

## NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/317

### Devices

<b>2N2369A</b>	<b>2N4449</b>
<b>2N2369AU</b>	<b>2N4449U</b>
<b>2N2369AUA</b>	<b>2N4449UA</b>
<b>2N2369AUB</b>	<b>2N4449UB</b>

### 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	
		@ $T_A = +25^{\circ}C$	@ $T_C = +25^{\circ}C$		
Total Power Dissipation	$P_T$	2N2369A; 2N4449	0.50 <sup>(1)</sup>	1.2 <sup>(2)</sup>	W
		All UA	0.50 <sup>(5)</sup>	1.2 <sup>(2)</sup>	W
		All UB	0.40 <sup>(6)</sup>	1.4 <sup>(7)</sup>	
		All U	0.60 <sup>(3)</sup>	1.5 <sup>(4)</sup>	
Operating & Storage Junction Temperature Range	$T_{op}, T_{stg}$	-65 to +200		$^{\circ}C$	

### THERMAL CHARACTERISTICS

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

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

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

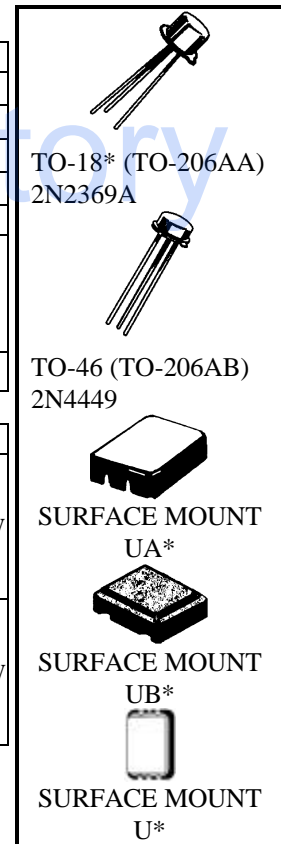
3) Derate linearly 3.44 mW/ $^{\circ}C$  above  $T_A = +63.5^{\circ}C$

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

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

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

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



\*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 $I_C = 10 \text{ mAdc}$	$V_{(BR)CEO}$	15		Vdc
Collector-Emitter Cutoff Current $V_{CE} = 20 \text{ Vdc}$	$I_{CES}$		0.4	$\mu\text{A}$ dc
Emitter-Base Breakdown Voltage $V_{EB} = 4.5 \text{ Vdc}$	$I_{EBO}$		10	$\mu\text{A}$ dc
Emitter-Base Cutoff Current $V_{EB} = 4.0 \text{ Vdc}$			0.25	
Collector-Base Breakdown Voltage $V_{CB} = 40 \text{ Vdc}$	$I_{CBO}$		10	$\mu\text{A}$ dc
Collector-Base Cutoff Current $V_{CB} = 32 \text{ Vdc}$			0.2	

**ON CHARACTERISTICS (1)**

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

**DYNAMIC CHARACTERISTICS**

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

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

**SWITCHING CHARACTERISTICS**

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