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# FDP65N06

## N-Channel UniFET™ MOSFET

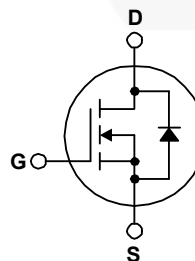
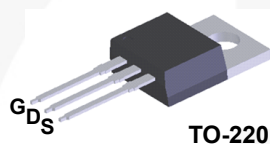
60 V, 65 A, 16 mΩ

### Features

- $R_{DS(on)} = 13 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 32.5 \text{ A}$
- Low Gate Charge ( typical 33 nC)
- Low  $C_{rss}$  ( typical 35 pF)
- Fast Switching
- Improved dv/dt Capability

### 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	FDP65N06	Units
$V_{DSS}$	Drain-Source Voltage	60	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	65	A
	- Continuous ( $T_C = 100^\circ\text{C}$ )	41	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	260	A
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	430	mJ
$I_{AR}$	Avalanche Current (Note 1)	65	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	13.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	135	W
	- Derate above $25^\circ\text{C}$	1.08	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	FDP65N06	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.92	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP65N06	FDP65N06	TO-220	Tube	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	60	-	-	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	-	0.5	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	-	-	1	μA
		V <sub>DS</sub> = 48 V, T <sub>C</sub> = 125°C	-	-	10	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V	-	-	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -20 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	2.0	-	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 32.5 A	-	0.013	0.016	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 32.5 A	-	39	-	S
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	-	1670	2170	pF
C <sub>oss</sub>	Output Capacitance		-	464	600	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	35	52	pF
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 65A, R <sub>G</sub> = 25 Ω  (Note 4)	-	24	58	ns
t <sub>r</sub>	Turn-On Rise Time		-	94	200	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	98	210	ns
t <sub>f</sub>	Turn-Off Fall Time		-	52	114	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 48 V, I <sub>D</sub> = 65A, V <sub>GS</sub> = 10 V  (Note 4)	-	33	43	nC
Q <sub>gs</sub>	Gate-Source Charge		-	10	-	nC
Q <sub>gd</sub>	Gate-Drain Charge		-	11	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		-	-	65	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-	-	260	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 65 A	-	-	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 65 A, dI <sub>F</sub> / dt = 100 A/μs	-	62	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	132	-	nC

### NOTES:

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2.  $L = 47\text{ }\mu\text{H}$ ,  $I_{AS} = 65\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\text{ }\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 65\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

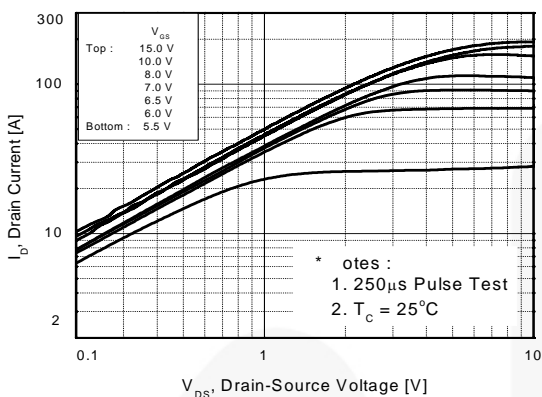


Figure 2. Transfer Characteristics

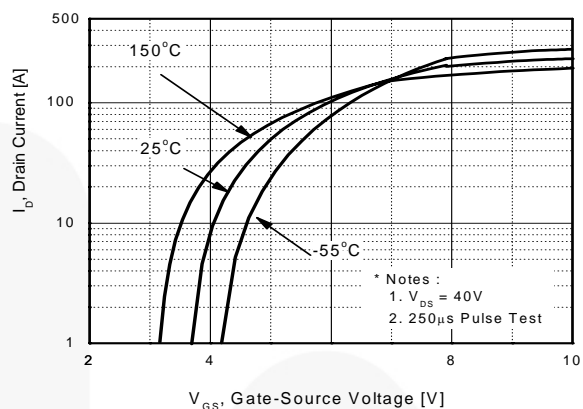


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

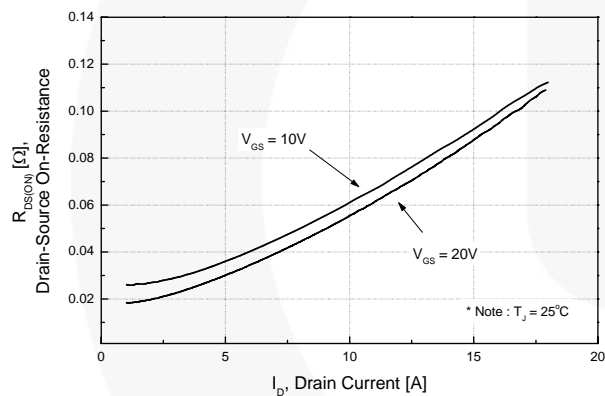


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

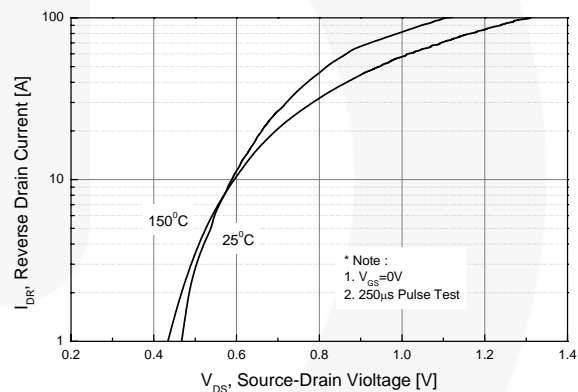


Figure 5. Capacitance Characteristics

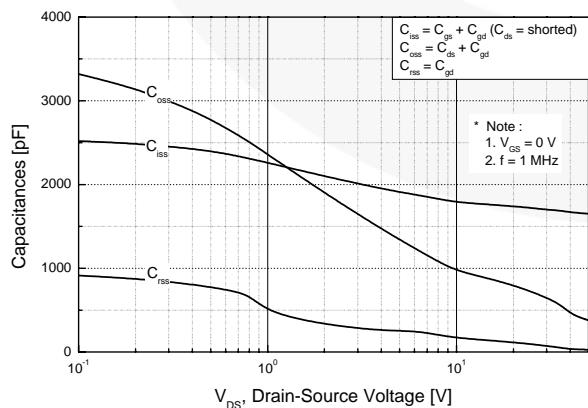
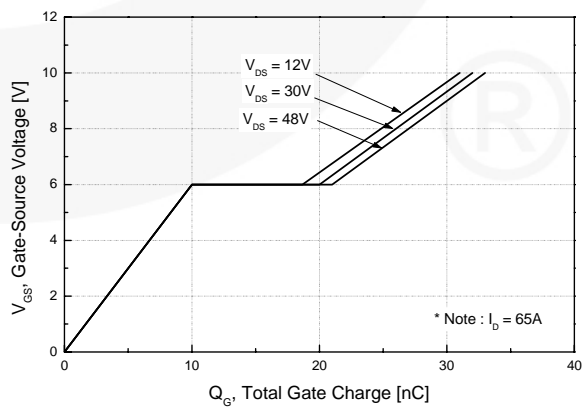
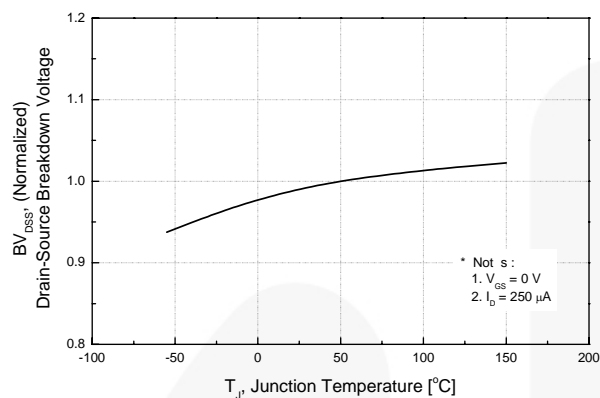


Figure 6. Gate Charge Characteristics

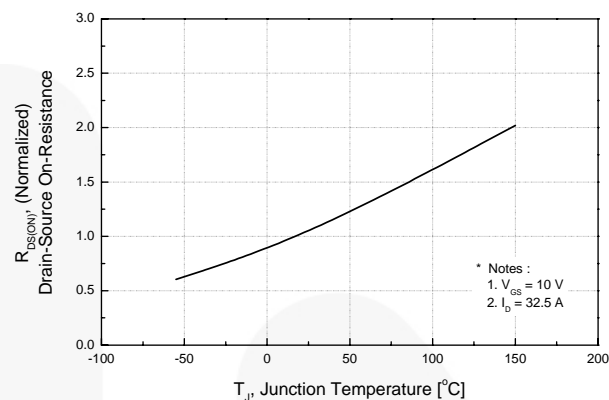


## Typical Performance Characteristics (Continued)

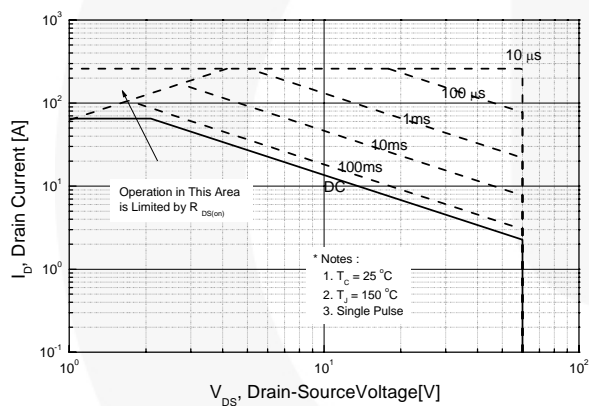
**Figure 7. Breakdown Voltage Variation vs. Temperature**



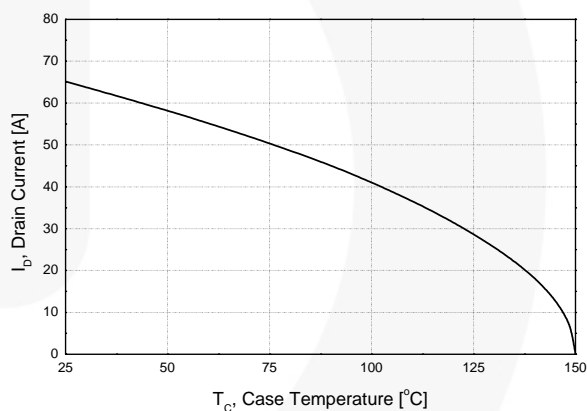
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



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



**Figure 11. Transient Thermal Response Curve**

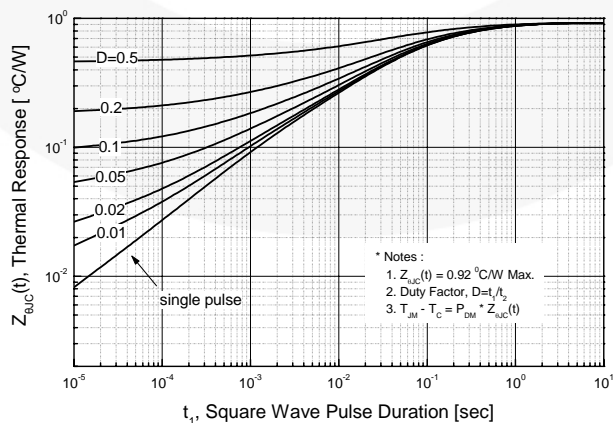


Figure 12. Gate Charge Test Circuit &amp; Waveform

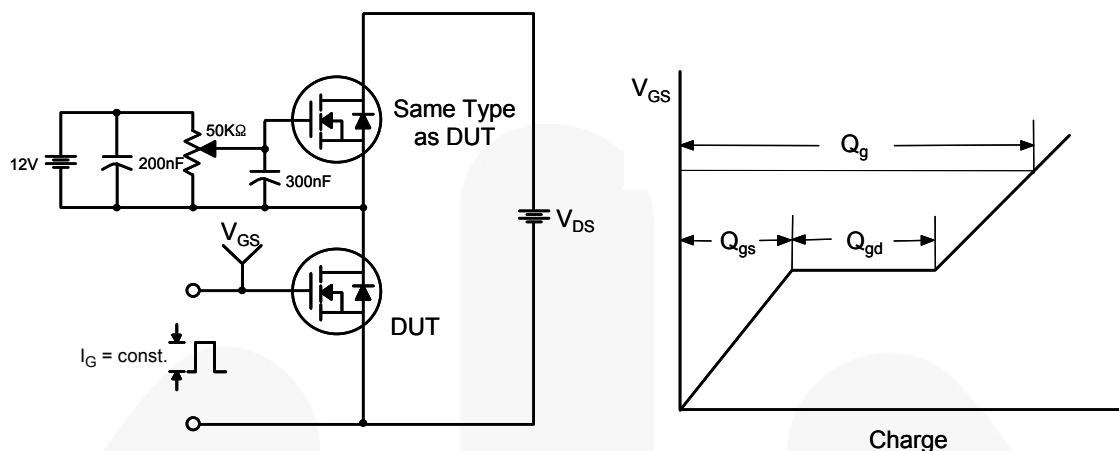


Figure 13. Resistive Switching Test Circuit &amp; Waveforms

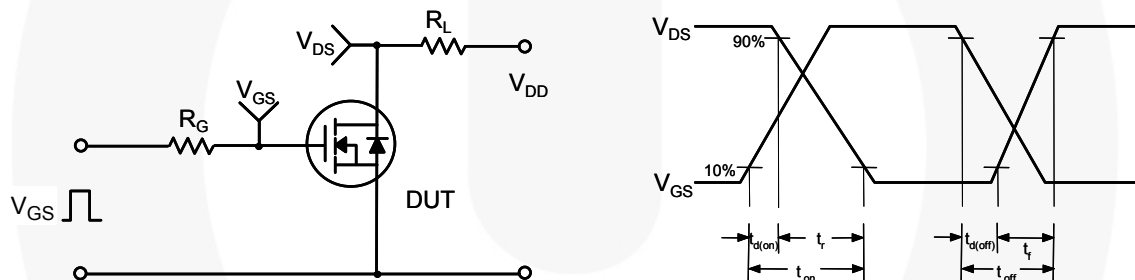


Figure 14. Unclamped Inductive Switching Test Circuit &amp; Waveforms

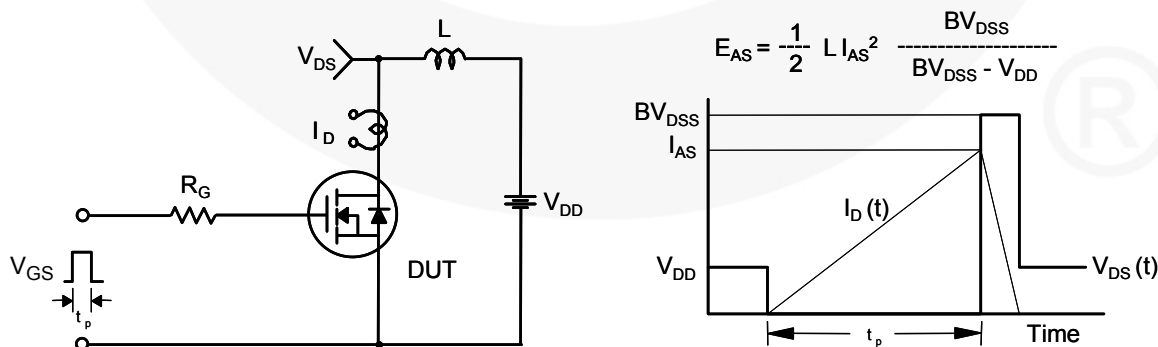
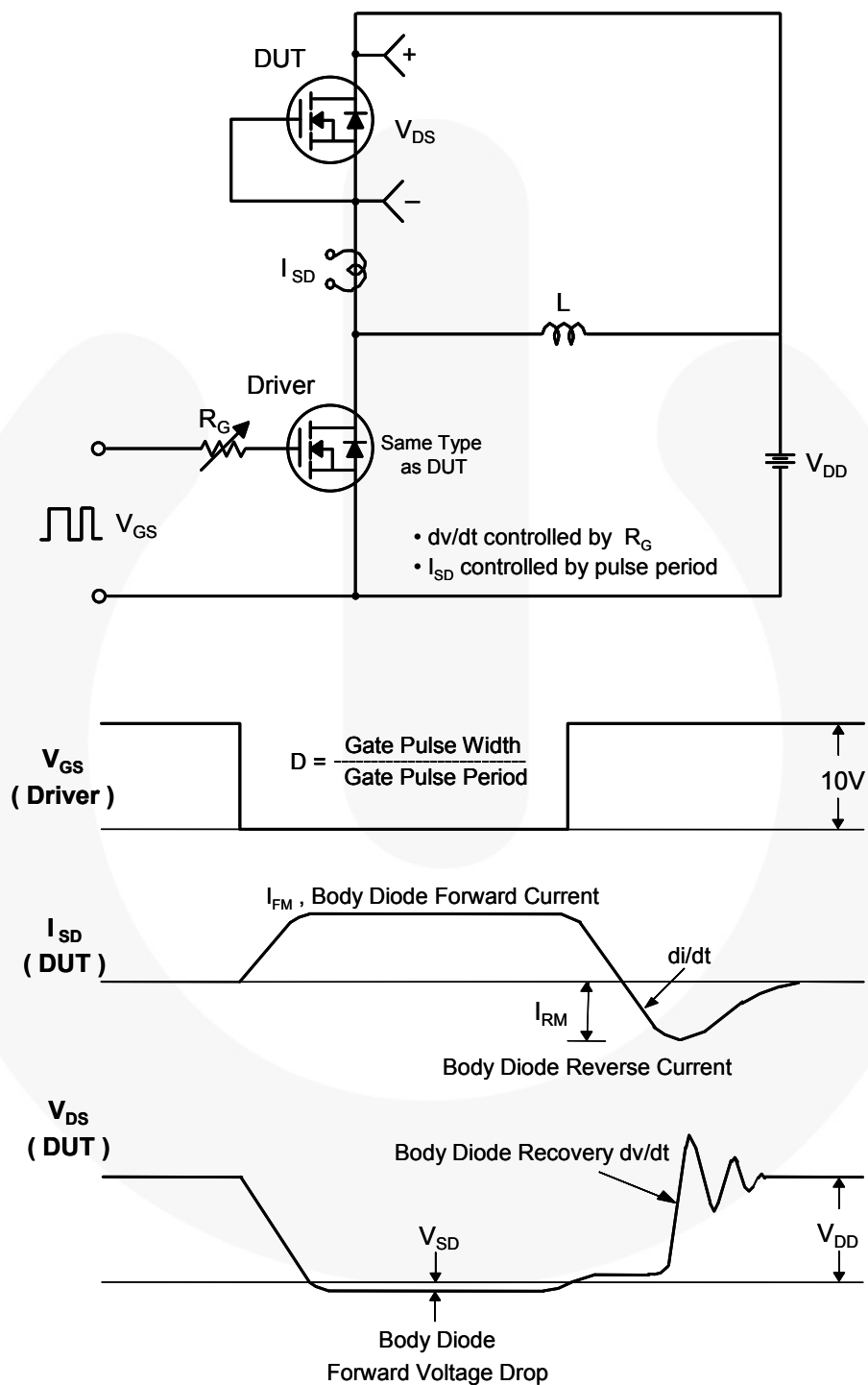


Figure 15. Peak Diode Recovery dv/dt Test Circuit &amp; Waveforms



## Mechanical Dimensions

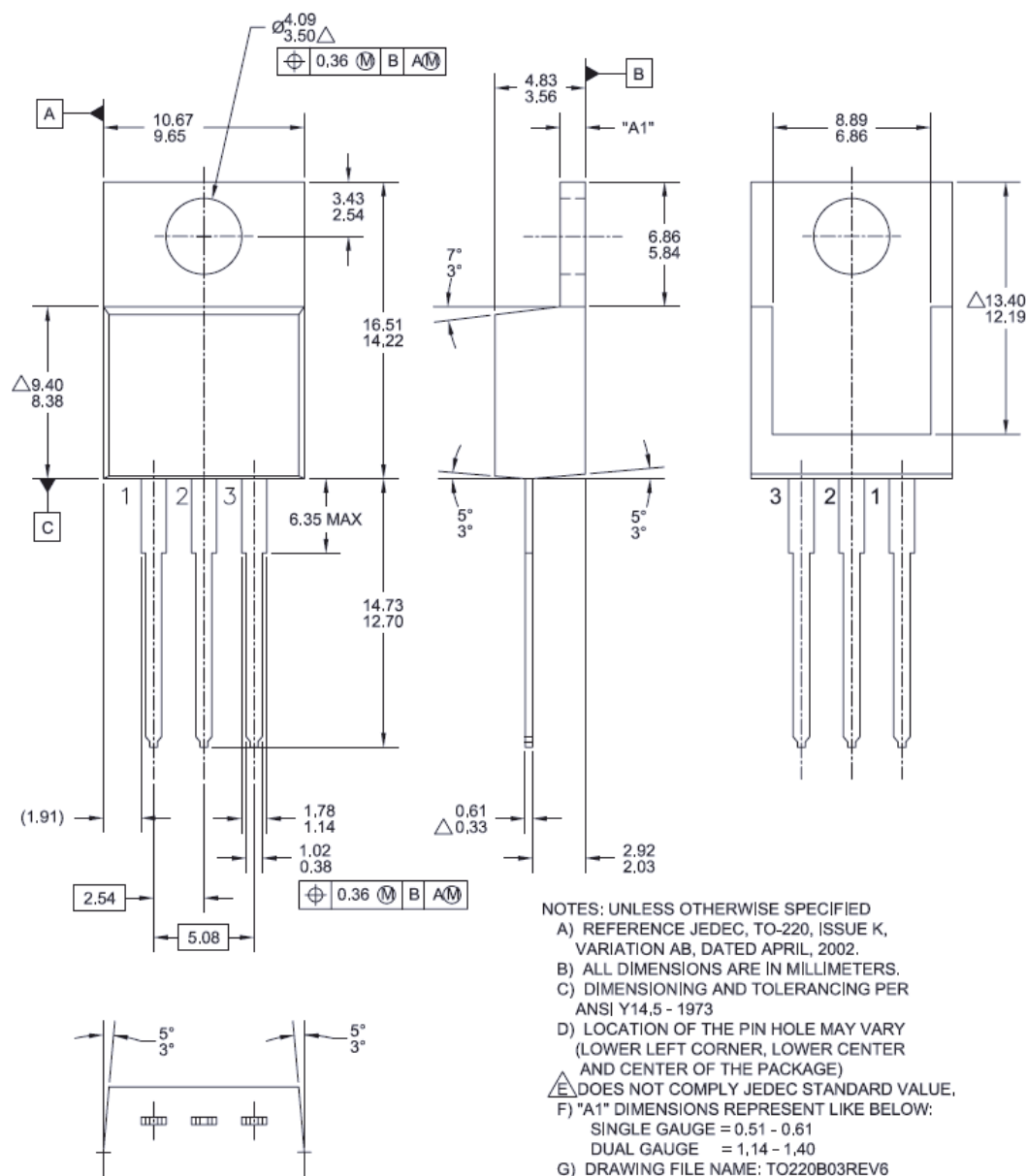


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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