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# **FDD2670**

# 200V N-Channel PowerTrench® MOSFET

#### **General Description**

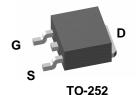
This N-Channel MOSFET has been de signed specifically to improve the overall efficiency of DC/DC converters u sing ei ther s ynchronous or conventional switching PWM controllers.

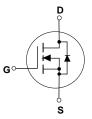
These M OSFETs f eature f aster s witching and lower gate c harge than ot her M OSFETs w ith comparable  $RDS_{(\text{ON})}$  specifications.

The result is a MOSFET that is easy and safer to drive (even at very hi gh f requencies), and DC/DC power supply designs with higher overall efficiency.

#### **Features**

- 3.6 A, 200 V.  $R_{DS(ON)} = 130 \text{ m}\Omega$  @  $V_{GS} = 10 \text{ V}$
- Low gate charge
- Fas t switching speed
- High performance trench technology for extremely low  $R_{\text{DS(ON)}}$
- · High power and current handling capability





### Absolute Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

| Symbol            | Parameter   |           | Ratings     | Units |
|-------------------|---|-----------|-------------|-------|
| V <sub>DSS</sub>  | Drain-Source Voltage                              |           | 200         | V     |
| $V_{GSS}$         | Gate-Source Voltage                               |           | ±20         | V     |
| I <sub>D</sub>    | Drain Current - Continuous                        | (Note 1)  | 3.6         | А     |
|                   | Drain Current - Pulsed                            |           | 20          |       |
| P <sub>D</sub>    | Maximum Power Dissipation @ T <sub>C</sub> = 25°C | (Note 1)  | 70          | W     |
|                   | @ T <sub>A</sub> = 25°C                           | (Note 1a) | 3.2         |       |
|                   | @ T <sub>A</sub> = 25°C                           | (Note 1b) | 1.3         |       |
| dv/dt             | Peak Diode Recovery dv/dt                         | (Note 3)  | 3.2         | V/ns  |
| $T_J$ , $T_{STG}$ | Operating and Storage Junction Temperature Range  |           | -55 to +150 | °C    |

#### **Thermal Characteristics**

| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | (Note 1)  | 1.8 | °C/W |
|-----------------|---|-----------|-----|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1b) | 96  | °C/W |

## **Package Marking and Ordering Information**

| Device Marking | Device  | Reel Size | Tape width | Quantity   |
|----------------|---------|-----------|------------|------------|
| FDD2670        | FDD2670 | 13"       | 16mm       | 2500 units |

| Symbol                                  | Parameter                                      | Test Conditions   | Min | Тур        | Max        | Units |
|---|--|---|-----|------------|------------|-------|
| Drain-Sc                                | ource Avalanche Ratings (Note                  | 1)  |     | .1         | I          | ı     |
| W <sub>DSS</sub>                        | Single Pulse Drain-Source<br>Avalanche Energy  | $V_{DD} = 100 \text{ V},  I_D = 3.6 \text{ A}$  |     |            | 375        | mJ    |
| I <sub>AR</sub>                         | Maximum Drain-Source Avalanche Current         |   |     |            | 3.6        | Α     |
| Off Char                                | acteristics                                    |   |     |            |            |       |
| BV <sub>DSS</sub>                       | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA  | 200 |            |            | V     |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$    | Breakdown Voltage Temperature Coefficient      | $I_D$ = 250 $\mu$ A, Referenced to 25°C   |     | 214        |            | mV/°C |
| I <sub>DSS</sub>                        | Zero Gate Voltage Drain Current                | V <sub>DS</sub> = 160 V, V <sub>GS</sub> = 0 V  |     |            | 1          | μΑ    |
| I <sub>GSSF</sub>                       | Gate-Body Leakage, Forward                     | $V_{GS} = 20 \text{ V}, \qquad V_{DS} = 0 \text{ V}$  |     |            | 100        | NA    |
| I <sub>GSSR</sub>                       | Gate-Body Leakage, Reverse                     | $V_{GS} = -20 \text{ V},  V_{DS} = 0 \text{ V}$   |     |            | -100       | NA    |
| On Char                                 | acteristics (Note 2)                           | •   |     | •          |            | •     |
| V <sub>GS(th)</sub>                     | Gate Threshold Voltage                         | $V_{DS} = V_{GS}, I_{D} = 250 \mu A$  | 2   | 4          | 4.5        | V     |
| $\Delta V_{GS(th)} \over \Delta T_{.1}$ | Gate Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C  |     | -10        |            | mV/°C |
| R <sub>DS(on)</sub>                     | Static Drain–Source<br>On–Resistance           | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.6 A<br>V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.6 A T <sub>J</sub> = 125°C |     | 100<br>205 | 130<br>275 | mΩ    |
| I <sub>D(on)</sub>                      | On-State Drain Current                         | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 5 V   | 20  |            |            | Α     |
| <b>g</b> FS                             | Forward Transconductance                       | $V_{DS} = 5 \text{ V}, \qquad I_{D} = 3.6 \text{ A}$  |     | 15         |            | S     |
| Dvnamio                                 | : Characteristics                              |   |     |            |            |       |
| C <sub>iss</sub>                        | Input Capacitance                              | V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V,<br>f = 1.0 MHz  |     | 1228       |            | PF    |
| Coss                                    | Output Capacitance                             |   |     | 112        |            | PF    |
| C <sub>rss</sub>                        | Reverse Transfer Capacitance                   | 1   |     | 17         |            | pF    |
| Switchin                                | g Characteristics (Note 2)                     | 1   |     |            | ı          | ı     |
| t <sub>d(on)</sub>                      | Turn–On Delay Time                             | V <sub>DD</sub> = 100 V, I <sub>D</sub> = 1 A,  |     | 13         | 23         | ns    |
| t <sub>r</sub>                          | Turn–On Rise Time                              | $V_{GS} = 10 \text{ V}, \qquad R_{GEN} = 6 \Omega$  |     | 8          | 16         | ns    |
| $t_{\text{d(off)}}$                     | Turn-Off Delay Time                            | 1 , , , , , , , , , , , , , , , , , ,   |     | 30         | 48         | ns    |
| t <sub>f</sub>                          | Turn-Off Fall Time                             | 1   |     | 25         | 40         | ns    |
| Qg                                      | Total Gate Charge                              | $V_{DS} = 100 \text{ V},  I_{D} = 3.6 \text{ A},$   |     | 27         | 43         | nC    |
| Q <sub>gs</sub>                         | Gate-Source Charge                             | V <sub>GS</sub> = 10 V  |     | 7          |            | nC    |
| $Q_{gd}$                                | Gate-Drain Charge                              | 1   |     | 10         |            | nC    |
| Drain-Se                                | ource Diode Characteristics a                  | and Maximum Ratings   |     |            | •          | •     |
| l <sub>s</sub>                          | Maximum Continuous Drain–Source                |   |     |            | 2.1        | Α     |
| V <sub>SD</sub>                         | Drain–Source Diode Forward<br>Voltage          | $V_{GS} = 0 \text{ V},  I_S = 2.1 \text{ A}  \text{(Note 2)}$   |     | 0.7        | 1.2        | V     |

#### Notes

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



Scale 1 : 1 on letter size paper

**2.** Pulse Test: Pulse Width < 300 $\mu$ s, Duty Cycle < 2.0%

3.  $I_{SD} \leq 3A$ , di/dt  $\leq 100A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J$  = 25°C

# **Typical Characteristics**

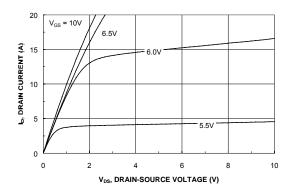
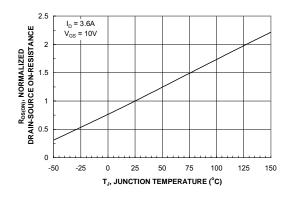


Figure 1. On-Region Characteristics.

Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.



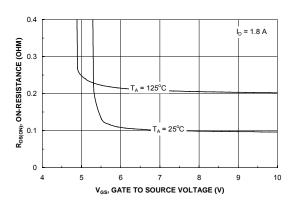
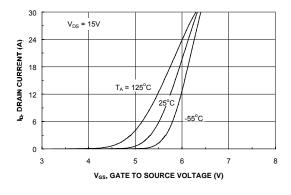


Figure 3. On-Resistance Variation with Temperature.

Figure 4. On-Resistance Variation with Gate-to-Source Voltage.



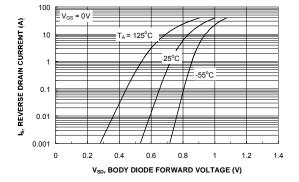
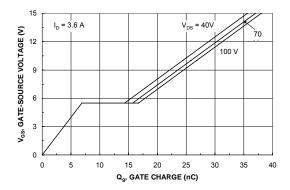


Figure 5. Transfer Characteristics.

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

# **Typical Characteristics**



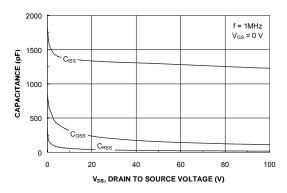


Figure 7. Gate Charge Characteristics.

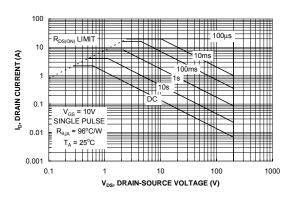


Figure 8. Capacitance Characteristics.

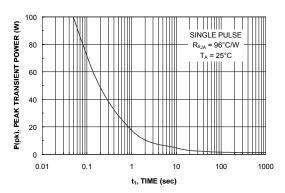


Figure 9. Maximum Safe Operating Area.



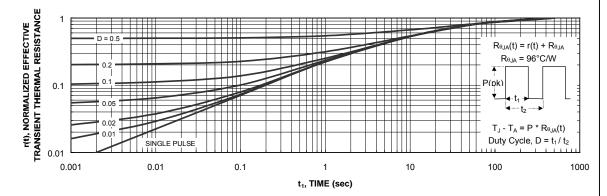
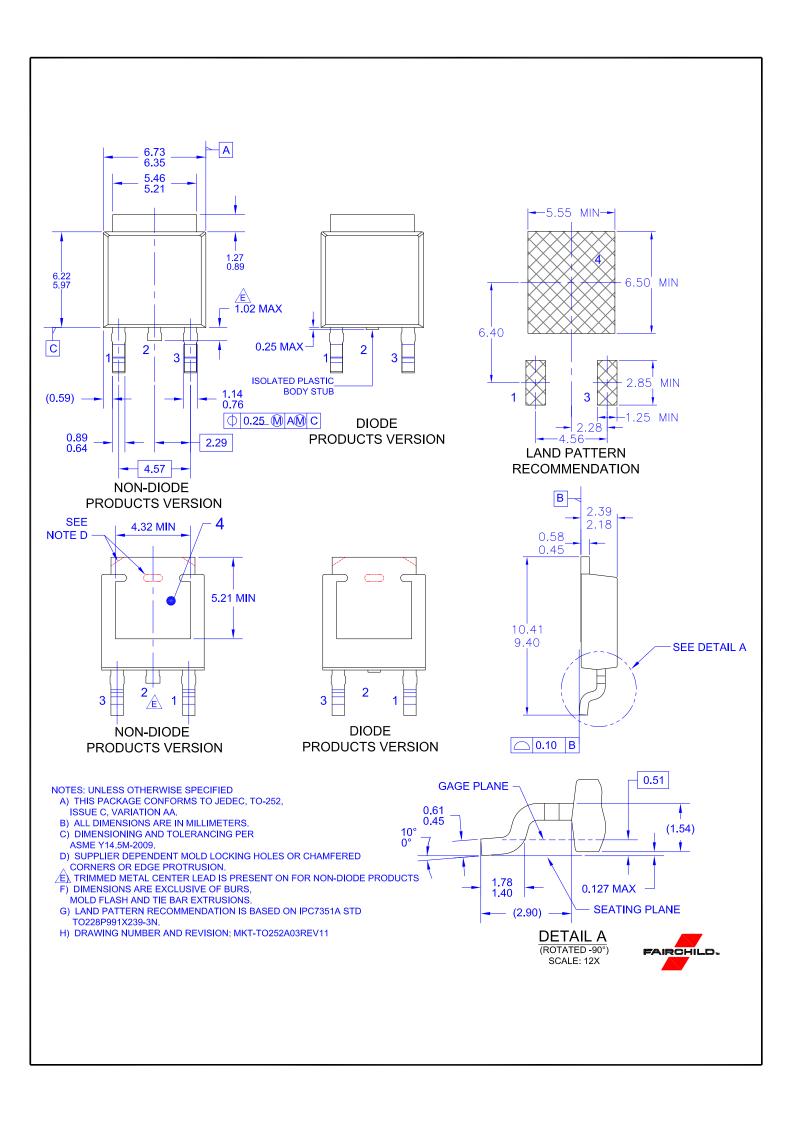


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.



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