

# FDP6035AL/FDB6035AL

## 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.

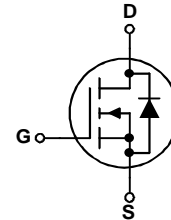
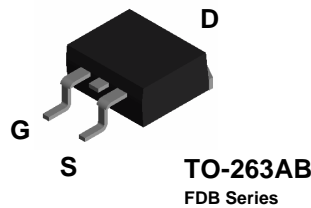
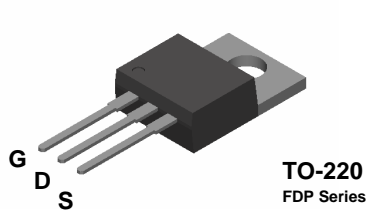
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{DS(ON)}$  specifications.

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

- 48 A, 30 V  $R_{DS(ON)} = 12\text{ m}\Omega @ V_{GS} = 10\text{ V}$   
 $R_{DS(ON)} = 14\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
- 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	48	A
	– Pulsed (Note 1)	180	
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	52	W
	Derate above $25^\circ\text{C}$	0.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-65 to +175	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.9	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDB6035AL	FDB6035AL	13"	24mm	800 units
FDP6035AL	FDP6035AL	Tube	n/a	45

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Drain-Source Avalanche Ratings** (Note 1)

$E_{AS}$	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 15\text{ V}, I_D = 48\text{ A}$			58	mJ
$I_{AS}$	Maximum Drain-Source Avalanche Current				48	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	$\mu\text{A}$
$I_{GSS}$	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 24\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 24\text{ A}, T_J = 125^\circ\text{C}$		7.9 10.2 13.0	12 14 21	m $\Omega$
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 10\text{ V}$	60			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 24\text{ A}$		68		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		1250		pF
$C_{oss}$	Output Capacitance			330		pF
$C_{riss}$	Reverse Transfer Capacitance			155		pF
$R_G$	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$		1.3		$\Omega$

**Switching Characteristics** (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		11	20	ns
$t_r$	Turn-On Rise Time			12	22	ns
$t_{d(off)}$	Turn-Off Delay Time			29	46	ns
$t_f$	Turn-Off Fall Time			12	21	ns
$Q_g$	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 48\text{ A},$ $V_{GS} = 5\text{ V}$		13	18	nC
$Q_{gs}$	Gate-Source Charge			4.3		nC
$Q_{gd}$	Gate-Drain Charge			5.5		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	$V_{GS} = 0\text{ V}, I_S = 24\text{ A}$ (Note 1)		0.92	1.3	V
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 24\text{ A},$ $dI_F/dt = 100\text{ A}/\mu\text{s}$		26		nS
$Q_{rr}$	Diode Reverse Recovery Charge			15		nC

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

## Typical Characteristics

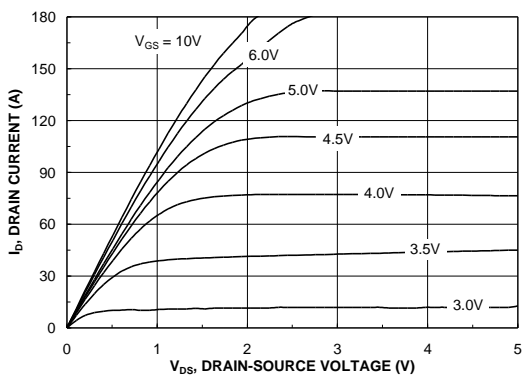


Figure 1. On-Region Characteristics.

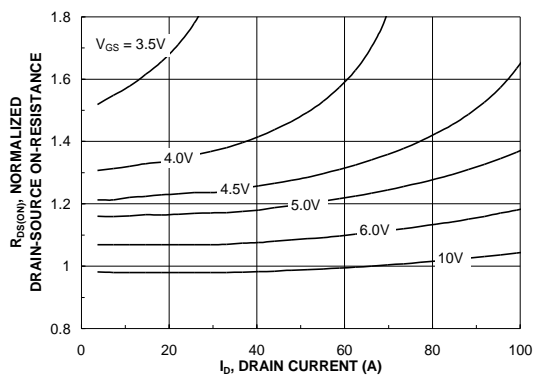


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

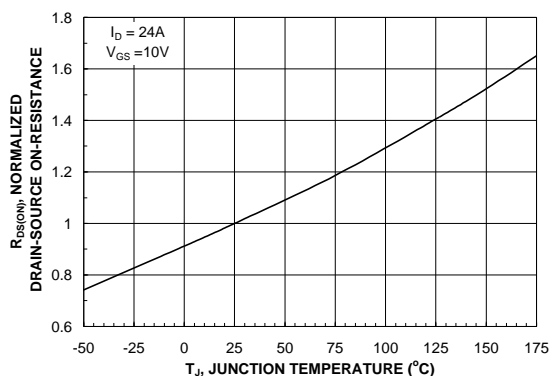


Figure 3. On-Resistance Variation with Temperature.

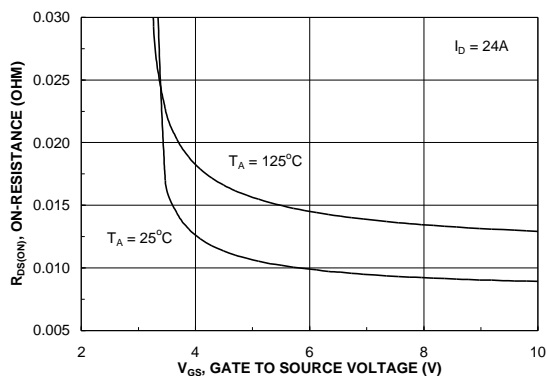


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

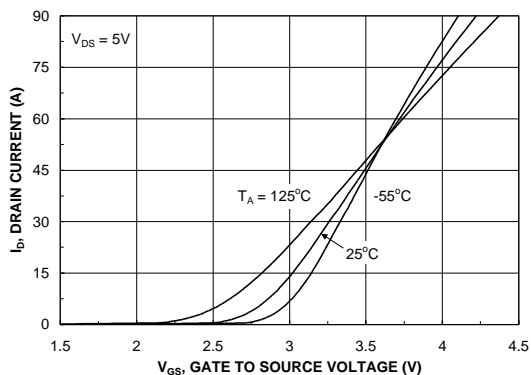


Figure 5. Transfer Characteristics.

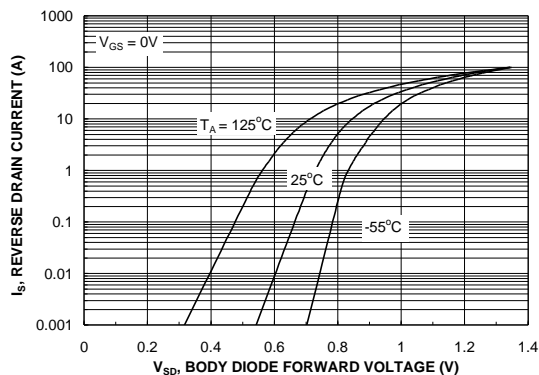


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

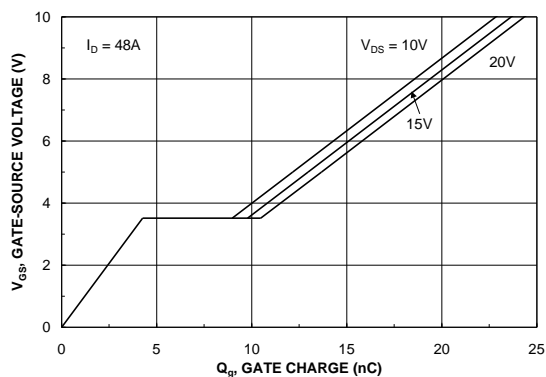


Figure 7. Gate Charge Characteristics.

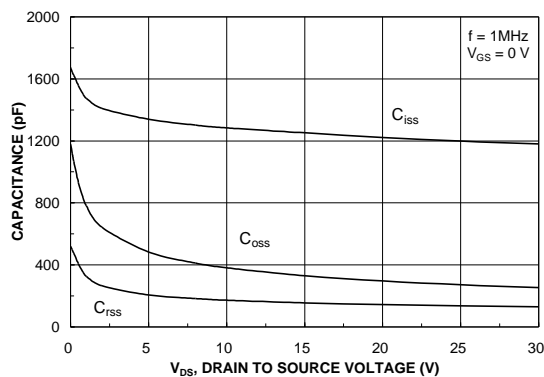


Figure 8. Capacitance Characteristics.

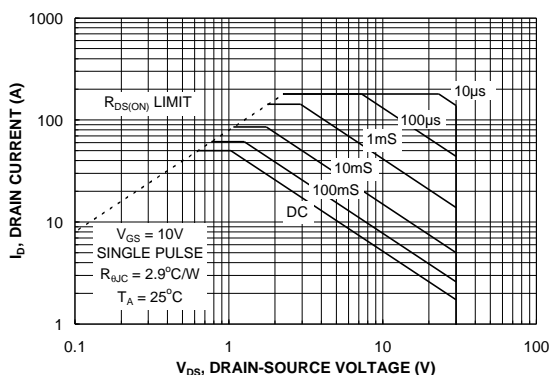


Figure 9. Maximum Safe Operating Area.

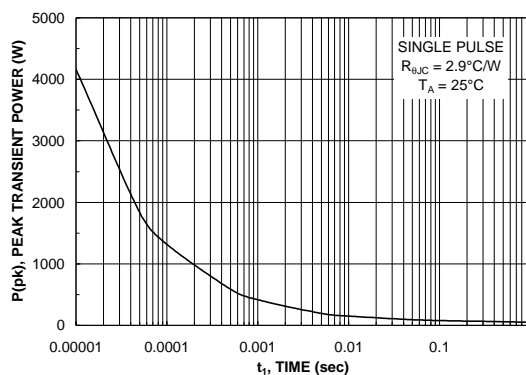


Figure 10. Single Pulse Maximum Power Dissipation.

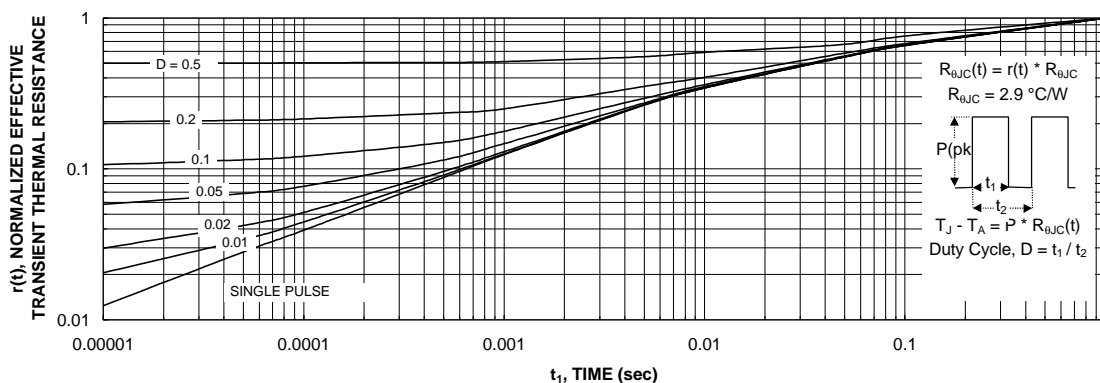


Figure 11. Transient Thermal Response Curve

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

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