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FDMC7680

N-Channel Power Trench[®] MOSFET

30 V, 14.8 A, 7.2 mΩ

Features

- Max $r_{DS(on)}$ = 7.2 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 14.8\text{ A}$
- Max $r_{DS(on)}$ = 9.5 mΩ at $V_{GS} = 4.5\text{ V}$, $I_D = 12.4\text{ A}$
- High performance technology for extremely low $r_{DS(on)}$
- Termination is Lead-free and RoHS Compliant



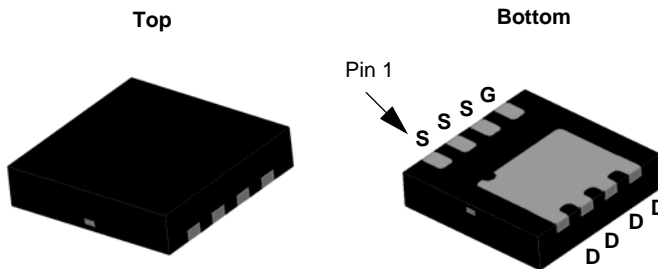
General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench[®] process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

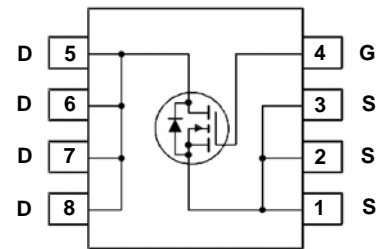
Application

- DC - DC Buck Converters
- Notebook battery power management
- Load switch in Notebook

FDMC7680 N-Channel Power Trench[®] MOSFET



MLP 3.3x3.3



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

Symbol	Parameter	Conditions	Rated Value	Units
V_{DS}	Drain to Source Voltage		30	V
V_{GS}	Gate to Source Voltage		± 20	V
I_D	Drain Current	-Continuous $T_C = 25\text{ °C}$	18	A
		-Continuous $T_A = 25\text{ °C}$ (Note 1a)	14.8	
		-Pulsed	45	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	72	mJ
P_D	Power Dissipation	$T_C = 25\text{ °C}$	31	W
	Power Dissipation	$T_A = 25\text{ °C}$ (Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		4.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC7680	FDMC7680	MLP 3.3x3.3	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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		15		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$, $V_{GS} = 0\text{ V}$ $T_J = 125\text{ }^\circ\text{C}$			1 250	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1.2	2.0	3.0	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 $25\text{ }^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 14.8\text{ A}$ $V_{GS} = 4.5\text{ V}$, $I_D = 12.4\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 14.8\text{ A}$ $T_J = 125\text{ }^\circ\text{C}$		5.8 7.3 7.4	7.2 9.5 9.2	m Ω
g_{FS}	Forward Transconductance	$V_{DD} = 5\text{ V}$, $I_D = 14.8\text{ A}$		68		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		2145	2855	pF
C_{oss}	Output Capacitance			770	1020	pF
C_{rss}	Reverse Transfer Capacitance			75	115	pF
R_g	Gate Resistance			0.5	1.6	Ω

Switching Characteristics

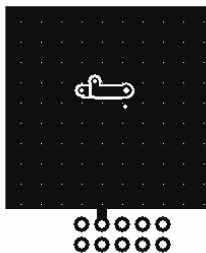
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$, $I_D = 14.8\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		12	22	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			25	40	ns
t_f	Fall Time			3	10	ns
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		30	42
	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$	$V_{DD} = 15\text{ V}$ $I_D = 14.8\text{ A}$	14	19	nC
Q_{gs}	Total Gate Charge			7		nC
Q_{gd}	Gate to Drain "Miller" Charge			4		nC

Drain-Source Diode Characteristics

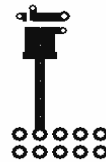
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 14.8\text{ A}$ (Note 2)		0.84	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = 1.9\text{ A}$ (Note 2)		0.73	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 14.8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		34	54	ns
Q_{rr}	Reverse Recovery Charge			15	24	nC

NOTES:

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



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

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

3: E_{AS} of 72 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 1\text{ mH}$, $I_{AS} = 12\text{ A}$, $V_{DD} = 27\text{ V}$, $V_{GS} = 10\text{ V}$.

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

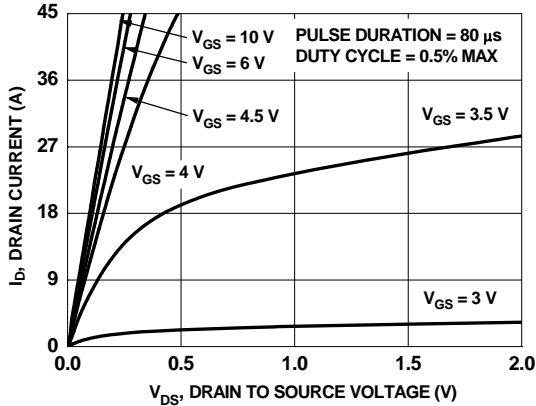


Figure 1. On-Region Characteristics

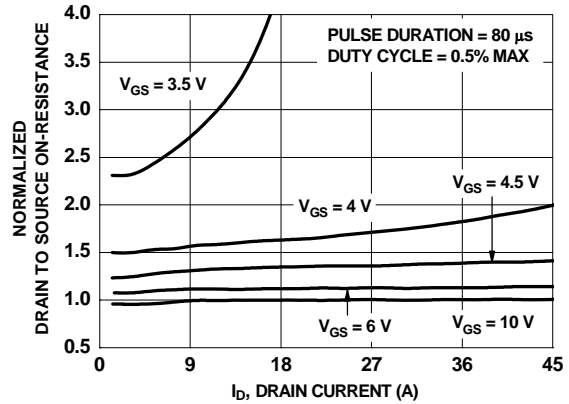


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

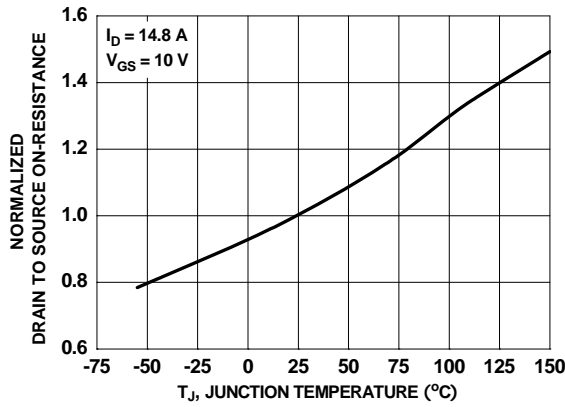


Figure 3. Normalized On-Resistance vs. Junction Temperature

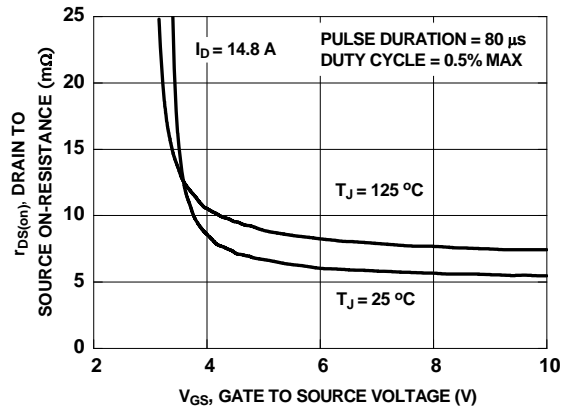


Figure 4. On-Resistance vs. Gate to Source Voltage

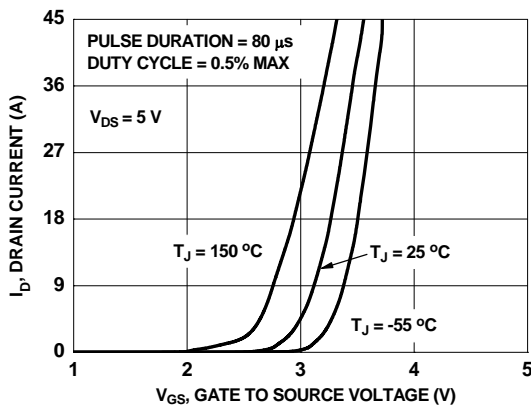


Figure 5. Transfer Characteristics

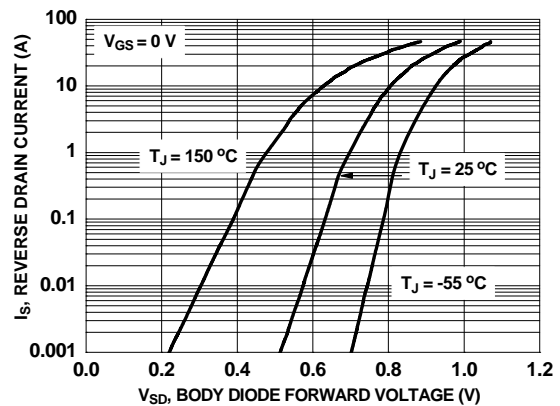


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

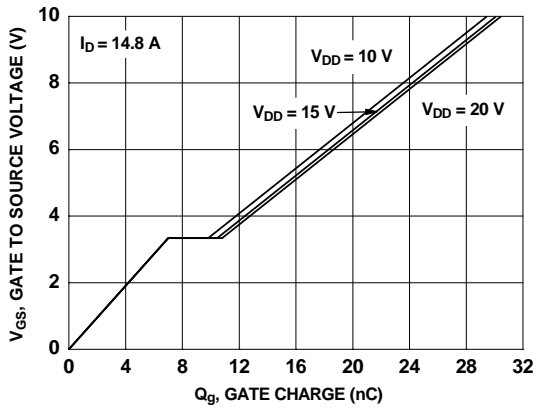


Figure 7. Gate Charge Characteristics

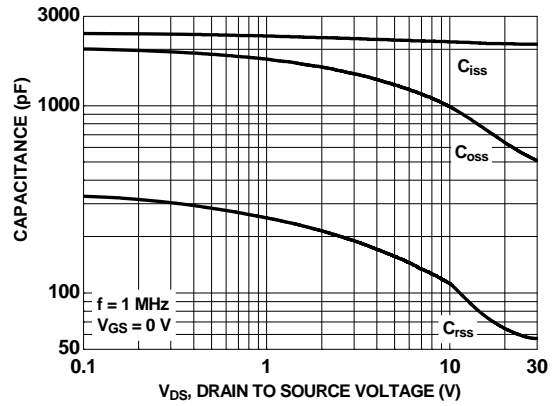


Figure 8. Capacitance vs. Drain to Source Voltage

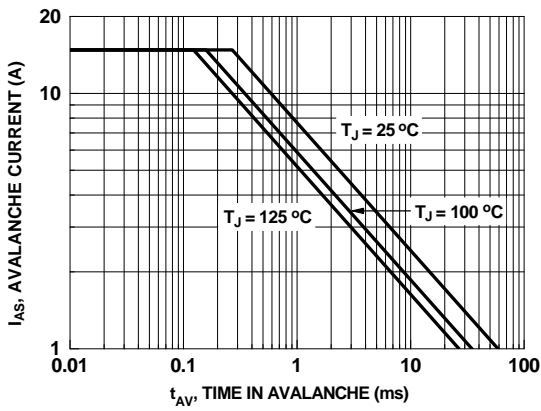


Figure 9. Unclamped Inductive Switching Capability

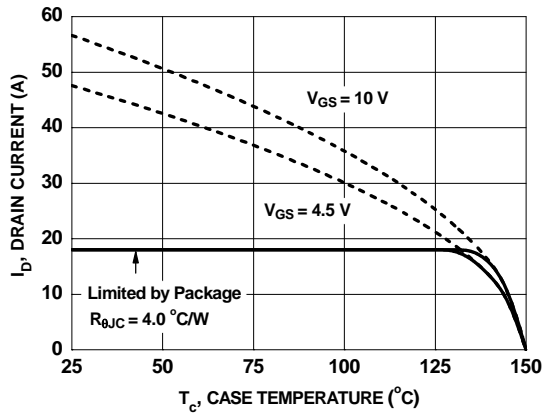


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

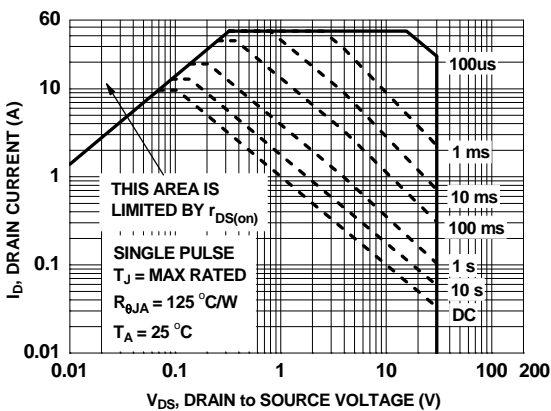


Figure 11. Forward Bias Safe Operating Area

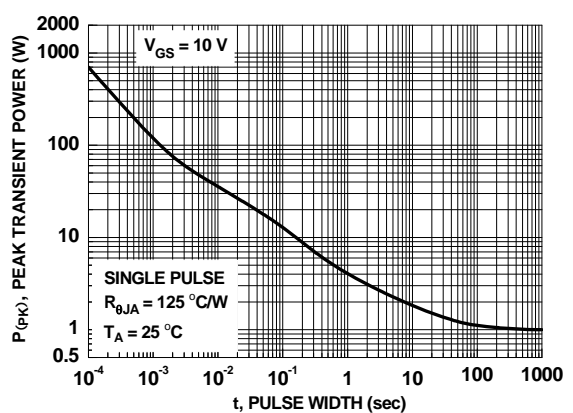


Figure 12. Single Pulse Maximum Power Dissipation

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

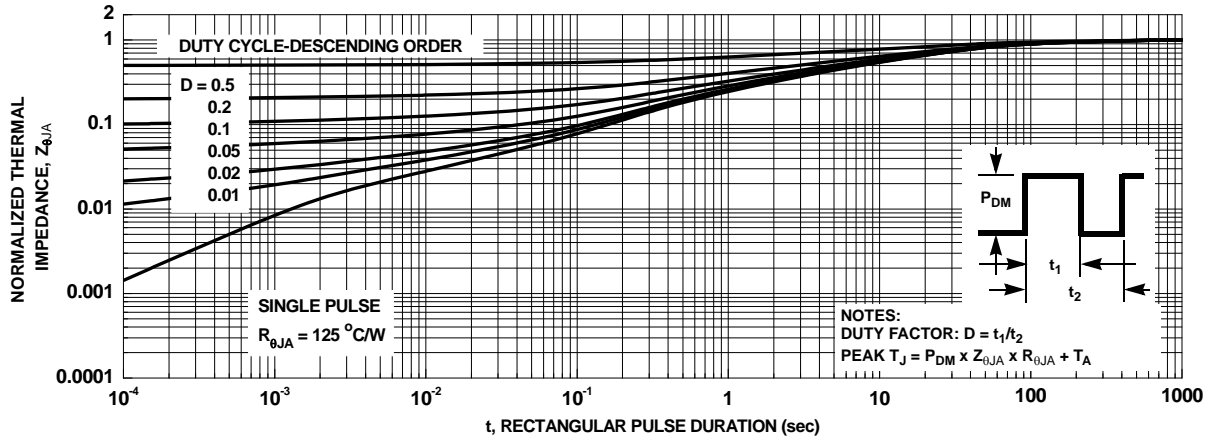
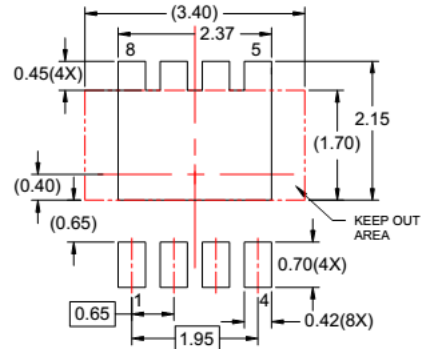
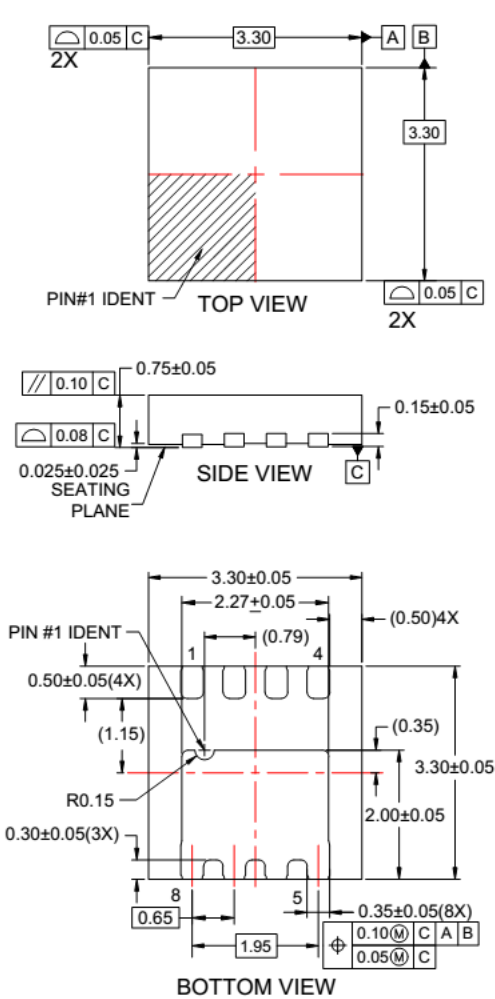


Figure 13. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



RECOMMENDED LAND PATTERN

NOTES:

- A. DOES NOT CONFORM TO JEDEC REGISTRATION MO-229
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
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