

# MOSFET – N-Channel, UniFET™ 75 V, 210 A, 5.5 mΩ

## FDH210N08

### 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

- $R_{DS(ON)} = 4.65 \text{ m}\Omega$  (Typ.),  $V_{GS} = 10 \text{ V}$ ,  $I_D = 125 \text{ A}$
- 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

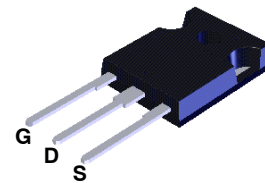
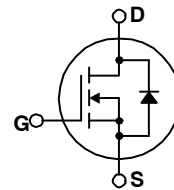
- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies



ON Semiconductor®

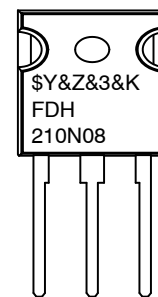
[www.onsemi.com](http://www.onsemi.com)

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



TO-247-3  
CASE 340CK

### 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.

# FDH210N08

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, Unless otherwise noted)

Symbol	Parameter	Value	Unit
V <sub>DSS</sub>	Drain-Source Voltage	75	V
I <sub>D</sub>	Drain Current	Continuous (T <sub>C</sub> = 25°C)	210
		Continuous (T <sub>C</sub> = 100°C)	132
I <sub>DM</sub>	Drain Current	Pulsed (Note 1)	840
V <sub>GSS</sub>	Gate-Source Voltage	±20	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	9375	mJ
I <sub>AR</sub>	Avalanche Current (Note 1)	210	A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	46.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C)	462
		Derate Above 25°C	3.7
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +175	°C
T <sub>L</sub>	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<sub>AS</sub> = 125 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25 Ω, starting T<sub>J</sub> = 25°C.
3. I<sub>SD</sub> ≤ 125 A, di/dt ≤ 260 A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, starting T<sub>J</sub> = 25°C.

## THERMAL CHARACTERISTICS

Symbol	Parameter	FDH210N08	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction to Case, Max.	0.27	°C/W
R <sub>θJA</sub>	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

# FDH210N08

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	75			V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		0.1		$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}$			20	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, T_J = 150^\circ\text{C}$			250	
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			200	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-200	nA

### ON CHARACTERISTICS

$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 125\text{ A}$		4.65	5.5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 25\text{ V}, I_D = 125\text{ A}$		200		S

### DYNAMIC CHARACTERISTICS

$C_{ISS}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		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	$V_{DD} = 37.5\text{ V}, I_D = 69\text{ A}, R_G = 25\ \Omega$ (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	$V_{DS} = 60\text{ V}, I_D = 125\text{ A}, V_{GS} = 10\text{ V}$ (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	$V_{GS} = 0\text{ V}, I_S = 125\text{ A}$			1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 125\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$		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

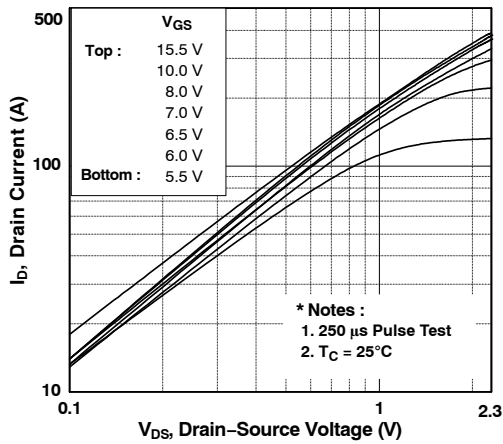


Figure 1. On-Region Characteristics

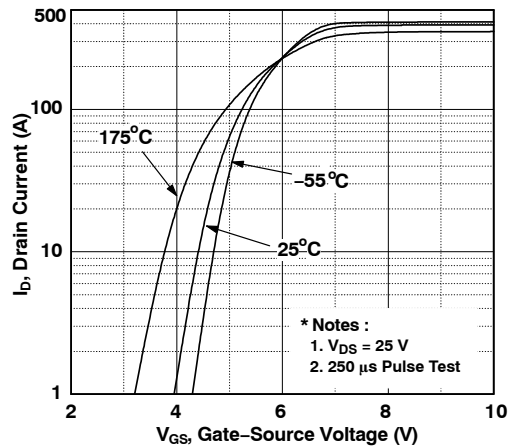


Figure 2. Transfer Characteristics

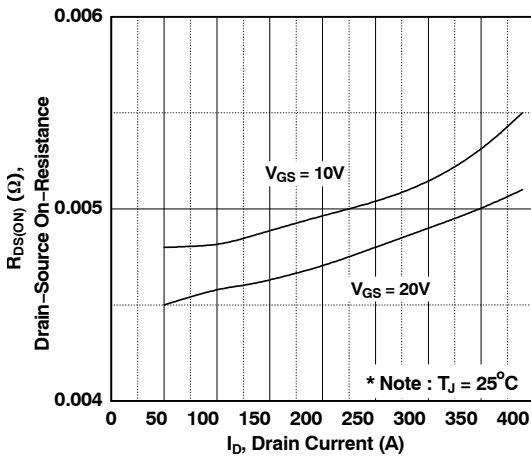


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

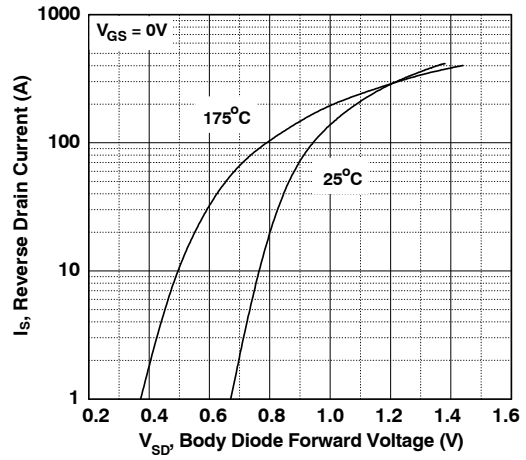


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

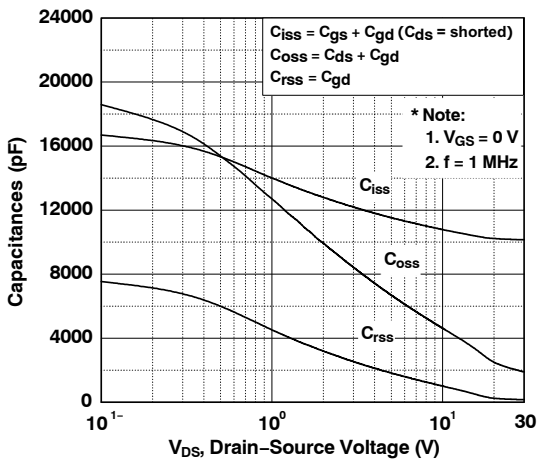


Figure 5. Capacitance Characteristics

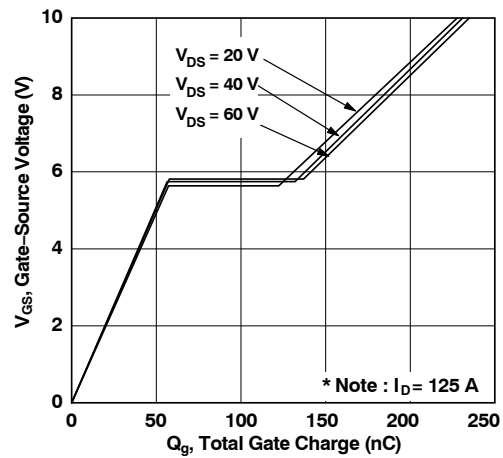


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

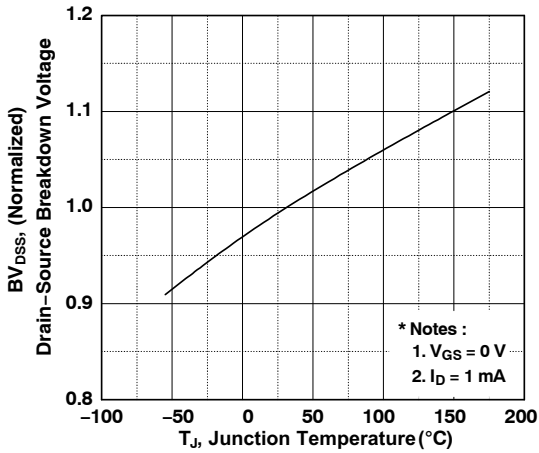


Figure 7. Breakdown Voltage Variation vs. Temperature

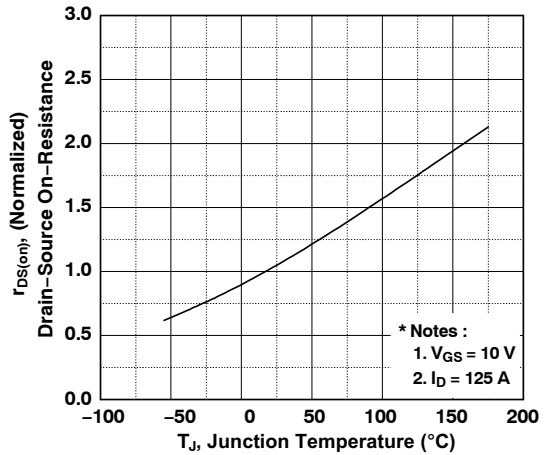


Figure 8. On-Resistance Variation vs. Temperature

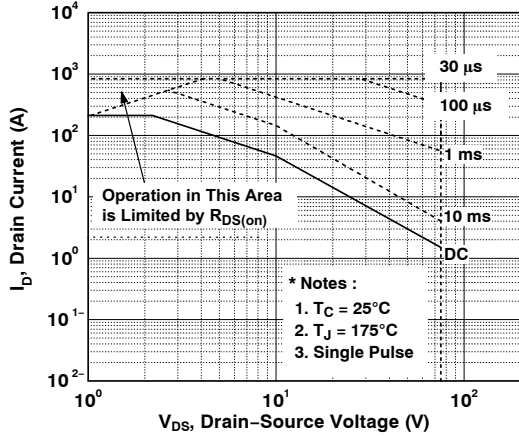


Figure 9. Maximum Safe Operating Area

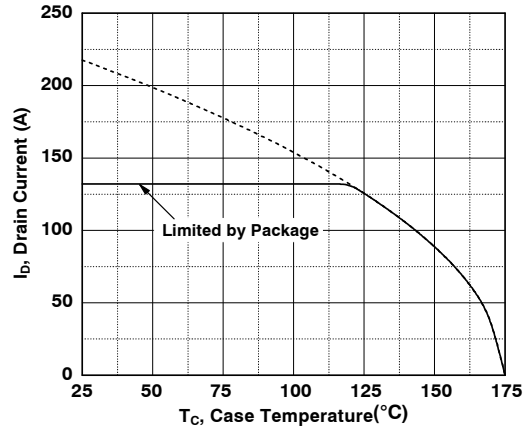


Figure 10. Maximum Drain Current vs. Case Temperature

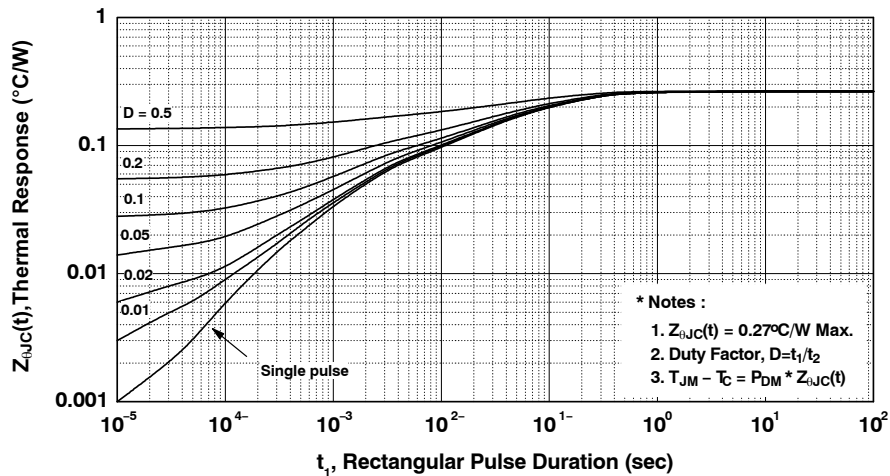


Figure 11. Transient Thermal Response Curve

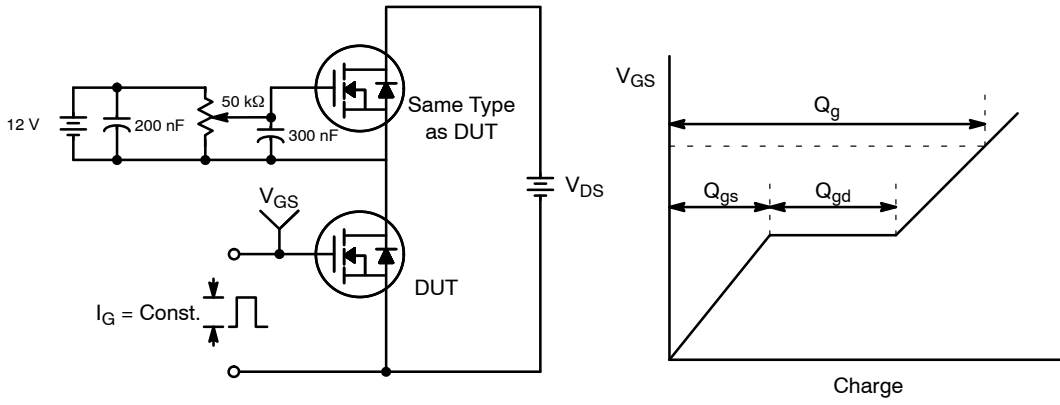


Figure 12. Gate Charge Test Circuit & Waveform

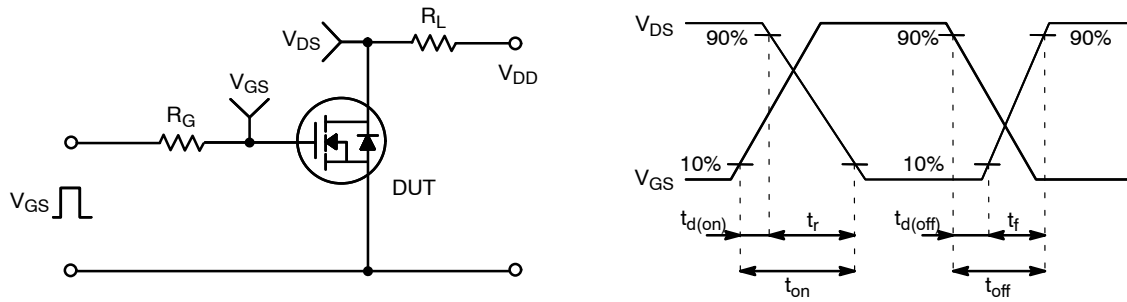


Figure 13. Resistive Switching Test Circuit & Waveforms

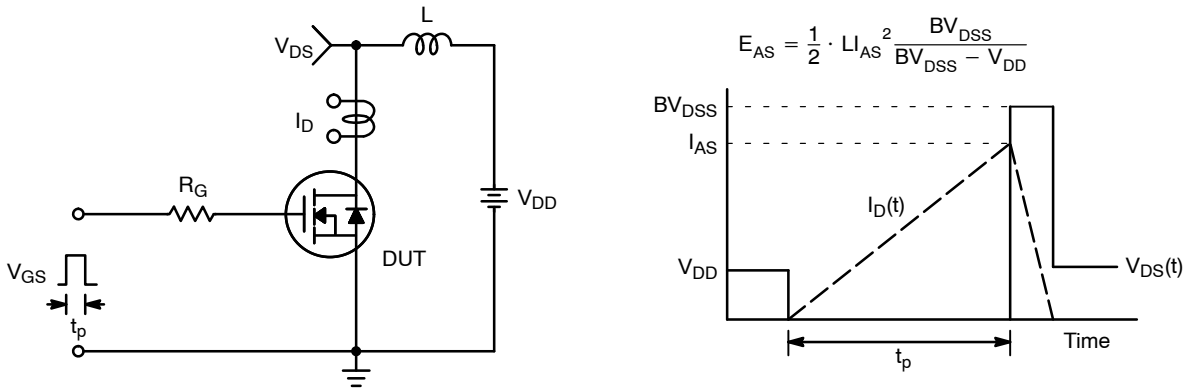
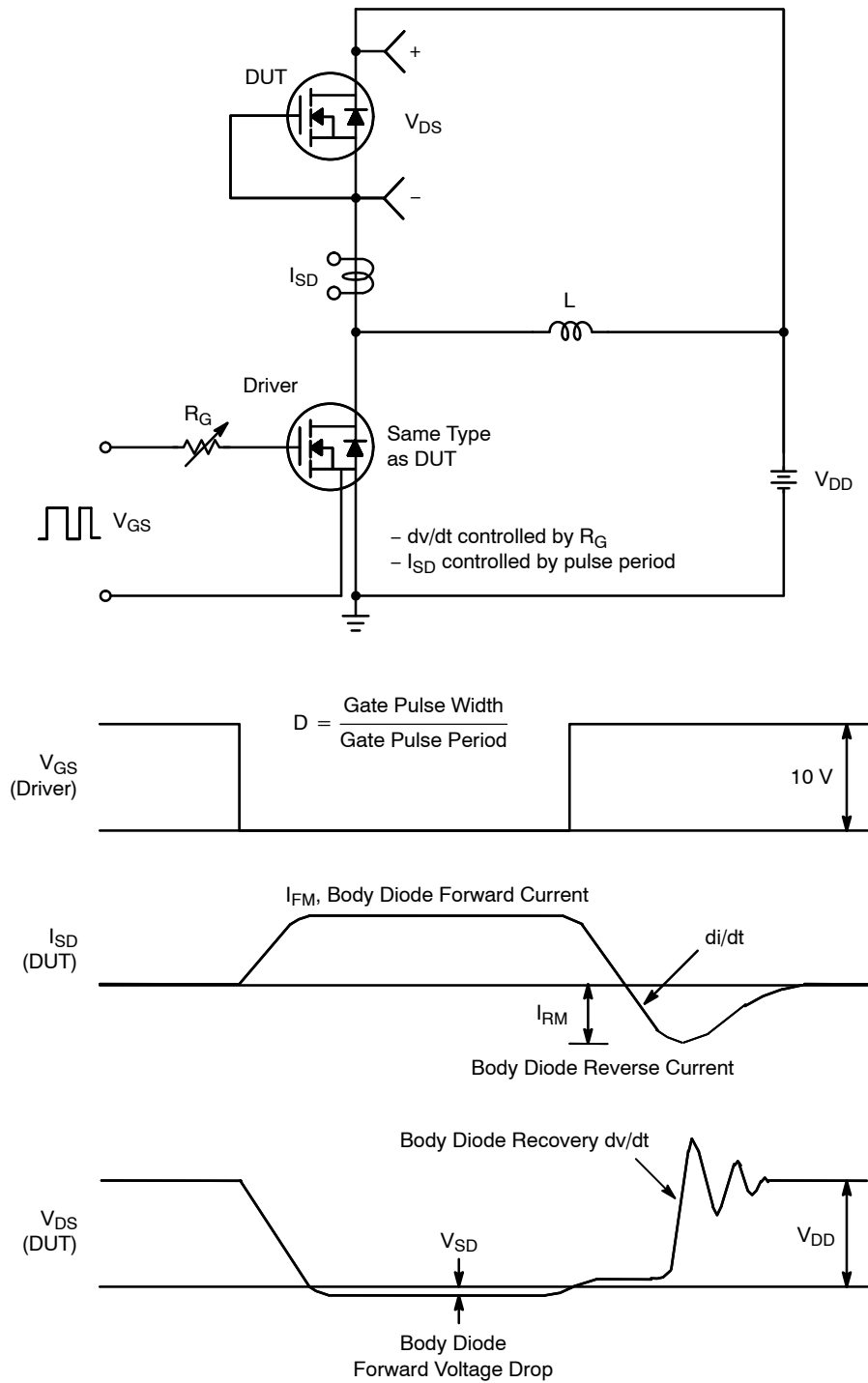


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

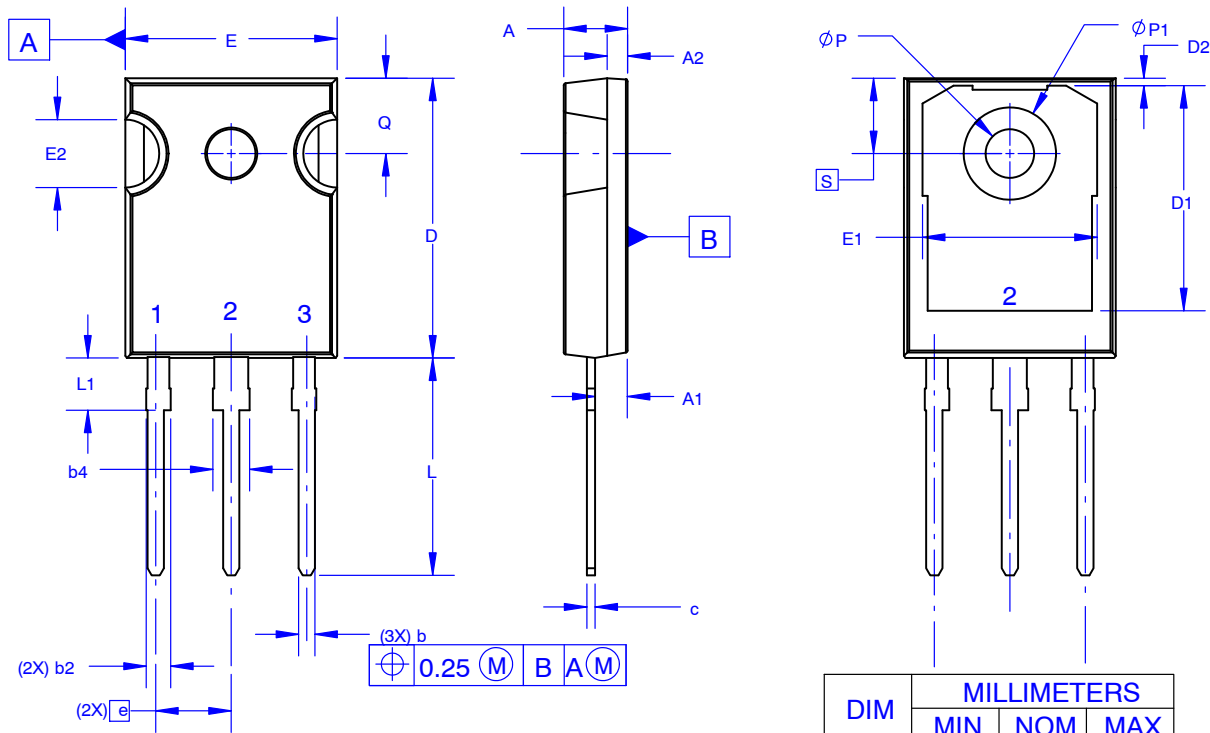
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**Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms**

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

DATE 31 JAN 2019



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.

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

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