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



June 2014

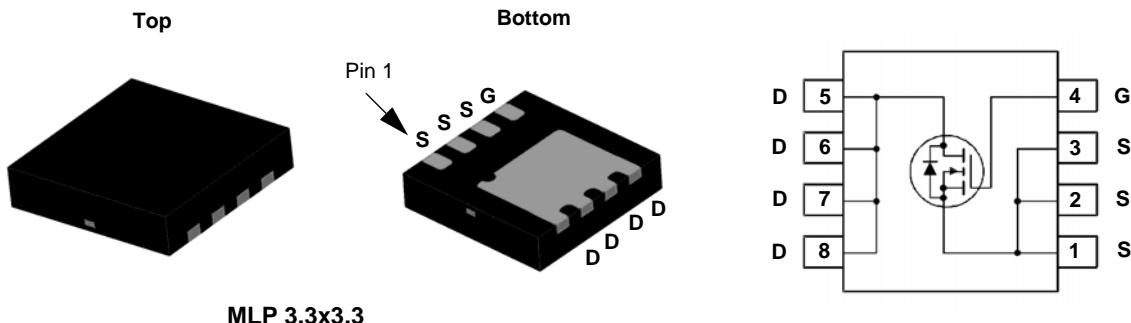


### General Description

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



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous $T_C = 25$ °C	18	A
	-Continuous $T_A = 25$ °C (Note 1a)	14.8	
	-Pulsed	45	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	mJ
$P_D$	Power Dissipation $T_C = 25$ °C	31	W
	Power Dissipation $T_A = 25$ °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 $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	30			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		15		$\text{mV}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}, V_{GS} = 0 \text{ V}$ $T_J = 125^\circ\text{C}$		1	250	$\mu\text{A}$
$I_{\text{GSS}}$	Gate to Source Leakage Current	$V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$		100		$\text{nA}$

## On Characteristics

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

## Dynamic Characteristics

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

## Switching Characteristics

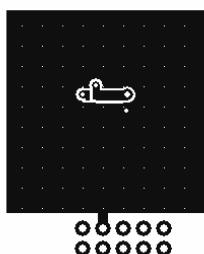
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{DD} = 15 \text{ V}, I_D = 14.8 \text{ A}, V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$		12	22	ns
$t_r$	Rise Time			4	10	ns
$t_{d(\text{off})}$	Turn-Off Delay Time			25	40	ns
$t_f$	Fall Time			3	10	ns
$Q_{g(\text{TOT})}$	Total Gate Charge	$V_{GS} = 0 \text{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

## Drain-Source Diode Characteristics

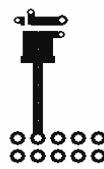
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 14.8 \text{ A}$ (Note 2)		0.84	1.2	V
		$V_{GS} = 0 \text{ V}, I_S = 1.9 \text{ A}$ (Note 2)		0.73	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 14.8 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		34	54	ns
				15	24	

### NOTES:

1:  $R_{\text{fJA}}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\text{fJC}}$  is guaranteed by design while  $R_{\text{fCA}}$  is determined by the user's board design.



a. 53 °C/W when mounted on  
a 1 in<sup>2</sup> pad of 2 oz copper



b. 125 °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 %.  
3:  $E_{AS}$  of 72 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 1 \text{ mH}$ ,  $I_{AS} = 12 \text{ A}$ ,  $V_{DD} = 27 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ .

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

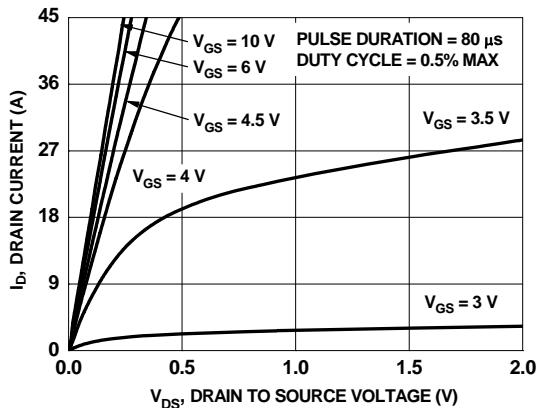


Figure 1. On-Region Characteristics

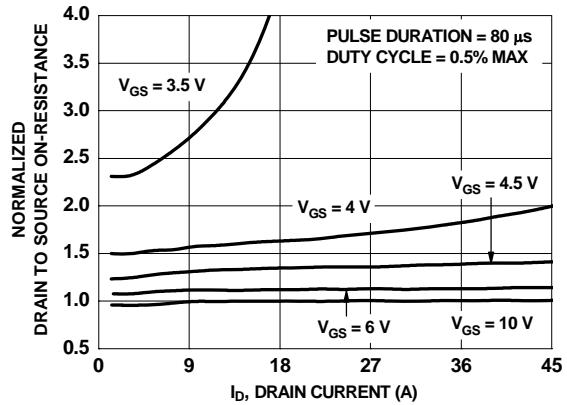


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

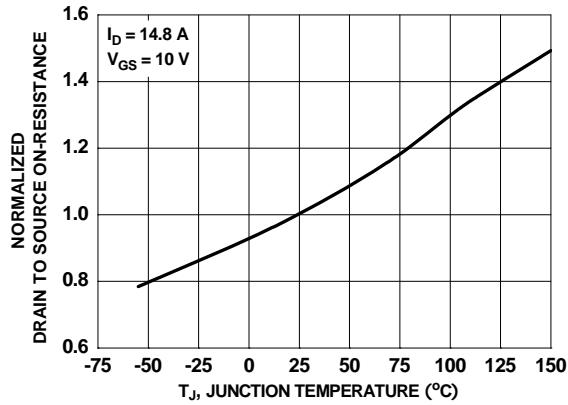


Figure 3. Normalized On-Resistance vs. Junction Temperature

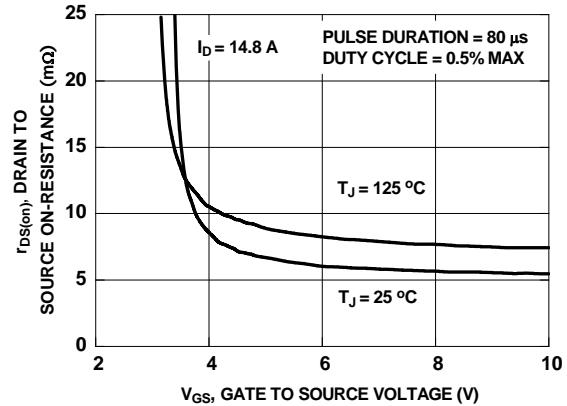


Figure 4. On-Resistance vs. Gate to Source Voltage

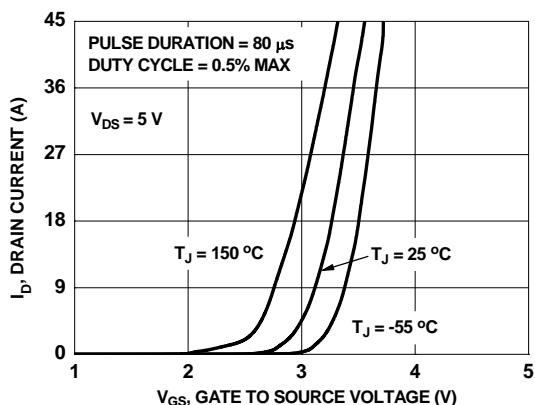


Figure 5. Transfer Characteristics

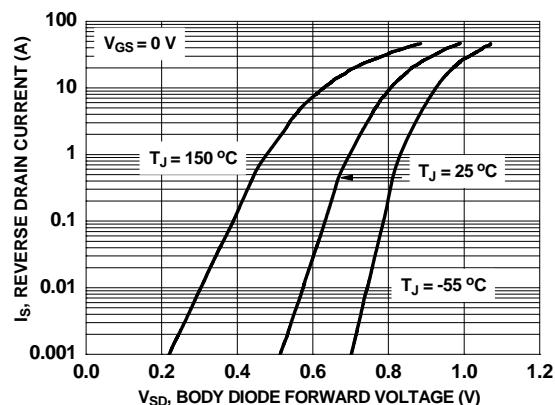
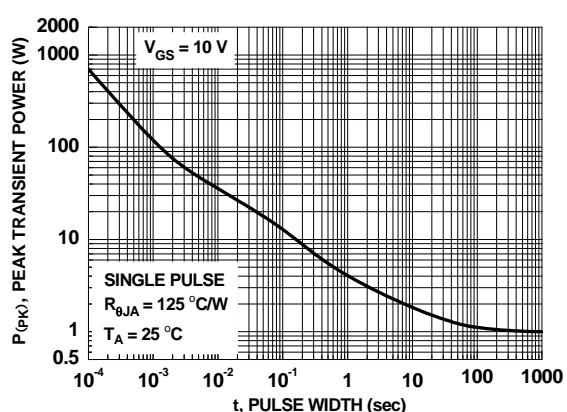
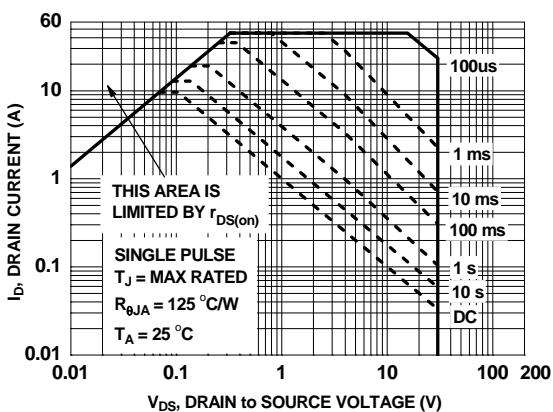
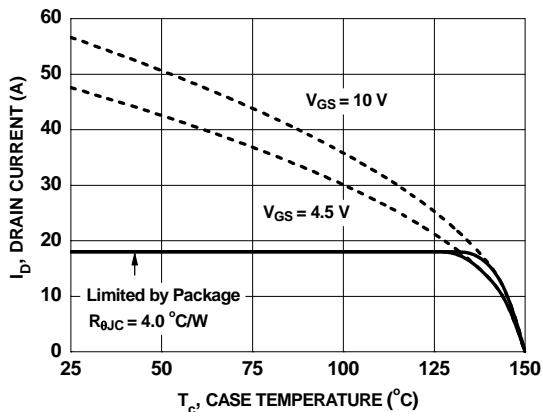
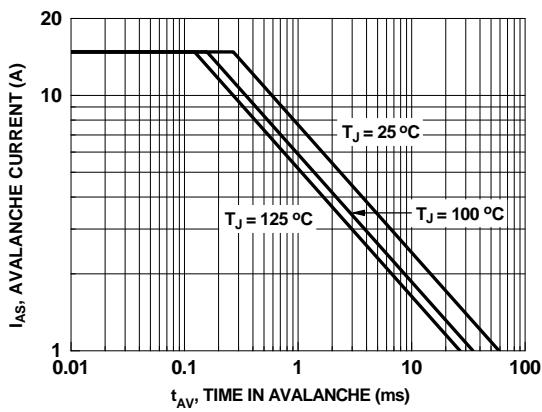
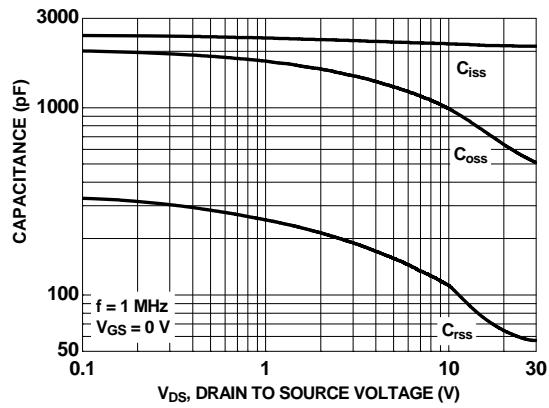
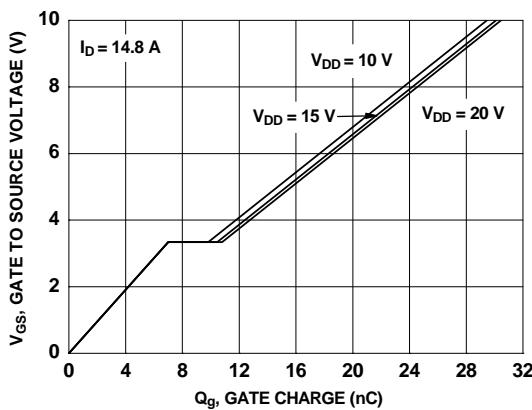


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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



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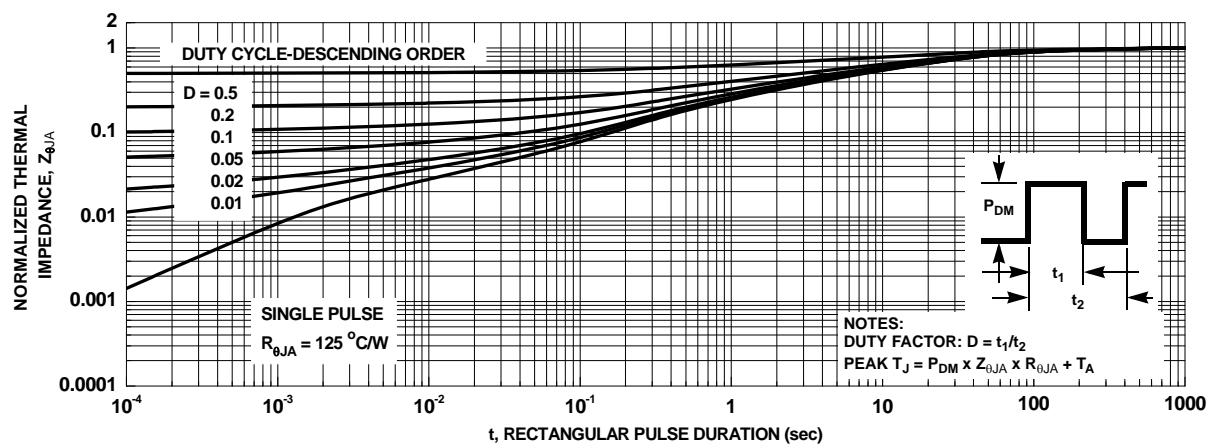
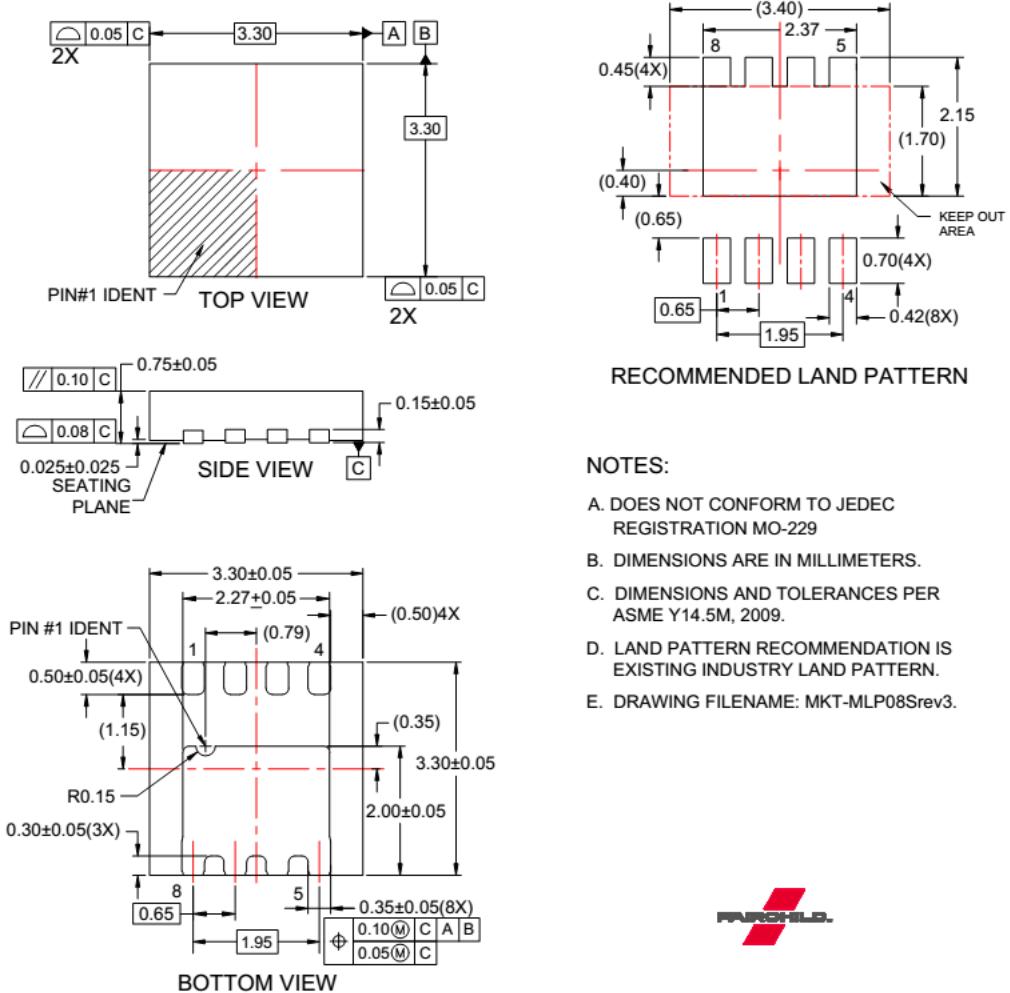


Figure 13. Transient Thermal Response Curve

## Dimensional Outline and Pad Layout



## NOTES:

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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
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(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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