

# FDPF085N10A

## N-Channel PowerTrench® MOSFET 100V, 40A, 8.5mΩ

### Features

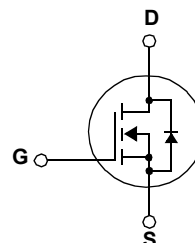
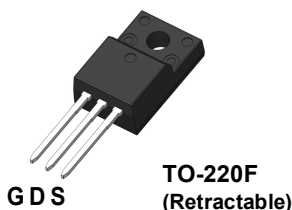
- $R_{DS(on)} = 6.5m\Omega$  (Typ.) @  $V_{GS} = 10V$ ,  $I_D = 40A$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### General 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 Server/Telecom PSU
- Battery Charger
- AC motor drives and Uninterruptible Power Supplies
- Off-line UPS



### MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	100	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ C$ )	A
		- Continuous ( $T_C = 100^\circ C$ )	
$I_{DM}$	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	( $T_C = 25^\circ C$ )	W
		- Derate above $25^\circ C$	$W/^\circ C$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.5	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF085N10A	FDPF085N10A	TO-220F	-	-	50

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.07	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{V}$ , $V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 80\text{V}$ , $T_C = 150^\circ\text{C}$	-	-	500	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$	-	-	$\pm 100$	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	$V_{GS} = 10\text{V}$ , $I_D = 40\text{A}$	-	6.5	8.5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}$ , $I_D = 40\text{A}$ (Note 4)	-	76	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 50\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	2025	2695	pF
$C_{oss}$	Output Capacitance		-	468	620	pF
$C_{rss}$	Reverse Transfer Capacitance		-	20	-	pF
$C_{oss(er)}$	Engry Related Output Capacitance	$V_{DS} = 50\text{V}$ , $V_{GS} = 0\text{V}$	-	752	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{GS} = 10\text{V}$ , $V_{DS} = 50\text{V}$ $I_D = 96\text{A}$ (Note 4, 5)	-	31	40	nC
$Q_{gs}$	Gate to Source Gate Charge		-	9.7	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	5.0	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	7.5	-	nC
ESR	Equivalent Series Resistance (G-S)	Drain Open, $f = 1\text{MHz}$	-	0.97	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{V}$ , $I_D = 96\text{A}$ $V_{GS} = 10\text{V}$ , $R_{GEN} = 4.7\Omega$ (Note 4, 5)	-	18	46	ns
$t_r$	Turn-On Rise Time		-	22	54	ns
$t_{d(off)}$	Turn-Off Delay Time		-	29	68	ns
$t_f$	Turn-Off Fall Time		-	8	26	ns

### Drain-Source Diode Characteristics

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	40	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	160	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 40A	-	-	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>DD</sub> = 50V, V <sub>GS</sub> = 0V, I <sub>SD</sub> = 96A	-	59	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt = 100A/μs (Note 4)	-	80	-	nC

#### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 3\text{mH}$ ,  $I_{AS} = 13.4\text{A}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 40\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Dual Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

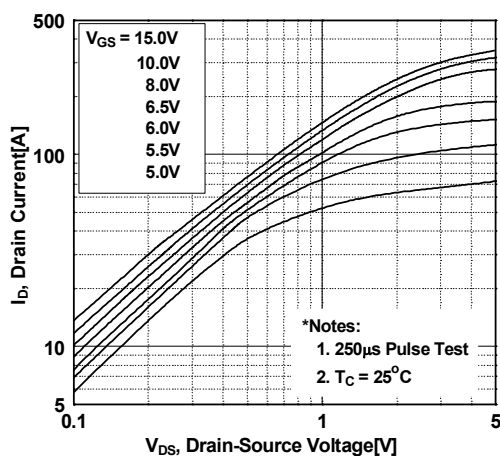


Figure 2. Transfer Characteristics

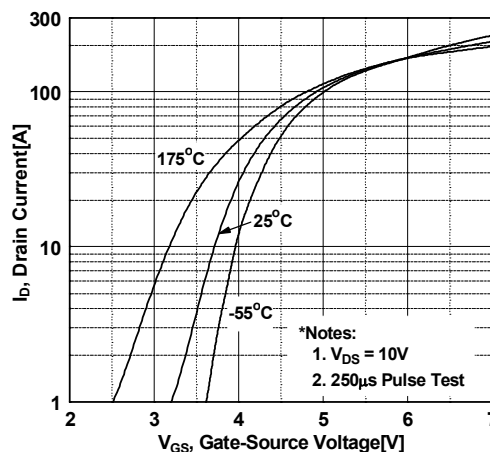


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

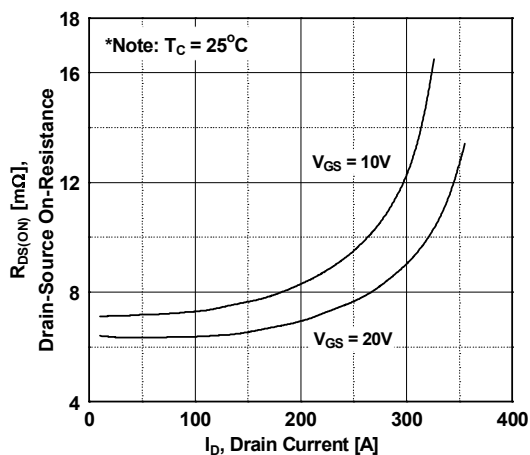


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

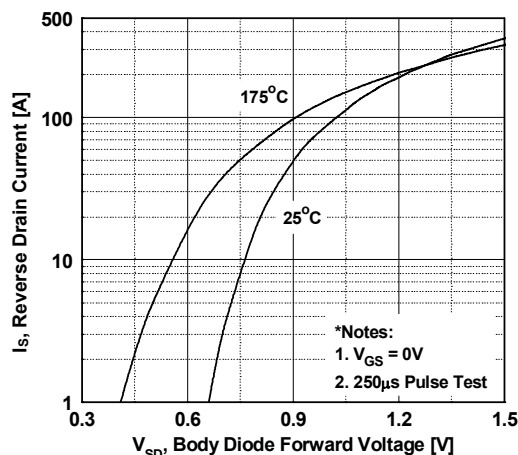


Figure 5. Capacitance Characteristics

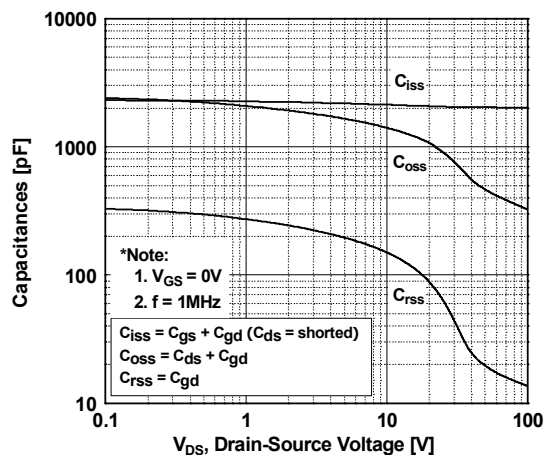
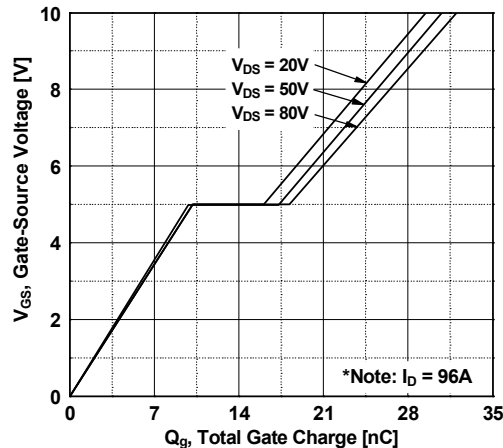
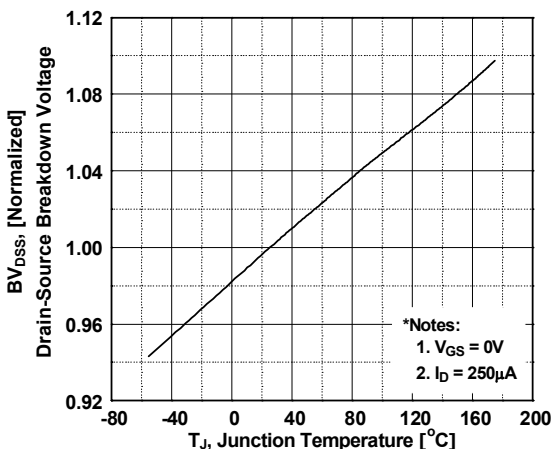


Figure 6. Gate Charge Characteristics

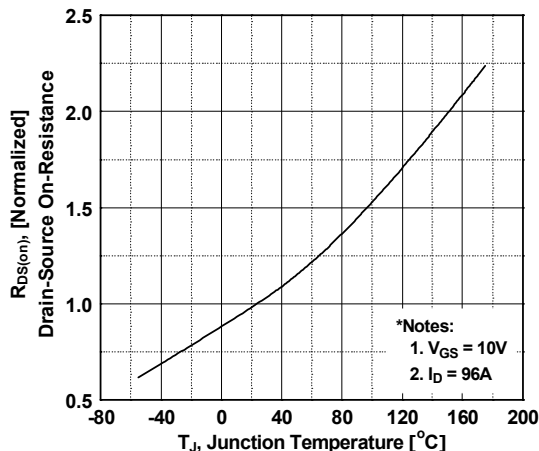


# Typical Performance Characteristics (Continued)

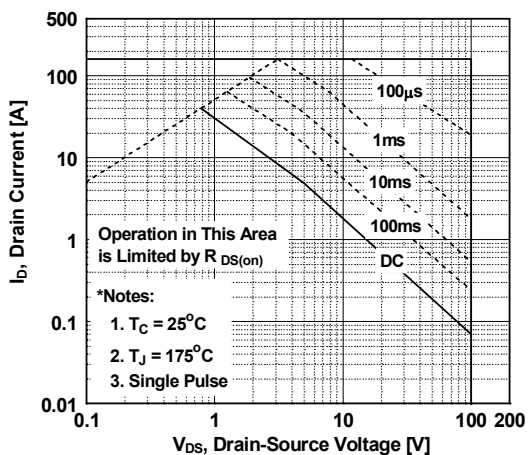
**Figure 7. Breakdown Voltage Variation vs. Temperature**



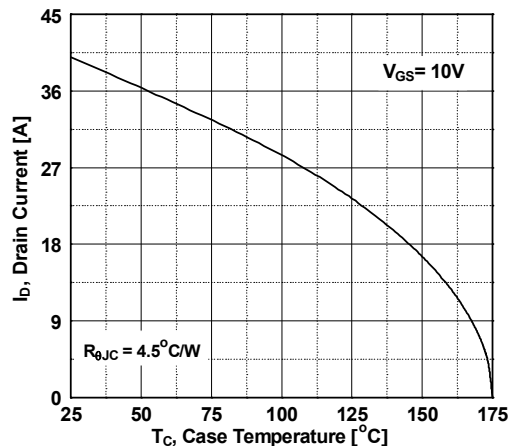
**Figure 8. On-Resistance Variation vs. Temperature**



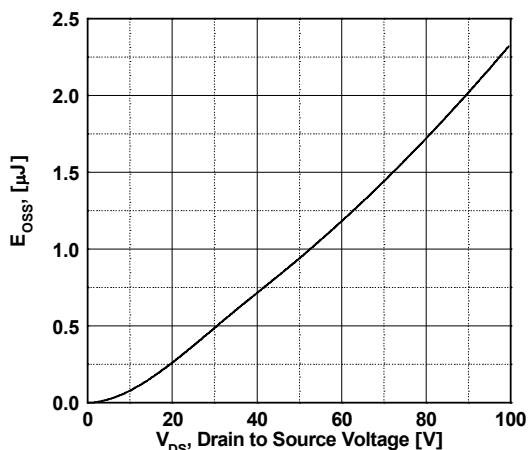
**Figure 9. Maximum Safe Operating Area**



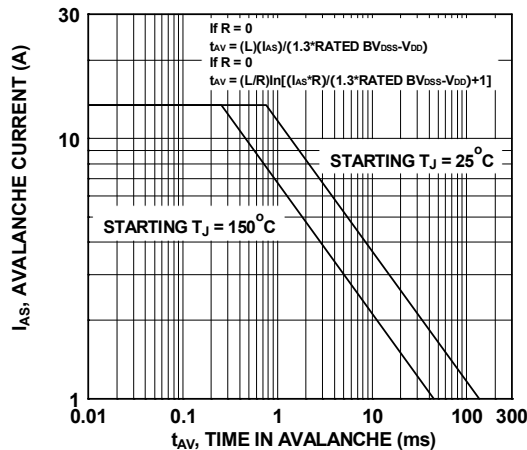
**Figure 10. Maximum Drain Current vs. Case Temperature**



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

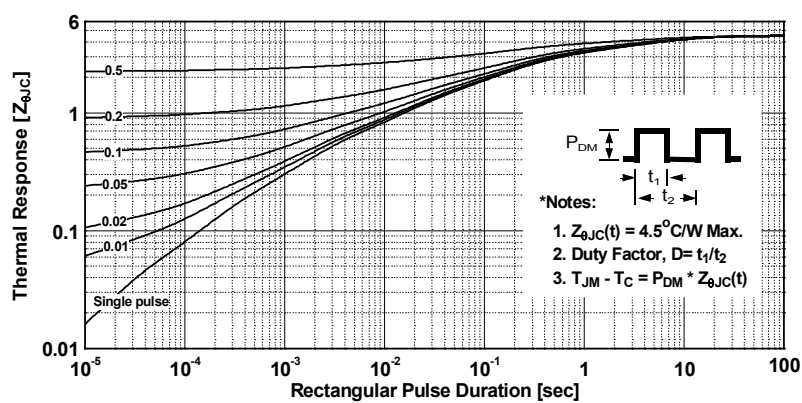


**Figure 12. Unclamped Inductive Switching Capability**

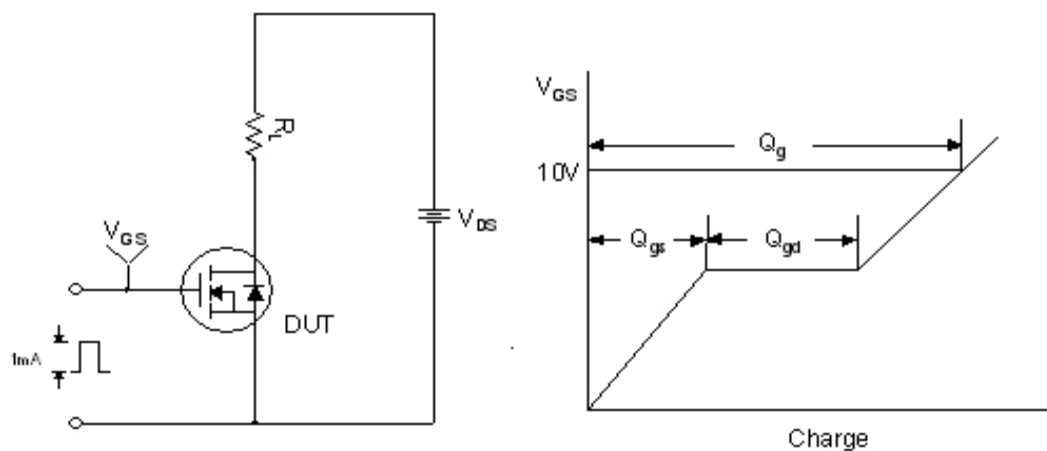


## Typical Performance Characteristics (Continued)

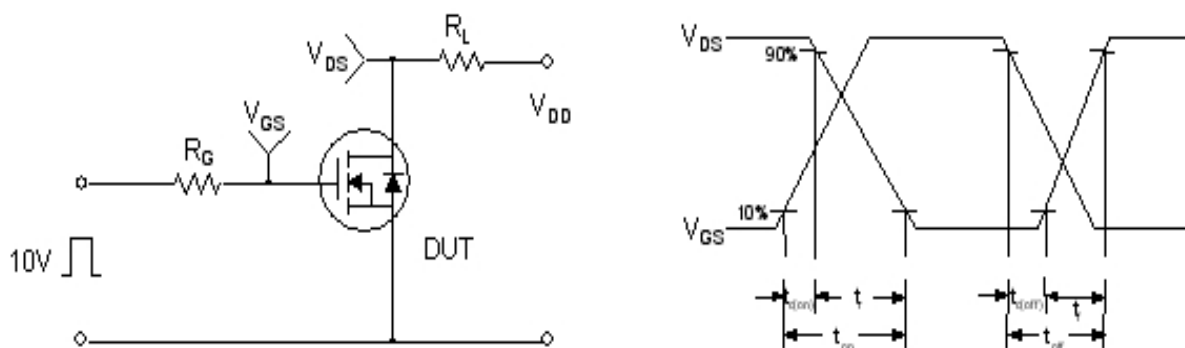
Figure 13. Transient Thermal Response Curve



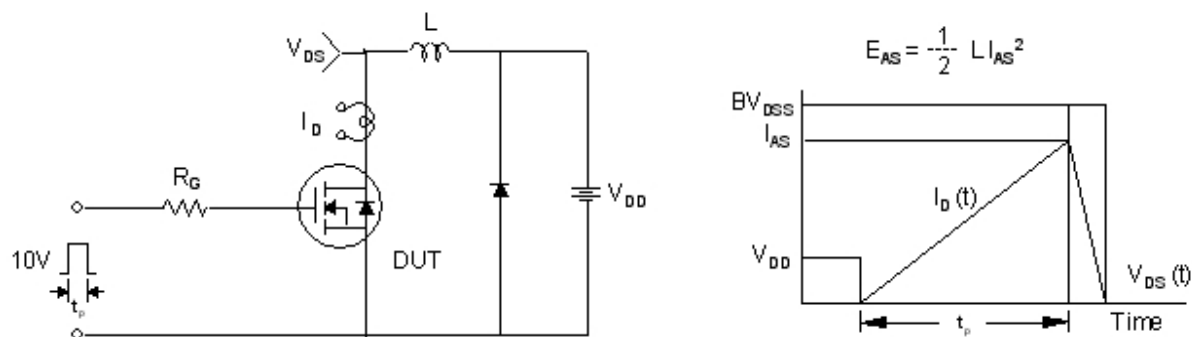
Gate Charge Test Circuit & Waveform



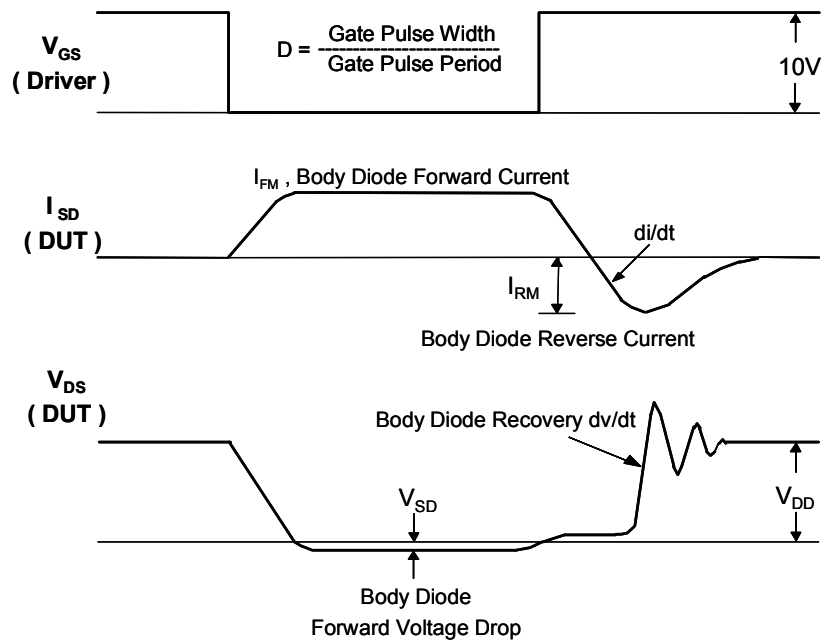
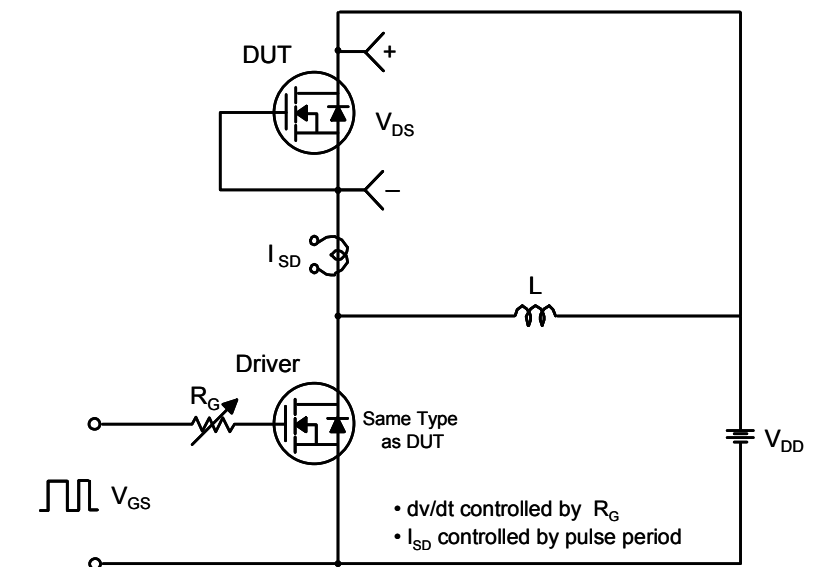
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

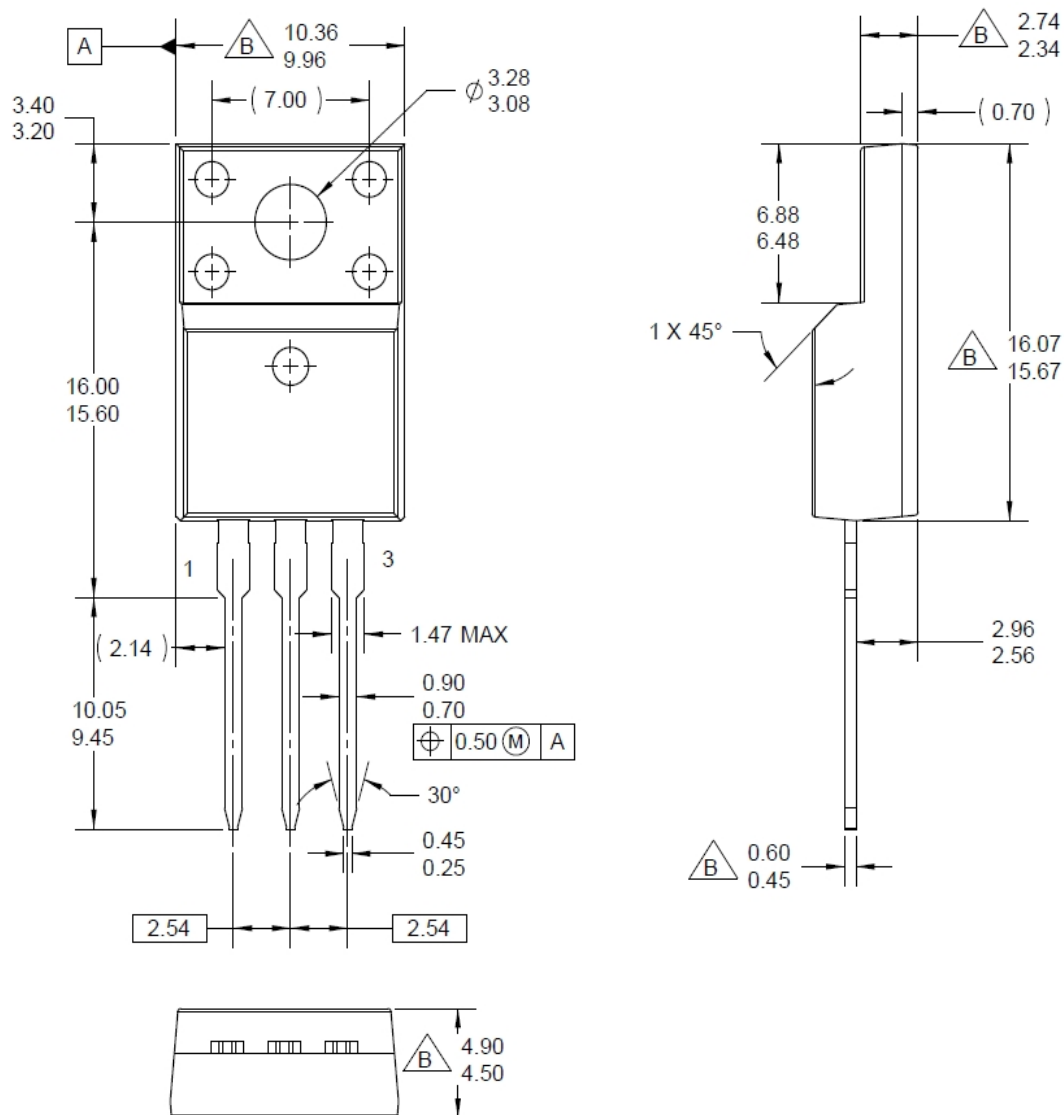


# Peak Diode Recovery dv/dt Test Circuit & Waveforms



# Package Dimensions

## TO-220F (Retractable)








\* Front/Back Side Isolation Voltage : AC 2500V

Dimensions in Millimeters



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Rev. I54