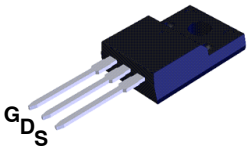
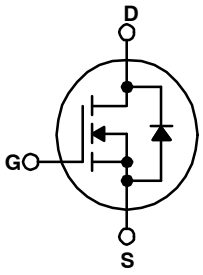
MOSFET – N-Channel, POWERTRENCH®

100 V, 67 A, 8.5 mΩ

FDPF045N10A



TO−220F
CASE 221AT



Description

This N−Channel MOSFET is Produced using **onsemi**'s advanced PowerTrench Process that has been tailored to minimize the on−state resistance while maintaining superior switching performance.

Features

- $R_{DS(on)}$ = 3.7 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 67 A
- Fast Switching Speed
- Low Gate Charge, Qg = 57 nC (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- This Device is Pb−Free Halide, Free and RoHS Compliant

Applications

- Synchronous Rectification for ATX / Sever / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter

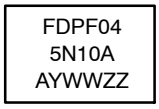
ABSOLUTE MAXIMUM RATINGS

(T_C = 25°C unless otherwise noted.)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain to Source Voltage	100	V
V_{GSS}	Gate to Source Voltage	±20	V
I_D	Drain Current – Continuous (T_C = 25°C) – Continuous (T_C = 100°C)	 67 47	A
I_{DM}	Drain Current – Pulsed (Note 1)	268	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	637	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
P_D	Power Dissipation – (T_C = 25°C) – Derate Above 25°C	 43 0.29	 W W/°C
T_J,T_{STG}	Operating and Storage Temperature Range	−55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 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.

MARKING DIAGRAM



FDPF045N10A	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year and Week)
ZZ	= Assembly Lot Code

ORDERING INFORMATION

Device	Package	Shipping
FDPF045N10A	TO−220−3 FullPack	1000 Units / Tube

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.5	°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 Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	0.06	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	–	–	1	μA
		V_{DS} = 80 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	2.0	–	4.0	V
$R_{DS(on)}$	Static Drain to Source On−Resistance	V_{GS} = 10 V, I_D = 67 A	–	3.7	4.5	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 67 A	–	127	–	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	–	3961	5270	pF
C_{oss}	Output Capacitance		–	925	1230	pF
C_{rss}	Reverse Transfer Capacitance		–	34	–	pF
C_{oss}(er)	Engry Related Output Capacitance	V_{DS} = 50 V, V_{GS} = 0 V	–	1521	–	pF
$Q_{g(tot)}$	Total Gate Charge at 10 V	V_{GS} = 10 V, V_{DS} = 50 V, I_D = 100 A	–	57	74	nC
Q_{gs}	Gate to Source Gate Charge		–	17	–	nC
Q_{gs2}	Gate Charge Threshold to Plateau		–	8	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	13	–	nC
ESR	Equivalent Series Resistance (G−S)	f = 1 MHz	–	1.9	–	Ω
Switching Characteristics						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 50 V, I_D = 100 A, V_{GS} = 10 V, R_{GEN} = 4.7 Ω (Note 4)	–	23	56	ns
t_r	Turn−On Rise Time		–	26	62	ns
$t_{d(off)}$	Turn−Off Delay Time		–	50	110	ns
t_f	Turn−Off Fall Time		–	15	40	ns
Drain−Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		–	–	67	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	268	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 67 A	–	–	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, V_{DD} = 50 V, I_{SD} = 100 A, dI_F/dt = 100 A/μs	–	75	–	ns
Q_{rr}	Reverse Recovery Charge		–	120	–	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 = 3 mH, I_{AS} = 20.6 A, R_G = 25 Ω starting T_J = 25°C.
3. I_{SD} ≤ 100 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature.

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TYPICAL CHARACTERISTICS

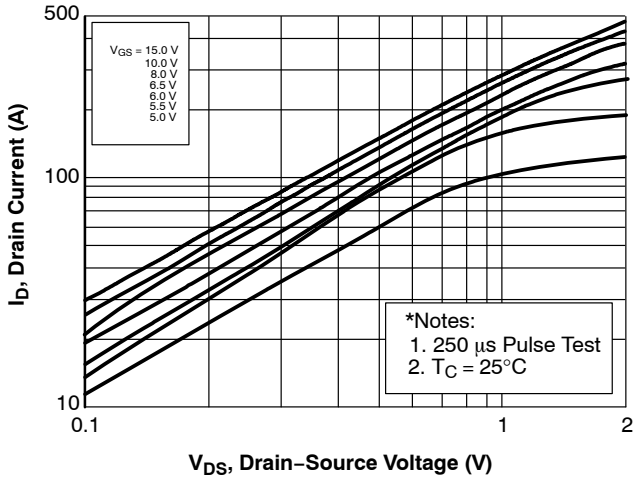

Figure 1. On−Region Characteristics

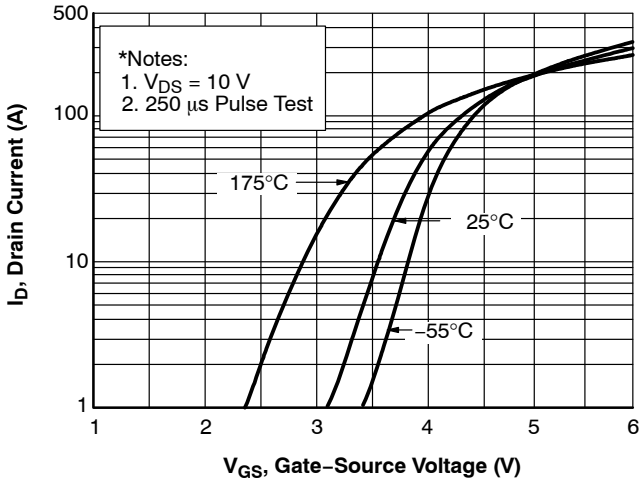

Figure 2. Transfer Characteristics

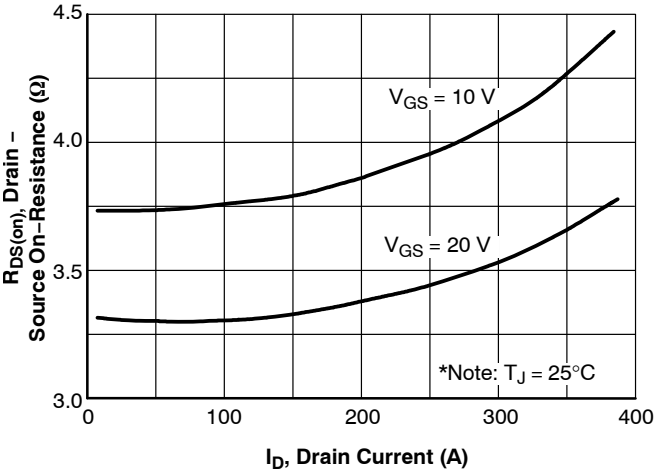

Figure 3. On−Resistance Variation vs Drain Current and Gate Voltage

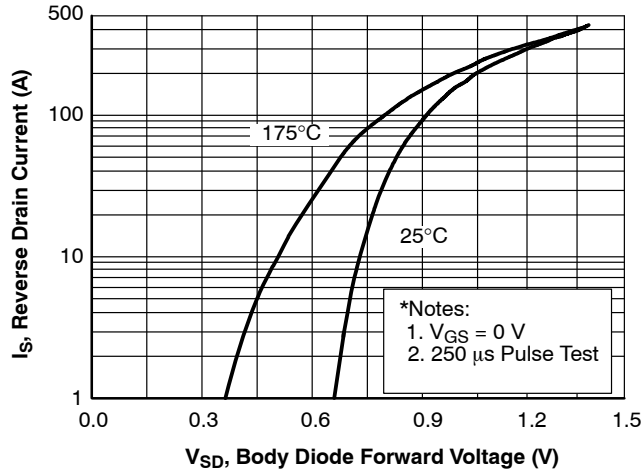

Figure 4. Body Diode Forward Voltage Variation vs Source Current and Temperature

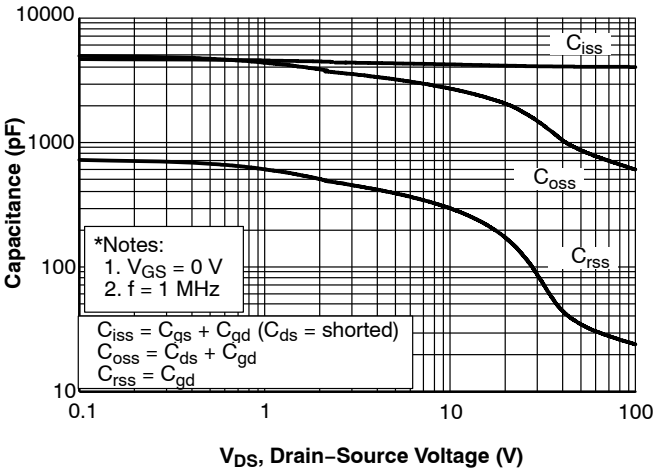

Figure 5. Capacitance Characteristics

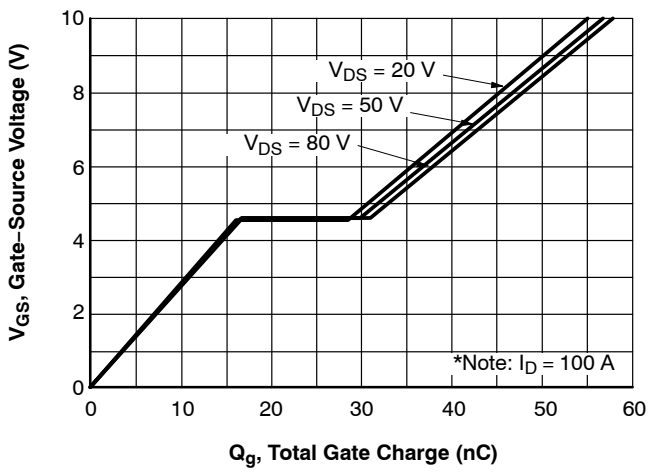

Figure 6. Gate Charge Characteristics

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TYPICAL CHARACTERISTICS (CONTINUED)

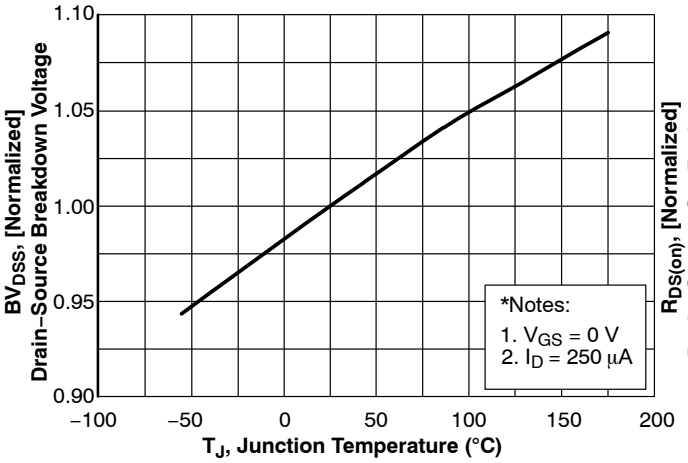

Figure 7. Breakdown Voltage Variation vs Temperature

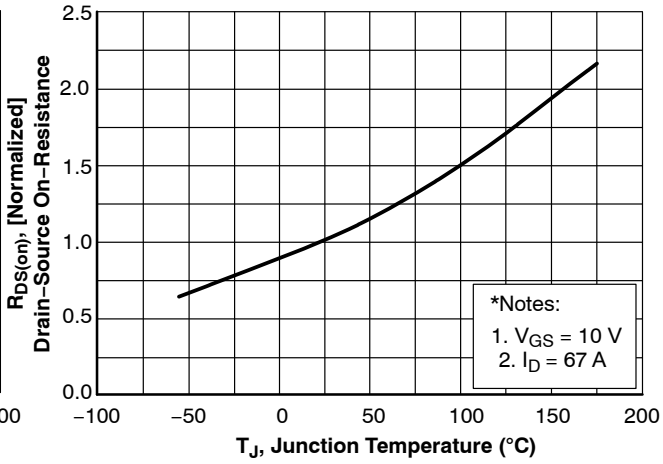

Figure 8. On−Resistance Variation vs Temperature

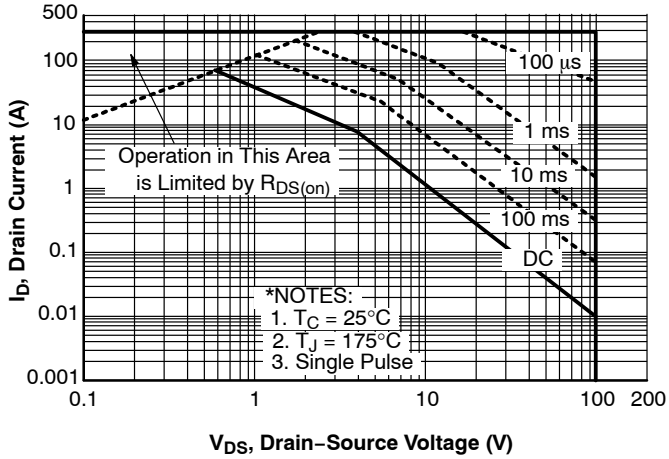

Figure 9. Maximum Safe Operating Area vs. Case Temperature

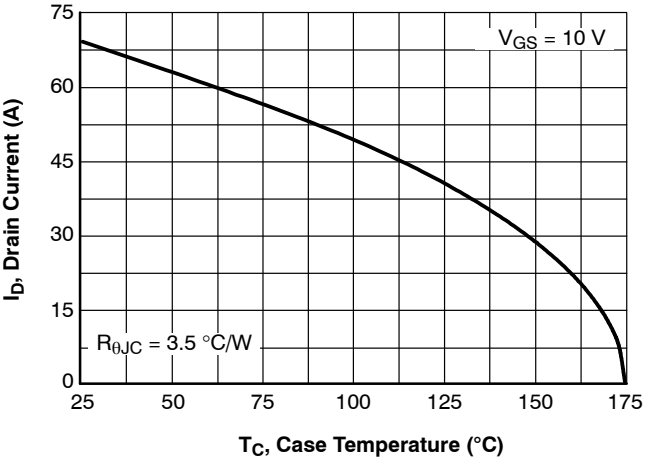

Figure 10. Maximum Drain Current

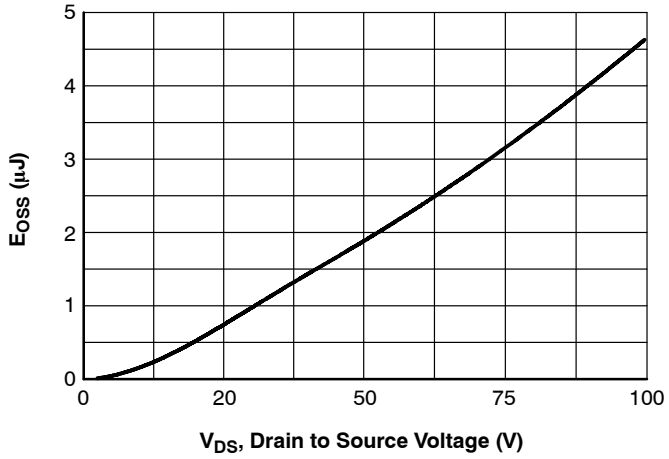

Figure 11. Eoss vs. Drain to Source Voltage

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TYPICAL CHARACTERISTICS (CONTINUED)

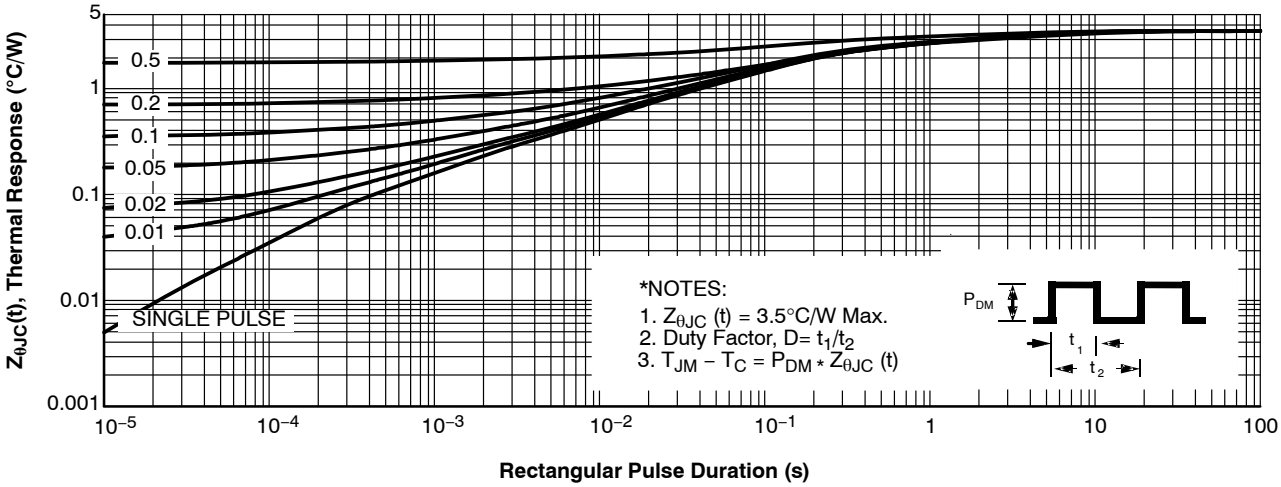

Figure 12. Transient Thermal Response Curve

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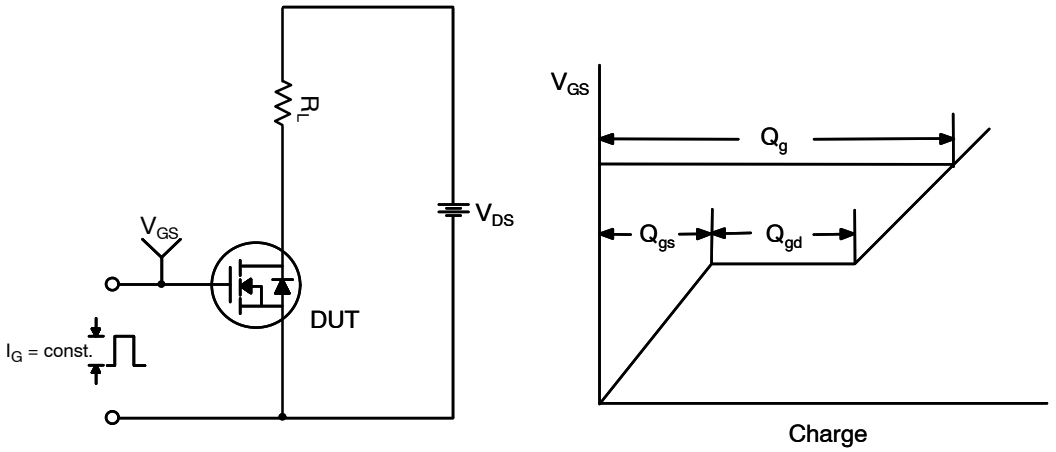

Figure 13. Gate Charge Test Circuit & Waveform

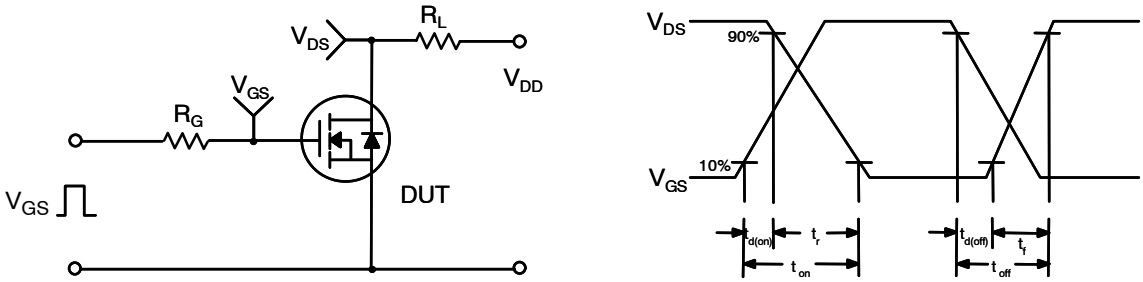

Figure 14. Resistive Switching Test Circuit & Waveforms

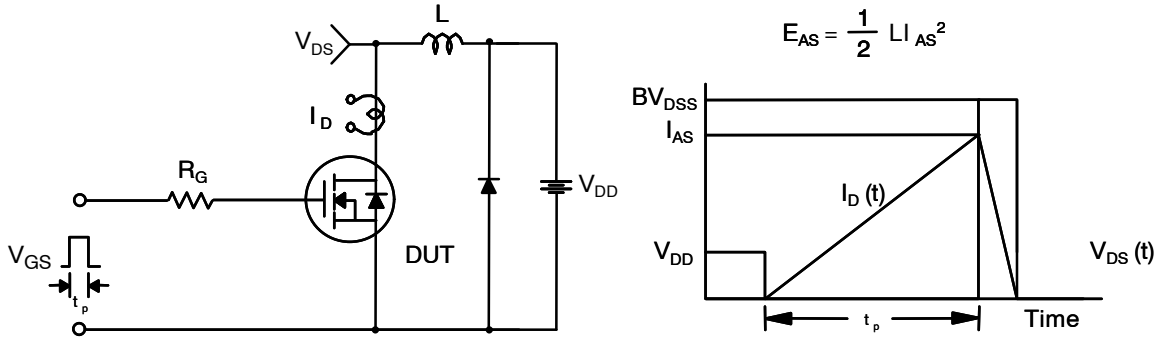

Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

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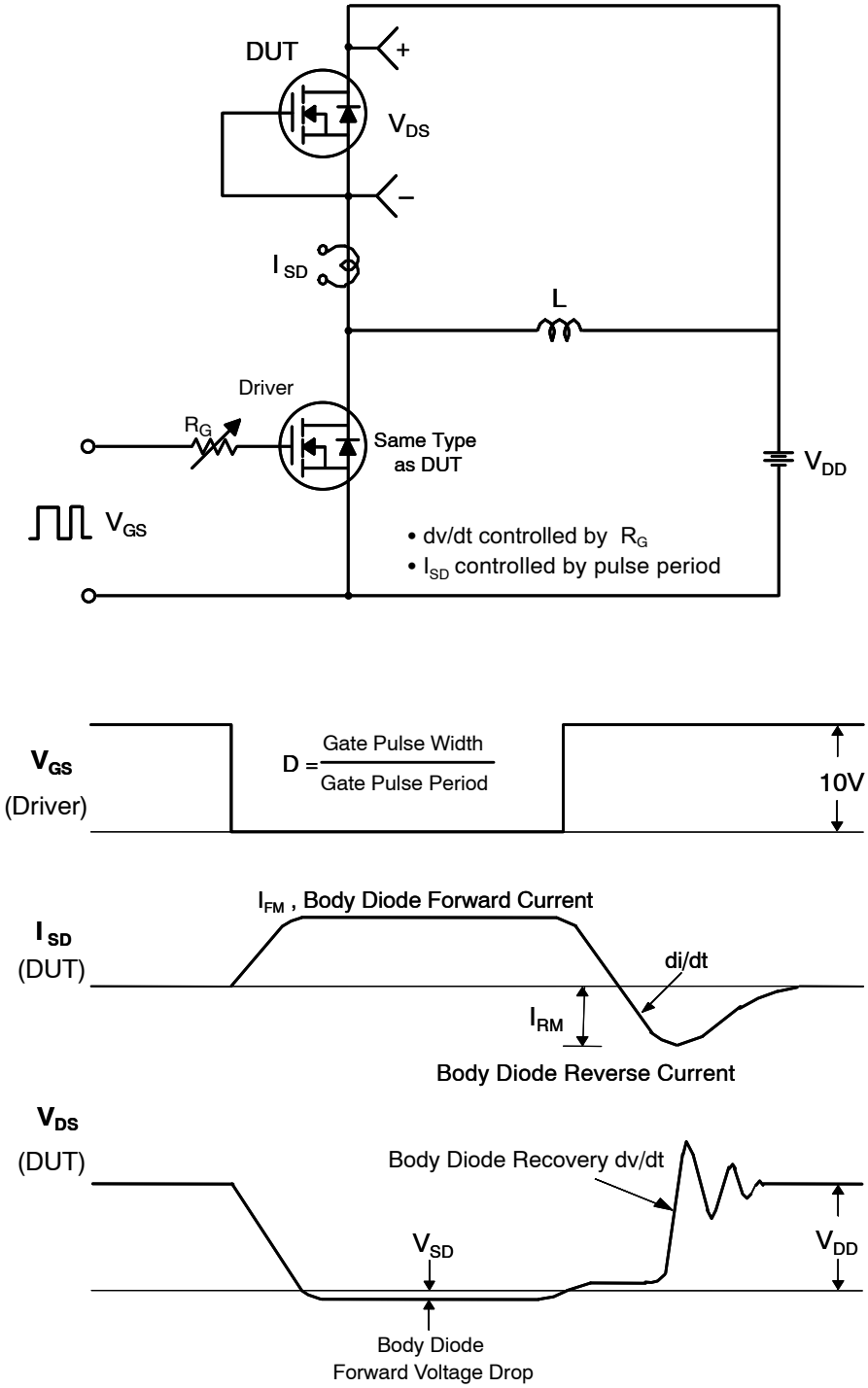

Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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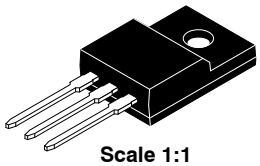
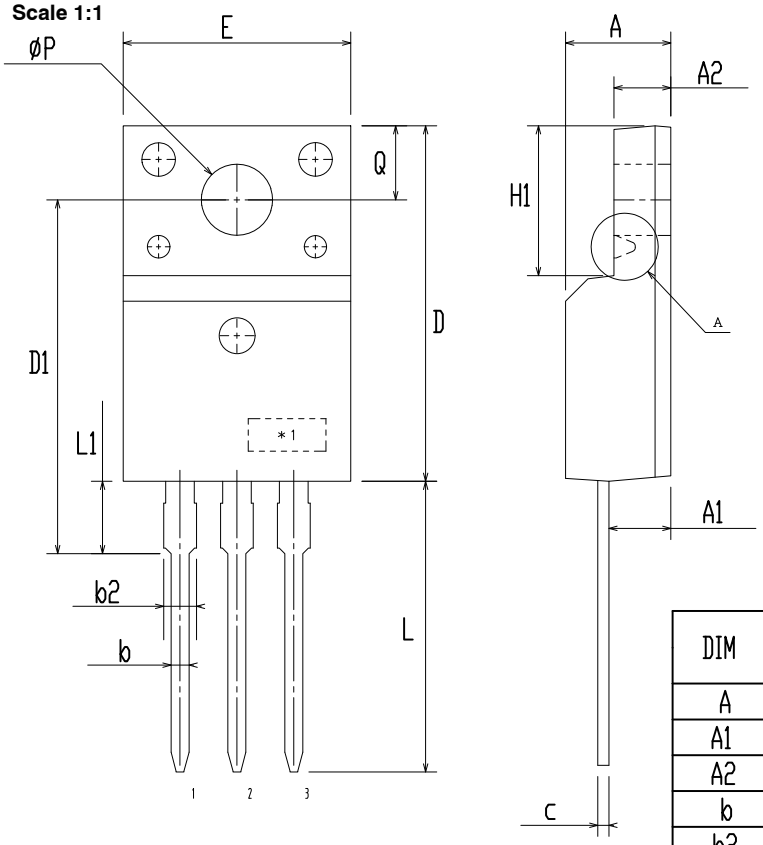
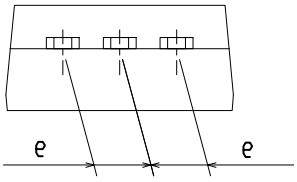
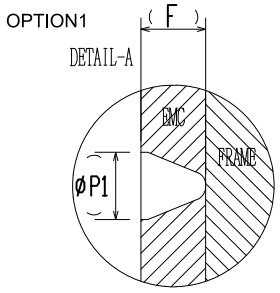


Scale 1:1







DIM	MILLIMITERS		
	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.56	2.76	2.96
A2	2.34	2.54	2.74
b	0.70	0.80	0.90
b2	~	~	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.60	15.80	16.00
E	9.96	10.16	10.36
e	2.34	2.54	2.74
F	~	0.84	~
H1	6.48	6.68	6.88
L	12.78	12.98	13.18
L1	3.03	3.23	3.43
ø P	2.98	3.18	3.38
ø P1	~	1.00	~
Q	3.20	3.30	3.40

NOTES:
A. DIMENSION AND TOLERANCE AS ASME Y14.5-2009
B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUCSIONS.
C. OPTION 1 - WITH SUPPORT PIN HOLE
OPTION 2 - NO SUPPORT PIN HOLE

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DESCRIPTION:	**TO−220 FULLPACK, 3−LEAD / TO−220F−3SG**		**PAGE 1 OF 1**

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