

2N2368 **2N2369,A** **2N3227**

**2N2369A JAN, JTX,
JTXV AVAILABLE
CASE 22, STYLE 1
TO-18 (TO-206AA)**

SWITCHING TRANSISTOR

NPN SILICON

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage 2N2368,9,A 2N3227	V _{CEO}	15 20	Vdc
Collector-Emitter Voltage	V _{CES}	40	Vdc
Collector-Base Voltage	V _{CBO}	40	Vdc
Emitter-Base Voltage 2N2368,9,A 2N3227	V _{EBO}	4.5 6.0	Vdc
Collector Current (10 μ sec pulse)	I _{C(Peak)}	500	mA
Collector Current — Continuous 2N2369A, 2N3227	I _C	200	mA
Total Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	0.36 2.06	Watt mW/°C
Total Device Dissipation @ T _C = 25°C Derate above 25°C 2N3227	P _D	1.2 6.85	Watts mW/°C
Total Device Dissipation @ T _C = 100°C Derate above 100°C	P _D	.68 6.85	Watts mW/°C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage(1) (I _C = 10 mAdc, V _{BE} = 0) 2N3227	V _{(BR)CEO}	20	—	Vdc
Collector-Emitter Breakdown Voltage (I _C = 10 μ A, V _{BE} = 0)	V _{(BR)CES}	40	—	Vdc
Collector-Emitter Sustaining Voltage(1) (I _C = 10 mAdc, I _B = 0) 2N2368, 2N2369, 2N2369A	V _{CEO(sus)}	15	—	Vdc
Collector-Base Breakdown Voltage (I _C = 10 μ A, I _B = 0)	V _{(BR)CBO}	40	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μ Adc, I _E = 0) 2N2368, 2N2369, 2N2369A 2N3227	V _{(BR)EBO}	4.5 6.0	— —	Vdc
Collector Cutoff Current (V _{CE} = 20 Vdc, V _{BE} = 3.0 Vdc) 2N3227	I _{CEX}	—	0.2	μ Adc
Collector Cutoff Current (V _{CB} = 20 Vdc, I _E = 0) 2N2368, 2N2369 2N3227	I _{CBO}	— —	0.4 0.2	μ Adc
(V _{CB} = 20 Vdc, I _E = 0, T _A = 150°C) 2N2368, 2N2369, 2N2369A 2N3227		— —	30 50	
Collector Cutoff Current (V _{CE} = 20 Vdc, V _{BE} = 0) 2N2369A	I _{CES}	—	0.4	μ Adc
Base Current (V _{CE} = 20 Vdc, V _{BE} = 0) 2N2369A	I _B	—	0.4	μ Adc

ON CHARACTERISTICS

DC Current Gain(1) (I _C = 10 mAdc, V _{CE} = 1.0 Vdc) 2N2368 2N2369 2N2369A 2N3227	h _{FE}	20 40 — 100	60 120 120 300	—
(I _C = 10 mAdc, V _{CE} = 1.0 Vdc, T _A = -55°C) 2N2368 2N2369 2N3227		10 20 40	— — —	
(I _C = 10 mAdc, V _{CE} = 0.35 Vdc, T _A = -55°C) 2N2369A		20	—	
(I _C = 30 mAdc, V _{CE} = 0.4 Vdc) 2N2369A		30	—	

2N2368, 2N2369, A, 2N3227**ELECTRICAL CHARACTERISTICS** (continued) ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
($I_C = 100\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) 2N2369A 2N3227		20 30	— —	
($I_C = 100\text{ mAdc}$, $V_{CE} = 2.0\text{ Vdc}$) 2N2368 2N2369		10 20	— —	
Collector-Emitter Saturation Voltage(1) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$) 2N2368, 2N2369, 2N3227 2N2369A	$V_{CE(sat)}$	— —	0.25 0.20	Vdc
($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$, $T_A = +125^\circ\text{C}$) ($I_C = 30\text{ mAdc}$, $I_B = 3.0\text{ mAdc}$) 2N2369A 2N2369A		— —	0.30 0.25	
($I_C = 100\text{ mAdc}$, $I_B = 10\text{ mAdc}$) 2N2369A 2N3227		— —	0.50 .45	
Base-Emitter Saturation Voltage(1) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$, $T_A = +125^\circ\text{C}$) ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$, $T_A = -55^\circ\text{C}$) ($I_C = 30\text{ mAdc}$, $I_B = 3.0\text{ mAdc}$) All Types 2N2369A 2N2369A 2N2369A 2N2369A	$V_{BE(sat)}$	0.70 0.59 — —	0.85 — 1.02 1.15	Vdc
($I_C = 100\text{ mAdc}$, $I_B = 10\text{ mAdc}$) 2N2369A 2N3227		— 0.8	1.60 1.4	

SMALL-SIGNAL CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 100\text{ MHz}$) 2N2368 2N2369, 2N2369A, 2N3227	f_T	400 500	— —	MHz
Output Capacitance ($V_{CB} = 5.0\text{ Vdc}$, $I_E = 0$, $f = 140\text{ kHz}$) All Types	C_{obo}	—	4.0	pF
Input Capacitance ($V_{BE} = 1.0\text{ Vdc}$, $I_C = 0$, $f = 140\text{ kHz}$) 2N3227	C_{ibo}	—	4.0	pF

SWITCHING CHARACTERISTICS

Delay Time ($V_{CC} = 10\text{ V}$, $V_{EB} = 2.0\text{ Vdc}$, 100 mA, $I_{B1} = 10\text{ mA}$) 2N3227	t_d	—	5.0	ns
Rise Time ($V_{CC} = 10\text{ V}$, $V_{EB} = 2.0\text{ Vdc}$, 100 mA, $I_{B1} = 10\text{ mA}$) 2N3227	t_r	—	18	ns
Storage Time ($I_C = I_{B1} = 10\text{ mAdc}$, $I_{B2} = -10\text{ mAdc}$) ($I_C = 100\text{ mAdc}$, $I_{B1} = I_{B2} = 10\text{ mAdc}$, $V_{CC} = 10\text{ V}$) 2N2368 2N2369, A 2N3227	t_s	— — —	10 13 13	ns
Fall Time ($V_{CC} = 10\text{ V}$, $I_C = 100\text{ mA}$, $I_{B1} = I_{B2} = 10\text{ mA}$) 2N3227	t_f	—	15	ns
Turn-On Time ($I_C = 10\text{ mAdc}$, $I_{B1} = 3.0\text{ mA}$, $I_{B2} = -1.5\text{ mA}$, $V_{CC} = 3.0\text{ Vdc}$) All Types	t_{on}	—	12	ns
Turn-Off Time ($I_C = 10\text{ mAdc}$, $I_{B1} = 3.0\text{ mA}$, $I_{B2} = -1.5\text{ mA}$, $V_{CC} = 3.0\text{ Vdc}$) 2N2368 2N2369 2N2369A 2N3227	t_{off}	— — — —	— 18 15 18	ns
Total Control Charge ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$, $V_{CC} = 3.0\text{ V}$) 2N3227	Q_T	—	50	pC

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS FOR 2N2369, 2N3227

FIGURE 1 — t_{on} CIRCUIT — 10 mA

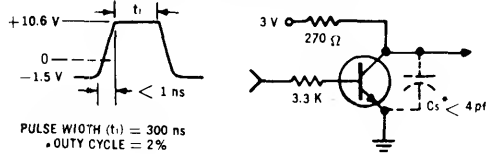


FIGURE 3 — t_{off} CIRCUIT — 10 mA

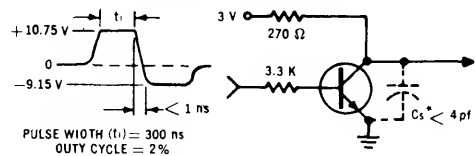


FIGURE 2 — t_{on} CIRCUIT — 100 mA

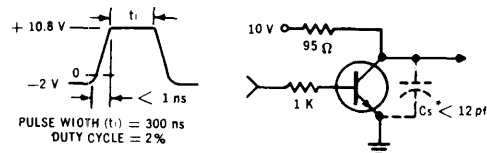
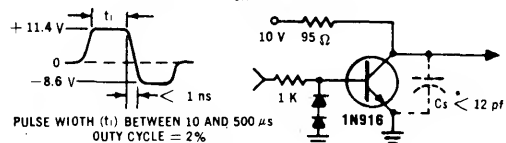


FIGURE 4 — t_{off} CIRCUIT — 100 mA



* Total shunt capacitance of test jig and connectors.

FIGURE 5 — TURN-ON AND TURN-OFF TIME TEST CIRCUIT

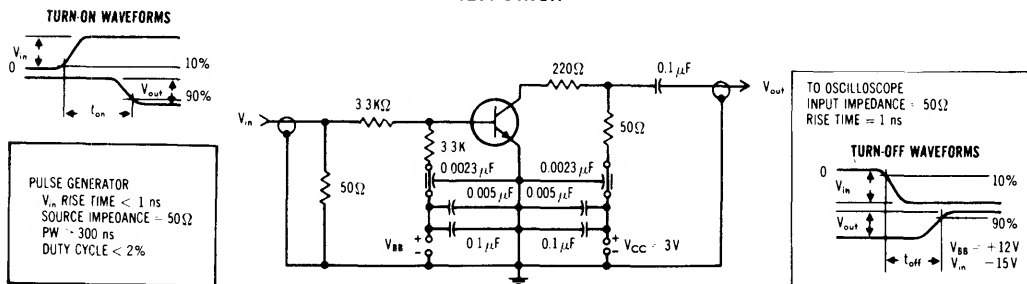


FIGURE 6 — JUNCTION CAPACITANCE VARIATIONS

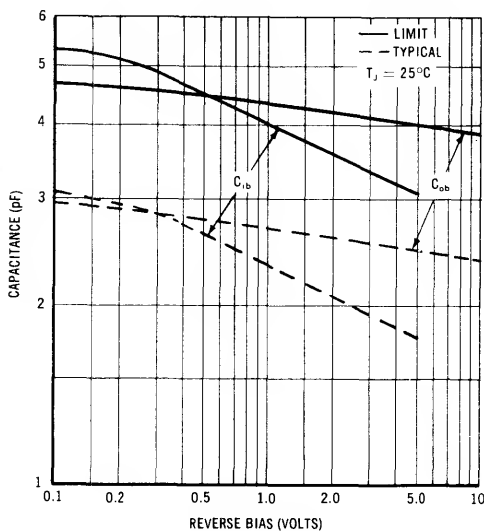


FIGURE 7 — TYPICAL SWITCHING TIMES

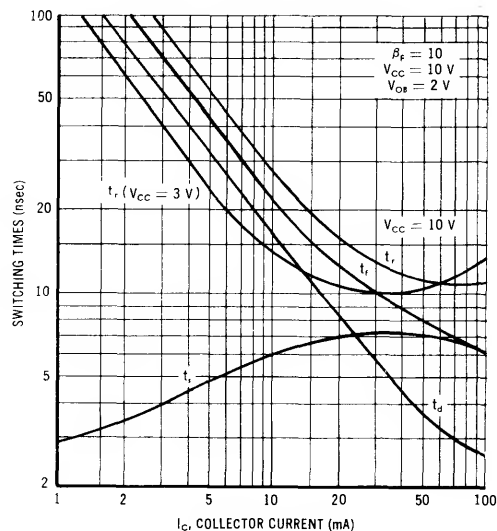


FIGURE 8 — MAXIMUM CHARGE DATA

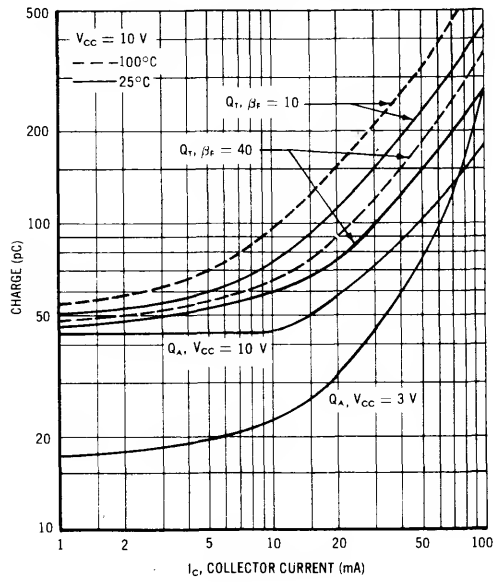


FIGURE 9 — Q_T TEST CIRCUIT

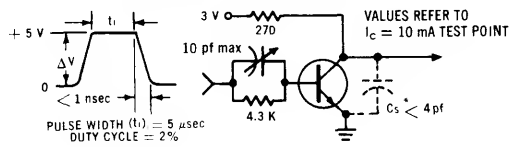


FIGURE 10 — TURN-OFF WAVE FORM

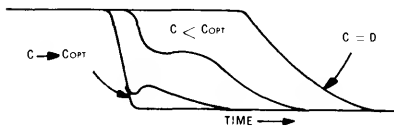


FIGURE 11 — STORAGE TIME EQUIVALENT TEST CIRCUIT

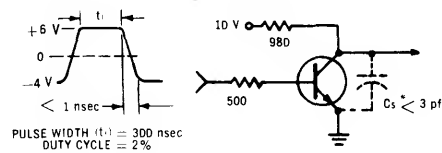


FIGURE 12 — MAXIMUM COLLECTOR SATURATION VOLTAGE CHARACTERISTICS

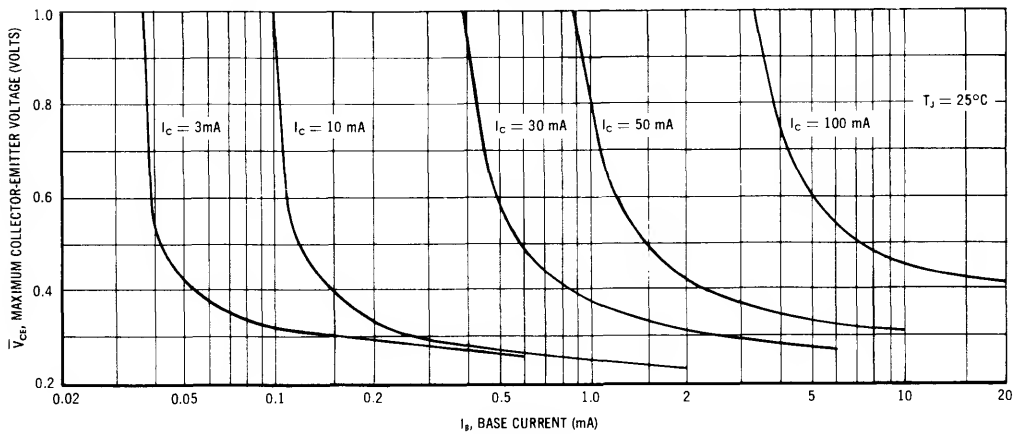


FIGURE 13 — MINIMUM CURRENT GAIN CHARACTERISTICS

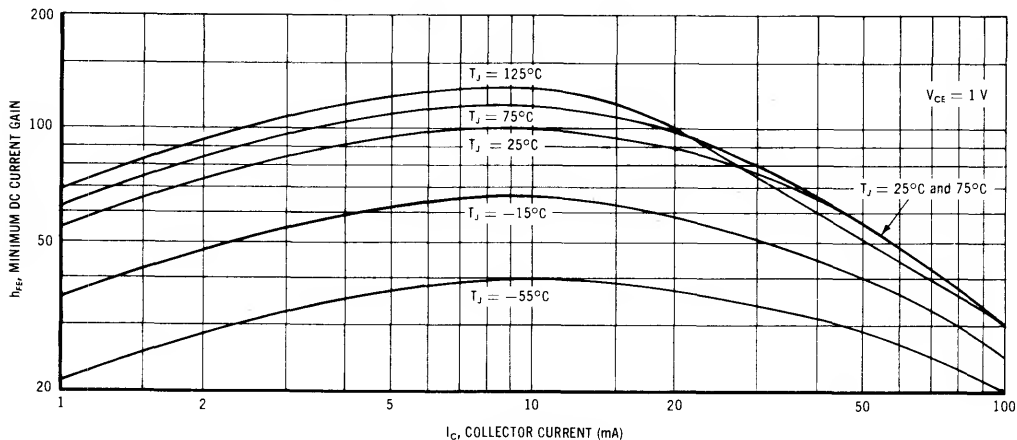


FIGURE 14 — SATURATION VOLTAGE LIMITS

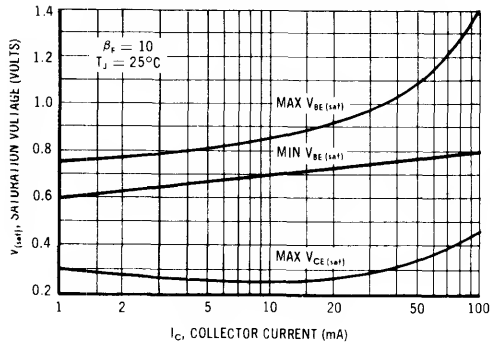


FIGURE 15 — TYPICAL TEMPERATURE COEFFICIENTS

