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FDP8440

N-Channel PowerTrench® MOSFET

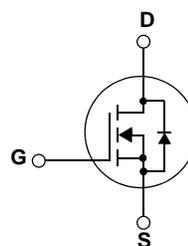
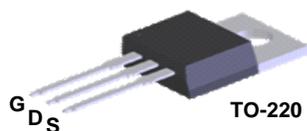
40 V, 277 A, 2.2 mΩ

Features

- $R_{DS(on)} = 1.64 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 80 \text{ A}$
- $Q_{g(tot)} = 345 \text{ nC}$ (Typ.) @ $V_{GS} = 10 \text{ V}$
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant

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		FDP8440	Unit
V_{DSS}	Drain to Source Voltage		40	V
V_{GSS}	Gate to Source Voltage		± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$, Silicon Limited)	277*	A
		- Continuous ($T_C = 100^\circ\text{C}$, Silicon Limited)	196*	
		- Continuous ($T_C = 25^\circ\text{C}$, Package Limited)	100	
I_{DM}	Drain Current	- Pulsed (Note 1)	500	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		1682	mJ
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	306	W
		- Derate above 25°C	2.04	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 100A.

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.49	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink (Typ.)	0.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8440	FDP8440	TO-220	N/A	N/A	50units

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Off Characteristics							
BV _{DSS}	Drain to Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	40	--	--	V	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 32V	--	--	1	μA	
I _{GSS}		V _{GS} = 0V, T _C = 150°C	--	--	250	μA	
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±20V	--	--	±100	nA	
On Characteristics							
V _{GS(th)}	Gate to Source Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1	--	3	V	
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 4.5V, I _D = 80A	--	1.88	2.4	mΩ	
		V _{GS} = 10V, I _D = 80A	--	1.64	2.2		
		V _{GS} = 10V, I _D = 80A, T _C = 175°C	--	3.00	4.4		
Dynamic Characteristics							
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	18600	24740	pF	
C _{oss}	Output Capacitance		--	1840	2450	pF	
C _{rss}	Reverse Transfer Capacitance		--	1400	2100	pF	
R _G	Gate Resistance		V _{GS} = 0.5V, f = 1MHz	--	1.1	--	Ω
Q _{g(tot)}	Total Gate Charge at 10V	V _{GS} = 0V to 10V	V _{DD} = 20V I _D = 80A I _g = 1.0mA	--	345	450	nC
Q _{g(2)}	Threshold Gate Charge	V _{GS} = 0V to 2V		--	32.5	--	nC
Q _{gs}	Gate to Source Gate Charge			--	49	--	nC
Q _{gs2}	Gate Charge Threshold to Plateau			--	16.5	--	nC
Q _{gd}	Gate to Drain "Miller" Charge			--	74	--	nC
Switching Characteristics (V_{GS} = 10V)							
t _{ON}	Turn-On Time	V _{DD} = 20V, I _D = 80A V _{GS} = 10V, R _{GEN} = 7Ω	--	175	360	ns	
t _{d(on)}	Turn-On Delay Time		--	43	95	ns	
t _r	Rise Time		--	130	275	ns	
t _{d(off)}	Turn-Off Delay Time		--	435	875	ns	
t _f	Fall Time		--	290	590	ns	
t _{OFF}	Turn-Off Time		--	730	1470	ns	
Drain-Source Diode Characteristics and Maximum Ratings							
V _{SD}	Source to Drain Diode Voltage	I _{SD} = 80A	--	--	1.25	V	
		I _{SD} = 40A	--	--	1.0	V	
t _{rr}	Reverse Recovery Time	I _{SD} = 75A, di _{SD} /dt = 100A/μs	--	59	--	ns	
Q _{RR}	Reverse Recovery Charge	I _{SD} = 75A, di _{SD} /dt = 100A/μs	--	77	--	nC	

NOTES:

- 1: Pulse width limited by maximum junction temperature.
- 2: Starting T_J = 25°C, L = 1mH, I_{AS} = 58A, V_{DD} = 36V, V_{GS} = 10V.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

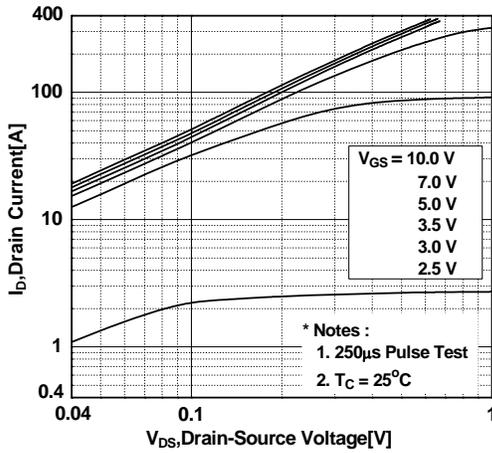


Figure 2. Transfer Characteristics

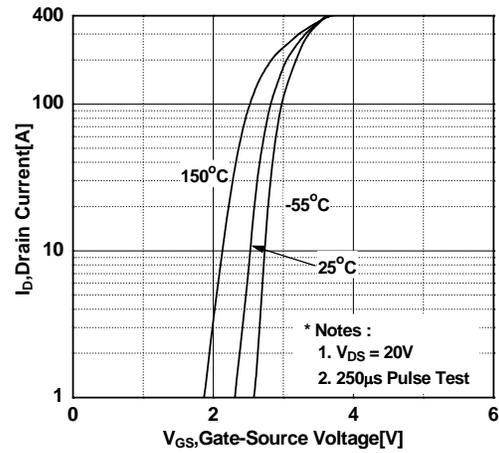


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

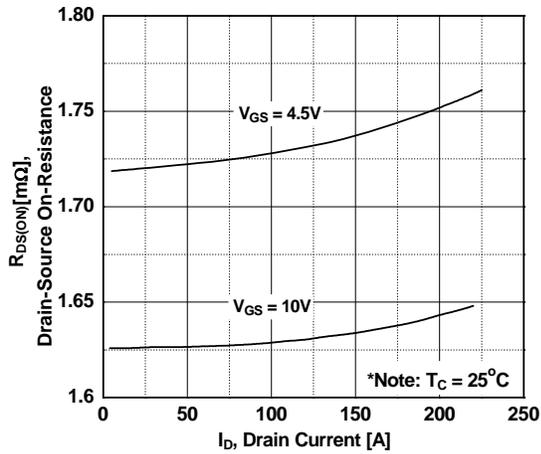


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

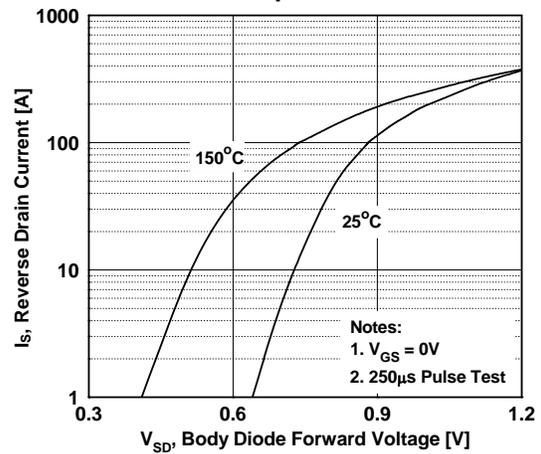


Figure 5. Capacitance Characteristics

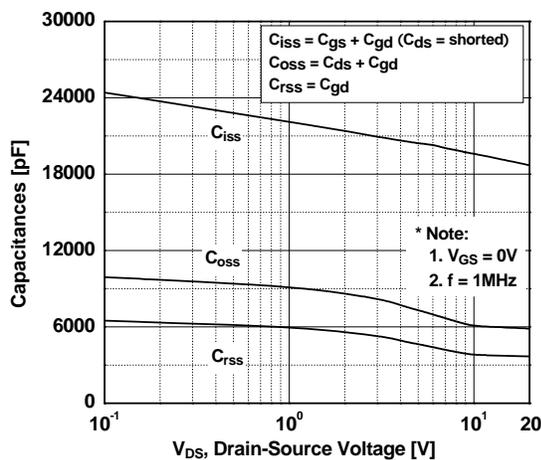
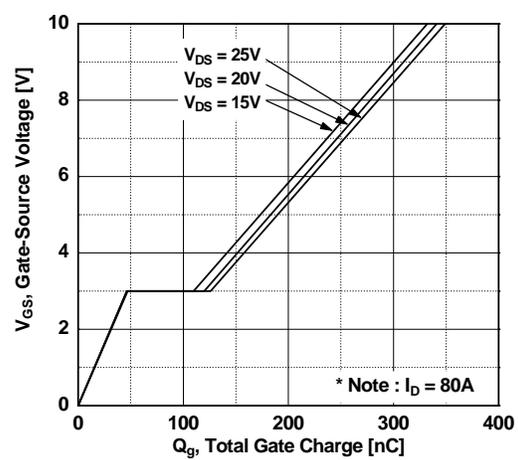


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

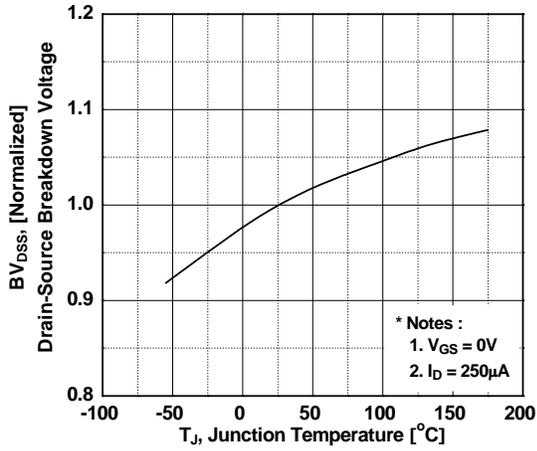


Figure 8. On-Resistance Variation vs. Temperature

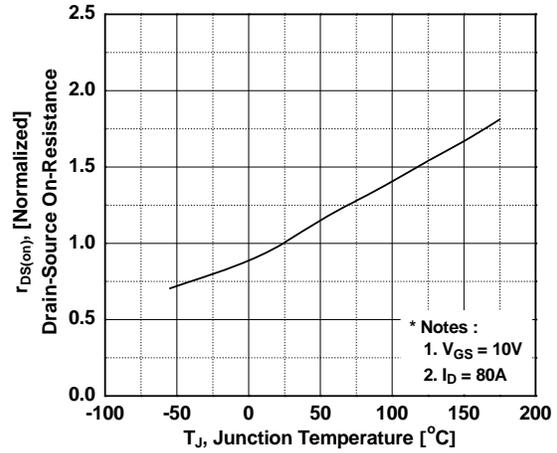


Figure 9. Unclamped Inductive Switching Capability

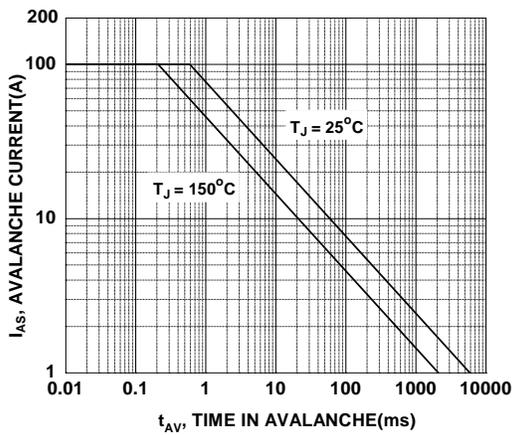


Figure 10. Safe Operating Area

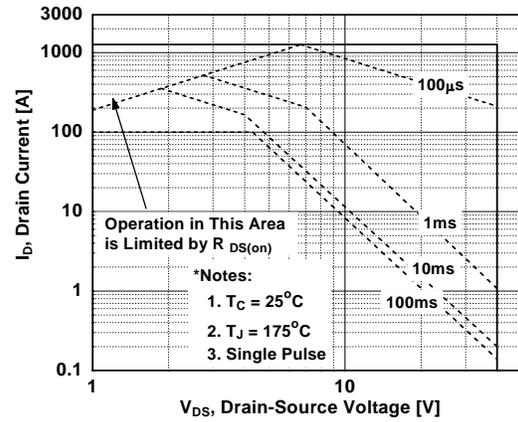
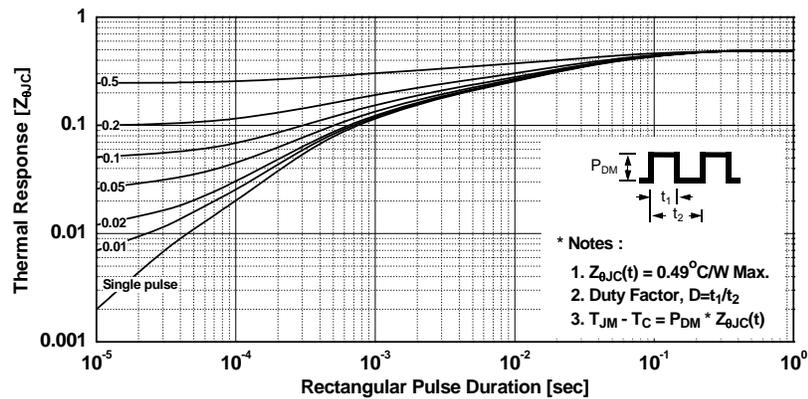
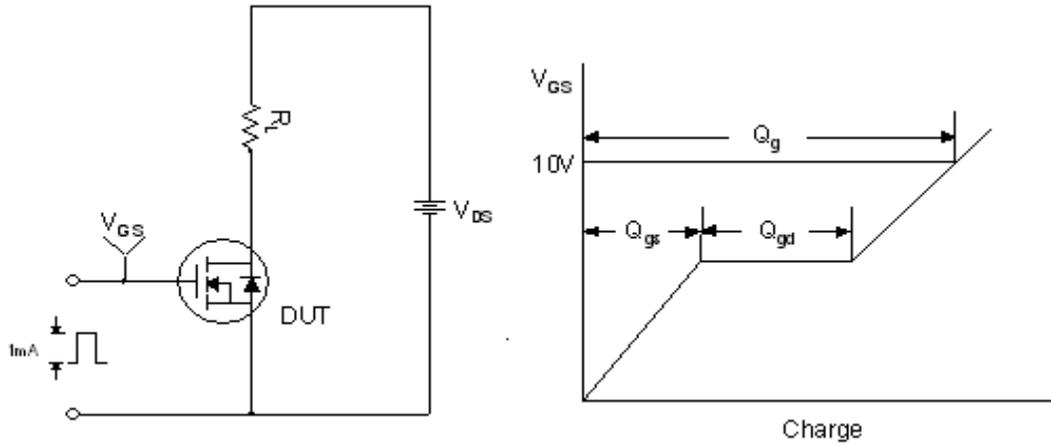


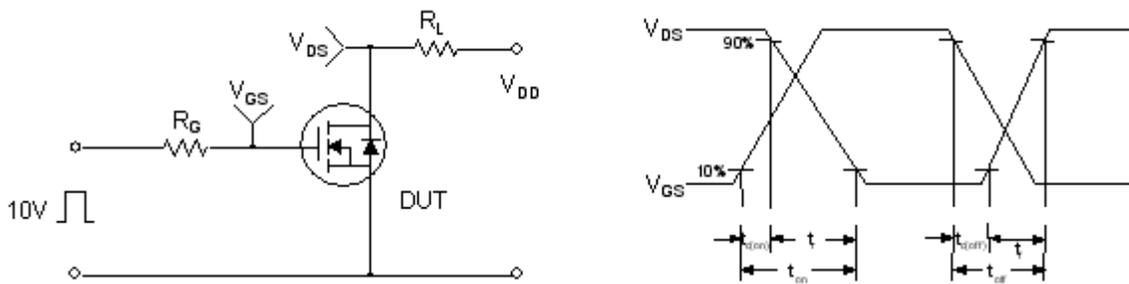
Figure 11. Transient Thermal Response Curve



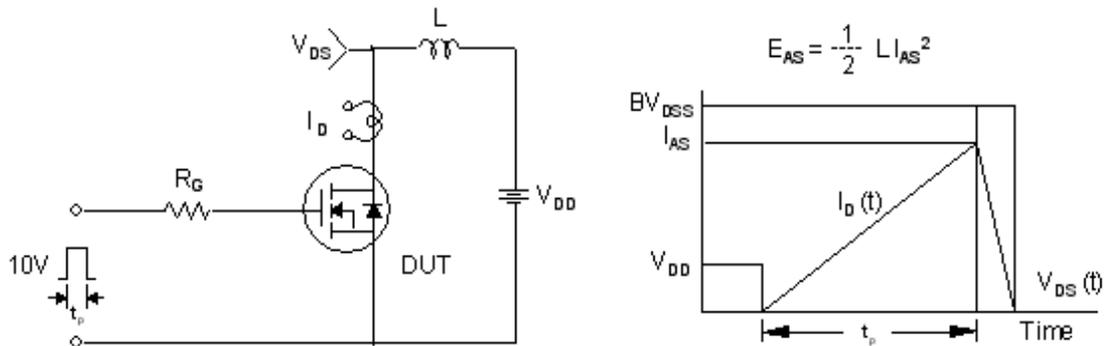
Gate Charge Test Circuit & Waveform



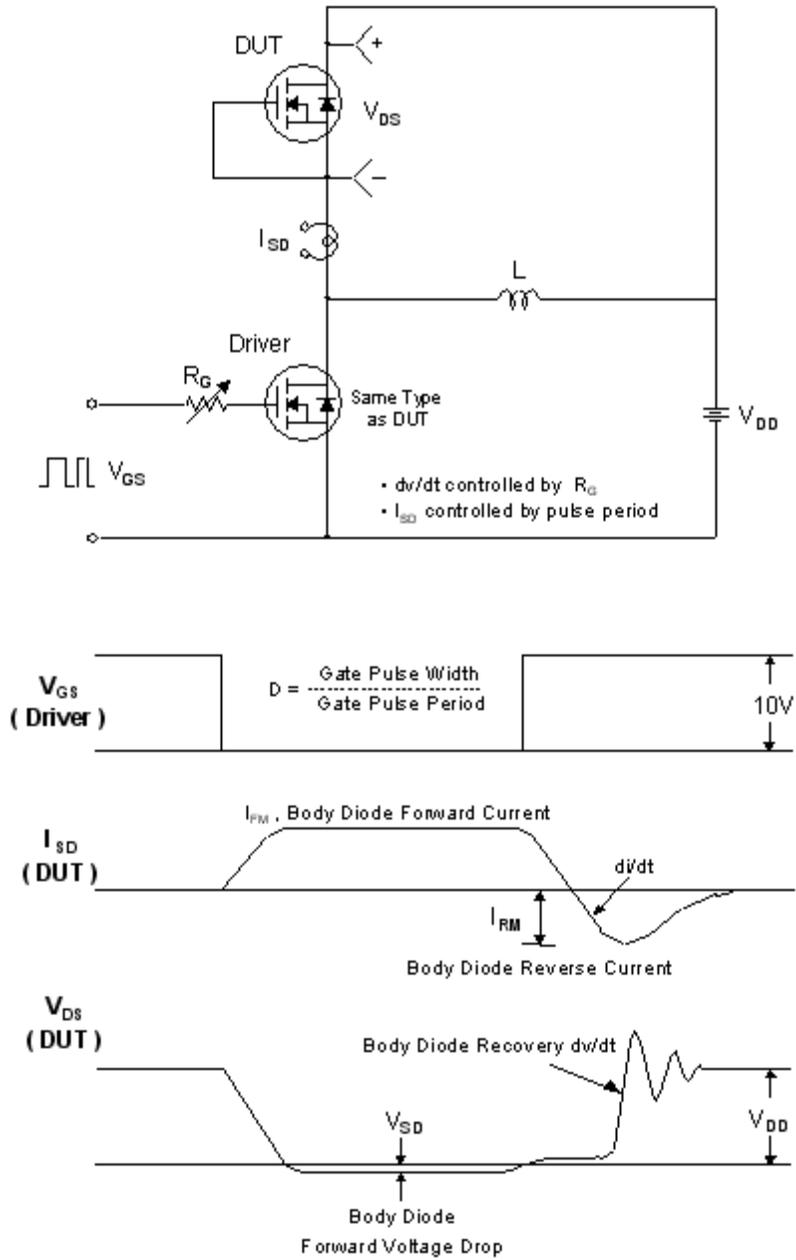
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms





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