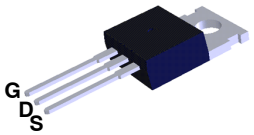
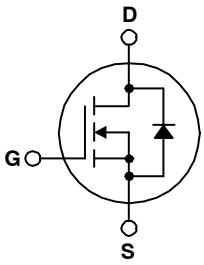
MOSFET – N-Channel, POWERTRENCH®

100 V, 75 A, 9 mΩ

FDP090N10



TO−220−3LD
CASE 340AT



Description

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

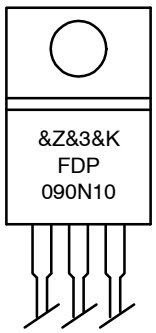
Features

- $R_{DS(on)}$ = 7.2 mΩ (Typ) @ V_{GS} = 10 V, I_D = 75 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

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.

MOSFET MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Symbol	Parameter		FDP090N10	Unit
V_{DSS}	Drain to Source Voltage		100	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current	– Continuous T_C = 85°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°C	208	W
		– Derate Above 25°C	1.39	W/°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +175	°C
T_L	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
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.72	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	62.5	

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V, T_C = 25°C	100	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	0.1	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 100 V, V_{GS} = 0 V	–	–	1	μA
		V_{DS} = 100 V, V_{GS} = 0 V, T_C = 150°C	–	–	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 75 A	–	7.2	9	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 37.5 A	–	100	–	S

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 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 V, I_D = 75 A, V_{GS} = 10 V, R_G = 25 Ω (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 V, I_D = 75 A V_{GS} = 10 V (Note 4)	–	89	116	nC
Q_{gs}	Gate to Source Gate Charge		–	37	–	
Q_{gd}	Gate to Drain “Miller” Charge		–	22	–	
DRAIN−SOURE DIODE CHARACTERISTICS						
I_S	Maximum Continuous Drain to Source Diode Forward Current		–	–	75	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	300	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 75 A	–	–	1.25	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 75 A, dI_F/dt = 100 A/μs	–	73	–	ns
Q_{rr}	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_{AS} = 75 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 75 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

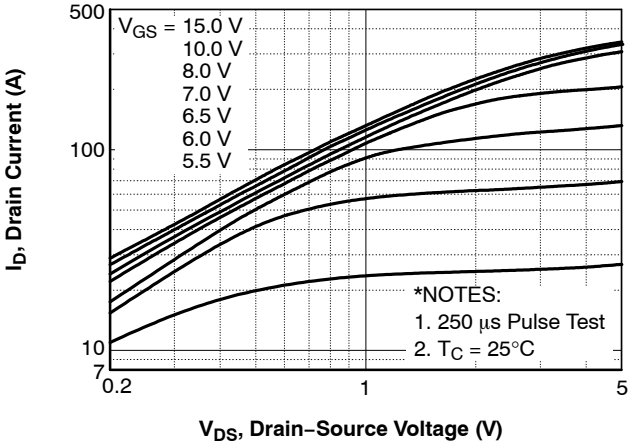


Figure 1. On−Region Characteristics

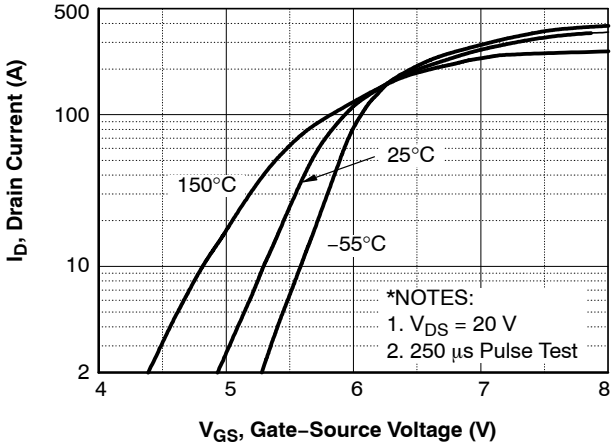


Figure 2. Transfer Characteristics

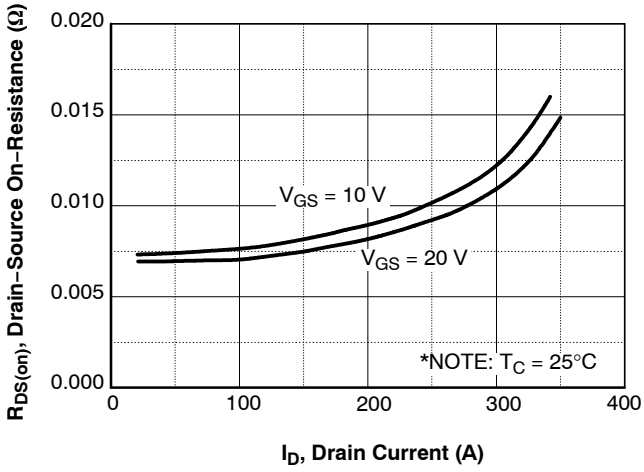


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

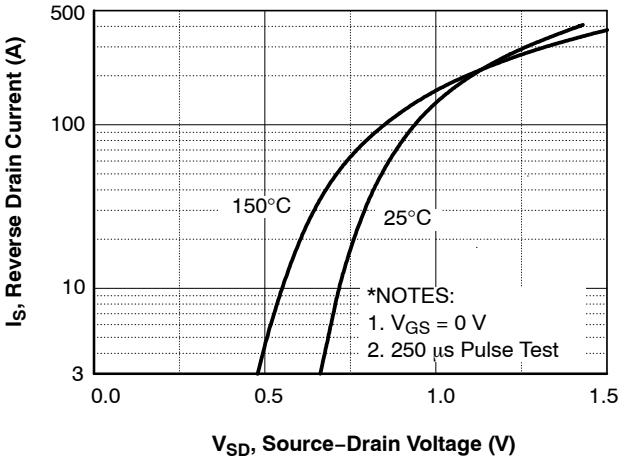


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

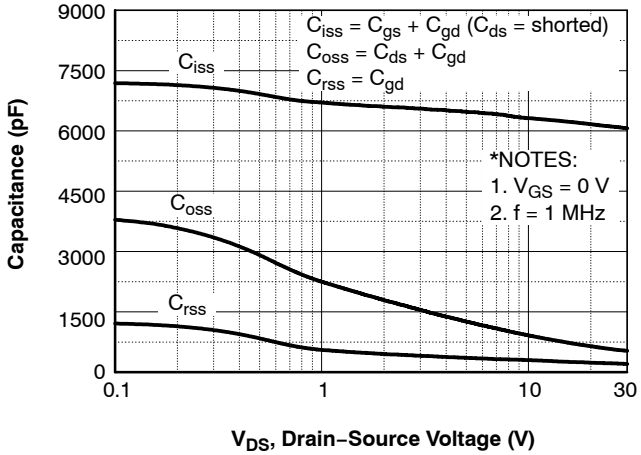


Figure 5. Capacitance Characteristics

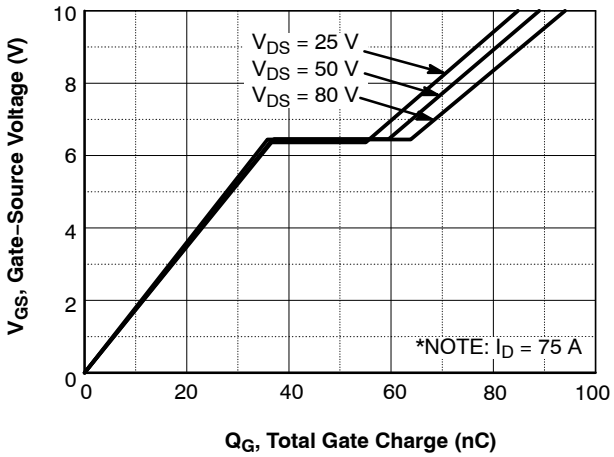


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

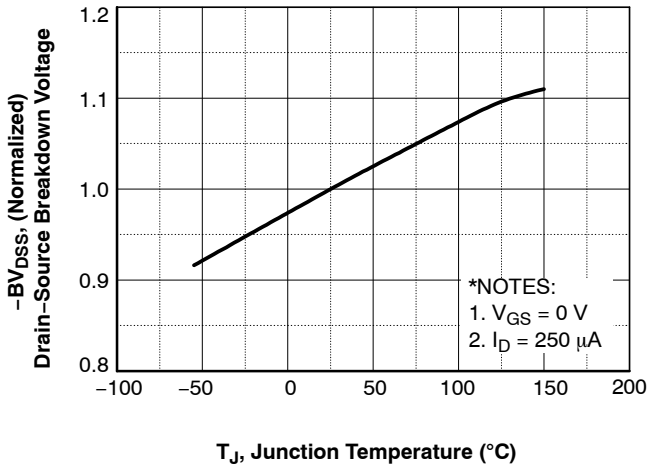


Figure 7. Breakdown Voltage Variation vs. Temperature

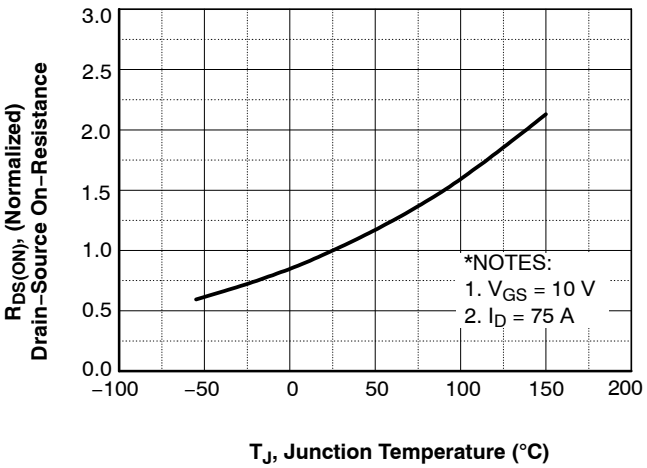


Figure 8. On−Resistance Variation vs. Temperature

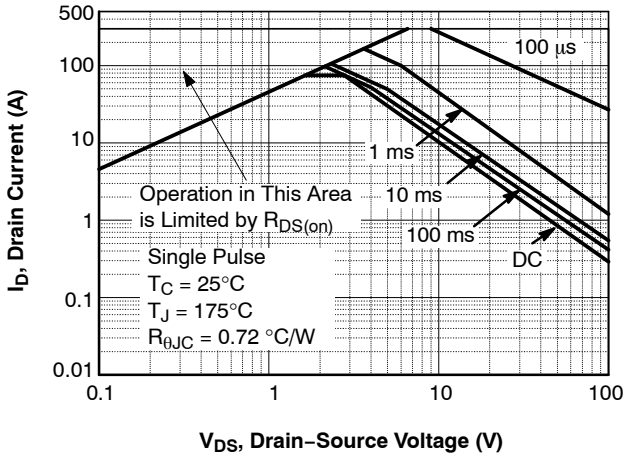


Figure 9. Maximum Safe Operating Area

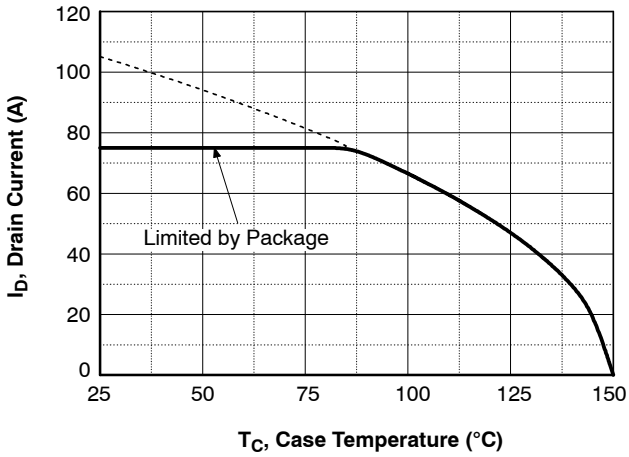


Figure 10. Maximum Drain Current vs. Case Temperature

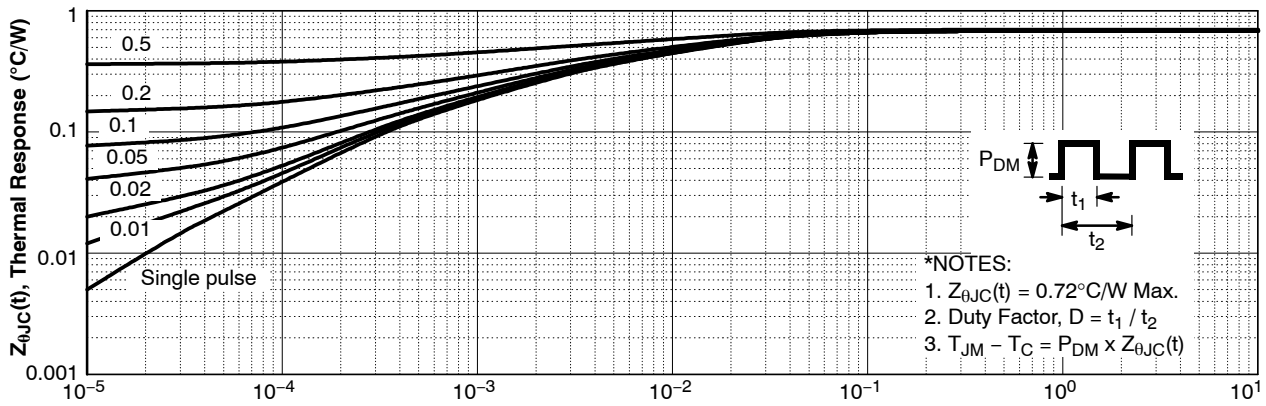


Figure 11. Transient Thermal Response Curve

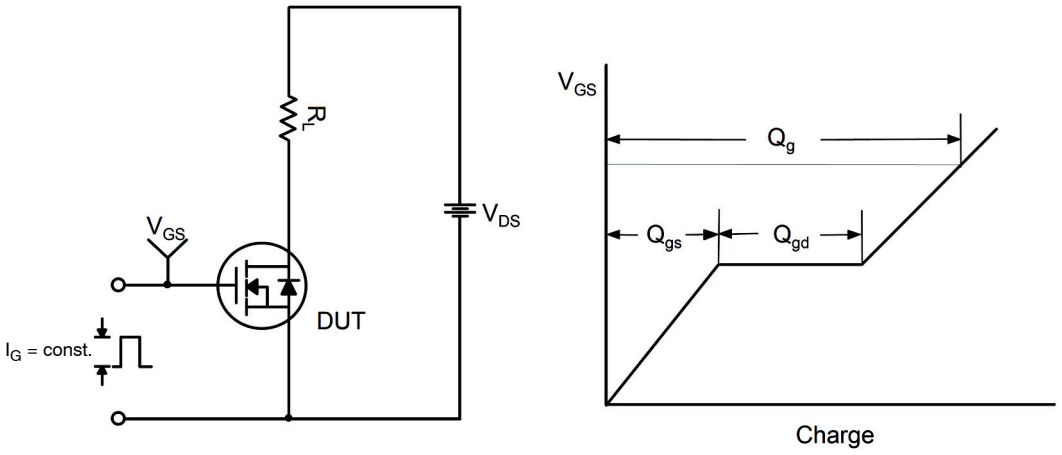


Figure 12. Gate Charge Test Circuit & Waveform

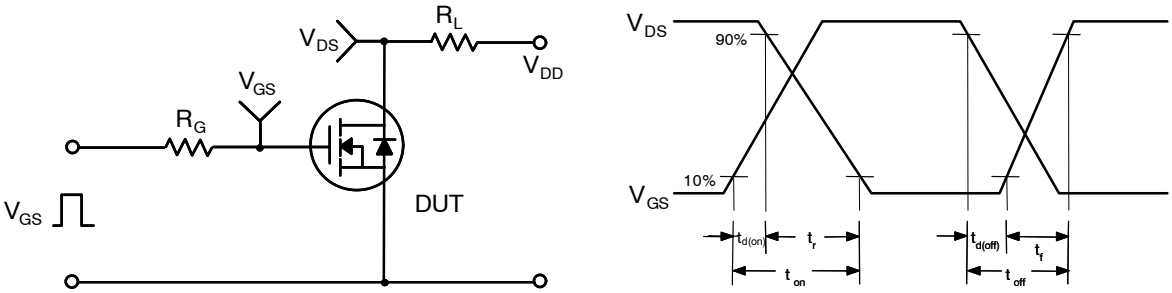


Figure 13. Resistive Switching Test Circuit & Waveforms

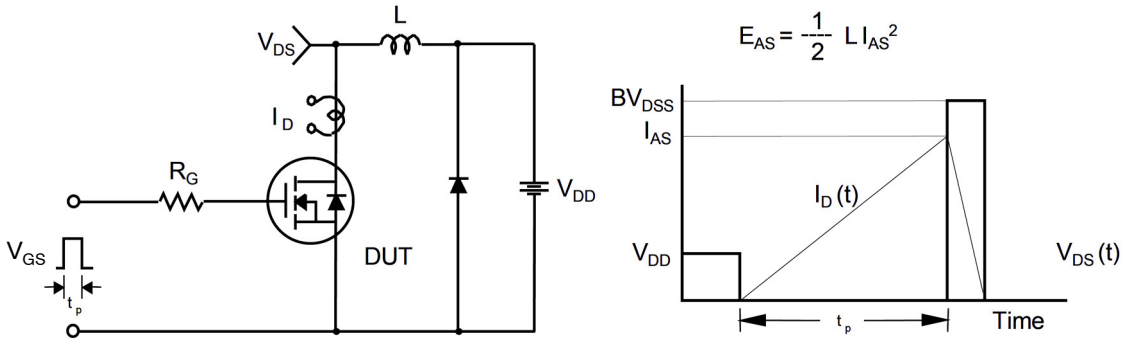


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

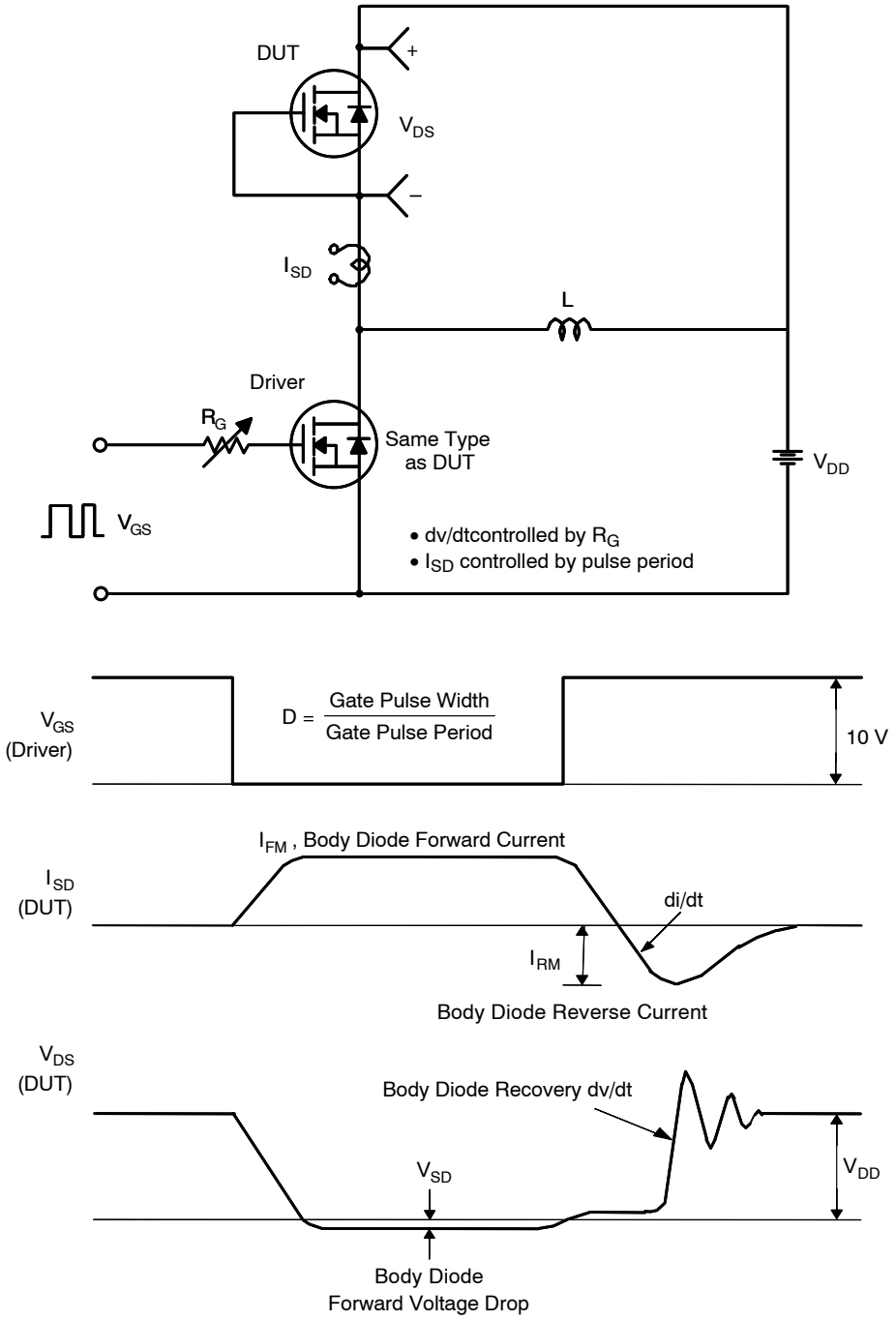
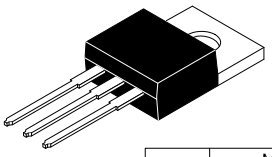


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

PACKAGE MARKING AND ORDERING INFORMATION

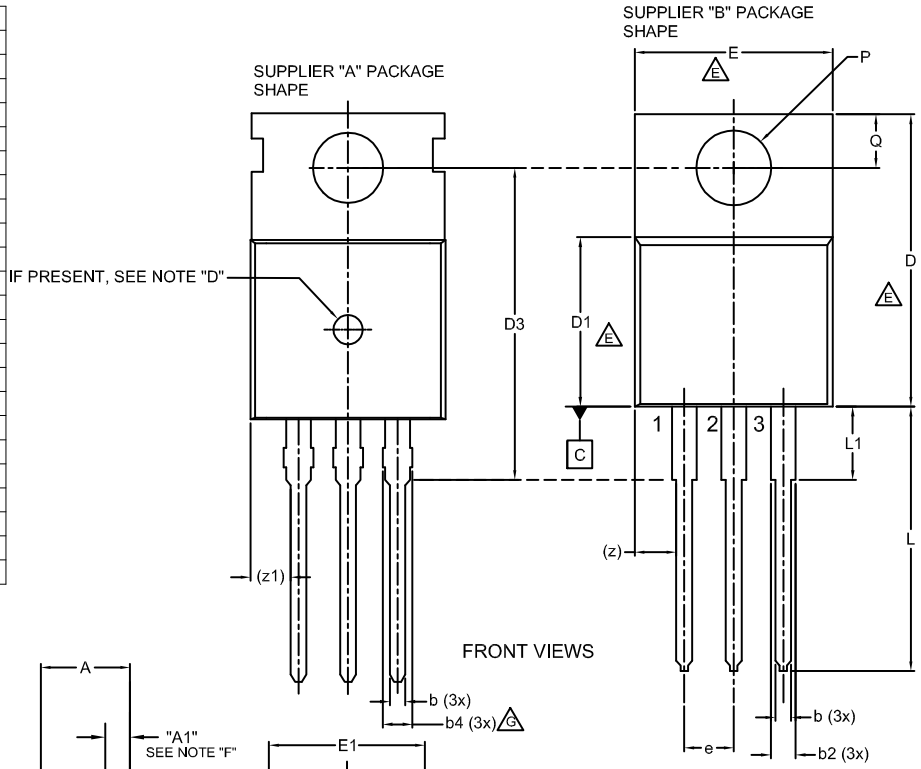
Part Number	Top Mark	Package	Shipping
FDP090N10	FDP090N10	TO−220	800 Units / Tube

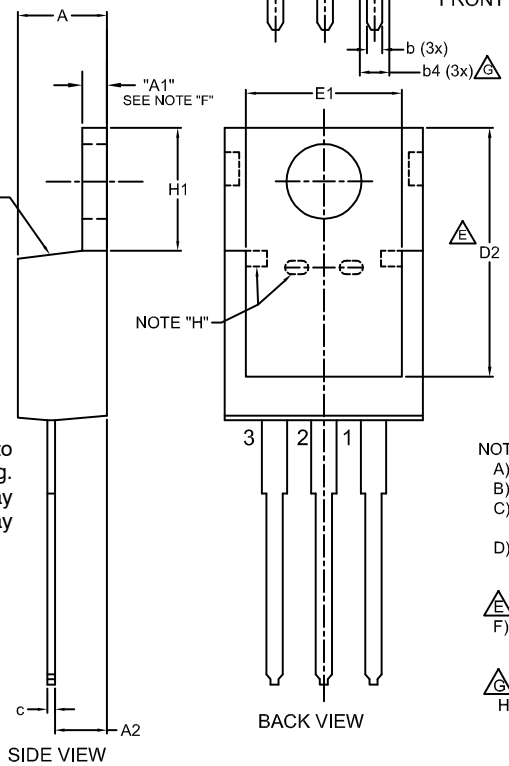


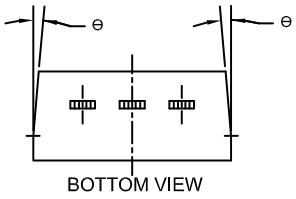
TO−220−3LD
CASE 340AT
ISSUE B

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°







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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DESCRIPTION:	**TO−220−3LD**		**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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