

FDP6670AL/FDB6670AL

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.

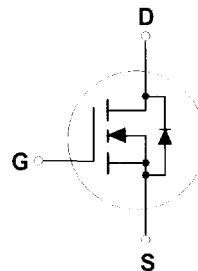
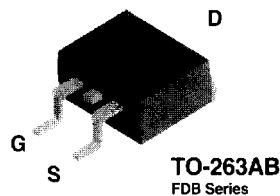
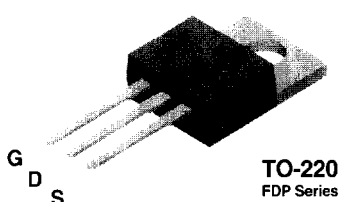
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

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.

Features

- 80 A, 30 V. $R_{DS(ON)} = 0.0065 \Omega @ V_{GS} = 10 V$,
 $R_{DS(ON)} = 0.0085 \Omega @ V_{GS} = 4.5 V$.
- 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.

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

Symbol	Parameter	FDP6670AL	FDB6670AL	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Drain Current - Continuous (Note 1)		80	A
	- Pulsed (Note 1)		240	
P_D	Total Power Dissipation @ $T_c = 25^\circ\text{C}$		75	W
	Derate above 25°C		0.5	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-65 to 175	$^\circ\text{C}$
T_l	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		275	$^\circ\text{C}$

THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ\text{C/W}$

Electrical Characteristics (T _c = 25°C unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DRAIN-SOURCE AVALANCHE RATINGS (Note 1)						
W _{DSS}	Single Pulse Drain-Source Avalanche Energy	V _{DD} = 15 V, I _D = 80 A			300	mJ
I _{AR}	Maximum Drain-Source Avalanche Current				80	A
OFF CHARACTERISTICS						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	30			V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	I _D = 250 μA, Referenced to 25 °C		22		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 24 V, V _{GS} = 0 V			1	μA
I _{GSSF}	Gate - Body Leakage, Forward	V _{GS} = 20 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate - Body Leakage, Reverse	V _{GS} = -20 V, V _{DS} = 0 V			-100	nA
ON CHARACTERISTICS (Note 2)						
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 250 μA	1	1.5	3	V
ΔV _{GS(th)} /ΔT _J	Gate Threshold Voltage Temp. Coefficient	I _D = 250 μA, Referenced to 25 °C		-5		mV/°C
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 40 A		0.005	0.0065	Ω
		T _J = 125°C		0.0072	0.0091	
		V _{GS} = 4.5 V, I _D = 37 A		0.0067	0.0085	
I _{D(on)}	On-State Drain Current	V _{GS} = 10 V, V _{DS} = 10 V	80			A
g _{FS}	Forward Transconductance	V _{DS} = 10 V, I _D = 40 A		86		S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input Capacitance	V _{DS} = 15 V, V _{GS} = 0 V, f = 1.0 MHz		3200		pF
C _{oss}	Output Capacitance			820		pF
C _{rss}	Reverse Transfer Capacitance			400		pF
SWITCHING CHARACTERISTICS (Note 1)						
t _{D(on)}	Turn - On Delay Time	V _{DD} = 10 V, I _D = 1 A, V _{GS} = 10 V, R _{GEN} = 6 Ω		15	27	nS
t _r	Turn - On Rise Time			15	27	
t _{D(off)}	Turn - Off Delay Time			85	105	
t _f	Turn - Off Fall Time			42	68	
Q _g	Total Gate Charge	V _{DS} = 15 V I _D = 40 A, V _{GS} = 5 V		35	50	nC
Q _{gs}	Gate-Source Charge			9		
Q _{gd}	Gate-Drain Charge			16		
DRAIN-SOURCE DIODE CHARACTERISTICS						
I _S	Maximum Continuous Drain-Source Diode Forward Current (Note 1)				80	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current (Note 1)				240	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 40 A (Note 1)		0.9	1.3	V
t _r	Reverse Recovery Time	V _{GS} = 0 V, I _F = 40 A		32	55	ns
I _{rr}	Reverse Recovery Current	di _F /dt = 100 A/μs		0.83	5	A
Notes						
1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.						

Typical Electrical Characteristics

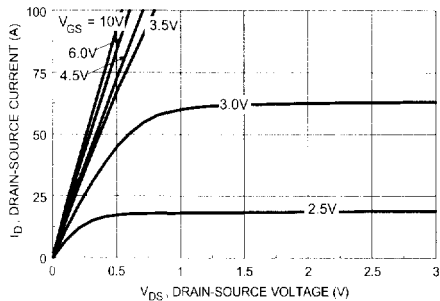


Figure 1. On-Region Characteristics.

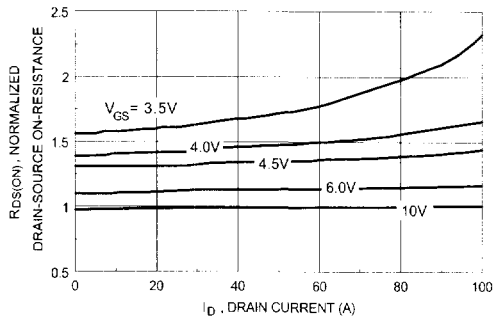


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

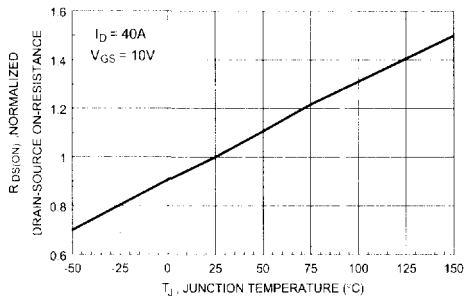


Figure 3. On-Resistance Variation with Temperature.

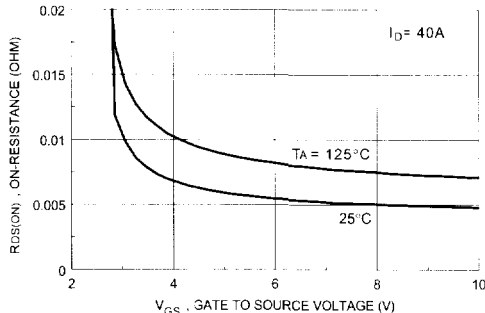


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

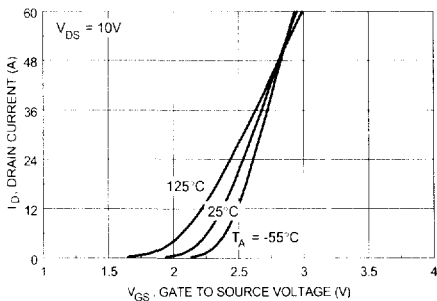


Figure 5. Transfer Characteristics.

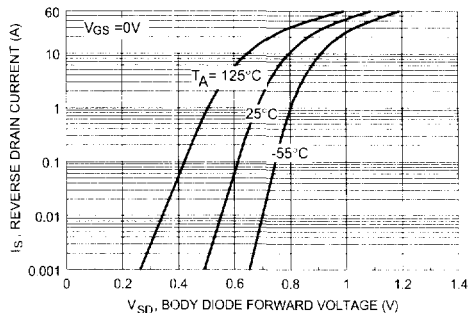


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

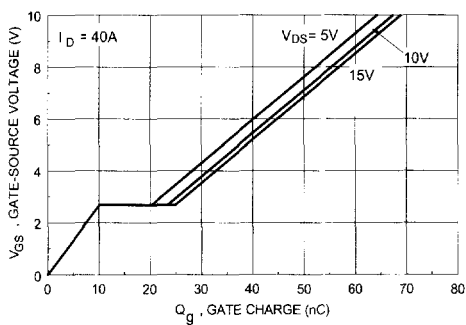


Figure 7. Gate Charge Characteristics.

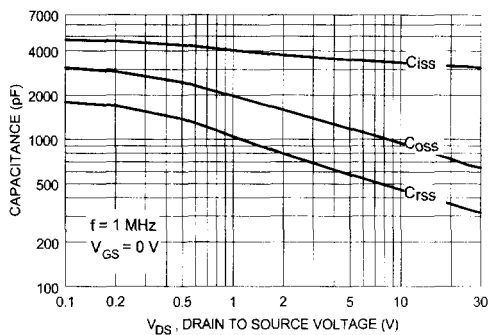


Figure 8. Capacitance Characteristics.

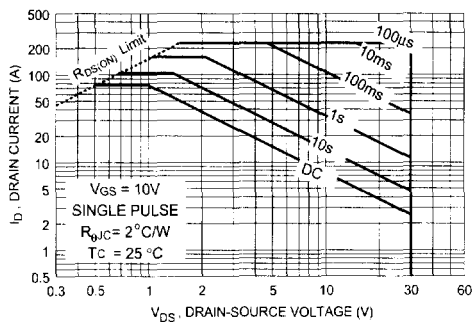


Figure 9. Maximum Safe Operating Area.

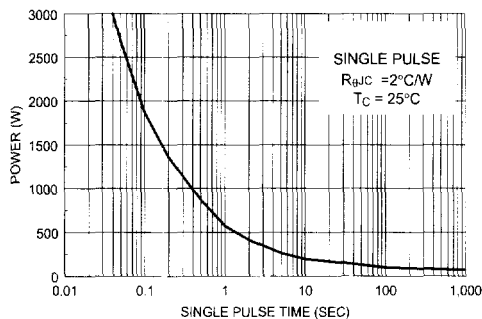


Figure 10. Single Pulse Maximum Power Dissipation.

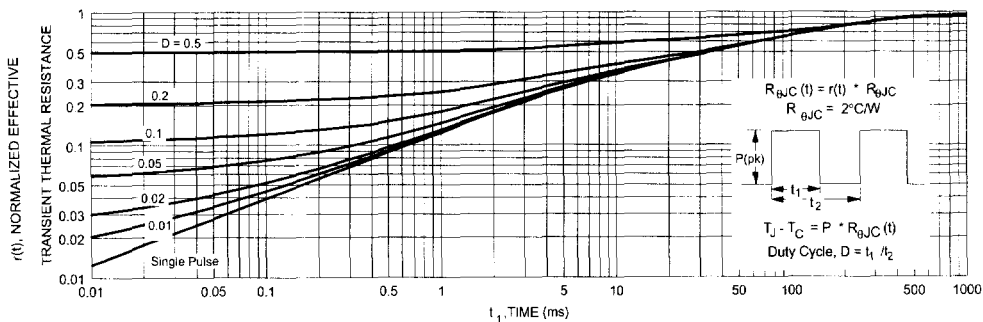


Figure 11. Transient Thermal Response Curve.