
**Is Now Part of**


**ON Semiconductor®**

**To learn more about ON Semiconductor, please visit our website at**
**www.onsemi.com**

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

www.onsemi.com

ON Semiconductor®

# FDD86369

## N-Channel PowerTrench® MOSFET

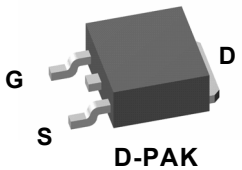
### 80 V, 90 A, 7.9 mΩ

### Features

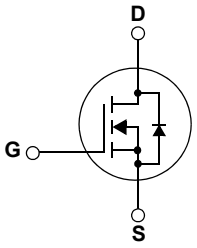
- Typical $R_{DS(on)}$ = 5.9 mΩ at $V_{GS}$ = 10V, $I_D$ = 80 A
- Typical $Q_{g(tot)}$ = 34 nC at $V_{GS}$ = 10V, $I_D$ = 80 A
- UIS Capability
- RoHS Compliant

### Applications

- PowerTrain Management
- Solenoid and Motor Drivers
- Integrated Starter/Alternator
- Primary Switch for 12V Systems




D-PAK
(TO-252)




For current package drawing, please refer to the ON website at http://www.fairchildsemi.com/package-drawings/TO/TO252A03.pdf

### MOSFET Maximum Ratings $T_J$ = 25°C unless otherwise noted.

| Symbol | Parameter | | Ratings | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-to-Source Voltage | | 80 | V |
| $V_{GS}$ | Gate-to-Source Voltage | | ±20 | V |
| $I_D$ | Drain Current - Continuous ($V_{GS}$=10) (Note 1) | $T_C$ = 25°C | 90 | A |
| | Pulsed Drain Current | $T_C$ = 25°C | See Figure 4 | |
| $E_{AS}$ | Single Pulse Avalanche Energy | (Note 2) | 29 | mJ |
| $P_D$ | Power Dissipation | | 150 | W |
| | Derate Above 25°C | | 1.0 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature | | -55 to + 175 | °C |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | | 1.0 | °C/W |
| $R_{\theta JA}$ | Maximum Thermal Resistance, Junction to Ambient | (Note 3) | 52 | °C/W |

**Notes:**
1: Current is limited by bondwire configuration.
2: Starting $T_J$ = 25°C, L = 14μH, $I_{AS}$ = 64A, $V_{DD}$ = 80V during inductor charging and $V_{DD}$ = 0V during time in avalanche.
3: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design, while $R_{\theta JA}$is determined by the board design. The maximum rating presented here is based on mounting on a 1 $in^2$ pad of 2oz copper.

### Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDD86369 | FDD86369 | D-PAK(TO-252) | 13” | 16 mm | 2500 units |

Semiconductor Components Industries, LLC, 2017
January, 2017, Rev. 1.0

Publication Order Number:
FDD86369/D

## Electrical Characteristics $T_J$ = 25°C unless otherwise noted.

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $B_{VDSS}$ | Drain-to-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 80 | - | - | V |
| $I_{DSS}$ | Drain-to-Source Leakage Current | $V_{DS}$=80V, $T_J$ = 25°C | - | - | 1 | μA |
| | | $V_{GS}$ = 0V, $T_J$ = 175°C (Note 4) | - | - | 1 | mA |
| $I_{GSS}$ | Gate-to-Source Leakage Current | $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 2.0 | 2.7 | 4.0 | V |
| $R_{DS(on)}$ | Drain to Source On Resistance | $I_D$ = 80A, $V_{GS}$= 10V, $T_J$ = 25°C | - | 5.9 | 7.9 | mΩ |
| | | $I_D$ = 80A, $V_{GS}$= 10V, $T_J$ = 175°C (Note 4) | - | 13.0 | 17.4 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 40V, $V_{GS}$ = 0V, f = 1MHz | - | 2530 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 430 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 16 | - | pF |
| $R_g$ | Gate Resistance | $V_{GS}$ = 0.5V, f = 1MHz | - | 2.2 | - | Ω |
| $Q_{g(ToT)}$ | Total Gate Charge | $V_{GS}$ = 0 to 10V, $V_{DD}$ = 64V, $I_D$ = 80A | - | 36 | 54 | nC |
| $Q_{g(th)}$ | Threshold Gate Charge | $V_{GS}$ = 0 to 2V, $V_{DD}$ = 64V, $I_D$ = 80A | - | 4.6 | - | nC |
| $Q_{gs}$ | Gate-to-Source Gate Charge | $V_{DD}$ = 64V, $I_D$ = 80A | - | 13 | - | nC |
| $Q_{gd}$ | Gate-to-Drain “Miller“ Charge | $V_{DD}$ = 64V, $I_D$ = 80A | - | 8.5 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{on}$ | Turn-On Time | $V_{DD}$ = 40V, $I_D$ = 80A, $V_{GS}$ = 10V, $R_{GEN}$ = 6Ω | - | - | 70 | ns |
| $t_{d(on)}$ | Turn-On Delay | | - | 13 | - | ns |
| $t_r$ | Rise Time | | - | 34 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay | | - | 22 | - | ns |
| $t_f$ | Fall Time | | - | 9 | - | ns |
| $t_{off}$ | Turn-Off Time | | - | - | 46 | ns |
| **Drain-Source Diode Characteristics** | | | | | | |
| $V_{SD}$ | Source-to-Drain Diode Voltage | $I_{SD}$ =80A, $V_{GS}$ = 0V | - | - | 1.25 | V |
| | | $I_{SD}$ = 40A, $V_{GS}$ = 0V | - | - | 1.2 | V |
| $t_{rr}$ | Reverse-Recovery Time | $I_F$ = 80A, $dI_{SD}/dt$ = 100A/μs | - | 49 | 64 | ns |
| $Q_{rr}$ | Reverse-Recovery Charge | | - | 40 | 53 | nC |

**Note:**

4: The maximum value is specified by design at $T_J$ = 175°C. Product is not tested to this condition in production.

## Typical Characteristics

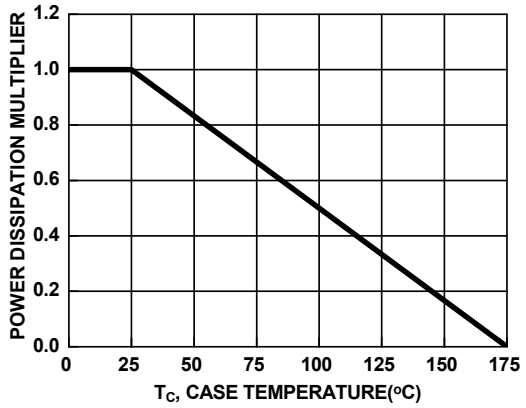



**Figure 1. Normalized Power Dissipation vs. Case Temperature**

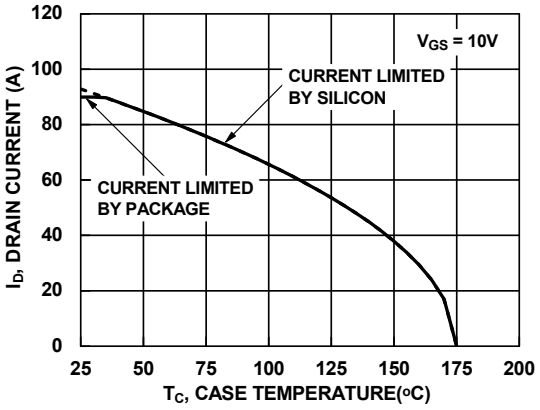



**Figure 2. Maximum Continuous Drain Current vs. Case Temperature**

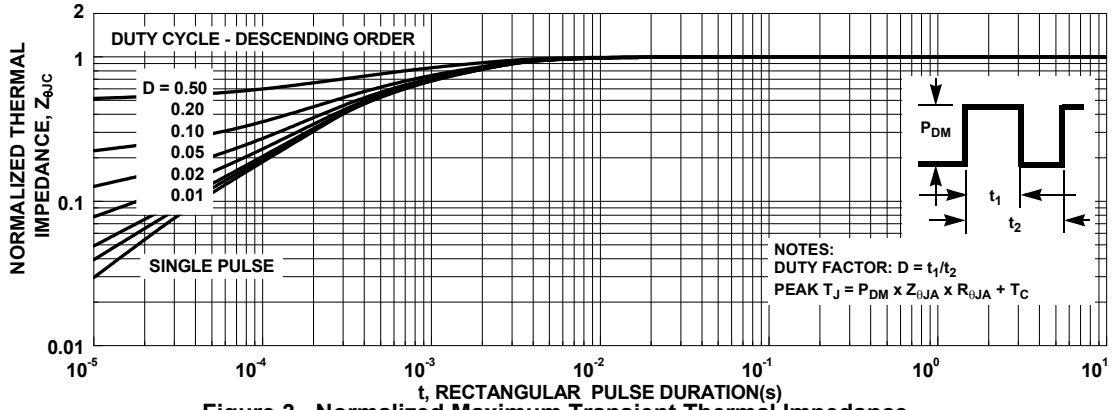



**Figure 3. Normalized Maximum Transient Thermal Impedance**

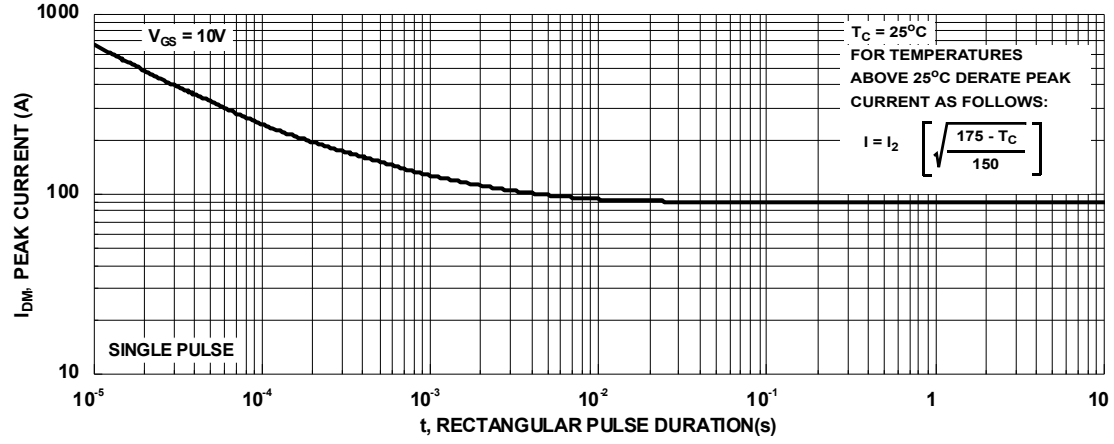



**Figure 4. Peak Current Capability**

## Typical Characteristics

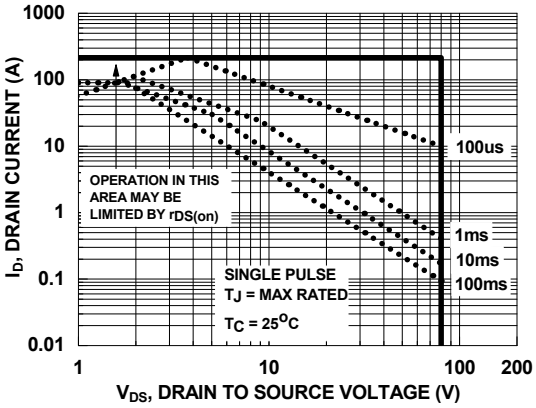
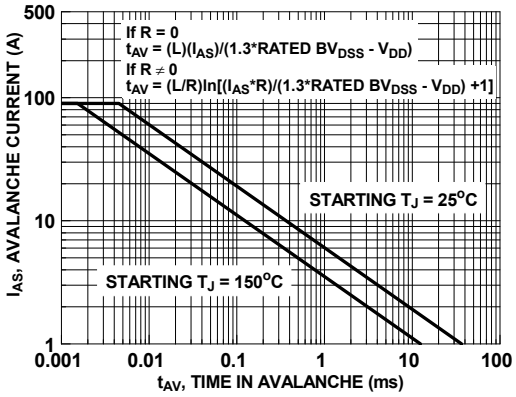



**Figure 5. Forward Bias Safe Operating Area**




NOTE: Refer to ON Application Notes AN7514 and AN7515

**Figure 6. Unclamped Inductive Switching Capability**

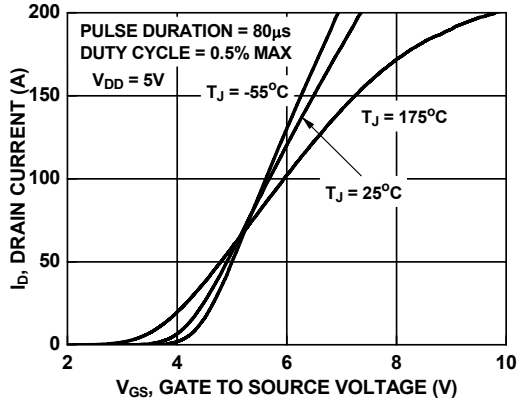



**Figure 7. Transfer Characteristics**

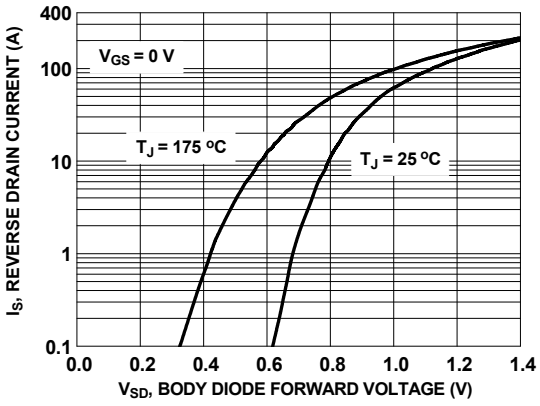



**Figure 8. Forward Diode Characteristics**

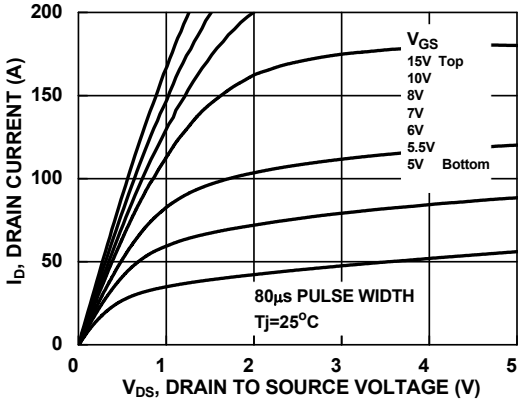



**Figure 9. Saturation Characteristics**

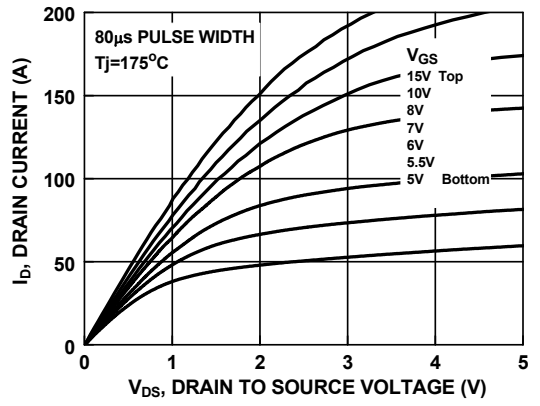



**Figure 10. Saturation Characteristics**

## Typical Characteristics

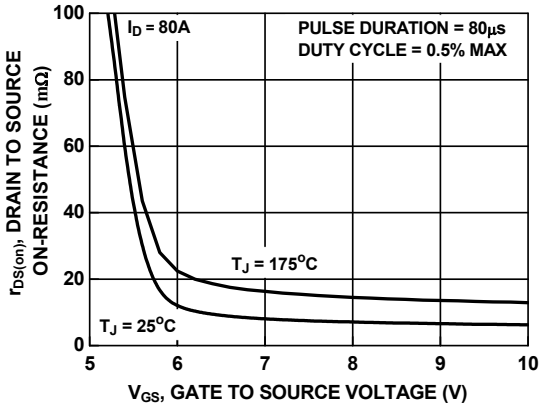



**Figure 11. $R_{DSON}$ vs. Gate Voltage**

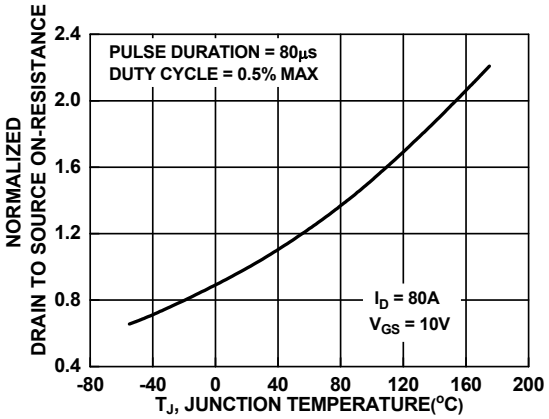



**Figure 12. Normalized $R_{DSON}$ vs. Junction Temperature**

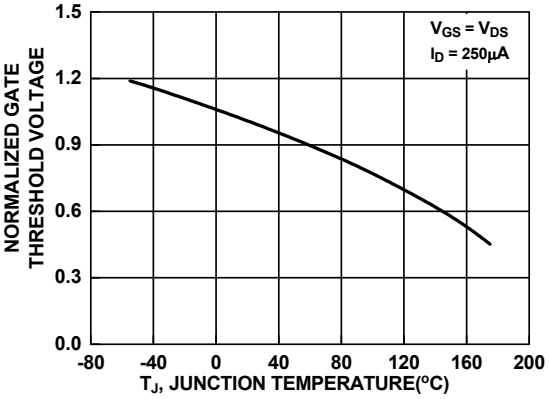



**Figure 13. Normalized Gate Threshold Voltage vs. Temperature**

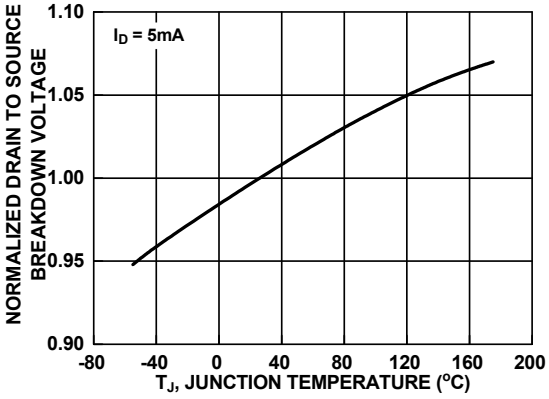



**Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature**

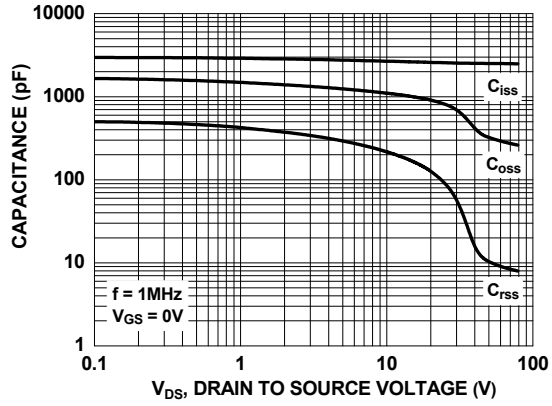



**Figure 15. Capacitance vs. Drain to Source Voltage**

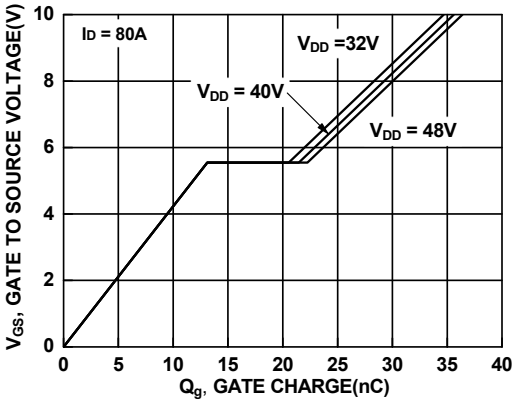
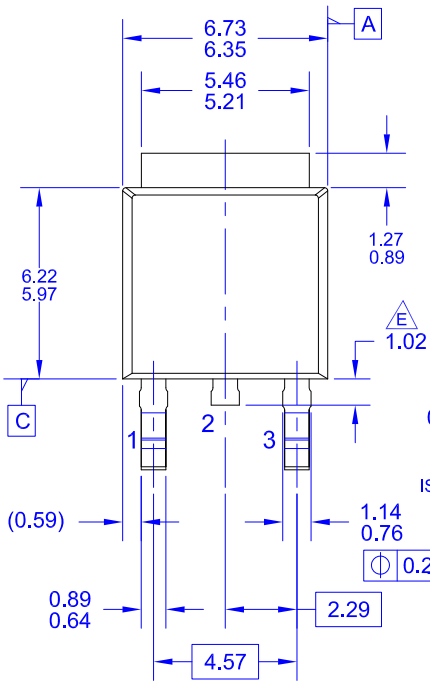
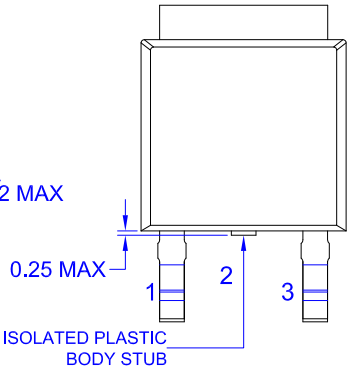


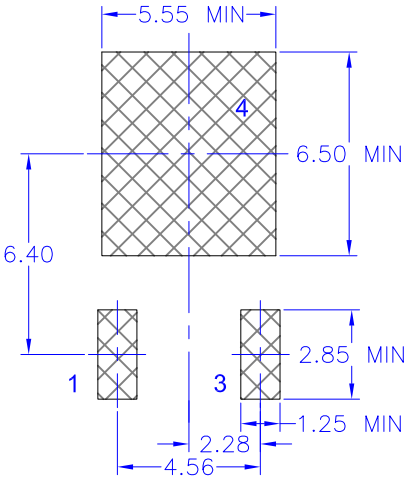

**Figure 16. Gate Charge vs. Gate to Source Voltage**



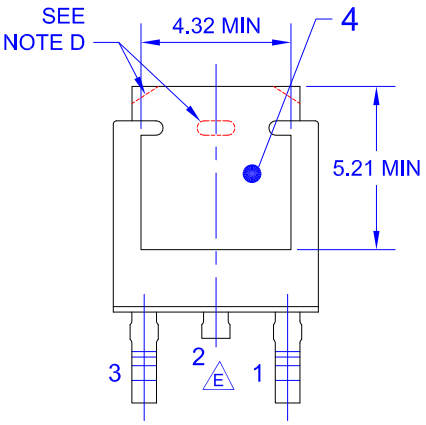

NON-DIODE PRODUCTS VERSION



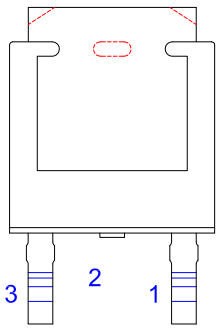

DIODE PRODUCTS VERSION



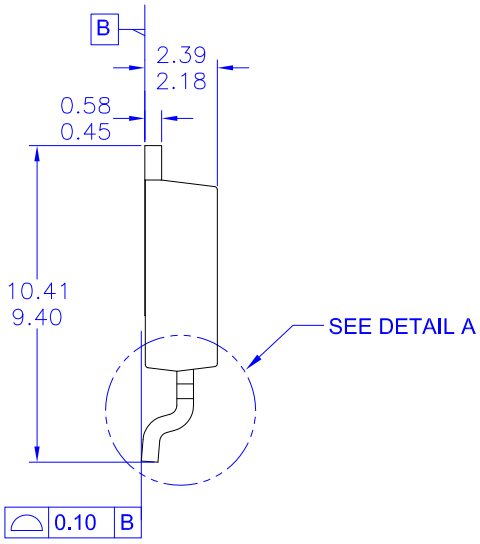

LAND PATTERN RECOMMENDATION




NON-DIODE PRODUCTS VERSION

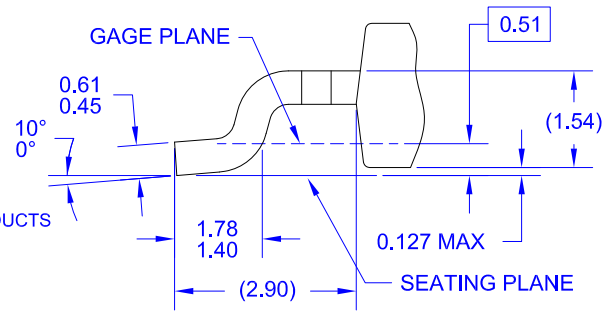



DIODE PRODUCTS VERSION




NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
E) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS
F) DIMENSIONS ARE EXCLUSIVE OF BURS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11




DETAIL A
(ROTATED -90°)
SCALE: 12X

FAIRCHILD

## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5817−1050

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative