

# MOSFET – N-Channel, POWERTRENCH®

80 V, 22 A, 11.7 mΩ

## FDMC86320

### General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $r_{DS(on)}$ , fast switching speed and body diode reverse recovery performance.

### Features

- Max  $r_{DS(on)}$  = 11.7 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 10.7\text{ A}$
- Max  $r_{DS(on)}$  = 16 mΩ at  $V_{GS} = 8\text{ V}$ ,  $I_D = 8.5\text{ A}$
- MSL1 Robust Package Design
- 100% UIL Tested
- These Devices are Pb-Free, Halide Free and are RoHS Compliant

### Applications

- Primary DC-DC Switch
- Motor Bridge Switch
- Synchronous Rectifier

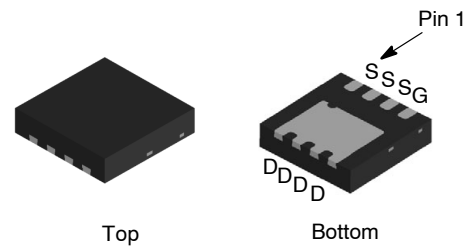
### MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	80	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current		A
	–Continuous $T_C = 25^\circ\text{C}$	22	
	–Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	10.7	
	–Pulsed	50	
EAS	Single Pulse Avalanche Energy (Note 3)	60	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	40	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	–55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

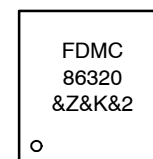
### THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	3.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	°C/W



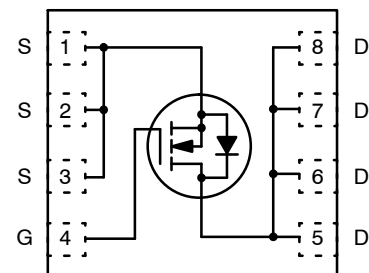
WDFN8 3.3x3.3, 0.65P  
CASE 511DH

### MARKING DIAGRAM



FDMC = Specific Device Code  
86320 = Specific Device Code  
&Z = Assembly Location  
&K = Lot Run Traceability Code  
&2 = Date Code (Year and Week)

### PIN ASSIGNMENT



N-Channel MOSFET

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	80			V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C		56		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0 V			1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±100	nA

## ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	2.4	3.5	4.5	V
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Gate to Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C		-11		mV/°C
r <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10.7 A		9.7	11.7	mΩ
		V <sub>GS</sub> = 8 V, I <sub>D</sub> = 8.5 A		11.4	16	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10.7 A, T <sub>J</sub> = 125°C		15	18	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10.7 A		20		S

## DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, f = 1 MHz		1985	2640	pF
C <sub>oss</sub>	Output Capacitance			353	469	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			12	30	pF
R <sub>g</sub>	Gate Resistance			0.5		Ω

## SWITCHING CHARACTERISTICS

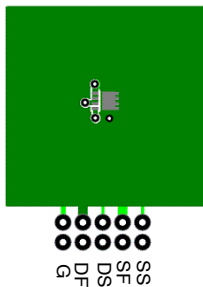
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 40 V, I <sub>D</sub> = 10.7 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω		15	28	ns
t <sub>r</sub>	Rise Time			8	16	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			20	35	ns
t <sub>f</sub>	Fall Time			5	10	ns
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V	V <sub>DD</sub> = 40 V I <sub>D</sub> = 10.7 A	29	41	nC
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 8 V		24	34	nC
Q <sub>gs</sub>	Gate to Source Charge			10		nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge			6.9		nC

## DRAIN-SOURCE DIODE CHARACTERISTICS

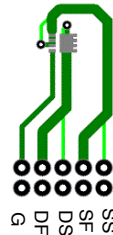
V <sub>SD</sub>	Source to Drain Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 10.7 A (Note 2)		0.84	1.3	V
		V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2 A (Note 2)		0.75	1.2	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 10.7 A, di/dt = 100 A/μs		38	61	ns
Q <sub>rr</sub>	Reverse Recovery Charge			27	43	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- R<sub>θJA</sub> is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design.



a. 53 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0 %.
- Starting T<sub>J</sub> = 25 °C, N-ch: L = 0.3 mH, I<sub>AS</sub> = 20 A, V<sub>DD</sub> = 72 V, V<sub>GS</sub> = 10 V.

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

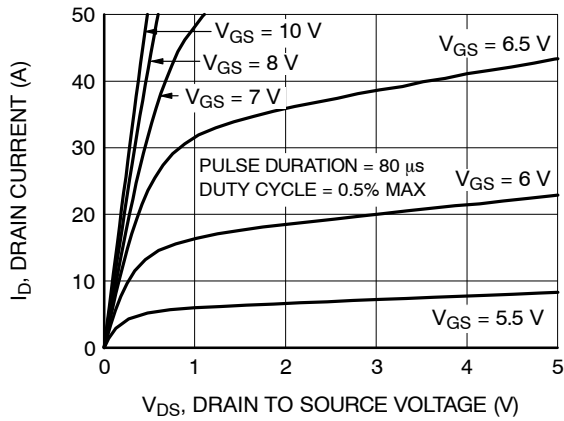


Figure 1. On-Region Characteristics

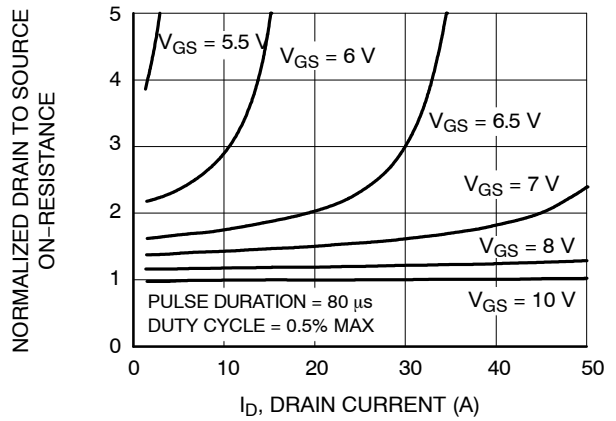


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

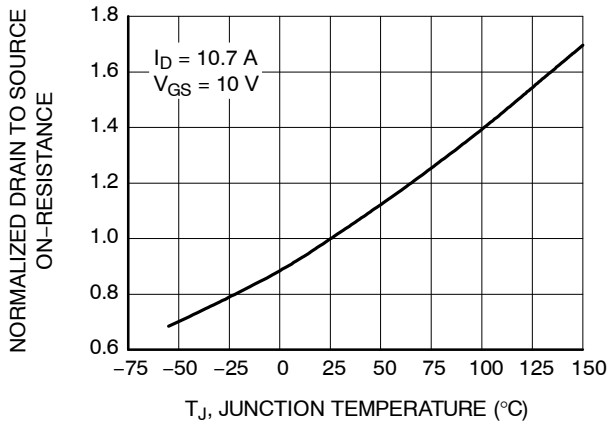


Figure 3. Normalized On-Resistance vs. Junction Temperature

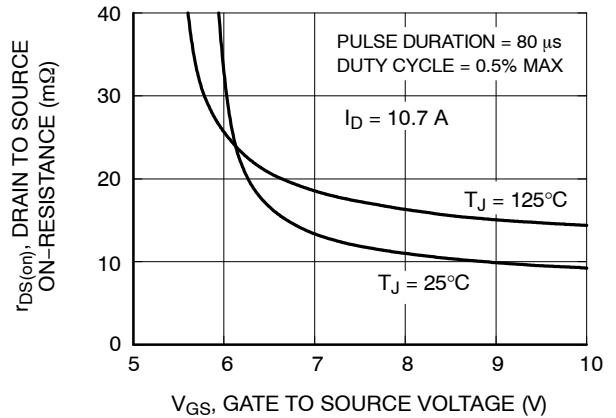


Figure 4. On-Resistance vs. Gate to Source Voltage

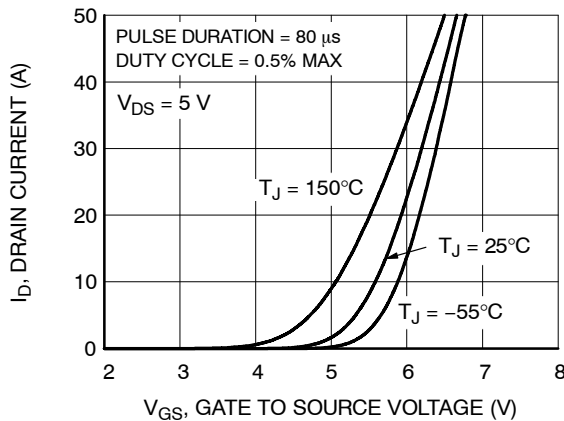


Figure 5. Transfer Characteristics

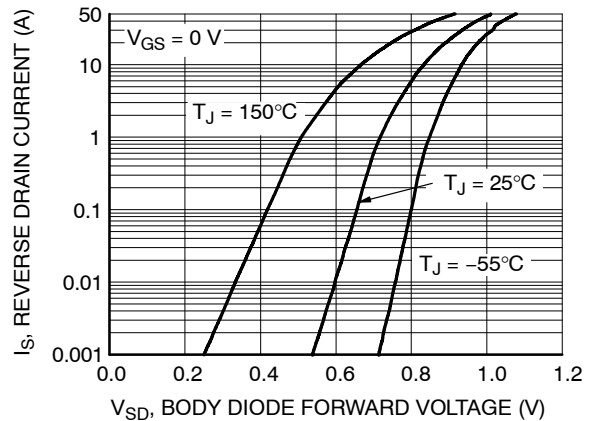


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

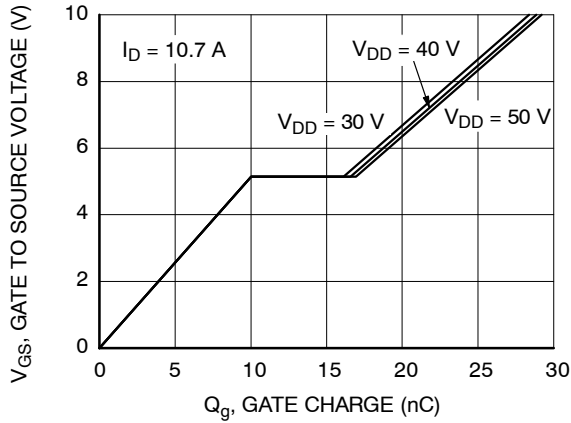


Figure 7. Gate Charge Characteristics

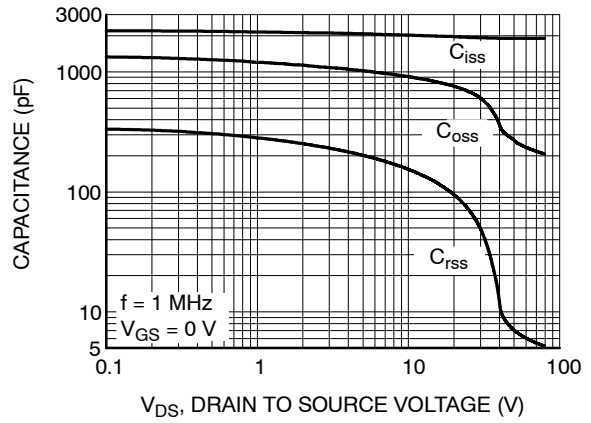


Figure 8. Capacitance vs. Drain to Source Voltage

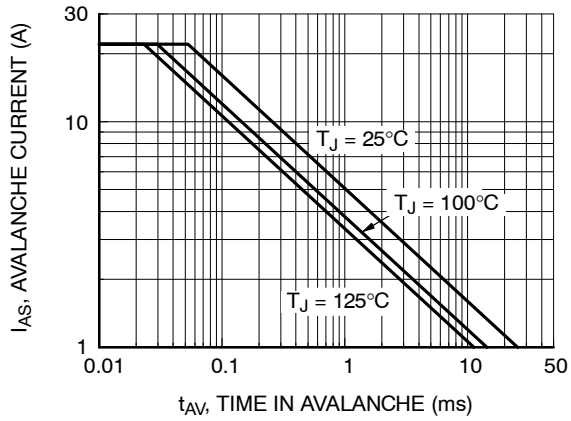


Figure 9. Unclamped Inductive Switching Capability

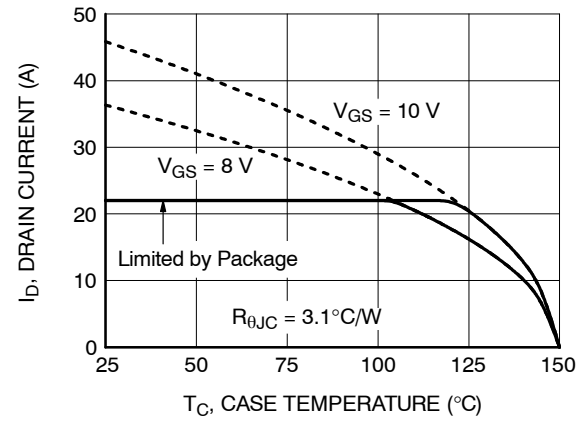


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

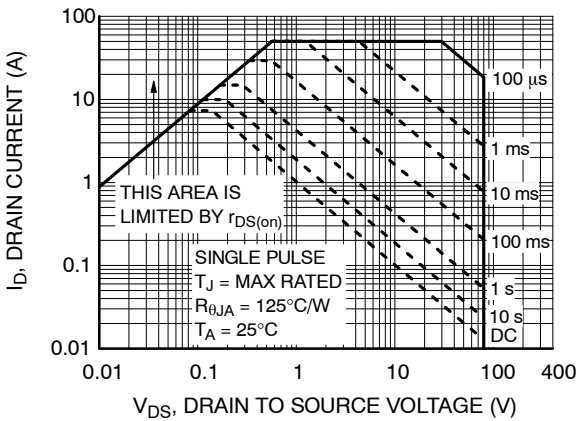


Figure 11. Forward Bias Safe Operating Area

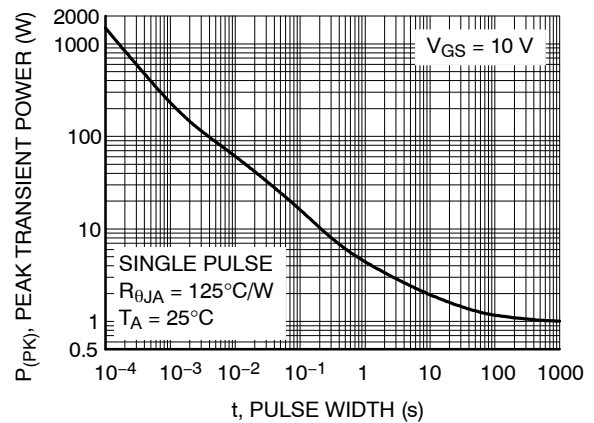


Figure 12. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

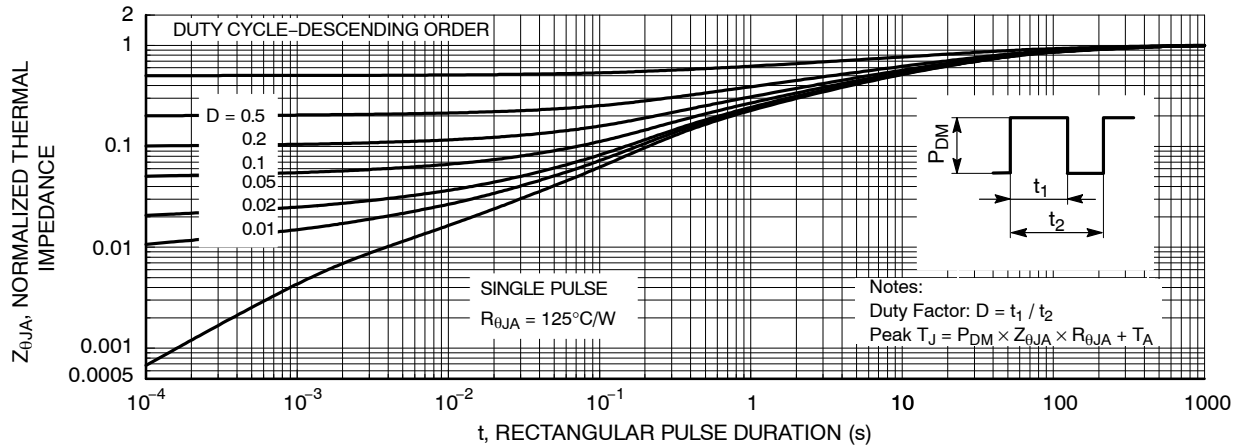


Figure 13. Junction-to-Case Transient Thermal Response Curve

### ORDERING INFORMATION

Device	Device Marking	Package Type	Shipping <sup>†</sup>
FDMC86320	FDMC86320	WDFN8 3.3x3.3, 0.65P (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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