FAIRCHILD
SEMICONDUCTOR®

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FDP8443

## N-Channel PowerTrench® MOSFET

40V, 80A, 3.5mΩ

Features

- Typ $r_{DS(on)}$ = 2.7mΩ at V_{GS} = 10V, I_D = 80A

- Typ $Q_{g(10)}$ = 142nC at V_{GS} = 10V

- Low Miller Charge

- Low Q_{rr} Body Diode

- UIS Capability (Single Pulse and Repetitive Pulse)

- Qualified to AEC Q101

- RoHS Compliant

Applications

- Automotive Engine Control

- Powertrain Management

- Solenoid and Motor Drivers

- Electronic Steering

- Integrated Starter / Alternator

- Distributed Power Architecture and VRMs

- Primary Switch for 12V Systems

100% RoHS COMPLIANT

TO-220AB
FDP SERIES
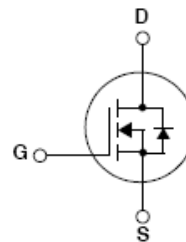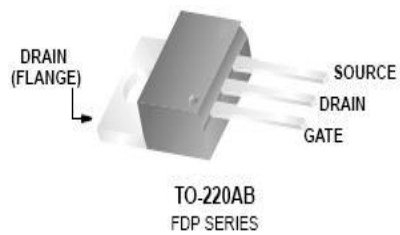
MOSFET Maximum Ratings $T_C = 25°C$ unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		40	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current Continuous ($T_C < 144°C$, $V_{GS} = 10V$)		80	A
	Continuous ($T_{amb} = 25°C$, $V_{GS} = 10V$, with $R_{\theta JA} = 62°C/W$)		20	
	Pulsed		See Figure 4	
E_{AS}	Single Pulse Avalanche Energy	(Note 1)	531	mJ
P_D	Power Dissipation		188	W
	Derate above 25°C		1.25	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case		0.8	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	(Note 2)	62	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8443	FDP8443	TO-220AB	Tube	N/A	50 units

Electrical Characteristics $T_C = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
B_{VDSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$		40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32V$, $V_{GS} = 0V$		-	-	1	μA
			$T_C = 150°C$	-	-	250	
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = ±20V$		-	-	±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	2	2.8	4	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 80A$, $V_{GS} = 10V$	-	2.7	3.5	mΩ
		$I_D = 80A$, $V_{GS} = 10V$, $T_J = 175°C$	-	4.7	6.1	

Dynamic Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
C_{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$, f = 1MHz		-	9310	-	pF
C_{oss}	Output Capacitance			-	800	-	pF
C_{rss}	Reverse Transfer Capacitance			-	510	-	pF
R_G	Gate Resistance	$V_{GS} = 0.5V$, f = 1MHz		-	0.9	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0$ to 10V	$V_{DD} = 20V$ $I_D = 35A$ $I_g = 1mA$	-	142	185	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0$ to 2V		-	17.5	23	nC
Q_{gs}	Gate to Source Gate Charge			-	36	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau			-	18.8	-	nC
Q_{gd}	Gate to Drain "Miller" Charge			-	32	-	nC

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
t_{on}	Turn-On Time	$V_{DD} = 20V$, $I_D = 35A$ $V_{GS} = 10V$, $R_{GS} = 2\Omega$	-	-	58	ns
$t_{d(on)}$	Turn-On Delay Time		-	18.4	-	ns
t_r	Rise Time		-	17.9	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	55	-	ns
t_f	Fall Time		-	13.5	-	ns
t_{off}	Turn-Off Time		-	-	109	ns

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 35A$	-	0.8	1.25	V
		$I_{SD} = 15A$	-	0.8	1.0	
t_{rr}	Reverse Recovery Time	$I_{SD} = 35A$, $dI_{SD}/dt = 100A/\mu s$	-	42	55	ns
Q_{rr}	Reverse Recovery Charge		-	48	62	nC

Notes:
1: Starting $T_J = 25^oC$, L = 0.26mH, $I_{AS} = 64A$.
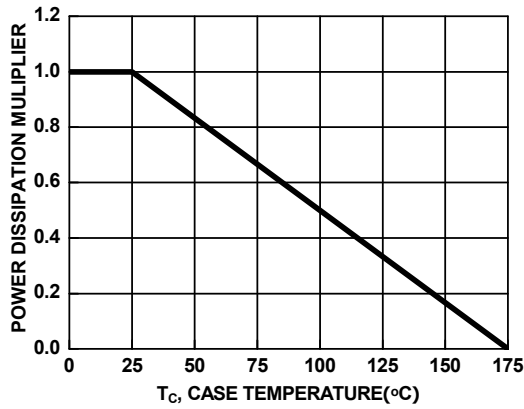**2:** Pulse width = 100s.

Typical Characteristics

Figure 1. Normalized Power Dissipation vs Case Temperature
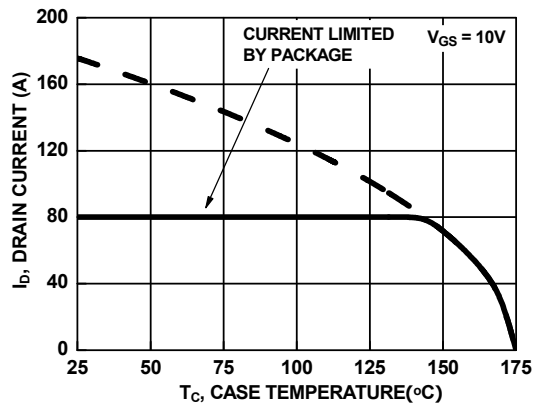
Figure 2. Maximum Continuous Drain Current vs Case Temperature
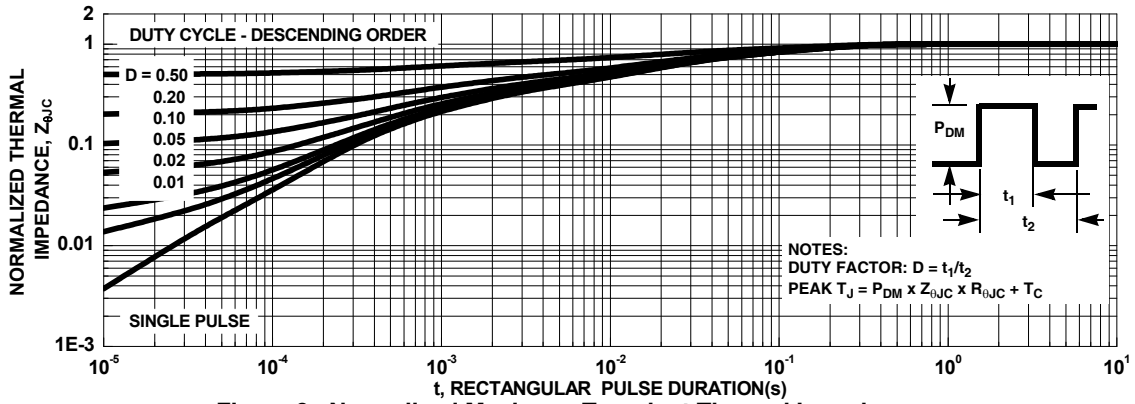

NOTES:
DUTY FACTOR: $D = t_1/t_2$
PEAK $T_J = P_{DM} \times Z_{\theta JC} \times R_{\theta JC} + T_C$

Figure 3. Normalized Maximum Transient Thermal Impedance

$V_{GS} = 10V$
TRANSCONDUCTANCE MAY LIMIT CURRENT IN THIS REGION

$T_C = 25^oC$
FOR TEMPERATURES ABOVE 25°C DERATE PEAK CURRENT AS FOLLOWS:

$$I = I_2 \left[\sqrt{\frac{175 - T_C}{150}} \right]$$
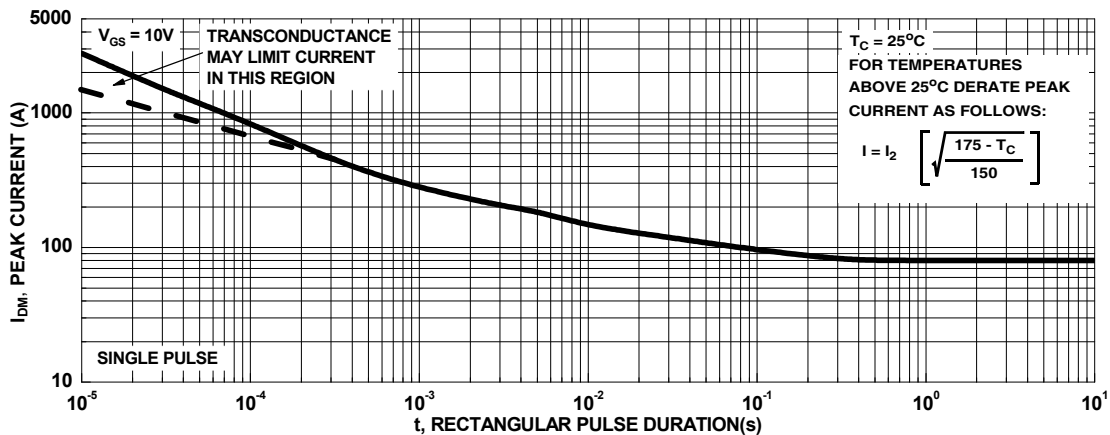
Figure 4. Peak Current Capability

Typical Characteristics
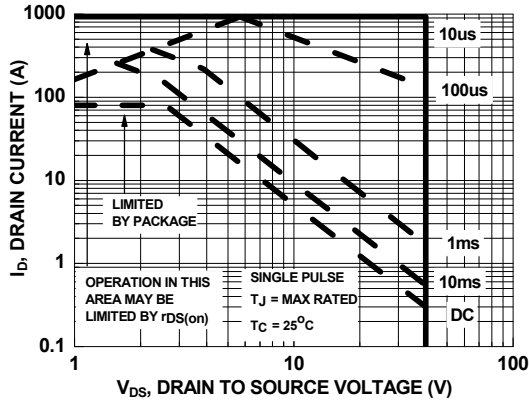
Figure 5. Forward Bias Safe Operating Area
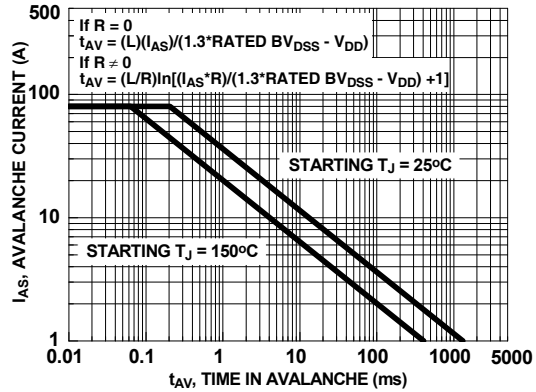
NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

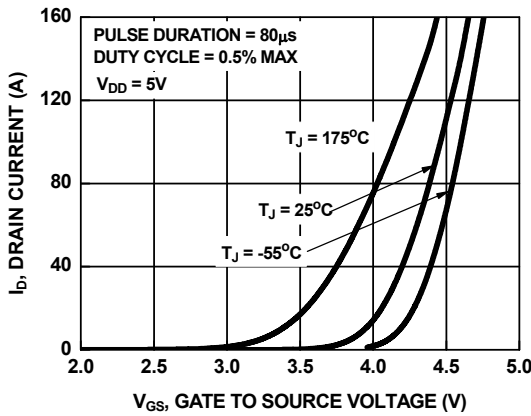Figure 6. Unclamped Inductive Switching Capability
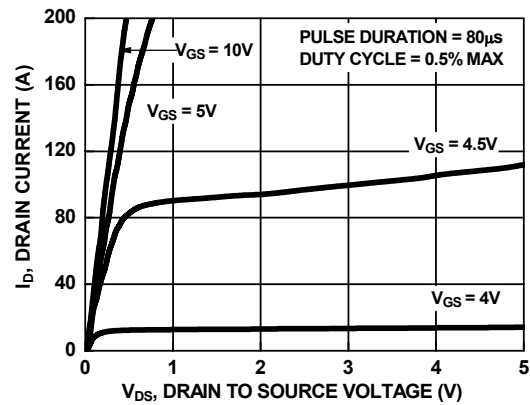

Figure 7. Transfer Characteristics
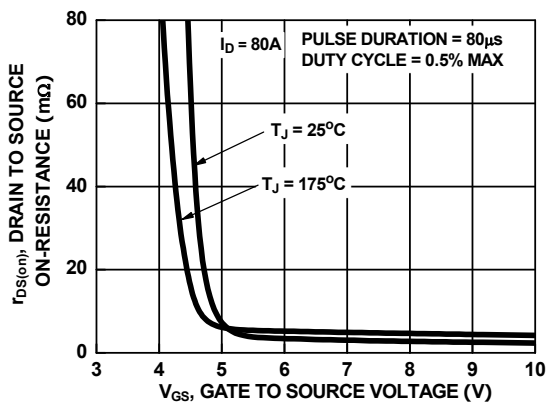

Figure 8. Saturation Characteristics

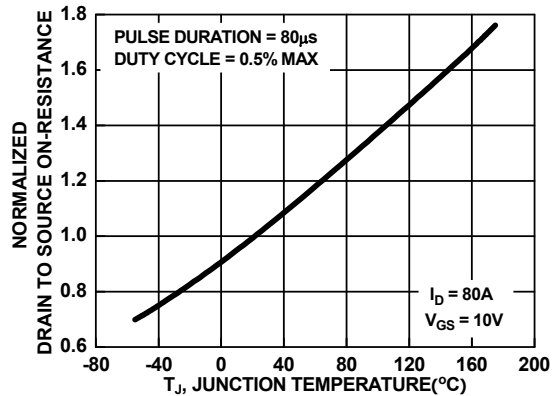Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature
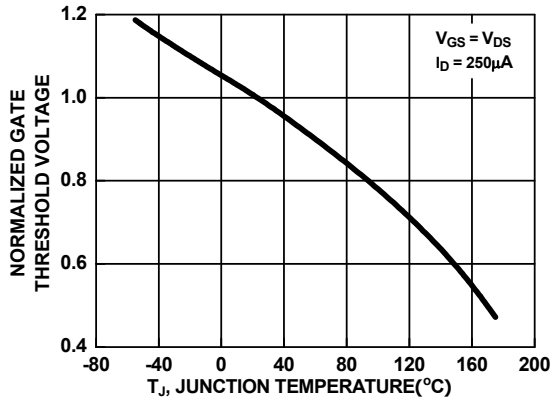
Typical Characteristics

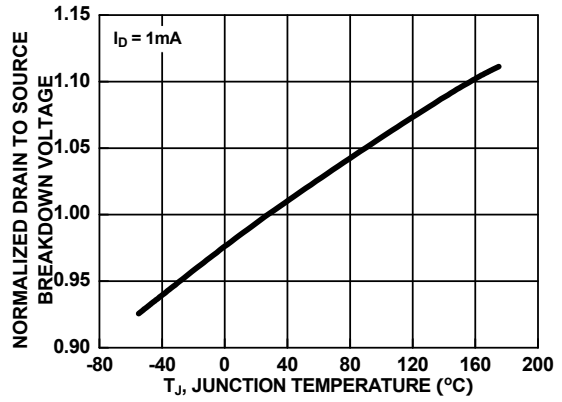Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature
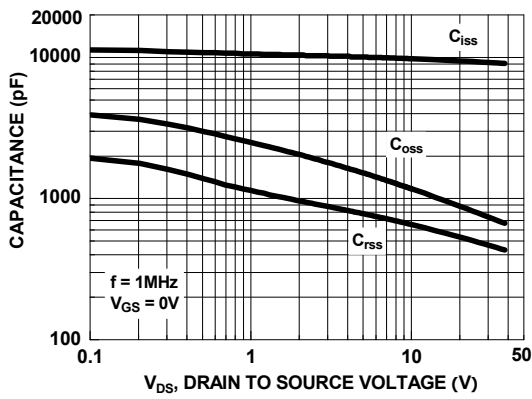
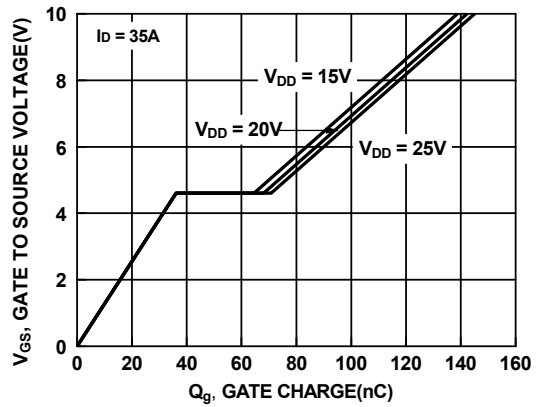Figure 13. Capacitance vs Drain to Source Voltage

Figure 14. Gate Charge vs Gate to Source Voltage

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