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July 2008

FDW2503NZ

Dual N-Channel 2.5V Specified PowerTrench[®] MOSFET

General Description

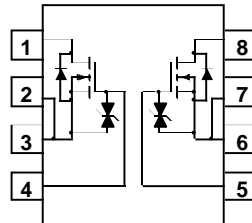
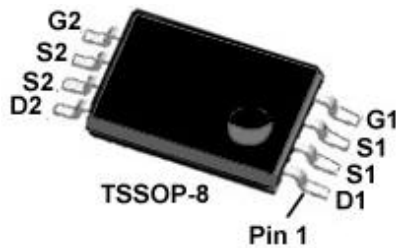
This NChannel 2.5V specified MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications with a wide range of gate drive voltage (2.5V – 12V).

Applications

- Load switch
- Motor drive
- DC/DC conversion
- Power management

Features

- 5.5 A, 20 V. $R_{DS(ON)} = 20\text{ m}\Omega$ @ $V_{GS} = 4.5\text{V}$
 $R_{DS(ON)} = 26\text{ m}\Omega$ @ $V_{GS} = 2.5\text{V}$
- Extended V_{GSS} range ($\pm 12\text{V}$) for battery applications
- ESD protection diode (note 3)
- High performance trench technology for extremely low $R_{DS(ON)}$
- Low profile TSSOP-8 package



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	20	V
V_{GSS}	Gate-Source Voltage	± 12	V
I_b	Drain Current – Continuous (Note 1a)	5.5	A
	– Pulsed	30	
P_D	Power Dissipation (Note 1a)	1.0	W
		(Note 1b)	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to $+150$	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	100	$^\circ\text{C/W}$
		(Note 1b)	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
2503NZ	FDW2503NZ	13"	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	V _{GS} = 0 V, I _b = 250 μA	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _b = 250 μA, Referenced to 25°C		14		mV/°C
I _{bSS}	Zero Gate Voltage Drain Current	V _{DS} = 16 V, V _{GS} = 0 V			1	μA
I _{GSSF}	Gate–Body Leakage, Forward	V _{GS} = 12 V, V _{DS} = 0 V			10	μA
I _{GSSR}	Gate–Body Leakage, Reverse	V _{GS} = -12 V, V _{DS} = 0 V			-10	μA
On Characteristics (Note 2)						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _b = 250 μA	0.6	1.0	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I _b = 250 μA, Referenced to 25°C		-3		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	V _{GS} = 4.5 V, I _b = 5.5 A V _{GS} = 2.5 V, I _b = 5 A V _{GS} = 4.5 V, I _b = 5.5 A, T _J = 125°C		14 19 19	20 26 29	mΩ
I _{D(on)}	On–State Drain Current	V _{GS} = 4.5 V, V _{DS} = 5 V	30			A
g _{FS}	Forward Transconductance	V _{DS} = 5 V, I _b = 5.5 A		30		S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 10 V, V _{GS} = 0 V,		1286		pF
C _{oss}	Output Capacitance	f = 1.0 MHz		305		pF
C _{rss}	Reverse Transfer Capacitance			161		pF
Switching Characteristics (Note 2)						
t _{d(on)}	Turn–On Delay Time	V _{DD} = 10 V, I _b = 1 A,		10	20	ns
t _r	Turn–On Rise Time	V _{GS} = 4.5 V, R _{GEN} = 6 Ω		14	25	ns
t _{d(off)}	Turn–Off Delay Time			25	40	ns
t _f	Turn–Off Fall Time			8	16	ns
Q _g	Total Gate Charge	V _{DS} = 10 V, I _b = 5.5 A,		12	17	nC
Q _{gs}	Gate–Source Charge	V _{GS} = 4.5 V		2.6		nC
Q _{gd}	Gate–Drain Charge			3		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain–Source Diode Forward Current				1.0	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 1.0 A (Note 2)		0.7	1.2	V

Notes:

- 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_{θCA} is determined by the user's board design.
 - R_{θJA} is 100°C/W (steady state) when mounted on a 1 inch² copper pad on FR-4.
 - R_{θJA} is 125°C/W (steady state) when mounted on a minimum copper pad on FR-4.
- Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%
- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics

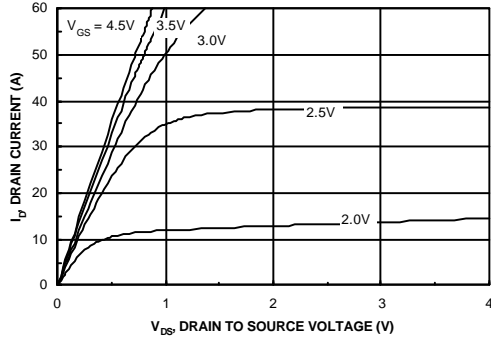


Figure 1. On-Region Characteristics.

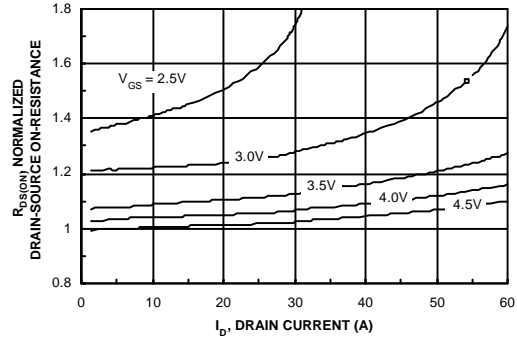


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

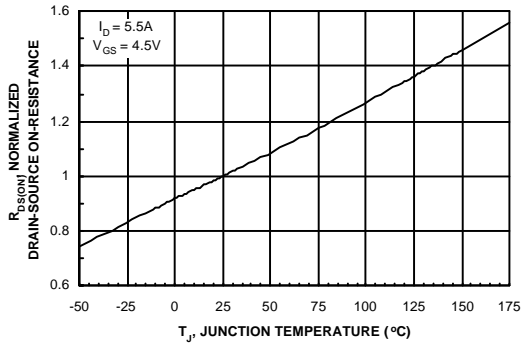


Figure 3. On-Resistance Variation with Temperature.

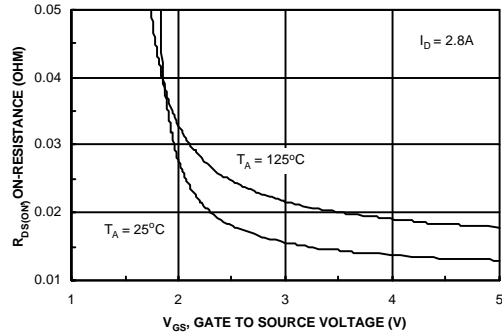


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

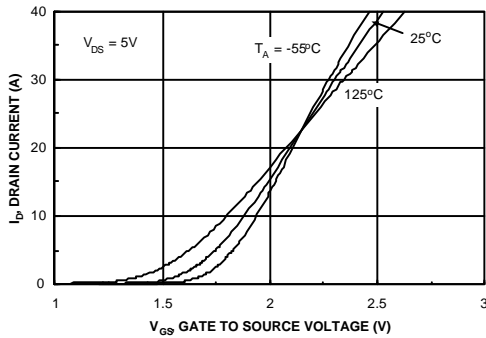


Figure 5. Transfer Characteristics.

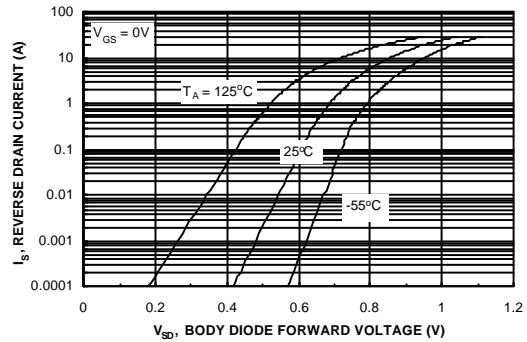


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

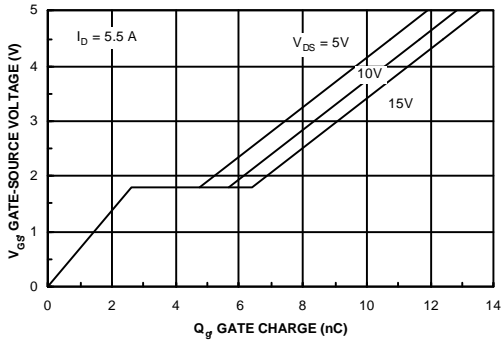


Figure 7. Gate Charge Characteristics.

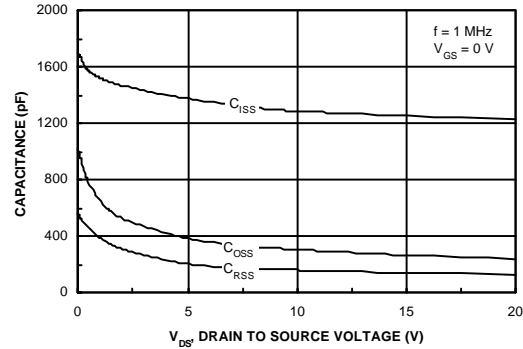


Figure 8. Capacitance Characteristics.

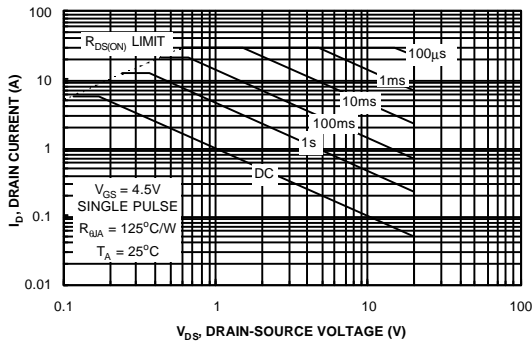


Figure 9. Maximum Safe Operating Area.

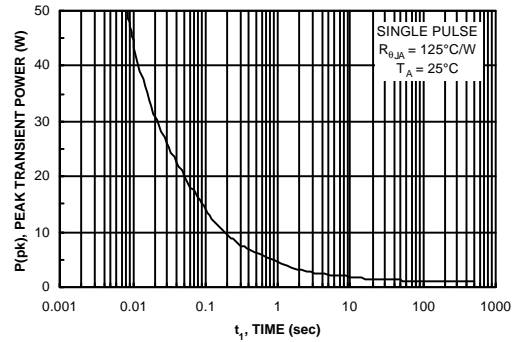


Figure 10. Single Pulse Maximum Power Dissipation.

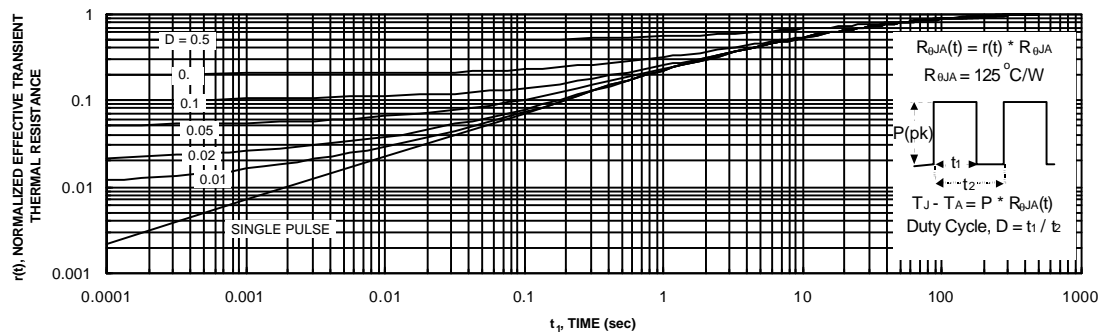


Figure 11. Transient Thermal Response Curve.

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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