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FDP5800

N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

Features

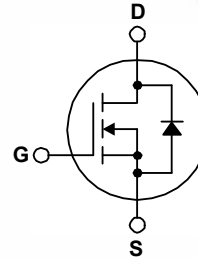
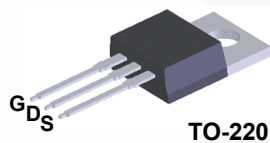
- $R_{DS(on)} = 4.6 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 80 \text{ A}$
- High Performance Trench Technology for Externly Low $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Power Tools
- Motor Drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDP5800	Unit
V_{DSS}	Drain-Source Voltage	60	V
V_{GSS}	Gate-Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	80
		- Continuous ($T_C = 100^\circ\text{C}$)	80*
		- Continuous ($T_A = 25^\circ\text{C}$)	14
I_{DM}	Drain Current - Pulsed	320	A
E_{AS}	Single Pulsed Avalanche Energy (Note 1)	652	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate Above 25°C	242	W
		1.61	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

*Drain current limited by package.

Thermal Characteristics

Symbol	Parameter	FDP5800	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.62	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP5800	FDP5800	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

B_{VDSS}	Drain-Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}, T_J = 25^\circ\text{C}$	60	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 48 \text{ V}$ $V_{GS} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$	--	--	1	μA
I_{GSS}	Gate-Body Leakage Current, Forward	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0	--	2.5	V
$R_{DS(on)}$	Static Drain-Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 80 \text{ A}$	--	4.6	6.0	m Ω
		$V_{GS} = 4.5 \text{ V}, I_D = 80 \text{ A}$	--	5.9	7.2	m Ω
		$V_{GS} = 5 \text{ V}, I_D = 80 \text{ A}$	--	5.6	7.0	m Ω
		$V_{GS} = 10 \text{ V}, I_D = 80 \text{ A},$ $T_J = 175^\circ\text{C}$	--	10.4	12.6	m Ω

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$	--	6890	9160	pF
C_{oss}	Output Capacitance		--	750	1000	pF
C_{rss}	Reverse Transfer Capacitance		--	295	445	pF
R_G	Gate Resistance	$V_{GS} = 0.5 \text{ V}, f = 1 \text{ MHz}$	--	1.2	--	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0 \text{ V to } 10 \text{ V}$	--	112	145	nC
$Q_{g(TH)}$	Total Gate Charge at 5V	$V_{GS} = 0 \text{ V to } 5 \text{ V}$	--	58	--	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0 \text{ V to } 1 \text{ V}$	--	7.0	--	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DS} = 30 \text{ V},$ $I_D = 80 \text{ A},$ $I_g = 1 \text{ mA}$	--	23	--	nC
Q_{gs2}	Gate Charge Threshold to Plateau		--	13	--	nC
Q_{gd}	Gate to Drain "Miller" Charge		--	18	--	nC

Switching Characteristics ($V_{GS} = 10\text{V}$)

t_{ON}	Turn-On Time	$V_{DD} = 30 \text{ V}, I_D = 80 \text{ A},$ $V_{GS} = 10 \text{ V}, R_G = 1.5 \Omega$	--	37	85	ns
$t_{d(on)}$	Turn-On Delay Time		--	18	46	ns
t_r	Turn-On Rise Time		--	19	47	ns
$t_{d(off)}$	Turn-Off Delay Time		--	55	120	ns
t_f	Turn-Off Fall Time		--	9	28	ns
t_{OFF}	Turn-Off Time		--	64	138	ns

Drain-Source Diode Characteristics

V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 80 \text{ A}$	--	--	1.25	V
		$V_{GS} = 0 \text{ V}, I_{SD} = 40 \text{ A}$	--	--	1.0	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 60 \text{ A},$	--	58	--	ns
Q_{rr}	Reverse Recovery Charge	$di_f/dt = 100 \text{ A}/\mu\text{s}$	--	106	--	nC

Notes:

1: $L = 1 \text{ mH}, I_{AS} = 36 \text{ A}, V_{DD} = 54 \text{ V}, V_{GS} = 10 \text{ V}, R_G = 25 \Omega,$ Starting $T_J = 25^\circ\text{C}$

Typical Performance Characteristics

Figure 1. On-Region Characteristics

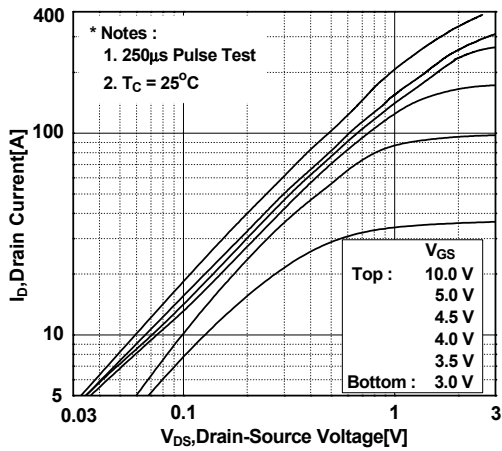


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

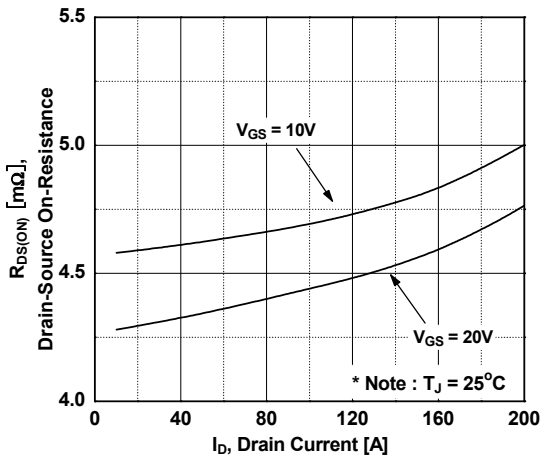


Figure 5. Capacitance Characteristics

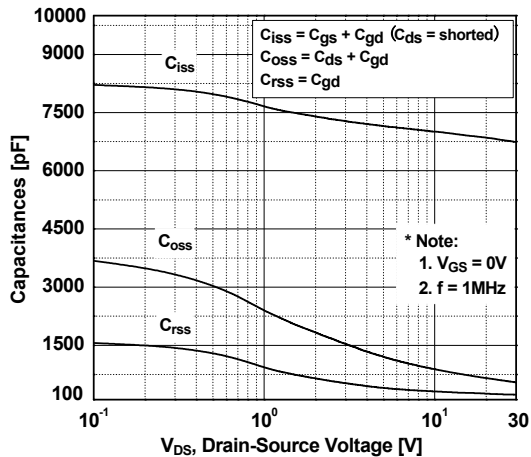


Figure 2. Transfer Characteristics

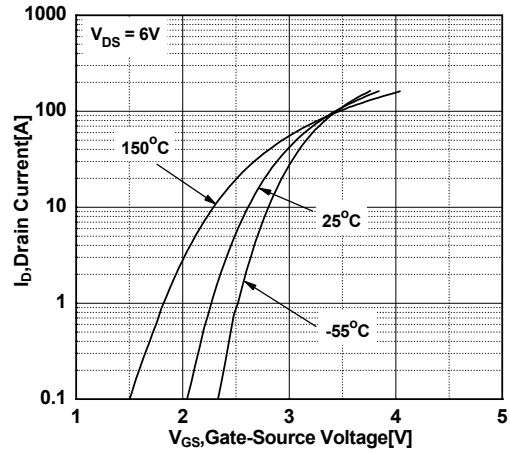


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

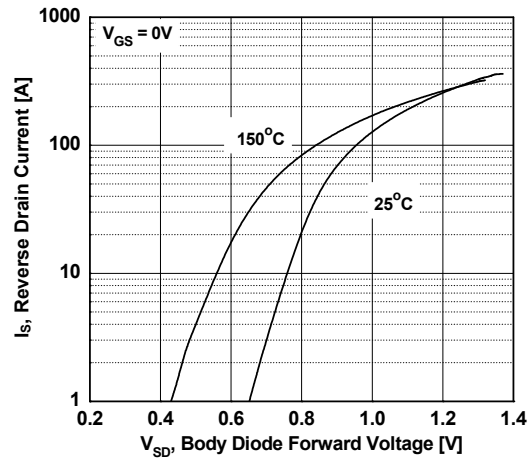
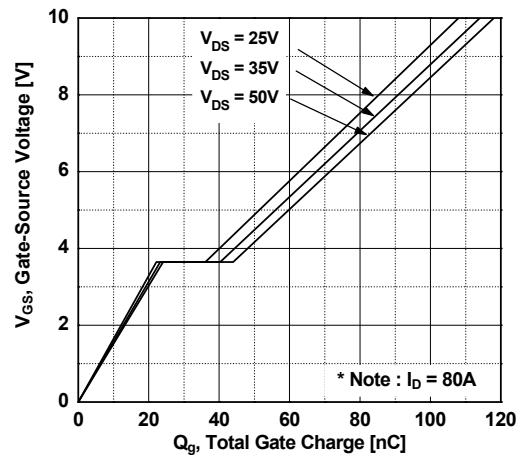


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

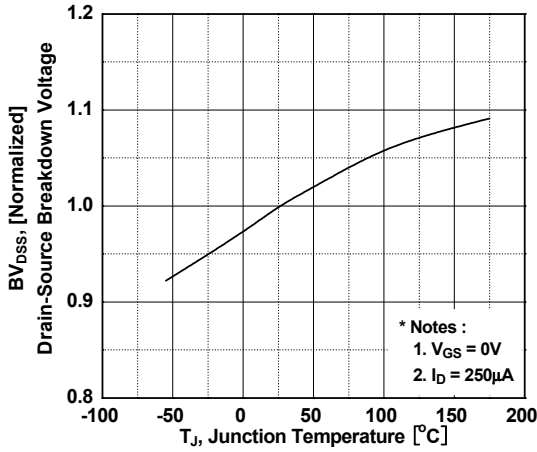


Figure 8. On-Resistance Variation vs. Temperature

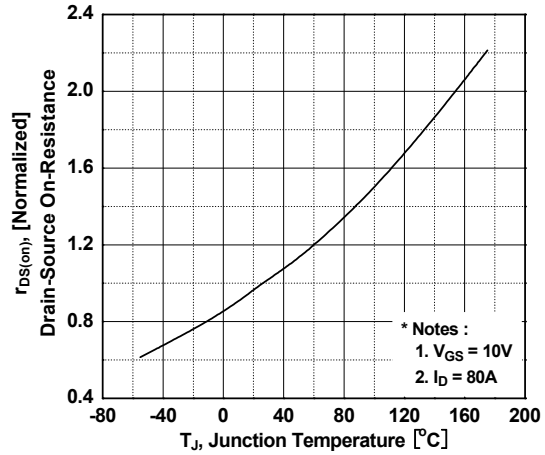


Figure 9. Maximum Safe Operating Area

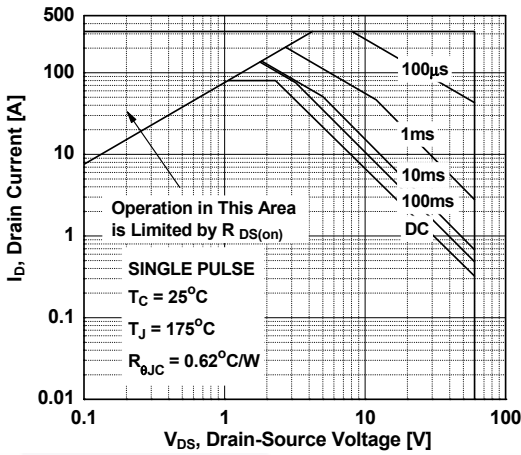


Figure 10. Maximum Drain Current vs. Case Temperature

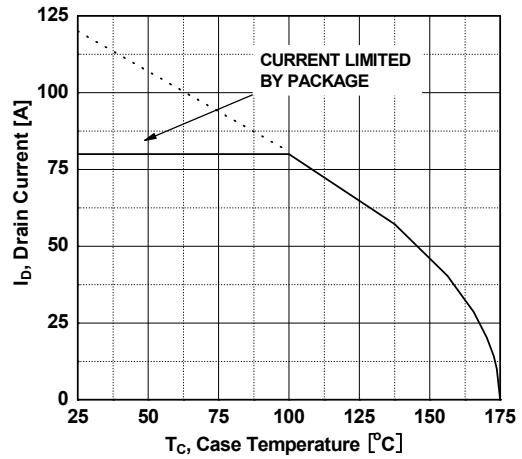
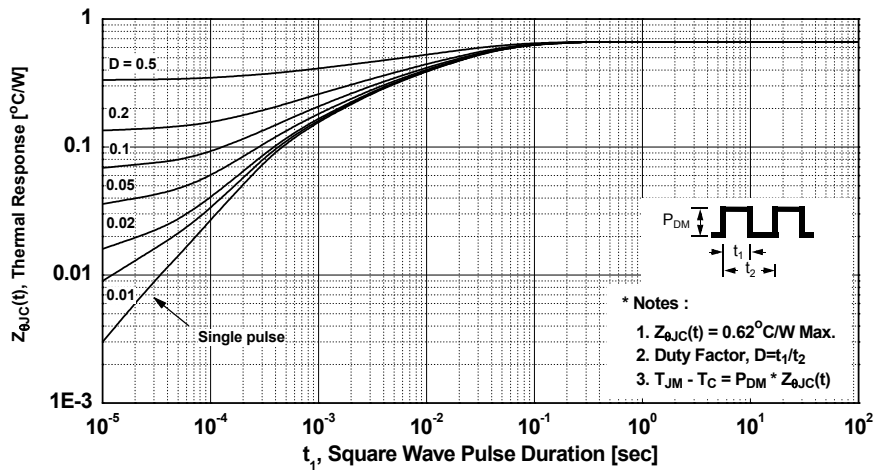


Figure 11. Transient Thermal Response Curve



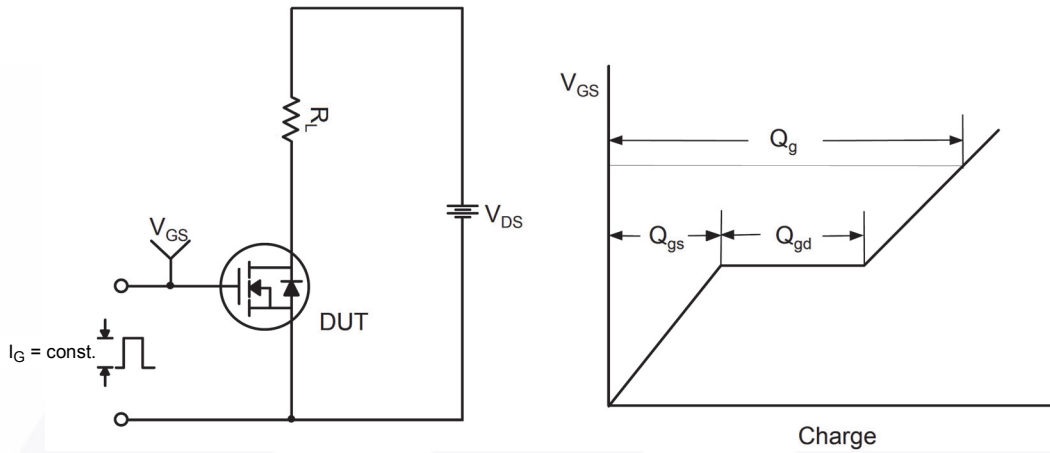


Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

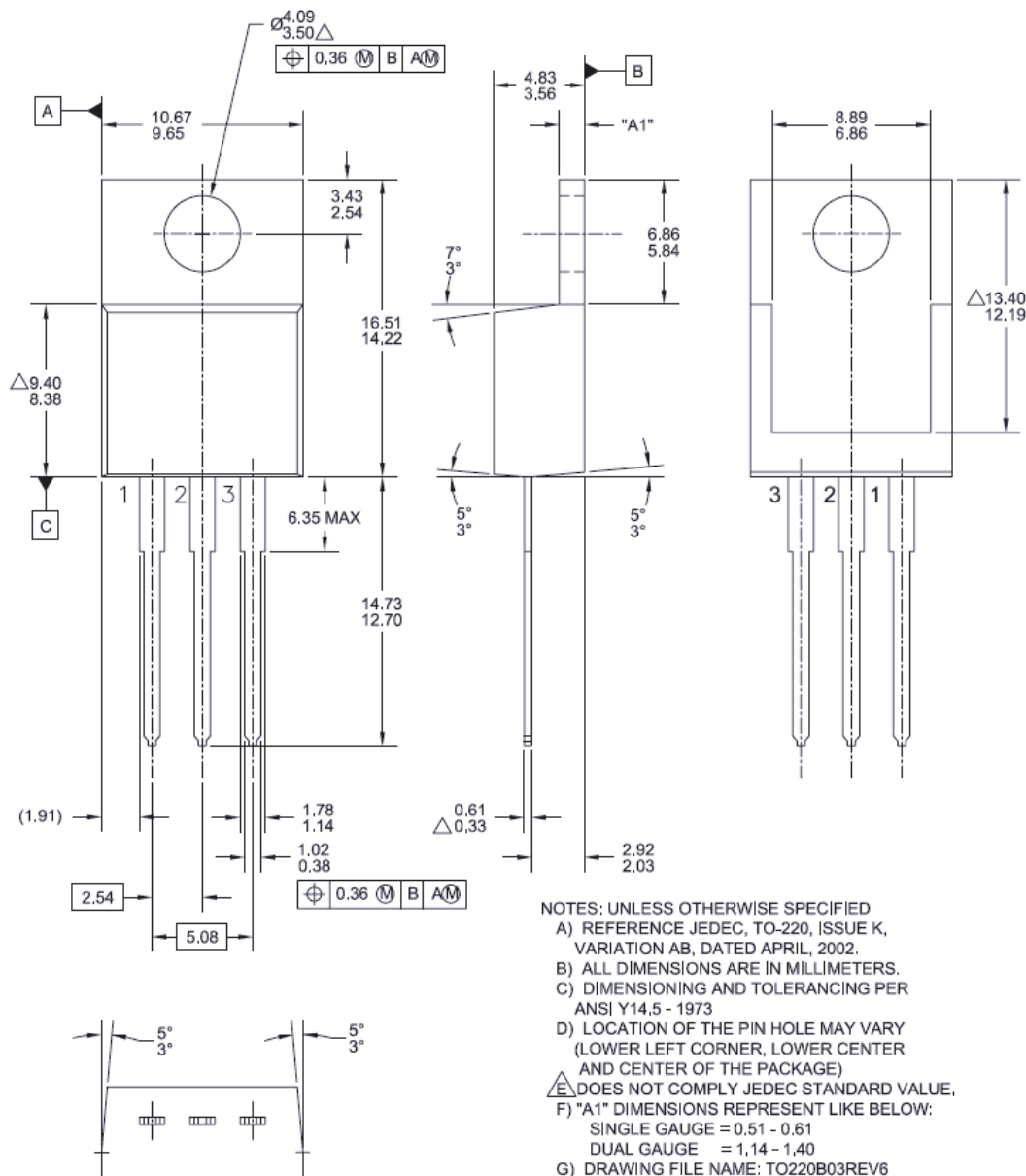


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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