# FDMS86150A

# MOSFET – N-Channel, Shielded Gate, POWERTRENCH®

## 100 V, 80 A, 4.85 mΩ

### General Description

This N−Channel MOSFET is produced using ON Semiconductor's advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized for the on−state resistance and yet maintain superior switching performance.

### Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 4.85 mΩ at $V_{GS}$ = 10 V, $I_D$ = 16 A
- Max $r_{DS(on)}$ = 7.8 mΩ at $V_{GS}$ = 6 V, $I_D$ = 13 A
- Advanced Package and Silicon Combination for Low $r_{DS(on)}$ and High Efficiency
- MSL1 Robust Package Design
- 100% UIL Tested
- This Device is Pb−Free and is RoHS Compliant

### Applications

- Primary DC−DC MOSFET
- Secondary Synchronous Rectifier
- Load Switch

ON Semiconductor®

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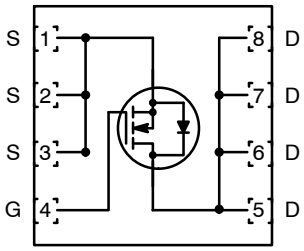
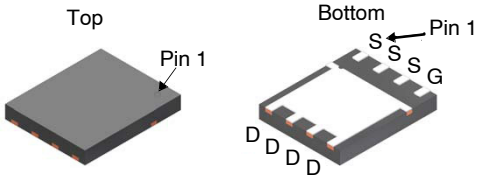
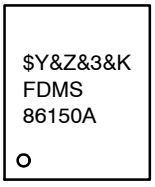
**N−CHANNEL MOSFET**




**PQFN8 5X6, 1.27P**
**Power 56**
**CASE 483AF**

### MARKING DIAGRAM




| | |
|---|---|
| $Y | = ON Semiconductor Logo |
| &Z | = Assembly Plant Code |
| &3 | = 3−Digit Date code |
| &K | = 2−Digits Lot Run Traceability Code |
| FDMS86150A | = Specific Device Code |

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

## MOSFET MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted)

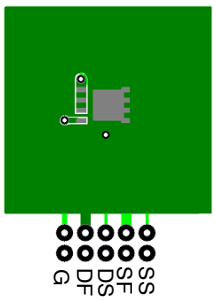
| Symbol | Parameter | | | Ratings | Unit |
|---|---|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | | | 100 | V |
| $V_{GS}$ | Gate to Source Voltage | | | ±20 | V |
| $I_D$ | Drain Current –Continuous | $T_C$ = 25°C | | 80 | A |
| | –Continuous | $T_A$ = 25°C | (Note 1a) | 16 | |
| | –Pulsed | | (Note 3) | 300 | |
| $E_{AS}$ | Single Pulse Avalanche Energy | | (Note 2) | 726 | mJ |
| $P_D$ | Power Dissipation | $T_C$ = 25°C | | 113 | W |
| | Power Dissipation | $T_A$ = 25°C | (Note 1a) | 2.7 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | –55 to +150 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

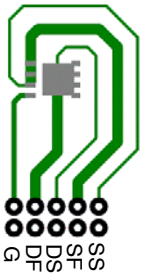
## THERMAL CHARACTERISTICS

| Symbol | Parameter | | Ratings | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | | 1.1 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 45 | |

1. $R_{\theta JA}$ is determined with the device mounted on a 1 $in^2$ pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR–4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.




a) 45°C/W when mounted on a 1 $in^2$ pad of 2 oz copper.




b) 115°C/W when mounted on a minimum pad of 2 oz copper.

2. $E_{AS}$ of 726 mJ is based on starting $T_J$ = 25°C, L = 3 mH, $I_{AS}$ = 22 A, $V_{DD}$ = 100 V, $V_{GS}$ = 10 V, 100% test at L = 0.1 mH, $I_{AS}$ = 69 A.
3. Pulse Id measured at td = 250 μs, refer to Fig 11 SOA graph for more details.

## ORDERING INFORMATION

| Device | Device Marking | Package | Reel Size | Tape Width | Shipping† |
|---|---|---|---|---|---|
| FDMS86150A | FDMS86150A | PQFN8 5X6, 1.27P Power 56 (Pb–Free) | 13” | 12 mm | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 100 | – | – | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25°C | – | 72 | – | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 80 V, $V_{GS}$ = 0 V | – | – | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | – | – | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | 2.0 | 3.0 | 4.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25°C | – | −10 | – | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 16 A | – | 4.2 | 4.85 | mΩ |
| | | $V_{GS}$ = 6 V, $I_D$ = 13 A | – | 6 | 7.8 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 16 A, $T_J$ = 125°C | – | 7.8 | 9.1 | |
| $g_{FS}$ | Forward Transconductance | $V_{DD}$ = 10 V, $I_D$ = 16 A | – | 53 | – | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 50 V, $V_{GS}$ = 0 V, f = 1 MHz | – | 3330 | 4665 | pF |
| $C_{oss}$ | Output Capacitance | | – | 703 | 985 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 20 | 45 | pF |
| $R_g$ | Gate Resistance | | 0.1 | 0.7 | 3.6 | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(on)}$ | Turn−on Delay Time | $V_{DD}$ = 50 V, $I_D$ = 16 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | – | 21 | 34 | ns |
| $t_r$ | Rise Time | | – | 8.6 | 17 | ns |
| $t_{d(off)}$ | Turn−off Delay Time | | – | 28 | 45 | ns |
| $t_f$ | Fall Time | | – | 6 | 12 | ns |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 10 V, $V_{DD}$ = 50 V, $I_D$ = 16 A | – | 47 | 66 | nC |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 5 V, $V_{DD}$ = 50 V, $I_D$ = 16 A | – | 25 | 35 | nC |
| $Q_{gs}$ | Gate to Source Charge | $V_{DD}$ = 50 V, $I_D$ = 16 A | – | 14 | – | nC |
| $Q_{gd}$ | Gate to Drain ”Miller” Charge | $V_{DD}$ = 50 V, $I_D$ = 16 A | – | 9.7 | – | nC |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 2.1 A (Note 4) | – | 0.69 | 1.2 | V |
| | | $V_{GS}$ = 0 V, $I_S$ = 16 A (Note 4) | – | 0.78 | 1.3 | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 16 A, di/dt = 100 A/μs | – | 64 | 102 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | – | 86 | 138 | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: Pulse Width <300 μs, Duty cycle <2.0%.

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

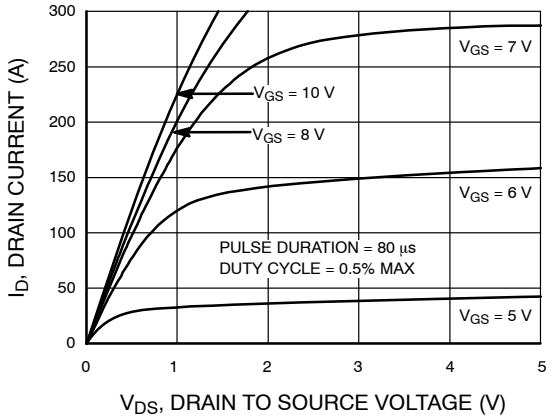



**Figure 1. On Region Characteristics**

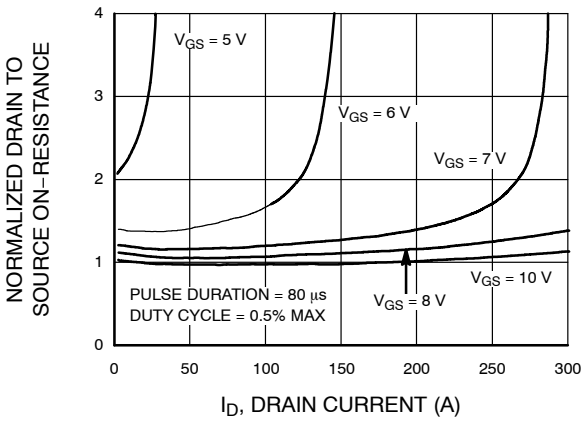



**Figure 2. Normalized On−Resistance vs Drain Current and Gate Voltage**

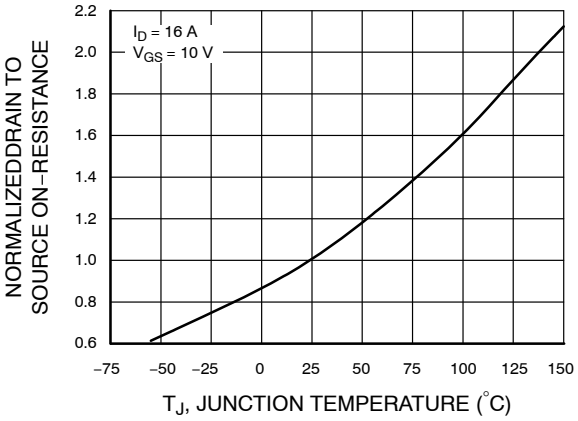



**Figure 3. Normalized On Resistance vs Junction Temperature**

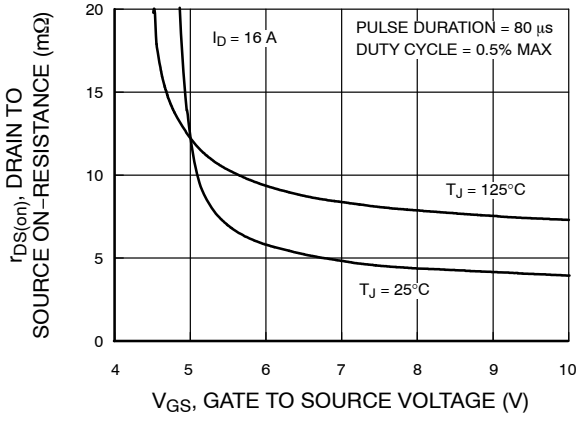



**Figure 4. On−Resistance vs Gate to Source Voltage**

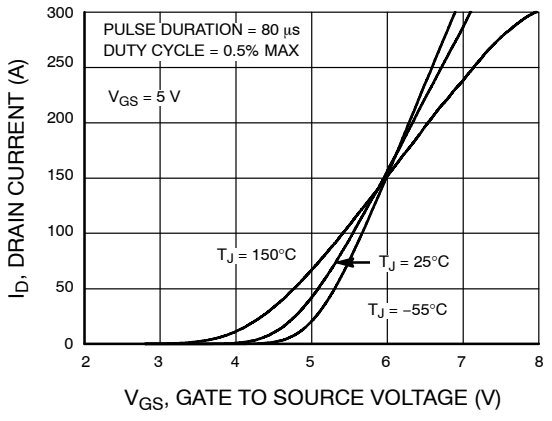



**Figure 5. Transfer Characteristics**

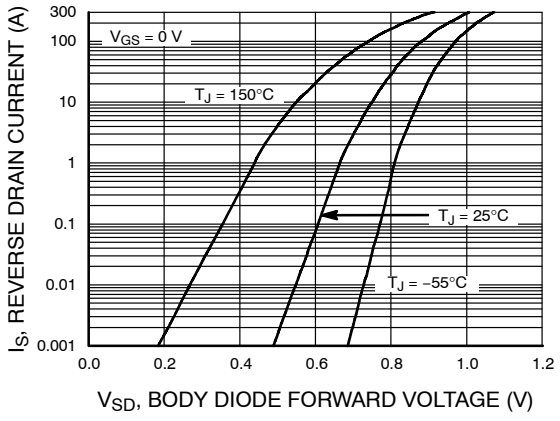



**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted) (continued)

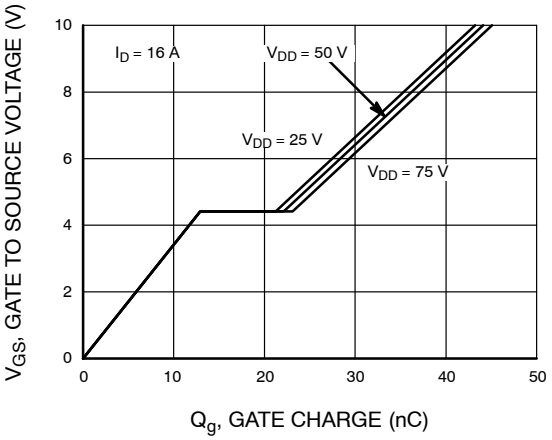



**Figure 7. Gate Charge Characteristics**

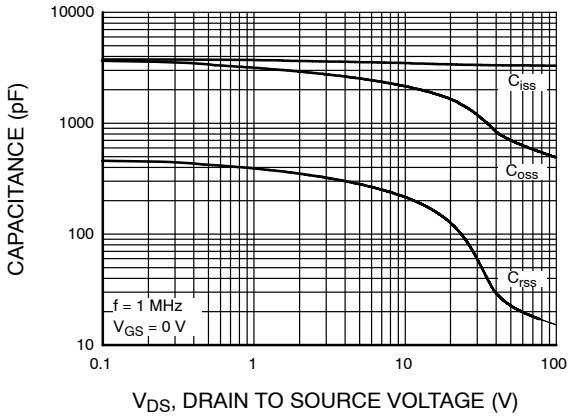



**Figure 8. Capacitance vs Drain to Source Voltage**

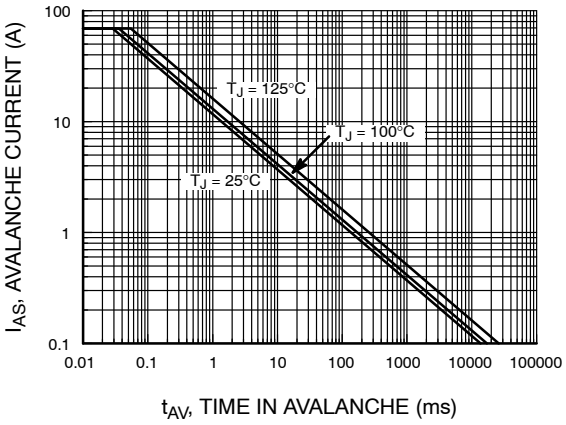



**Figure 9. Unclamped Inductive Switching Capability**

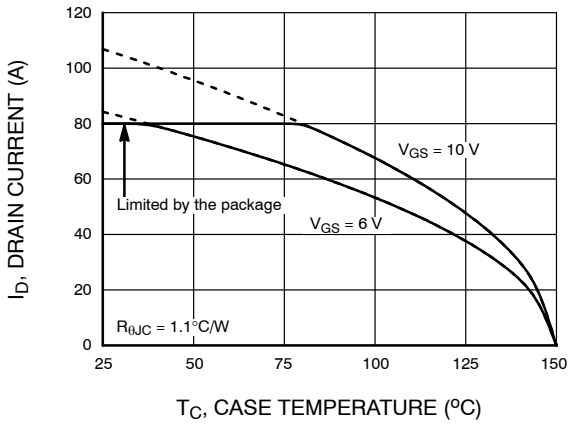



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

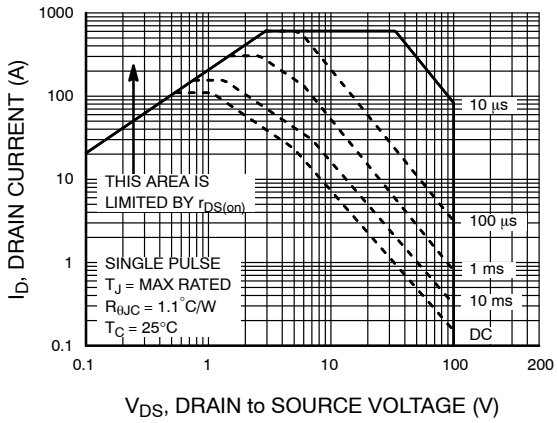



**Figure 11. Forward Bias Safe Operating Area**

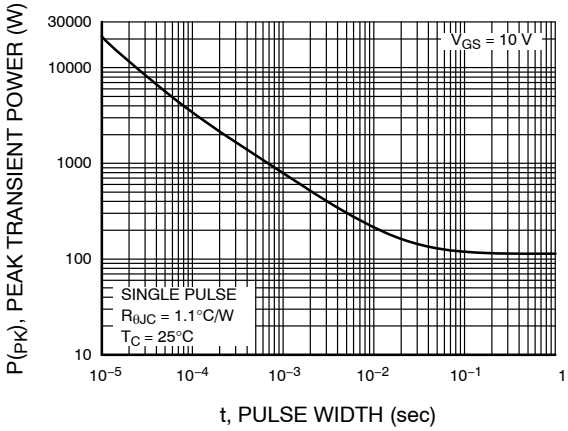



**Figure 12. Single Pulse Maximum Power Dissipation**

**TYPICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted) (continued)

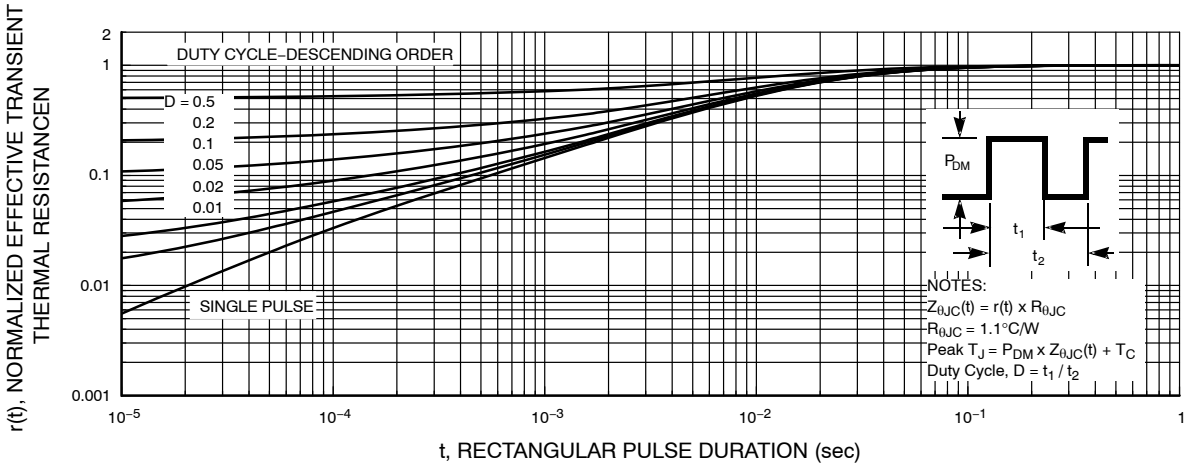
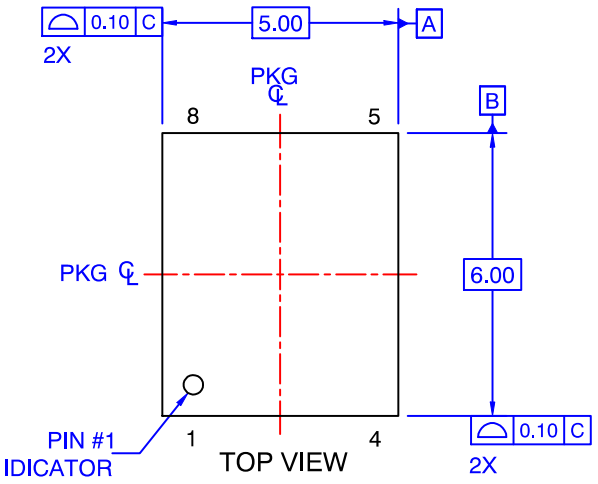
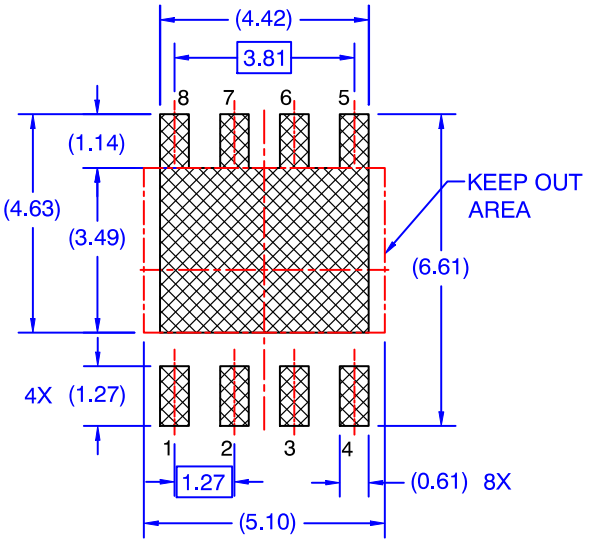



**Figure 13. Junction−to−Ambient Transient Thermal Response Curve**

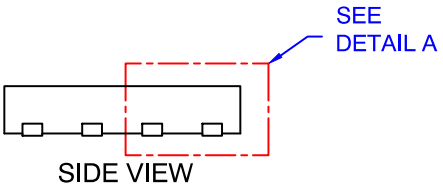
## PACKAGE DIMENSIONS

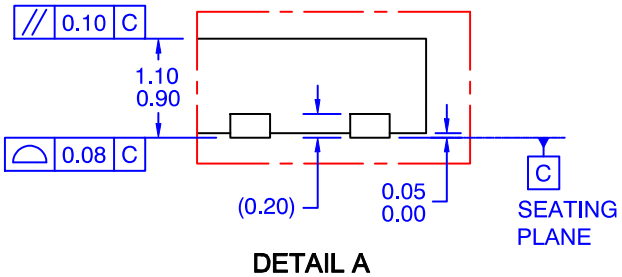
**PQFN8 5X6, 1.27P**
CASE 483AF
ISSUE O



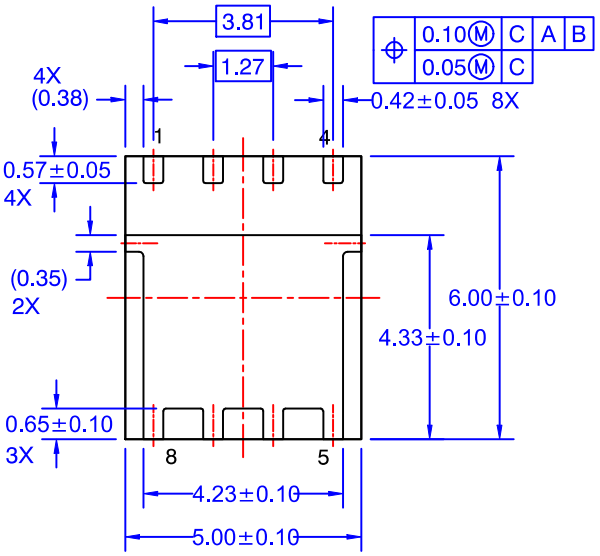




LAND PATTERN
RECOMMENDATION




**DETAIL A**
SCALE: 2:1




NOTES: UNLESS OTHERWISE SPECIFIED
A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA,
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

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