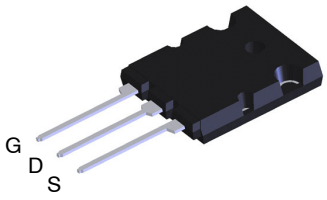
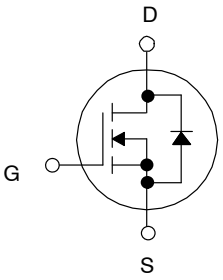
MOSFET – N-Channel, UniFET™ FRFET®
500 V, 100 A, 55 mΩ

FDL100N50F



TO−264−3LD
CASE 340CA



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 trr 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 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 50 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

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.

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MOSFET MAXIMUM RATINGS (T_J = 25°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°C)		100	A
		– Continuous (T_C = 100°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°C)		2500	W
		– Derate Above 25°C		20	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			–55 to +150	°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 = 1 mH, I_{AS} = 100 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 100 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.

THERMAL CHARACTERISTICS

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

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V, T_C = 25°C	500	–	–	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	0.5	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	–	–	10	μA
		V_{DS} = 400 V, T_C = 125°C	–	–	100	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	3.0	–	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 50 A	–	0.043	0.055	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 50 A	–	95	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 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 V, I_D = 50 A, V_{GS} = 10 V (Note 4)	–	238	–	nC
Q_{gs}	Gate to Source Gate Charge		–	74	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	95	–	nC

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 250 V, I_D = 50 A, V_{GS} = 10 V, R_G = 4.7 Ω (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 V, I_{SD} = 100 A	−	−	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 100 A dI_F/dt = 100 A/μs	−	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

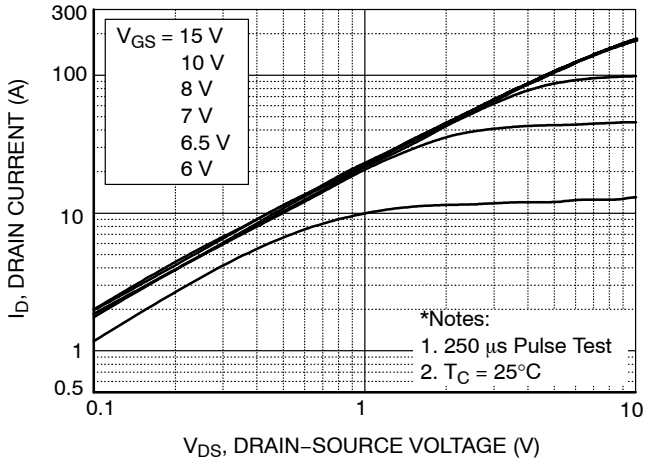

Figure 1. On−Region Characteristics

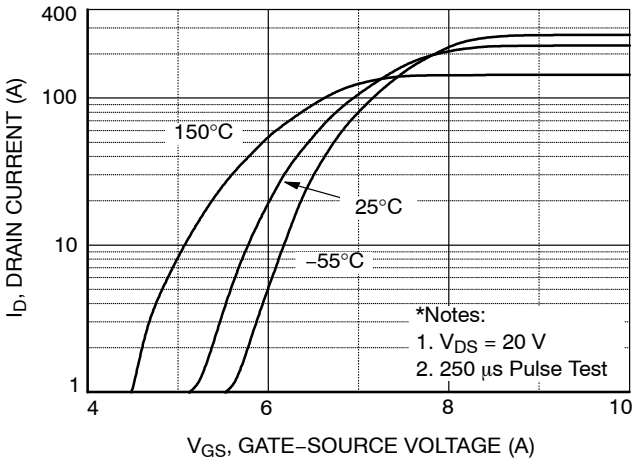

Figure 2. Transfer Characteristics

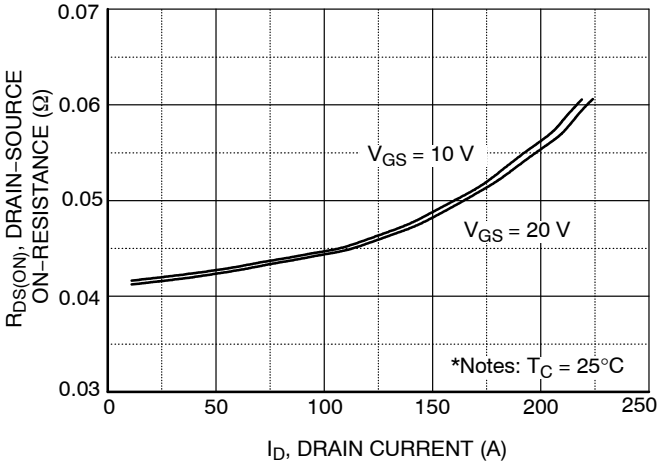

Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

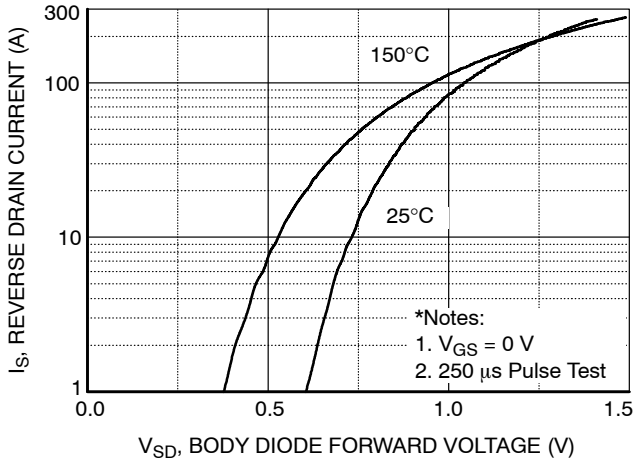

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

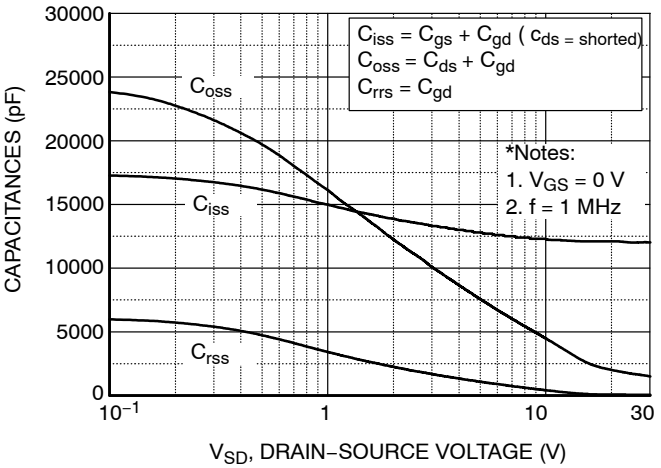

Figure 5. Capacitance Characteristics

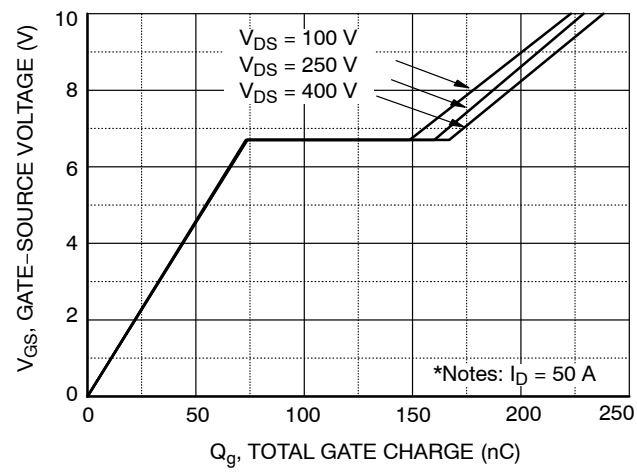

Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (continued)

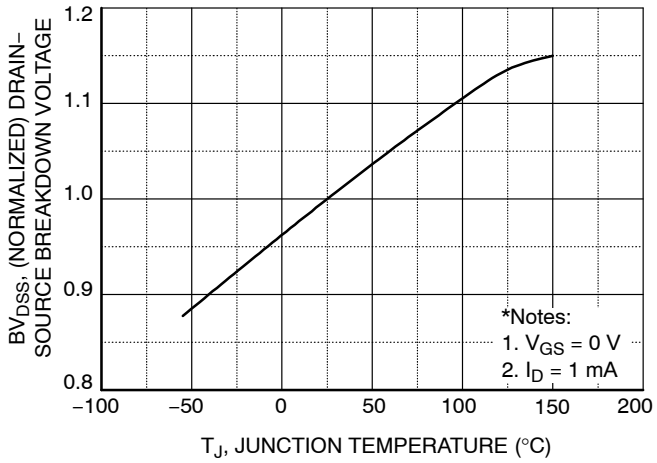

Figure 7. Breakdown Voltage Variation vs. Temperature

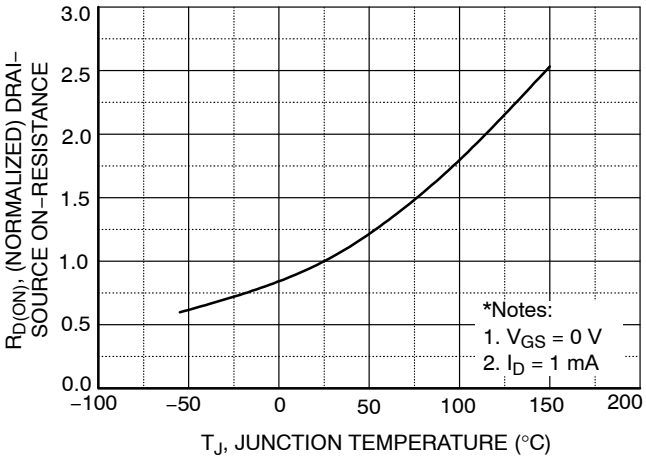

Figure 8. On–Resistance Variation vs. Temperature

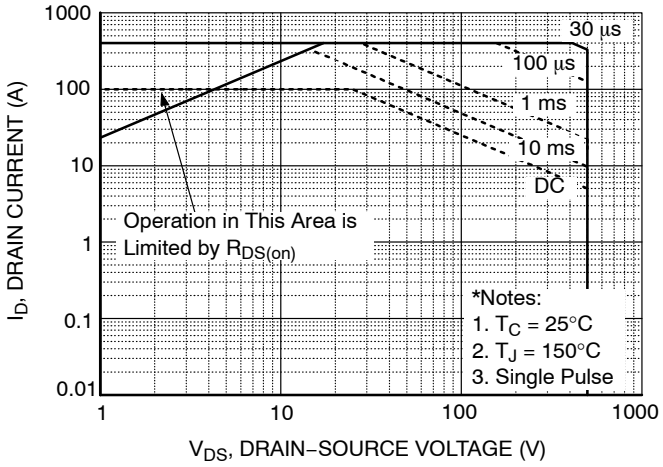

Figure 9. Maximum Safe Operating Area

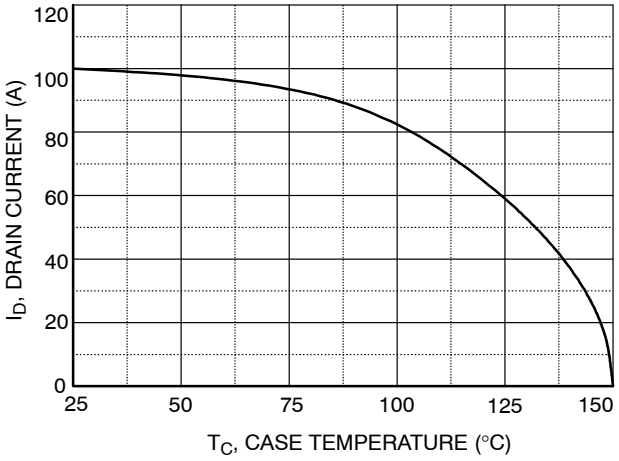

Figure 10. Maximum Drain Current vs. Case Temperature

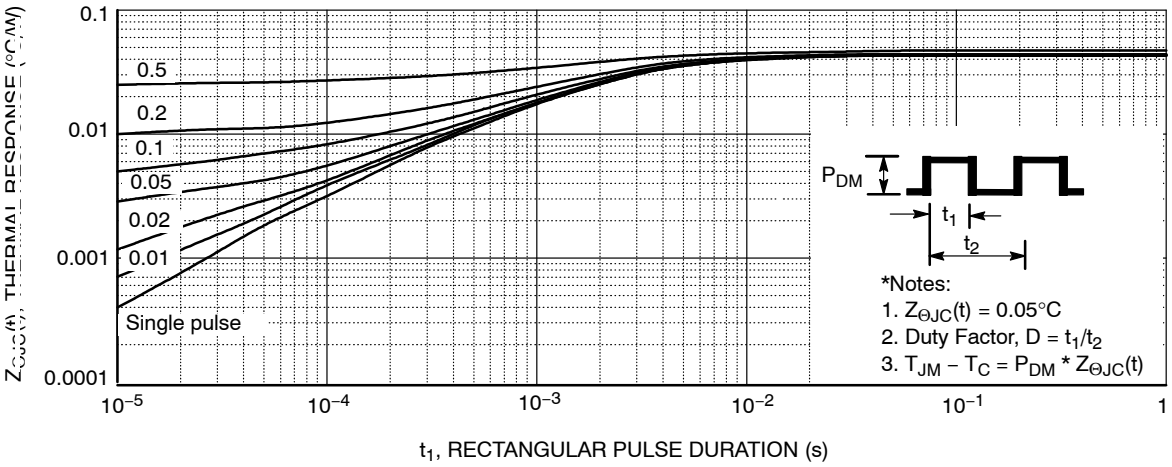

Figure 11. Transient Thermal Response Curve

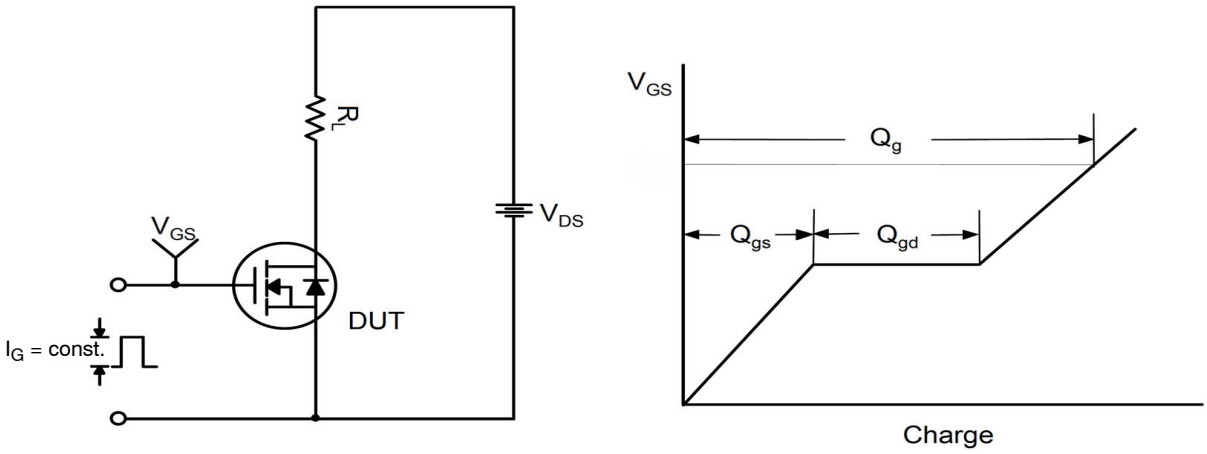

Figure 12. Gate Charge Test Circuit & Waveforms

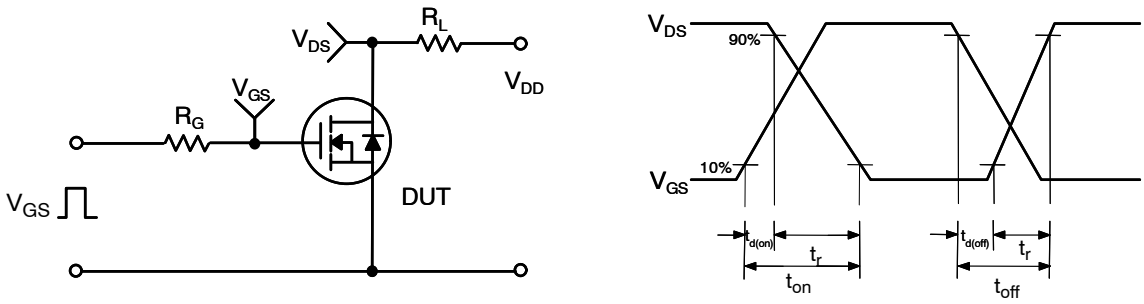

Figure 13. Resistive Switching Test Circuit & Waveforms

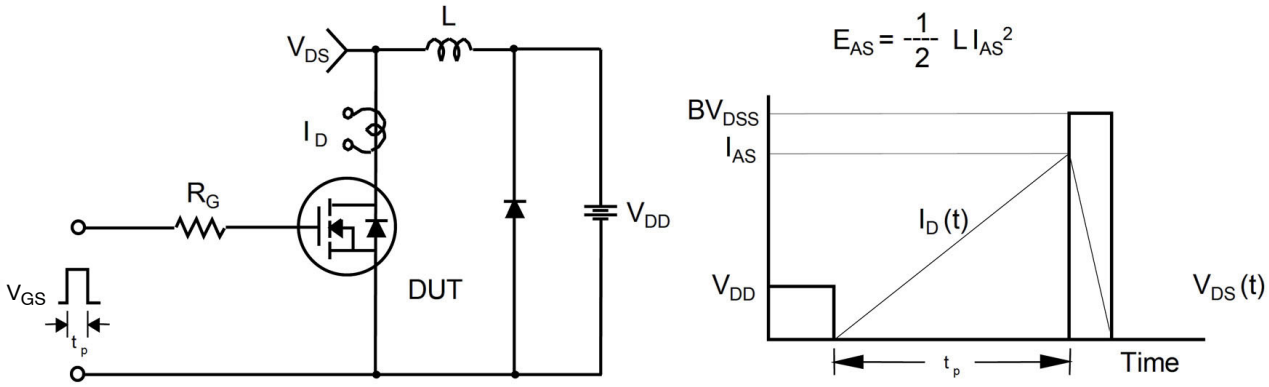

Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

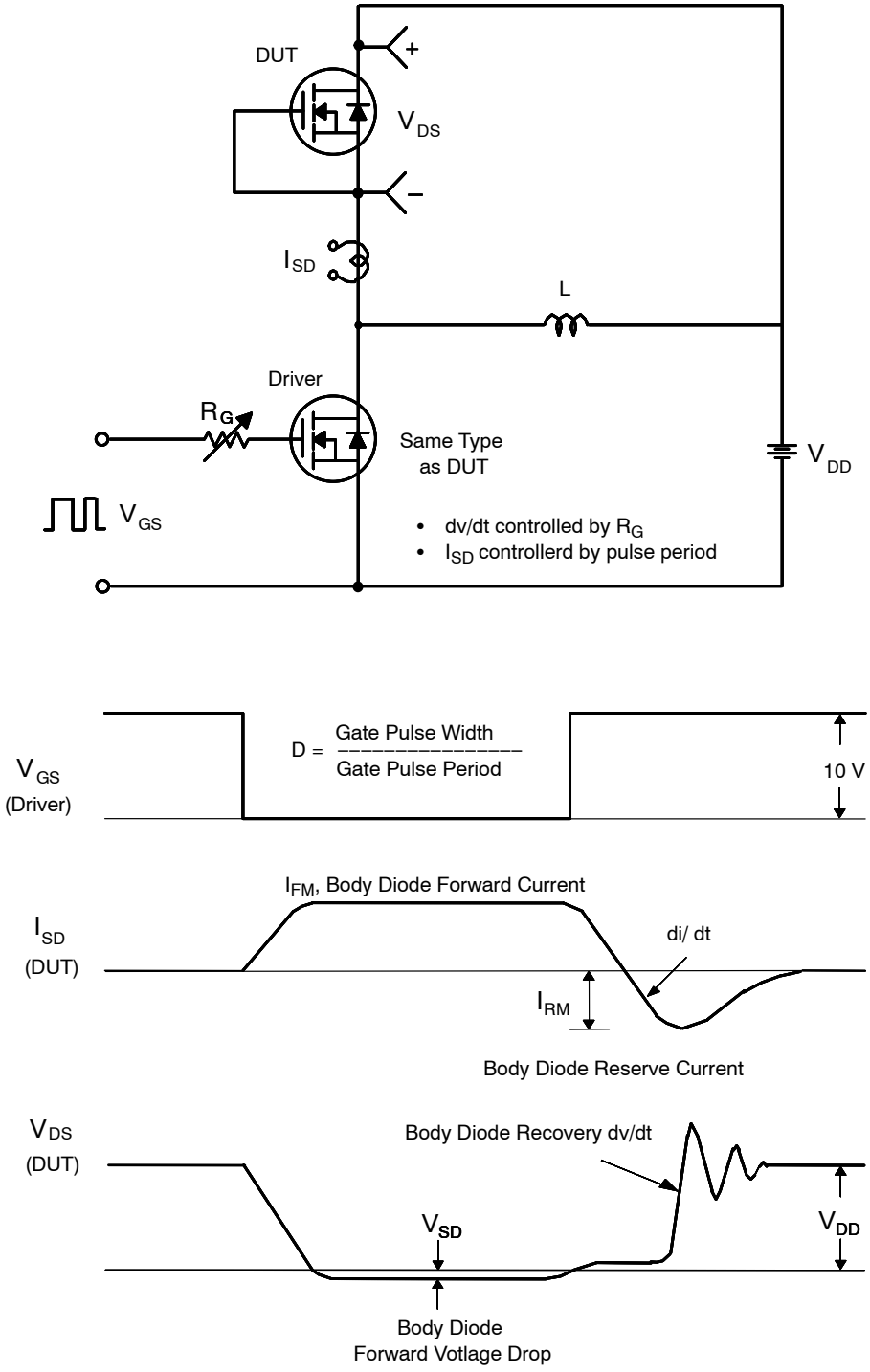

Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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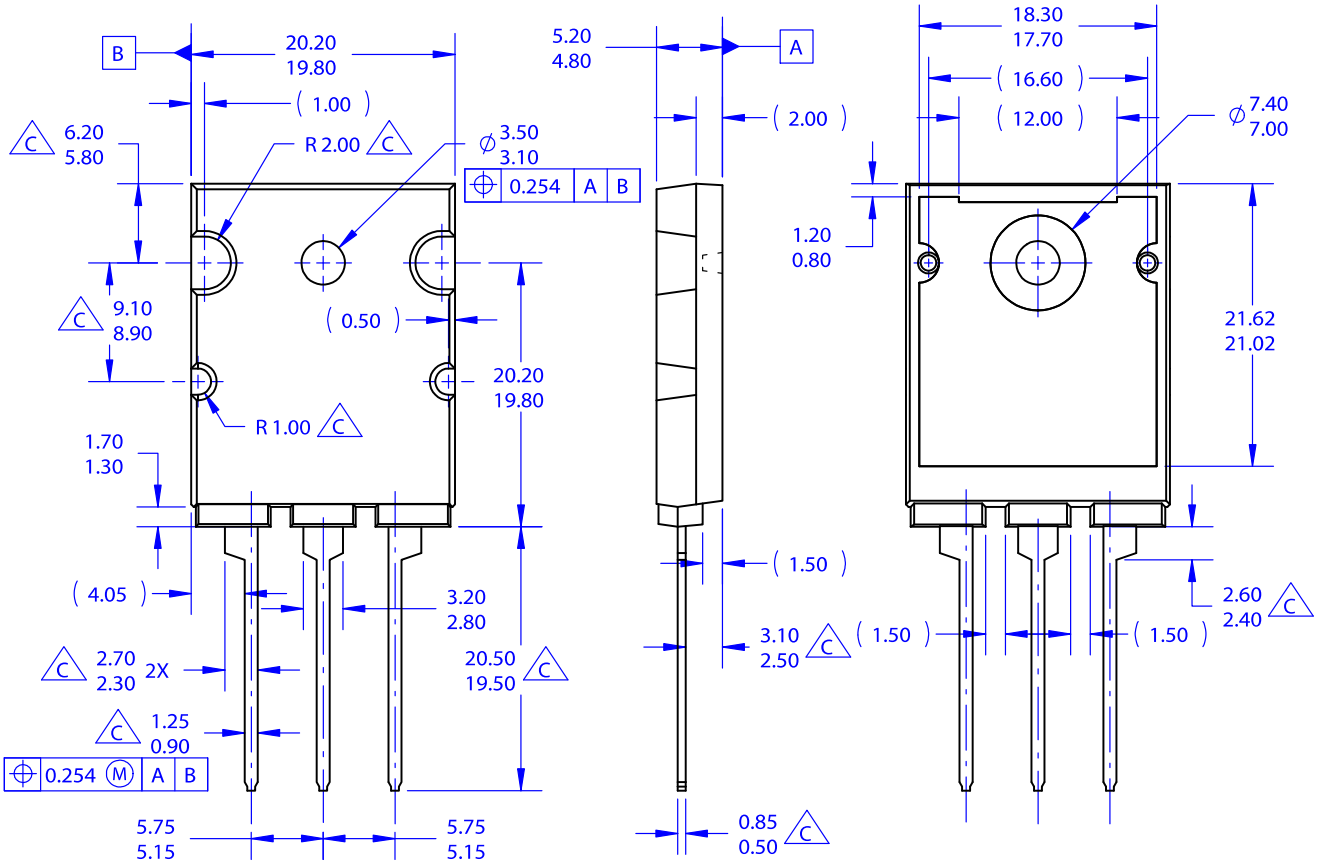
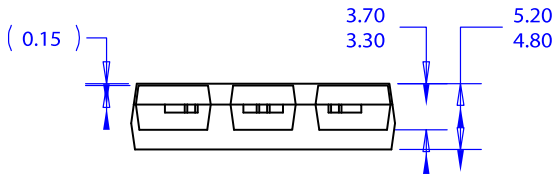


FRONT VIEW SIDE VIEW BACK VIEW



BOTTOM VIEW

NOTES:

A. PACKAGE REFERENCE: JEDEC TO264 VARIATION AA.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C OUT OF JEDEC STANDARD VALUE.
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.

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