

**Features**

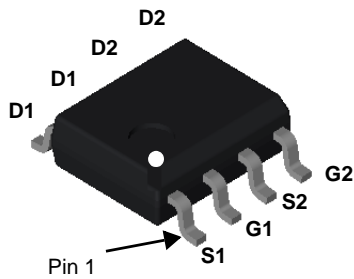
- Max  $r_{DS(on)}$  = 183 mΩ at  $V_{GS} = -10$  V,  $I_D = -2.1$  A
- Max  $r_{DS(on)}$  = 247 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -1.9$  A
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- 100% UIL Tested
- RoHS Compliant

**General Description**

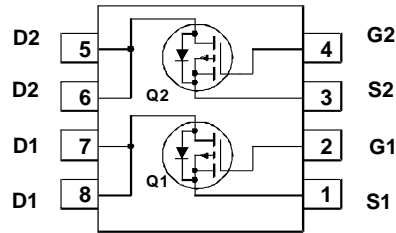
- This P-channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been optimized for  $r_{DS(on)}$ , switching performance and ruggedness.

**Applications**

- Load Switch
- Synchronous Rectifier



SO-8



**MOSFET Maximum Ratings**  $T_A = 25$  °C unless otherwise noted

| Symbol         | Parameter  | Ratings     | Units |
|----------------|--|-------------|-------|
| $V_{DS}$       | Drain to Source Voltage                          | -80         | V     |
| $V_{GS}$       | Gate to Source Voltage                           | ±20         | V     |
| $I_D$          | Drain Current -Continuous                        | -2.1        | A     |
|                | -Pulsed  | -10         |       |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 3)           | 37          | mJ    |
| $P_D$          | Power Dissipation $T_A = 25$ °C (Note 1a)        | 3.1         | W     |
|                | Power Dissipation $T_A = 25$ °C (Note 1b)        | 1.6         |       |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | °C    |

**Thermal Characteristics**

|                 |   |    |      |
|-----------------|---|----|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1)     | 40 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 78 |      |

**Package Marking and Ordering Information**

| Device Marking | Device  | Package | Reel Size | Tape Width | Quantity   |
|----------------|---------|---------|-----------|------------|------------|
| FDS8935        | FDS8935 | SO-8    | 13 "      | 12 mm      | 2500 units |

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

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

### Off Characteristics

|                                      |   |   |     |     |           |                      |
|--------------------------------------|---|---|-----|-----|-----------|----------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = -250 \mu\text{A}, V_{GS} = 0 \text{ V}$              | -80 |     |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250 \mu\text{A}$ , referenced to $25^\circ\text{C}$ |     | -61 |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = -64 \text{ V}, V_{GS} = 0 \text{ V}$              |     |     | -1        | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$           |     |     | $\pm 100$ | nA                   |

### On Characteristics

|  |  |   |    |      |     |                      |
|--|--|---|----|------|-----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}, I_D = -250 \mu\text{A}$                               | -1 | -1.8 | -3  | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = -250 \mu\text{A}$ , referenced to $25^\circ\text{C}$             |    | 5    |     | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = -10 \text{ V}, I_D = -2.1 \text{ A}$                          |    | 148  | 183 | m $\Omega$           |
|  |  | $V_{GS} = -4.5 \text{ V}, I_D = -1.9 \text{ A}$                         |    | 176  | 247 |                      |
|  |  | $V_{GS} = -10 \text{ V}, I_D = -2.1 \text{ A}, T_J = 125^\circ\text{C}$ |    | 249  | 308 |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = -10 \text{ V}, I_D = -2.1 \text{ A}$                          |    | 6.4  |     | S                    |

### Dynamic Characteristics

|           |                              |  |  |     |     |          |
|-----------|------------------------------|--|--|-----|-----|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = -40 \text{ V}, V_{GS} = 0 \text{ V},$<br>$f = 1 \text{ MHz}$ |  | 661 | 879 | pF       |
| $C_{oss}$ | Output Capacitance           |  |  | 47  | 63  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |  |  | 24  | 36  | pF       |
| $R_g$     | Gate Resistance              |  |  | 6   |     | $\Omega$ |

### Switching Characteristics

|              |                               |   |  |     |    |    |    |
|--------------|-------------------------------|---|--|-----|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = -40 \text{ V}, I_D = -2.1 \text{ A},$<br>$V_{GS} = -10 \text{ V}, R_{GEN} = 6 \Omega$ |  | 5   | 10 | ns |    |
| $t_r$        | Rise Time                     |   |  | 3   | 10 | ns |    |
| $t_{d(off)}$ | Turn-Off Delay Time           |   |  | 22  | 36 | ns |    |
| $t_f$        | Fall Time                     |   |  | 3   | 10 | ns |    |
| $Q_{g(TOT)}$ | Total Gate Charge             |   | $V_{GS} = 0 \text{ V to } -10 \text{ V}$ |     | 13 | 19 | nC |
| $Q_{g(TOT)}$ | Total Gate Charge             |   | $V_{GS} = 0 \text{ V to } -5 \text{ V}$  |     | 7  | 10 | nC |
| $Q_{gs}$     | Gate to Source Charge         | $V_{DD} = -40 \text{ V},$<br>$I_D = -2.1 \text{ A}$   |  | 1.6 |    | nC |    |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |   |  | 2.6 |    | nC |    |

### Drain-Source Diode Characteristics

|          |                                       |   |  |      |      |    |
|----------|---------------------------------------|---|--|------|------|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0 \text{ V}, I_S = -2.1 \text{ A}$ (Note 2)     |  | -1.8 | -1.3 | V  |
|          |                                       | $V_{GS} = 0 \text{ V}, I_S = -1.3 \text{ A}$ (Note 2)     |  | -0.8 | -1.2 |    |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = -2.1 \text{ A}, di/dt = 300 \text{ A}/\mu\text{s}$ |  | 19   | 30   | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |   |  | 34   | 54   | nC |

#### NOTES:

- $R_{\theta JA}$  is determined with the device mounted on a  $1 \text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5 \text{ in.}$  board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



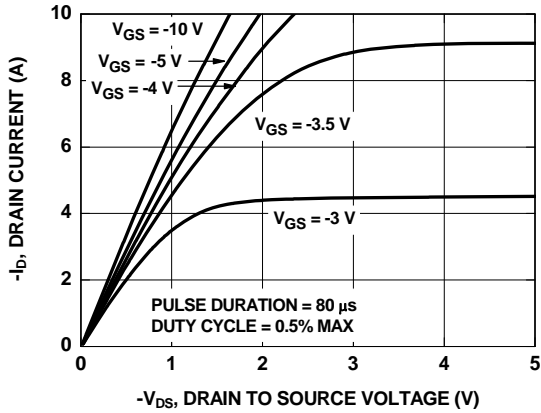
a)  $78^\circ\text{C/W}$  when mounted on a  $1 \text{ in}^2$  pad of 2 oz copper



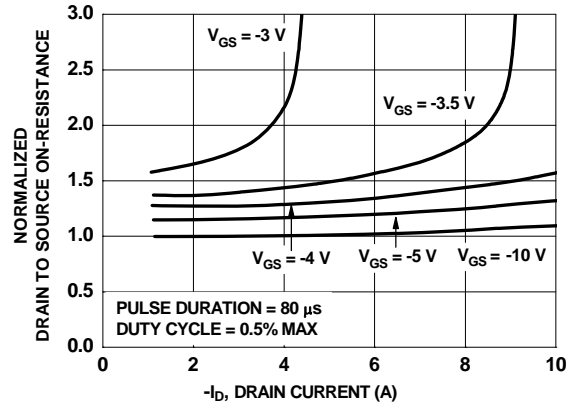
b)  $135^\circ\text{C/W}$  when mounted on a minimum pad

- Pulse Test: Pulse Width <  $300 \mu\text{s}$ , Duty cycle < 2.0%.
- Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3.0 \text{ mH}$ ,  $I_{AS} = -5.0 \text{ A}$ ,  $V_{DD} = -80 \text{ V}$ ,  $V_{GS} = -10 \text{ V}$ .

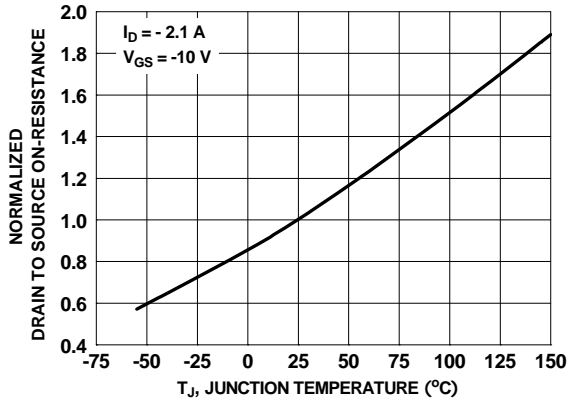
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



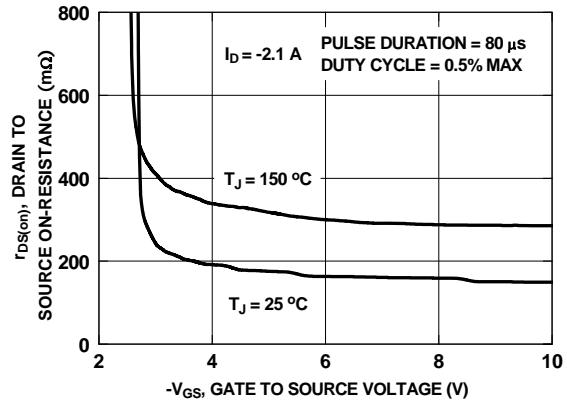
**Figure 1. On-Region Characteristics**



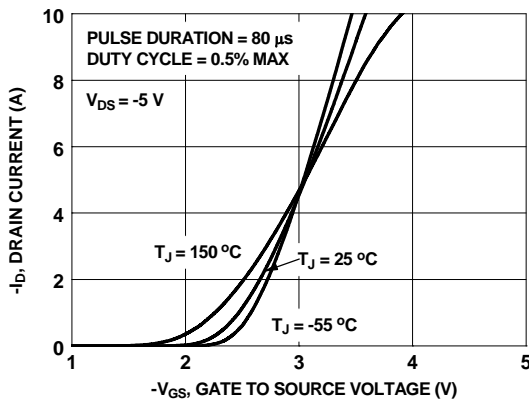
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



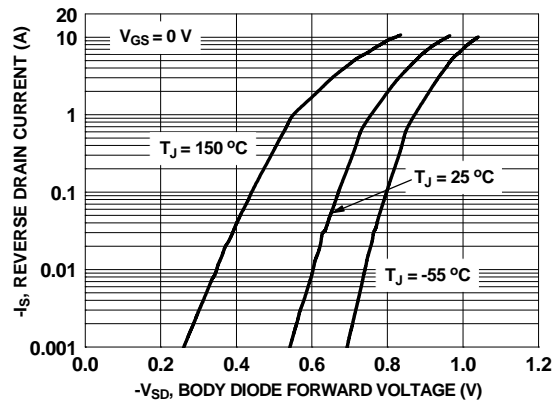
**Figure 3. Normalized On-Resistance vs Junction Temperature**



**Figure 4. On-Resistance vs Gate to Source Voltage**

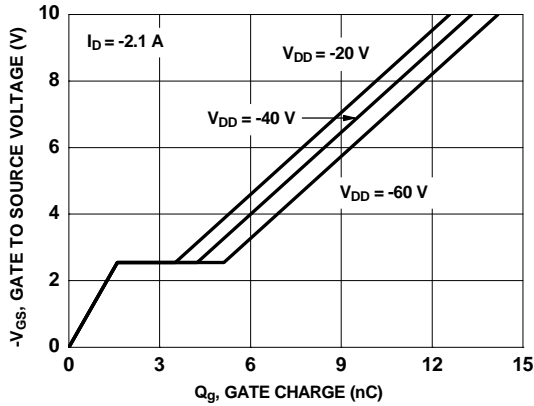


**Figure 5. Transfer Characteristics**

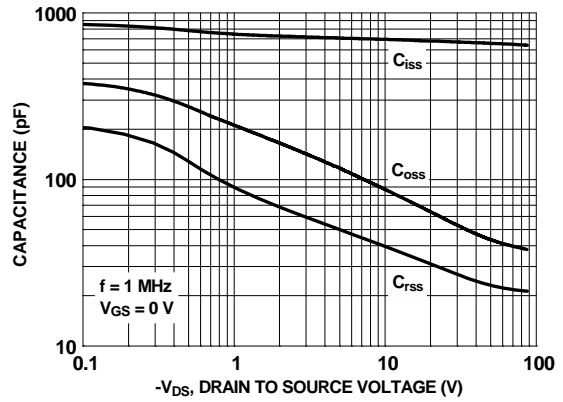


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

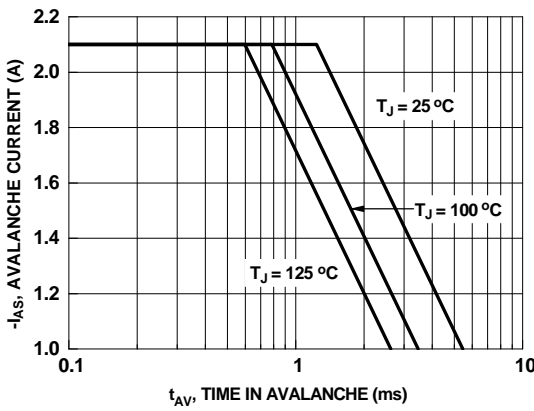
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



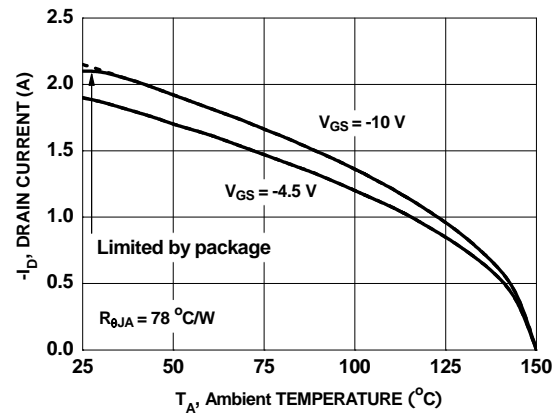
**Figure 7. Gate Charge Characteristics**



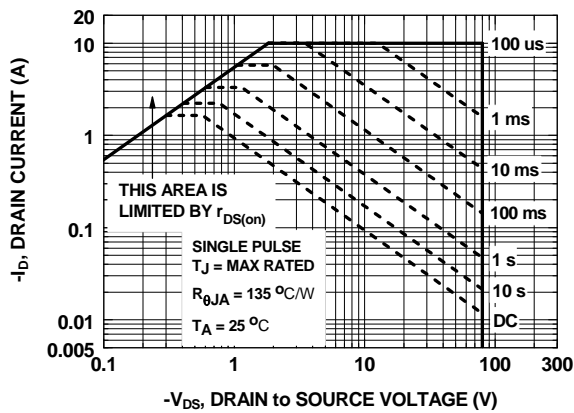
**Figure 8. Capacitance vs Drain to Source Voltage**



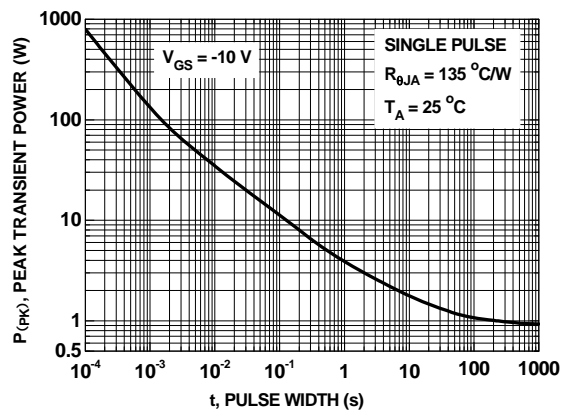
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Ambient Temperature**

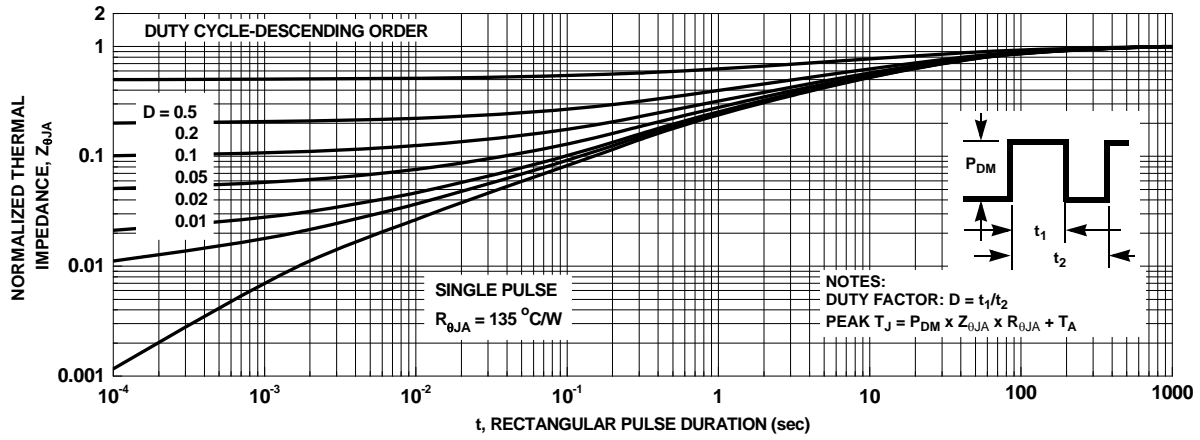


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

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








**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**



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