

# MOSFET – N-Channel, POWERTRENC<sup>®</sup>, SyncFET<sup>™</sup>

**30 V, 14.8 A, 6.0 mΩ**

## FDMC7672S

### General Description

This FDMC7672S is produced using onsemi's advanced POWERTRENC process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery packs.

### Features

- Max  $R_{DS(on)}$  = 6.0 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 14.8\text{ A}$
- Max  $R_{DS(on)}$  = 7.1 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 12.4\text{ A}$
- High Performance Technology for Extremely Low  $R_{DS(on)}$
- Pb-Free, Halide Free and RoHS Compliant

### Applications

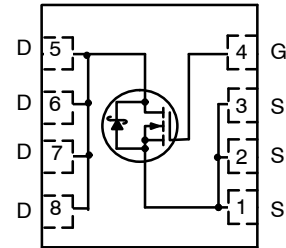
- DC-DC Buck Converters
- Notebook Battery Power Management
- Load Switch in Notebook

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

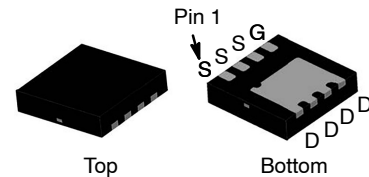
| Symbol         | Parameter                                                                                                          | Value            | Unit             |
|----------------|--------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                                                                                            | 30               | V                |
| $V_{GS}$       | Gate to Source Voltage                                                                                             | $\pm 20$         | V                |
| $I_D$          | Drain Current:<br>Continuous, $T_C = 25^\circ\text{C}$<br>Continuous, $T_A = 25^\circ\text{C}$ (Note 1a)<br>Pulsed | 18<br>14.8<br>45 | A                |
| $E_{AS}$       | Single Pulse Avalanche Energy<br>(Note 3)                                                                          | 60               | mJ               |
| $P_D$          | Power Dissipation:<br>$T_C = 25^\circ\text{C}$<br>$T_A = 25^\circ\text{C}$ (Note 1a)                               | 36<br>2.3        | W                |
| $T_J, T_{STG}$ | Operating and Storage Junction<br>Temperature Range                                                                | -55 to +150      | $^\circ\text{C}$ |

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.

| $V_{DS}$ | $R_{DS(on)}$ MAX | $I_D$ MAX |
|----------|------------------|-----------|
| 30 V     | 6.0 mΩ @ 10 V    | 14.8 A    |
|          | 7.1 mΩ @ 4.5 V   |           |

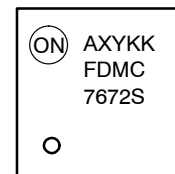


**N-CHANNEL MOSFET**



**WDFN8 3.3 x 3.3, 0.65P  
CASE 511DQ  
(Option A)**

### MARKING DIAGRAM



A = Assembly Location  
XY = 2-Digit Date Code  
KK = 2-Digit Lot Run Traceability Code  
FDMC7672S = Specific Device Code

### ORDERING INFORMATION

| Device    | Package                            | Shipping <sup>†</sup> |
|-----------|------------------------------------|-----------------------|
| FDMC7672S | WDFN8<br>(Pb-Free,<br>Halide Free) | 3000 /<br>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 Specification Brochure, [BRD8011/D](http://BRD8011/D).

# FDMC7672S

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                         | Value | Unit |
|-----------------|---------------------------------------------------|-------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case              | 3.5   | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 53    |      |

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

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

### OFF CHARACTERISTICS

|                                |                                           |                                                         |    |    |     |       |
|--------------------------------|-------------------------------------------|---------------------------------------------------------|----|----|-----|-------|
| $BV_{DSS}$                     | Drain to Source Breakdown Voltage         | $I_D = 1\text{ mA}, V_{GS} = 0\text{ V}$                | 30 | –  | –   | V     |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 10\text{ mA}$ , referenced to $25^\circ\text{C}$ | –  | 12 | –   | mV/°C |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$             | –  | –  | 1   | mA    |
| $I_{GSS}$                      | Gate to Source Leakage Current            | $V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$             | –  | –  | 100 | nA    |

### ON CHARACTERISTICS (Note 2)

|                                  |                                                          |                                                                      |     |     |     |       |
|----------------------------------|----------------------------------------------------------|----------------------------------------------------------------------|-----|-----|-----|-------|
| $V_{GS(th)}$                     | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}, I_D = 1\text{ mA}$                                 | 1.2 | 1.6 | 3.0 | V     |
| $\Delta V_{GS(th)} / \Delta T_J$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 10\text{ mA}$ , referenced to $25^\circ\text{C}$              | –   | –6  | –   | mV/°C |
| $R_{DS(on)}$                     | Static Drain to Source On Resistance                     | $V_{GS} = 10\text{ V}, I_D = 14.8\text{ A}$                          | –   | 5.0 | 6.0 | mΩ    |
|                                  |                                                          | $V_{GS} = 4.5\text{ V}, I_D = 12.4\text{ A}$                         | –   | 6.1 | 7.1 |       |
|                                  |                                                          | $V_{GS} = 10\text{ V}, I_D = 14.8\text{ A}, T_J = 125^\circ\text{C}$ | –   | 5.9 | 9.0 |       |
| $g_{FS}$                         | Forward Transconductance                                 | $V_{DS} = 5\text{ V}, I_D = 14.8\text{ A}$                           | –   | 78  | –   | S     |

### DYNAMIC CHARACTERISTICS

|           |                              |                                                               |   |      |      |    |
|-----------|------------------------------|---------------------------------------------------------------|---|------|------|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | – | 1895 | 2520 | pF |
| $C_{oss}$ | Output Capacitance           |                                                               | – | 770  | 1025 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                               | – | 85   | 130  | pF |
| $R_g$     | Gate Resistance              | $f = 1\text{ MHz}$                                            | – | 1.2  | 3.2  | Ω  |

### SWITCHING CHARACTERISTICS

|              |                               |                                                                                              |   |     |    |    |
|--------------|-------------------------------|----------------------------------------------------------------------------------------------|---|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 15\text{ V}, I_D = 14.8\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$ | – | 11  | 21 | ns |
| $t_r$        | Rise Time                     |                                                                                              | – | 4   | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                              | – | 26  | 42 | ns |
| $t_f$        | Fall Time                     |                                                                                              | – | 3   | 10 | ns |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{ V to }10\text{ V}, V_{DD} = 15\text{ V}, I_D = 14.8\text{ A}$              | – | 30  | 42 | nC |
|              |                               | $V_{GS} = 0\text{ V to }4.5\text{ V}, V_{DD} = 15\text{ V}, I_D = 14.8\text{ A}$             | – | 14  | 20 | nC |
| $Q_{gs}$     | Gate to Source Gate Charge    | $V_{DD} = 15\text{ V}, I_D = 14.8\text{ A}$                                                  | – | 5.3 | –  | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge | $V_{DD} = 15\text{ V}, I_D = 14.8\text{ A}$                                                  | – | 4.0 | –  | nC |

# FDMC7672S

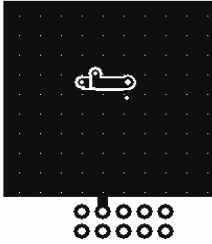
## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Symbol                                    | Parameter                             | Test Condition                                          | Min | Typ | Max | Unit |
|-------------------------------------------|---------------------------------------|---------------------------------------------------------|-----|-----|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS</b> |                                       |                                                         |     |     |     |      |
| $V_{SD}$                                  | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 14.8\text{ A}$ (Note 2)     | –   | 0.8 | 1.3 | V    |
|                                           |                                       | $V_{GS} = 0\text{ V}, I_S = 1.9\text{ A}$ (Note 2)      | –   | 0.5 | 1.2 |      |
| $t_{rr}$                                  | Reverse Recovery Time                 | $I_F = 14.8\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$ | –   | 29  | 45  | ns   |
| $Q_{rr}$                                  | Reverse Recovery Charge               |                                                         | –   | 28  | 44  | nC   |

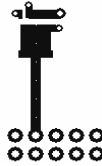
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### 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 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



- a)  $53^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



- b)  $125^\circ\text{C/W}$  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 60 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 11\text{ A}$ ,  $V_{DD} = 27\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 3\text{ mH}$ ,  $I_{AS} = 4.8\text{ A}$ .

# TYPICAL CHARACTERISTICS

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

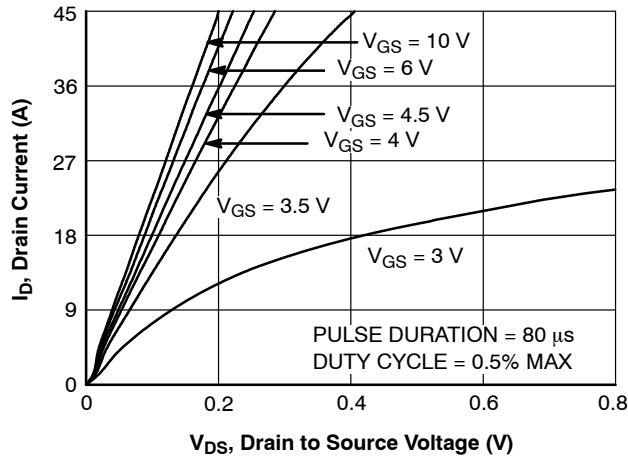


Figure 1. On-Region Characteristics

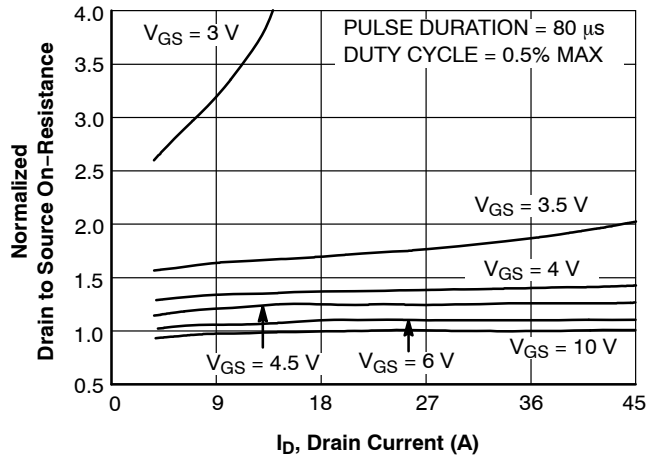


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

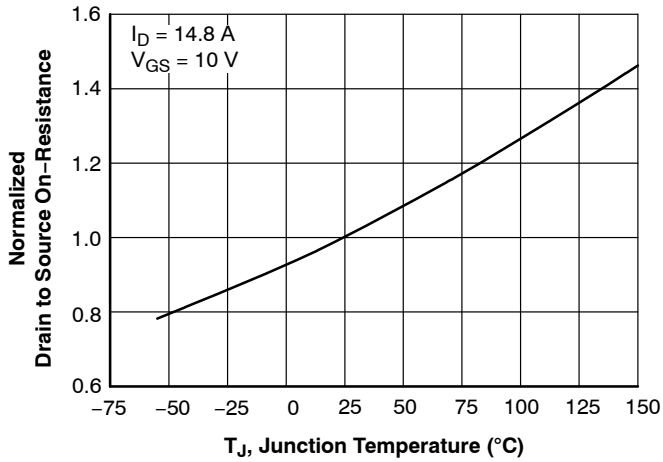


Figure 3. Normalized On-Resistance vs. Junction Temperature

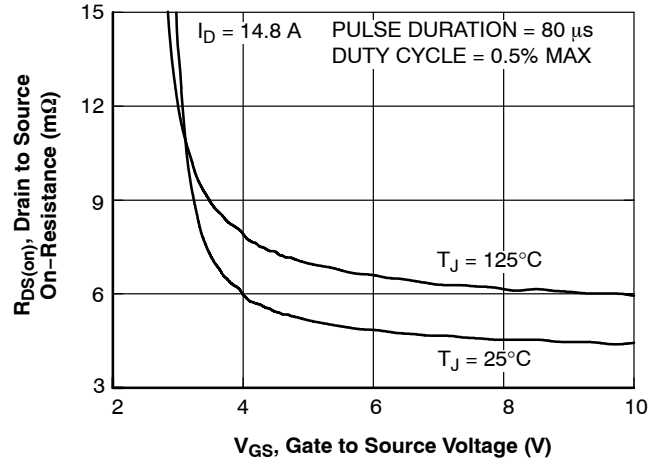


Figure 4. On-Resistance vs. Gate to Source Voltage

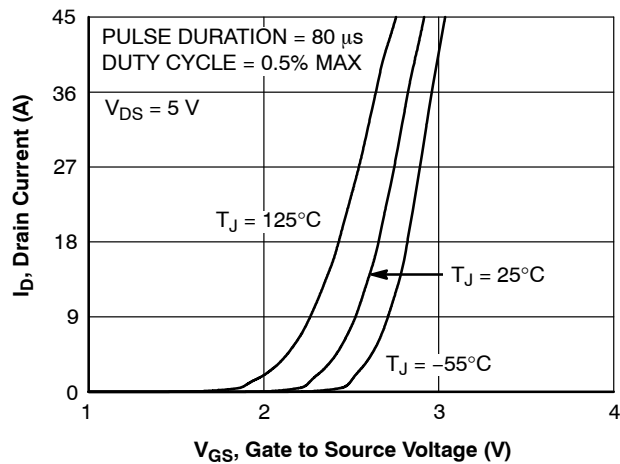


Figure 5. Transfer Characteristics

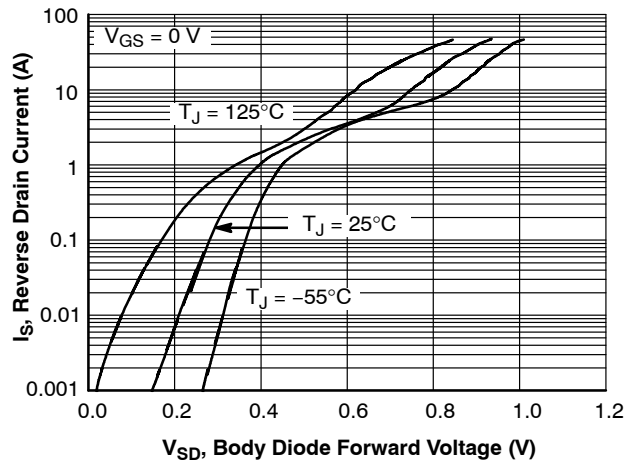


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

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

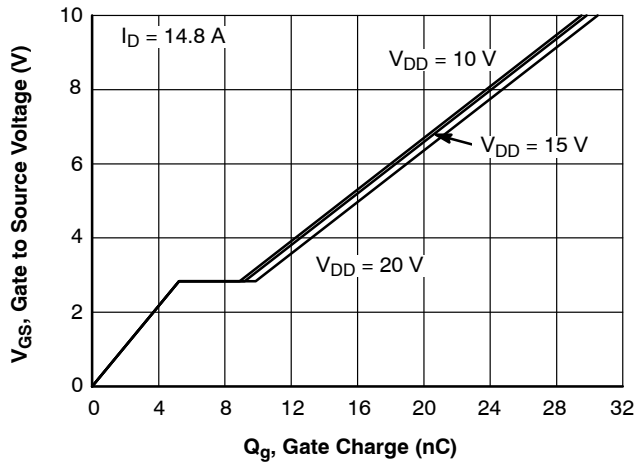


Figure 7. Gate Charge Characteristics

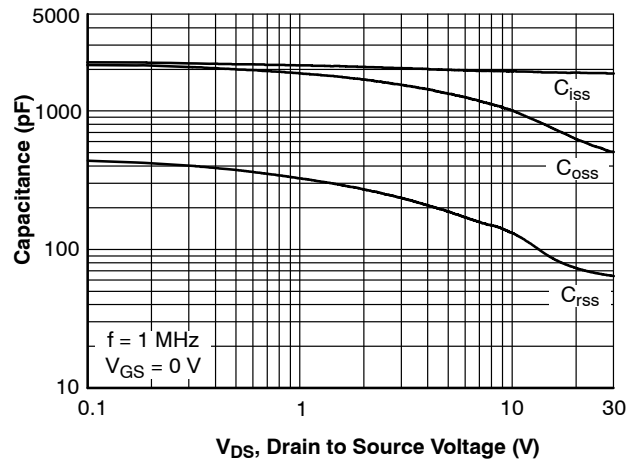


Figure 8. Capacitance vs. Drain to Source Voltage

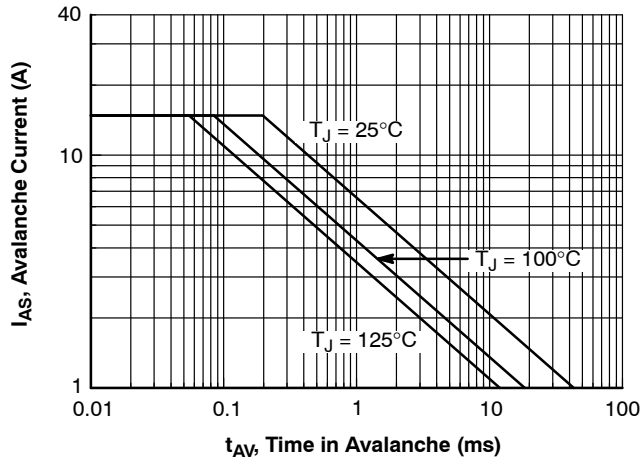


Figure 9. Unclamped Inductive Switching Capability

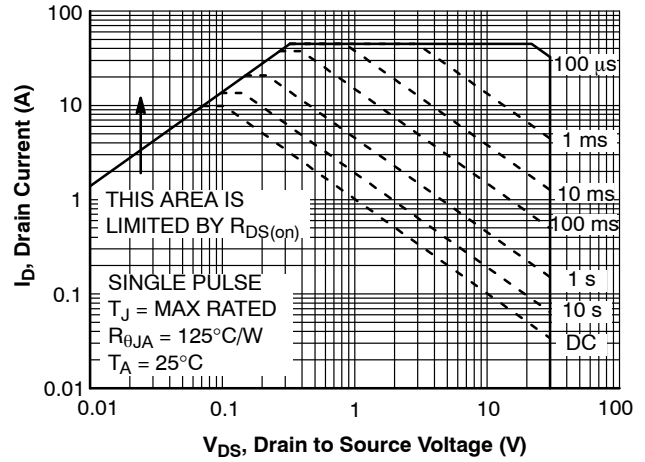


Figure 10. Forward Bias Safe Operating Area

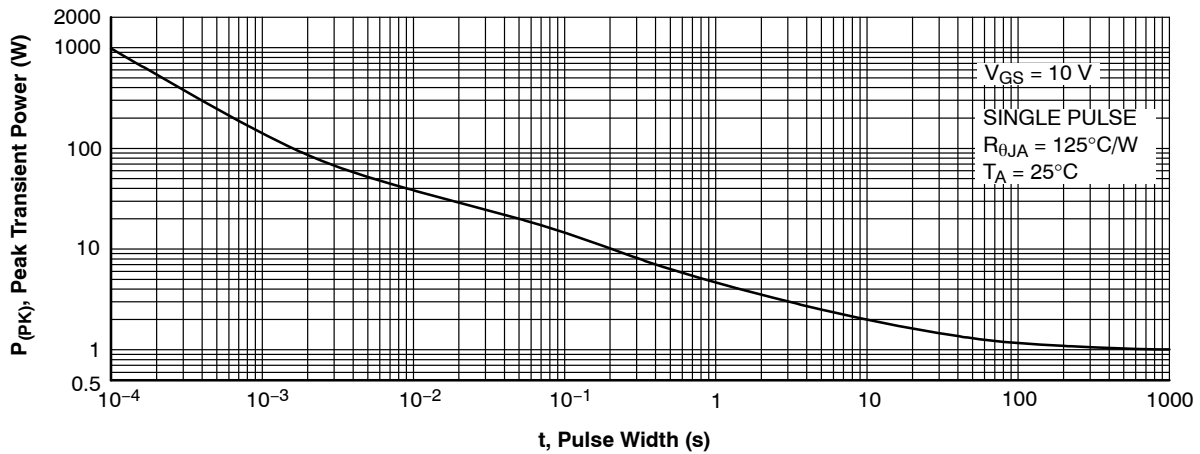
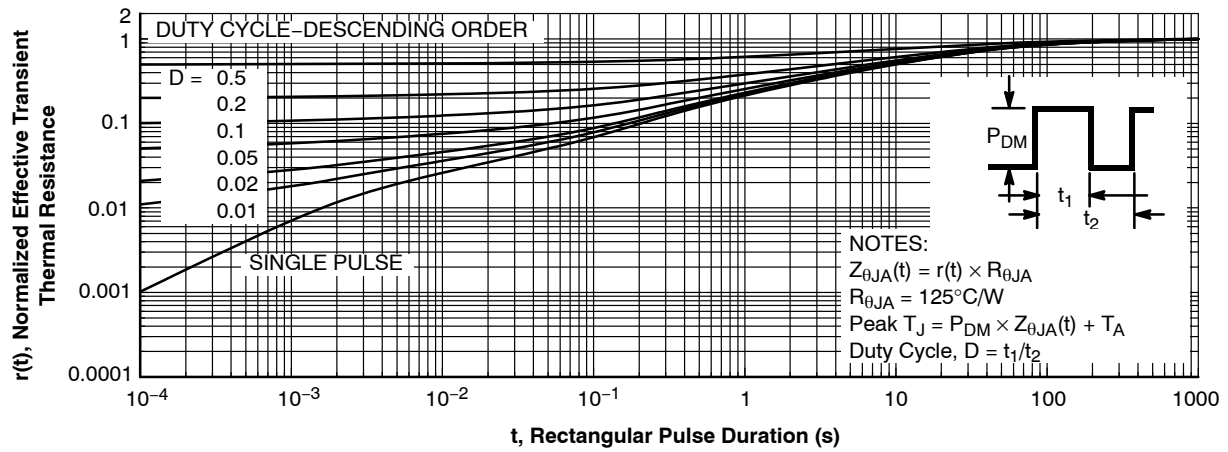


Figure 11. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

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



TYPICAL CHARACTERISTICS (continued)

**SyncFET Schottky Body Diode Characteristics**

onsemi's SyncFET process embeds a Schottky diode in parallel with POWERTRENCH MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 13 shows the reverse recovery characteristic of the FDMC7672S.

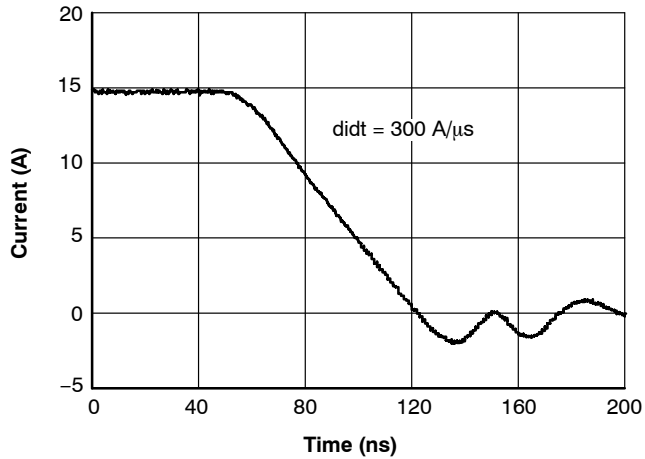


Figure 13. SyncFET Body Diode Reverse Recovery Characteristics

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

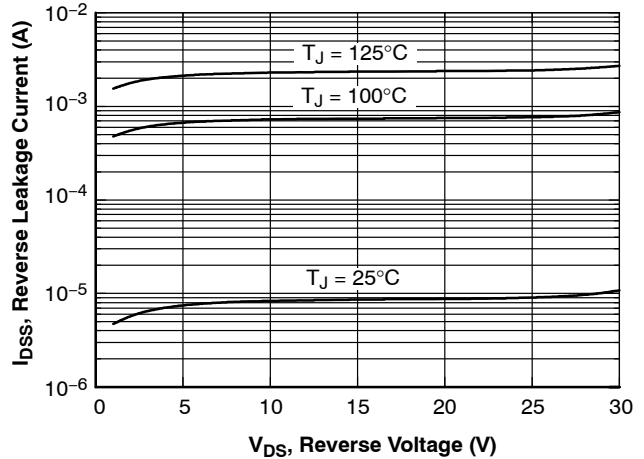


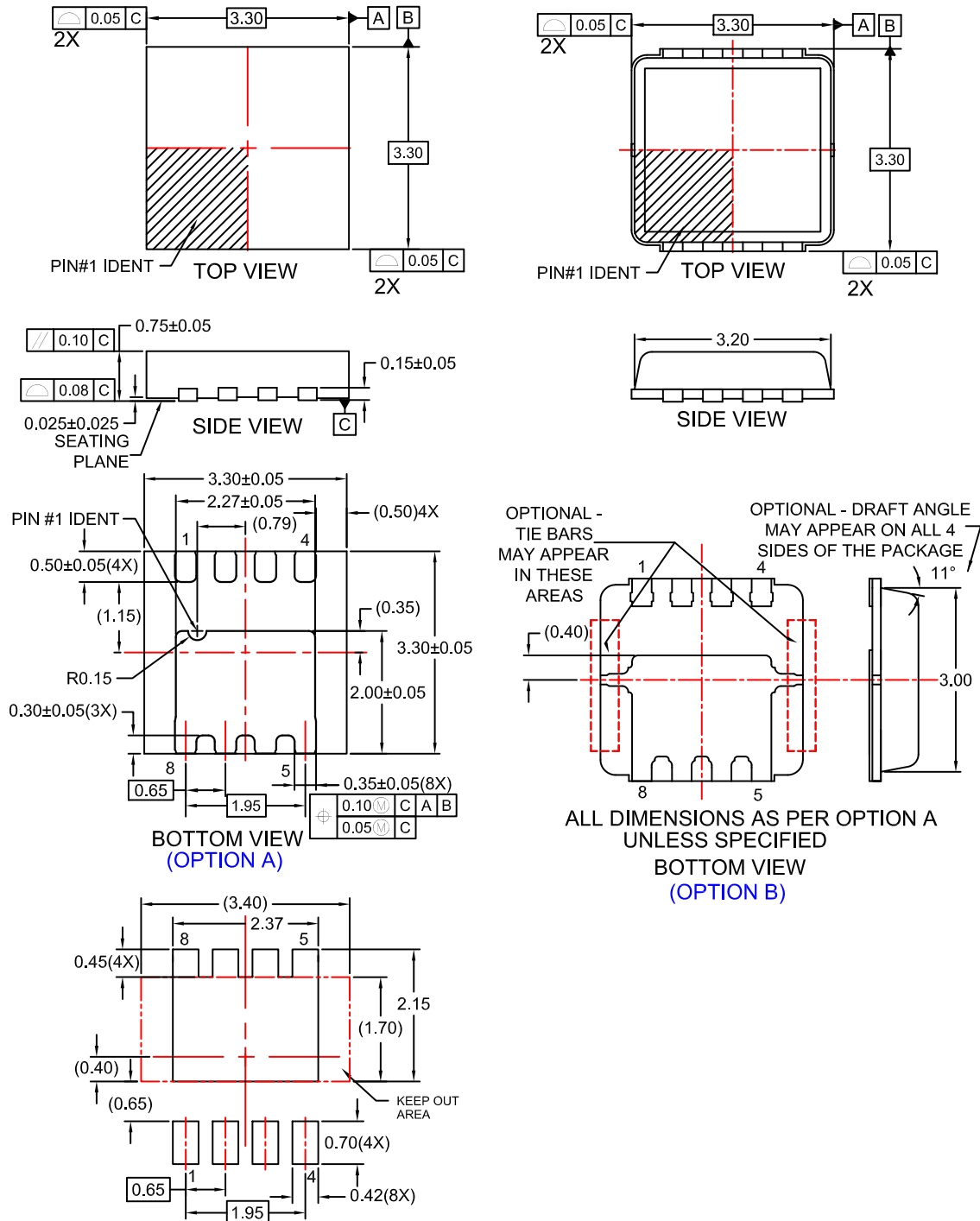
Figure 14. SyncFET Body Diode Reverse Leakage vs. Drain-Source Voltage

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**WDFN8 3.3x3.3, 0.65P**  
**CASE 511DQ**  
**ISSUE O**

DATE 31 OCT 2016



**RECOMMENDED LAND PATTERN**

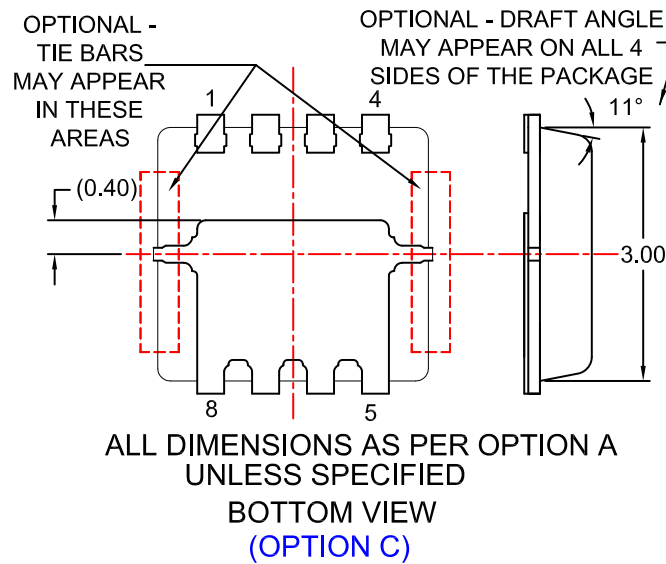
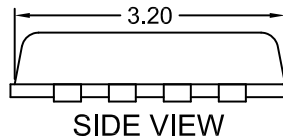
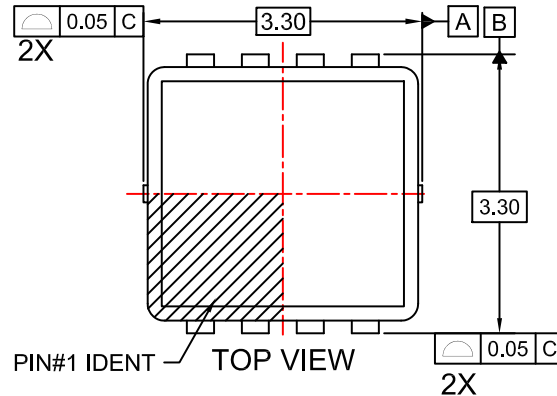
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**WDFN8 3.3x3.3, 0.65P**  
CASE 511DQ  
ISSUE O

DATE 31 OCT 2016



**NOTES:**

- A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-240.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN
- E. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. BURRS OR MOLD FLASH SHALL NOT EXCEED 0.10MM.

|                         |                             |                                                                                                                                                                                     |
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