

# FDP036N10A

## N-Channel PowerTrench® MOSFET

100 V, 214 A, 3.6 mΩ

### Features

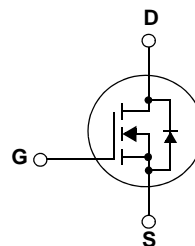
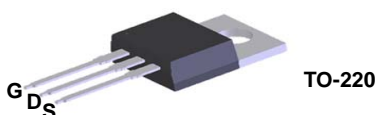
- $R_{DS(on)} = 3.2 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 75 \text{ A}$
- Fast Switching Speed
- Low Gate Charge,  $Q_G = 89 \text{ nC(Typ.)}$
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's 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
- Micro Solar Inverter



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

Symbol	Parameter	FDP036N10A	Unit
$V_{DSS}$	Drain to Source Voltage	100	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ , Silicon Limited)	214*
		-Continuous ( $T_C = 100^\circ\text{C}$ , Silicon Limited)	151*
		-Continuous ( $T_C = 25^\circ\text{C}$ , Package Limited)	120
$I_{DM}$	Drain Current	- Pulsed (Note 1)	856
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	658
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	6.0
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	333
		- Derate above $25^\circ\text{C}$	2.22
$T_J, T_{STG}$	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	$^\circ\text{C}$

\*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

### Thermal Characteristics

Symbol	Parameter	FDP036N10A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.45	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP036N10A	FDP036N10A	TO-220	-	-	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	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$ , $T_C = 25^\circ\text{C}$	100	-	-	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	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{V}$ , $V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 80\text{V}$ , $T_C = 150^\circ\text{C}$	-	-	500	
$I_{GSS}$	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	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	2.0	3.0	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 75\text{A}$	-	3.2	3.6	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{V}$ , $I_D = 75\text{A}$	-	167	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	5485	7295	pF
$C_{oss}$	Output Capacitance		-	2430	3230	pF
$C_{rss}$	Reverse Transfer Capacitance		-	210	315	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 80\text{V}$ , $I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ (Note 4)	-	89	116	nC
$Q_{gs}$	Gate to Source Gate Charge		-	24	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	8	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	25	-	nC

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{V}$ , $I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ , $R_{GEN} = 4.7\Omega$ (Note 4)	-	22	54	ns
$t_r$	Turn-On Rise Time		-	54	118	ns
$t_{d(off)}$	Turn-Off Delay Time		-	37	84	ns
$t_f$	Turn-Off Fall Time		-	11	32	ns
ESR	Equivalent Series Resistance (G-S)	$f = 1\text{MHz}$	-	1.2	-	$\Omega$

### Drain-Source Diode Characteristics

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	214	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	856	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 75A	-	-	1.25	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 75A	-	72	93.6	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt = 100A/μs	-	129	-	nC

#### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{mH}$ ,  $I_{SD} = 36.3\text{A}$
3.  $I_{SD} \leq 75\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

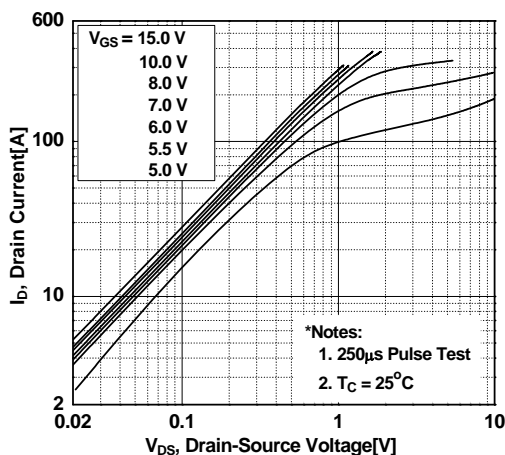


Figure 2. Transfer Characteristics

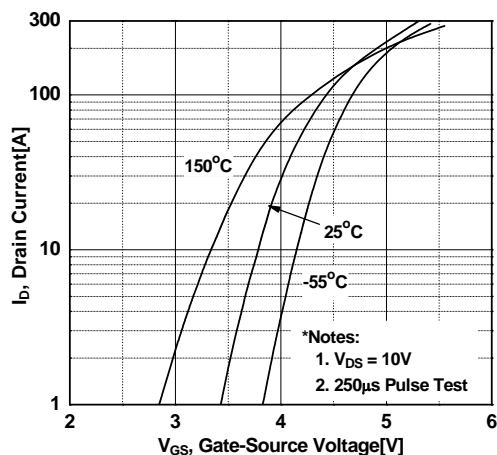


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

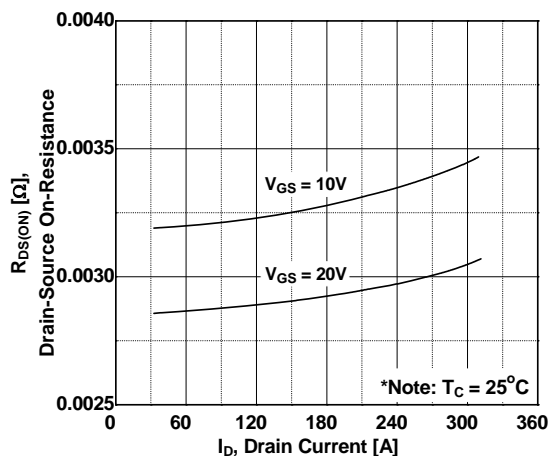


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

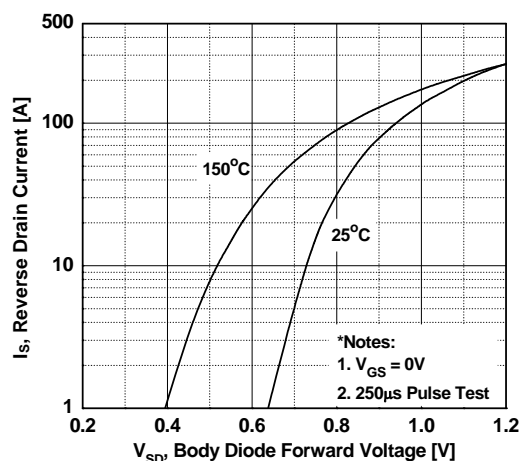


Figure 5. Capacitance Characteristics

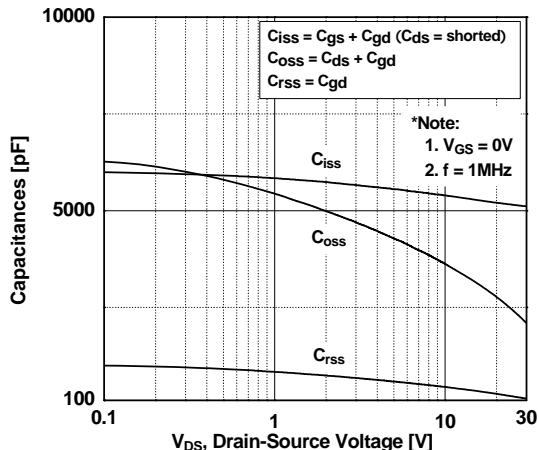
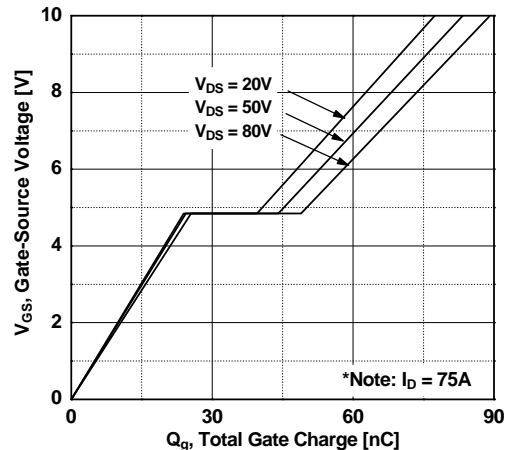


Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

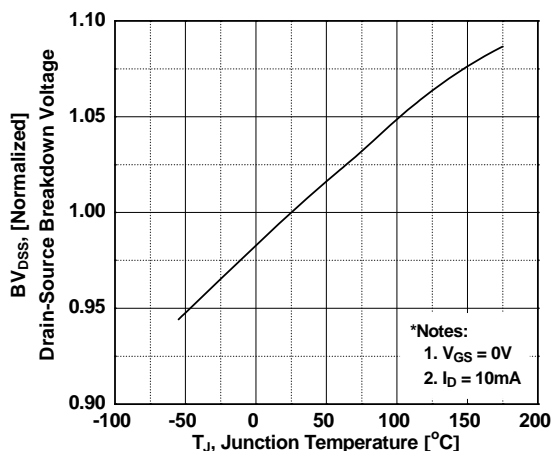


Figure 8. On-Resistance Variation vs. Temperature

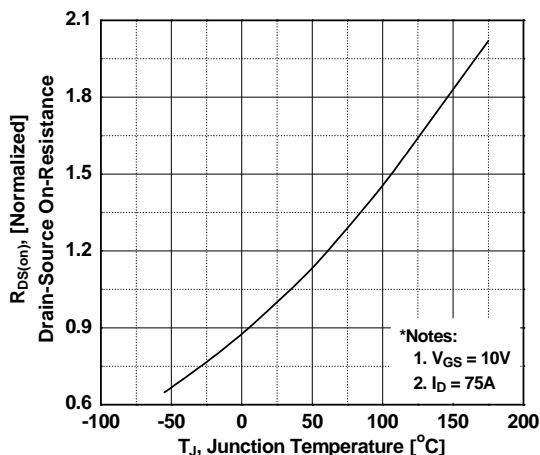


Figure 9. Maximum Safe Operating Area

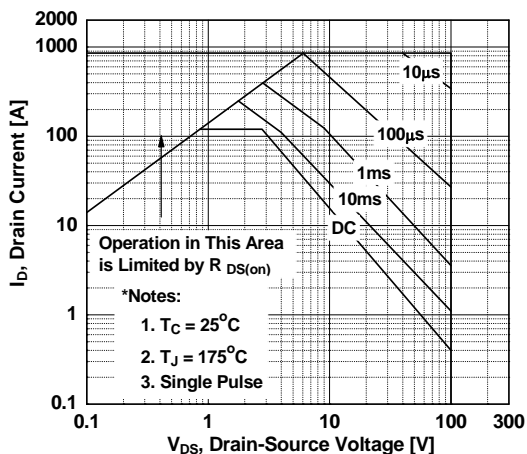


Figure 10. Maximum Drain Current vs. Case Temperature

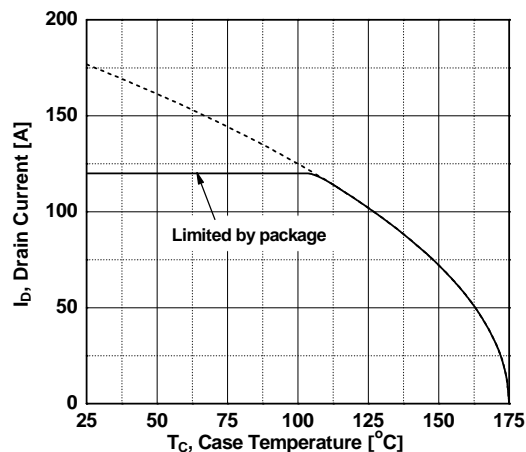
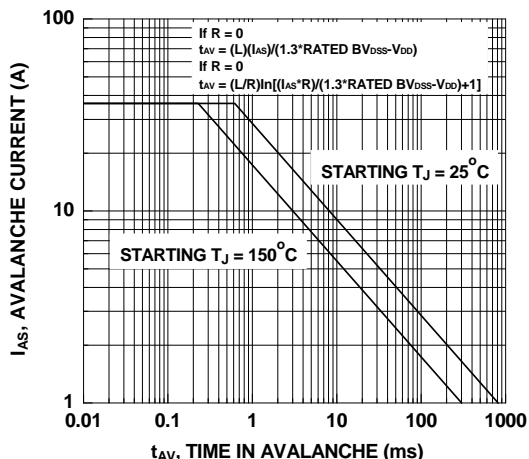
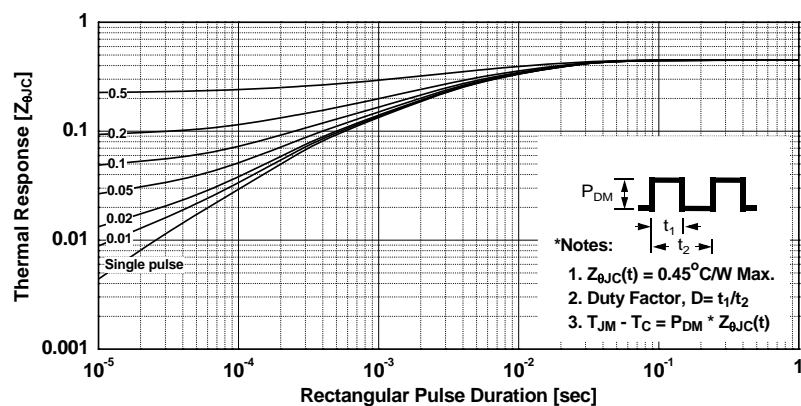


Figure 11. Unclamped Inductive Switching Capability

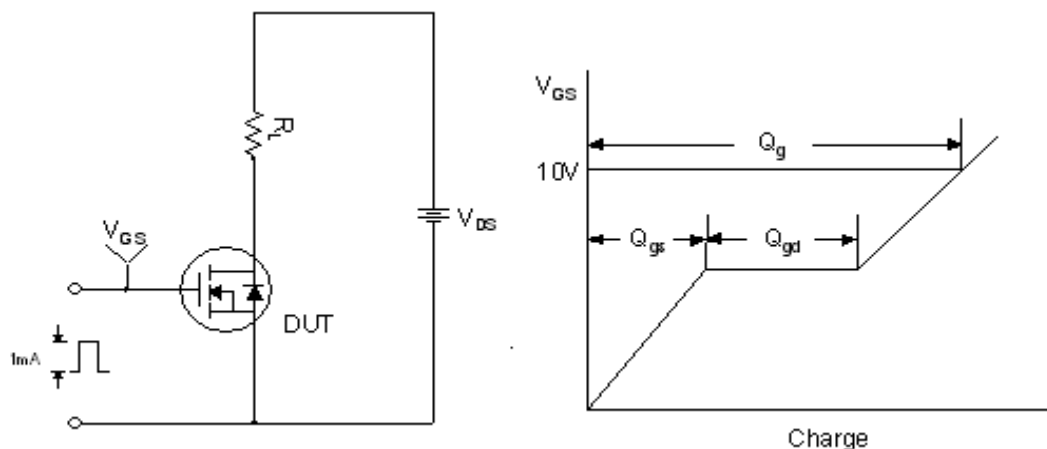


## Typical Performance Characteristics

Figure 12. Transient Thermal Response Curve



Gate Charge Test Circuit & Waveform



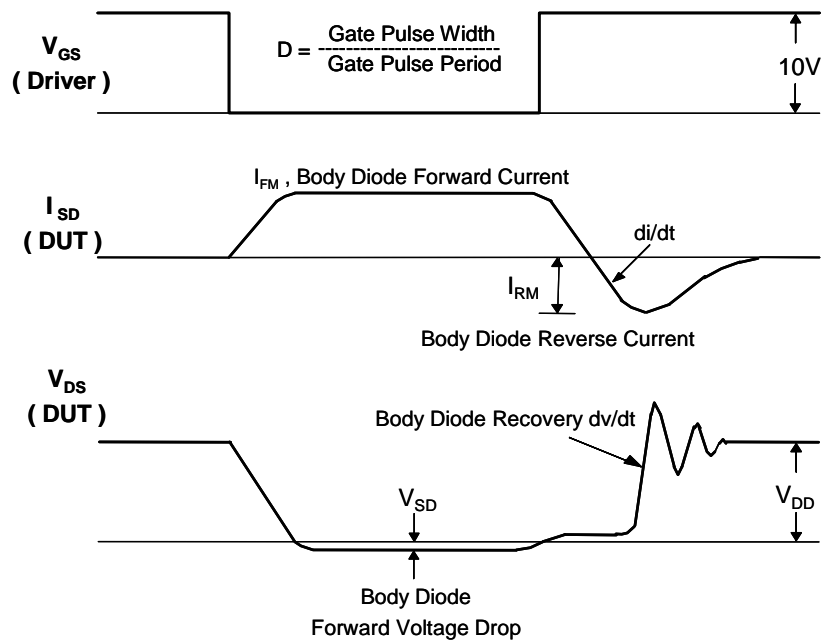
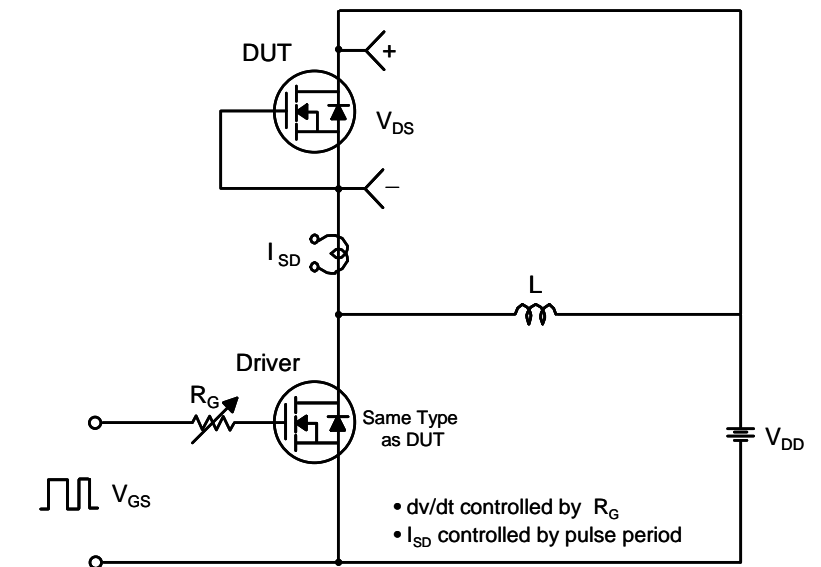
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

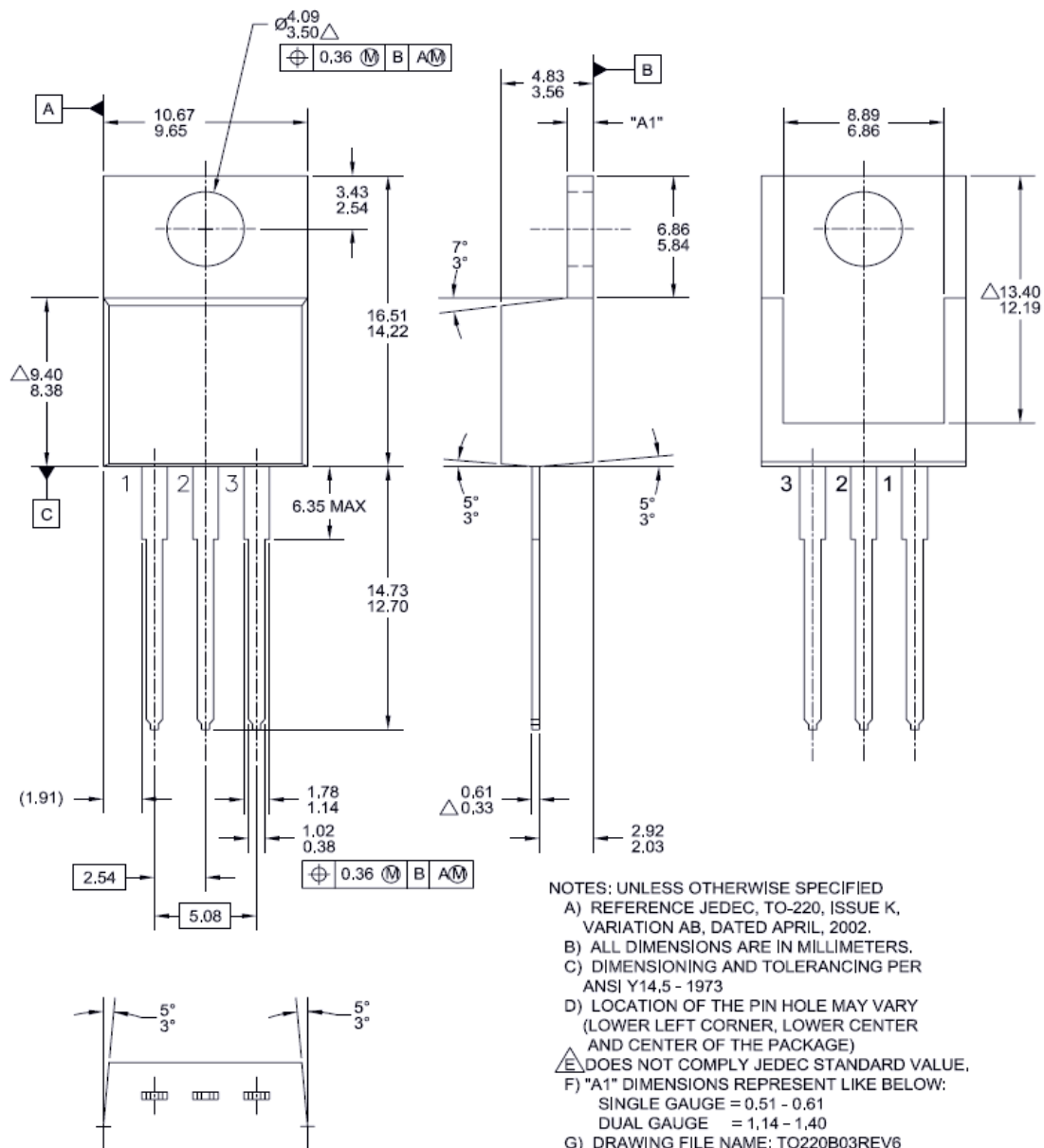


# Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

## TO-220B03







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