

FDP3205

N-Channel PowerTrench® MOSFET

55V, 100A, 7.5mΩ

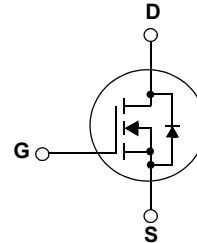
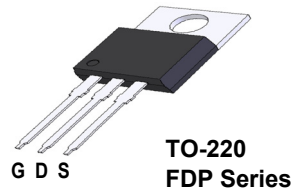
Features

- $R_{DS(on)} = 6.1m\Omega$ (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 | ± 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 |
|--------|-----------|-----------------|------|------|------|-------|
|--------|-----------|-----------------|------|------|------|-------|

Off Characteristics

| | | | | | | |
|------------|-----------------------------------|--|----|---|-----------|---------------|
| BV_{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 | μA |
| | | $V_{DS} = 44\text{V}, T_C = 150^\circ\text{C}$ | - | - | 250 | |
| I_{GSS} | Gate to Body Leakage Current | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ | - | - | ± 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 Ω |
| | | $V_{GS} = 10\text{V}, I_D = 59\text{A}$ $T_J = 175^\circ\text{C}$ | - | 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 | Ω |
| $Q_{g(tot)}$ | 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

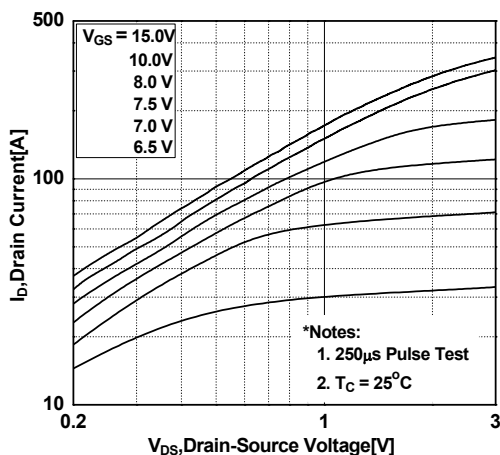


Figure 2. Transfer Characteristics

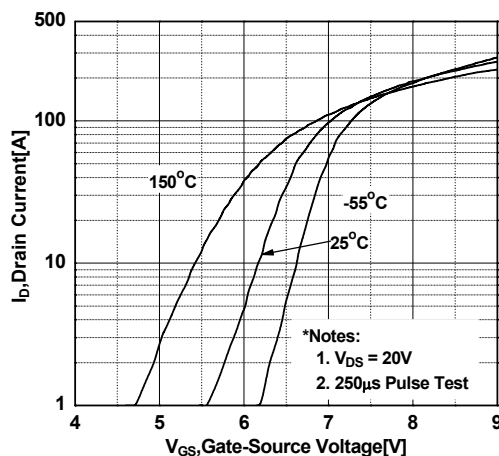


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

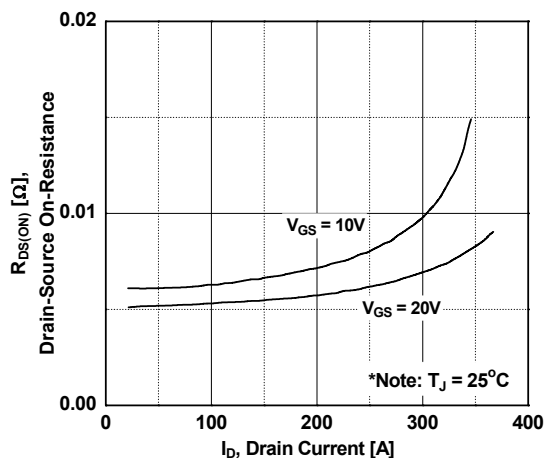


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

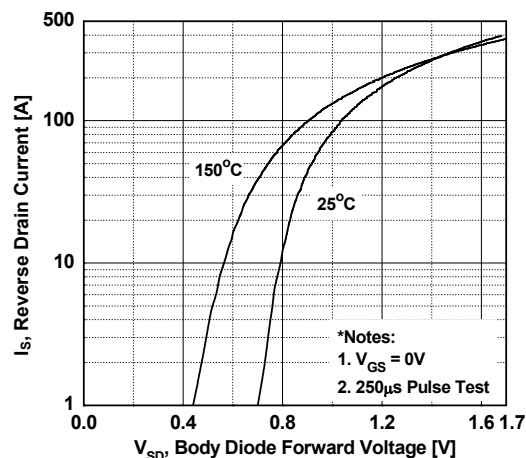


Figure 5. Capacitance Characteristics

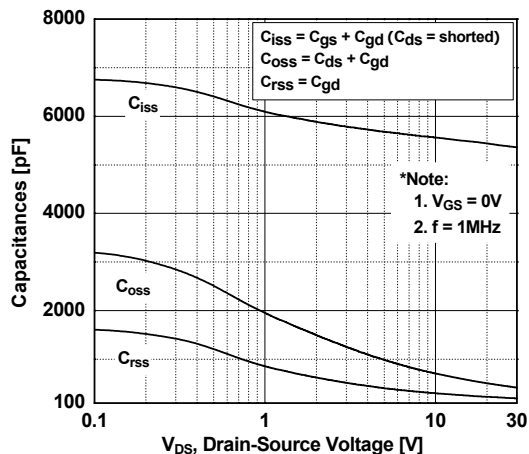
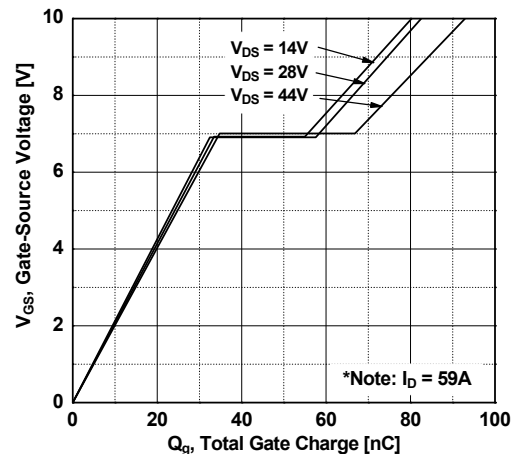


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

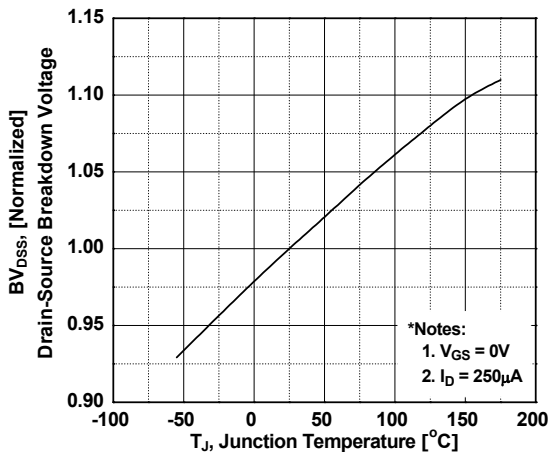


Figure 8. On-Resistance Variation vs. Temperature

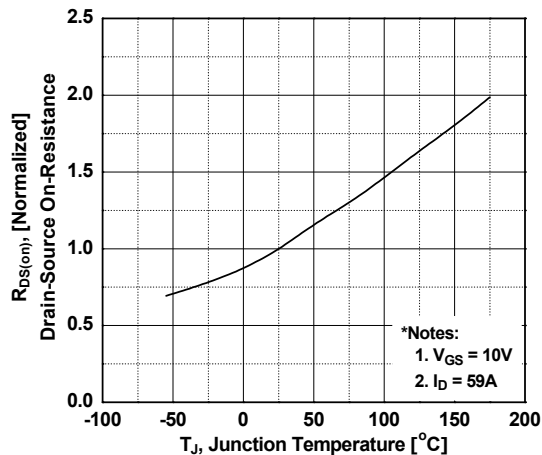


Figure 9. Maximum Safe Operating Area

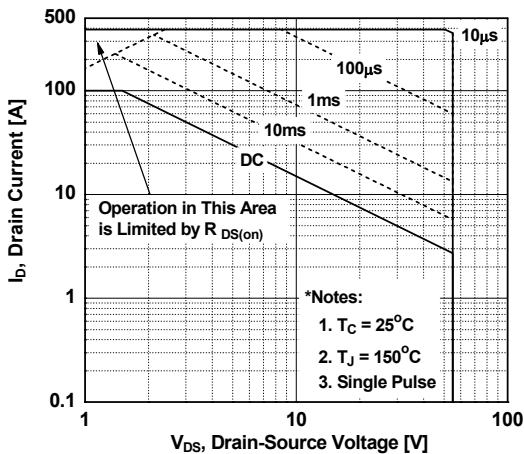


Figure 10. Maximum Drain Current vs. Case Temperature

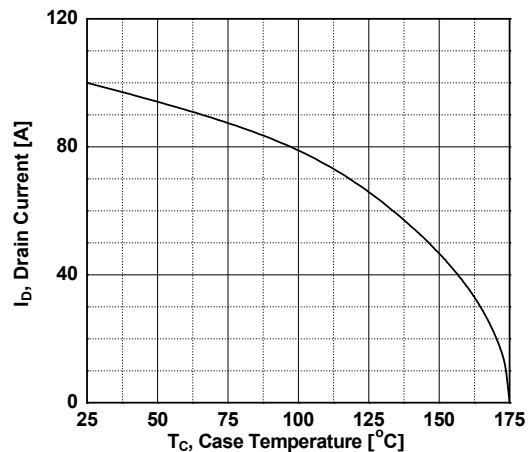
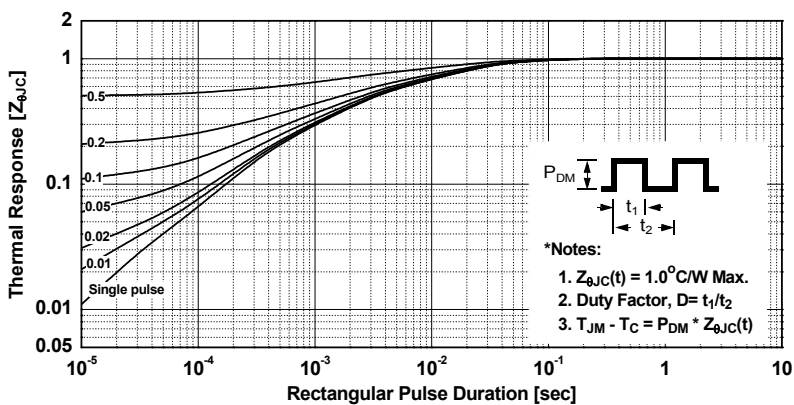
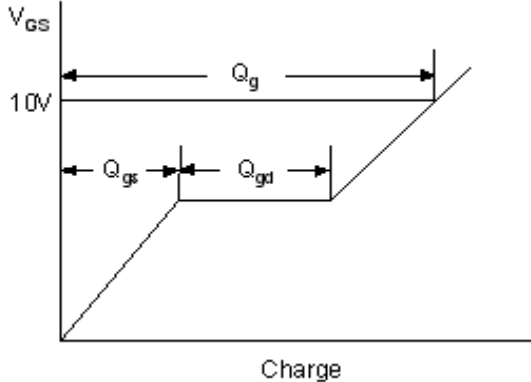
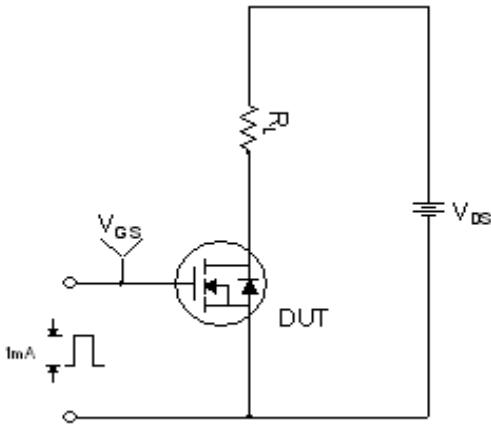


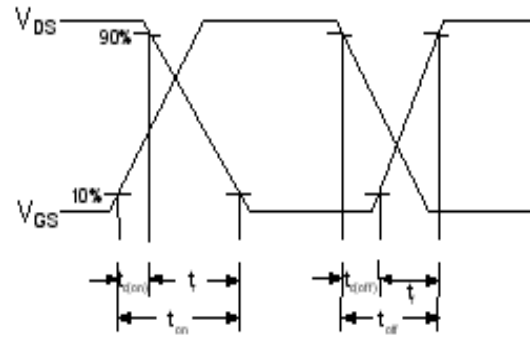
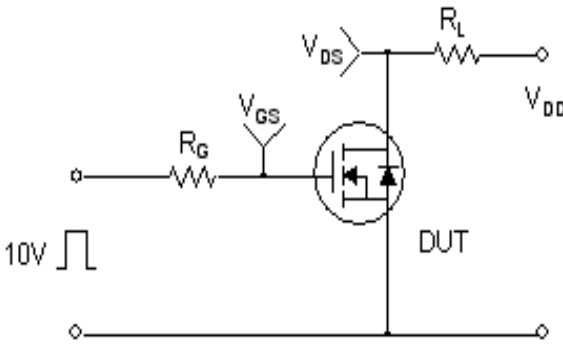
Figure 11. Transient Thermal Response Curve



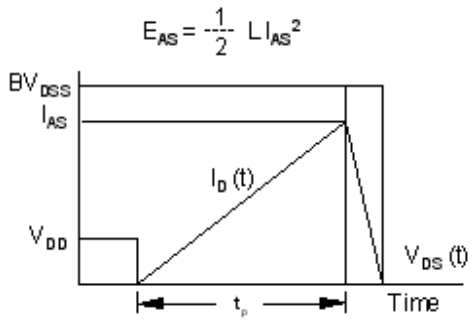
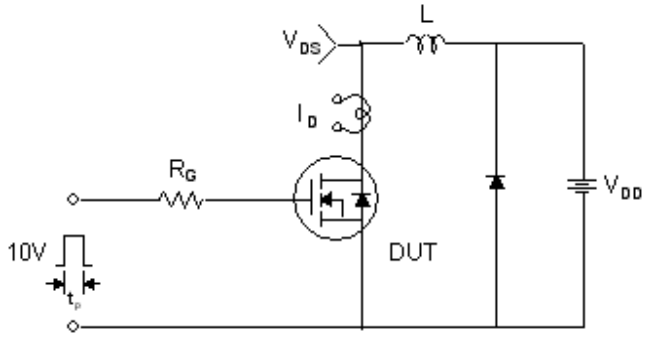
Gate Charge Test Circuit & Waveform



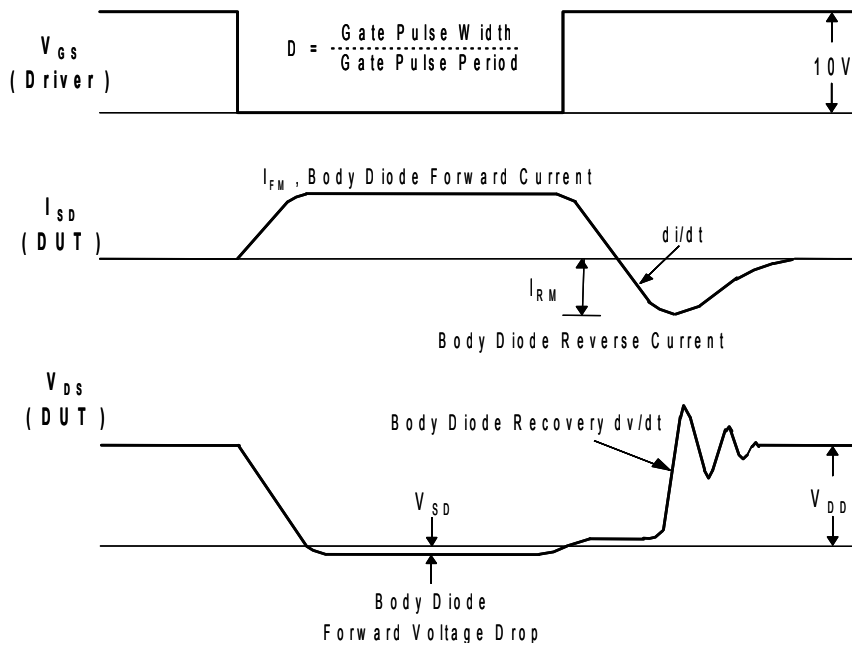
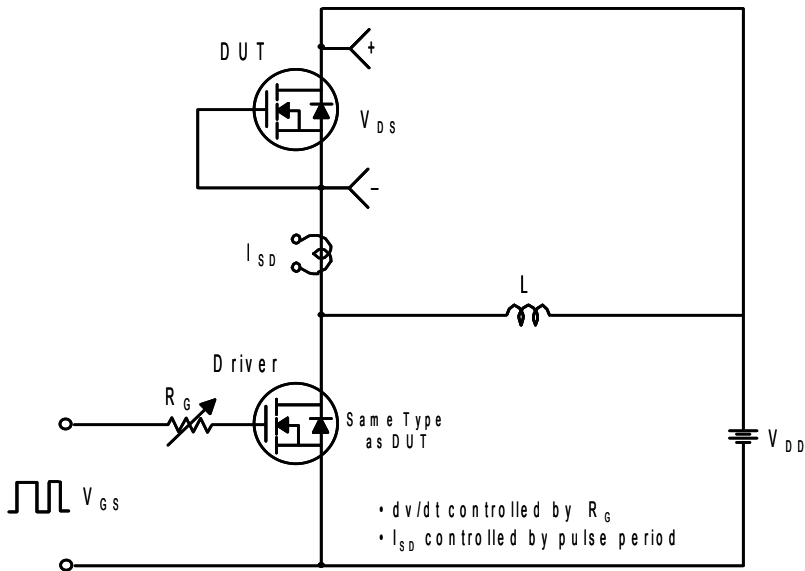
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

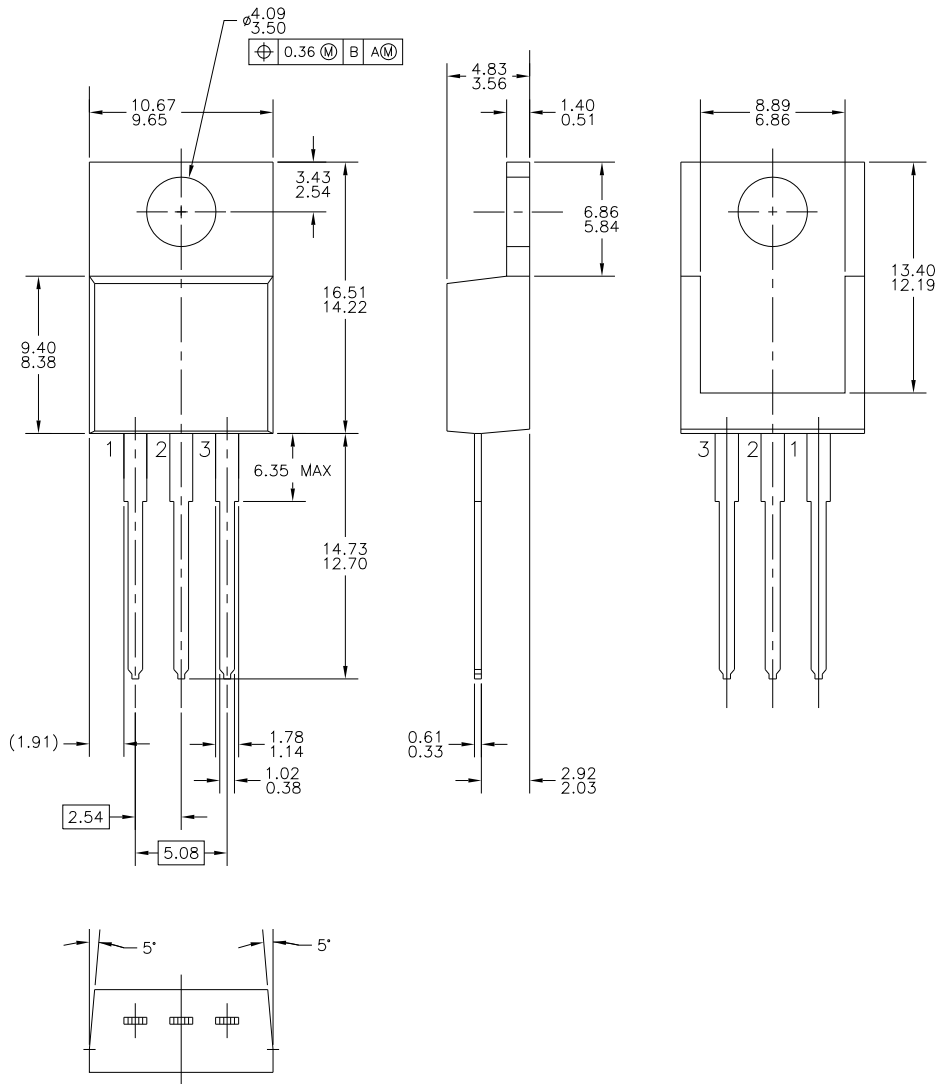


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220







FDP3205 N-Channel PowerTrench® MOSFET



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