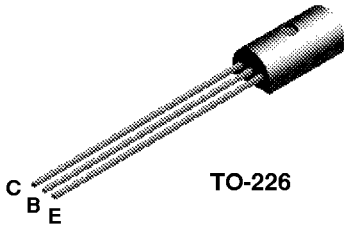
FAIRCHILD SEMICONDUCTOR

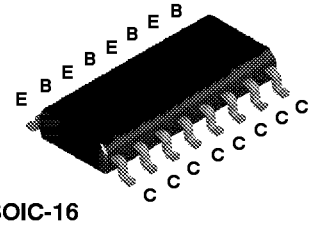
Discrete POWER & Signal Technologies

TN3725A



TO-226

MMPQ3725



SOIC-16

NPN Switching Transistor

This device is designed for high speed core driver applications up to collector currents of 1.0 A. Sourced from Process 25.

Absolute Maximum Ratings

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	1.2	A
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
		TN3725A	MMPQ3725	
P_D	Total Device Dissipation	1.0	1.0	W
	Derate above 25°C	8.0	8.0	mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	50		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	125		°C/W
	Effective 4 Die		125	°C/W
	Each Die		240	°C/W

NPN Switching Transistor

(continued)

Electrical Characteristics

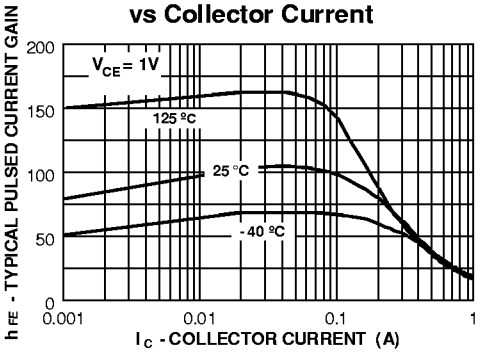
TA= 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	40		V
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	I_C = 10 µA, V_{BE} = 0	60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_{CE} = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	6.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 60 V, I_E = 0 V_{CB} = 60 V, I_E = 0, T_A = 100°C		1.7 120	µA µA
I_{CES}	Collector Cutoff Current	V_{CE} = 80 V, V_{EB} = 0		10	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 10 mA, V_{CE} = 1.0 V I_C = 100 mA, V_{CE} = 1.0 V I_C =100mA,V_{CE}=1.0V,T_A= -55°C I_C = 300 mA, V_{CE} = 1.0 V I_C = 500 mA, V_{CE} = 1.0 V I_C =500mA,V_{CE}=1.0V,T_A= -55°C I_C = 800 mA, V_{CE} = 2.0 V I_C = 1.0 A, V_{CE} = 5.0 V	30 60 30 40 35 20 20 25	 150	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 100 mA, I_B = 10 mA I_C = 300 mA, I_B = 30 mA I_C = 500 mA, I_B = 50 mA I_C = 800 mA, I_B = 80 mA I_C = 1.0 A, I_B = 100 mA		0.25 0.26 0.4 0.52 0.8 0.95	V V V V V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 100 mA, I_B = 10 mA I_C = 300 mA, I_B = 30 mA I_C = 500 mA, I_B = 50 mA I_C = 800 mA, I_B = 80 mA I_C = 1.0 A, I_B = 100 mA		0.76 0.86 1.1 1.2 1.5 1.7	V V V V V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz	300		MHz
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		10	pF
C_{ibo}	Input Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz		55	pF
SWITCHING CHARACTERISTICS (except MMPQ3725)					
t_{on}	Turn-on Time	V_{CC} = 30 V, $V_{BE(off)}$ = 3.8 V,		35	ns
t_d	Delay Time	I_C = 500 mA, I_{B1} = 50 mA		10	ns
t_r	Rise Time			30	ns
t_{off}	Turn-off Time	V_{CC} = 30 V, I_C = 500 mA		60	ns
t_s	Storage Time	I_{B1} = I_{B2} = 50 mA		50	ns
t_f	Fall Time			30	ns

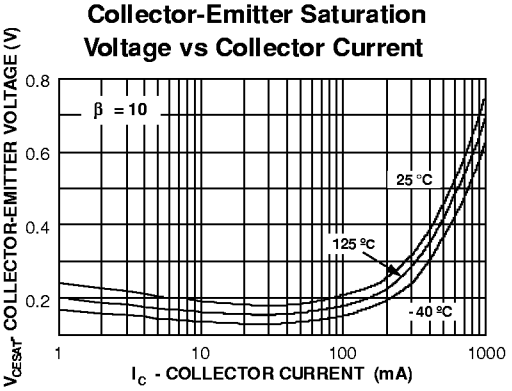
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 1.0%

DC Typical Characteristics

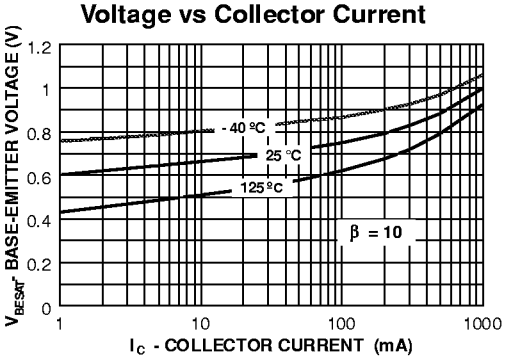
Typical Pulsed Current Gain vs Collector Current



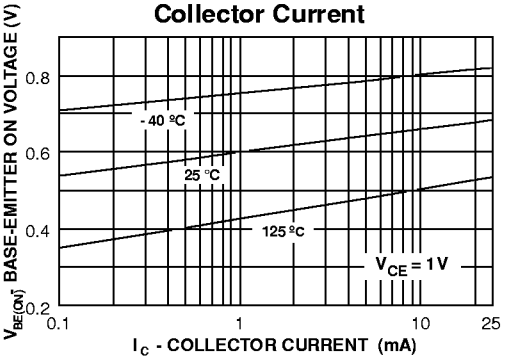
Collector-Emitter Saturation Voltage vs Collector Current



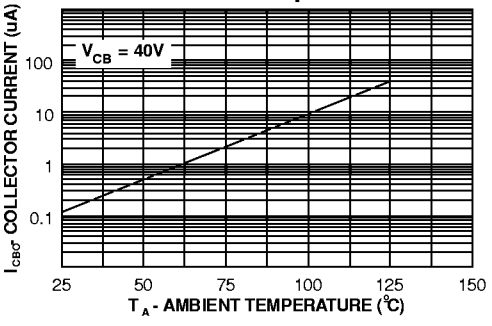
Base-Emitter Saturation Voltage vs Collector Current



Base-Emitter ON Voltage vs Collector Current

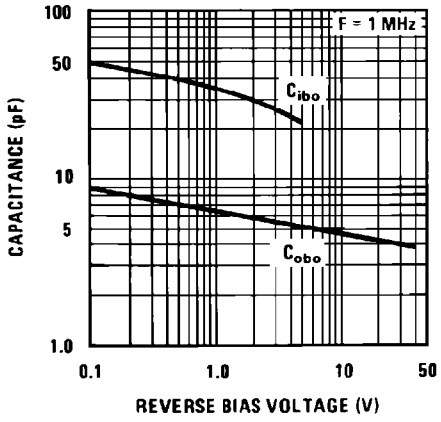


Collector-Cutoff Current vs Ambient Temperature

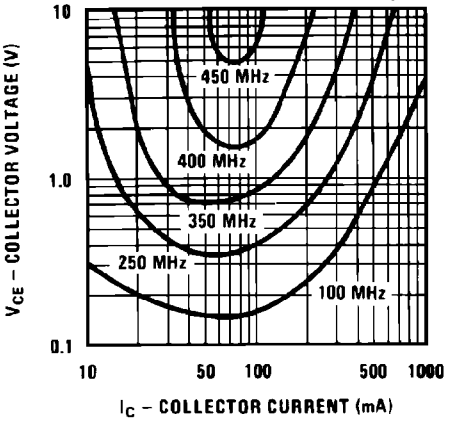


AC Typical Characteristics

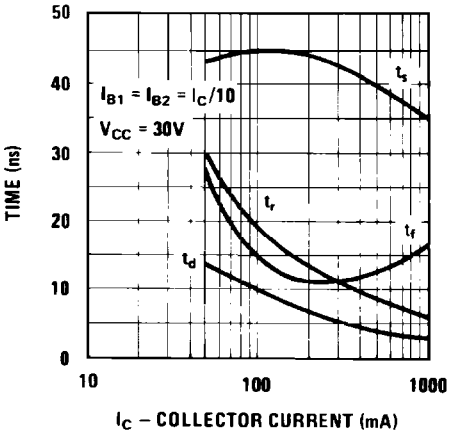
Input/Output Capacitance vs. Reverse Bias



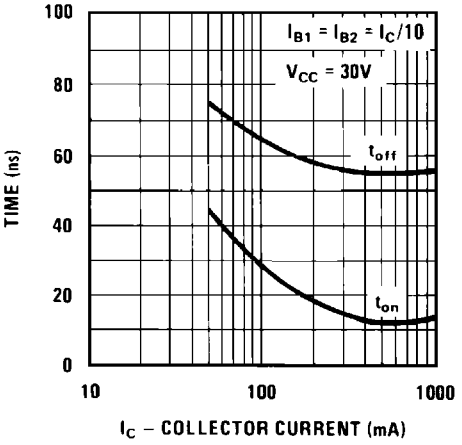
Contours of Constant Bandwidth Product (f_T)



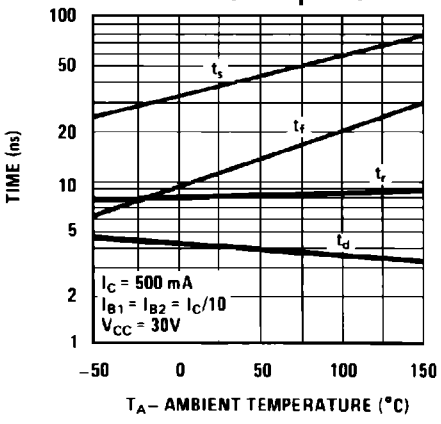
Switching Time vs. Collector Current



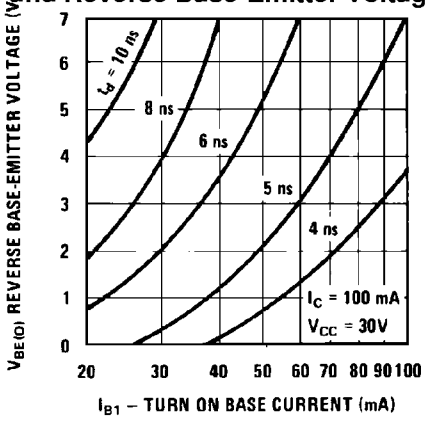
Turn On / Turn Off Times vs. Collector Current



Switching Times vs. Ambient Temperature

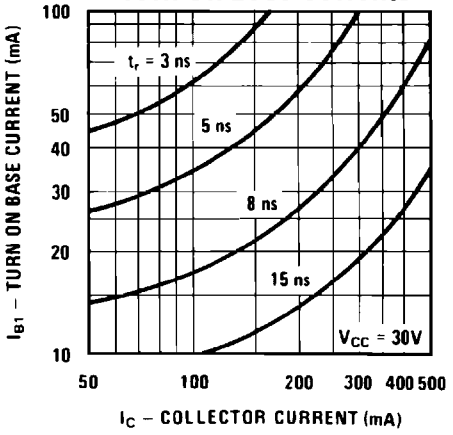


Delay Time vs. Turn On Base Current and Reverse Base-Emitter Voltage

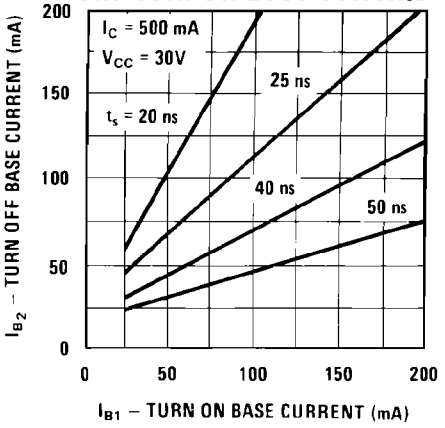


AC Typical Characteristics (continued)

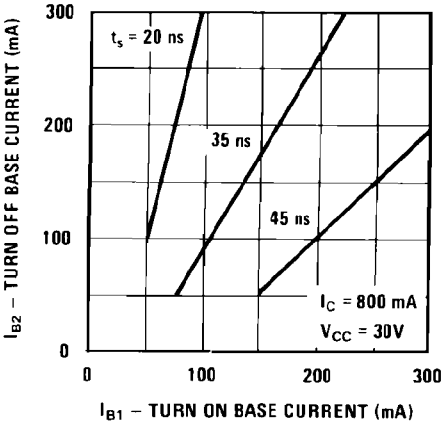
Rise Time vs. Collector and Turn On Base Currents



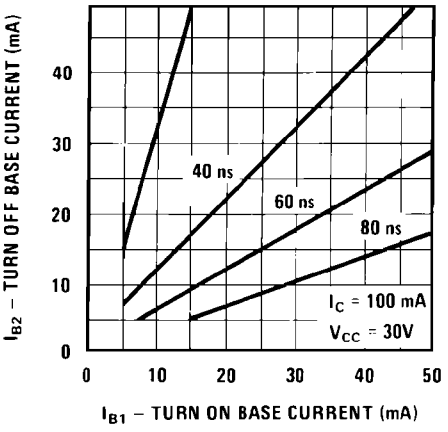
Storage Time vs. Turn On and Turn Off Base Currents



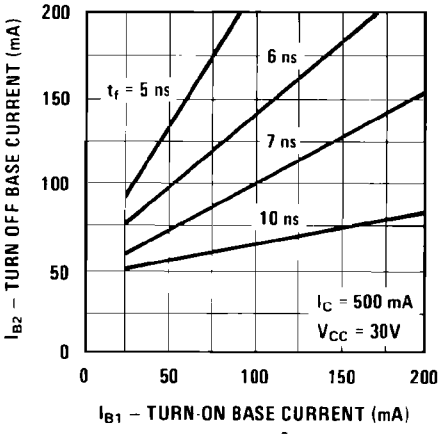
Storage Time vs. Turn On and Turn Off Base Currents



Storage Time vs. Turn On and Turn Off Base Currents

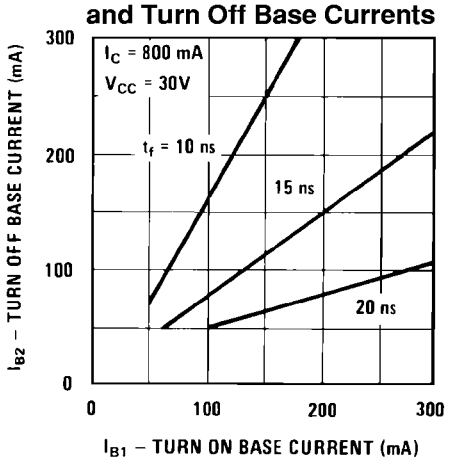


Fall Time vs. Turn On and Turn Off Base Currents

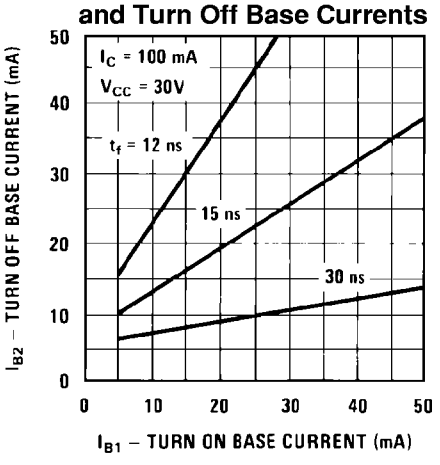


AC Typical Characteristics (continued)

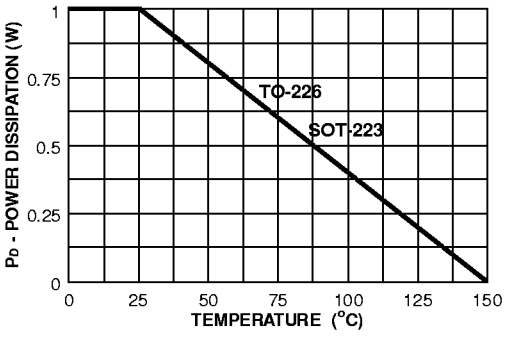
Fall Time vs. Turn On and Turn Off Base Currents



Fall Time vs. Turn On and Turn Off Base Currents



POWER DISSIPATION vs AMBIENT TEMPERATURE



Test Circuit

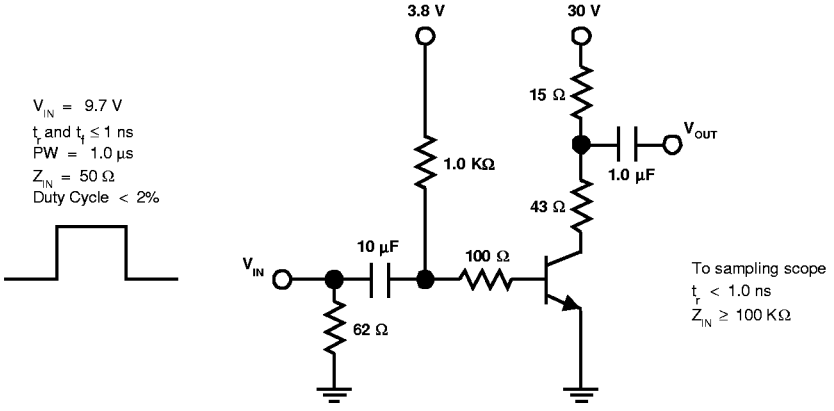


FIGURE 1: Switching Time Test Circuit
(I_C = 500 mA, I_{B1} = 50 mA, I_{B2} = 50 mA)