

# FDP5800

## N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

### Features

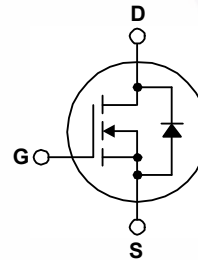
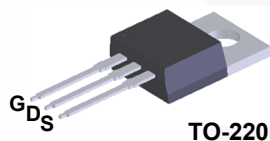
- $R_{DS(on)} = 4.6 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- High Performance Trench Technology for Externly Low  $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability
- RoHS Compliant

### 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	$\pm 20$	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 $25^\circ\text{C}$	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	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current, Forward	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	$\pm 100$	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 $\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 80 \text{ A}$	--	5.9	7.2	m $\Omega$
		$V_{GS} = 5 \text{ V}, I_D = 80 \text{ A}$	--	5.6	7.0	m $\Omega$
		$V_{GS} = 10 \text{ V}, I_D = 80 \text{ A},$ $T_J = 175^\circ\text{C}$	--	10.4	12.6	m $\Omega$

### 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	--	$\Omega$
$Q_g(TOT)$	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

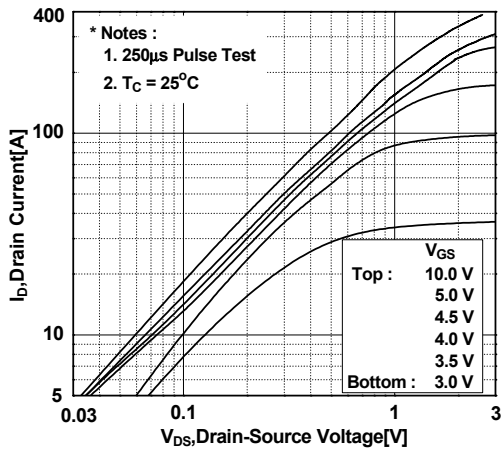
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 80 \text{ A}$	--	--	1.25	V
		$V_{GS} = 0 \text{ V}, I_{SD} = 40 \text{ A}$	--	--	1.0	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 60 \text{ A},$	--	58	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_f/dt = 100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

#### Notes:

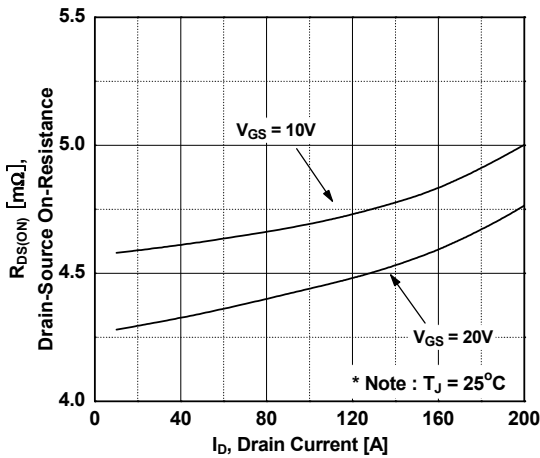
1:  $L = 1 \text{ mH}, I_{AS} = 36 \text{ A}, V_{DD} = 54 \text{ V}, V_{GS} = 10 \text{ V}, R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$

## Typical Performance Characteristics

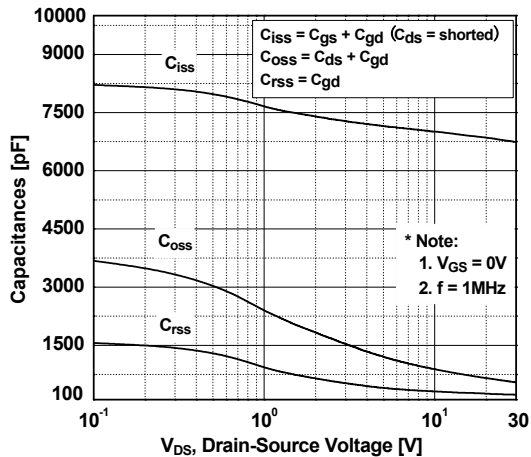
**Figure 1. On-Region Characteristics**



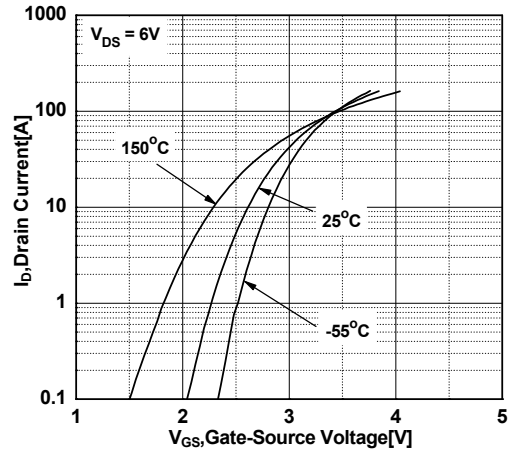
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



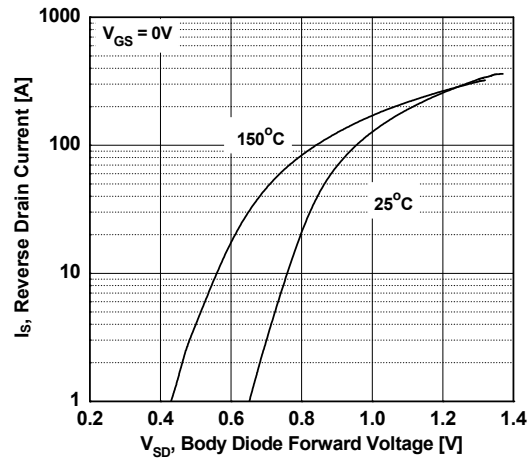
**Figure 5. Capacitance Characteristics**



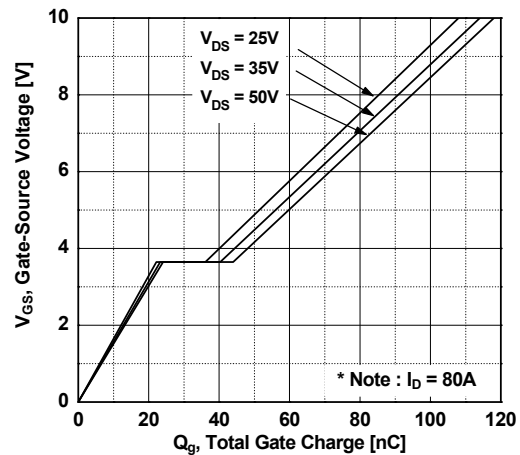
**Figure 2. Transfer Characteristics**



**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

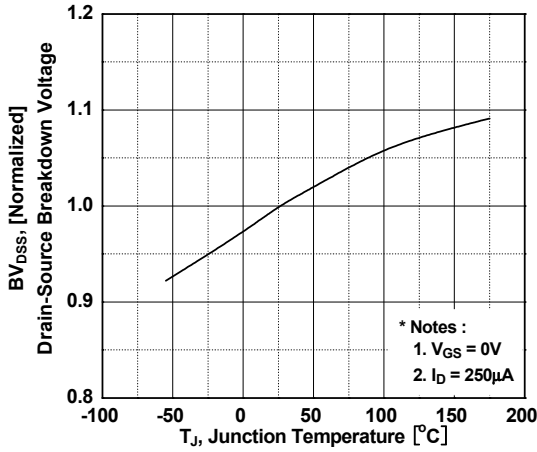


Figure 8. On-Resistance Variation vs. Temperature

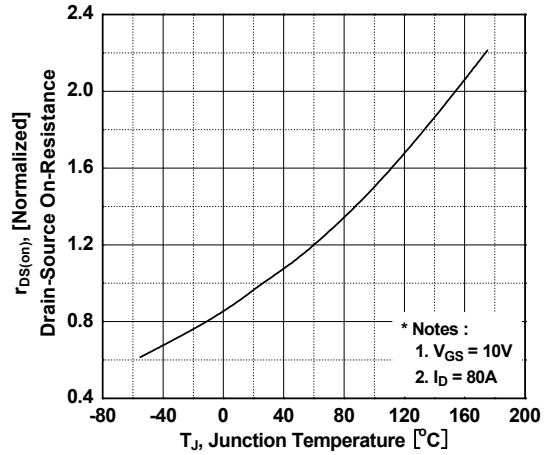


Figure 9. Maximum Safe Operating Area

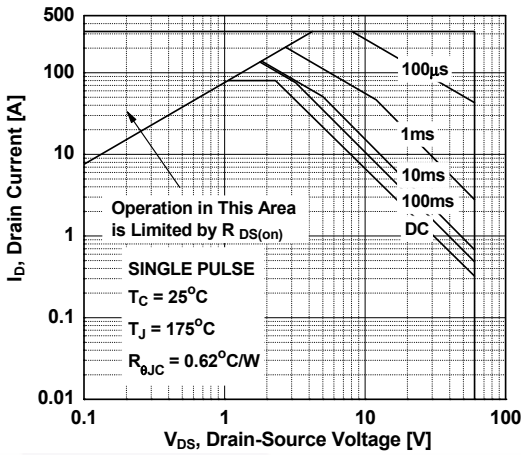


Figure 10. Maximum Drain Current vs. Case Temperature

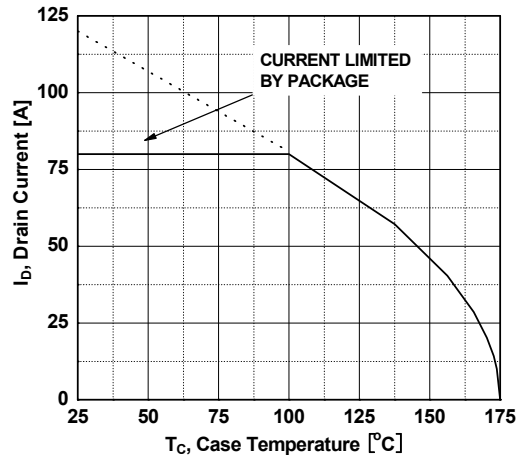
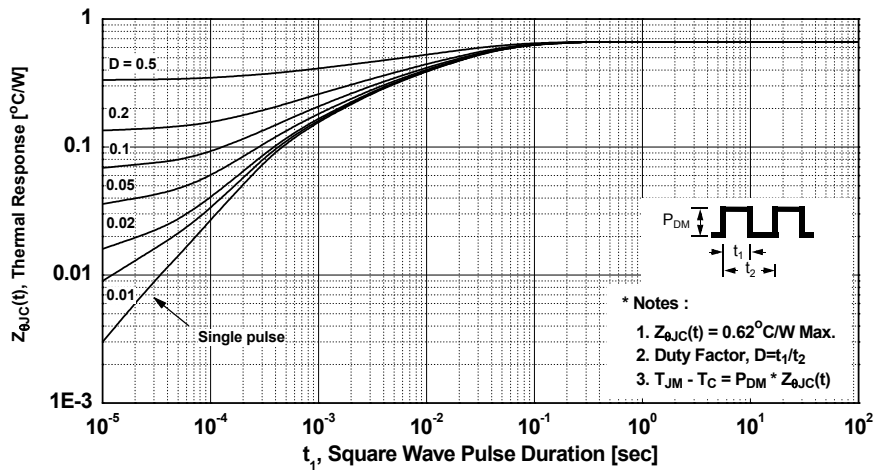


Figure 11. Transient Thermal Response Curve



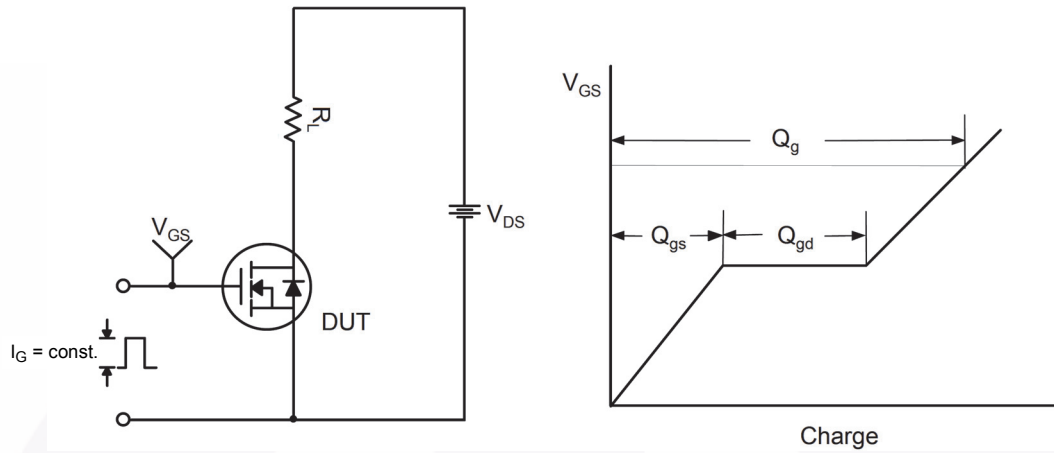


Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms

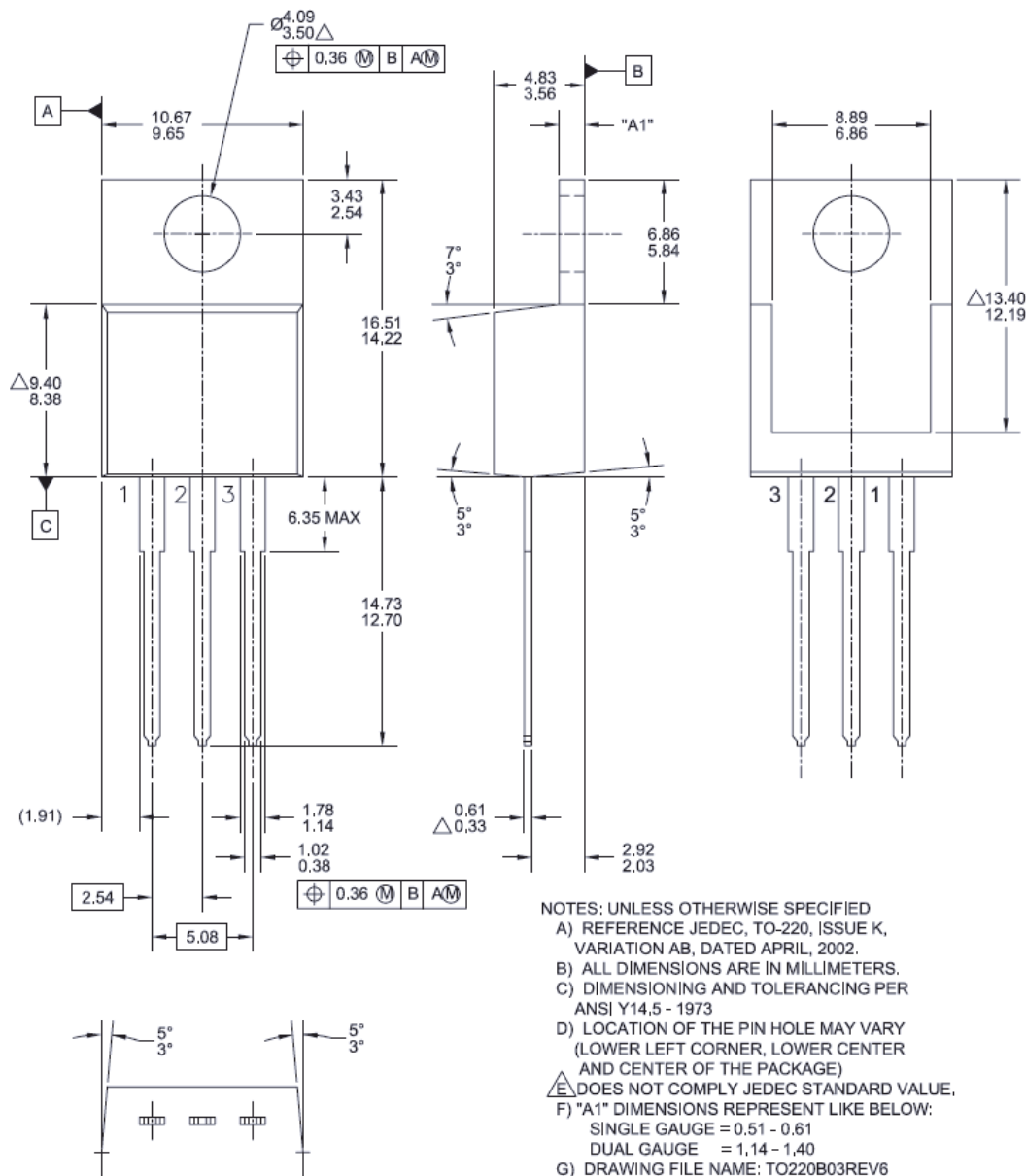


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



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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