July 2014

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.

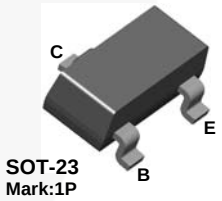

Figure 1. MMBT2222A Device Package

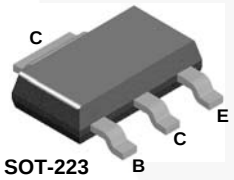

Figure 2. PZT2222A Device Package

Ordering Information

Part Number	Top Mark	Package	Packing Method
MMBT2222A	1P	SOT-23 3L	Tape and Reel
PZT2222A	2222A	SOT-223 4L	Tape and Reel

Absolute Maximum Ratings(1), (2)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
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 to 150	°C

Note:

1. These rating are based on a maximum junction temperature of 150 °C.
2. These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty-cycle operation.

Thermal Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Max.		Unit
		MMBT2222A(3)	PZT2222A(4)	
P_D	Total Device Dissipation	350	1000	mW
	Derate Above 25°C	2.8	8.0	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	125	°C/W

Notes:

3. Device is mounted on FR-4 PCB 1.6 inch x 1.6 inch x 0.06 inch.
4. Device is mounted on FR-4 PCB 36 mm x 18 mm x 1.5 mm, mounting pad for the collector lead minimum 6 cm^2.

Electrical Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Max.	Unit
Off Characteristics					
$BV_{(BR)CEO}$	Collector-Emitter Breakdown Voltage[5]	I_C = 10 mA, I_B = 0	40		V
$BV_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	75		V
$BV_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	6.0		V
I_{CEX}	Collector Cut-Off Current	V_{CE} = 60 V, $V_{EB(off)}$ = 3.0 V		10	nA
I_{CBO}	Collector Cut-Off Current	V_{CB} = 60 V, I_E = 0		0.01	µA
		V_{CB} = 60 V, I_E = 0, T_A = 125°C		10	
I_{EBO}	Emitter Cut-Off Current	V_{EB} = 3.0 V, I_C = 0		10	nA
I_{BL}	Base Cut-Off Current	V_{CE} = 60 V, $V_{EB(off)}$ = 3.0 V		20	nA
On Characteristics					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 10 V	35		
		I_C = 1.0 mA, V_{CE} = 10 V	50		
		I_C = 10 mA, V_{CE} = 10 V	75		
		I_C = 10 mA, V_{CE} = 10 V, T_A = -55°C	35		
		I_C = 150 mA, V_{CE} = 10 V[5]	100	300	
		I_C = 150 mA, V_{CE} = 1 V[5]	50		
		I_C = 500 mA, V_{CE} = 10 V[5]	40		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage[5]	I_C = 150 mA, I_B = 15 mA		0.3	V
		I_C = 500 mA, I_B = 50 mA		1.0	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage[5]	I_C = 150 mA, I_B = 15 mA	0.6	1.2	V
		I_C = 500 mA, I_B = 50 mA		2.0	
Small Signal Characteristics					
f_T	Current Gain Bandwidth Product	I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	300		MHz
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1 MHz		8.0	pF
C_{ibo}	Input Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		25	pF
$rb'C_c$	Collector Base Time Constant	I_C = 20 mA, V_{CB} = 20 V, f = 31.8 MHz		150	pS
NF	Noise Figure	I_C = 100 µA, V_{CE} = 10 V, R_S = 1.0 kΩ, f = 1.0 kHz		4.0	dB
$Re(h_{ie})$	Real Part of Common-Emitter High Frequency Input Impedance	I_C = 20 mA, V_{CE} = 20 V, f = 300 MHz		60	Ω
Switching Characteristics					
t_d	Delay Time	V_{CC} = 30 V, $V_{EB(off)}$ = 0.5 V, I_C = 150 mA, I_{B1} = 15 mA		10	ns
t_r	Rise Time			25	ns
t_s	Storage Time	V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA		225	ns
t_f	Fall Time			60	ns

Note:

5. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2.0%.

Typical Performance Characteristics

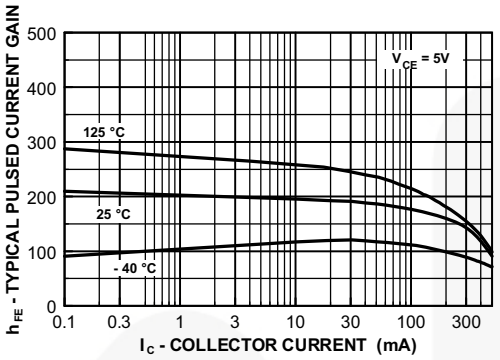

Figure 3. Typical Pulsed Current Gain vs. Collector Current

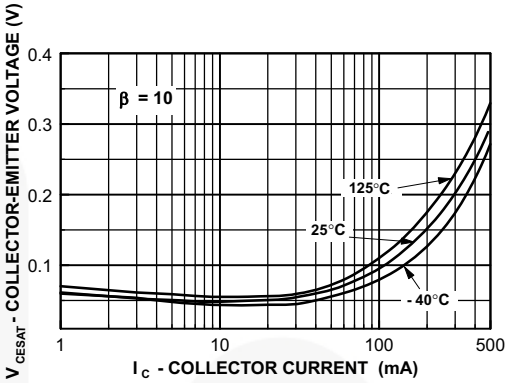

Figure 4. Collector-Emitter Saturation Voltage vs. Collector Current

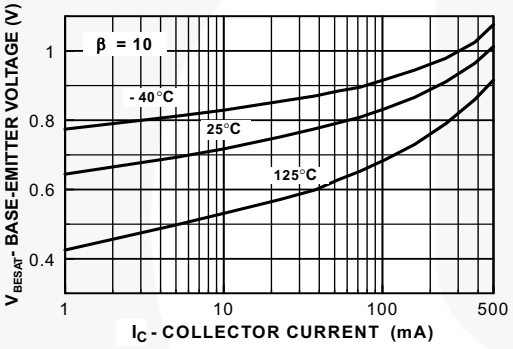

Figure 5. Base-Emitter Saturation Voltage vs. Collector Current

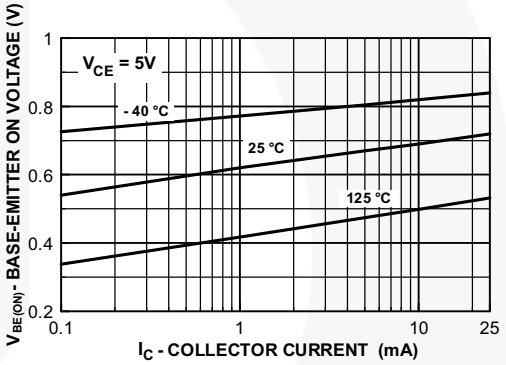

Figure 6. Base-Emitter On Voltage vs. Collector Current

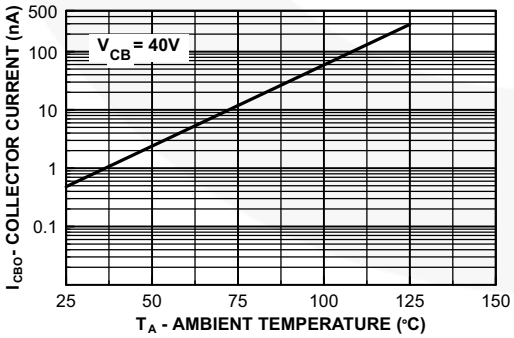

Figure 7. Collector Cut-Off Current vs. Ambient Temperature

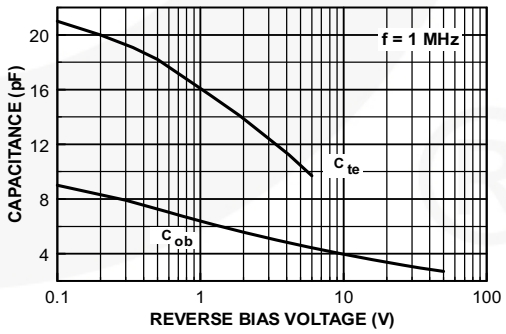

Figure 8. Emitter Transition and Output Capacitance vs. Reverse Bias Voltage

Typical Performance Characteristics (Continued)

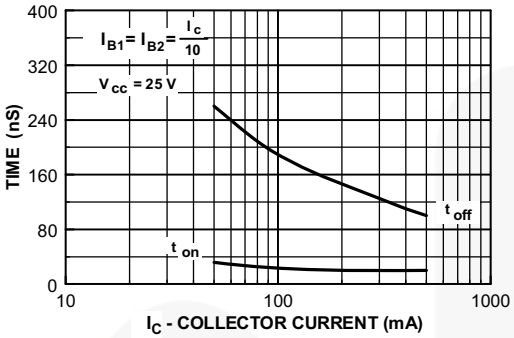

Figure 9. Turn-On and Turn-Off Times vs. Collector Current

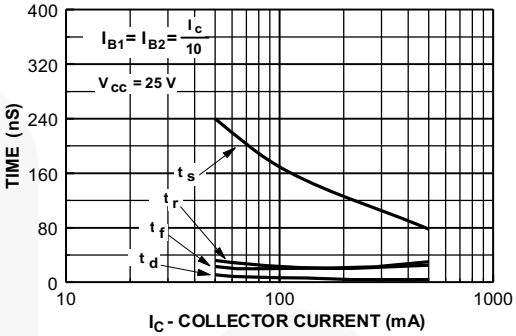

Figure 10. Switching Times vs. Collector Current

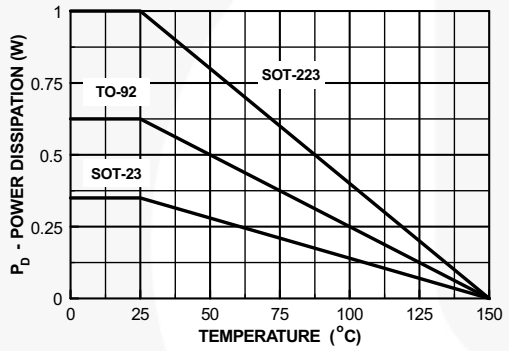

Figure 11. Power Dissipation vs. Ambient Temperature

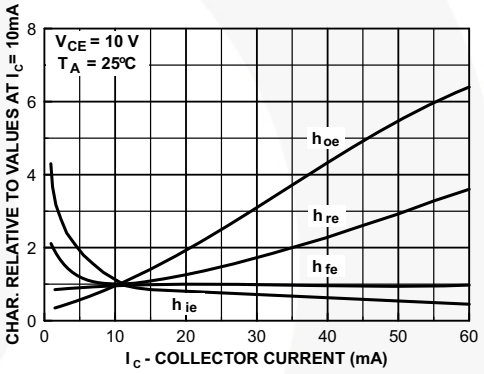

Figure 12. Common Emitter Characteristics

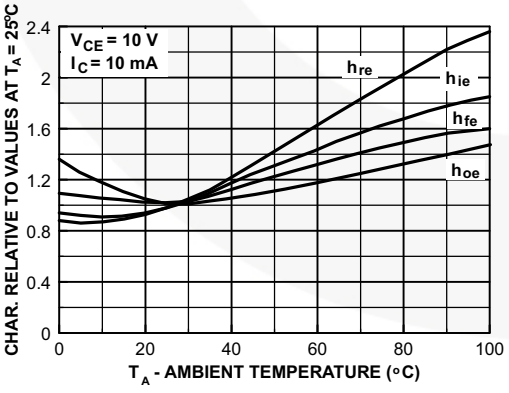

Figure 13. Common Emitter Characteristics

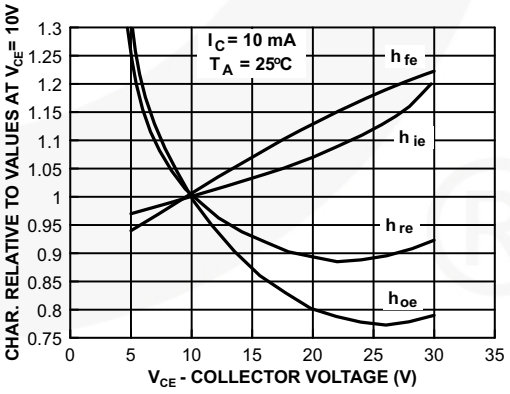

Figure 14. Common Emitter Characteristics

Physical Dimensions

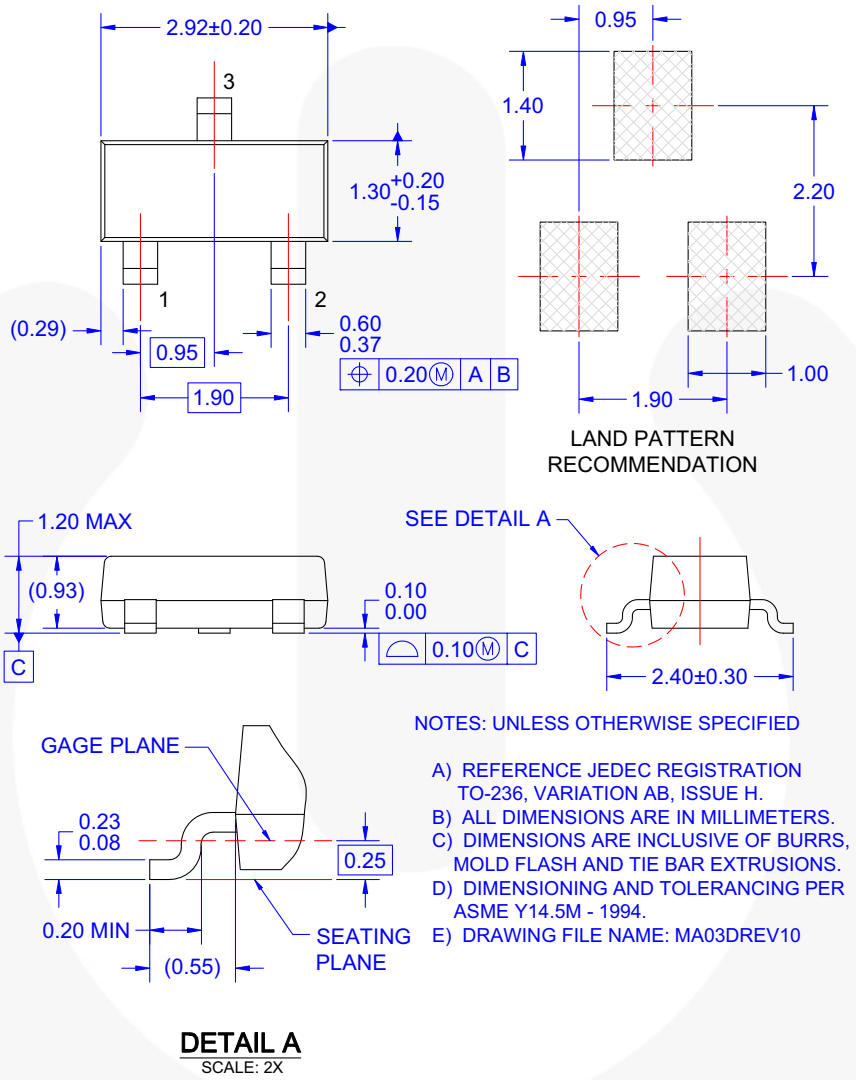

Figure 15. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE (ACTIVE)

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Physical Dimensions (Continued)

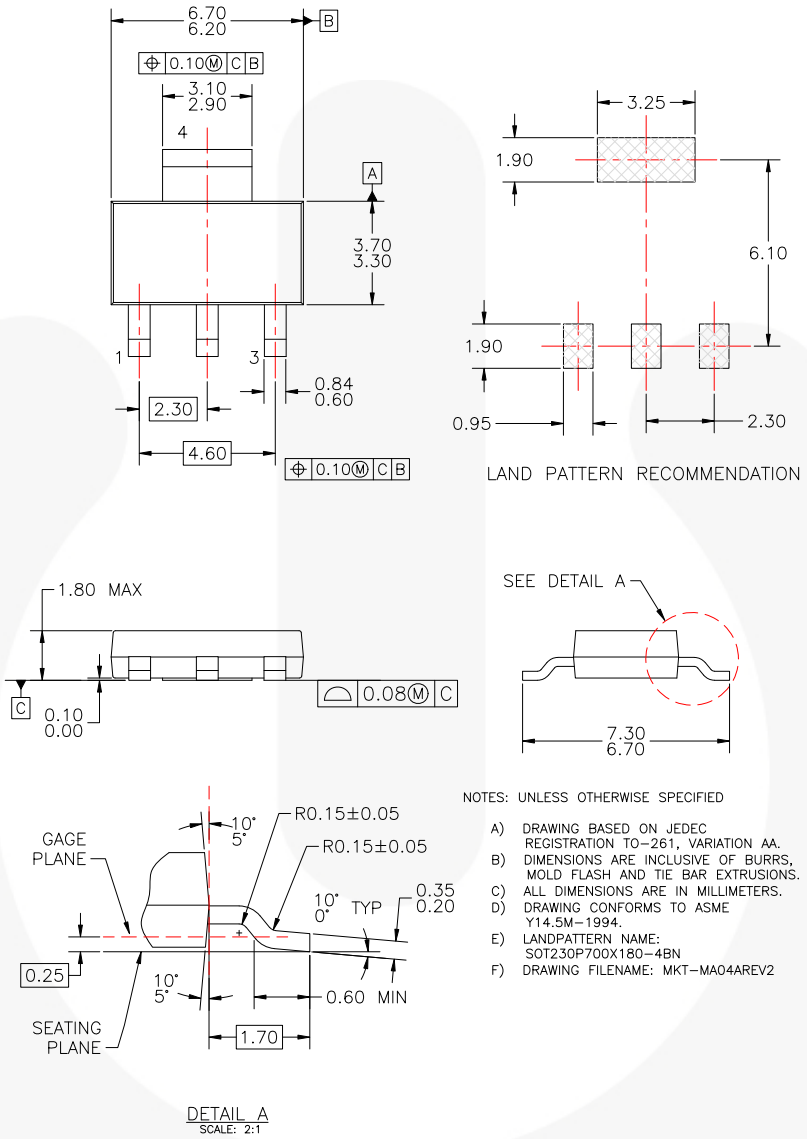

Figure 16. MOLDED PACKAGING, SOT-223, 4-LEAD (ACTIVE)

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