



FUKUCOM COMPANY LTD.

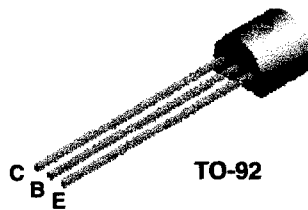
福 靈 有 限 公 司

FLAT P, 3/F, EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,
KWUN TONG, KOWLOON, HONG KONG.

TEL: 2790-0314 FAX: 2790-0206

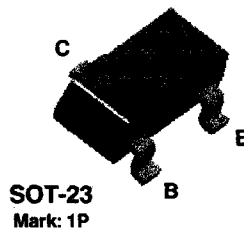
FAIRCHILD
SEMICONDUCTOR™

PN2222A



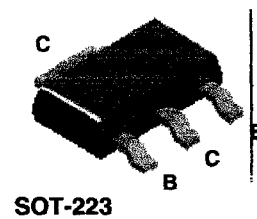
TO-92

MMBT2222A



SOT-23
Mark: 1P

PZT2222A



SOT-223

NPN General Purpose Amplifier

This device is for use as a medium power amplifier and switch requiring collector currents up to 500 mA. Sourced from Process 19.

Absolute Maximum Ratings*

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
V_{CE0}	Collector-Emitter Voltage	40	V
V_{CB0}	Collector-Base Voltage	75	V
V_{EB0}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	1.0	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

* 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

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Characteristic	Max			Units
		PN2222A	*MMBT2222A	**PZT2222A	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	1,000 8.0	mW mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3			$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	125	$^\circ\text{C/W}$

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

** Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm^2 .

PN2222A / MMBT2222A / PZT2222A



FUKUCOM COMPANY LTD.

福 靈 有 限 公 司

FLAT P, 3/F, EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,
KWUN TONG, KOWLOON, HONG KONG.

TEL: 2790-0314 FAX: 2790-0206

NPN General Purpose Amplifier

(continued)

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 10\text{ mA}, I_B = 0$	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\text{ }\mu\text{A}, I_E = 0$	75		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_C = 0$	6.0		V
I_{CEX}	Collector Cutoff Current	$V_{CE} = 60\text{ V}, V_{EB(OFF)} = 3.0\text{ V}$		10	nA
I_{CBO}	Collector Cutoff Current	$V_{CB} = 60\text{ V}, I_E = 0$ $V_{CB} = 60\text{ V}, I_E = 0, T_A = 150^\circ\text{C}$		0.01 10	μA μA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 3.0\text{ V}, I_C = 0$		10	nA
I_{BL}	Base Cutoff Current	$V_{CE} = 60\text{ V}, V_{EB(OFF)} = 3.0\text{ V}$		20	nA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 0.1\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 1.0\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 10\text{ V}, T_A = -55^\circ\text{C}$ $I_C = 150\text{ mA}, V_{CE} = 10\text{ V}^*$ $I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}^*$ $I_C = 500\text{ mA}, V_{CE} = 10\text{ V}^*$	35 50 75 35 100 50 40	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage*	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$ $I_C = 500\text{ mA}, I_B = 50\text{ mA}$		0.3 1.0	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage*	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$ $I_C = 500\text{ mA}, I_B = 50\text{ mA}$	0.6	1.2 2.0	V V

SMALL SIGNAL CHARACTERISTICS

f_T	Current Gain - Bandwidth Product	$I_C = 20\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$	300		MHz
C_{obo}	Output Capacitance	$V_{CB} = 10\text{ V}, I_E = 0, f = 100\text{ kHz}$		8.0	pF
C_{ibo}	Input Capacitance	$V_{EB} = 0.5\text{ V}, I_C = 0, f = 100\text{ kHz}$		25	pF
r_b/C_C	Collector Base Time Constant	$I_C = 20\text{ mA}, V_{CB} = 20\text{ V}, f = 31.8\text{ MHz}$		150	pS
NF	Noise Figure	$I_C = 100\text{ }\mu\text{A}, V_{CE} = 10\text{ V},$ $R_S = 1.0\text{ k}\Omega, f = 1.0\text{ kHz}$		4.0	dB
$Re(h_{ie})$	Real Part of Common-Emitter High Frequency Input Impedance	$I_C = 20\text{ mA}, V_{CE} = 20\text{ V},$ $f = 300\text{ MHz}$		60	Ω

SWITCHING CHARACTERISTICS

t_d	Delay Time	$V_{CC} = 30\text{ V}, V_{BE(OFF)} = 0.5\text{ V},$		10	ns
t_r	Rise Time	$I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}$		25	ns
t_s	Storage Time	$V_{CC} = 30\text{ V}, I_C = 150\text{ mA},$		225	ns
t_f	Fall Time	$I_{B1} = I_{B2} = 15\text{ mA}$		60	ns

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

Spice Model

NPN (Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=7.306p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=411.1p Itf=.6 Vtf=1.7 Xtf=3 Rb=10)

PN2222A / MMBT2222A / PZT2222A



FUKUCOM COMPANY LTD.

福 靈 有 限 公 司

FLAT P, 3/F., EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,
KWUN TONG, KOWLOON, HONG KONG.

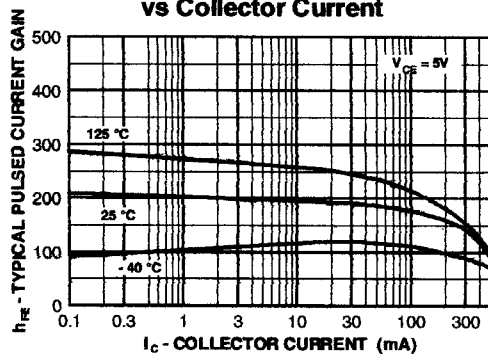
TEL: 2790-0314

FAX: 2790-0206

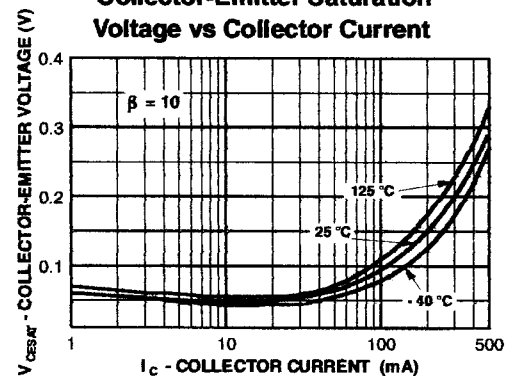
NPN General Purpose Amplifier (continued)

Typical Characteristics

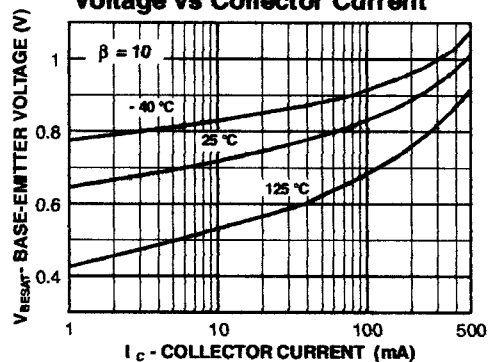
Typical Pulsed Current Gain
vs Collector Current



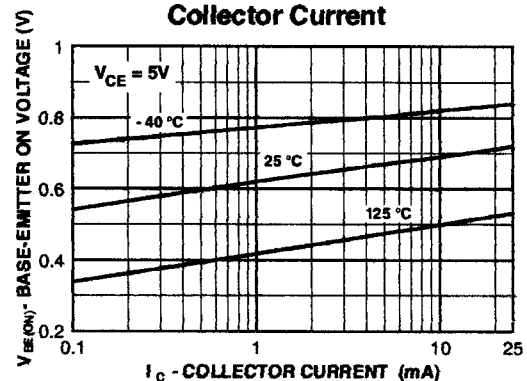
Collector-Emitter Saturation
Voltage vs Collector Current



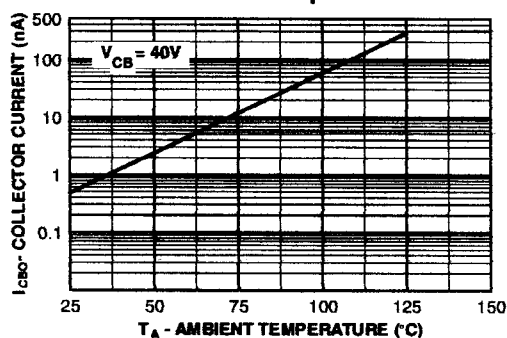
Base-Emitter Saturation
Voltage vs Collector Current



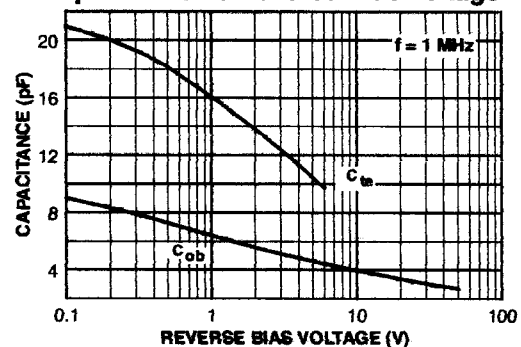
Base-Emitter ON Voltage vs
Collector Current



Collector-Cutoff Current
vs Ambient Temperature



Emitter Transition and Output
Capacitance vs Reverse Bias Voltage



PN2222A / MMBT2222A / PZT2222A



FUKUCOM COMPANY LTD.

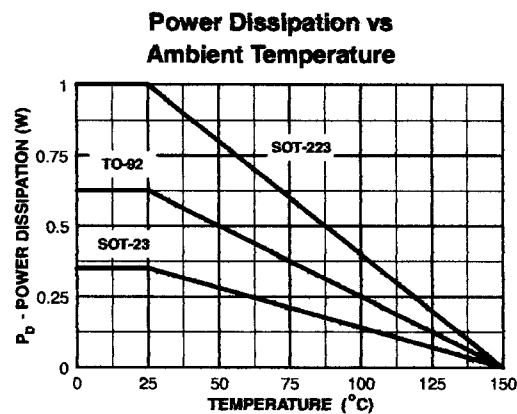
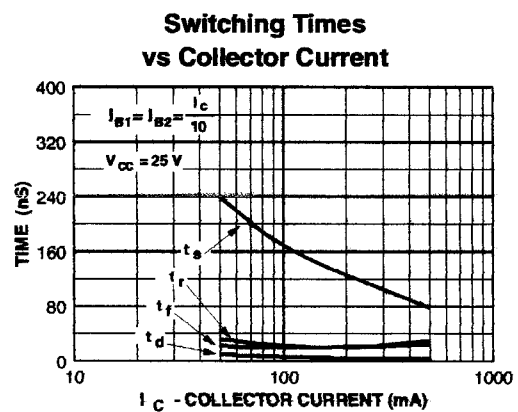
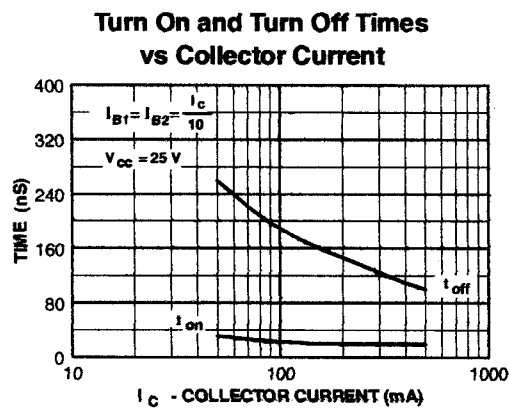
福 靈 有 限 公 司

FLAT P, 3/F, EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,
KWUN TONG, KOWLOON, HONG KONG.

TEL: 2790-0314 FAX: 2790-0206

NPN General Purpose Amplifier (continued)

Typical Characteristics (continued)



PN2222A / MMBT2222A / PZT2222A



FUKUCOM COMPANY LTD.

福 靈 有 限 公 司

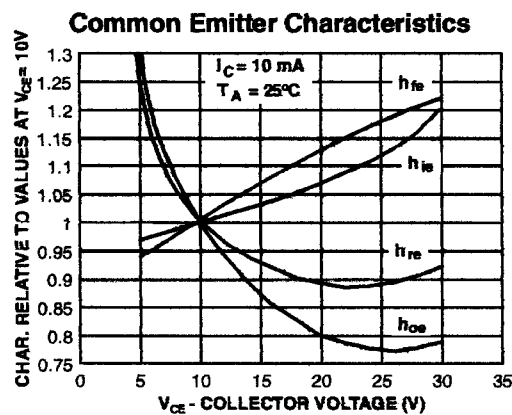
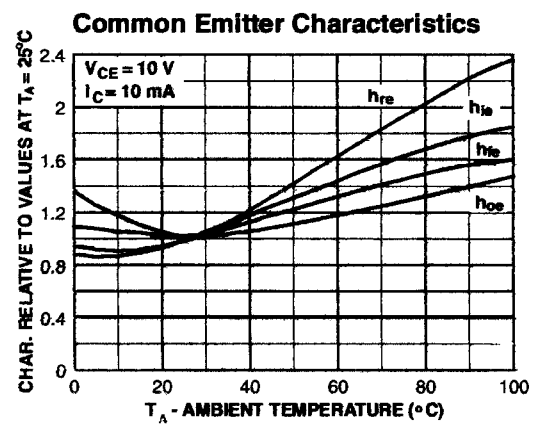
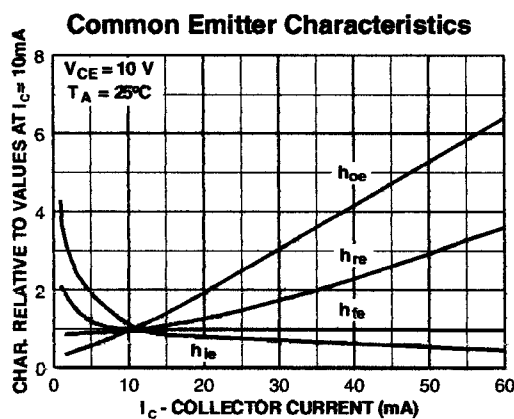
FLAT P, 3/F, EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,
KWUN TONG, KOWLOON, HONG KONG.

TEL: 2790-0314 FAX: 2790-0206

NPN General Purpose Amplifier

(continued)

Typical Common Emitter Characteristics (f = 1.0kHz)



PN2222A / MMBT2222A / PZT2222A



FUKUCOM COMPANY LTD.

福 靈 有 限 公 司

FLAT P, 3/F., EVEREST INDUSTRIAL CENTRE, 396 KWUN TONG ROAD,
KWUN TONG, KOWLOON, HONG KONG.

TEL: 2790-0314

FAX: 2790-0206

NPN General Purpose Amplifier

(continued)

Test Circuits

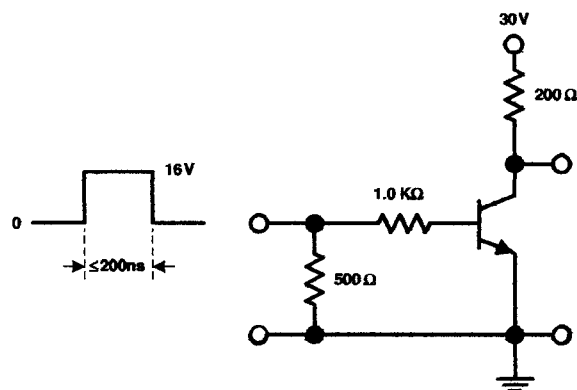


FIGURE 1: Saturated Turn-On Switching Time

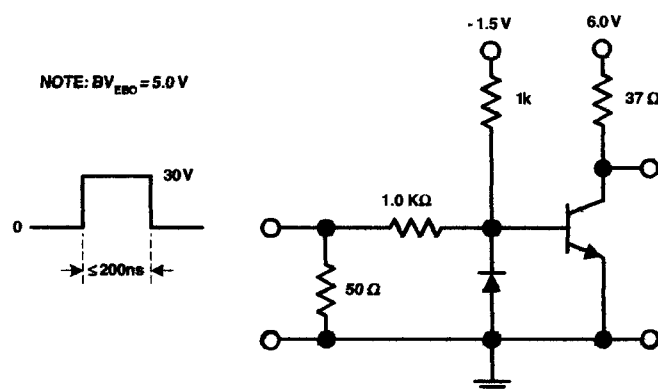


FIGURE 2: Saturated Turn-Off Switching Time

PN2222A / MMBT2222A / PZT2222A