

MOSFET – P-Channel, QFET

-150 V, -3 A, 1.5 Ω

FDMC2523P

General Description

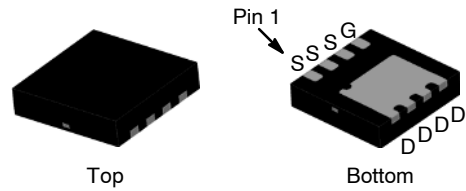
These P-Channel MOSFET enhancement mode power field effect transistors are produced using onsemi's proprietary, planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for low voltage applications such as audio amplifier, high efficiency switching DC-DC converters, and DC motor control.

Features

- Max $R_{DS(on)} = 1.5 \Omega$ at $V_{GS} = -10 V$, $I_D = -1.5 A$
- Low C_{rSS} (Typical 10 pF)
- Fast Switching
- Low Gate Charge (Typical 6.2 nC)
- Improved dv / dt Capability
- This Device is Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

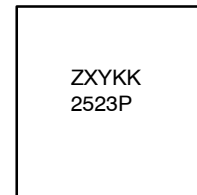
Applications

- Active Clamp Switch

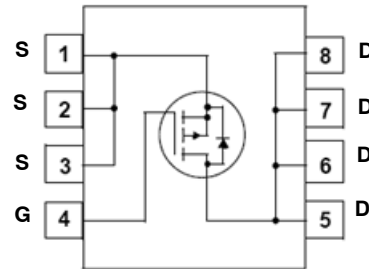


WDFN8 3.3x3.3, 0.65P
CASE 511DH

MARKING DIAGRAM



- Z = Assembly Plant Code
- XY = Date Code (Year & Week)
- KK = Lot Traceability Code
- 2523P = Specific Device Code



ORDERING INFORMATION

Device	Package	Shipping [†]
FDMC2523P	WDFN8 (Pb-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](http://www.onsemi.com/BRD8011/D).

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

Symbol	Parameter		Ratings	Unit	
V_{DS}	Drain to Source Voltage		-150	V	
V_{GS}	Gate to Source Voltage		± 30	V	
I_D	Drain Current	Continuous	$T_C = 25^\circ\text{C}$	-3	
		Continuous	$T_C = 100^\circ\text{C}$	-1.8	
		Pulsed	-	-12	
P_D	Power Dissipation (Steady State)		$T_C = 25^\circ\text{C}$	42	W
E_{AS}	Single Pulse Avalanche Energy (Note 5)		3.3	mJ	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	$^\circ\text{C}$	
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	$^\circ\text{C}$	
dv/dt	Peak Diode Recovery dv/dt (Note 2)		-5	V/ns	

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)	3.0	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	60	

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	$I_D = -250 \mu\text{A}, V_{GS} = 0 \text{ V}$	-150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$, referenced to 25°C	-	-138	-	mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -150 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	-1	μA
		$V_{DS} = -150 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 125^\circ\text{C}$	-	-	-10	μA
I_{GSS}	Gate-to-Source Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	± 100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate-to-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250 \mu\text{A}$	-3	-3.8	-5	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/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-to-Source On Resistance	$V_{GS} = -10 \text{ V}, I_D = -1.5 \text{ A}$	-	1.1	1.5	Ω
		$V_{GS} = -10 \text{ V}, I_D = -1.5 \text{ A}, T_J = 125^\circ\text{C}$	-	2.0	3.6	
g_{FS}	Forward Transconductance	$V_{DS} = -40 \text{ V}, I_D = -1.5 \text{ A}$ (Note 4)	-	1.4	-	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = -25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	200	270	pF
C_{oss}	Output Capacitance		-	60	80	
C_{rss}	Reverse Transfer Capacitance		-	10	15	
R_g	Gate Resistance	$f = 1 \text{ MHz}$	0.1	7.5	15	Ω

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
t _{d(on)}	Turn-On Delay Time	V _{DD} = -75 V, I _D = -3 A, V _{GS} = -10 V, R _{GEN} = 25 Ω (Note 3, 4)	-	15	27	ns
t _r	Rise Time		-	11	20	
t _{d(off)}	Turn-Off Delay Time		-	19	35	
t _f	Fall Time		-	13	24	
Q _g	Total Gate Charge	V _{GS} = -10 V, V _{DD} = -75 V, I _D = -3 A (Note 3, 4)	-	6.2	9	nC
Q _{gs}	Gate-to-Source Charge		-	1.4	-	
Q _{gd}	Gate-to-Drain "Miller" Charge		-	3.3	-	

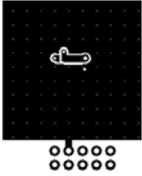
DRAIN-SOURCE DIODE CHARACTERISTICS

I _S	Maximum Continuous Drain - Source Diode Forward Current		-	-	-3	A
I _{SM}	Maximum Pulse Drain - Source Diode Forward Current		-	-	-12	
V _{SD}	Source-to-Drain Diode Forward Voltage	V _{GS} = 0 V, I _S = -3.0 A	-	-1.8	-5	V
t _{rr}	Reverse Recovery Time	I _F = -3.0 A, di/dt = 100 A/μs (Note 3)	-	93	-	ns
Q _{rr}	Reverse Recovery Charge		-	0.27	-	μC

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_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design.



- a) 60°C/W when mounted on a 1 in² pad of 2 oz copper



- b) 135°C/W when mounted on a minimum pad of 2 oz copper

- I_{SD} ≤ -3 A, di/dt ≤ 300 A/μs, V_{DD} ≤ B_VD_{SS}, Starting T_J = 25°C.
- Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
- Essentially independent of operating temperature.
- E_{AS} of 3.3 mJ is based on starting T_J = 25°C, P-ch: L = 3 mH, I_{AS} = -1.5 A, V_{DD} = -150 V, V_{GS} = -10 V.

TYPICAL CHARACTERISTICS

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

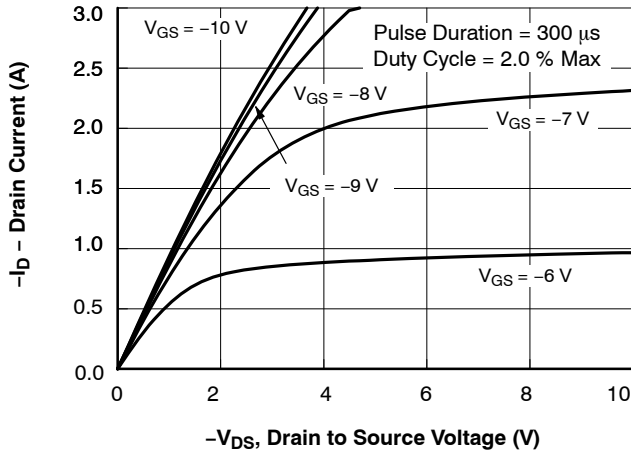


Figure 1. On-Region Characteristics

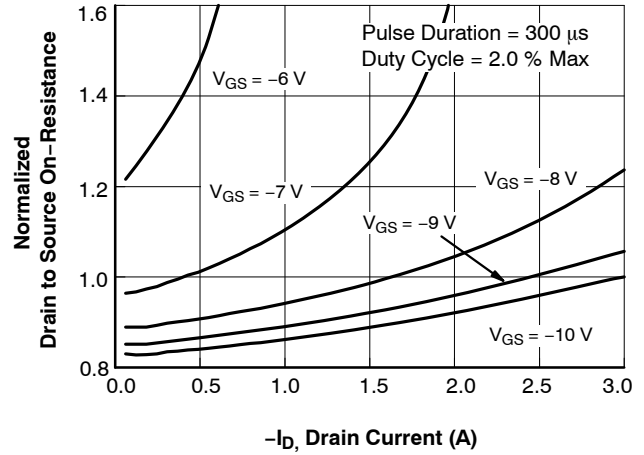


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

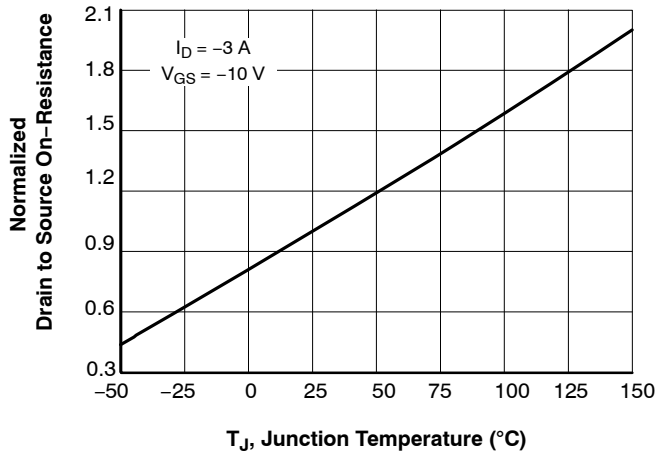


Figure 3. Normalized On-Resistance vs. Junction Temperature

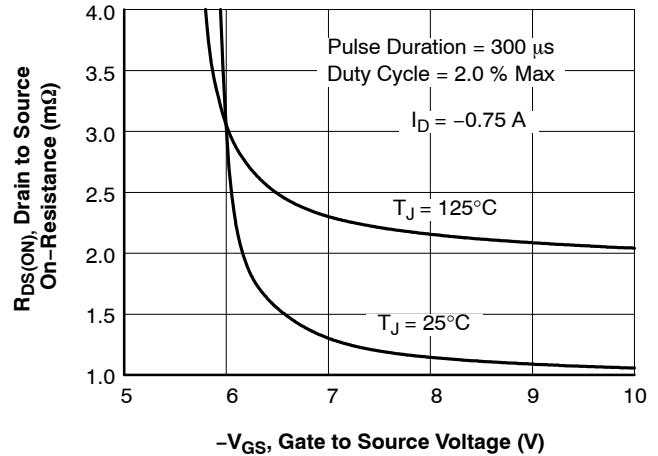


Figure 4. On-Resistance vs. Gate to Source Voltage

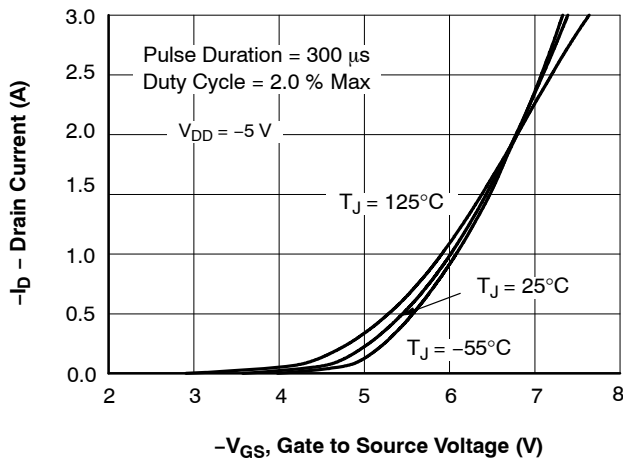


Figure 5. Transfer Characteristics

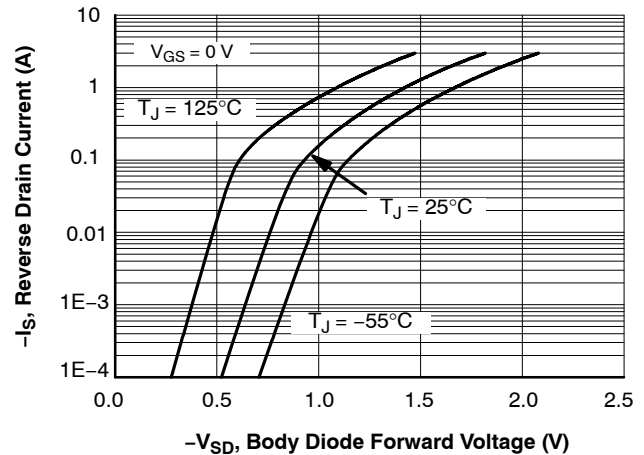


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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TYPICAL CHARACTERISTICS (continued)

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

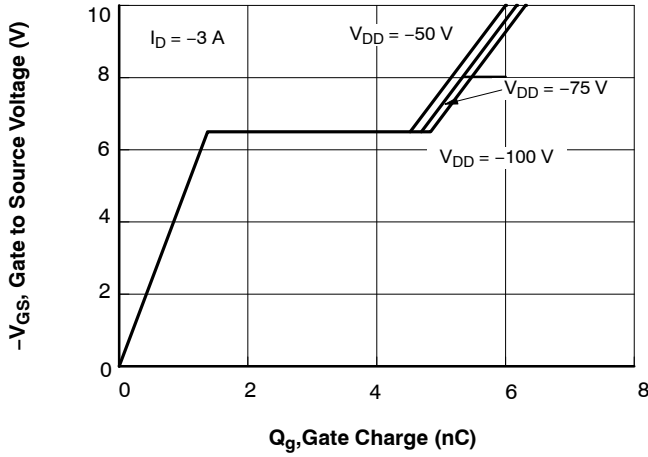


Figure 7. Gate Charge Characteristics

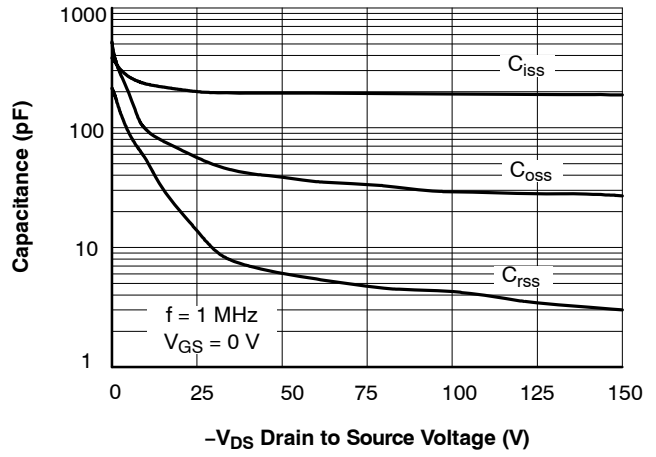


Figure 8. Capacitance vs Drain to Source Voltage

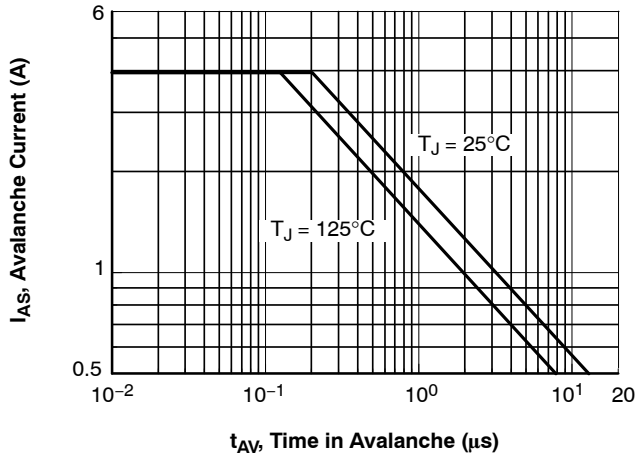


Figure 9. Unclamped Inductive Switching Capability

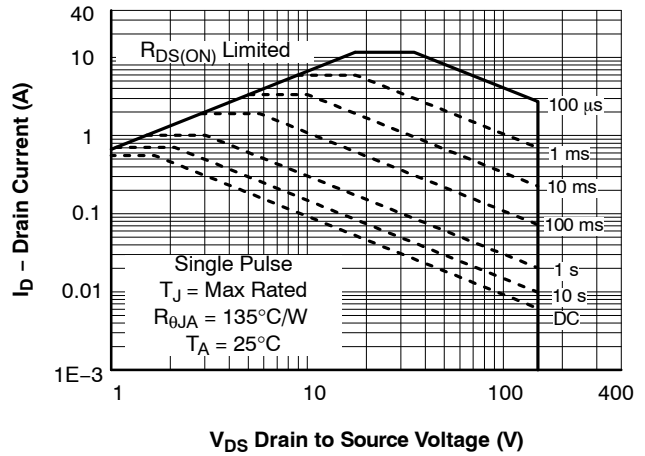


Figure 10. Forward Bias Safe Operating Area

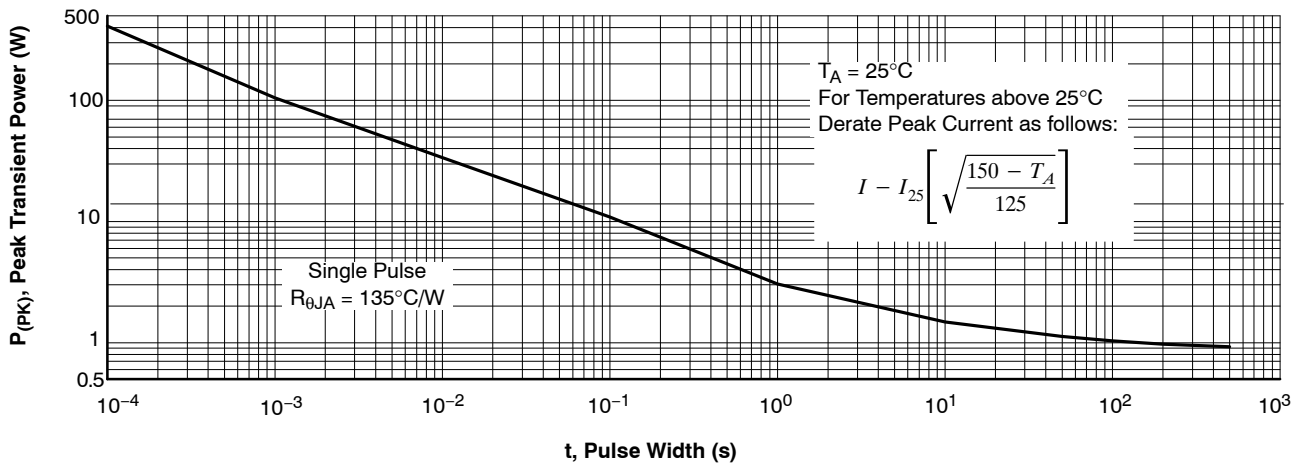


Figure 11. Single Pulse Maximum Power Dissipation

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TYPICAL CHARACTERISTICS (continued)

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

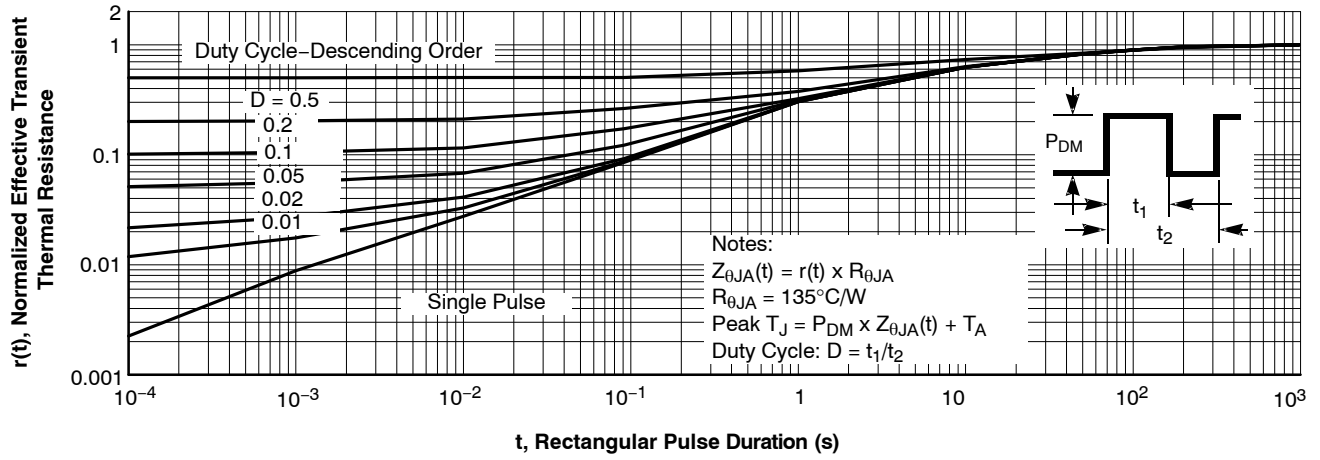


Figure 12. Transient Thermal Response Curve

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