

MOSFET - N-Channel, Shielded Gate, POWERTRENCH®

100 V, 24 mΩ, 22 A

FDMC86102LZ

Description

This N-Channel logic Level MOSFETs are produced using onsemi's advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance. G-S zener has been added to enhance ESD voltage level.

Features

- Shielded Gate MOSFET Technology
- Max $R_{DS(on)}$ = 24 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 6.5\text{ A}$
- Max $R_{DS(on)}$ = 35 mΩ at $V_{GS} = 4.5\text{ V}$, $I_D = 5.5\text{ A}$
- HBM ESD Protection Level > 6 kV Typical (Note 4)
- 100% UIL Tested
- RoHS Compliant

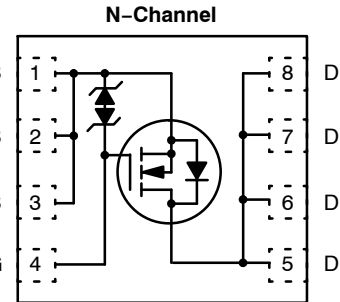
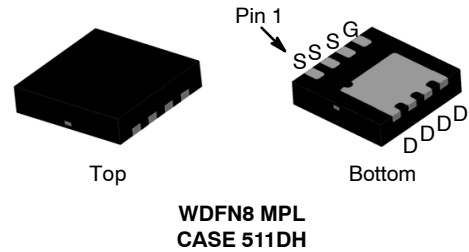
Applications

- DC-DC Switching

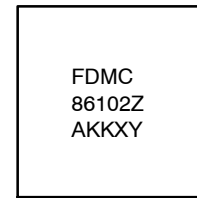
MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain-to-Source Voltage	100	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)	7	
	- Pulsed	30	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	84	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	41	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	$^\circ\text{C}$

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.



MARKING DIAGRAM



FDMC86102Z = Specific Device Code
A = Assembly Plant Code
KK = Lot Run Traceability Code
XY = Numeric Date Code

ORDERING INFORMATION

Device	Package	Shipping†
FDMC86102LZ	WDFN8 (Pb-Free, Halide Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

FDMC86102LZ

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	53	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain-to-Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C	-	71	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80 \text{V}, V_{GS} = 0 \text{V}$	-	-	1	μA
I_{GSS}	Gate-to-Source Leakage Current	$V_{GS} = \pm 20 \text{V}, V_{DS} = 0 \text{V}$	-	-	± 10	μA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate-to-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0	1.6	2.2	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate-to-Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C	-	-6	-	mV/°C
$R_{DS(on)}$	Static Drain-to-Source On Resistance	$V_{GS} = 10 \text{V}, I_D = 6.5 \text{A}$	-	19	24	m Ω
		$V_{GS} = 4.5 \text{V}, I_D = 5.5 \text{A}$	-	25	35	
		$V_{GS} = 10 \text{V}, I_D = 6.5 \text{A}, T_J = 125^\circ\text{C}$	-	31	40	
g_{FS}	Forward Transconductance	$V_{DS} = 5 \text{V}, I_D = 6.5 \text{A}$	-	24	-	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 50 \text{V}, V_{GS} = 0 \text{V}, f = 1 \text{MHz}$	-	969	1290	pF
C_{oss}	Output Capacitance		-	181	240	pF
C_{rss}	Reverse Transfer Capacitance		-	9	15	pF
R_g	Gate Resistance		-	0.4	-	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50 \text{V}, I_D = 6.5 \text{A}, V_{GS} = 10 \text{V}, R_{GEN} = 6 \Omega$	-	7.1	15	ns
t_r	Rise Time		-	2.3	10	
$t_{d(off)}$	Turn-Off Delay Time		-	19	35	
t_f	Fall Time		-	2.5	10	
$Q_{g(tot)}$	Total Gate Charge	$V_{GS} = 0 \text{V to } 10 \text{V}, V_{DD} = 50 \text{V}, I_D = 6.5 \text{A}$	-	15.3	22	nC
$Q_{g(tot)}$	Total Gate Charge	$V_{GS} = 0 \text{V to } 4.5 \text{V}, V_{DD} = 50 \text{V}, I_D = 6.5 \text{A}$	-	7.6	11	
Q_{gs}	Gate-to-Source Charge	$V_{DD} = 50 \text{V}, I_D = 6.5 \text{A}$	-	2.4	-	
Q_{gd}	Gate-to-Drain "Miller" Charge	$V_{DD} = 50 \text{V}, I_D = 6.5 \text{A}$	-	2.5	-	

FDMC86102LZ

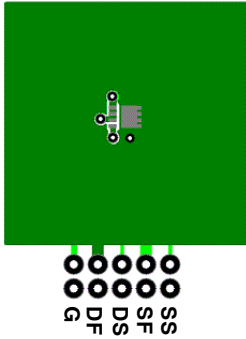
ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source-to-Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 6.5\text{ A}$ (Note 2)	-	0.80	1.3	V
		$V_{GS} = 0\text{ V}, I_S = 2\text{ A}$ (Note 2)	-	0.72	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 6.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	37	59	ns
Q_{rr}	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.

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) $53^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b) $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- Starting $T_J = 25^\circ\text{C}$; N-ch: $L = 1\text{ mH}$, $I_{AS} = 13\text{ A}$, $V_{DD} = 90\text{ V}$, $V_{GS} = 10\text{ V}$.
- The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

TYPICAL CHARACTERISTICS

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

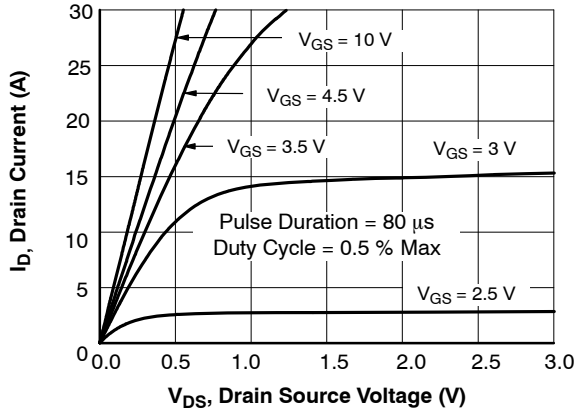


Figure 1. On-Region Characteristics

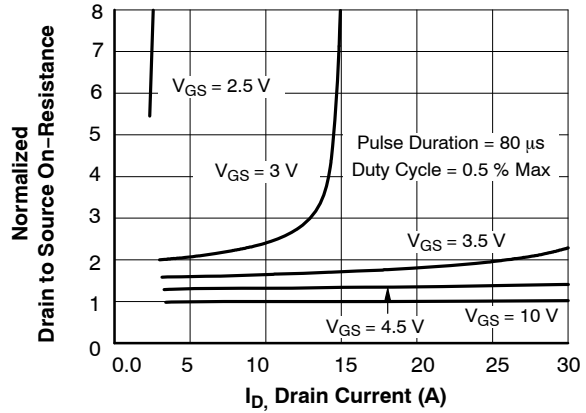


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

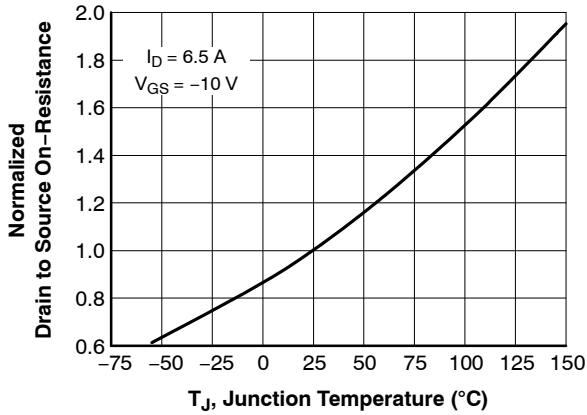


Figure 3. Normalized On-Resistance vs. Junction Temperature

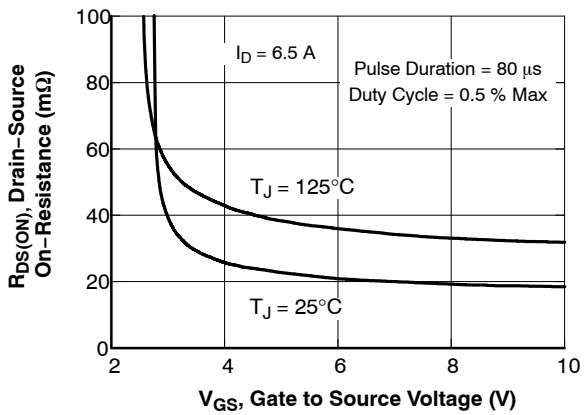


Figure 4. On-Resistance vs. Gate-to-Source Voltage

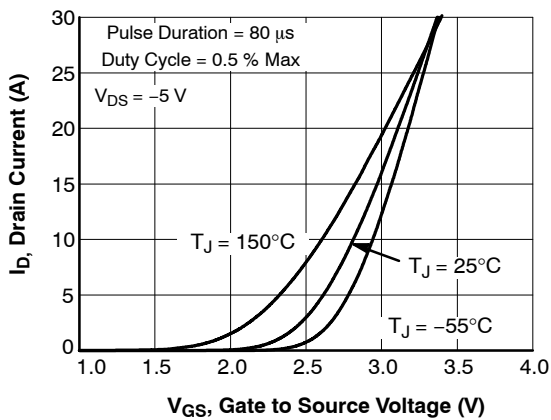


Figure 5. Transfer Characteristics

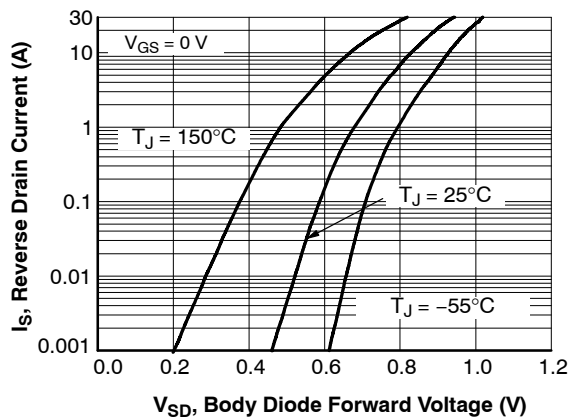


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

FDMC86102LZ

TYPICAL CHARACTERISTICS (continued)

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

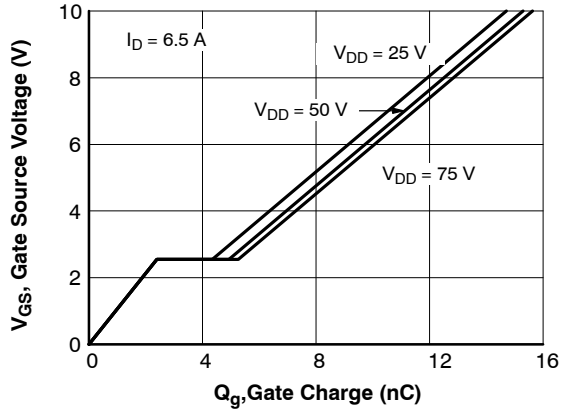


Figure 7. Gate Charge Characteristics

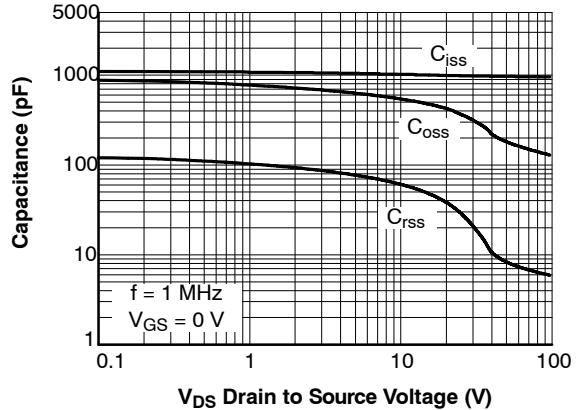


Figure 8. Capacitance vs Drain-to-Source Voltage

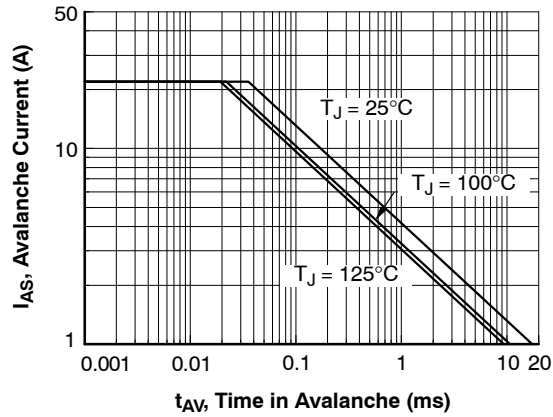


Figure 9. Unclamped Inductive Switching Capability

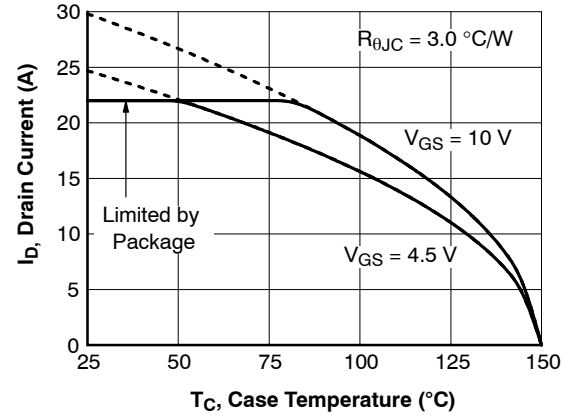


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

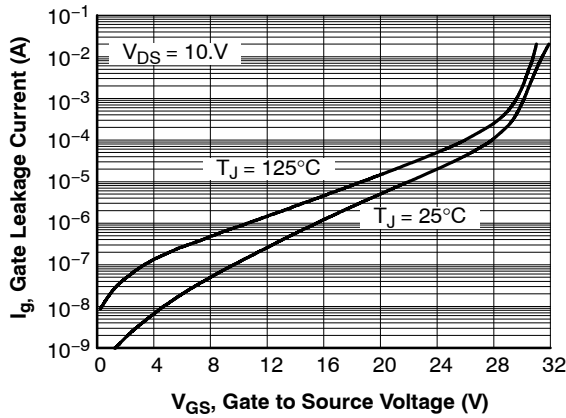


Figure 11. Gate Leakage Current vs. Gate-to-Source Voltage

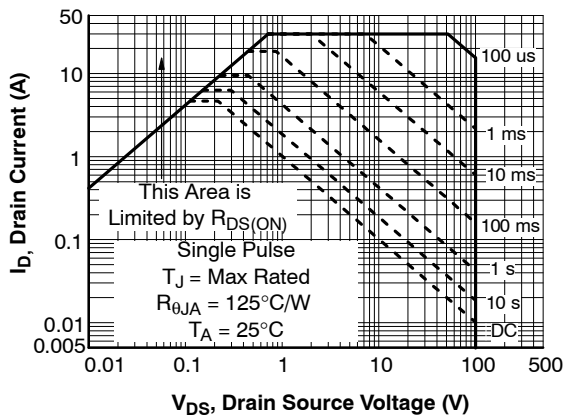


Figure 12. Forward Bias Safe Operating Area

FDMC86102LZ

TYPICAL CHARACTERISTICS (continued)

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

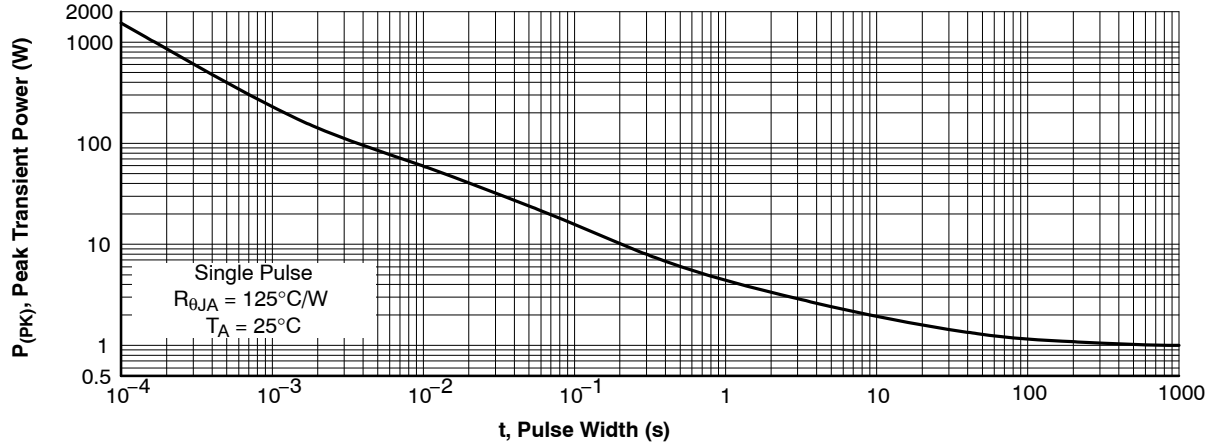


Figure 13. Single Pulse Maximum Power Dissipation

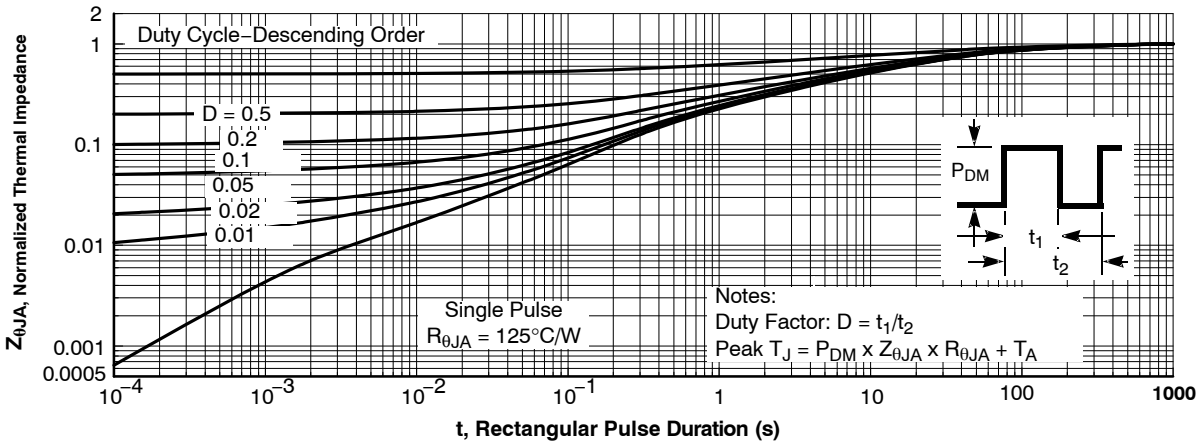


Figure 14. Junction-to-Ambient Transient Thermal Response

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