



on semiconductor* FDD3680

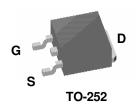
100V N-Channel PowerTrench® MOSFET

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

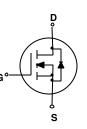
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{\text{DS}(\text{ON})}$ specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.



Features

- 25 A, 100 V. $R_{DS(ON)} = 46 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$ $R_{DS(ON)} = 51 \text{ m}\Omega @ V_{GS} = 6 \text{ V}$
- Low gate charge (38 nC typical)
- Fast switching speed
- High performance trench technology for extremely low $R_{\text{DS}(\text{ON})}$
- High power and current handling capability.



Absolute Maximum Ratings T_{A=25°C} unless otherwise noted

Symbol	Parameter	Ratings	Units
V _{DSS}	Drain-Source Voltage	100	V
V _{GSS}	Gate-Source Voltage	±20	V
D	Drain Current – Continuous (Note 1)	25	A
	Drain Current – Pulsed	100	
PD	Maximum Power Dissipation (Note 1)	68	W
	(Note 1a)	3.8	
	(Note 1b)	1.6	
T _J , T _{STG}	Operating and Storage Junction Temperature Range	–55 to +175	°C

Thermal Characteristics

R _{eJC}	Thermal Resistance, Junction-to-Case	(Note 1)	2.2	°C/W
R _{0JA}	Thermal Resistance, Junction-to-Ambient	(Note 1b)	96	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDD3680	FDD3680	13" 16mm		2500 units
		•	•	

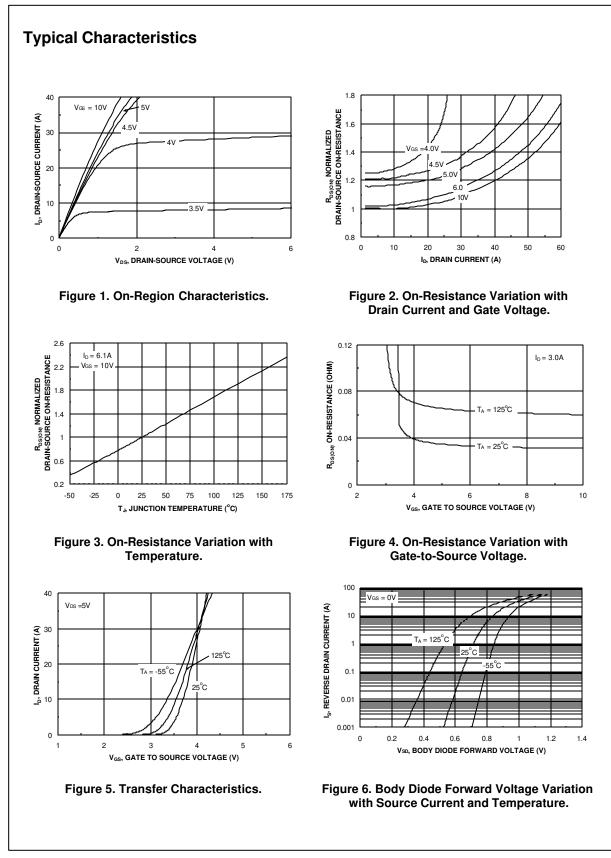
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Publication Order Number: FDD3680/D

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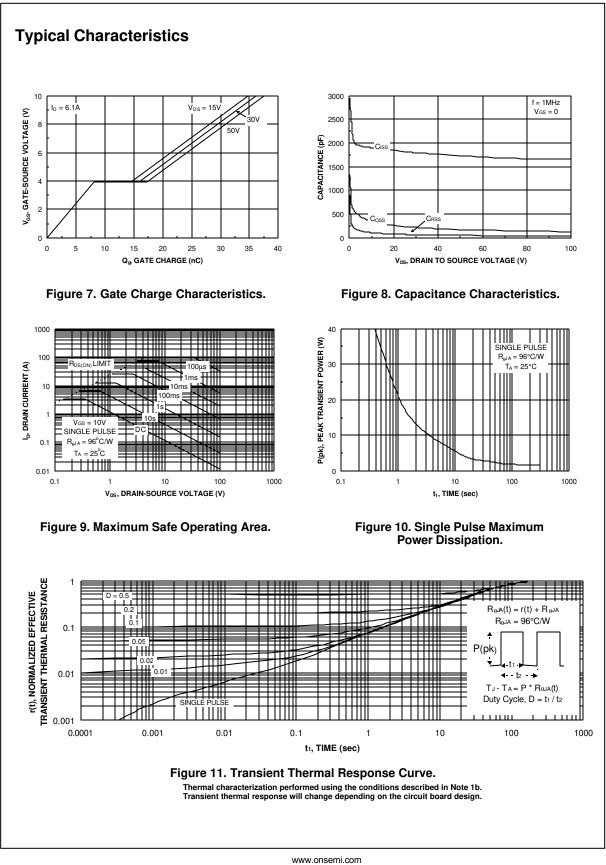
Avalanche EnergyImage: Construct of the second	Symbol	Parameter	Tes	t Conditions	Min	Тур	Мах	Units
W_{DS} Single Pulse Drain-Source Avalanche Energy Maximum Drain-Source Avalanche Current $V_{D0} = 50 \text{ V}$, $b = 6.1 \text{ A}$ 245n $Maximum Drain-Source BreakdownVoltageBreakdown Voltage TemperatureCoefficientV_{CS} = 0 \text{ V}, b = 250 \mu \text{ A}100100100ABV_{CSS}AT_{1}Breakdown Voltage TemperatureCoefficientb = 250 \mu \text{ A}, Referenced to 25^{\circ}\text{C}-101mNbssZero Gate Voltage Drain CurrentV_{CS} = 80 \text{ V}, V_{CS} = 0 \text{ V}100\mubssGate-Body Leakage, ForwardV_{CS} = 20 \text{ V}, V_{CS} = 0 \text{ V}100\mubssGate-Body Leakage, ReverseV_{CS} = -20 \text{ V}V_{CS} = 0 \text{ V}-100nV_{CS}(m)Gate Threshold VoltageV_{CS} = -20 \text{ V}V_{CS} = 0 \text{ V}-100n\Delta V_{CS}(m)Gate Threshold VoltageV_{CS} = 10 \text{ V}, b = 6.1 \text{ A}22.44\Delta V_{CS}(m)Gate Threshold VoltageV_{CS} = 10 \text{ V}, b = 6.1 \text{ A}2525n\Delta T_{O}Temperature CoefficientV_{CS} = 10 \text{ V}, b = 6.1 \text{ A}25525n\Delta T_{O}Temperature CoefficientV_{CS} = 50 \text{ V}V_{CS} = 5 \text{ V}25n\Delta T_{O}Don-State Drain CurrentV_{CS} = 50 \text{ V}V_{CS} = 0 \text{ V},1735p\Delta T_{O}Turn-On Delay TimeV_{CS} = 50 \text{ V}b = 1 \text{ A},1425n\Delta T_{O}Turn-On Rise Time$	Drain-So	burce Avalanche Ratings (No	ote 1)			•		
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$ \begin{array}{c c c c c c c } \Delta T_J & Temperature Coefficient & V_{GS} = 10 V, & b = 6.1 A \\ Pos(on) & Static Drain–Source & V_{GS} = 10 V, & b = 6.1 A, T_J = 125^{\circ}C & 32 & 46 & m \\ V_{GS} = 10 V, & b = 6.1 A, T_J = 125^{\circ}C & 34 & 51 & 0 \\ \hline \\ b(on) & On–State Drain Current & V_{GS} = 6 V, & b = 5.8 & 25 & 25 & 24 & 0 \\ \hline \\ grs & Forward Transconductance & V_{DS} = 5 V, & b = 6.1 A & 25 & 25 & 24 & 0 \\ \hline \\ grs & Input Capacitance & V_{DS} = 50 V, & V_{GS} = 0 V, & 1735 & p \\ \hline \\ \hline \\ C_{oss} & Output Capacitance & f = 1.0 \text{ MHz} & 176 & p \\ \hline \\ \hline \\ \hline \\ C_{rss} & Reverse Transfer Capacitance & V_{DD} = 50 V, & b = 1 A, & 14 & 25 & n \\ \hline \\ t_{(on)} & Turn–On Delay Time & V_{CS} = 50 V, & b = 1 A, & 14 & 25 & n \\ \hline \\ t_{(on)} & Turn–On Rise Time & V_{CS} = 10 V, & R_{GEN} = 10 \Omega & 8.5 & 17 & n \\ \hline \\ t_{(on)} & Turn–On Rise Time & V_{CS} = 50 V, & b = 6.1 A & 21 & 34 & n \\ \hline \\ q_{g} & Total Gate Charge & V_{CS} = 50 V, & b = 6.1 A, & 38 & 53 & n \\ \hline \\ q_{g} & Gate–Source Charge & V_{CS} = 50 V, & b = 6.1 A, & 38 & 53 & n \\ \hline \\ q_{gd} & Gate–Drain Charge & V_{CS} = 50 V, & b = 6.1 A, & 38 & 53 & n \\ \hline \\$			$V_{DS} = V_{GS},$	l _D = 250 μA	2	2.4	4	V
On-Resistance $V_{0S} = 10 \text{ V}, \text{ b} = 6.1 \text{ A}, \text{ T}_{J} = 125^{\circ}\text{C}$ $61 \\ 34 \\ 51 \\ 51 \\ 53 \\ 53 \\ 53 \\ 53 \\ 53 \\ 53$			I _D = 250 μA, R	eferenced to 25°C		-6.5		mV/°C
VGS GGSForward TransconductanceVGS S S10 V, VGS S VGS S10 V, S S10 V, S S10 V, S 	R _{DS(on)}							mΩ
b_{(on)}On-State Drain Current $V_{GS} = 10 \text{ V}, V_{DS} = 5 \text{ V}$ 25A g_{FS} Forward Transconductance $V_{DS} = 5 \text{ V}, b = 6.1 \text{ A}$ 253Dynamic Characteristics G_{SS} Input Capacitance $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, \\ f = 1.0 \text{ MHz}$ 1735p G_{SS} Output Capacitance $f = 1.0 \text{ MHz}$ 176p G_{SS} Reverse Transfer Capacitance 53 pSwitching Characteristics (Note 2) $t_{d(on)}$ Turn-On Delay Time $V_{DD} = 50 \text{ V}, b = 1 \text{ A}, \\ V_{GS} = 10 \text{ V}, B_{GEN} = 10 \Omega$ $8.5 \text{ 177} \text{ m}$ $t_{d(off)}$ Turn-Off Delay Time $V_{DS} = 50 \text{ V}, b = 6.1 \text{ A}, \\ V_{GS} = 10 \text{ V}, B_{GEN} = 10 \Omega$ $8.5 \text{ 177} \text{ m}$ $t_{d(off)}$ Turn-Off Fall Time $V_{DS} = 50 \text{ V}, b = 6.1 \text{ A}, \\ V_{GS} = 10 \text{ V}$ $8.1 \text{ 4} \text{ 4} \text{ 25}$ q_g Total Gate Charge $V_{DS} = 50 \text{ V}, b = 6.1 \text{ A}, \\ V_{GS} = 10 \text{ V}$ $9.2 \text{ 1} \text{ 34}$ q_g Gate-Source Charge $V_{DS} = 50 \text{ V}, b = 6.1 \text{ A}, \\ V_{GS} = 10 \text{ V}$ 9.2 m D_{qd} Gate-Drain Charge $V_{DS} = 50 \text{ V}, b = 6.1 \text{ A}, \\ V_{GS} = 10 \text{ V}$ 9.2 m d_{gd} Gate-Drain Charge $V_{DS} = 50 \text{ V}, b = 6.1 \text{ A}, \\ V_{SS} = 10 \text{ V}$ 9.2 m $Drain-Source Diode Characteristics and Maximum Ratings9.2 \text{ m}9.2 \text{ m}V_{SS}Drain-Source Diode ForwardV_{SS} = 0 \text{ V}b = 2.9 \text{ A} (Note 2)0.73 \text{ 1.3} \text{ M}$		On-Resistance		l₀ = 6.1 A, TJ = 125°C l₀ = 5.8 A			-	
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G_{ss} Input Capacitance $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, 1735$ p G_{oss} Output Capacitance $f = 1.0 \text{ MHz}$ 176 p G_{rss} Reverse Transfer Capacitance 53 pSwitching Characteristics (Note 2) 176 53 p $t_{d(on)}$ Turn-On Delay Time $V_{DD} = 50 \text{ V}, I_D = 1 \text{ A}, 14$ 25 n t_r Turn-On Rise Time $V_{GS} = 10 \text{ V}, R_{GEN} = 10 \Omega$ $8.5 \text{ 17} \text{ n}$ $t_{d(off)}$ Turn-Off Delay Time $V_{DS} = 50 \text{ V}, I_D = 6.1 \text{ A}, 21 \text{ 34} \text{ n}$ Q_g Total Gate Charge $V_{DS} = 50 \text{ V}, I_D = 6.1 \text{ A}, 38 \text{ 53} \text{ n}$ Q_{gd} Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $I_D = 6.1 \text{ A}, 9.2 \text{ n}$ Drain-Source Diode Characteristics and Maximum Ratings 9.2 n I_S Maximum Continuous Drain-Source Diode Forward 2.9 A $V_{GS} = 0 \text{ V}$ $I_S = 2.9 \text{ A}$ (Note 2) 0.73 1.3			· 👦 • • ,					
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trTurn-On Rise Time td(off)VGS = 10 V,RGEN = 10 Ω 8.517ntd(off)Turn-Off Delay Time trC6394nQgTotal Gate Charge QgsVGS = 50 V,Ib = 6.1 A, VGS = 10 V3853nQgTotal Gate Charge QgsVGS = 50 V,Ib = 6.1 A, VGS = 10 V88.1nDrain-Source Diode Characteristics and Maximum Ratings9.2nVspDrain-Source Diode ForwardVGS = 0 VIs = 2.9 A (Note 2)0.731.3			Vac = 50 V	h = 1 Δ		1/	25	ne
$t_{d(off)}$ Turn-Off Delay Time $t_{d(off)}$ Turn-Off Delay Time t_r Turn-Off Fall Time Q_g Total Gate Charge Q_{gs} Gate-Source Charge Q_{gd} Gate-Drain Charge Q_{gd} Gate-Drain Charge Q_{gd} Gate-Drain Charge P_{gs} Maximum Continuous Drain-Source Diode Forward Current Q_{gs} Drain-Source Diode Forward $V_{GS} = 0$ $k_s = 2.9$ A (Note 2) $V_{GS} = 0$ $k_s = 2.9$ A (Note 2)			$V_{GS} = 10 V$,	$R_{GEN} = 10 \Omega$			-	
Turn-Off Fall Time 21 34 n Qg Total Gate Charge V _{DS} = 50 V, Ib = 6.1 A, V _{GS} = 10 V 38 53 n Qgd Gate-Source Charge V _{SS} = 10 V 8.1 n Drain-Source Diode Characteristics and Maximum Ratings 9.2 n b Maximum Continuous Drain-Source Diode Forward Current 2.9 0 Vsp Drain-Source Diode Forward V _{GS} = 0 V b = 2.9 A (Note 2) 0.73 1.3								
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IsMaximum Continuous Drain–Source Diode Forward Current2.9 V_{sp} Drain–Source Diode Forward $V_{cs} = 0.V$ $k = 2.9 \text{ A}$ (Note 2)0.731.3	Qgd	Gale-Drain Charge				9.2		nC
Use Drain–Source Diode Forward $V_{CS} = 0.V$ $k = 2.9 \text{ A}$ (Note 2) 0.73 1.3	Drain-So				r	T		
$V c_{P} = U V$ $ c_{P} = 2.9 \text{ A} (\text{Note 2}) $ $ U/3 U/3 $	s		ce Diode Forwa	ard Current			2.9	A
Voltage	V _{SD}	Voltage	$V_{GS}=0\ V,$	$I_{S} = 2.9 \text{ A}$ (Note 2)		0.73	1.3	V
Notes: 1. R _{RA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface						I		
		■ a) R _{aJA} = 40°C/W when mounted on a 1in ² pad of 2oz copper.	■:	b) R _{euA} = 96 ^o C/W on a minimum mounting pa				

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