FAIRCHILD
SEMICONDUCTOR™

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FDP5690/FDB5690

60V N-Channel PowerTrench™ MOSFET

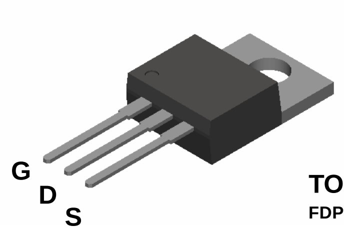
General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

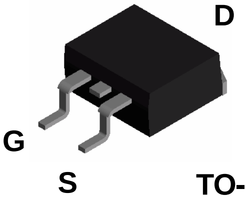
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(on)}$ specifications resulting in DC/DC power supply designs with higher overall efficiency.

Features

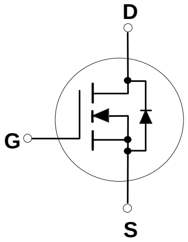
- 32 A, 60 V. $R_{DS(ON)} = 0.027\ \Omega$ @ $V_{GS} = 10$ V
  $R_{DS(ON)} = 0.032\ \Omega$ @ $V_{GS} = 6$ V.
- Critical DC electrical parameters specified at evevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- High performance 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

$T_C = 25°C$ unless otherwise noted

Symbol	Parameter	FDP5690	FDB5690	Units
V_{DSS}	Drain-Source Voltage	60		V
V_{GSS}	Gate-Source Voltage	±20		V
I_D	Maximum Drain Current - Continuous	32		A
	- Pulsed	100		
P_D	Total Power Dissipation @ T_C = 25°C	58		W
	Derate above 25°C	0.4		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	2.6	°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
FDB5690	FDB5690	13"	24mm	800
FDP5690	FDP5690	Tube	N/A	45

Electrical Characteristics

T_c = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note1)						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	V_{DD} = 30 V, I_D = 32A			80	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				32	A
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		61		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V			1	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20 V, V_{DS} = 0 V			-100	nA
On Characteristics (Note 1)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	2	2.4	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		-6.4		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 16 A, V_{GS} = 10 V, I_D = 16 A, T_J = 125°C V_{GS} = 6 V, I_D = 15 A		0.021 0.042 0.024	0.027 0.055 0.032	Ω
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	50			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 16 A		32		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz		1120		pF
C_{oss}	Output Capacitance			160		pF
C_{rss}	Reverse Transfer Capacitance			80		pF
Switching Characteristics (Note 1)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		10	18	ns
t_r	Turn-On Rise Time			9	18	ns
$t_{d(off)}$	Turn-Off Delay Time			24	39	ns
t_f	Turn-Off Fall Time			10	18	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 16 A, V_{GS} = 10 V		23	33	nC
Q_{gs}	Gate-Source Charge			3.9		nC
Q_{gd}	Gate-Drain Charge			6.8		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current (Note 1)				32	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 16 A (Note 1)		0.92	1.2	V

Note:

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

Typical Characteristics

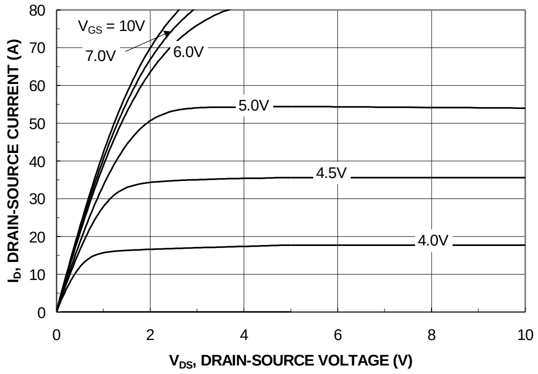


Figure 1. On-Region Characteristics.

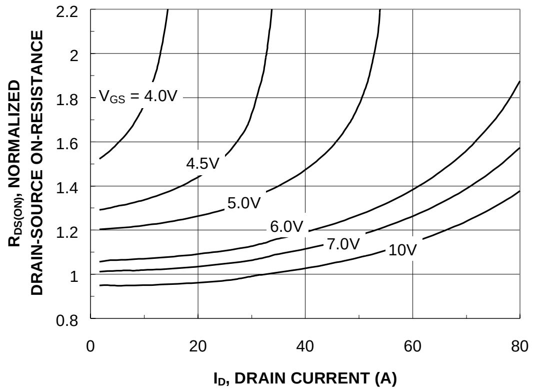


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

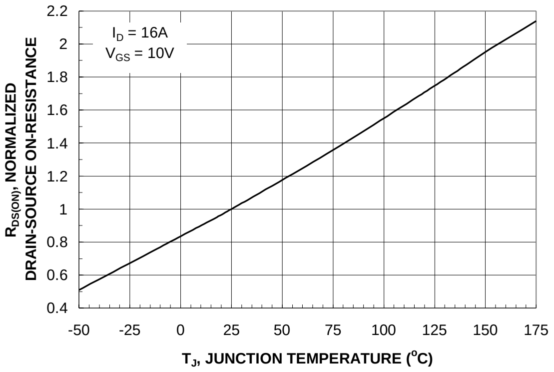


Figure 3. On-Resistance Variation with Temperature.

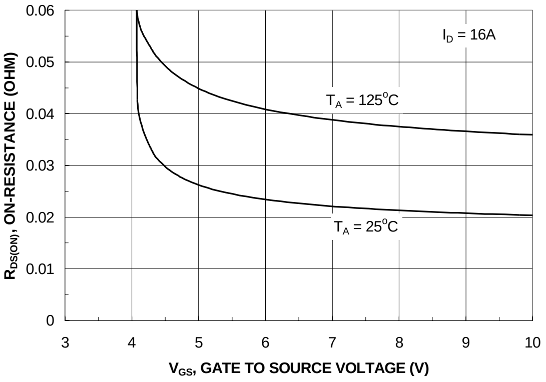


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

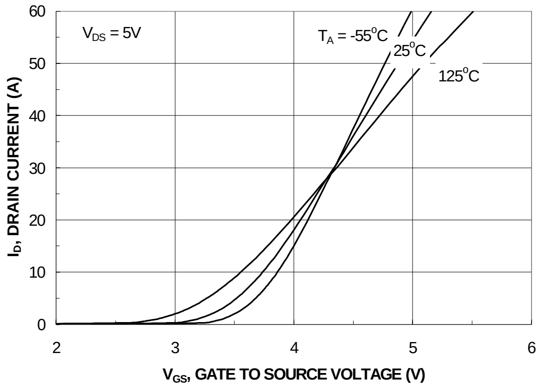


Figure 5. Transfer Characteristics.

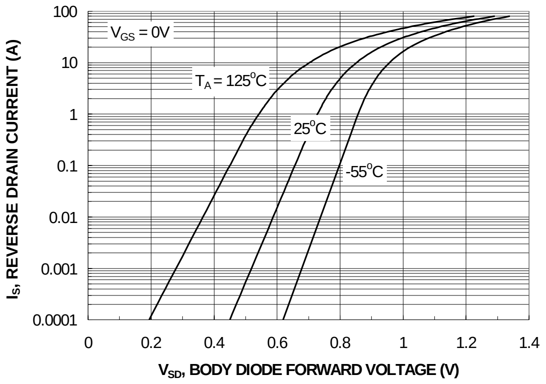


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)

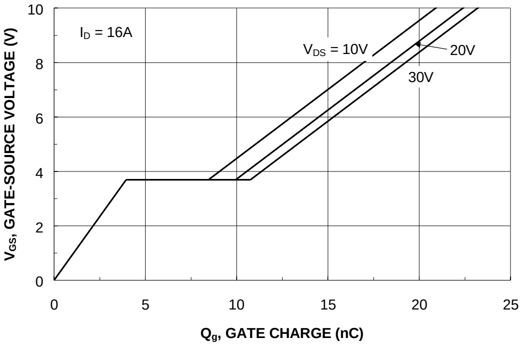


Figure 7. Gate-Charge Characteristics.

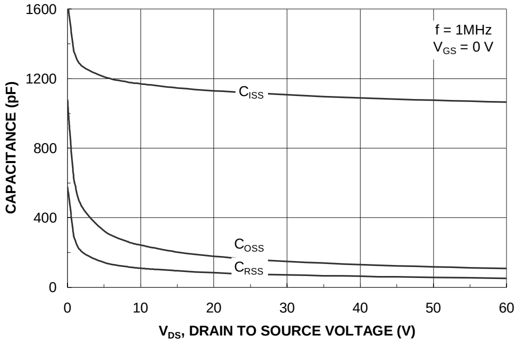


Figure 8. Capacitance Characteristics.

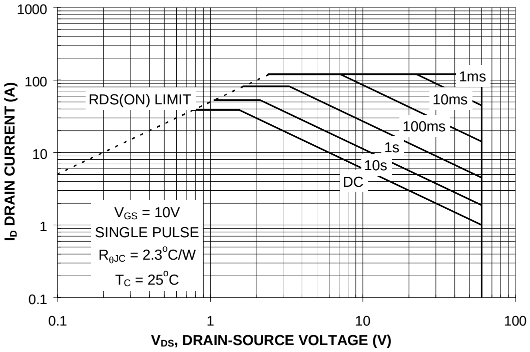


Figure 9. Maximum Safe Operating Area.

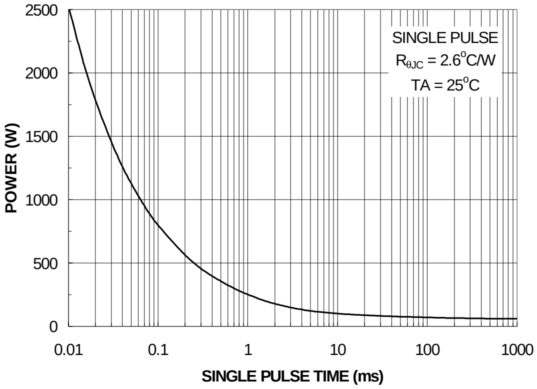


Figure 10. Single Pulse Maximum Power Dissipation.

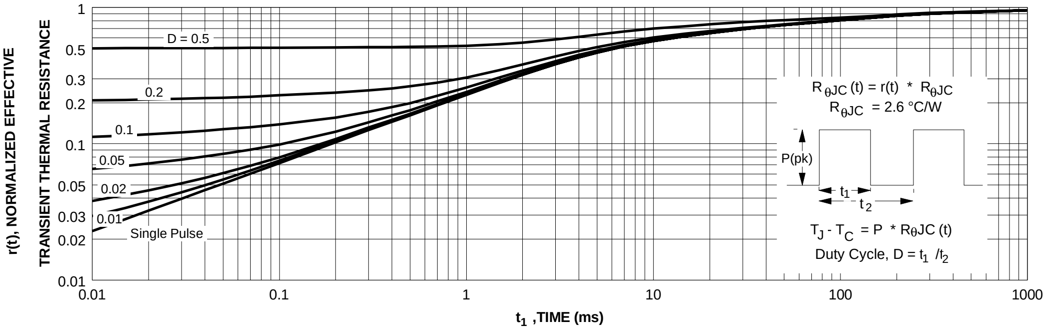


Figure 11. Transient Thermal Response Curve.

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Rev. E