

# FDWS86068-F085

## N-Channel POWERTRENCH® MOSFET

100 V, 80 A, 6.4 mΩ

### Features

- Typ  $R_{DS(on)}$  = 5.2 mΩ at  $V_{GS}$  = 10 V,  $I_D$  = 80 A
- Typ  $Q_{g(tot)}$  = 31 nC at  $V_{GS}$  = 10 V,  $I_D$  = 80 A
- UIS Capability
- Qualified to AEC Q101
- Wettable flanks for automatic optical inspection (AOI)
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Automotive Engine Control
- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Steering

### MOSFET MAXIMUM RATINGS ( $T_A$ = 25°C, Unless otherwise specified)

| Symbol          | Parameter                                                                         | Ratings            | Unit      |
|-----------------|-----------------------------------------------------------------------------------|--------------------|-----------|
| $V_{DS}$        | Drain to Source Voltage                                                           | 100                | V         |
| $V_{GS}$        | Gate to Source Voltage                                                            | ±20                | V         |
| $I_D$           | Drain Current ( $T_C$ = 25°C)<br>Continuous ( $V_{GS}$ = 10 V) (Note 1)<br>Pulsed | 80<br>(see Fig. 4) | A         |
| $E_{AS}$        | Single Pulse Avalanche Energy<br>(Note 2)                                         | 36                 | mJ        |
| $P_D$           | Power Dissipation<br>Derate above 25°C                                            | 214<br>1.43        | W<br>W/°C |
| $T_J, T_{STG}$  | Operating and Storage Temperature                                                 | -55 to +150        | °C        |
| $R_{\theta JC}$ | Thermal Resistance<br>(Junction to case)                                          | 0.7                | °C/W      |
| $R_{\theta JA}$ | Maximum Thermal Resistance<br>(Junction to Ambient) (Note 3)                      | 50                 | °C/W      |

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.

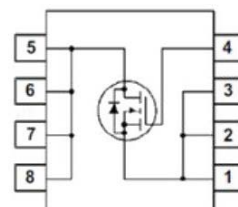


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| $V_{DS}$ | $I_D$ MAX | $R_{DS(on)}$ MAX |
|----------|-----------|------------------|
| 100 V    | 80 A      | 6.4 mΩ           |

### ELECTRICAL CONNECTION

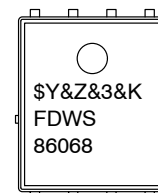


### N-Channel MOSFET



Power 56  
(DFN8)  
CASE 506DW

### MARKING DIAGRAM



|           |                         |
|-----------|-------------------------|
| \$Y       | = ON Semiconductor Logo |
| &Z        | = Assembly Plant Code   |
| &3        | = Numeric Date Code     |
| &K        | = Lot Code              |
| FDWS86068 | = Specific Device Code  |

### ORDERING INFORMATION

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

## PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device         | Package  | Reel Size | Tape Width | Quantity    |
|----------------|----------------|----------|-----------|------------|-------------|
| FDWS86068      | FDWS86068–F085 | Power 56 | 13"       | 12 mm      | 3,000 Units |

## NOTES:

- Current is limited by wirebond configuration.
- Starting  $T_J = 25^\circ\text{C}$ ,  $L = 20\ \mu\text{H}$ ,  $I_{AS} = 60\ \text{A}$ ,  $V_{DD} = 80\ \text{V}$  during inductor charging and  $V_{DD} = 0\ \text{V}$  during time in avalanche.
- $R_{\theta JA}$  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 user's board design. The maximum rating presented here is based on mounting on a 1 in2 pad of 2oz copper.

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

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

## OFF CHARACTERISTICS

|              |                                   |                                                                                                                             |        |        |           |                     |
|--------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------|--------|-----------|---------------------|
| $B_{V_{DS}}$ | Drain to Source Breakdown Voltage | $I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$                                                                           | 100    | –      | –         | V                   |
| $I_{DSS}$    | Drain to Source Leakage Current   | $V_{DS} = 100\ \text{V}$ , $V_{GS} = 0\ \text{V}$<br>( $T_J = 25^\circ\text{C}$ )<br>( $T_J = 175^\circ\text{C}$ ) (Note 4) | –<br>– | –<br>– | 1<br>1    | $\mu\text{A}$<br>mA |
| $I_{GSS}$    | Gate to Source Leakage Current    | $V_{GS} = \pm 20\ \text{V}$                                                                                                 | –      | –      | $\pm 100$ | nA                  |

## ON CHARACTERISTICS

|              |                                  |                                                                                                                          |        |             |           |            |
|--------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------|-------------|-----------|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$                                                                             | 2      | 3           | 4         | V          |
| $R_{DS(on)}$ | Drain to Source On Resistance    | $V_{GS} = 10\ \text{V}$ , $I_D = 80\ \text{A}$<br>( $T_J = 25^\circ\text{C}$ )<br>( $T_J = 175^\circ\text{C}$ ) (Note 4) | –<br>– | 5.2<br>11.4 | 6.4<br>14 | m $\Omega$ |

## DYNAMIC CHARACTERISTICS

|              |                               |                                                                                 |   |      |    |          |
|--------------|-------------------------------|---------------------------------------------------------------------------------|---|------|----|----------|
| $C_{iss}$    | Input Capacitance             | $V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ ,<br>$f = 1\ \text{MHz}$       | – | 2220 | –  | pF       |
| $C_{oss}$    | Output Capacitance            |                                                                                 | – | 1350 | –  | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance  |                                                                                 | – | 19   | –  | pF       |
| $R_g$        | Gate Resistance               | $V_{GS} = 0.5\ \text{V}$ , $f = 1\ \text{MHz}$                                  | – | 0.3  | –  | $\Omega$ |
| $Q_{g(tot)}$ | Total Gate Charge             | $V_{GS} = 0$ to $10\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 80\ \text{A}$ | – | 31   | 43 | nC       |
| $Q_{g(th)}$  | Threshold Gate Charge         | $V_{GS} = 0$ to $2\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 80\ \text{A}$  | – | 4    | –  | nC       |
| $Q_{gs}$     | Gate to Source Gate Charge    | $V_{DD} = 50\ \text{V}$ , $I_D = 80\ \text{A}$                                  | – | 12   | –  | nC       |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |                                                                                 | – | 7    | –  | nC       |

## SWITCHING CHARACTERISTICS

|              |                     |                                                                                                     |   |    |    |    |
|--------------|---------------------|-----------------------------------------------------------------------------------------------------|---|----|----|----|
| $t_{on}$     | Turn-On Time        | $V_{DD} = 50\ \text{V}$ , $I_D = 80\ \text{A}$ ,<br>$V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$ | – | –  | 30 | ns |
| $t_{d(on)}$  | Turn-On Delay Time  |                                                                                                     | – | 15 | –  | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                                     | – | 6  | –  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                                     | – | 24 | –  | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                                     | – | 7  | –  | ns |
| $t_{off}$    | Turn-Off Time       |                                                                                                     | – | –  | 48 | ns |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|          |                                       |                                                                 |   |      |     |    |
|----------|---------------------------------------|-----------------------------------------------------------------|---|------|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $I_{SD} = 80\ \text{A}$ , $V_{GS} = 0\ \text{V}$                | – | 0.95 | 1.3 | V  |
|          |                                       | $I_{SD} = 40\ \text{A}$ , $V_{GS} = 0\ \text{V}$                | – | 0.87 | 1.2 | V  |
| $T_{rr}$ | Reverse Recovery Time                 | $I_F = 80\ \text{A}$ , $dI_{SD}/dt = 100\ \text{A}/\mu\text{s}$ | – | 61   | 80  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |                                                                 | – | 56   | 84  | 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.

- The maximum value is specified by design at  $T_J = 175^\circ\text{C}$ . Product is not tested to this condition in production

## TYPICAL CHARACTERISTICS

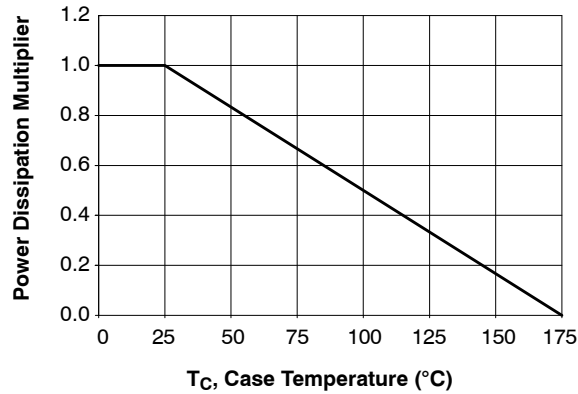
(T<sub>J</sub> = 25°C unless otherwise noted)

Figure 1. Normalized Power Dissipation vs. Case Temperature

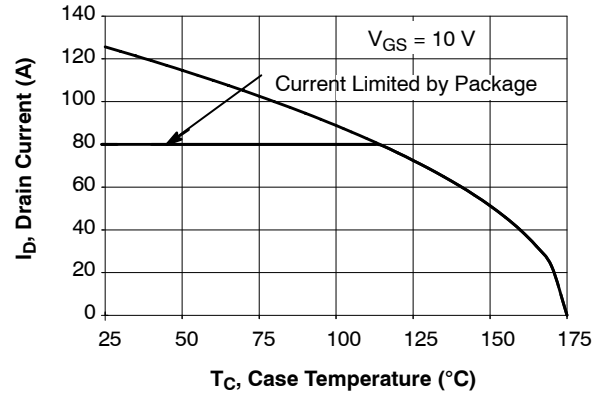


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

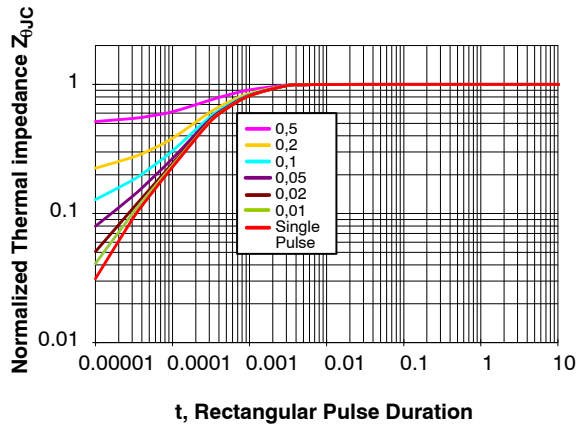


Figure 3. Normalized Maximum Transient Thermal Impedance

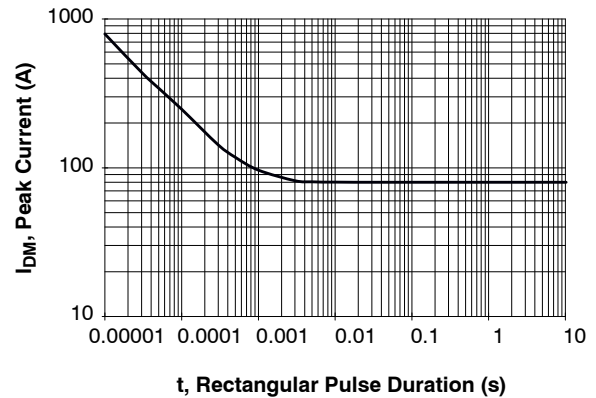


Figure 4. Peak Current Capability

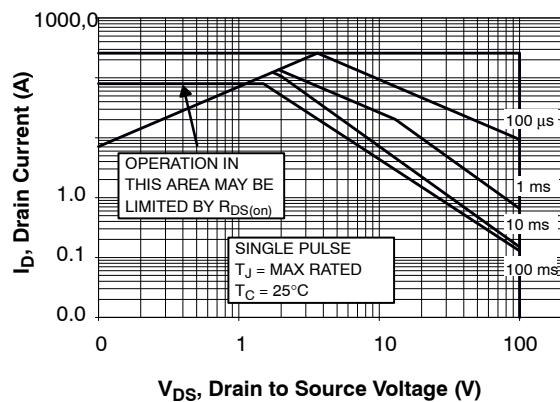


Figure 5. Forward Bias Safe Operating Area

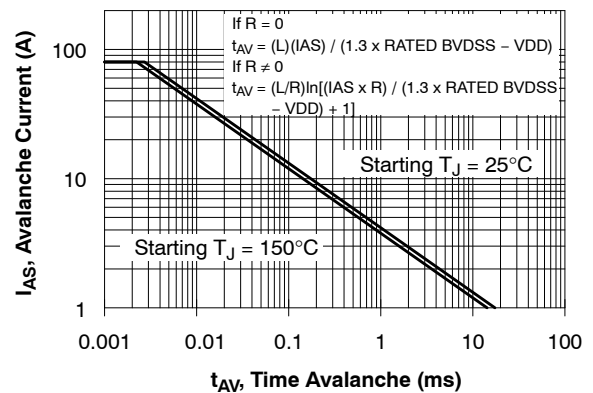


Figure 6. Unclamped Inductive Switching Capability

NOTE: Refer to On Semiconductor Application Notes AN7514 and AN7515

## TYPICAL CHARACTERISTICS

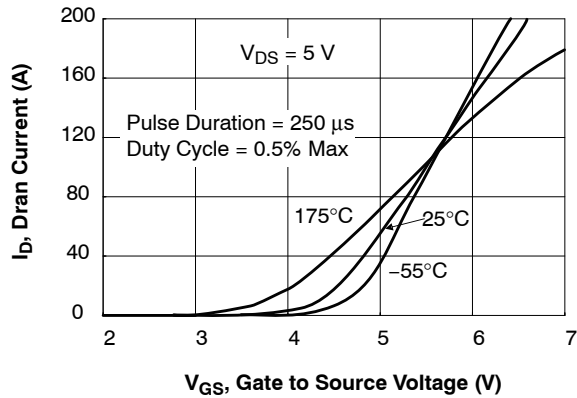
(T<sub>J</sub> = 25°C unless otherwise noted)

Figure 7. Transfer Characteristic

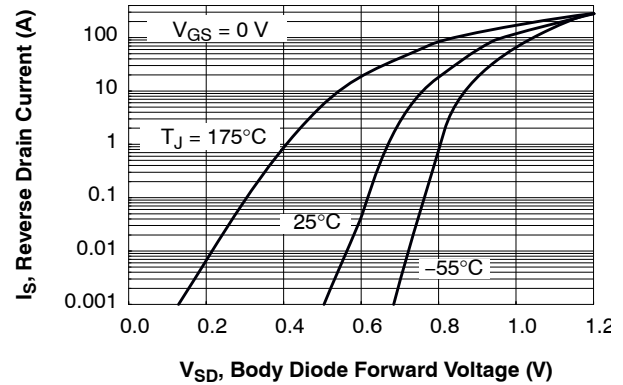


Figure 8. Forward Diode Characteristics

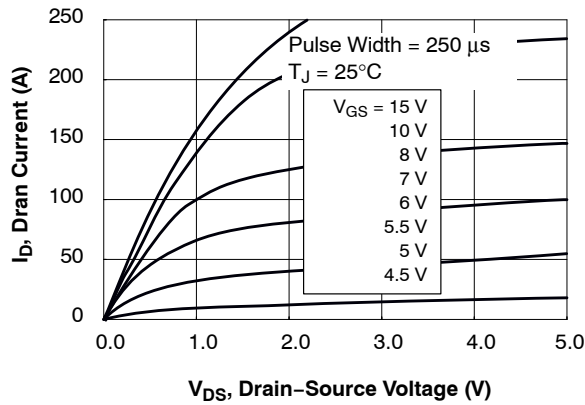


Figure 9.

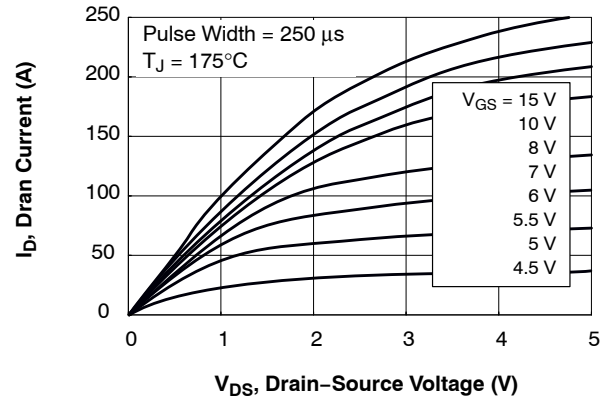
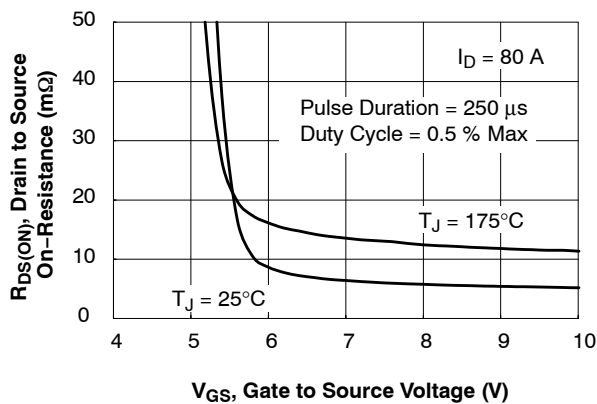
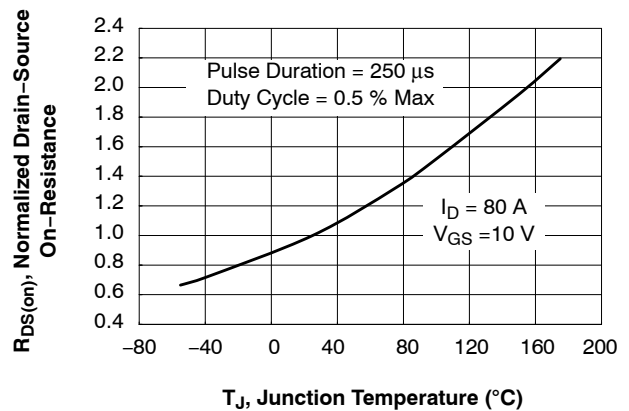


Figure 10. Peak Current Capability

Figure 11. R<sub>DS(on)</sub> vs. Gate VoltageFigure 12. Normalized R<sub>DS(on)</sub> vs. Junction Temperature

## TYPICAL CHARACTERISTICS

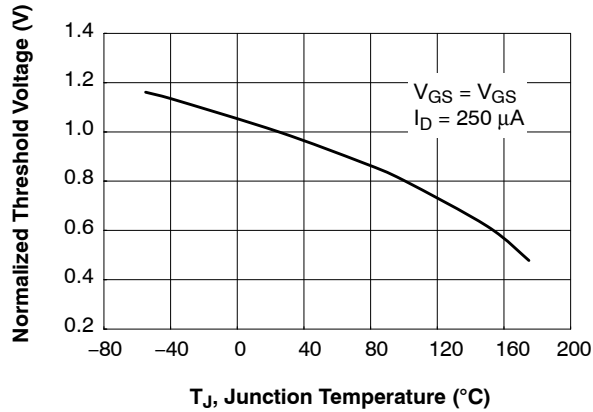
(T<sub>J</sub> = 25°C unless otherwise noted)

Figure 13. Normalized Gate Threshold Voltage vs. Temperature

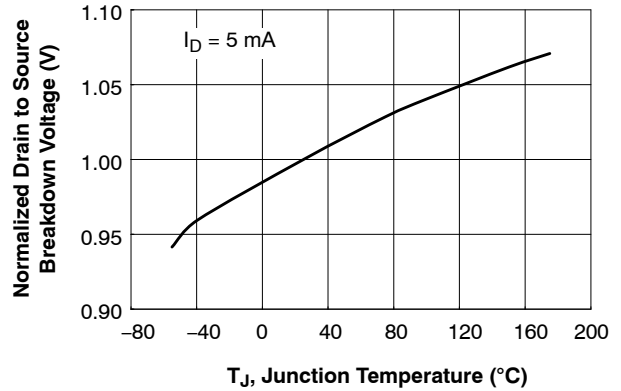


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

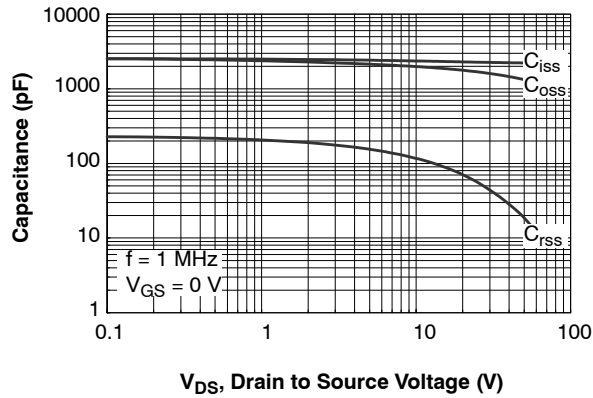


Figure 15. Capacitance vs. Drain to Source Voltage

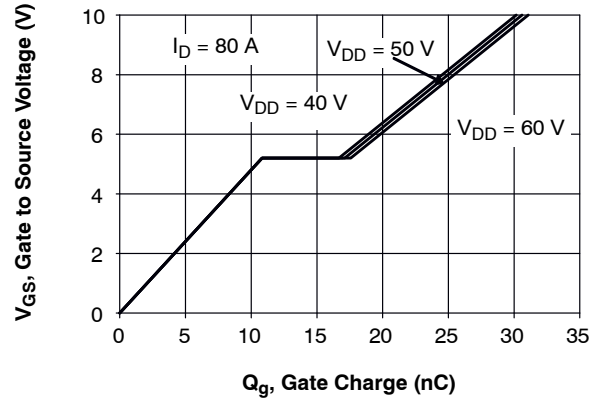
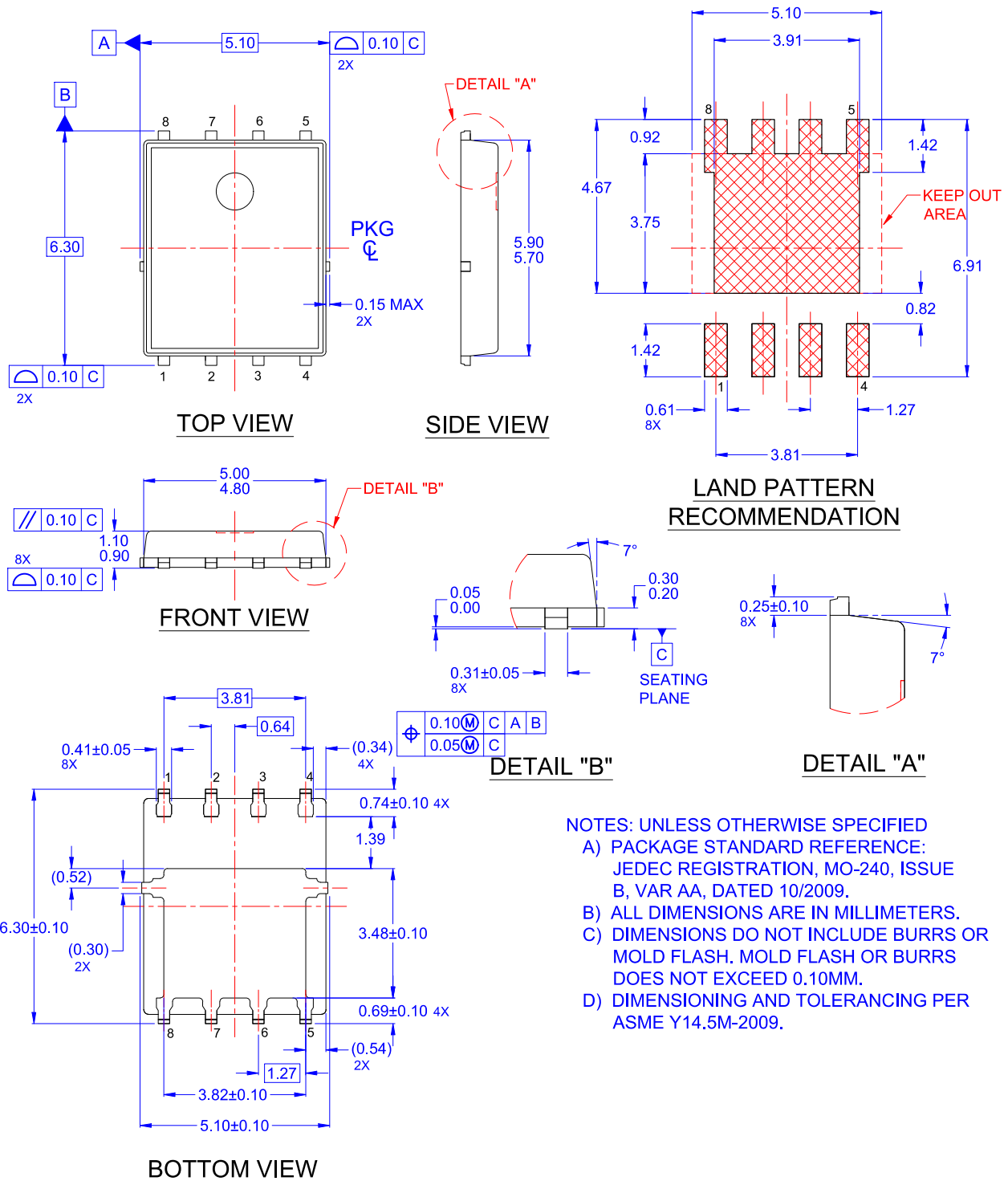


Figure 16. Gate Charge vs. Gate to Source Voltage

**DFN8 5.1x6.3, 1.27P**  
**CASE 506DW**  
**ISSUE O**

DATE 28 FEB 2017



- NOTES: UNLESS OTHERWISE SPECIFIED**
- A) PACKAGE STANDARD REFERENCE: JEDEC REGISTRATION, MO-240, ISSUE B, VAR AA, DATED 10/2009.
  - 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.

|                         |                                  |                                                                                                                                                                                  |
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| <b>NEW STANDARD:</b>    |                                  |                                                                                                                                                                                  |
| <b>DESCRIPTION:</b>     | <b>DFN8 5.1x6.3, 1.27P</b>       |                                                                                                                                                                                  |
|                         |                                  | <b>PAGE 1 OF 2</b>                                                                                                                                                               |

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