FAIRCHILD SEMICONDUCTOR®

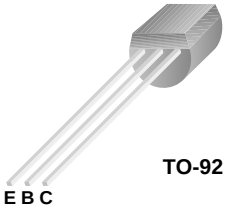
August 2010

PN2222A / MMBT2222A / PZT2222A
NPN General Purpose Amplifier

Features

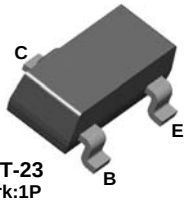
- This device is for use as a medium power amplifier and switch requiring collector currents up to 500mA.
- Sourced from process 19.

PN2222A



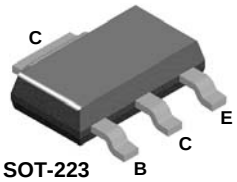
TO-92

MMBT2222A



SOT-23
Mark:1P

PZT2222A



SOT-223

Absolute Maximum Ratings * T_a = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	75	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current	1.0	A
T_{STG}	Operating and Storage Junction Temperature Range	- 55 ~ 150	°C

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

NOTES:

1) These rating are based on a maximum junction temperature of 150 degrees C.

2) These are steady limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics T_a = 25°C unless otherwise noted

Symbol	Parameter	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/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3			°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	125	°C/W

* Device mounted on FR-4 PCB 1.6” × 1.6” × 0.06”.

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

Electrical Characteristics T_a = 25°C unless otherwise noted

Symbol	Parameter	Test Condition	Min.	Max.	Units
Off Characteristics					
$BV_{(BR)CEO}$	Collector-Emitter Breakdown Voltage *	I_C = 10mA, I_B = 0	40		V
$BV_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10μA, I_E = 0	75		V
$BV_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10μA, I_C = 0	6.0		V
I_{CEX}	Collector Cutoff Current	V_{CE} = 60V, $V_{EB(off)}$ = 3.0V		10	nA
I_{CBO}	Collector Cutoff Current	V_{CB} = 60V, I_E = 0 V_{CB} = 60V, I_E = 0, T_a = 125°C		0.01 10	μA μA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0V, I_C = 0		10	nA
I_{BL}	Base Cutoff Current	V_{CE} = 60V, $V_{EB(off)}$ = 3.0V		20	nA
On Characteristics					
h_{FE}	DC Current Gain	I_C = 0.1mA, V_{CE} = 10V I_C = 1.0mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V, T_a = -55°C I_C = 150mA, V_{CE} = 10V * I_C = 150mA, V_{CE} = 1V * I_C = 500mA, V_{CE} = 10V *	35 50 75 35 100 50 40	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage *	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA		0.3 1.0	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage *	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA	0.6	1.2 2.0	V V
Small Signal Characteristics					
f_T	Current Gain Bandwidth Product	I_C = 20mA, V_{CE} = 20V, f = 100MHz	300		MHz
C_{obo}	Output Capacitance	V_{CB} = 10V, I_E = 0, f = 1MHz		8.0	pF
C_{ibo}	Input Capacitance	V_{EB} = 0.5V, I_C = 0, f = 1MHz		25	pF
rb'C_c	Collector Base Time Constant	I_C = 20mA, V_{CB} = 20V, f = 31.8MHz		150	pS
NF	Noise Figure	I_C = 100μA, V_{CE} = 10V, R_S = 1.0KΩ, f = 1.0KHz		4.0	dB
Re(h_{ie})	Real Part of Common-Emitter High Frequency Input Impedance	I_C = 20mA, V_{CE} = 20V, f = 300MHz		60	Ω
Switching Characteristics					
t_d	Delay Time	V_{CC} = 30V, $V_{EB(off)}$ = 0.5V, I_C = 150mA, I_{B1} = 15mA		10	ns
t_r	Rise Time			25	ns
t_s	Storage Time	V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA		225	ns
t_f	Fall Time			60	ns

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

Typical Performance Characteristics

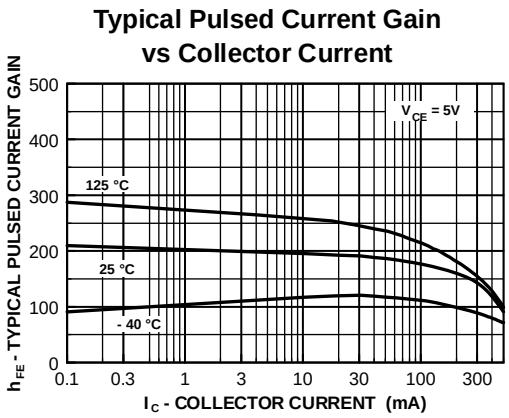


Figure 1. Typical Pulsed Current Gain vs Collector Current

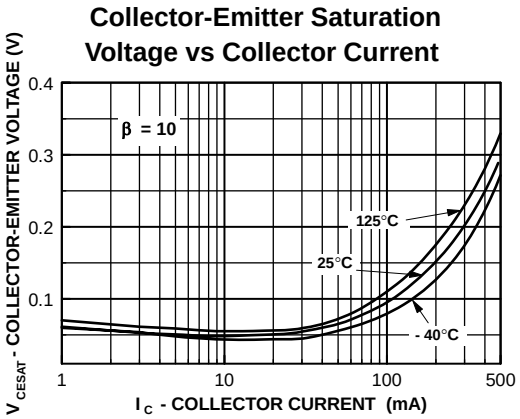


Figure 2. Collector-Emitter Saturation Voltage vs Collector Current

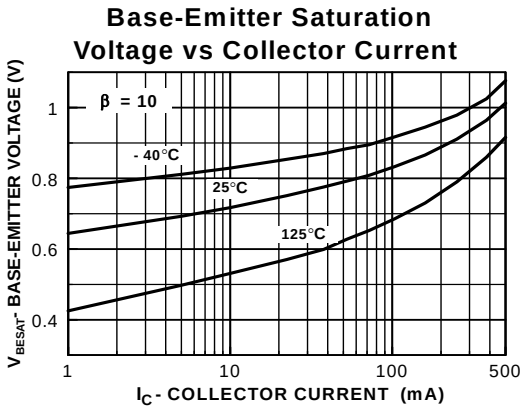


Figure 3. Base-Emitter Saturation Voltage vs Collector Current

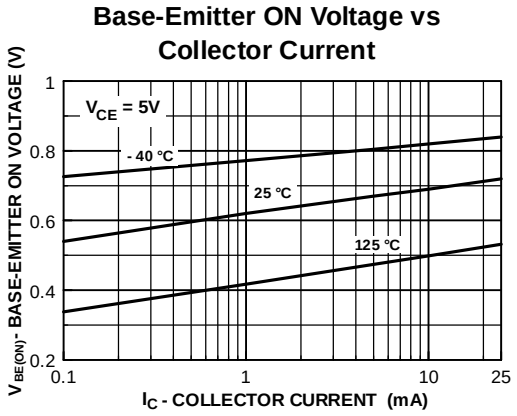


Figure 4. Base-Emitter On Voltage vs Collector Current

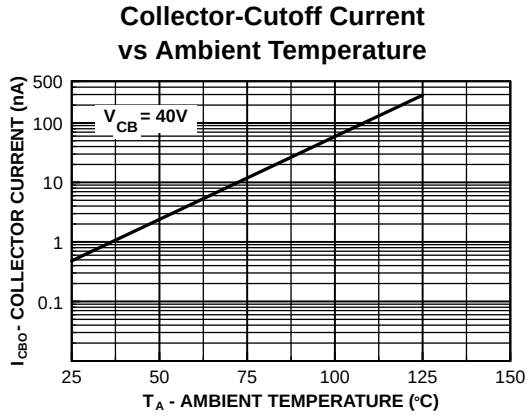


Figure 5. Collector Cutoff Current vs Ambient Temperature

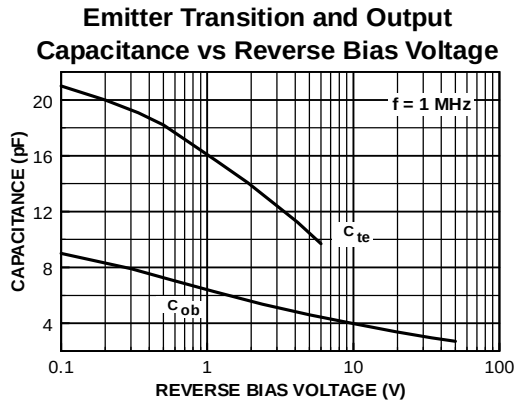


Figure 6. Emitter Transition and Output Capacitance vs Reverse Bias Voltage

Typical Performance Characteristics (Continued)

Turn On and Turn Off Times vs Collector Current

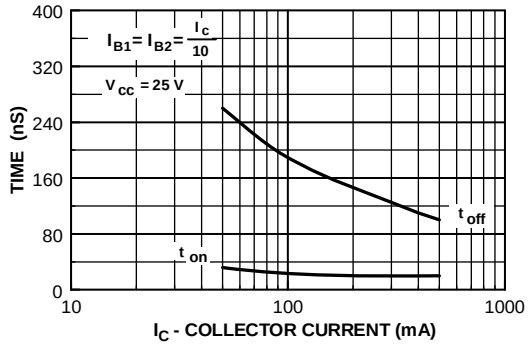


Figure 7. Turn On and Turn Off Times vs Collector Current

Switching Times vs Collector Current

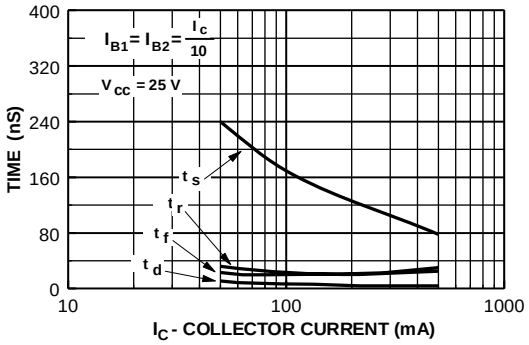


Figure 8. Switching Times vs Collector Current

Power Dissipation vs Ambient Temperature

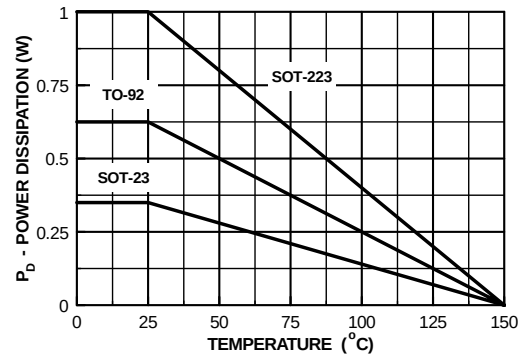


Figure 9. Power Dissipation vs Ambient Temperature

Common Emitter Characteristics

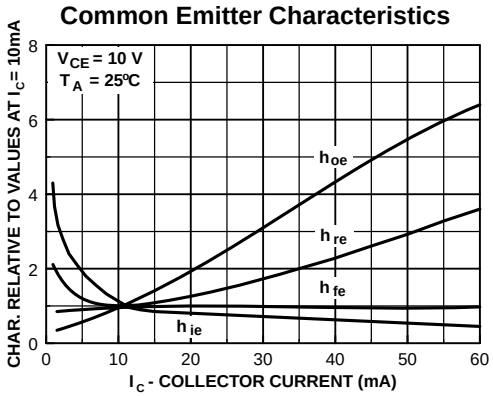


Figure 10. Common Emitter Characteristics

Common Emitter Characteristics

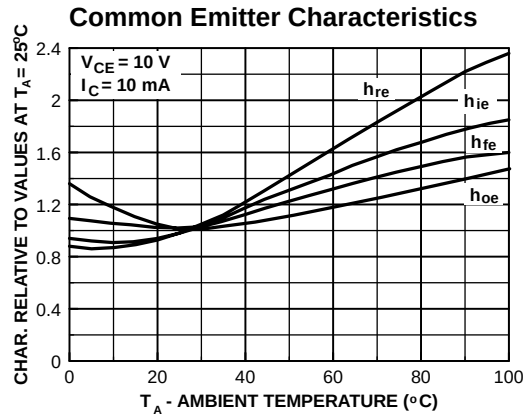


Figure 11. Common Emitter Characteristics

Common Emitter Characteristics

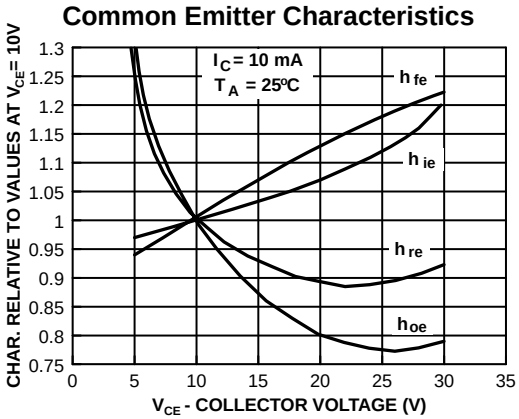


Figure 12. Common Emitter Characteristics

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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PRODUCT STATUS DEFINITIONS

Definition of Terms

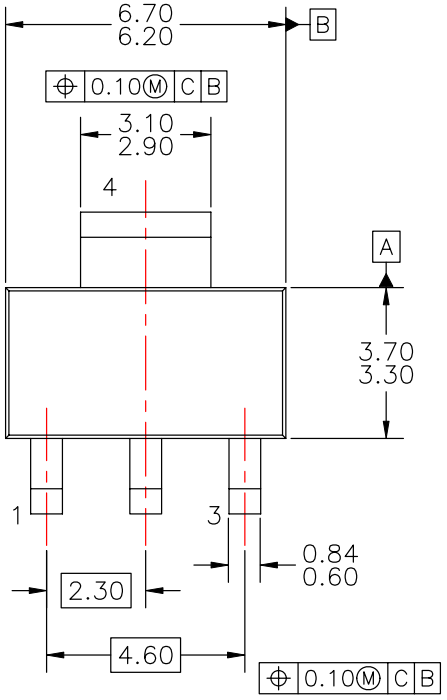
Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

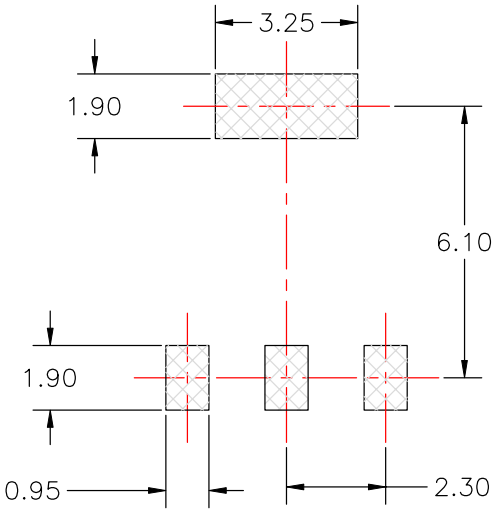
Rev. I49

APPROVED
July-14-2008

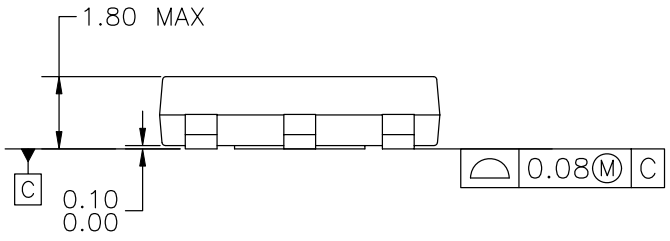
REVISIONS

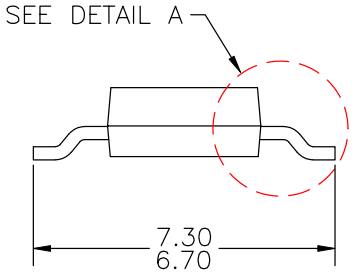
LTR	DESCRIPTION	DATE	NAME/SITE
A	RELEASE TO DOCUMENT CONTROL	JAN.25,1996	TL/FSCP
2	CHG DWG TEMPLATE FR NATIONAL TO FAIRCHILD; CHG DIM STYLE FR DUAL INCH[MM] TO SINGLE, MM; CHG LD WID FR $0.74^{+0.05}_{-0.07}$ TO 0.60–0.84; REMOVE PKG THICK DIM (1.6); CHG TOTAL PKG HT FR $1.80^{}_{1.20}$ TO 1.80 MAX; CHG FOOT LANDING DIM FR 0.91 MIN TO 0.60 MIN; CHG LD THICKNESS FR $0.3^{+0.09}_{-0.07}$ TO 0.20–0.35; ADD DRAFT ANGLE OF MOLDED BODY TOP & BOT; CHG LD LGTH TO PKG EDGE DIM TO BASIC; CHG LD PITCH FR 2.29 BS TO 2.30 BS; CHG BODY WID FR $3.56^{+0.18}_{-0.38}$ TO $3.70^{}_{3.30}$; CHG BODY LN FR $6.5^{+0.3}_{-0.4}$ TO $6.70^{}_{6.30}$; CHG TOTAL PKG WID FR $6.96^{+0.33}_{-0.38}$ TO $7.30^{}_{6.70}$; CHG PAD SIZE FR 0.99 MAX TO 0.95; CHG PAD PITCH FR 2.286 TO 2.30; CHG THERMAL TAB SIZE FR 3.28 MAX TO 3.25; CHG PAD SIZE FR 1.5 TO 1.90; CHG PAD SPACE FR 6.3 TO 6.10; CHG NOTE '2' TO 'A' W/O DATE; DEL NOTE ON LD FINISH; ADD NOTES B, C, D, E & F.	12FEB08	LZSC/FSCP

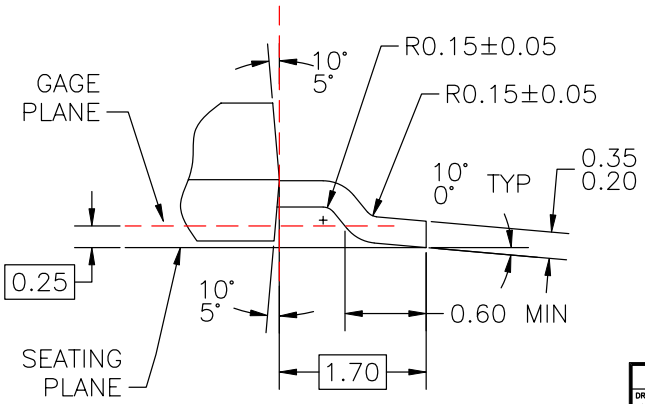




LAND PATTERN RECOMMENDATION







DETAIL A
SCALE: 2:1

NOTES: UNLESS OTHERWISE SPECIFIED

A) DRAWING BASED ON JEDEC REGISTRATION TO–261, VARIATION AA.
B) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
C) ALL DIMENSIONS ARE IN MILLIMETERS.
D) DRAWING CONFORMS TO ASME Y14.5M–1994.
E) LANDPATTERN NAME: SOT230P700X180–4BN
F) DRAWING FILENAME: MKT–MA04AREV2

APPROVALS	DATE
DRAWN: J.U. COMPARATIVO JR.	26FEB2008
CHECKED: L.Z. STA CRUZ	
APPROVED: M.R. GESTOLE	
G.S. BAJE	

PROJECTION INCH [MM]

FAIRCHILD SEMICONDUCTOR TM

MOLDED PACKAGE
SOT–223, 4 LEAD

SCALE	SIZE	DRAWING NUMBER	REV
1:1	A3	MKT–MA04A	2

FORMERLY: N/A

SHEET : 1 OF 1