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FDS4470

40V N-Channel PowerTrench® MOSFET

General Description

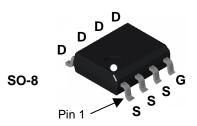
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{\mbox{\scriptsize DS(ON)}}$ and fast switching speed.

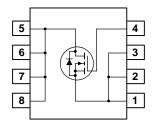
Applications

DC/DC converter

Features

- 12.5 A, 40 V. $R_{DS(ON)} = 9 \text{ m}\Omega$ @ $V_{GS} = 10 \text{ V}$
- Low gate charge (45 nC)
- High performance trench technology for extremely low $R_{\mbox{\scriptsize DS(ON)}}$
- High power and current handling capability





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V _{DSS}	Drain-Source Voltage		40	V
V _{GSS}	Gate-Source Voltage		+30/–20	V
I _D	Drain Current - Continuous	(Note 1a)	12.5	А
	– Pulsed		50	
P _D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.4	
		(Note 1c)	1.2	
T _J , T _{STG}	Operating and Storage Junction Temperation	ture Range	-55 to +175	°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 1c)	125	°C/W
R _{eJC}	Thermal Resistance, Junction-to-Case	(Note 1)	25	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS4470	FDS4470	13"	12mm	2500 units

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Drain-So	ource Avalanche Ratings (Note 2	2)		I		l
E _{AS}	Drain-Source Avalanche Energy	Single Pulse, V _{DD} =40V, I _D =12.5A			370	mJ
I _{AS}	Drain-Source Avalanche Current				12.5	Α
Off Char	acteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, \qquad I_{D} = 250 \mu\text{A}$	40			V
ΔBV _{DSS} ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C		42		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$			1	μА
I _{GSSF}	Gate-Body Leakage, Forward	$V_{GS} = 30 \text{ V}, V_{DS} = 0 \text{ V}$			100	nA
I _{GSSR}	Gate-Body Leakage, Reverse	$V_{GS} = -20 \text{ V}, V_{DS} = 0 \text{ V}$			-100	nA
On Char	acteristics (Note 2)					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$	2	3.9	5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C		-8		mV/°C
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 12.5 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 12.5 \text{ A}, T_J = 125 ^{\circ}\text{C}$		6 9	9 14	mΩ
I _{D(on)}	On-State Drain Current	V _{GS} = 10 V, V _{DS} = 5 V	25			Α
g _{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_{D} = 12.5 \text{ A}$		45		S
Dynamic	Characteristics					
C _{iss}	Input Capacitance	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V},$		2659		pF
C _{oss}	Output Capacitance	f = 1.0 MHz		605		pF
C _{rss}	Reverse Transfer Capacitance]		298		pF
Switchir	ng Characteristics (Note 2)					
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 20 \text{ V}, I_{D} = 1 \text{ A},$		14	25	ns
t _r	Turn-On Rise Time	$V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$		12	22	ns
t _{d(off)}	Turn-Off Delay Time	1		37	59	ns
t _f	Turn-Off Fall Time	1		29	46	ns
Q _g	Total Gate Charge	$V_{DS} = 20 \text{ V}, I_{D} = 12.5 \text{ A},$		45	63	nC
Q_{gs}	Gate-Source Charge	V _{GS} = 10 V		11.2		nC
Q_{gd}	Gate-Drain Charge			11		nC

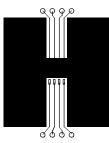
Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units	
Drain-So	Drain-Source Diode Characteristics and Maximum Ratings						
Is	Maximum Continuous Drain-Source Diode Forward Current				2.1	Α	
V _{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 2.1 \text{ A} \text{(Note 2)}$		0.7	1.2	V	
t _{rr}	Diode Reverse Recovery Time	$I_F = 12.5 \text{ A}, d_{iF}/d_t = 100 \text{ A}/\mu\text{s}$		33		nS	
Q _{rr}	Diode Reverse Recovery Charge			39		nC	

Notes

R_{0JA} 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_{0JC} is guaranteed by design while R_{0CA} is determined by the user's board design.



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



b) 105°C/W when mounted on a .04 in² pad of 2 oz copper



c) 125°C/W when mounted on a minimum pad.

Scale 1:1 on letter size paper

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

Typical Characteristics

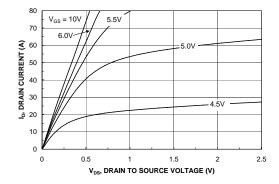


Figure 1. On-Region Characteristics.

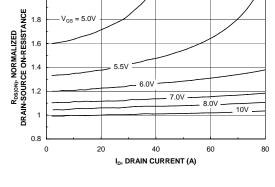


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

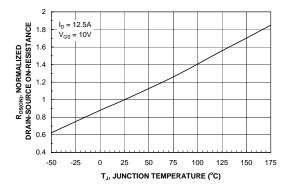


Figure 3. On-Resistance Variation withTemperature.

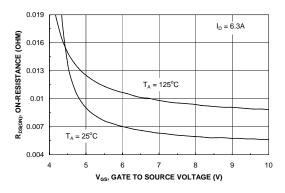


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

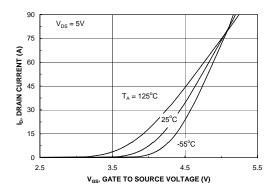


Figure 5. Transfer Characteristics.

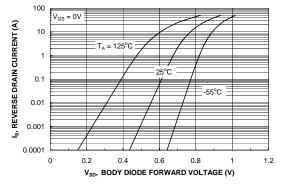
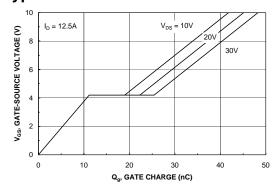


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics



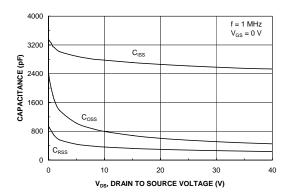
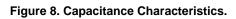
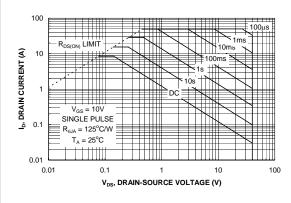


Figure 7. Gate Charge Characteristics.





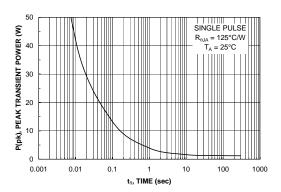


Figure 9. Maximum Safe Operating Area.

Figure 10. Single Pulse Maximum Power Dissipation.

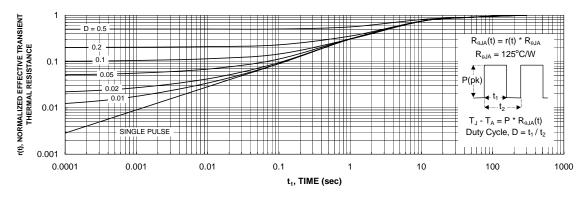


Figure 11. Transient Thermal Response Curve.

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



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