# MOSFET – N-Channel, UniFET™

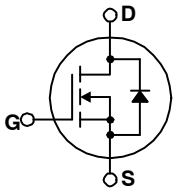
## 75 V, 210 A, 5.5 mΩ

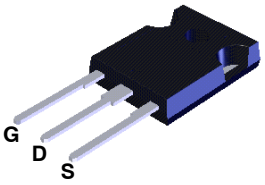
# FDH210N08

ON Semiconductor®

www.onsemi.com

| $V_{DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 75 V | 5.5 mΩ | 210 A |




**TO−247−3**
**CASE 340CK**

### Description

UniFET™ MOSFET is ON Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on−state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.

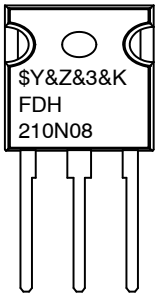
### Features

- $R_{DS(ON)}$ = 4.65 mΩ (Typ.), $V_{GS}$ = 10 V, $I_D$ = 125 A
- Low Gate Charge (Typ. 232 nC)
- Low $C_{rss}$ (Typ. 262 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- This Device is Pb−Free and is RoHS Compliant

### Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies

### MARKING DIAGRAM




| | |
|---|---|
| $Y | = ON Semiconductor Logo |
| &Z | = Assembly Plant Code |
| &3 | = Data Code (Year & Week) |
| &K | = Lot |
| FDH210N08 | = Specific Device Code |

### ORDERING INFORMATION

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

**ABSOLUTE MAXIMUM RATINGS** ($T_C$ = 25°C, Unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain−Source Voltage | | 75 | V |
| $I_D$ | Drain Current | Continuous ($T_C$ = 25°C) | 210 | A |
| | | Continuous ($T_C$ = 100°C) | 132 | |
| $I_{DM}$ | Drain Current | Pulsed (Note 1) | 840 | A |
| $V_{GSS}$ | Gate−Source Voltage | | ±20 | V |
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note 2) | | 9375 | mJ |
| $I_{AR}$ | Avalanche Current (Note 1) | | 210 | A |
| $E_{AR}$ | Repetitive Avalanche Energy (Note 1) | | 46.2 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | | 4.5 | V/ns |
| $P_D$ | Power Dissipation | ($T_C$ = 25°C) | 462 | W |
| | | Derate Above 25°C | 3.7 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | −55 to +175 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering, 1/8″ from Case for 5 Seconds | | 300 | °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.

1. Repetitive rating: pulse width limited by maximum junction temperature.
2. L = 0.4 mH, $I_{AS}$ = 125 A, $V_{DD}$ = 50 V, $R_G$ = 25 Ω, starting $T_J$ = 25°C.
3. $I_{SD}$ ≤ 125 A, di/dt ≤ 260 A/μs, $V_{DD}$ ≤ $BV_{DSS}$, starting $T_J$ = 25°C.

**THERMAL CHARACTERISTICS**

| Symbol | Parameter | FDH210N08 | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 0.27 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. | 40 | °C/W |

**PACKAGE MARKING AND ORDERING INFORMATION**

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|---|
| FDH210N08 | FDH210N08 | TO−247 | Tube | N/A | N/A | 30 Units |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain−Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 75 | | | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | | 0.1 | | V/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 75 V, $V_{GS}$ = 0 V | | | 20 | μA |
| | | $V_{DS}$ = 60 V, TJ = 150°C | | | 250 | |
| $I_{GSSF}$ | Gate−Body Leakage Current, Forward | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | | | 200 | nA |
| $I_{GSSR}$ | Gate−Body Leakage Current, Reverse | $V_{GS}$ = −20 V, $V_{DS}$ = 0 V | | | −200 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 2.0 | | 4.0 | V |
| $R_{DS(ON)}$ | Static Drain−Source On−Resistance | $V_{GS}$ = 10 V, $I_D$ = 125 A | | 4.65 | 5.5 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 25 V, $I_D$ = 125 A | | 200 | | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{ISS}$ | Input Capacitance | $V_{DS}$ = 25 V, $V_{GS}$ = 0 V, f = 1 MHz | | 8743 | 11340 | pF |
| $C_{OSS}$ | Output Capacitance | | | 2134 | 2778 | pF |
| $C_{RSS}$ | Reverse Transfer Capacitance | | | 262 | 393 | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(ON)}$ | Turn-On Delay Time | $V_{DD}$ = 37.5 V, $I_D$ = 69 A, $R_G$ = 25 Ω (Note 4) | | 100 | 210 | ns |
| $t_r$ | Turn−On Rise Time | | | 410 | 830 | ns |
| $t_{d(OFF)}$ | Turn-Off Delay Time | | | 630 | 1270 | ns |
| $t_f$ | Turn−Off Fall Time | | | 290 | 590 | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 60 V, $I_D$ = 125 A, $V_{GS}$ = 10 V (Note 4) | | 232 | 301 | nC |
| $Q_{gs}$ | Gate−Source Charge | | | 58 | | nC |
| $Q_{gd}$ | Gate−Drain Charge | | | 77 | | nC |
| **DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS** | | | | | | |
| $I_S$ | Maximum Continuous Drain−Source Diode Forward Current | | | | 210 | A |
| $I_{SM}$ | Maximum Pulsed Drain−Source Diode Forward Current | | | | 840 | A |
| $V_{SD}$ | Drain−Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 125 A | | | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0 V, $I_S$ = 125 A, $dI_F/dt$ = 100 A/μs | | 123 | | ns |
| $Q_{RR}$ | Reverse Recovered Charge | | | 420 | | 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. Essentially independent of operating temperature typical characteristics.

## TYPICAL PERFORMANCE CHARACTERISTICS

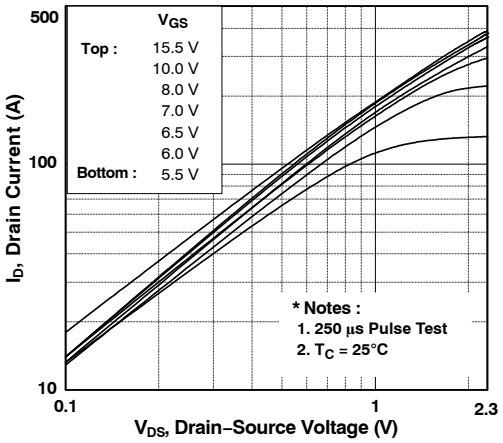



Figure 1. On−Region Characteristics

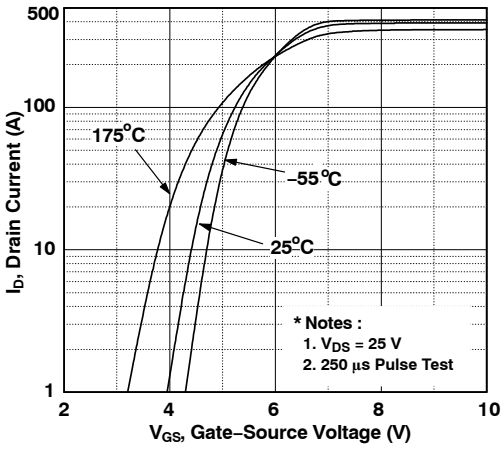



Figure 2. Transfer Characteristics

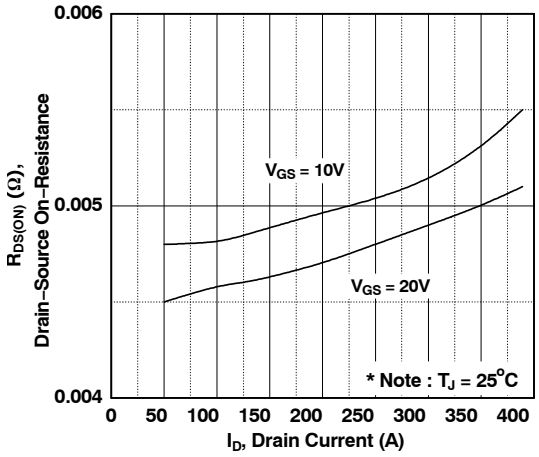



Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

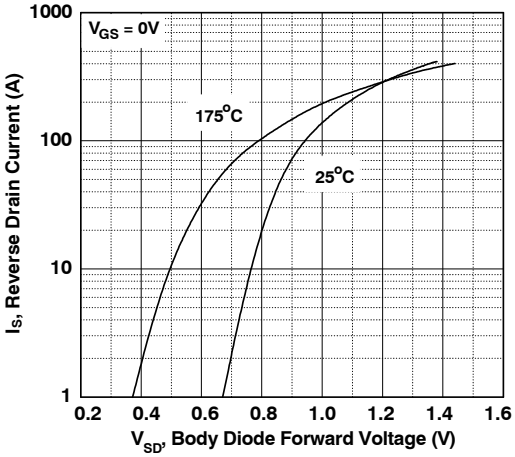



Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

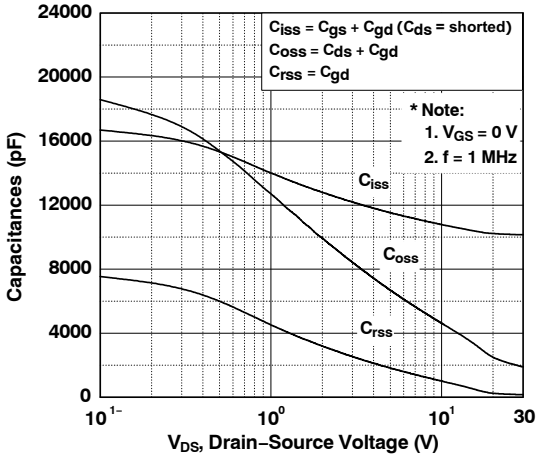



Figure 5. Capacitance Characteristics

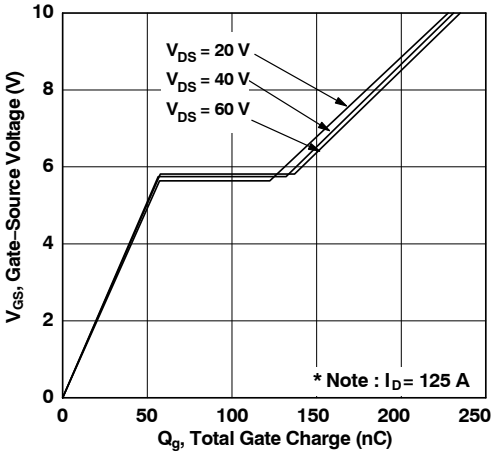



Figure 6. Gate Charge Characteristics

## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

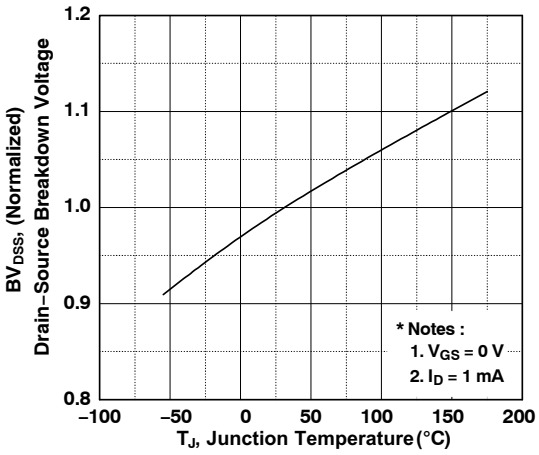



**Figure 7. Breakdown Voltage Variation vs. Temperature**

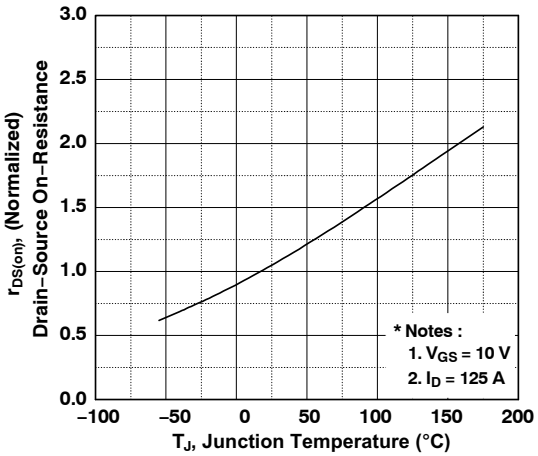



**Figure 8. On− Resistance Variation vs. Temperature**

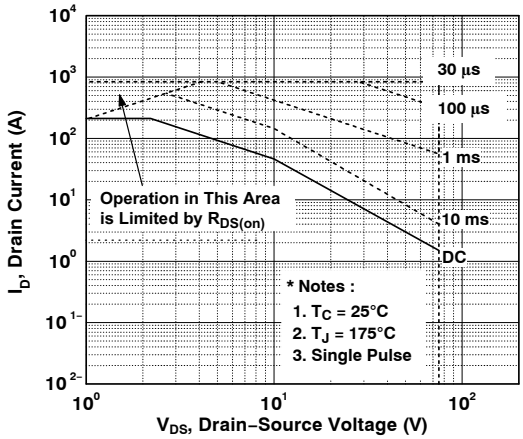



**Figure 9. Maximum Safe Operating Area**

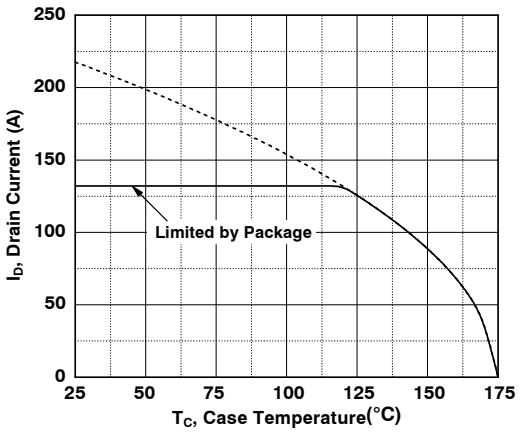



**Figure 10. Maximum Drain Current vs. Case Temperature**

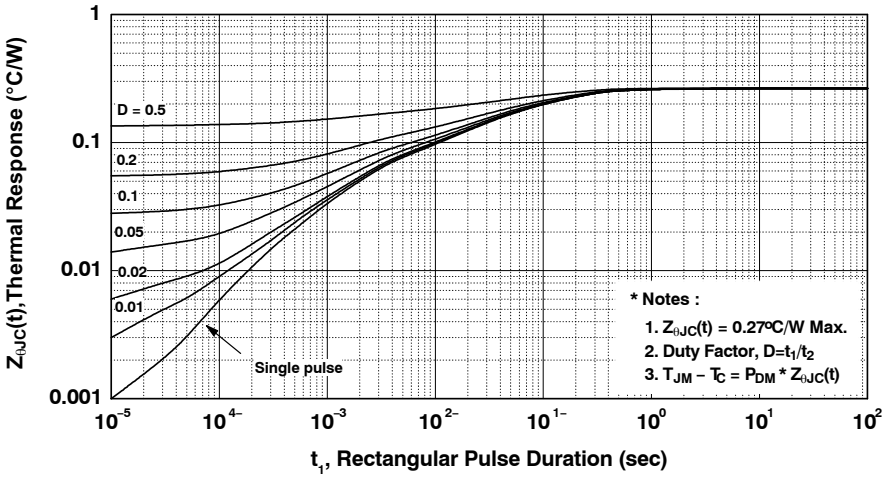



**Figure 11. Transient Thermal Response Curve**

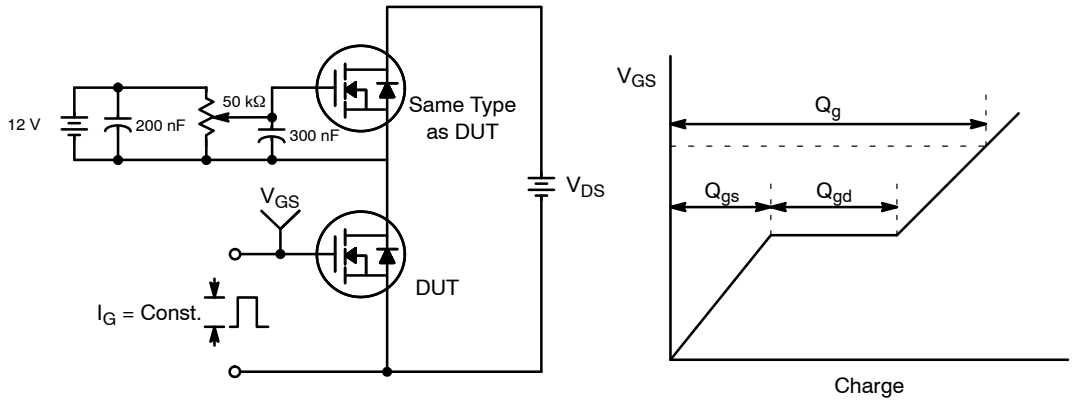



**Figure 12. Gate Charge Test Circuit & Waveform**

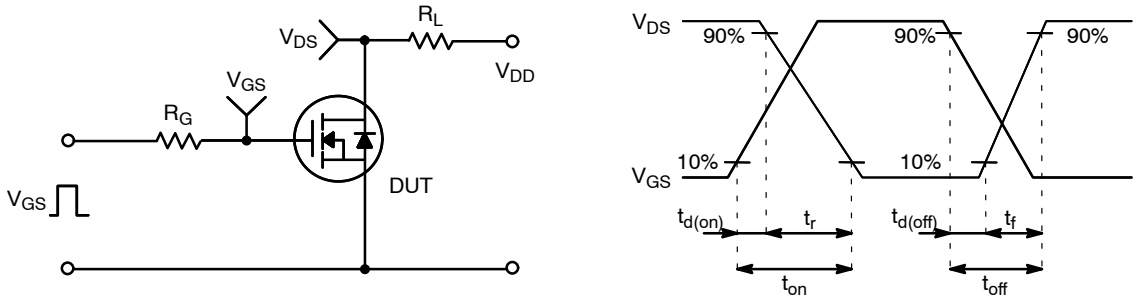



**Figure 13. Resistive Switching Test Circuit & Waveforms**

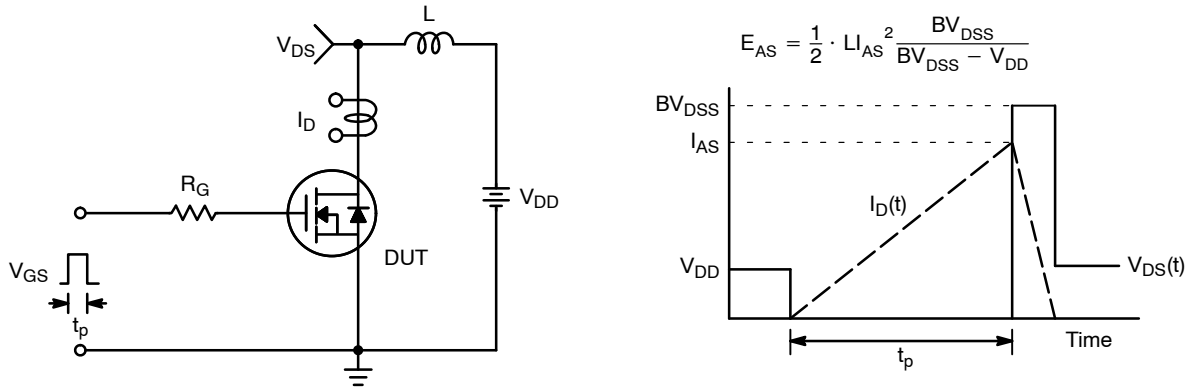



**Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms**

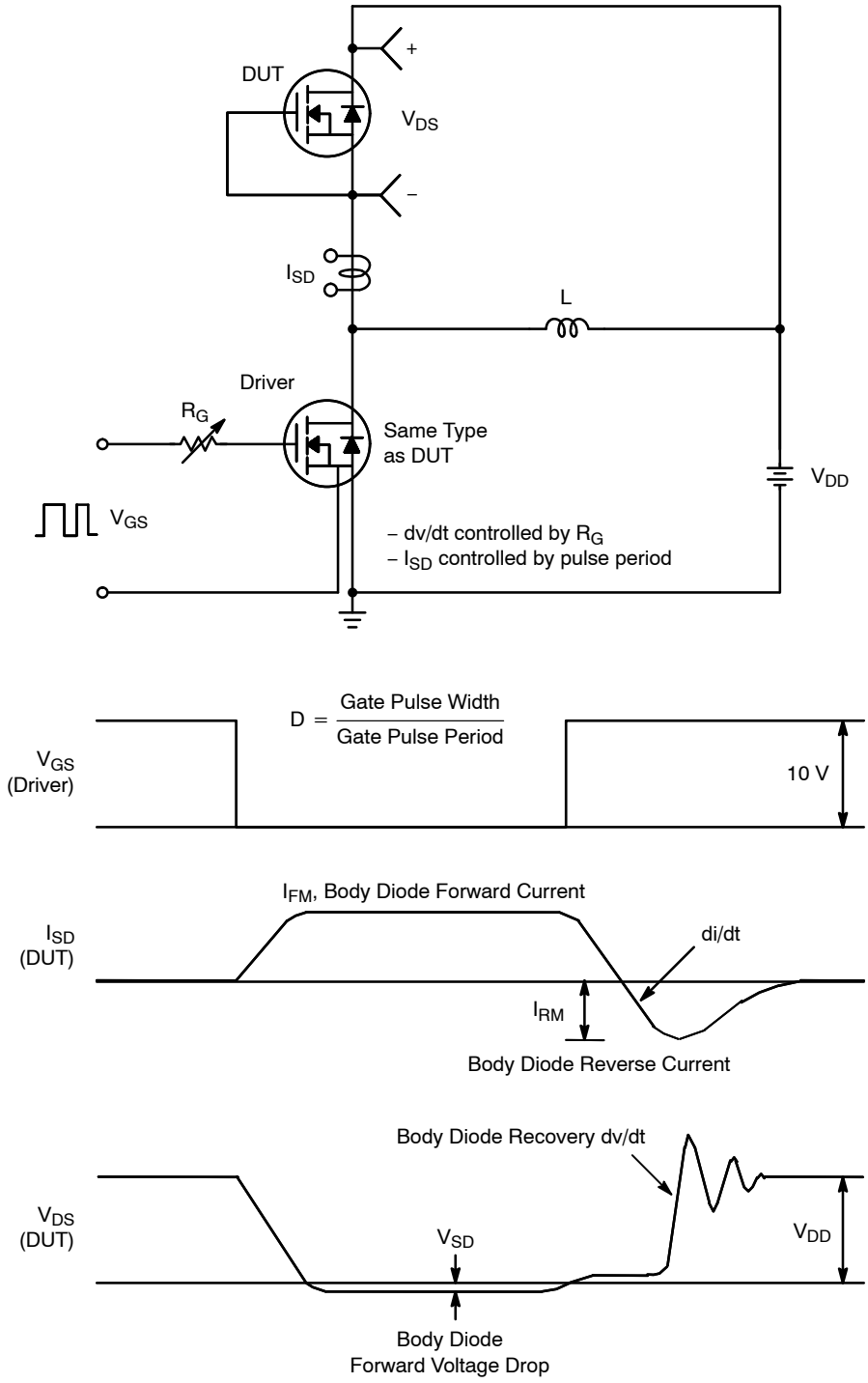


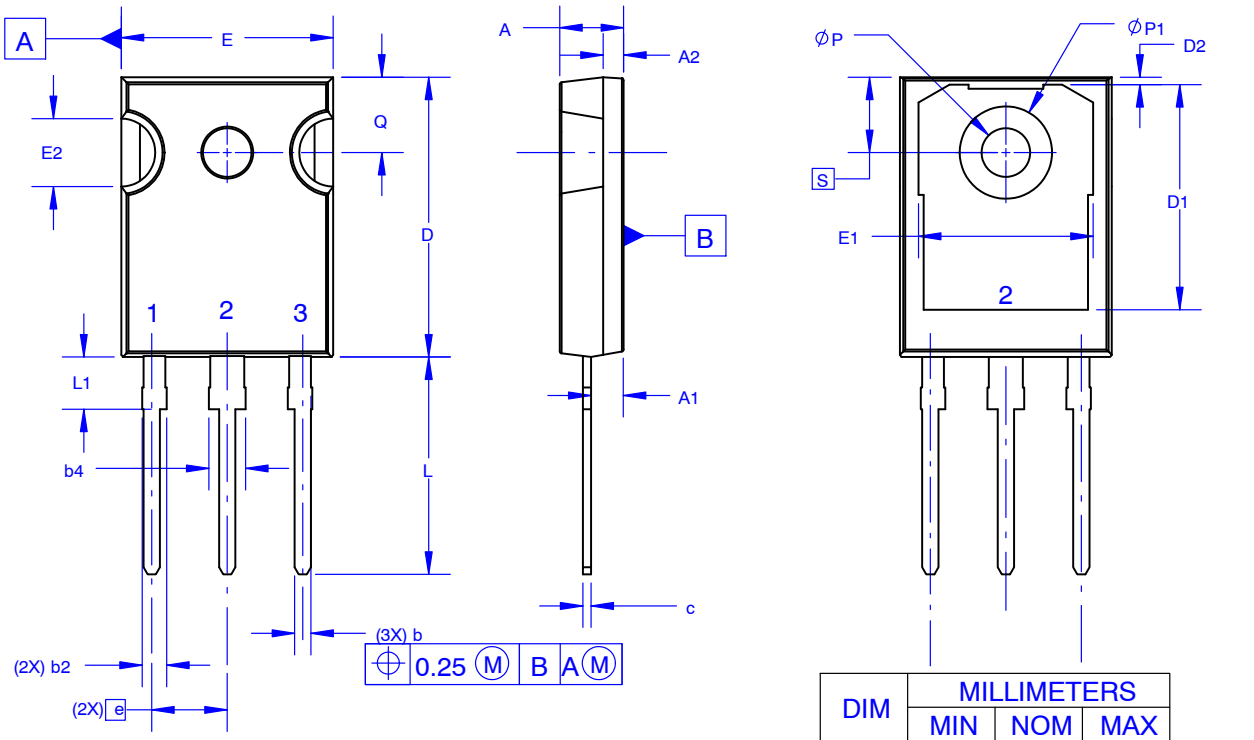

**Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms**

# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

ON Semiconductor®

**TO−247−3LD SHORT LEAD**
CASE 340CK
ISSUE A

DATE 31 JAN 2019

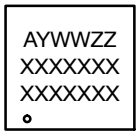



| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.58 | 4.70 | 4.82 |
| A1 | 2.20 | 2.40 | 2.60 |
| A2 | 1.40 | 1.50 | 1.60 |
| b | 1.17 | 1.26 | 1.35 |
| b2 | 1.53 | 1.65 | 1.77 |
| b4 | 2.42 | 2.54 | 2.66 |
| c | 0.51 | 0.61 | 0.71 |
| D | 20.32 | 20.57 | 20.82 |
| D1 | 13.08 | ~ | ~ |
| D2 | 0.51 | 0.93 | 1.35 |
| E | 15.37 | 15.62 | 15.87 |
| E1 | 12.81 | ~ | ~ |
| E2 | 4.96 | 5.08 | 5.20 |
| e | ~ | 5.56 | ~ |
| L | 15.75 | 16.00 | 16.25 |
| L1 | 3.69 | 3.81 | 3.93 |
| ØP | 3.51 | 3.58 | 3.65 |
| ØP1 | 6.60 | 6.80 | 7.00 |
| Q | 5.34 | 5.46 | 5.58 |
| S | 5.34 | 5.46 | 5.58 |

NOTES: UNLESS OTHERWISE SPECIFIED.

A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

**GENERIC**
**MARKING DIAGRAM***




XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

| | | |
|---|---|---|
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| **DESCRIPTION:** | **TO−247−3LD SHORT LEAD** | **PAGE 1 OF 1** |

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