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FDN537N

Single N-Channel Power Trench® MOSFET 30 V, 6.5 A, 23 mΩ

Features

- Max $r_{DS(on)}$ = 23 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 6.5\text{ A}$
- Max $r_{DS(on)}$ = 36 mΩ at $V_{GS} = 4.5\text{ V}$, $I_D = 6.0\text{ A}$
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- Fast switching speed
- 100% UIL Tested
- RoHS Compliant



General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench® process that has been optimized for $r_{DS(on)}$, switching performance and ruggedness.

Application

- Primary DC-DC Switch



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

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage (Note 3)	±20	V
I_D	Drain Current -Continuous (Package limited) $T_C = 25\text{ °C}$	8.0	A
	-Continuous $T_A = 25\text{ °C}$ (Note 1a)	6.5	
	-Pulsed	25	
P_D	Power Dissipation (Note 1a)	1.5	W
	Power Dissipation (Note 1b)	0.6	
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)	80	°C/W
	Thermal Resistance, Junction to Ambient (Note 1b)	180	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
537	FDN537N	SSOT-3	7"	8 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 $25\text{ }^\circ\text{C}$		18		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, Forward	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1.2	1.8	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	$V_{GS} = 10\text{ V}$, $I_D = 6.5\text{ A}$		19	23	m Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 6.0\text{ A}$		25	36	
		$V_{GS} = 10\text{ V}$, $I_D = 6.5\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		25	30	
g_{FS}	Forward Transconductance	$V_{DD} = 5\text{ V}$, $I_D = 6.5\text{ A}$		24		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		360	465	pF
C_{oss}	Output Capacitance			143	180	pF
C_{rss}	Reverse Transfer Capacitance			22	35	pF
R_g	Gate Resistance			1.0		Ω

Switching Characteristics

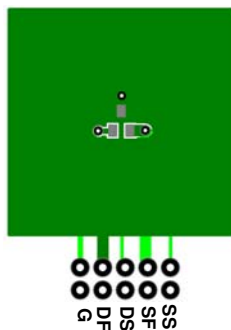
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$, $I_D = 6.5\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		5	10	ns
t_r	Rise Time			1	10	ns
$t_{d(off)}$	Turn-Off Delay Time			11	19	ns
t_f	Fall Time			1	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 15\text{ V}$, $I_D = 6.5\text{ A}$	6.0	8.4	nC
	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$		3.0	4.2	nC
Q_{gs}	Total Gate Charge			1.2		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.1		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 6.5\text{ A}$ (Note 2)		0.86	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 6.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		14	22	ns
Q_{rr}	Reverse Recovery Charge			3	10	nC

NOTES:

- $R_{\theta JA}$ 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 $R_{\theta CA}$ is determined by the user's board design.



a) $80\text{ }^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $180\text{ }^\circ\text{C}/\text{W}$ when mounted on a minimum pad.

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

3. As an N-ch device, the negative V_{GS} rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

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

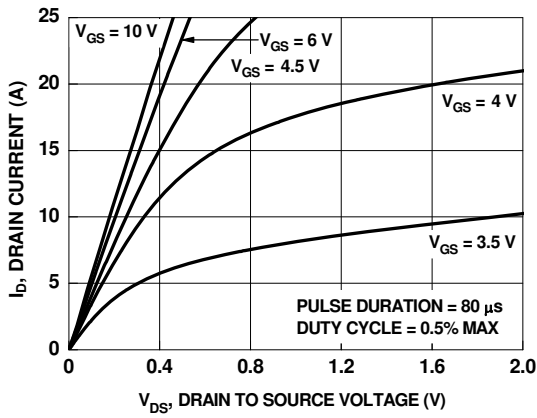


Figure 1. On Region Characteristics

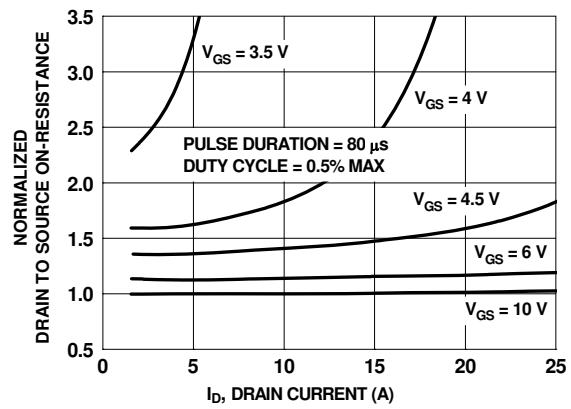


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

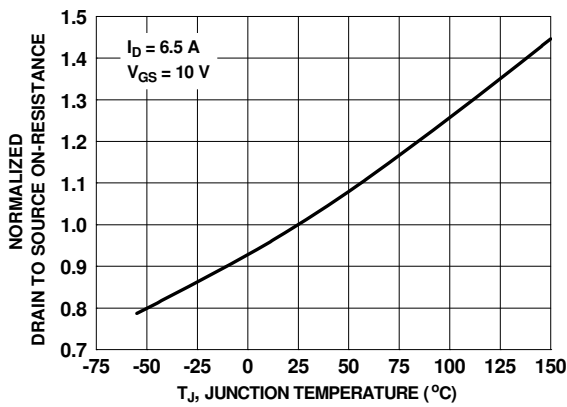


Figure 3. Normalized On Resistance vs Junction Temperature

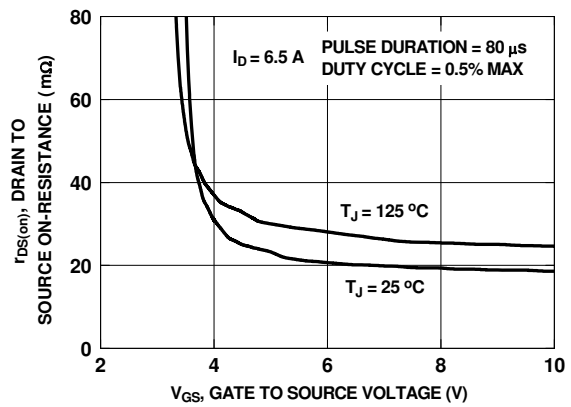


Figure 4. On-Resistance vs Gate to Source Voltage

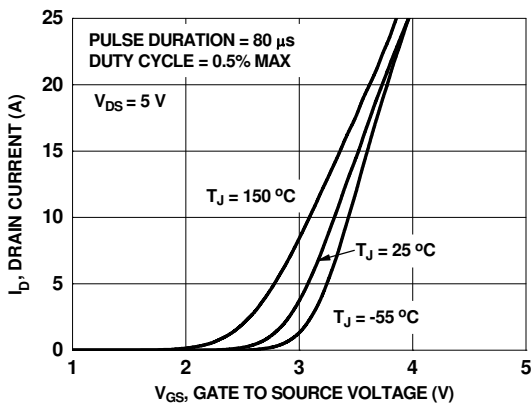


Figure 5. Transfer Characteristics

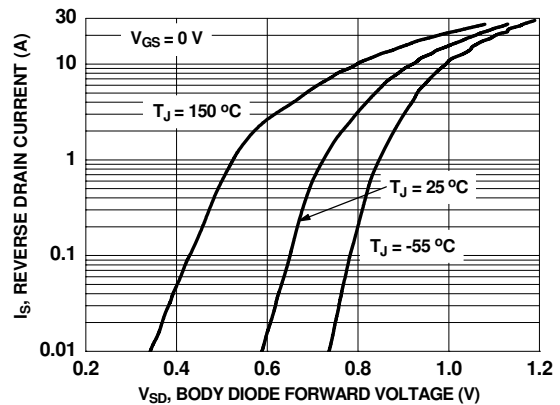


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

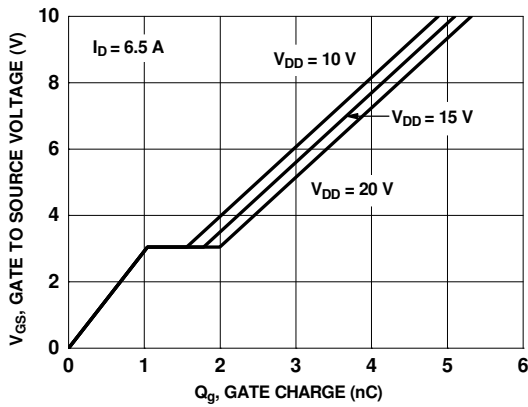


Figure 7. Gate Charge Characteristics

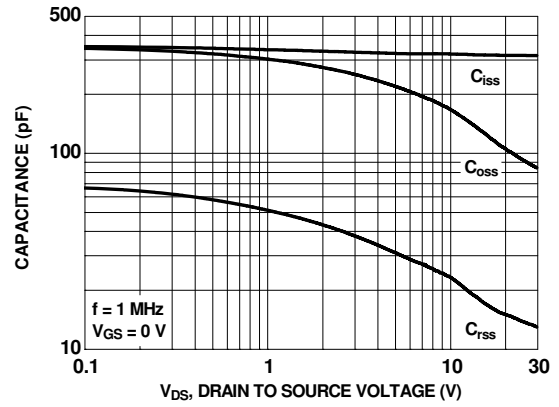


Figure 8. Capacitance vs Drain to Source Voltage

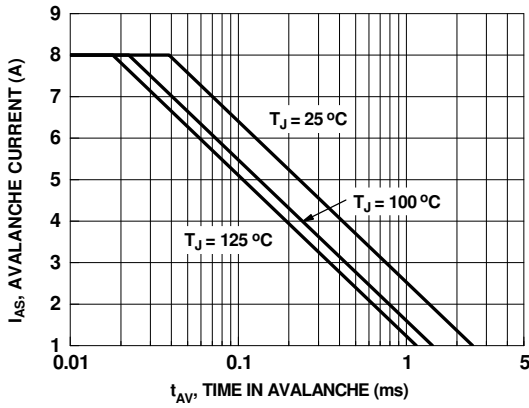


Figure 9. Unclamped Inductive Switching Capability

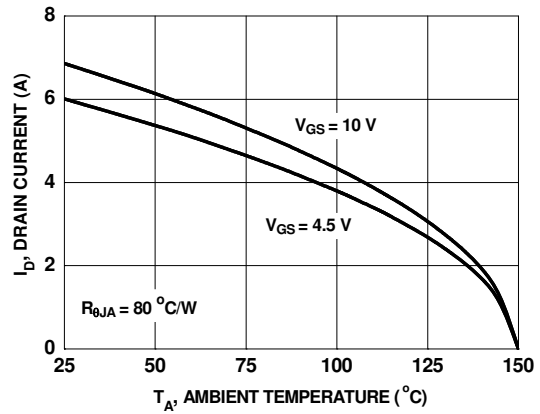


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

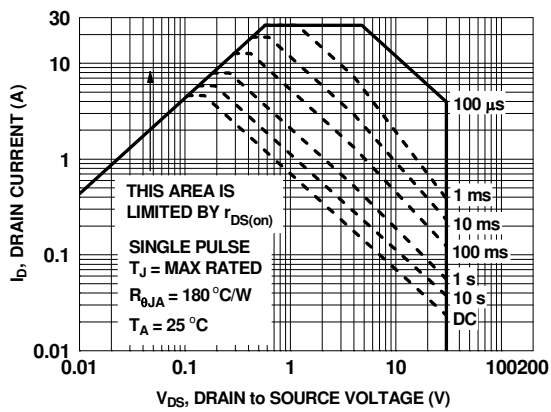


Figure 11. Forward Bias Safe Operating Area

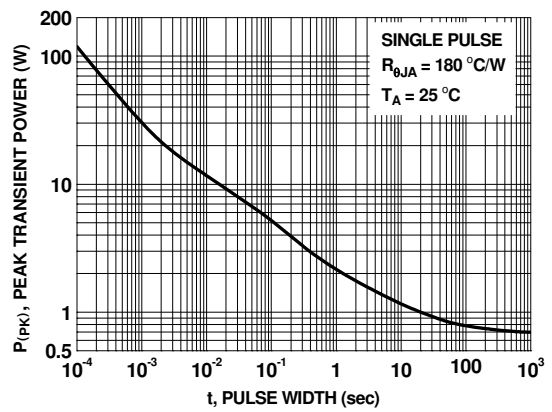


Figure 12. Single Pulse Maximum Power Dissipation

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

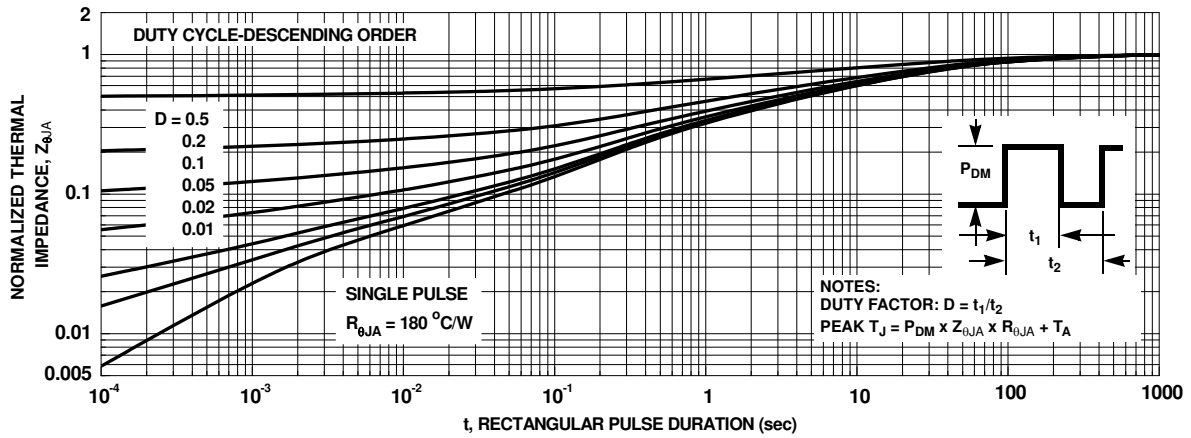


Figure 13. Junction-to-Ambient Transient Thermal Response Curve



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