

MOSFET – N-Channel, UniFET™ FRFET® 500 V, 100 A, 55 mΩ

FDL100N50F

Description

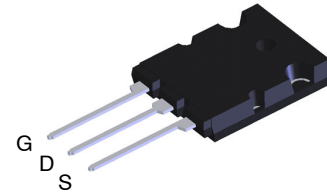
UniFET MOSFET is onsemi's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. The body diode's reverse recovery performance of UniFET FRFET MOSFET has been enhanced by lifetime control. Its t_{rr} is less than 100 nsec and the reverse dv/dt immunity is 15 V/ns while normal planar MOSFET's have over 200 nsec and 4.5 V/nsec respectively. Therefore, it can remove additional component and improve system reliability in certain applications in which the performance of MOSFET's body diode is significant. 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

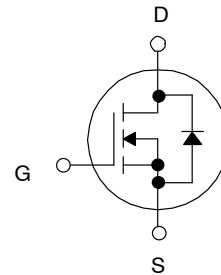
- $R_{DS(on)} = 43 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 50 \text{ A}$
- Low Gate Charge (Typ. 238 nC)
- Low C_{rss} (Typ. 64 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

Applications

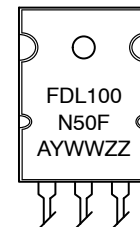
- Uninterruptible Power Supply
- AC-DC Power Supply



TO-264-3LD
CASE 340CA



MARKING DIAGRAM



A	= Assembly Location
YWW	= Date Code
ZZ	= Assembly Lot

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

FDL100N50F

MOSFET MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter		FDL100N50F	Unit
V_{DSS}	Drain to Source Voltage		500	V
V_{GSS}	Gate to Source Voltage		± 30	V
I_D	Drain Current	– Continuous ($T_C = 25^\circ\text{C}$)	100	A
		– Continuous ($T_C = 100^\circ\text{C}$)	60	
I_{DM}	Drain Current	– Pulsed (Note 1)	400	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	5000	mJ
I_{AR}	Avalanche Current	(Note 1)	100	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	73.5	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	20	V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	2500	W
		– Derate Above 25°C	20	W/ $^\circ\text{C}$
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.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $L = 1\text{ mH}$, $I_{AS} = 100\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 100\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.

THERMAL CHARACTERISTICS

Symbol	Parameter	FDL100N50F	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.05	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	30	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\text{ V}$, $T_C = 25^\circ\text{C}$	500	–	–	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	–	0.5	–	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 500\text{ V}$, $V_{GS} = 0\text{ V}$	–	–	10	μA
		$V_{DS} = 400\text{ V}$, $T_C = 125^\circ\text{C}$	–	–	100	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{ V}$, $V_{DS} = 0\text{ V}$	–	–	± 100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	3.0	–	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 50\text{ A}$	–	0.043	0.055	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}$, $I_D = 50\text{ A}$	–	95	–	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	–	12000	–	pF
C_{oss}	Output Capacitance		–	1700	–	pF
C_{rss}	Reverse Transfer Capacitance		–	64	–	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DD} = 400\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$ (Note 4)	–	238	–	nC
Q_{gs}	Gate to Source Gate Charge		–	74	–	nC
Q_{gd}	Gate to Drain "Miller" Charge		–	95	–	nC

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 250\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 4.7\ \Omega$ (Note 4)	–	63	–	ns
t_r	Turn-On Rise Time		–	186	–	ns
$t_{d(off)}$	Turn-Off Delay Time		–	202	–	ns
t_f	Turn-Off Fall Time		–	105	–	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

I_S	Maximum Continuous Drain to Source Diode Forward Current		–	–	100	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	400	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 100\text{ A}$	–	–	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}$, $I_{SD} = 100\text{ A}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$	–	250	–	ns
Q_{rr}	Reverse Recovery Charge		–	1.5	–	uC

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.

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Reel Size	Tape Width	Shipping [†]
FDL100N50F	FDL100N50F	TO – 264	N/A	N/A	25 Units / Tube

[†]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](#).

TYPICAL CHARACTERISTICS

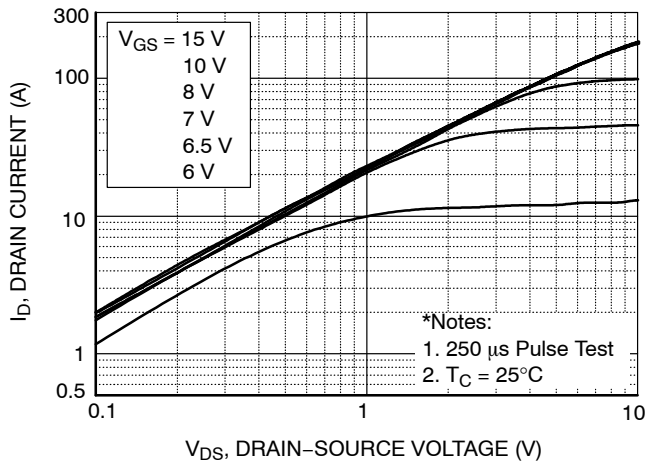


Figure 1. On-Region Characteristics

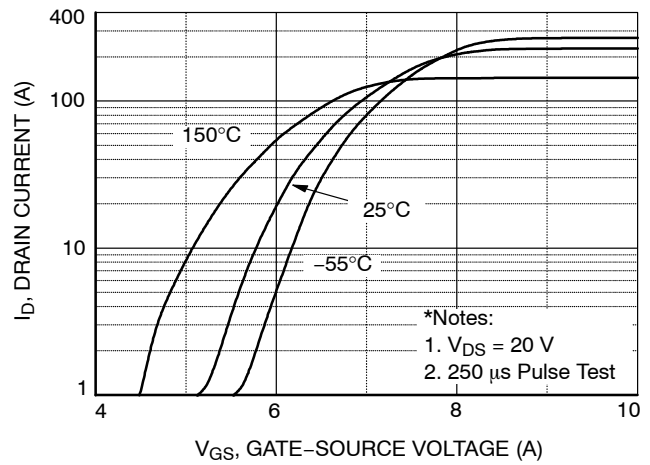


Figure 2. Transfer Characteristics

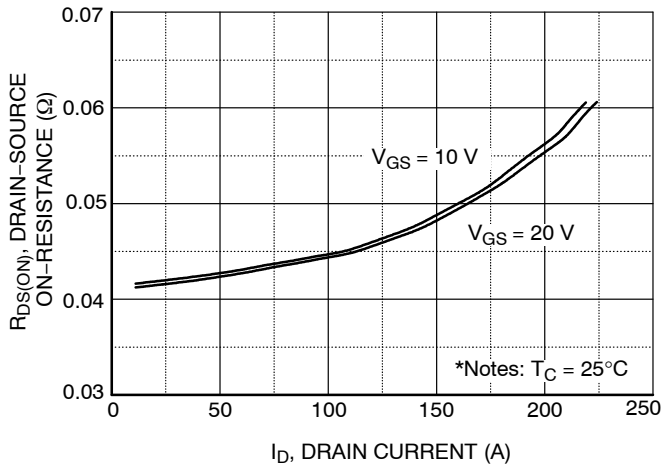


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

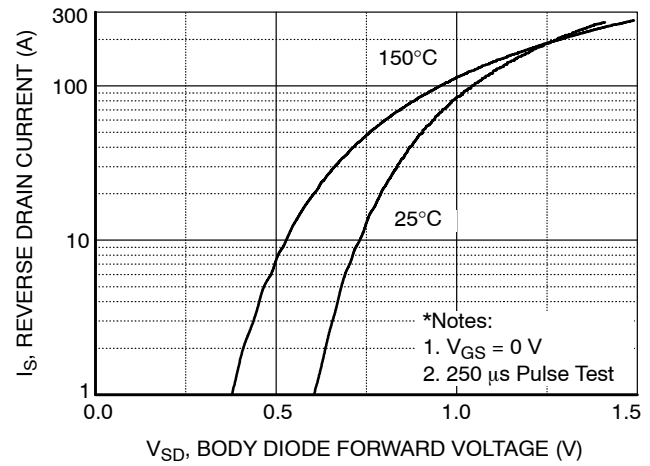


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

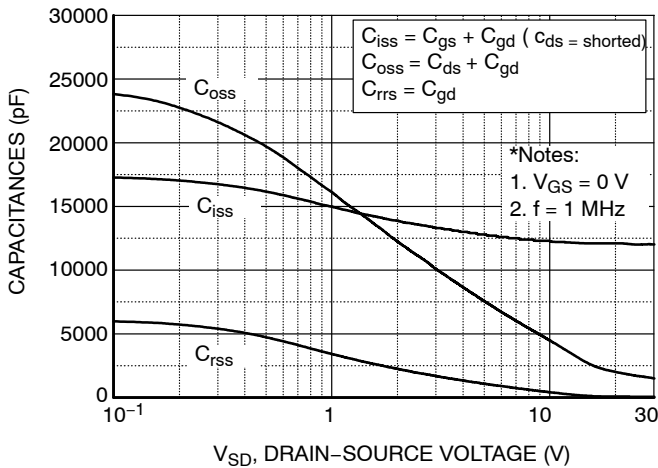


Figure 5. Capacitance Characteristics

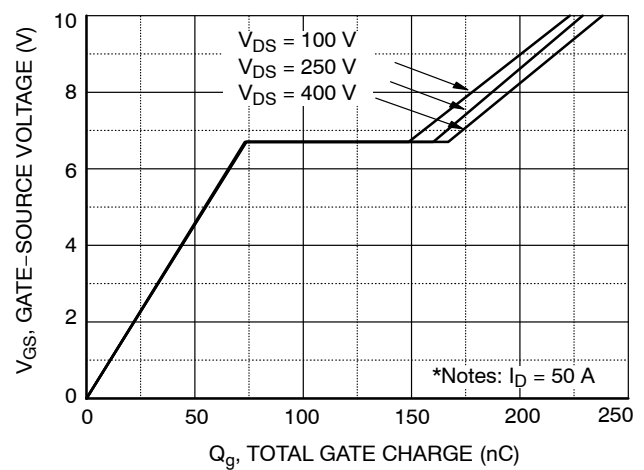


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (continued)

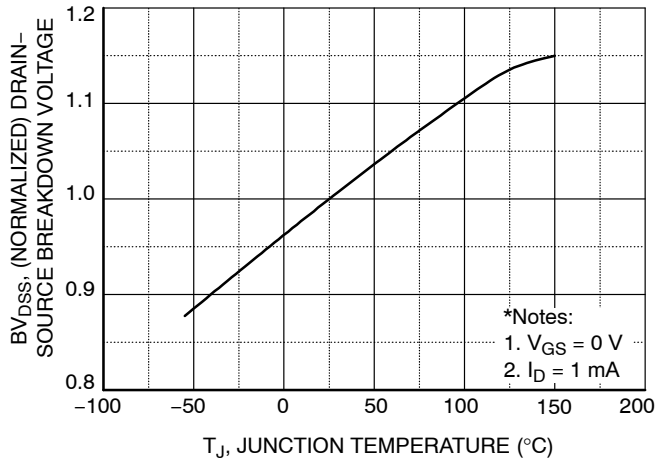


Figure 7. Breakdown Voltage Variation vs. Temperature

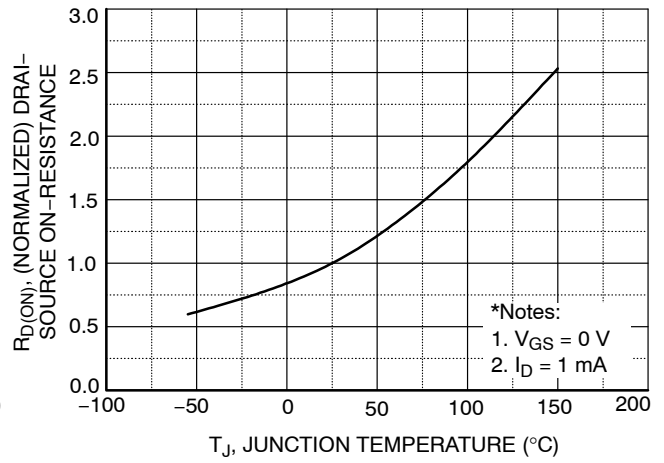


Figure 8. On-Resistance Variation vs. Temperature

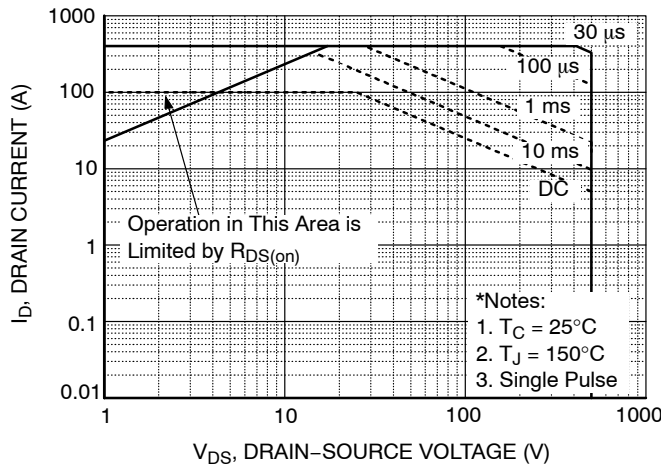


Figure 9. Maximum Safe Operating Area

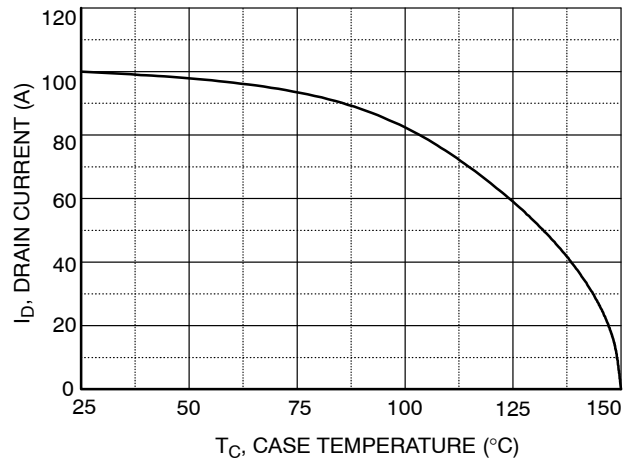


Figure 10. Maximum Drain Current vs. Case Temperature

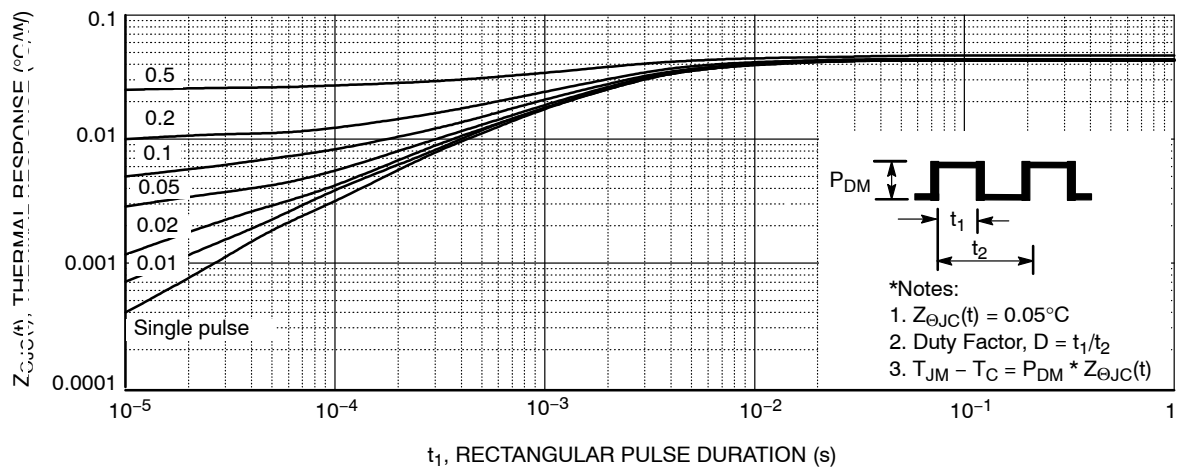


Figure 11. Transient Thermal Response Curve

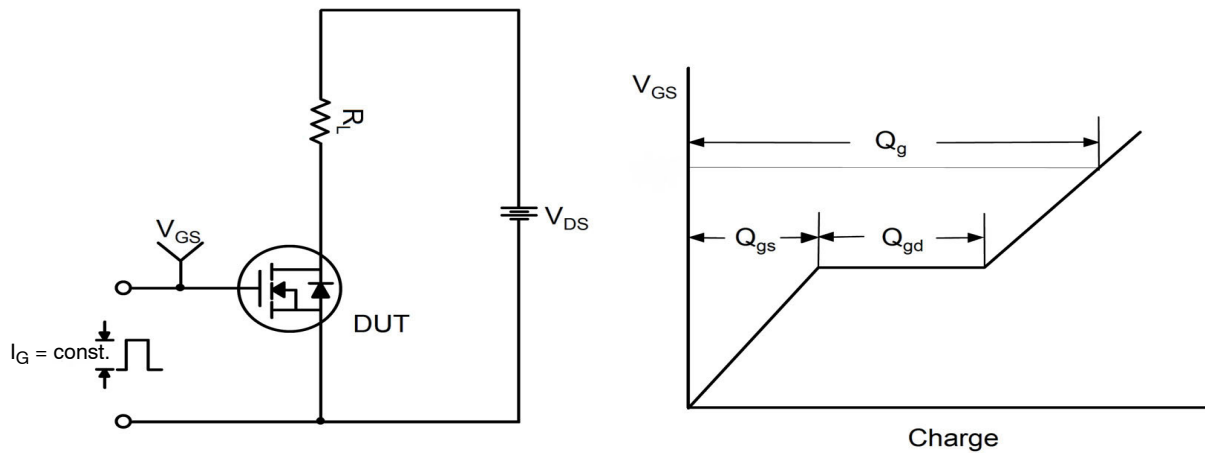


Figure 12. Gate Charge Test Circuit & Waveforms

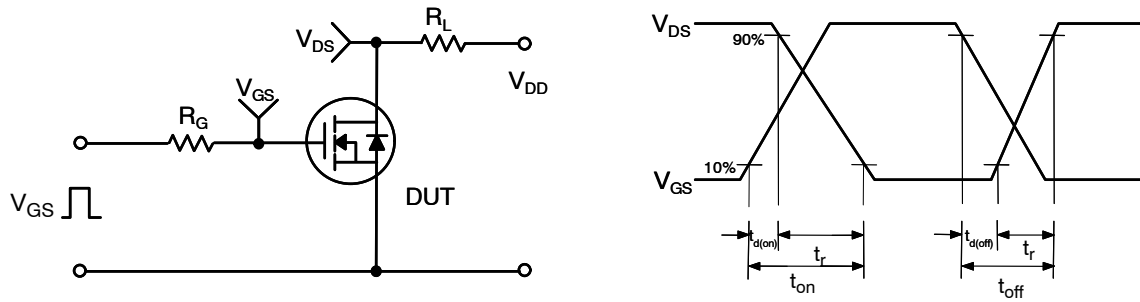


Figure 13. Resistive Switching Test Circuit & Waveforms

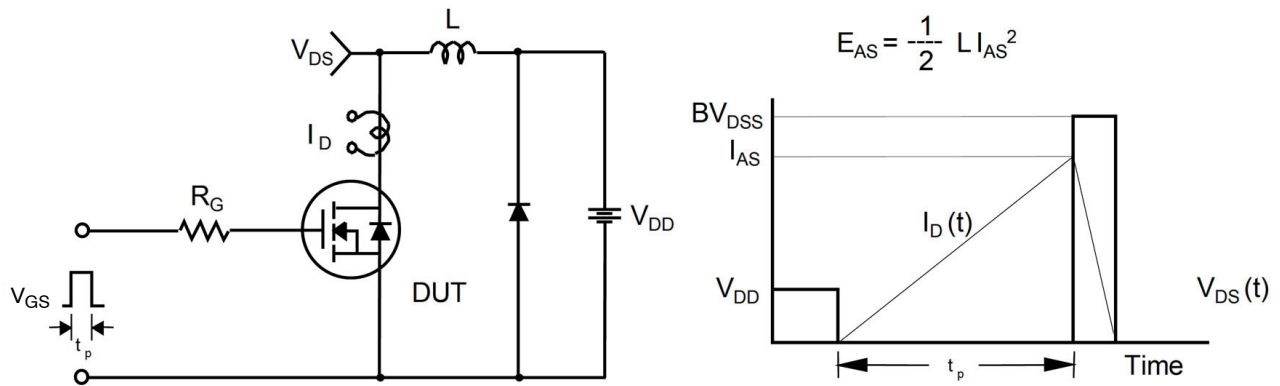
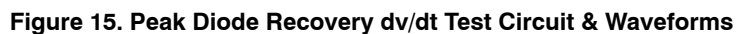


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

The diagram shows a switching circuit. A MOSFET, labeled "DUT", has its drain connected to a positive terminal (+) and its source connected to a negative terminal (-). The drain-source voltage is labeled V_{DS} . The source current is labeled I_{SD} . A MOSFET "Driver" is connected to the gate of the DUT. The driver's gate is connected to a pulse voltage source V_{GS} through a resistor R_G . The driver's drain is connected to the source of the DUT through an inductor L . The driver is labeled "Same Type as DUT". The driver's source is connected to ground. The DUT's source is also connected to ground. A DC voltage source V_{DD} is connected to the positive terminal (+) and ground. A list of control parameters is provided:

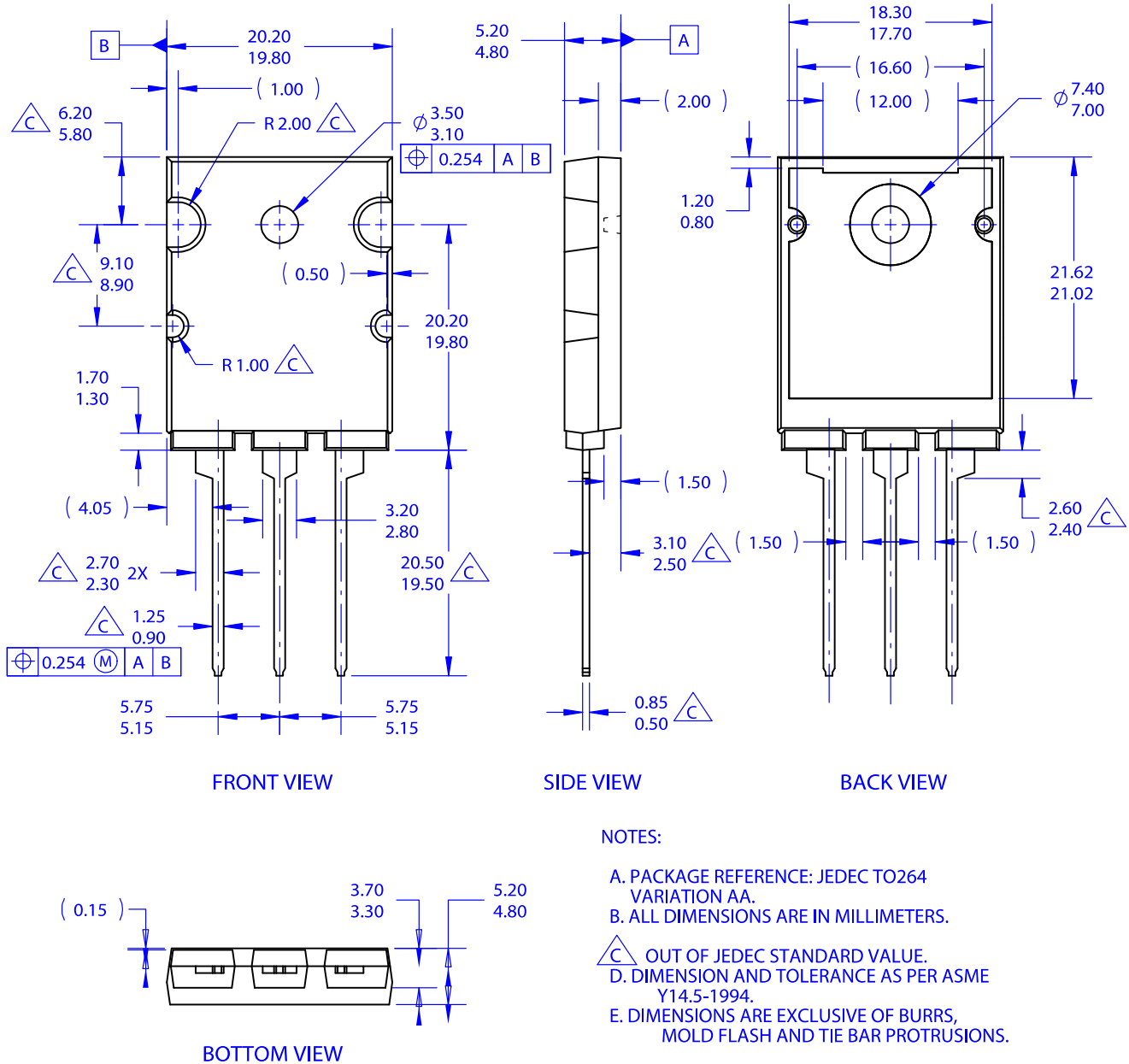
- dv/dt controlled by R_G
- I_{SD} controlled by pulse period



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DATE 31 OCT 2016



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