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# FCPF7N60NT

## N-Channel MOSFET

600 V, 6.8 A, 0.52 Ω

### Features

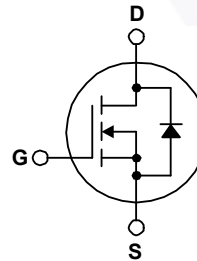
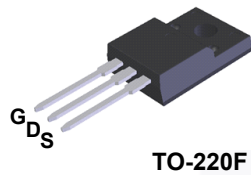
- Typ  $R_{DS(on)} = 460m\Omega$
- Ultra Low Gate Charge (typ.  $Q_g = 17.8$  nC)
- Low Effective Output Capacitance (typ.  $C_{oss(eff.)} = 91$  pF)
- 100% Avalanche Tested
- RoHS Compliant

### Application

- Solar Inverter
- AC-DC Power Supply

### Description

The SupreMOS® MOSFET is Fairchild Semiconductor's next generation of high voltage super-junction (SJ) technology employing a deep trench filling process that differentiates it from the conventional SJ MOSFETs. This advanced technology and precise process control provides lowest Rsp on-resistance, superior switching performance and ruggedness. SupreMOS MOSFET is suitable for high frequency switching power converter applications such as PFC, server/telecom power, FPD TV power, ATX power, and industrial power applications.



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

Symbol	Parameter	FCPF7N60NT	Units
$V_{DSS}$	Drain to Source Voltage	600	V
$V_{GSS}$	Gate to Source Voltage	±30	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	6.8*
		-Continuous ( $T_C = 100^\circ\text{C}$ )	4.3*
$I_{DM}$	Drain Current	- Pulsed (Note 1)	20.4
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	79.4
$I_{AR}$	Avalanche Current		6.8
$E_{AR}$	Repetitive Avalanche Energy		0.6
dv/dt	MOSFET dv/dt Ruggedness		100
	Peak Diode Recovery dv/dt	(Note 3)	4.9
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	30.5
		- Derate above $25^\circ\text{C}$	0.24
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	°C
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

\*Drain current limited by maximum junction temperature.

### Thermal Characteristics

Symbol	Parameter	FCPF7N60NT	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	4.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCPF7N60NT	FCPF7N60NT	TO-220F	-	-	50

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}, T_C = 25^\circ\text{C}$	600	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{mA}$ , Referenced to $25^\circ\text{C}$	-	0.6	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 480\text{V}, V_{GS} = 0\text{V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 480\text{V}, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$	-	-	100	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 3.4\text{A}$	-	0.46	0.52	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{V}, I_D = 3.4\text{A}$	-	8.5	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	719	960	pF
$C_{oss}$	Output Capacitance		-	30	40	pF
$C_{riss}$	Reverse Transfer Capacitance		-	2.1	3.2	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	17	-	pF
$C_{oss,eff}$	Effective Output Capacitance	$V_{DS} = 0\text{V to } 380\text{V}, V_{GS} = 0\text{V}$	-	91	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{V}, I_D = 3.4\text{A}$ $V_{GS} = 10\text{V}$ (Note 4)	-	17.8	35.6	nC
$Q_{gs}$	Gate to Source Gate Charge		-	3.2	6.3	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	6.0	11.9	nC
ESR	Equivalent Series Resistance (G-S)	Drain Open	-	2.5	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{V}, I_D = 3.4\text{A}$ $R_G = 4.7\Omega$ (Note 4)	-	12	24	ns
$t_r$	Turn-On Rise Time		-	6	22	ns
$t_{d(off)}$	Turn-Off Delay Time		-	35	80	ns
$t_f$	Turn-Off Fall Time		-	12	24	ns

### Drain-Source Diode Characteristics

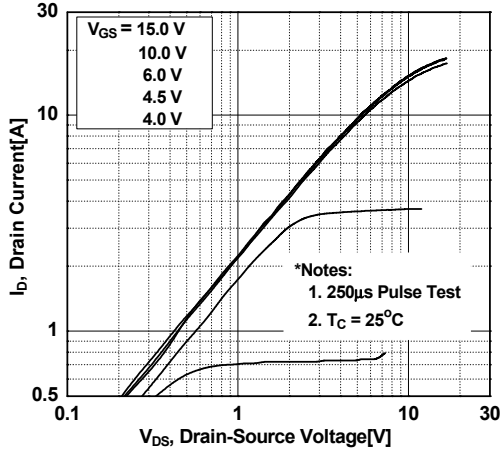
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	6.8	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	20.4	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 3.4\text{A}$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 3.4\text{A}$	-	211	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	1.8	-	$\mu\text{C}$

#### Notes:

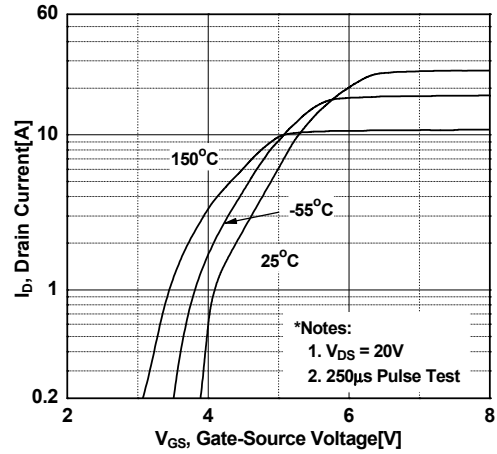
1. Repetitive rating; pulse-width limited by maximum junction temperature.
2.  $I_{AS} = 12\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 36\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} = 380\text{V}$  starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature.

## Typical Characteristics

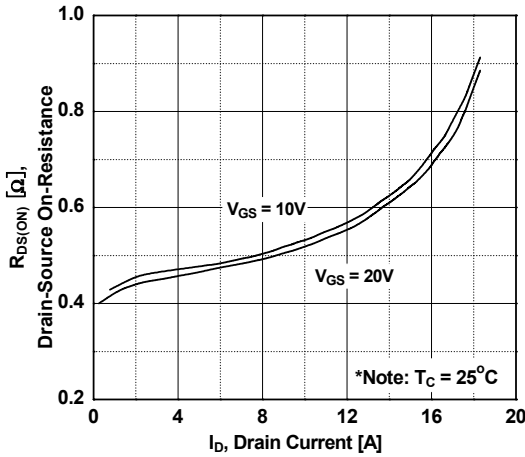
**Figure 1. On-Region Characteristics**



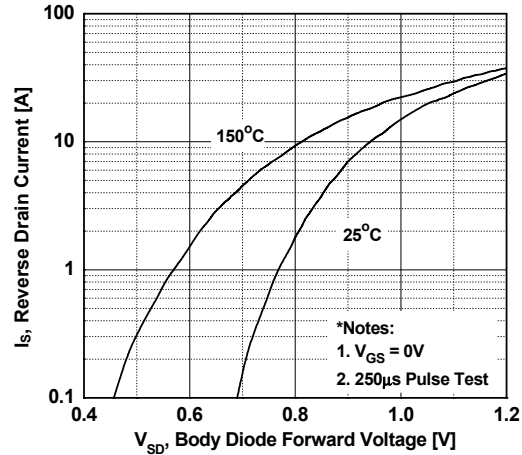
**Figure 2. Transfer Characteristics**



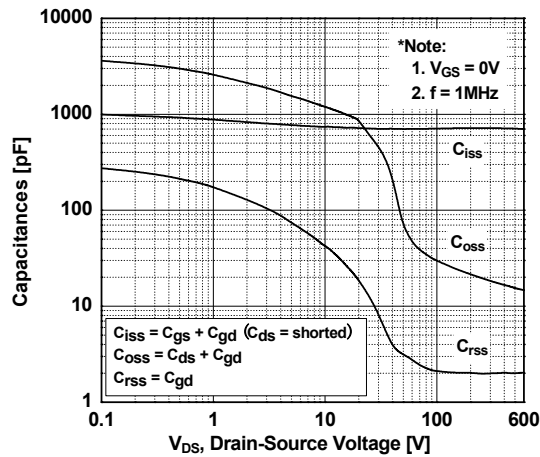
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



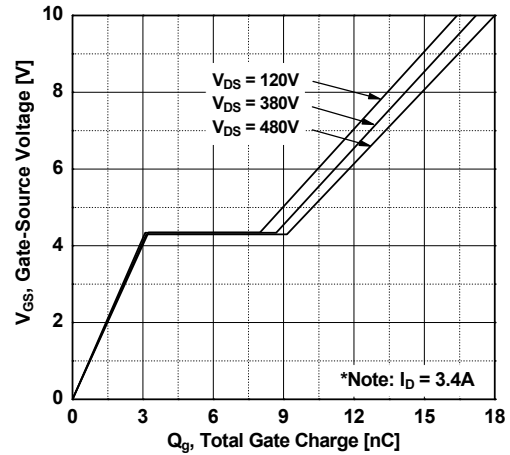
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

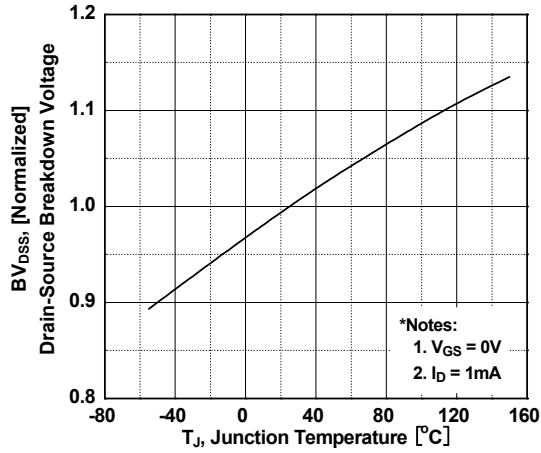


Figure 8. On-Resistance Variation vs. Temperature

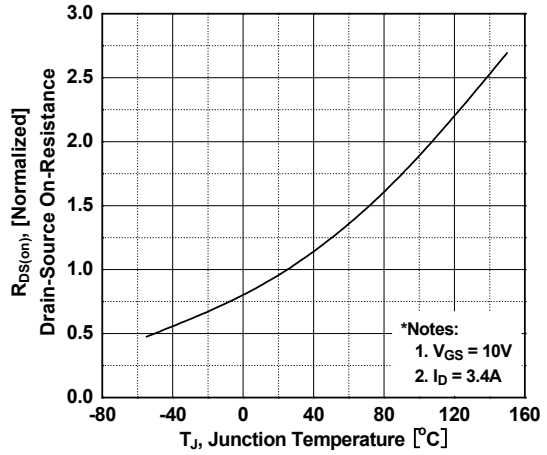


Figure 9. Maximum Safe Operating Area \_ FCPF7N60NT

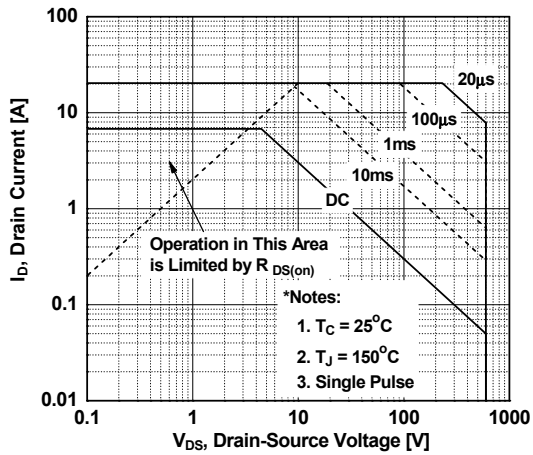
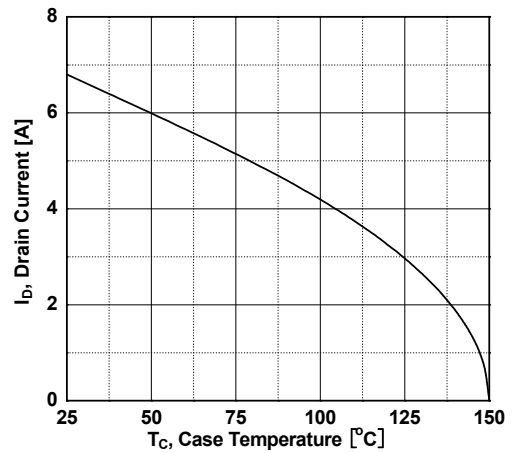


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Characteristics (Continued)

Figure 11. Transient Thermal Response Curve \_ FCPF7N60NT

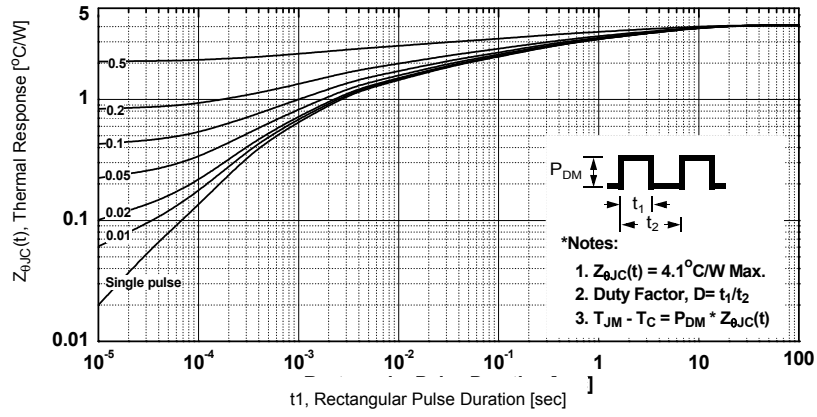


Figure 12. Gate Charge Test Circuit & Waveform

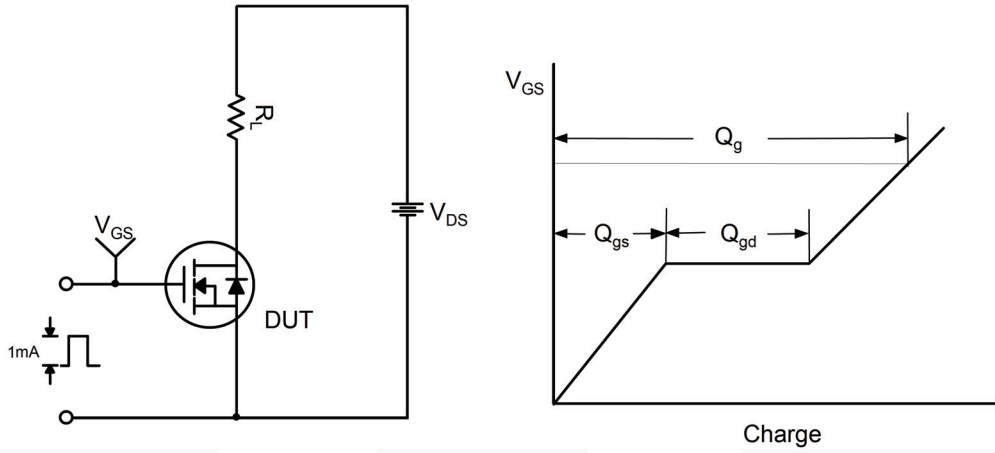


Figure 13. Resistive Switching Test Circuit & Waveforms

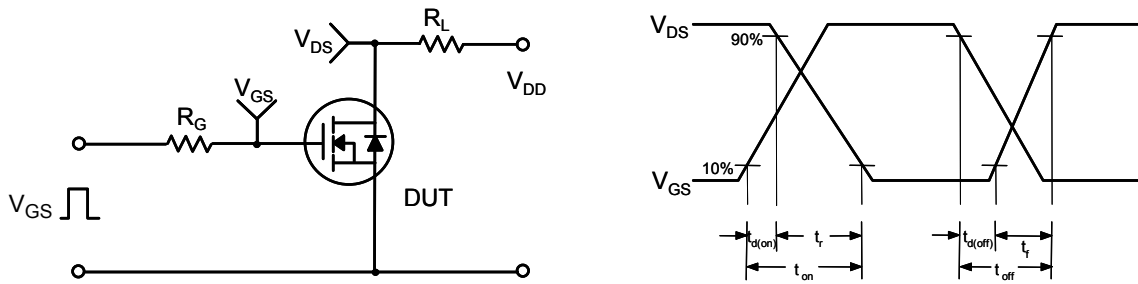


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

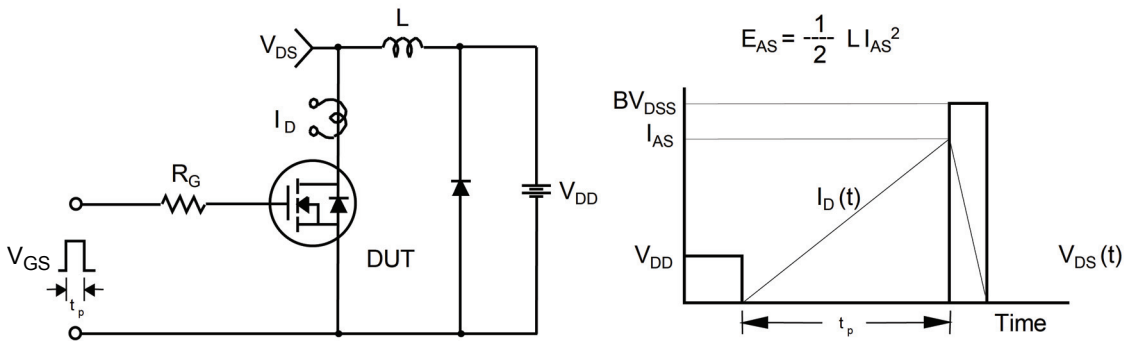


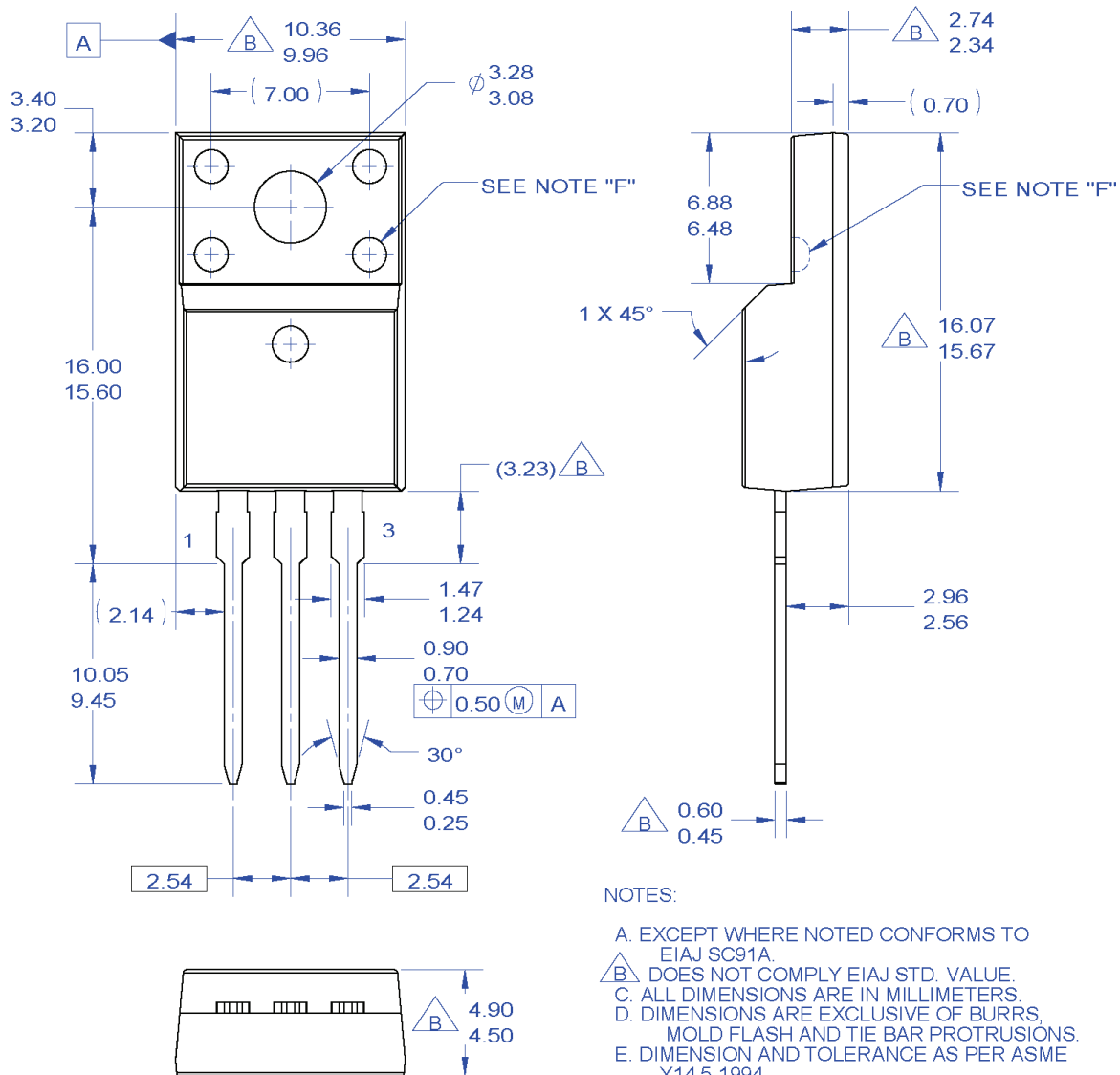
Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





## Mechanical Dimensions

### TO-220F 3L



#### NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. OPTION 1 - WITH SUPPORT PIN HOLE.  
OPTION 2 - NO SUPPORT PIN HOLE.
- G. DRAWING FILE NAME: TO220M03REV3

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

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|                          | PowerTrench®                                    |                          |
|                          | PowerXS™  |                          |
|                          | Programmable Active Droop™                      |                          |
|                          | QFET®   |                          |
|                          | QS™   |                          |
|                          | Quiet Series™                                   |                          |
|                          | RapidConfigure™                                 |                          |
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|                          | SuperSOT™-6                                     |                          |
|                          | SuperSOT™-8                                     |                          |
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