

# FDP2570/FDB2570

## 150V N-Channel PowerTrench® MOSFET

### General Description

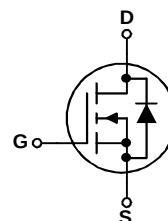
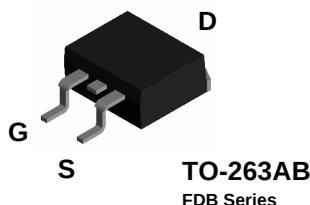
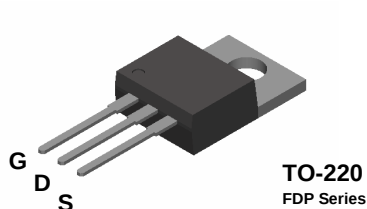
This N-Channel MOSFET has been designed specifically for switching on the primary side in the isolated DC/DC converter application. Any application requiring a 150V MOSFETs with low on-resistance and fast switching will benefit.

These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{DS(ON)}$  specifications.

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

### Features

- 22 A, 150 V.  $R_{DS(ON)} = 80 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$   
 $R_{DS(ON)} = 90 \text{ m}\Omega @ V_{GS} = 6 \text{ V}$
- Low gate charge (40nC typical)
- Fast switching speed
- High performance trench technology for extremely low  $R_{DS(ON)}$
- 175°C maximum junction temperature rating



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

| Symbol         | Parameter                                          | Ratings     | Units |
|----------------|----------------------------------------------------|-------------|-------|
| $V_{DSS}$      | Drain-Source Voltage                               | 150         | V     |
| $V_{GSS}$      | Gate-Source Voltage                                | $\pm 20$    | V     |
| $I_D$          | Drain Current – Continuous (Note 1)                | 22          | A     |
|                | – Pulsed (Note 1)                                  | 50          | A     |
| $P_D$          | Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | 93          | W     |
|                | Derate above $25^\circ\text{C}$                    | 0.63        | W/°C  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range   | -65 to +175 | °C    |

### Thermal Characteristics

|                 |                                         |      |      |
|-----------------|-----------------------------------------|------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 1.6  | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | °C/W |

### Package Marking and Ordering Information

| Device Marking | Device  | Reel Size | Tape width | Quantity  |
|----------------|---------|-----------|------------|-----------|
| FDB2570        | FDB2570 | 13"       | 24mm       | 800 units |
| FDP2570        | FDP2570 | Tube      | n/a        | 45 units  |

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

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

**Drain-Source Avalanche Ratings (Note 1)**

|           |                                            |                                           |  |  |     |    |
|-----------|--------------------------------------------|-------------------------------------------|--|--|-----|----|
| $W_{DSS}$ | Single Pulse Drain-Source Avalanche Energy | $V_{DD} = 75\text{ V}, I_D = 11\text{ A}$ |  |  | 375 | mJ |
| $I_{AR}$  | Maximum Drain-Source Avalanche Current     |                                           |  |  | 11  | A  |

**Off Characteristics**

|                                      |                                           |                                                                   |     |     |      |                      |
|--------------------------------------|-------------------------------------------|-------------------------------------------------------------------|-----|-----|------|----------------------|
| $BV_{DSS}$                           | Drain-Source Breakdown Voltage            | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$               | 150 |     |      | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$ |     | 154 |      | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 120\text{ V}, V_{GS} = 0\text{ V}$                      |     |     | 1    | $\mu\text{A}$        |
| $I_{GSSF}$                           | Gate-Body Leakage, Forward                | $V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$                       |     |     | 100  | nA                   |
| $I_{GSSR}$                           | Gate-Body Leakage, Reverse                | $V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$                      |     |     | -100 | nA                   |

**On Characteristics (Note 2)**

|                                        |                                                |                                                                                                                                                               |    |                 |                 |                      |
|----------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------|-----------------|----------------------|
| $V_{GS(th)}$                           | Gate Threshold Voltage                         | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$                                                                                                               | 2  | 2.6             | 4               | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$                                                                                             |    | -7              |                 | mV/ $^\circ\text{C}$ |
| $R_{DS(on)}$                           | Static Drain-Source On-Resistance              | $V_{GS} = 10\text{ V}, I_D = 11\text{ A}$<br>$V_{GS} = 6.0\text{ V}, I_D = 10\text{ A}$<br>$V_{GS} = 10\text{ V}, I_D = 11\text{ A}, T_J = 125^\circ\text{C}$ |    | 61<br>63<br>127 | 80<br>90<br>175 | m $\Omega$           |
| $I_{D(on)}$                            | On-State Drain Current                         | $V_{GS} = 10\text{ V}, V_{DS} = 10\text{ V}$                                                                                                                  | 25 |                 |                 | A                    |
| $g_{FS}$                               | Forward Transconductance                       | $V_{DS} = 10\text{ V}, I_D = 11\text{ A}$                                                                                                                     |    | 39              |                 | S                    |

**Dynamic Characteristics**

|           |                              |                                                                      |  |      |  |    |
|-----------|------------------------------|----------------------------------------------------------------------|--|------|--|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V},$<br>$f = 1.0\text{ MHz}$ |  | 1911 |  | pF |
| $C_{oss}$ | Output Capacitance           |                                                                      |  | 106  |  | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                      |  | 33   |  | pF |

**Switching Characteristics (Note 2)**

|              |                     |                                                                                                |  |    |    |    |
|--------------|---------------------|------------------------------------------------------------------------------------------------|--|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 75\text{ V}, I_D = 1\text{ A},$<br>$V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$ |  | 12 | 22 | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                                |  | 5  | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                                |  | 33 | 53 | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                                |  | 23 | 37 | ns |
| $Q_g$        | Total Gate Charge   | $V_{DS} = 75\text{ V}, I_D = 11\text{ A},$<br>$V_{GS} = 10\text{ V}$                           |  | 40 | 56 | nC |
| $Q_{gs}$     | Gate-Source Charge  |                                                                                                |  | 7  |    | nC |
| $Q_{gd}$     | Gate-Drain Charge   |                                                                                                |  | 12 |    | nC |

**Drain-Source Diode Characteristics and Maximum Ratings**

|          |                                                       |                                                   |  |      |     |   |
|----------|-------------------------------------------------------|---------------------------------------------------|--|------|-----|---|
| $I_S$    | Maximum Continuous Drain-Source Diode Forward Current |                                                   |  |      | 22  | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = 11\text{ A}$ (Note 2) |  | 0.83 | 1.3 | V |

**Notes:**

1. Calculated continuous current based on maximum allowable junction temperature.
2. Pulse Test: Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2.0%

## Typical Characteristics

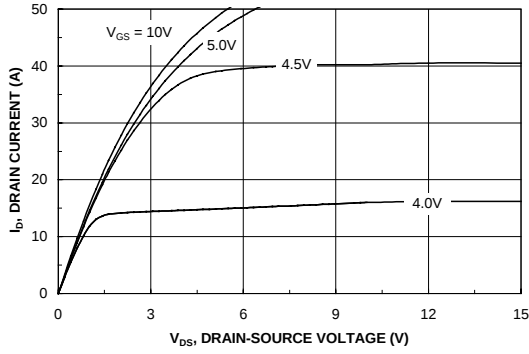


Figure 1. On-Region Characteristics.

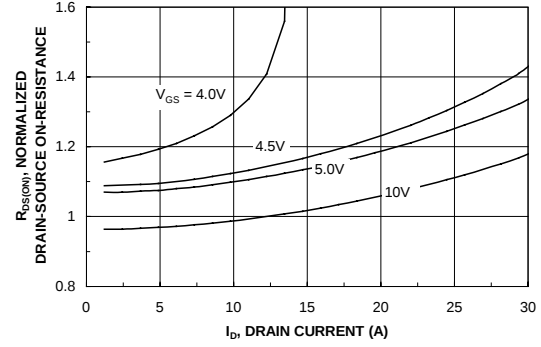


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

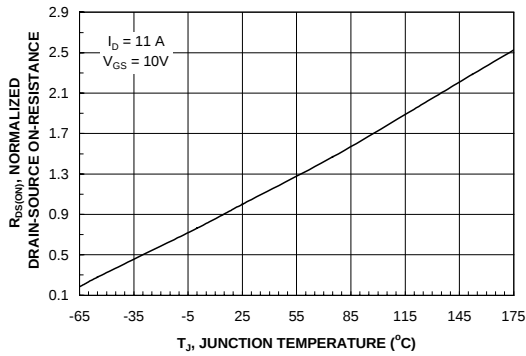


Figure 3. On-Resistance Variation with Temperature.

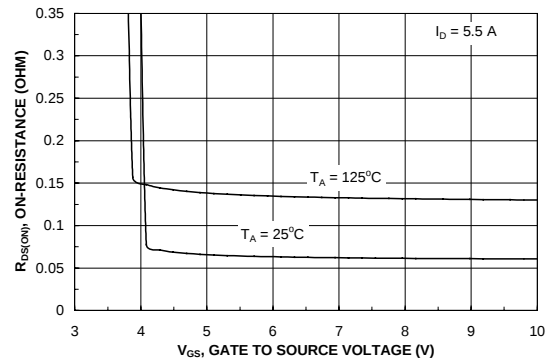


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

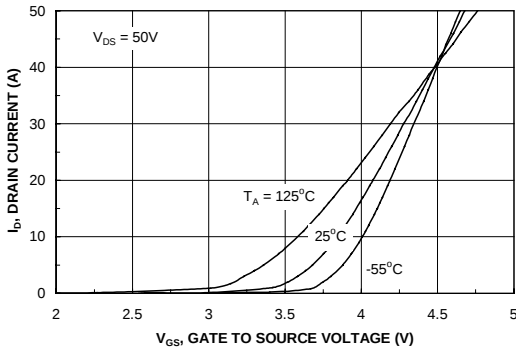


Figure 5. Transfer Characteristics.

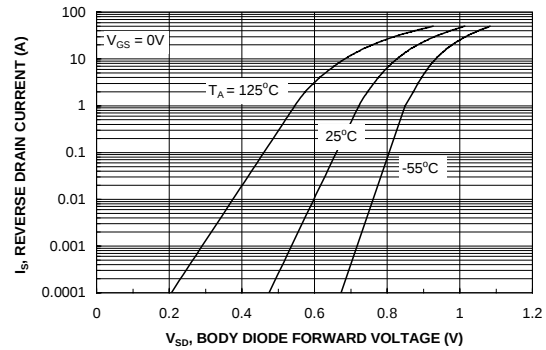


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

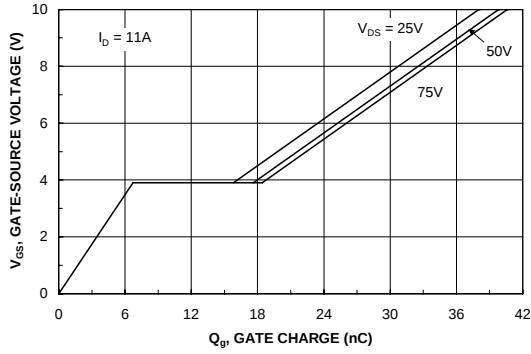


Figure 7. Gate Charge Characteristics.

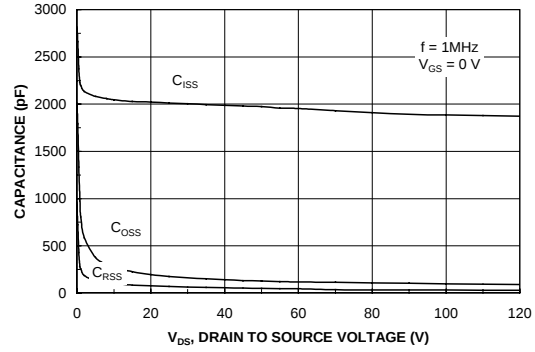


Figure 8. Capacitance Characteristics.

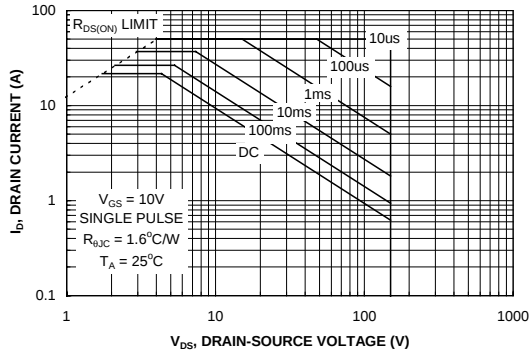


Figure 9. Maximum Safe Operating Area.

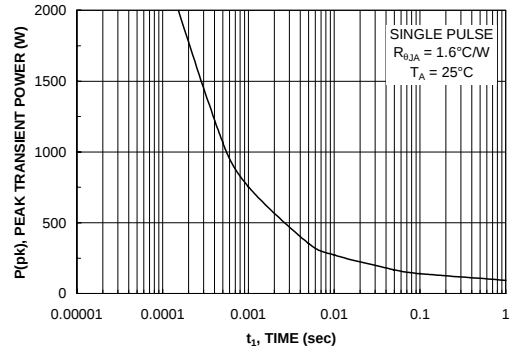


Figure 10. Single Pulse Maximum Power Dissipation.

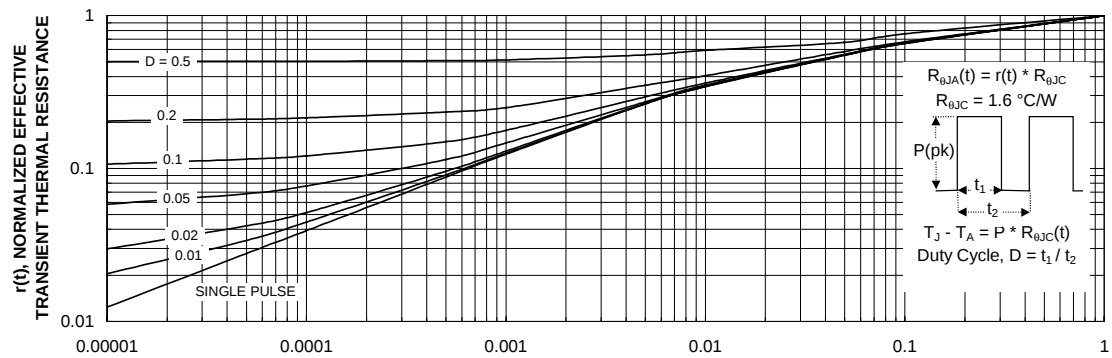


Figure 11. Transient Thermal Response Curve.

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

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