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FDMC610P

P-Channel PowerTrench® MOSFET

-12 V, -80 A, 3.9 mΩ

Features

- Max $r_{DS(on)}$ = 3.9 mΩ at $V_{GS} = -4.5$ V, $I_D = -22$ A
- Max $r_{DS(on)}$ = 6.4 mΩ at $V_{GS} = -2.5$ V, $I_D = -16$ A
- State-of-the-art switching performance
- Lower output capacitance, gate resistance, and gate charge boost efficiency
- Shielded gate technology reduces switch node ringing and increases immunity to EMI and cross conduction
- RoHS Compliant



General Description

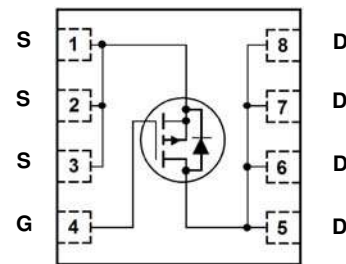
This P-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$, fast switching speed and body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

Applications

- High side switching for high end computing
- High power density DC-DC synchronous buck converter



Power 33



MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	-12	V
V_{GS}	Gate to Source Voltage	±8	V
I_D	Drain Current - Continuous $T_C = 25$ °C	-80	A
	- Continuous (Note 1a)	-22	
	- Pulsed	-200	
P_D	Power Dissipation $T_C = 25$ °C	48	W
	Power Dissipation $T_A = 25$ °C (Note 1a)	2.4	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	$T_C = 25$ °C	2.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	$T_A = 25$ °C (Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
23AB	FDMC610P	Power 33	13 "	12 mm	3000 units

Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	-12			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-13		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -9.6\text{ V}$, $V_{GS} = 0\text{ V}$			-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 8\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	-0.4	-0.7	-1	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		3.1		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -4.5\text{ V}$, $I_D = -22\text{ A}$		2.8	3.9	m Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -16\text{ A}$		3.7	6.4	
		$V_{GS} = -4.5\text{ V}$, $I_D = -22\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		3.6	5.4	
g_{FS}	Forward Transconductance	$V_{DD} = -5\text{ V}$, $I_D = -22\text{ A}$		16		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -6\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		0.89	1.25	nF
C_{oss}	Output Capacitance			1620	2270	pF
C_{rss}	Reverse Transfer Capacitance			1440	2015	pF
R_g	Gate Resistance		0.1	3.6	7.2	Ω

Switching Characteristics

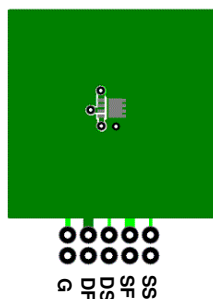
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -6\text{ V}$, $I_D = -22\text{ A}$, $V_{GS} = -4.5\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		24	39	ns
t_r	Rise Time			37	60	ns
$t_{d(off)}$	Turn-Off Delay Time			193	309	ns
t_f	Fall Time			87	139	ns
Q_g	Total Gate Charge			71	99	nC
Q_{gs}	Gate to Source Charge	$V_{DD} = -6\text{ V}$, $I_D = -22\text{ A}$, $V_{GS} = -4.5\text{ V}$		13		nC
Q_{gd}	Gate to Drain "Miller" Charge			14		nC

Drain-Source Diode Characteristics

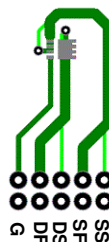
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -2\text{ A}$ (Note 2)		-0.6	-1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = -22\text{ A}$ (Note 2)		-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -22\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		36	58	ns
Q_{rr}	Reverse Recovery Charge			19	33	nC

Note:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{ in.}$ 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. $53\text{ }^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



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

2. Pulse Test: Pulse Width < $300\text{ }\mu\text{s}$, Duty cycle < 2.0%.

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

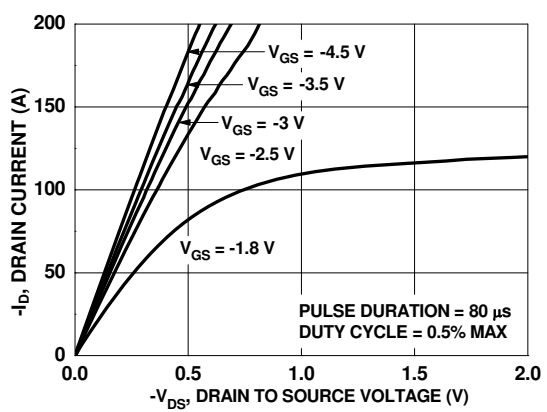


Figure 1. On Region Characteristics

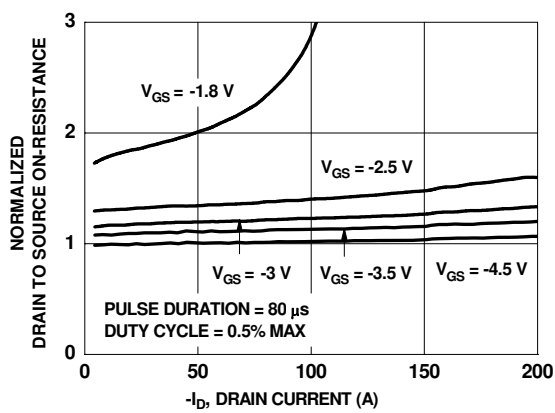


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

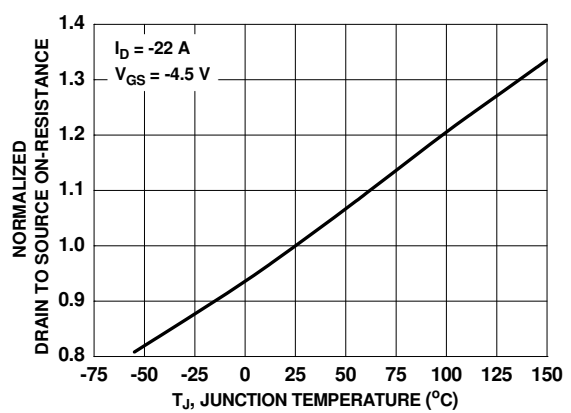


Figure 3. Normalized On Resistance vs Junction Temperature

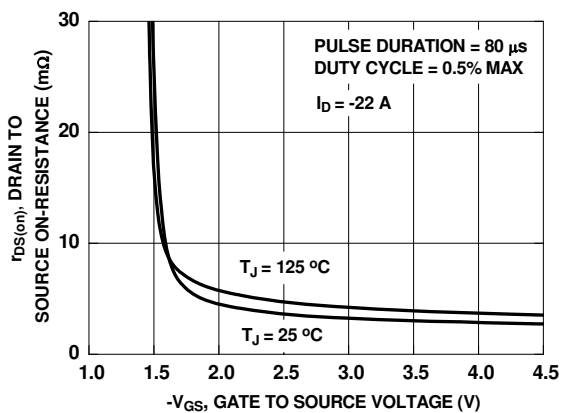


Figure 4. On-Resistance vs Gate to Source Voltage

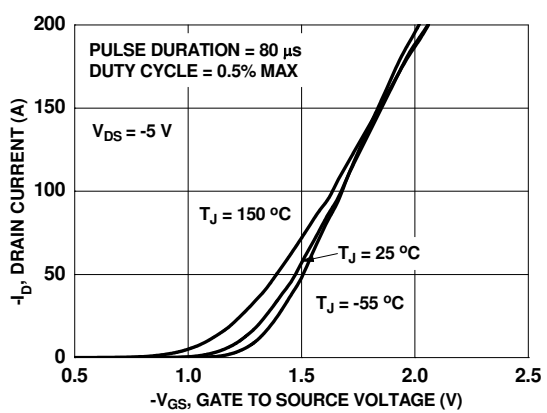


Figure 5. Transfer Characteristics

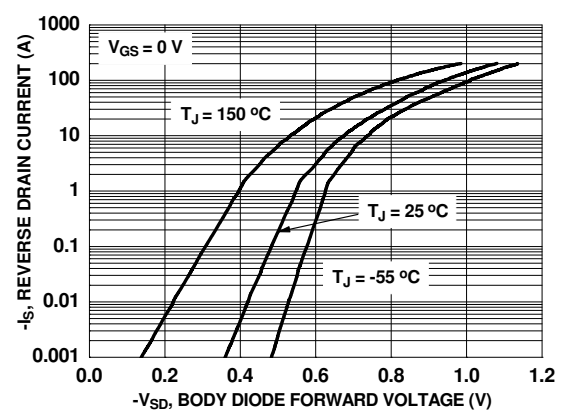


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

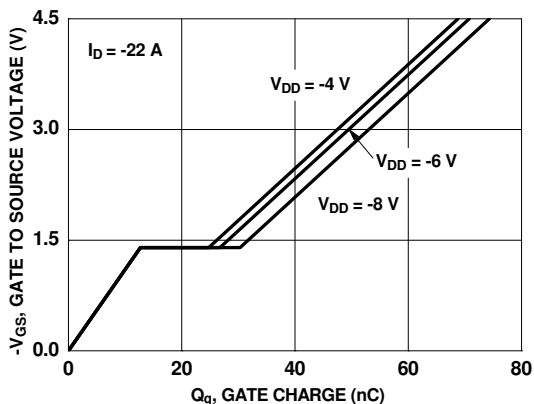


Figure 7. Gate Charge Characteristics

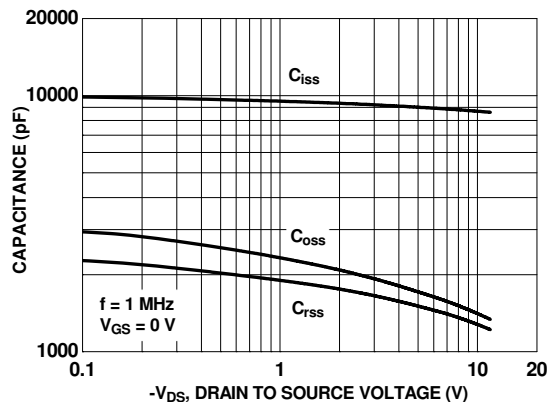


Figure 8. Capacitance vs Drain to Source Voltage

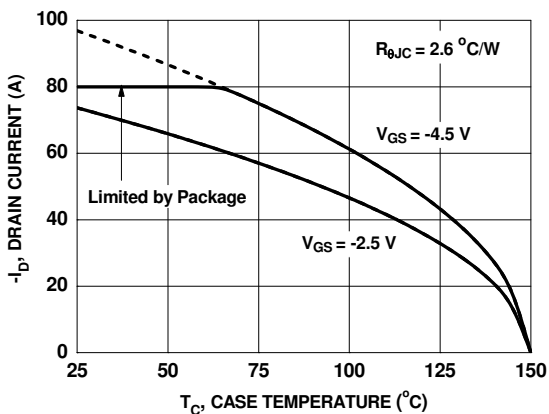


Figure 9. Maximum Continuous Drain Current vs Case Temperature

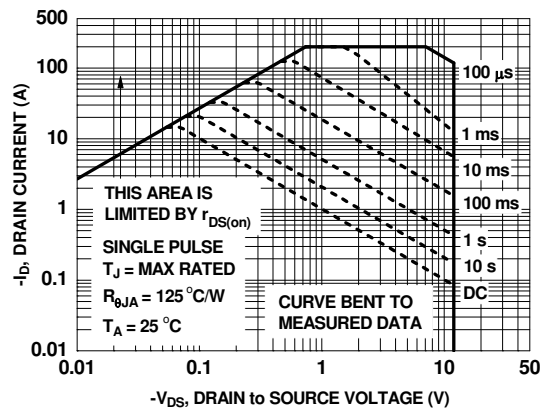


Figure 10. Forward Bias Safe Operating Area

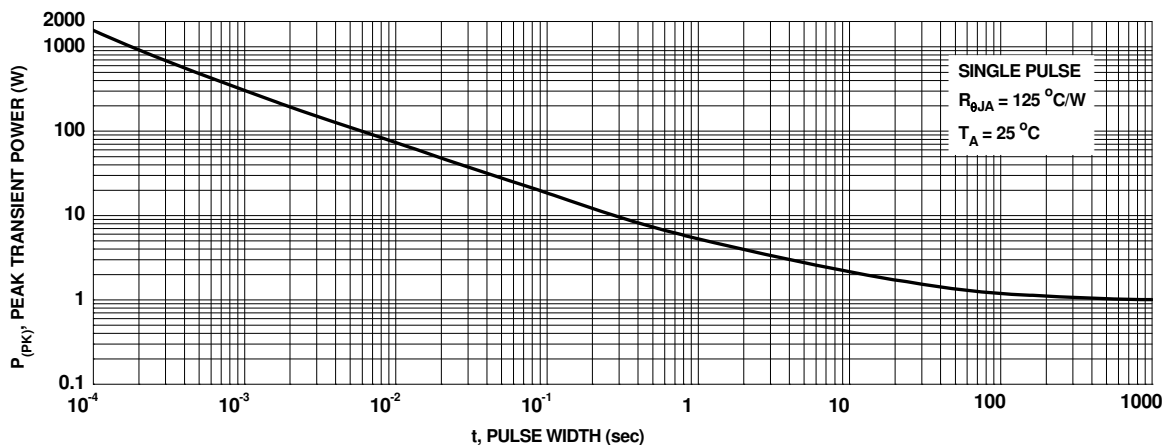


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

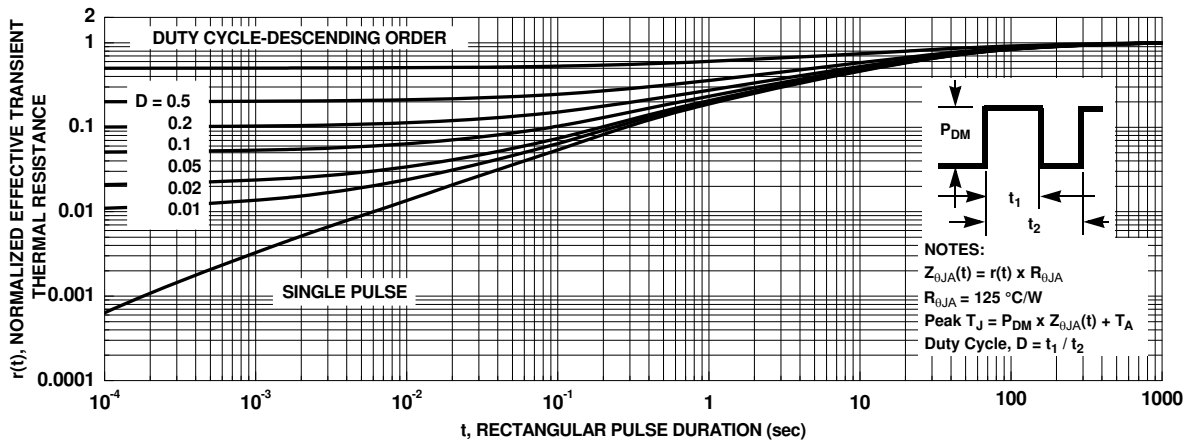




Figure 12. Junction-to-Ambient Transient Thermal Response Curve



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