

MOSFET – N-Channel, UniFET™ II

500 V, 22 A, 220 mΩ

FDP22N50N

Description

UniFET II MOSFET is onsemi's high voltage MOSFET family based on advanced planar stripe and DMOS technology. This advanced MOSFET family has the smallest on-state resistance among the planar MOSFET, and also provides superior switching performance and higher avalanche energy strength. In addition, internal gate-source ESD diode allows UniFET II MOSFET to withstand over 2 kV HBM surge stress. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.

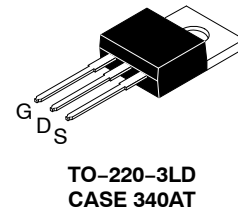
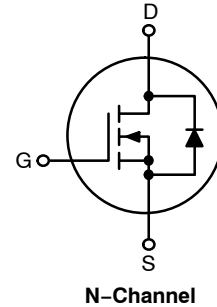
Features

- $R_{DS(on)} = 185 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 11 \text{ A}$
- Low Gate Charge (Typ. 49 nC)
- Low C_{rss} (Typ. 24 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

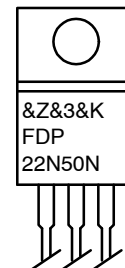
Applications

- PDP TV
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

V_{DSS}	$R_{DS(on)}$ MAX	I_D MAX
500 V	220 mΩ @ 10 V	22 A



MARKING DIAGRAM



&Z	= Assembly Plant Code
&3	= 3-Digit Date Code
&K	= 2-Digits Lot Run Code
FDP22N50N	= Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping
FDP22N50N	TO-220-3LD	1000 Units / Tube

FDP22N50N

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

Symbol	Parameter		FDP22N50N	Unit
V _{DSS}	Drain to Source Voltage		500	V
V _{GSS}	Gate to Source Voltage		±30	V
I _D	Drain Current	– Continuous (T _C = 25°C)	22	A
		– Continuous (T _C = 100°C)	13.2	
I _{DM}	Drain Current	– Pulsed (Note 1)	88	A
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		1000	mJ
I _{AR}	Avalanche Current (Note 1)		22	A
E _{AR}	Repetitive Avalanche Energy (Note 1)		31.25	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		10	V/ns
P _D	Power Dissipation	(T _C = 25°C)	312.5	W
		–Derate above 25°C	2.5	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		–55 to +150	°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.

1. Repetitive rating: pulse–width limited by maximum junction temperature.
2. L = 4.1 mH, I_{AS} = 22 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C
3. I_{SD} ≤ 22 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C

THERMAL CHARACTERISTICS

Symbol	Parameter	FDP22N50N	Unit
R _{θJC}	Thermal Resistance, Junction to Case, Max.	0.4	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient, Max.	62.5	

FDP22N50N

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV _{DSS}	Drain to Source Breakdown Voltage	I _D = 250 μ A, V _{GS} = 0 V	500	–	–	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I _D = 250 μ A, Referenced to 25°C	–	0.45	–	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 500 V, V _{GS} = 0 V	–	–	1	μ A
		V _{DS} = 400 V, T _C = 125°C	–	–	10	
I _{GSS}	Gate to Body Leakage Current	V _{GS} = \pm 30 V, V _{DS} = 0 V	–	–	\pm 100	nA

ON CHARACTERISTICS

V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 250 μ A	3.0	–	5.0	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10 V, I _D = 11 A	–	0.185	0.220	Ω
g _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 11 A	–	24.4	–	S

DYNAMIC CHARACTERISTICS

C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	–	2456	3200	pF
C _{oss}	Output Capacitance		–	351	460	pF
C _{rss}	Reverse Transfer Capacitance		–	24	50	pF
Q _{g(tot)}	Total Gate Charge at 10 V	V _{DS} = 400 V, I _D = 22 A, V _{GS} = 10 V (Note 4)	–	49	65	nC
Q _{gs}	Gate to Source Gate Charge		–	15	–	nC
Q _{gd}	Gate to Drain “Miller” Charge		–	19	–	nC

SWITCHING CHARACTERISTICS

t _{d(on)}	Turn-On Delay Time	V _{DD} = 250 V, I _D = 22 A, R _G = 4.7 Ω (Note 4)	–	22	55	ns
t _r	Turn-On Rise Time		–	50	110	ns
t _{d(off)}	Turn-Off Delay Time		–	48	110	ns
t _f	Turn-Off Fall Time		–	35	80	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

I _S	Maximum Continuous Drain to Source Diode Forward Current		–	–	22	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	88	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 22 A	–	–	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 22 A, dI _F /dt = 100 A/μs	–	472	–	ns
Q _{rr}	Reverse Recovery Charge		–	6.5	–	μC

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.

4. Essentially independent of operating temperature typical characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

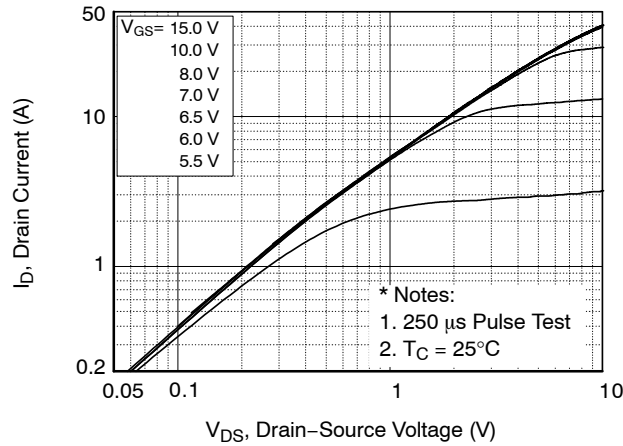


Figure 1. On-Region Characteristics

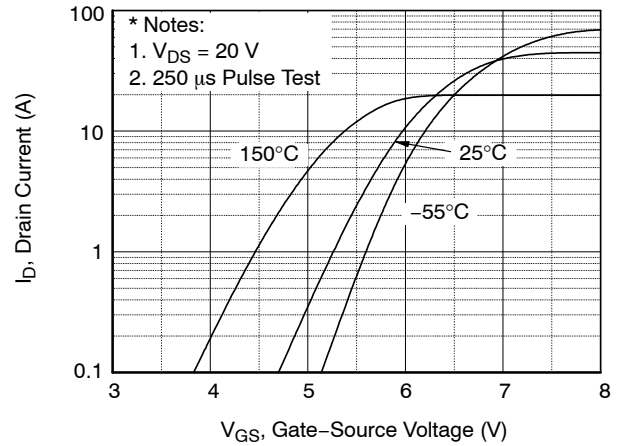


Figure 2. Transfer Characteristics

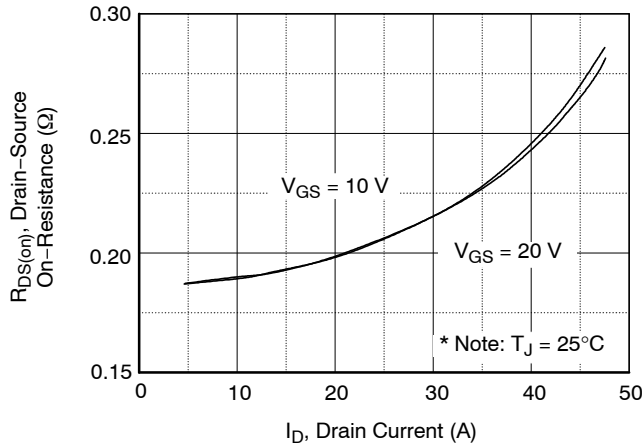


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

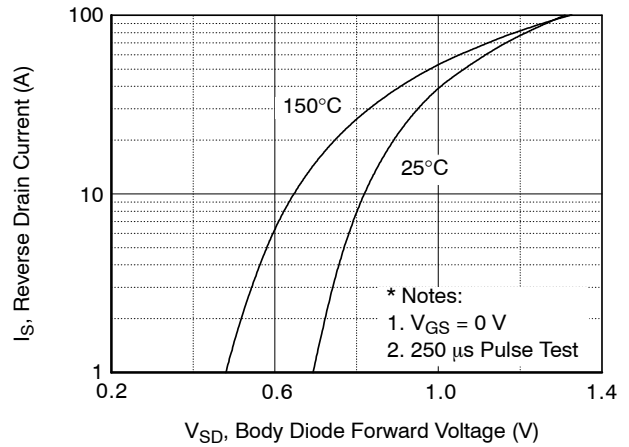


Figure 4. Body Diode Forward Voltage Variation vs. Source Current And Temperature

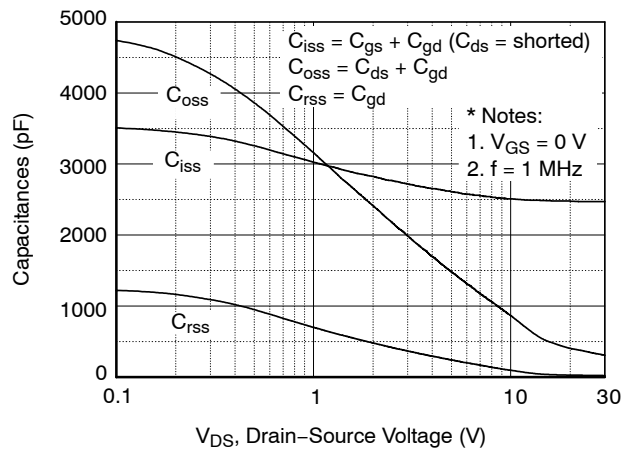


Figure 5. Capacitance Characteristics

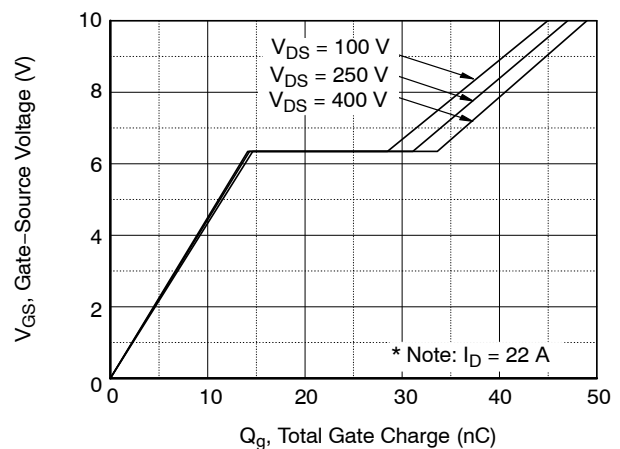


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

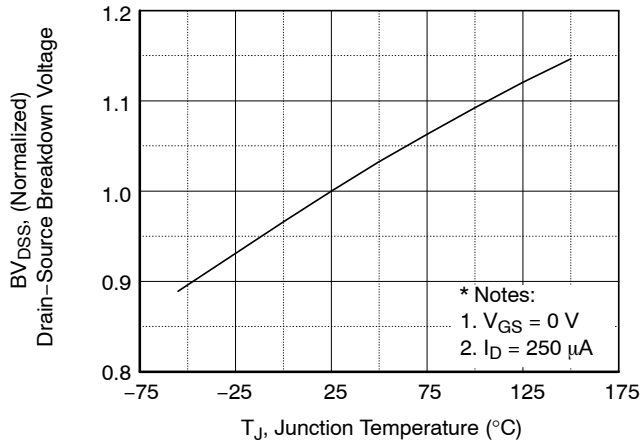


Figure 7. Breakdown Voltage Variation vs. Temperature

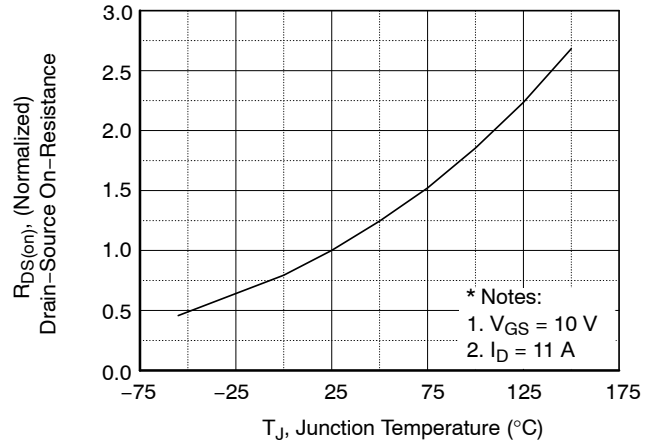


Figure 8. On-Resistance Variation vs. Temperature

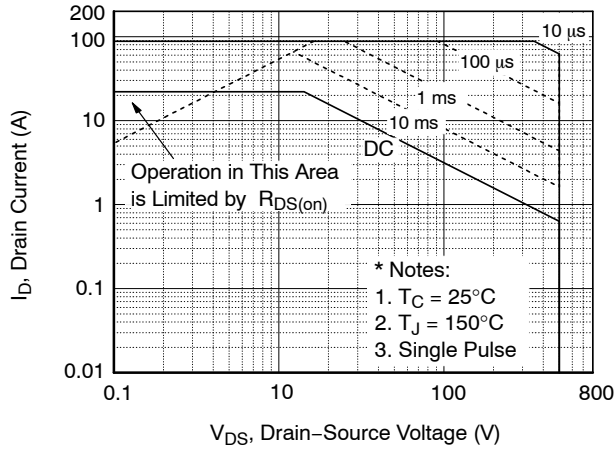


Figure 9. Maximum Safe Operating Area

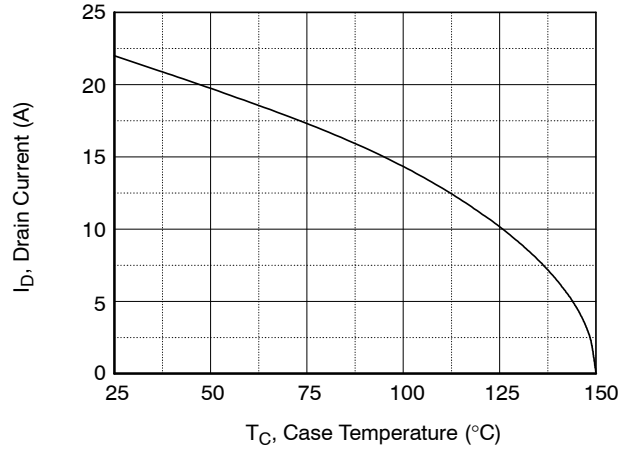


Figure 10. Maximum Drain Current vs. Case Temperature

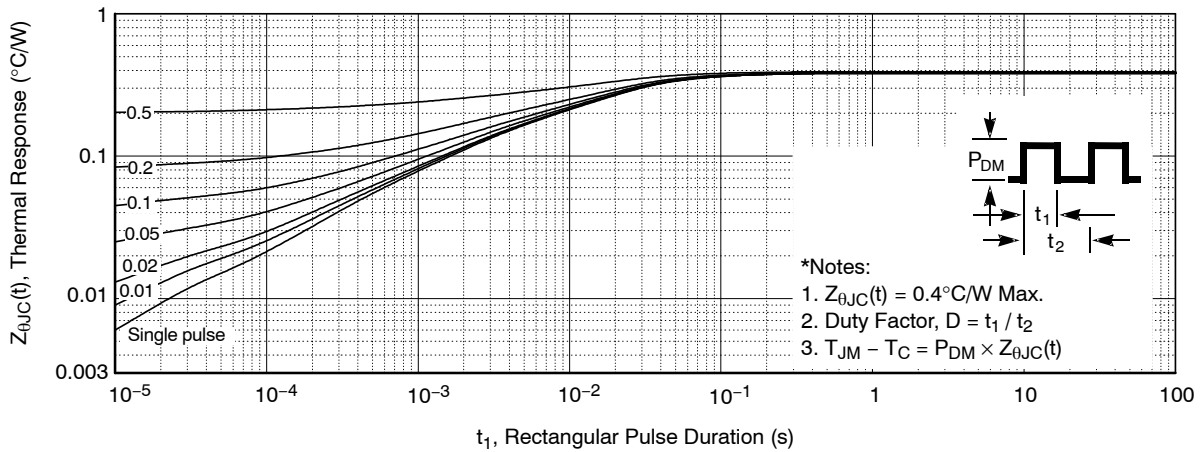


Figure 11. Transient Thermal Response Curve

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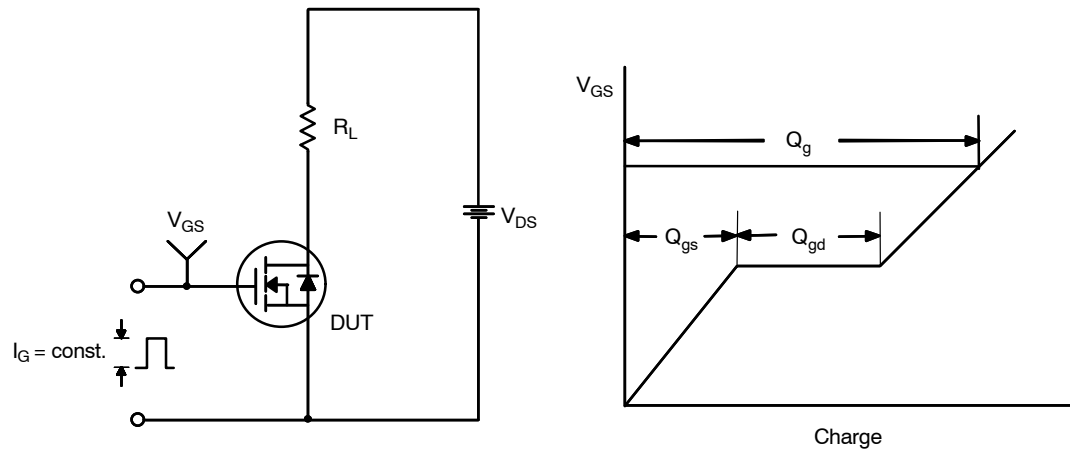


Figure 12. Gate Charge Test Circuit & Waveform

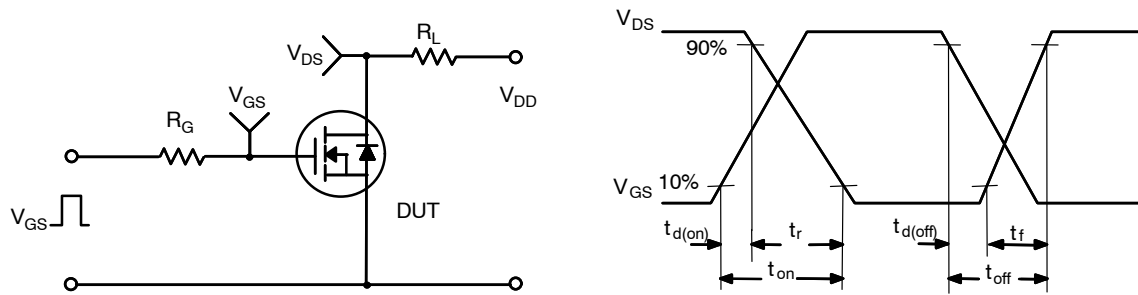


Figure 13. Resistive Switching Test Circuit & Waveforms

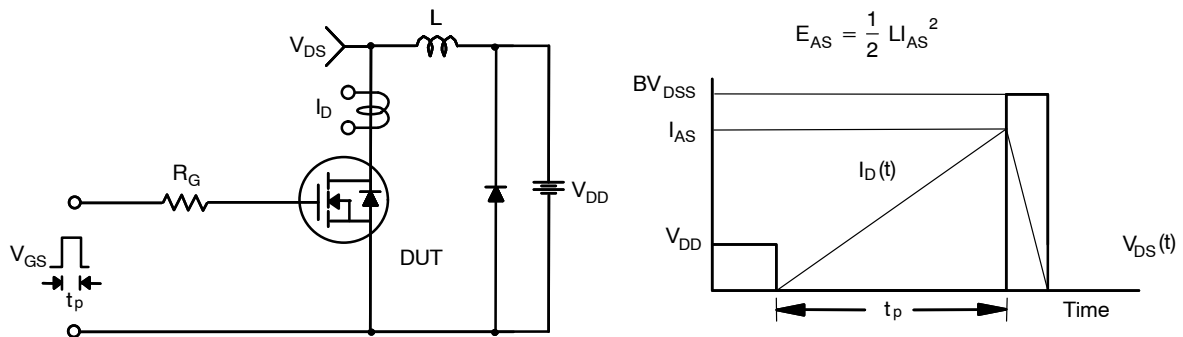


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

FDP22N50N

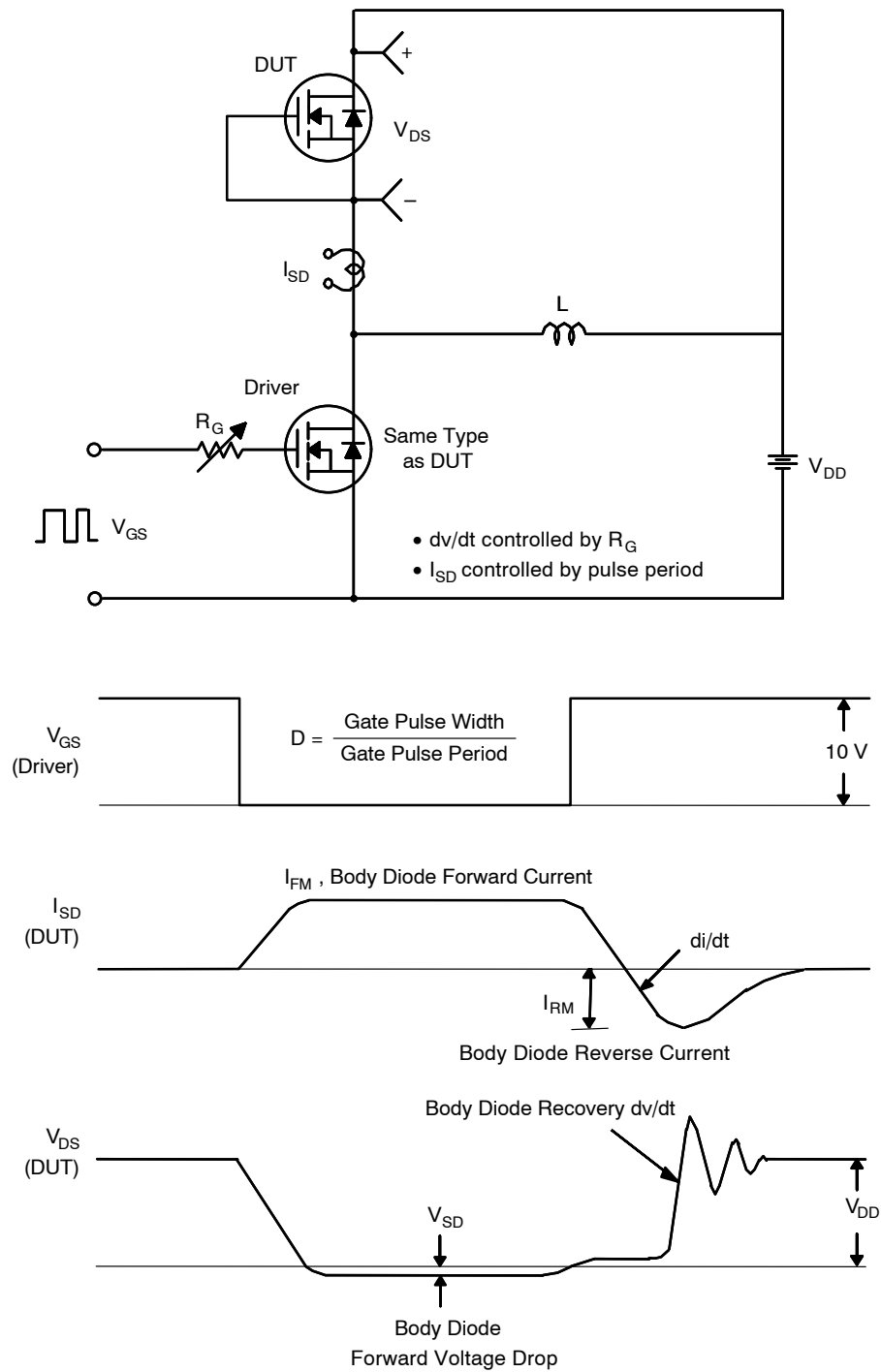
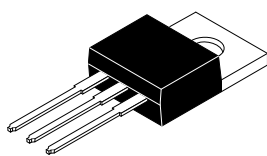


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

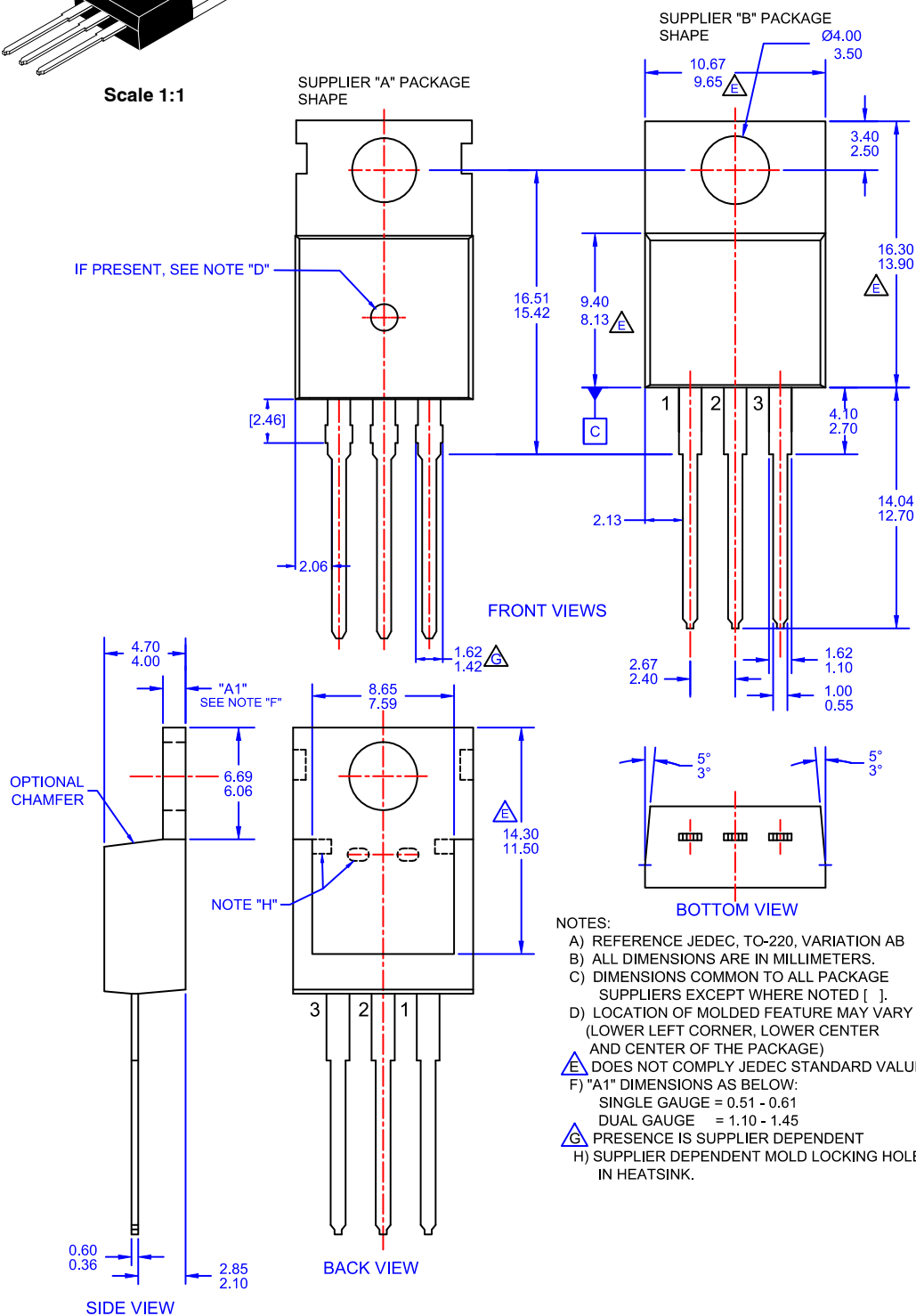
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Scale 1:1

TO-220-3LD CASE 340AT ISSUE A

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