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ON Semiconductor®

FDC610PZ

P-Channel PowerTrench® MOSFET

–30V, –4.9A, 42mΩ

Features

- Max $r_{DS(on)}$ = 42mΩ at $V_{GS} = -10V$, $I_D = -4.9A$
- Max $r_{DS(on)}$ = 75mΩ at $V_{GS} = -4.5V$, $I_D = -3.7A$
- Low gate charge (17nC typical).
- High performance trench technology for extremely low $r_{DS(on)}$.
- SuperSOT™ –6 package: small footprint (72% smaller than standard SO–8) low profile (1mm thick).
- RoHS Compliant

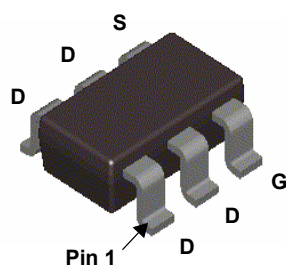


General Description

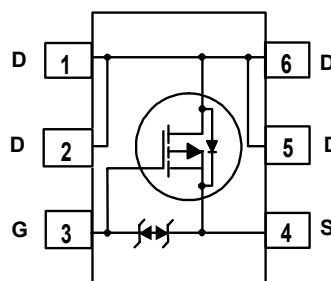
This P-Channel MOSFET is produced using ON Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance. These devices are well suited for battery power applications: load switching and power management, battery charging circuits, and DC/DC conversion.

Application

- DC - DC Conversion



SuperSOT™ –6



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	–30	V
V_{GS}	Gate to Source Voltage	±25	V
I_D	Drain Current –Continuous (Note 1a)	–4.9	A
	–Pulsed	–20	
P_D	Power Dissipation (Note 1a)	1.6	W
	Power Dissipation (Note 1b)	0.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	–55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	156	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.610Z	FDC610PZ	SSOT6	7"	8mm	3000units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		-22		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -24\text{V}$, $V_{GS} = 0\text{V}$			-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 25\text{V}$, $V_{DS} = 0\text{V}$			± 10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\mu\text{A}$	-1	-2.2	-3	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	$V_{GS} = -10\text{V}$, $I_D = -4.9\text{A}$		36	42	m Ω
		$V_{GS} = -4.5\text{V}$, $I_D = -3.7\text{A}$		58	75	
		$V_{GS} = -10\text{V}$, $I_D = -4.9\text{A}$, $T_J = 125^\circ\text{C}$		50	60	
g_{FS}	Forward Transconductance	$V_{DD} = -10\text{V}$, $I_D = -4.9\text{A}$		15		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -15\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		755	1005	pF
C_{oss}	Output Capacitance			145	195	pF
C_{rss}	Reverse Transfer Capacitance			125	190	pF
R_g	Gate Resistance	$f = 1\text{MHz}$		13		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\text{V}$, $I_D = -4.9\text{A}$ $V_{GS} = -10\text{V}$, $R_{GEN} = 6\Omega$		7	14	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			33	53	ns
t_f	Fall Time			23	37	ns
Q_g	Total Gate Charge	$V_{GS} = 0\text{V}$ to -10V	$V_{DD} = -15\text{V}$, $I_D = -4.9\text{A}$	17	24	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{V}$ to -4.5V		9	13	nC
Q_{gs}	Gate to Source Gate Charge			2.9		nC
Q_{gd}	Gate to Drain "Miller" Charge			4.3		nC

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain-Source Diode Forward Current				-1.3	A
V _{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0V, I _S = -1.3A (Note 2)		-0.8	-1.2	V
t _{rr}	Reverse Recovery Time	I _F = -4.9A, di/dt = 100A/μs		19	35	ns
Q _{rr}	Reverse Recovery Charge			9	18	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^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. 78°C/W when mounted on a 1in^2 pad of 2 oz copper.



b. 156°C/W when mounted on a minimum pad of 2 oz copper.

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

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

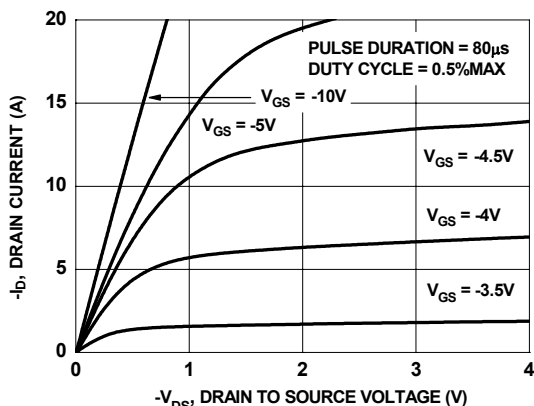


Figure 1. On-Region Characteristics

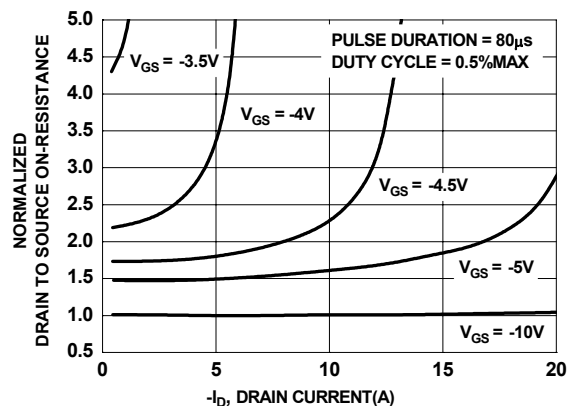


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

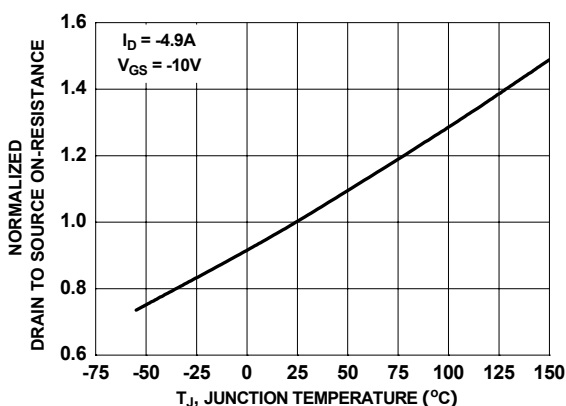


Figure 3. Normalized On-Resistance vs Junction Temperature

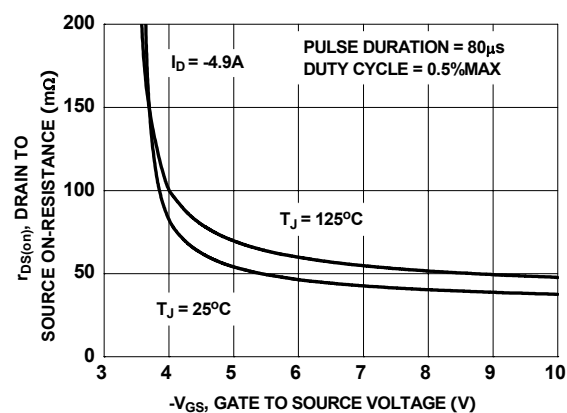


Figure 4. On-Resistance vs Gate to Source Voltage

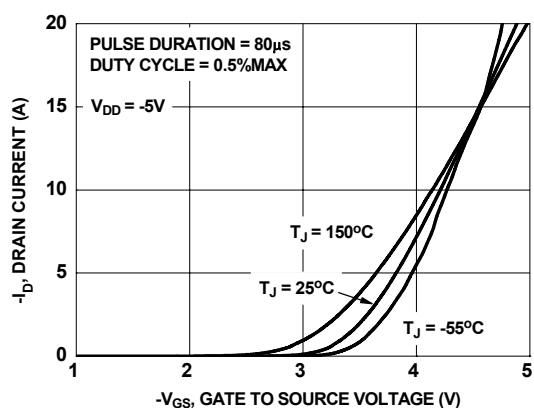


Figure 5. Transfer Characteristics

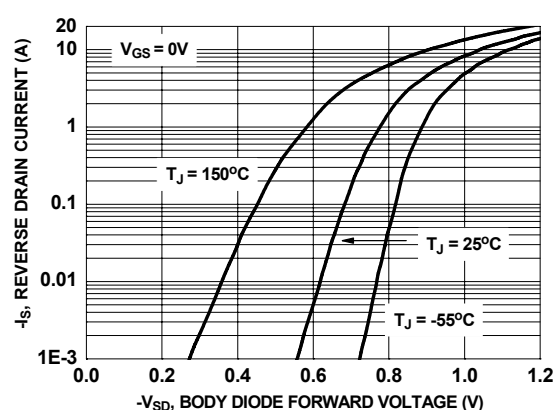


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

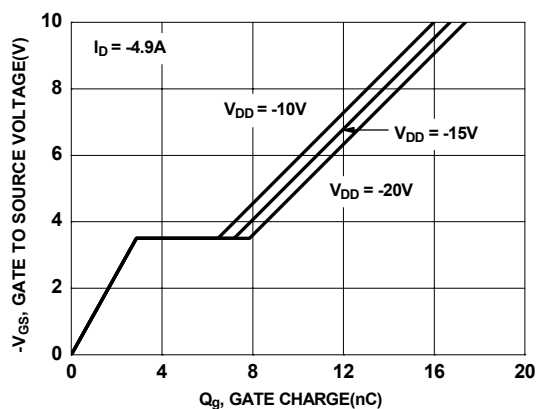


Figure 7. Gate Charge Characteristics

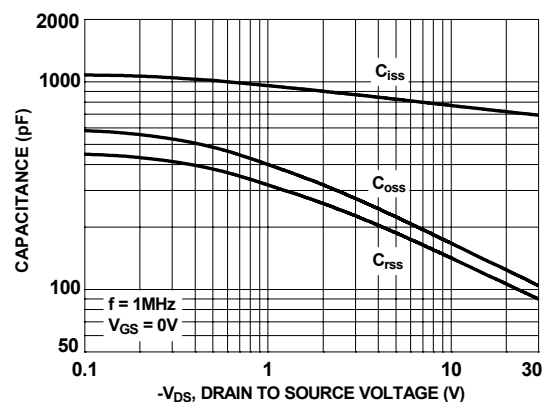


Figure 8. Capacitance vs Drain to Source Voltage

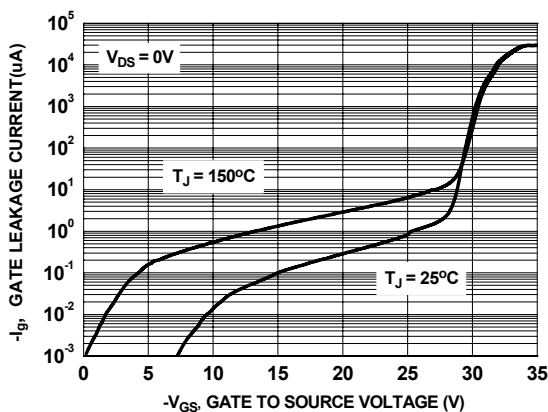


Figure 9. Gate Leakage Current vs Gate to Source Voltage

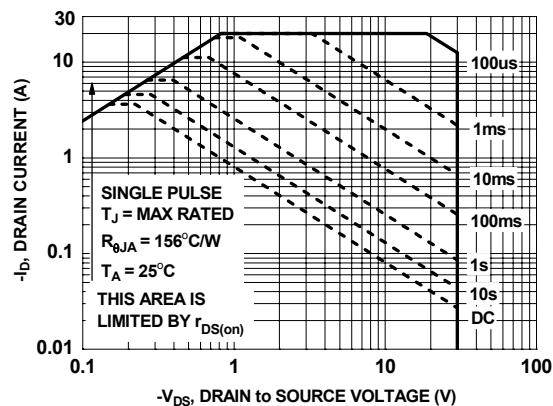


Figure 10. Forward Bias Safe Operating Area

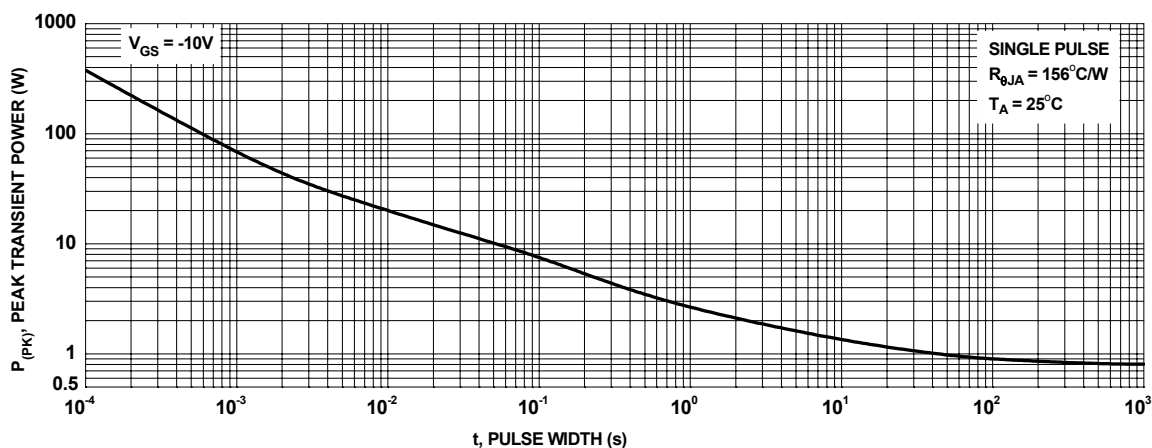


Figure 11. Single Pulse Maximum Power Dissipation

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

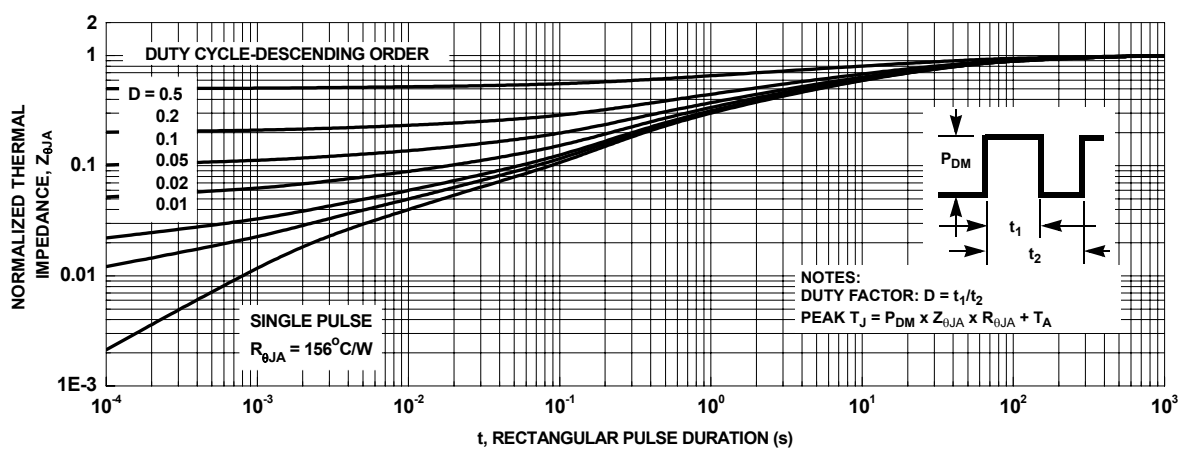


Figure 12. Transient Thermal Response Curve

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