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FAIRCHILD

SEMICONDUCTOR®

FDP6644/FDB6644

30V 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 $RDS_{(ON)}$ 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

- 50 A, 30 V. $R_{DS(ON)}$ = 8.5 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 10.5 mΩ @ V_{GS} = 4.5 V

- Low gate charge (27 nC typical)

- Fast switching speed

- High performance trench technology for extremely low $R_{DS(ON)}$

- 175°C maximum junction temperature rating

TO-220
FDP Series

TO-263AB
FDB Series
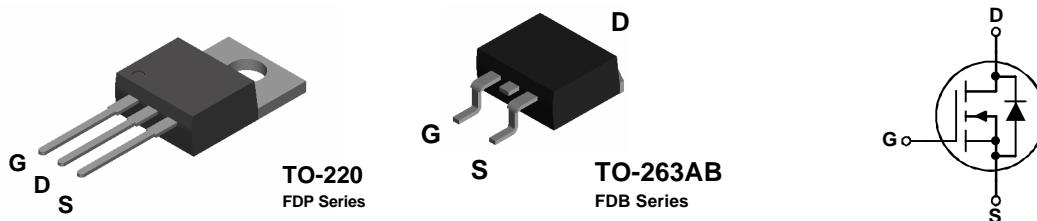
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		± 16	V
I_D	Drain Current – Continuous	(Note 1)	50	A
	– Pulsed	(Note 1)	150	A
P_D	Total Power Dissipation @ T_C = 25°C		83	W
	Derate above 25°C		0.55	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		1.8	°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
FDB6644	FDB6644	13''	24mm	800 units
FDP6644	FDP6644	Tube	n/a	45

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	$V_{DD} = 15$ V, $I_D = 25$ A			240	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				25	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ µA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C		26		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	$V_{GS} = 16$ V, $V_{DS} = 0$ V			100	NA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = -16$ V, $V_{DS} = 0$ V			−100	NA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250$ µA	1	1.5	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C		−5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10$ V, $I_D = 25$A $V_{GS} = 4.5$ V, $I_D = 25$ A $V_{GS} = 10$ V, $I_D = 25$ A, $T_J = 125°C$		6.4 7.3 9.3	8.5 10.5 15	mΩ
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10$ V, $V_{DS} = 5$ V	60			A
g_{FS}	Forward Transconductance	$V_{DS} = 5$ V, $I_D = 25$ A		98		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 15$ V, $V_{GS} = 0$ V, $f = 1.0$ MHz		3068		pF
C_{oss}	Output Capacitance			513		pF
C_{rss}	Reverse Transfer Capacitance			196		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 15$ V, $I_D = 1$ A, $V_{GS} = 10$ V, $R_{GEN} = 6$ Ω		12.5	22.5	ns
t_r	Turn–On Rise Time			8	16	ns
$t_{d(off)}$	Turn–Off Delay Time			54	86	ns
t_f	Turn–Off Fall Time			14	26	ns
Q_g	Total Gate Charge	$V_{DS} = 15$ V, $I_D = 25$ A, $V_{GS} = 4.5$ V		27	38	nC
Q_{gs}	Gate–Source Charge			9		nC
Q_{gd}	Gate–Drain Charge			7		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				50	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0$ V, $I_S = 25$ A (Note 2)		0.8	1.3	V

Notes:

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

2. Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%
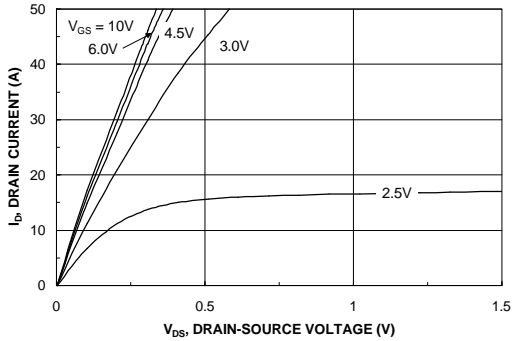
Typical Characteristics
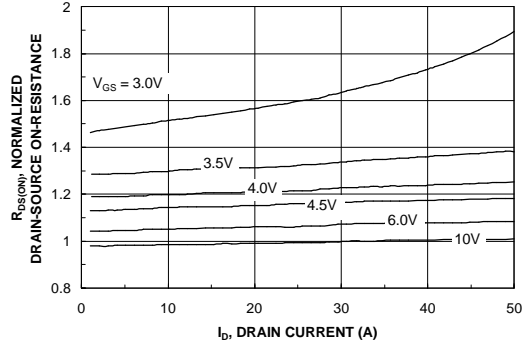
Figure 1. On-Region Characteristics.

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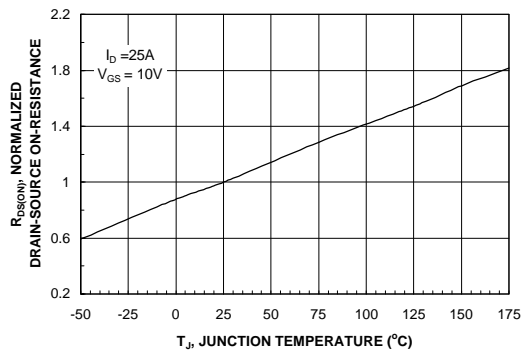Drain Current and Gate Voltage.

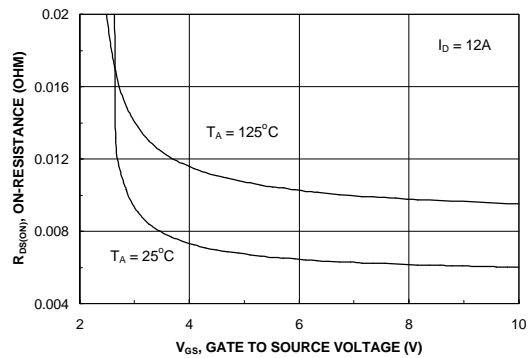Figure 3. On-Resistance Variation with
Temperature.

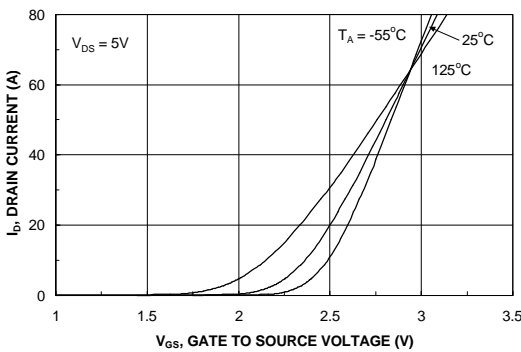Figure 4. On-Resistance Variation with
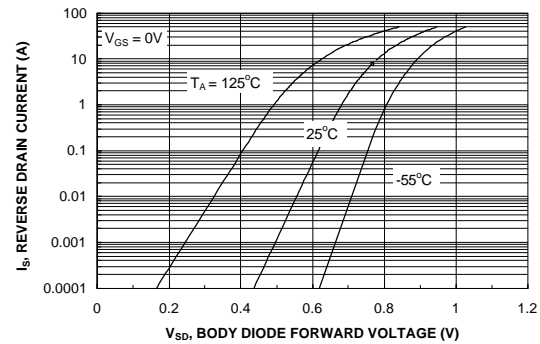Gate-to-Source Voltage.

Figure 5. Transfer Characteristics.

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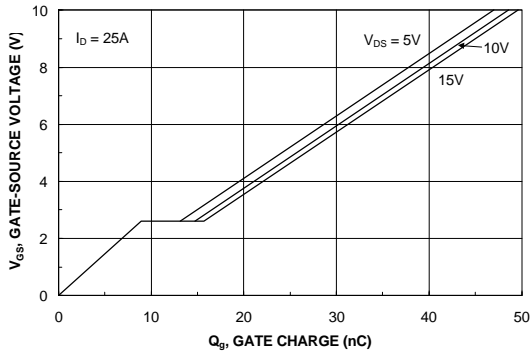with Source Current and Temperature.

Typical Characteristics
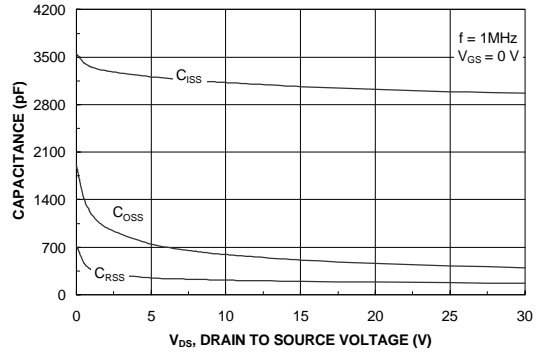

Figure 7. Gate Charge Characteristics.
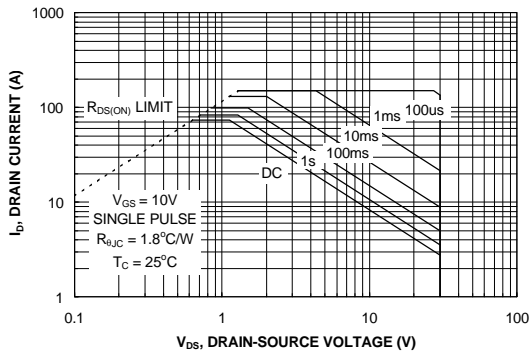

Figure 8. Capacitance Characteristics.

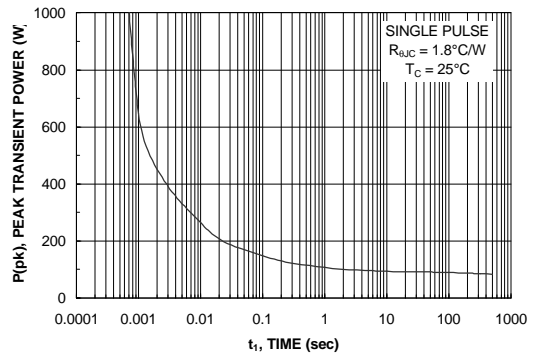**Figure 9. Maximum Safe Operating Area.**

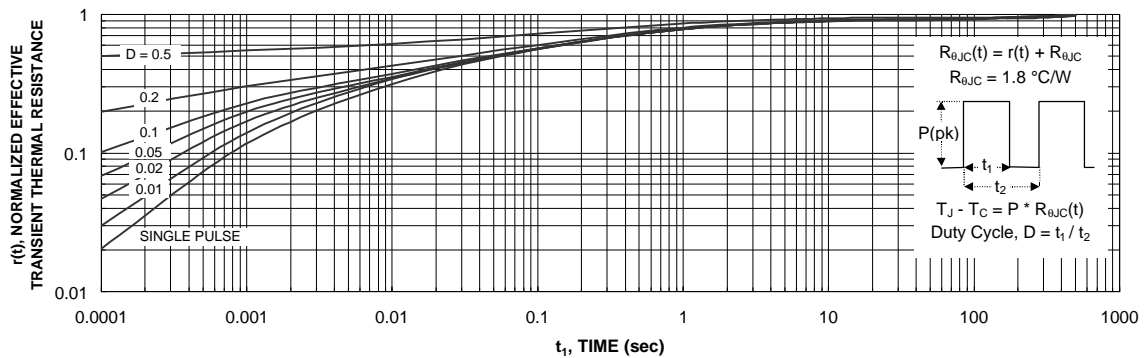**Figure 10. Single Pulse Maximum Power Dissipation.**

Figure 11. Transient Thermal Response Curve.

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

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