

ON Semiconductor®

FDWS86380-F085

N-Channel PowerTrench® MOSFET **80 V, 50 A, 13.4 m**Ω

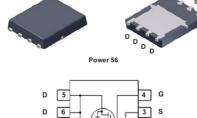
Features

- Typical $R_{DS(on)}$ = 11.3 m Ω at V_{GS} = 10V, I_D = 50 A
- Typical $Q_{g(tot)}$ = 20 nC at V_{GS} = 10V, I_D = 50 A
- UIS Capability
- RoHS Compliant
- Qualified to AEC Q101
- Wettable flanks for automatic optical inspection (AOI)

Applications

- Automotive Engine Control
- PowerTrain Management
- Solenoid and Motor Drivers
- Electronic Steering
- Integrated Starter/Alternator
- Distributed Power Architectures and VRM
- Primary Switch for 12V Systems





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MOSFET Maximum Ratings $T_J = 25$ °C unless otherwise noted.

Symbol	Parameter	Ratings	Units	
V_{DSS}	Drain-to-Source Voltage		80	V
V_{GS}	Gate-to-Source Voltage	±20	V	
1	Drain Current - Continuous (V _{GS} =10) (Note 1)	$T_C = 25^{\circ}C$	50	А
'D	Pulsed Drain Current	T _C = 25°C	See Figure 4	_ A
E _{AS}	Single Pulse Avalanche Energy	(Note 2)	16	mJ
D	Power Dissipation		75	W
P_{D}	Derate Above 25°C		0.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to + 175	°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case		2	°C/W
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient	(Note 3)	50	°C/W

Notes:

- Current is limited by bondwire configuration.
 Starting T_J = 25°C, L = 20uH, I_{AS} = 40A, V_{DD} = 80V during inductor charging and V_{DD} = 0V during time in avalanche.
 R_{θJA} 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 of the drain pins. R_{θJC} is guaranteed by design, while R_{θJA}is determined by the board design. The maximum rating presented here is based on mounting on a 1 in² pad of 2oz copper.

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDWS86380	FDWS86380-F085	Power56	13"	12mm	3000units

Units

Max.

Electrical Characteristics $T_J = 25$ °C unless otherwise noted.

Parameter

Off Characteristics								
B _{VDSS}	Drain-to-Source Breakdown Voltage	$I_D = 250 \mu A$	V _{GS} = 0V	80	-	-	V	
	Drain-to-Source Leakage Current	V _{DS} =80V,	$T_{\rm J} = 25^{\rm o}{\rm C}$	-	-	1	μА	
DSS		$V_{GS} = 0V$	$T_J = 175^{\circ}C \text{ (Note 4)}$	-	-	1	mA	
I_{GSS}	Gate-to-Source Leakage Current	V _{GS} = ±20V		-	-	±100	nA	

Test Conditions

Min.

Тур.

On Characteristics

Symbol

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$		2.0	3.0	4.0	V
R _{DS(on)}	Drain to Source On Resistance	$I_{D} = 50A,$	$T_{\rm J} = 25^{\rm o}{\rm C}$	-	11.3	13.4	mΩ
		V _{GS} = 10V	$T_J = 175^{\circ}C \text{ (Note 4)}$	-	25.3	30.0	mΩ

Dynamic Characteristics

C _{iss}	Input Capacitance	10)/)/ 0)/		-	1440	-	pF
C _{oss}	Output Capacitance		V _{DS} = 40V, V _{GS} = 0V, f = 1MHz		300	-	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1101112			14	-	pF
R_g	Gate Resistance	f = 1MHz	f = 1MHz		2.0	-	Ω
$Q_{g(ToT)}$	Total Gate Charge	V _{GS} = 0 to 10V	$V_{GS} = 0 \text{ to } 10V$ $V_{DD} = 64V$ $I_{D} = 50A$		20	30	nC
$Q_{g(th)}$	Threshold Gate Charge	$V_{GS} = 0$ to 2V			2.7	-	nC
Q _{gs}	Gate-to-Source Gate Charge		_	-	8.8	-	nC
Q_{gd}	Gate-to-Drain "Miller" Charge			-	4.4	-	nC

Switching Characteristics

t _{on}	Turn-On Time		-	-	31	ns
t _{d(on)}	Turn-On Delay		-	13	-	ns
t _r	Rise Time	V _{DD} = 40V, I _D = 50A,	-	8	-	ns
t _{d(off)}	Turn-Off Delay	V_{GS} = 10V, R_{GEN} = 6Ω	-	15	-	ns
t _f	Fall Time		-	5	-	ns
t _{off}	Turn-Off Time		-	-	30	ns

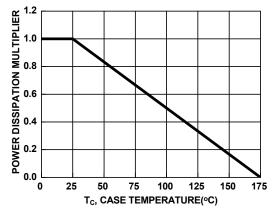
Drain-Source Diode Characteristics

V_{SD}	ISOURCE-TO-LURAIN LUICOE VOITAGE	I _{SD} =50A, V _{GS} = 0V	-	-	1.25	V
		$I_{SD} = 25A, V_{GS} = 0V$	-	-	1.2	٧
t _{rr}	Reverse-Recovery Time	$I_F = 50A$, $dI_{SD}/dt = 100A/\mu s$	-	37	55	ns
Q _{rr}	Reverse-Recovery Charge	V _{DD} = 64V	-	23	35	nC

Note:

4: The maximum value is specified by design at T_J = 175°C. Product is not tested to this condition in production.

Typical Characteristics



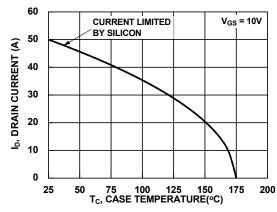


Figure 1. Normalized Power Dissipation vs. Case Temperature

Figure 2. Maximum Continuous Drain Current vs. Case Temperature

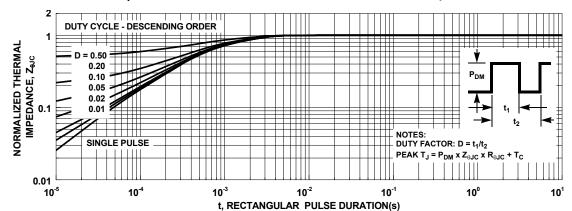


Figure 3. Normalized Maximum Transient Thermal Impedance

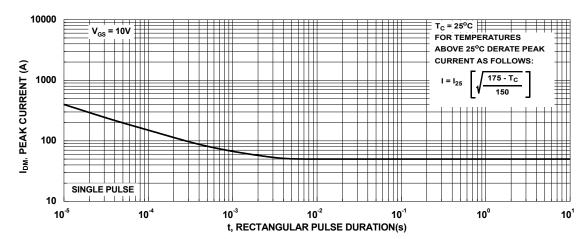


Figure 4. Peak Current Capability

Typical Characteristics

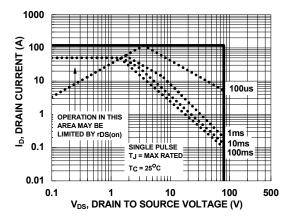
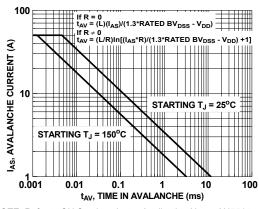


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

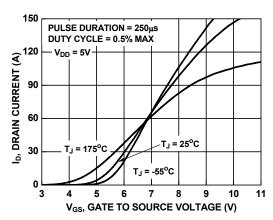


Figure 7. Transfer Characteristics

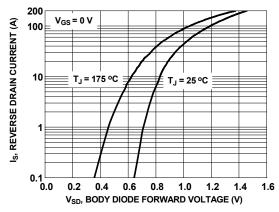


Figure 8. Forward Diode Characteristics

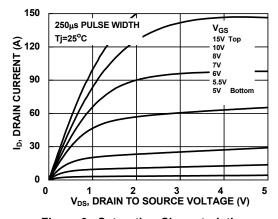


Figure 9. Saturation Characteristics

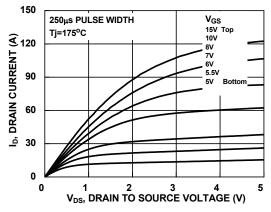


Figure 10. Saturation Characteristics

Typical Characteristics

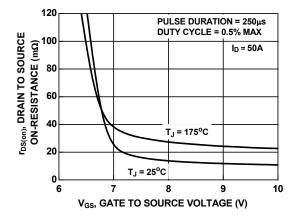


Figure 11. R_{DSON} vs. Gate Voltage

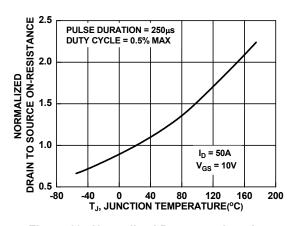


Figure 12. Normalized R_{DSON} vs. Junction Temperature

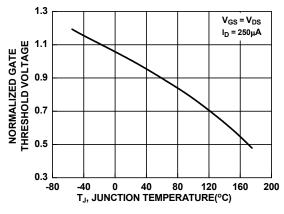


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

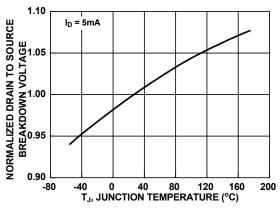


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

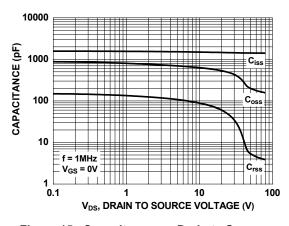


Figure 15. Capacitance vs. Drain to Source Voltage

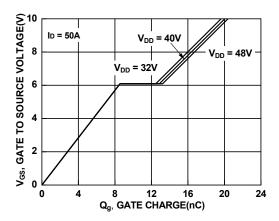


Figure 16. Gate Charge vs. Gate to Source Voltage

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