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# FDP8440

## N-Channel PowerTrench® MOSFET

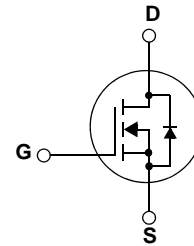
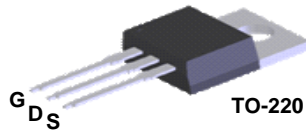
40 V, 277 A, 2.2 mΩ

### Features

- $R_{DS(on)} = 1.64 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- $Q_{g(tot)} = 345 \text{ nC}$  (Typ.) @  $V_{GS} = 10 \text{ V}$
- Low Miller Charge
- Low  $Q_{rr}$  Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant

### Applications

- Power Tools
- Motor Drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit



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

Symbol	Parameter		FDP8440	Unit
V <sub>DSS</sub>	Drain to Source Voltage		40	V
V <sub>GSS</sub>	Gate to Source Voltage		±20	V
I <sub>D</sub>	Drain Current	- Continuous (T <sub>C</sub> = 25°C, Silicon Limited) - Continuous (T <sub>C</sub> = 100°C, Silicon Limited) - Continuous (T <sub>C</sub> = 25°C, Package Limited)	277* 196* 100	A
I <sub>DM</sub>	Drain Current	- Pulsed (Note 1)	500	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)		1682	mJ
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C) - Derate above 25°C	306	W
			2.04	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +175	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

\*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 100A.

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.49	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink (Typ.)	0.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8440	FDP8440	TO-220	N/A	N/A	50units

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Off Characteristics							
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	40	--	--	V	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32V	--	--	1	μA	
		V <sub>GS</sub> = 0V      T <sub>C</sub> = 150°C	--	--	250	μA	
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>GS</sub> = ±20V	--	--	±100	nA	
On Characteristics							
V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1	--	3	V	
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 80A	--	1.88	2.4	mΩ	
		V <sub>GS</sub> = 10V, I <sub>D</sub> = 80A	--	1.64	2.2		
		V <sub>GS</sub> = 10V, I <sub>D</sub> = 80A, T <sub>C</sub> = 175°C	--	3.00	4.4		
Dynamic Characteristics							
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	--	18600	24740	pF	
C <sub>oss</sub>	Output Capacitance		--	1840	2450	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	1400	2100	pF	
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0.5V, f = 1MHz	--	1.1	--	Ω	
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 0V to 10V	V <sub>DD</sub> = 20V I <sub>D</sub> = 80A I <sub>g</sub> = 1.0mA	--	345	450	nC
Q <sub>g(2)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 0V to 2V		--	32.5	--	nC
Q <sub>gs</sub>	Gate to Source Gate Charge			--	49	--	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau			--	16.5	--	nC
Q <sub>gd</sub>	Gate to Drain “Miller” Charge			--	74	--	nC
Switching Characteristics (V <sub>GS</sub> = 10V)							
t <sub>ON</sub>	Turn-On Time	V <sub>DD</sub> = 20V, I <sub>D</sub> = 80A V <sub>GS</sub> = 10V, R <sub>GEN</sub> = 7Ω	--	175	360	ns	
t <sub>d(on)</sub>	Turn-On Delay Time		--	43	95	ns	
t <sub>r</sub>	Rise Time		--	130	275	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time		--	435	875	ns	
t <sub>f</sub>	Fall Time		--	290	590	ns	
t <sub>OFF</sub>	Turn-Off Time		--	730	1470	ns	
Drain-Source Diode Characteristics and Maximum Ratings							
V <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 80A	--	--	1.25	V	
		I <sub>SD</sub> = 40A	--	--	1.0	V	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 75A, dI <sub>SD</sub> /dt = 100A/μs	--	59	--	ns	
Q <sub>RR</sub>	Reverse Recovery Charge	I <sub>SD</sub> = 75A, dI <sub>SD</sub> /dt = 100A/μs	--	77	--	nC	

### NOTES:

1: Pulse width limited by maximum junction temperature.

2: Starting T<sub>J</sub> = 25°C, L = 1mH, I<sub>AS</sub> = 58A, V<sub>DD</sub> = 36V, V<sub>GS</sub> = 10V.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

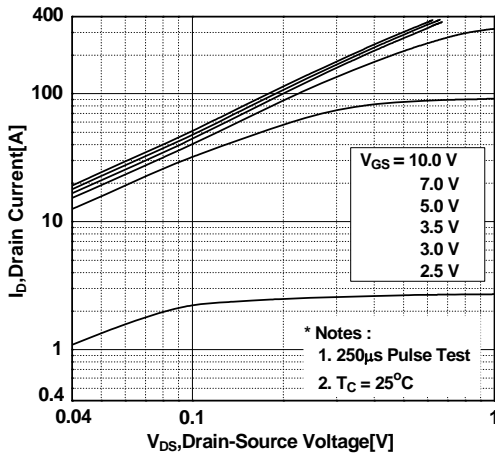


Figure 2. Transfer Characteristics

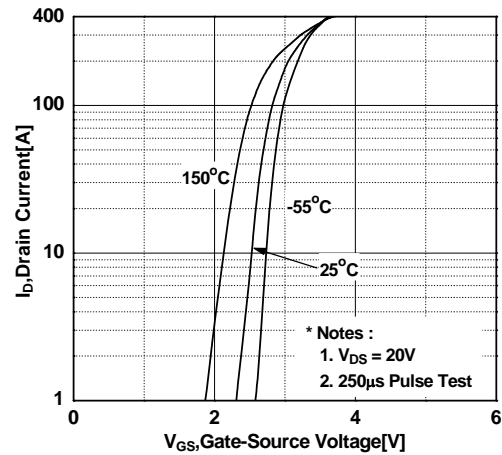


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

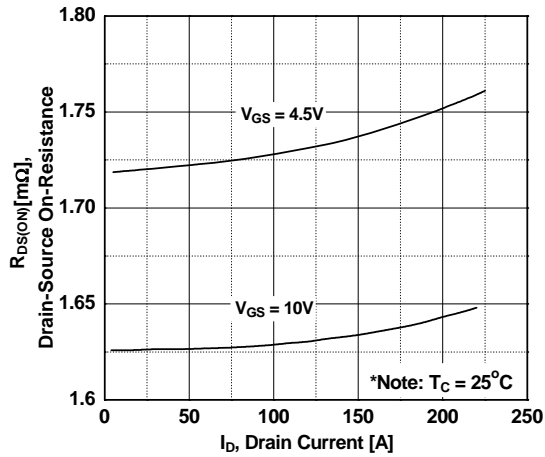


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

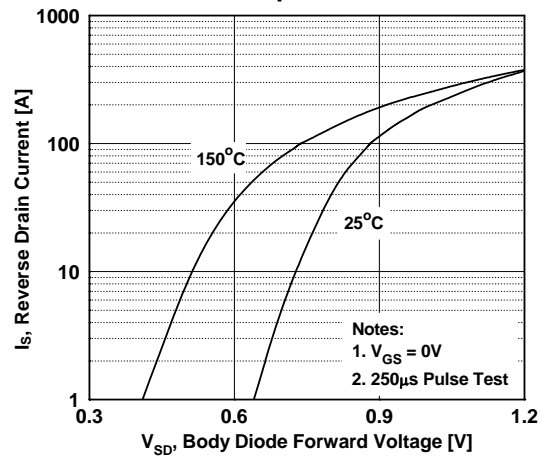


Figure 5. Capacitance Characteristics

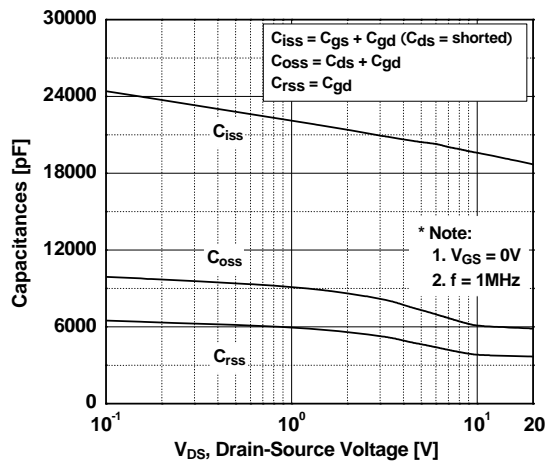
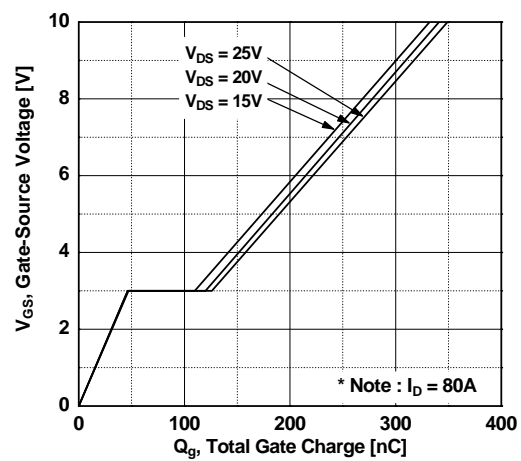


Figure 6. Gate Charge Characteristics



# Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

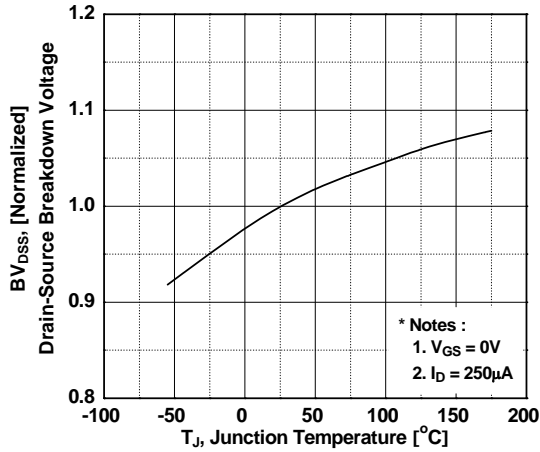


Figure 8. On-Resistance Variation vs. Temperature

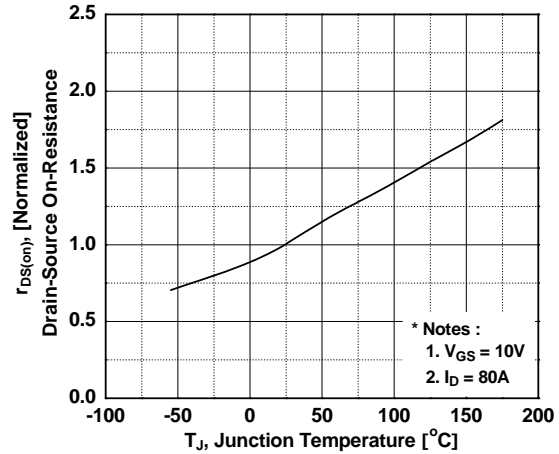


Figure 9. Unclamped Inductive Switching Capability

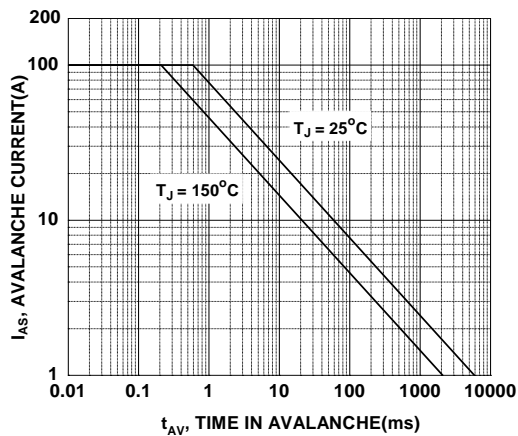


Figure 10. Safe Operating Area

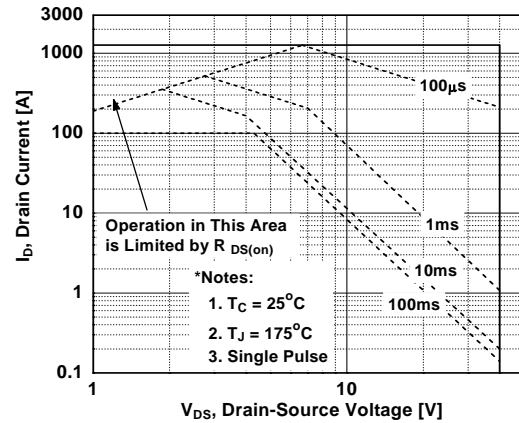
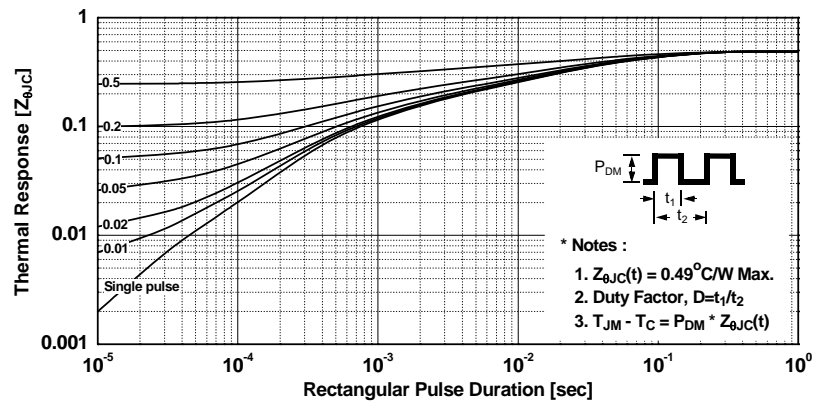


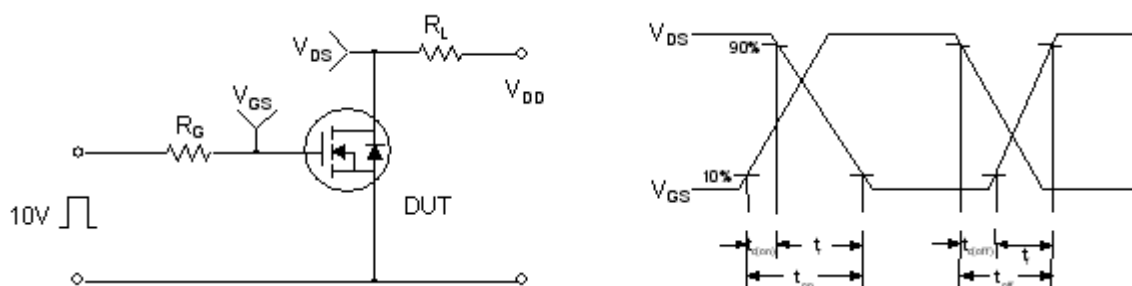
Figure 11. Transient Thermal Response Curve



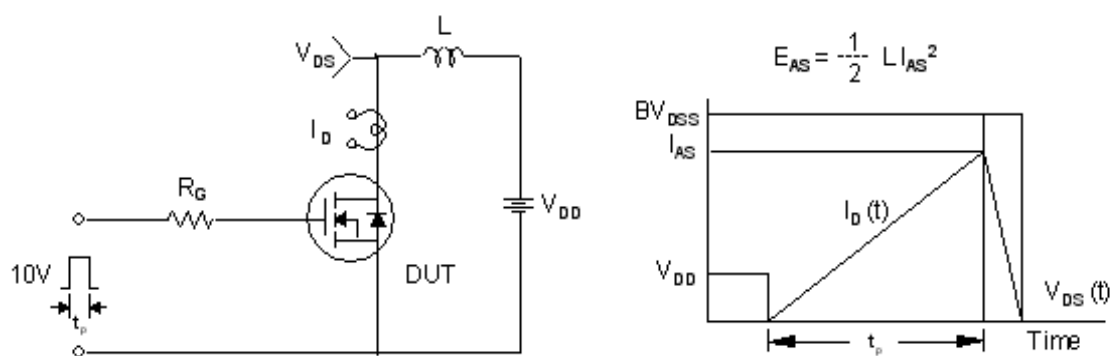
Gate Charge Test Circuit &amp; Waveform



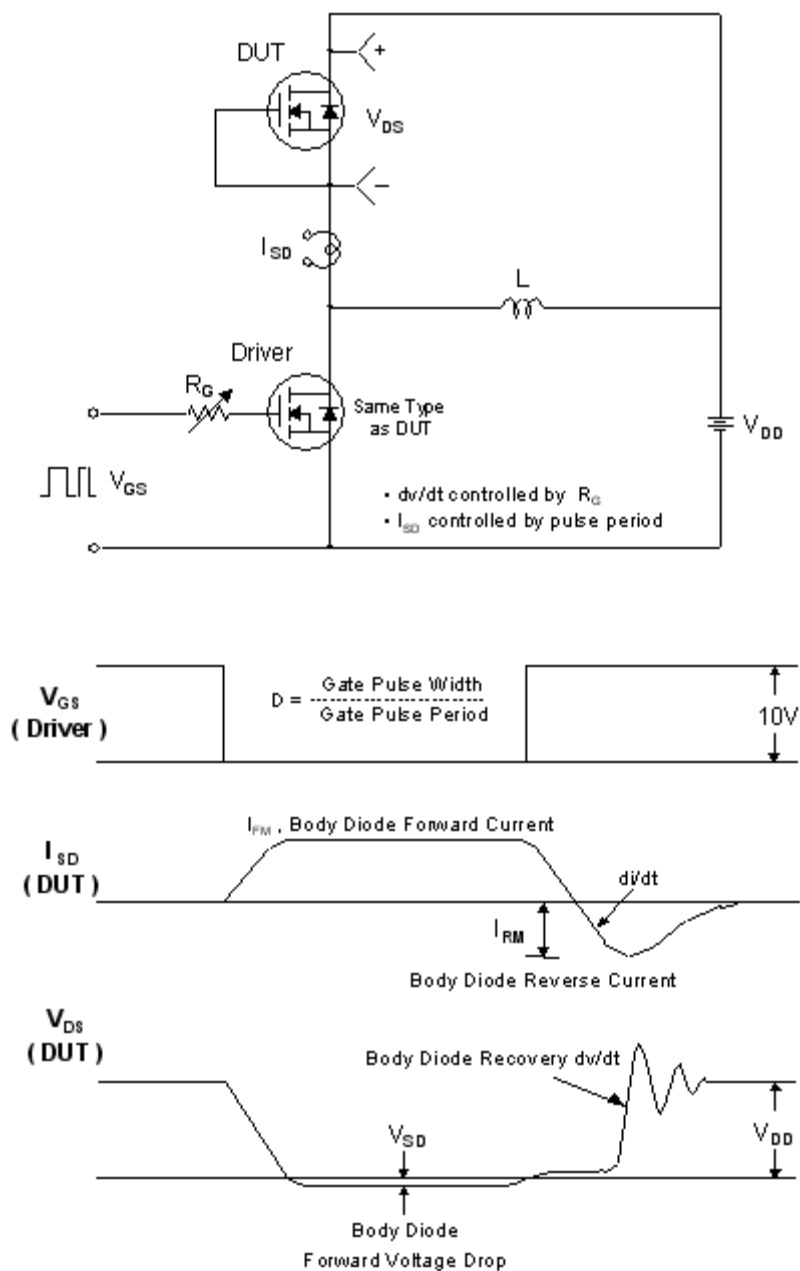
Resistive Switching Test Circuit &amp; Waveforms



Unclamped Inductive Switching Test Circuit &amp; Waveforms

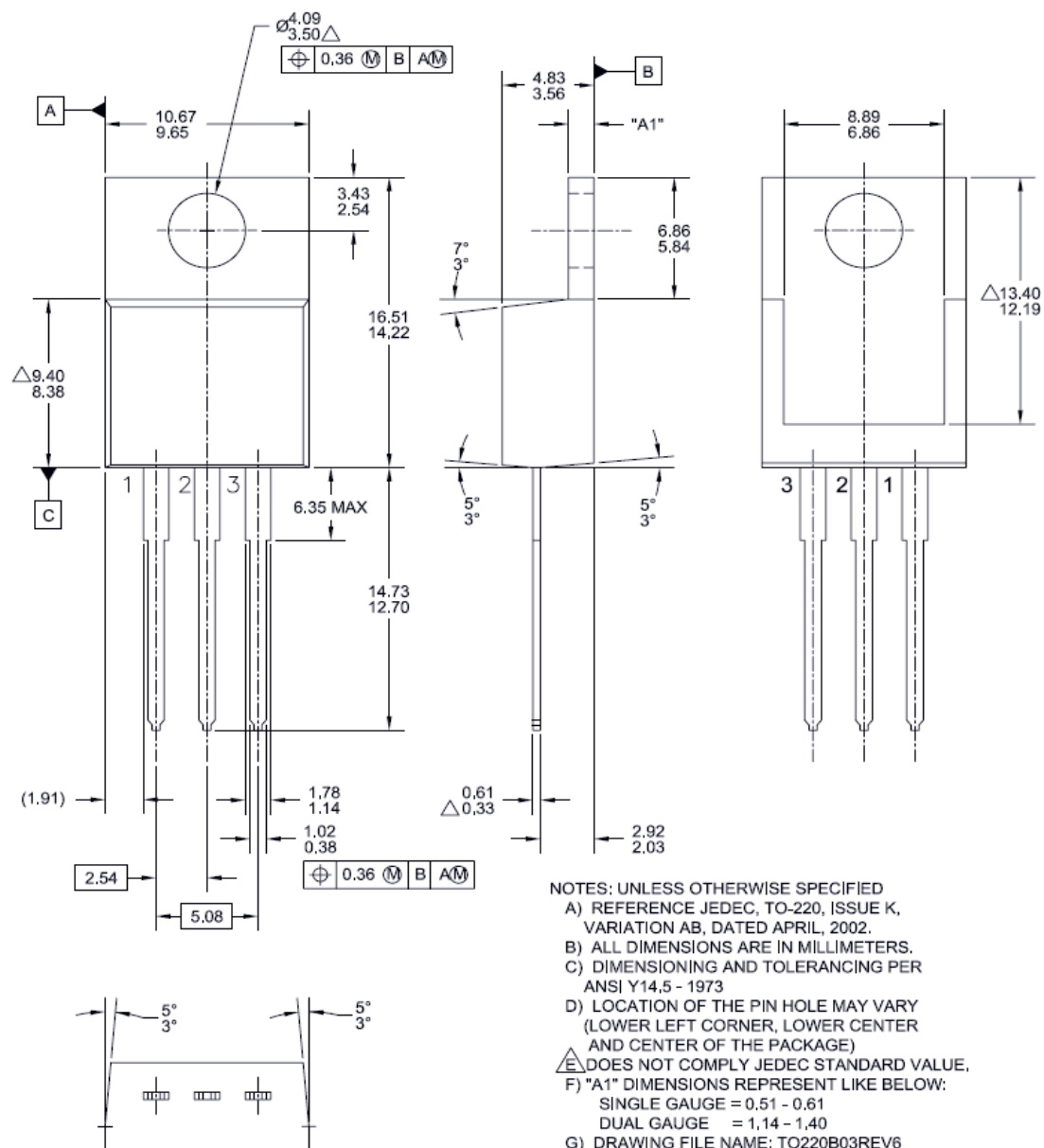


# Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

## TO-220B03







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