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# FDP7030BL/FDB7030BL

## N-Channel Logic Level PowerTrench<sup>®</sup> MOSFET

### General Description

This N-Channel Logic Level MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

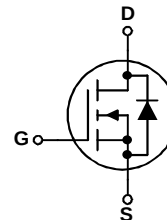
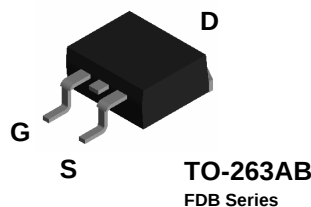
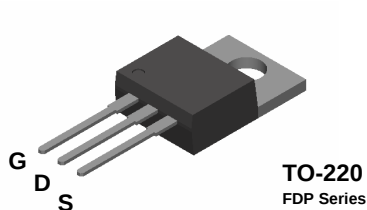
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{DS(ON)}$  specifications.

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.

It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

### Features

- 60 A, 30 V  $R_{DS(ON)} = 9\text{ m}\Omega @ V_{GS} = 10\text{ V}$   
 $R_{DS(ON)} = 12\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
- Critical DC electrical parameters specified at elevated temperature
- 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                               | 30              | V                |
| $V_{GSS}$      | Gate-Source Voltage                                | $\pm 20$        | V                |
| $I_D$          | Drain Current – Continuous (Note 1)                | 60              | A                |
|                | – Pulsed (Note 1)                                  | 180             |                  |
| $P_D$          | Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | 60              | W                |
|                | Derate above $25^\circ\text{C}$                    | 0.4             |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range   | $-65$ to $+175$ | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |                                         |      |                    |
|-----------------|-----------------------------------------|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 2.5  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | $^\circ\text{C/W}$ |

### Package Marking and Ordering Information

| Device Marking | Device    | Reel Size | Tape width | Quantity  |
|----------------|-----------|-----------|------------|-----------|
| FDB7030BL      | FDB7030BL | 13"       | 24mm       | 800 units |
| FDP7030BL      | FDP7030BL | Tube      | n/a        | 45        |

**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 | $V_{DD} = 15\text{ V}, I_D = 60\text{ A}$ |  |  | 73 | mJ |
| $I_{AR}$  | Maximum Drain-Source Avalanche Current     |                                           |  |  | 60 | A  |

**Off Characteristics**

|                                      |                                           |                                                                   |    |    |           |                      |
|--------------------------------------|-------------------------------------------|-------------------------------------------------------------------|----|----|-----------|----------------------|
| $BV_{DSS}$                           | Drain-Source Breakdown Voltage            | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$               | 30 |    |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$ |    | 22 |           | 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-Body Leakage                         | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$                   |    |    | $\pm 100$ | nA                   |

**On Characteristics** (Note 2)

|                                        |                                                |                                                                                                                                                               |    |                    |               |                      |
|----------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------|---------------|----------------------|
| $V_{GS(th)}$                           | Gate Threshold Voltage                         | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$                                                                                                               | 1  | 1.9                | 3             | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$                                                                                             |    | -5                 |               | mV/ $^\circ\text{C}$ |
| $R_{DS(on)}$                           | Static Drain-Source On-Resistance              | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}$<br>$V_{GS} = 4.5\text{ V}, I_D = 25\text{ A}$<br>$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125^\circ\text{C}$ |    | 6.8<br>8.5<br>10.1 | 9<br>12<br>18 | m $\Omega$           |
| $I_{D(on)}$                            | On-State Drain Current                         | $V_{GS} = 10\text{ V}, V_{DS} = 10\text{ V}$                                                                                                                  | 30 |                    |               | A                    |
| $g_{FS}$                               | Forward Transconductance                       | $V_{DS} = 10\text{ V}, I_D = 30\text{ A}$                                                                                                                     |    | 85                 |               | S                    |

**Dynamic Characteristics**

|           |                              |                                                                 |  |      |  |          |
|-----------|------------------------------|-----------------------------------------------------------------|--|------|--|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ |  | 1760 |  | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                 |  | 440  |  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                 |  | 185  |  | pF       |
| $R_G$     | Gate Resistance              | $V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$                     |  | 1.2  |  | $\Omega$ |

**Switching Characteristics** (Note 2)

|              |                     |                                                                                           |  |     |    |    |
|--------------|---------------------|-------------------------------------------------------------------------------------------|--|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 15\text{ V}, I_D = 1\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$ |  | 12  | 22 | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                           |  | 12  | 22 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                           |  | 30  | 48 | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                           |  | 19  | 33 | ns |
| $Q_g$        | Total Gate Charge   | $V_{DS} = 15\text{ V}, I_D = 30\text{ A}, V_{GS} = 5\text{ V}$                            |  | 17  | 24 | nC |
| $Q_{gs}$     | Gate-Source Charge  |                                                                                           |  | 5.4 |    | nC |
| $Q_{gd}$     | Gate-Drain Charge   |                                                                                           |  | 6.4 |    | nC |

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

|          |                                                       |                                                         |  |      |     |    |
|----------|-------------------------------------------------------|---------------------------------------------------------|--|------|-----|----|
| $I_S$    | Maximum Continuous Drain-Source Diode Forward Current |                                                         |  |      | 60  | A  |
| $V_{SD}$ | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = 30\text{ A}$ (Note 1)       |  | 0.92 | 1.3 | V  |
| $t_{rr}$ | Diode Reverse Recovery Time                           | $I_F = 30\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ |  |      | 30  | nS |
| $Q_{rr}$ | Diode Reverse Recovery Charge                         |                                                         |  |      | 20  | nC |

**Notes:**

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

## Typical Characteristics

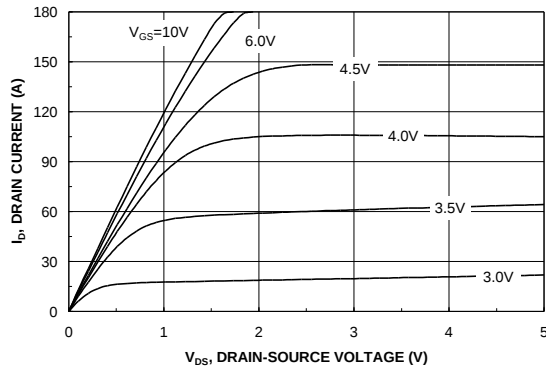


Figure 1. On-Region Characteristics.

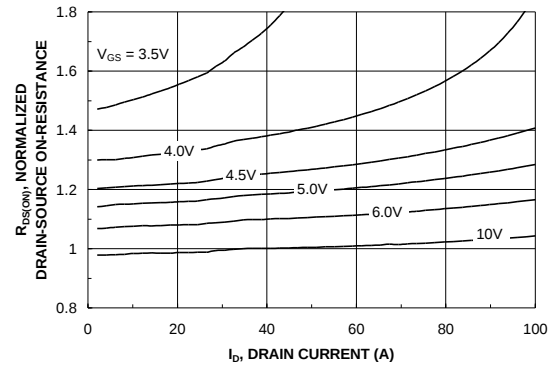


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

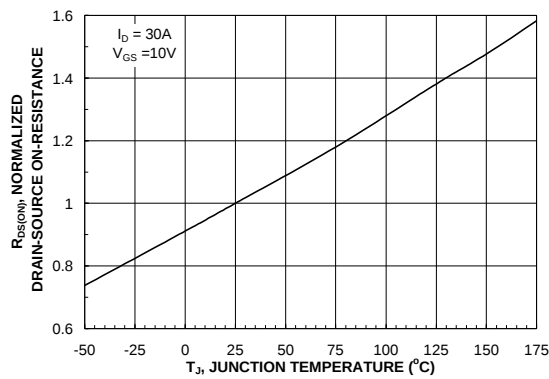


Figure 3. On-Resistance Variation with Temperature.

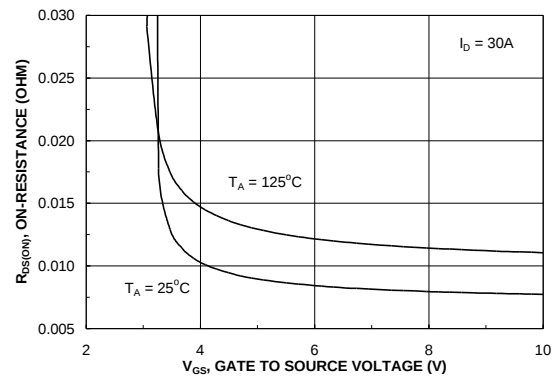


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

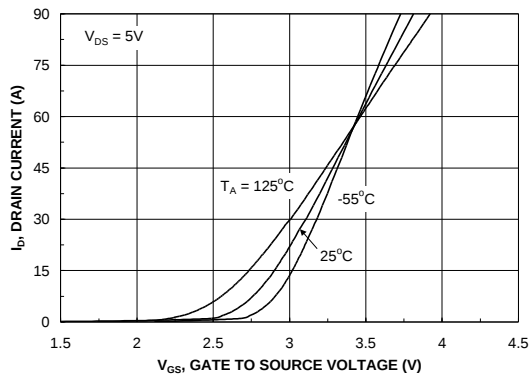


Figure 5. Transfer Characteristics.

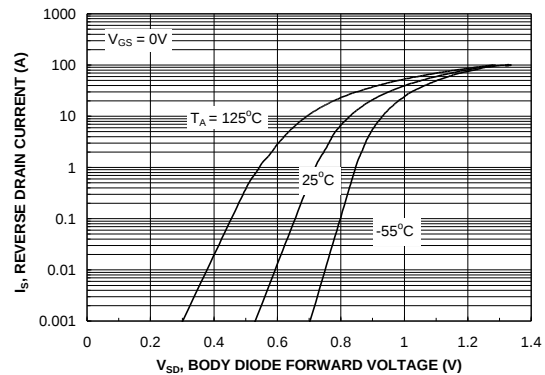


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

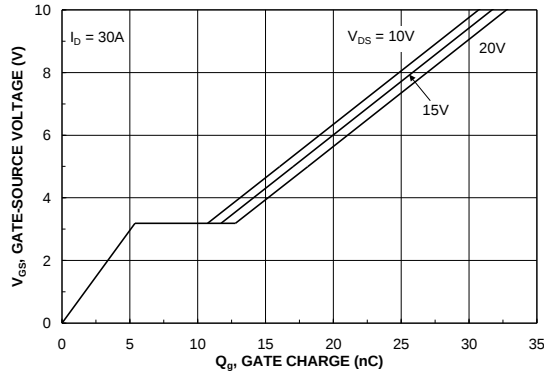


Figure 7. Gate Charge Characteristics.

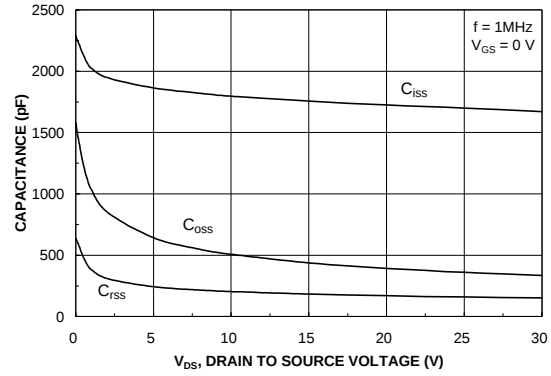


Figure 8. Capacitance Characteristics.

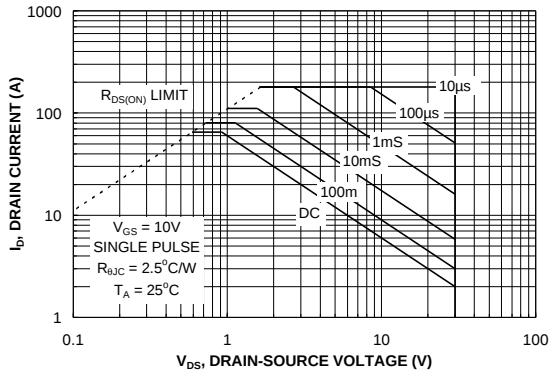


Figure 9. Maximum Safe Operating Area.

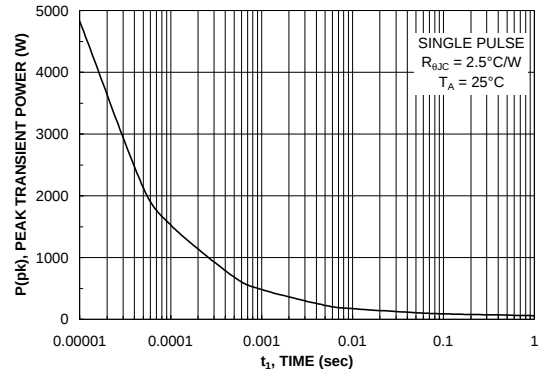


Figure 10. Single Pulse Maximum Power Dissipation.

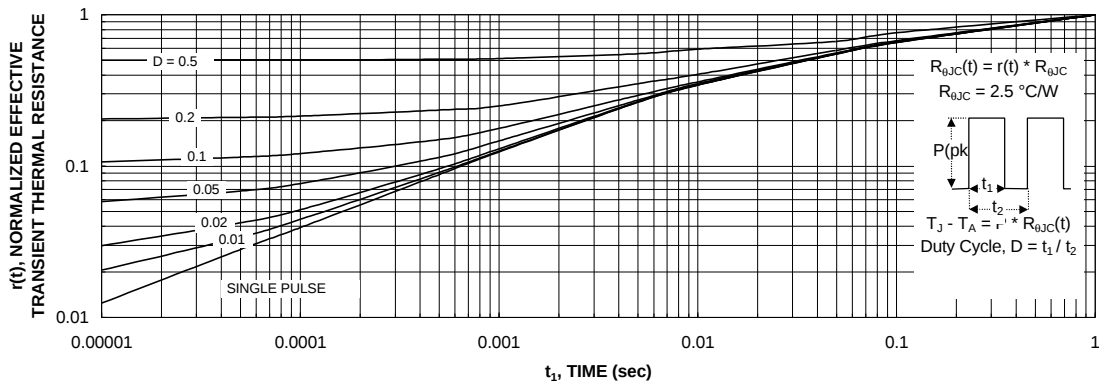


Figure 11. Transient Thermal Response Curve.

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