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ON Semiconductor®

# PN2907A / MMBT2907A / PZT2907A 60 V PNP General-Purpose Transistor

## Features

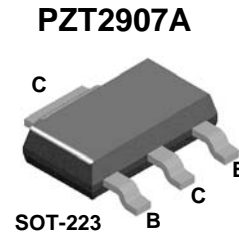
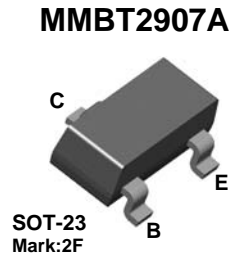
- High DC Current Gain ( $h_{FE}$ ) Range: 100 ~ 300
- High-Current Gain Bandwidth Product ( $f_T$ ): 200 MHz (Minimum)
- Maximum Turn-On Time ( $t_{on}$ ): 45 ns
- Maximum Turn-Off Time ( $t_{off}$ ): 100 ns
- Ultra-Small Surface-Mount Package: SOT-223 (PZT2907A)

## Applications

- General-Purpose Amplifier
- Switch

## Description

The PN2907A, MMBT2907A, and PZT2907A are 60 V PNP bipolar transistors designed for use as a general-purpose amplifier or switch in applications that require up to 500 mA. Offered in an ultra-small surface-mount package (SOT-223), the PZT2907A is ideal for space-constrained systems. The NPN complementary types are the PN2222A, MMBT2222A, and PZT2222A; respectively.



## Ordering Information

Part Number	Top Mark	Package	Packing Method
PN2907ABU	2907A	TO-92 3L	Bulk
PN2907ATF	2907A	TO-92 3L	Tape and Reel
PN2907ATFR	2907A	TO-92 3L	Tape and Reel
PN2907ATA	2907A	TO-92 3L	Ammo
PN2907ATAR	2907A	TO-92 3L	Ammo
MMBT2907A	2F	SOT-23 3L	Tape and Reel
MMBT2907A-D87Z	2F	SOT-23 3L	Tape and Reel
PZT2907A	2907A	SOT-223 4L	Tape and Reel

PN2907A / MMBT2907A / PZT2907A — 60 V PNP General-Purpose Transistor

## Absolute Maximum Ratings<sup>(1),(2)</sup>

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

Symbol	Parameter	Value	Unit
$V_{CEO}$	Collector-Emitter Voltage	-60	V
$V_{CBO}$	Collector-Base Voltage	-60	V
$V_{EBO}$	Emitter-Base Voltage	-5.0	V
$I_C$	Collector Current - Continuous	-800	mA
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Notes:

1. These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ .
2. These are steady-state limits. ON Semiconductor should be consulted on applications involving pulsed or low-duty cycle operations.

## Thermal Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Max.			Unit
		PN2907A <sup>(4)</sup>	MMBT2907A <sup>(3)</sup>	PZT2907A <sup>(4)</sup>	
$P_D$	Total Device Dissipation	625	350	1000	mW
	Derate Above $25^\circ\text{C}$	5.0	2.8	8.0	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3			$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	125	$^\circ\text{C}/\text{W}$

### Notes:

3. Device is mounted on FR-4 PCB 1.6 inch X 1.6 inch X 0.06 inch.
4. PCB size: FR-4 76 x 114 x 1.57 mm<sup>3</sup> (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

## Electrical Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Max.	Unit
<b>Off Characteristics</b>					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage <sup>(5)</sup>	$I_C = -10\text{ mA}, I_B = 0$	-60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = -10\text{ }\mu\text{A}, I_E = 0$	-60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = -10\text{ }\mu\text{A}, I_C = 0$	-5.0		V
$I_{BL}$	Base Cut-Off Current	$V_{CE} = -30\text{ V}, V_{EB} = -0.5\text{ V}$		-50	nA
$I_{CEX}$	Collector Cut-Off Current	$V_{CE} = -30\text{ V}, V_{EB} = -0.5\text{ V}$		-50	nA
$I_{CBO}$	Collector Cut-Off Current	$V_{CB} = -50\text{ V}, I_E = 0$		-0.02	$\mu\text{A}$
		$V_{CB} = -50\text{ V}, I_E = 0, T_A = 150^\circ\text{C}$		-20	
<b>On Characteristics</b>					
$h_{FE}$	DC Current Gain	$I_C = -0.1\text{ mA}, V_{CE} = -10\text{ V}$	75		
		$I_C = -1.0\text{ mA}, V_{CE} = -10\text{ V}$	100		
		$I_C = -10\text{ mA}, V_{CE} = -10\text{ V}$	100		
		$I_C = -150\text{ mA}, V_{CE} = -10\text{ V}^{(5)}$	100	300	
		$I_C = -500\text{ mA}, V_{CE} = -10\text{ V}^{(5)}$	50		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage <sup>(5)</sup>	$I_C = -150\text{ mA}, I_B = -15\text{ mA}$		-0.4	V
		$I_C = -500\text{ mA}, I_B = -50\text{ mA}$		-1.6	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = -150\text{ mA}, I_B = -15\text{ mA}^{(5)}$		-1.3	V
		$I_C = -500\text{ mA}, I_B = -50\text{ mA}$		-2.6	
<b>Small Signal Characteristics</b>					
$f_T$	Current Gain - Bandwidth Product	$I_C = -50\text{ mA}, V_{CE} = -20\text{ V},$ $f = 100\text{ MHz}$	200		MHz
$C_{ob}$	Output Capacitance	$V_{CB} = -10\text{ V}, I_E = 0,$ $f = 100\text{ kHz}$		8.0	pF
$C_{ib}$	Input Capacitance	$V_{EB} = -2.0\text{ V}, I_C = 0, f = 100\text{ kHz}$		30	pF
<b>Switching Characteristics</b>					
$t_{on}$	Turn-On Time	$V_{CC} = -30\text{ V}, I_C = -150\text{ mA},$ $I_{B1} = -15\text{ mA}$		45	ns
$t_d$	Delay Time			10	ns
$t_r$	Rise Time			40	ns
$t_{off}$	Turn-Off Time	$V_{CC} = -6.0\text{ V}, I_C = -150\text{ mA},$ $I_{B1} = I_{B2} = -15\text{ mA}$		100	ns
$t_s$	Storage Time			80	ns
$t_f$	Fall Time			30	ns

### Notes:

5. Pulse test: pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

## Typical Performance Characteristics

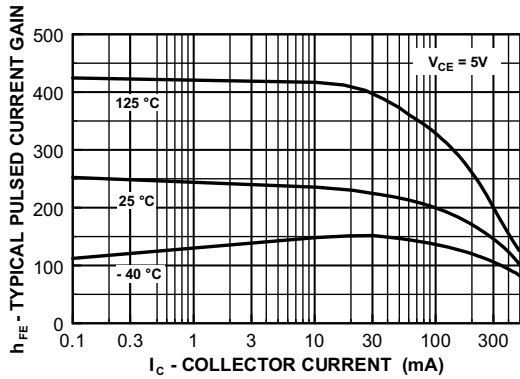


Figure 1. Typical Pulsed Current Gain vs. Collector Current

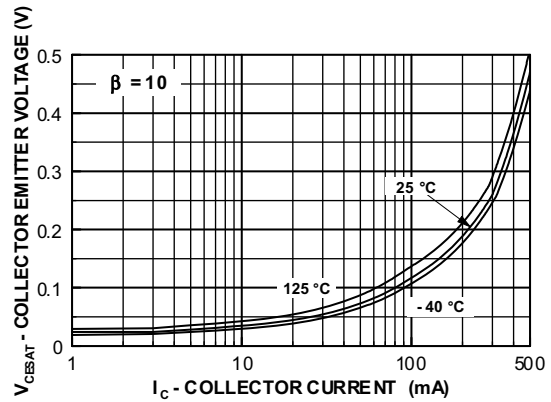


Figure 2. Collector-Emitter Saturation Voltage vs. Collector Current

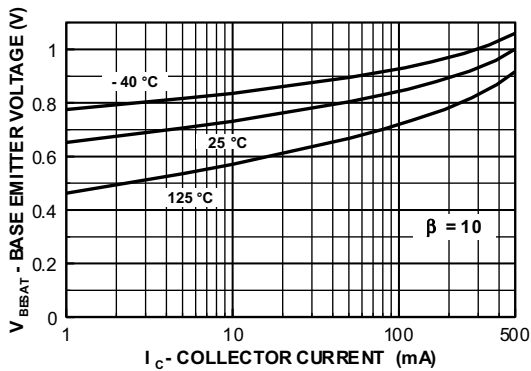


Figure 3. Base-Emitter Saturation Voltage vs. Collector Current

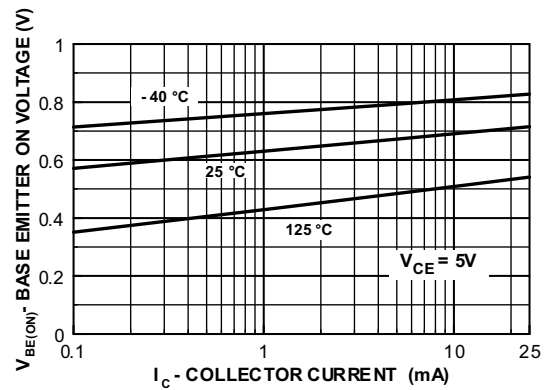


Figure 4. Base-Emitter On Voltage vs. Collector Current

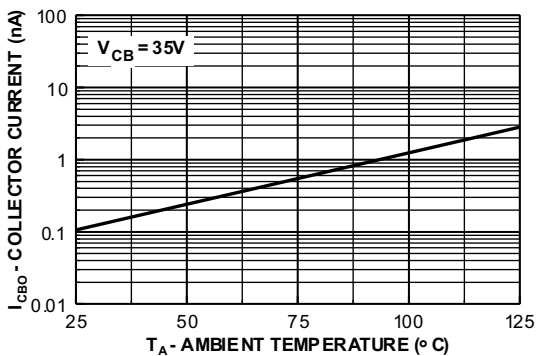


Figure 5. Collector Cut-Off Current vs. Ambient Temperature

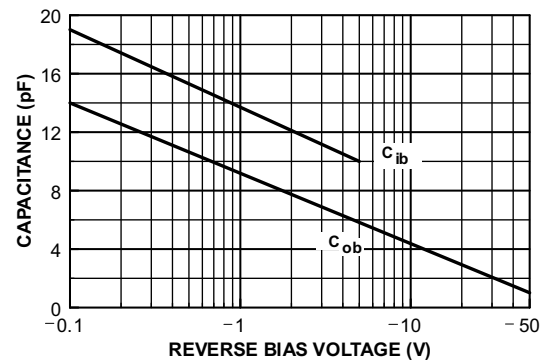


Figure 6. Input and Output Capacitance vs. Reverse Bias Voltage

Typical Performance Characteristics (Continued)

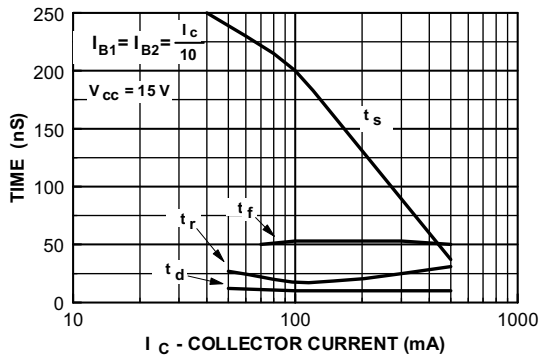


Figure 7. Switching Times vs. Collector Current

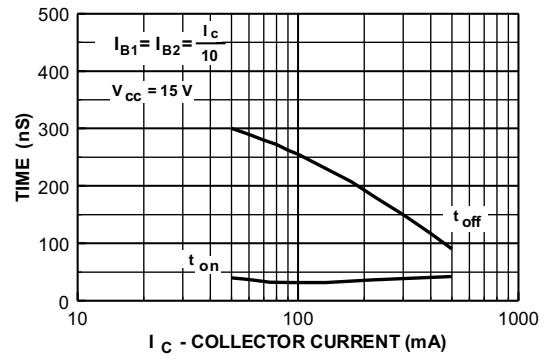


Figure 8. Turn-On and Turn-Off Times vs. Collector Current

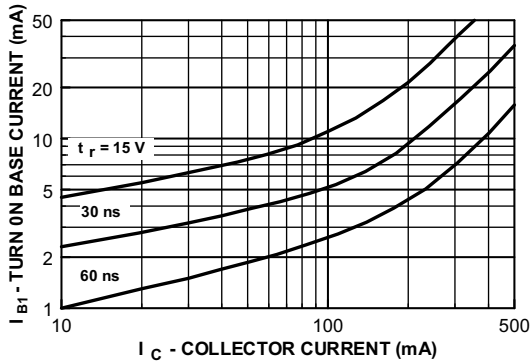


Figure 9. Rise Time vs. Collector and Turn-On Base Currents

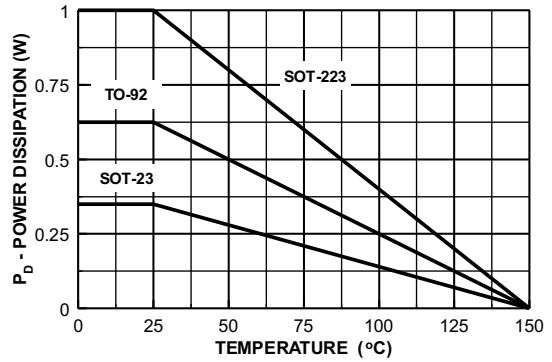


Figure 10. Power Dissipation vs. Ambient Temperature

Typical Performance Characteristics (f = 1.0 kHz)

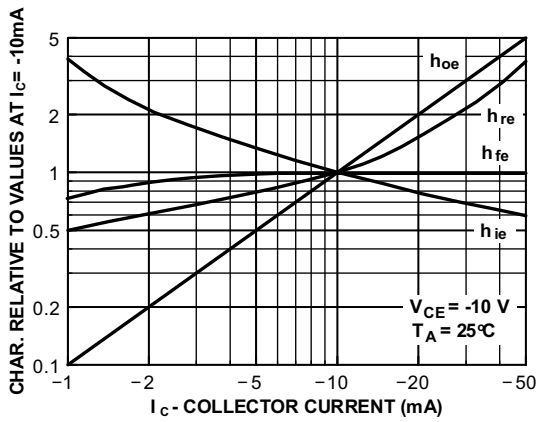


Figure 11. Common Emitter Characteristics

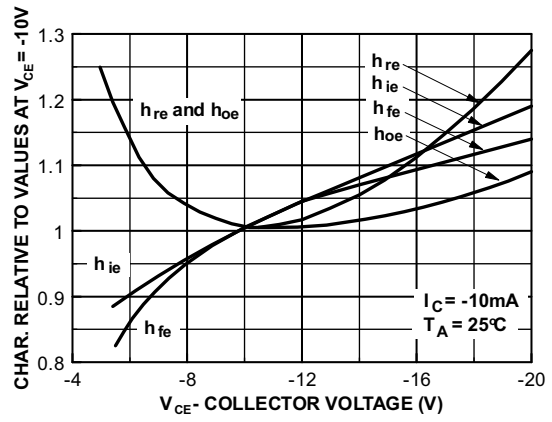


Figure 12. Common Emitter Characteristics

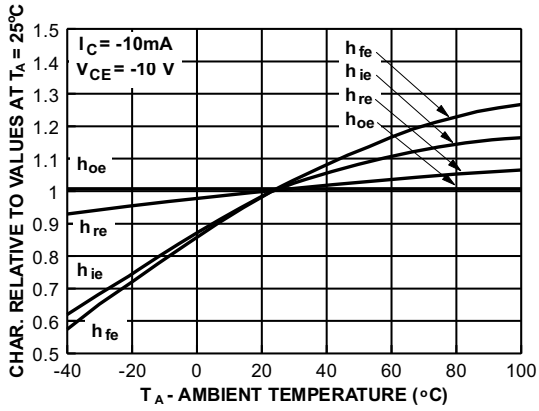
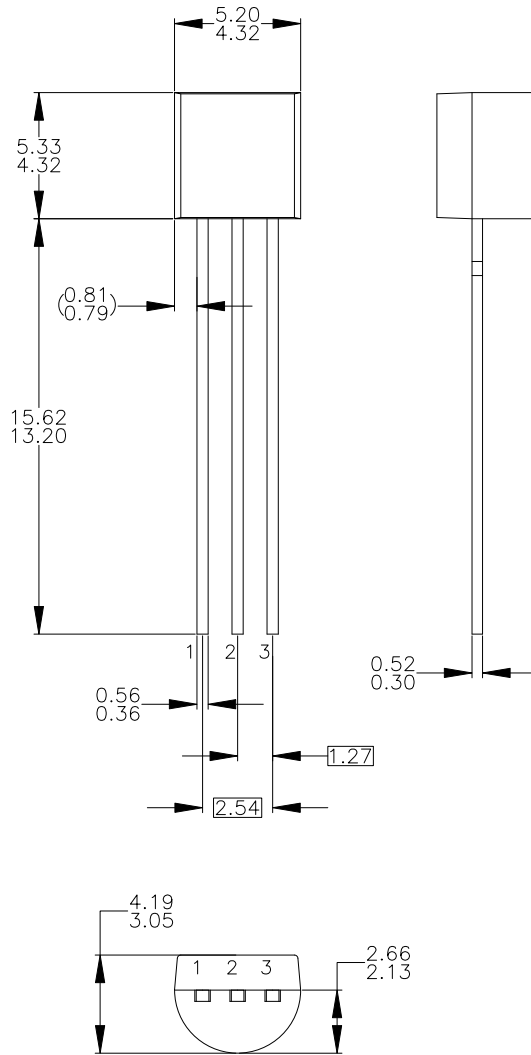


Figure 13. Common Emitter Characteristics

Physical Dimensions

TO-92 (Bulk)



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

PIN	92	94	96	97	98
P	F	M	P	F	M
1	E	S	S	E	S
2	B	D	G	C	G
3	C	G	D	B	D

LEGEND:

- P - BIPOLAR
- F - JFET
- M - DMOS
- E - EMITTER
- B - BASE
- C - COLLECTOR
- D - DRAIN
- S - SOURCE
- G - GATE

- E) FOR PACKAGE 92, 94, 96, 97 AND 98: PIN CONFIGURATION DRAIN "D" AND SOURCE "S" ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03DREV3.

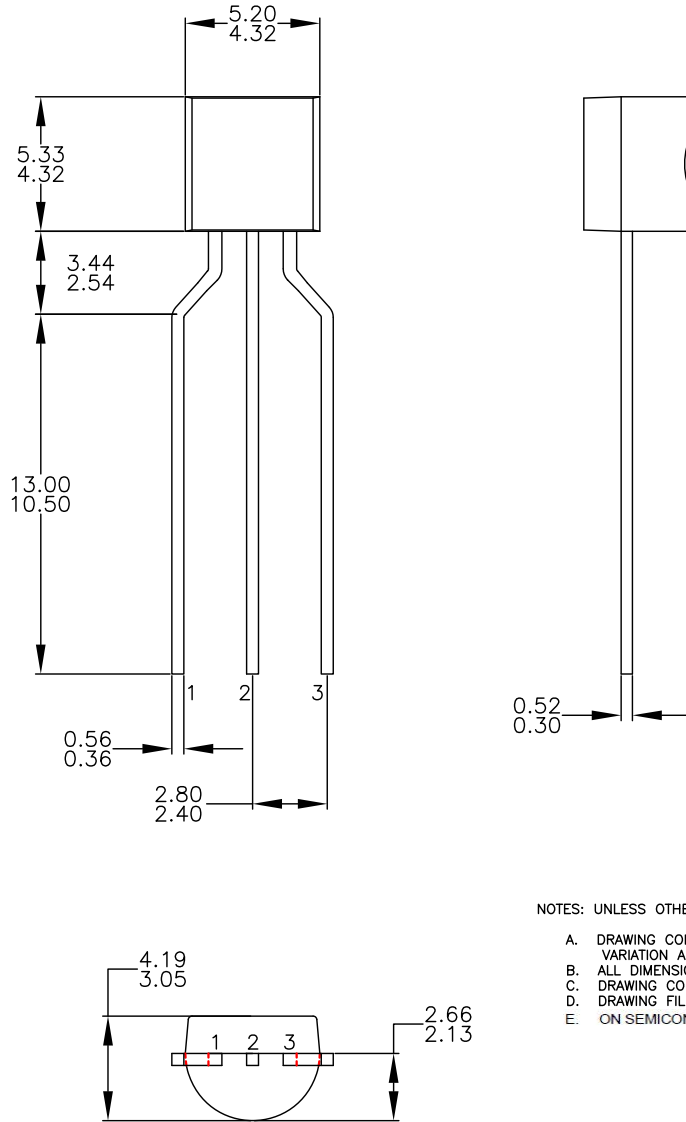
Figure 14. 3-LEAD, TO92, JEDEC TO-92 COMPLIANT STRAIGHT LEAD CONFIGURATION (OLD TO92AM3) (ACTIVE)

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Physical Dimensions (Continued)

TO-92 (Tape and Reel, Ammo)



NOTES: UNLESS OTHERWISE SPECIFIED

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- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5M-2009.
- D. DRAWING FILENAME: MKT-ZA03FREV3.
- E. ON SEMICONDUCTOR

Figure 15. 3-LEAD, TO92, MOLDED 0.200 IN LINE SPACING LEAD FORM (J61Z OPTION) (ACTIVE)

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Physical Dimensions (Continued)

SOT-23

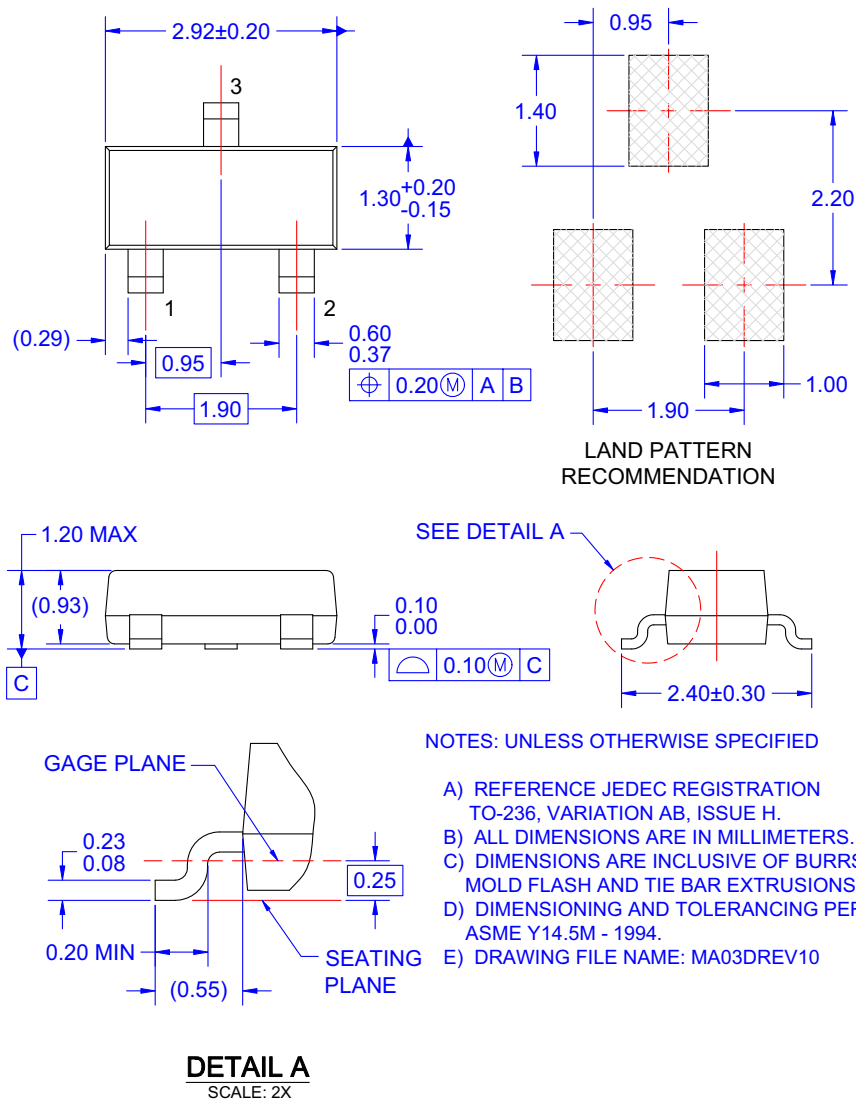


Figure 16. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE (ACTIVE)

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Physical Dimensions (Continued)

SOT-223

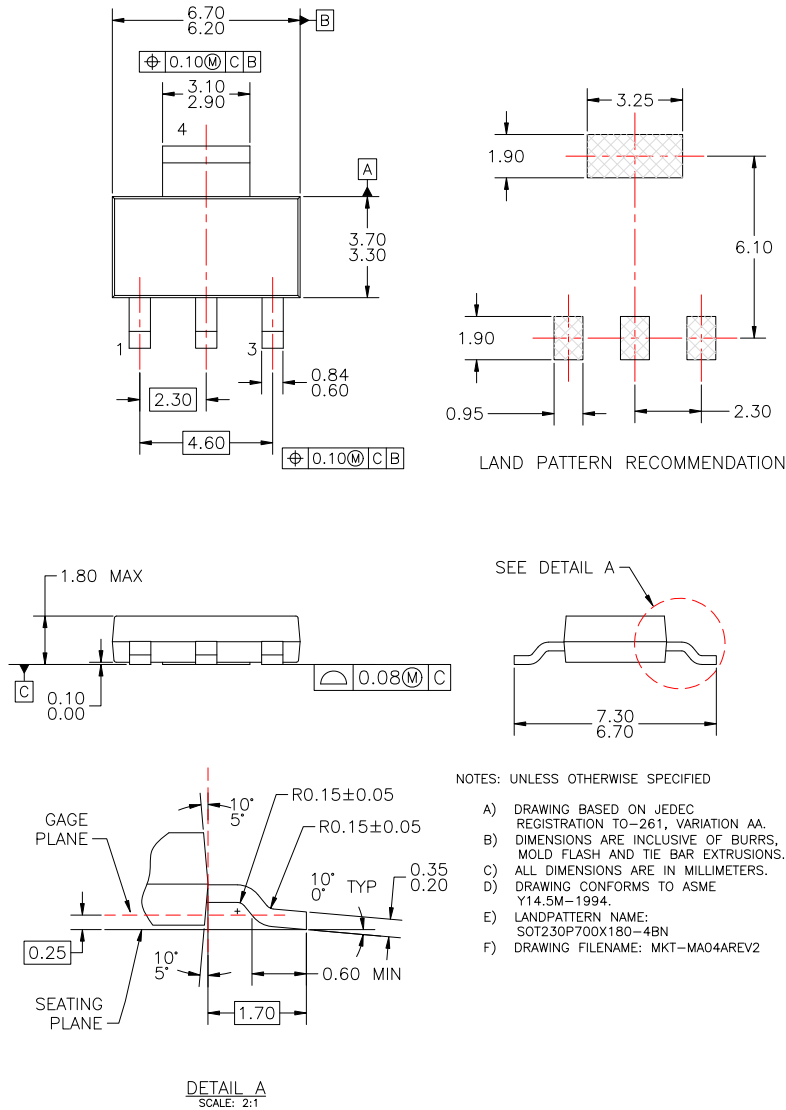


Figure 17. MOLDED PACKAGING, SOT-223, 4-LEAD (ACTIVE)

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