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# FQPF16N25C

## N-Channel QFET<sup>®</sup> MOSFET

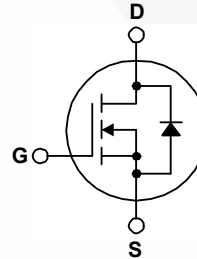
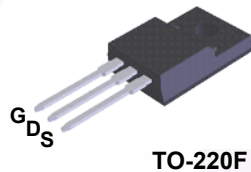
250 V, 15.6 A, 270 mΩ

### Features

- 15.6 A, 250 V,  $R_{DS(on)} = 270 \text{ m}\Omega$  (Max) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 7.8 \text{ A}$
- Low Gate Charge (Typ. 41 nC)
- Low  $C_{rss}$  (Typ. 68 pF)
- 100% Avalanche Tested

### 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, active power factor correction (PFC), and electronic lamp ballasts.



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

Symbol	Parameter	FQPF16N25C	Unit
$V_{DSS}$	Drain to Source Voltage	250	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	15.6 *
		- Continuous ( $T_C = 100^\circ\text{C}$ )	9.8 *
$I_{DM}$	Drain Current	- Pulsed (Note 1)	62.4 *
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	410
$I_{AR}$	Avalanche Current	(Note 1)	15.6
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	13.9
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.5
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	43
		- Derate Above $25^\circ\text{C}$	0.34
$T_J, T_{STG}$	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	$^\circ\text{C}$

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FQPF16N25C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	2.89	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	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
FQPF16N25C	FQPF16N25C	TO-220F	Tube	N/A	50 units

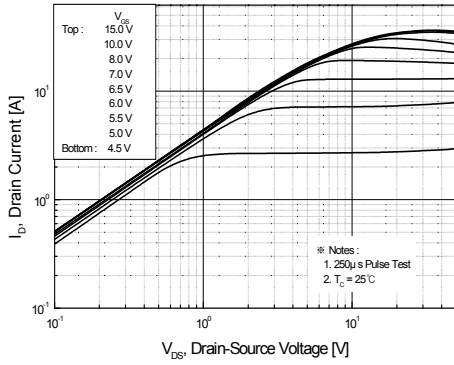
## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	250	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.31	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	$\mu\text{A}$
		$V_{DS} = 200\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	$\mu\text{A}$
$I_{GSSF}$	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
<b>On Characteristics</b>						
$V_{GS(th)}$	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	$V_{GS} = 10\text{ V}, I_D = 7.8\text{ A}$	--	0.22	0.27	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 7.8\text{ A}$	--	10.5	--	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	830	1080	pF
$C_{oss}$	Output Capacitance		--	170	220	pF
$C_{riss}$	Reverse Transfer Capacitance		--	68	89	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{ V}, I_D = 15.6\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 25\ \Omega$	--	15	40	ns
$t_r$	Turn-On Rise Time		--	130	270	ns
$t_{d(off)}$	Turn-Off Delay Time		--	135	280	ns
$t_f$	Turn-Off Fall Time		(Note 4)	--	105	220
$Q_g$	Total Gate Charge	$V_{DS} = 200\text{ V}, I_D = 15.6\text{ A},$ $V_{GS} = 10\text{ V}$	--	41	53.5	nC
$Q_{gs}$	Gate-Source Charge		--	5.6	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4)	--	22.7	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		--	--	15.6	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		--	--	62.4	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 15.6\text{ A}$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 15.6\text{ A},$ $di_F / dt = 100\text{ A}/\mu\text{s}$	--	260	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	2.47	--	$\mu\text{C}$

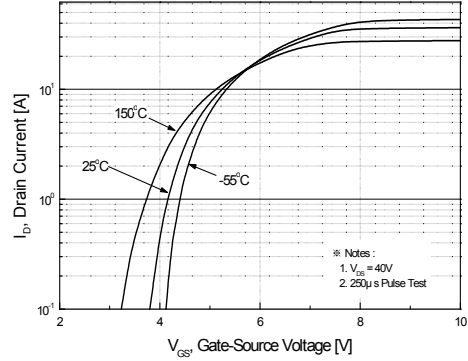
### Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature
2.  $L = 2.7\text{ mH}, I_{AS} = 15.6\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 15.6\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

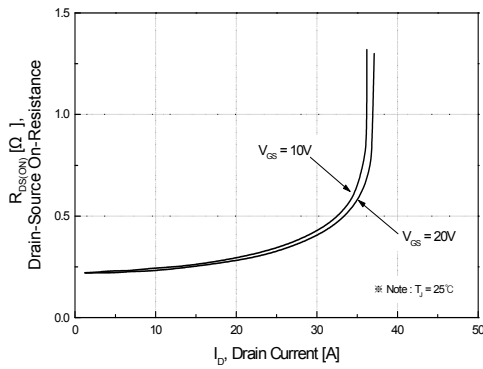
## Typical Characteristics



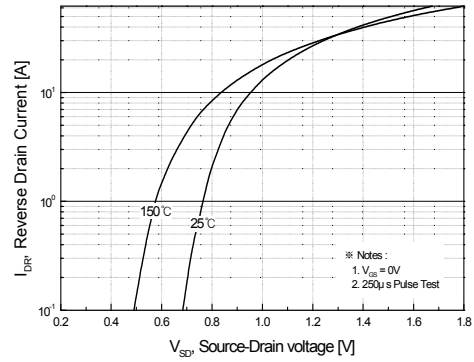
**Figure 1. On-Region Characteristics**



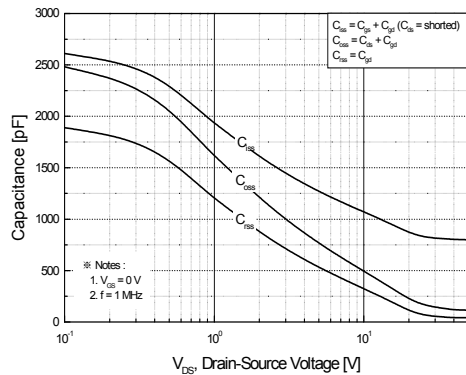
**Figure 2. Transfer Characteristics**



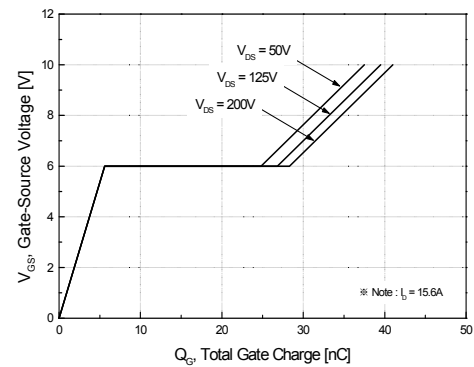
**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**



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

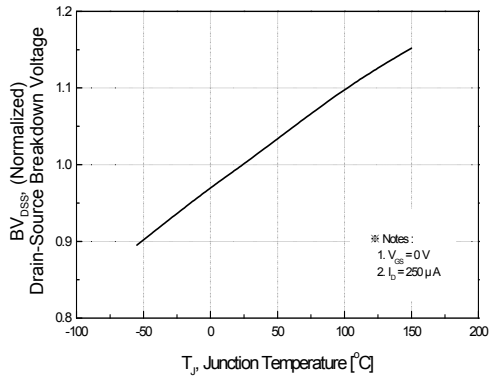


**Figure 5. Capacitance Characteristics**

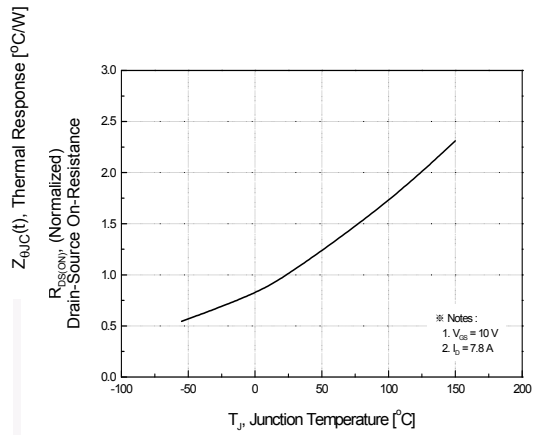


**Figure 6. Gate Charge Characteristics**

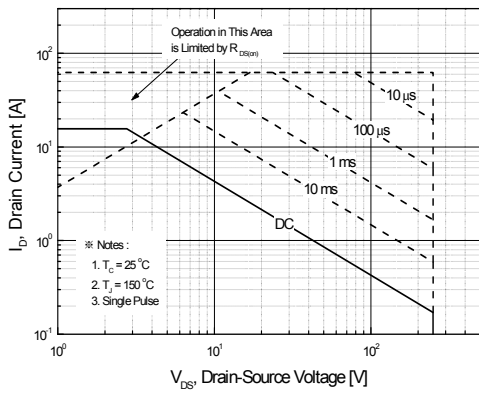
**Typical Characteristics** (Continued)



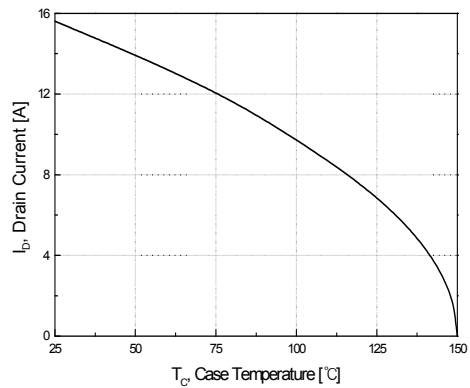
**Figure 7. Breakdown Voltage Variation vs Temperature**



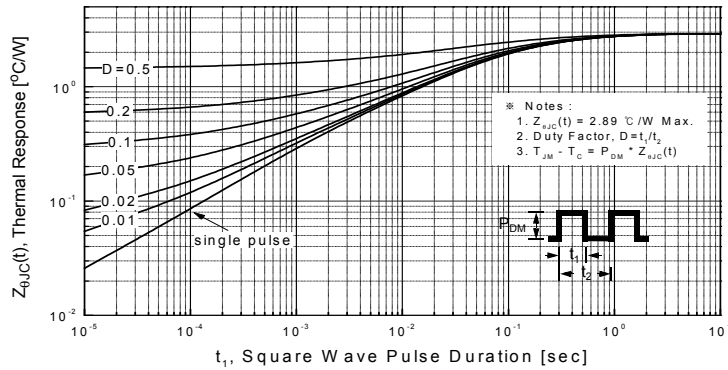
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9. Maximum Safe Operating Area**



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



**Figure 11. Transient Thermal Response Curve**

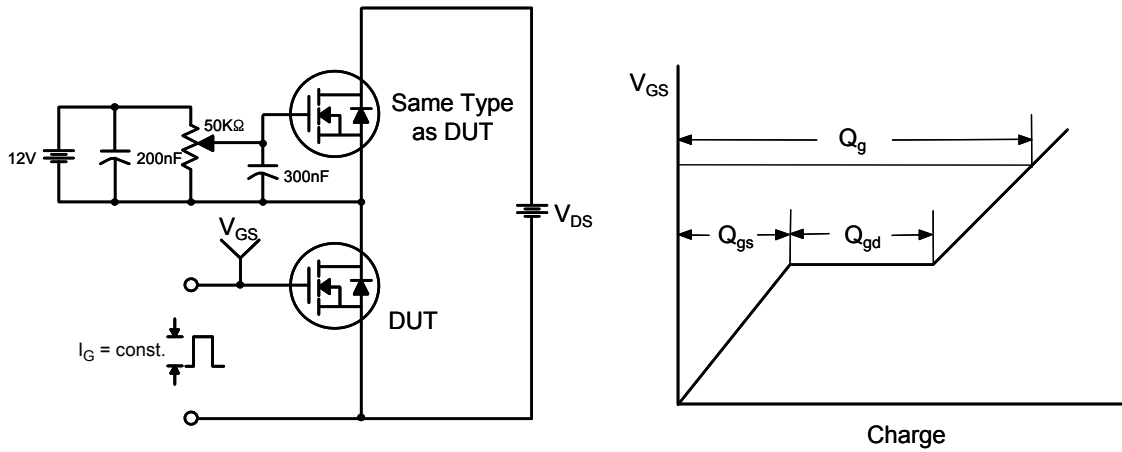


Figure 12. Gate Charge Test Circuit & Waveform

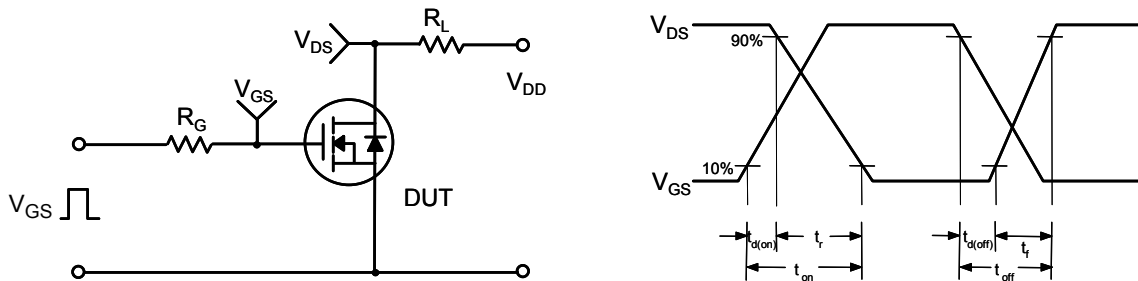


Figure 13. Resistive Switching Test Circuit & Waveforms

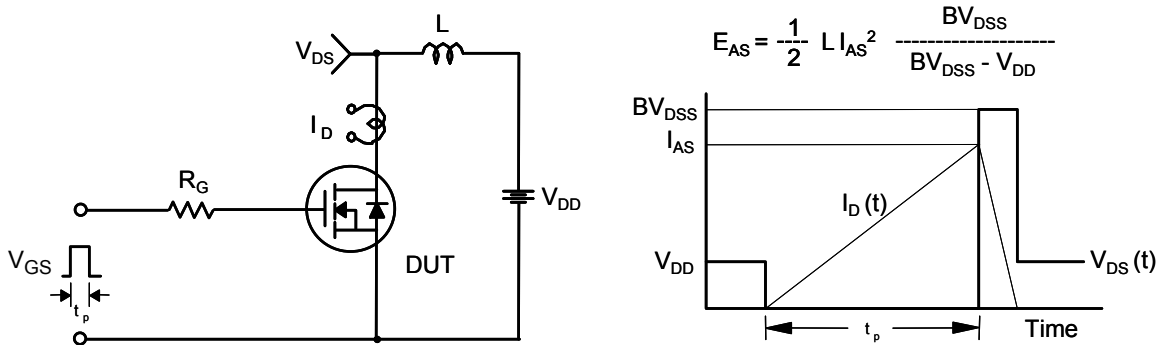


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

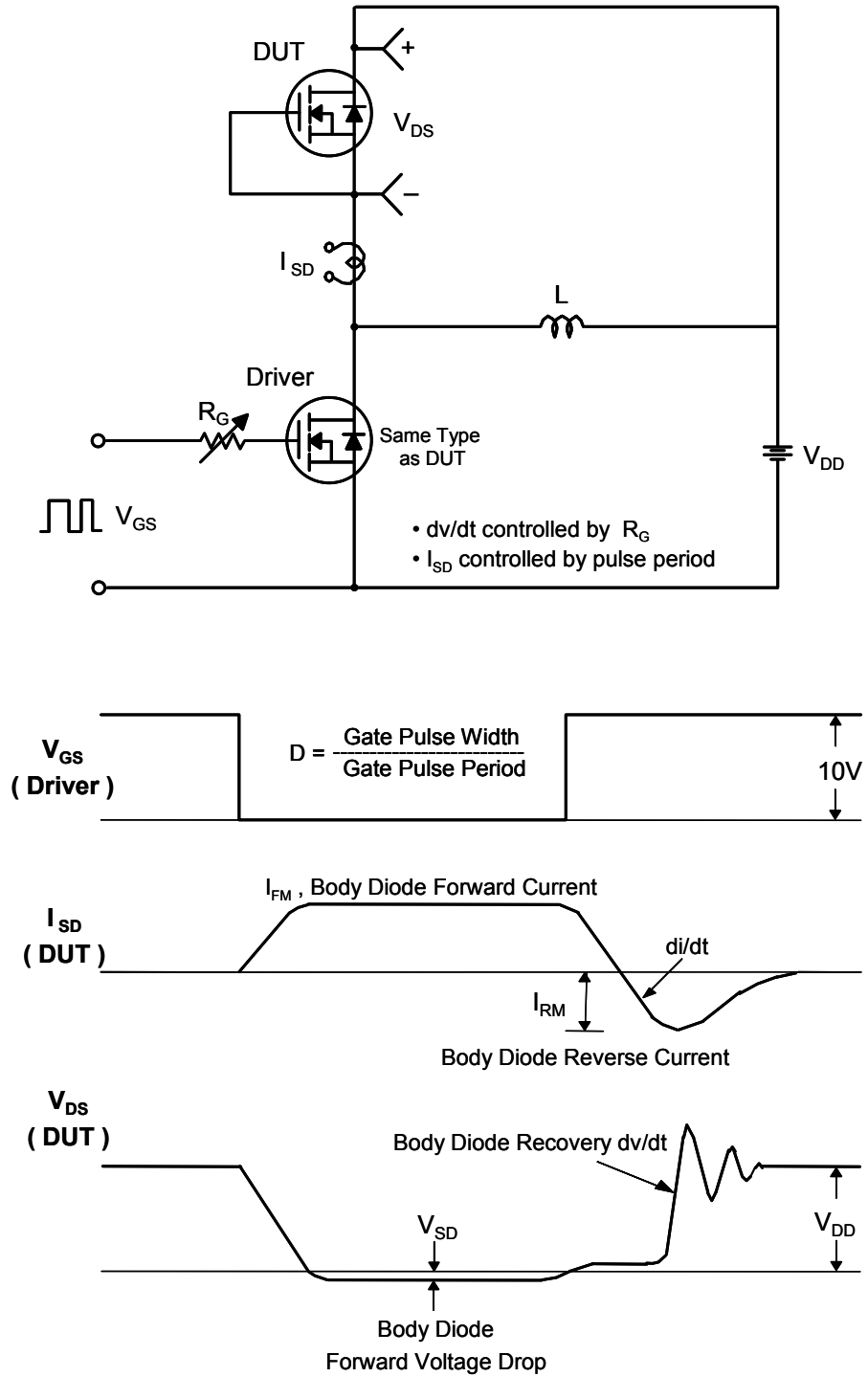
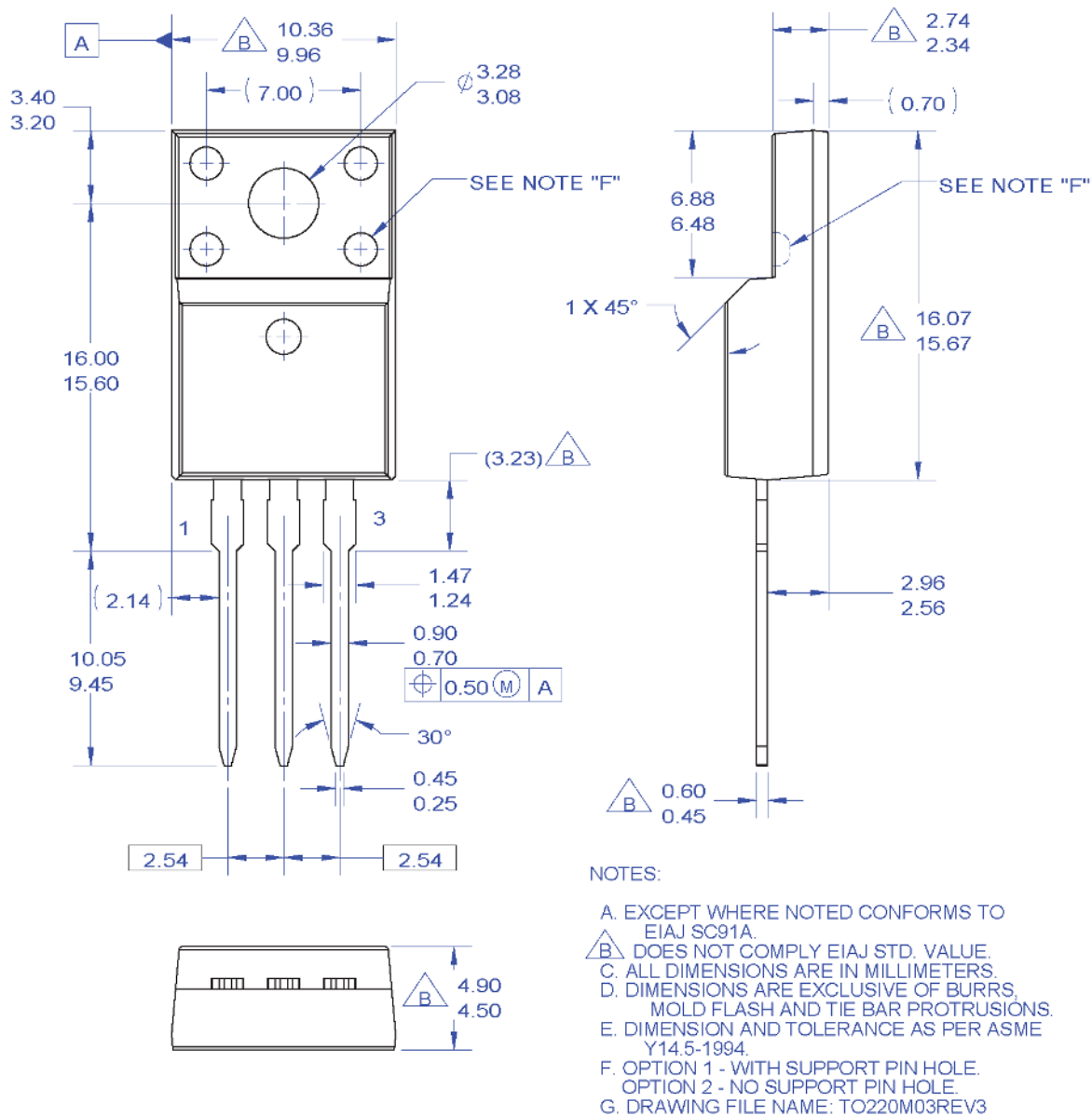


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Mechanical Dimensions



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

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