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# FDPF770N15A

## N-Channel PowerTrench® MOSFET

### 150 V, 10 A, 77 mΩ

#### Features

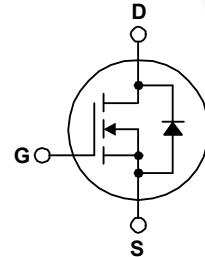
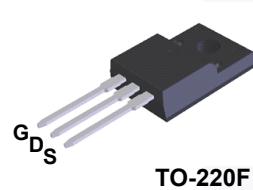
- $R_{DS(on)} = 60 \text{ mΩ}$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 10 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

#### Description

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

#### Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification for ATX / Server / Telecom PSU
- Uninterruptible Power Supply
- Micro Solar Inverter



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

Symbol	Parameter		FDPF770N15A	Unit
$V_{DSS}$	Drain to Source Voltage		150	V
$V_{GSS}$	Gate to Source Voltage	- DC	$\pm 20$	V
		- AC ( $f > 1 \text{ Hz}$ )	$\pm 30$	
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	10	A
		- Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	7	
$I_{DM}$	Drain Current	- Pulsed	(Note 1)	A
$E_{AS}$	Single Pulsed Avalanche Energy		(Note 2)	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$		(Note 3)	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	21	W
		- Derate Above $25^\circ\text{C}$	0.17	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	$^\circ\text{C}$

#### Thermal Characteristics

Symbol	Parameter	FDPF770N15A	Unit
$R_{\theta,JC}$	Thermal Resistance, Junction to Case, Max.	5.9	$^\circ\text{C}/\text{W}$
$R_{\theta,JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF770N15A	FDPF770N15A	TO-220F	Tube	N/A	N/A	50 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

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

### On Characteristics

$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.0	-	4.0	V
$R_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$	-	60	77	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 10 \text{ A}$	-	15	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	575	765	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	64	85	pF
$C_{rss}$	Reverse Transfer Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	3.9	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 75 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	113	-	pF
$Q_g(\text{tot})$	Total Gate Charge at 10V	$V_{DS} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}$	-	8.6	11.2	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DS} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}$	-	3.2	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau	$V_{DS} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}$	(Note 4)	-	1.2	nC
$Q_{gd}$	Gate to Drain "Miller" Charge	$V_{DS} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}$	-	1.9	-	nC
ESR	Equivalent Series Resistance (G-S)	$f = 1 \text{ MHz}$	-	0.5	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	12	34	ns	
$t_r$	Turn-On Rise Time	$V_{DD} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	8	26	ns	
$t_{d(off)}$	Turn-Off Delay Time	$V_{DD} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	15	40	ns	
$t_f$	Turn-Off Fall Time	$V_{DD} = 75 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	(Note 4)	-	3	16	ns

### Drain-Source Diode Characteristics

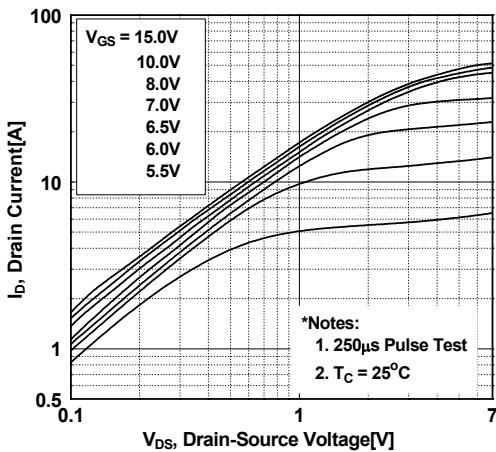
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	10	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	40	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 10 \text{ A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 10 \text{ A}, V_{DD} = 75 \text{ V}, dI_F/dt = 100 \text{ A}/\mu\text{s}$	-	59	-	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt = 100 \text{ A}/\mu\text{s}$	-	124	-	nC

#### Notes:

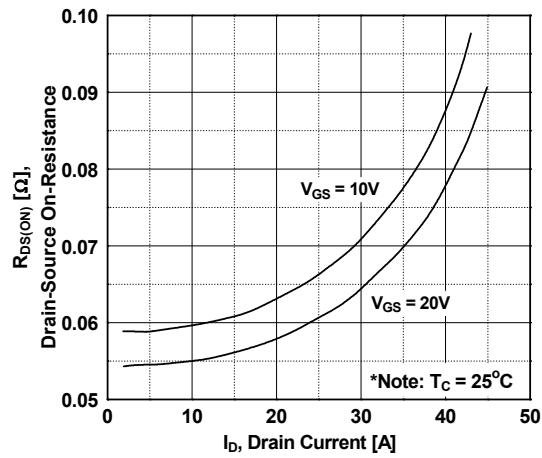
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3 \text{ mH}$ ,  $I_{SD} = 4.8 \text{ A}$ .
3.  $I_{SD} \leq 10 \text{ A}$ ,  $dI/dt \leq 200 \text{ A}/\mu\text{s}$ ,  $V_{DD} \leq \text{BV}_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

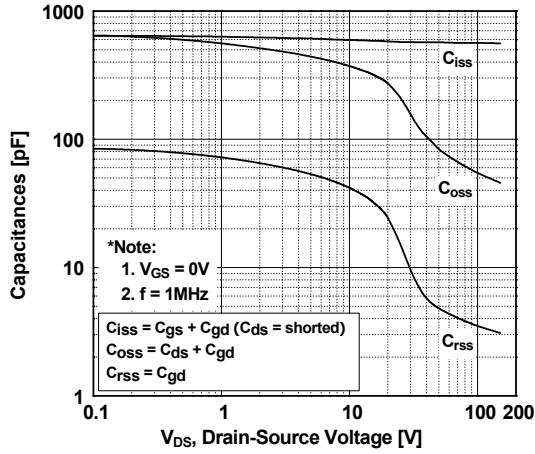
**Figure 1. On-Region Characteristics**



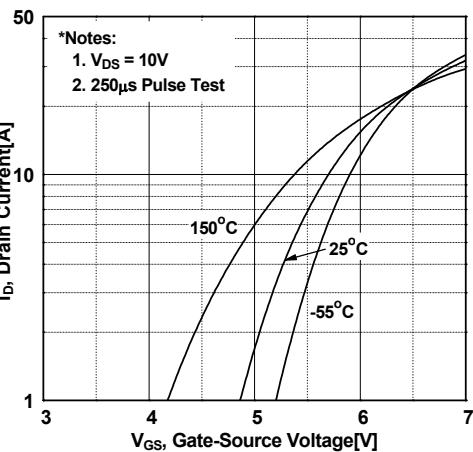
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



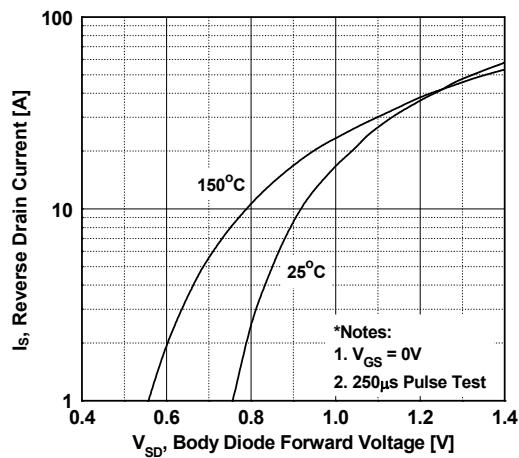
**Figure 5. Capacitance Characteristics**



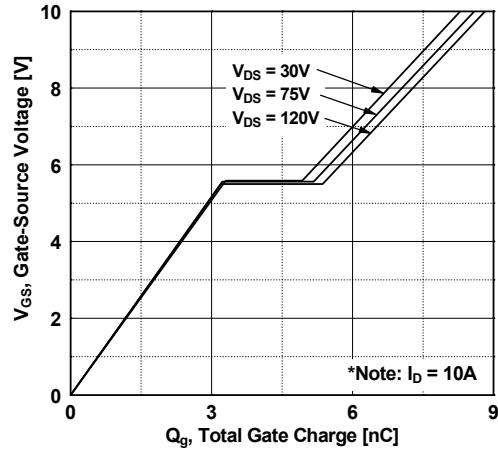
**Figure 2. Transfer Characteristics**



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

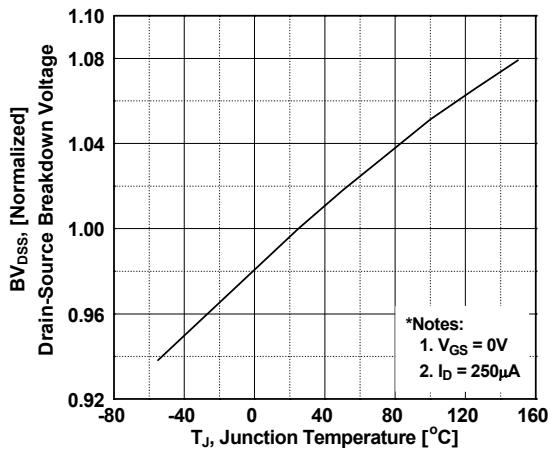


**Figure 6. Gate Charge Characteristics**

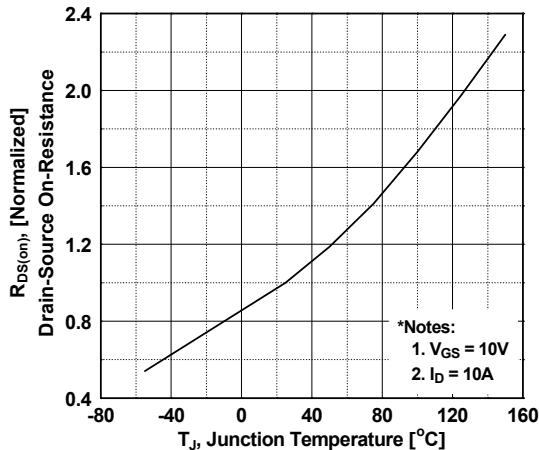


## Typical Performance Characteristics (Continued)

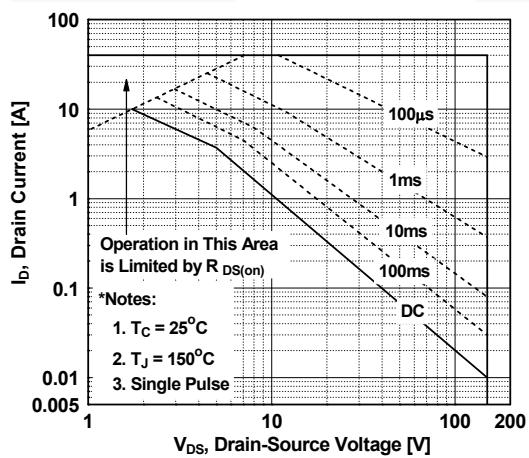
**Figure 7. Breakdown Voltage Variation vs. Temperature**



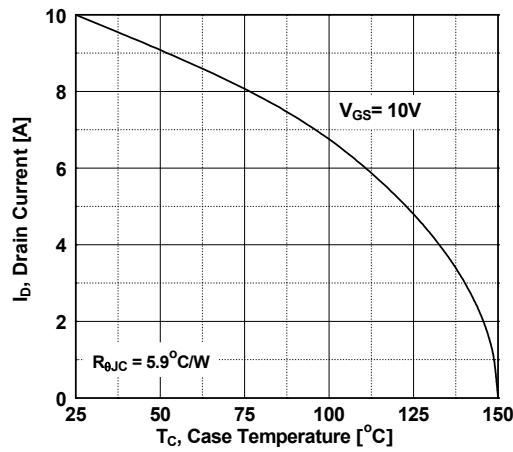
**Figure 8. On-Resistance Variation vs. Temperature**



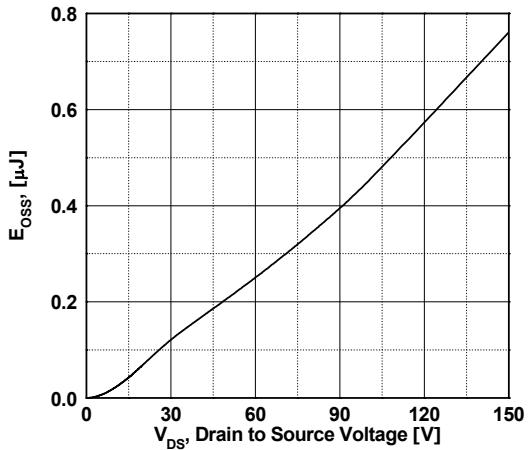
**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**

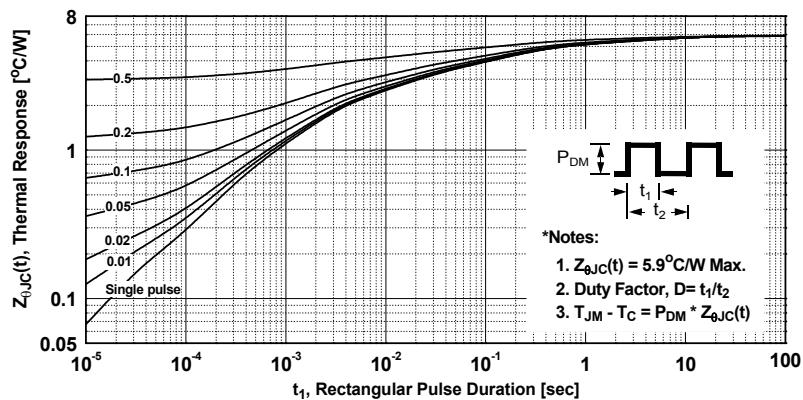


**Figure 11. Eoss vs. Drain to Source Voltage**



## Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



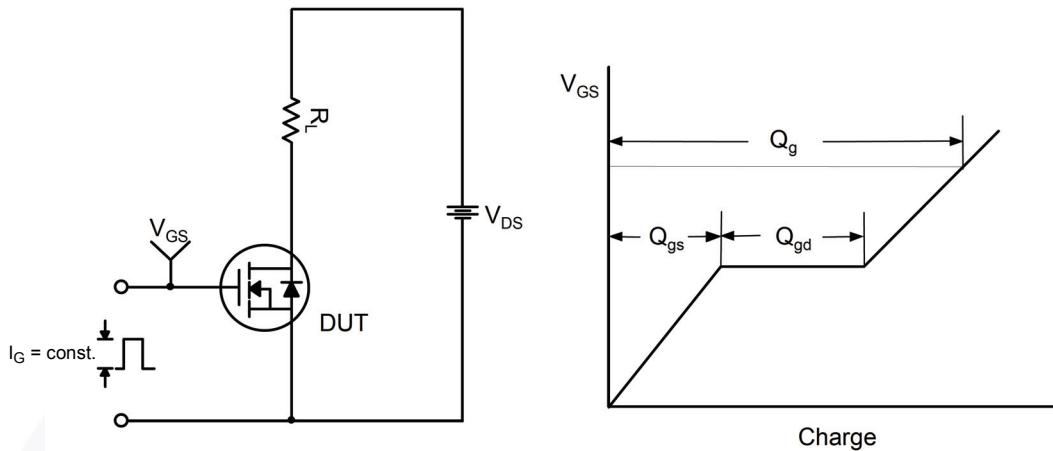


Figure 13. Gate Charge Test Circuit & Waveform

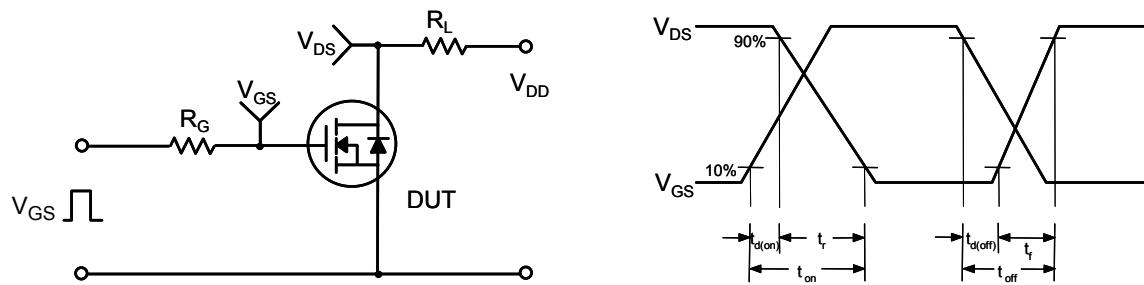


Figure 14. Resistive Switching Test Circuit & Waveforms

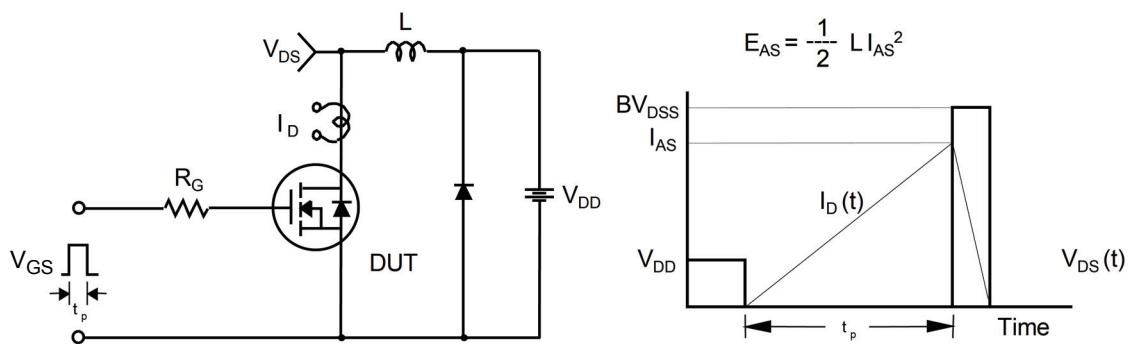


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

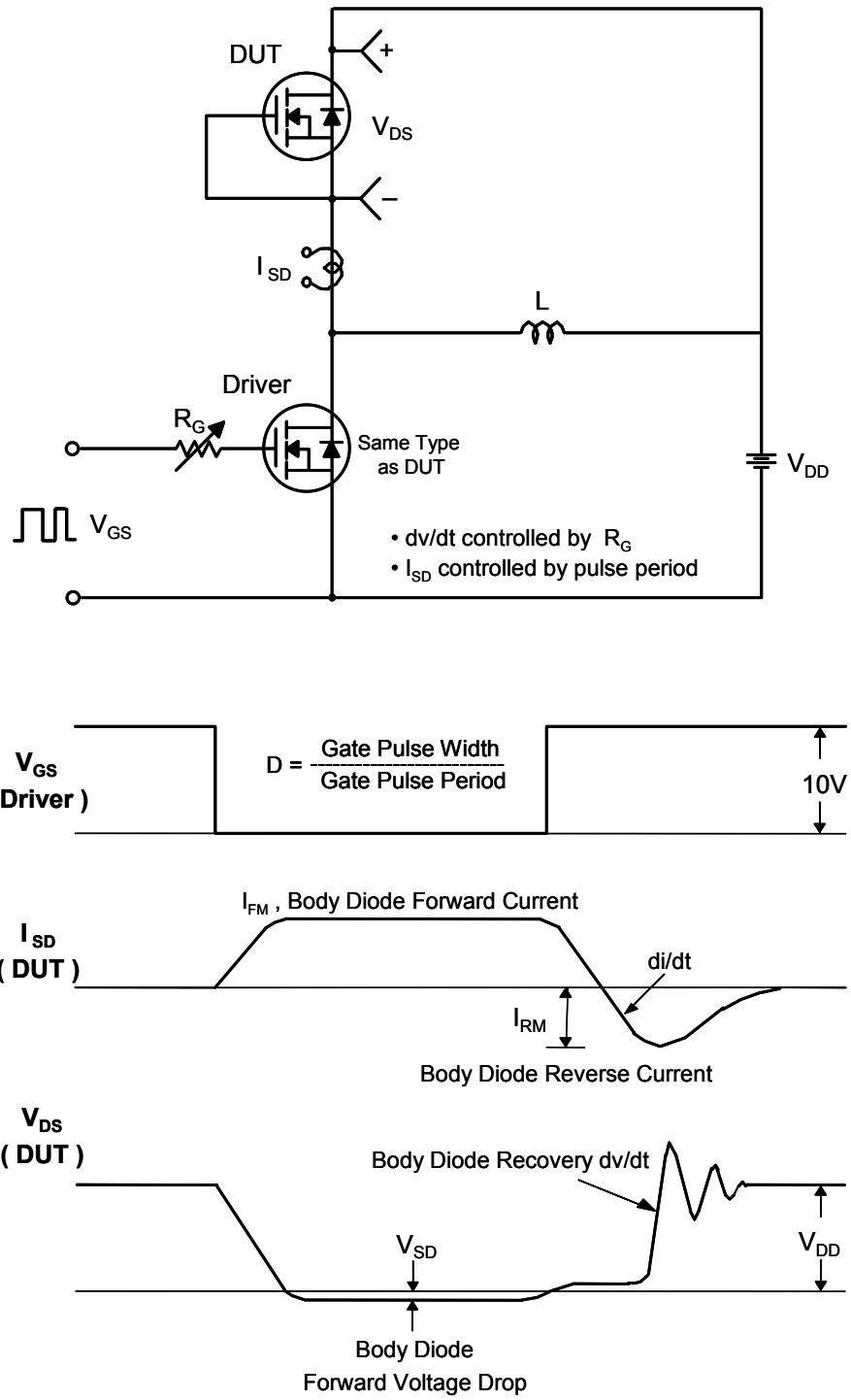
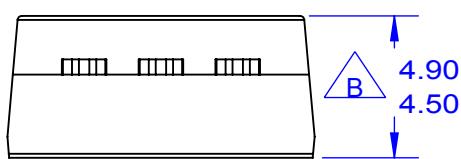
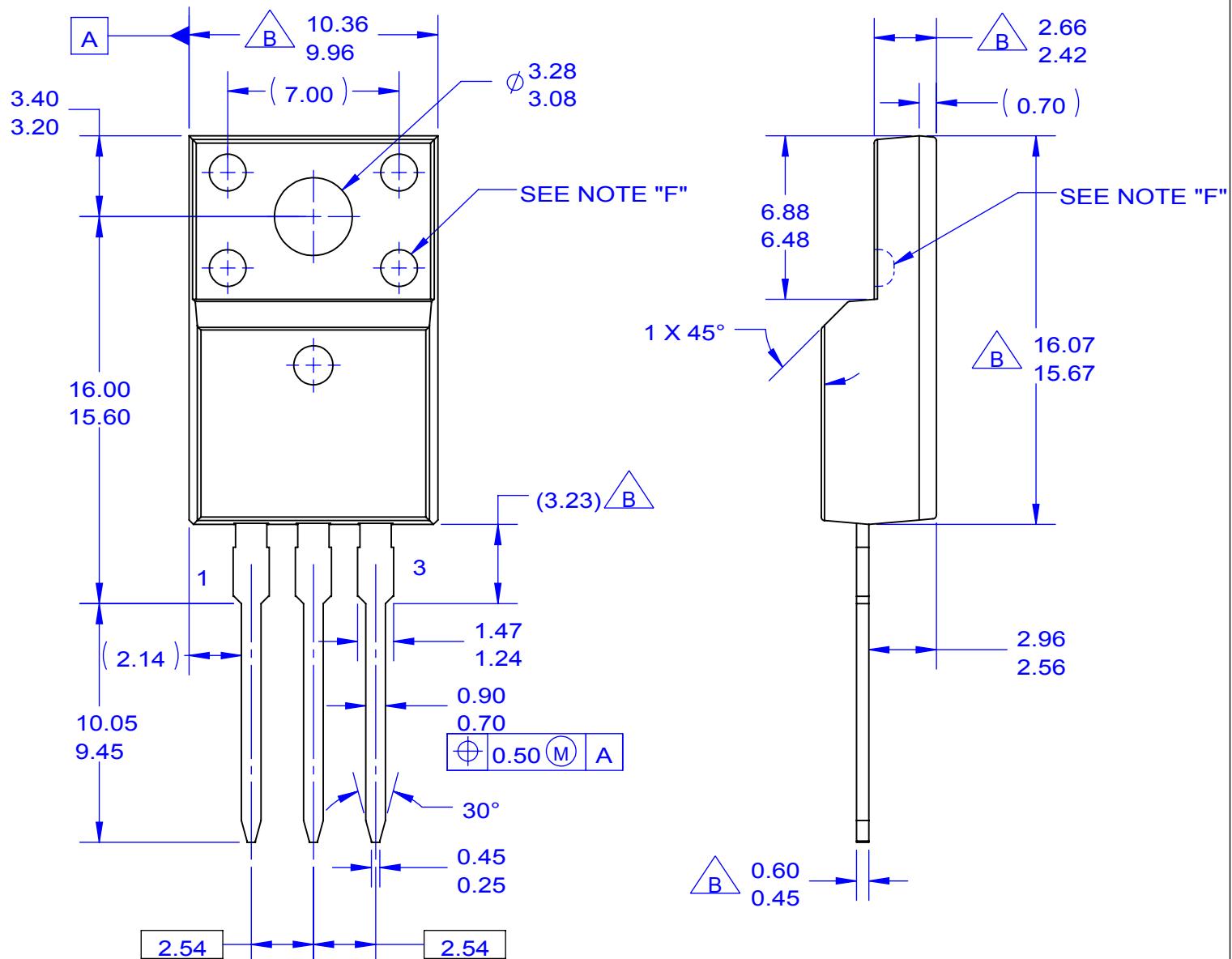


Figure 16. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms



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## NOTES:

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 B. DOES NOT COMPLY EIAJ STD. VALUE.

C. ALL DIMENSIONS ARE IN MILLIMETERS.

D. DIMENSIONS ARE EXCLUSIVE OF BURRS,  
MOLD FLASH AND TIE BAR PROTRUSIONS.

E. DIMENSION AND TOLERANCE AS PER ASME  
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F. OPTION 1 - WITH SUPPORT PIN HOLE.  
OPTION 2 - NO SUPPORT PIN HOLE.

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