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ON Semiconductor®

## FDP6030BL/FDB6030BL

### N-Channel Logic Level PowerTrench® MOSFET

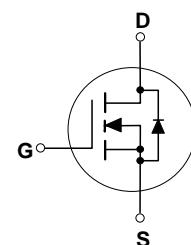
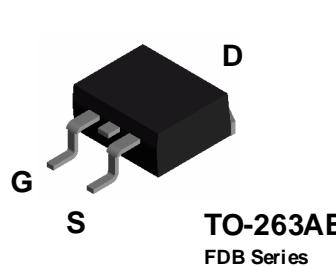
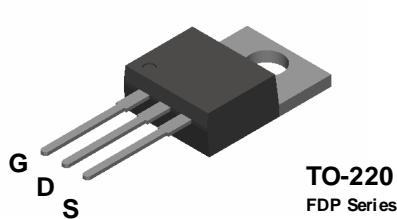
#### General Description

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		$\pm 20$	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/°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	2.5	°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
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
<b>DRAIN-SOURCE AVALANCHE RATINGS</b> (Note 1)						
$W_{DSS}$	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 15\text{ V}$ , $I_D = 40\text{ A}$			150	$\text{mJ}$
$I_{AR}$	Maximum Drain-Source Avalanche Current				40	$\text{A}$
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	30			$\text{V}$
$\Delta BV_{DSS}$ $\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$		23		$\text{mV/}^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	$\text{nA}$
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$			-100	$\text{nA}$
<b>On Characteristics</b> (Note 1)						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1	1.6	3	$\text{V}$
$\Delta V_{GS(\text{th})}$ $\Delta T_J$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$		-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	$\Omega$
$I_{D(\text{on})}$	On-State Drain Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 10\text{ V}$	40			$\text{A}$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}$ , $I_D = 20\text{ A}$		30		$\text{S}$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$		1160		$\text{pF}$
$C_{oss}$	Output Capacitance			250		$\text{pF}$
$C_{rss}$	Reverse Transfer Capacitance			100		$\text{pF}$
<b>Switching Characteristics</b> (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	$\text{ns}$
$t_r$	Turn-On Rise Time			11	20	$\text{ns}$
$t_{d(\text{off})}$	Turn-Off Delay Time			23	37	$\text{ns}$
$t_f$	Turn-Off Fall Time			8	16	$\text{ns}$
$Q_g$	Total Gate Charge	$V_{DS} = 15\text{ V}$ , $I_D = 20\text{ A}$ , $V_{GS} = 5\text{ V}$		12	17	$\text{nC}$
$Q_{gs}$	Gate-Source Charge			3.2		$\text{nC}$
$Q_{gd}$	Gate-Drain Charge			3.7		$\text{nC}$
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	$(\text{Note 1})$ $V_{GS} = 0\text{ V}$ , $I_S = 20\text{ A}$			40	$\text{A}$
$V_{SD}$	Drain-Source Diode Forward Voltage			0.95	1.2	$\text{V}$

## Note:

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

## Typical Characteristics

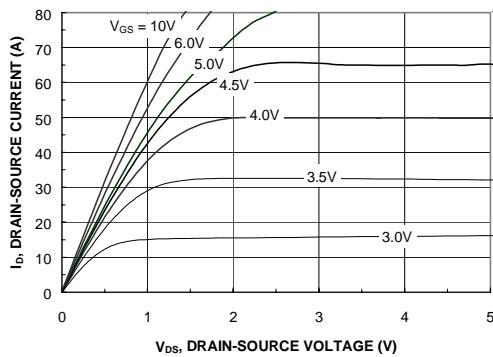


Figure 1. On-Region Characteristics.

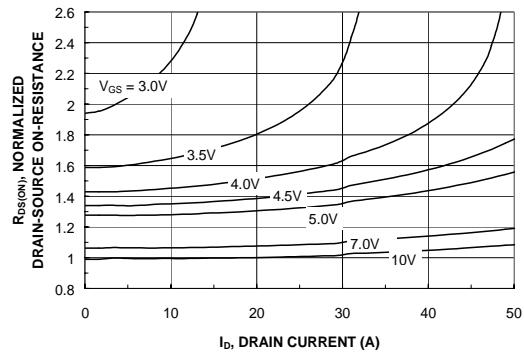


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

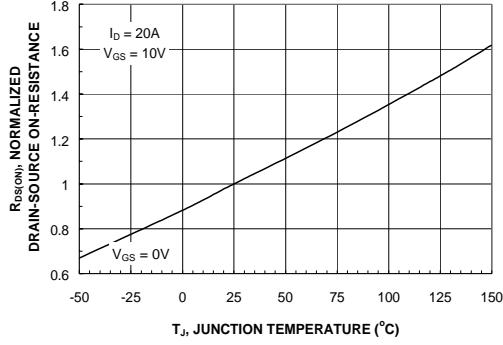


Figure 3. On-Resistance Variation with Temperature.

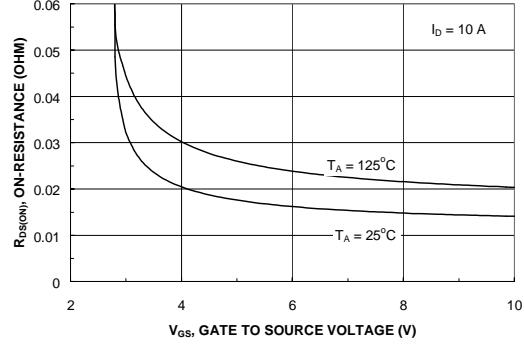


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

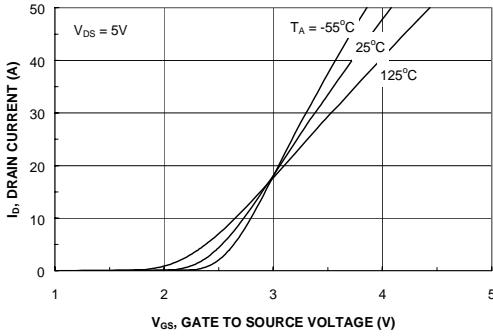


Figure 5. Transfer Characteristics.

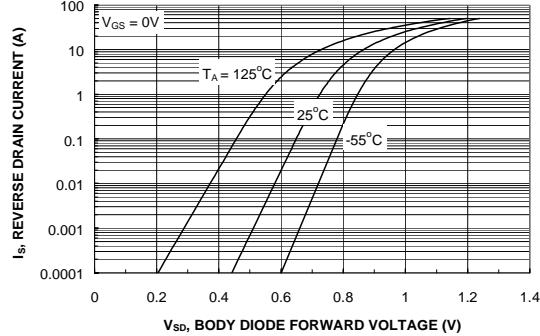


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics (continued)

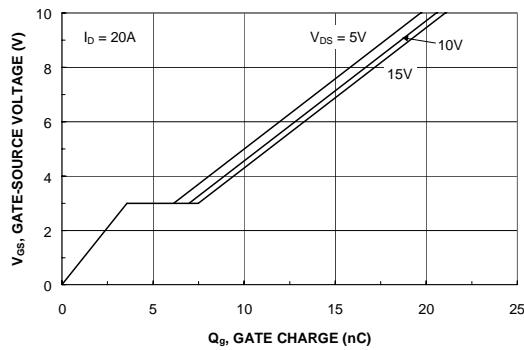


Figure 7. Gate-Charge Characteristics.

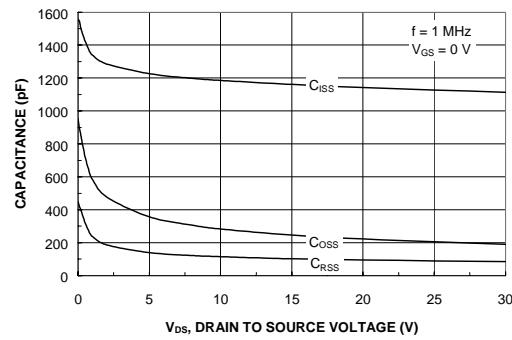


Figure 8. Capacitance Characteristics.

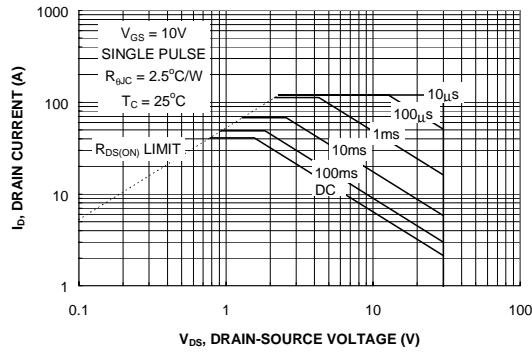


Figure 9. Maximum Safe Operating Area.

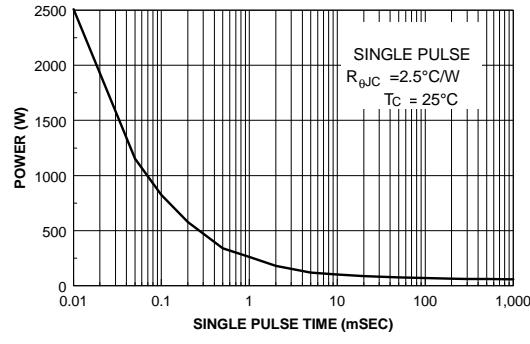


Figure 10. Single Pulse Maximum Power Dissipation.

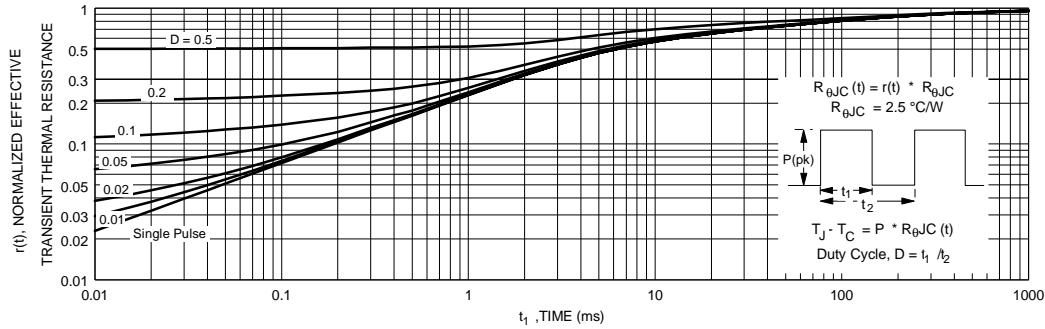


Figure 11. Transient Thermal Response Curve.

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