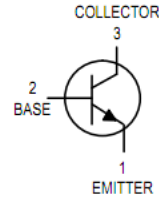


Switching Transistors

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
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⁾ ($I_C = 10 \text{ mAdc}, I_B = 0$)	$V_{CEO(\text{sus})}$	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 $\leq 2.0\%$.

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

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	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	— —	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	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	

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 $\leq 2.0\%$.

SWITCHING TIME EQUIVALENT TEST CIRCUITS FOR 2N2369, 2N3227

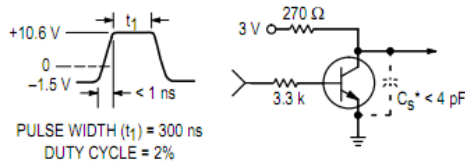


Figure 1. t_{on} Circuit — 10 mA

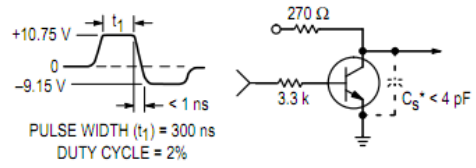


Figure 3. t_{off} Circuit — 10 mA

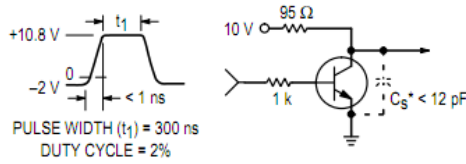


Figure 2. t_{on} Circuit — 100 mA

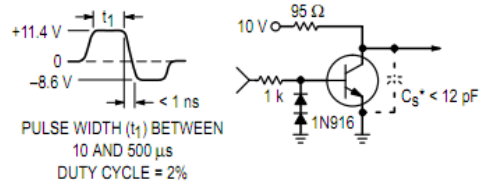


Figure 4. t_{off} Circuit — 100 mA

* Total shunt capacitance of test jig and connectors.

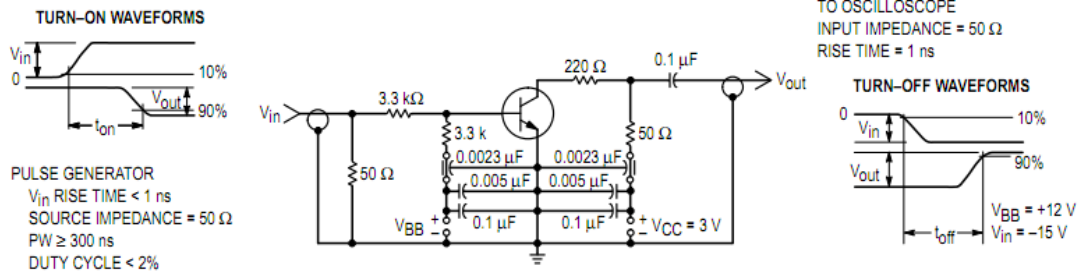


Figure 5. Turn-On and Turn-Off Time Test Circuit

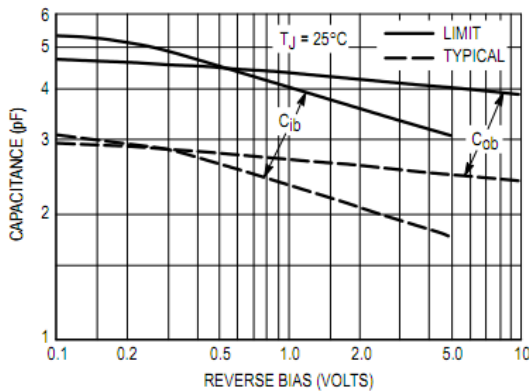


Figure 6. Junction Capacitance Variations

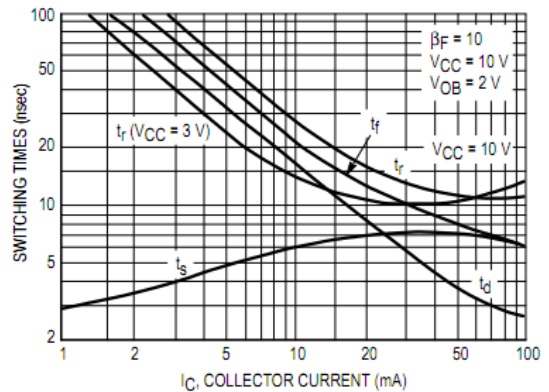


Figure 7. Typical Switching Times

2N2369 2N2369A

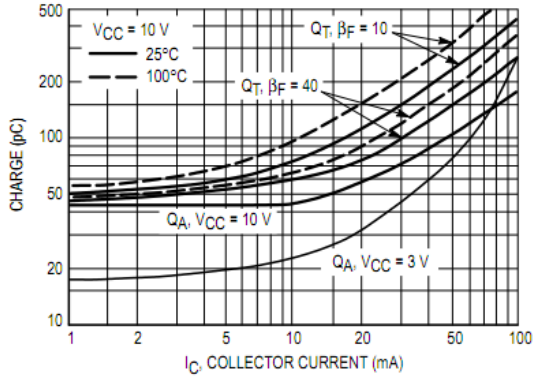


Figure 8. Maximum Charge Data

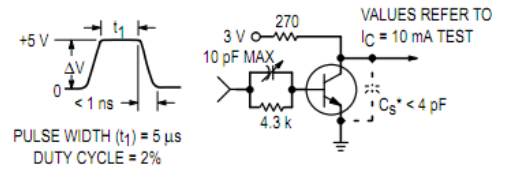


Figure 9. QT Test Circuit

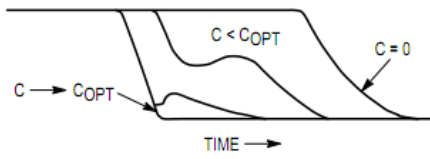


Figure 10. Turn-Off Waveform

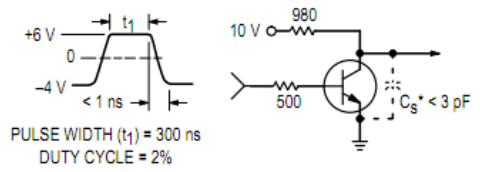


Figure 11. Storage Time Equivalent Test Circuit

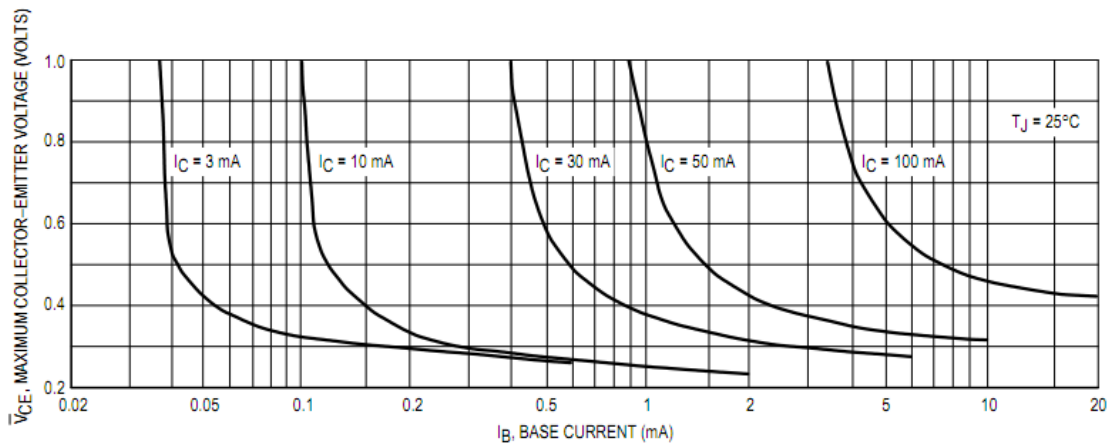


Figure 12. Maximum Collector Saturation Voltage Characteristics

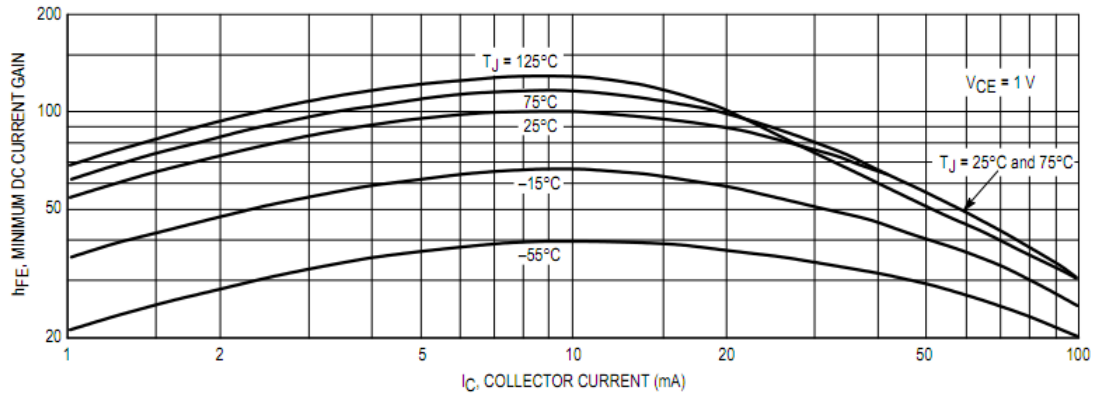


Figure 13. Minimum Current Gain Characteristics

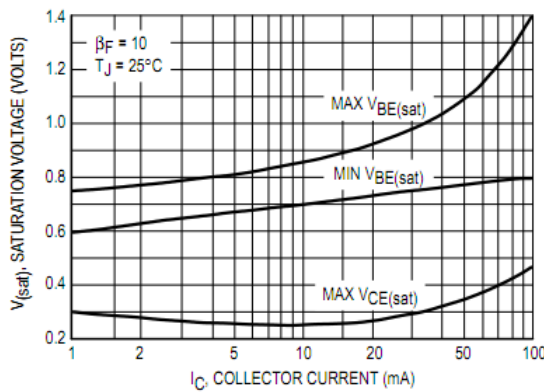


Figure 14. Saturation Voltage Limits

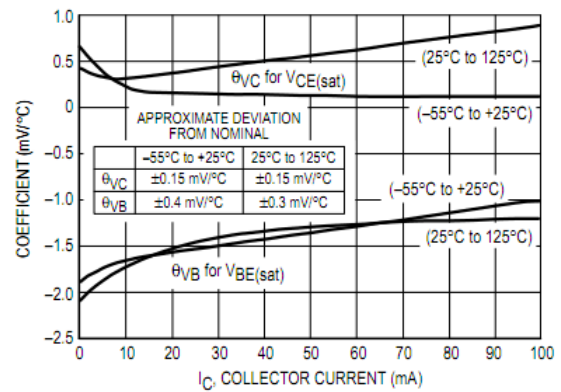


Figure 15. Typical Temperature Coefficients

2N2369 2N2369A

PACKAGE DIMENSIONS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1992.
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	0.018	0.021	0.406	0.533
E	---	0.030	---	0.762
F	0.018	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	0.600	---	12.70	---
L	0.250	---	6.35	---
M	---	45° BSC	---	45° BSC
N	0.050	BSC	1.27	BSC
P	---	0.050	---	1.27

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

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