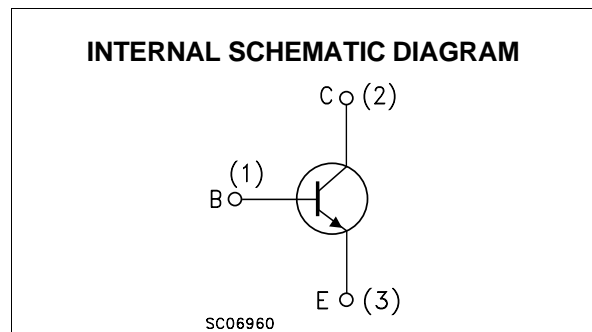
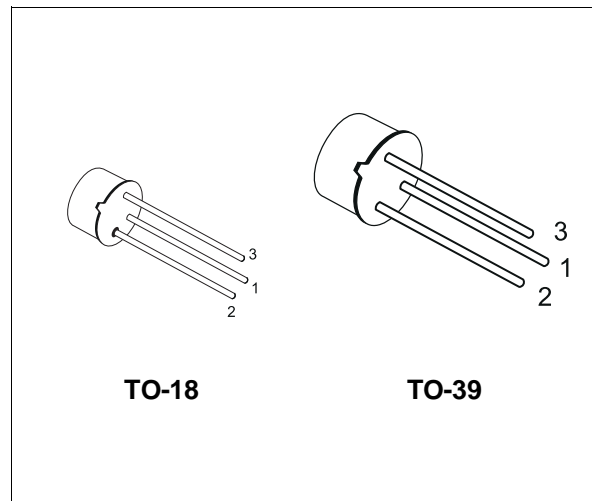
2N2219A
2N2222A

HIGH SPEED SWITCHES

PRELIMINARY DATA

DESCRIPTION

The 2N2219A and 2N2222A are silicon Planar Epitaxial NPN transistors in Jedec TO-39 (for 2N2219A) and in Jedec TO-18 (for 2N2222A) metal case. They are designed for high speed switching application at collector current up to 500mA, and feature useful current gain over a wide range of collector current, low leakage currents and low saturation voltage.



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|--|------------|------|
| V_{CBO} | Collector-Base Voltage ($I_E = 0$) | 75 | V |
| V_{CEO} | Collector-Emitter Voltage ($I_B = 0$) | 40 | V |
| V_{EBO} | Emitter-Base Voltage ($I_C = 0$) | 6 | V |
| I_C | Collector Current | 0.6 | A |
| I_{CM} | Collector Peak Current ($t_p < 5$ ms) | 0.8 | A |
| P_{tot} | Total Dissipation at $T_{amb} \leq 25$ °C for 2N2219A for 2N2222A at $T_C \leq 25$ °C for 2N2219A for 2N2222A | 0.8 | W |
| | | 0.5 | W |
| | | 3 | W |
| | | 1.8 | W |
| T_{stg} | Storage Temperature | -65 to 175 | °C |
| T_j | Max. Operating Junction Temperature | 175 | °C |

2N2219A / 2N2222A

THERMAL DATA

| | | | TO-39 | TO-18 | |
|-----------------------|-------------------------------------|-----|-------|-------|------|
| R _{thj-case} | Thermal Resistance Junction-Case | Max | 50 | 83.3 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-Ambient | Max | 187.5 | 300 | °C/W |

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--|--|---|------|------------|----------|
| I _{CBO} | Collector Cut-off Current (I _E = 0) | V _{CB} = 60 V V _{CB} = 60 V T _j = 150 °C | | | 10 10 | nA μA |
| I _{CEX} | Collector Cut-off Current (V _{BE} = -3V) | V _{CE} = 60 V | | | 10 | nA |
| I _{BEX} | Base Cut-off Current (V _{BE} = -3V) | V _{CE} = 60 V | | | 20 | nA |
| I _{EBO} | Emitter Cut-off Current (I _C = 0) | V _{EB} = 3 V | | | 10 | nA |
| V _{(BR)CBO} | Collector-Base Breakdown Voltage (I _E = 0) | I _C = 10 μA | 75 | | | V |
| V _{(BR)CEO*} | Collector-Emitter Breakdown Voltage (I _B = 0) | I _C = 10 mA | 40 | | | V |
| V _{(BR)EBO} | Emitter-Base Breakdown Voltage (I _C = 0) | I _E = 10 μA | 6 | | | V |
| V _{CE(sat)*} | Collector-Emitter Saturation Voltage | I _C = 150 mA I _B = 15 mA I _C = 500 mA I _B = 50 mA | | | 0.3 1 | V V |
| V _{BE(sat)*} | Base-Emitter Saturation Voltage | I _C = 150 mA I _B = 15 mA I _C = 500 mA I _B = 50 mA | 0.6 | | 1.2 2 | V V |
| h _{FE*} | DC Current Gain | I _C = 0.1 mA V _{CE} = 10 V I _C = 1 mA V _{CE} = 10 V I _C = 10 mA V _{CE} = 10 V I _C = 150 mA V _{CE} = 10 V I _C = 500 mA V _{CE} = 10 V I _C = 150 mA V _{CE} = 1 V I _C = 10 mA V _{CE} = 10 V T _{amb} = -55 °C | 35 50 75 100 40 50 35 | | 300 | |
| h _{fe*} | Small Signal Current Gain | I _C = 1 mA V _{CE} = 10 V f = 1KHz I _C = 10 mA V _{CE} = 10 V f = 1KHz | 50 75 | | 300 375 | |
| f _T | Transition Frequency | I _C = 20 mA V _{CE} = 20 V f = 100 MHz | | 300 | | MHz |
| C _{EBO} | Emitter-Base Capacitance | I _C = 0 V _{EB} = 0.5 V f = 100KHz | | | 25 | pF |
| C _{CBO} | Collector-Base Capacitance | I _E = 0 V _{CB} = 10 V f = 100 KHz | | | 8 | pF |
| R _{e(hie)} | Real Part of Input Impedance | I _C = 20 mA V _{CE} = 20 V f = 300MHz | | | 60 | Ω |

* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 1 %

ELECTRICAL CHARACTERISTICS (continued)

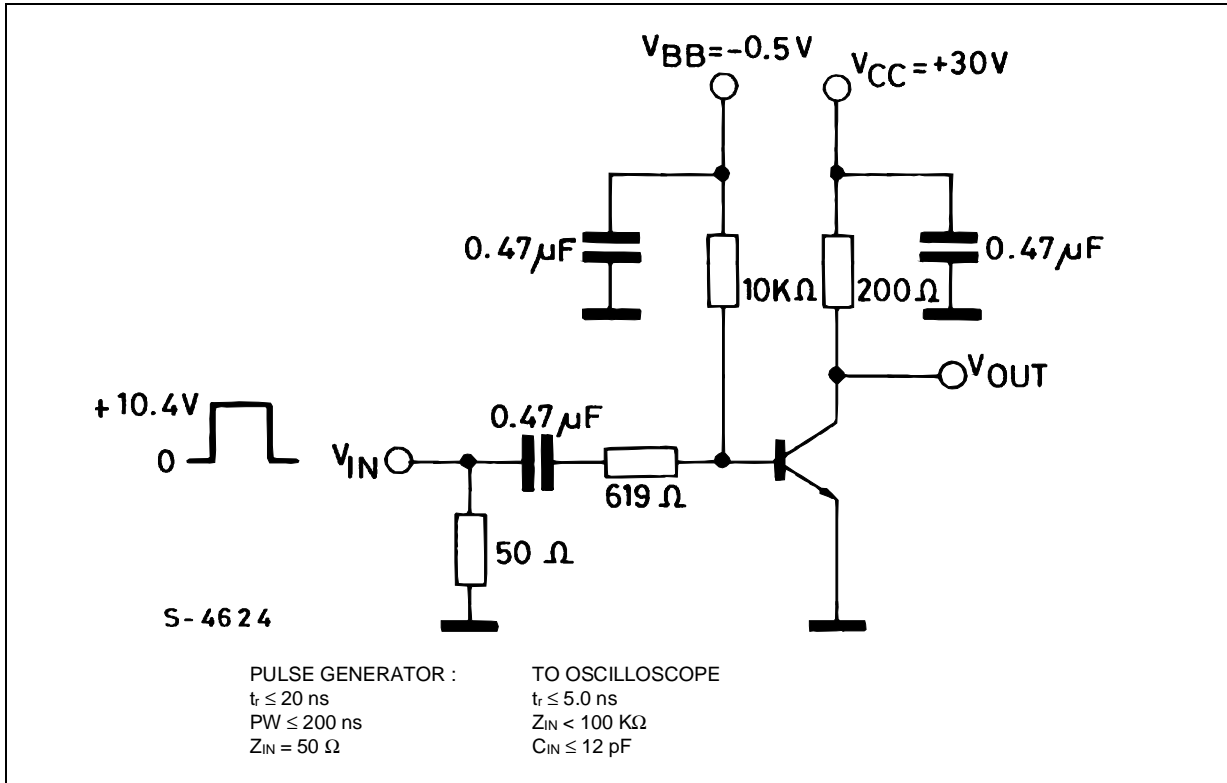
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|------------------------|--|-----------|------|-----------|--------------------------------------|
| NF | Noise Figure | $I_C = 0.1 \text{ mA}$ $V_{CE} = 10 \text{ V}$ $f = 1\text{KHz}$ $R_g = 1\text{K}\Omega$ | | 4 | | dB |
| h_{ie} | Input Impedance | $I_C = 1 \text{ mA}$ $V_{CE} = 10 \text{ V}$ $I_C = 10 \text{ mA}$ $V_{CE} = 10 \text{ V}$ | 2 0.25 | | 8 1.25 | $\text{k}\Omega$ $\text{k}\Omega$ |
| h_{re} | Reverse Voltage Ratio | $I_C = 1 \text{ mA}$ $V_{CE} = 10 \text{ V}$ $I_C = 10 \text{ mA}$ $V_{CE} = 10 \text{ V}$ | | | 8 4 | 10^{-4} 10^{-4} |
| h_{oe} | Output Admittance | $I_C = 1 \text{ mA}$ $V_{CE} = 10 \text{ V}$ $I_C = 10 \text{ mA}$ $V_{CE} = 10 \text{ V}$ | 5 25 | | 35 200 | μS μS |
| t_d^{**} | Delay Time | $V_{CC} = 30 \text{ V}$ $I_C = 150 \text{ mA}$ $I_{B1} = 15 \text{ mA}$ $V_{BB} = -0.5 \text{ V}$ | | | 10 | ns |
| t_r^{**} | Rise Time | $V_{CC} = 30 \text{ V}$ $I_C = 150 \text{ mA}$ $I_{B1} = 15 \text{ mA}$ $V_{BB} = -0.5 \text{ V}$ | | | 25 | ns |
| t_s^{**} | Storage Time | $V_{CC} = 30 \text{ V}$ $I_C = 150 \text{ mA}$ $I_{B1} = -I_{B2} = 15 \text{ mA}$ | | | 225 | ns |
| t_f^{**} | Fall Time | $V_{CC} = 30 \text{ V}$ $I_C = 150 \text{ mA}$ $I_{B1} = -I_{B2} = 15 \text{ mA}$ | | | 60 | ns |
| $r_{bb'}$, $C_{b'c}$ | Feedback Time Constant | $I_C = 20 \text{ mA}$ $V_{CE} = 20 \text{ V}$ $f = 31.8\text{MHz}$ | | | 150 | ps |

* Pulsed: Pulse duration = 300 μs , duty cycle $\leq 1\%$

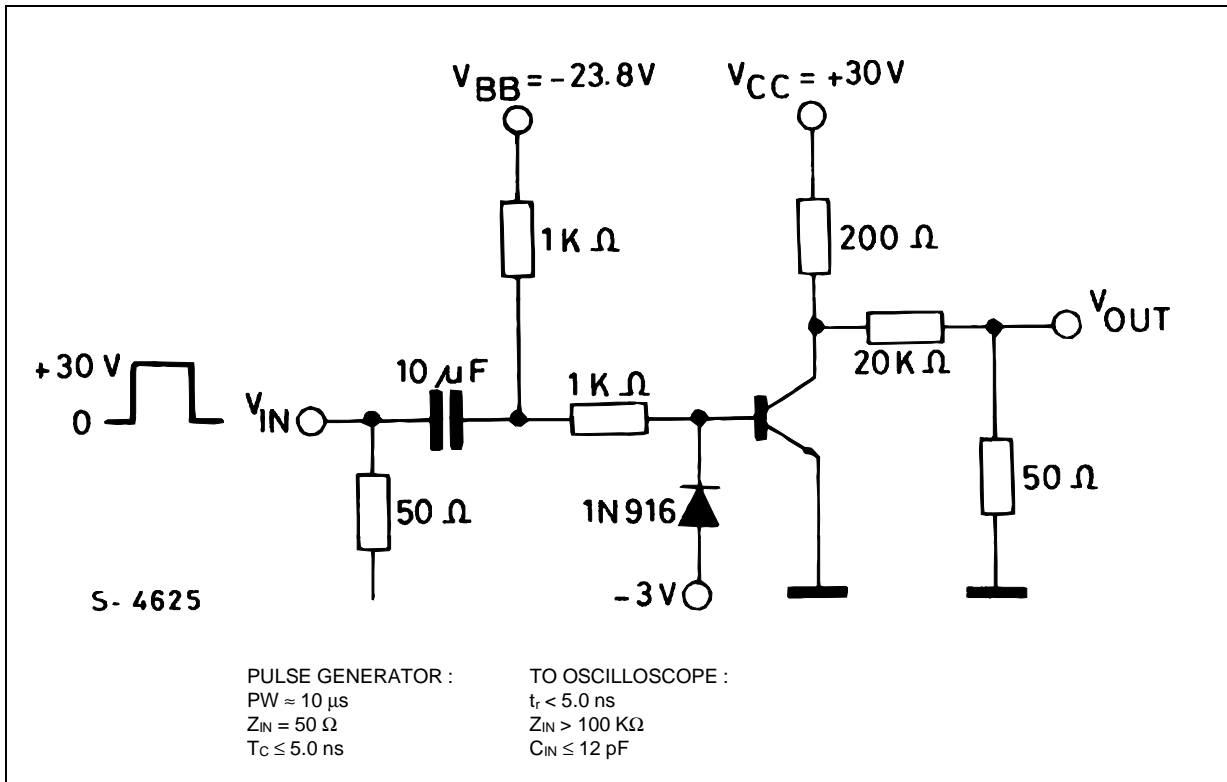
** See test circuit

2N2219A / 2N2222A

Test Circuit for t_d , t_r .



Test Circuit for t_d , t_r .



TO-18 MECHANICAL DATA

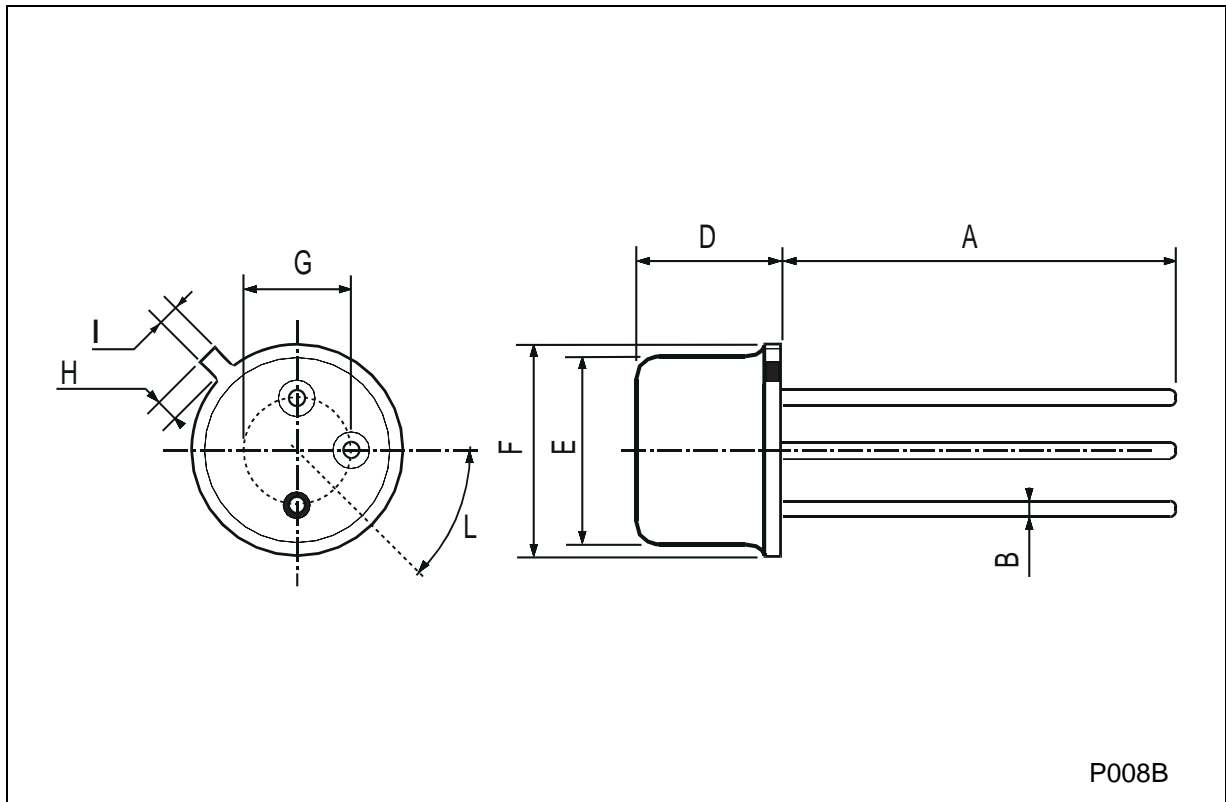
| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | 12.7 | | | 0.500 | |
| B | | | 0.49 | | | 0.019 |
| D | | | 5.3 | | | 0.208 |
| E | | | 4.9 | | | 0.193 |
| F | | | 5.8 | | | 0.228 |
| G | 2.54 | | | 0.100 | | |
|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



0016043

TO-39 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.) | | | | | |



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