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FDP6035AL/FDB6035AL

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.

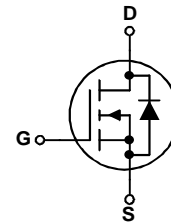
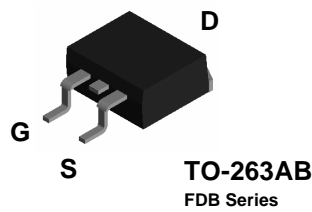
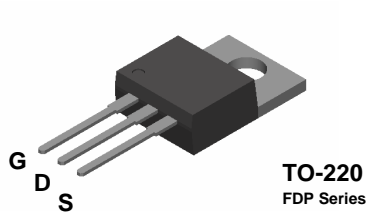
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

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	± 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°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°C		23		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 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°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 Ω
$I_{D(on)}$	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_{rss}	Reverse Transfer Capacitance			155		pF
R_G	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$		1.3		Ω

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 μs , Duty Cycle < 2.0%

Typical Characteristics

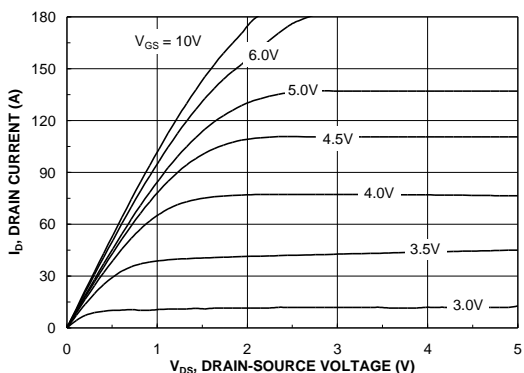


Figure 1. On-Region Characteristics.

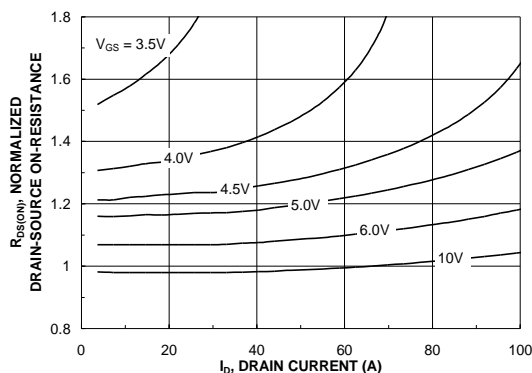


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

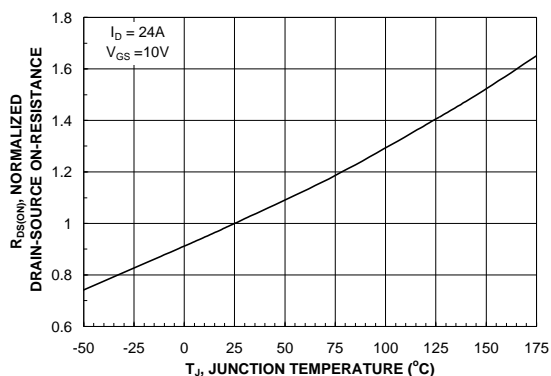


Figure 3. On-Resistance Variation with Temperature.

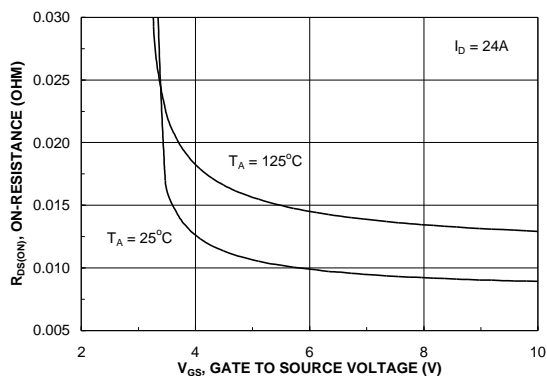


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

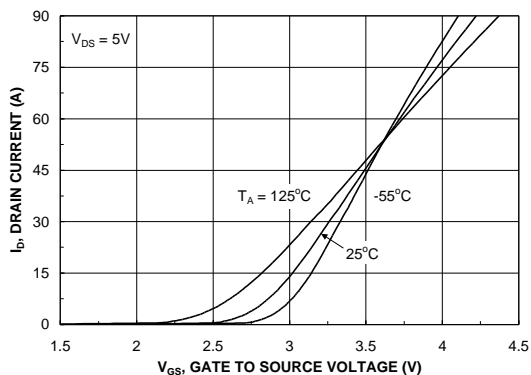


Figure 5. Transfer Characteristics.

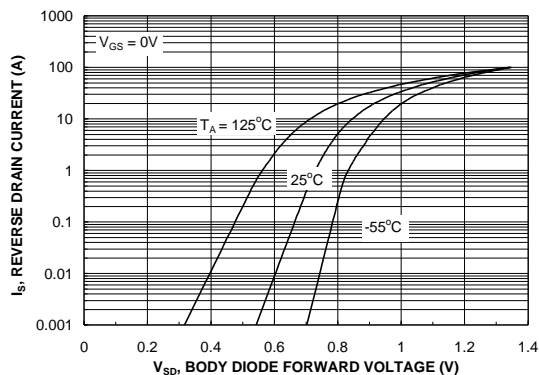


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

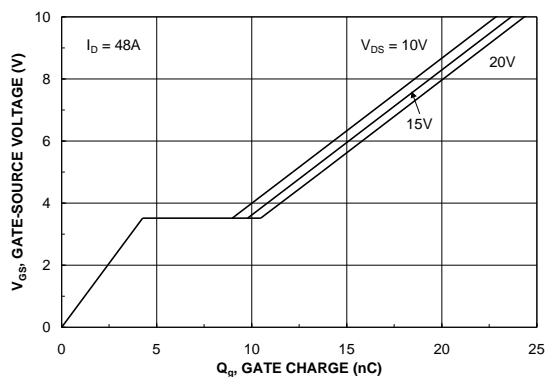


Figure 7. Gate Charge Characteristics.

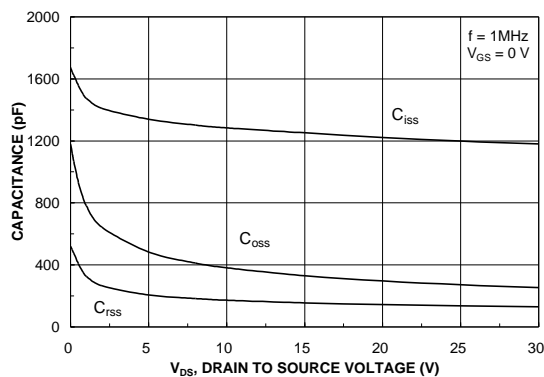


Figure 8. Capacitance Characteristics.

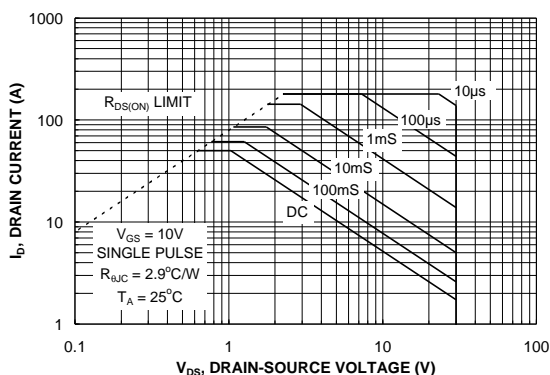


Figure 9. Maximum Safe Operating Area.

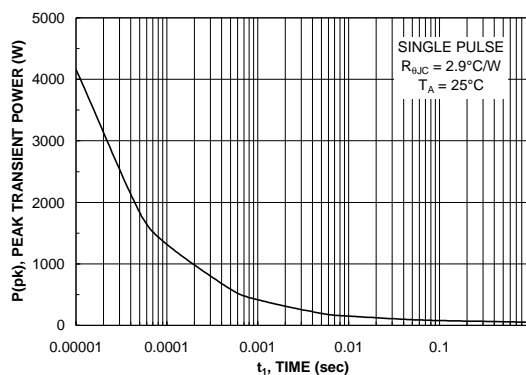


Figure 10. Single Pulse Maximum Power Dissipation.

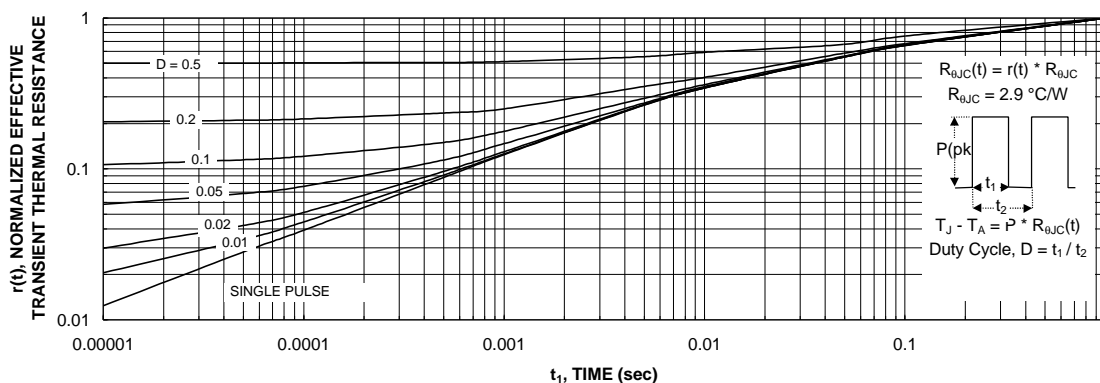


Figure 11. Transient Thermal Response Curve

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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