



ON Semiconductor®

FDD5810-F085

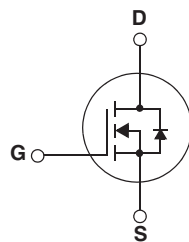
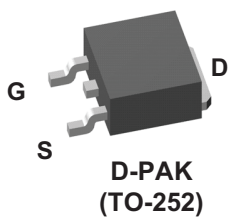
N-Channel Logic Level Trench® MOSFET 60V, 36A, 27mΩ

Features

- $R_{DS(ON)} = 22m\Omega$ (Typ.), $V_{GS} = 5V$, $I_D = 29A$
- $Q_{g(5)} = 13nC$ (Typ.), $V_{GS} = 5V$
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse / Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

Applications

- Motor / Body Load Control
- ABS Systems
- Powertrain Management
- Injection System
- DC-DC converters and Off-line UPS
- Distributed Power Architecture and VRMs
- Primary Switch for 12V and 24V systems



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

| Symbol | Parameter | Ratings | Units |
|----------------|---|------------|---------------------|
| V_{DS} | Drain to Source Voltage | 60 | V |
| V_{GS} | Gate to Source Voltage | ± 20 | V |
| I_D | Drain Current Continuous ($V_{GS} = 10\text{V}$) | 37 | A |
| | Drain Current Continuous ($V_{GS} = 5\text{V}$) | 33 | A |
| | Continuous ($T_A = 25^\circ\text{C}$, $V_{GS} = 10\text{V}$, with $R_{\theta JA} = 52^\circ\text{C/W}$) | 7.4 | A |
| | Pulsed | Figure 4 | A |
| E_{AS} | Single Pulse Avalanche Energy (Note 1) | 45 | mJ |
| P_D | Power Dissipation | 72 | W |
| | Derate above 25°C | 0.48 | W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| | | | |
|-----------------|---|-----|--------------------|
| $R_{\theta JC}$ | Maximum Thermal resistance Junction to Case TO-252 | 2.1 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-252, 1in ² copper pad area | 52 | $^\circ\text{C/W}$ |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|--------------|----------|-----------|------------|------------|
| FDD5810 | FDD5810-F085 | TO-252AA | 330mm | 16mm | 2500 units |

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

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

Off Characteristics

| | | | | | | |
|-----------|-----------------------------------|--|----|---|-----------|---------------|
| B_{VDS} | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$ | 60 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 48\text{V}$ | - | - | 1 | μA |
| | | $V_{GS} = 0\text{V}$, $T_C = 150^\circ\text{C}$ | - | - | 250 | |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 20\text{V}$ | - | - | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|----------------------------------|---|---|-----|----|------------|
| $V_{GS(TH)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$, $I_D = 250\mu\text{A}$ | 1 | 1.6 | 2 | V |
| $R_{DS(ON)}$ | Drain to Source On Resistance | $I_D = 32\text{A}$, $V_{GS} = 10\text{V}$ | - | 18 | 22 | m Ω |
| | | $I_D = 29\text{A}$, $V_{GS} = 5\text{V}$ | - | 22 | 27 | |
| | | $I_D = 32\text{A}$, $V_{GS} = 10\text{V}$, $T_J = 175^\circ\text{C}$ | - | 43 | 53 | |
| | | | | | | |

Dynamic Characteristics

| | | | | | | |
|-------------|----------------------------------|---|---|------|------|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$ | - | 1420 | 1890 | pF |
| C_{oss} | Output Capacitance | | - | 150 | 200 | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 65 | 100 | pF |
| R_G | Gate Resistance | $f = 1\text{MHz}$ | - | 3.5 | - | Ω |
| Q_g | Total Gate Charge at 10V | $V_{GS} = 0\text{V}$ to 10V | - | 24 | 34 | nC |
| Q_g | Total Gate Charge at 5V | $V_{GS} = 0\text{V}$ to 5V | - | 13 | 18 | nC |
| $Q_{g(th)}$ | Threshold Gate Charge | $V_{GS} = 0\text{V}$ to 1V | - | 1.3 | - | nC |
| Q_{gs} | Gate to Source Gate Charge | $V_{DD} = 30\text{V}$ $I_D = 35\text{A}$ | - | 4.0 | - | nC |
| Q_{gs2} | Gate Charge Threshold to Plateau | | - | 2.7 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | - | 5.0 | - | nC |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|---|---|----|-----|----|
| t_{on} | Turn-On Time | $V_{DD} = 30V, I_D = 35A$ $V_{GS} = 5V, R_{GS} = 11\Omega$ | - | - | 130 | ns |
| $t_{d(on)}$ | Turn-On Delay Time | | - | 12 | - | ns |
| t_r | Rise Time | | - | 75 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 26 | - | ns |
| t_f | Fall Time | | - | 34 | - | ns |
| t_{off} | Turn-Off Time | | - | - | 90 | ns |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|-------------------------------|---------------------------------|---|---|------|----|
| V_{SD} | Source to Drain Diode Voltage | $I_{SD} = 32A$ | - | - | 1.25 | V |
| | | $I_{SD} = 16A$ | - | - | 1.0 | V |
| t_{rr} | Reverse Recovery Time | $I_F = 35A, di/dt = 100A/\mu s$ | - | - | 39 | ns |
| Q_{rr} | Reverse Recovery Charge | $I_F = 35A, di/dt = 100A/\mu s$ | - | - | 35 | nC |

Notes:

1: Starting $T_j = 25^\circ C$, $L = 110\mu H$, $I_{AS} = 28A$, $V_{DD} = 54V$, $V_{GS} = 10V$.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

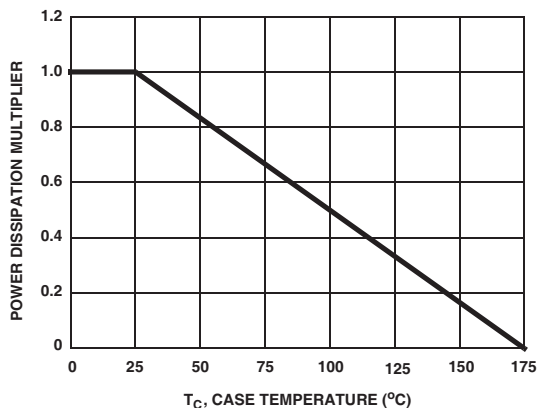


Figure 1. Normalized Power Dissipation vs Case Temperature

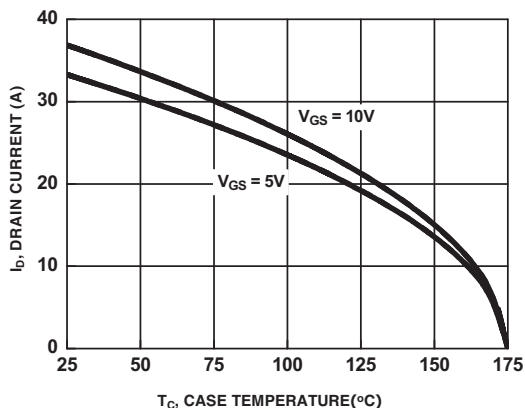


Figure 2. Maximum Continuous Drain Current vs Case Temperature

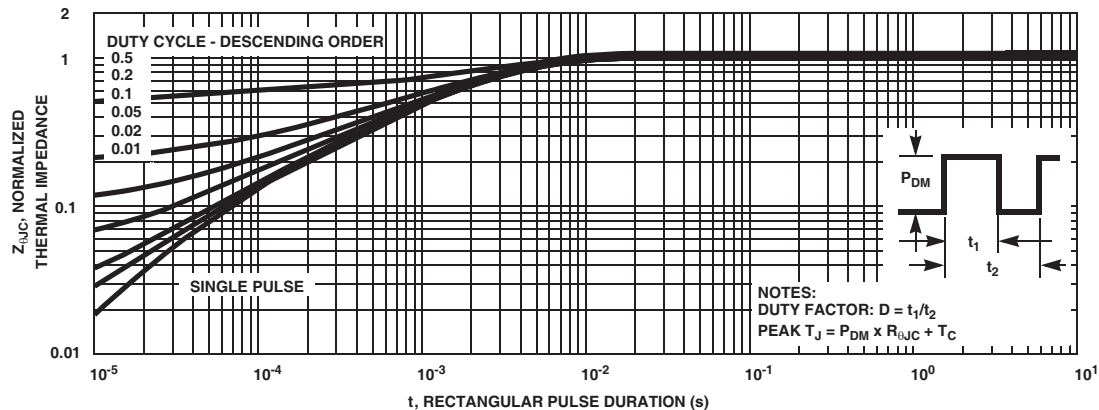


Figure 3. Normalized Maximum Transient Thermal Impedance

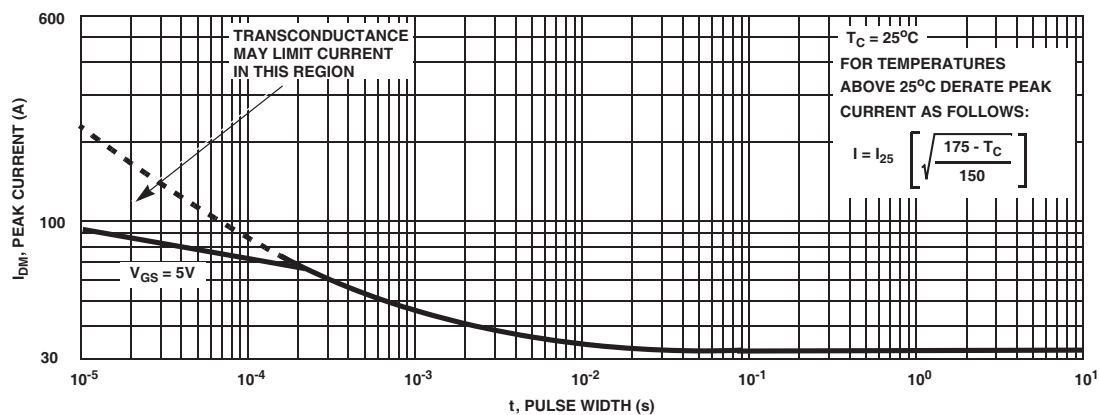


Figure 4. Peak Current Capability

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

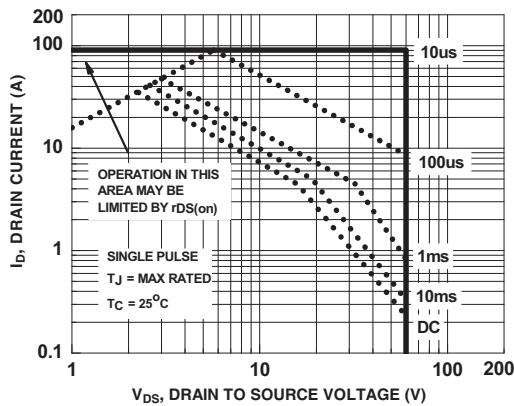
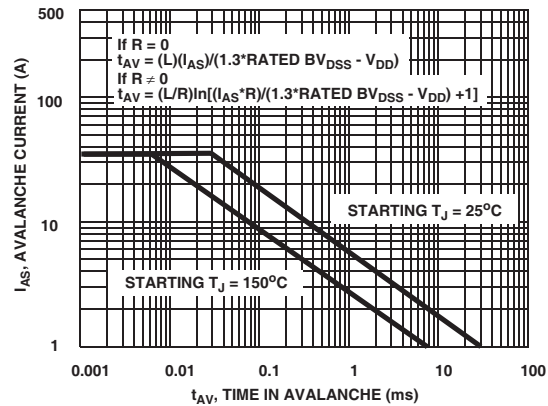


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

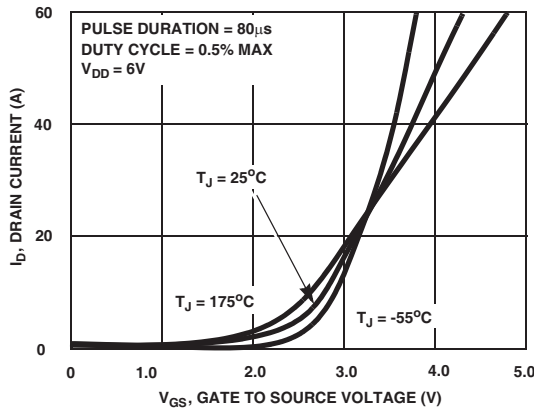


Figure 7. Transfer Characteristics

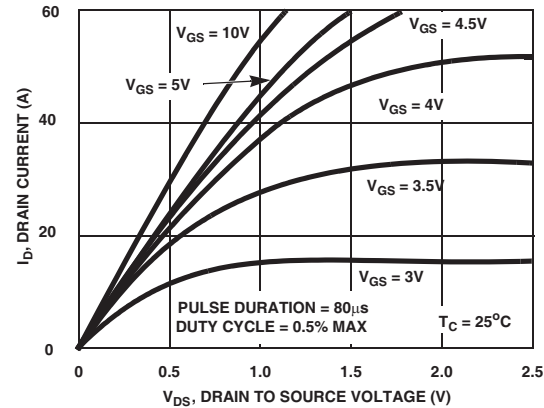


Figure 8. Saturation Characteristics

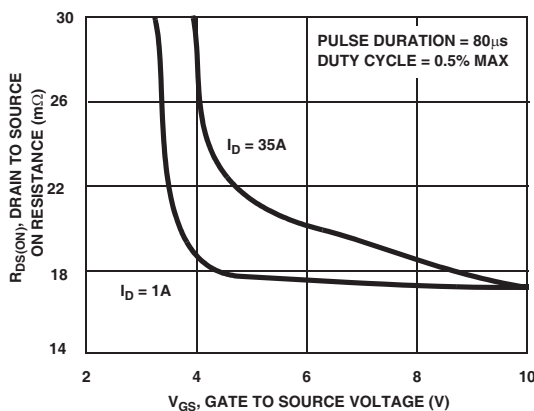


Figure 9. Drain to Source On Resistance vs Gate Voltage and Drain Current

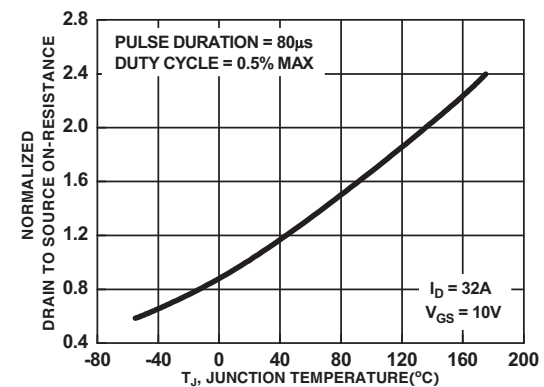


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

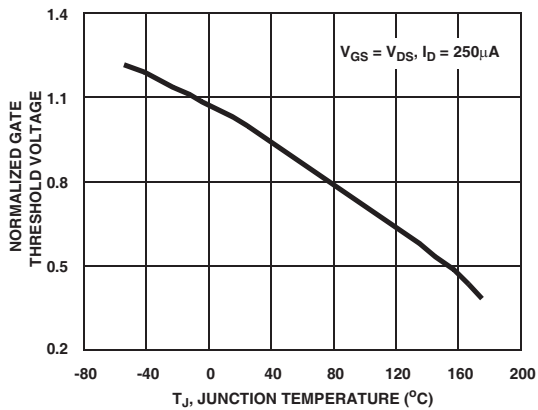


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

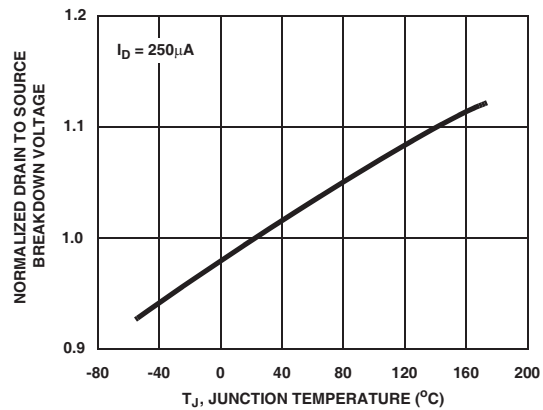


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

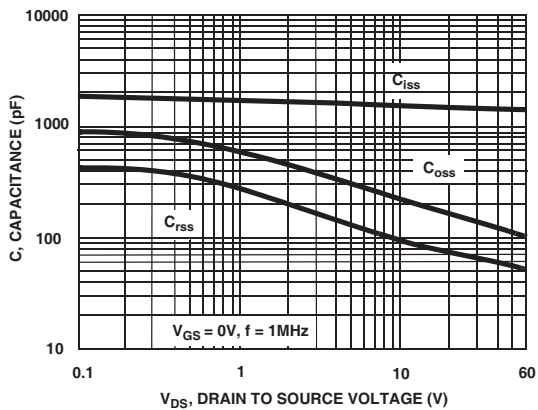


Figure 13. Capacitance vs Drain to Source Voltage

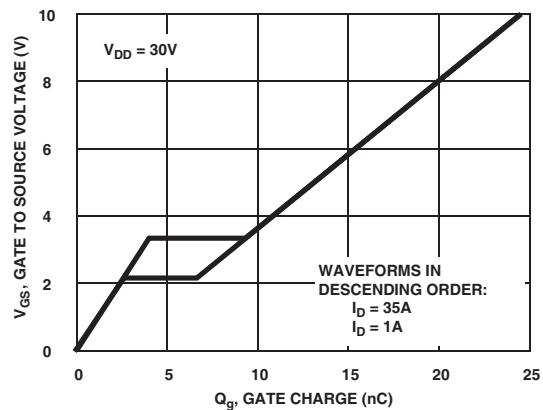


Figure 14. Gate Charge Waveforms for Constant Gate Current

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