FDMS86300DC

POWERTRENCH® MOSFET, N-Channel, DUAL COOL® 56

80 V, 110 A, 3.1 mΩ

General Description

This N−Channel MOSFET is produced using Fairchild Semiconductor's advanced POWERTRENCH® process that incorporates Shielded Gate technology. Advancements in both silicon and DUAL COOL® package technologies have been combined to offer the lowest $r_{DS(on)}$ while maintaining excellent switching performance by extremely low Junction−to−Ambient thermal resistance.

Features

- DUAL COOL Top Side Cooling PQFN package
- Max $r_{DS(on)}$ = 3.1 mΩ at V_{GS} = 10 V, I_D = 24 A
- Max $r_{DS(on)}$ = 4.0 mΩ at V_{GS} = 8 V, I_D = 21 A
- High performance technology for extremely low $r_{DS(on)}$
- 100% UIL Tested
- RoHS Compliant

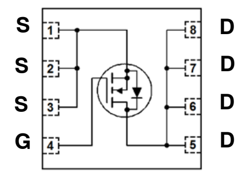
Typical Applications

- Synchronous Rectifier for DC/DC Converters
- Telecom Secondary Side Rectification
- High End Server/Workstation Vcore Low Side

ON Semiconductor®

www.onsemi.com

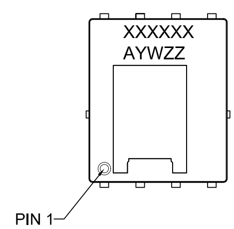
ELECTRICAL CONNECTION



N-Channel MOSFET

DFN8 5.1x6.15
(Dual Cool 56)
CASE 506EG

MARKING DIAGRAM



XXXXXX	= Device Code
A	= Assy Location
Y	= Year Code
WW	= Work Week Code
ZZ	= Assy Lot Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

May, 2019 − Rev. 2

Publication Order Number:
FDMS86300DC/D

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Shipping†
86300	FDMS86300DC	UDFN8	13”	12 mm	3000 Units/ Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter				Ratings	Units
V_{DS}	Drain to Source Voltage				80	V
V_{GS}	Gate to Source Voltage				±20	V
I_D	Drain Current	−Continuous	T_C = 25°C		110	A
		−Continuous	T_A = 25°C	(Note 1a)	24	
		−Pulsed		(Note 2)	260	
E_{AS}	Single Pulse Avalanche Energy			(Note 3)	240	mJ
P_D	Power Dissipation		T_C = 25°C		125	W
	Power Dissipation		T_A = 25°C	(Note 1a)	3.2	
T_J, T_{STG}	Operating and Storage Junction Temperature Range				−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C		45		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 64 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.5	3.3	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C		−11		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 24 A		2.6	3.1	mΩ
		V_{GS} = 8 V, I_D = 21 A		3.1	4.0	
		V_{GS} = 10 V, I_D = 24 A, T_J = 125°C		4.1	5.0	
g_{FS}	Forward Transconductance	V_{DD} = 10 V, I_D = 24 A		79		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 40 V, V_{GS} = 0 V, f = 1 MHz		5265	7005	pF
C_{oss}	Output Capacitance			929	1235	pF
C_{rss}	Reverse Transfer Capacitance			21	50	pF
R_G	Gate Resistance		0.1	1.2	2.6	Ω

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
SWITCHING CHARACTERISTICS						
$t_{d(ON)}$	Turn – On Delay Time	V_{DD} = 40 V, I_D = 24 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		29	47	ns
t_r	Rise Time			25	44	ns
$t_{D(OFF)}$	Turn – Off Delay Time			35	57	ns
t_f	Fall Time			9	18	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 40 V, I_D = 24 A		72	101	nC
	Total Gate Charge	V_{GS} = 0 V to 8 V		59	84	nC
Q_{gs}	Gate to Source Gate Charge			26		nC
Q_{gd}	Gate to Drain "Miller" Charge			14		nC
DRAIN–SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.7 A (Note 2)		0.72	1.2	V
		V_{GS} = 0 V, I_S = 24 A (Note 2)		0.80	1.3	
I_S	Source to Drain Diode Forward Voltage	T_C = 25°C			75	V
					150	
t_{rr}	Reverse Recovery Time	I_F = 24 A, di/dt = 100 A/μs		56	88	ns
Q_{rr}	Reverse Recovery Charge			42	67	nC

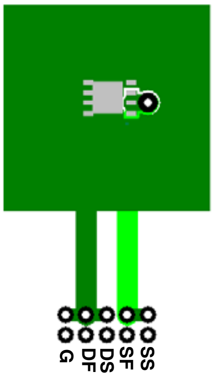
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Top Source)	2.3	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Bottom Drain)	1.0	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	38	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	81	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1c)	27	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1d)	34	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1e)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1f)	19	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1g)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1h)	61	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1i)	16	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1j)	23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1k)	11	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1l)	13	

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a FR−4 board using a specified pad of 2 oz copper as shown below. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 38°C/W when mounted on a 1 in^2 pad of 2 oz copper.

b) 81°C/W when mounted on a minimum pad of 2 oz copper.

c) Still air, 20.9×10.4×12.7 mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper
d) Still air, 20.9×10.4×12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
e) Still air, 45.2×41.4×11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in^2 pad of 2 oz copper
f) Still air, 45.2×41.4×11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, minimum pad of 2 oz copper
g) .200FPM Airflow, No Heat Sink, 1 in^2 pad of 2 oz copper
h) .200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
i) .200FPM Airflow, 20.9×10.4×12.7 mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper
j) .200FPM Airflow, 20.9×10.4×12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper
k) .200FPM Airflow, 45.2×41.4×11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in^2 pad of 2 oz copper
l) .200FPM Airflow, 45.2×41.4×11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. Starting T_J = 25°C; N−ch: L = 0.3 mH, I_{AS} = 40 A, V_{DD} = 72 V, V_{GS} = 10 V.

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

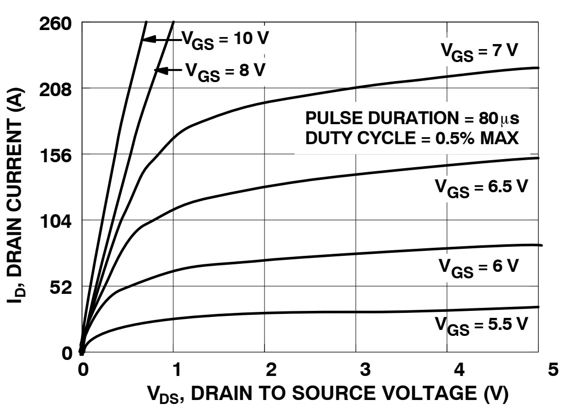


Figure 1. On Region Characteristics

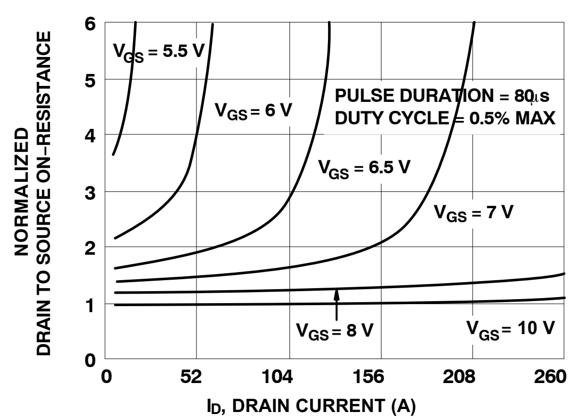


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

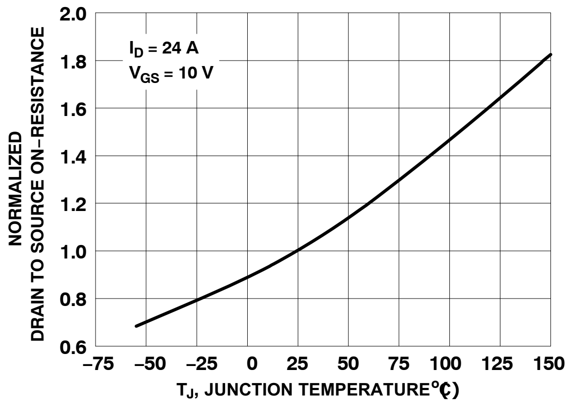


Figure 3. Normalized On Resistance vs. Junction Temperature

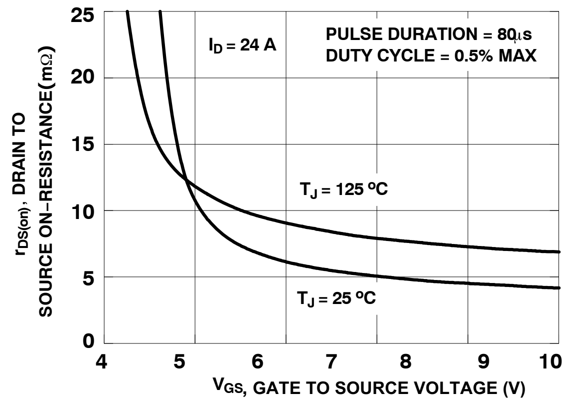


Figure 4. On-Resistance vs. Gate to Source Voltage

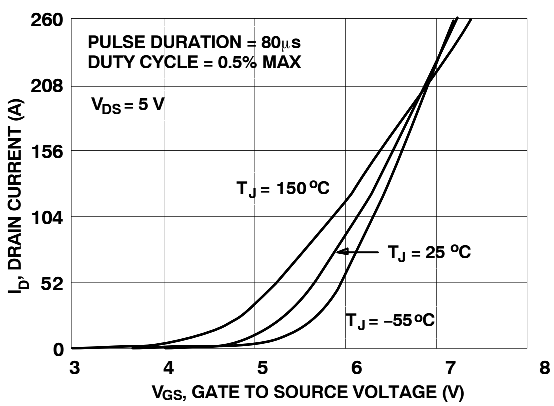


Figure 5. Transfer Characteristics

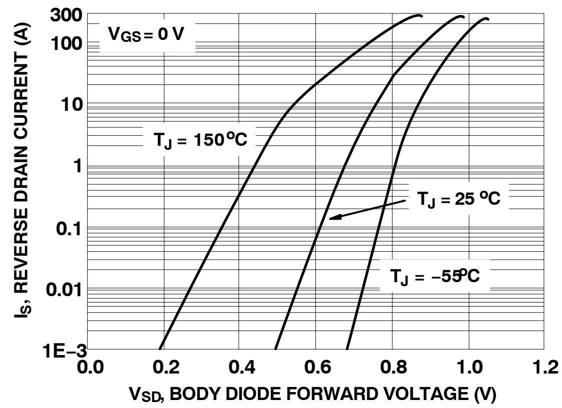


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

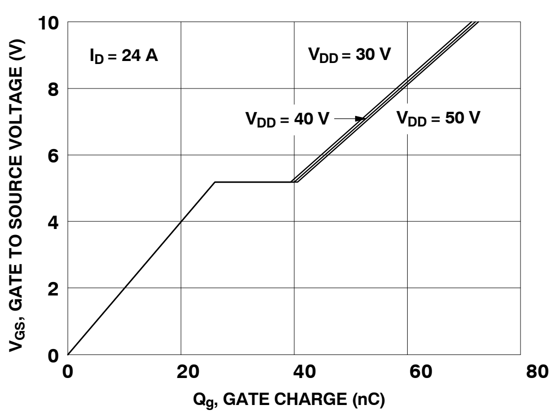


Figure 7. Gate Charge Characteristics

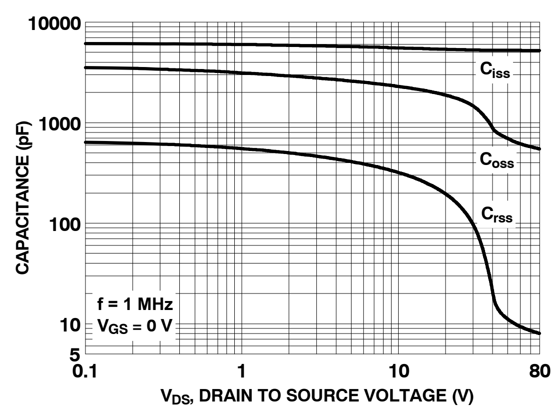


Figure 8. Capacitance vs. Drain to Source Voltage

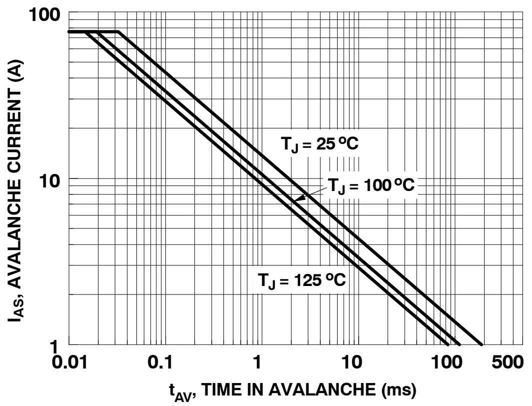


Figure 9. Unclamped Inductive Switching Capability

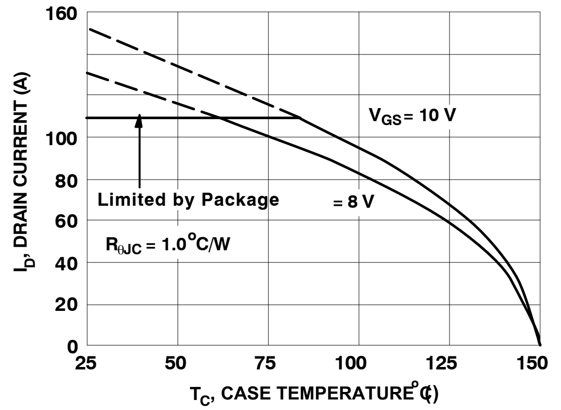


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

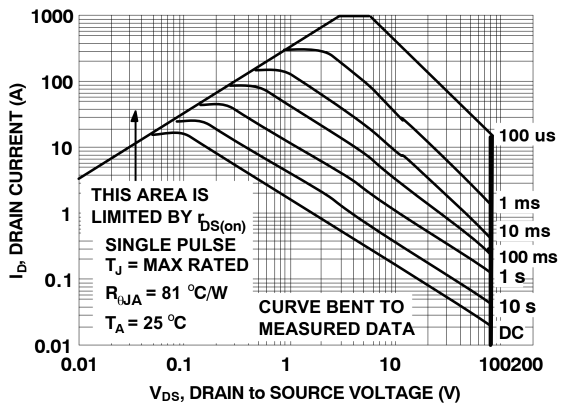


Figure 11. Forward Bias Safe Operating Area

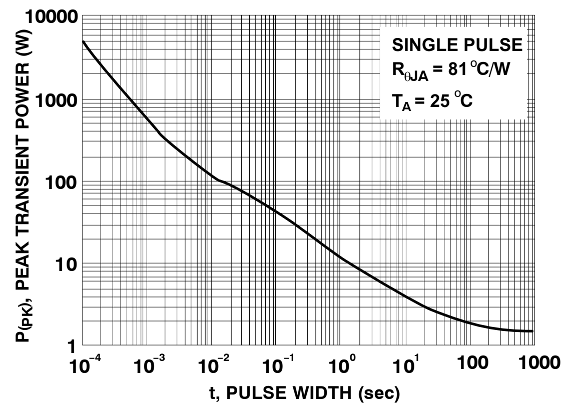


Figure 12. Single Pulse Maximum Power Dissipation

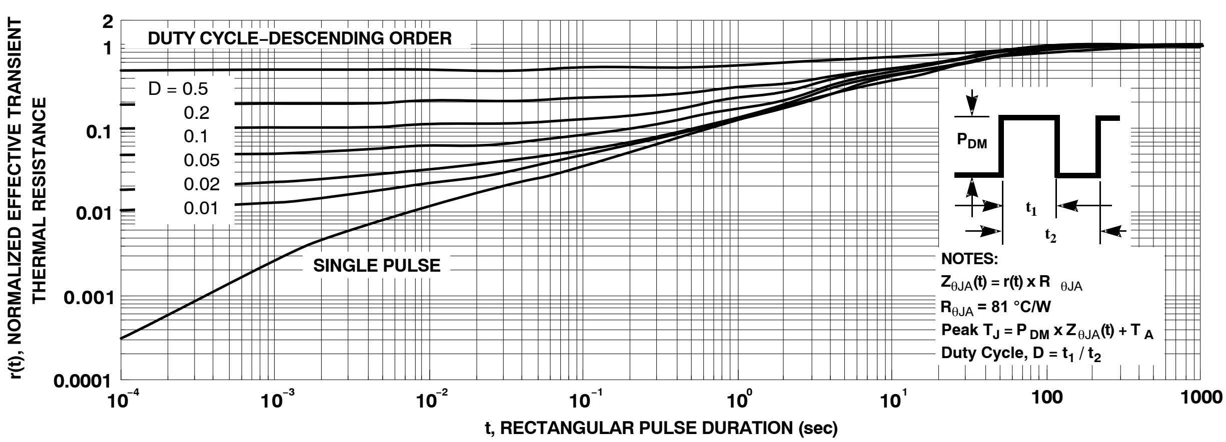


Figure 13. Junction−to−Case Transient Thermal Response Curve

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative