

FDMA7670

Single N-Channel PowerTrench® MOSFET

30 V, 11 A, 15 mΩ

Features

- Max $r_{DS(on)}$ = 15 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 11\text{ A}$
- Max $r_{DS(on)}$ = 22 mΩ at $V_{GS} = 4.5\text{ V}$, $I_D = 9\text{ A}$
- Low Profile - 0.8 mm maximum - in the new package MicroFET 2x2 mm
- Free from halogenated compounds and antimony oxides
- RoHS compliant

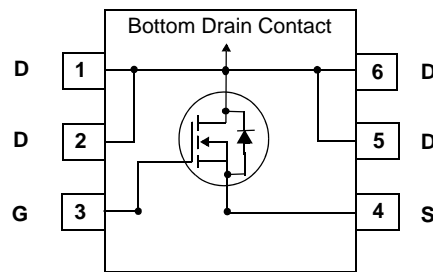
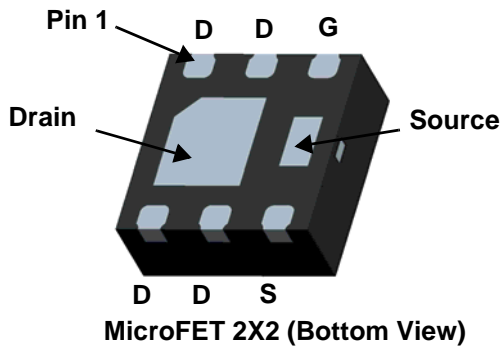


General Description

This device has been designed to provide maximum efficiency and thermal performance for synchronous buck converters. The low $r_{DS(on)}$ and gate charge provide excellent switching performance.

Application

- DC – DC Buck Converters



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

Symbol	Parameter	Rated	Units
V_{DSS}	Drain to Source Voltage	30	V
V_{GSS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous $T_A = 25\text{ °C}$ (Note 1a)	11	A
	-Pulsed	24	
P_D	Power Dissipation $T_A = 25\text{ °C}$ (Note 1a)	2.4	W
	Power Dissipation $T_A = 25\text{ °C}$ (Note 1b)	0.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	6.9	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	52	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	145	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
670	FDMA7670	MicroFET 2x2	7"	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	$V_{DS} = 24\text{ V}$, $V_{GS} = 0\text{ V}$			1	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	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1.0	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	$V_{GS} = 10\text{ V}$, $I_D = 11\text{ A}$		10	15	m Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 9\text{ A}$		14	22	
		$V_{GS} = 10\text{ V}$, $I_D = 11\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		14	21	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 11\text{ A}$		36		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$ $f = 1.0\text{ MHz}$		1020	1360	pF
C_{oss}	Output Capacitance			315	415	pF
C_{rss}	Reverse Transfer Capacitance			35	55	pF
R_g	Gate Resistance			1.7		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$, $I_D = 11\text{ A}$ $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		8	15	ns
t_r	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	34	ns
t_f	Fall Time			3	10	ns
Q_g	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 15\text{ V}$, $I_D = 11\text{ A}$	16	22
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$	8		10	nC
Q_{gs}	Gate to Source Gate Charge		3.0			nC
Q_{gd}	Gate to Drain "Miller" Charge		2.2			nC

Drain-Source Diode Characteristics

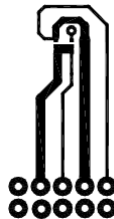
I_S	Maximum Continuous Drain-Source Diode Forward Current			2	A	
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2\text{ A}$ (Note 2)		0.8	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 11\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		21	33	ns
Q_{rr}	Reverse Recovery Charge			6	12	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. $52\text{ }^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper.



b. $145\text{ }^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper.

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

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

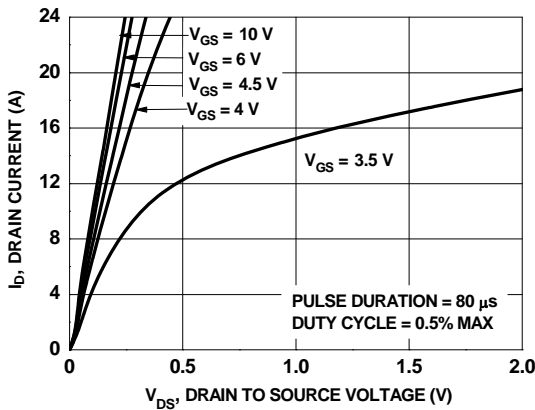


Figure 1. On-Region Characteristics

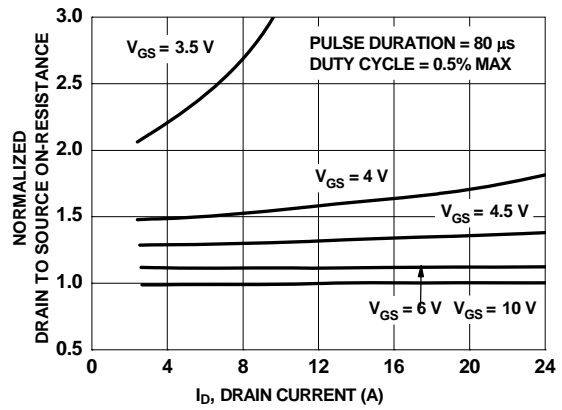


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

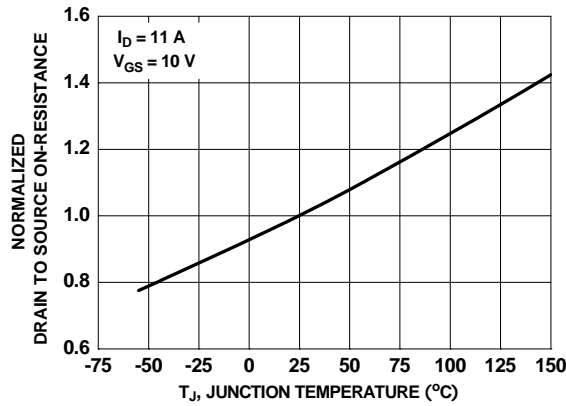


Figure 3. Normalized On-Resistance vs Junction Temperature

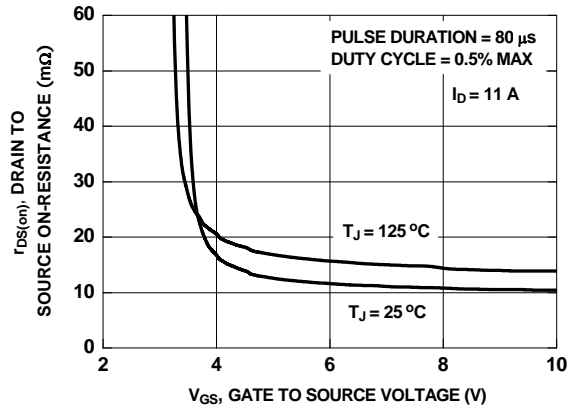


Figure 4. On-Resistance vs Gate to Source Voltage

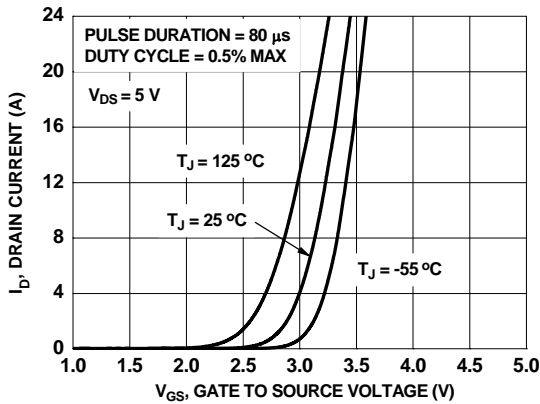


Figure 5. Transfer Characteristics

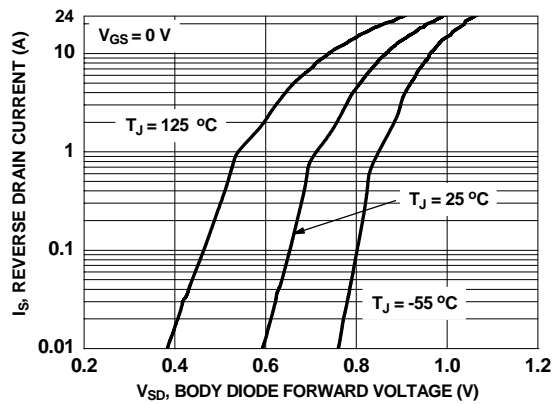


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

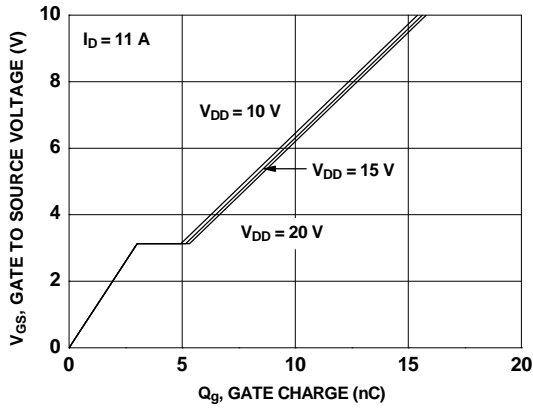


Figure 7. Gate Charge Characteristics

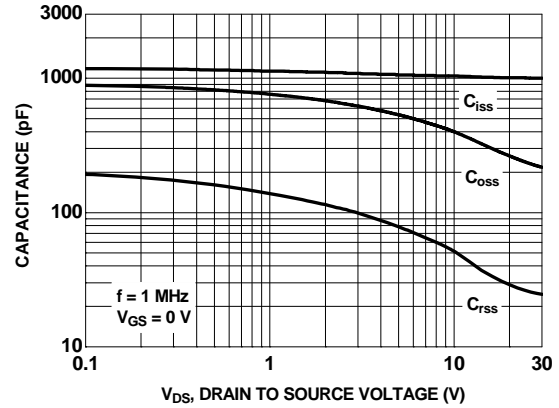


Figure 8. Capacitance vs Drain to Source Voltage

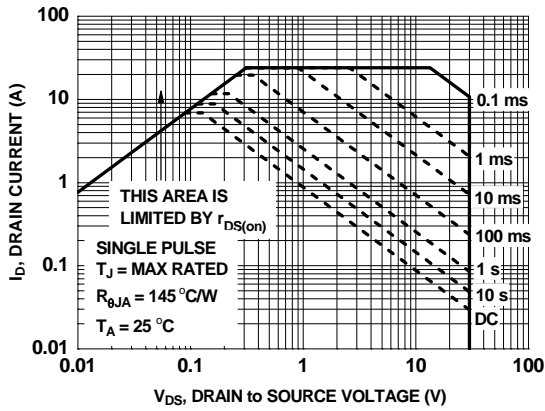


Figure 9. Forward Bias Safe Operating Area

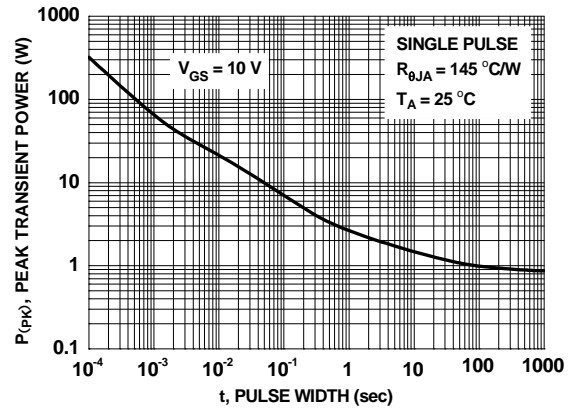


Figure 10. Single Pulse Maximum Power Dissipation

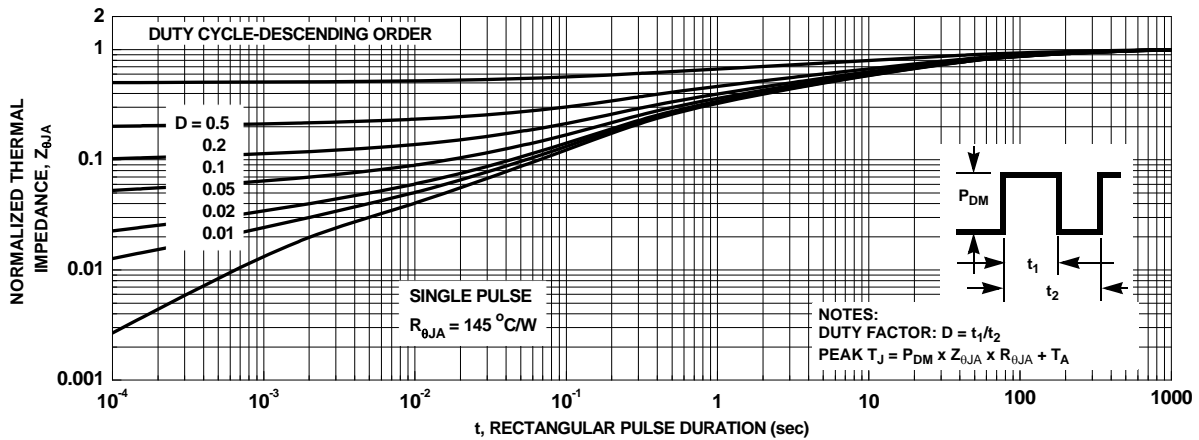
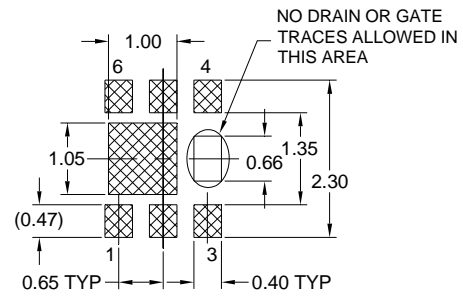
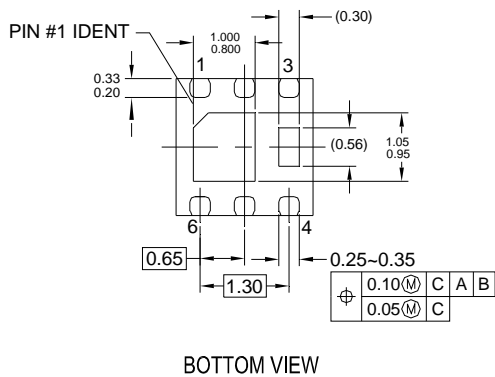
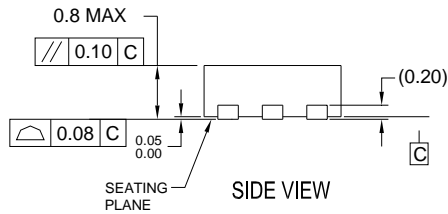
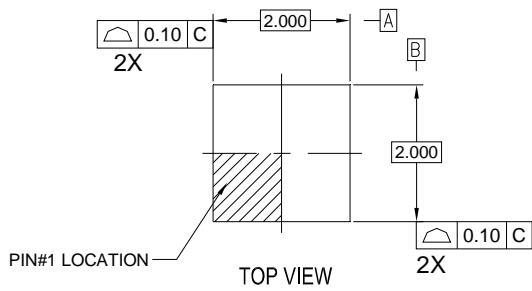
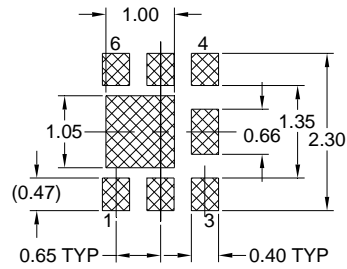


Figure 11. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



RECOMMENDED LAND PATTERN OPT 1



RECOMMENDED LAND PATTERN OPT 2





NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-229 DATED AUG/2003
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994



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