

# MOSFET – N-Channel, POWER TRENCH®

100 V, 75 A, 9 mΩ

**FDP090N10**

## Description

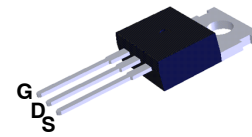
This N-Channel MOSFET is produced using onsemi's advance POWER TRENCH process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

## Features

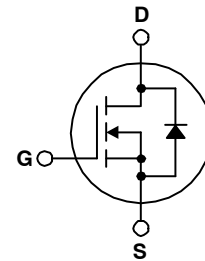
- $R_{DS(on)} = 7.2 \text{ m}\Omega$  (Typ) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

## Applications

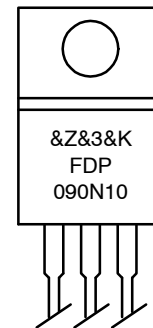
- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Micor Solar Inverter



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<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Parameter		FDP090N10	Unit
V <sub>DSS</sub>	Drain to Source Voltage		100	V
V <sub>GSS</sub>	Gate to Source Voltage		±20	V
I <sub>D</sub>	Drain Current	– Continuous T <sub>C</sub> = 85°C	75	A
I <sub>DM</sub>	Drain Current	– Pulsed (Note 1)	300	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (Note 2)		309	mJ
I <sub>AR</sub>	Avalanche Current (Note 1)		75	A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)		20.8	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		5.6	V/ns
P <sub>D</sub>	Power Dissipation	T <sub>C</sub> = 25°C	208	W
		– Derate Above 25°C	1.39	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range		–55 to +175	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°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 <sub>θJC</sub>	Thermal Resistance, Junction to Case, Max	0.72	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient, Max	62.5	

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V, T <sub>C</sub> = 25°C	100	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	–	0.1	–	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V	–	–	1	μA
		V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, T <sub>C</sub> = 150°C	–	–	500	
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	–	–	±100	nA

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	2.5	3.5	4.5	V
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 75 A	–	7.2	9	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 37.5 A	–	100	–	S

# FDP090N10

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted) (continued)

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

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	–	6185	8225	pF
C <sub>oss</sub>	Output Capacitance		–	585	775	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	235	355	pF

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 75 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 25 Ω (Note 4)	–	107	224	ns
t <sub>r</sub>	Turn-On Rise Time		–	322	655	
t <sub>d(off)</sub>	Turn-Off Delay Time		–	166	342	
t <sub>f</sub>	Turn-Off Fall Time		–	149	309	
Q <sub>g(TOT)</sub>	Total Gate Charge at 10 V	V <sub>DS</sub> = 50 V, I <sub>D</sub> = 75 A V <sub>GS</sub> = 10 V (Note 4)	–	89	116	nC
Q <sub>gs</sub>	Gate to Source Gate Charge		–	37	–	
Q <sub>gd</sub>	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 mH, I<sub>AS</sub> = 75 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25 Ω, starting T<sub>J</sub> = 25°C.
3. I<sub>SD</sub> ≤ 75 A, di/dt ≤ 200 A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, starting T<sub>J</sub> = 25°C.
4. Essentially independent of operating temperature typical characteristics.

## TYPICAL PERFORMANCE CHARACTERISTICS

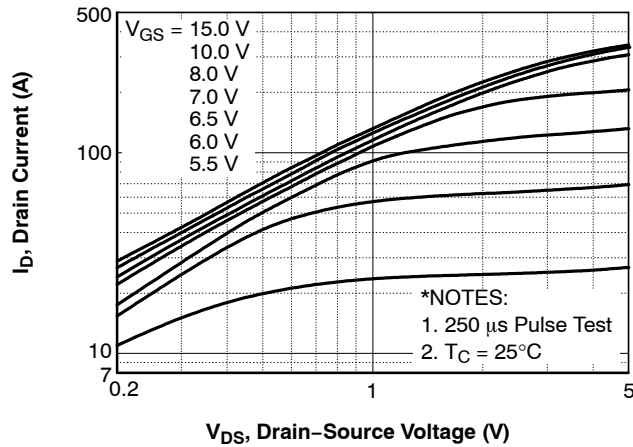


Figure 1. On-Region Characteristics

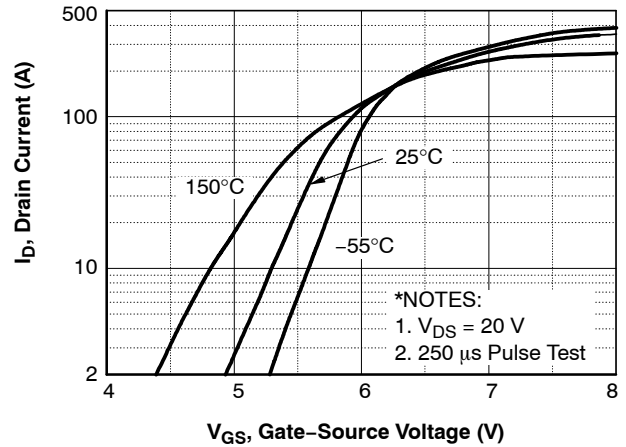


Figure 2. Transfer Characteristics

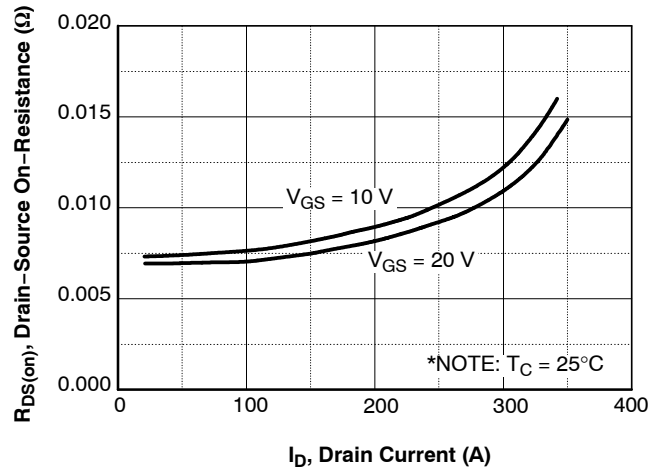


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

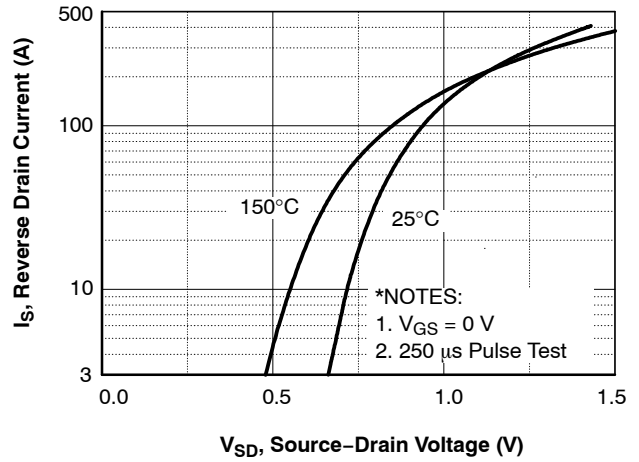


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

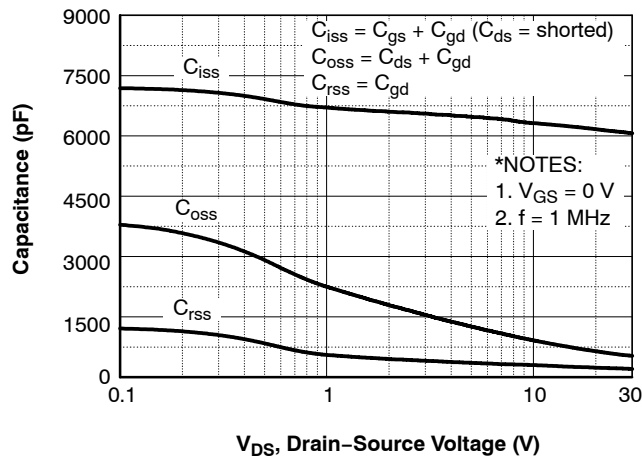


Figure 5. Capacitance Characteristics

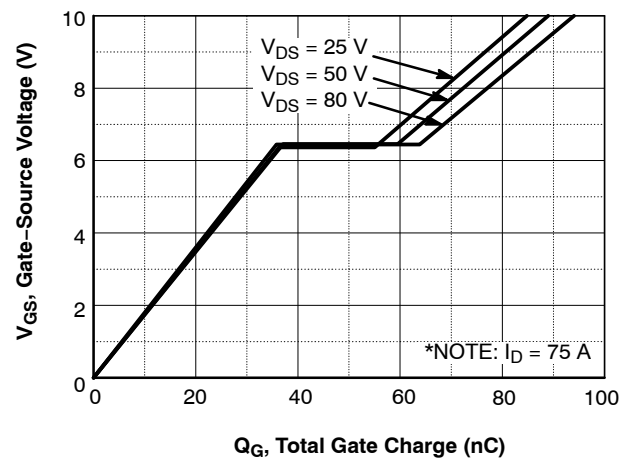
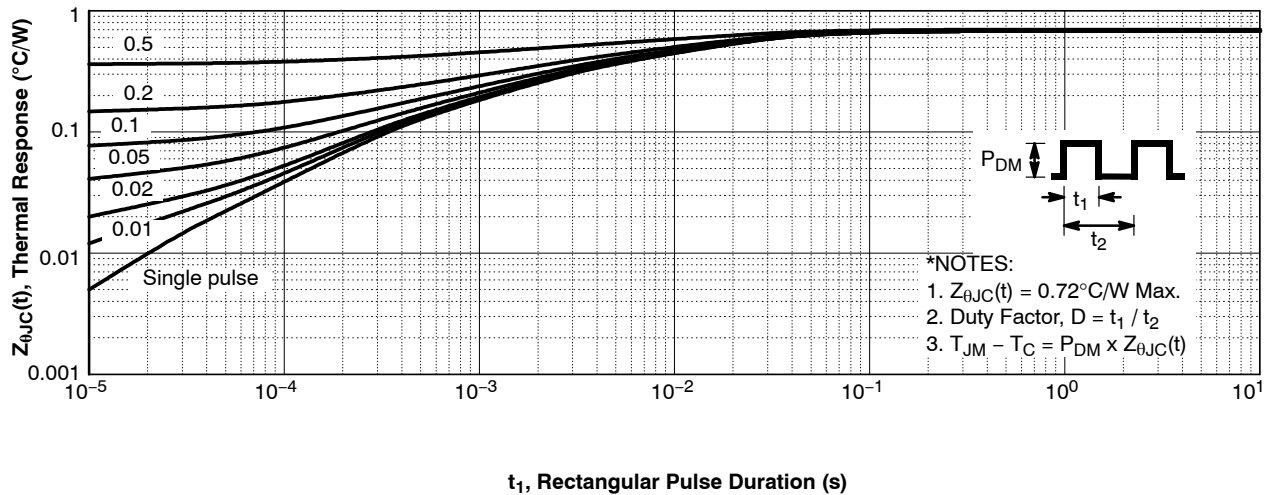
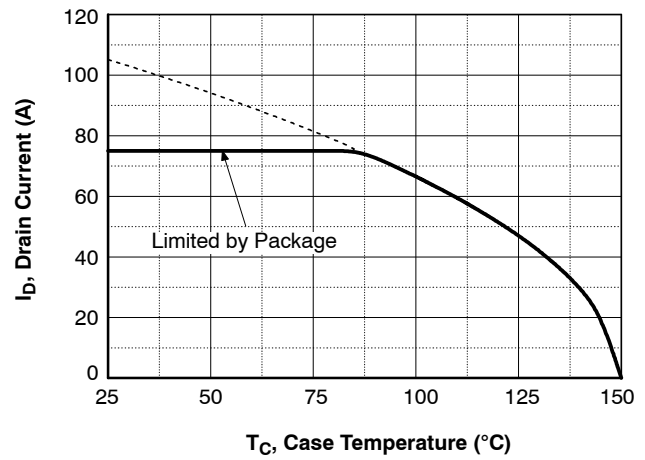
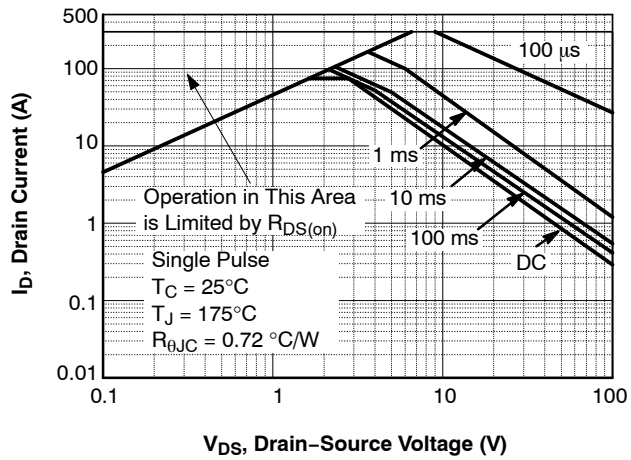
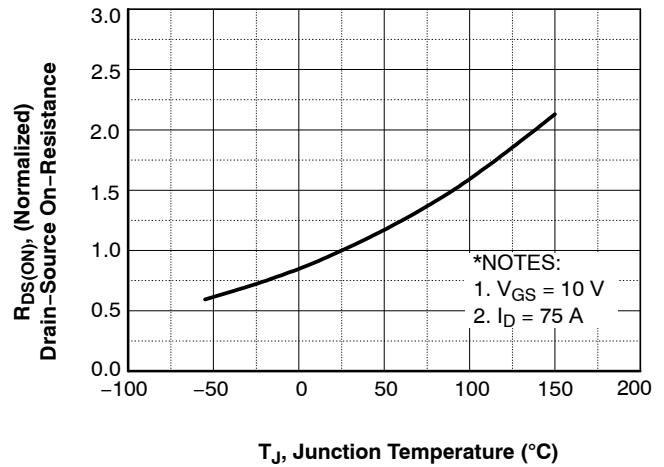
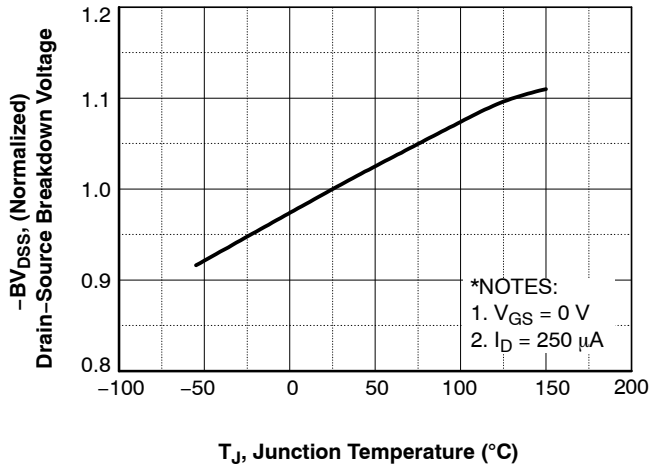


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)



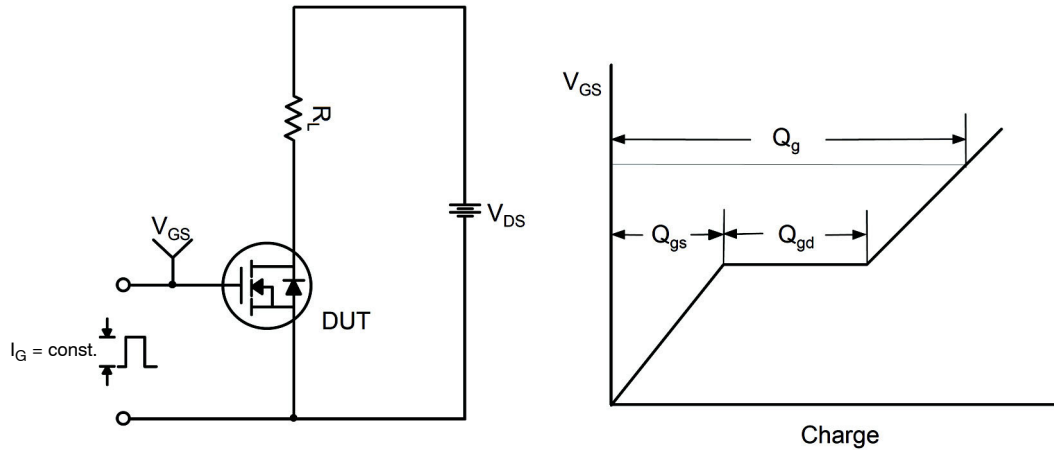


Figure 12. Gate Charge Test Circuit & Waveform

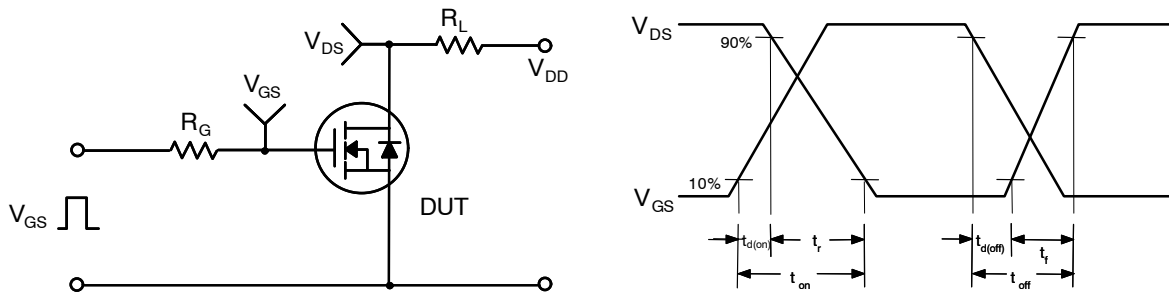


Figure 13. Resistive Switching Test Circuit & Waveforms

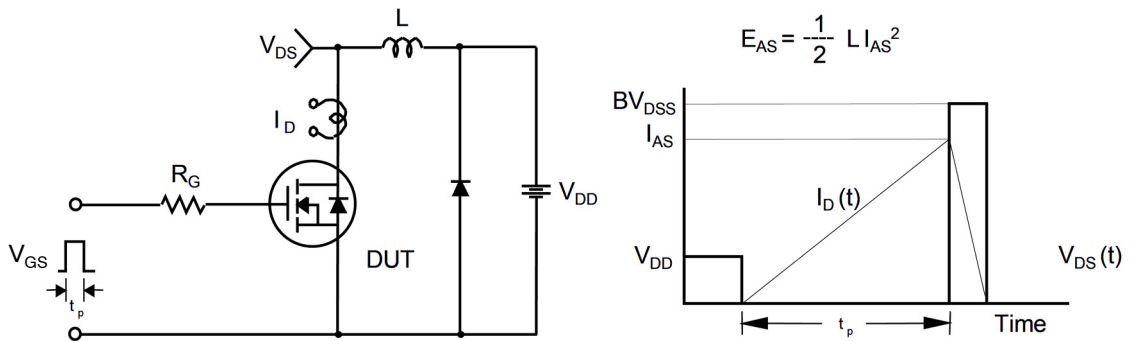


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

## FDP090N10

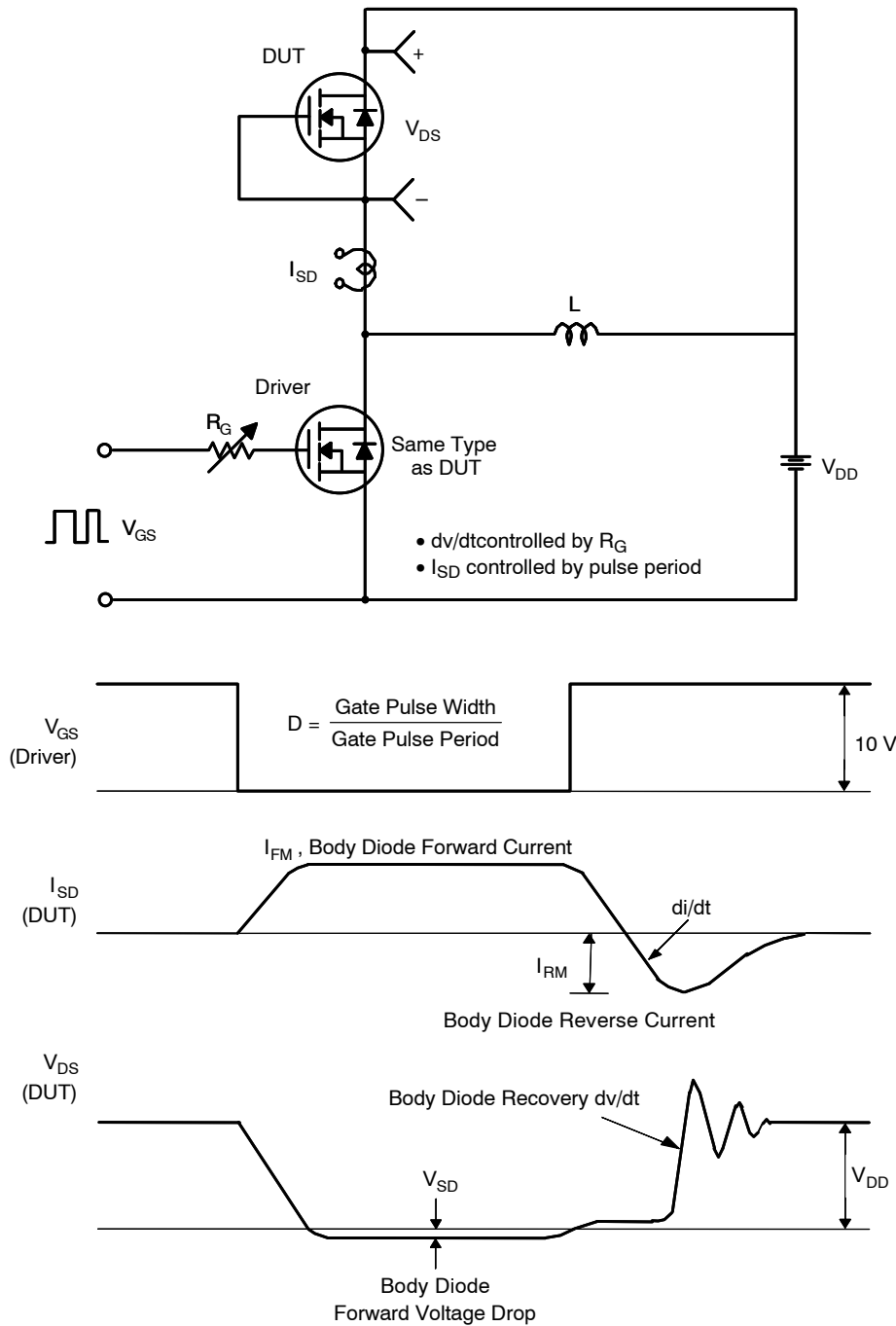
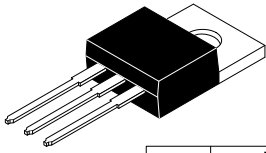


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

### PACKAGE MARKING AND ORDERING INFORMATION

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

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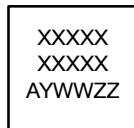
TO-220-3LD  
CASE 340AT  
ISSUE B

DATE 08 AUG 2022

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.00	--	4.70
A1	SEE NOTE "F"		
A2	2.10	--	2.85
b	0.55	--	1.00
b2	1.10	--	1.62
b4	1.42	--	1.62
c	0.36	--	0.60
D	13.90	--	16.30
D1	8.13	--	9.40
D2	11.50	--	14.30
D3	15.42	--	16.51
E	9.65	--	10.67
E1	7.59	--	8.65
e	2.40	--	2.67
H1	6.06	--	6.69
L	12.70	--	14.04
L1	2.70	--	4.10
P	3.50	--	4.00
Q	2.50	--	3.40
z	2.13 REF		
z1	2.06 REF		
θ	3°	--	5°

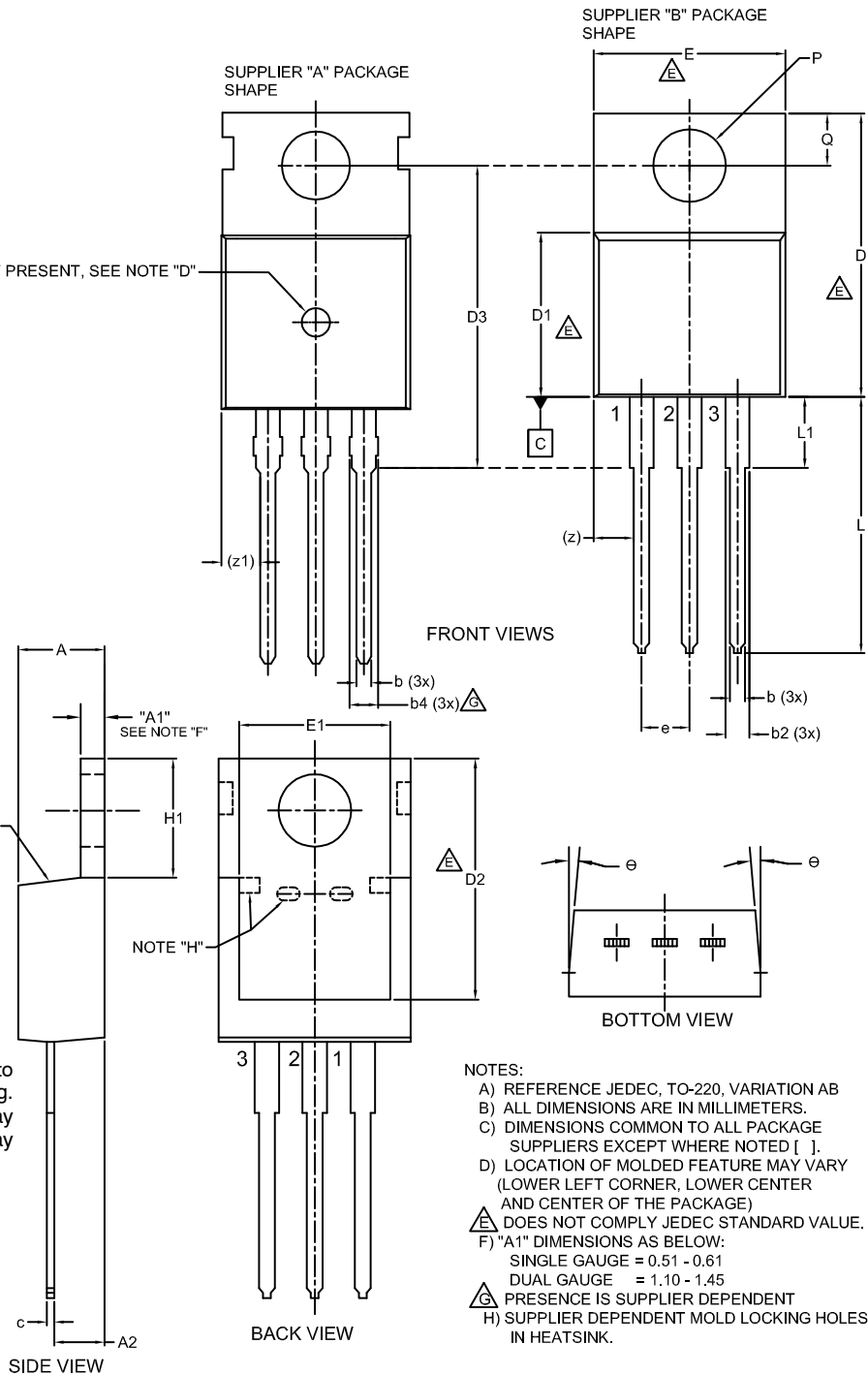
IF PRESENT, SEE NOTE "D"

GENERIC  
MARKING DIAGRAM\*



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Assembly Lot Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



NOTES:

- A) REFERENCE JEDEC, TO-220, VARIATION AB
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [ ].
- D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
- E) DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS AS BELOW:  
SINGLE GAUGE = 0.51 - 0.61  
DUAL GAUGE = 1.10 - 1.45
- G) PRESENCE IS SUPPLIER DEPENDENT
- H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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