



May 2008

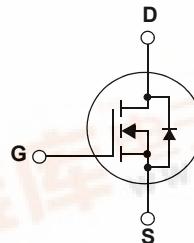
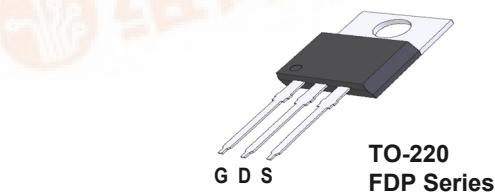
# FDP3205

## N-Channel PowerTrench® MOSFET

55V, 100A, 7.5mΩ

### Features

- $R_{DS(on)} = 6.1\text{m}\Omega$  (Typ.) @  $V_{GS} = 10\text{V}$ ,  $I_D = 59\text{A}$
- High performance trench technology for extremely low  $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant



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

Symbol	Parameter		Ratings	Units
$V_{DSS}$	Drain to Source Voltage		55	V
$V_{GSS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	100	A
$I_{DM}$	Drain Current	-Pulsed	390	A
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	365	mJ
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	150	W
		-Derate above $25^\circ\text{C}$	1.0	$\text{W}/^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.0	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

## Package Marking and Ordering Information $T_C = 25^\circ\text{C}$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP3205	FDP3205	TO-220	-	-	50units

## Electrical Characteristics

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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	55	-	-	V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 44\text{V}, V_{GS} = 0\text{V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 44\text{V}, T_C = 150^\circ\text{C}$	-	-	250	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	3.5	-	5.5	V
$R_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 59\text{A}$	-	6.1	7.5	$\text{m}\Omega$
		$V_{GS} = 10\text{V}, I_D = 59\text{A}$ $T_J = 175^\circ\text{C}$	-	12	-	

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$	-	5810	7730	pF
$C_{oss}$	Output Capacitance	$f = 1\text{MHz}$	-	460	610	pF
$C_{rss}$	Reverse Transfer Capacitance		-	230	345	pF
$R_G$	Gate Resistance	$V_{GS} = 0\text{V}, f = 1\text{MHz}$	3	4	5	$\Omega$
$Q_g(\text{tot})$	Total Gate Charge at 10V	$V_{GS} = 0\text{V to } 10\text{V}$	-	93	120	nC
$Q_g(\text{th})$	Threshold Gate Charge	$V_{GS} = 0\text{V to } 2\text{V}$	-	25.5	33	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DS} = 44\text{V}$ $I_D = 59\text{A}$ $I_g = 1\text{mA}$	-	35	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	9.5	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	32	-	nC

### Switching Characteristics

$t_{ON}$	Turn-On Time	$V_{DD} = 28\text{V}, I_D = 59\text{A}$ $V_{GS} = 10\text{V}, R_{\text{GEN}} = 2.5\Omega$	-	170	350	ns
$t_{d(on)}$	Turn-On Delay Time		-	23	56	ns
$t_f$	Turn-On Rise Time		-	147	305	ns
$t_{d(off)}$	Turn-Off Delay Time		-	42	94	ns
$t_f$	Turn-Off Fall Time		-	18	46	ns
$t_{OFF}$	Turn-Off Time		-	60	130	ns

### Drain-Source Diode Characteristics

$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 59\text{A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 59\text{A}$	-	43.3	-	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt = 100\text{A}/\mu\text{s}$	-	70.8	-	nC

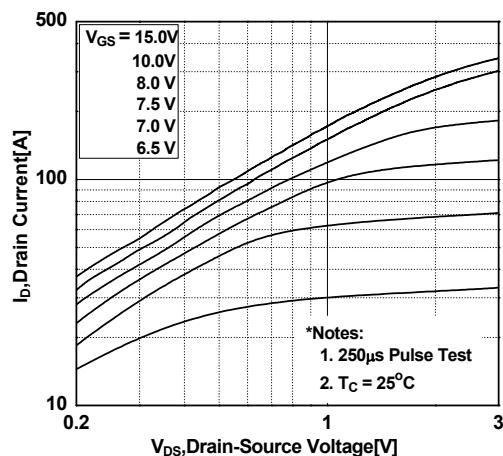
#### Notes:

1: Calculated continuous current based on maximum allowable junction temperature. Package limited to 75A continuous, see Figure 9.

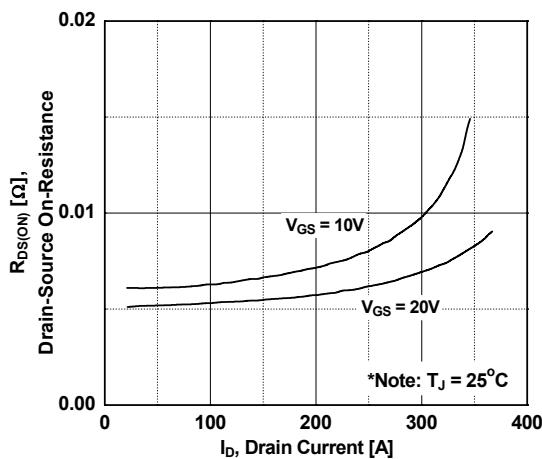
2:  $L = 0.21\text{mH}, I_{AS} = 59\text{A}, V_{DD} = 50\text{V}, V_{GS} = 10\text{V}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

## Typical Performance Characteristics

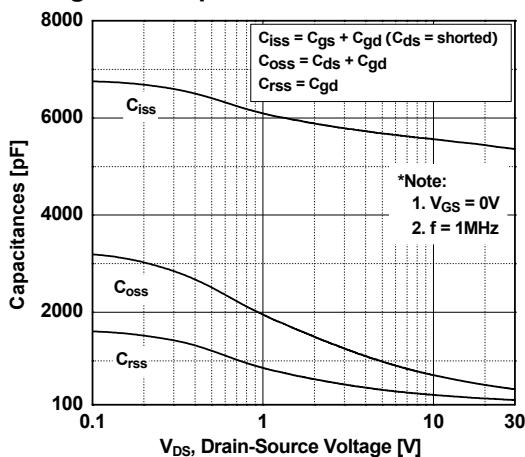
**Figure 1. On-Region Characteristics**



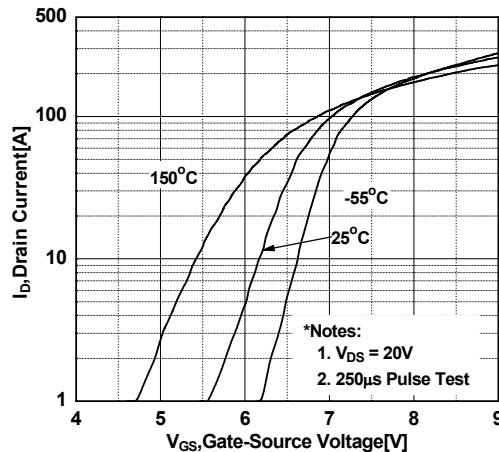
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



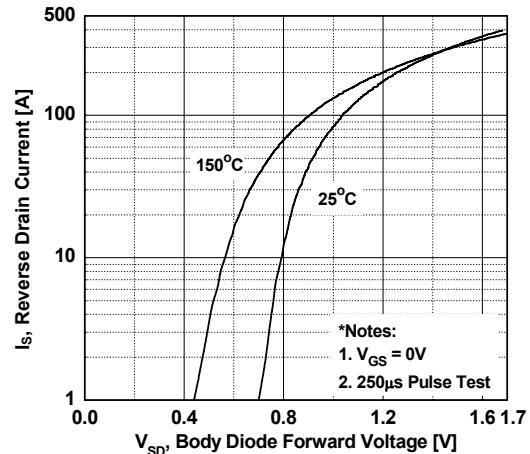
**Figure 5. Capacitance Characteristics**



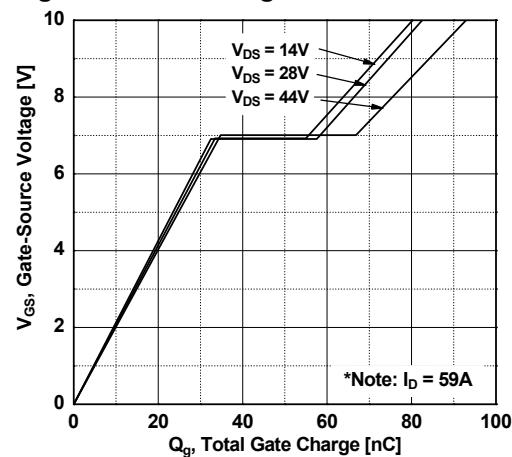
**Figure 2. Transfer Characteristics**



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

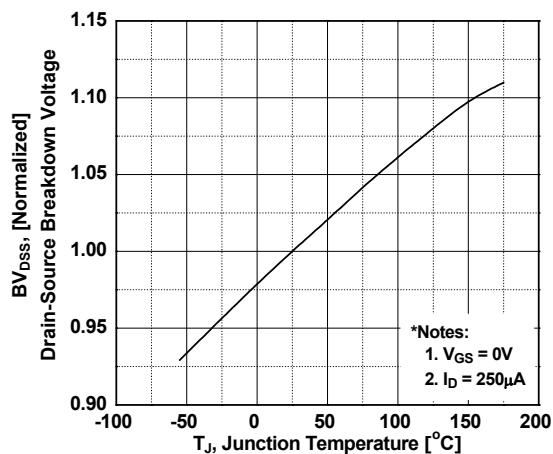


**Figure 6. Gate Charge Characteristics**

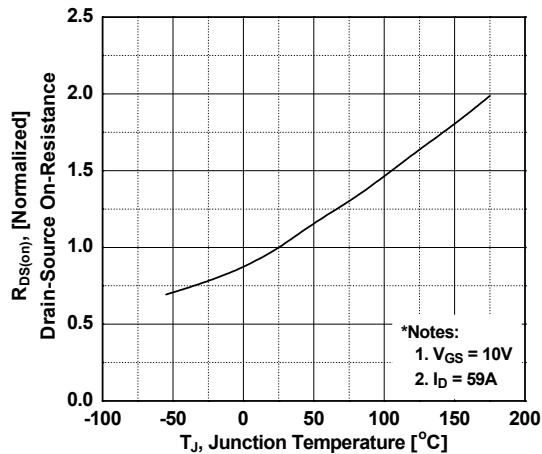


## Typical Performance Characteristics (Continued)

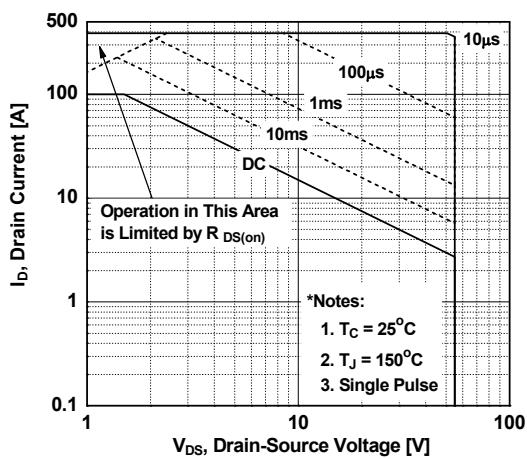
**Figure 7. Breakdown Voltage Variation vs. Temperature**



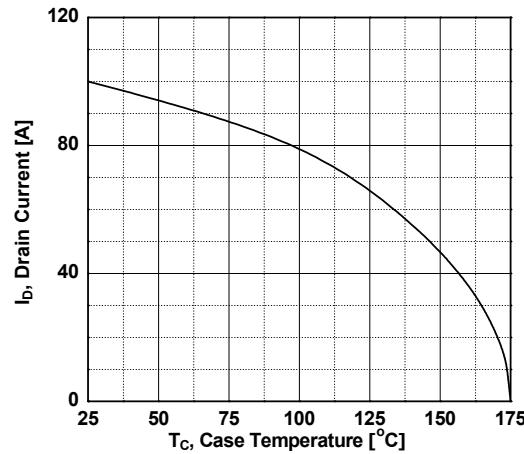
**Figure 8. On-Resistance Variation vs. Temperature**



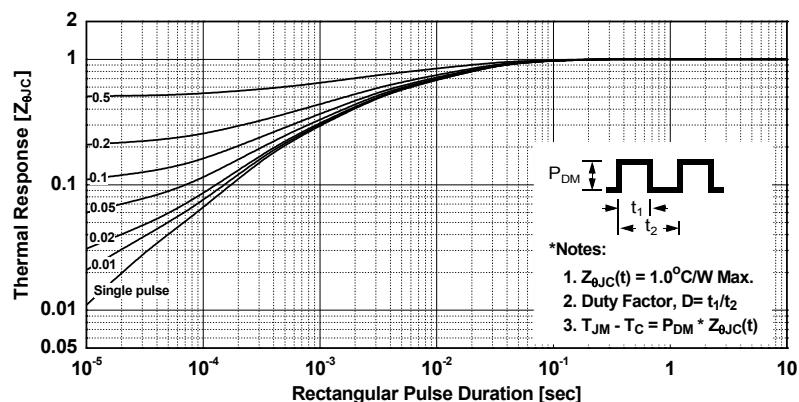
**Figure 9. Maximum Safe Operating Area**



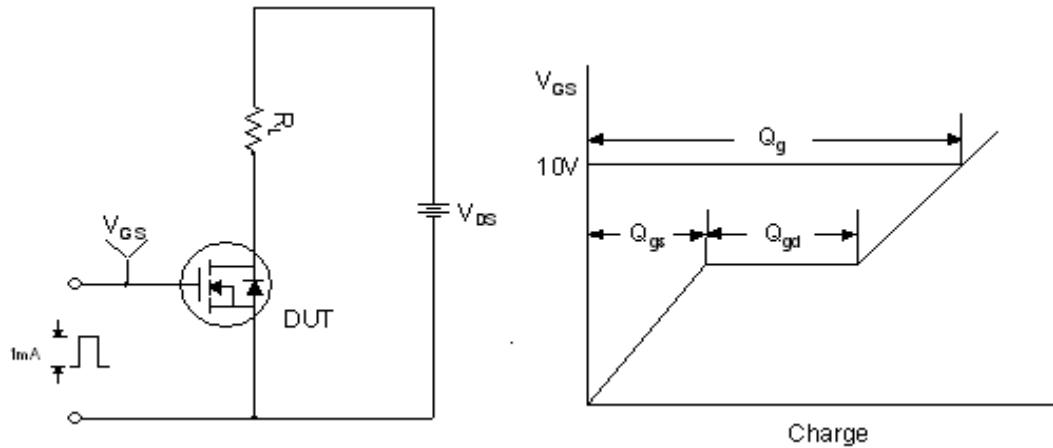
**Figure 10. Maximum Drain Current vs. Case Temperature**



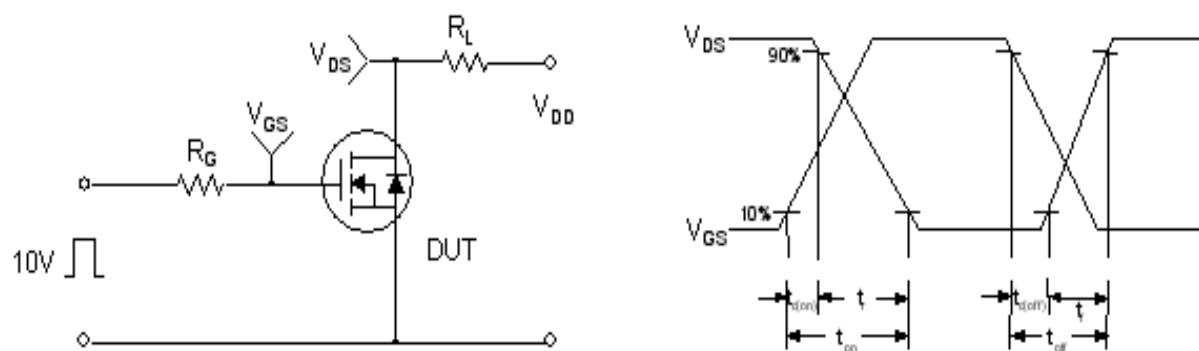
**Figure 11. Transient Thermal Response Curve**



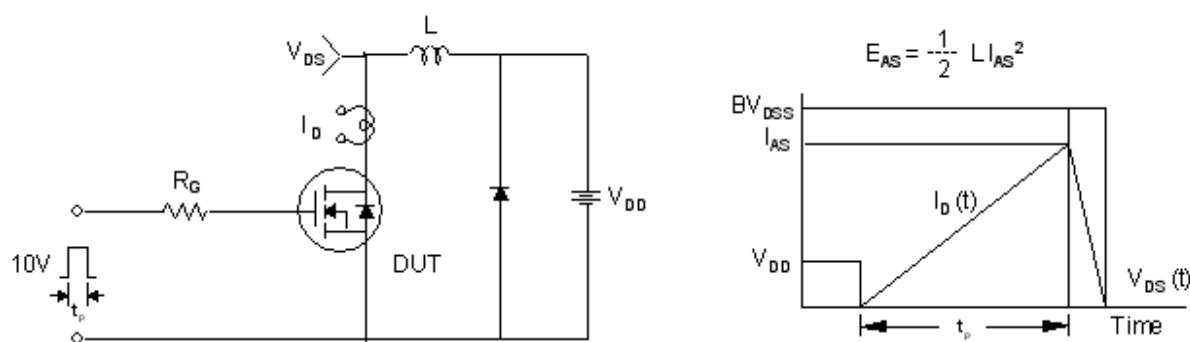
Gate Charge Test Circuit & Waveform



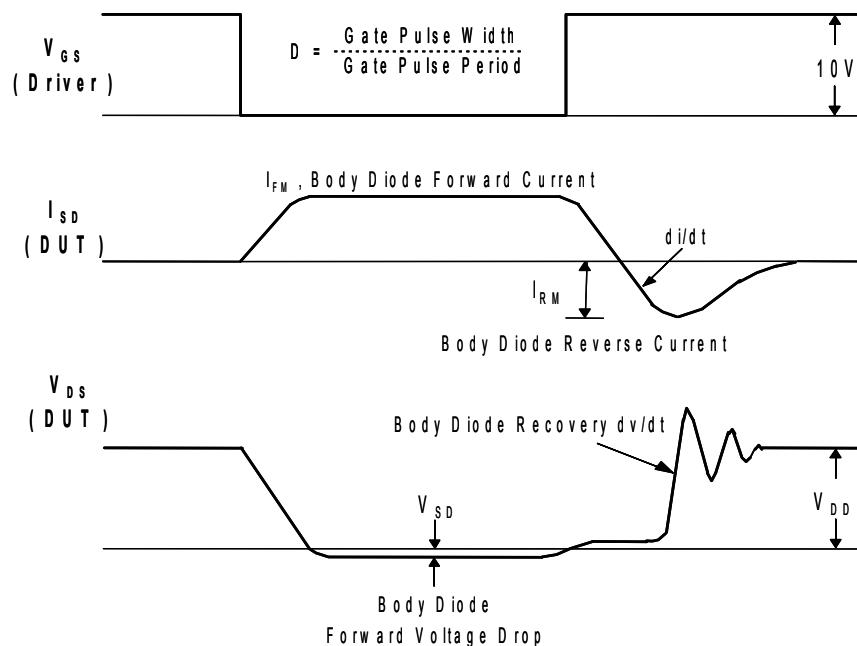
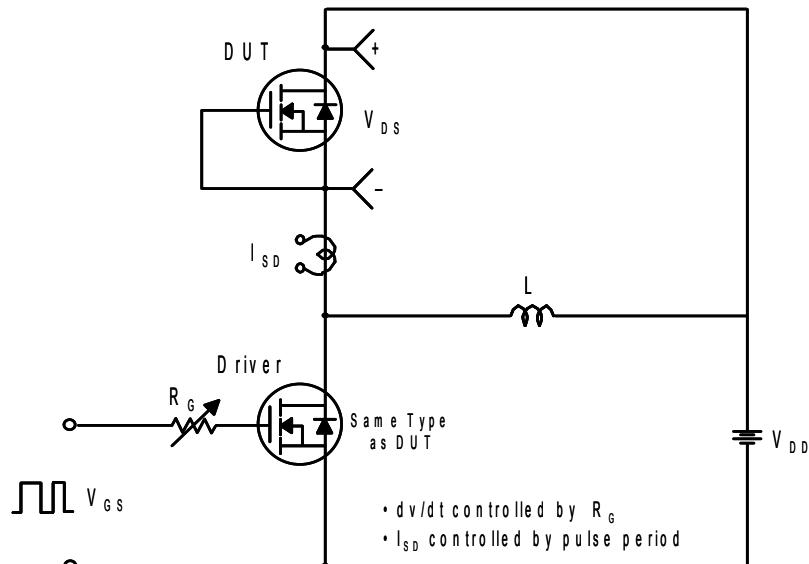
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

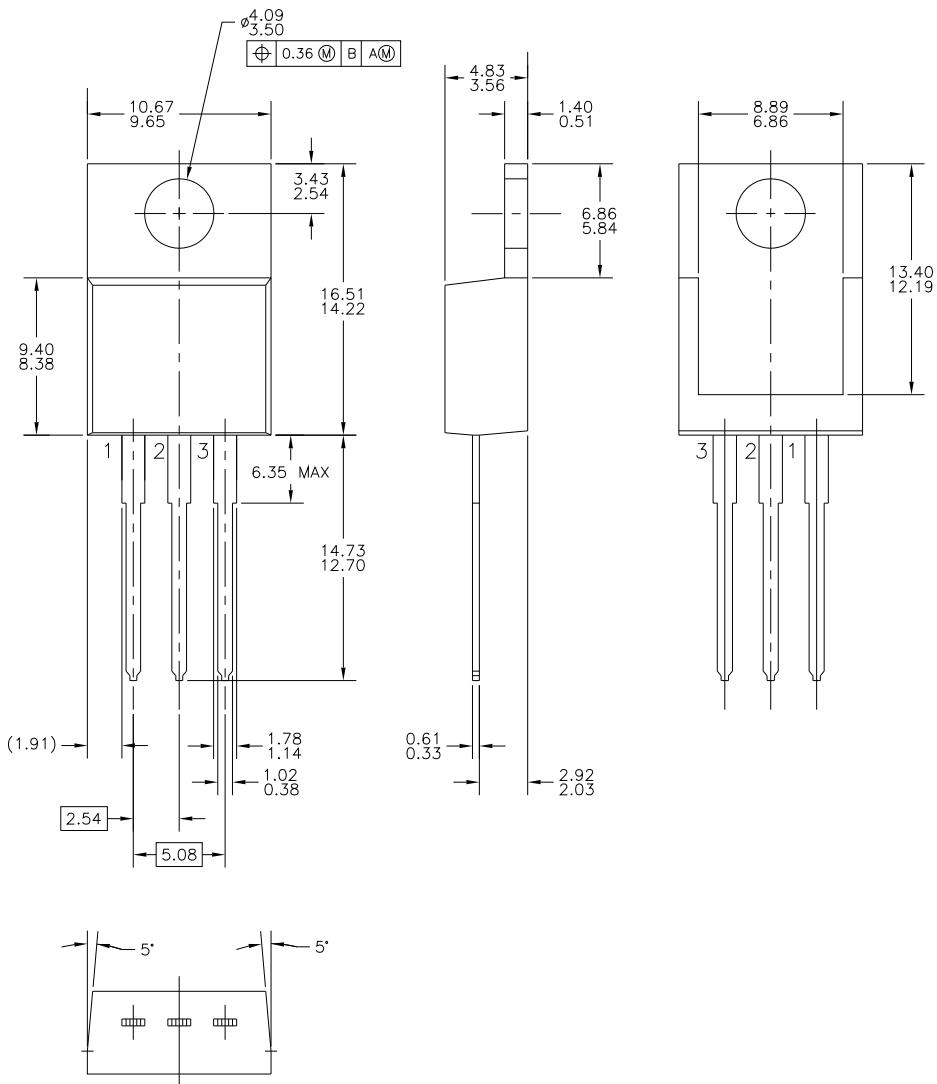


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

TO-220





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