FDP5645/FDB5645

60V N-Channel PowerTrench® MOSFET

General Description

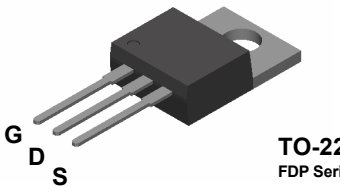
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

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

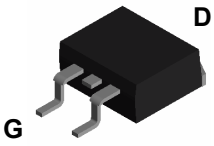
The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

Features

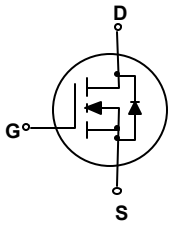
- 80 A, 60 V. $R_{DS(ON)}$ = 0.0095 Ω @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 0.011 Ω @ V_{GS} = 6 V.
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- High performance trench technology for extremely low $R_{DS(ON)}$.
- 175°C maximum junction temperature rating.



TO-220
FDP Series



TO-263AB
FDB Series



Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		FDP5645 FDB5645	Units
V_{DSS}	Drain-Source Voltage		60	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Maximum Drain Current	– Continuous (note 3)	80	A
		– Pulsed	300	
P_D	Total Power Dissipation	@ T_C = 25°C	125	W
		Derate above 25°C	0.83	W/°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-65 to +175	°C
T_L	Maximum lead termperature for soldering purposes, 1/8“ from case for 5 seconds		+275	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.2	°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
FDB5645	FDB5645	13”	24mm	800 units
FDP5645	FDP5645	note 2		

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 1)						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	V_{DD} = 40 V, I_D = 80 A			800	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	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		64		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 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 1)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		-7.8		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 40 A V_{GS}=10V, I_D = 40 A, T_J=125°C V_{GS} = 6 V, I_D = 38 A		8 13 9	9.5 18 11	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 10 V	60			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 40 A		88		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 30 V, V_{GS} = 0 V, f = 1.0 MHz		4468		pF
C_{oss}	Output Capacitance			810		pF
C_{rss}	Reverse Transfer Capacitance			198		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 30 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		21	30	ns
t_r	Turn–On Rise Time			13	20	ns
$t_{d(off)}$	Turn–Off Delay Time			77	90	ns
t_f	Turn–Off Fall Time			42	50	ns
Q_g	Total Gate Charge	V_{DS} = 30 V, I_D = 80 A, V_{GS} = 10 V		76	107	nC
Q_{gs}	Gate–Source Charge			18		nC
Q_{gd}	Gate–Drain Charge			21		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				80	A
I_S	Maximum Pulsed Drain–Source Diode Forward Current				300	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 40 A		0.9	1.3	V

Notes:

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

2. TO-220 package is supplied in tube / rail @ 45 pieces per rail.

3. Calculated continuous current based on maximum allowable junction temperature. Actual maximum continuous current limited by package constraints to 75A

Typical Characteristics

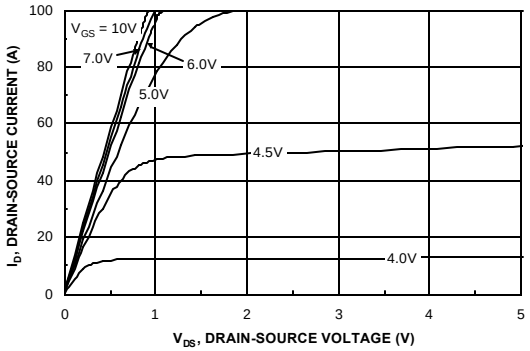


Figure 1. On-Region Characteristics.

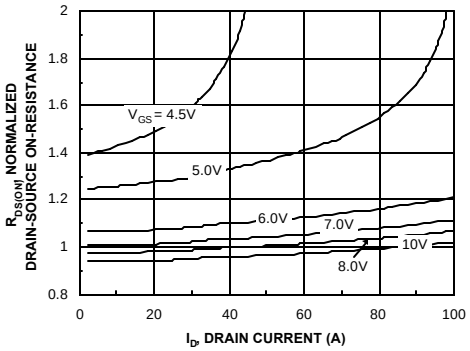


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

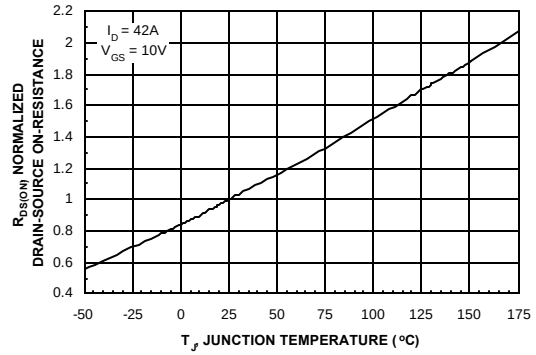


Figure 3. On-Resistance Variation withTemperature.

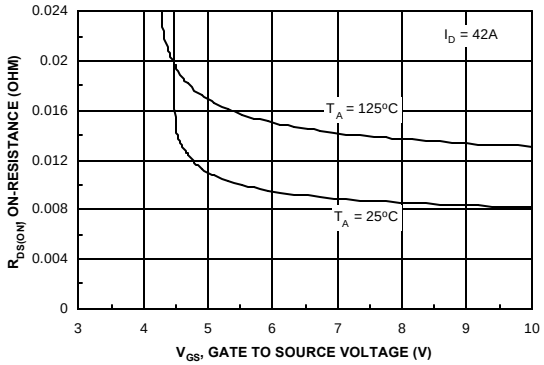


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

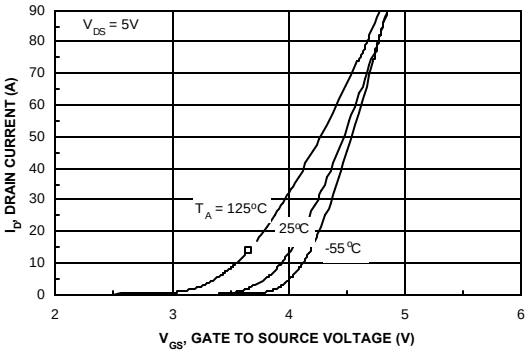


Figure 5. Transfer Characteristics.

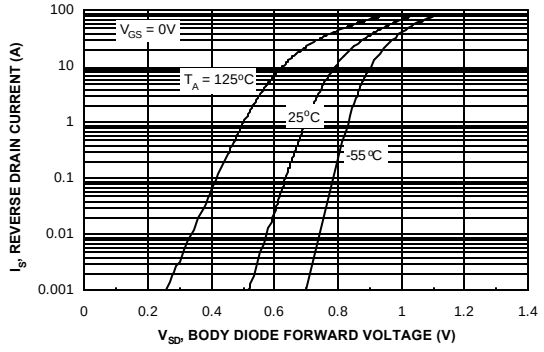


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.