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April 2015

FDD390N15A

N-Channel PowerTrench[®] MOSFET

150 V, 26 A, 40 mΩ



Features

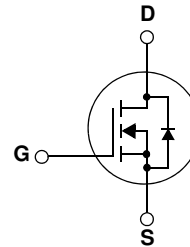
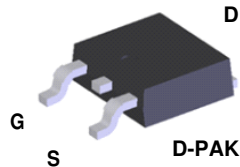
- $R_{DS(on)} = 33.5 \text{ m}\Omega$ (Typ.)@ $V_{GS} = 10 \text{ V}$, $I_D = 26 \text{ A}$
- Fast Switching Speed
- Low Gate Charge, $Q_G = 14.3 \text{ nC}$ (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

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

Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter



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

Symbol	Parameter	FDD390N15A	Unit
V_{DSS}	Drain to Source Voltage	150	V
V_{GSS}	Gate to Source Voltage	- DC	± 20
		- AC (f > 1 Hz)	± 30
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$, Silicon Limited)	26
		- Continuous ($T_C = 100^\circ\text{C}$, Silicon Limited)	17
I_{DM}	Drain Current - Pulsed (Note 1)	104	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 ($T_C = 25^\circ\text{C}$)		63
		- Derate above 25°C	0.5
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FDD390N15A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.0	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	87	

FDD390N15A — N-Channel PowerTrench[®] MOSFET

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDD390N15A	FDD390N15A	DDPAK	Tape and Reel	330 mm	16 mm	2500 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	150	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	-	0.1	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 120 \text{ V}, T_C = 125^\circ\text{C}$	-	-	1 500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 26 \text{ A}$	-	33.5	40	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 26 \text{ A}$	-	33	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	-	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	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}$	-	169	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 75 \text{ V}, I_D = 27 \text{ A}$ $V_{GS} = 10 \text{ V}$	-	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		(Note 4)	-	3.5	-
ESR	Equivalent Series Resistance (G-S)	$f = 1 \text{ MHz}$	-	1.4	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}, I_D = 27 \text{ A}$ $V_{GS} = 10 \text{ V}, R_{GEN} = 4.7 \Omega$	-	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		(Note 4)	-	5	20

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	26	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	104	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 26 \text{ A}$	-	-	1.25	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 27 \text{ A}, V_{DD} = 75 \text{ V}$	-	63	-	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100 \text{ A}/\mu\text{s}$	-	131	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Starting $T_J = 25^\circ\text{C}$, $L = 3 \text{ mH}$, $I_{SD} = 7.2 \text{ A}$
3. $I_{SD} \leq 26 \text{ A}$, $di/dt \leq 200 \text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

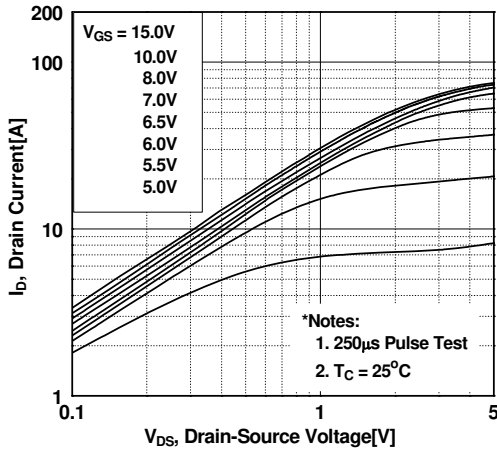


Figure 2. Transfer Characteristics

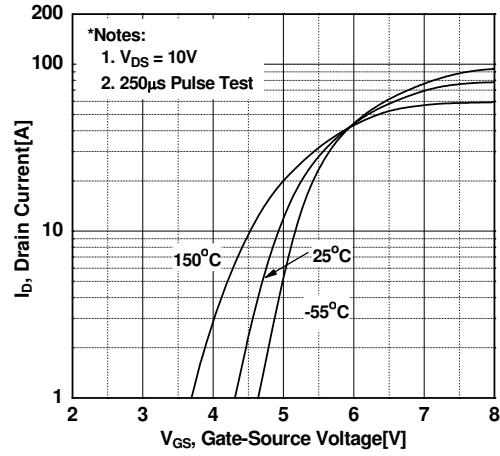


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

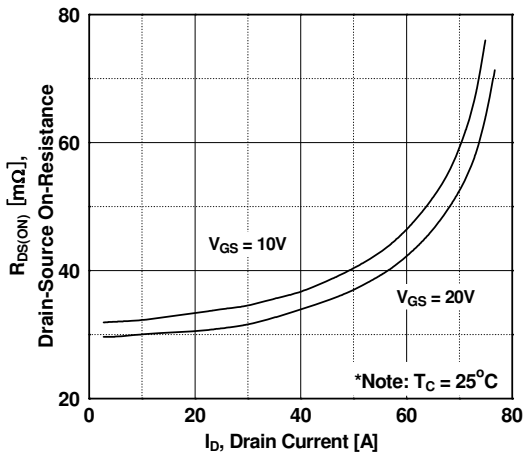


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

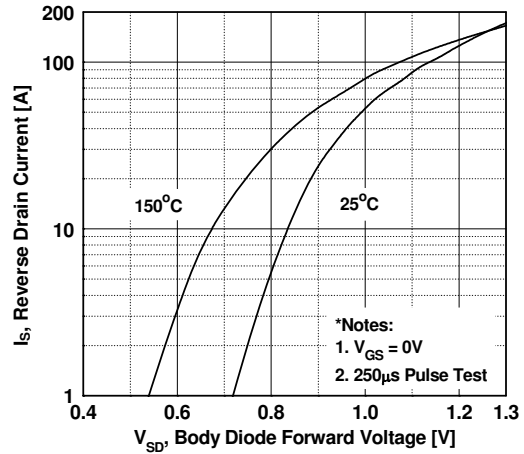


Figure 5. Capacitance Characteristics

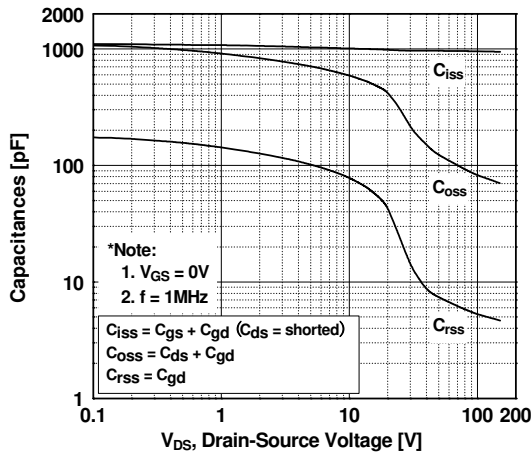
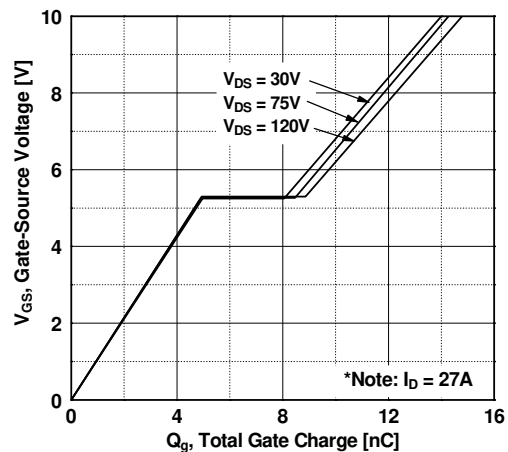


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

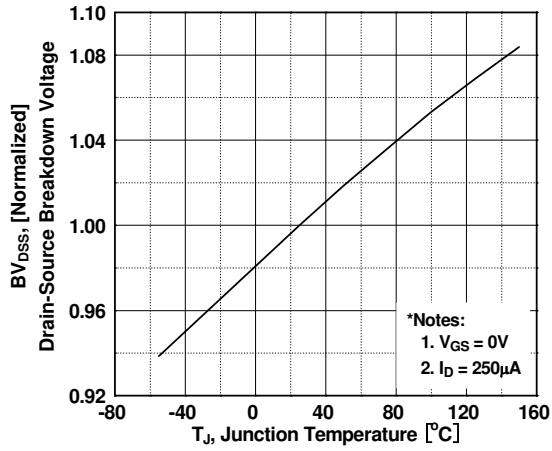


Figure 8. On-Resistance Variation vs. Temperature

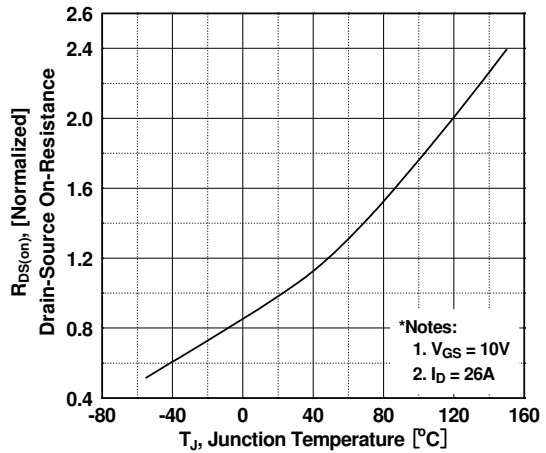


Figure 9. Maximum Safe Operating Area

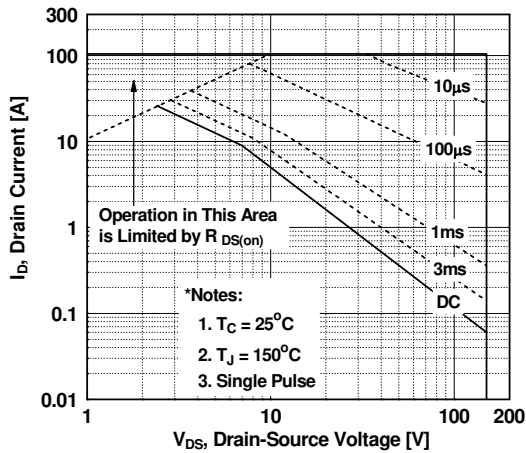


Figure 10. Maximum Drain Current vs. Case Temperature

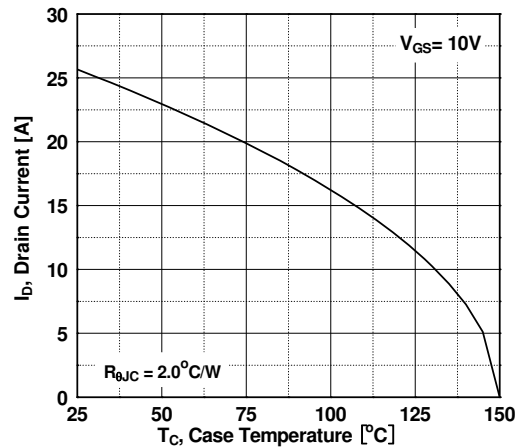


Figure 11. Eoss vs. Drain to Source Voltage

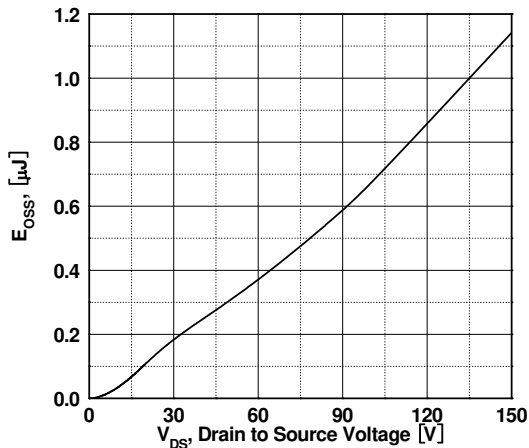
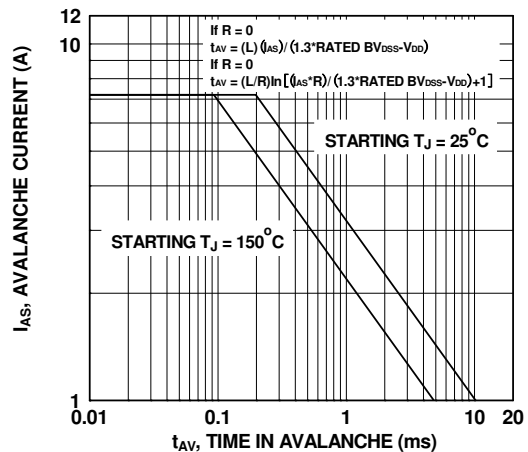
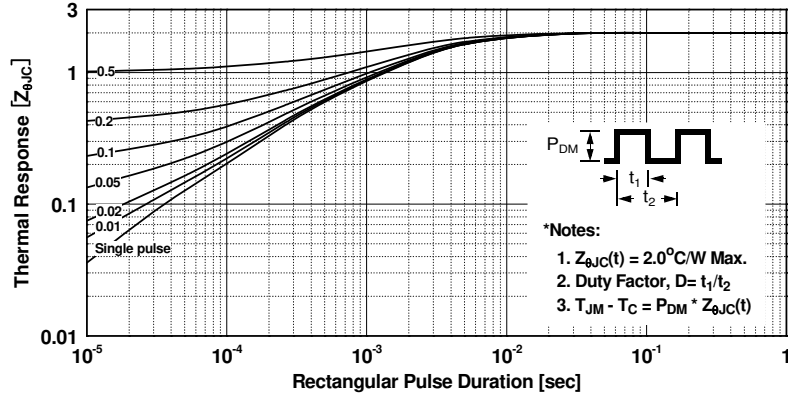


Figure 12. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve



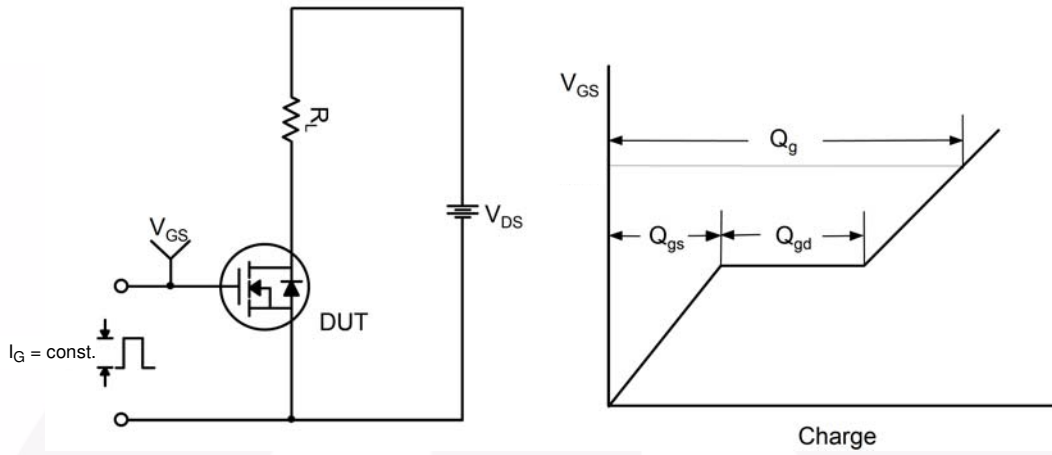


Figure 14. Gate Charge Test Circuit & Waveform

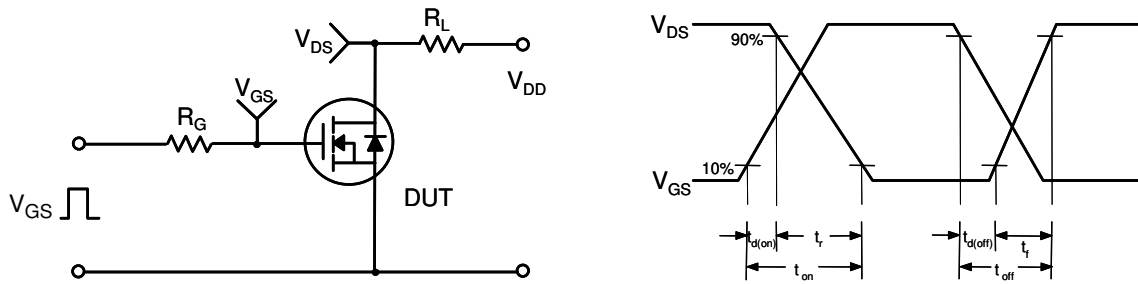


Figure 15. Resistive Switching Test Circuit & Waveforms

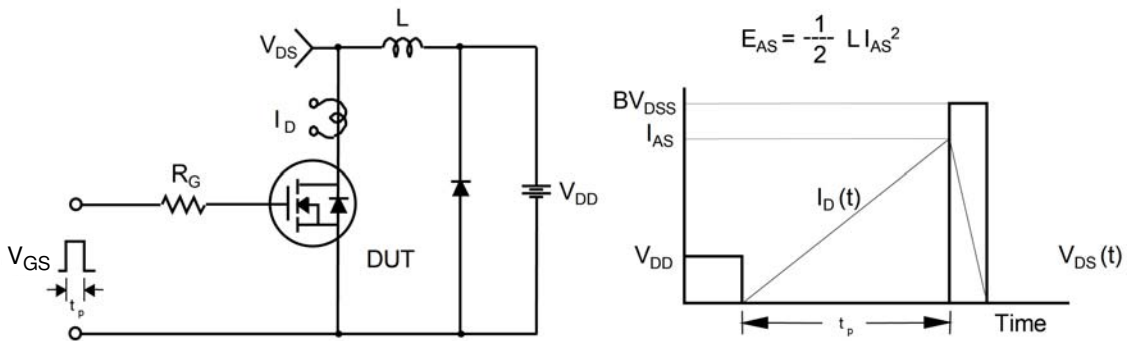


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

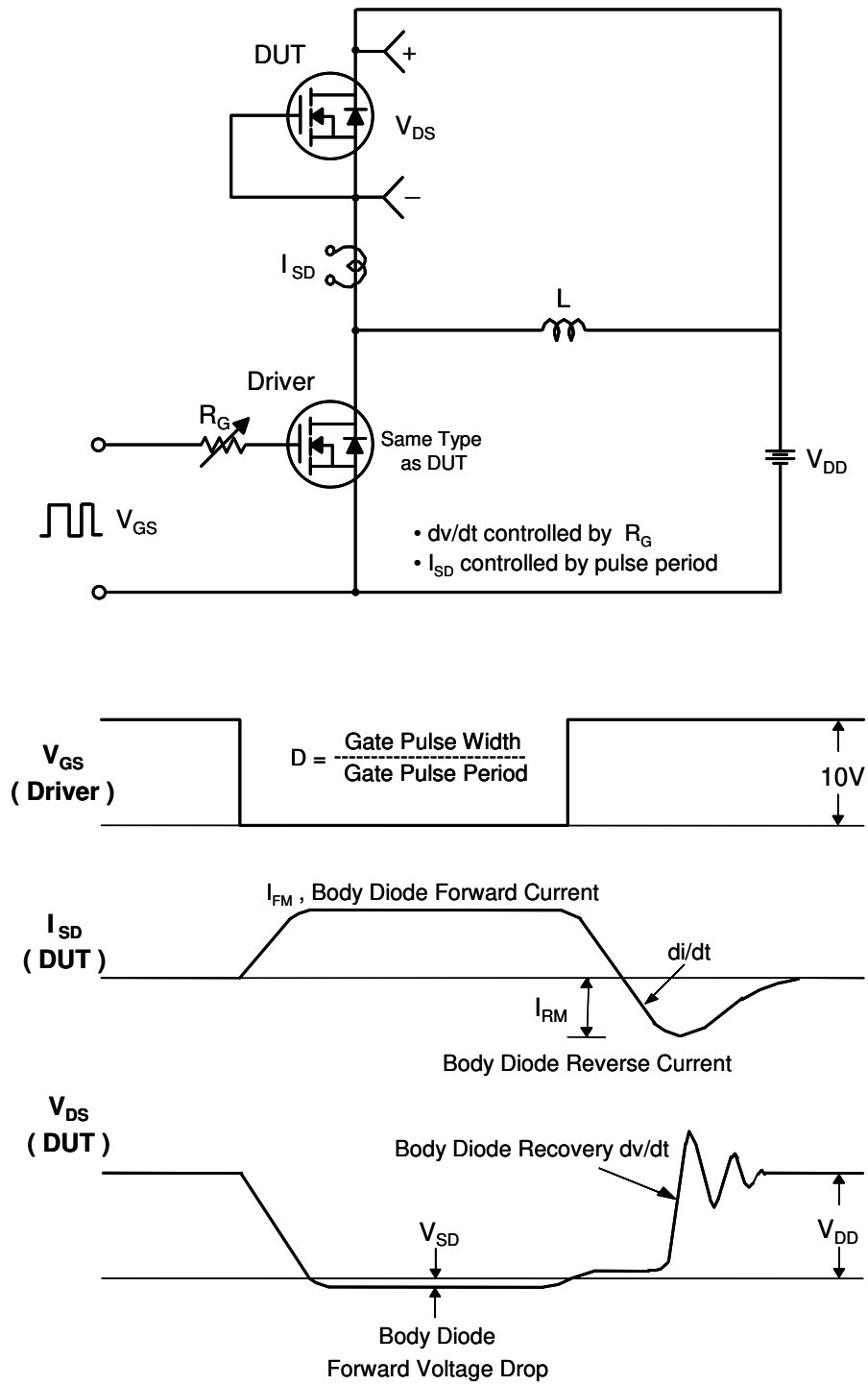
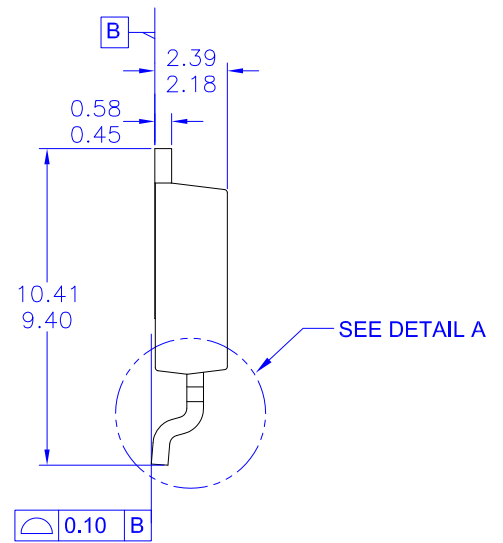
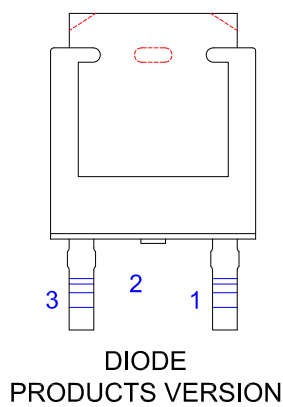
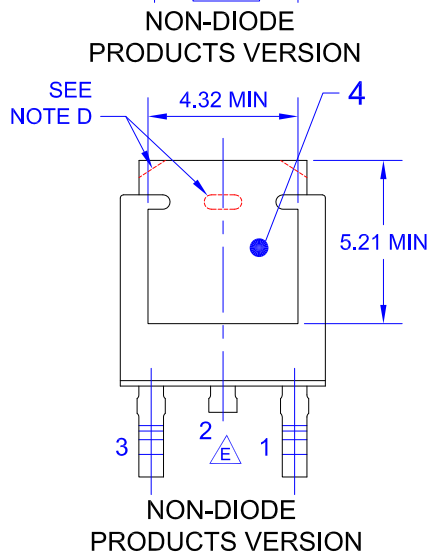
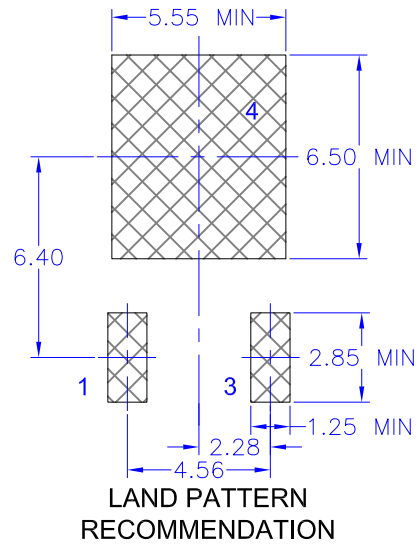
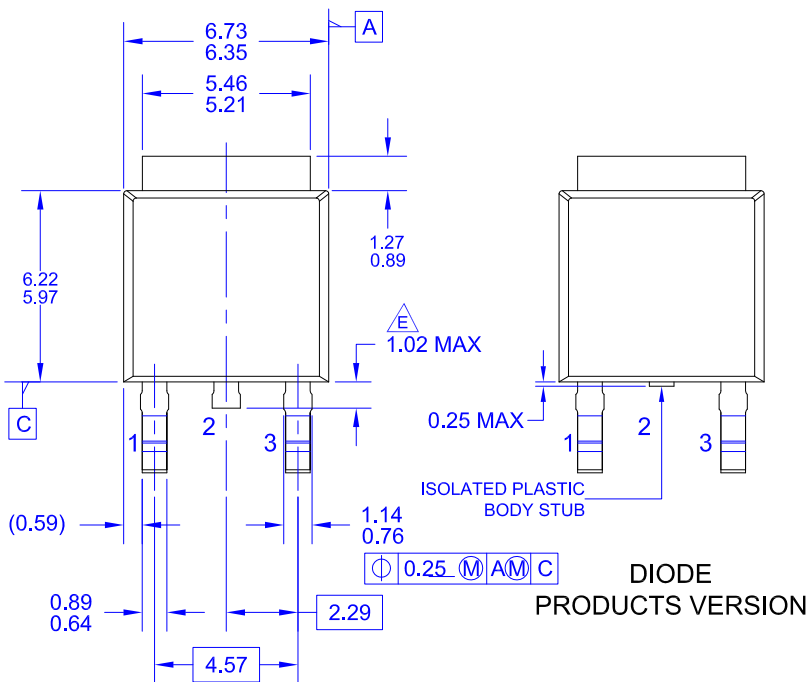
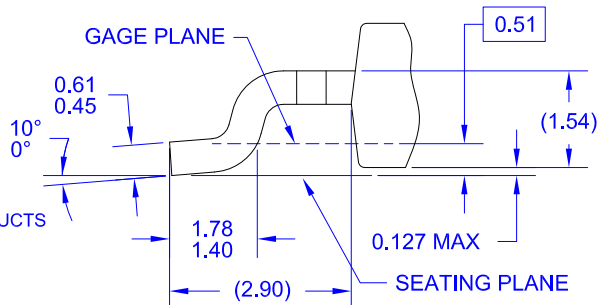


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
- E) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS
- F) DIMENSIONS ARE EXCLUSIVE OF BURS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.
- H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11



DETAIL A
(ROTATED -90°)
SCALE: 12X



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