

## NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500 / 317

### Devices

|           |          |
|-----------|----------|
| 2N2369A   | 2N4449   |
| 2N2369AU  | 2N4449U  |
| 2N2369AUA | 2N4449UA |
| 2N2369AUB | 2N4449UB |

### Qualified Level

JAN  
JANTX  
JANTXV

### MAXIMUM RATINGS

| Ratings                                                                 | Symbol            | All UB              | All others         | Unit               |
|-------------------------------------------------------------------------|-------------------|---------------------|--------------------|--------------------|
| Collector-Emitter Voltage                                               | $V_{CEO}$         | 20                  | 15                 | Vdc                |
| Emitter-Base Voltage                                                    | $V_{EBO}$         | 6.0                 | 4.5                | Vdc                |
| Collector-Base Voltage                                                  | $V_{CBO}$         | 40                  |                    | Vdc                |
| Collector-Emitter Voltage                                               | $V_{CES}$         | 40                  |                    | Vdc                |
| @ $T_A = +25^{\circ}\text{C}$ @ $T_C = +25^{\circ}\text{C}$             |                   |                     |                    |                    |
| Total Power Dissipation<br>2N2369A; 2N4449<br>All UA<br>All UB<br>All U | $P_T$             | 0.50 <sup>(1)</sup> | 1.2 <sup>(2)</sup> | W                  |
|                                                                         |                   | 0.50 <sup>(5)</sup> | 1.2 <sup>(2)</sup> | W                  |
|                                                                         |                   | 0.40 <sup>(6)</sup> | 1.4 <sup>(7)</sup> |                    |
|                                                                         |                   | 0.60 <sup>(3)</sup> | 1.5 <sup>(4)</sup> |                    |
| Operating & Storage Junction Temperature Range                          | $T_{op}, T_{stg}$ | -65 to +200         |                    | $^{\circ}\text{C}$ |

### THERMAL CHARACTERISTICS

| Characteristics                                                                      | Symbol          | Max.                     | Unit                         |
|--------------------------------------------------------------------------------------|-----------------|--------------------------|------------------------------|
| Thermal Resistance, Junction-to-Case<br>2N2369A; 2N4449<br>All UA<br>All UB<br>All U | $R_{\theta JC}$ | 146<br>125<br>135<br>117 | $^{\circ}\text{C}/\text{mW}$ |
| Thermal Resistance, Ambient-to-Case<br>2N2369A; 2N4449<br>All UA<br>All UB<br>All U  | $R_{\theta JA}$ | 325<br>350<br>437<br>291 | $^{\circ}\text{C}/\text{mW}$ |

1) Derate linearly 3.08 mW/ $^{\circ}\text{C}$  above  $T_A = +37.5^{\circ}\text{C}$

2) Derate linearly 6.85 mW/ $^{\circ}\text{C}$  above  $T_C = +25^{\circ}\text{C}$

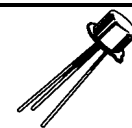
3) Derate linearly 3.44 mW/ $^{\circ}\text{C}$  above  $T_A = +63.5^{\circ}\text{C}$

4) Derate linearly 8.55 mW/ $^{\circ}\text{C}$  above  $T_C = +63.5^{\circ}\text{C}$

5) Derate linearly 2.86 mW/ $^{\circ}\text{C}$  above  $T_C = +63.5^{\circ}\text{C}$

6) Derate linearly 2.29 mW/ $^{\circ}\text{C}$  above  $T_C = +63.5^{\circ}\text{C}$

7) Derate linearly 8.00 mW/ $^{\circ}\text{C}$  above  $T_C = +63.5^{\circ}\text{C}$



TO-18\* (TO-206AA)  
2N2369A



TO-46 (TO-206AB)  
2N4449



SURFACE MOUNT  
UA\*



SURFACE MOUNT  
UB\*



SURFACE MOUNT  
U\*

\*See appendix A for  
package outline

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

| Characteristics                                                | Symbol        | Min. | Max. | Unit            |
|----------------------------------------------------------------|---------------|------|------|-----------------|
| <b>OFF CHARACTERISTICS</b>                                     |               |      |      |                 |
| Collector-Emitter Breakdown Voltage<br>$I_C = 10 \text{ mAdc}$ | $V_{(BR)CEO}$ | 15   |      | Vdc             |
| Collector-Emitter Cutoff Current<br>$V_{CE} = 20 \text{ Vdc}$  | $I_{CES}$     |      | 0.4  | $\mu\text{Adc}$ |
| Emitter-Base Breakdown Voltage<br>$V_{EB} = 4.5 \text{ Vdc}$   | $I_{EBO}$     |      | 10   | $\mu\text{Adc}$ |
| Emitter-Base Cutoff Current<br>$V_{EB} = 4.0 \text{ Vdc}$      |               |      | 0.25 |                 |
| Collector-Base Breakdown Voltage<br>$V_{CB} = 40 \text{ Vdc}$  | $I_{CBO}$     |      | 10   | $\mu\text{Adc}$ |
| Collector-Base Cutoff Current<br>$V_{CB} = 32 \text{ Vdc}$     |               |      | 0.2  |                 |

**ON CHARACTERISTICS (1)**

|                                                                                                                                                                                                                                                      |               |              |                      |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------|----------------------|-----|
| Forward-Current Transfer Ratio<br>$I_C = 10 \text{ mAdc}, V_{CE} = 0.35 \text{ Vdc}$<br>$I_C = 30 \text{ mAdc}, V_{CE} = 0.4 \text{ Vdc}$<br>$I_C = 10 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc}$<br>$I_C = 100 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc}$ | $h_{FE}$      | 40           | 120                  |     |
|                                                                                                                                                                                                                                                      |               | 30           | 120                  |     |
|                                                                                                                                                                                                                                                      |               | 40           | 120                  |     |
|                                                                                                                                                                                                                                                      |               | 20           | 120                  |     |
| Collector-Emitter Saturation Voltage<br>$I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$<br>$I_C = 30 \text{ mAdc}, I_B = 3.0 \text{ mAdc}$<br>$I_C = 100 \text{ mAdc}, I_B = 10 \text{ mAdc}$                                                        | $V_{CE(sat)}$ |              | 0.20<br>0.25<br>0.45 | Vdc |
| Base-Emitter Saturation Voltage<br>$I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$<br>$I_C = 30 \text{ mAdc}, I_B = 3.0 \text{ mAdc}$<br>$I_C = 100 \text{ mAdc}, I_B = 10 \text{ mAdc}$                                                             | $V_{BE(sat)}$ | 0.70<br>0.80 | 0.85<br>0.90<br>1.20 | Vdc |

**DYNAMIC CHARACTERISTICS**

|                                                                                                         |            |     |     |    |
|---------------------------------------------------------------------------------------------------------|------------|-----|-----|----|
| Forward Current Transfer Ratio<br>$I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 100 \text{ MHz}$ | $ h_{fe} $ | 5.0 | 10  |    |
| Output Capacitance<br>$V_{CB} = 5.0 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$  | $C_{obo}$  |     | 4.0 | pF |
| Input Capacitance<br>$V_{EB} = 0.5 \text{ Vdc}, I_C = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$   | $C_{ibo}$  |     | 5.0 | pF |

(1)Pulse Test: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .**SWITCHING CHARACTERISTICS**

|                                                                                                    |           |  |    |                |
|----------------------------------------------------------------------------------------------------|-----------|--|----|----------------|
| Turn-On Time<br>$I_C = 10 \text{ mAdc}; I_{B1} = 3.0 \text{ mAdc}, I_{B2} = 1.5 \text{ mAdc}$      | $t_{on}$  |  | 12 | $\eta\text{s}$ |
| Turn-Off Time<br>$I_C = 10 \text{ mAdc}; I_{B1} = 3.0 \text{ mAdc}, I_{B2} = 1.5 \text{ mAdc}$     | $t_{off}$ |  | 18 | $\eta\text{s}$ |
| Charge Storage Time<br>$I_C = 10 \text{ mAdc}; I_{B1} = 10 \text{ mAdc}, I_{B2} = 10 \text{ mAdc}$ | $t_s$     |  | 13 | $\eta\text{s}$ |