

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

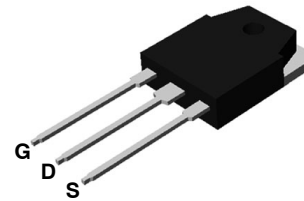
Applications

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

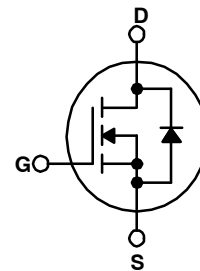
MOSFET MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain to Source Voltage	500	V
V_{GSS}	Gate to Source Voltage	± 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
	– ($T_C = 25^\circ\text{C}$)	310	
	– Derate Above 25°C	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	$^\circ\text{C}$

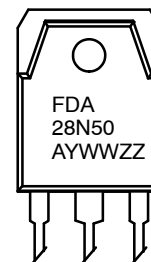
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



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](#).

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°C	–	0.59	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 500\ \text{V}$, $V_{GS} = 0\ \text{V}$	–	–	1	μA
		$V_{DS} = 400\ \text{V}$, $T_C = 125^\circ\text{C}$	–	–	10	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30\ \text{V}$, $V_{DS} = 0\ \text{V}$	–	–	± 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	Ω
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	pF
C_{rss}	Reverse Transfer Capacitance		–	42	63	pF
$Q_{g(tot)}$	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	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	32	–	nC

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	ns
$t_{d(off)}$	Turn-Off Delay Time		–	210	430	ns
t_f	Turn-Off Fall Time		–	110	230	ns

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 V, I _{SD} = 20 A	–	–	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 20 A, dI _F /dt = 100 A/μs	–	530	–	ns
Q _{rr}	Reverse Recovery Charge		–	8	–	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.

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

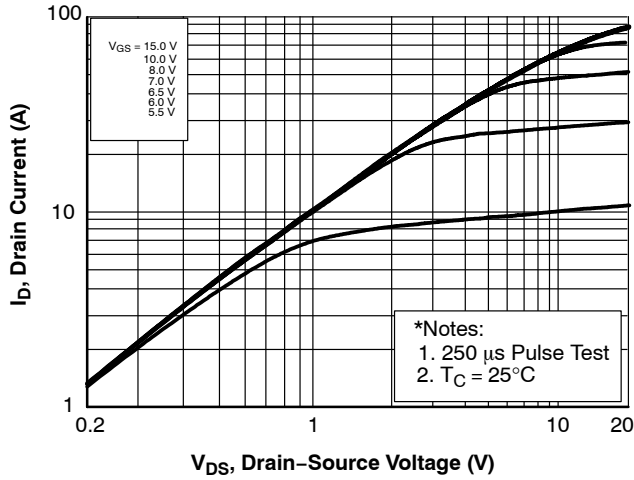


Figure 1. On-Region Characteristics

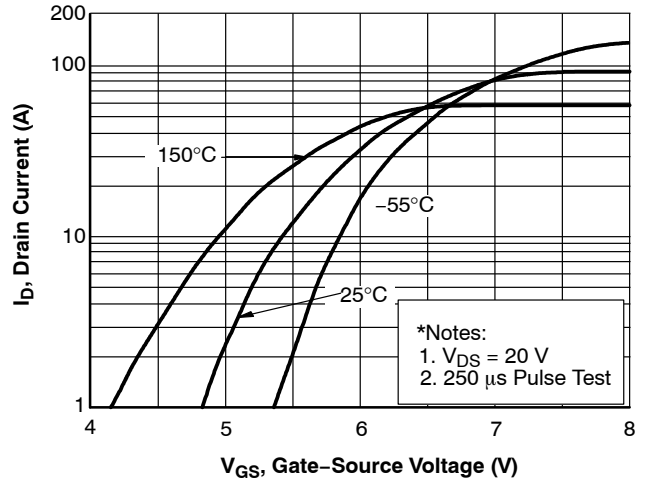


Figure 2. Transfer Characteristics

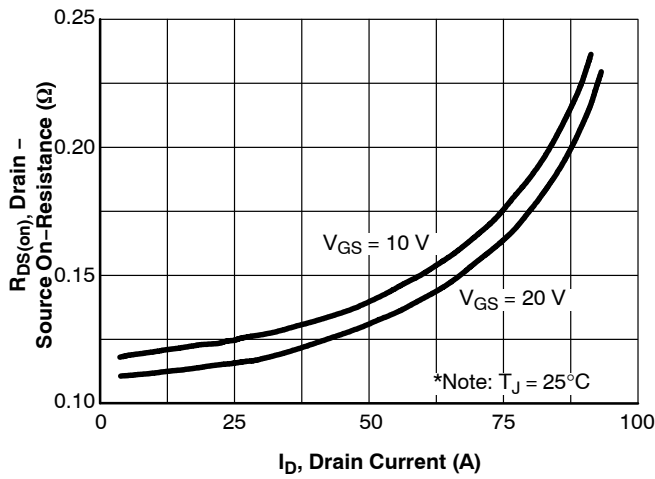


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

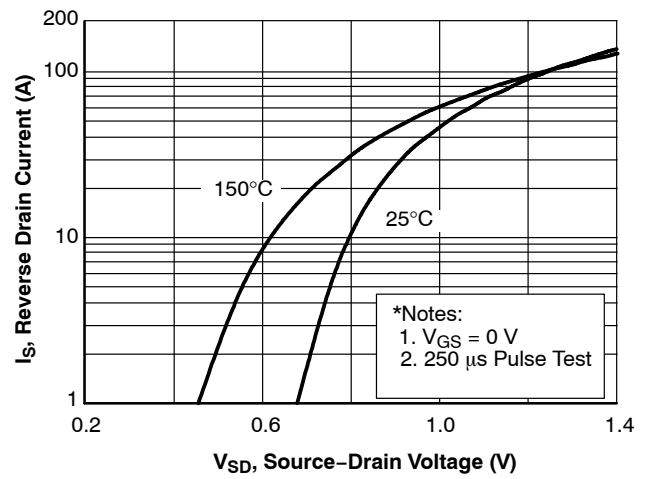


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

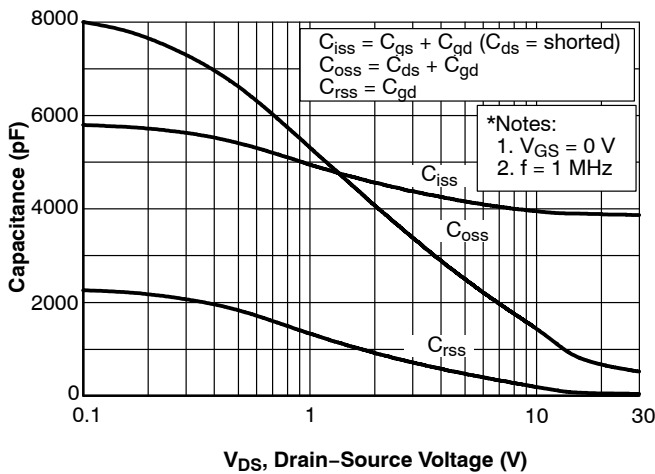


Figure 5. Capacitance Characteristics

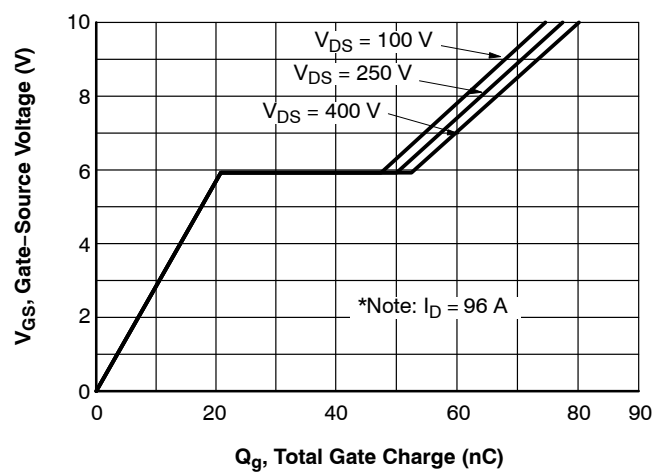


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (CONTINUED)

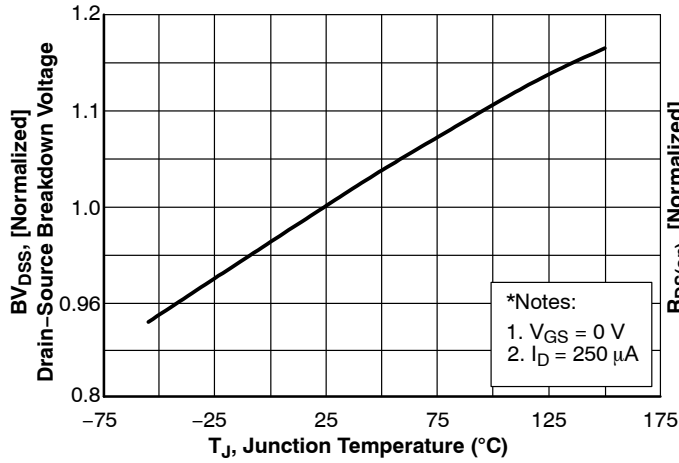


Figure 7. Breakdown Voltage Variation vs Temperature

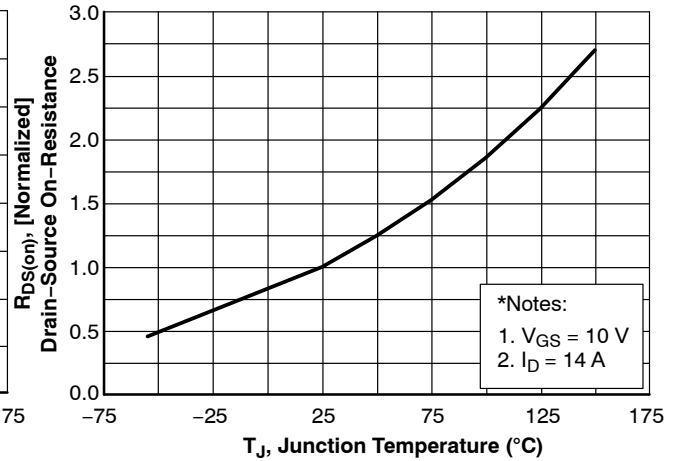


Figure 8. On-Resistance Variation vs Temperature

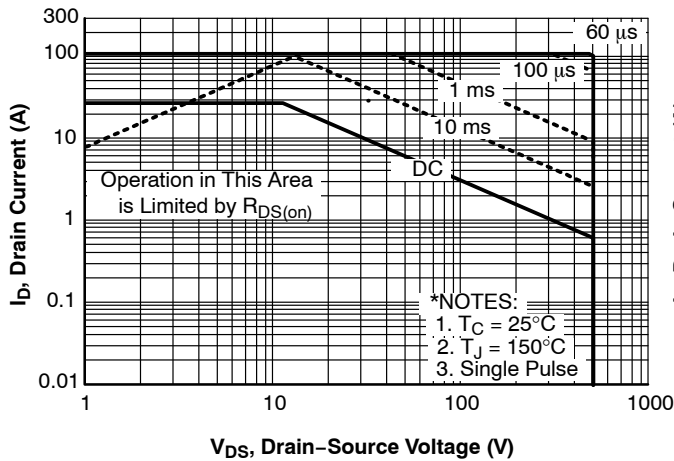


Figure 9. Maximum Safe Operating Area

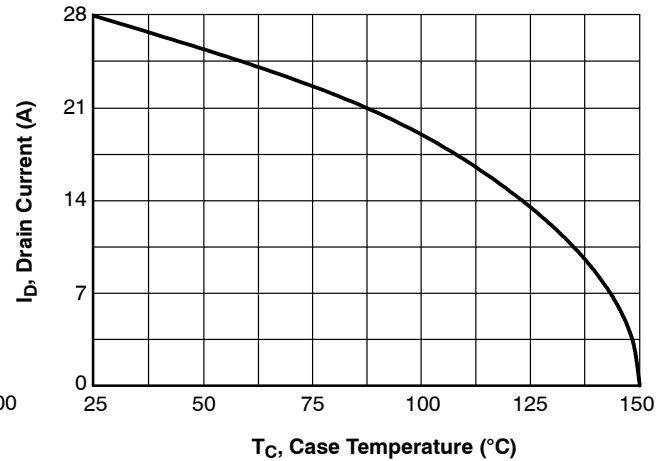


Figure 10. Maximum Drain Current vs. Case Temperature

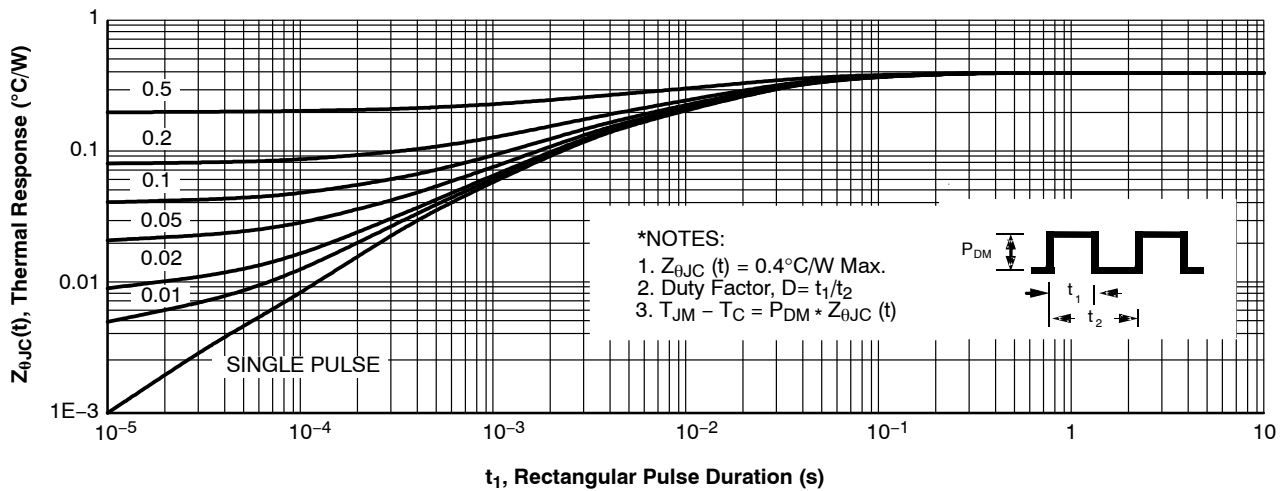


Figure 11. Transient Thermal Response Curve

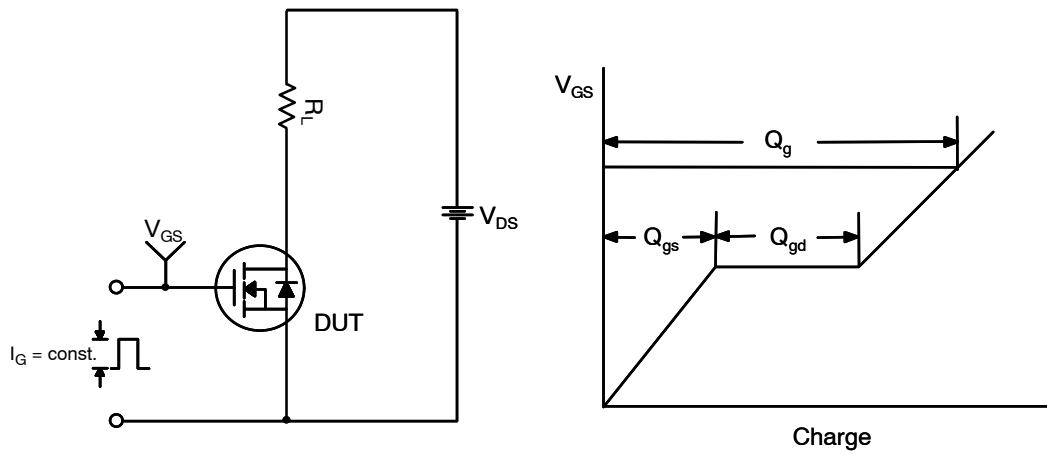


Figure 12. Gate Charge Test Circuit & Waveform

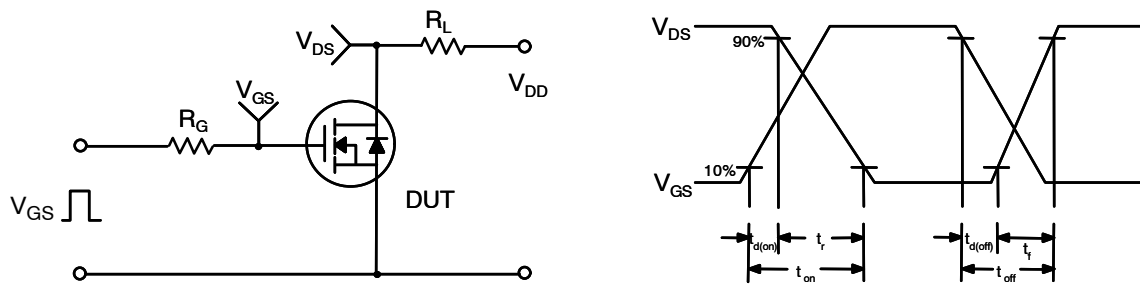


Figure 13. Resistive Switching Test Circuit & Waveforms

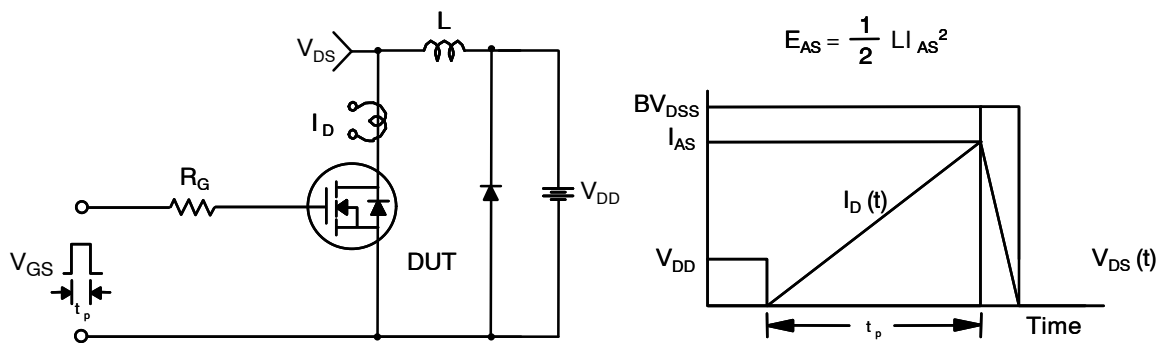


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

The circuit diagram shows a MOSFET (DUT) with its source connected to a common ground and its drain connected to a load inductor L and a supply voltage V_{DD} . The gate is driven by a pulse generator V_{GS} through a resistor R_G . A current sense resistor is placed between the drain and the inductor to measure I_{SD} . The MOSFET is labeled "Same Type as DUT".

Key parameters and notes from the diagram:

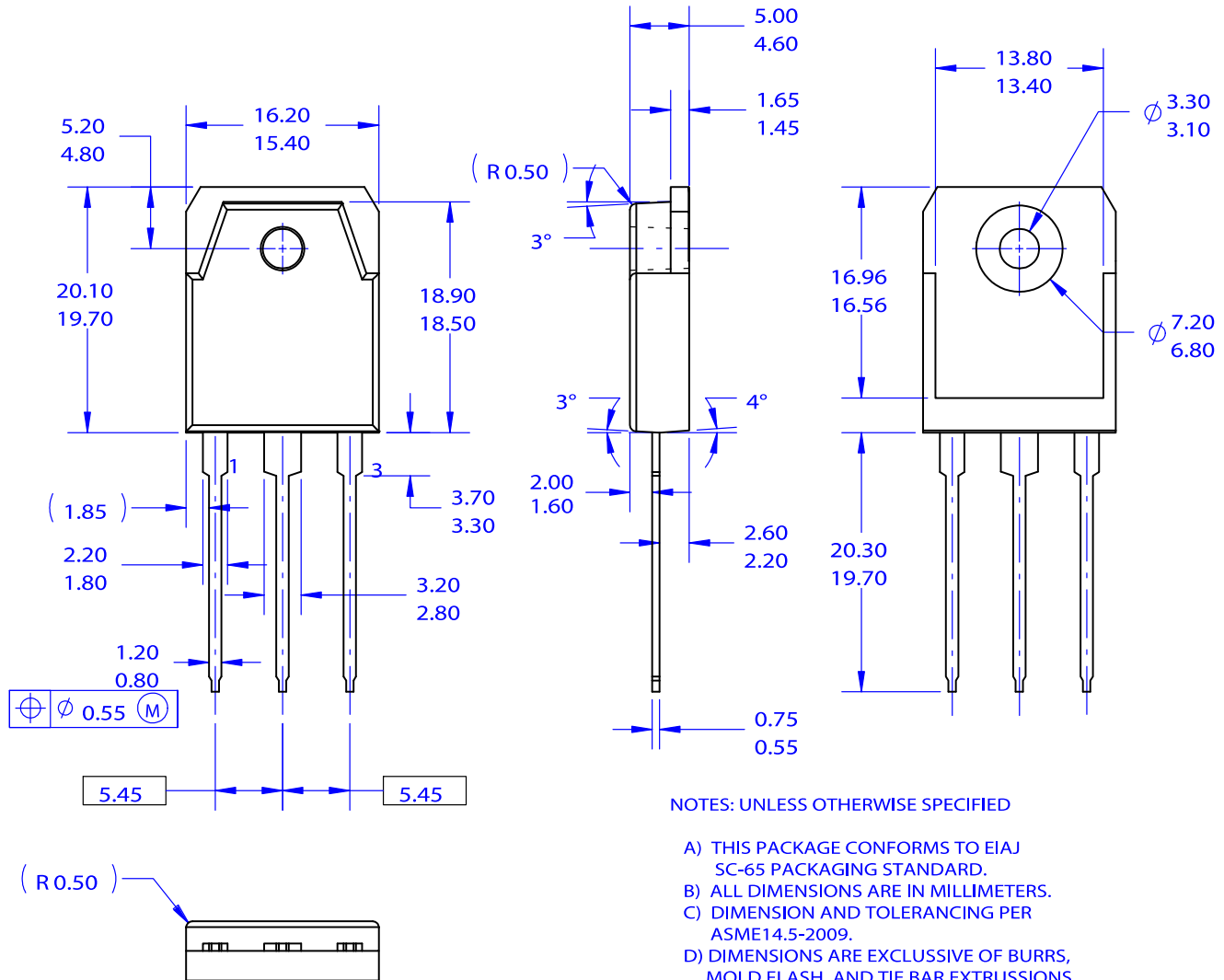
- V_{DS} : Drain-Source Voltage
- I_{SD} : Source-Drain Current
- L : Load Inductor
- V_{DD} : Supply Voltage
- R_G : Gate Resistor
- Notes:
 - dv/dt controlled by R_G
 - I_{SD} controlled by pulse period

The waveforms show:

- V_{GS} (Driver)**: A square wave pulse with duty cycle $D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$ and amplitude $10V$.
- I_{SD} (DUT)**: Shows forward current I_{FM} during the pulse, followed by reverse current I_{RM} during the off-time. The reverse current is labeled "Body Diode Reverse Current" and shows a di/dt transition.
- V_{DS} (DUT)**: Shows the drain-source voltage. During the off-time, it rises to V_{DD} . The initial rise is labeled "Body Diode Recovery dv/dt ". The forward voltage drop is labeled V_{SD} .

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

DATE 31 OCT 2016



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