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ON Semiconductor®

# FDP6030BL/FDB6030BL

## N-Channel Logic Level PowerTrench® MOSFET

FDP6030BL/FDB6030BL

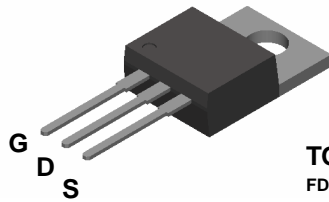
### General Description

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.

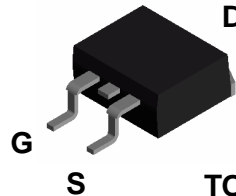
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{DS(on)}$  specifications resulting in DC/DC power supply designs with higher overall efficiency.

### Features

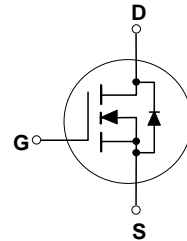
- 40 A, 30 V.  $R_{DS(on)} = 0.018 \Omega @ V_{GS} = 10 \text{ V}$   
 $R_{DS(on)} = 0.024 \Omega @ V_{GS} = 4.5 \text{ V}$ .
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.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



**TO-220**  
FDP Series



**TO-263AB**  
FDB Series



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

Symbol	Parameter	FDP6030BL	FDB6030BL	Units
V <sub>DSS</sub>	Drain-Source Voltage	30		V
V <sub>GSS</sub>	Gate-Source Voltage	±20		V
I <sub>D</sub>	Maximum Drain Current - Continuous (Note 1)	40		A
		120		
P <sub>D</sub>	Total Power Dissipation @ T <sub>C</sub> = 25°C	60		W
	Derate above 25°C	0.36		
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range	-65 to +175		°C

### Thermal Characteristics

R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	2.5	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62.5	°C/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
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### 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	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		23		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSSF}$	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)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.6	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-4.5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	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	$\Omega$
$I_{D(on)}$	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)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A}$ , $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		9	17	ns
$t_r$	Turn-On Rise Time			11	20	ns
$t_{d(off)}$	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)				40	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 20\text{ A}$ (Note 1)		0.95	1.2	V

**Note:**

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

## Typical Characteristics

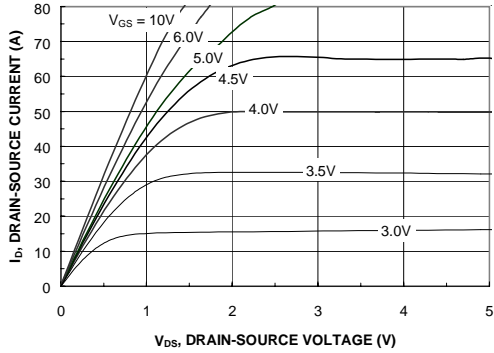


Figure 1. On-Region Characteristics.

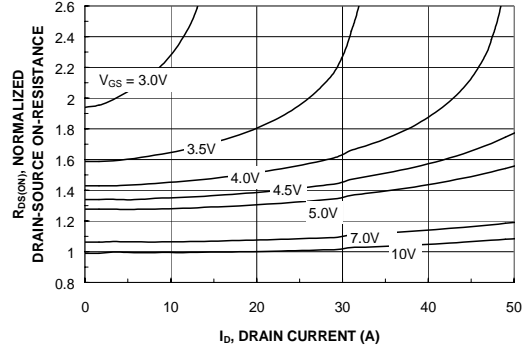


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

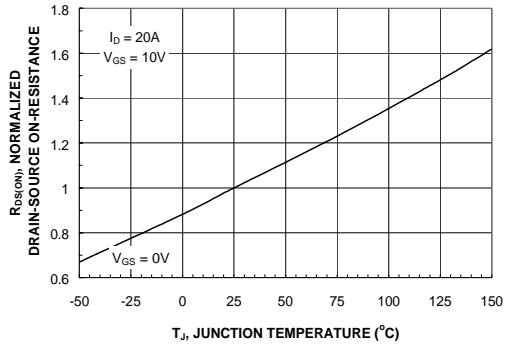


Figure 3. On-Resistance Variation with Temperature.

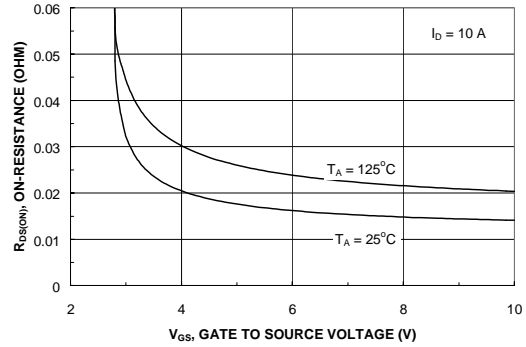


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

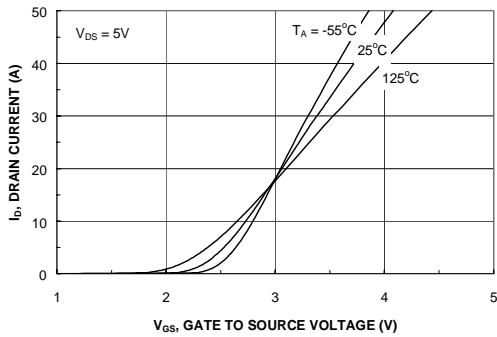


Figure 5. Transfer Characteristics.

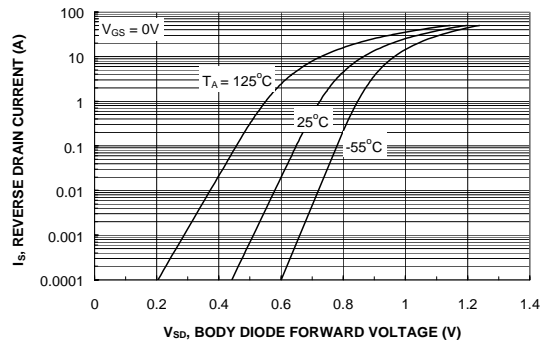
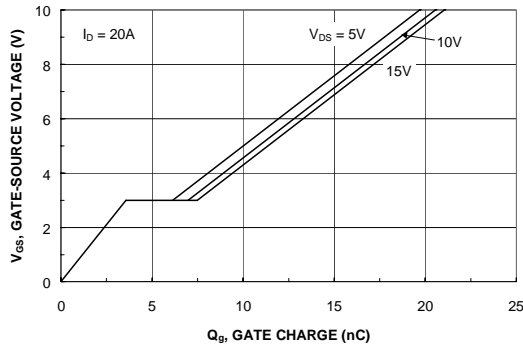
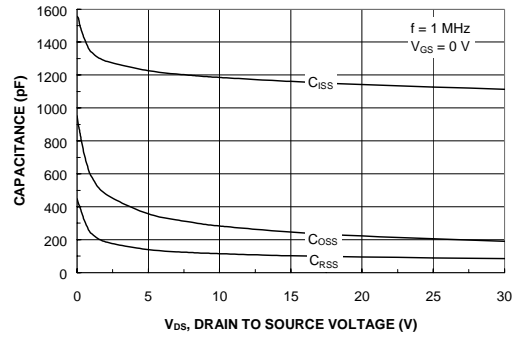


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

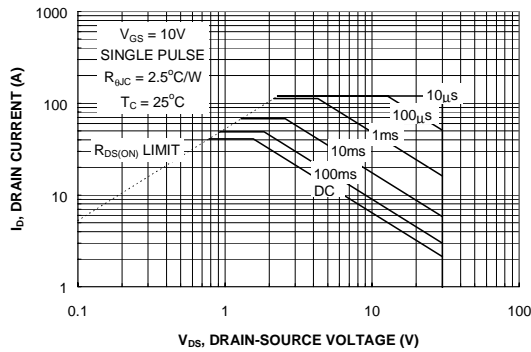
**Typical Characteristics** (continued)



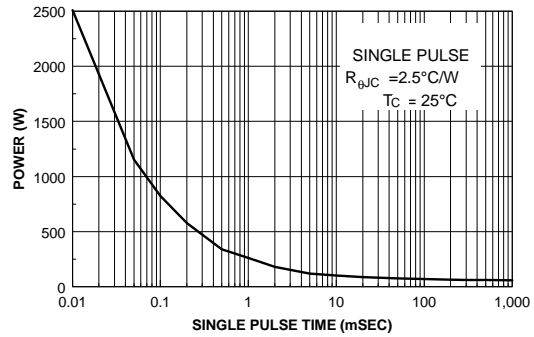
**Figure 7. Gate-Charge Characteristics.**



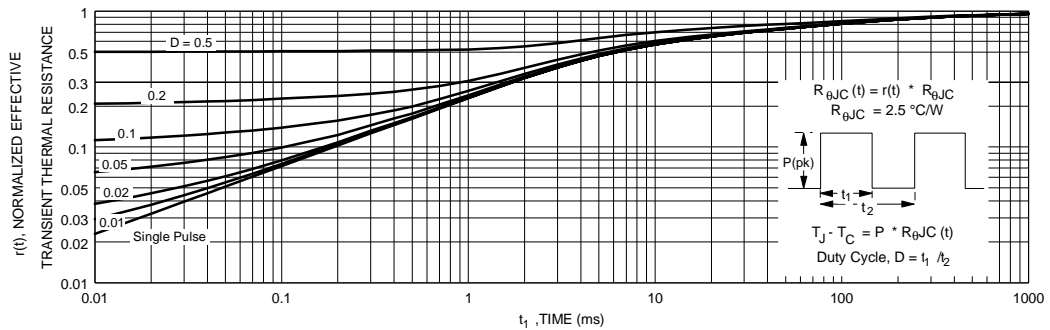
**Figure 8. Capacitance Characteristics.**



**Figure 9. Maximum Safe Operating Area.**



**Figure 10. Single Pulse Maximum Power Dissipation.**



**Figure 11. Transient Thermal Response Curve.**

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