

# MOSFET – N-Channel, POWER trench®

100 V, 75 A, 9 mΩ

FDP090N10

## Description

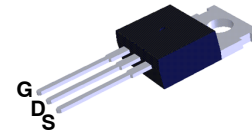
This N-Channel MOSFET is produced using onsemi's advance POWER trench process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

## Features

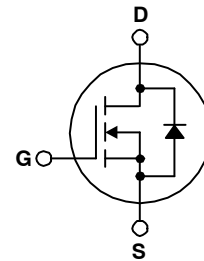
- $R_{DS(on)} = 7.2 \text{ m}\Omega$  (Typ) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

## Applications

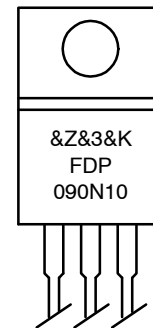
- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Micor Solar Inverter



TO-220-3LD  
CASE 340AT



## MARKING DIAGRAM



&Z	= Assembly Plant Code
&3	= 3-Digit Date Code
&K	= 2-Digit Lot Run Traceability Code
FDP090N10	= Specific Device Code

## ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

# FDP090N10

## MOSFET MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter		FDP090N10	Unit
$V_{DSS}$	Drain to Source Voltage		100	V
$V_{GSS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	– Continuous $T_C = 85^\circ\text{C}$	75	A
$I_{DM}$	Drain Current	– Pulsed (Note 1)	300	A
$E_{AS}$	Single Pulse Avalanche Energy (Note 2)		309	mJ
$I_{AR}$	Avalanche Current (Note 1)		75	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)		20.8	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)		5.6	V/ns
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	208	W
		– Derate Above $25^\circ\text{C}$	1.39	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range		$-55$ to $+175$	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

Symbol	Parameter	FDP090N10	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.72	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	62.5	

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}, T_C = 25^\circ\text{C}$	100	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	–	0.1	–	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$	–	–	1	$\mu\text{A}$
		$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}, T_C = 150^\circ\text{C}$	–	–	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	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 75 \text{ A}$	–	7.2	9	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 37.5 \text{ A}$	–	100	–	S

# FDP090N10

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	–	6185	8225	pF
$C_{oss}$	Output Capacitance		–	585	775	pF
$C_{rss}$	Reverse Transfer Capacitance		–	235	355	pF

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}, I_D = 75\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 25\ \Omega$ (Note 4)	–	107	224	ns
$t_r$	Turn-On Rise Time		–	322	655	
$t_{d(off)}$	Turn-Off Delay Time		–	166	342	
$t_f$	Turn-Off Fall Time		–	149	309	
$Q_{g(TOT)}$	Total Gate Charge at 10 V	$V_{DS} = 50\text{ V}, I_D = 75\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	–	89	116	nC
$Q_{gs}$	Gate to Source Gate Charge		–	37	–	
$Q_{gd}$	Gate to Drain "Miller" Charge		–	22	–	

### DRAIN-SOURCE DIODE CHARACTERISTICS

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		–	–	75	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		–	–	300	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 75 A	–	–	1.25	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 75 A, dI <sub>F</sub> /dt = 100 A/μs	–	73	–	ns
Q <sub>rr</sub>	Reverse Recovery Charge		–	166	–	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

#### NOTES:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 0.11\text{ mH}$ ,  $I_{AS} = 75\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 75\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## TYPICAL PERFORMANCE CHARACTERISTICS

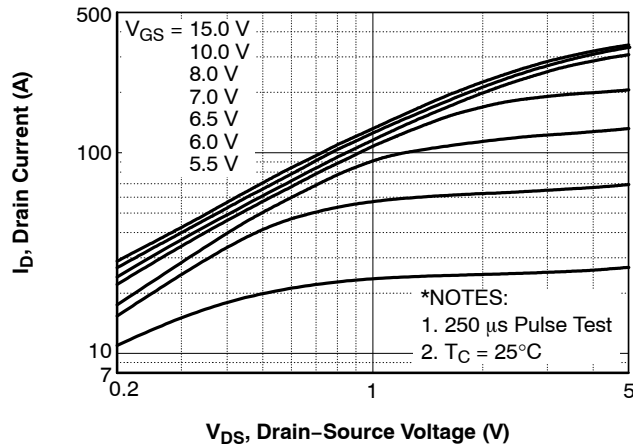


Figure 1. On-Region Characteristics

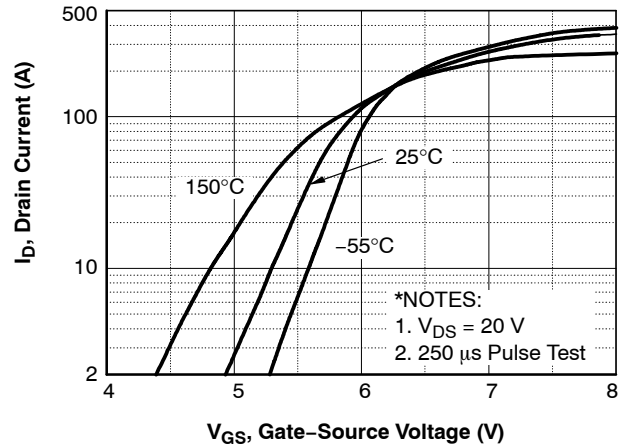


Figure 2. Transfer Characteristics

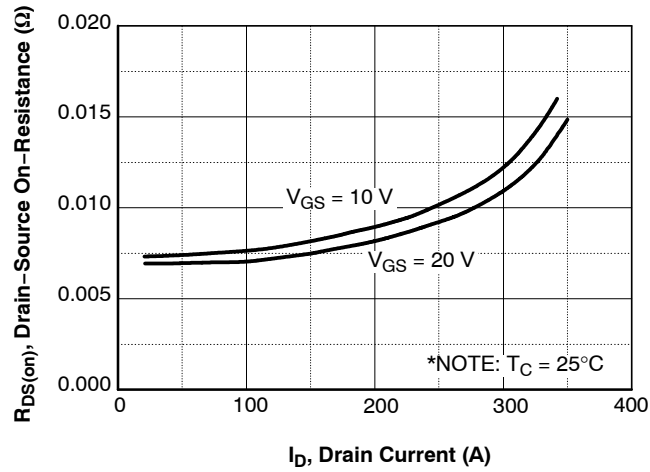


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

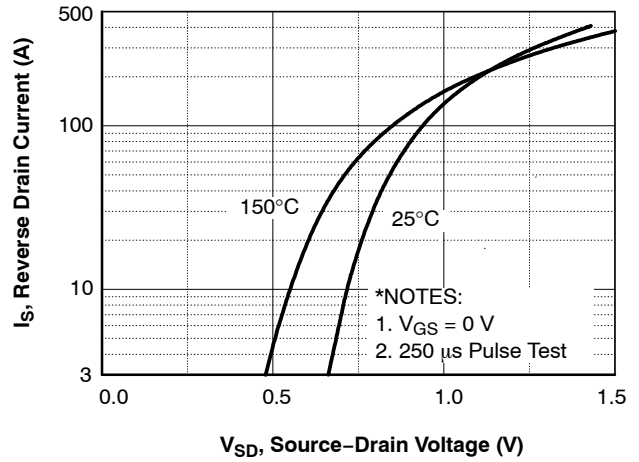


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

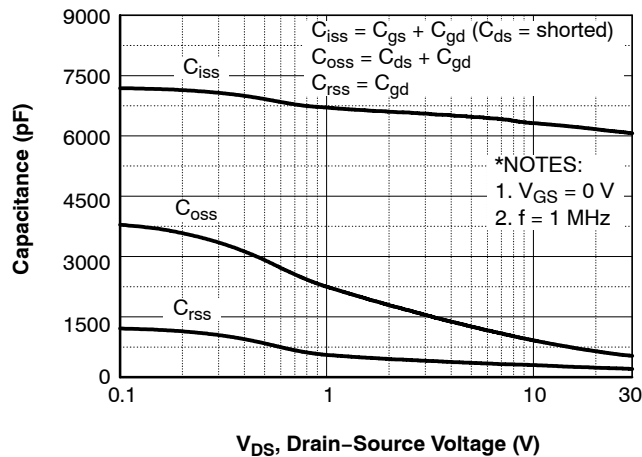


Figure 5. Capacitance Characteristics

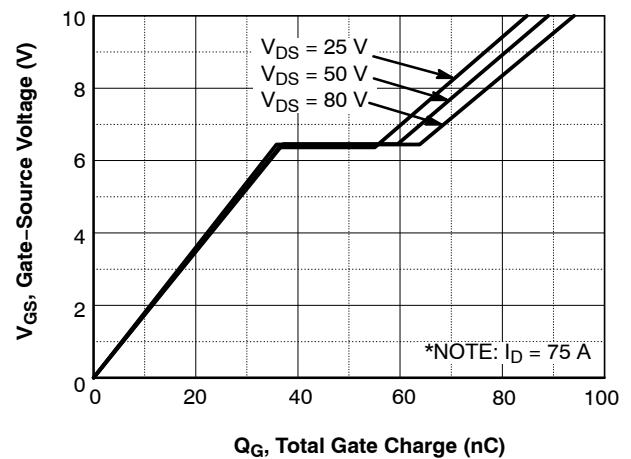


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

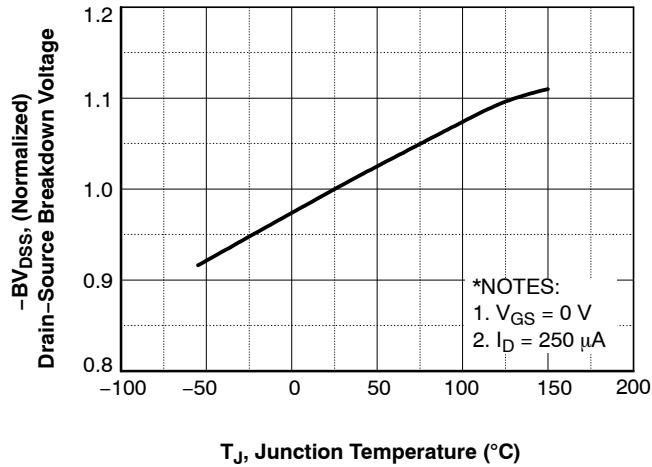


Figure 7. Breakdown Voltage Variation vs. Temperature

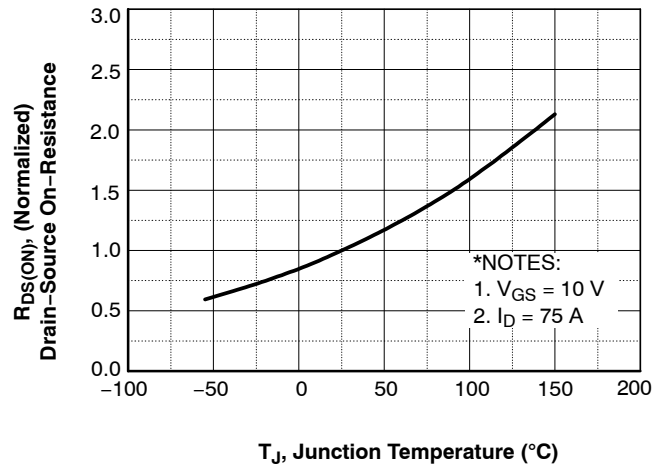


Figure 8. On-Resistance Variation vs. Temperature

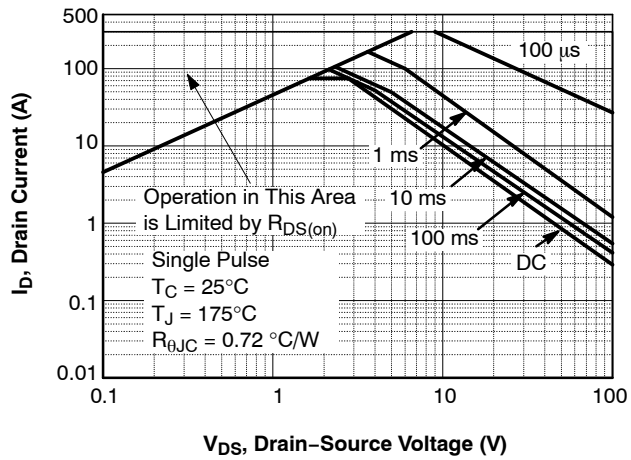


Figure 9. Maximum Safe Operating Area

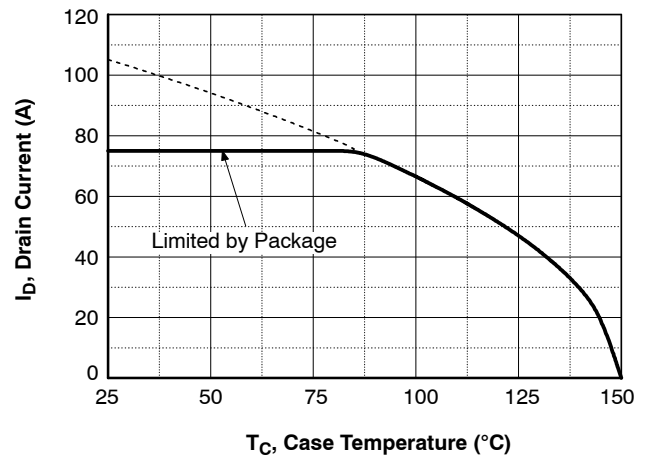


Figure 10. Maximum Drain Current vs. Case Temperature

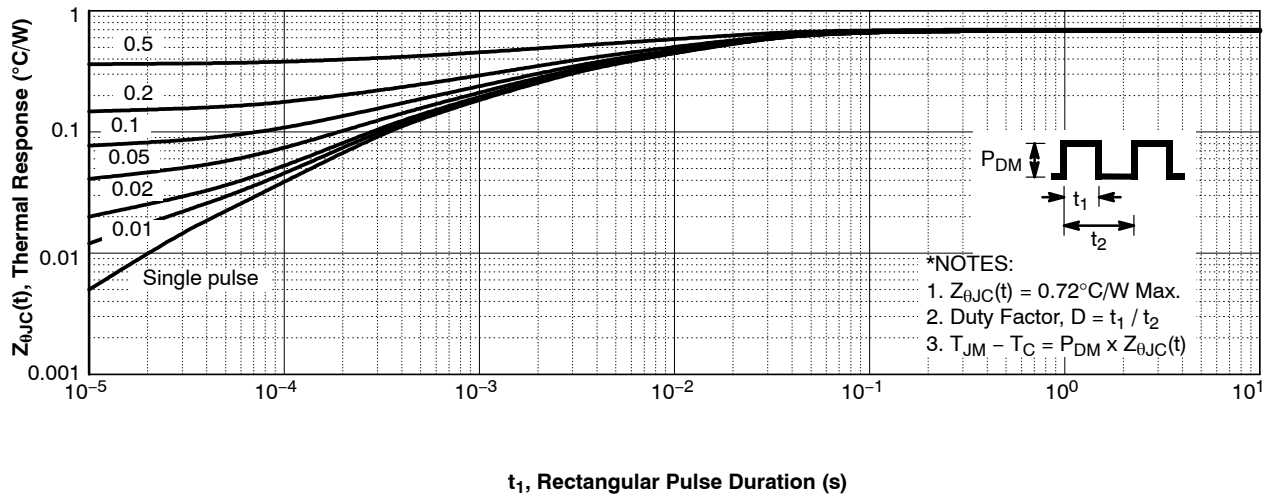


Figure 11. Transient Thermal Response Curve

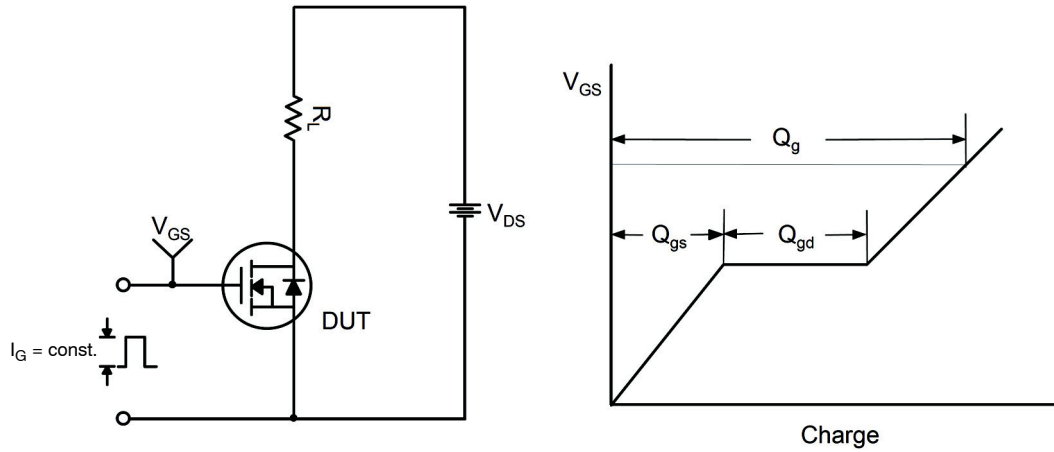


Figure 12. Gate Charge Test Circuit & Waveform

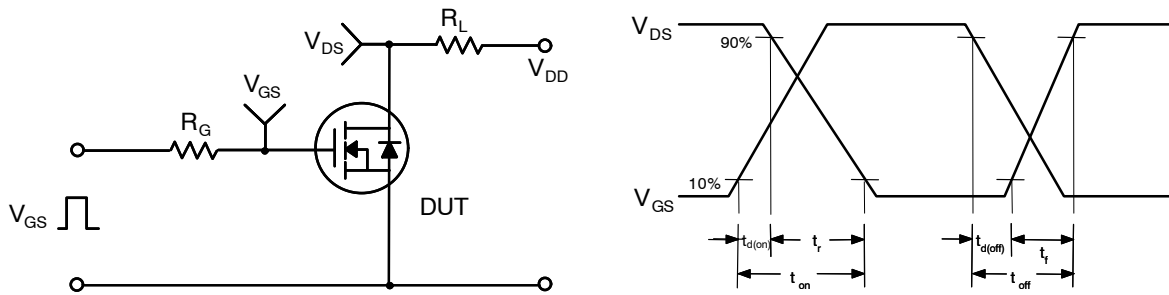


Figure 13. Resistive Switching Test Circuit & Waveforms

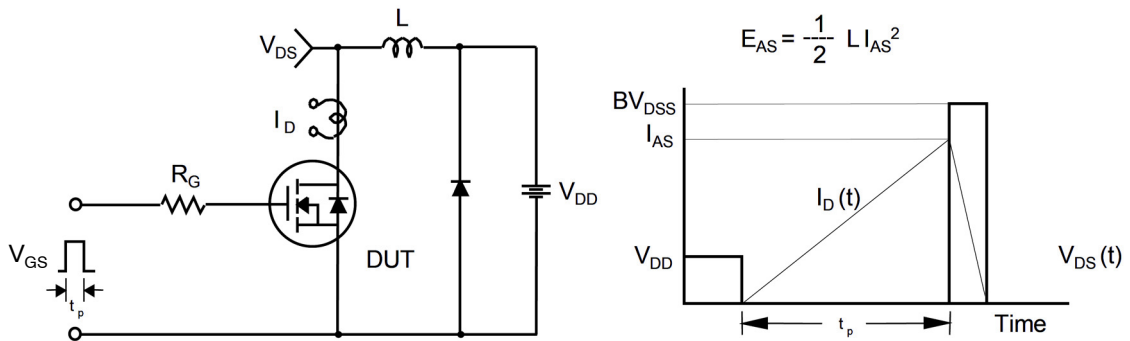


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

## FDP090N10

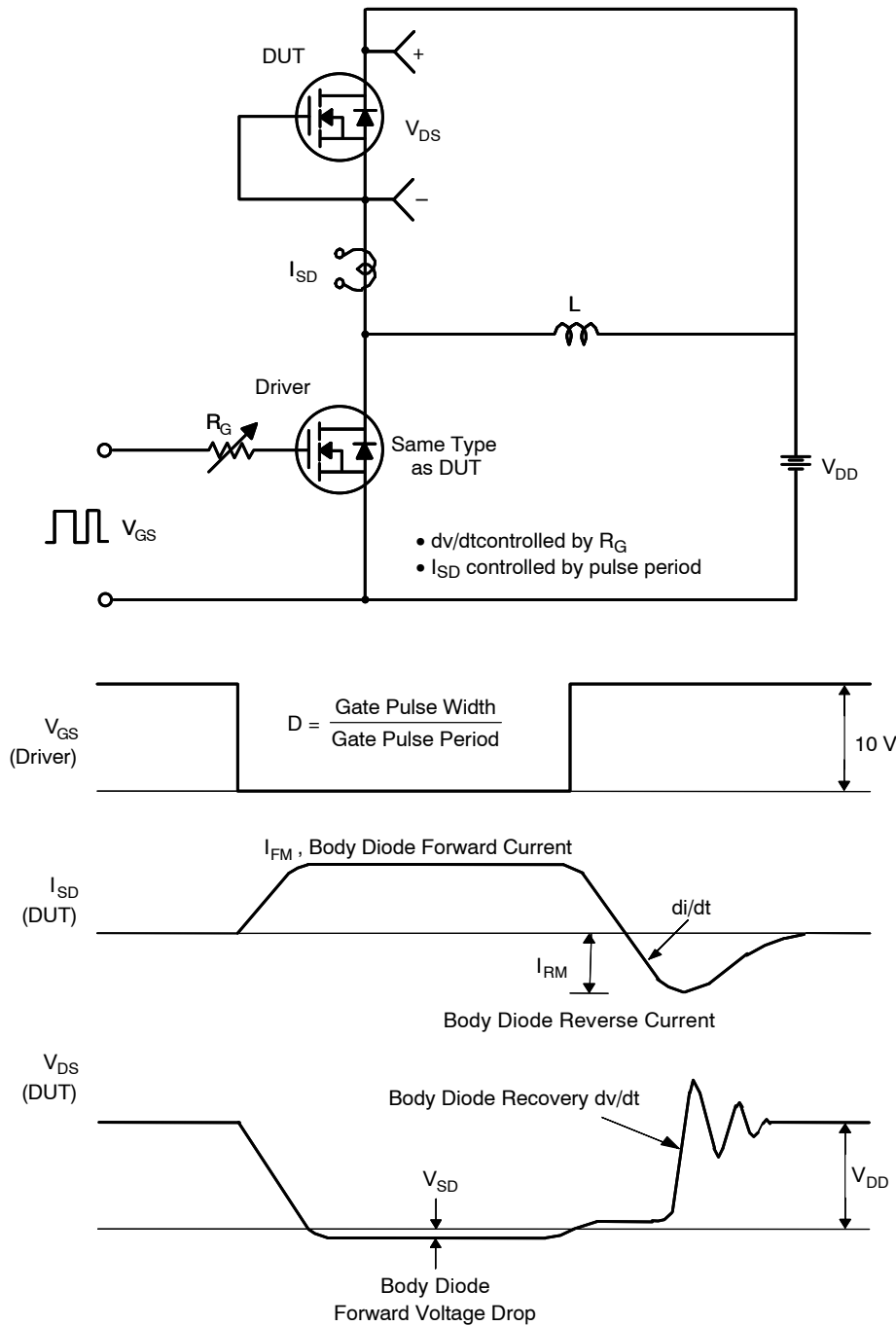


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

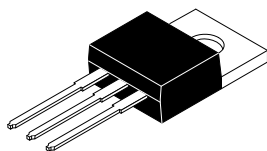
### PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Shipping
FDP090N10	FDP090N10	TO-220	800 Units / Tube

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

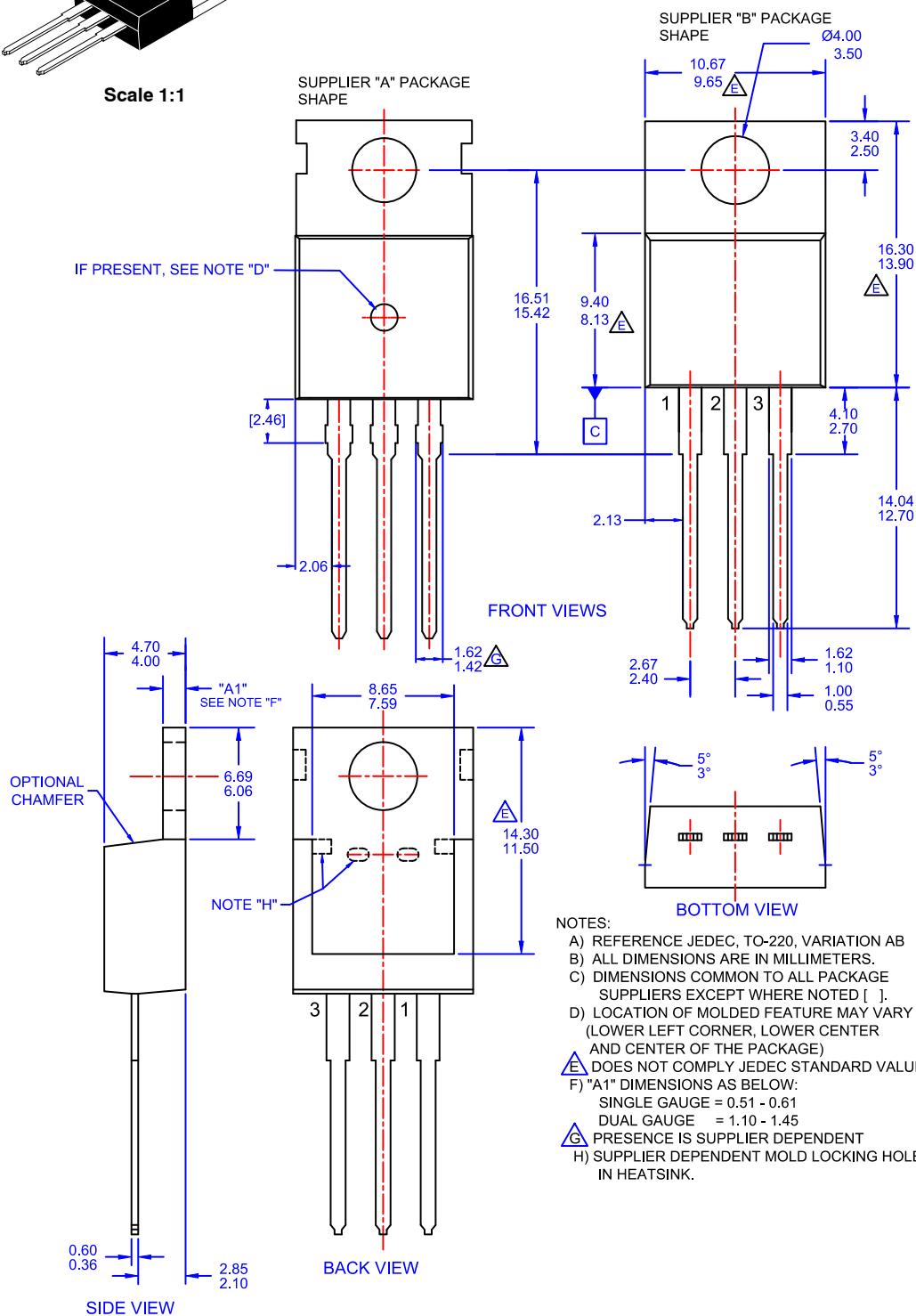
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Scale 1:1

## TO-220-3LD CASE 340AT ISSUE A

DATE 03 OCT 2017



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