



June 2014

# FDA69N25

## N-Channel UniFET™ MOSFET

250 V, 69 A, 41 mΩ

### Features

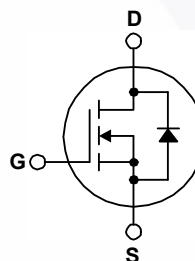
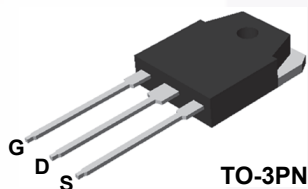
- $R_{DS(on)} = 34 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 34.5 \text{ A}$
- Low Gate Charge (Typ. 77 nC)
- Low  $C_{rss}$  (Typ. 84 pF)

### Applications

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

### Description

UniFET™ MOSFET is Fairchild Semiconductor'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.



### Absolute Maximum Ratings

 $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter		FDA69N25	Unit
$V_{DSS}$	Drain-Source Voltage		250	V
$V_{DS(Avalanche)}$	Repetitive Avalanche Voltage (Note 1, 2)		300	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	69	A
		- Continuous ( $T_C = 100^\circ\text{C}$ )	44.2	A
$I_{DM}$	Drain Current	- Pulsed (Note 1)	276	A
$V_{GSS}$	Gate-Source Voltage		$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)		1894	mJ
$I_{AR}$	Avalanche Current (Note 1)		69	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)		48	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)		4.5	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	480	W
		- Derate above $25^\circ\text{C}$	3.84	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$
$T_L$	Maximum lead temperature for soldering, 1/8" from case for 5 seconds		300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDA69N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.26	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA69N25	FDA69N25	TO-3PN	Tube	N/A	N/A	30 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	250	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	--	0.25	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V	--	--	1	μA
		V <sub>DS</sub> = 200 V, T <sub>C</sub> = 125°C	--	--	10	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V	--	--	-100	nA
On Characteristics						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	3.0	--	5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 34.5 A	--	0.034	0.041	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 34.5 A	--	25	--	S
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	--	3570	4640	pF
C <sub>oss</sub>	Output Capacitance		--	750	980	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	84	130	pF
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 69 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 25 Ω  (Note 4)	--	95	200	ns
t <sub>r</sub>	Turn-On Rise Time		--	855	1720	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	130	270	ns
t <sub>f</sub>	Turn-Off Fall Time		--	220	450	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 200 V, I <sub>D</sub> = 69 A, V <sub>GS</sub> = 10 V  (Note 4)	--	77	100	nC
Q <sub>gs</sub>	Gate-Source Charge		--	24	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	37	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	34	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	136	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 69 A	--	--	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 69 A, dI <sub>F</sub> / dt = 100 A/μs	--	210	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	5.7	--	μC

### Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2.  $L = 0.64\text{ mH}$ ,  $I_{AS} = 69\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\text{ }\Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 69\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

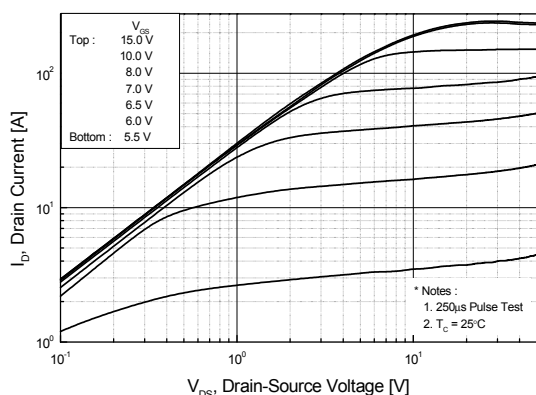


Figure 2. Transfer Characteristics

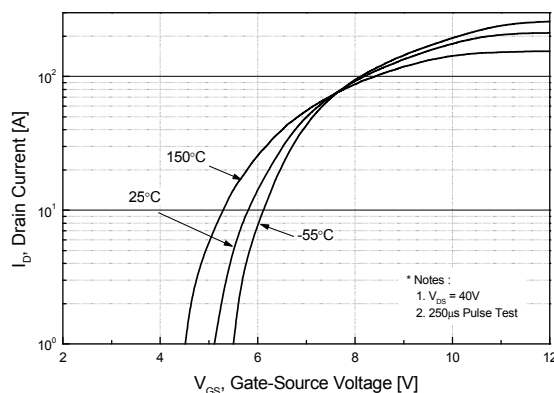


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

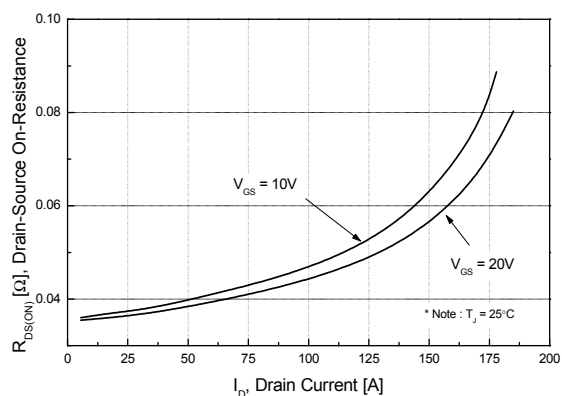


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

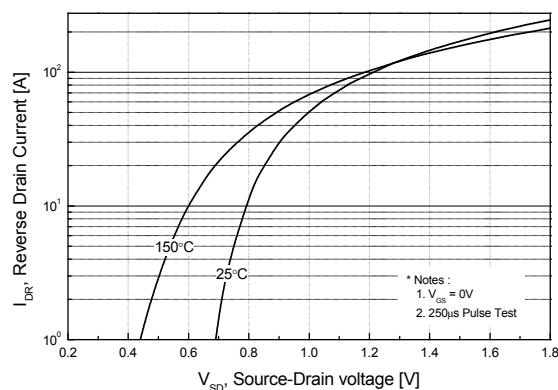


Figure 5. Capacitance Characteristics

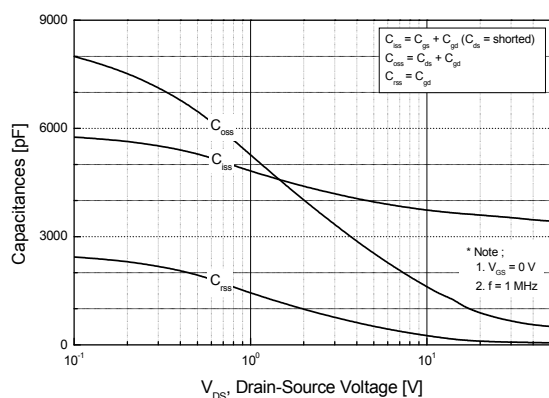
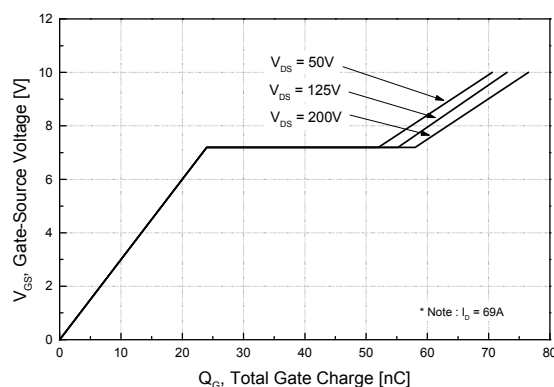
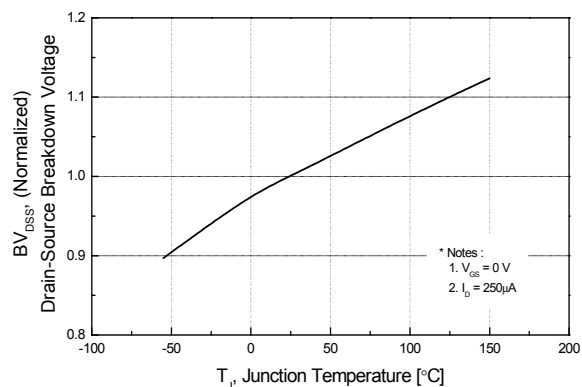


Figure 6. Gate Charge Characteristics

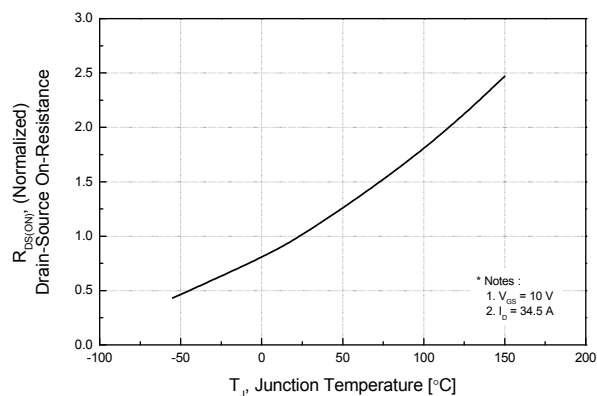


# Typical Performance Characteristics (Continued)

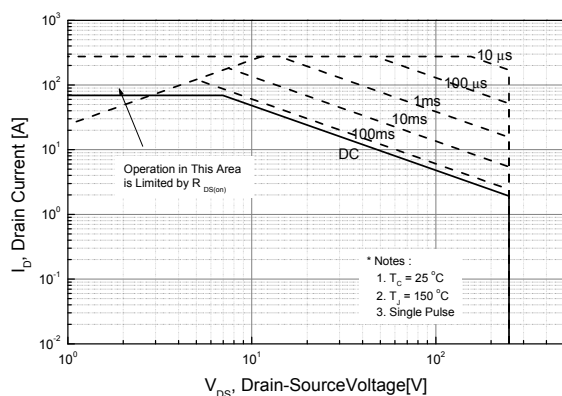
**Figure 7. Breakdown Voltage Variation vs. Temperature**



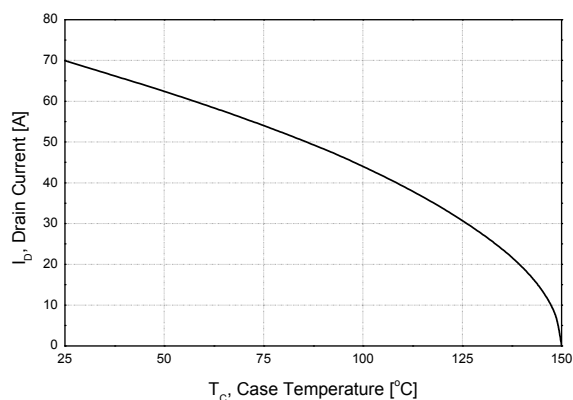
**Figure 8. On-Resistance Variation vs. Temperature**



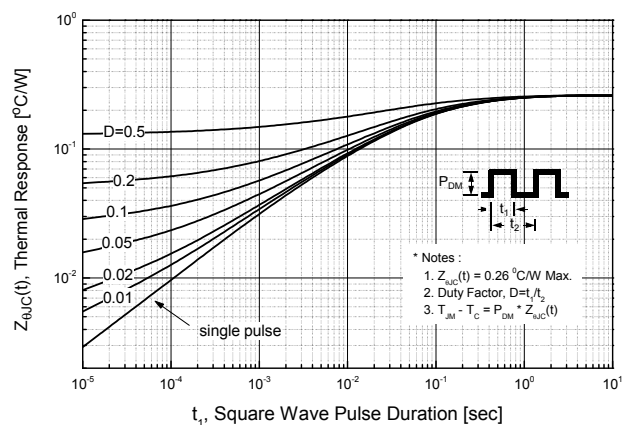
**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**



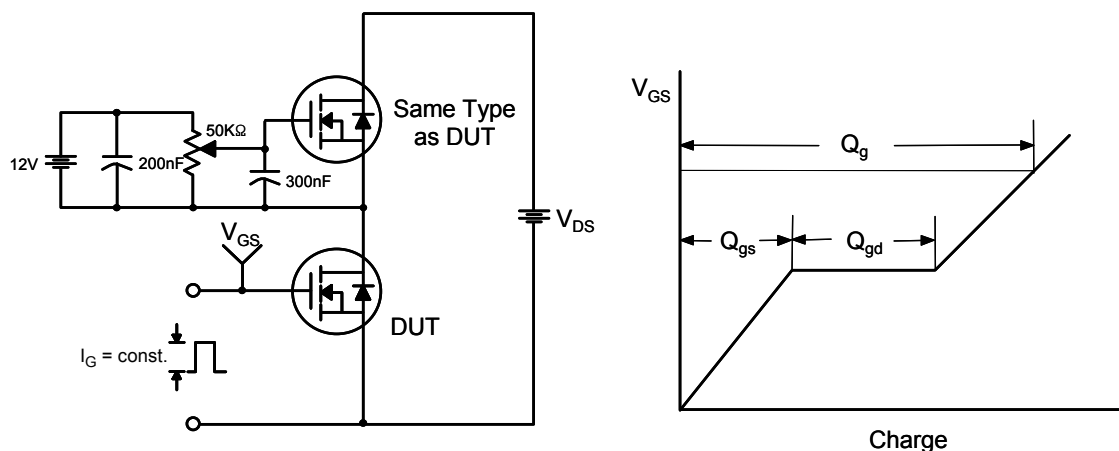


Figure 12. Gate Charge Test Circuit & Waveform

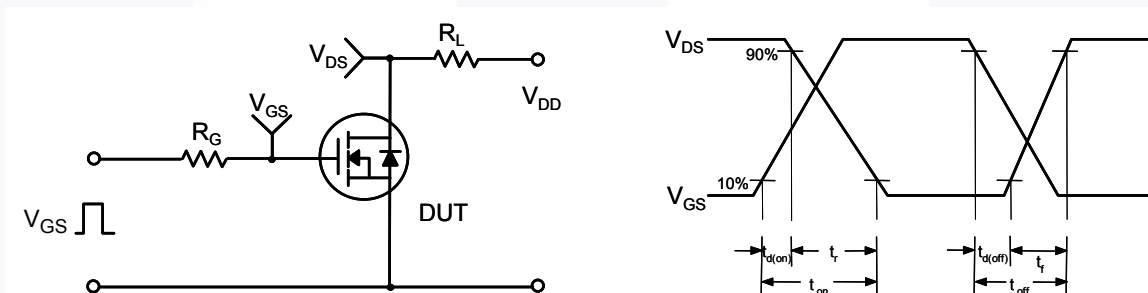


Figure 13. Resistive Switching Test Circuit & Waveforms

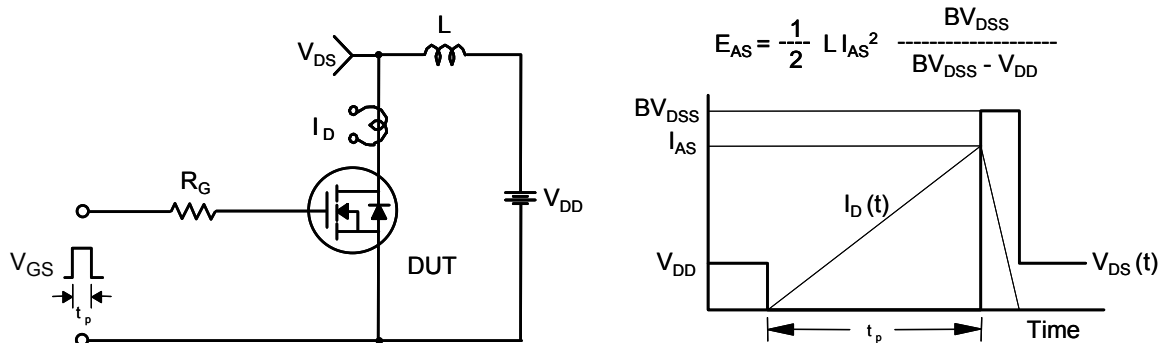


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

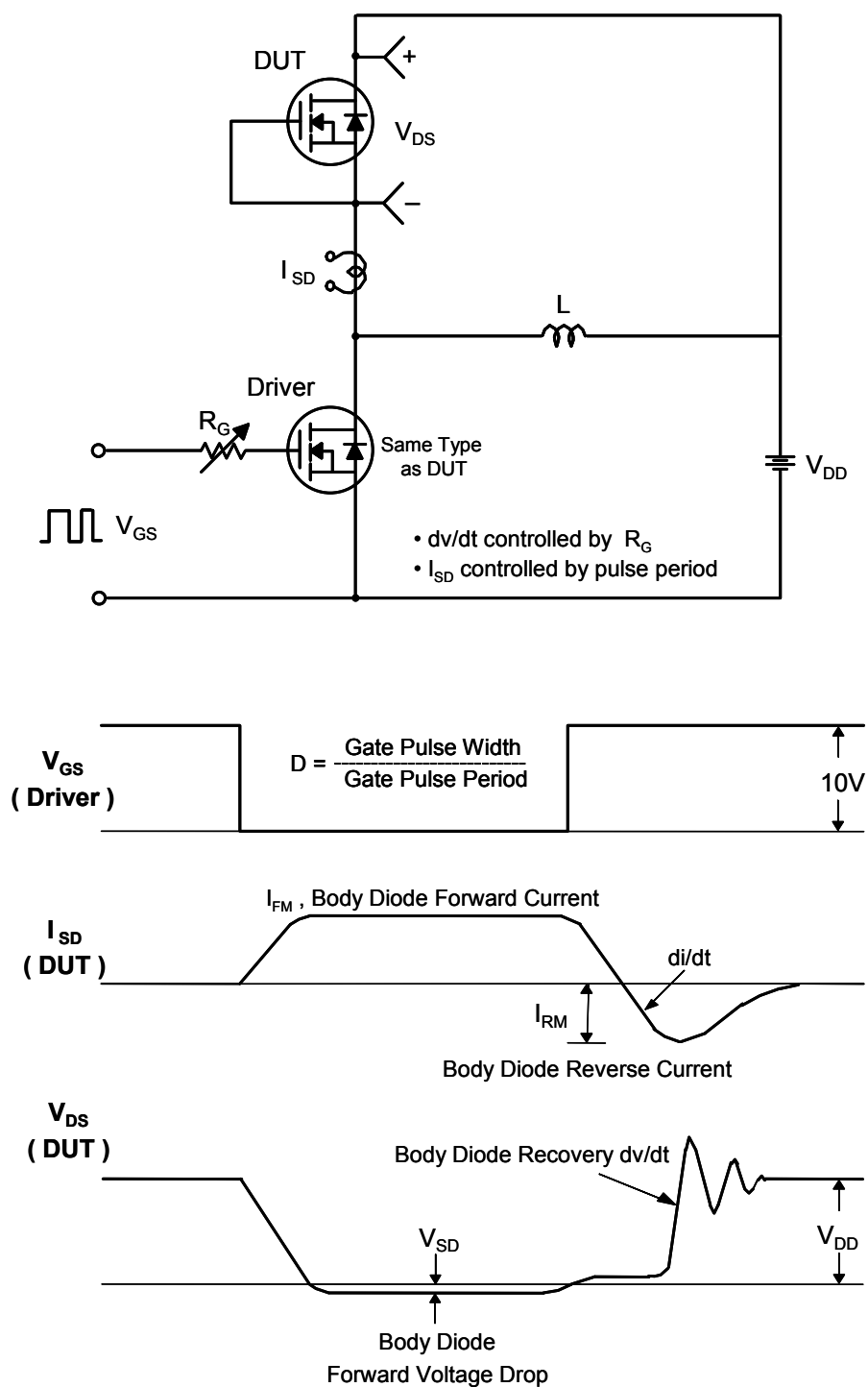
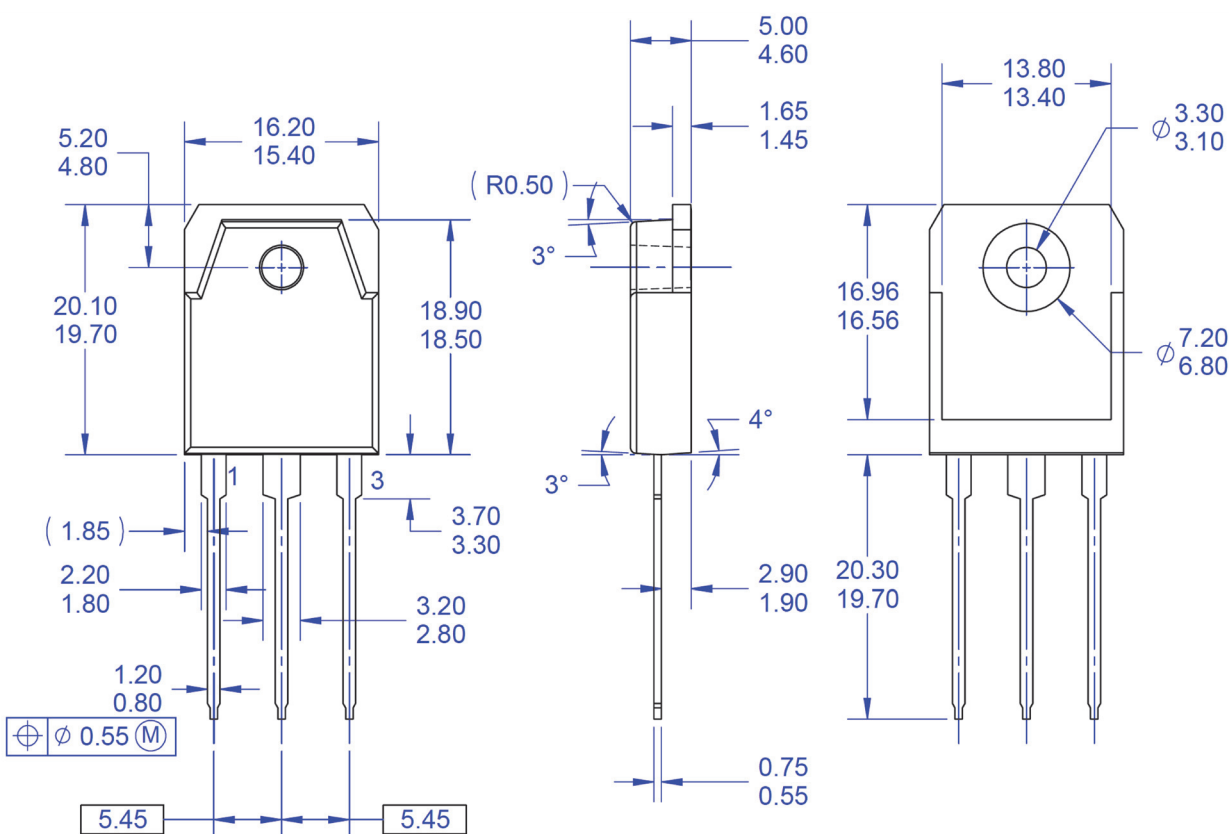


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

**Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65**


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