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# FDH210N08

## N-Channel UniFET™ MOSFET

75 V, 210 A, 5.5 mΩ

### Features

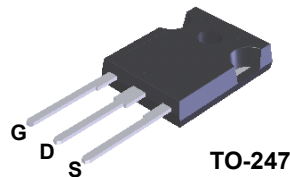
- $R_{DS(on)} = 4.65 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 125 \text{ A}$
- Low Gate Charge (Typ. 232 nC)
- Low  $C_{rss}$  (Typ. 262 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability

### Applications

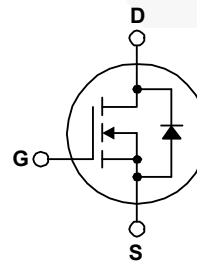
- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies

### Description

UniFET™ MOSFET is Fairchild 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.



TO-247



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDH210N08	Unit
$V_{DSS}$	Drain-Source Voltage	75	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	210	A
		132	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	840	A
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	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 ( $T_C = 25^\circ\text{C}$ )	462	W
	- Derate Above $25^\circ\text{C}$	3.7	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

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

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	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	$\mu\text{A}$
$I_{GSSF}$	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
<b>On Characteristics</b>						
$V_{GS(th)}$	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	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 25\text{ V}, I_D = 125\text{ A}$	--	200	--	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	8743	11340	pF
$C_{oss}$	Output Capacitance		--	2134	2778	pF
$C_{rss}$	Reverse Transfer Capacitance		--	262	393	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 37.5\text{ V}, I_D = 69\text{ A},$ $R_G = 25\ \Omega$	--	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		(Note 4)	--	290	590
$Q_g$	Total Gate Charge	$V_{DS} = 60\text{ V}, I_D = 125\text{ A},$ $V_{GS} = 10\text{ V}$	--	232	301	nC
$Q_{gs}$	Gate-Source Charge		--	58	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4)	--	77	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	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 Recovery Charge		--	420	--	nC

### Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 0.4\text{ mH}, I_{AS} = 125\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 125\text{ A}, di/dt \leq 260\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

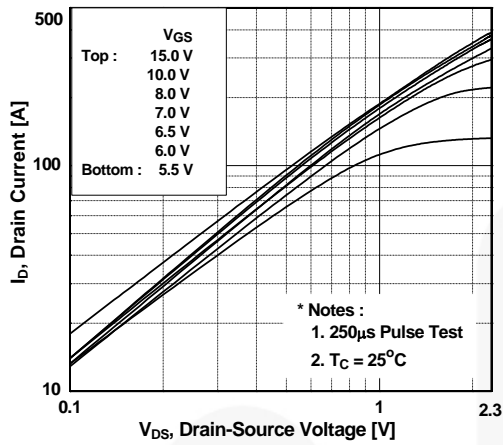


Figure 1. On-Region Characteristics

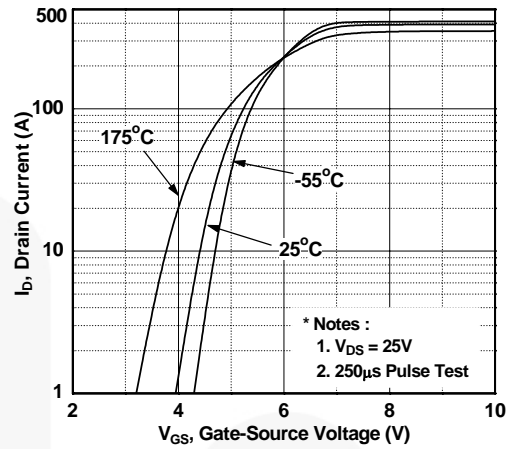


Figure 2. Transfer Characteristics

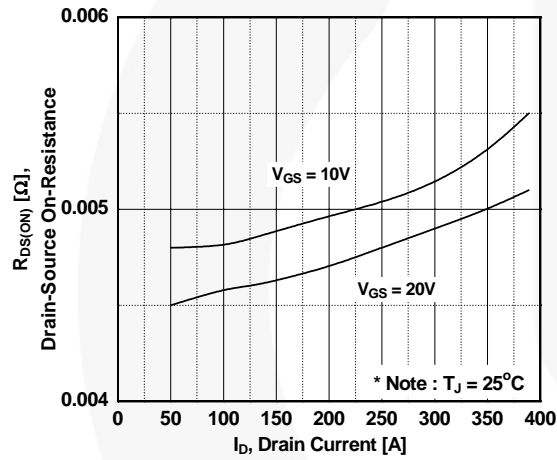


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

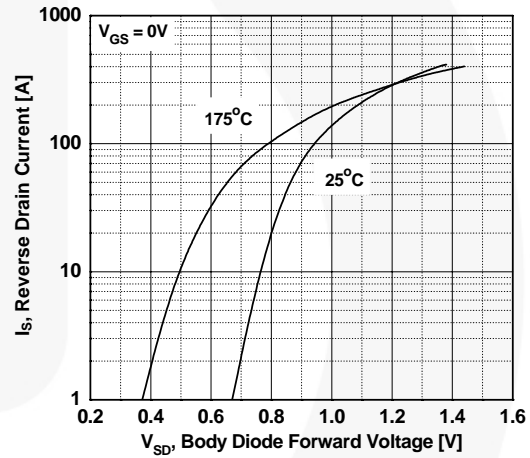


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

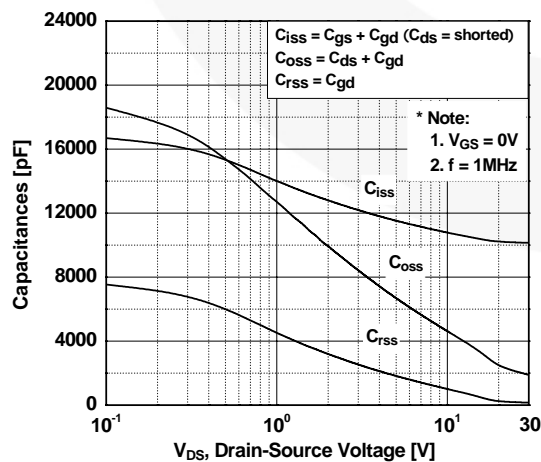


Figure 5. Capacitance Characteristics

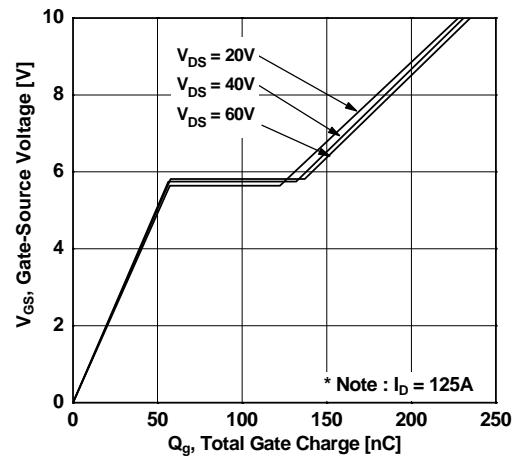
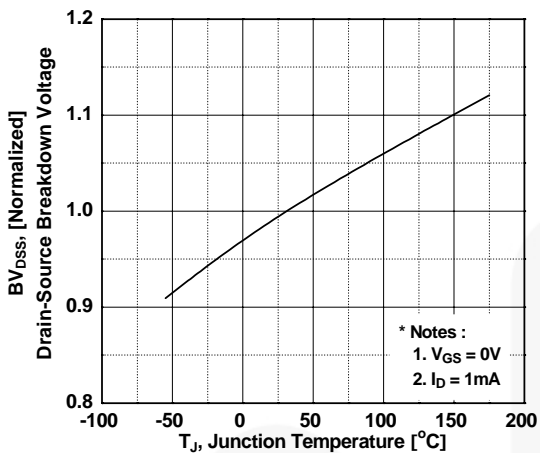
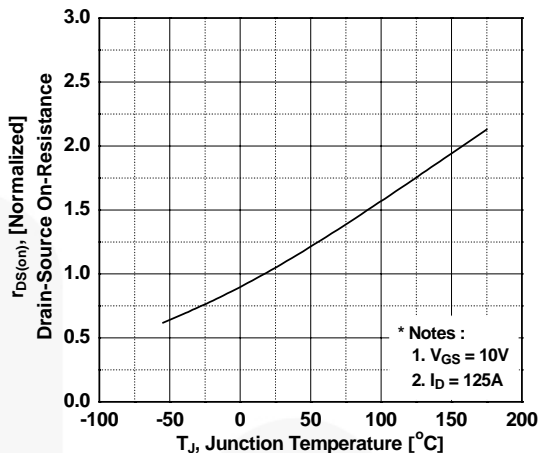


Figure 6. Gate Charge Characteristics

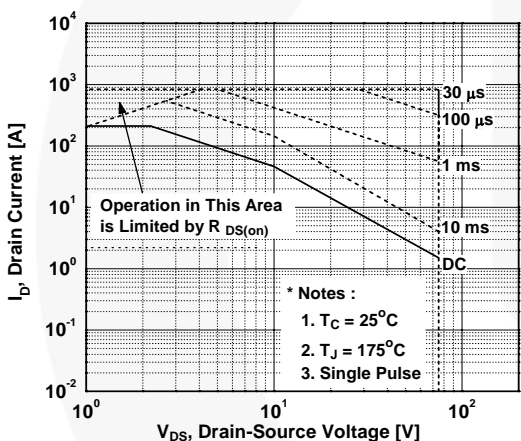
**Typical Performance Characteristics (Continued)**



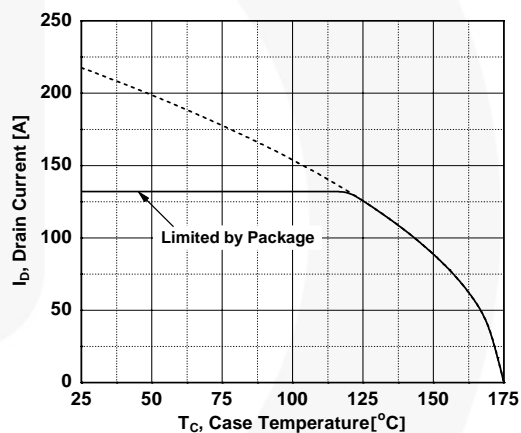
**Figure 7. Breakdown Voltage Variation vs. Temperature**



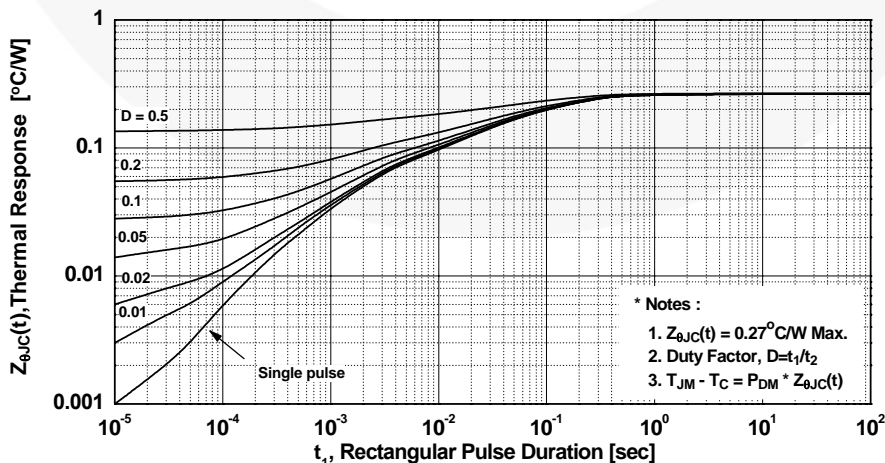
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



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



**Figure 11. Transient Thermal Response Curve**

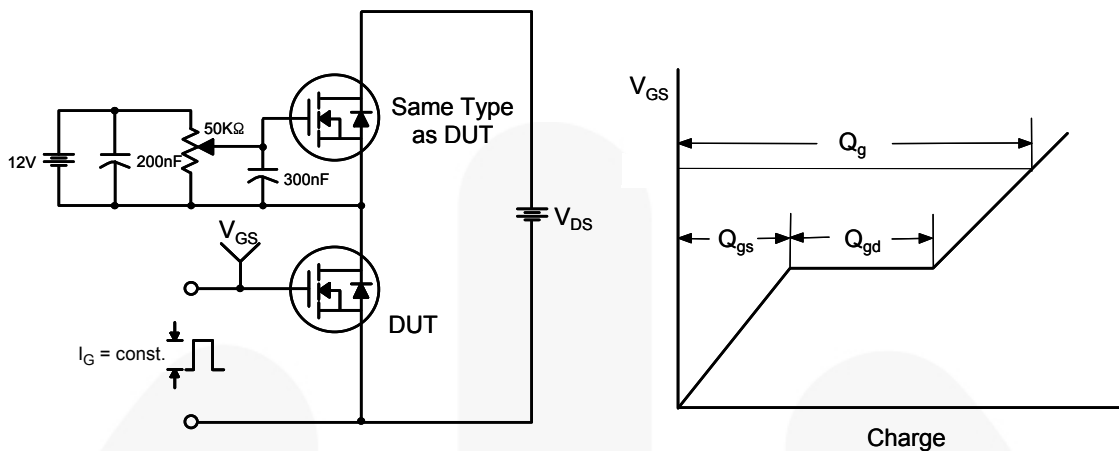


Figure 12. Gate Charge Test Circuit & Waveform

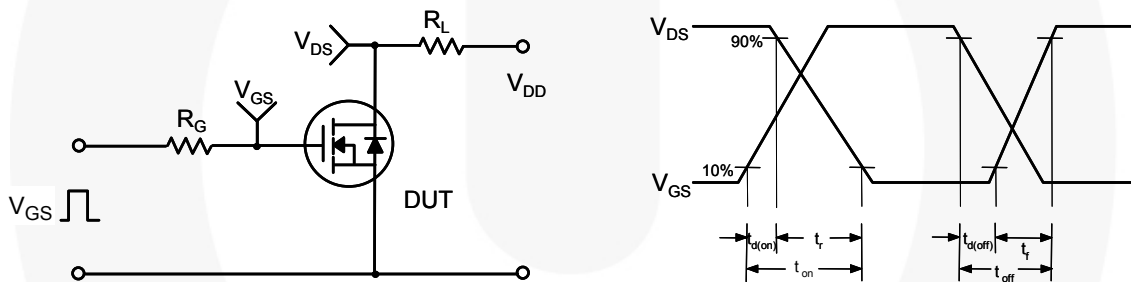


Figure 13. Resistive Switching Test Circuit & Waveforms

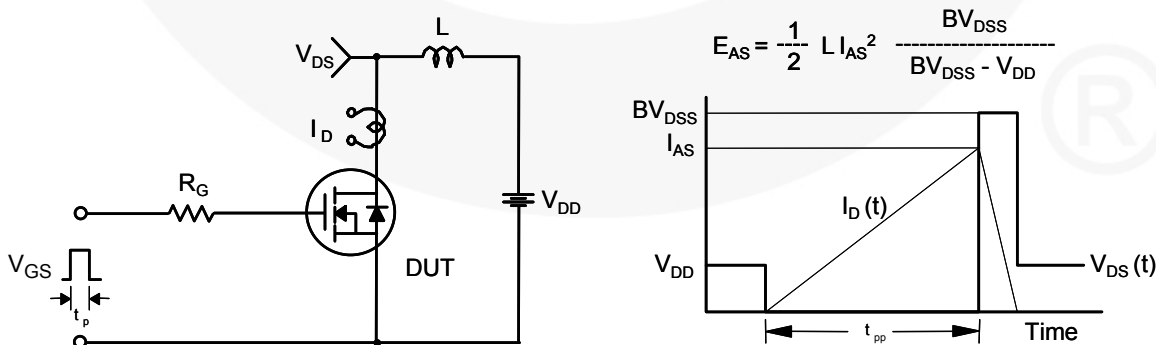


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

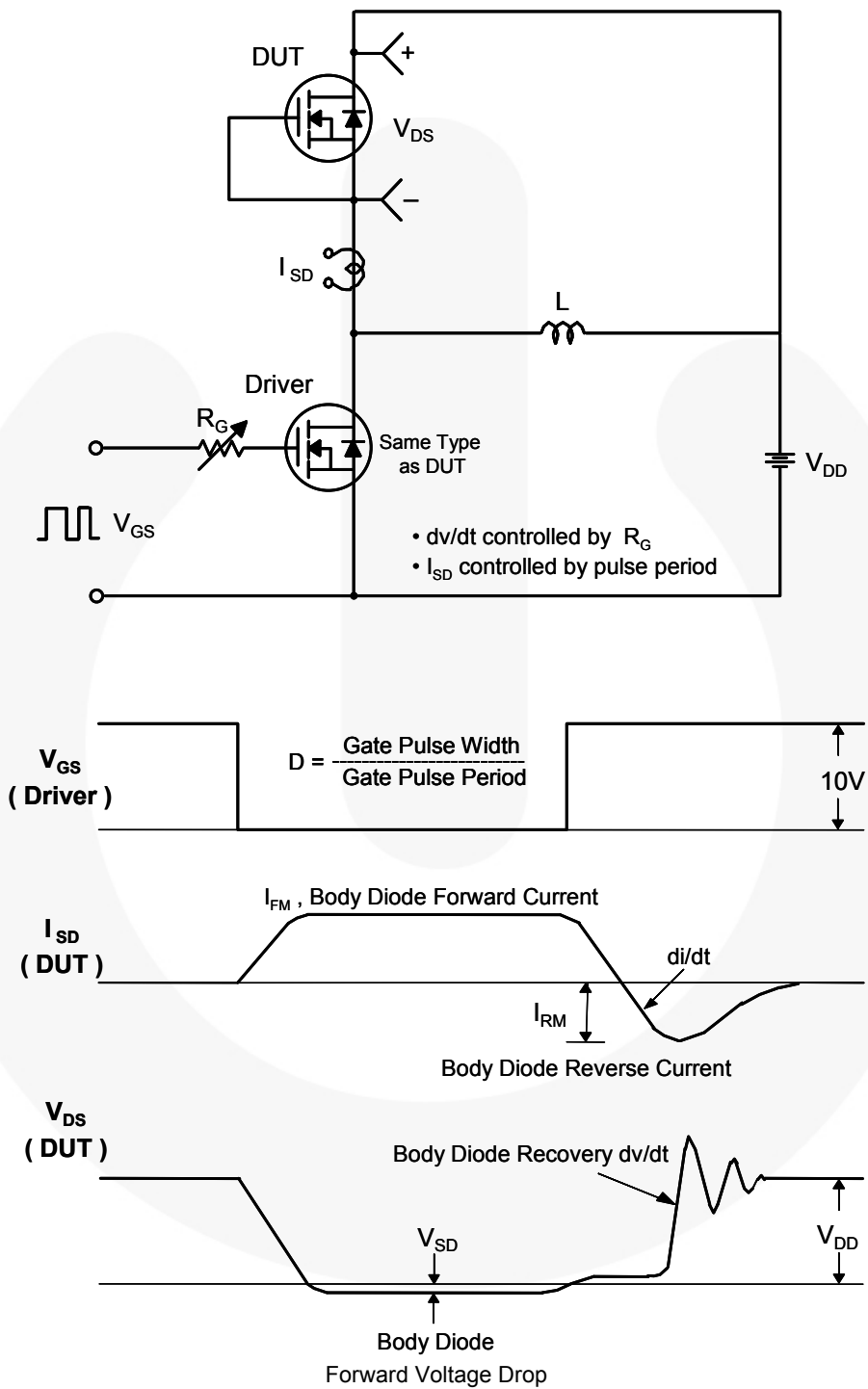
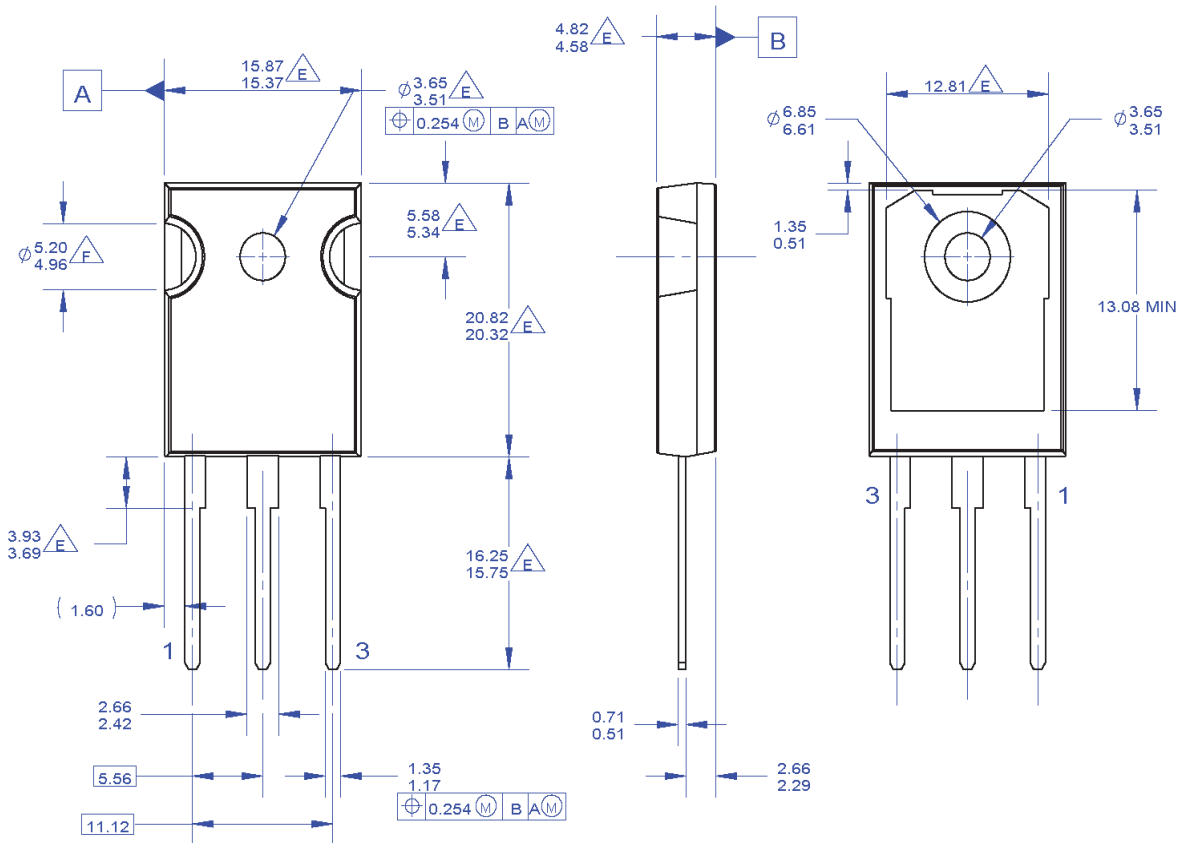


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Mechanical Dimensions



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G. DRAWING FILENAME: MKT-TO247A03\_REV03

**Figure 16. TO-247, Molded, 3-Lead, Jedec Variation AB**

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