



ON Semiconductor®

## FDP5500-F085

### N-Channel UltraFET Power MOSFET

55V, 80A, 7mΩ

#### Features

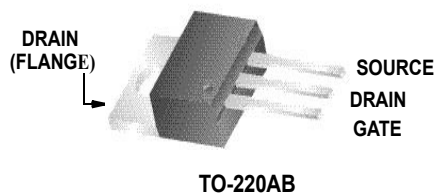
- Typ  $r_{DS(on)}$  = 5.1mΩ at  $V_{GS}$  = 10V,  $I_D$  = 80A
- Typ  $Q_{g(10)}$  = 114nC at  $V_{GS}$  = 10V
- Simulation Models
  - Temperature Compensated PSPICE and SABER™ Models
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- Qualified to AEC Q101
- RoHS Compliant

#### Applications

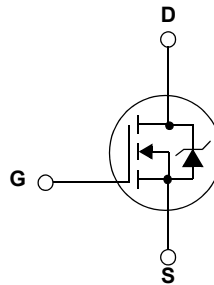
- DC Linear Mode Control
- Solenoid and Motor Control
- Switching Regulators
- Automotive Systems



#### Package



#### Symbol



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

| Symbol         | Parameter  | Ratings      | Units               |
|----------------|--|--------------|---------------------|
| $V_{DSS}$      | Drain to Source Voltage (Note 1)   | 55           | V                   |
| $V_{DGR}$      | Drain to Gate Voltage ( $R_{GS} = 20k\Omega$ ) (Note 1)                        | 55           | V                   |
| $V_{GS}$       | Gate to Source Voltage   | $\pm 20$     | V                   |
| $I_D$          | Drain Current Continuous ( $T_C < 135^\circ\text{C}$ , $V_{GS} = 10\text{V}$ ) | 80           | A                   |
|                | Pulsed   | See Figure 4 |                     |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 2)   | 860          | mJ                  |
| $P_D$          | Power Dissipation  | 375          | W                   |
|                | Derate above $25^\circ\text{C}$  | 2.5          | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature  | -55 to + 175 | $^\circ\text{C}$    |
| $T_L$          | Max. Lead Temp. for Soldering (at 1.6mm from case for 10sec)                   | 300          |                     |
| $T_{pkg}$      | Max. Package Temp. for Soldering (Package Body for 10sec)                      | 260          |                     |

**Thermal Characteristics**

|                 |   |     |                    |
|-----------------|---|-----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case   | 0.4 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-220AB, 1in <sup>2</sup> copper pad area | 62  | $^\circ\text{C/W}$ |

**Package Marking and Ordering Information**

| Device Marking | Device       | Package  | Reel Size | Tape Width | Quantity |
|----------------|--------------|----------|-----------|------------|----------|
| FDP5500        | FDP5500-F085 | TO-220AB | Tube      | N/A        | 50 units |

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**Off Characteristics**

|            |                                   |   |    |   |           |               |
|------------|-----------------------------------|---|----|---|-----------|---------------|
| $B_{VDSS}$ | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$     | 55 | - | -         | V             |
| $I_{DSS}$  | Zero Gate Voltage Drain Current   | $V_{DS} = 50\text{V}$ , $V_{GS} = 0\text{V}$      | -  | - | 1         | $\mu\text{A}$ |
|            |                                   | $V_{DS} = 45\text{V}$ , $T_C = 150^\circ\text{C}$ | -  | - | 250       |               |
| $I_{GSS}$  | Gate to Source Leakage Current    | $V_{GS} = \pm 20\text{V}$                         | -  | - | $\pm 100$ | nA            |

**On Characteristics**

|              |                                  |  |   |     |   |            |
|--------------|----------------------------------|--|---|-----|---|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$ | 2 | 2.8 | 4 | V          |
| $r_{DS(on)}$ | Drain to Source On Resistance    | $I_D = 80\text{A}$ , $V_{GS} = 10\text{V}$ | - | 5.1 | 7 | m $\Omega$ |

**Dynamic Characteristics**

|              |                               |  |   |      |     |    |
|--------------|-------------------------------|--|---|------|-----|----|
| $C_{iss}$    | Input Capacitance             | $V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$                      | - | 3565 | -   | pF |
| $C_{oss}$    | Output Capacitance            |  | - | 1310 | -   | pF |
| $C_{rss}$    | Reverse Transfer Capacitance  |  | - | 395  | -   | pF |
| $Q_{g(TOT)}$ | Total Gate Charge at 20V      | $V_{GS} = 0$ to 20V  | - | 207  | 269 | nC |
| $Q_{g(10)}$  | Total Gate Charge at 10V      | $V_{GS} = 0$ to 10V  | - | 114  | 148 | nC |
| $Q_{g(TH)}$  | Threshold Gate Charge         | $V_{GS} = 0$ to 2V   | - | 6.6  | 8.6 | nC |
| $Q_{gs}$     | Gate to Source Gate Charge    | $V_{DD} = 30\text{V}$<br>$I_D = 80\text{A}$<br>$R_L = 0.4\Omega$<br>$I_g = 1.0\text{mA}$ | - | 17.2 | -   | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |  | - | 52   | -   | nC |

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**Switching Characteristics**

|              |                     |   |   |    |    |    |
|--------------|---------------------|---|---|----|----|----|
| $t_{on}$     | Turn-On Time        | $V_{DD} = 30\text{V}$ , $I_D = 80\text{A}$ ,<br>$R_L = 0.4\Omega$ , $V_{GS} = 10\text{V}$ ,<br>$R_{GS} = 2.5\Omega$ | - | -  | 75 | ns |
| $t_{d(on)}$  | Turn-On Delay Time  |   | - | 12 | -  | ns |
| $t_r$        | Rise Time           |   | - | 34 | -  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |   | - | 37 | -  | ns |
| $t_f$        | Fall Time           |   | - | 23 | -  | ns |
| $t_{off}$    | Turn-Off Time       |   | - | -  | 96 | ns |

**Drain-Source Diode Characteristics**

|          |                               |   |   |     |      |    |
|----------|-------------------------------|---|---|-----|------|----|
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD} = 80\text{A}$                                       | - | 0.9 | 1.25 | V  |
| $t_{rr}$ | Reverse Recovery Time         | $I_F = 80\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | 58  | 75   | ns |
| $Q_{rr}$ | Reverse Recovery Charge       |   | - | 71  | 92   | nC |

**Notes:**1: Starting  $T_J = 25^\circ\text{C}$  to  $175^\circ\text{C}$ .2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.42\text{mH}$ ,  $I_{AS} = 64\text{A}$

## Typical Characteristics

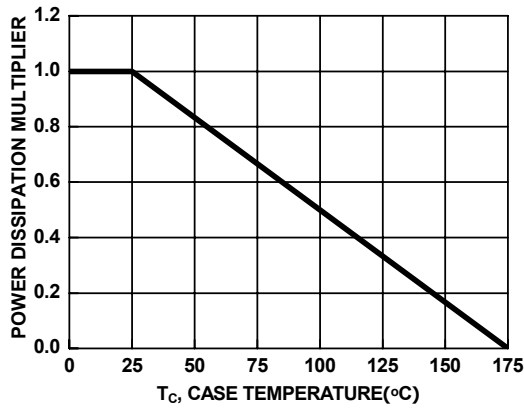


Figure 1. Normalized Power Dissipation vs Case Temperature

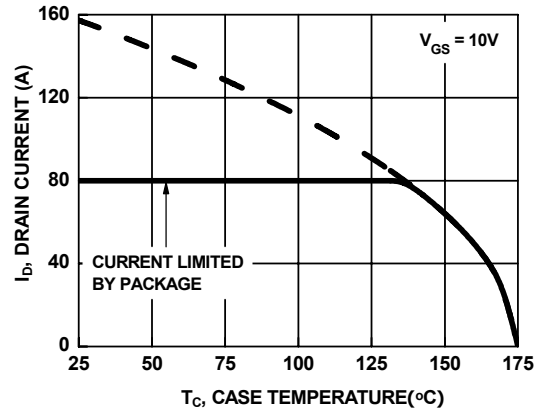


Figure 2. Maximum Continuous Drain Current vs Case Temperature

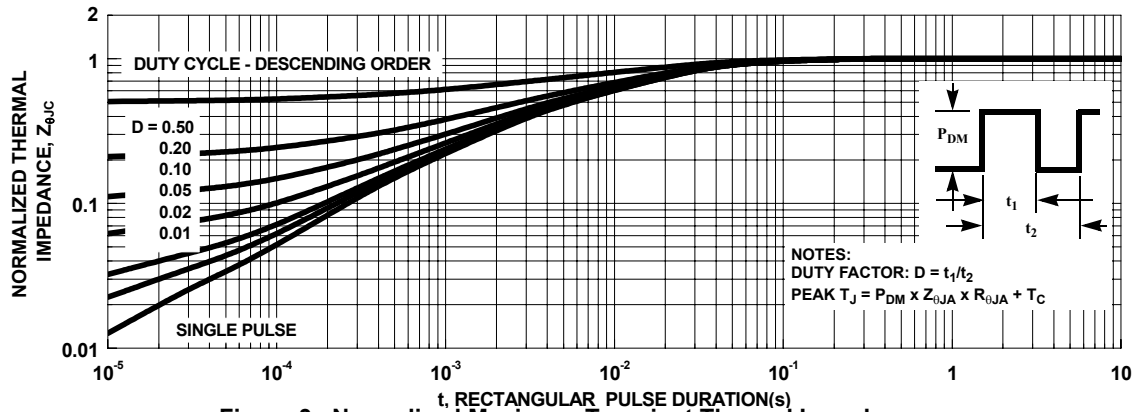


Figure 3. Normalized Maximum Transient Thermal Impedance

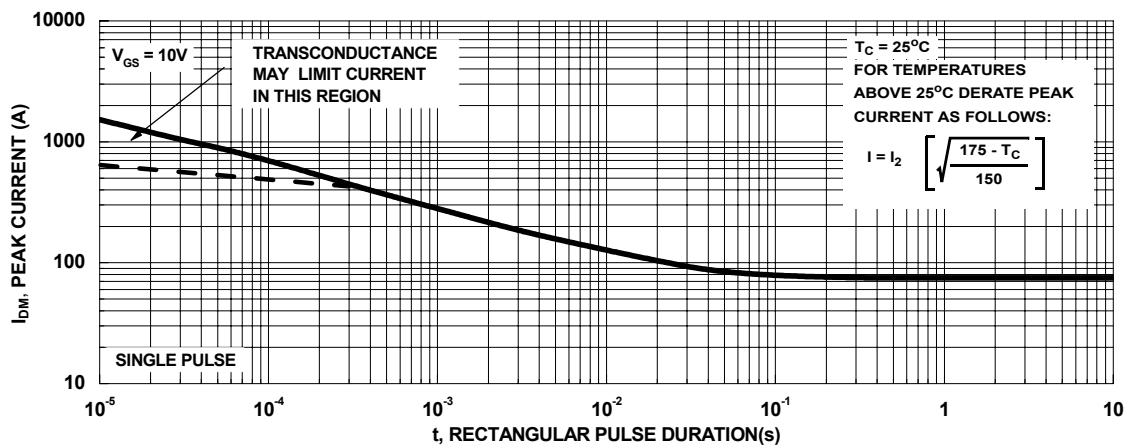


Figure 4. Peak Current Capability

## Typical Characteristics

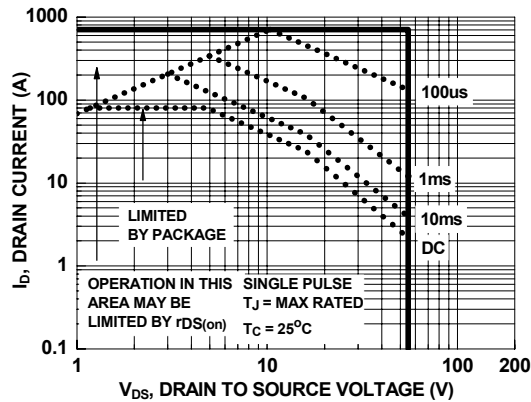
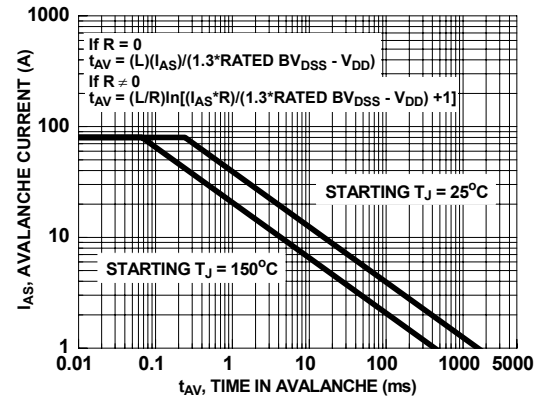


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

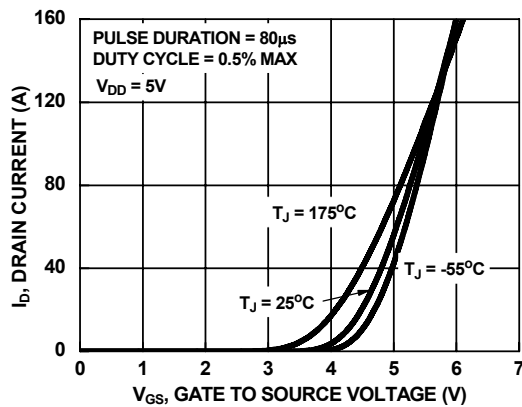


Figure 7. Transfer Characteristics

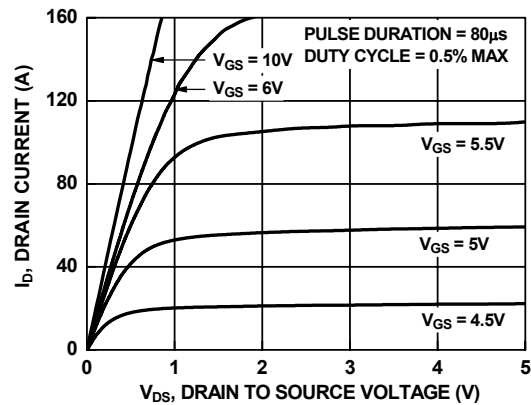


Figure 8. Saturation Characteristics

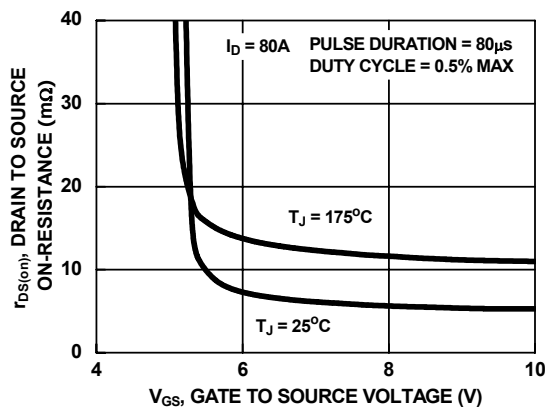


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

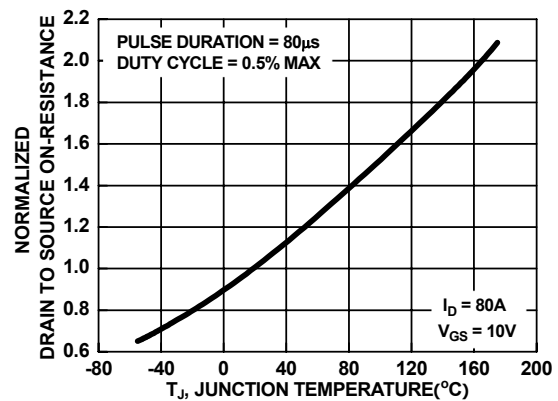


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

## Typical Characteristics

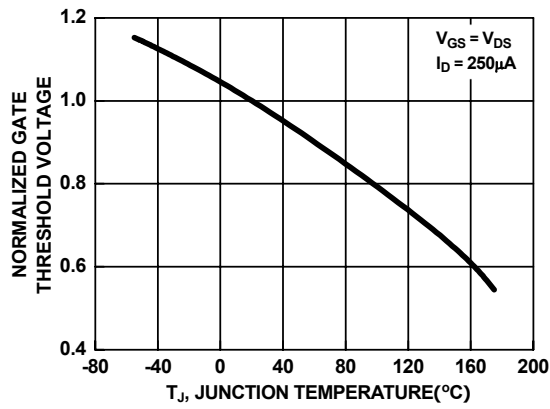


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

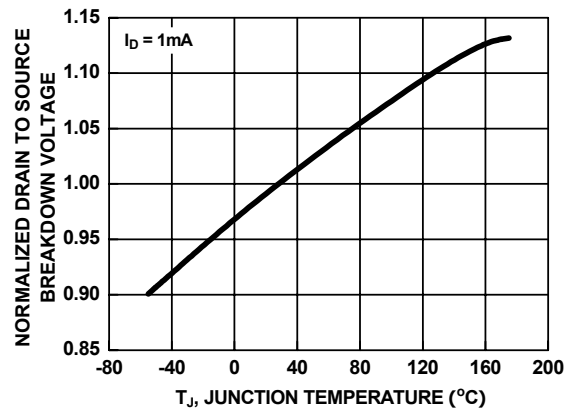


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

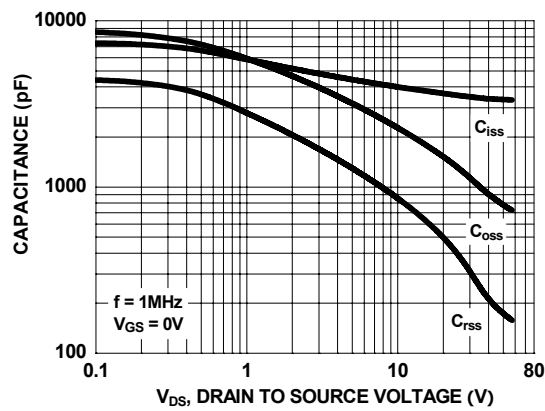


Figure 13. Capacitance vs Drain to Source Voltage

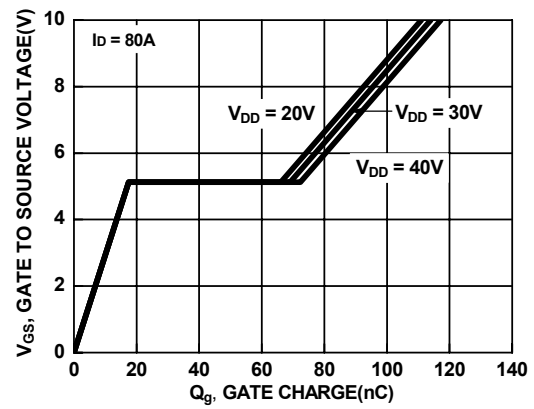


Figure 14. Gate Charge vs Gate to Source Voltage

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