

# FDP3205

## N-Channel PowerTrench® MOSFET

55V, 100A, 7.5mΩ

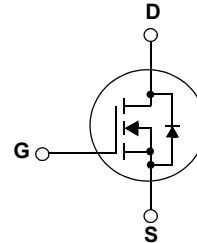
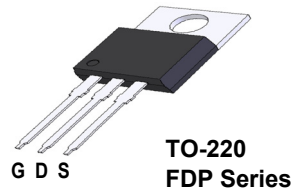
### Features

- $R_{DS(on)} = 6.1m\Omega$  (Typ.) @  $V_{GS} = 10V, I_D = 59A$
- 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 advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.



### MOSFET Maximum Ratings $T_C = 25^\circ C$ 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 ( $T_C = 25^\circ C$ ) (Note 1)	100	A
$I_{DM}$	Drain Current	- Pulsed	390	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)		365	mJ
$P_D$	Power Dissipation	( $T_C = 25^\circ C$ )	150	W
		- Derate above $25^\circ C$	1.0	W/ $^\circ C$
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +175	$^\circ C$

### Thermal Characteristics

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

$B_{V_{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	55	-	-	V
$I_{DSS}$	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**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	3.5	-	5.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 59\text{A}$	-	6.1	7.5	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	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	5810	7730	pF
$C_{oss}$	Output Capacitance		-	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	$\Omega$
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{GS} = 0\text{V to } 10\text{V}$	-	93	120	nC
$Q_{g(th)}$	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	$V_{DD} = 28\text{V}, I_D = 59\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 2.5\Omega$	-	170	350	ns
$t_{d(on)}$	Turn-On Delay Time		-	23	56	ns
$t_r$	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

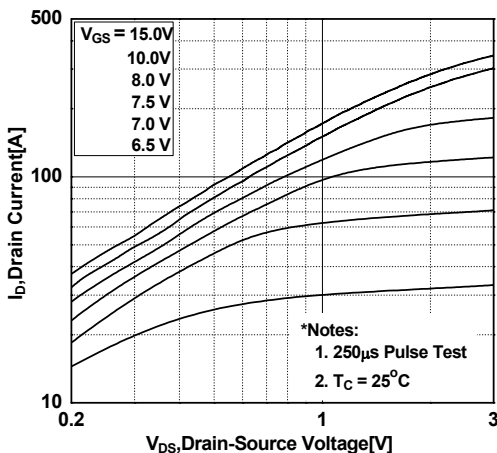


Figure 2. Transfer Characteristics

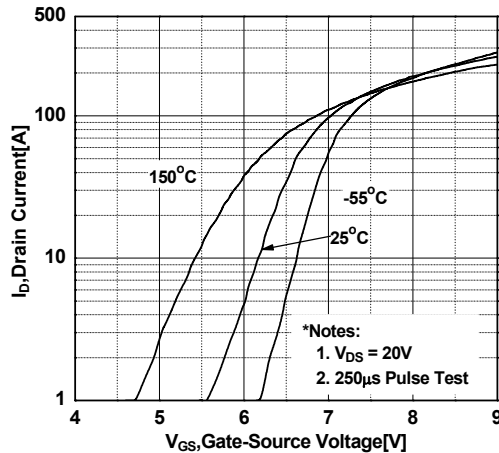


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

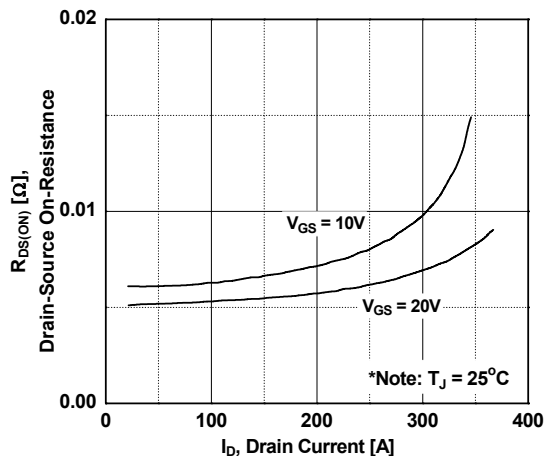


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

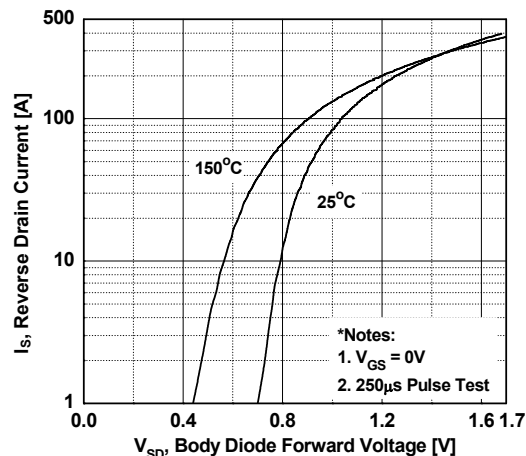


Figure 5. Capacitance Characteristics

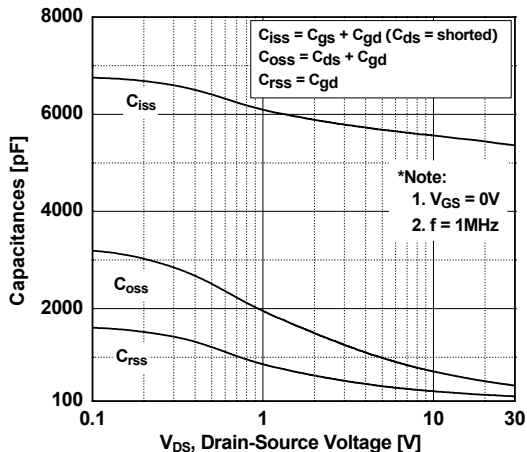
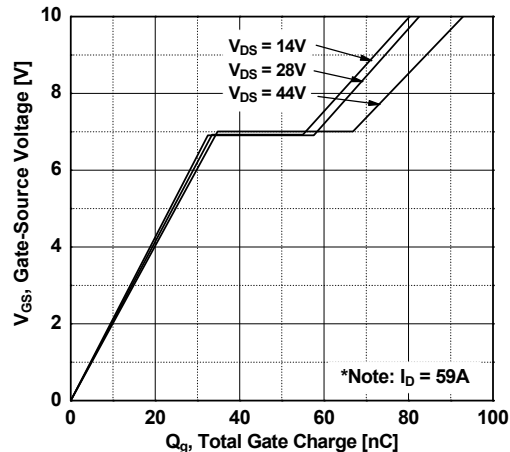


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

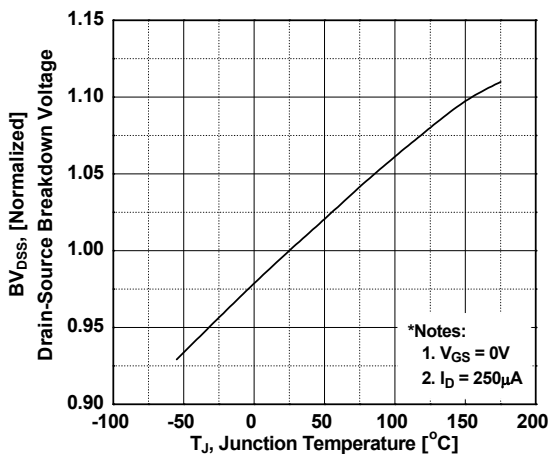


Figure 8. On-Resistance Variation vs. Temperature

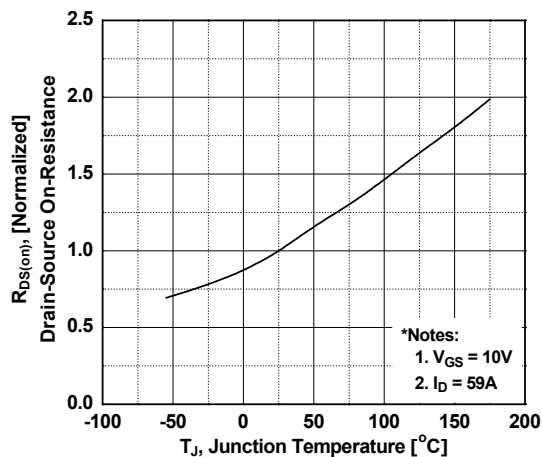


Figure 9. Maximum Safe Operating Area

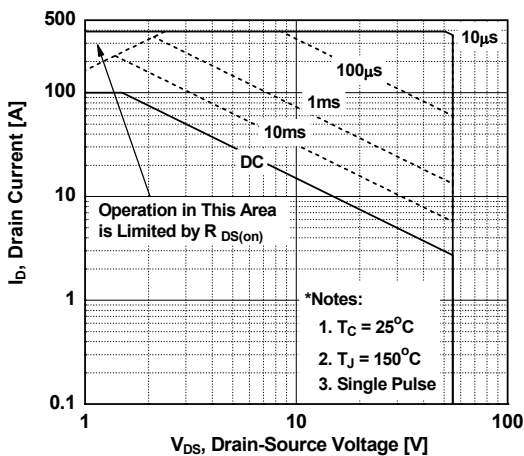


Figure 10. Maximum Drain Current vs. Case Temperature

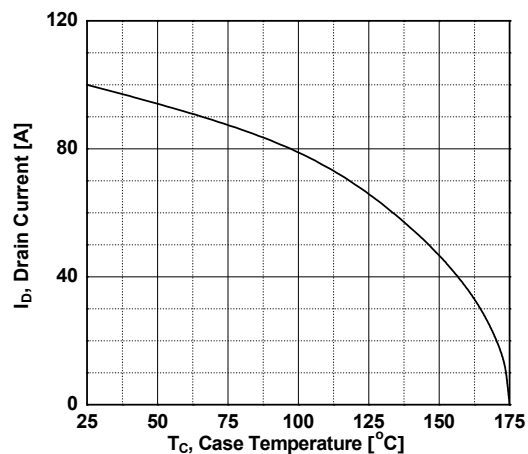
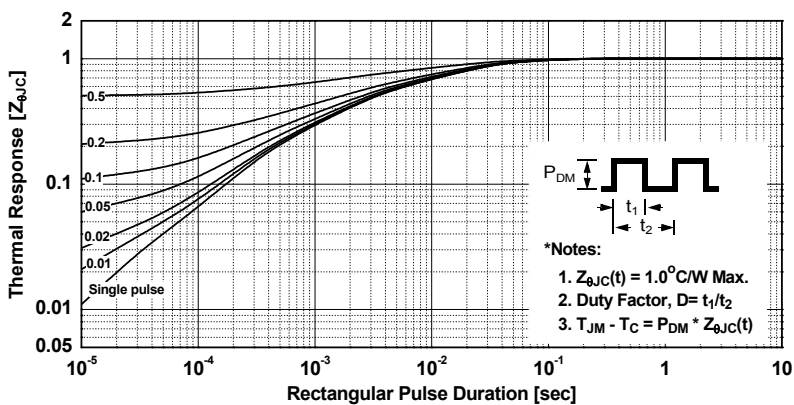
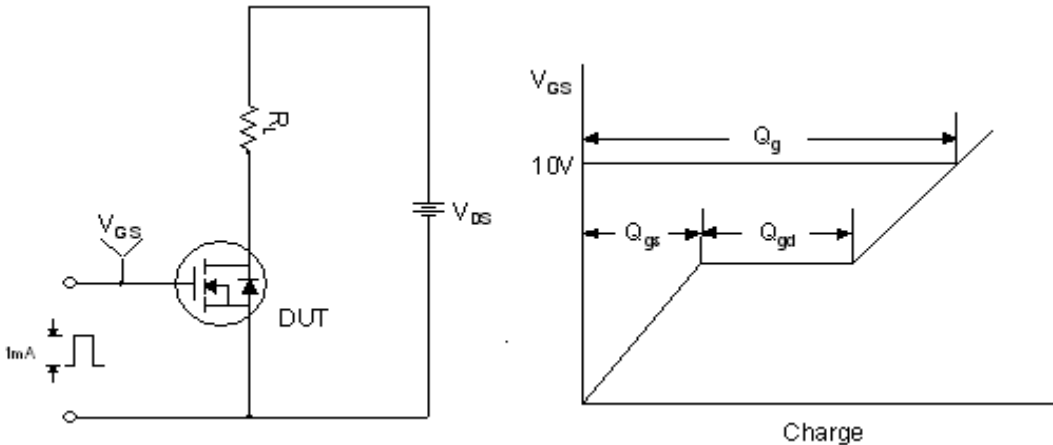


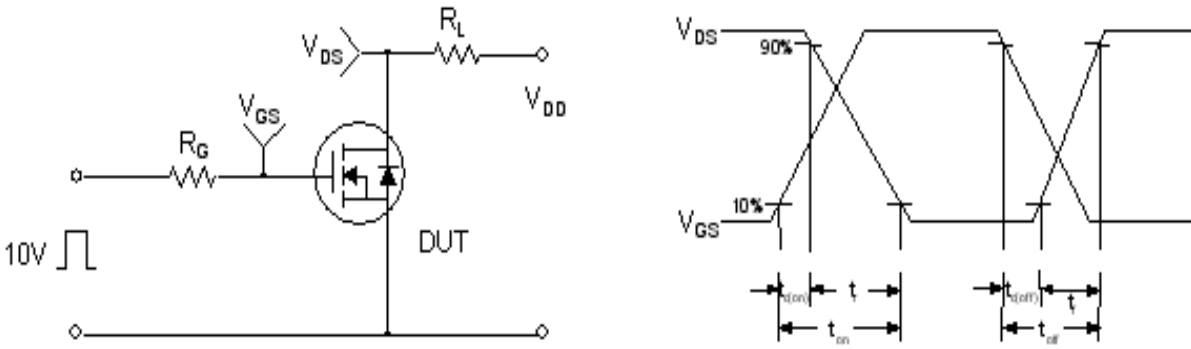
Figure 11. Transient Thermal Response Curve



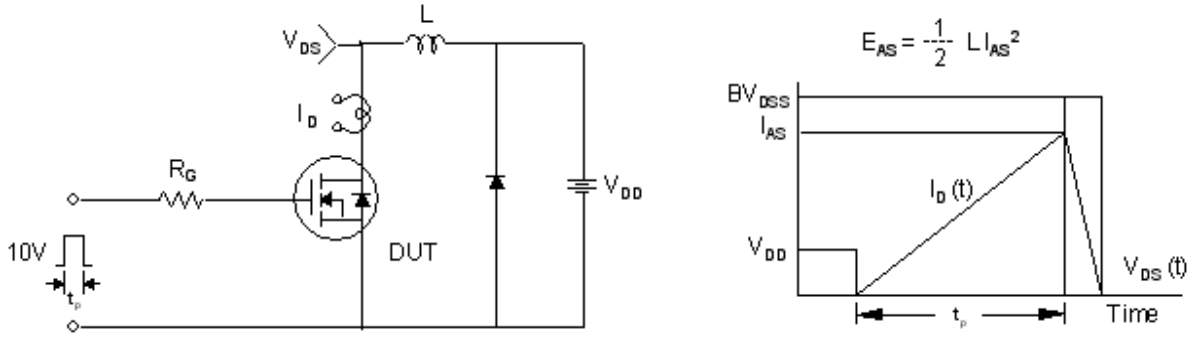
**Gate Charge Test Circuit & Waveform**



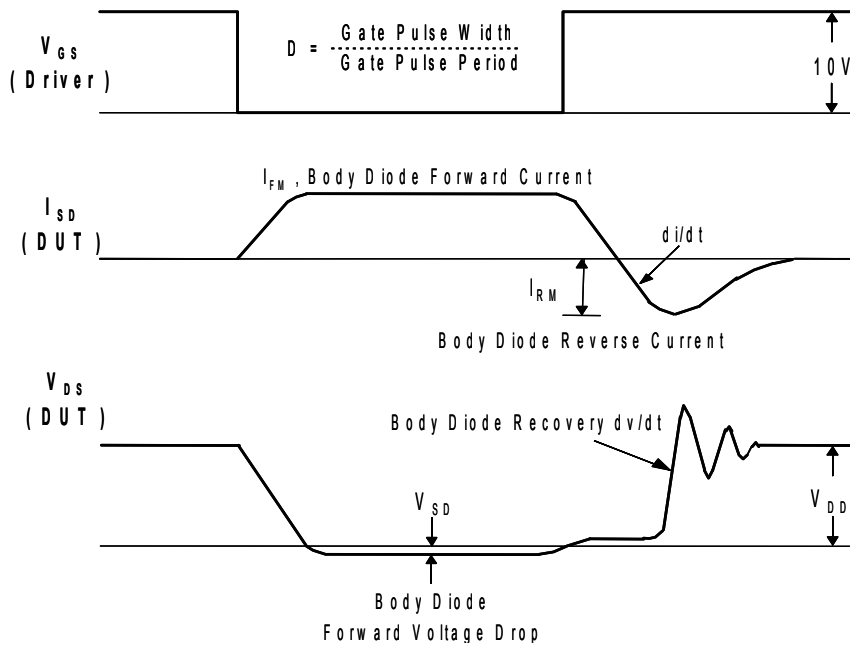
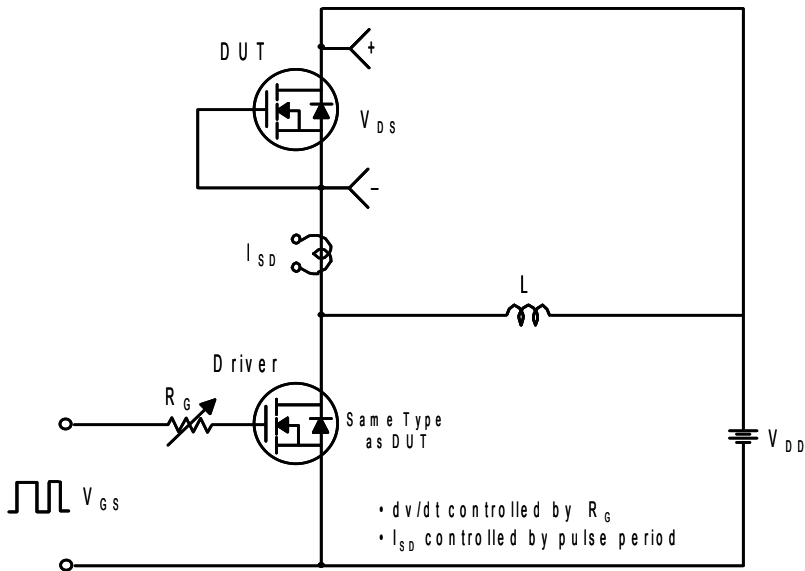
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

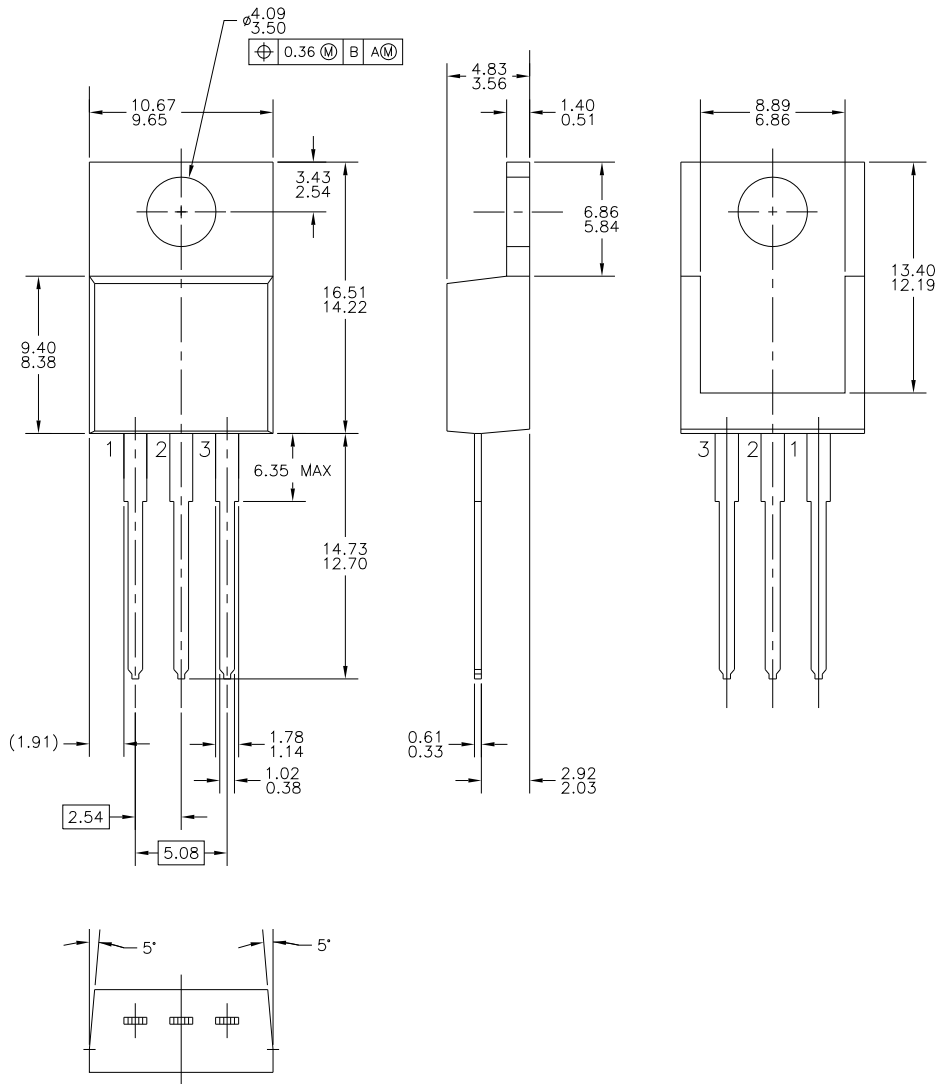


Peak Diode Recovery dv/dt Test Circuit & Waveforms



# Mechanical Dimensions

## TO-220







FDP3205 N-Channel PowerTrench® MOSFET



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