FAIRCHILD SEMICONDUCTOR®

July 2011

FDB390N15A

N-Channel PowerTrench® MOSFET

150V, 27A, 39mΩ

Features

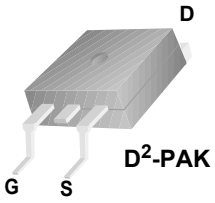
- $R_{DS(on)}$ = 33.5mΩ (Typ.)@ V_{GS} = 10V, I_D = 27A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

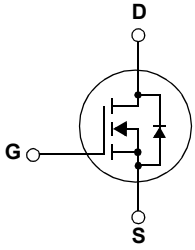
Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- DC to DC Converters
- Synchronous Rectification for Telecommunication PSU
- Battery Charger
- AC Motor Drives and Uninterruptible Power Supplies
- Off-line UPS





MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		150	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25°C,Silicon Limited)	27	A
		- Continuous (T_C = 100°C,Silicon Limited)	19	
I_{DM}	Drain Current	- Pulsed (Note 1)	108	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	78	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)	75	W
		- Derate above 25°C	0.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB390N15A	FDB390N15A	D2-PAK	330mm	24mm	800

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.1	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 120V, T_C = 150°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 27A	-	33.5	39	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 27A (Note 4)	-	33	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75V, V_{GS} = 0V f = 1MHz	-	965	1285	pF
C_{oss}	Output Capacitance		-	96	130	pF
C_{rss}	Reverse Transfer Capacitance		-	5.8	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	V_{DS} = 75V, I_D = 27A		169	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 75V, I_D = 27A V_{GS} = 10V (Note 4,5)	-	14.3	18.6	nC
Q_{gs}	Gate to Source Gate Charge			5.0	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	2.0	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	3.5	-	nC
ESR	Equivalent Series Resistance (G-S)	Drain Open,f = 1MHz	-	1.4	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75V, I_D = 27A V_{GS} = 10V, R_{GEN} = 4.7Ω (Note 4,5)	-	14	38	ns
t_r	Turn-On Rise Time		-	10	30	ns
$t_{d(off)}$	Turn-Off Delay Time		-	20	50	ns
t_f	Turn-Off Fall Time		-	5	20	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	27	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	108	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 27A	-	-	1.25	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 27A, V_{DD} = 75V dI_F/dt = 100A/μs (Note 4)	-	63	-	ns
Q_{rr}	Reverse Recovery Charge		-	131	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Starting T_J = 25°C, L = 3 mH, I_{SD} = 7.2 A
3. I_{SD} ≤ 27A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Char acteristics

Figure 1. On-Region Characteristics

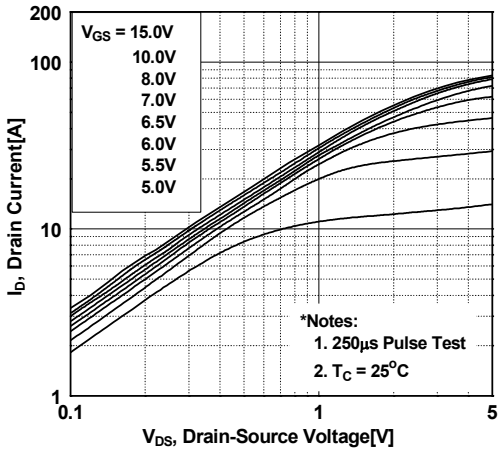


Figure 2. Transfer Characteristics

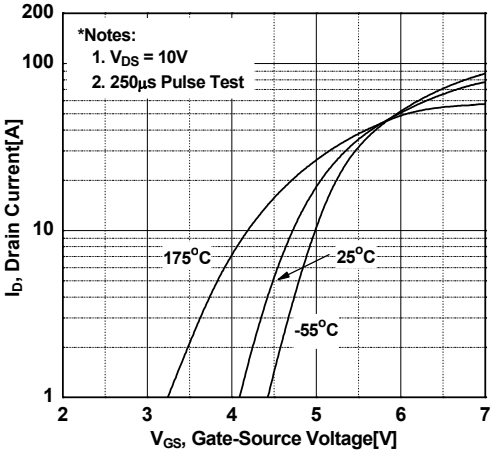


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

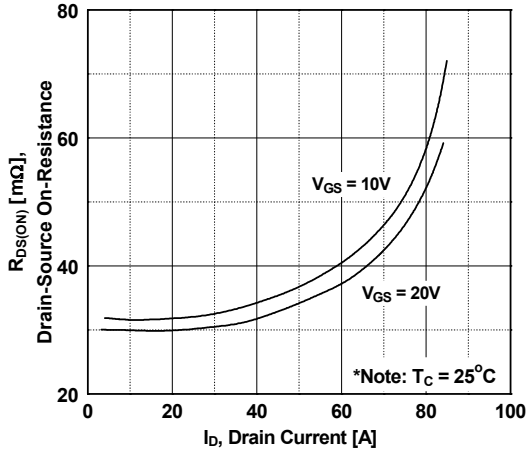


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

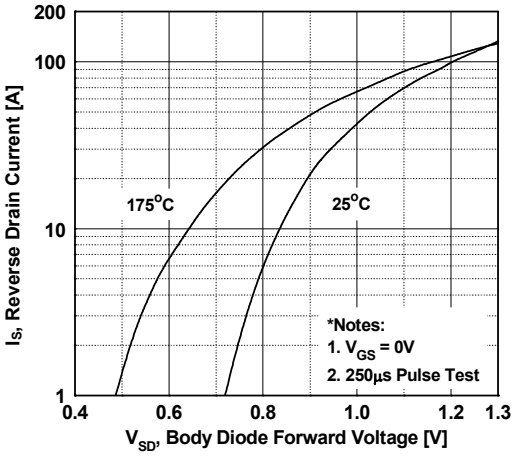


Figure 5. Capacitance Characteristics

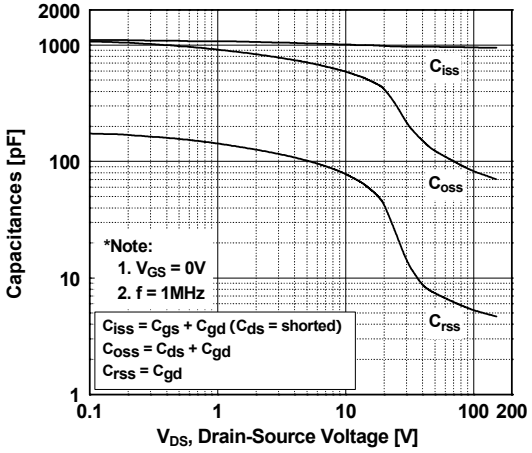
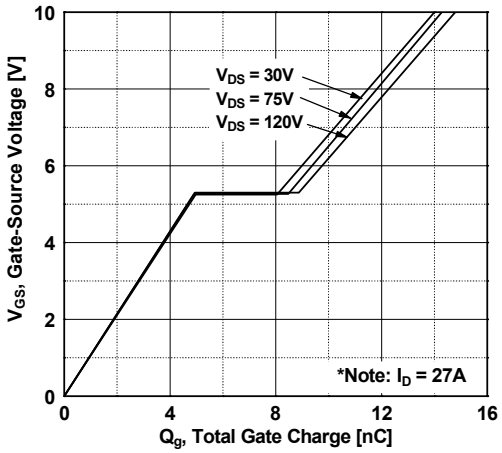


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

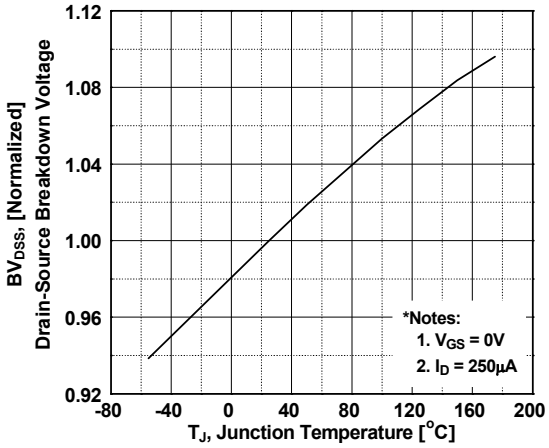


Figure 8. On-Resistance Variation vs. Temperature

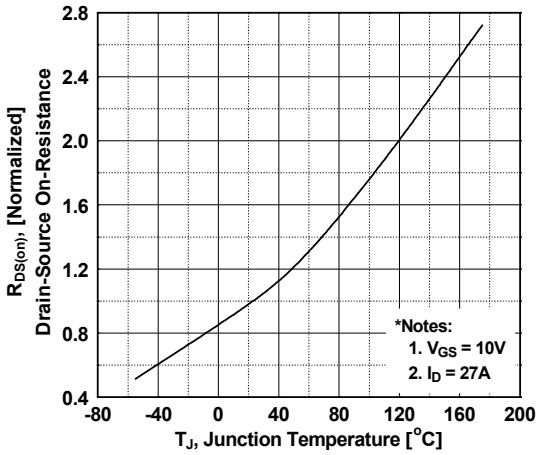


Figure 9. Maximum Safe Operating Area

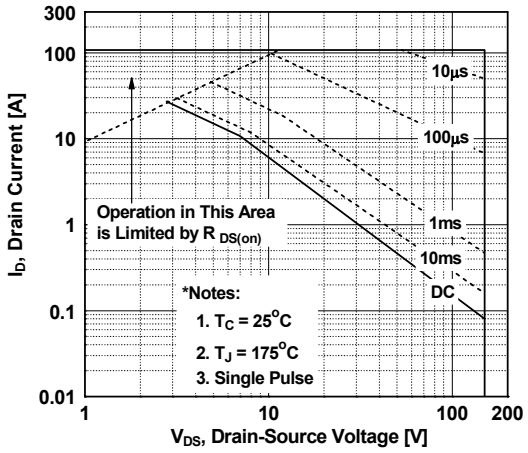


Figure 10. Maximum Drain Current vs. Case Temperature

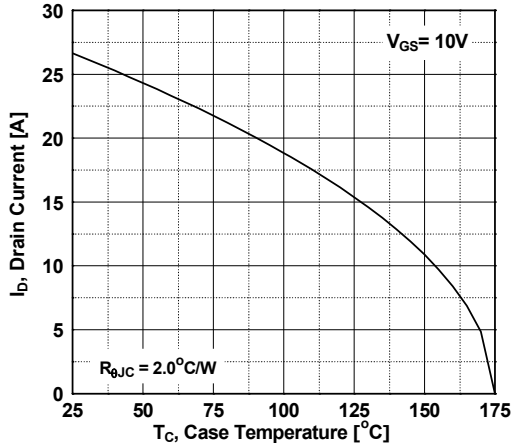


Figure 11. Eoss vs.Drain to Source Voltage

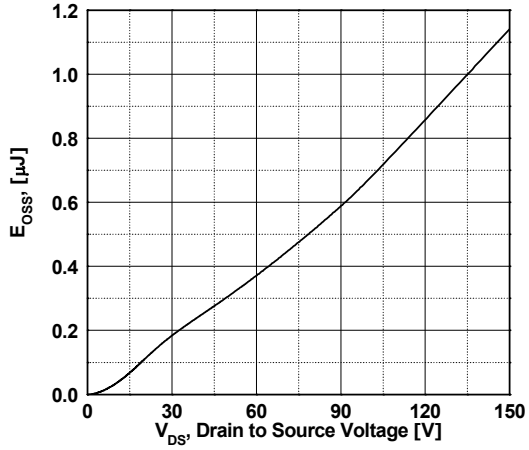
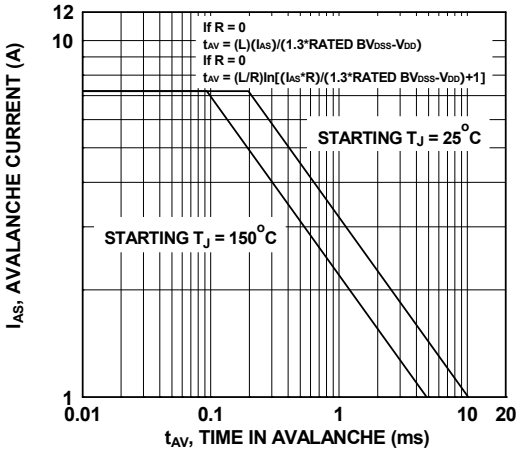
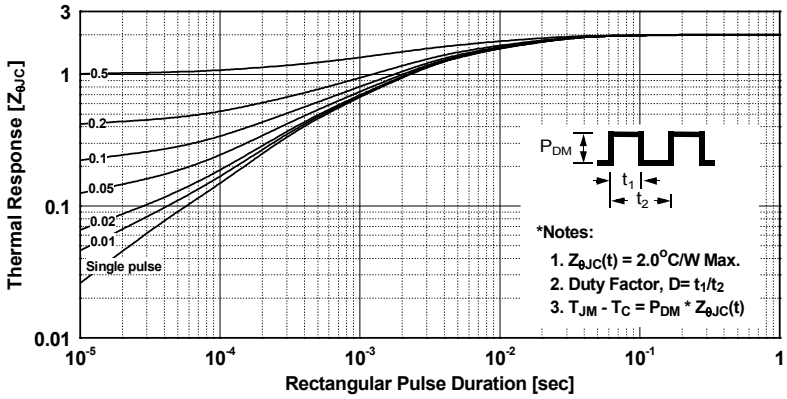


Figure 12. Unclamped Inductive Switching Capability

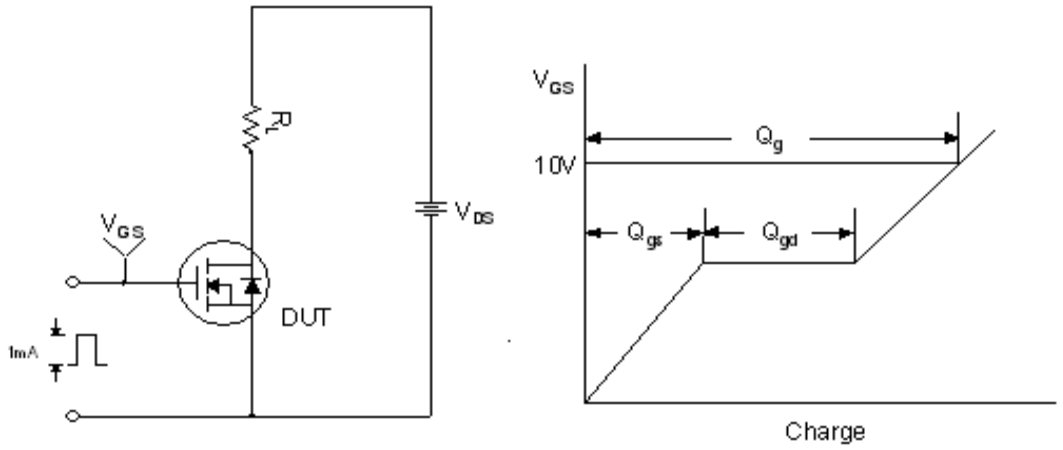


Typical Performance Characteristics (Continued)

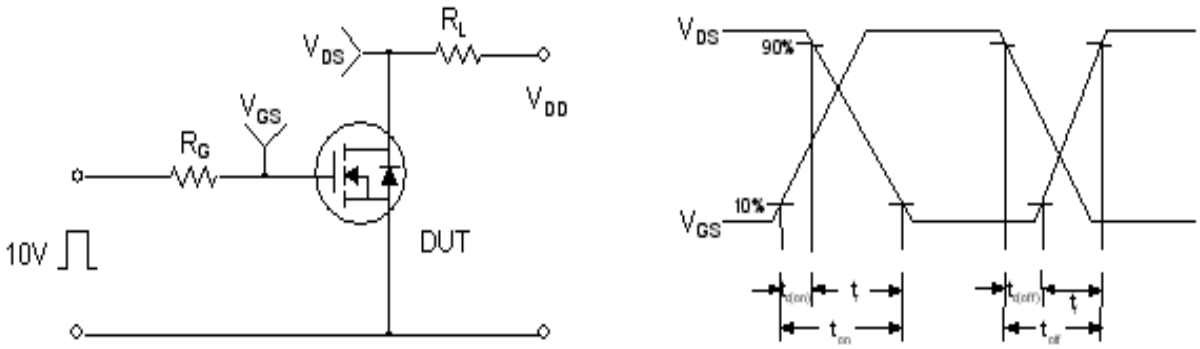
Figure 13. Transient Thermal Response Curve



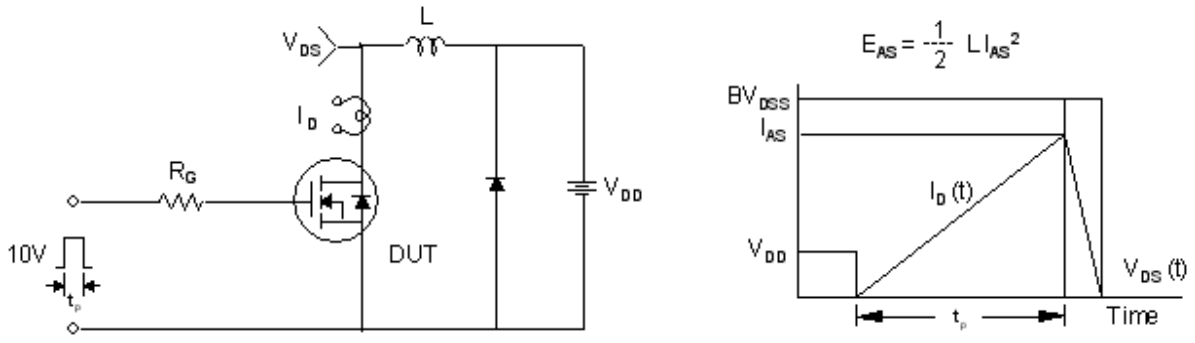
Gate Charge Test Circuit & Waveform



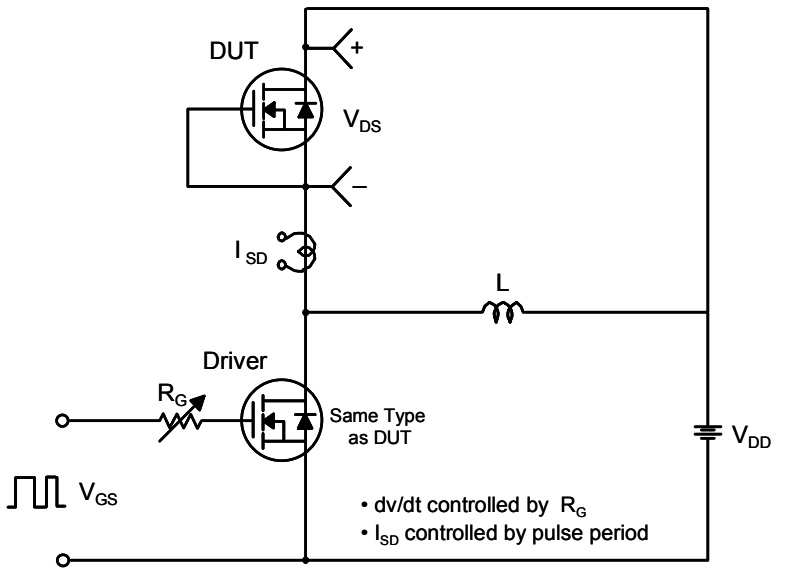
Resistive Switching Test Circuit & Waveforms

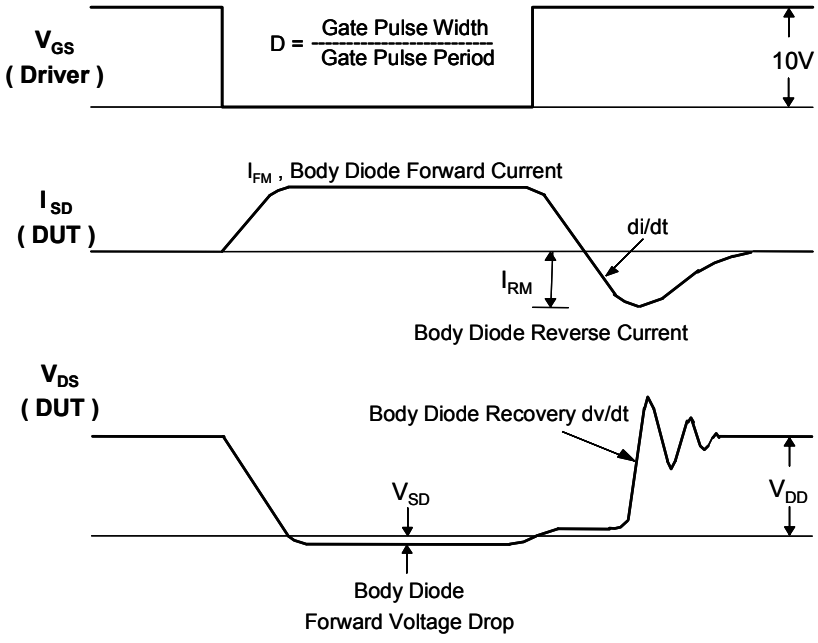


Unclamped Inductive Switching Test Circuit & Waveforms



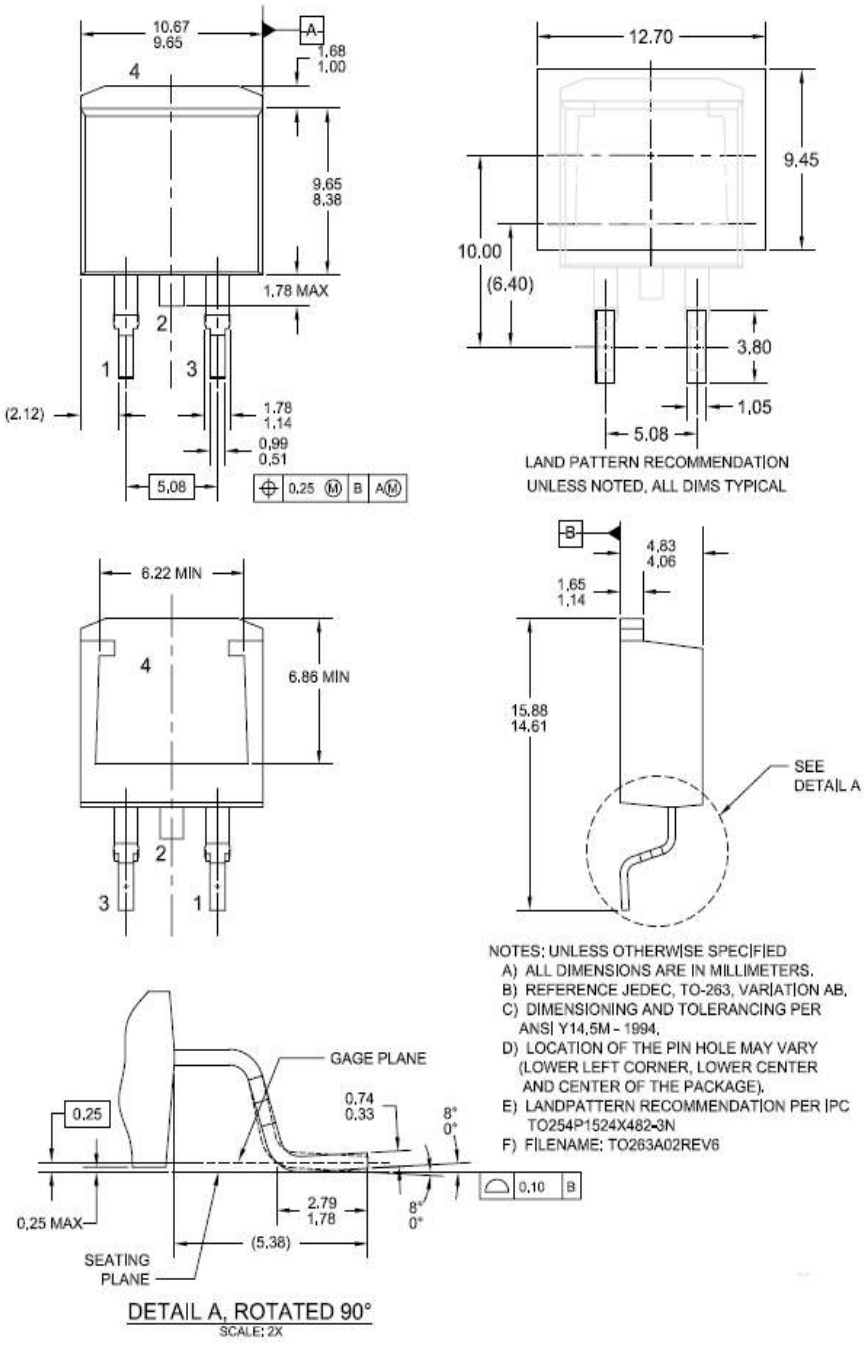
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

D^2PAK



Dimensions in Millimeters

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