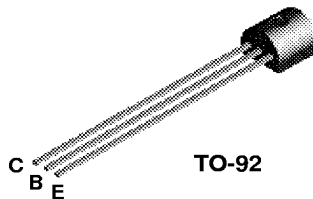




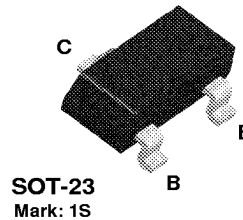
Discrete POWER & Signal
Technologies

PN2369A / MMBT2369A / MMPQ2369

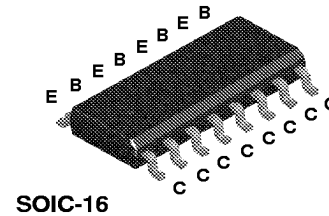
PN2369A



MMBT2369A



MMPQ2369



NPN Switching Transistor

This device is designed for high speed saturation switching at collector currents of 10 mA to 100 mA. Sourced from Process 21.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	15	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	4.5	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max			Units
		PN2369A	MMBT2369A*	MMPQ2369	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	225 1.8	1,000 8.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125			°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Effective 4 Die Each Die	357	556	125 240	°C/W °C/W °C/W

* Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

NPN Switching Transistor

(continued)

PN2369A / MMBT2369A / MMPQ2369

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

V _{(BR)CEO}	Collector-Emitter Breakdown Voltage*	I _C = 10 mA, I _B = 0	15		V
V _{(BR)CES}	Collector-Emitter Breakdown Voltage	I _C = 10 μA, V _{BE} = 0	40		V
V _{(BR)CBO}	Collector-Base Breakdown Voltage	I _C = 10 μA, I _E = 0	40		V
V _{(BR)EBO}	Emitter-Base Breakdown Voltage	I _E = 10 μA, I _C = 0	4.5		V
I _{CBO}	Collector Cutoff Current	V _{CB} = 20 V, I _E = 0 V _{CB} = 20 V, I _E = 0, T _A = 125°C		0.4 30	μA μA

ON CHARACTERISTICS

h _{FE}	DC Current Gain*	I _C = 10 mA, V _{CE} = 1.0 V I _C = 10 mA, V _{CE} = 0.35 V, T _A = -55°C I _C = 100 mA, V _{CE} = 2.0 V	40 20 20	120	
V _{CE(sat)}	Collector-Emitter Saturation Voltage*	I _C = 10 mA, I _B = 1.0 mA I _C = 10 mA, I _B = 1.0 mA, T _A = 125°C I _C = 30 mA, I _B = 3.0 mA I _C = 100 mA, I _B = 10 mA		0.2 0.3 0.25 0.5	V V V V
V _{BE(sat)}	Base-Emitter Saturation Voltage	I _C = 10 mA, I _B = 1.0 mA I _C = 10 mA, I _B = 1.0 mA, T _A = -55°C I _C = 10 mA, I _B = 1.0 mA, T _A = 125°C I _C = 30 mA, I _B = 3.0 mA I _C = 100 mA, I _B = 10 mA	0.7 0.59	0.85 1.02 1.15 1.6	V V V V

SMALL SIGNAL CHARACTERISTICS

C _{obo}	Output Capacitance	V _{CB} = 5.0 V, I _E = 0, f = 1.0 MHz		4.0	pF
C _{ibo}	Input Capacitance	V _{EB} = 0.5 V, I _C = 0, f = 1.0 MHz		5.0	pF
h _{fe}	Small-Signal Current Gain	I _C = 10 mA, V _{CE} = 10 V, R _G = 2.0 kΩ, f = 100 MHz	5.0		

SWITCHING CHARACTERISTICS (except MMPQ2369)

t _s	Storage Time	I _{B1} = I _{B2} = I _C = 10 mA		13	ns
t _{on}	Turn-On Time	V _{CC} = 3.0 V, I _C = 10 mA, I _{B1} = 3.0 mA		12	ns
t _{off}	Turn-Off Time	V _{CC} = 3.0 V, I _C = 10 mA, I _{B1} = 3.0 mA, I _{B2} = 1.5 mA		18	ns

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

Spice Model

NPN (Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=.3498 Xtb=1.5 Br=12.69m Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10)

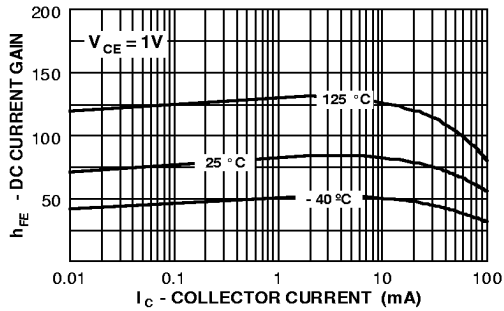
NPN Switching Transistor

(continued)

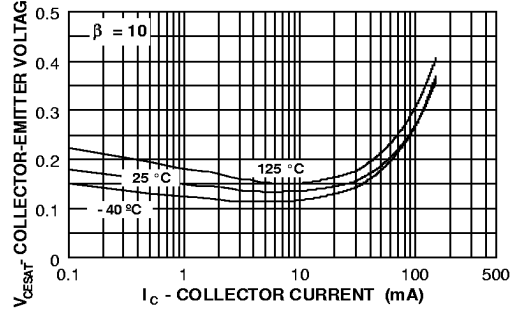
PN2369A / MMBT2369A / MM2369A

DC Typical Characteristics

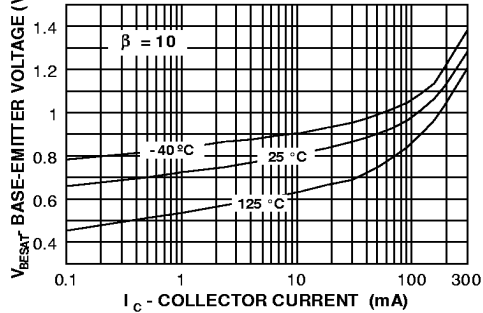
**DC Current Gain
vs Collector Current**



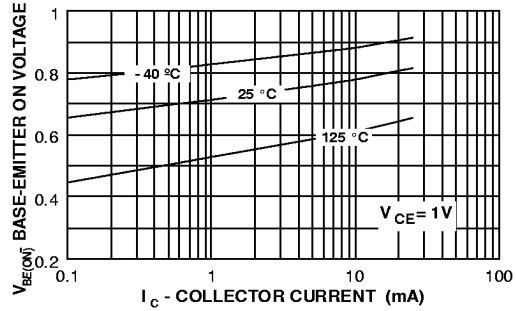
**Collector-Emitter Saturation
Voltage vs Collector Current**



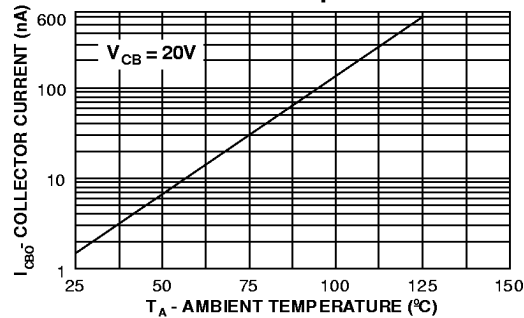
**Base-Emitter Saturation
Voltage vs Collector Current**



**Base-Emitter ON Voltage vs
Collector Current**



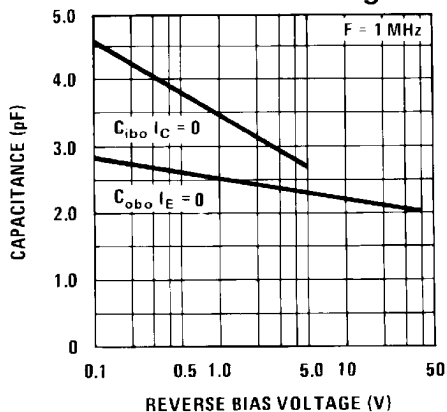
**Collector-Cutoff Current
vs Ambient Temperature**



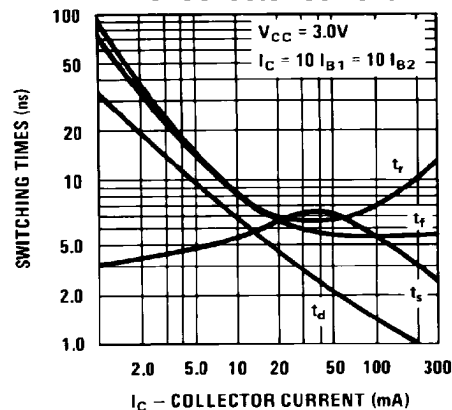
NPN Switching Transistor (continued)

AC Typical Characteristics

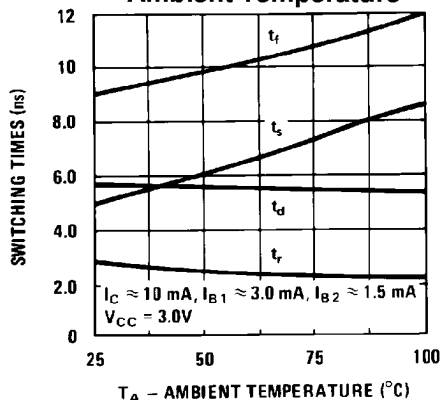
Output Capacitances vs.
Reverse Bias Voltage



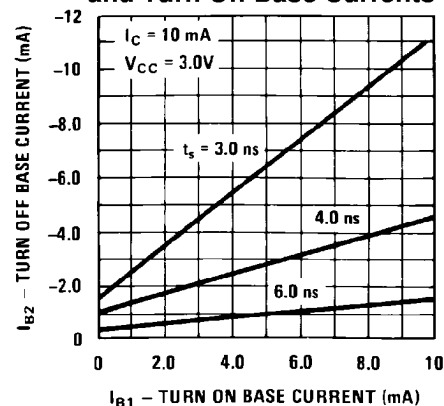
Switching Times
vs. Collector Current



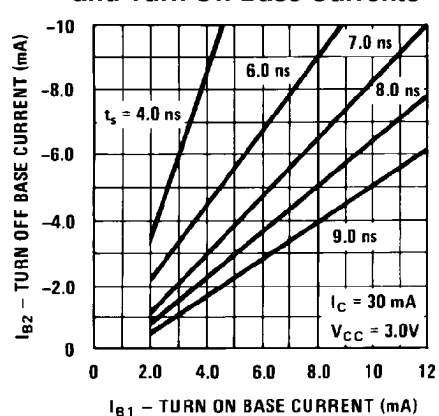
Switching Times vs.
Ambient Temperature



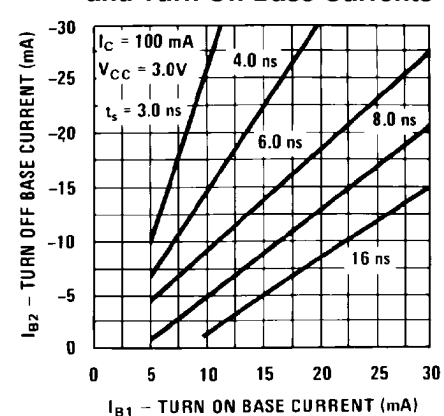
Storage Time vs. Turn On
and Turn Off Base Currents



Storage Time vs. Turn On
and Turn Off Base Currents



Storage Time vs. Turn On
and Turn Off Base Currents

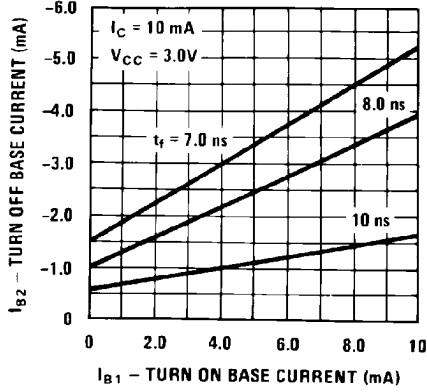


NPN Switching Transistor

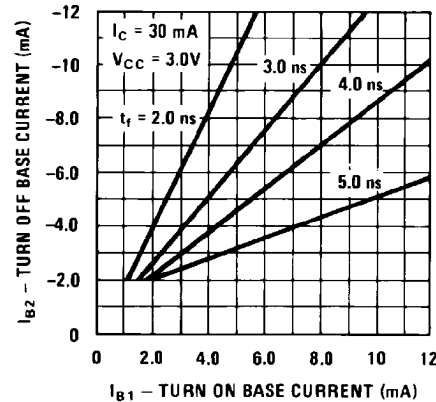
(continued)

AC Typical Characteristics (continued)

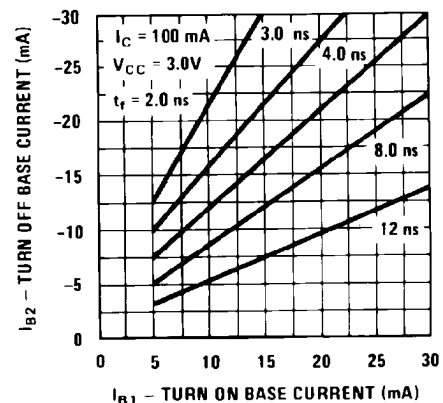
Fall Time vs. Turn On and Turn Off Base Currents



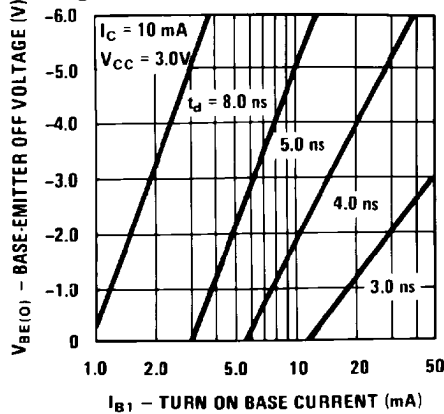
Fall Time vs. Turn On and Turn Off Base Currents



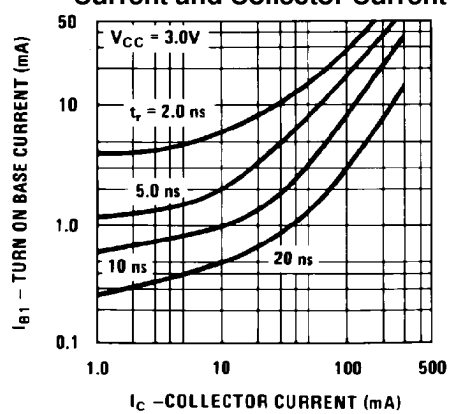
Fall Time vs. Turn On and Turn Off Base Currents



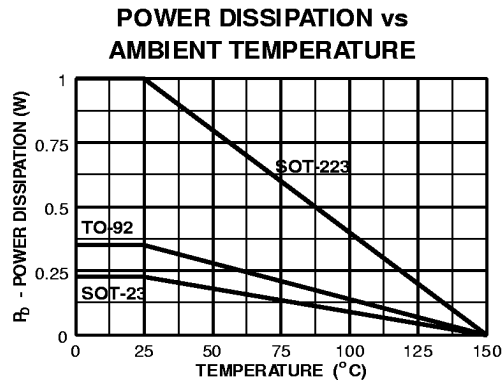
Delay Time vs. Base-Emitter OFF Voltage and Turn On Base Current



Rise Time vs. Turn On Base Current and Collector Current



AC Typical Characteristics (continued)



Test Circuits

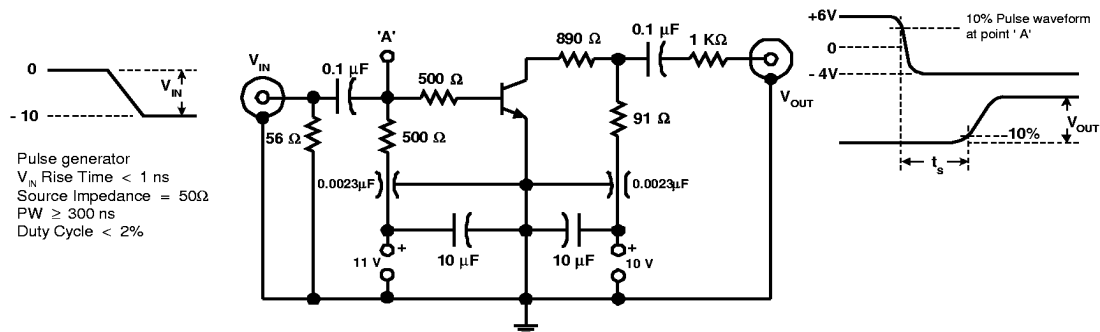


FIGURE 1: Charge Storage Time Measurement Circuit

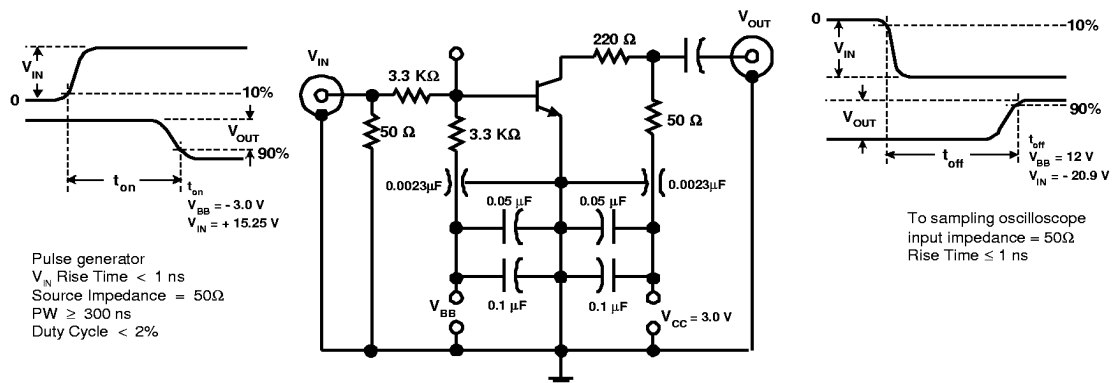


FIGURE 2: t_{ON}, t_{OFF} Measurement Circuit