

FDS8670

30V N-Channel PowerTrench® MOSFET

General Description

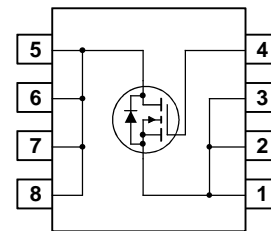
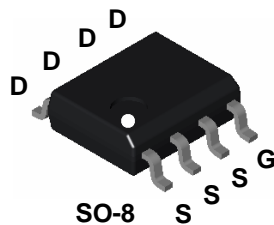
This device has been designed specifically to improve the efficiency of DC-DC converters. Using new techniques in MOSFET construction, the various components of gate charge and capacitance have been optimized to reduce switching losses. Low gate resistance and very low Miller charge enable excellent performance with both adaptive and fixed dead time gate drive circuits. Very low $R_{ds(on)}$ has been maintained to provide an extremely versatile device.

Applications

- High Efficiency DC-DC Converters:
 - Notebook Vcore Power Supply
 - Telecom Brick Synchronous Rectifier
 - Multi purpose Point Of Load

Features

- 21 A, 30 V Max $R_{DS(ON)} = 3.7\text{ m}\Omega$ @ $V_{GS} = 10\text{ V}$
 Max $R_{DS(ON)} = 5.0\text{ m}\Omega$ @ $V_{GS} = 4.5\text{ V}$
- High performance trench technology for extremely low $R_{DS(ON)}$ and gate charge
- Minimal Qgd (5.5 nC typical)
- 100% R_g tested (0.9 Ω typical)
- RoHS Compliant



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

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	30	V
V_{GSS}	Gate-Source Voltage	± 16	V
I_D	Drain Current – Continuous (Note 1a)	21	A
	– Pulsed	105	
P_D	Power Dissipation (Note 1a) (Note 1b) (Note 1c)	2.5	W
		1.2	
		1	
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)	50	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	25	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS8670	FDS8670	13"	12mm	2500 units

Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		39		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-Body Leakage	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	1.4	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		-5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 21\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 18\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 21\text{ A}, T_J = 125^\circ\text{C}$		3.3 4.2 4.4	3.7 5.0 5.5	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 21\text{ A}$		118		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		4040		pF
C_{oss}	Output Capacitance			1730		pF
C_{rss}	Reverse Transfer Capacitance			160		pF
R_G	Gate Resistance	$f = 1.0\text{ MHz}$	0.2	0.9	1.5	Ω

Switching Characteristics (Note 2)

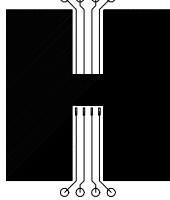
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		12	21	ns
t_r	Turn-On Rise Time			11	20	ns
$t_{d(off)}$	Turn-Off Delay Time			56	90	ns
t_f	Turn-Off Fall Time			68	108	ns
$Q_{g(TOT)}$	Total Gate Charge at $V_{GS} = 10\text{ V}$	$V_{DD} = 15\text{ V}, I_D = 21\text{ A}$		58.5	82	nC
$Q_{g(TOT)}$	Total Gate Charge at $V_{GS} = 5\text{ V}$			30	42	nC
Q_{gs}	Gate-Source Charge			9.5		nC
Q_{gd}	Gate-Drain Charge			5.5		nC

Drain-Source Diode Characteristics and Maximum Ratings

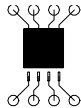
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.1\text{ A}$ (Note 2)		0.7	1.2	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 21\text{ A},$ $dI_F/dt = 100\text{ A}/\mu\text{s}$		51		ns
I_{RM}	Diode Reverse Recovery Current			1.5		A
Q_{rr}	Diode Reverse Recovery Charge			37		nC

Notes:

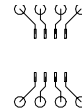
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 50°W when mounted on a 1 in^2 pad of 2 oz copper



b) 105°W when mounted on a $.04\text{ in}^2$ pad of 2 oz copper



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

Scale 1 : 1 on letter size paper

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

Typical Characteristics

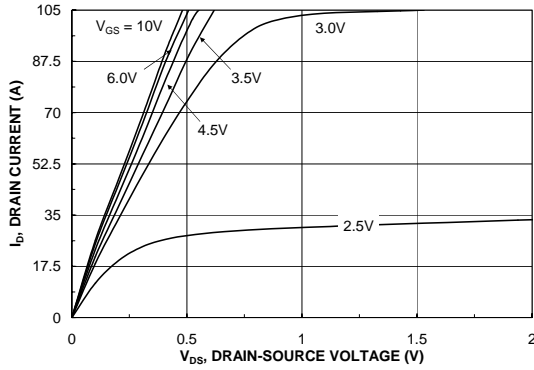


Figure 1. On-Region Characteristics.

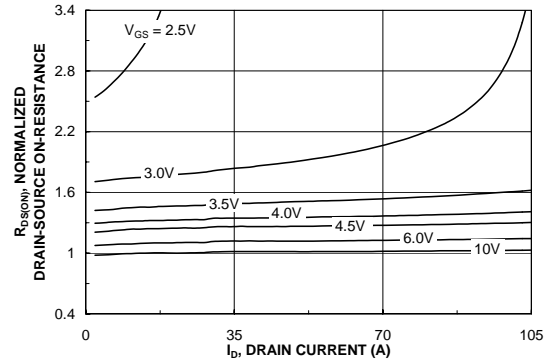


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

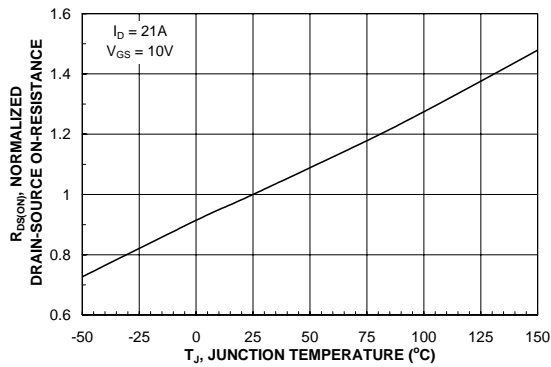


Figure 3. On-Resistance Variation with Temperature.

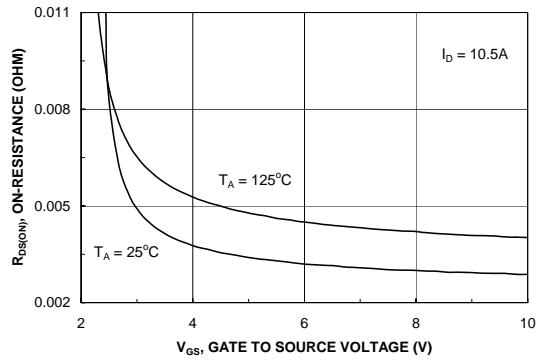


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

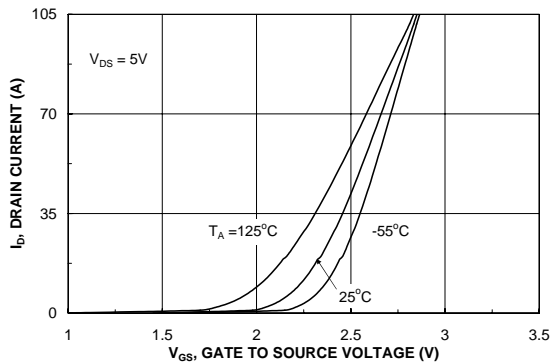


Figure 5. Transfer Characteristics.

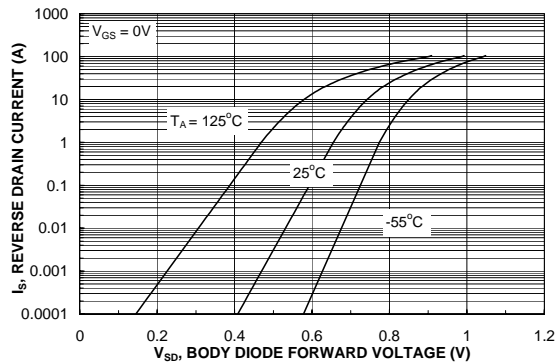


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)

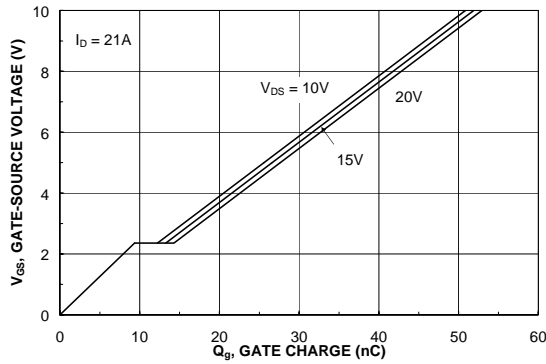


Figure 7. Gate Charge Characteristics.

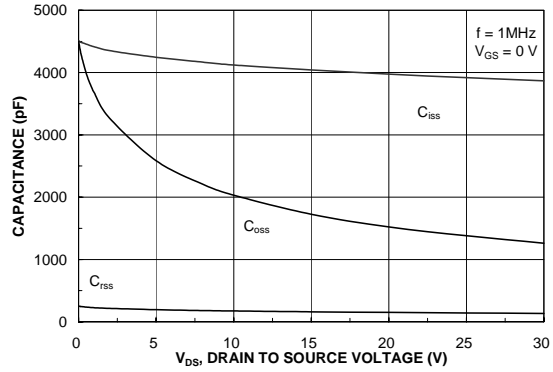


Figure 8. Capacitance Characteristics.

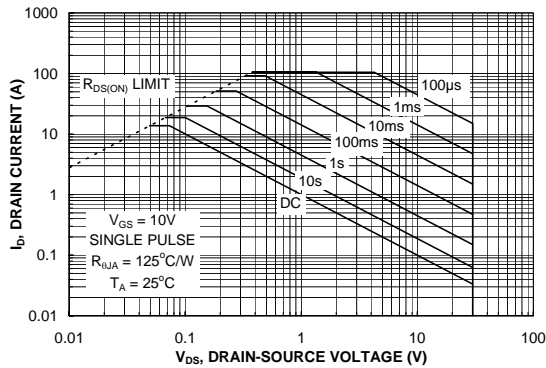


Figure 9. Maximum Safe Operating Area.

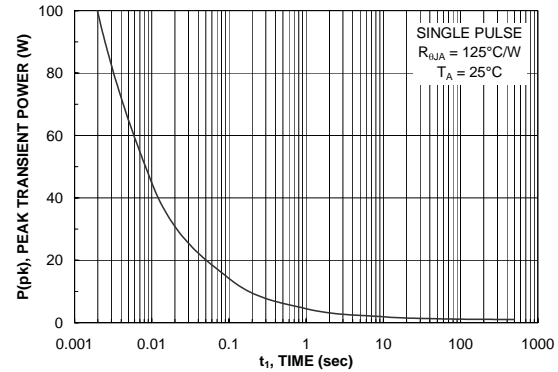


Figure 10. Single Pulse Maximum Power Dissipation.

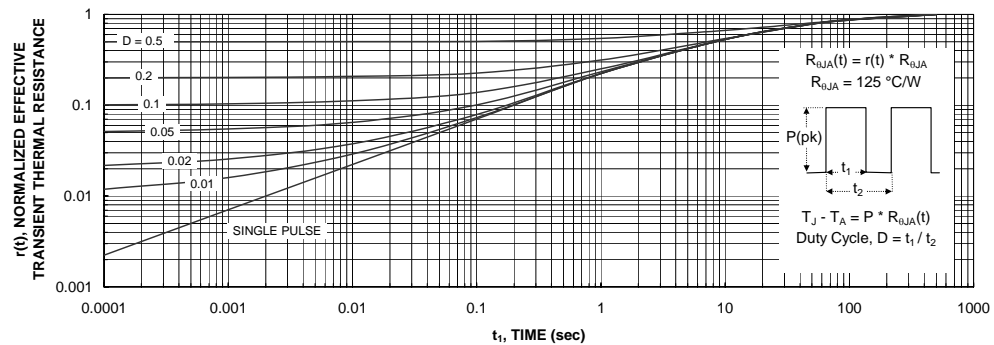


Figure 11. Transient Thermal Response Curve.

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

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