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FAIRCHILD SEMICONDUCTOR®

March 2025

FDB031N08

N-Channel PowerTrench® MOSFET

75 V, 235 A, 3.1 mΩ

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Features

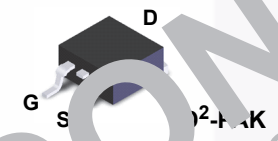
- $R_{DS(on)}$ = 2.4 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 75 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

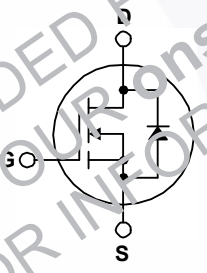
Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resist[illegible] while maintaining superior switching performance.

Applications

- Synchronous Rect[illegible]ATX / Server / Telecom PSU
- Battery Prot[illegible]tion Ci[illegible]it
- Motor D[illegible]s a[illegible] Unint[illegible]ruptible Power Supplies





MOSFET Maximum Ratings

T_C = 25°C unless otherwise noted.

Symbol	Parameter		FDB031N08	Unit
V_{DS}	Drain to Source Voltage		75	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current - Continuous (T_C = 25°C, Silicon Limited)		235	A
	- Continuous (T_C = 100°C, Silicon Limited)		165	A
	- Continuous (T_C = 25°C, Package Limited)		120	A
I_{DM}	Drain Current	- Pulsed (Note 1)	940	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1995	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.5	V/ns
P_D	Power Dissipation	(T_C = 25°C)	375	W
		- Derate Above 25°C	2.5	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

Thermal Characteristics

Symbol	Parameter	FDB031N08	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB031N08	FDB031N08	D^2-PAK	Tape and Reel	330 mm	24 mm	800 units

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

Symbol	Parameter	Test Conditions	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	75	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.05	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 75 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 75 V, T_C = 150°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 75 A	-	2.4	3.1	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 75	-	130	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V = 25 V, V = 0 V, f = MHz	-	11100	15130	pF
C_{oss}	Output Capacitance		-	1360	1810	pF
C_{rss}	Reverse Transfer Capacitance		-	595	800	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 0 V, I_D = 75 A, V_{GS} = 10 V (Note 4)	-	169	220	nC
Q_{gs}	Gate to Source Gate Charge		-	60	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	47	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 37.5 V, I_D = 75 A, R_G = 25 Ω, V_{GS} = 10 V (Note 4)	-	230	470	ns
t_r	Turn-On Rise Time		-	191	392	ns
$t_{d(off)}$	Turn-Off Delay Time		-	335	680	ns
t_f	Turn-Off Fall Time		-	121	252	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	235	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	940	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 75 A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 75 A, dI_F/dt = 100 A/μs	-	53	-	ns
Q_{rr}	Reverse Recovery Charge		-	77	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 0.71 mH, I_{AS} = 75 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 75 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

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Typical Performance Characteristics

Figure 1. On-Region Characteristics

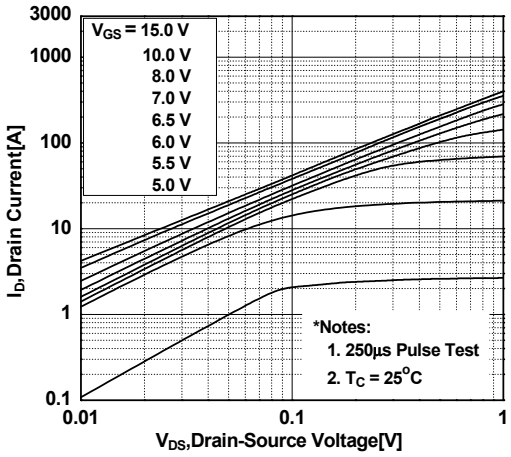


Figure 2. Transfer Characteristics

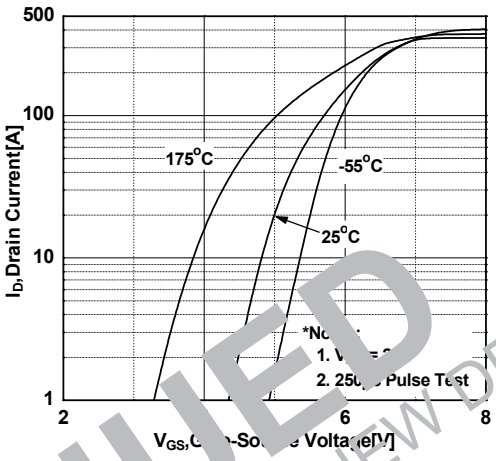


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

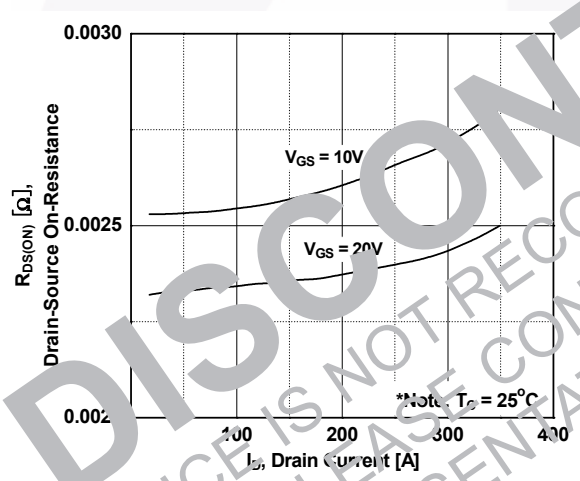


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

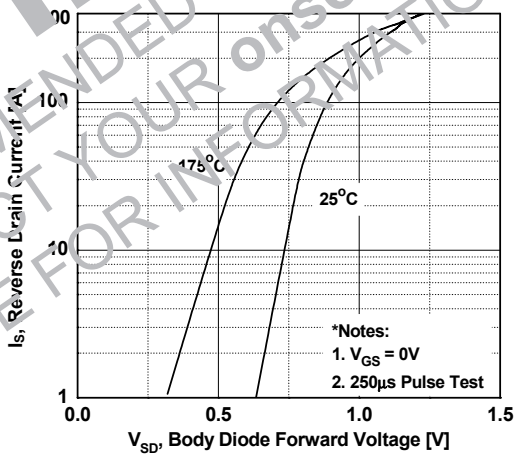


Figure 5. Capacitance Characteristics

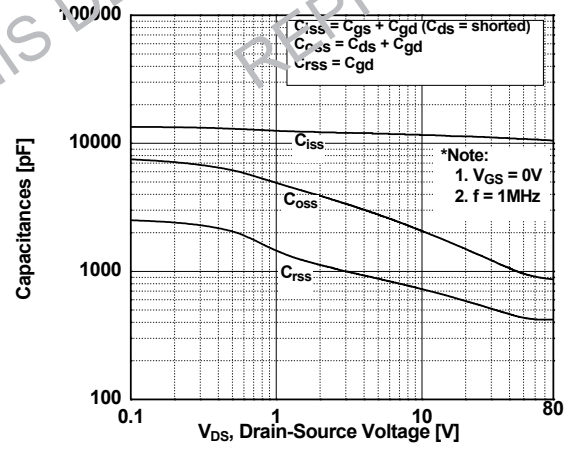
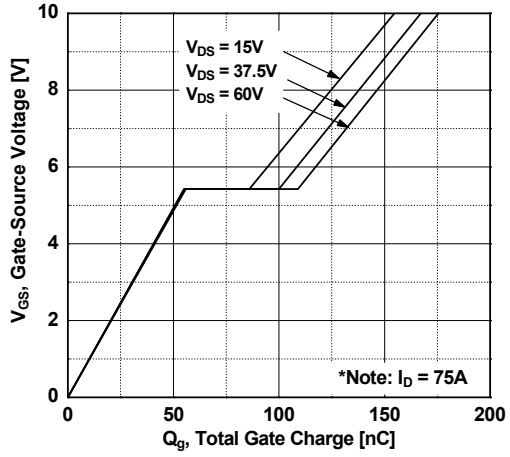


Figure 6. Gate Charge Characteristics



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Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

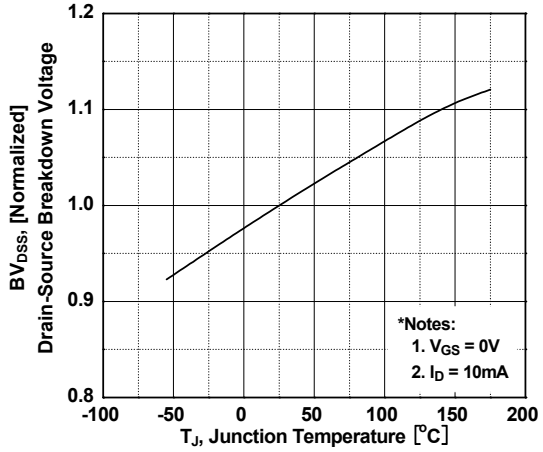


Figure 8. On-Resistance Variation vs. Temperature

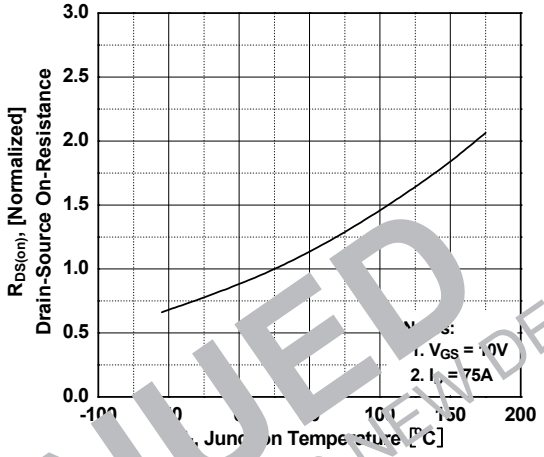


Figure 9. Maximum Safe Operating Area

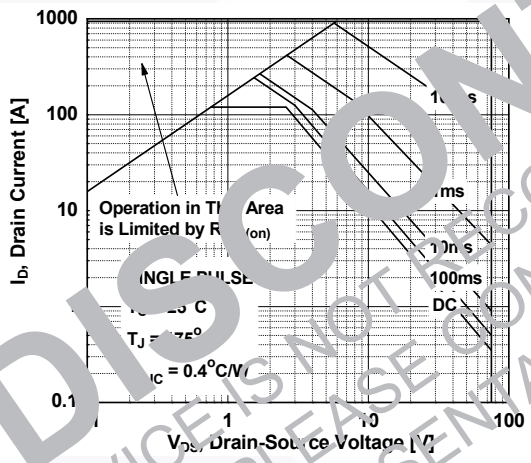


Figure 10. Maximum Drain Current vs. Case Temperature

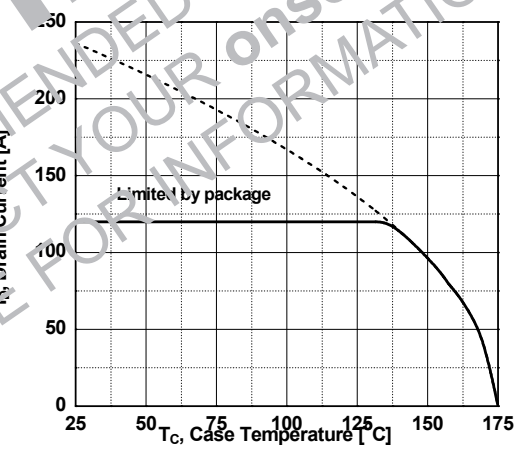
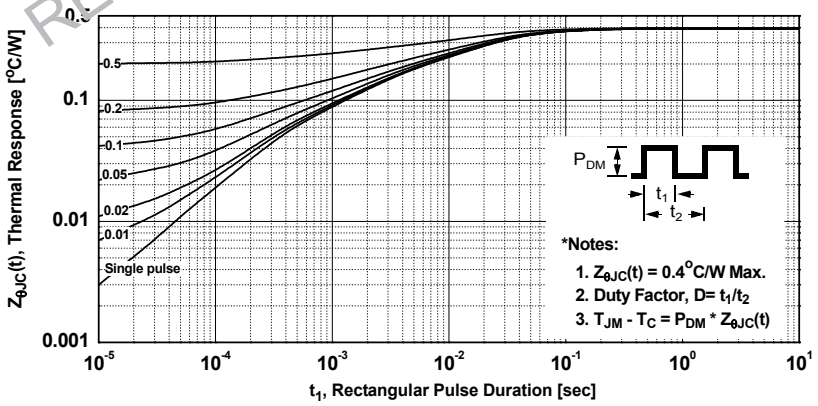


Figure 11. Transient Thermal Response Curve



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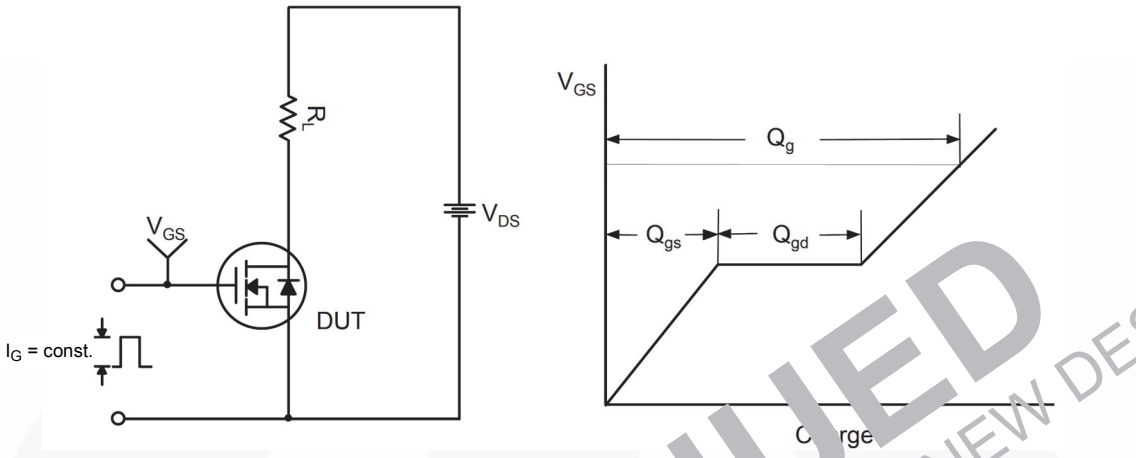


Figure 12. Gate Charge Test Circuit & Waveform

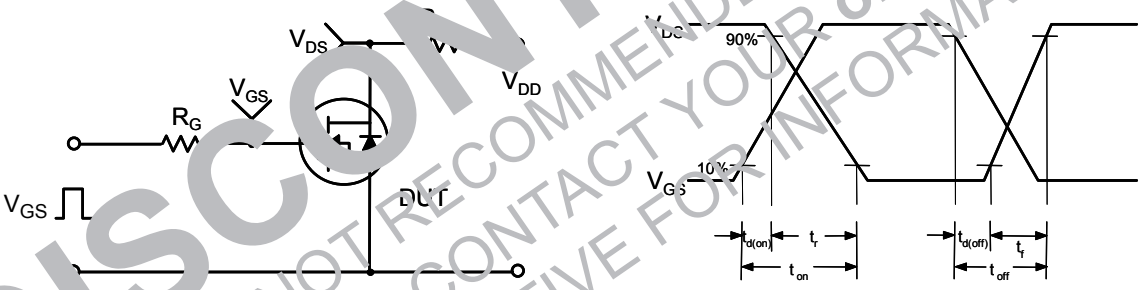


Figure 13. Resistive Switching Test Circuit & Waveforms

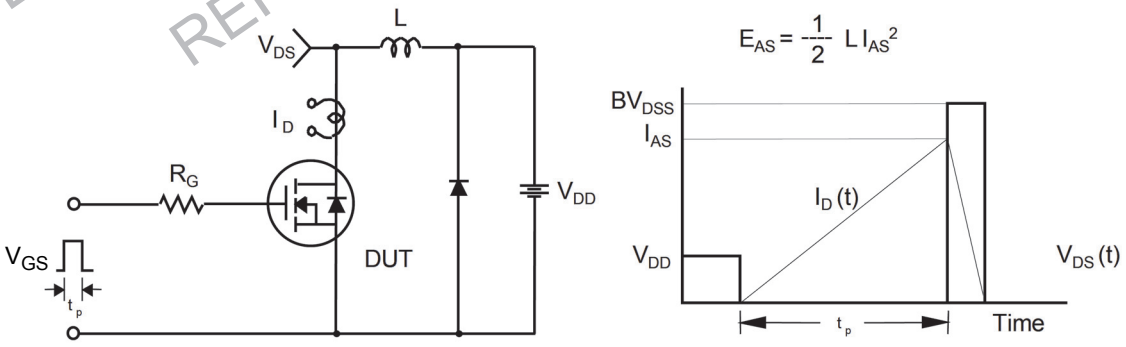


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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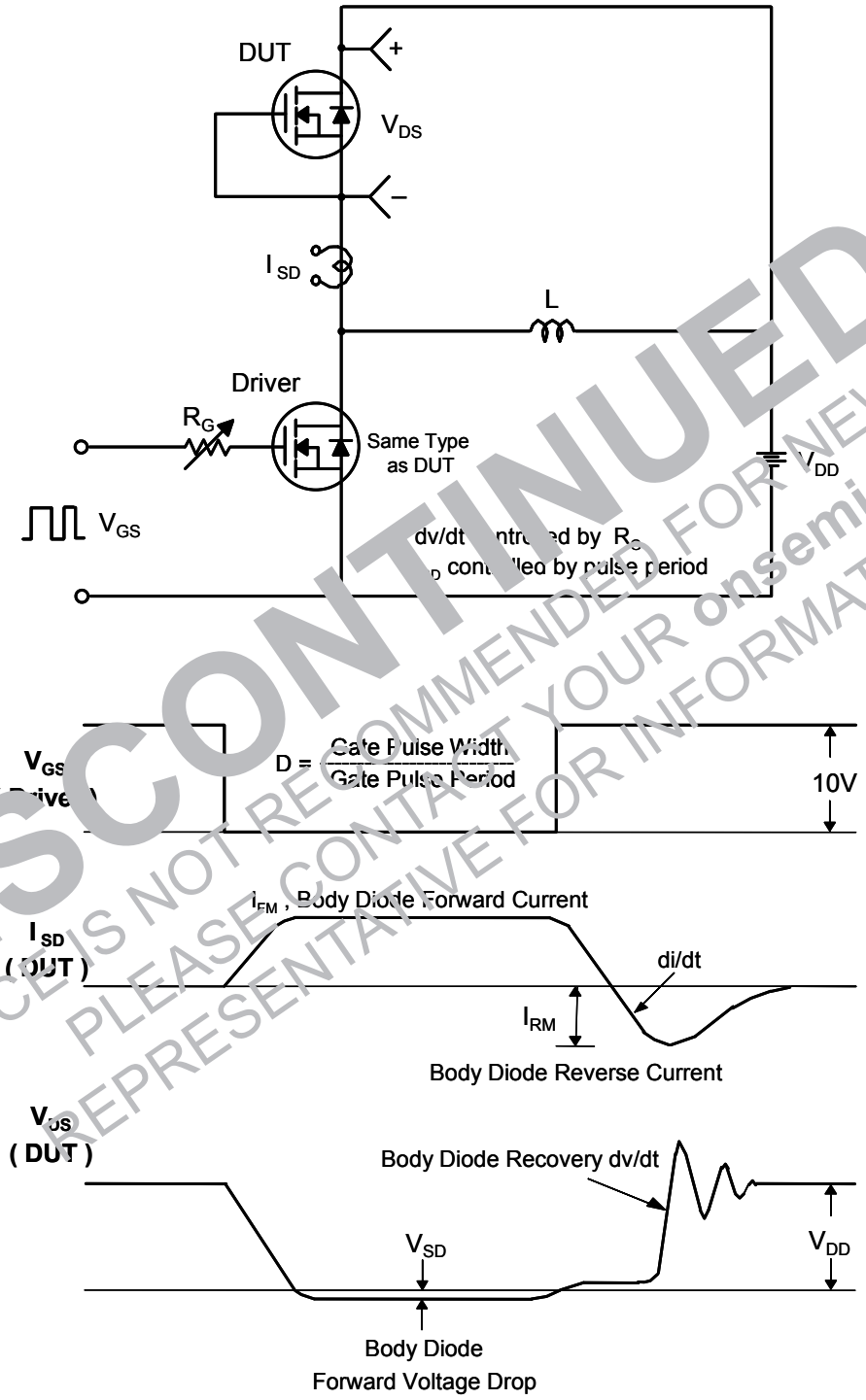


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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Mechanical Dimensions

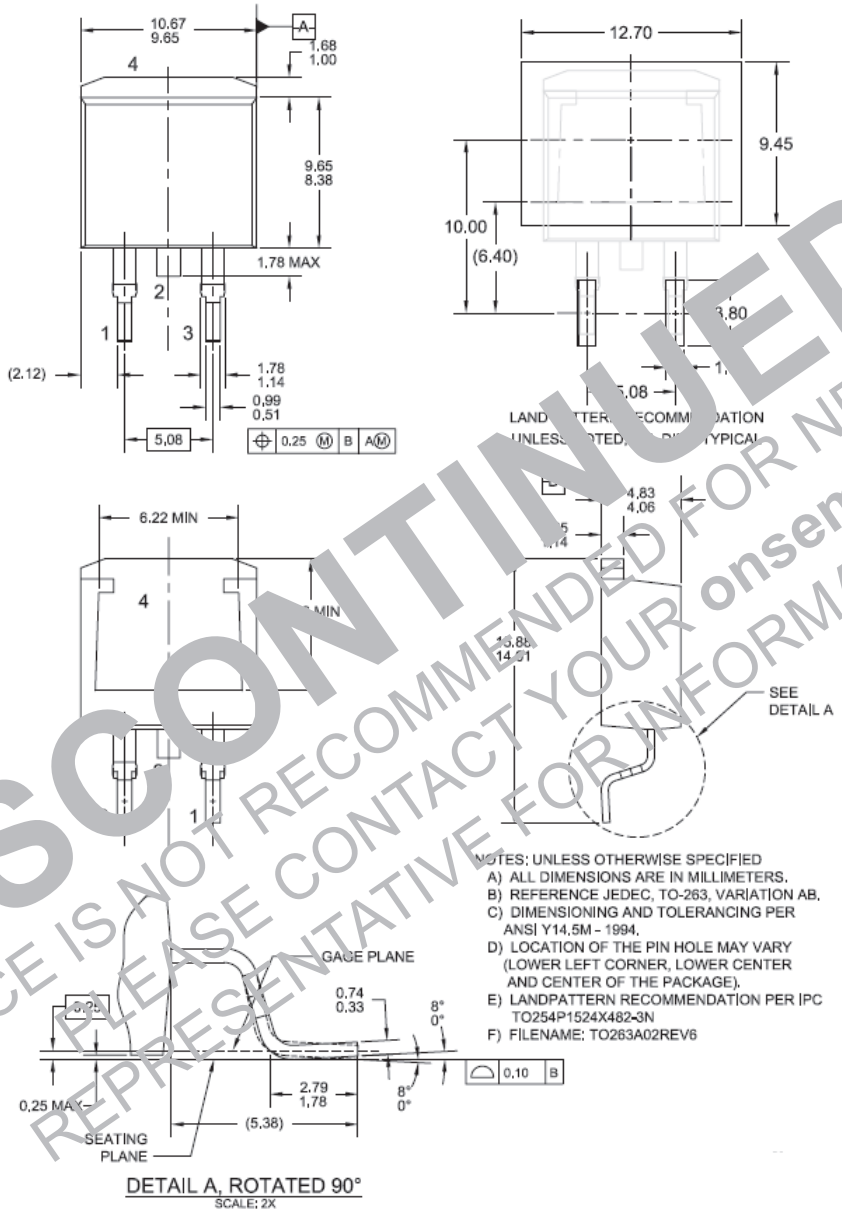


Figure 16. TO263 (D^2PAK), Molded, 2-Lead, Surface Mount

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