



# FDMC8854

## N-Channel Power Trench<sup>®</sup> MOSFET

30V, 15A, 5.7mΩ

### Features

- Max  $r_{DS(on)}$  = 5.7mΩ at  $V_{GS} = 10V, I_D = 15A$
- Max  $r_{DS(on)}$  = 7.6mΩ at  $V_{GS} = 4.5V, I_D = 13A$
- Low Profile - 1mm max in Power 33
- RoHS Compliant

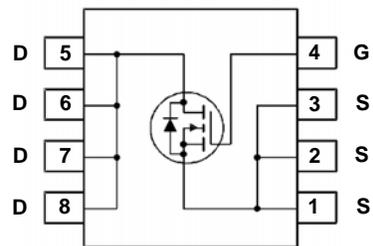
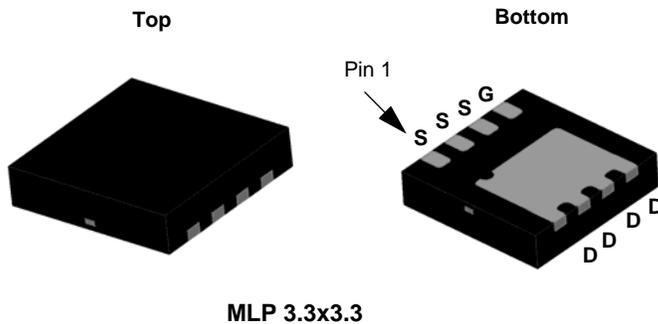


### General Description

This N-Channel MOSFET is a rugged gate version of Fairchild Semiconductor's advanced Power Trench process. It has been optimized for power management applications.

### Application

- DC - DC Conversion



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

| Symbol         | Parameter  | Rated       | Units            |
|----------------|--|-------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                              | 30          | V                |
| $V_{GS}$       | Gate to Source Voltage                               | $\pm 20$    | V                |
| $I_D$          | Drain Current -Continuous $T_C = 25^\circ\text{C}$   | 15          | A                |
|                | -Continuous $T_A = 25^\circ\text{C}$ (Note 1a)       | 15          |                  |
|                | -Pulsed  | 100         |                  |
| $P_D$          | Power Dissipation $T_C = 25^\circ\text{C}$           | 41          | W                |
|                | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a) | 2.0         |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range     | -55 to +150 | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |   |    |                    |
|-----------------|---|----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case              | 3  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 60 |                    |

### Package Marking and Ordering Information

| Device Marking | Device   | Package     | Reel Size | Tape Width | Quantity   |
|----------------|----------|-------------|-----------|------------|------------|
| FDMC8854       | FDMC8854 | MLP 3.3x3.3 | 7"        | 8mm        | 3000 units |

FDMC8854 N-Channel PowerTrench<sup>®</sup> MOSFET

## 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         | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$                | 30 |    |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$ |    | 21 |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$                 |    |    | 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 (Note 2)

|  |  |  |   |     |     |                      |
|--|--|--|---|-----|-----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$                          | 1 | 1.9 | 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 $25^\circ\text{C}$        |   | -6  |     | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 10\text{V}, I_D = 15\text{A}$                          |   | 4.4 | 5.7 | m $\Omega$           |
|  |  | $V_{GS} = 4.5\text{V}, I_D = 13\text{A}$                         |   | 5.6 | 7.6 |                      |
|  |  | $V_{GS} = 10\text{V}, I_D = 15\text{A}, T_J = 125^\circ\text{C}$ |   | 6.6 | 9.0 |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = 5\text{V}, I_D = 15\text{A}$                           |   | 60  |     | S                    |

### Dynamic Characteristics

|            |                              |  |  |      |      |          |
|------------|------------------------------|--|--|------|------|----------|
| $C_{iss}$  | Input Capacitance            | $V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |  | 2560 | 3405 | pF       |
| $C_{oss}$  | Output Capacitance           |  |  | 515  | 685  | pF       |
| $C_{riss}$ | Reverse Transfer Capacitance |  |  | 290  | 435  | pF       |
| $R_g$      | Gate Resistance              | $f = 1\text{MHz}$  |  | 1.3  |      | $\Omega$ |

### Switching Characteristics

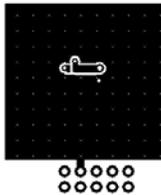
|              |                               |   |  |    |    |    |
|--------------|-------------------------------|---|--|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 10\text{V}, I_D = 15\text{A}, V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$ |  | 13 | 23 | ns |
| $t_r$        | Rise Time                     |   |  | 5  | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           |   |  | 31 | 50 | ns |
| $t_f$        | Fall Time                     |   |  | 5  | 10 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge             |   |  | 41 | 57 | nC |
| $Q_{gs}$     | Gate to Source Gate Charge    | $V_{DD} = 10\text{V}, I_D = 15\text{A}, V_{GS} = 10\text{V}$                    |  | 7  |    | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |   |  | 7  |    | nC |

### Drain-Source Diode Characteristics

|          |                                       |   |  |     |     |    |
|----------|---------------------------------------|---|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 15\text{A}$ (Note 2)     |  | 0.8 | 1.3 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 15\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |  | 33  | 50  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |   |  | 28  | 42  | nC |

#### Notes:

1:  $R_{\theta JA}$  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.  $60^\circ\text{C}/\text{W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper



b.  $135^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width <  $300\mu\text{s}$ , Duty cycle < 2.0%.

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

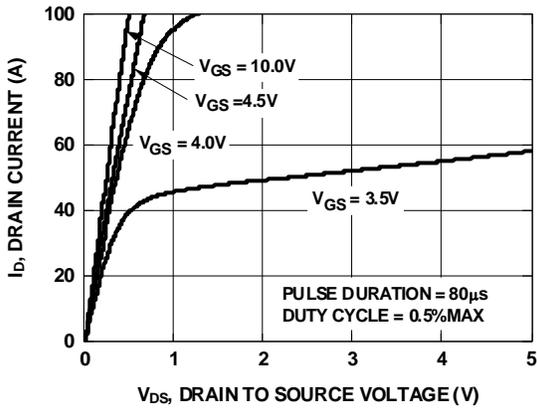


Figure 1. On-Region Characteristics

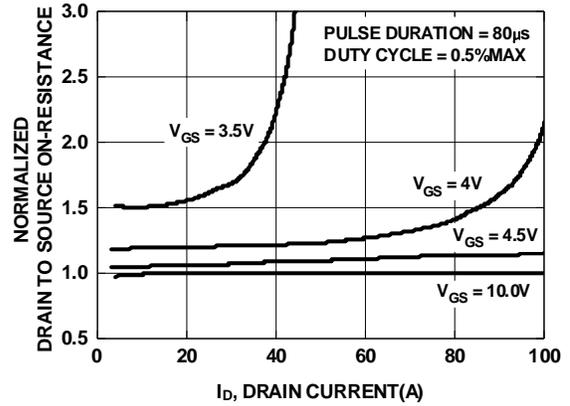


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

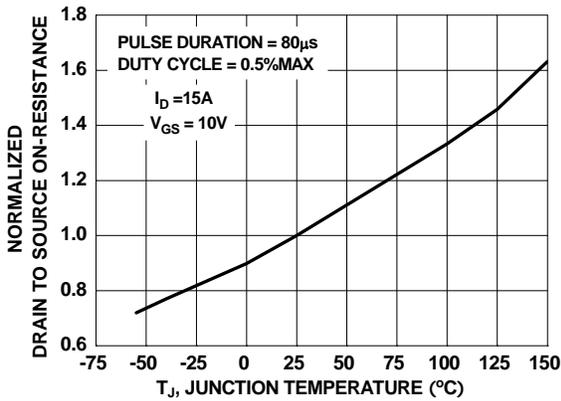


Figure 3. Normalized On-Resistance vs. Junction Temperature

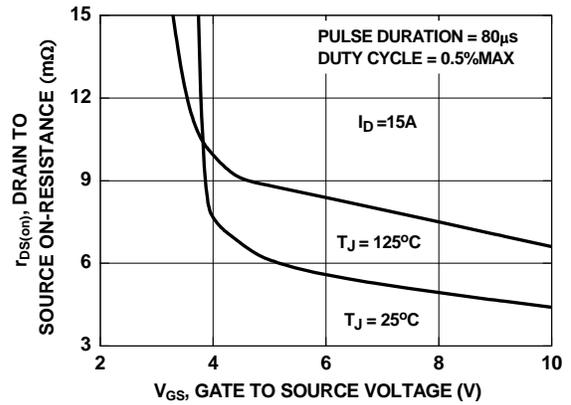


Figure 4. On-Resistance vs. Gate to Source Voltage

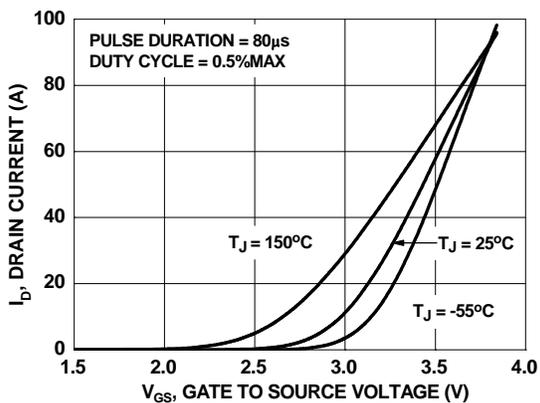


Figure 5. Transfer Characteristics

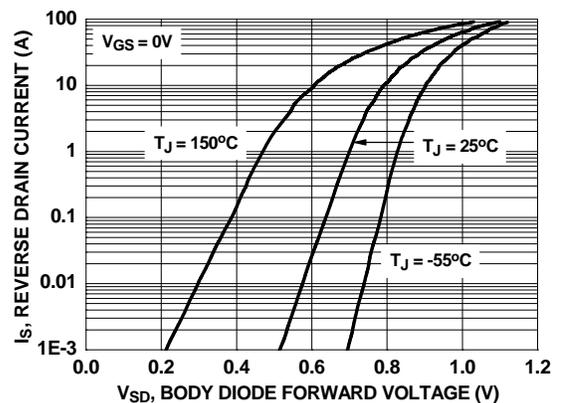
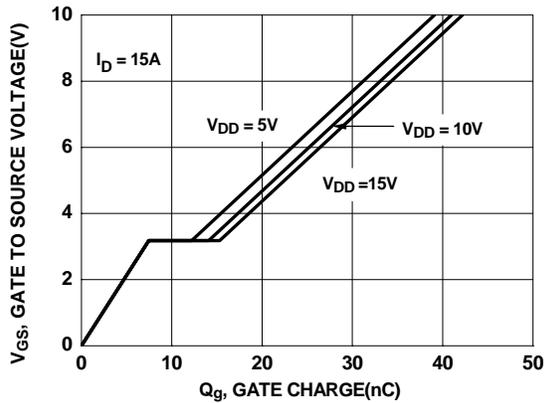
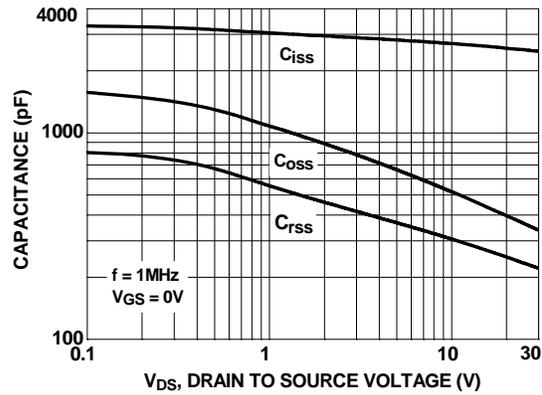


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

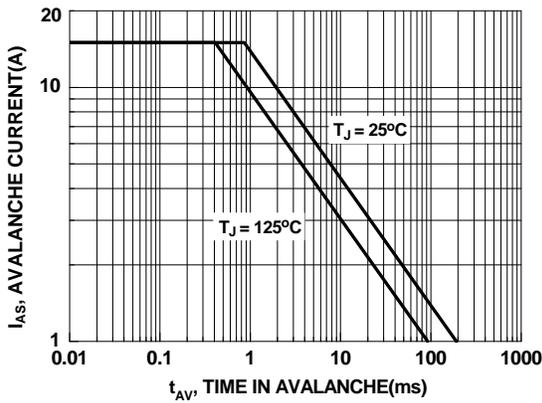
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



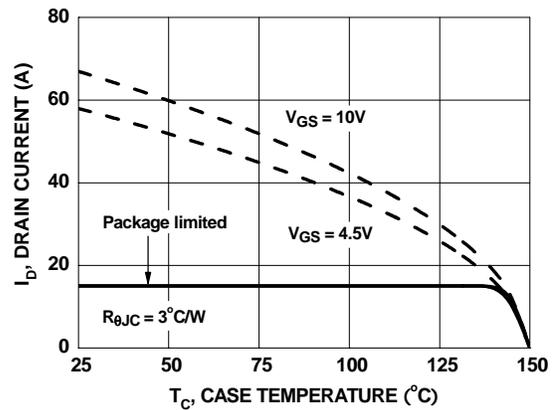
**Figure 7. Gate Charge Characteristics**



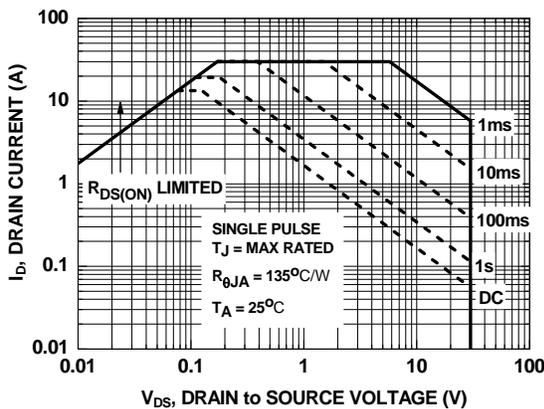
**Figure 8. Capacitance vs. Drain to Source Voltage**



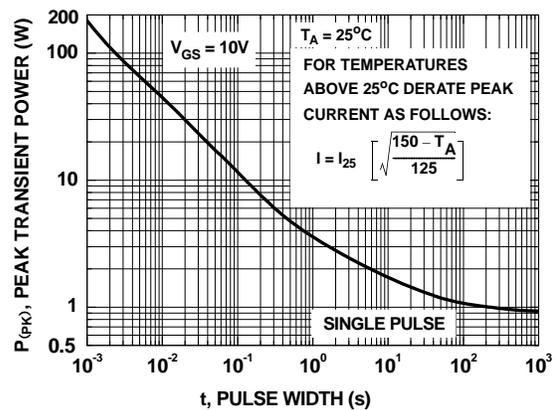
**Figure 9. Unclamped Inductive Switching Capability**



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

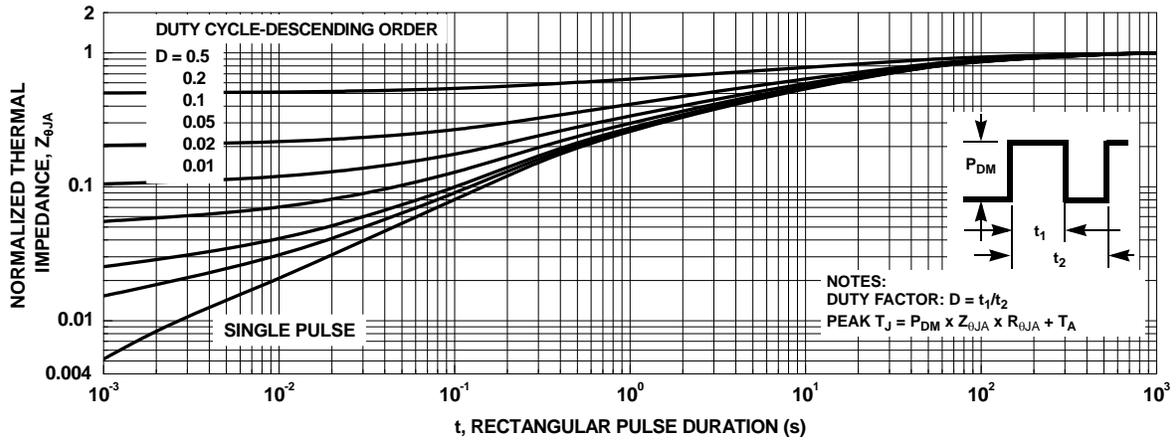


**Figure 11. Forward Bias Safe Operating Area**



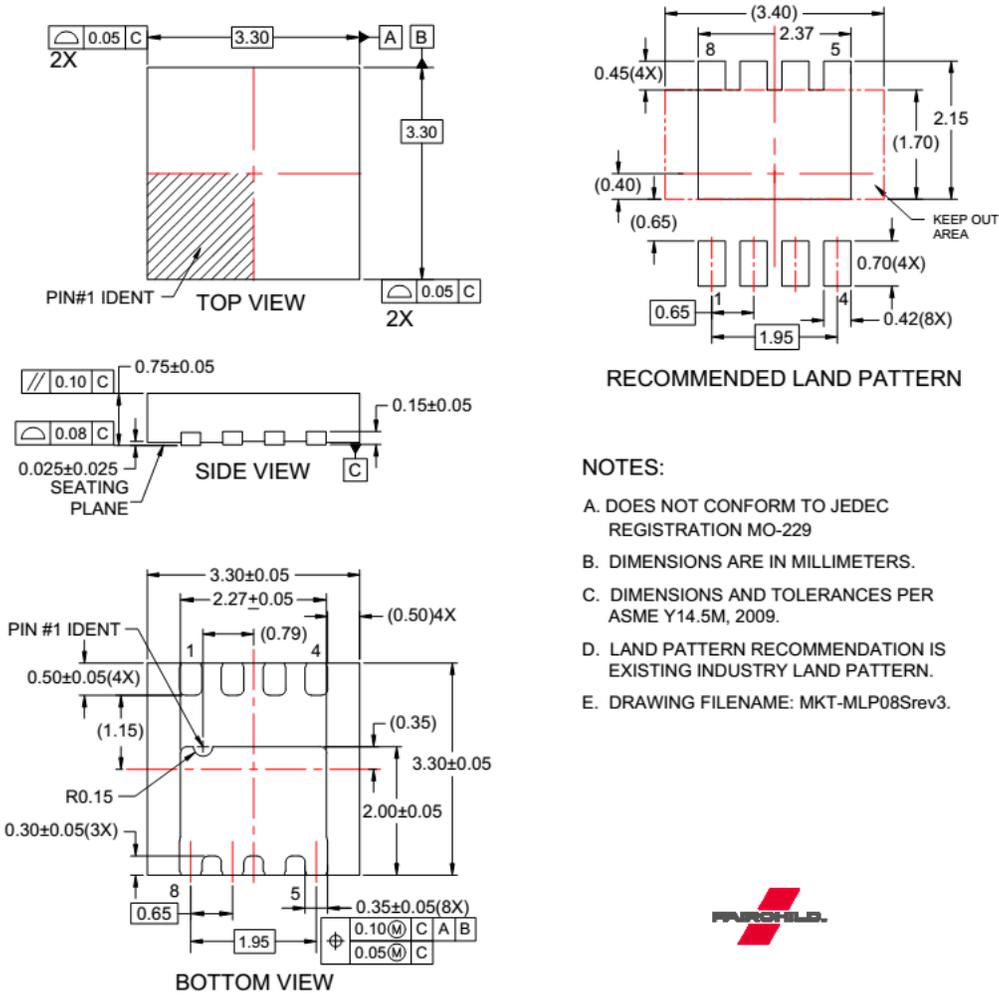
**Figure 12. Single Pulse Maximum Power Dissipation**

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



**Figure 13. Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout



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