

# FDPF035N06B\_F152

## N-Channel PowerTrench® MOSFET

60 V, 88 A, 3.5 mΩ

### Features

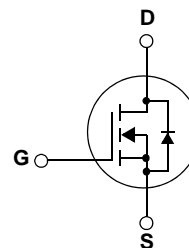
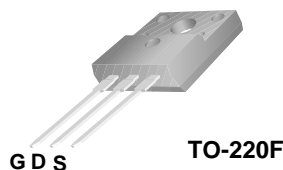
- $R_{DS(on)} = 2.91 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 88 \text{ A}$
- Low FOM  $R_{DS(on)} * Q_G$
- Low Reverse Recovery Charge,  $Q_{rr}$
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

### Description

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

### Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Renewable System



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

Symbol	Parameter	FDPF035N06B_F152	Unit
$V_{DSS}$	Drain to Source Voltage	60	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	88
		- Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	62
$I_{DM}$	Drain Current	- Pulsed (Note 1)	352
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	600
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	46.3
		- Derate above $25^\circ\text{C}$	0.31
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDPF035N06B_F152	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	3.24	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Quantity
FDPF035N06B	FDPF035N06B_F152	TO-220F	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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.03	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2	-	4	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 88\text{A}$	-	2.91	3.5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 88\text{A}$	-	176	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	6035	8030	pF	
$C_{oss}$	Output Capacitance		-	1685	2240	pF	
$C_{rss}$	Reverse Transfer Capacitance		-	55	-	pF	
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$	-	2619	-	pF	
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 30\text{V}, I_D = 100\text{A}$ $V_{GS} = 10\text{V}$	-	76	99	nC	
$Q_{gs}$	Gate to Source Gate Charge		-	29	-	nC	
$Q_{gd}$	Gate to Drain "Miller" Charge		-	12	-	nC	
$V_{plateau}$	Gate Plateau Voltage		(Note 4)	-	5.2	-	V
$Q_{sync}$	Total Gate Charge Sync.	$V_{DS} = 0\text{V}, I_D = 50\text{A}$	(Note 5)	-	67.3	-	nC
$Q_{oss}$	Output Charge	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$	-	92.4	-	nC	

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{V}, I_D = 100\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$	-	32	74	ns
$t_r$	Turn-On Rise Time		-	33	76	ns
$t_{d(off)}$	Turn-Off Delay Time		-	56	122	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	23	56
ESR	Equivalent Series Resistance (G-S)	$f = 1\text{MHz}$	-	2.0	-	$\Omega$

### Drain-Source Diode Characteristics

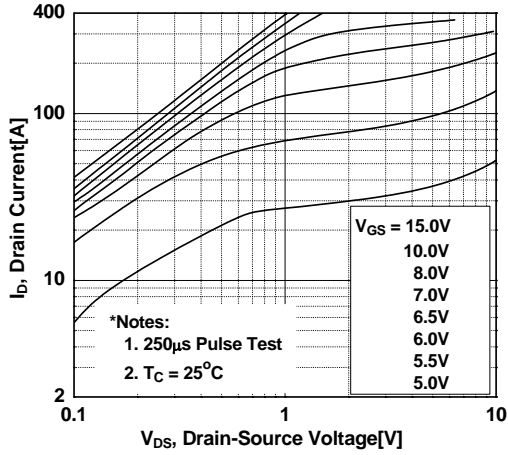
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	88	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	352	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 88\text{A}$	-	-	1.25	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 100\text{A}$	-	71	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	78	-	nC

#### Notes:

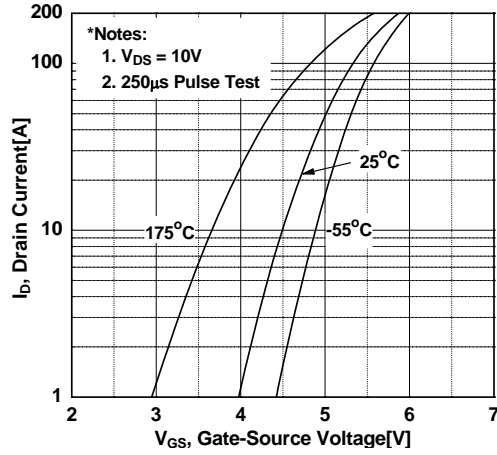
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 3\text{mH}, I_{AS} = 20\text{A}$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 100\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics
5. See the test circuit in page 8

## Typical Performance Characteristics

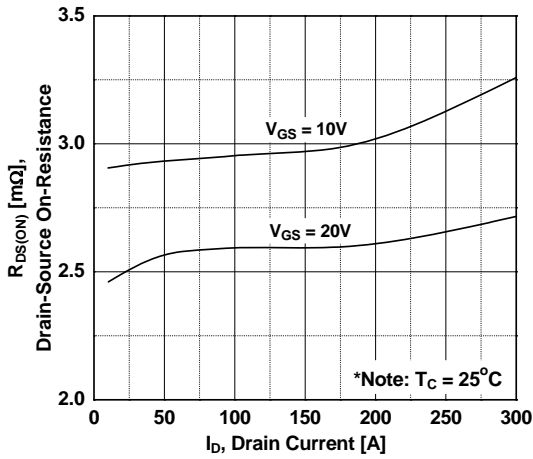
**Figure 1. On-Region Characteristics**



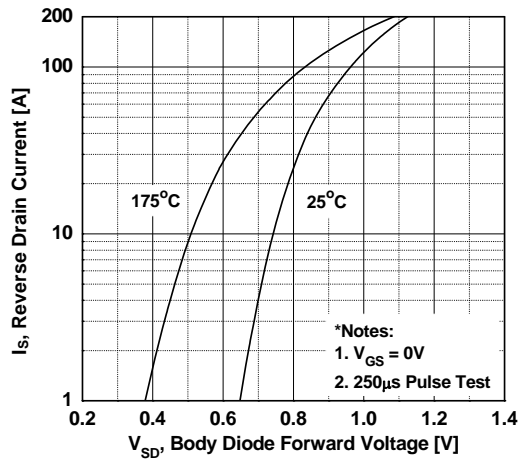
**Figure 2. Transfer Characteristics**



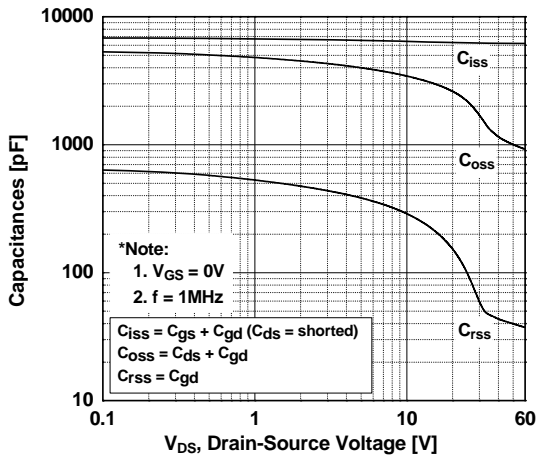
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



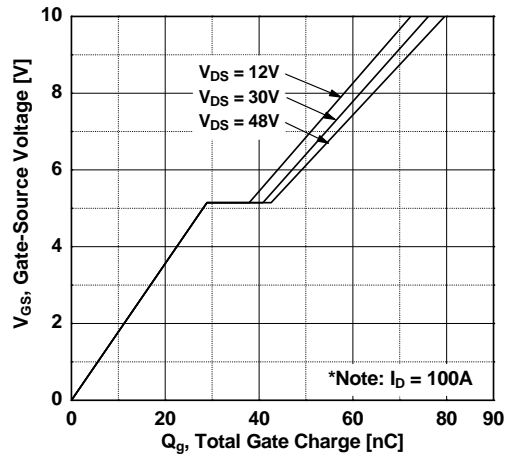
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

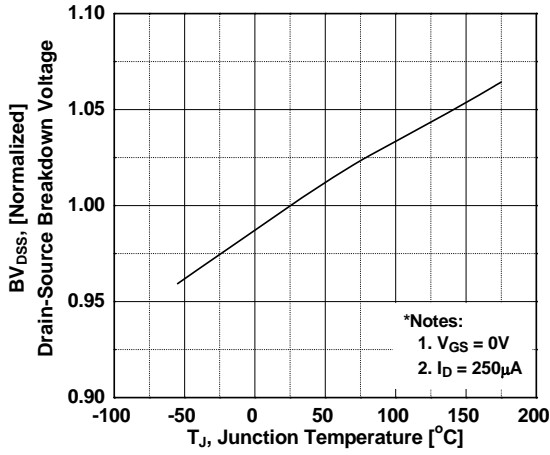


**Figure 6. Gate Charge Characteristics**

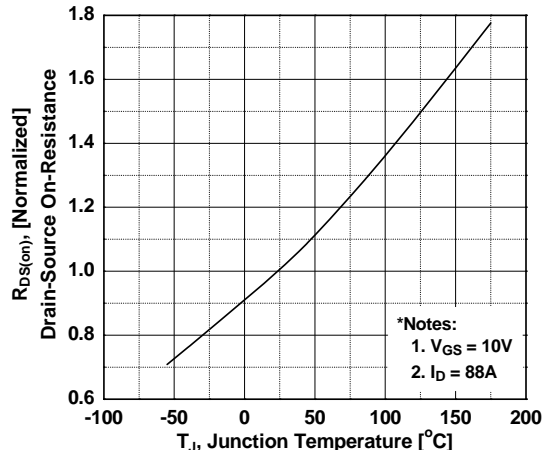


**Typical Performance Characteristics** (Continued)

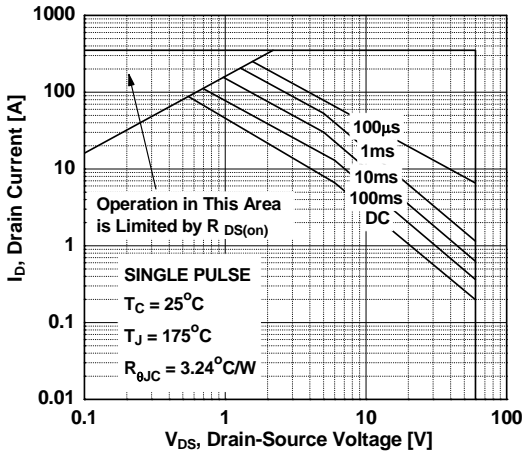
**Figure 7. Breakdown Voltage Variation vs. Temperature**



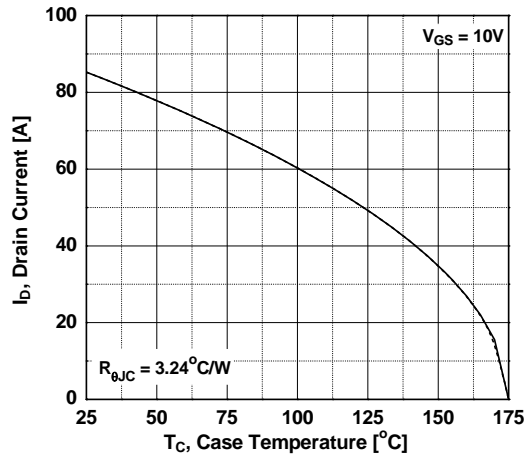
**Figure 8. On-Resistance Variation vs. Temperature**



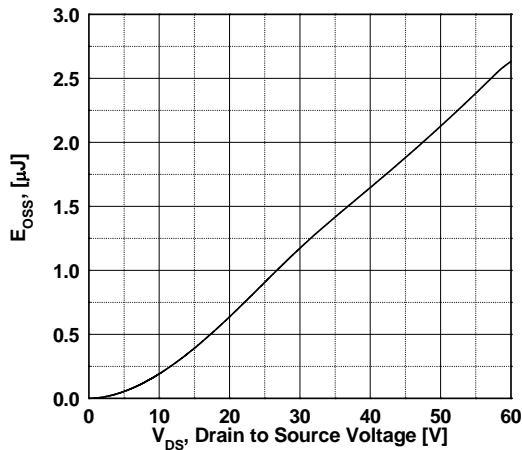
**Figure 9. Maximum Safe Operating Area vs. Case Temperature**



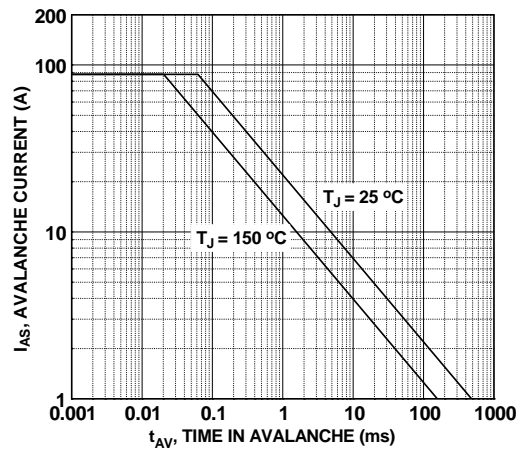
**Figure 10. Maximum Drain Current**



**Figure 11. E\_oss vs. Drain to Source Voltage**

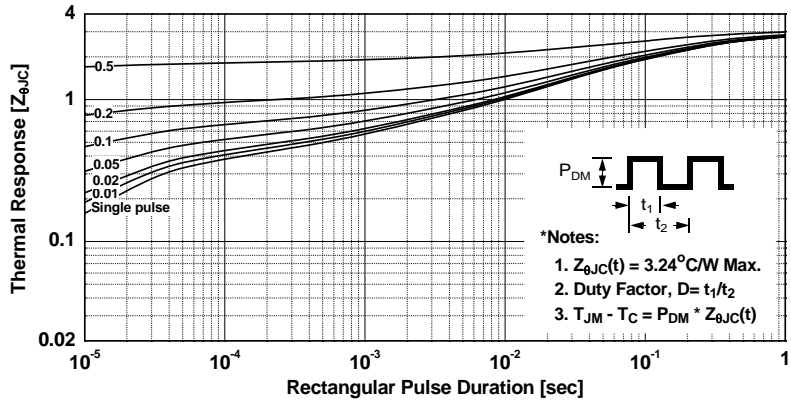


**Figure 12. Unclamped Inductive Switching Capability**

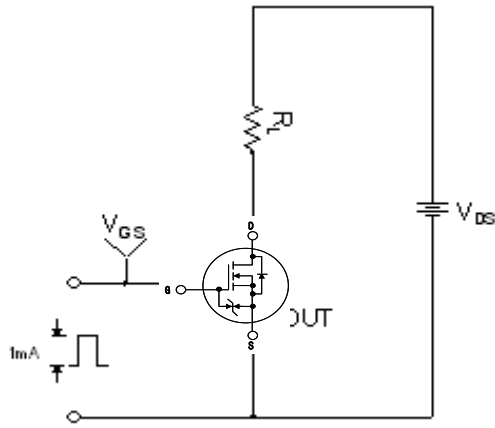


Typical Performance Characteristics (Continued)

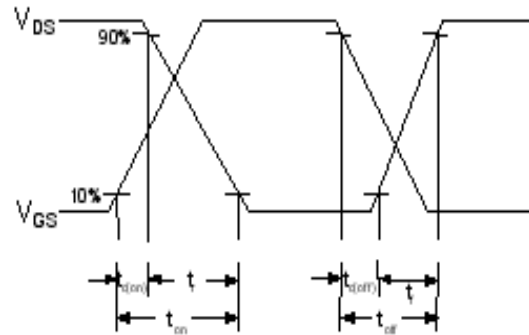
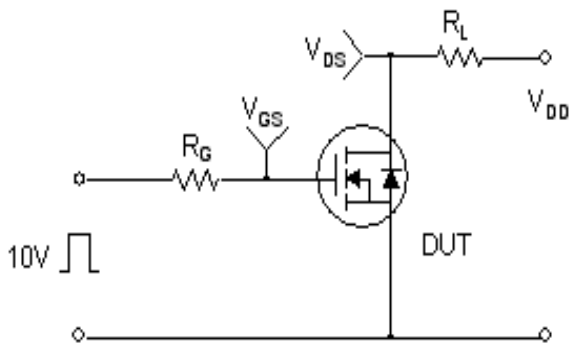
Figure 13. Transient Thermal Response Curve



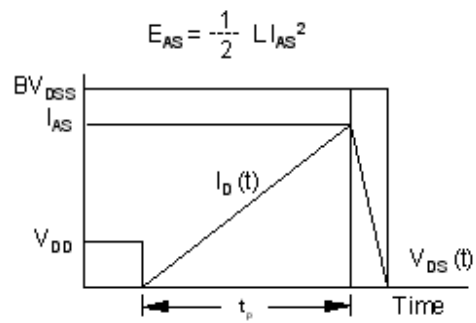
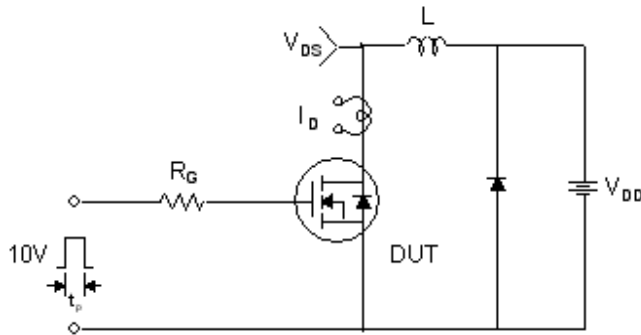
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**

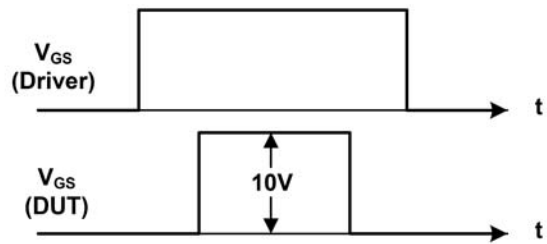
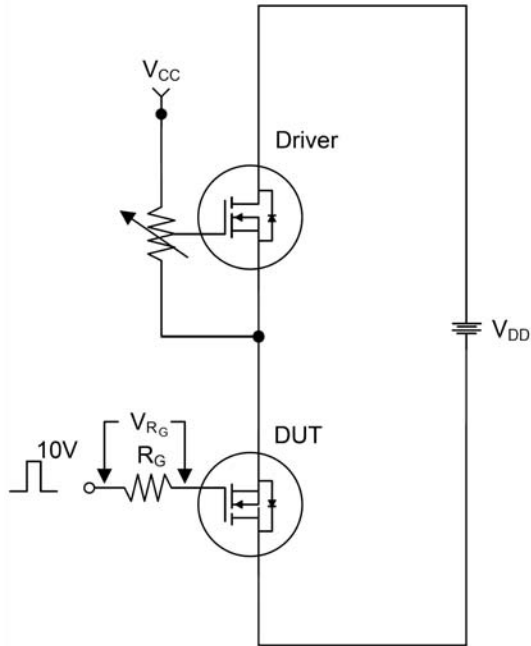


**Unclamped Inductive Switching Test Circuit & Waveforms**





Total Gate Charge  $Q_{sync}$ . Test Circuit & Waveforms

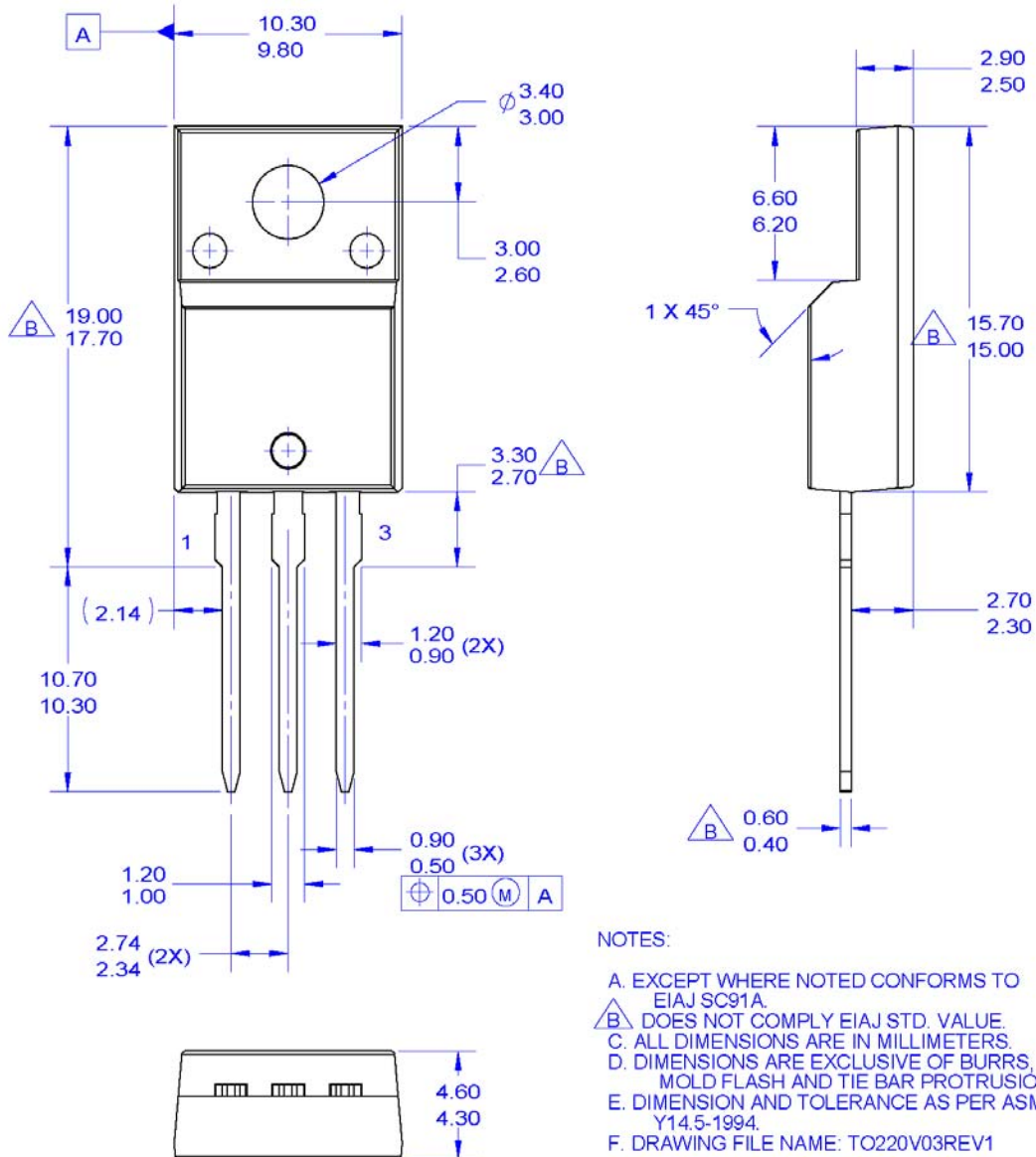


$$Q_{sync} = \frac{1}{R_G} \cdot \int V_{R_G}(t) dt$$



## Mechanical Dimensions

### TO-220F




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



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