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# FQP45N15V2 / FQPF45N15V2

## N-Channel QFET® MOSFET

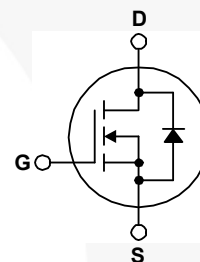
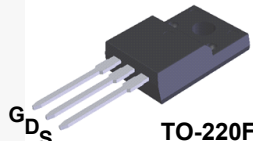
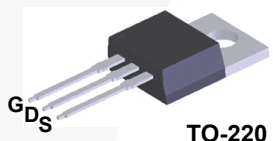
150 V, 45 A, 40 mΩ

### Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

### Features

- 45 A, 150 V,  $R_{DS(on)} = 40 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 22.5 \text{ A}$
- Low Gate Charge (Typ. 72 nC)
- Low  $C_{rss}$  (Typ. 135 pF)
- 100% Avalanche Tested



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

Symbol	Parameter	FQP45N15V2	FQPF45N15V2	Unit
$V_{DSS}$	Drain-Source Voltage	150		V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	45	45 *	A
		31	31 *	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	180	180 *	A
$V_{GSS}$	Gate-Source Voltage	$\pm 30$		V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	1124		mJ
$I_{AR}$	Avalanche Current (Note 1)	45		A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	22		mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)	4.5		V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ ) - Derate above $25^\circ\text{C}$	220	66	W
		1.47	0.44	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 purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

\* Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FQP45N15V2	FQPF45N15V2	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.68	2.25	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	62.5	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP45N15V2	PV245N15	TO-220	Tube	N/A	N/A	50 units
FQPF45N15V2	FQPF45N15V2	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

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	150	--	--	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.21	--	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 150\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 120\text{ V}, T_C = 150^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 22.5\text{ A}$	--	0.034	0.04	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 22.5\text{ A}$	--	40	--	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2330	3030	pF
$C_{oss}$	Output Capacitance		--	510	670	pF
$C_{rfs}$	Reverse Transfer Capacitance		--	135	176	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}, I_D = 45\text{ A},$ $R_G = 25\ \Omega$	--	22	54	ns
$t_r$	Turn-On Rise Time		--	232	474	ns
$t_{d(off)}$	Turn-Off Delay Time		--	224	458	ns
$t_f$	Turn-Off Fall Time		(Note 4)	--	246	502
$Q_g$	Total Gate Charge	$V_{DS} = 120\text{ V}, I_D = 45\text{ A},$ $V_{GS} = 10\text{ V}$	--	72	94	nC
$Q_{gs}$	Gate-Source Charge		--	13	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4)	--	31	--

### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	45	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	180	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 45\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 45\text{ A},$ $di_F / dt = 100\text{ A}/\mu\text{s}$	--	176	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	1.19	--	$\mu\text{C}$

#### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 0.74\text{ mH}, I_{AS} = 45\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 45\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

## Typical Characteristics

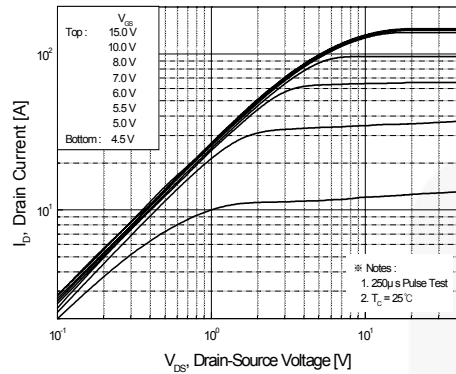


Figure 1. On-Region Characteristics

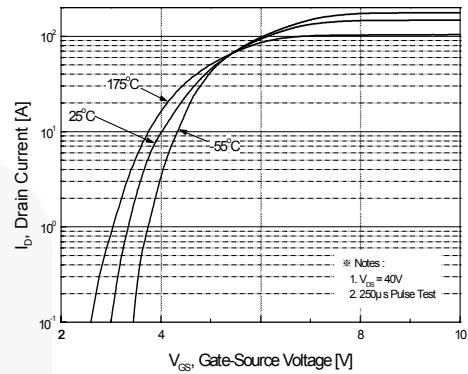


Figure 2. Transfer Characteristics

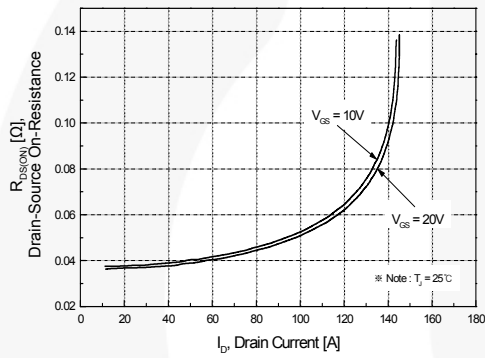


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

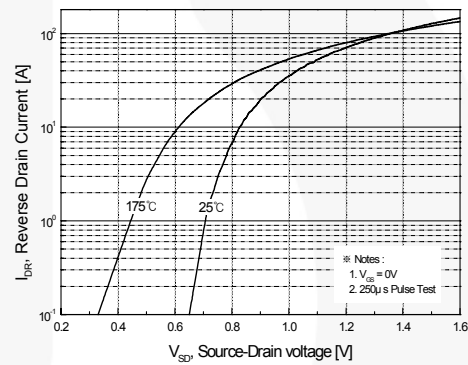


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

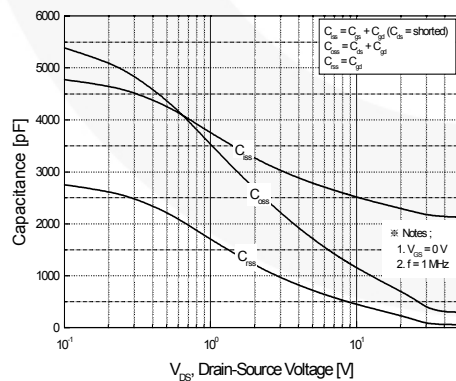


Figure 5. Capacitance Characteristics

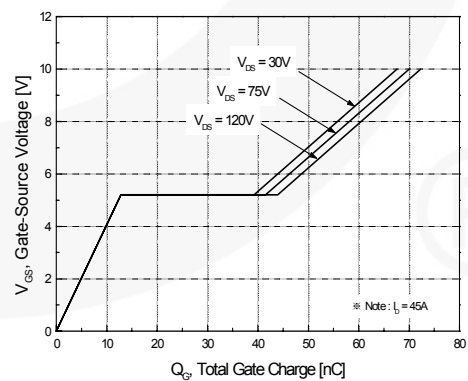
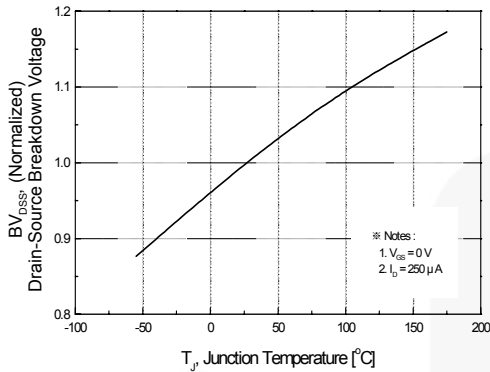
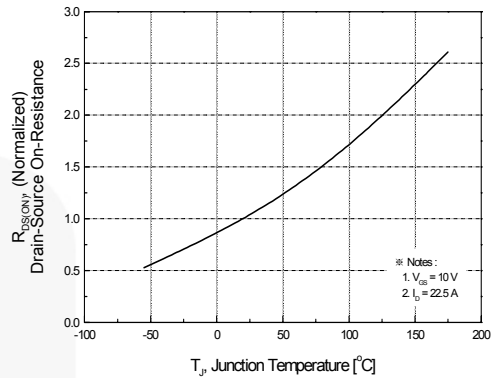


Figure 6. Gate Charge Characteristics

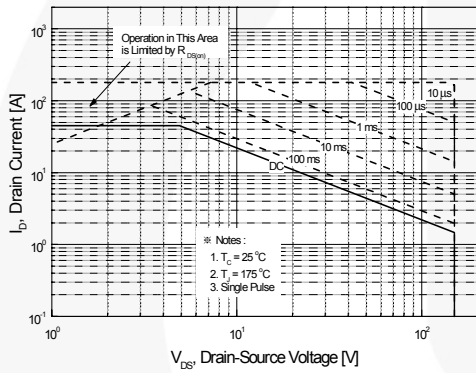
**Typical Characteristics** (Continued)



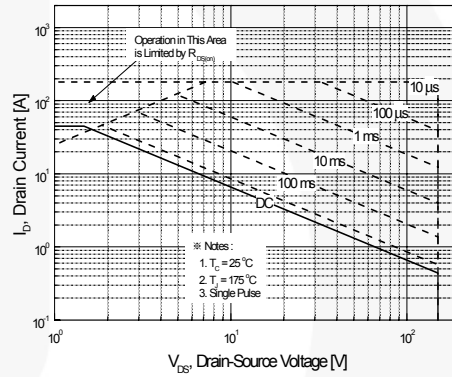
**Figure 7. Breakdown Voltage Variation vs Temperature**



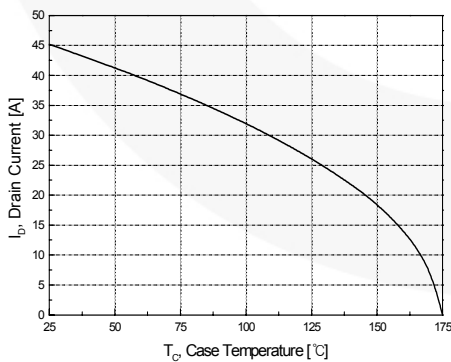
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9-1. Maximum Safe Operating Area for FQP45N15V2**



**Figure 9-2. Maximum Safe Operating Area for FQPF45N15V2**



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

Typical Characteristics (Continued)

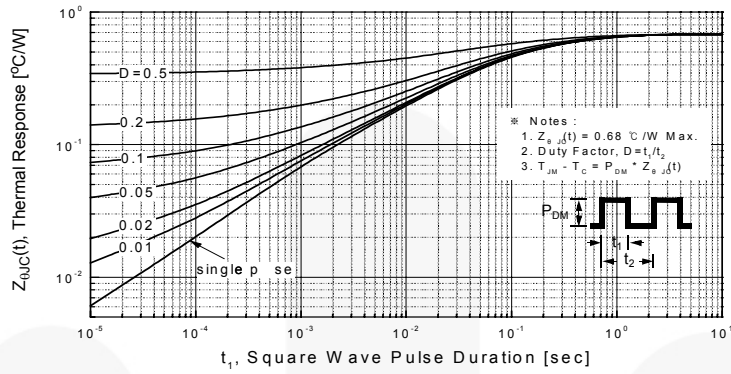


Figure 11. Transient Thermal Response Curve for FQP45N15V2

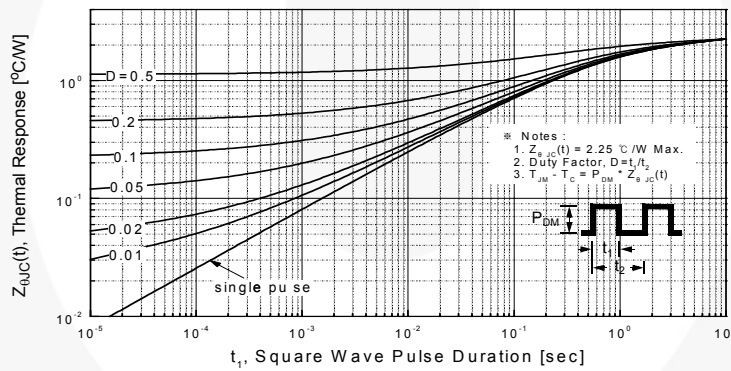


Figure 11-2. Transient Thermal Response Curve for FQPF45N15V2

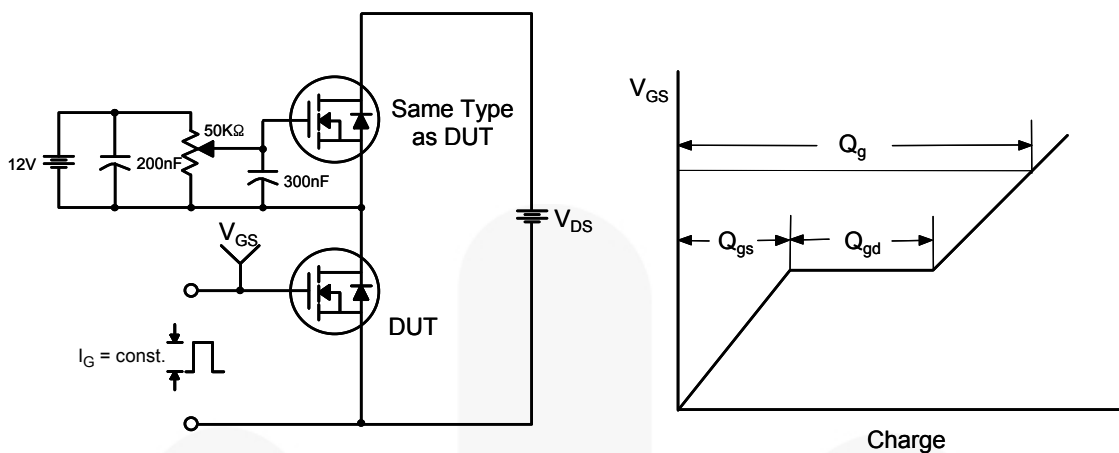


Figure 12. Gate Charge Test Circuit & Waveform

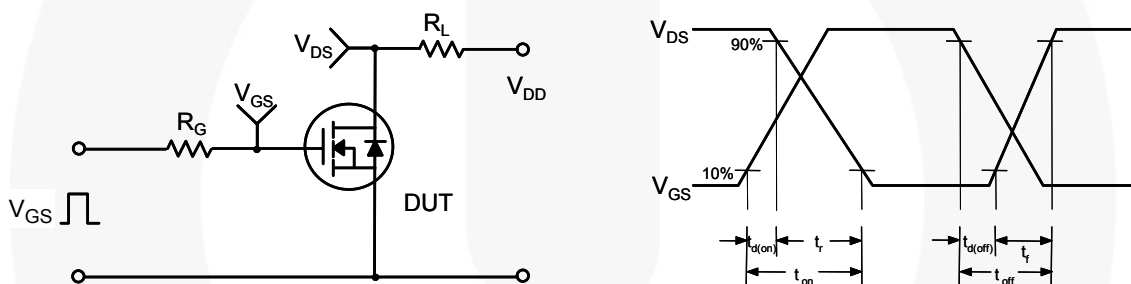


Figure 13. Resistive Switching Test Circuit & Waveforms

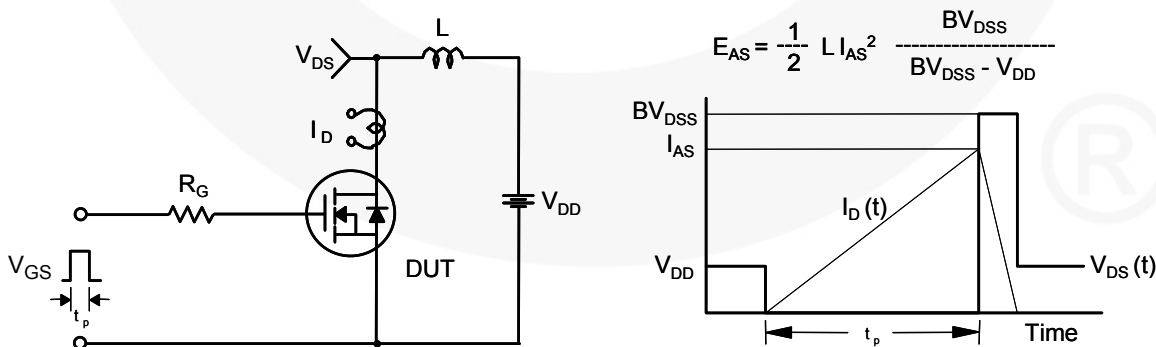


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

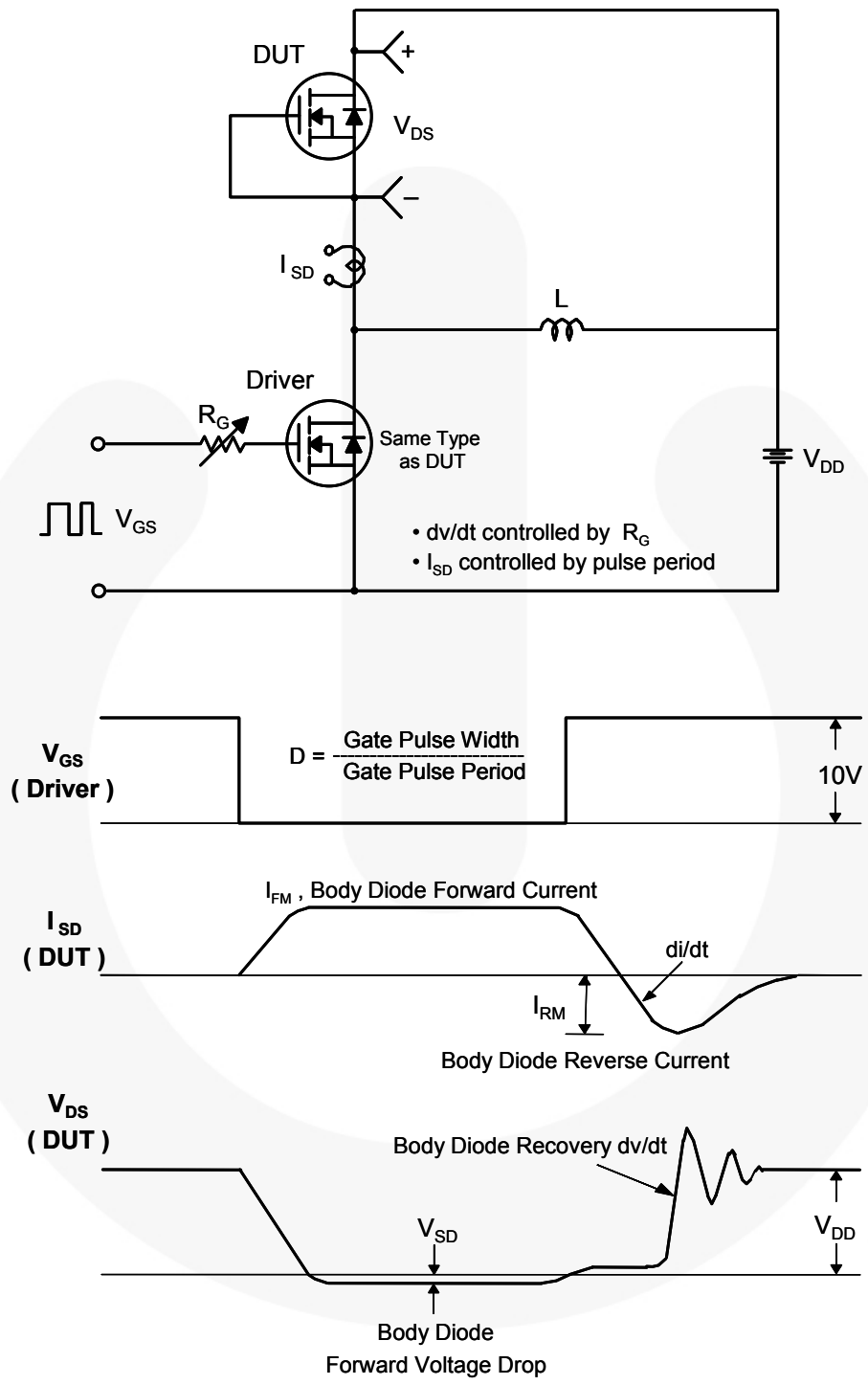
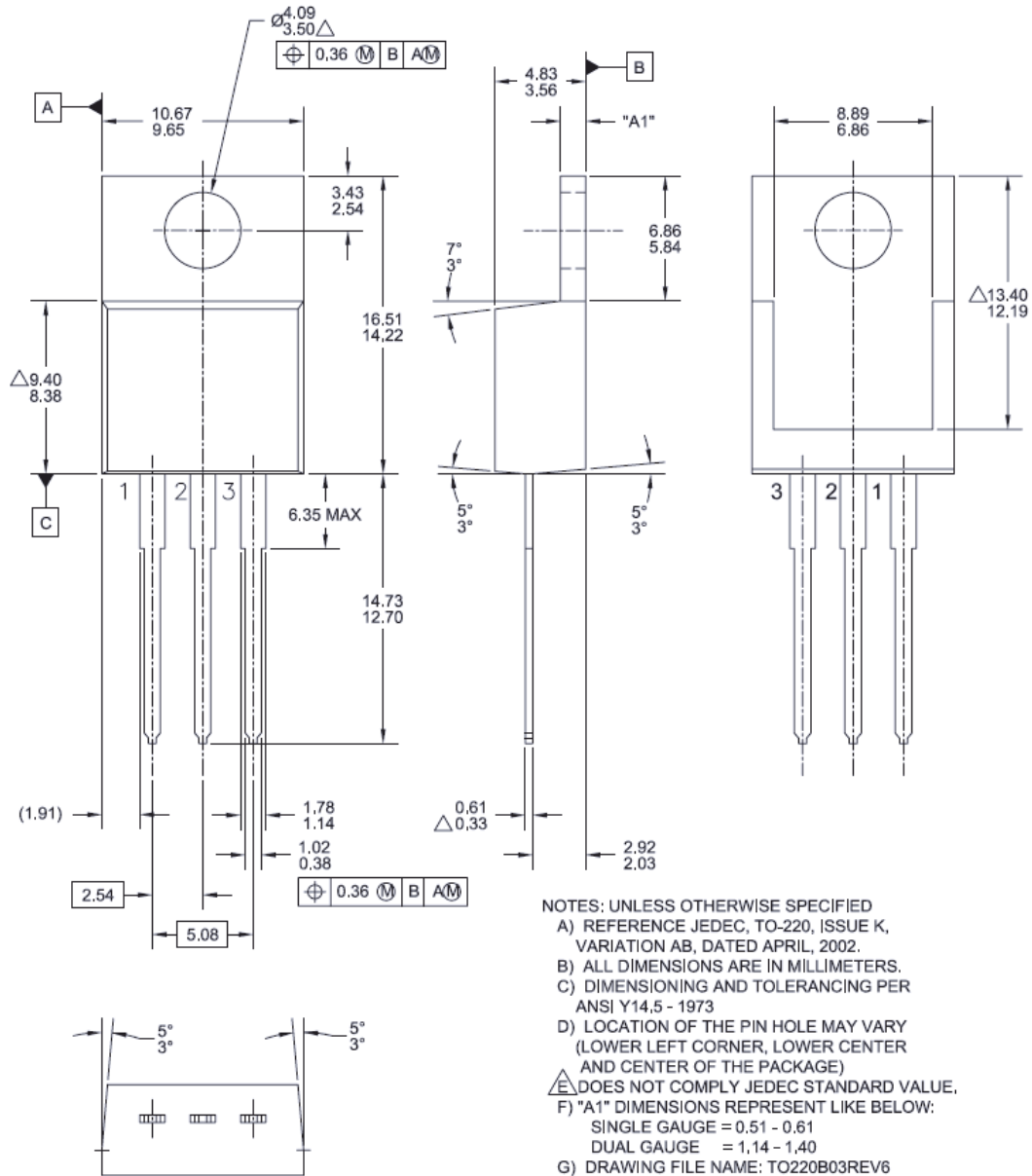


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Mechanical Dimensions

### TO-220 3L



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

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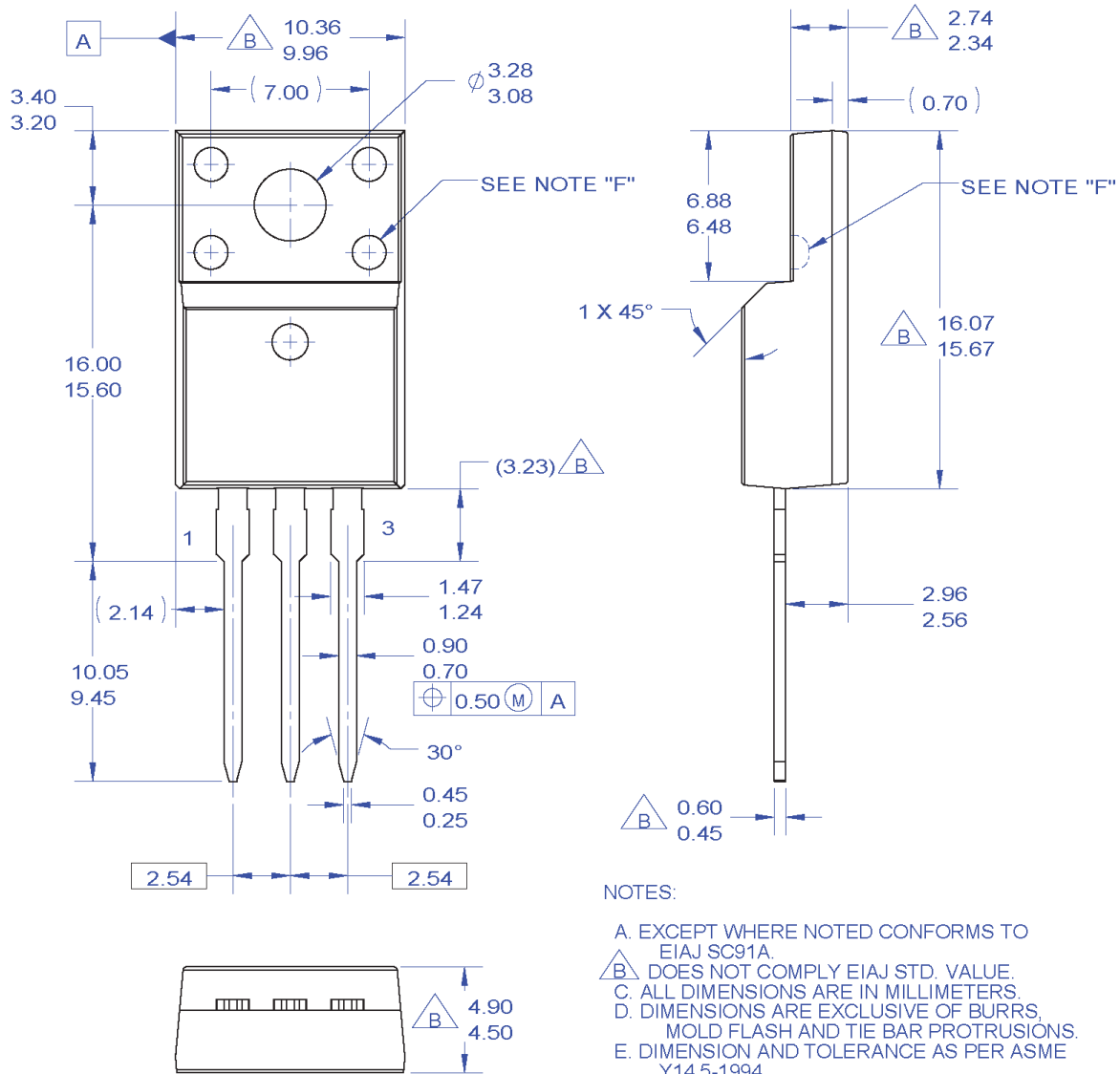
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Dimension in Millimeters

**Mechanical Dimensions**

**TO-220F 3L**



**Figure 17. TO220, Molded, 3LD, Full Pack, EIAJ SC91, Straight Lead**

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Dimension in Millimeters



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