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January 2015

# 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.

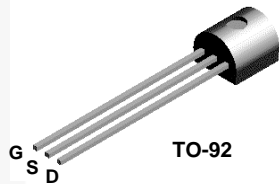


Figure 1. J111 / J112 / J113 Device Package

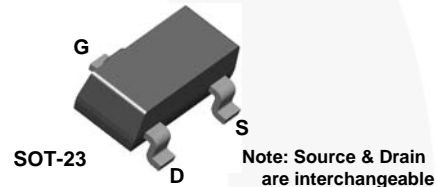


Figure 2. MMBFJ111 / MMBFJ112 / MMBFJ113 Device Package

## 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. Fairchild 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  $6\text{cm}^2$ .



## 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                    | $V_{DS} = 15 \text{ V}, I_D = 1.0 \mu\text{A}$            | 111  | -3.0 | -10.0 | V        |
|                                     |  |   | 112  | -1.0 | -5.0  |          |
|                                     |  |   | 113  | -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> | $V_{DS} = 15 \text{ V}, V_{GS} = 0$                       | 111  | 20   |       | mA       |
|                                     |  |   | 112  | 5.0  |       |          |
|                                     |  |   | 113  | 2.0  |       |          |
| $r_{DS(on)}$                        | Drain-Source On Resistance                     | $V_{DS} \leq 0.1 \text{ V}, V_{GS} = 0$                   | 111  |      | 30    | $\Omega$ |
|                                     |  |   | 112  |      | 50    |          |
|                                     |  |   | 113  |      | 100   |          |
| <b>Small Signal Characteristics</b> |  |   |      |      |       |          |
| $C_{dg(on)}$<br>$C_{sg(on)}$        | 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

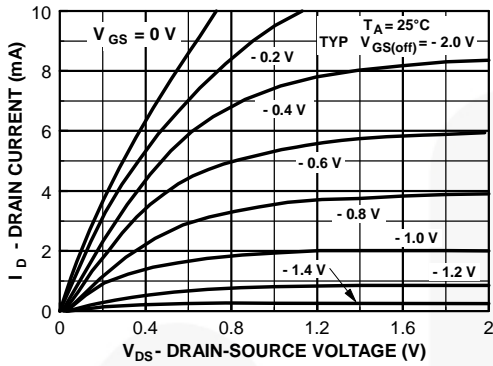


Figure 3. Common Drain-Source

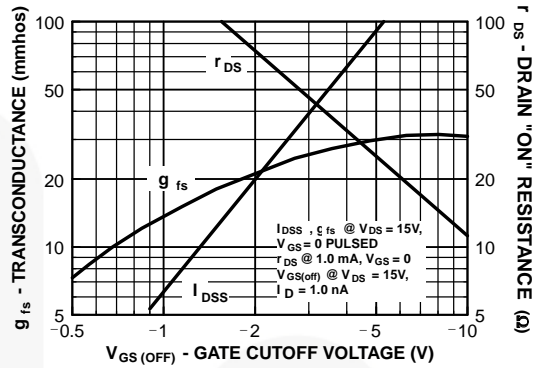


Figure 4. Parameter Interactions

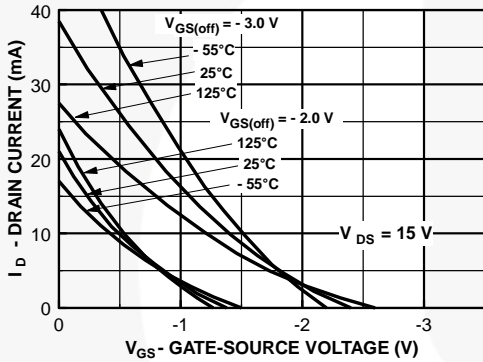


Figure 5. Transfer Characteristics

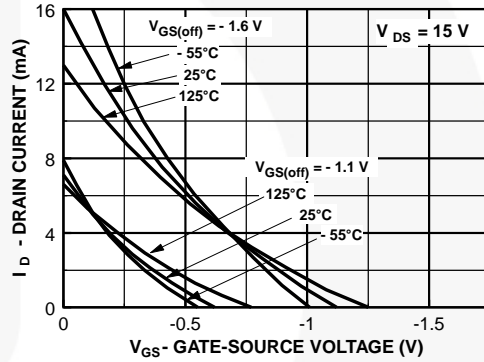


Figure 6. Transfer Characteristics

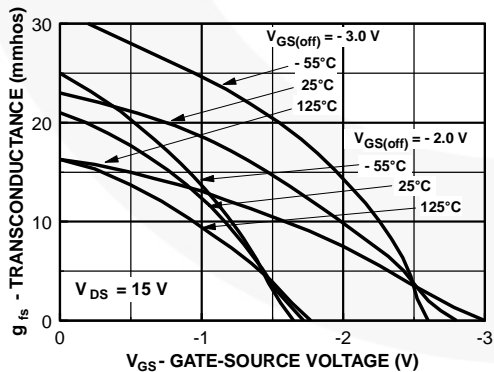


Figure 7. Transfer Characteristics

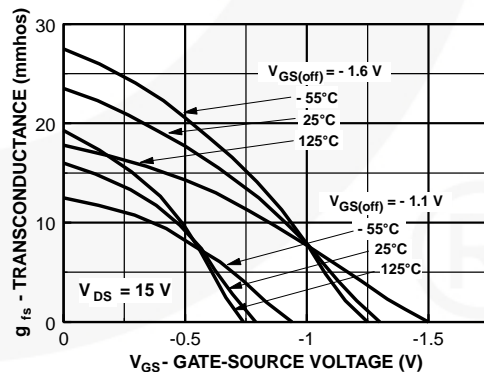


Figure 8. Transfer Characteristics

Typical Performance Characteristics (Continued)

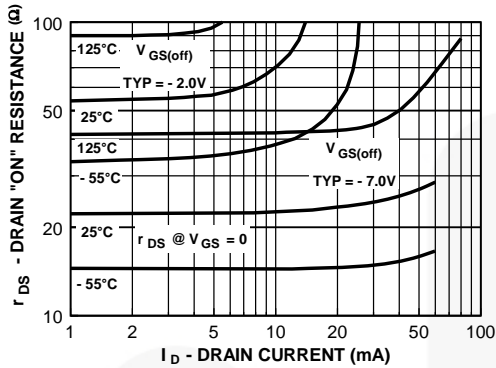


Figure 9. On Resistance vs. Drain Current

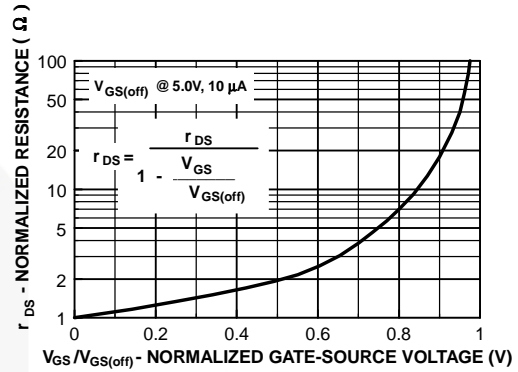


Figure 10. Normalized Drain Resistance vs. Bias Voltage

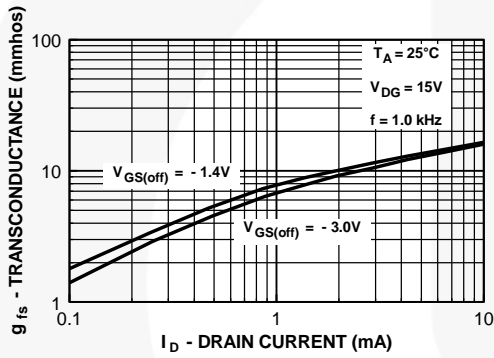


Figure 11. Transconductance vs. Drain Current

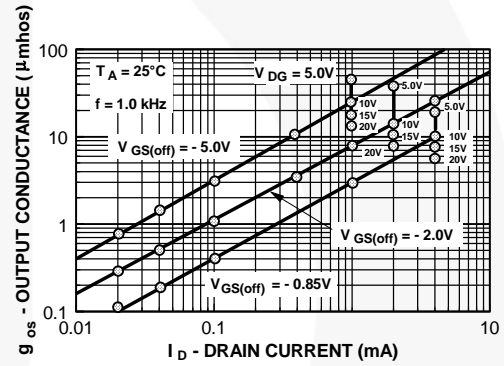


Figure 12. Output Conductance vs. Drain Current

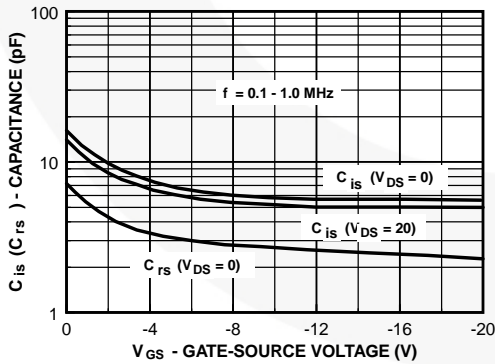


Figure 13. Capacitance vs. Voltage

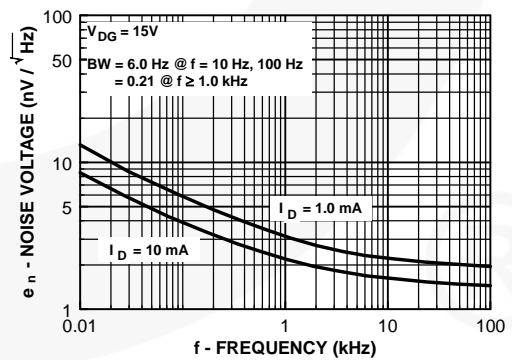


Figure 14. Noise Voltage vs. Frequency

Typical Performance Characteristics (Continued)

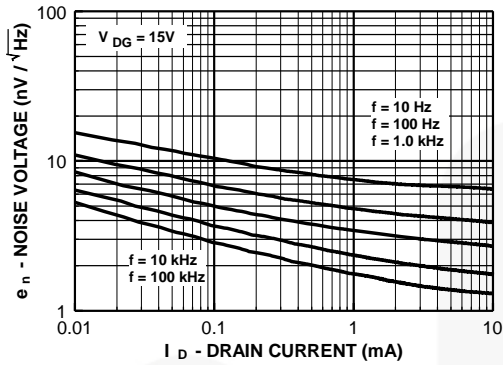


Figure 15. Noise Voltage vs. Current

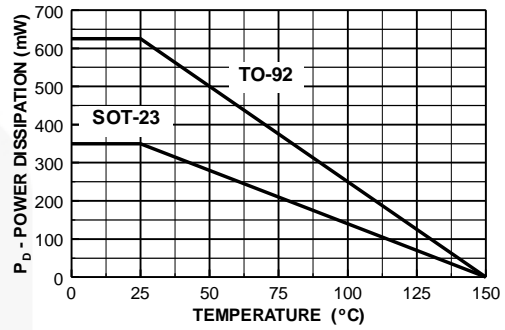


Figure 16. Power Dissipation vs. Ambient Temperature

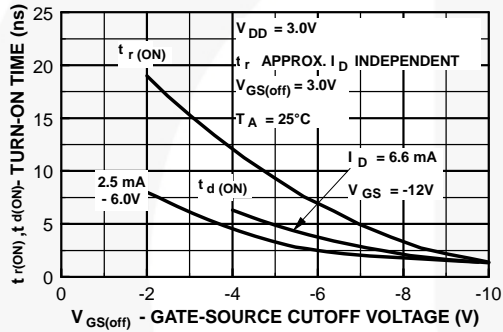


Figure 17. Switching Turn-On Time vs. Gate-Source Voltage

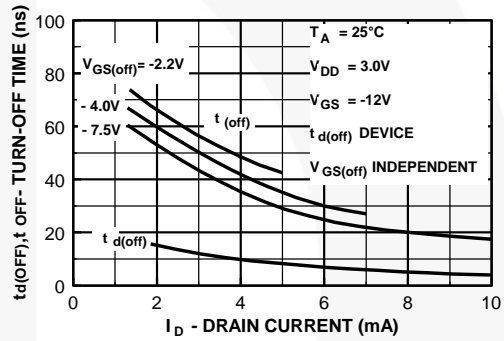
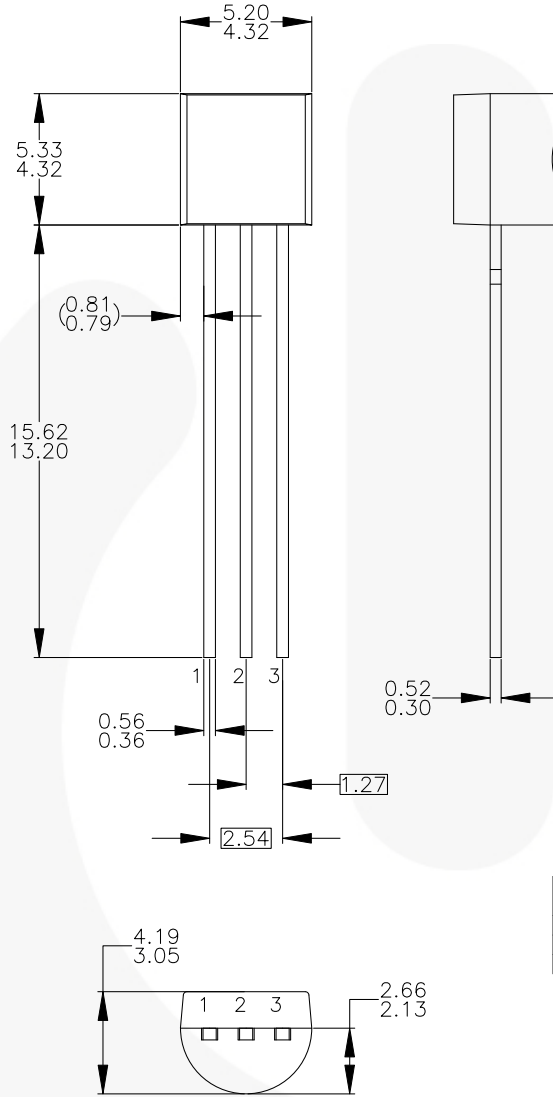


Figure 18. Switching Turn-Off Time vs. Drain Current

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 |

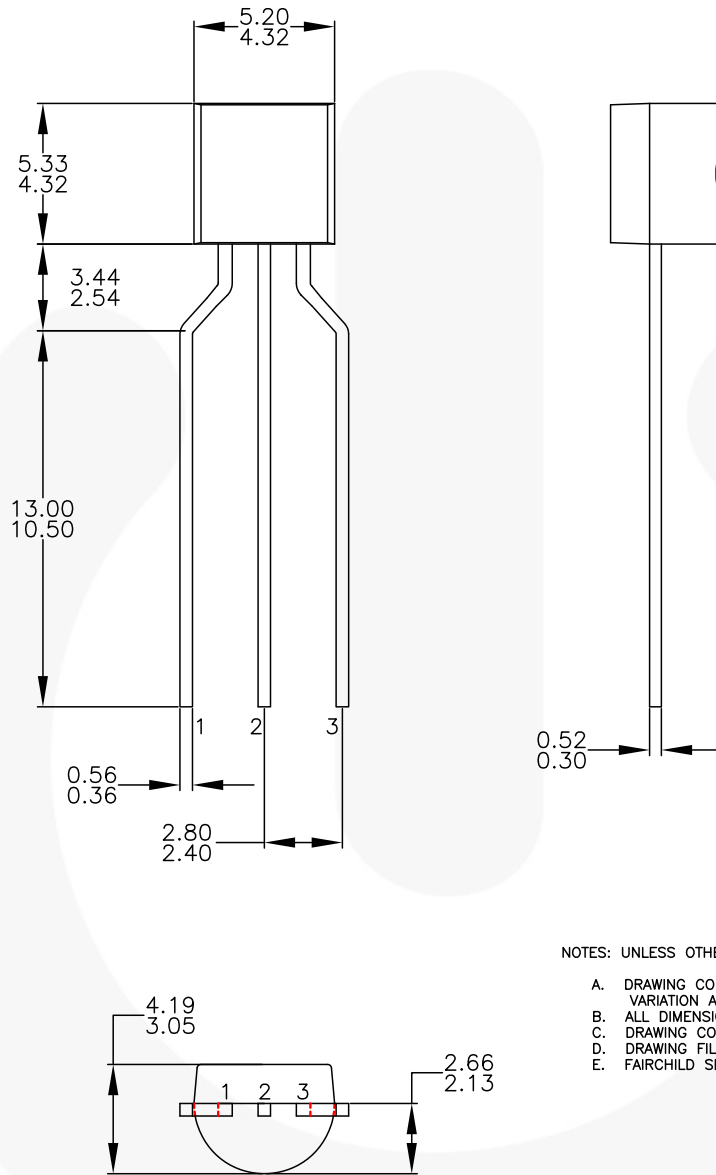
LEGEND:

- 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)

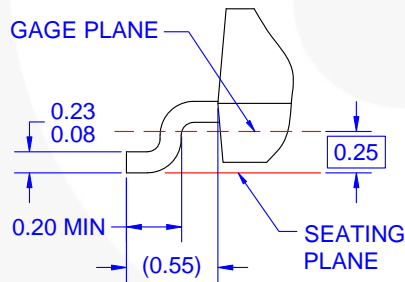
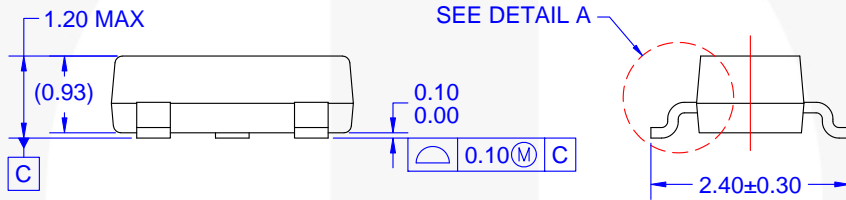
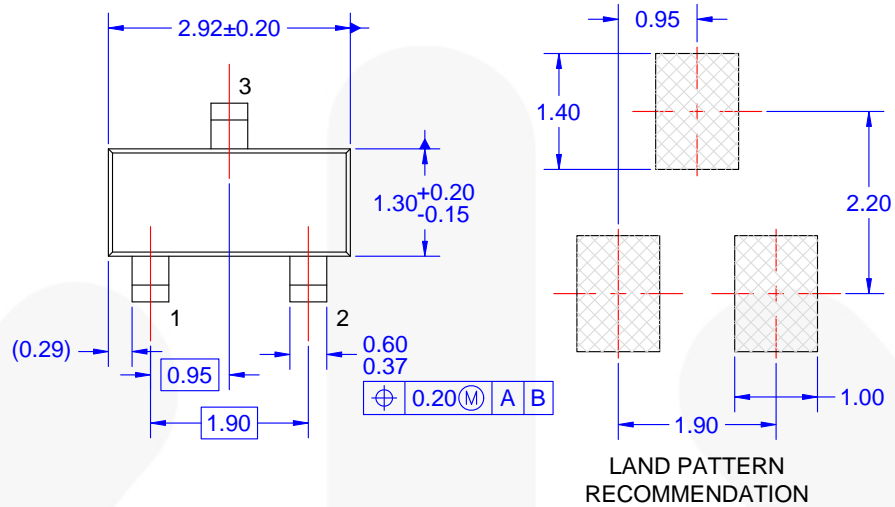


NOTES: UNLESS OTHERWISE SPECIFIED

- 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. FAIRCHILD 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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| AX-CAP®*   | GreenBridge™                                   | PowerXS™  | TinyCalc™   |
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| EcoSPARK®  | MicroFET™                                      | SMART START™  |  SerDes™         |
| EfficientMax™  | MicroPak™                                      | Solutions for Your Success™   | UHC®  |
| ESBC™  | MicroPak2™                                     | SPM®  | Ultra FRFET™  |
|  Fairchild® | MillerDrive™                                   | STEALTH™  | UniFET™   |
| Fairchild Semiconductor®   | MotionMax™                                     | SuperFET®   | VCX™  |
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| FACT®  | MTi®   | SuperSOT™-6   | VoltagePlus™  |
| FAST®  | MTx®   | SuperSOT™-8   | XS™   |
| FastvCore™   | MVN®   | SupreMOS®   | Xsens™  |
| FETBench™  | mWSaver®                                       | SyncFET™  | 仙童™   |
| FPS™   | OptoHiT™                                       | Sync-Lock™  |   |
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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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| 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.   |
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