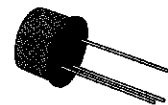


## HIGH-SPEED SATURATED SWITCH

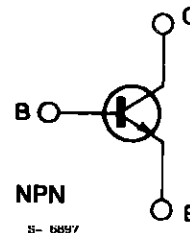
### DESCRIPTION

The 2N2369A is a silicon planar epitaxial NPN transistor in Jedec TO-18 metal case. It is designed specifically for high-speed saturated switching applications at current levels from 100  $\mu$ A to 100 mA.



TO-18

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol         | Parameter                                                  | Value       | Unit             |
|----------------|------------------------------------------------------------|-------------|------------------|
| $V_{CBO}$      | Collector-base Voltage ( $I_E = 0$ )                       | 40          | V                |
| $V_{CES}$      | Collector-emitter Voltage ( $V_{BE} = 0$ )                 | 40          | V                |
| $V_{CEO}$      | Collector-emitter Voltage ( $I_B = 0$ )                    | 15          | V                |
| $V_{EBO}$      | Emitter-base Voltage ( $I_C = 0$ )                         | 4.5         | V                |
| $I_C$          | Collector Current                                          | 0.2         | A                |
| $I_{CM}$       | Collector Current (10 $\mu$ s pulse)                       | 0.5         | A                |
| $P_{tot}$      | Total Power Dissipation at $T_{amb} \leq 25^\circ\text{C}$ | 0.36        | W                |
|                | at $T_{case} \leq 25^\circ\text{C}$                        | 1.2         | W                |
|                | at $T_{case} \leq 100^\circ\text{C}$                       | 0.68        | W                |
| $T_{stg}, T_j$ | Storage and Junction Temperature                           | - 65 to 200 | $^\circ\text{C}$ |

## THERMAL DATA

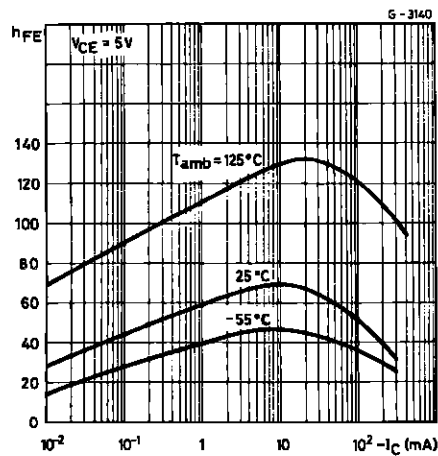
|                 |                                     |     |     |               |
|-----------------|-------------------------------------|-----|-----|---------------|
| $R_{th j-case}$ | Thermal Resistance Junction-case    | Max | 146 | $^{\circ}C/W$ |
| $R_{th j-amb}$  | Thermal Resistance Junction-ambient | Max | 486 | $^{\circ}C/W$ |

ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25^{\circ}C$  unless otherwise specified)

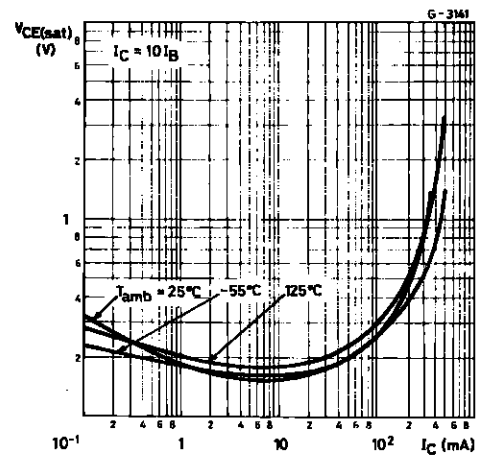
| Symbol          | Parameter                                            | Test Conditions                                                                                                                                             | Min.                 | Typ.                         | Max.                        | Unit             |
|-----------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------|-----------------------------|------------------|
| $I_{CBO}$       | Collector Cutoff Current ( $I_E = 0$ )               | $V_{CB} = 20 V$ $T_{amb} = 150^{\circ}C$                                                                                                                    |                      |                              | 30                          | $\mu A$          |
| $I_{CES}$       | Collector Cutoff Current ( $V_{BE} = 0$ )            | $V_{CE} = 20 V$                                                                                                                                             |                      |                              | 0.4                         | $\mu A$          |
| $V_{(BR)CBO}$   | Collector-base Breakdown Voltage ( $I_E = 0$ )       | $I_C = 10 \mu A$                                                                                                                                            | 40                   |                              |                             | V                |
| $V_{(BR)CES}$   | Collector-emitter Breakdown Voltage ( $V_{BE} = 0$ ) | $I_C = 10 \mu A$                                                                                                                                            | 40                   |                              |                             | V                |
| $V_{(BR)CEO}^*$ | Collector-emitter Breakdown Voltage ( $I_B = 0$ )    | $I_C = 10 mA$                                                                                                                                               | 15                   |                              |                             | V                |
| $V_{(BR)EBO}$   | Emitter-base Breakdown Voltage ( $I_C = 0$ )         | $I_E = 10 \mu A$                                                                                                                                            | 4.5                  |                              |                             | V                |
| $V_{CE(sat)}^*$ | Collector-emitter Saturation Voltage                 | $I_C = 10 mA$ $I_B = 1 mA$<br>$I_C = 30 mA$ $I_B = 3 mA$<br>$I_C = 100 mA$ $I_B = 10 mA$<br>$I_C = 10 mA$ $I_B = 1 mA$<br>$T_{amb} = 125^{\circ}C$          |                      | 0.14<br>0.17<br>0.28<br>0.19 | 0.2<br>0.25<br>0.5<br>0.3   | V<br>V<br>V<br>V |
| $V_{BE(sat)}^*$ | Base-emitter Saturation Voltage                      | $I_C = 10 mA$ $I_B = 1 mA$<br>$I_B = 30 mA$ $I_B = 3 mA$<br>$I_C = 100 mA$ $I_B = 10 mA$<br>$I_C = 10 mA$ $I_B = 1 mA$<br>$T_{amb} = -55$ to $125^{\circ}C$ | 0.7<br><br><br>0.59  | 0.8<br>0.9<br>1.1            | 0.85<br>1.15<br>1.6<br>1.02 | V<br>V<br>V<br>V |
| $h_{FE}^*$      | DC Current Gain                                      | $I_C = 10 mA$ $V_{CE} = 0.35 V$<br>$I_C = 10 mA$ $V_{CE} = 1 V$<br>$I_C = 30 mA$ $V_{CE} = 0.4 V$<br>$I_C = 100 mA$ $V_{CE} = 1 V$                          | 40<br>40<br>30<br>20 | 63<br>66<br>71               | 120<br>120                  |                  |
| $h_{FE}^*$      | DC Current Gain                                      | $I_C = 10 mA$ $T_{amb} = -55^{\circ}C$ $V_{CE} = 0.35 V$                                                                                                    | 20                   | 50                           |                             |                  |
| $f_T$           | Transition Frequency                                 | $I_C = 10 mA$ $V_{CE} = 10 V$<br>$f = 100 MHz$                                                                                                              | 500                  | 675                          |                             | MHz              |
| $C_{CBO}$       | Collector-base Capacitance                           | $I_E = 0$ $V_{CB} = 5 V$<br>$f = 1 MHz$                                                                                                                     |                      | 2.3                          | 4                           | pF               |
| $t_s^{**}$      | Storage Time                                         | $I_C = 10 mA$ $V_{CC} = 10 V$<br>$I_{B1} = -I_{B2} = 10 mA$                                                                                                 |                      | 6                            | 13                          | ns               |
| $t_{on}^{**}$   | Turn-on Time                                         | $I_C = 10 mA$ $V_{CC} = 3 V$<br>$I_{B1} = 3 mA$                                                                                                             |                      | 9                            | 12                          | ns               |
| $t_{off}^{**}$  | Turn-off Time                                        | $I_C = 10 mA$ $V_{CC} = 3 V$<br>$I_{B1} = 3 mA$ $I_{B2} = -1.5 mA$                                                                                          |                      | 13                           | 18                          | ns               |

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

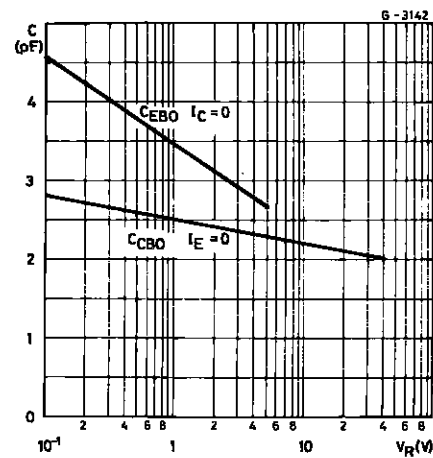
DC Current Gain.



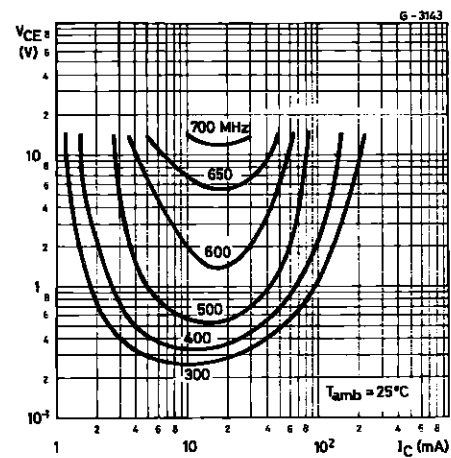
Collector-emitter Saturation Voltage.



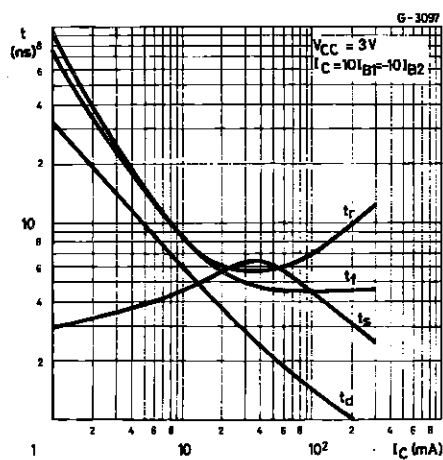
Collector-base and emitter-base capacitances.



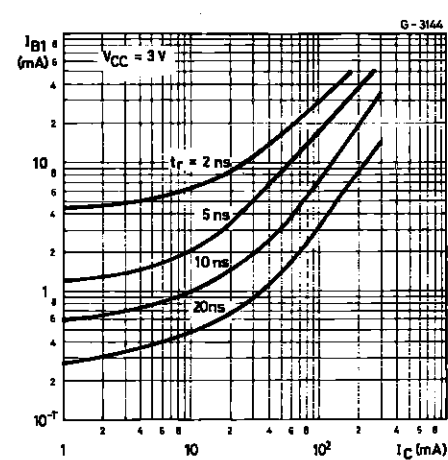
Contours of Constant Transition Frequency.



Switching Characteristics.

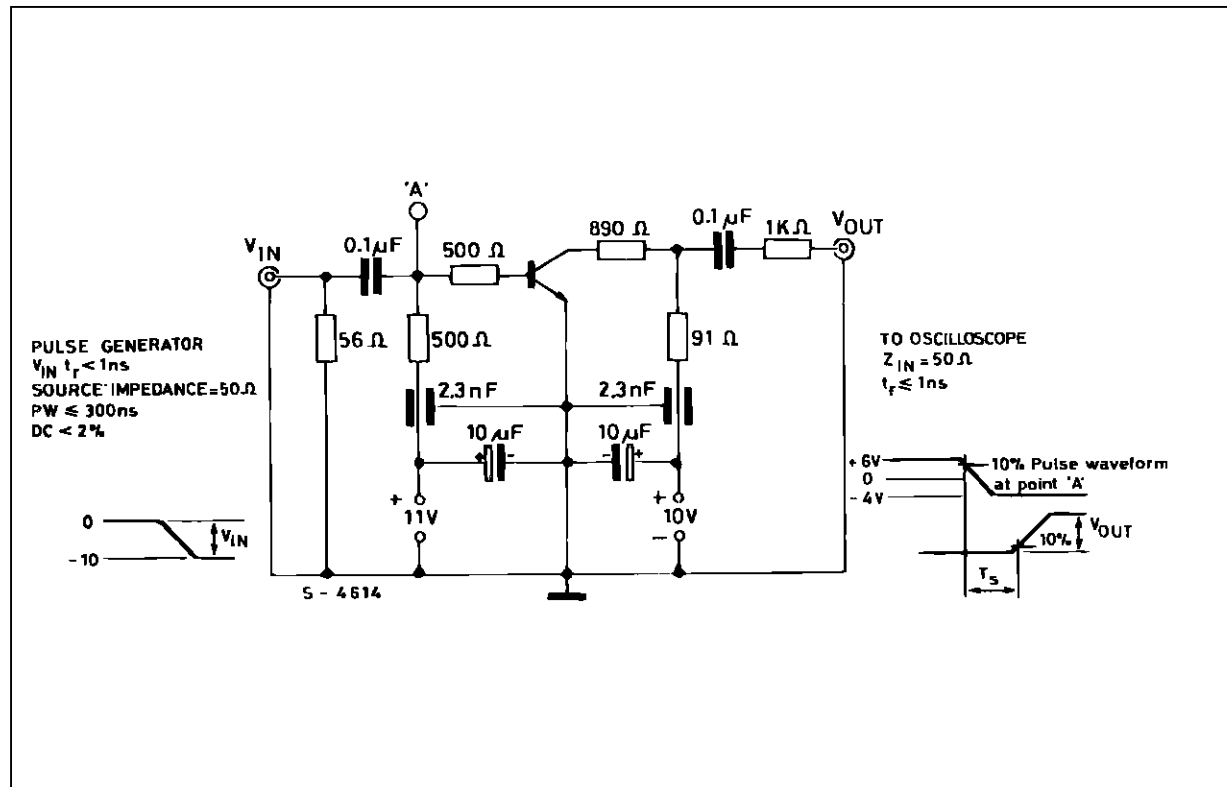


Switching Characteristics.

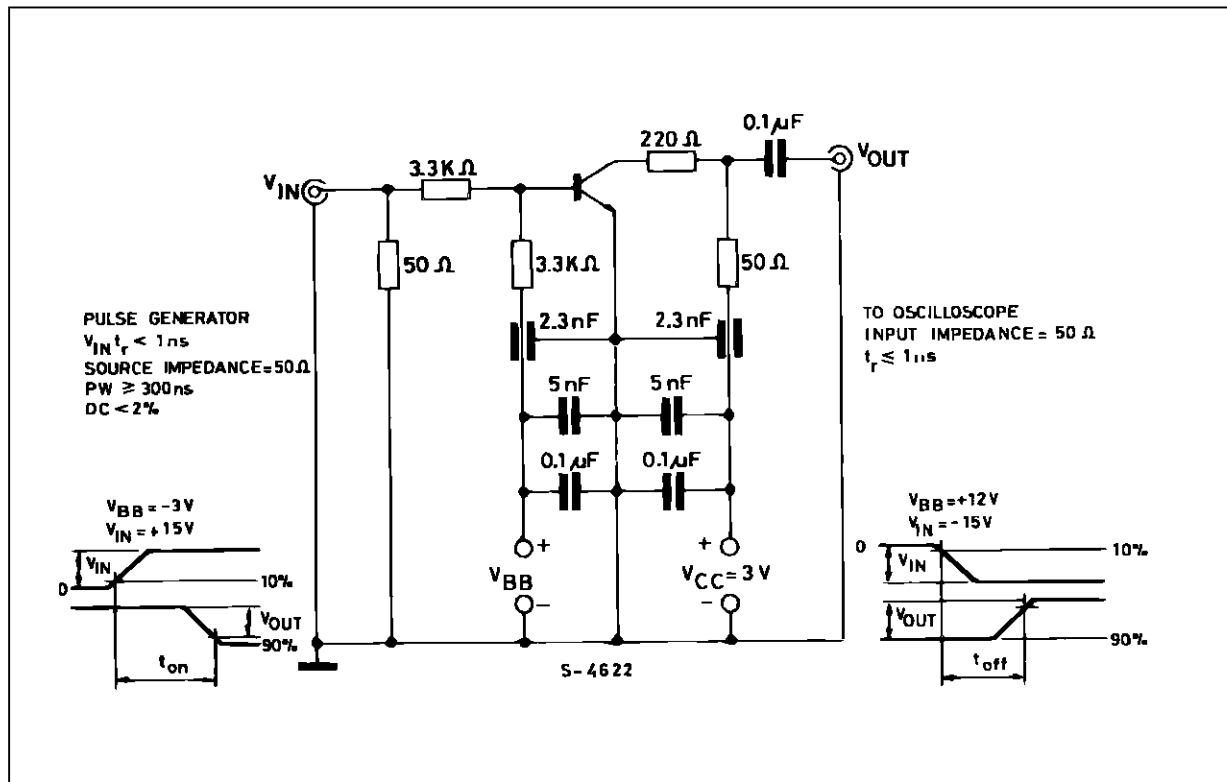


## 2N2369A

Test Circuit for  $t_s$

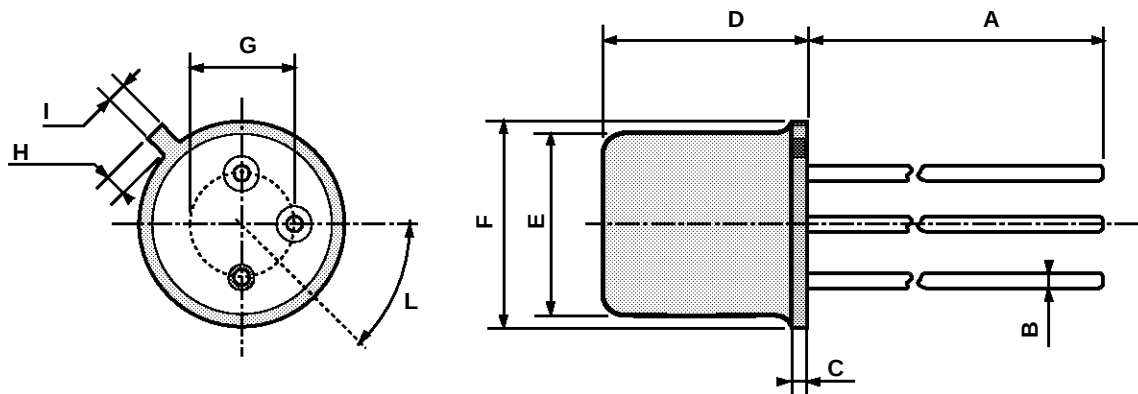


Test Circuit for  $t_{on}$ ,  $t_{off}$



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°   |       |       |



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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

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