



ON Semiconductor®

# J111 / J112 / J113 / MMBFJ111 / MMBFJ112 / MMBFJ113 N-Channel Switch

## Features

- This device is designed for low level analog switching, sample and hold circuits and chopper stabilized amplifiers.
- Sourced from process 51
- Source & Drain are interchangeable.

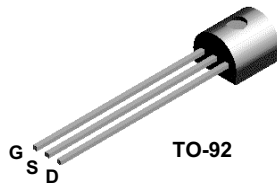


Figure 1. J111 / J112 / J113 Device Package

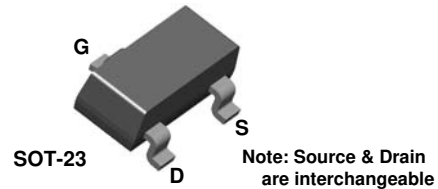


Figure 2. MMBFJ111 / MMBFJ112 / MMBFJ113 Device Package

## Ordering Information

Part Number	Top Mark	Package	Packing Method
J111	J111	TO-92 3L	Bulk
J111-D26Z	J111	TO-92 3L	Tape and Reel
J111-D74Z	J111	TO-92 3L	Ammo
J112	J112	TO-92 3L	Bulk
J112-D26Z	J112	TO-92 3L	Tape and Reel
J112-D27Z	J112	TO-92 3L	Tape and Reel
J112-D74Z	J112	TO-92 3L	Ammo
J113	J113	TO-92 3L	Bulk
J113-D74Z	J113	TO-92 3L	Ammo
J113-D75Z	J113	TO-92 3L	Ammo
MMBFJ111	6P	SOT-23 3L	Tape and Reel
MMBFJ112	6R	SOT-23 3L	Tape and Reel
MMBFJ113	6S	SOT-23 3L	Tape and Reel

J111 / J112 / J113 / MMBFJ111 / MMBFJ112 / MMBFJ113 — N-Channel Switch

### 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
$V_{DG}$	Drain-Gate Voltage	35	V
$V_{GS}$	Gate-Source Voltage	-35	V
$I_{GF}$	Forward Gate Current	50	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
		J111 / J112 / J113 <sup>(3)</sup>	MMBFJ111 / MMBFJ112 / MMBFJ113 <sup>(4)</sup>	
$P_D$	Total Device Dissipation	625	350	mW
	Derate Above $25^\circ\text{C}$	5.0	2.8	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	125		$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	200	357	$^\circ\text{C}/\text{W}$

**Notes:**

3. PCB size: FR-4, 76 mm x 114 mm x 1.57 mm (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.
4. Device mounted on FR-4 PCB 36mm x 18mm x 1.5mm; mounting pad for the collector lead minimum 6cm<sup>2</sup>.

## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Max.	Unit	
<b>Off Characteristics</b>						
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = -1.0 \mu\text{A}, V_{DS} = 0$	-35		V	
$I_{GSS}$	Gate Reverse Current	$V_{GS} = -15 \text{ V}, V_{DS} = 0$		-1.0	nA	
$V_{GS(off)}$	Gate-Source Cut-Off Voltage	$V_{DS} = 15 \text{ V}, I_D = 1.0 \mu\text{A}$	<b>111</b>	-3.0	-10.0	V
			<b>112</b>	-1.0	-5.0	
			<b>113</b>	-0.5	-3.0	
$I_{D(off)}$	Drain Cutoff Leakage Current	$V_{DS} = 5.0 \text{ V}, V_{GS} = -10 \text{ V}$		1.0	nA	
<b>On Characteristics</b>						
$I_{DSS}$	Zero-Gate Voltage Drain Current <sup>(5)</sup>	$V_{DS} = 15 \text{ V}, V_{GS} = 0$	<b>111</b>	20		mA
			<b>112</b>	5.0		
			<b>113</b>	2.0		
$r_{DS(on)}$	Drain-Source On Resistance	$V_{DS} \leq 0.1 \text{ V}, V_{GS} = 0$	<b>111</b>		30	$\Omega$
			<b>112</b>		50	
			<b>113</b>		100	
<b>Small Signal Characteristics</b>						
$C_{dg(on)}$ $C_{sg(on)}$	Drain-Gate & Source-Gate On Capacitance	$V_{DS} = 0, V_{GS} = 0, f = 1.0 \text{ MHz}$		28	pF	
$C_{dg(off)}$	Drain-Gate Off Capacitance	$V_{DS} = 0, V_{GS} = -10 \text{ V}, f = 1.0 \text{ MHz}$		5.0	pF	
$C_{sg(off)}$	Source-Gate Off Capacitance	$V_{DS} = 0, V_{GS} = -10 \text{ V}, f = 1.0 \text{ MHz}$		5.0	pF	

**Note:**

5. Pulse test: pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

## Typical Performance Characteristics

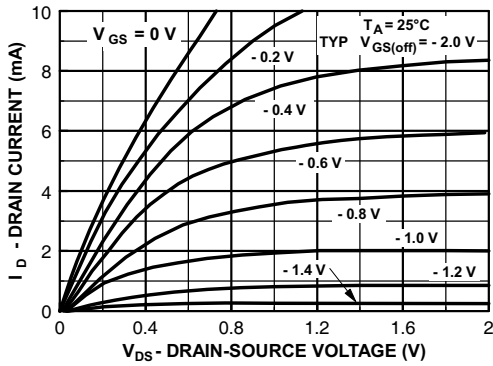


Figure 3. Common Drain-Source

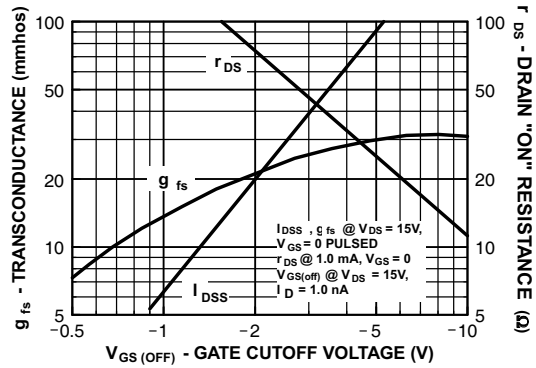


Figure 4. Parameter Interactions

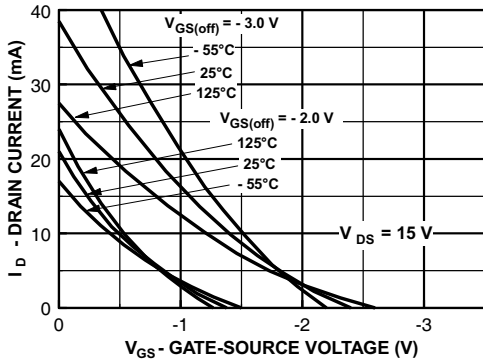


Figure 5. Transfer Characteristics

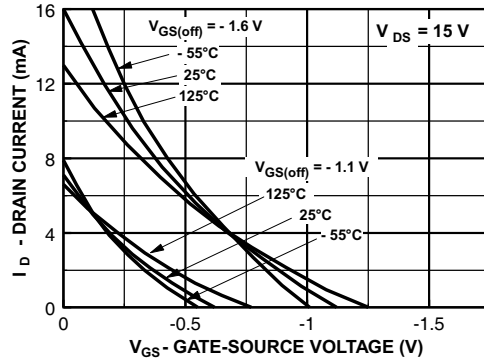


Figure 6. Transfer Characteristics

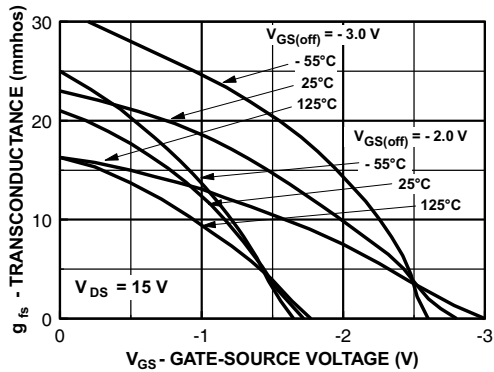


Figure 7. Transfer Characteristics

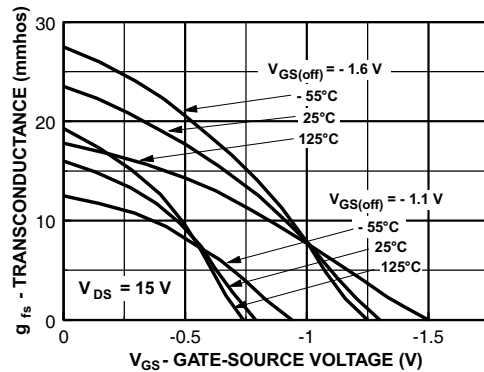


Figure 8. Transfer Characteristics

Typical Performance Characteristics (Continued)

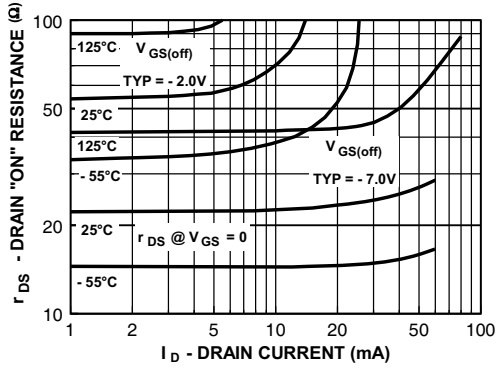


Figure 9. On Resistance vs. Drain Current

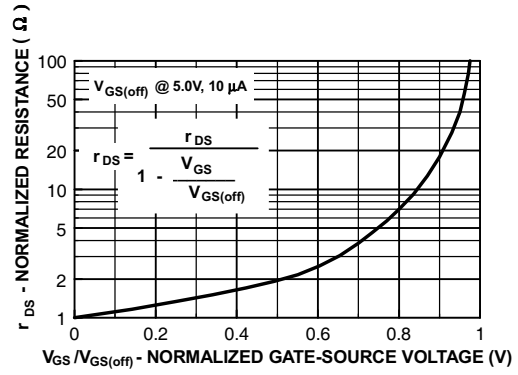


Figure 10. Normalized Drain Resistance vs. Bias Voltage

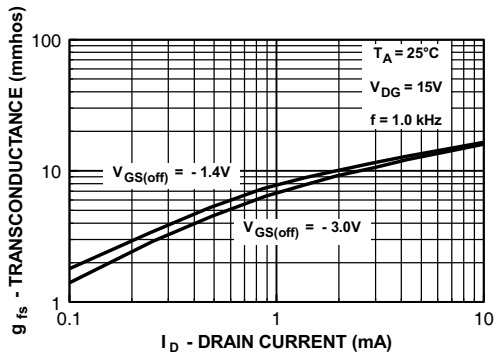


Figure 11. Transconductance vs. Drain Current

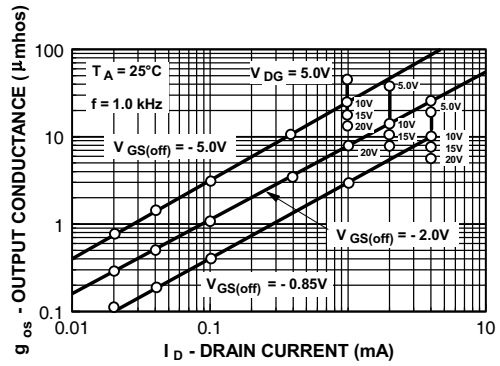


Figure 12. Output Conductance vs. Drain Current

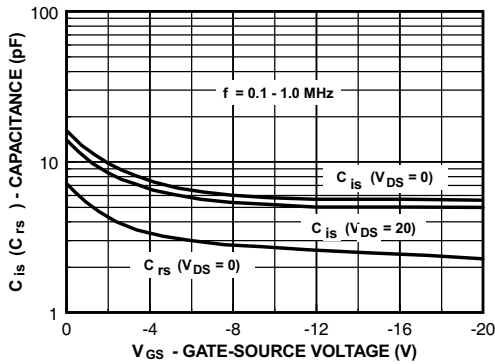


Figure 13. Capacitance vs. Voltage

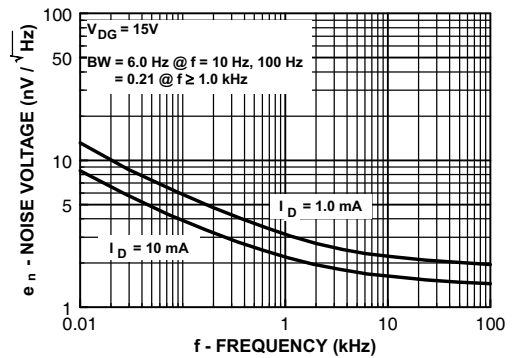


Figure 14. Noise Voltage vs. Frequency

Typical Performance Characteristics (Continued)

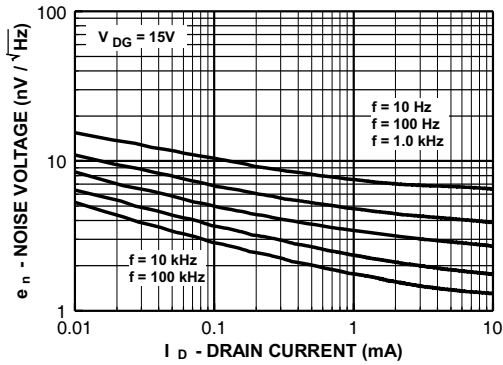


Figure 15. Noise Voltage vs. Current

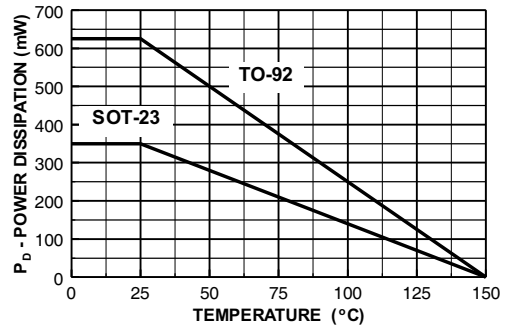


Figure 16. Power Dissipation vs. Ambient Temperature

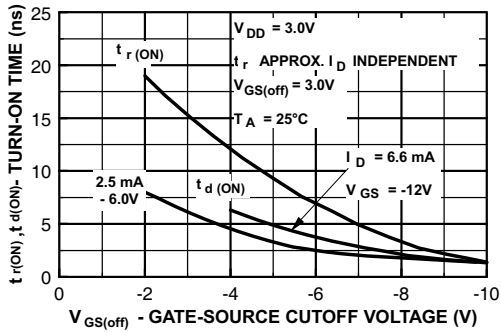


Figure 17. Switching Turn-On Time vs. Gate-Source Voltage

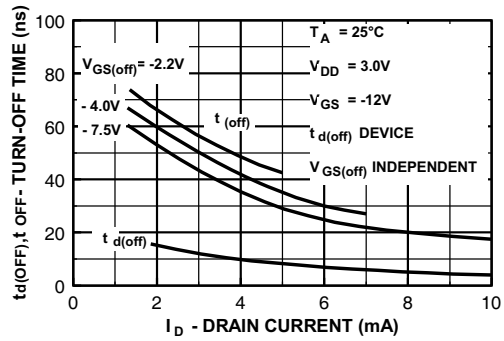
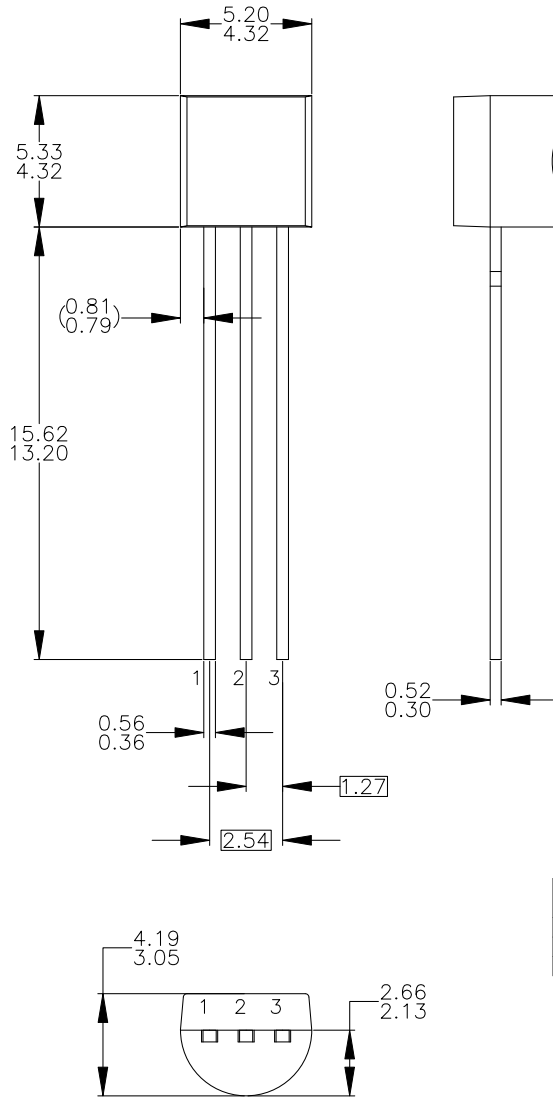


Figure 18. Switching Turn-Off Time vs. Drain Current

Physical Dimensions



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	B	F	M	P	F	M	P	F	M
1	E	S	S	E	S	S	B	D	G	C	G	D	C	G	D
2	B	D	G	C	G	D	E	S	S	B	D	G	E	S	S
3	C	G	D	B	D	G	C	G	D	E	S	S	B	D	G

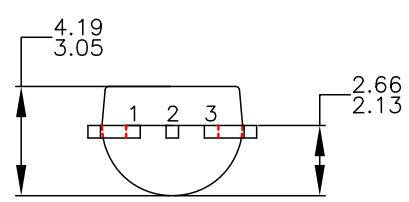
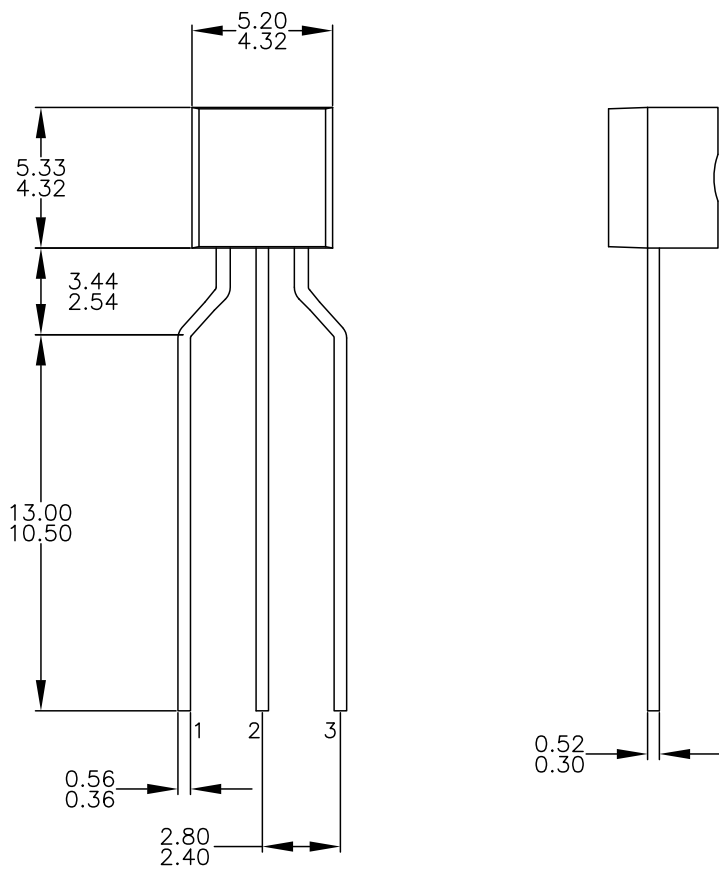
LEGEND:

- 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 19. 3-Lead, TO-92, JEDEC TO-92 Compliant Straight Lead Configuration, Bulk Type

Physical Dimensions (Continued)

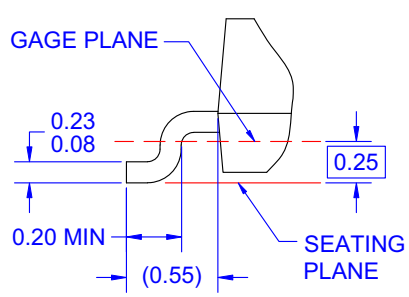
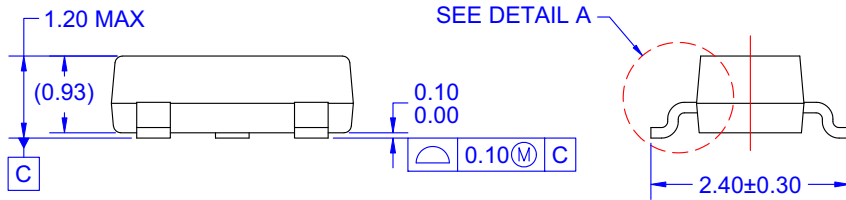
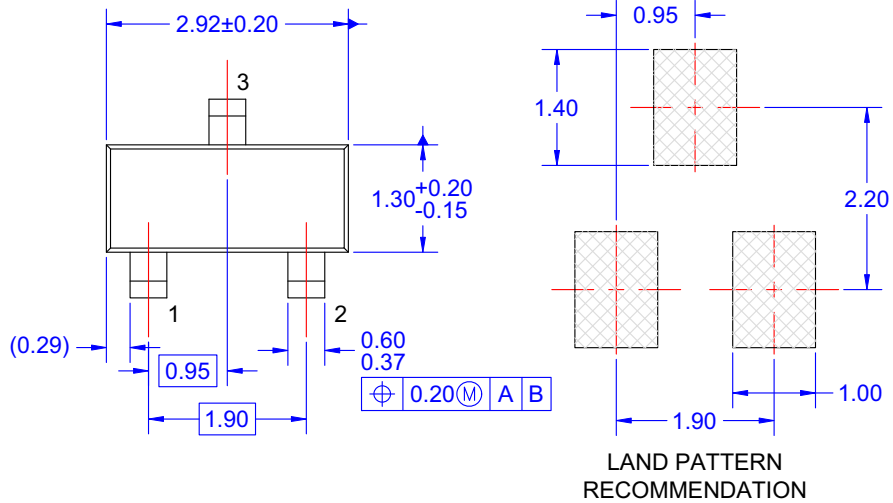


- NOTES: UNLESS OTHERWISE SPECIFIED
- A. DRAWING CONFORMS TO JEDEC MS-013, VARIATION AC.
  - B. ALL DIMENSIONS ARE IN MILLIMETERS.
  - C. DRAWING CONFORMS TO ASME Y14.5M-2009.
  - D. DRAWING FILENAME: MKT-ZA03FREV3.
  - E. ON SEMICONDUCTOR

Figure 20. 3-Lead, TO-92, Molded, 0.2 In Line Spacing Lead Form, Ammo, Tape and Reel Type




Physical Dimensions (Continued)



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
  - D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
  - E) DRAWING FILE NAME: MA03DREV10

**DETAIL A**  
SCALE: 2X

**Figure 21. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE**

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