FAIRCHILD SEMICONDUCTOR®

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FDS6298

30V N-Channel Fast Switching PowerTrench® MOSFET

General Description

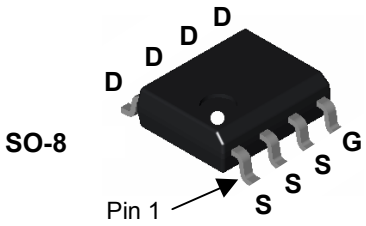
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

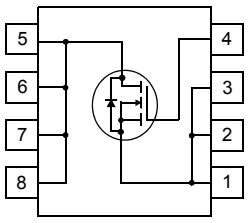
Applications

- Control Switch for DC-DC Buck converters
- Notebook Vcore
- Telecom / Networking Point of Load

Features

- 13 A, 30 V $R_{DS(ON)}$ = 9mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 12mΩ @ V_{GS} = 4.5 V
- Low gate charge (10nC @ V_{GS} = 5 V)
- Very low Miller Charge (3nC)
- Low Rg (1 Ohm)
- RoHS Compliant





Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current -Continuous	(Note 1a)	13	A
	-Pulsed		50	
P_D	Power Dissipation for Single Operation	(Note 1a)	3.0	W
	Power Dissipation for Single Operation	(Note 1b)	1.2	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	125	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	25	°C/W

Package Marking and Ordering Information

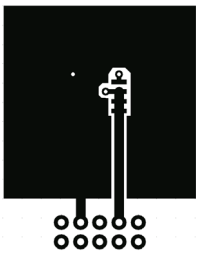
Device Marking	Device	Reel Size	Tape Width	Quantity
FDS6298	FDS6298	13inch	12mm	2500 units

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	30	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	30	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 24V	-	-	1	μA
I_{GSS}	Gate-Body Leakage,	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1	1.7	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	-5	-	mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	I_D = 13A, V_{GS} = 10V	-	7.4	9	mΩ
		I_D = 12A, V_{GS} = 4.5V	-	9.4	12	
		I_D = 13A, V_{GS} = 10V, T_J = 125°C	-	11	15	
g_{FS}	Forward Transconductance	I_D = 13A, V_{DS} = 10V	-	58	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz	-	1108	-	pF
C_{oss}	Output Capacitance		-	310	-	pF
C_{rss}	Reverse Transfer Capacitance		-	109	-	pF
R_G	Gate Resistance	V_{GS} = 15mV, f = 1MHz,	0.3	1	1.7	Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 1A V_{GS} = 10V, R_{GEN} = 6Ω	-	11	20	ns
t_r	Turn-On Rise Time		-	5	10	ns
$t_{d(off)}$	Turn-Off Delay Time		-	27	43	ns
t_f	Turn-Off Fall Time		-	7	14	ns
Q_g	Total Gate Charge	V_{DS} = 15V, I_D = 13A, V_{GS} = 5V	-	10	14	nC
Q_{gs}	Gate-Source Charge		-	3	-	nC
Q_{gd}	Gate-Drain Charge		-	3	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 2.1 A (Note 2)	-	0.74	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F= 13A, dI_F/dt=100A/μs	-	27	-	ns
Q_{rr}	Diode Reverse Recovery Charge		-	13	-	nC

Notes:

1. $R_{\theta JA}$ 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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a) 50°C/W when mounted on a 1in² pad of 2 oz copper

b) 125°C/W whe mounted on a minimum pad

Scale 1: 1 on letter size paper

2. Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

Typical Characteristics

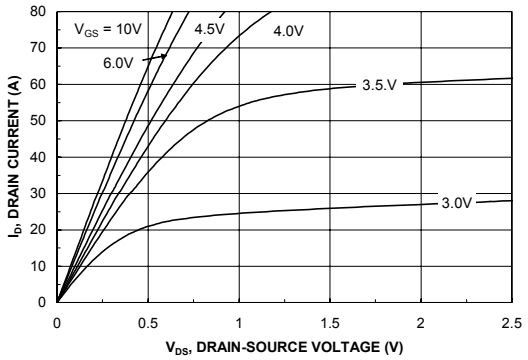


Figure 1. On-Region Characteristics

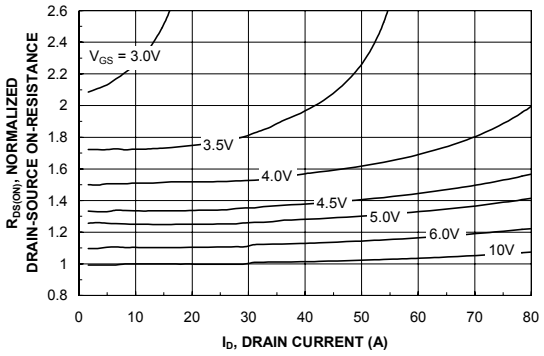


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

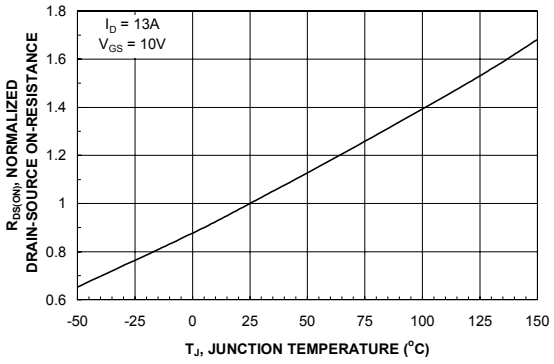


Figure 3. On-Resistance Variation with Temperature

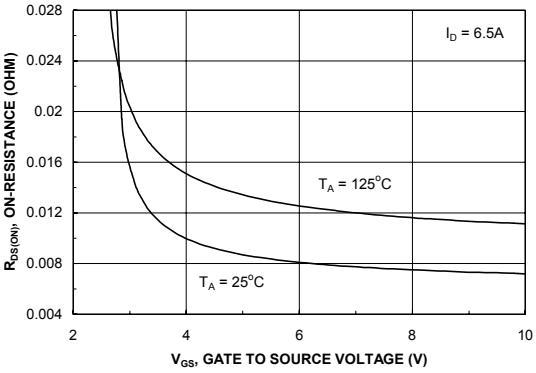


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

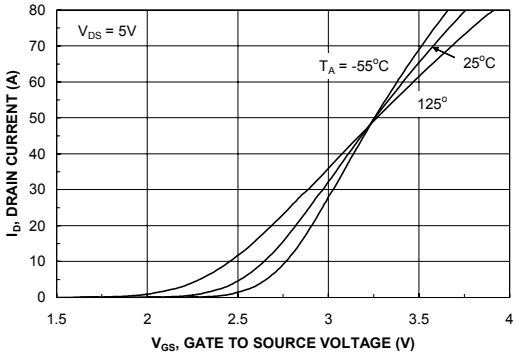


Figure 5. Transfer Characteristics

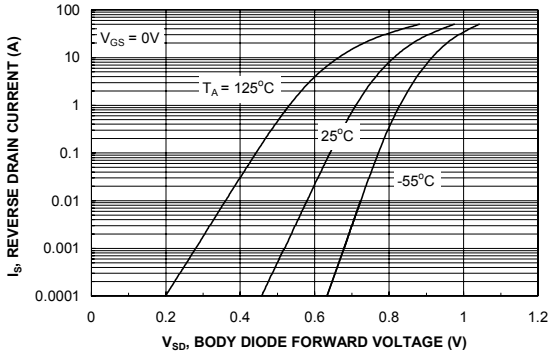


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

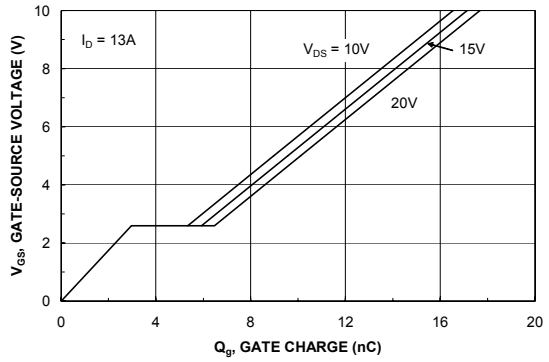


Figure 7. Gate Charge Characteristics

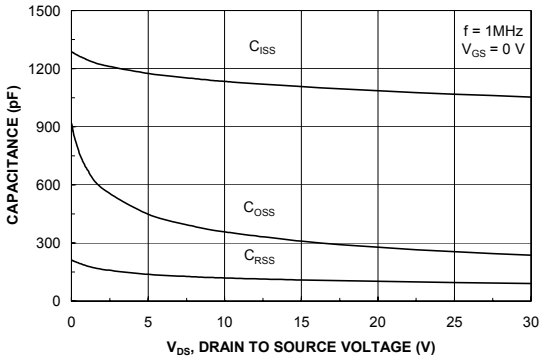


Figure 8. Capacitance Characteristics

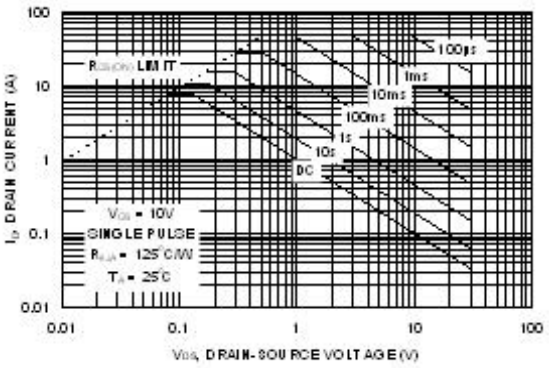


Figure 9. Maximum Safe Operation Area

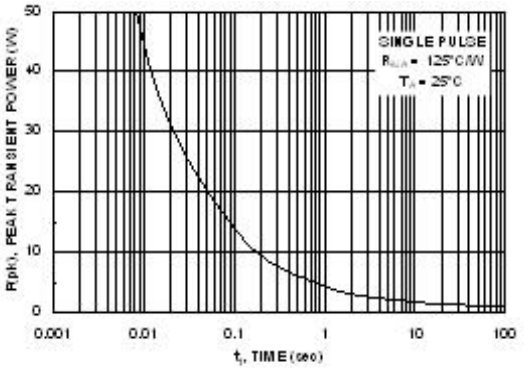


Figure 10. Single Pulse Maximum Power Dissipation

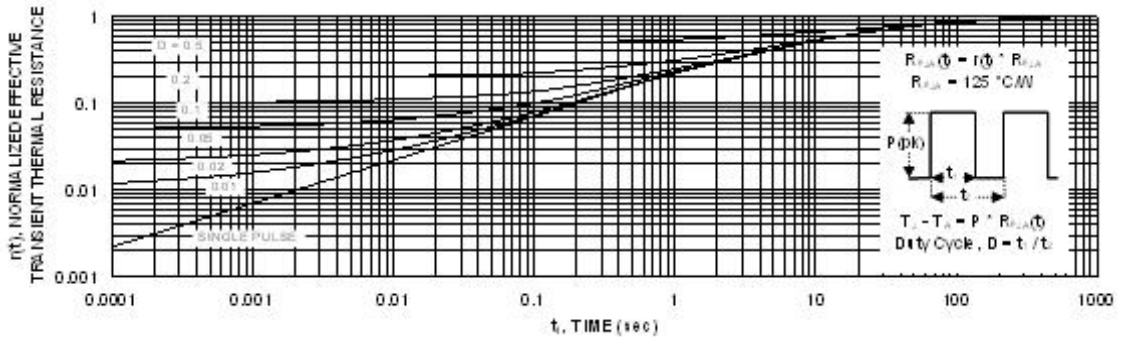


Figure 11. Transient Thermal Response Curve

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

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