



ON Semiconductor®

# FCPF260N60E-F152

## N-Channel SuperFET® II MOSFET Description

600 V, 15 A, 260 mΩ

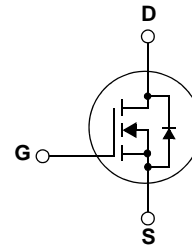
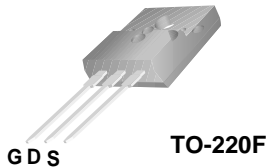
### Features

- 650 V @T<sub>J</sub> = 150°C
- Max. R<sub>DS(on)</sub> = 260 mΩ
- Ultra Low Gate Charge (Typ. Q<sub>g</sub> = 48 nC)
- Low Effective Output Capacitance (Typ. C<sub>oss,eff</sub> = 129 pF)
- 100% Avalanche Tested

### Applications

- LCD / LED / PDP TV Lighting
- Solar Inverter
- AC-DC Power Supply

SuperFET® II MOSFET is ON Semiconductor's first generation of high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. Consequently, SuperFET® II MOSFET is suitable for various AC/DC power conversion for system miniaturization and higher efficiency.



### MOSFET Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted


Symbol	Parameter	FCPF260N60E-F152	Unit
V <sub>DSS</sub>	Drain to Source Voltage	600	V
V <sub>GSS</sub>	Gate to Source Voltage	- DC	±20
		- AC (f > 1Hz)	±30
I <sub>D</sub>	Drain Current	-Continuous (T <sub>C</sub> = 25°C)	15*
		-Continuous (T <sub>C</sub> = 100°C)	9.5*
I <sub>DM</sub>	Drain Current	- Pulsed (Note 1)	45*
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	292.5
I <sub>AR</sub>	Avalanche Current	(Note 1)	3.0
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	1.56
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	20
	MOSFET dv/dt		100
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C)	36
		- Derate above 25°C	0.29
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C
T <sub>L</sub>	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	FCPF260N60E-F152	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	3.5	°C/W
R <sub>θCS</sub>	Thermal Resistance, Case to Heat Sink (Typical)	0.5	
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Eco Status	Packaging Type	Quantity
FCPF260N60E	FCPF260N60E-F152	TO-220F	Green 	Tube	50

## 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 to Source Breakdown Voltage	$V_{GS} = 0V, I_D = 10mA, T_J = 25^\circ\text{C}$	600	-	-	V
		$V_{GS} = 0V, I_D = 10mA, T_J = 150^\circ\text{C}$	650	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 10mA$ , Referenced to $25^\circ\text{C}$	-	0.67	-	$V/^\circ\text{C}$
$BV_{DS}$	Drain-Source Avalanche Breakdown Voltage	$V_{GS} = 0V, I_D = 15A$	-	700	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 480V, V_{GS} = 0V$	-	-	10	$\mu\text{A}$
		$V_{DS} = 480V, T_C = 125^\circ\text{C}$	-	-	10	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	-	3.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V, I_D = 7.5A$	-	0.22	0.26	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20V, I_D = 7.5A$	-	15.5	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V$ $f = 1\text{MHz}$	-	1880	2500	pF
$C_{oss}$	Output Capacitance		-	1330	1770	pF
$C_{rfs}$	Reverse Transfer Capacitance		-	85	130	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380V, V_{GS} = 0V, f = 1\text{MHz}$	-	32	-	pF
$C_{oss \text{ eff.}}$	Effective Output Capacitance	$V_{DS} = 0V \text{ to } 480V, V_{GS} = 0V$	-	129	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380V, I_D = 7.5A$ $V_{GS} = 10V$	-	48	62	nC
$Q_{gs}$	Gate to Source Gate Charge		-	7.4	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	-	17	-
ESR	Equivalent Series Resistance	$f = 1\text{MHz}$	-	5.8	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380V, I_D = 7.5A$ $V_{GS} = 10V, R_G = 4.7\Omega$	-	20	50	ns
$t_r$	Turn-On Rise Time		-	11	32	ns
$t_{d(off)}$	Turn-Off Delay Time		-	89	188	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	13	36

### Drain-Source Diode Characteristics

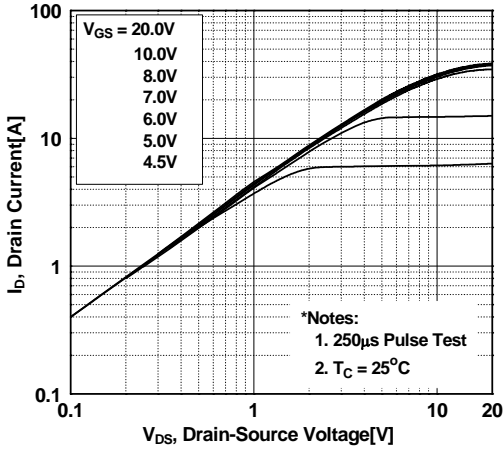
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	15	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	45	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0V, I_{SD} = 7.5A$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0V, I_{SD} = 7.5A$	-	270	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100A/\mu\text{s}$	-	3.6	-	$\mu\text{C}$

#### Notes:

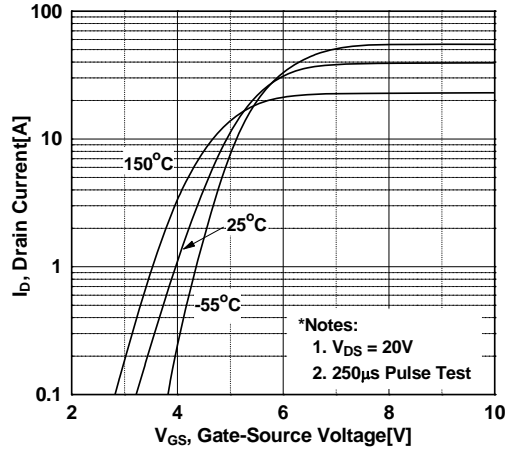
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 3A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 7.5A, di/dt \leq 200A/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

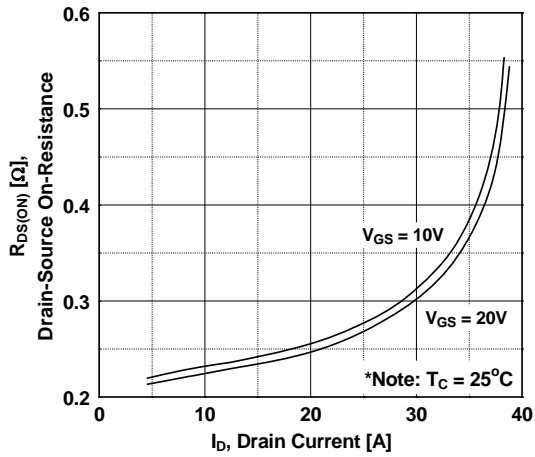
**Figure 1. On-Region Characteristics**



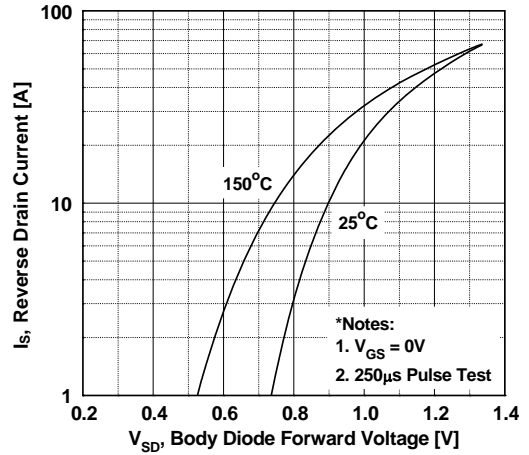
**Figure 2. Transfer Characteristics**



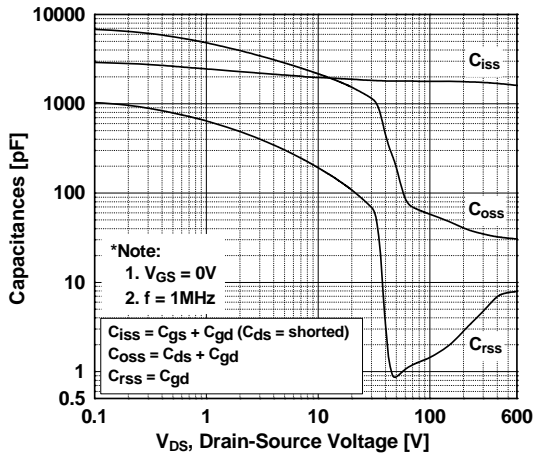
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



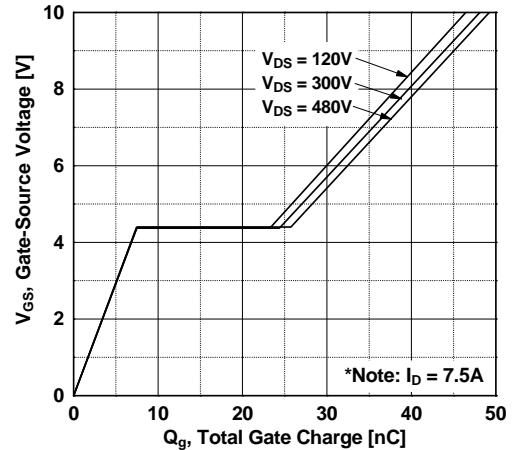
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

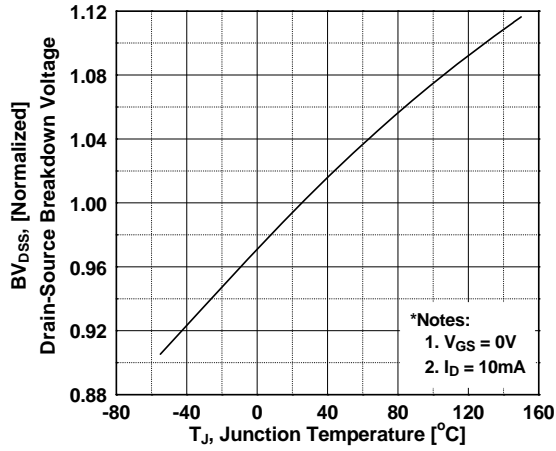


Figure 8. On-Resistance Variation vs. Temperature

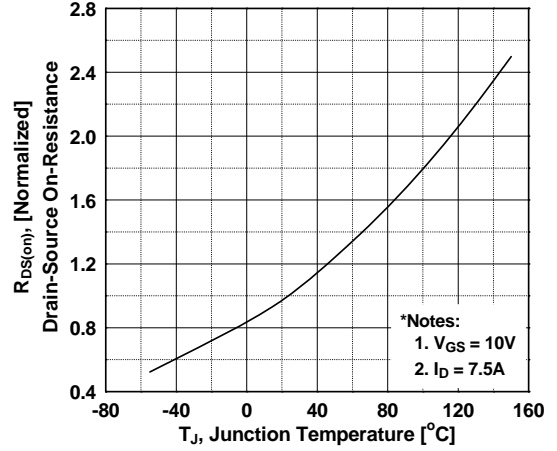


Figure 9. Maximum Safe Operating Area vs. Case Temperature

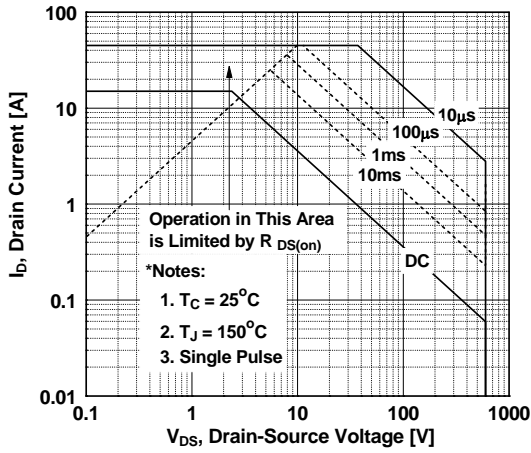


Figure 10. E<sub>oss</sub> vs. Drain to Source Voltage Switching Capability

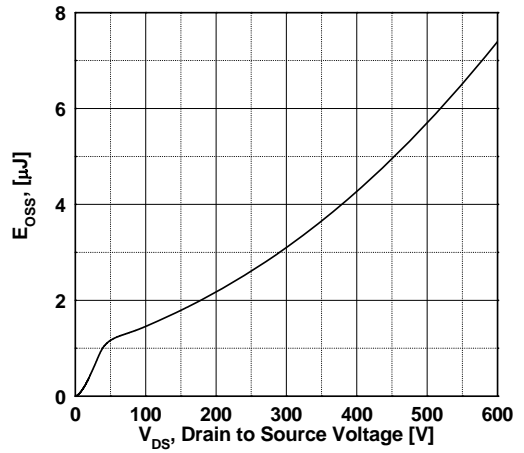
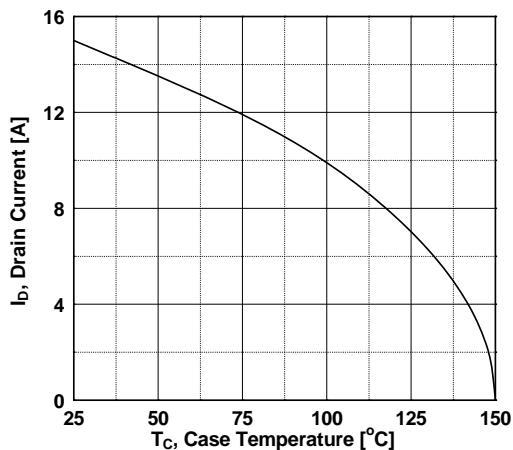
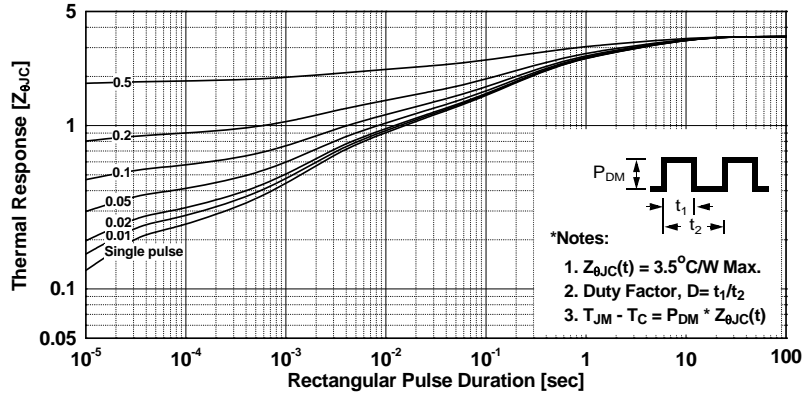


Figure 11. Maximum Drain Current



Typical Performance Characteristics (Continued)

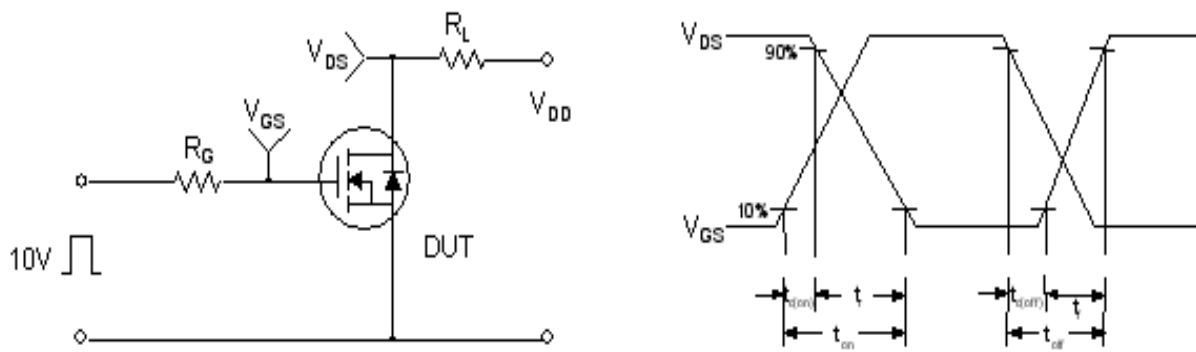
Figure 12. Transient Thermal Response Curve



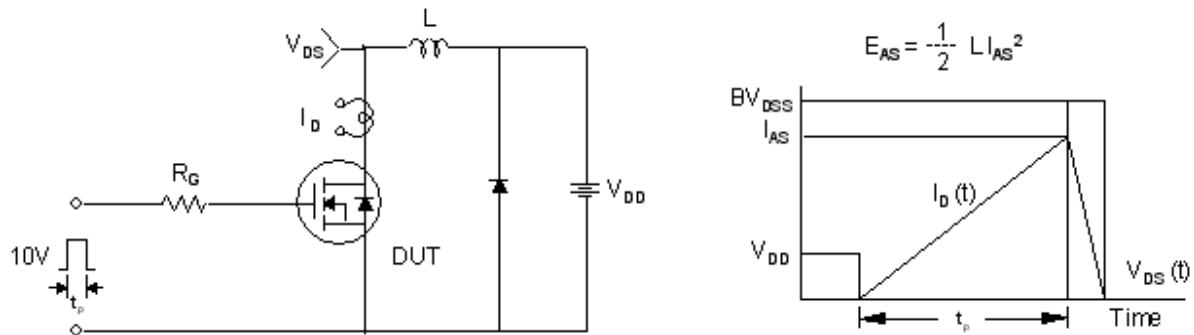
**Gate Charge Test Circuit & Waveform**



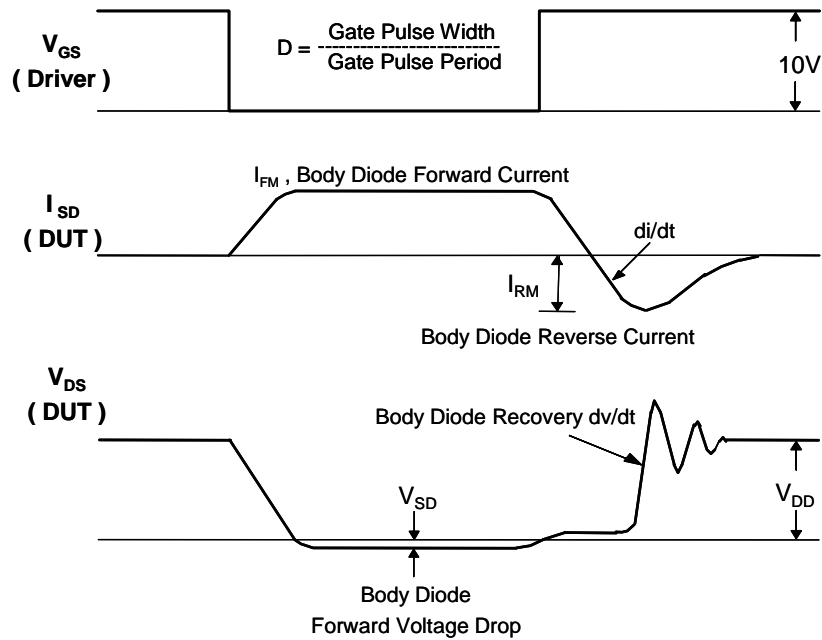
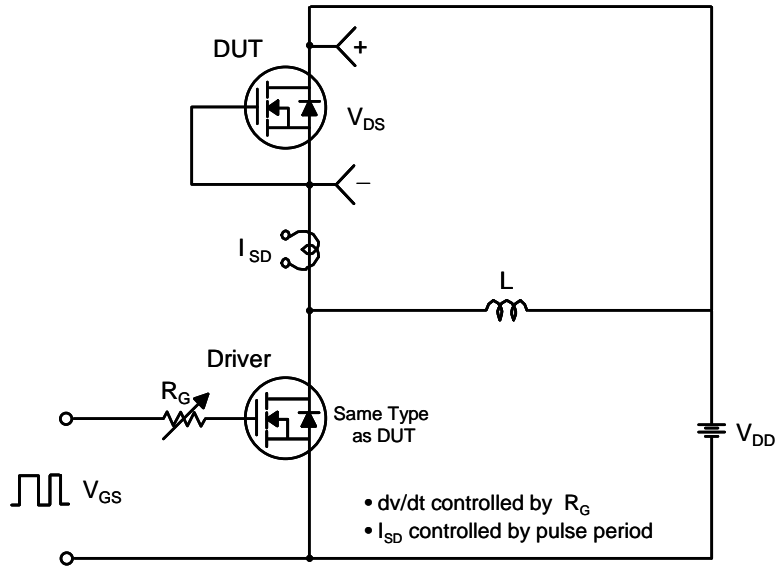
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

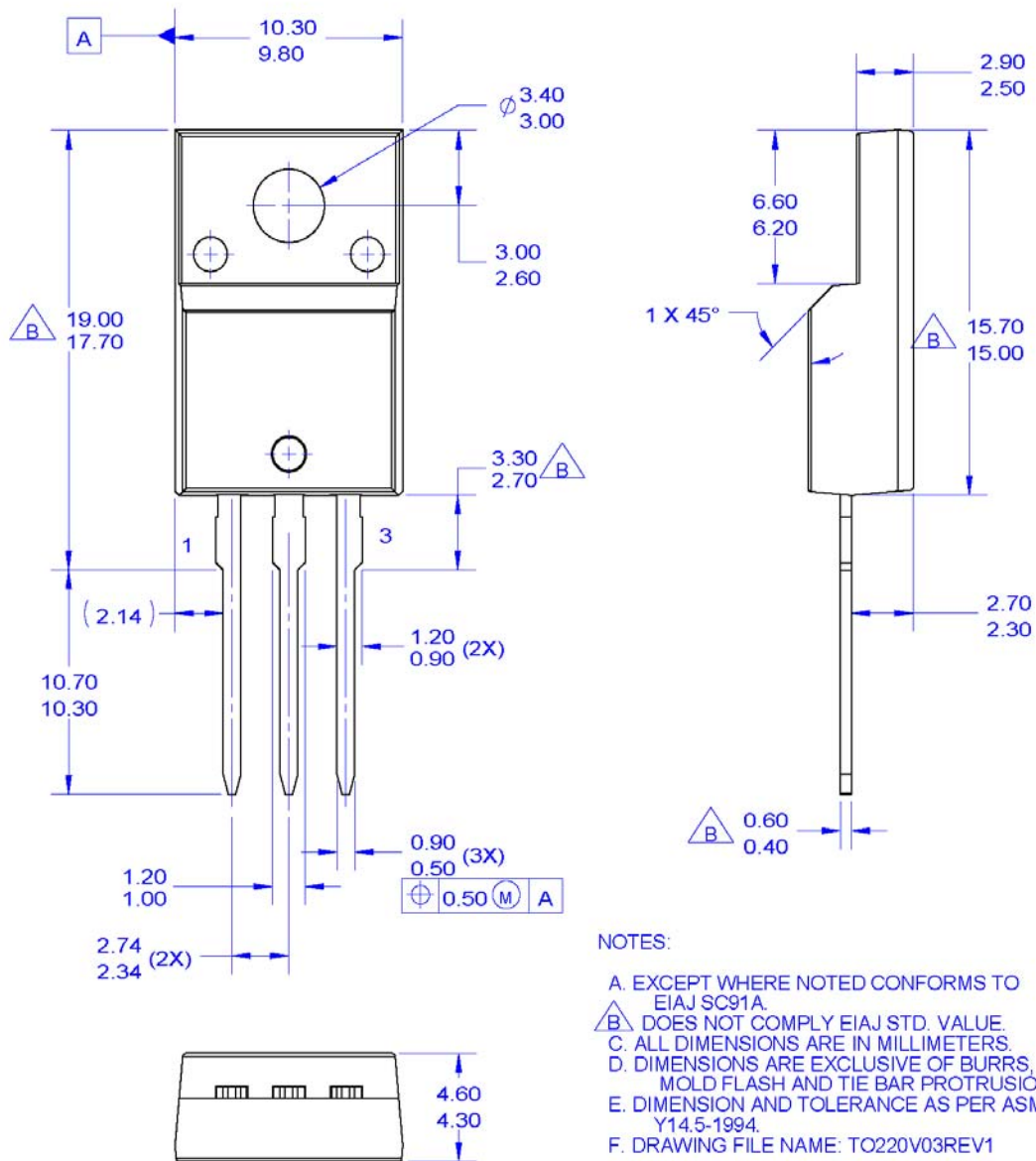


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220F



NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- $\triangle$  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. DRAWING FILE NAME: TO220V03REV1

\* Front/Back Side Isolation Voltage : AC 2500V

TO-220, MOLDED, 3LD, FULL PACK, EIAJ SC91

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