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FDP6030BL/FDB6030BL

N-Channel Logic Level PowerTrench® MOSFET

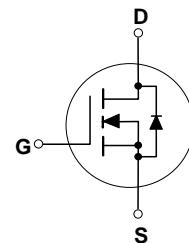
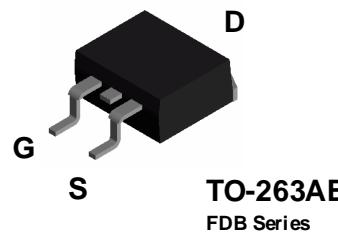
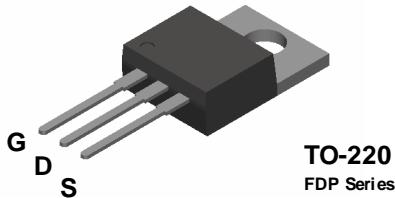
General Description

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 resulting in DC/DC power supply designs with higher overall efficiency.

Features

- 40 A, 30 V. $R_{DS(on)} = 0.018 \Omega$ @ $V_{GS} = 10$ V
 $R_{DS(on)} = 0.024 \Omega$ @ $V_{GS} = 4.5$ V.
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- High performance trench technology for extremely low $R_{DS(on)}$.
- 175°C maximum junction temperature rating.



Absolute Maximum Ratings

$T_c = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | FDP6030BL | FDB6030BL | Units |
|----------------|----------------------------------------------------|-------------|-----------|---------------------|
| V_{DSS} | Drain-Source Voltage | 30 | | V |
| V_{GSS} | Gate-Source Voltage | | ± 20 | V |
| I_D | Maximum Drain Current - Continuous (Note 1) | 40 | | A |
| | - Pulsed | 120 | | |
| P_D | Total Power Dissipation @ $T_c = 25^\circ\text{C}$ | 60 | | W |
| | Derate above 25°C | 0.36 | | W/ $^\circ\text{C}$ |
| 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 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | $^\circ\text{C}/\text{W}$ |

Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape Width | Quantity |
|----------------|-----------|-----------|------------|----------|
| FDB6030BL | FDB6030BL | 13" | 24mm | 800 |
| FDP6030BL | FDP6030BL | Tube | N/A | 45 |

Electrical Characteristics $T_C = 25^\circ\text{C}$ 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 | $V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$ | | | 150 | mJ |
| I_{AR} | Maximum Drain-Source Avalanche Current | | | | 40 | A |
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$ | 30 | | | V |
| ΔBV_{DSS} ΔT_J | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C | | 23 | | $\text{mV/}^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 24\text{ V}$, $V_{GS} = 0\text{ V}$ | | | 1 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$ | | | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -20\text{ V}$, $V_{DS} = 0\text{ V}$ | | | -100 | nA |
| On Characteristics (Note 1) | | | | | | |
| $V_{GS(\text{th})}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 1 | 1.6 | 3 | V |
| $\Delta V_{GS(\text{th})}$ ΔT_J | Gate Threshold Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C | | -4.5 | | $\text{mV/}^\circ\text{C}$ |
| $R_{DS(\text{on})}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$, $T_J = 125^\circ\text{C}$ $V_{GS} = 4.5\text{ V}$, $I_D = 17\text{ A}$ | | 0.015 0.021 0.019 | 0.018 0.030 0.024 | Ω |
| $I_{D(\text{on})}$ | On-State Drain Current | $V_{GS} = 10\text{ V}$, $V_{DS} = 10\text{ V}$ | 40 | | | A |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{ V}$, $I_D = 20\text{ A}$ | | 30 | | S |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$ | | 1160 | | pF |
| C_{oss} | Output Capacitance | | | 250 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 100 | | pF |
| Switching Characteristics (Note 1) | | | | | | |
| $t_{d(\text{on})}$ | Turn-On Delay Time | $V_{DD} = 15\text{ V}$, $I_D = 1\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{\text{GEN}} = 6\ \Omega$ | | 9 | 17 | ns |
| t_r | Turn-On Rise Time | | | 11 | 20 | ns |
| $t_{d(\text{off})}$ | Turn-Off Delay Time | | | 23 | 37 | ns |
| t_f | Turn-Off Fall Time | | | 8 | 16 | ns |
| Q_g | Total Gate Charge | $V_{DS} = 15\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = 5\text{ V}$ | | 12 | 17 | nC |
| Q_{gs} | Gate-Source Charge | | | 3.2 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 3.7 | | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I_S | Maximum Continuous Drain-Source Diode Forward Current | (Note 1) $V_{GS} = 0\text{ V}$, $I_S = 20\text{ A}$ | | | 40 | A |
| V_{SD} | Drain-Source Diode Forward Voltage | | | 0.95 | 1.2 | V |

Note:

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

Typical Characteristics

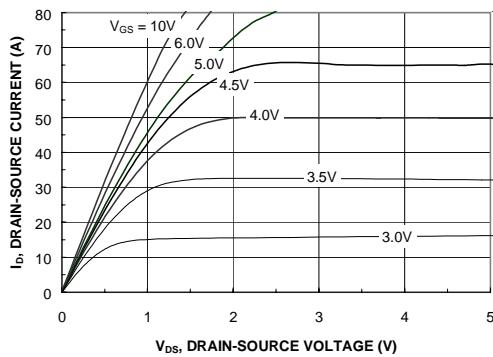


Figure 1. On-Region Characteristics.

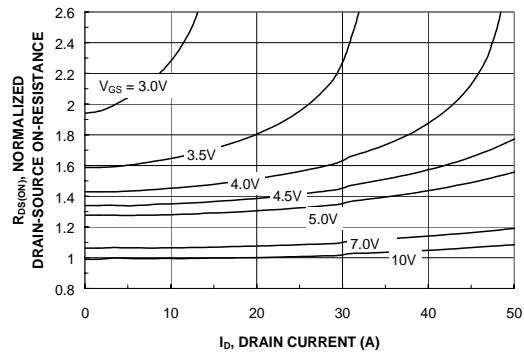


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

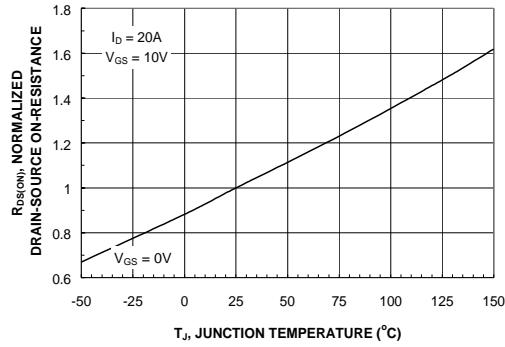


Figure 3. On-Resistance Variation with Temperature.

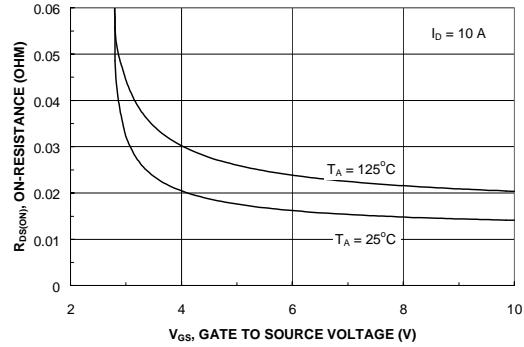


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

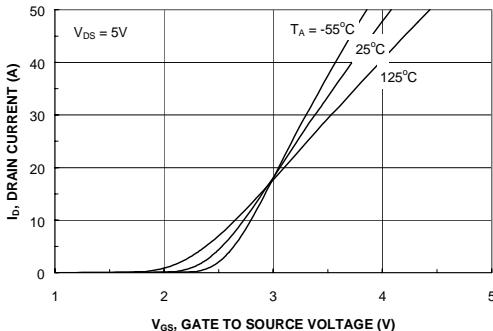


Figure 5. Transfer Characteristics.

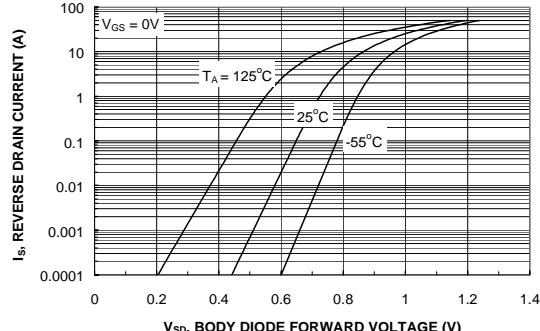


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)

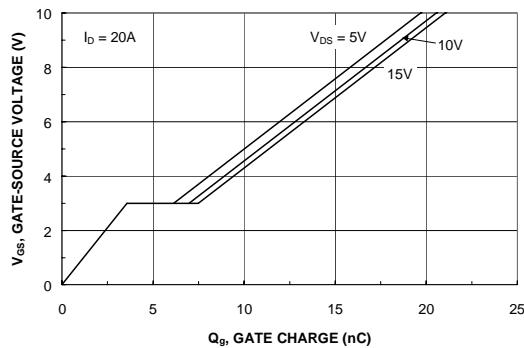


Figure 7. Gate-Charge Characteristics.

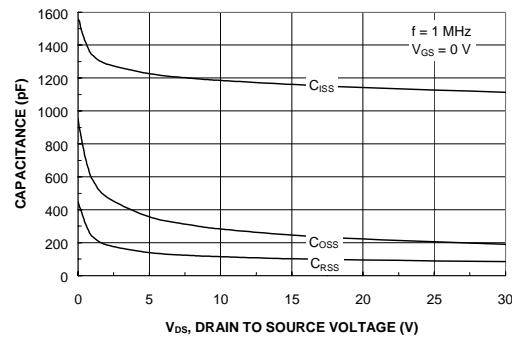


Figure 8. Capacitance Characteristics.

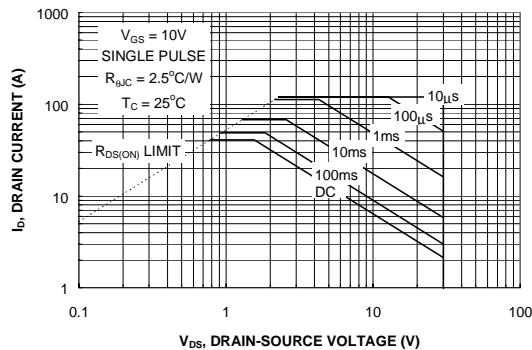


Figure 9. Maximum Safe Operating Area.

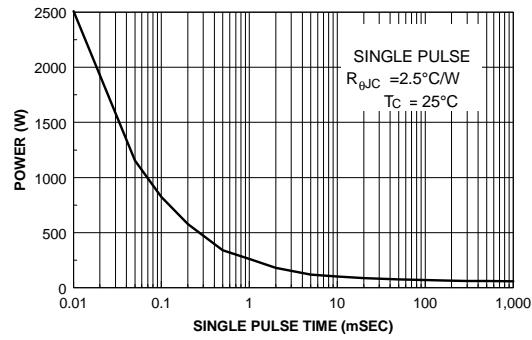


Figure 10. Single Pulse Maximum Power Dissipation.

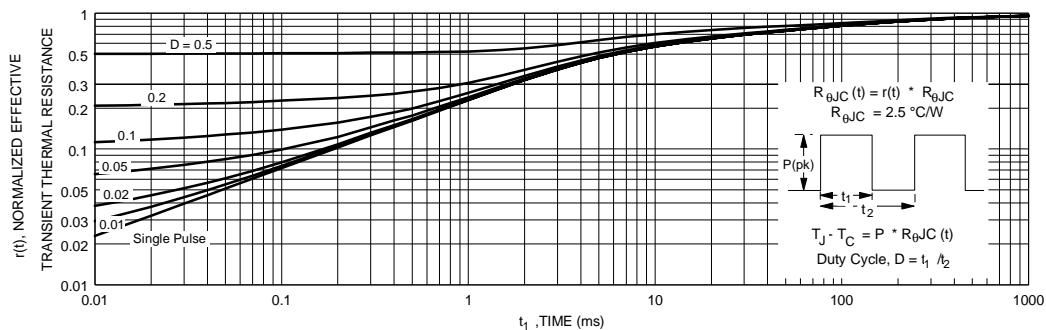


Figure 11. Transient Thermal Response Curve.

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