

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

100 V, 78 A, 7.2 mΩ

FDMS86182,  
FDMS86182-NC

## General Description

This N-Channel MV MOSFET is produced using onsemi's advanced POWETRENCH process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best class soft body diode.

## Features

- Shielded Gate MOSFET Technology
- Max  $R_{DS(on)}$  = 7.2 mΩ at  $V_{GS}$  = 10 V,  $I_D$  = 28 A
- Max  $R_{DS(on)}$  = 19.5 mΩ at  $V_{GS}$  = 6 V,  $I_D$  = 14 A
- 50% Lower  $Q_{rr}$  than Other MOSFET Suppliers
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

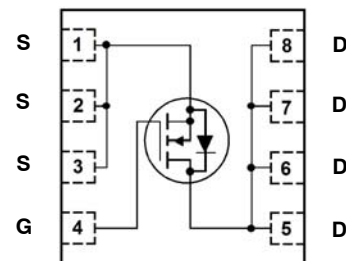
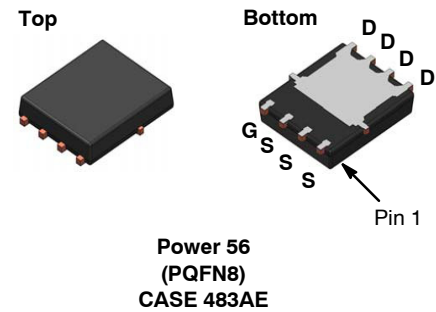
## Applications

- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive
- Solar

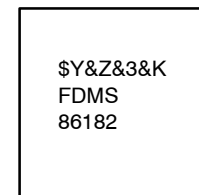
## MOSFET MAXIMUM RATINGS ( $T_A$ = 25 °C unless otherwise noted)

| Symbol         | Parameter                                                                                                                                                  | Value                 | Unit |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|
| $V_{DS}$       | Drain to Source Voltage                                                                                                                                    | 100                   | V    |
| $V_{GS}$       | Gate to Source Voltage                                                                                                                                     | ±20                   | V    |
| $I_D$          | Drain Current:<br>- Continuous $T_C$ = 25 °C (Note 5)<br>- Continuous $T_C$ = 100 °C (Note 5)<br>- Continuous $T_A$ = 25 °C (Note 1a)<br>- Pulsed (Note 4) | 78<br>49<br>13<br>364 | A    |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)                                                                                                                     | 216                   | mJ   |
| $P_D$          | Power Dissipation:<br>$T_C$ = 25 °C<br>$T_A$ = 25 °C (Note 1a)                                                                                             | 83<br>2.5             | W    |
| $T_J, T_{STG}$ | 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.



## MARKING DIAGRAM



\$Y  
&Z  
&3  
&K  
FDMS86182

= onsemi Logo  
= Assembly Plant Code  
= Date Code (Year & Week)  
= Lot Traceability Code  
= Specific Device Code

# THERMAL CHARACTERISTICS

| Symbol          | Parameter                                         | Ratings | Unit                        |
|-----------------|---------------------------------------------------|---------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case              | 1.5     | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 50      |                             |

# ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}\text{C}$ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------------|-----|-----|-----|------|
|--------|-----------|-----------------|-----|-----|-----|------|

## OFF CHARACTERISTICS

|                                      |                                           |                                                               |     |    |     |                              |
|--------------------------------------|-------------------------------------------|---------------------------------------------------------------|-----|----|-----|------------------------------|
| $BV_{DSS}$                           | Drain-to-Source Breakdown Voltage         | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$             | 100 |    |     | V                            |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^{\circ}\text{C}$ |     | 56 |     | $\text{mV}/^{\circ}\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$              |     |    | 1   | $\mu\text{A}$                |
| $I_{GSS}$                            | Gate-to-Source Leakage Current            | $V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$          |     |    | 100 | nA                           |

## ON CHARACTERISTICS

|                                        |                                                          |                                                                              |     |     |      |                              |
|----------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------|-----|-----|------|------------------------------|
| $V_{GS(th)}$                           | Gate-to-Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = 150\ \mu\text{A}$                                 | 2.0 | 3.2 | 4.0  | V                            |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate-to-Source Threshold Voltage Temperature Coefficient | $I_D = 150\ \mu\text{A}$ , referenced to $25^{\circ}\text{C}$                |     | -9  |      | $\text{mV}/^{\circ}\text{C}$ |
| $R_{DS(on)}$                           | Static Drain-to-Source On Resistance                     | $V_{GS} = 10\ \text{V}$ , $I_D = 28\ \text{A}$                               |     | 5.9 | 7.2  | $\text{m}\Omega$             |
|                                        |                                                          | $V_{GS} = 6\ \text{V}$ , $I_D = 14\ \text{A}$                                |     | 9.3 | 19.5 |                              |
|                                        |                                                          | $V_{GS} = 10\ \text{V}$ , $I_D = 28\ \text{A}$ , $T_J = 125^{\circ}\text{C}$ |     | 9.9 | 12.1 |                              |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = 5\ \text{V}$ , $I_D = 28\ \text{A}$                                |     | 63  |      | S                            |

## DYNAMIC CHARACTERISTICS

|           |                              |                                                                        |     |      |      |          |
|-----------|------------------------------|------------------------------------------------------------------------|-----|------|------|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$ |     | 1880 | 2635 | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                        |     | 1105 | 1550 | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                        |     | 13   | 25   | pF       |
| $R_g$     | Gate Resistance              |                                                                        | 0.1 | 0.5  | 1.2  | $\Omega$ |

## SWITCHING CHARACTERISTICS

|              |                               |                                                                                                  |  |     |    |    |
|--------------|-------------------------------|--------------------------------------------------------------------------------------------------|--|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 50\ \text{V}$ , $I_D = 28\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$ |  | 13  | 24 | ns |
| $t_r$        | Rise Time                     |                                                                                                  |  | 4   | 10 |    |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                                  |  | 18  | 33 |    |
| $t_f$        | Fall Time                     |                                                                                                  |  | 4   | 10 |    |
| $Q_{g(tot)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $10\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 28\ \text{A}$        |  | 26  | 37 | nC |
| $Q_{g(tot)}$ | Total Gate Charge             | $V_{GS} = 0\ \text{V}$ to $6\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 28\ \text{A}$         |  | 17  | 24 |    |
| $Q_{gs}$     | Gate-to-Source Charge         | $V_{DD} = 50\ \text{V}$ , $I_D = 28\ \text{A}$                                                   |  | 8.2 |    |    |
| $Q_{gd}$     | Gate-to-Drain "Miller" Charge | $V_{DD} = 50\ \text{V}$ , $I_D = 28\ \text{A}$                                                   |  | 5.1 |    |    |
| $Q_{oss}$    | Output Charge                 | $V_{DD} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$                                                 |  | 73  |    |    |

# FDMS86182, FDMS86182-NC

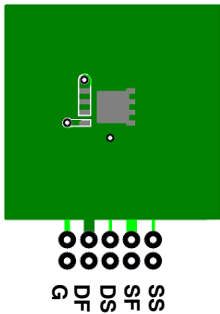
## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Symbol                                    | Parameter                             | Test Conditions                                        | Min | Typ | Max | Unit |
|-------------------------------------------|---------------------------------------|--------------------------------------------------------|-----|-----|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS</b> |                                       |                                                        |     |     |     |      |
| $V_{SD}$                                  | Source-to-Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 2.1\text{ A}$ (Note 2)     |     | 0.7 | 1.2 | V    |
|                                           |                                       | $V_{GS} = 0\text{ V}, I_S = 28\text{ A}$ (Note 2)      |     | 0.8 | 1.3 | V    |
| $t_{rr}$                                  | Reverse Recovery Time                 | $I_F = 14\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$  |     | 28  | 45  | ns   |
| $Q_{rr}$                                  | Reverse Recovery Charge               |                                                        |     | 52  | 84  | nC   |
| $t_{rr}$                                  | Reverse Recovery Time                 | $I_F = 14\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}$ |     | 22  | 36  | ns   |
| $Q_{rr}$                                  | Reverse Recovery Charge               |                                                        |     | 116 | 186 | nC   |

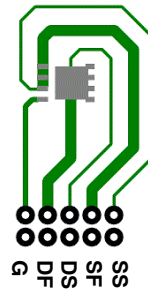
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### NOTES:

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material.  $R_{\theta CA}$  is determined by the user's board design.



a) 50 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b) 125 °C/W when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- $E_{AS}$  of 216 mJ is based on starting  $T_J = 25^\circ\text{C}$ , N-ch:  $L = 3\text{ mH}$ ,  $I_{AS} = 12\text{ A}$ ,  $V_{DD} = 100\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 38\text{ A}$ .
- Pulsed  $I_d$  please refer to Fig 11 SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.



## TYPICAL CHARACTERISTICS

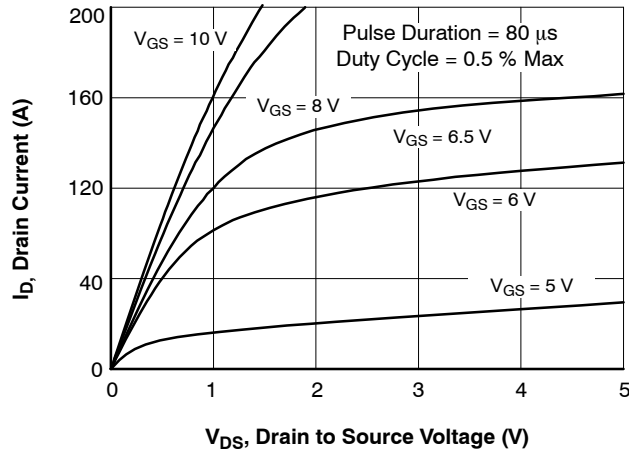
(T<sub>J</sub> = 25 °C unless otherwise noted)

Figure 1. On-Region Characteristics

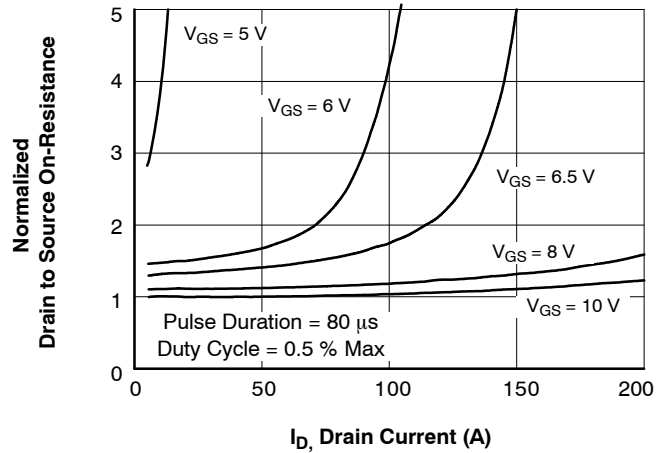


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

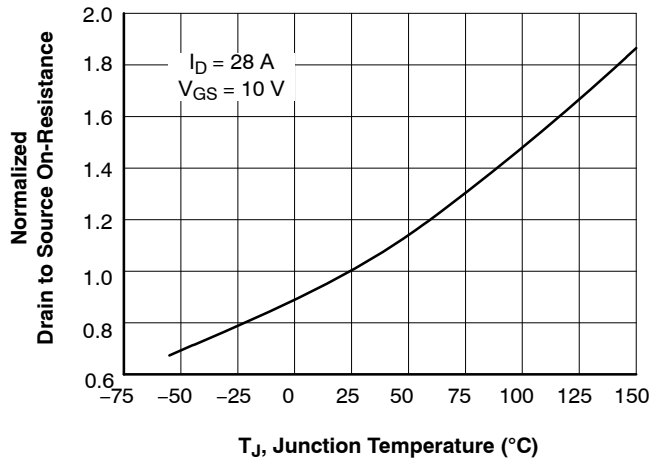


Figure 3. Normalized On-Resistance vs. Junction Temperature

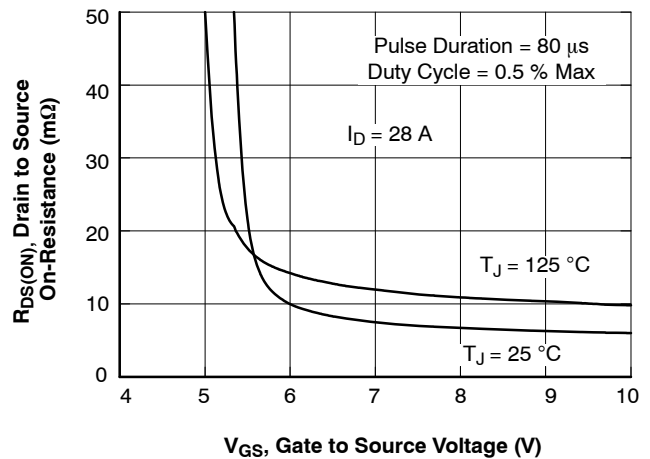


Figure 4. On-Resistance vs. Gate to Source Voltage

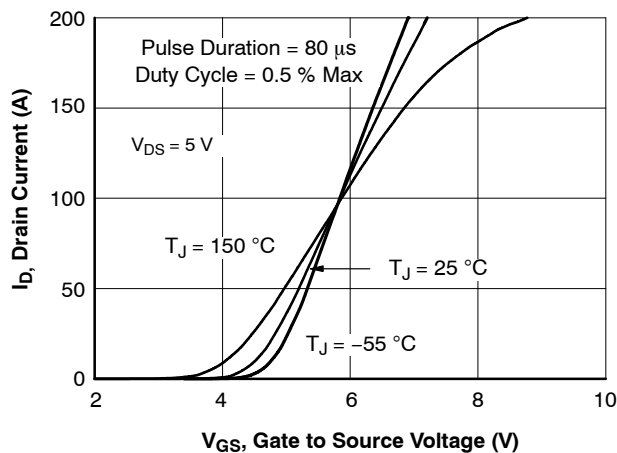


Figure 5. Transfer Characteristics

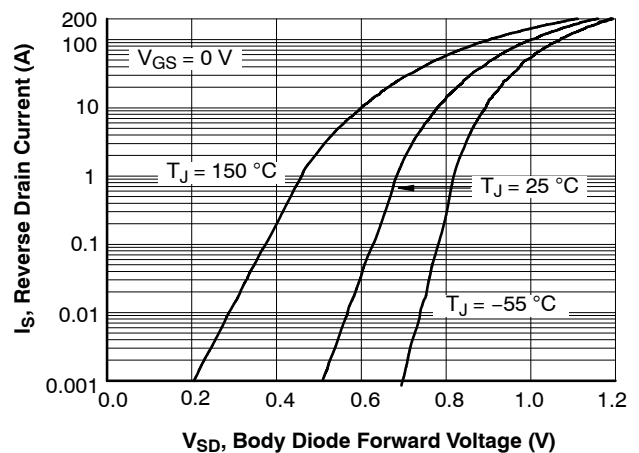


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

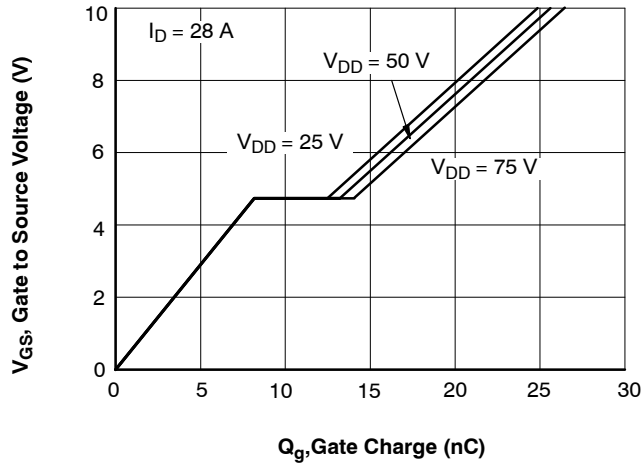


Figure 7. Gate Charge Characteristics

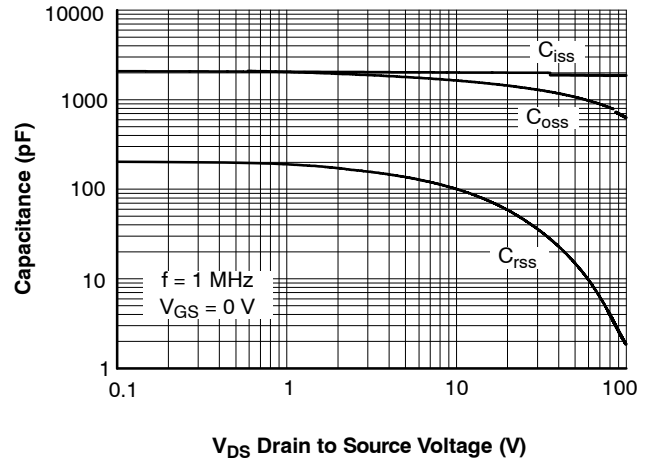


Figure 8. Capacitance vs Drain to Source Voltage

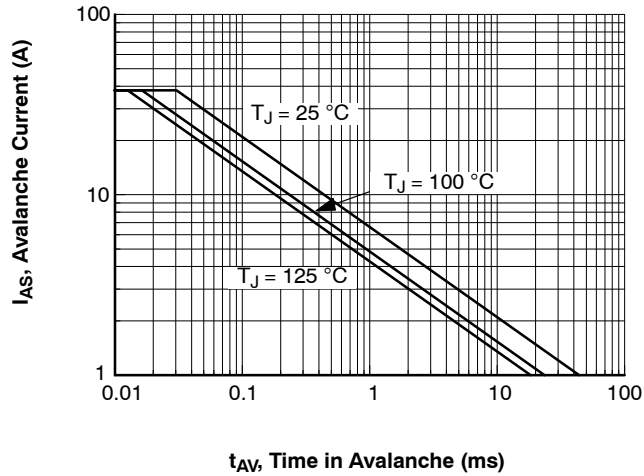


Figure 9. Unclamped Inductive Switching Capability

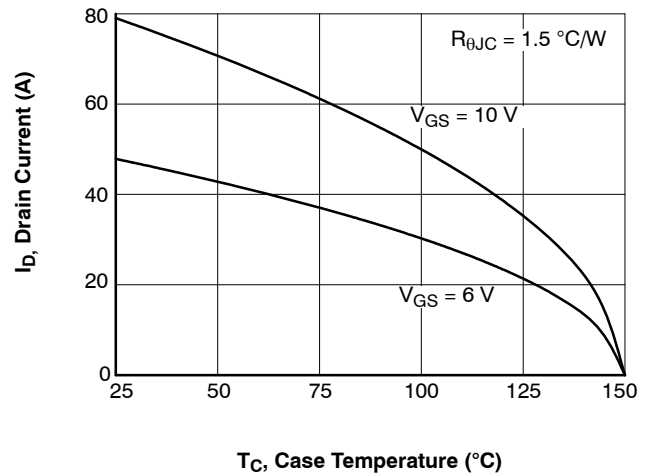


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

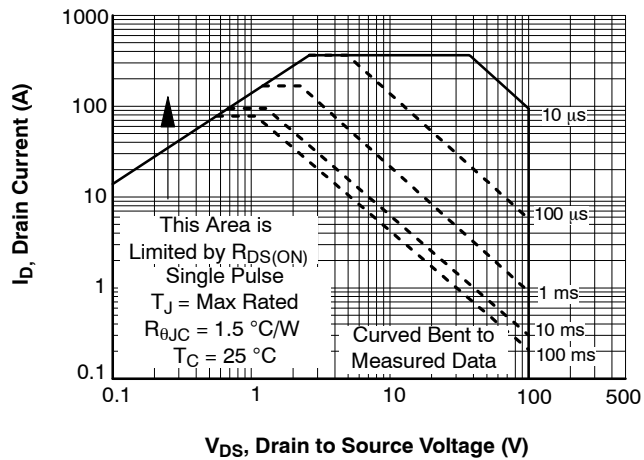


Figure 11. Forward Bias Safe Operating Area

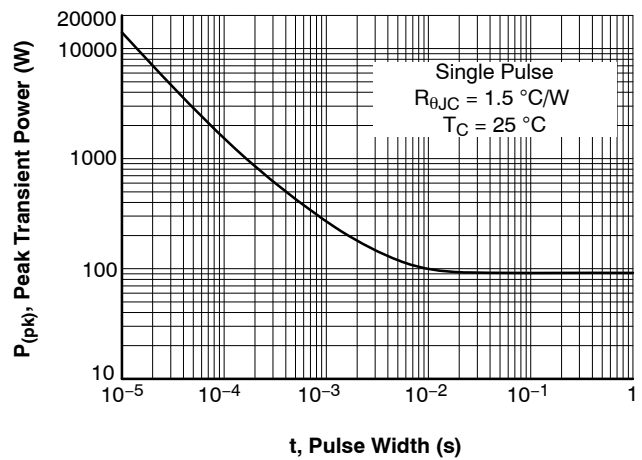


Figure 12. Single Pulse Maximum Power Dissipation

# FDMS86182, FDMS86182-NC

## TYPICAL CHARACTERISTICS (continued)

( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

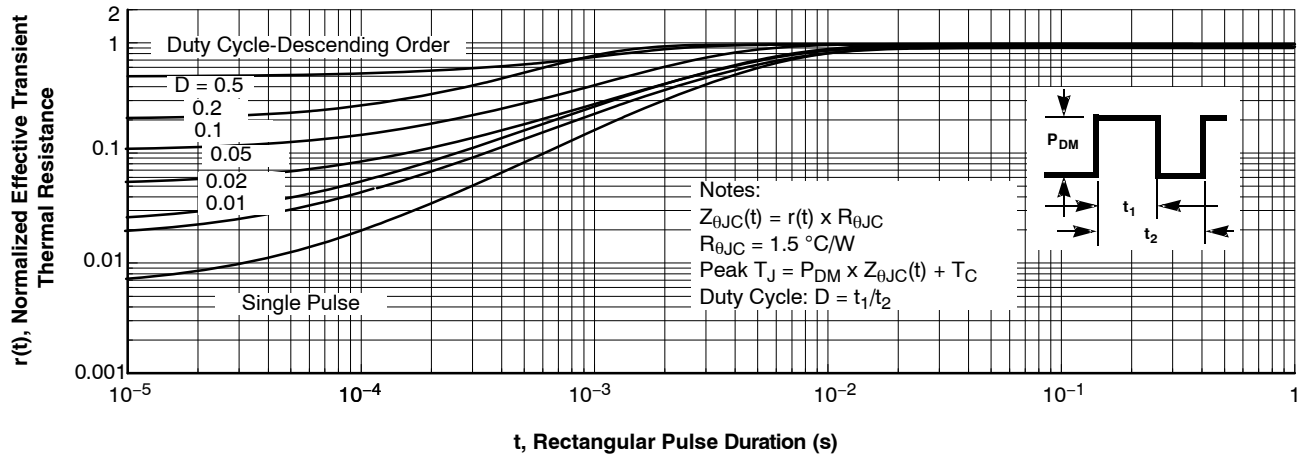


Figure 13. Junction-to-Case Transient Thermal Response Curve

### ORDERING INFORMATION

| Device       | Device Marking | Package  | Reel Size | Tape Width | Shipping <sup>†</sup> |
|--------------|----------------|----------|-----------|------------|-----------------------|
| FDMS86182    | FDMS86182      | Power 56 | 13"       | 12mm       | 3,000 / Tape & Reel   |
| FDMS86182-NC | FDMS86182      | Power 56 | 13"       | 12mm       | 3,000 / Tape & Reel   |

<sup>†</sup> 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](#).

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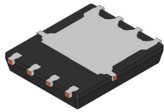


## FDMS86182, FDMS86182-NC

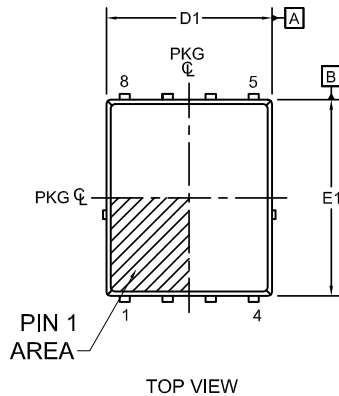
### REVISION HISTORY

| Revision | Description of Changes                                                           | Date     |
|----------|----------------------------------------------------------------------------------|----------|
| 2        | Addition of FDMS86182-NC OPN + Converted the Data Sheet to <b>onsemi</b> format. | 2/6/2026 |

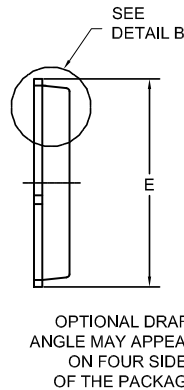



**PQFN8 5X6, 1.27P**  
**CASE 483AE**  
**ISSUE C**

DATE 21 JAN 2022

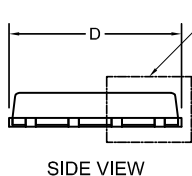


TOP VIEW

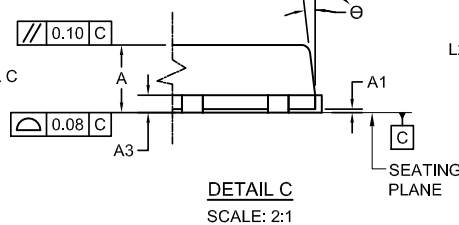
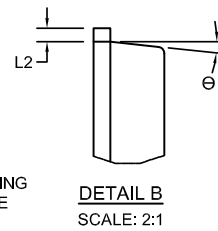
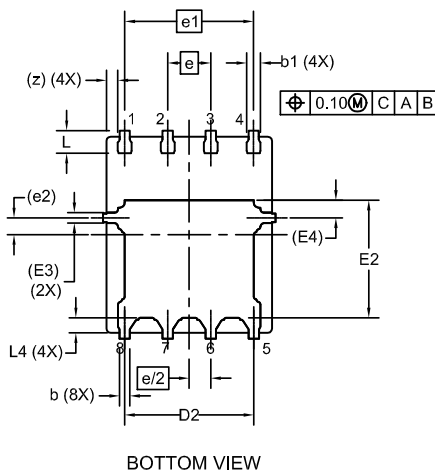

OPTIONAL DRAFT  
ANGLE MAY APPEAR  
ON FOUR SIDES  
OF THE PACKAGE

## NOTES:

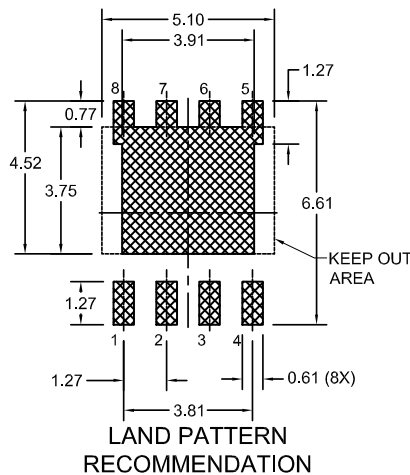
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.



SIDE VIEW


DETAIL C  
SCALE: 2:1

DETAIL B  
SCALE: 2:1


BOTTOM VIEW


LAND PATTERN  
RECOMMENDATION

\*FOR ADDITIONAL INFORMATION ON OUR  
PB-FREE STRATEGY AND SOLDERING  
DETAILS, PLEASE DOWNLOAD THE ON  
SEMICONDUCTOR SOLDERING AND  
MOUNTING TECHNIQUES REFERENCE  
MANUAL, SOLDERRM/D.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.90        | 1.00 | 1.10 |
| A1  | 0.00        | -    | 0.05 |
| b   | 0.21        | 0.31 | 0.41 |
| b1  | 0.31        | 0.41 | 0.51 |
| A3  | 0.15        | 0.25 | 0.35 |
| D   | 4.90        | 5.00 | 5.20 |
| D1  | 4.80        | 4.90 | 5.00 |
| D2  | 3.61        | 3.82 | 3.96 |
| E   | 5.90        | 6.15 | 6.25 |
| E1  | 5.70        | 5.80 | 5.90 |
| E2  | 3.38        | 3.48 | 3.78 |
| E3  | 0.30 REF    |      |      |
| E4  | 0.52 REF    |      |      |
| e   | 1.27 BSC    |      |      |
| e/2 | 0.635 BSC   |      |      |
| e1  | 3.81 BSC    |      |      |
| e2  | 0.50 REF    |      |      |
| L   | 0.51        | 0.66 | 0.76 |
| L2  | 0.05        | 0.18 | 0.30 |
| L4  | 0.34        | 0.44 | 0.54 |
| z   | 0.34 REF    |      |      |
| Θ   | 0°          | -    | 12°  |

DOCUMENT NUMBER: 98AON13655G

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DESCRIPTION: PQFN8 5X6, 1.27P

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