

# MOSFET – N-Channel, UniFET™

500 V, 28 A, 155 mΩ

## FDA28N50

### Description

UniFET MOSFET is onsemi's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. 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

- $R_{DS(on)} = 122 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 14 \text{ A}$
- Low Gate Charge (Typ. 80 nC)
- Low  $C_{rss}$  (Typ. 42 pF)
- 100% Avalanche Tested
- This Device is Pb-Free Halide, Free and RoHS Compliant

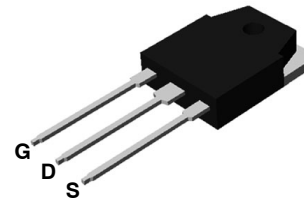
### Applications

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

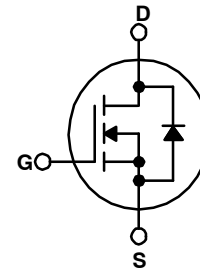
### MOSFET MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain to Source Voltage	500	V
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Drain Current		A
	- Continuous ( $T_C = 25^\circ\text{C}$ )	28	
	- Continuous ( $T_C = 100^\circ\text{C}$ )	17	
$I_{DM}$	Drain Current – Pulsed (Note 1)	112	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	2391	mJ
$I_{AR}$	Avalanche Current (Note 1)	28	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	31	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5	V/ns
$P_D$	Power Dissipation		W
	- ( $T_C = 25^\circ\text{C}$ ) - Derate Above $25^\circ\text{C}$	310 2.5	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

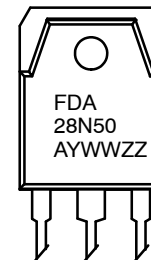
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



TO-3P-3L  
CASE 340BZ



### MARKING DIAGRAM



FDA28N50 = Specific Device Code  
A = Assembly Location  
YWW = Date Code (Year and Week)  
ZZ = Assembly Lot Code

### ORDERING INFORMATION

Device	Package	Shipping†
FDA28N50	TO-3P-3L (Pb-Free)	450 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](#).

# FDA28N50

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### Off Characteristics

$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 25^\circ\text{C}$	500	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.59	-	V/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 500 \text{ V}$ , $V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 400 \text{ V}$ , $T_C = 125^\circ\text{C}$	-	-	10	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250 \mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 14 \text{ A}$	-	0.122	0.155	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20 \text{ V}$ , $I_D = 14 \text{ A}$	-	34	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	-	3866	5140	pF
$C_{oss}$	Output Capacitance		-	576	766	
$C_{rss}$	Reverse Transfer Capacitance		-	42	63	
$Q_{g(tot)}$	Total Gate Charge at 10 V	$V_{DS} = 400 \text{ V}$ , $I_D = 28 \text{ A}$ , $V_{GS} = 10 \text{ V}$ (Note 4)	-	80	105	nC
$Q_{gs}$	Gate to Source Gate Charge		-	21	-	
$Q_{gd}$	Gate to Drain "Miller" Charge		-	32	-	

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 250 \text{ V}$ , $I_D = 28 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 25 \Omega$ (Note 4)	-	56	122	ns
$t_r$	Turn-On Rise Time		-	126	262	
$t_{d(off)}$	Turn-Off Delay Time		-	210	430	
$t_f$	Turn-Off Fall Time		-	110	230	

### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	28	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	112	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}$ , $I_{SD} = 20 \text{ A}$	-	-	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}$ , $I_{SD} = 20 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$	-	530	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	8	-	

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.  $L = 6.1 \text{ mH}$ ,  $I_{AS} = 28 \text{ A}$ ,  $V_{DD} = 50 \text{ V}$ ,  $R_G = 25 \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 28 \text{ A}$ ,  $di/dt \leq 200 \text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical Characteristics.

TYPICAL CHARACTERISTICS

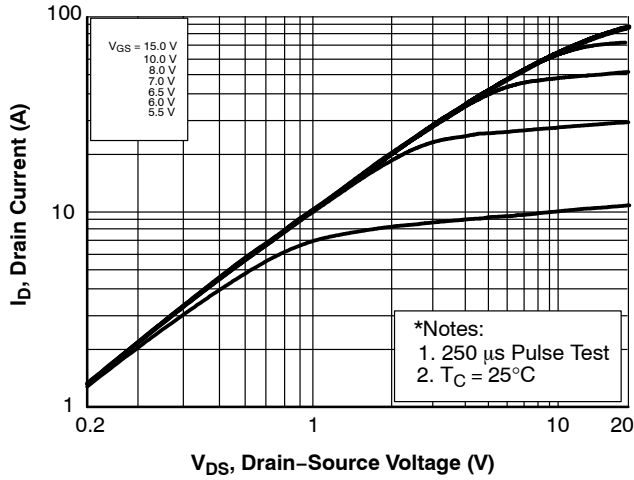


Figure 1. On-Region Characteristics

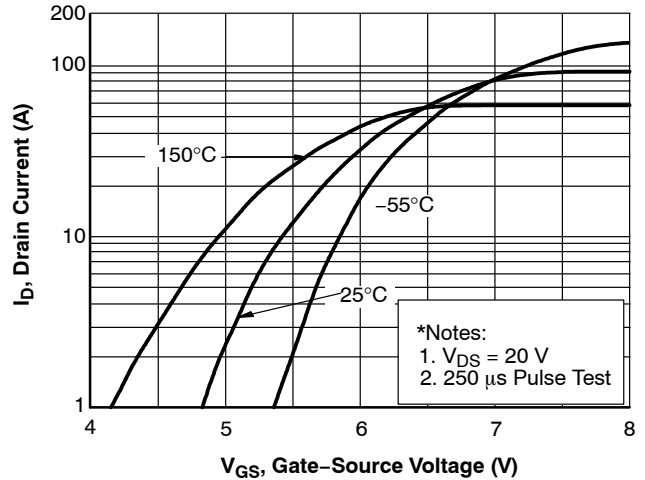


Figure 2. Transfer Characteristics

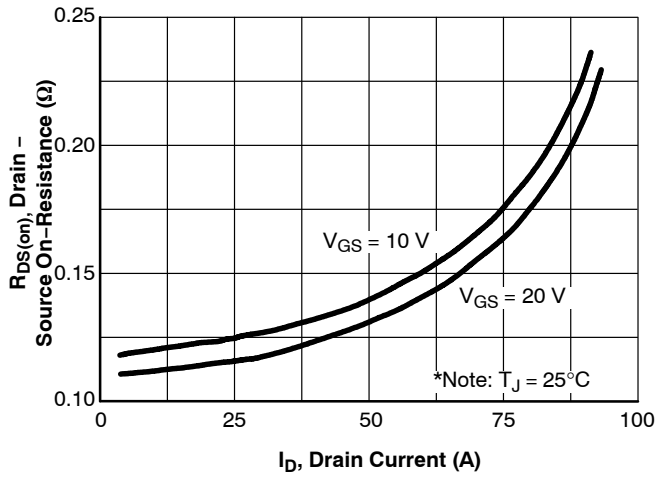


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

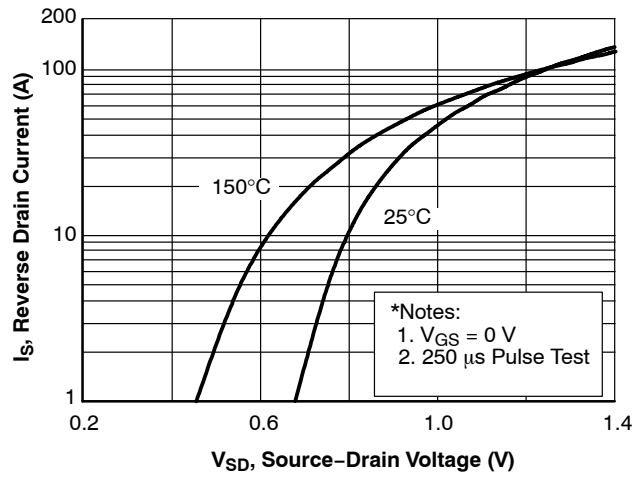


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

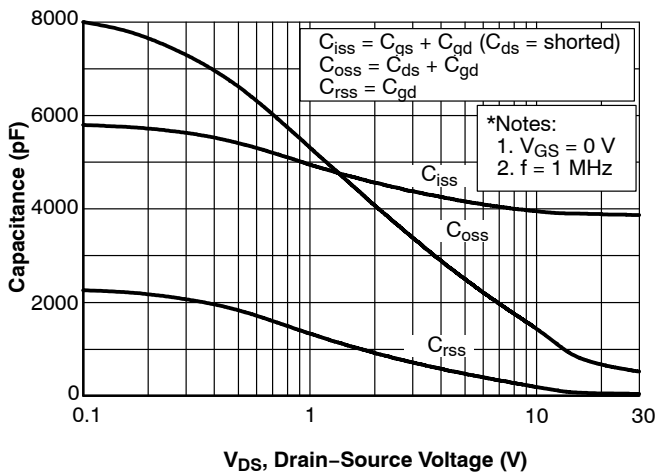


Figure 5. Capacitance Characteristics

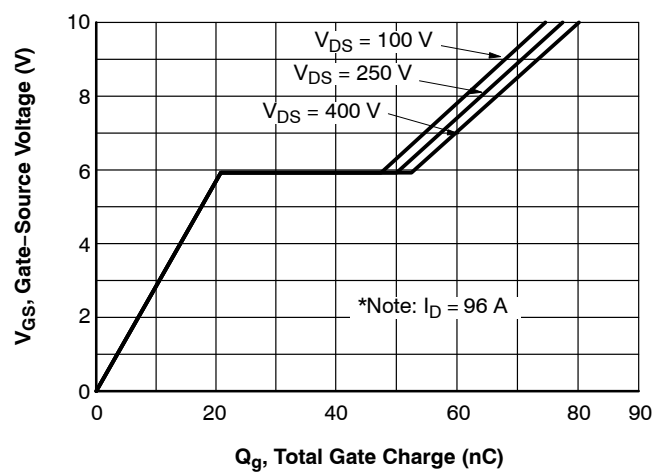


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (CONTINUED)

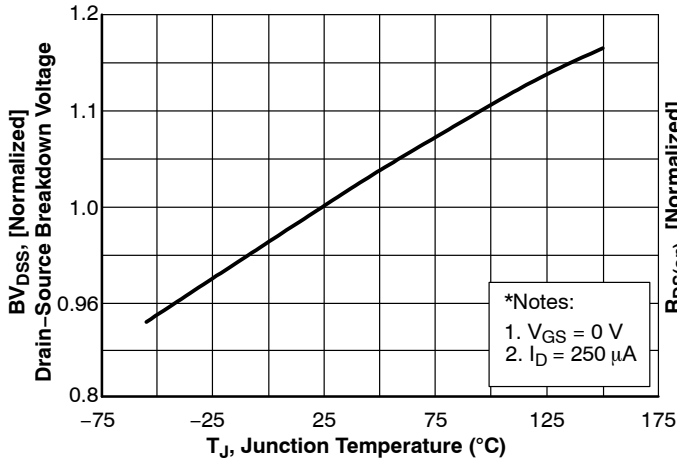


Figure 7. Breakdown Voltage Variation vs Temperature

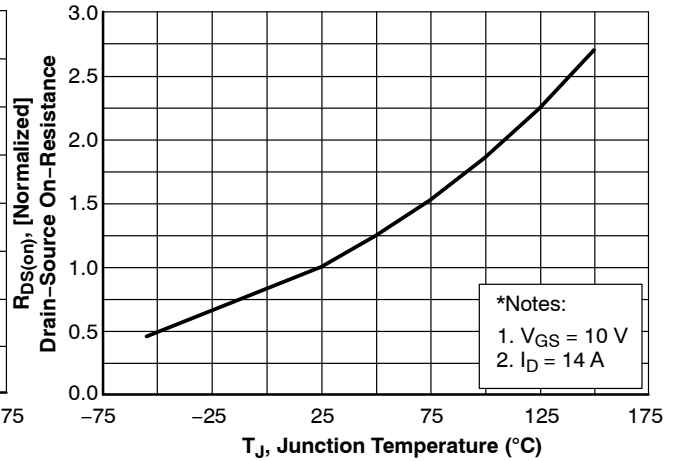


Figure 8. On-Resistance Variation vs Temperature

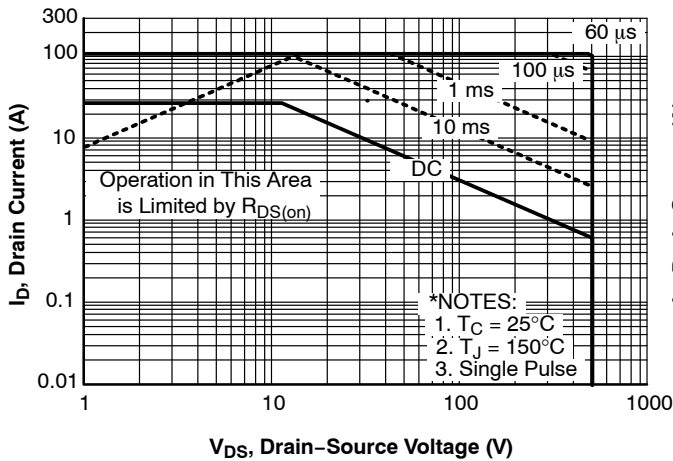


Figure 9. Maximum Safe Operating Area

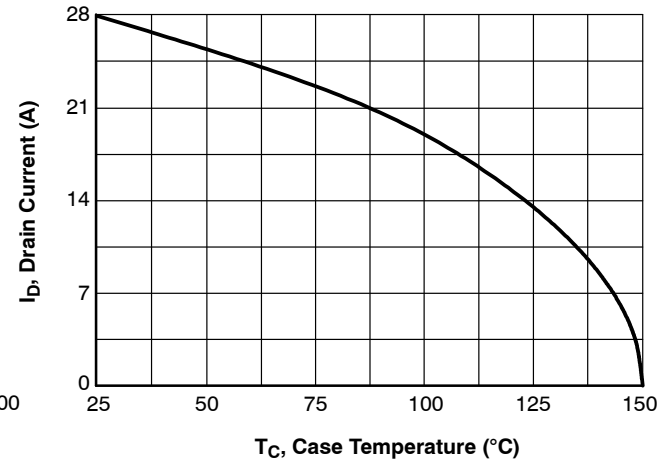


Figure 10. Maximum Drain Current vs. Case Temperature

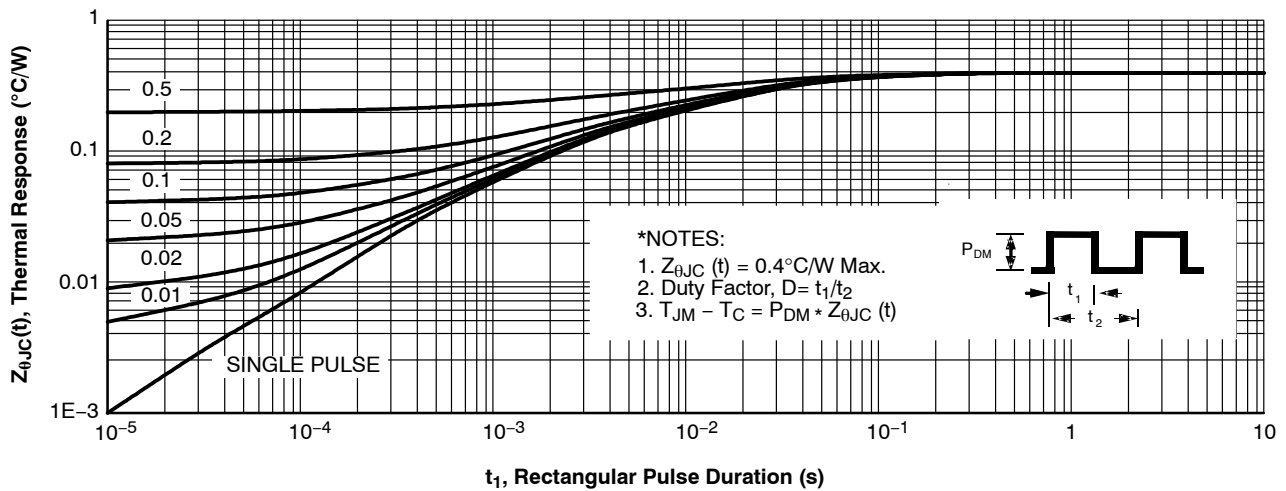


Figure 11. Transient Thermal Response Curve

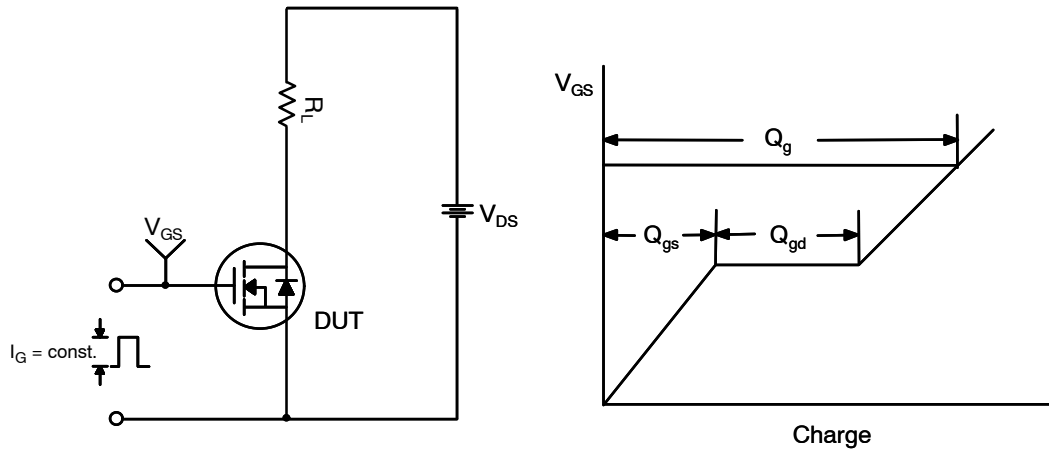


Figure 12. Gate Charge Test Circuit & Waveform

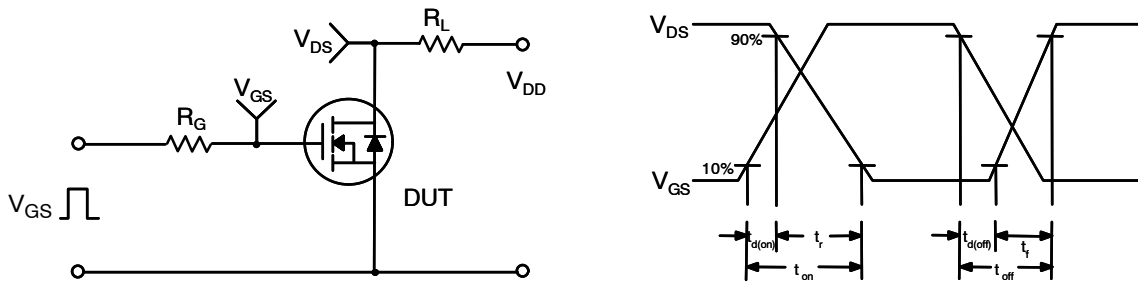


Figure 13. Resistive Switching Test Circuit & Waveforms

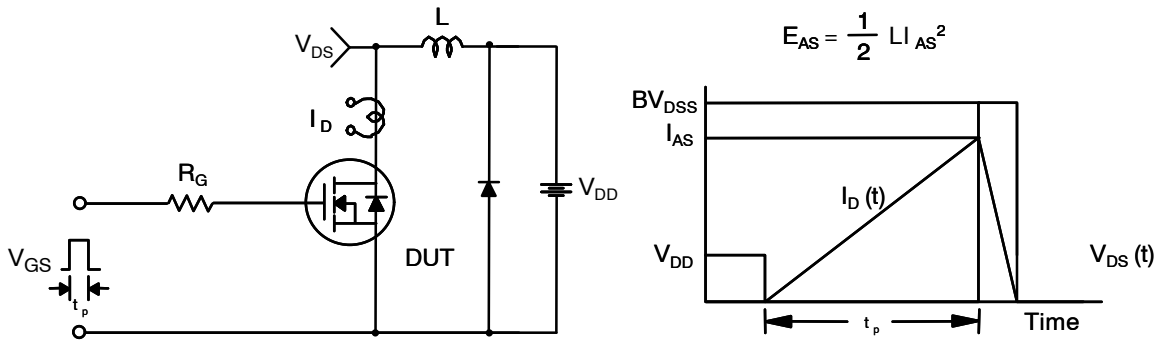
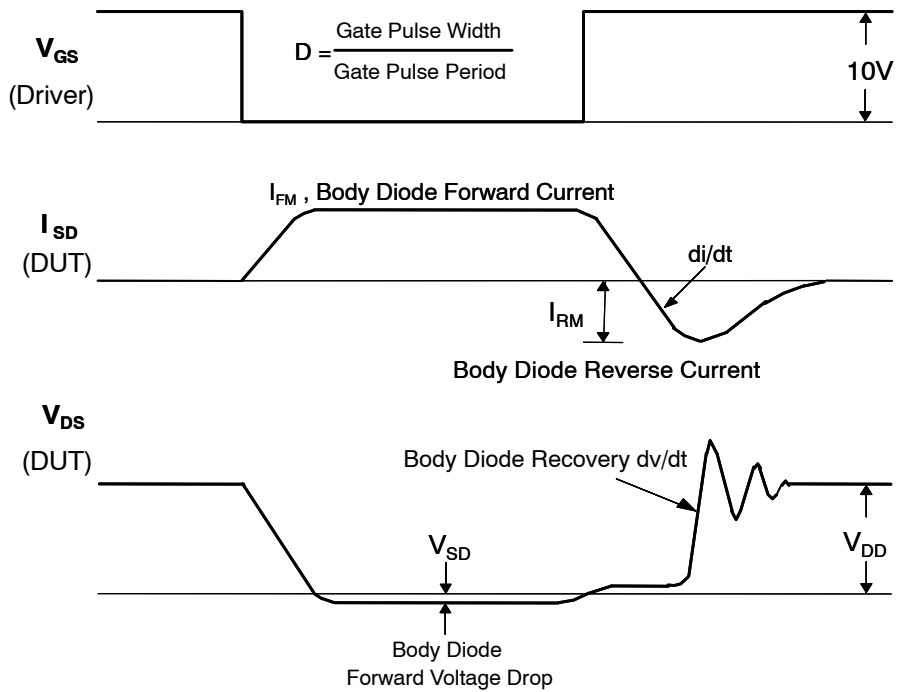
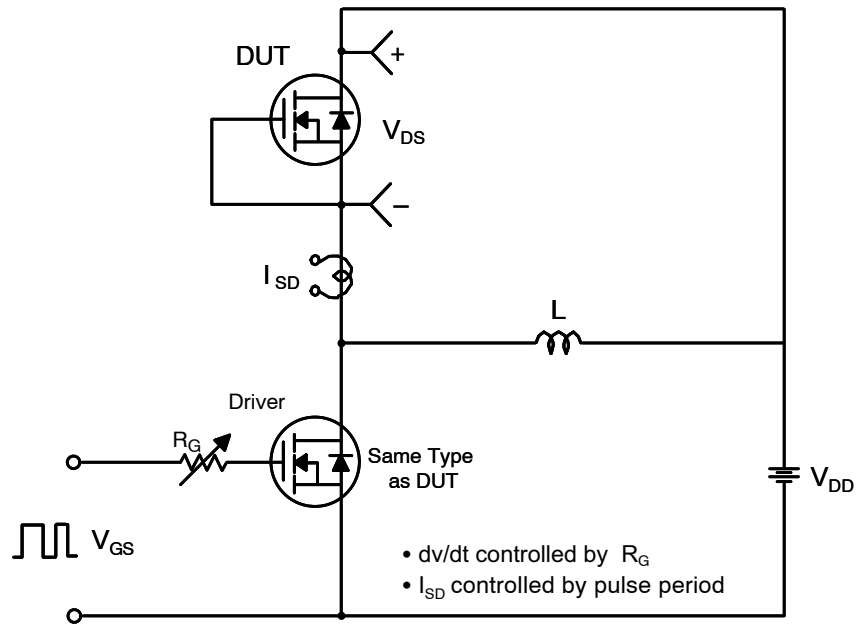


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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

# MECHANICAL CASE OUTLINE

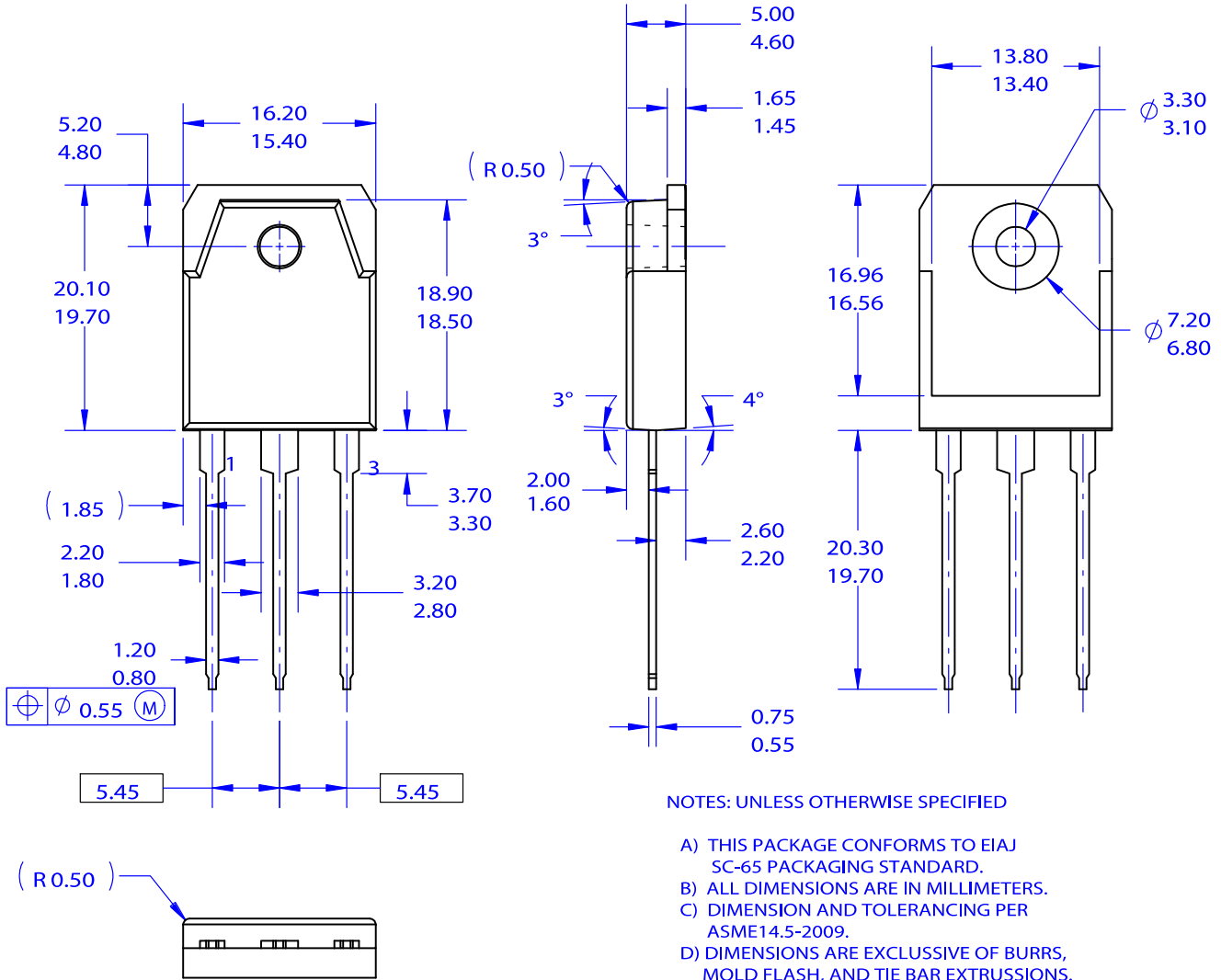
## PACKAGE DIMENSIONS

ON Semiconductor®



### TO-3P-3LD / EIAJ SC-65, ISOLATED CASE 340BZ ISSUE O

DATE 31 OCT 2016



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