# FDP3205

## N-Channel PowerTrench® MOSFET

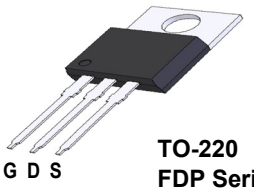
**55V, 100A, 7.5mΩ**

## Features

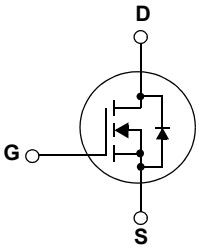
- $R_{DS(on)}$ = 6.1mΩ ( Typ.)@ $V_{GS}$ = 10V, $I_D$ = 59A
- High performance trench technology for extermly low $R_{DS(on)}$
- High power and current handing capability
- RoHS compliant

## 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.




**TO-220**
**FDP Series**




## MOSFET Maximum Ratings $T_C$ = 25°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°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°C) | | 150 | W |
| | | - Derate above 25°C | | 1.0 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | | -55 to +175 | °C |

## Thermal Characteristics

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

## Package Marking and Ordering Information $T_C$ = 25°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 | $I_D$ = 250μA, $V_{GS}$ = 0V, $T_J$ = 25°C | 55 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 44V, $V_{GS}$ = 0V | - | - | 25 | μA |
| | | $V_{DS}$ = 44V, $T_C$ = 150°C | - | - | 250 | |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 3.5 | - | 5.5 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10V, $I_D$ = 59A | - | 6.1 | 7.5 | mΩ |
| | | $V_{GS}$ = 10V, $I_D$ = 59A<br>$T_J$ = 175°C | - | 12 | - | |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V<br>f = 1MHz | - | 5810 | 7730 | pF |
| $C_{oss}$ | Output Capacitance | | - | 460 | 610 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 230 | 345 | pF |
| $R_G$ | Gate Resistance | $V_{GS}$ = 0V, f = 1MHz | 3 | 4 | 5 | Ω |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{GS}$ = 0V to 10V; $V_{DS}$ = 44V, $I_D$ = 59A, $I_g$ = 1mA | - | 93 | 120 | nC |
| $Q_{g(th)}$ | Threshold Gate Charge | $V_{GS}$ = 0V to 2V | - | 25.5 | 33 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | - | 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 | $V_{DD}$ = 28V, $I_D$ = 59A<br>$V_{GS}$ = 10V, $R_{GEN}$ = 2.5Ω | - | 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 | $V_{GS}$ = 0V, $I_{SD}$ = 59A | - | - | 1.3 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0V, $I_{SD}$ = 59A<br>$dI_F/dt$ = 100A/μs | - | 43.3 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 70.8 | - | nC |

**Notes:**
1: Calculated continuous current based on maximum allowable junction temperature. Package limited to 75A continuous, see Figure 9.
2: L = 0.21mH, $I_{AS}$ = 59A, $V_{DD}$ = 50V, $V_{GS}$ = 10V, $R_G$ = 25Ω, Starting $T_J$ = 25°C

## Typical Performance Characteristics

**Figure 1. On-Region Characteristics**

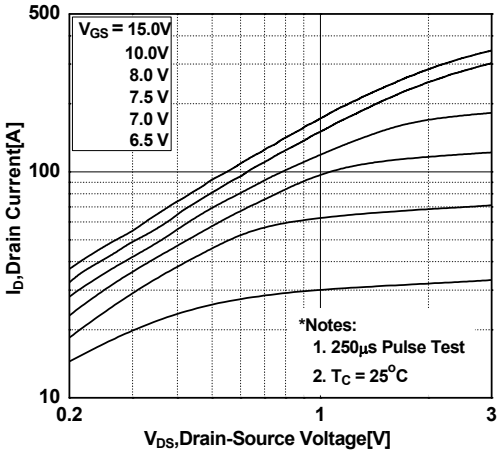



**Figure 2. Transfer Characteristics**

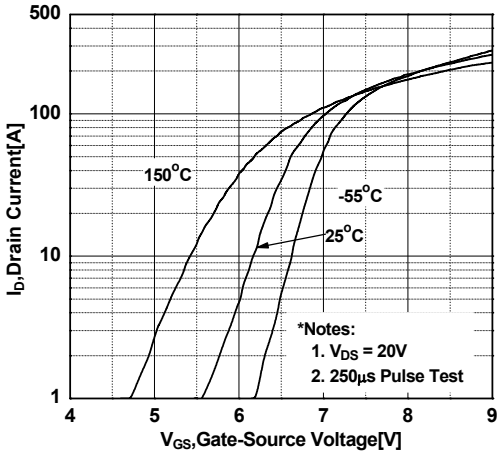



**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**

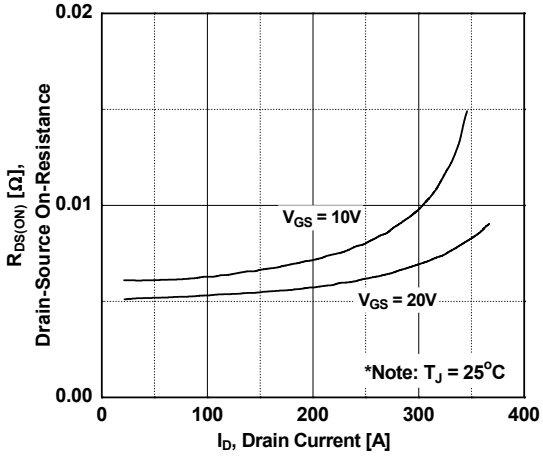



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**

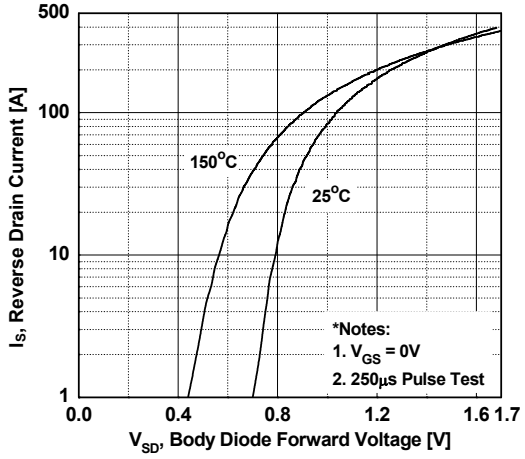



**Figure 5. Capacitance Characteristics**

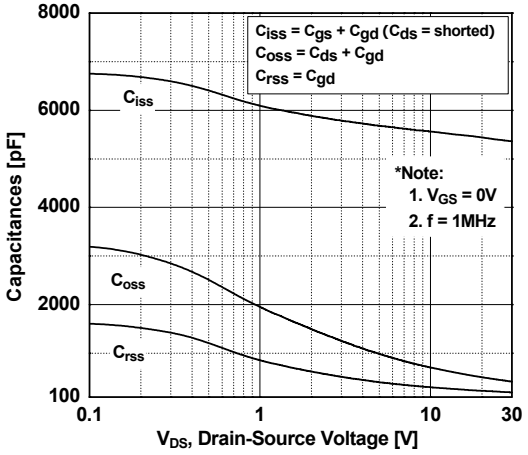



**Figure 6. Gate Charge Characteristics**