

# MOSFET – Power, N-Channel, UltraFET

**55 V, 15 A, 90 mΩ**

## FDMC15N06

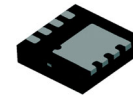
### Description

These N-Channel power MOSFETs are manufactured using the innovative UltraFET process. This advanced process technology achieves the lowest possible on-resistance per silicon area, resulting in outstanding performance.

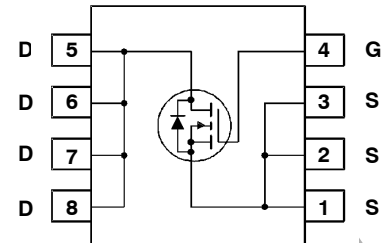
This device is capable of withstanding high energy in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching converters, motor drivers, relay drivers, low voltage bus switches, and power management in portable and battery-operated products.

### Features

- $R_{DS(on)} = 75 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 15 \text{ A}$
- 100% Avalanche Tested
- These Device is Pb-Free and RoHS Compliant



WDFN8 3.3X3.3, 0.65P  
CASE 511DQ



### MARKING DIAGRAM



Z = Assembly Plant Code  
XY = Date Code (Year & Week)  
KK = Lot Traceability Code  
15N06 = Specific Device Code

### ORDERING INFORMATION

| Device    | Package            | Shipping <sup>†</sup> |
|-----------|--------------------|-----------------------|
| FDMC15N06 | WDFN8<br>(Pb-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 Specifications Brochure, [BRD8011/D](http://BRD8011/D).

# FDMC15N06

## MOSFET MAXIMUM RATINGS $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter   | Ratings         | Unit             |
|----------------|---|-----------------|------------------|
| $V_{DSS}$      | Drain to Source Voltage   | 55              | V                |
| $V_{GSS}$      | Gate to Source Voltage  | $\pm 20$        | V                |
| $I_D$          | Drain Current<br>–Continuous ( $T_C = 25^\circ\text{C}$ )<br>–Continuous ( $T_C = 100^\circ\text{C}$ )<br>–Continuous ( $T_A = 25^\circ\text{C}$ ) (Note 1) | 15<br>9<br>2.4  | A                |
| $I_{DM}$       | Drain Current<br>–Pulsed (Note 2)   | 60              | A                |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)  | 36              | mJ               |
| $I_{AR}$       | Avalanche Energy  | 15              | A                |
| $E_{AR}$       | Repetitive Avalanche Energy   | 3.5             | mJ               |
| $P_D$          | Power Dissipation<br>( $T_C = 25^\circ\text{C}$ )<br>( $T_A = 25^\circ\text{C}$ )   | 35<br>2.3       | W                |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range   | $-55$ to $+150$ | $^\circ\text{C}$ |
| $T_L$          | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds  | 300             | $^\circ\text{C}$ |

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.

## THERMAL CHARACTERISTICS

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

## ELECTRICAL CHARACTERISTICS $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol                               | Parameter                                 | Test Conditions   | Min | Typ   | Max       | Unit                      |
|--------------------------------------|---|---|-----|-------|-----------|---------------------------|
| <b>Off Characteristics</b>           |   |   |     |       |           |                           |
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$ , $T_C = 25^\circ\text{C}$                            | 55  | –     | –         | V                         |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$   | –   | 70    | –         | $\text{V}/^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$<br>$V_{DS} = 45\ \text{V}$ , $T_C = 150^\circ\text{C}$ | –   | –     | 1<br>250  | $\mu\text{A}$             |
| $I_{GSS}$                            | Gate to Body Leakage Current              | $V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$  | –   | –     | $\pm 100$ | nA                        |
| <b>On Characteristics</b>            |   |   |     |       |           |                           |
| $V_{GS(th)}$                         | Gate to Source Threshold Voltage          | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$  | 2.0 | –     | 4.0       | V                         |
| $R_{DS(on)}$                         | Static Drain to Source On Resistance      | $V_{GS} = 10\ \text{V}$ , $I_D = 15\ \text{A}$  | –   | 0.075 | 0.090     | $\Omega$                  |
| $g_{FS}$                             | Forward Transconductance                  | $V_{DS} = 20\ \text{V}$ , $I_D = 15\ \text{A}$  | –   | 5     | –         | S                         |
| <b>Dynamic Characteristics</b>       |   |   |     |       |           |                           |
| $C_{iss}$                            | Input Capacitance                         | $V_{DS} = 25\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                  | –   | 265   | 350       | pF                        |
| $C_{oss}$                            | Output Capacitance                        |   | –   | 97    | 130       | pF                        |
| $C_{rss}$                            | Reverse Transfer Capacitance              |   | –   | 28    | 42        | pF                        |
| $Q_{g(tot)}$                         | Total Gate Charge at 10 V                 | $V_{DS} = 30\ \text{V}$ , $I_D = 15\ \text{A}$ ,<br>$V_{GS} = 10\ \text{V}$ (Note 4)                    | –   | 8.8   | 11.5      | nC                        |
| $Q_{gs}$                             | Gate to Source Gate Charge                |   | –   | 1.7   | –         | nC                        |
| $Q_{gd}$                             | Gate to Drain "Miller" Charge             |   | –   | 3.6   | –         | nC                        |

# FDMC15N06

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

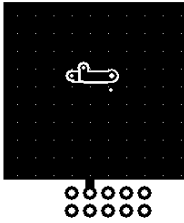
| Symbol                           | Parameter           | Test Conditions  | Min | Typ  | Max | Unit |
|----------------------------------|---------------------|--|-----|------|-----|------|
| <b>Switching Characteristics</b> |                     |  |     |      |     |      |
| $t_{d(on)}$                      | Turn-On Delay Time  | $V_{DD} = 30\text{ V}$ , $I_D = 15\text{ A}$ ,<br>$V_{GS} = 10\text{ V}$ , $R_G = 25\ \Omega$ (Note 4) | –   | 9.5  | 29  | ns   |
| $t_r$                            | Turn-On Rise Time   |  | –   | 36.5 | 83  | ns   |
| $t_{d(off)}$                     | Turn-Off Delay Time |  | –   | 22.5 | 55  | ns   |
| $t_f$                            | Turn-Off Fall Time  |  | –   | 22   | 54  | ns   |

### Drain-Source Diode Characteristics

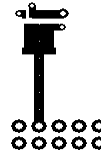
|          |  |   |   |    |      |    |
|----------|--|---|---|----|------|----|
| $I_S$    | Maximum Continuous Drain to Source Diode Forward Current |   | – | –  | 15   | A  |
|          |  |   | – | –  | 60   | A  |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current     |   | – | –  | 1.25 | V  |
| $V_{SD}$ | Drain to Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}$ , $I_{SD} = 15\text{ A}$  |   |    |      |    |
| $t_{rr}$ | Reverse Recovery Time                                    | $V_{GS} = 0\text{ V}$ , $I_{SD} = 15\text{ A}$ ,<br>$di_F/dt = 100\text{ A}/\mu\text{s}$ (Note 5) | – | 30 |      | ns |
| $Q_{rr}$ | Reverse Recovery Charge                                  |   | – | 35 | –    | 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.

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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.  $53^\circ\text{C}/\text{W}$  when mounted on  
a 1 in<sup>2</sup> pad of 2 oz copper



b.  $125^\circ\text{C}/\text{W}$  when mounted on  
a minimum pad of 2 oz copper

- Repetitive rating: pulse-width limited by maximum junction temperature.
- $L = 1\text{ mH}$ ,  $I_{AS} = 8.5\text{ A}$ ,  $R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
- Essentially independent of operating temperature typical characteristics.
- $I_{SD} \leq 15\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq 40\text{ V}$ , starting  $T_J = 25^\circ\text{C}$ .

## TYPICAL CHARACTERISTICS

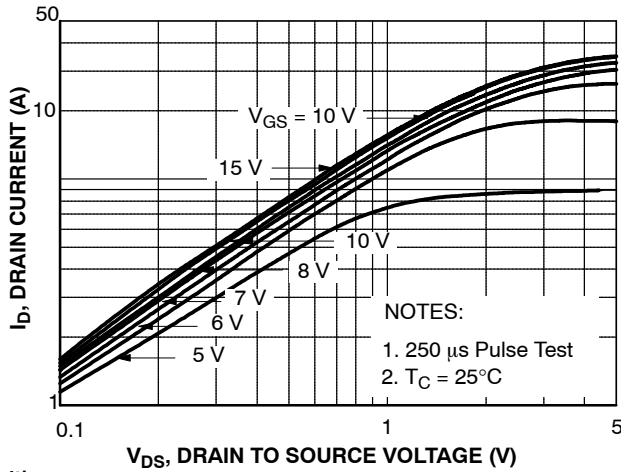


Figure 1. On-Region Characteristics

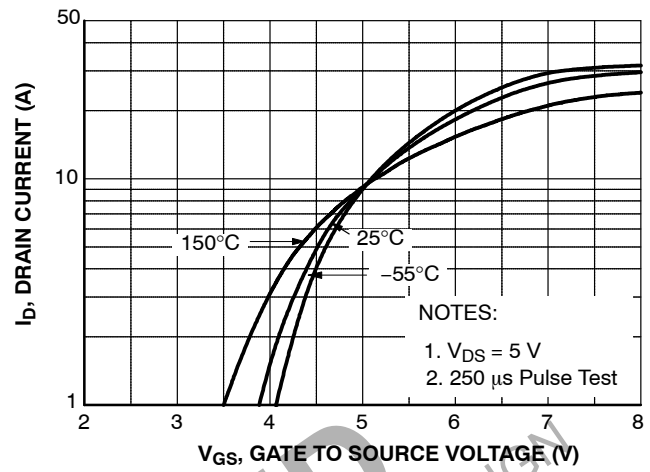


Figure 2. Transfer Characteristics

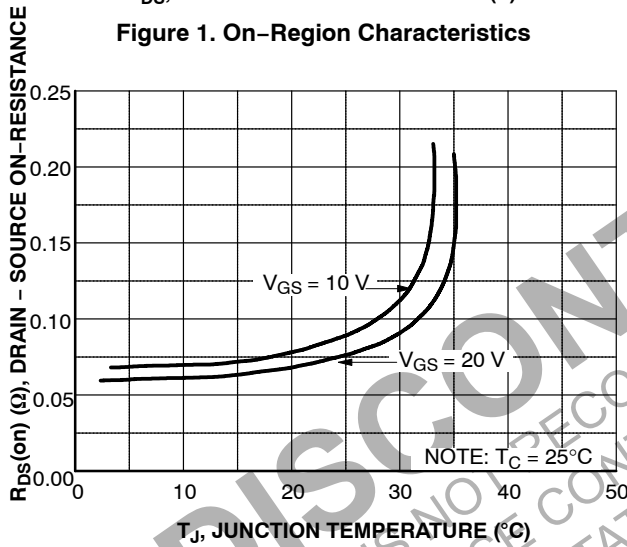


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

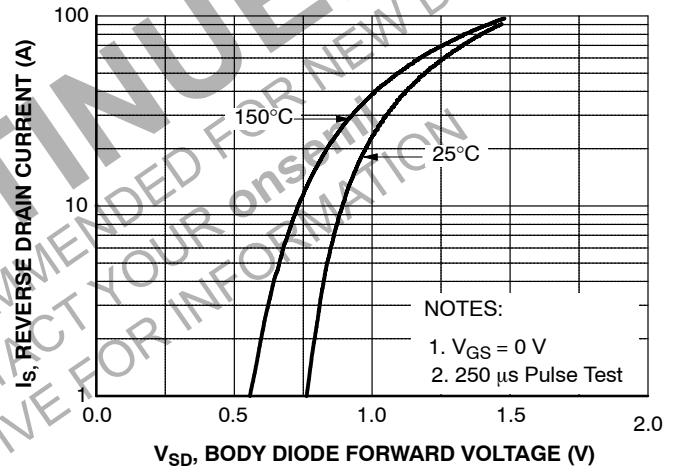


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

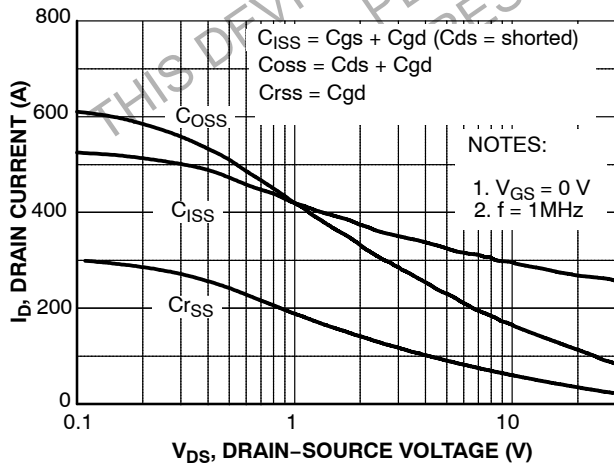


Figure 5. Capacitance Characteristics

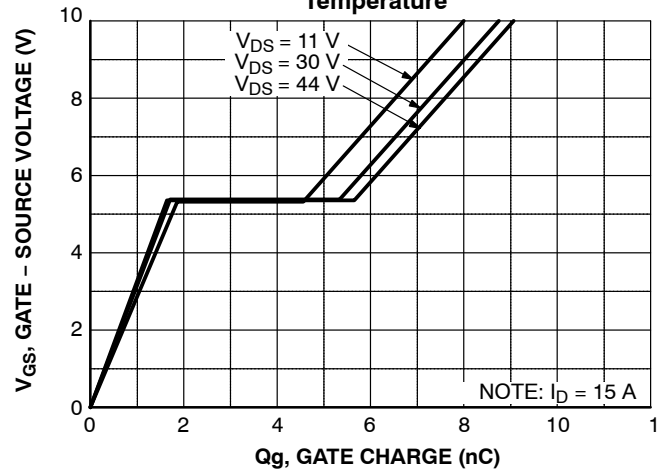
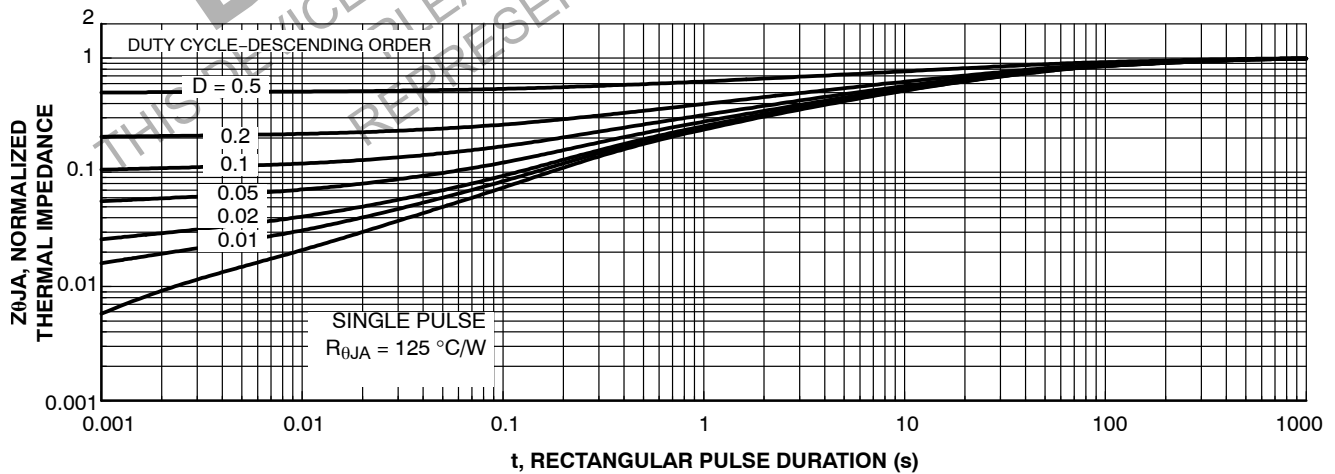
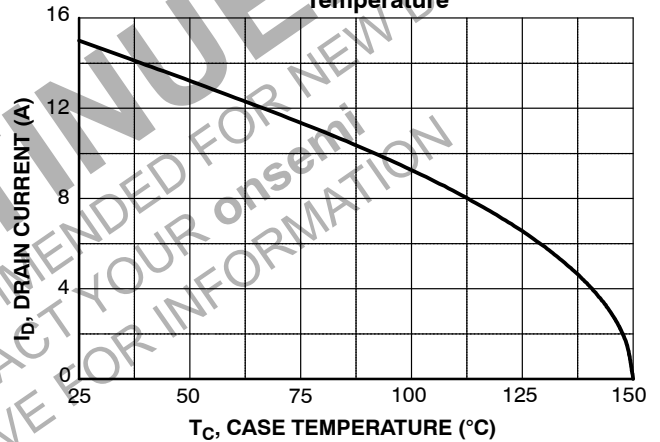
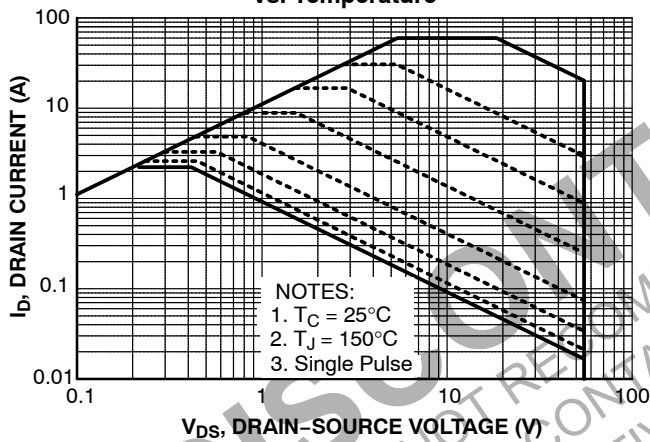
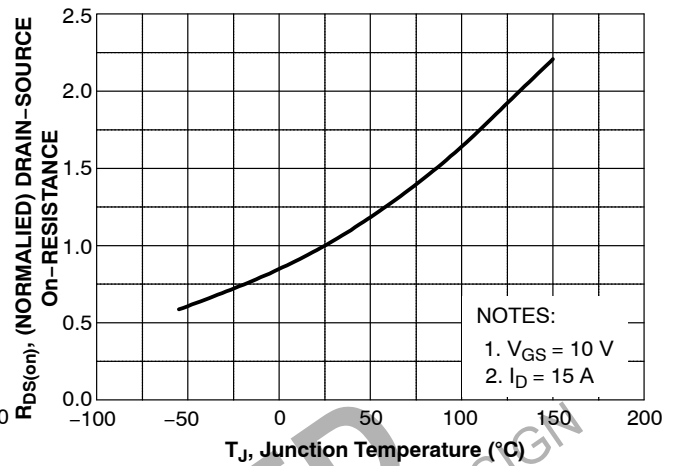
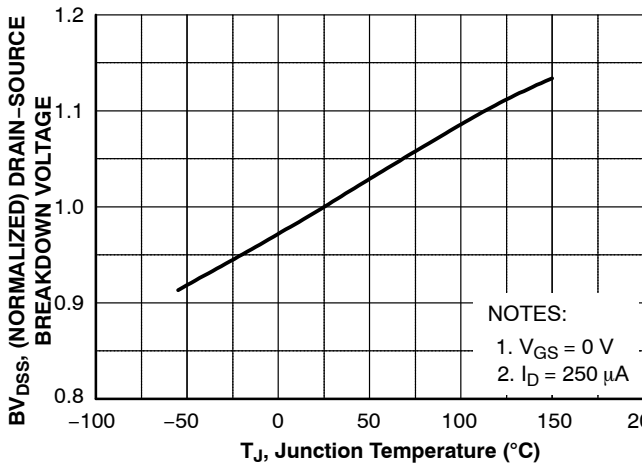


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (CONTINUED)



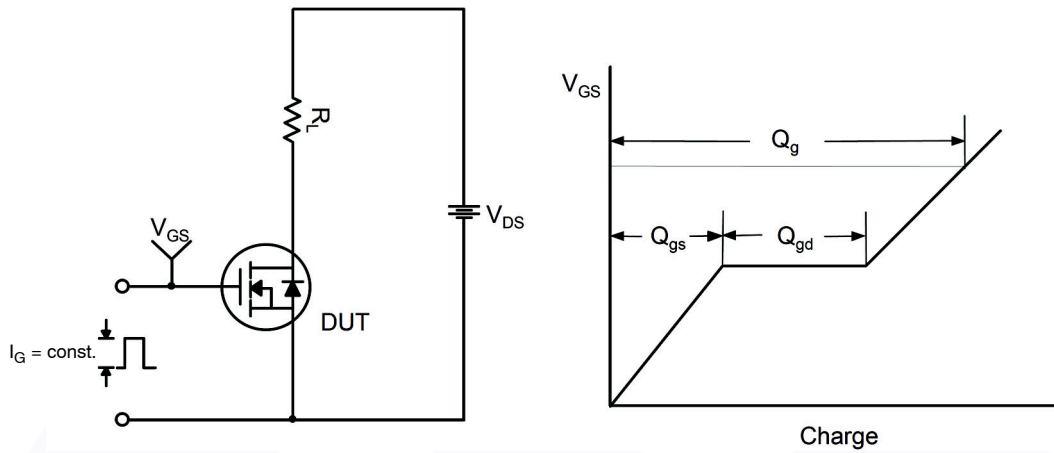


Figure 12. Gate Charge Test Circuit &amp; Waveform

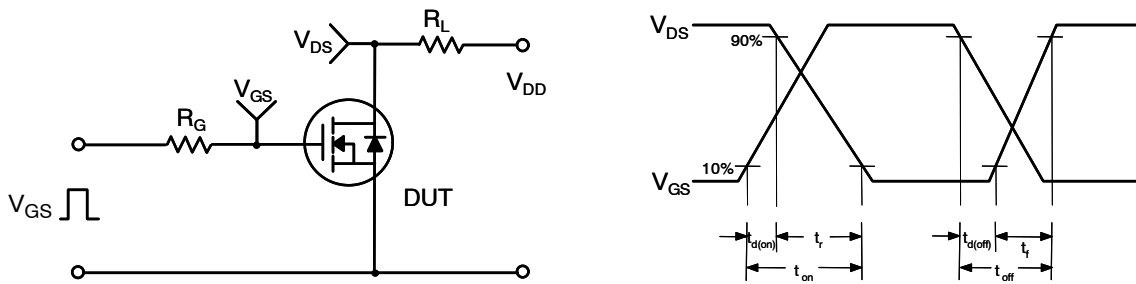


Figure 13. Resistive Switching Test Circuit &amp; Waveforms

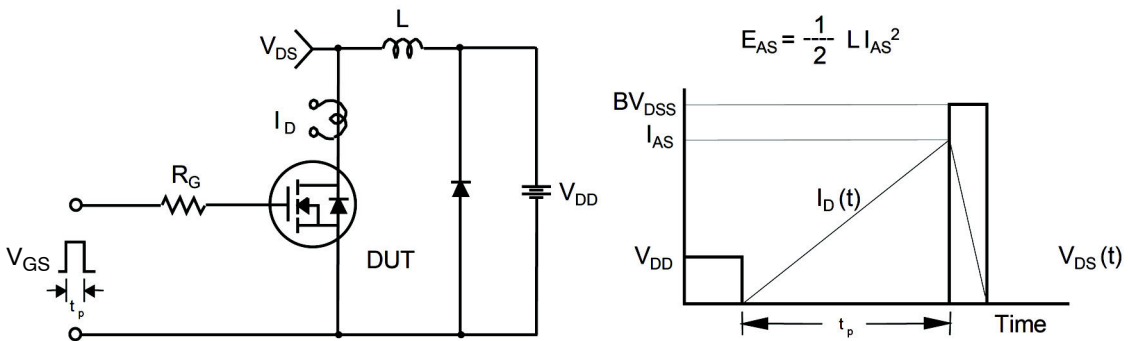


Figure 14. Unclamped Inductive Switching Test Circuit &amp; Waveforms

DUT

$V_{DS}$

$I_{SD}$

Driver

Same Type as DUT

$V_{GS}$

$V_{DD}$

$L$

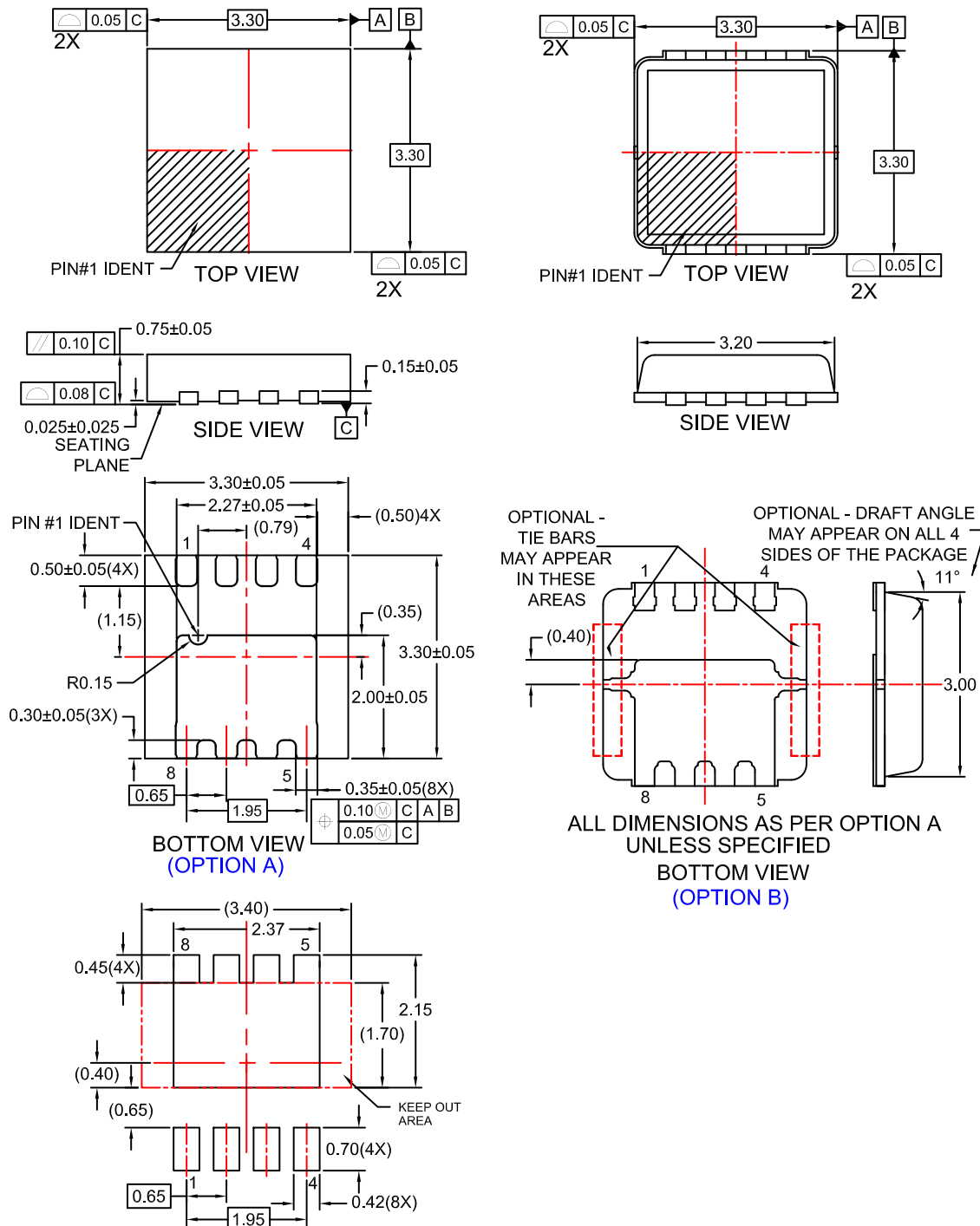
$R_G$

- $dv/dt$  controlled by  $R_G$
- $I_{SD}$  controlled by pulse period



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

DATE 31 OCT 2016



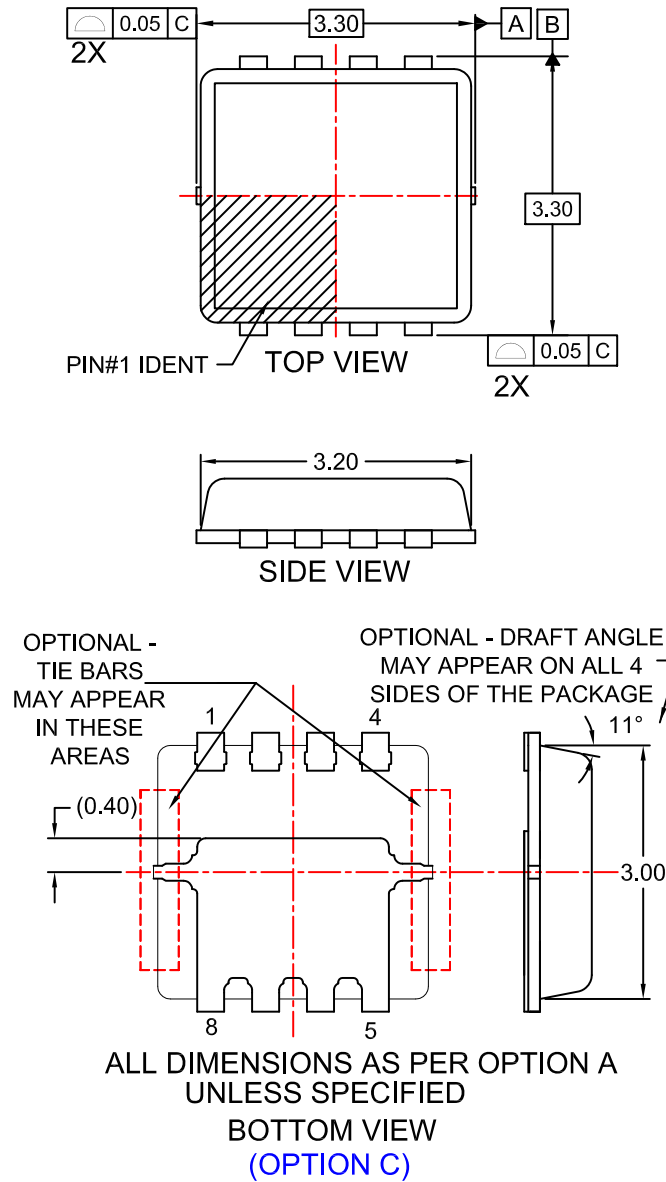
**RECOMMENDED LAND PATTERN**

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DATE 31 OCT 2016



NOTES:

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