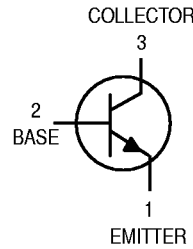


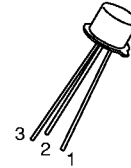
Switching Transistors

NPN Silicon



2N2369
2N2369A*

*Motorola Preferred Device



CASE 22-03, STYLE 1
TO-18 (TO-206AA)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	15	Vdc
Collector–Emitter Voltage	V_{CES}	40	Vdc
Collector–Base Voltage	V_{CBO}	40	Vdc
Emitter–Base Voltage	V_{EBO}	4.5	Vdc
Collector Current (10 μ s pulse)	$I_C(\text{Peak})$	500	mA
Collector Current — Continuous	I_C	200	mA
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	0.36 2.06	Watt mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 100^\circ\text{C}$ Derate above 100°C	P_D	0.68 6.85	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	486	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	147	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ($I_C = 10 \mu\text{A}, V_{BE} = 0$)	$V_{(BR)CES}$	40	—	Vdc
Collector–Emitter Sustaining Voltage ⁽¹⁾ ($I_C = 10 \text{ mAdc}, I_B = 0$)	$V_{CEO(sus)}$	15	—	Vdc
Collector–Base Breakdown Voltage ($I_C = 10 \mu\text{A}, I_B = 0$)	$V_{(BR)CBO}$	40	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	4.5	—	Vdc
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}	—	0.4 30	μAdc
Collector Cutoff Current ($V_{CE} = 20 \text{ Vdc}, V_{BE} = 0$)	I_{CES}	—	0.4	μAdc
Base Current ($V_{CE} = 20 \text{ Vdc}, V_{BE} = 0$)	I_B	—	0.4	μAdc

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

Preferred devices are Motorola recommended choices for future use and best overall value.

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datasheet directory

2N2369 2N2369A

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

Characteristic		Symbol	Min	Max	Unit
ON CHARACTERISTICS					
DC Current Gain ⁽¹⁾ ($I_C = 10\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$)	2N2369 2N2369A	h_{FE}	40 —	120 120	—
($I_C = 10\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$, $T_A = -55^\circ\text{C}$)	2N2369		20	—	
($I_C = 10\text{ mAdc}$, $V_{CE} = 0.35\text{ Vdc}$, $T_A = -55^\circ\text{C}$)	2N2369A		20	—	
($I_C = 30\text{ mAdc}$, $V_{CE} = 0.4\text{ Vdc}$)	2N2369A		30	—	
($I_C = 100\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$)	2N2369A		20	—	
($I_C = 100\text{ mAdc}$, $V_{CE} = 2.0\text{ Vdc}$)	2N2369		20	—	
Collector–Emitter Saturation Voltage ⁽¹⁾ ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$)	2N2369 2N2369A	$V_{CE(sat)}$	— —	0.25 0.20	Vdc
($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$, $T_A = +125^\circ\text{C}$)	2N2369A		—	0.30	
($I_C = 30\text{ mAdc}$, $I_B = 3.0\text{ mAdc}$)	2N2369A		—	0.25	
($I_C = 100\text{ mAdc}$, $I_B = 10\text{ mAdc}$)	2N2369A		—	0.50	
Base–Emitter Saturation Voltage ⁽¹⁾ ($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$)	All Types	$V_{BE(sat)}$	0.70	0.85	Vdc
($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$, $T_A = +125^\circ\text{C}$)	2N2369A		0.59	—	
($I_C = 10\text{ mAdc}$, $I_B = 1.0\text{ mAdc}$, $T_A = -55^\circ\text{C}$)	2N2369A		—	1.02	
($I_C = 30\text{ mAdc}$, $I_B = 3.0\text{ mAdc}$)	2N2369A		—	1.15	
($I_C = 100\text{ mAdc}$, $I_B = 10\text{ mAdc}$)	2N2369A		—	1.60	

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 100\text{ MHz}$)		f_T	500	—	MHz
Output Capacitance ($V_{CB} = 5.0\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)		C_{obo}	—	4.0	pF
Input Capacitance ($V_{EB} = 1.0\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)		C_{ibo}	—	4.0	pF

SWITCHING CHARACTERISTICS

Storage Time ($I_C = I_{B1} = 10\text{ mAdc}$, $I_{B2} = -10\text{ mAdc}$)		t_s	—	13	ns
Turn–On Time ($I_C = 10\text{ mAdc}$, $I_{B1} = 3.0\text{ mA}$, $I_{B2} = -1.5\text{ mA}$, $V_{CC} = 3.0\text{ Vdc}$)		t_{on}	—	12	ns
Turn–Off Time ($I_C = 10\text{ mAdc}$, $I_{B1} = 3.0\text{ mA}$, $I_{B2} = -1.5\text{ mA}$, $V_{CC} = 3.0\text{ Vdc}$)		t_{off}	—	18	ns

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

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SWITCHING TIME EQUIVALENT TEST CIRCUITS FOR 2N2369, 2N3227

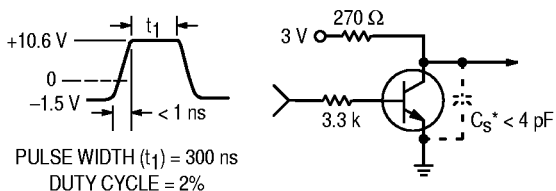


Figure 1. t_{on} Circuit — 10 mA

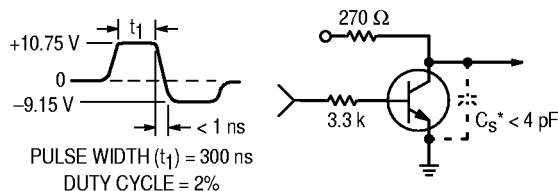


Figure 3. t_{off} Circuit — 10 mA

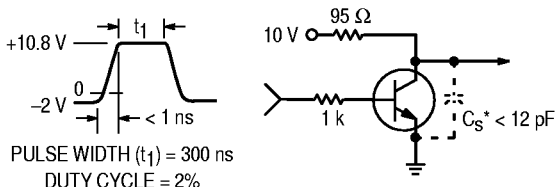


Figure 2. t_{on} Circuit — 100 mA

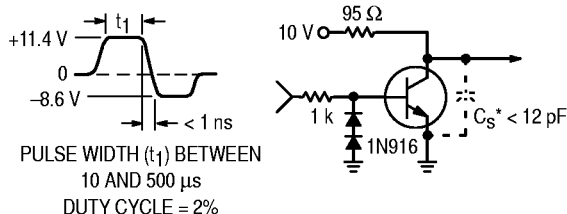


Figure 4. t_{off} Circuit — 100 mA

* Total shunt capacitance of test jig and connectors.

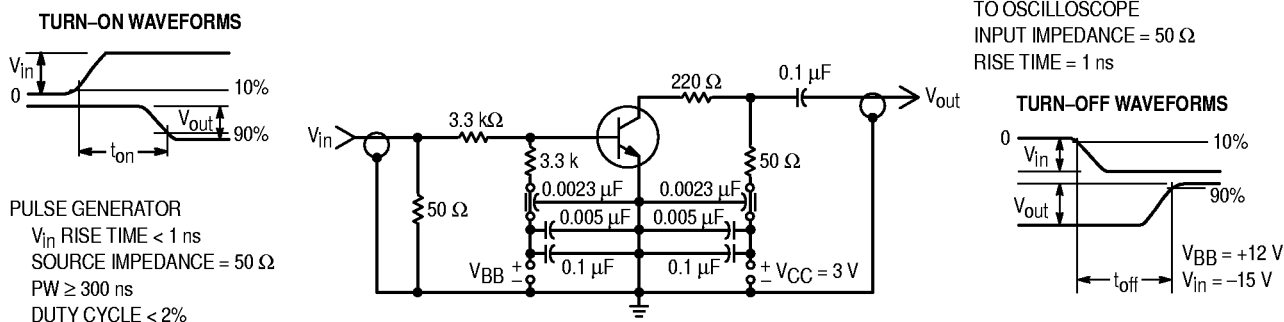


Figure 5. Turn-On and Turn-Off Time Test Circuit

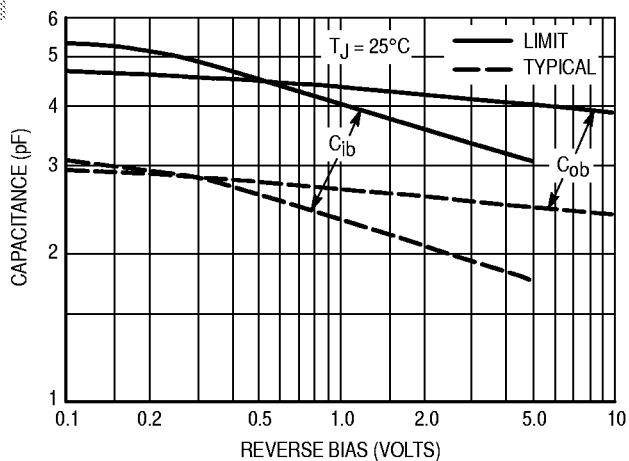


Figure 6. Junction Capacitance Variations

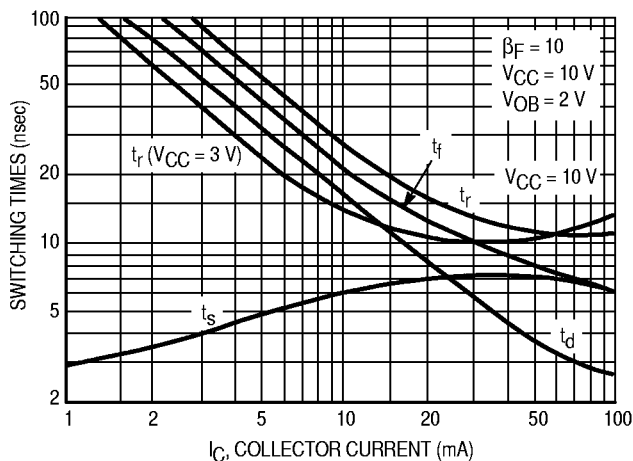


Figure 7. Typical Switching Times

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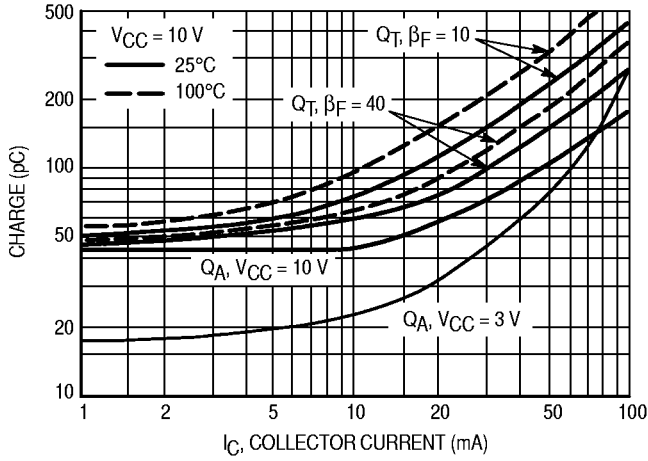


Figure 8. Maximum Charge Data

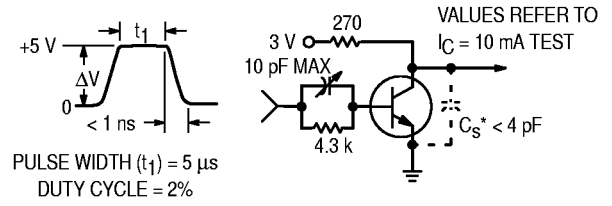


Figure 9. Q_T Test Circuit

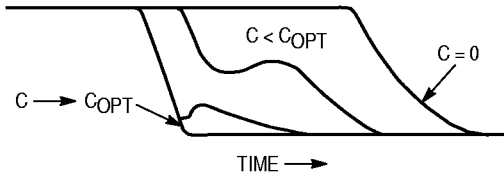


Figure 10. Turn-Off Waveform

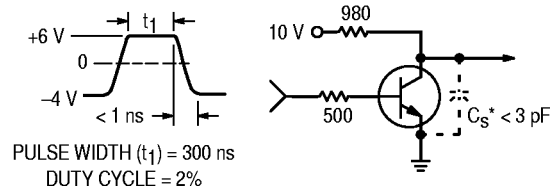


Figure 11. Storage Time Equivalent Test Circuit

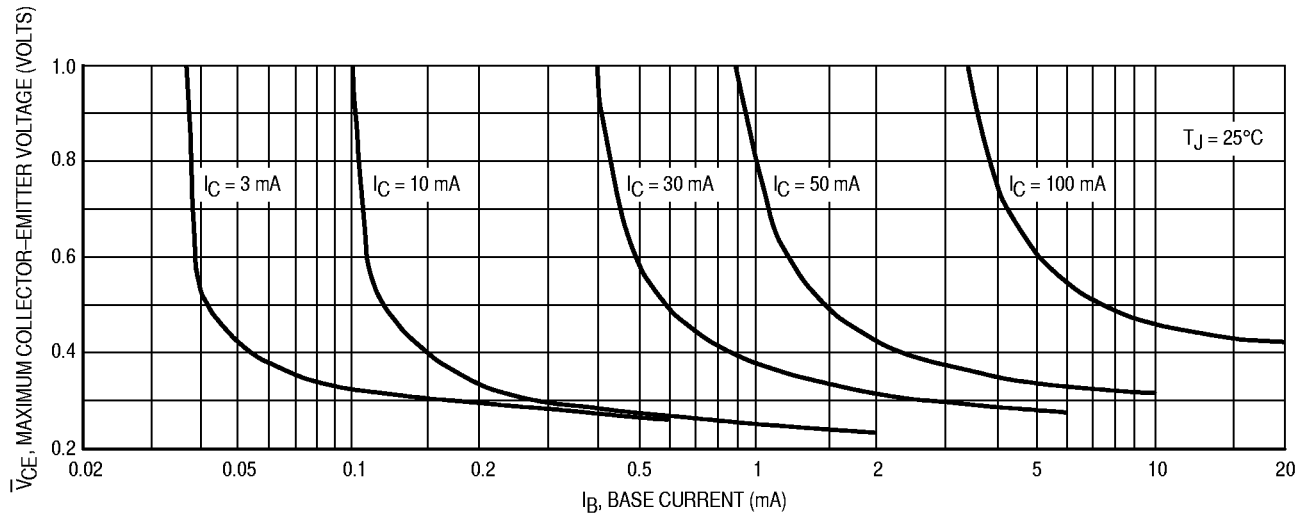


Figure 12. Maximum Collector Saturation Voltage Characteristics

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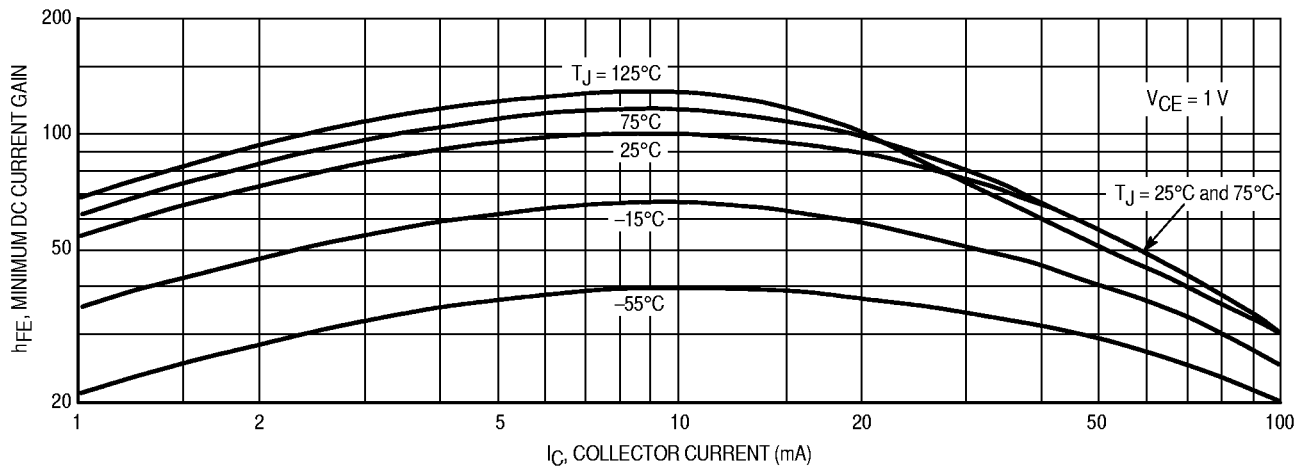


Figure 13. Minimum Current Gain Characteristics

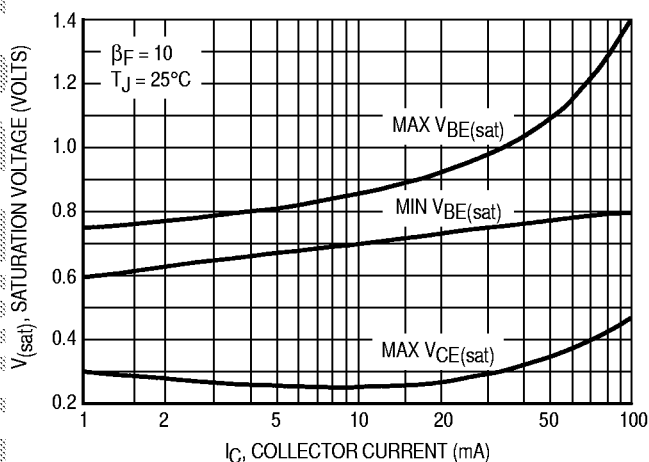


Figure 14. Saturation Voltage Limits

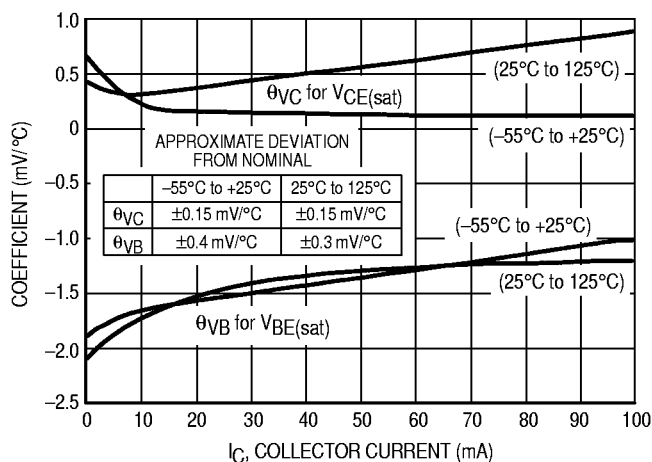
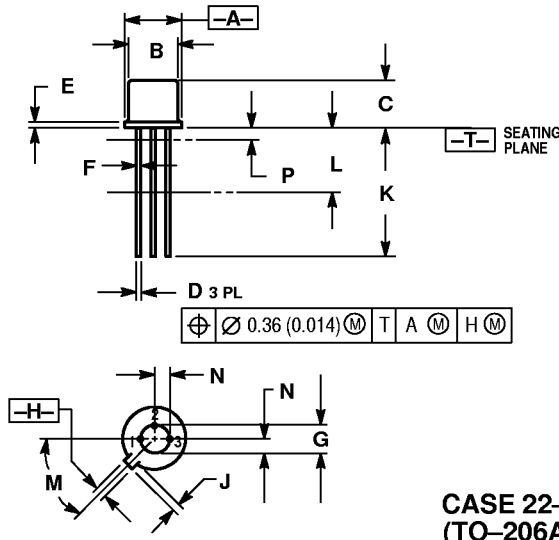


Figure 15. Typical Temperature Coefficients

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PACKAGE DIMENSIONS



⊕ ∅ 0.36 (0.014) Ⓜ T A Ⓜ H Ⓜ

STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

CASE 22-03
(TO-206AA)
ISSUE R

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION J MEASURED FROM DIMENSION A MAXIMUM.
 4. DIMENSION F APPLIES BETWEEN DIMENSION P AND L. DIMENSION D APPLIES BETWEEN DIMENSION L AND K MINIMUM. LEAD DIAMETER IS UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.
 5. DIMENSION E INCLUDES THE TAB THICKNESS. (TAB THICKNESS IS 0.01 (0.002) MAXIMUM).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.209	0.230	5.31	5.84
B	0.178	0.195	4.52	4.95
C	0.170	0.210	4.32	5.33
D	0.016	0.021	0.406	0.533
E	—	0.030	—	0.762
F	0.016	0.019	0.406	0.483
G	0.100 BSC	—	2.54 BSC	—
H	0.036	0.046	0.914	1.17
J	0.028	0.048	0.711	1.22
K	0.500	—	12.70	—
L	0.250	—	6.35	—
M	45° BSC	—	45° BSC	—
N	0.050 BSC	—	1.27 BSC	—
P	—	0.050	—	1.27

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