



# FDPF680N10T

## N-Channel PowerTrench® MOSFET

### 100 V, 12 A, 68 mΩ

#### Features

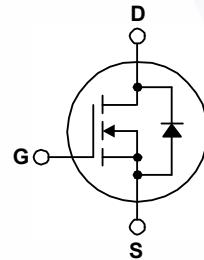
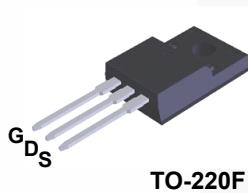
- $R_{DS(on)} = 54 \text{ mΩ}$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 6 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

#### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

#### Applications

- Consumer Appliances
- LCD/LED/PDP TV
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter



#### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter		FDPF680N10T	Unit
$V_{DSS}$	Drain to Source Voltage		100	V
$V_{GSS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	12	A
		- Continuous ( $T_C = 100^\circ\text{C}$ )	7.6	
$I_{DM}$	Drain Current	- Pulsed	(Note 1)	A
$E_{AS}$	Single Pulsed Avalanche Energy		50.4	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$		13.0	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	24	W
		- Derate Above $25^\circ\text{C}$	0.19	
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	°C
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

#### Thermal Characteristics

Symbol	Parameter	FDPF680N10T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	5.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF680N10T	FDPF680N10T	TO-220F	Tube	N/A	N/A	50 units

## 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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}, T_C = 25^\circ\text{C}$	100	-	-	V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.1	-	$\text{V}^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}, T_C = 150^\circ\text{C}$	-	-	500	
$I_{\text{GSS}}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.5	3.5	4.5	V
$R_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}$	-	54	68	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 12 \text{ A}$	-	26	-	S

### Dynamic Characteristics

$C_{\text{iss}}$	Input Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	750	1000	pF
$C_{\text{oss}}$	Output Capacitance		-	60	80	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		-	25	40	pF
$Q_{\text{g}(\text{tot})}$	Total Gate Charge	$V_{DS} = 80 \text{ V}, I_D = 12 \text{ A}, V_{GS} = 10 \text{ V}$	-	13	17	nC
$Q_{\text{gs}}$	Gate to Source Gate Charge		-	4	-	nC
$Q_{\text{gd}}$	Gate to Drain "Miller" Charge		(Note 4)	-	4	-

### Switching Characteristics

$t_{\text{d}(\text{on})}$	Turn-On Delay Time	$V_{DD} = 50 \text{ V}, I_D = 12 \text{ A}, V_{GS} = 10 \text{ V}, R_G = 10 \Omega$	-	13	36	ns
$t_r$	Turn-On Rise Time		-	19	48	ns
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time		-	18	46	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	6	22

### Drain-Source Diode Characteristics

$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	12	A	
$I_{\text{SM}}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	48	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 12 \text{ A}$	-	-	$1.3 \text{ V}$	
$t_{\text{rr}}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 12 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}$	-	29	-	ns
$Q_{\text{rr}}$	Reverse Recovery Charge	$dI/dt = 100 \text{ A}/\mu\text{s}$	-	35	-	nC

#### Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.

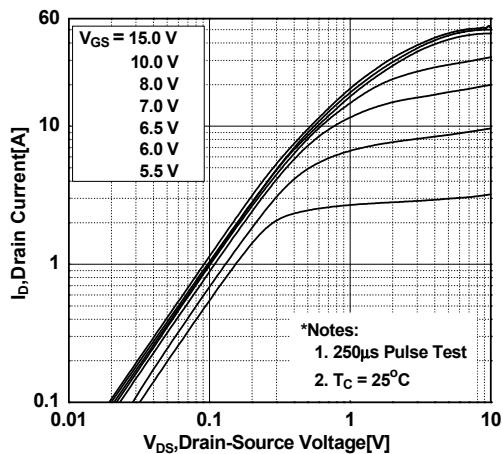
2.  $L = 0.7 \text{ mH}, I_{AS} = 12 \text{ A}, V_{DD} = 50 \text{ V}, R_G = 25 \Omega$ , starting  $T_J = 25^\circ\text{C}$ .

3.  $I_{SD} \leq 12 \text{ A}, dI/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq \text{BV}_{\text{DSS}}$ , starting  $T_J = 25^\circ\text{C}$ .

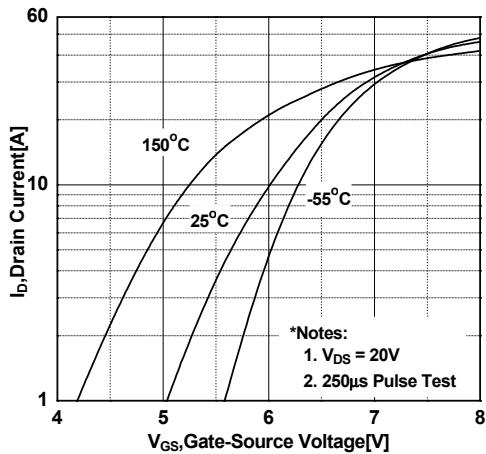
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

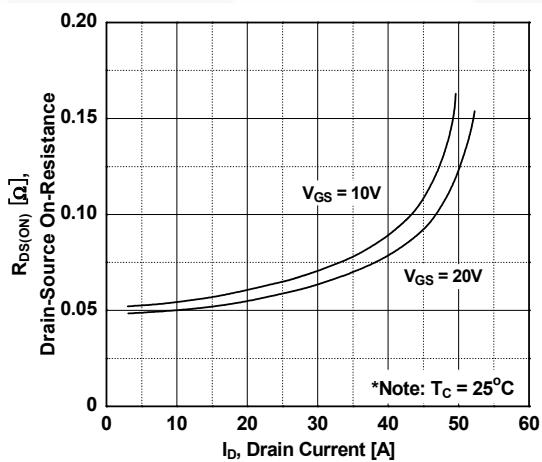
**Figure 1. On-Region Characteristics**



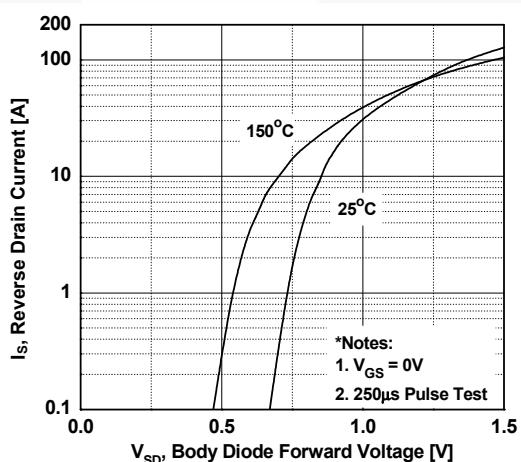
**Figure 2. Transfer Characteristics**



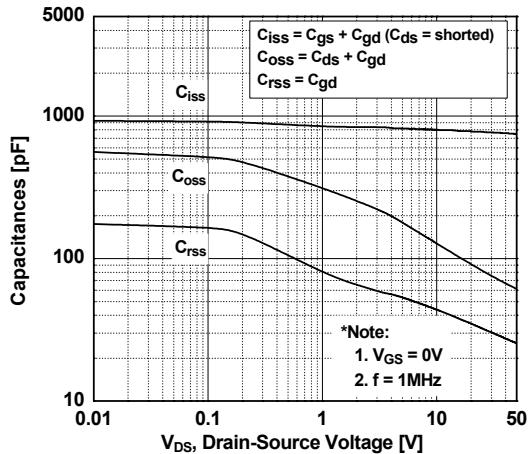
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



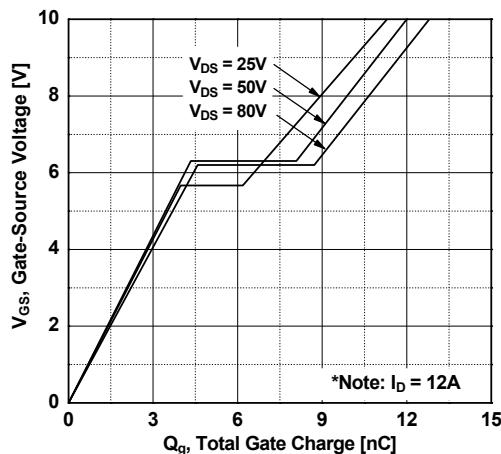
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

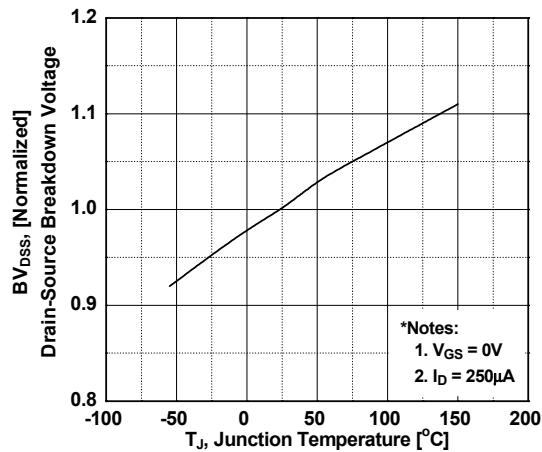


**Figure 6. Gate Charge Characteristics**

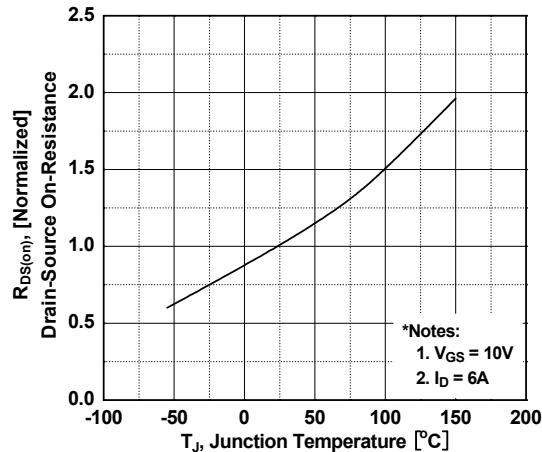


## Typical Performance Characteristics (Continued)

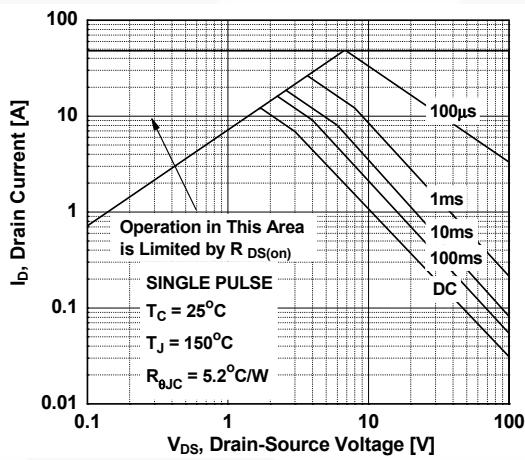
**Figure 7. Breakdown Voltage Variation vs. Temperature**



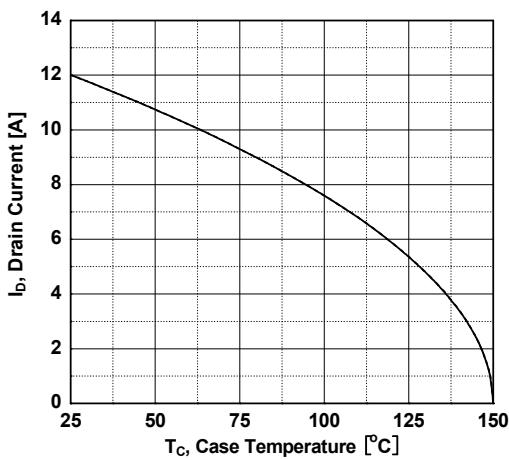
**Figure 8. On-Resistance Variation vs. Temperature**



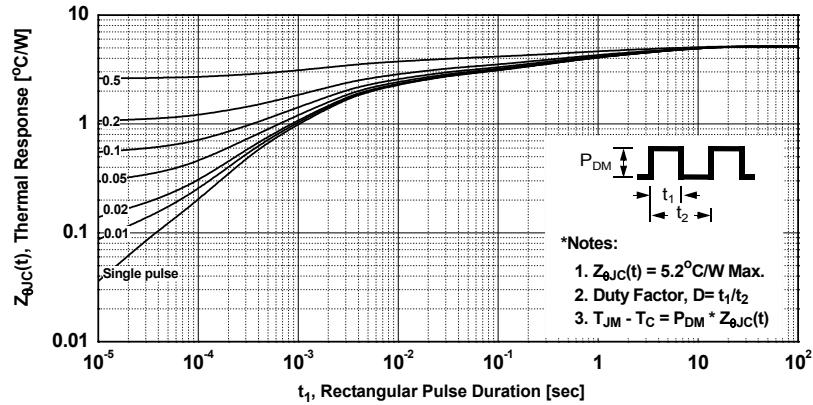
**Figure 9. Maximum Safe Operating Area**



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



**Figure 11. Transient Thermal Response Curve**



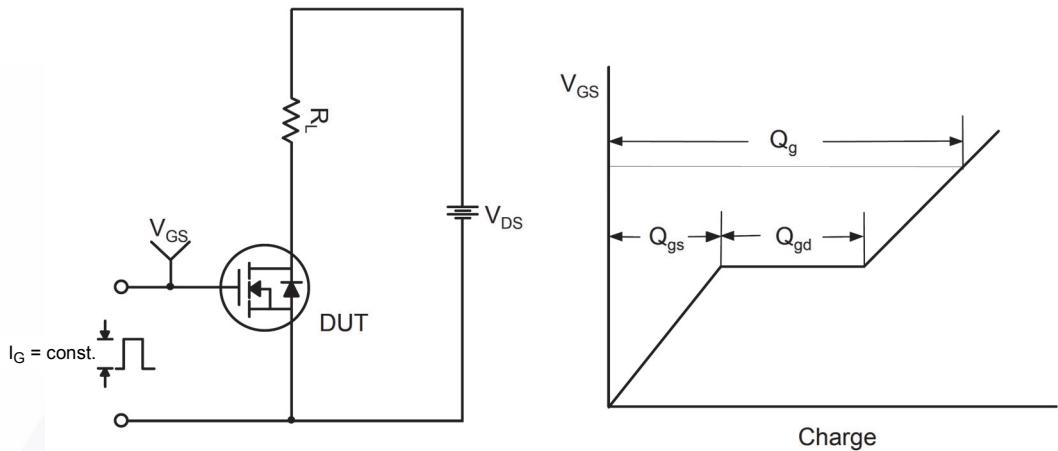


Figure 12. Gate Charge Test Circuit & Waveform

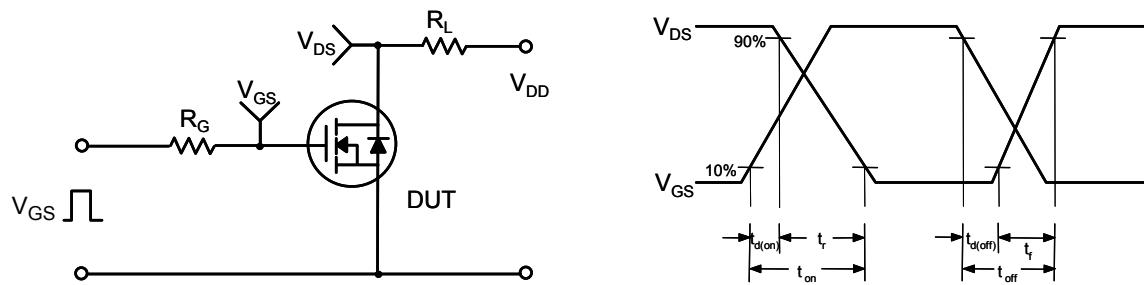


Figure 13. Resistive Switching Test Circuit & Waveforms

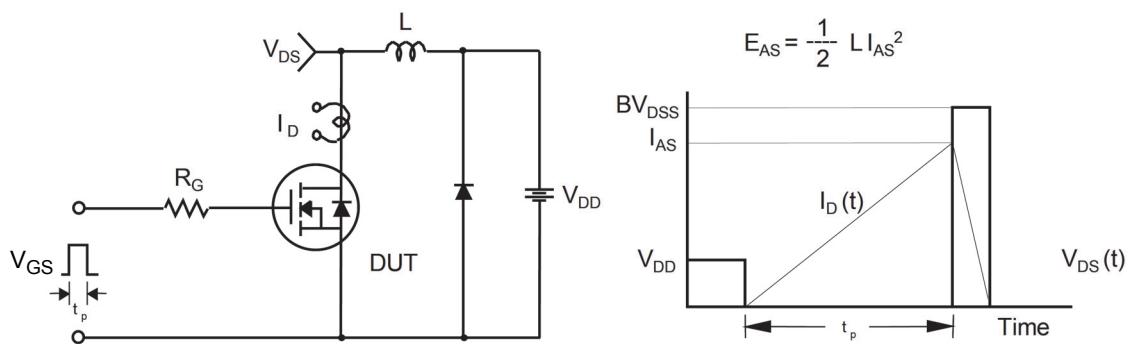


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

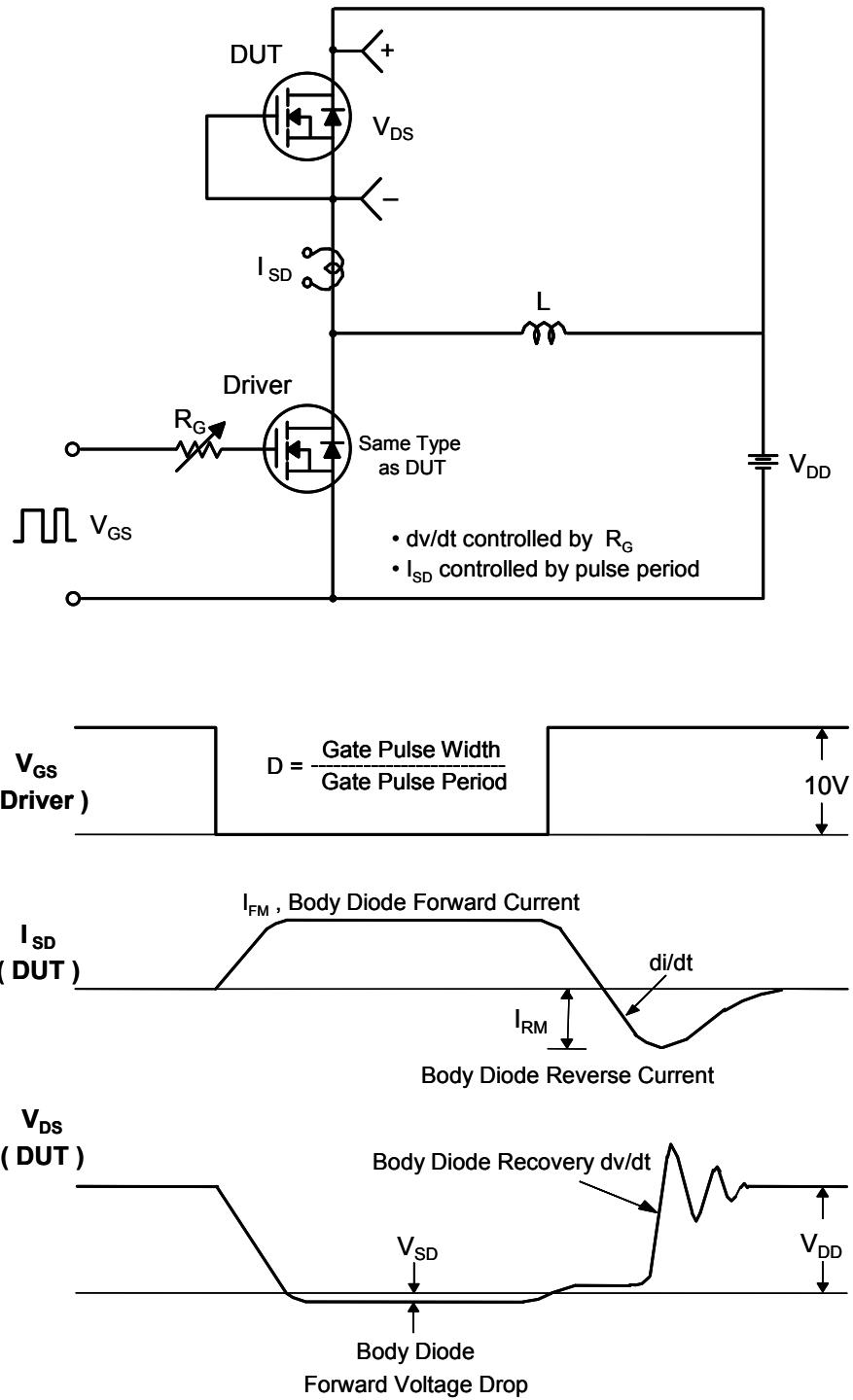
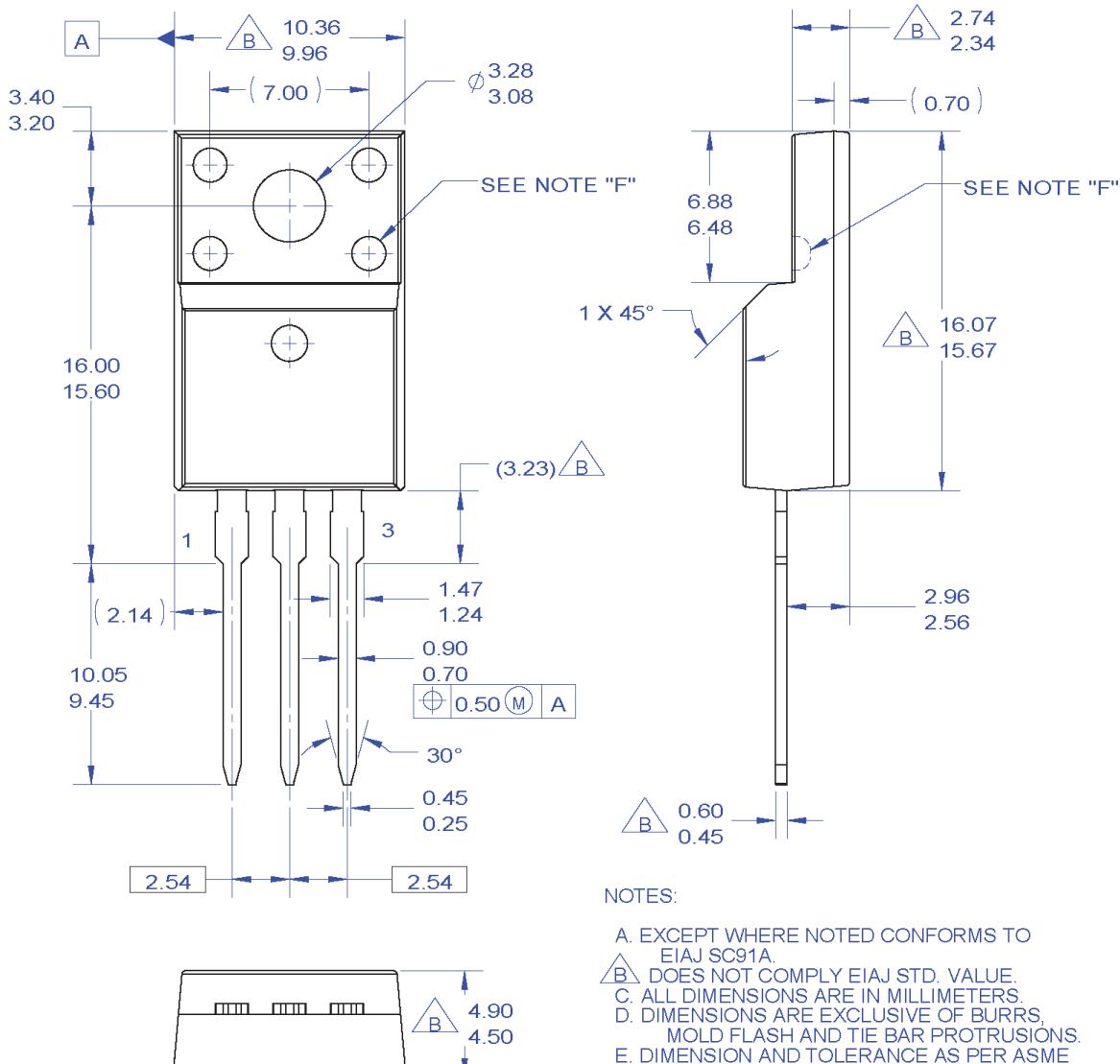


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Mechanical Dimensions



**Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead**

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