

SEMICONDUCTOR TECHNICAL DATA

2N2369AJAN, JTX, JTXV, JANS 2N3227JAN, JTX, JTXV 2N4449JAN, JTX, JTXV Processed per MIL-S-19500/317 NPN Silicon Small-Signal Transistors

...designed for general-purpose switching applications.

MAXIMUM RATINGS					
Rating	Symbol	2N2369A	2N3227	2N4449	Unit
Collector-Emitter Voltage	V_{CEO}	15	20	15	Vdc
Collector-Emitter Voltage	V_{CES}	40	40	40	Vdc
Collector-Base Voltage	V_{CBO}	40	40	40	Vdc
Emitter-Base Voltage	V_{EBO}	4.5	6.0	4.5	Vdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$	P_T	360	360	300	mW
Derate above 25°C		2.06	2.06	1.71	$\text{mW}/^\circ\text{C}$
@ $T_C = 25^\circ\text{C}$		1.2	1.2	1.5	Watts
Derate above 25°C		6.85	6.85	8.56	$\text{mW}/^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-65 to 200		°C	



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted.)					
Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(1) ($I_C = 10 \mu\text{Adc}, I_B = 0$)	$V_{(BR)CEO}$	15	—	Vdc	
		20	—		
2N2369A, 2N4449 2N3227					
Collector-Emitter Breakdown Voltage ($I_C = 10 \mu\text{Adc}, I_E = 0$)	$V_{(BR)CES}$	40	—	Vdc	
Collector-Base Breakdown Voltage ($I_C = 10 \mu\text{Adc}, I_E = 0$)	$V_{(BR)CBO}$	40	—	Vdc	
Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	4.5	—	Vdc	
		6.0	—		
2N2369A, 2N4449 2N3227					
Collector Cutoff Current ($V_{CB} = 20 \text{ Vdc}, I_E = 0$) ($V_{CB} = 20 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$)	I_{CBO}	—	0.2	μAdc	
		—	30		

(1) Pulsed. Pulse Width 250 to 350 μs . Duty Cycle 1.0 to 2.0%

(continued)

ELECTRICAL CHARACTERISTICS — continued ($T_A = 25^\circ\text{C}$ unless otherwise noted.)				
Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS (continued)				
Collector Cutoff Current ($V_{CE} = 10 \text{ Vdc}, V_{BE} = 0.25 \text{ Vdc}$) ($V_{CE} = 10 \text{ Vdc}, V_{BE} = 0.25 \text{ Vdc}, T_A = 125^\circ\text{C}$)	I_{CEX}	— —	0.3 30	μAdc
Collector Cutoff Current ($V_{CE} = 20 \text{ Vdc}, I_E = 0$)	I_{CES}	—	0.4	μAdc
Emitter Cutoff Current ($V_{BE} = 4.0 \text{ Vdc}, I_C = 0$)	I_{EBO}	—	0.25	μAdc
ON CHARACTERISTICS				
DC Current Gain ⁽¹⁾ ($I_C = 10 \text{ mA}, V_{CE} = 0.35 \text{ Vdc}$) 2N2369A, 2N4449 2N3227	h_{FE}	40 70	120 250	—
($I_C = 30 \text{ mA}, V_{CE} = 0.4 \text{ Vdc}$) 2N2369A, 2N4449 2N3227		30 40	120 250	
($I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ Vdc}$) 2N2369A, 2N4449 2N3227		40 100	120 300	
($I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ Vdc}$) 2N2369A, 2N4449 2N3227		20 30	120 150	
($I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ Vdc}, T_A = -55^\circ\text{C}$) 2N2369A, 2N4449 2N3227		20 40	— —	
Collector-Emitter Saturation Voltage ($I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$) ($I_C = 30 \text{ mA}, I_B = 3.0 \text{ mA}$) ($I_C = 100 \text{ mA}, I_B = 10 \text{ mA}$) ($I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}, T_A = 125^\circ\text{C}$)	$V_{CE(\text{sat})}$	— — — —	0.2 0.25 0.45 0.3	Vdc
Base-Emitter Saturation Voltage ($I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$) ($I_C = 30 \text{ mA}, I_B = 3.0 \text{ mA}$) ($I_C = 100 \text{ mA}, I_B = 10 \text{ mA}$) ($I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}, T_A = 125^\circ\text{C}$) ($I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}, T_A = -55^\circ\text{C}$) 2N2369A, 2N4449 2N3227	$V_{BE(\text{sat})}$	0.7 — 0.8 0.59 0.50	0.85 0.9 1.2 — 1.02	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Collector-Base Capacitance ($V_{CB} = 5.0 \text{ Vdc}, I_E = 0, f = 0.1 \text{ to } 1.0 \text{ MHz}$)	C_{cbo}	—	4.0	pF
Input Capacitance ($V_{BE} = 0.5 \text{ Vdc}, I_C = 0, f = 0.1 \text{ to } 1.0 \text{ MHz}$) 2N2369A, 2N4449 2N3227	C_{ibo}	— —	5.0 4.0	pF
Small-Signal Current Transfer Ratio, Magnitude ($I_C = 10 \text{ mA}, V_{CE} = 10 \text{ Vdc}, f = 100 \text{ MHz}$)	$ h_{fe} $	5.0	10	—
SWITCHING CHARACTERISTICS (See Figures 12 and 13)				
Storage Time 2N2369A, 2N4449 2N3227	t_s	— —	13 18	ns
Turn-On Time	$t_{(\text{on})}$	—	12	ns
Turn-Off Time	$t_{(\text{off})}$	— —	18 25	ns

(1) Pulsed. Pulse Width 750 to 1500 μs . Duty Cycle 1.0 to 2.0%.

2N2369AJAN, 2N3227JAN, 2N4449JAN SERIES

ASSURANCE TESTING (Pre/Post Burn-In)

Burn-In Conditions: $T_A = 25 \pm 3^\circ\text{C}$, $V_{CB} = 12 \text{ Vdc}$

$P_T = 360 \text{ mW } 2N2369A, 2N3227, 300 \text{ mW } 2N4449$

Characteristics Tested	Symbol	Initial and End Point Limits		Unit
		Min	Max	
Collector Cutoff Current ($V_{CE} = 20 \text{ Vdc}$)	i_{CES}	—	0.4	μAdc
DC Current Gain ⁽¹⁾ ($I_C = 10 \mu\text{Adc}$, $V_{CE} = 1.0 \text{ Vdc}$) 2N2369A, 2N4449 2N3227	h_{FE}	40 100	120 300	—

Delta from Pre-Burn-In Measured Values		Min	Max	
Delta Collector Cutoff Current	Δi_{CES}	—	± 100 or ± 25 whichever is greater	% of Initial Value μAdc
Delta DC Current Gain ⁽¹⁾	Δh_{FE}	—	± 15	% of Initial Value

(1) Pulsed. Pulse Width 250 to 350 μs . Duty Cycle 1.0 to 2.0%



CRYSTALONCS
2805 Veterans Highway
Suite 14
Ronkonkoma, N.Y. 11779