

# **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 Rds(on) has been maintained to provide an extremely versatile device.

## **Applications**

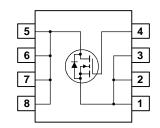
- High Efficiency DC-DC Converters:
  - Notebook Vcore Power Supply
  - Telecom Brick Synchronous Rectifier
  - Multi purpose Point Of Load

### **Features**

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







## **Absolute Maximum Ratings** T<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units	
V <sub>DSS</sub>	Drain-Source Voltage		30	V	
V <sub>GSS</sub>	Gate-Source Voltage		±16	V	
I <sub>D</sub>	Drain Current - Continuous	(Note 1a)	21	А	
	– Pulsed		105		
P <sub>D</sub>	Power Dissipation	(Note 1a)	2.5	W	
		(Note 1b)	1.2		
		(Note 1c)	1		
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range		-55 to +150	°C	

### **Thermal Characteristics**

R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	(Note 1a)	50	°C/W
R <sub>eJC</sub>	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

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
-						
	Acteristics	N 0 V 1 250 ·· A	20			V
BV <sub>DSS</sub> ΔBV <sub>DSS</sub>	Drain–Source Breakdown Voltage Breakdown Voltage Temperature	$V_{GS} = 0 \text{ V}, \qquad I_{D} = 250 \mu\text{A}$ $I_{D} = 250 \mu\text{A}, \text{ Referenced to } 25^{\circ}\text{C}$	30			mV/°C
$\Delta T_{\rm J}$	Coefficient	ID = 250 μA, Referenced to 25 C		39		IIIV/ C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}, \qquad V_{GS} = 0 \text{ V}$			1	μA
I <sub>GSS</sub>	Gate-Body Leakage	$V_{GS} = \pm 16 \text{ V},  V_{DS} = 0 \text{ V}$			±100	nA
On Chara	acteristics (Note 2)					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1	1.4	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250 \mu A$ , Referenced to $25^{\circ}C$		<b>-</b> 5		mV/°C
R <sub>DS(on)</sub>	Static Drain–Source	$V_{GS} = 10 \text{ V}, \qquad I_{D} = 21 \text{ A}$		3.3	3.7	mΩ
	On–Resistance	$V_{GS} = 4.5 \text{ V},  I_{D} = 18 \text{ A}$		4.2	5.0	
		V <sub>GS</sub> =10 V, I <sub>D</sub> =21 A, T <sub>J</sub> =125°C		4.4	5.5	
<b>g</b> <sub>FS</sub>	Forward Transconductance	$V_{DS} = 10 \text{ V}, \qquad I_{D} = 21 \text{ A}$		118		S
Dynamic	Characteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 15 \text{ V}, \qquad V_{GS} = 0 \text{ V},$		4040		pF
Coss	Output Capacitance	f = 1.0 MHz		1730		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			160		pF
R <sub>G</sub>	Gate Resistance	f = 1.0 MHz	0.2	0.9	1.5	Ω
Switchin	g Characteristics (Note 2)					
t <sub>d(on)</sub>	Turn-On Delay Time	$V_{DD} = 15 \text{ V}, \qquad I_D = 1 \text{ A},$		12	21	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{GS} = 10 \text{ V}, \qquad R_{GEN} = 6 \Omega$		11	20	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			56	90	ns
t <sub>f</sub>	Turn-Off Fall Time			68	108	ns
$Q_{g(TOT)}$	Total Gate Charge at V <sub>GS</sub> = 10V	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 21 A		58.5	82	nC
$Q_{g(TOT)}$	Total Gate Charge at V <sub>GS</sub> = 5V			30	42	nC
$Q_{gs}$	Gate-Source Charge			9.5		nC
$Q_{gd}$	Gate-Drain Charge			5.5		nC
Drain-So	ource Diode Characteristics	and Maximum Ratings				
V <sub>SD</sub>	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 <sub>rr</sub>	Diode Reverse Recovery Time	I <sub>F</sub> = 21 A,		51		ns
I <sub>RM</sub>	Diode Reverse Recovery Current	$dI_F/dt = 100 A/\mu s$		1.5		Α
Q <sub>rr</sub>	Diode Reverse Recovery Charge	7		37		nC

### Notes:

1.  $R_{\text{BJA}}$  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.  $R_{\text{BJC}}$  is guaranteed by design while  $R_{\text{BCA}}$  is determined by the user's board design.



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



b) 105°/W when mounted on a .04 in<sup>2</sup> 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 <  $300\mu$ s, Duty Cycle < 2.0%

# **Typical Characteristics**

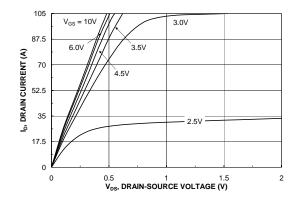


Figure 1. On-Region Characteristics.

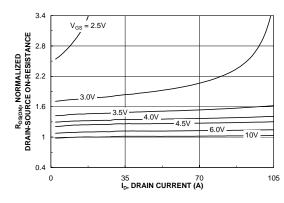


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

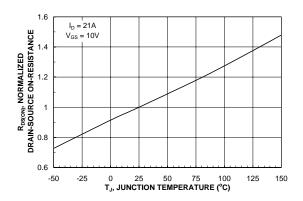


Figure 3. On-Resistance Variation with Temperature.

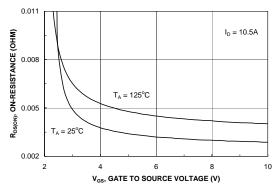


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

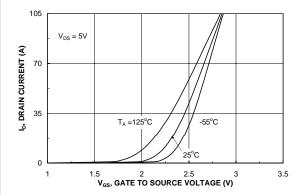


Figure 5. Transfer Characteristics.

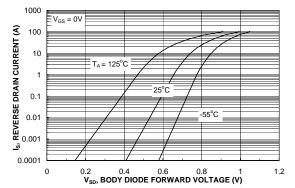
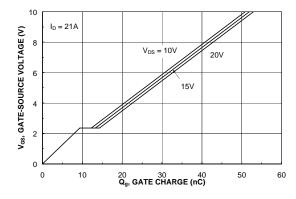


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics (continued)



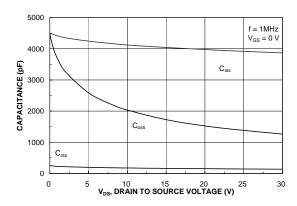
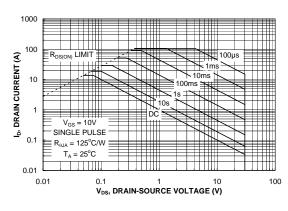


Figure 7. Gate Charge Characteristics.





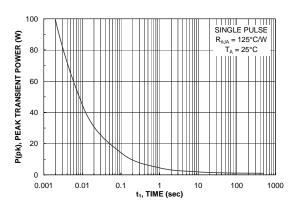


Figure 9. Maximum Safe Operating Area.

Figure 10. Single Pulse Maximum Power Dissipation.

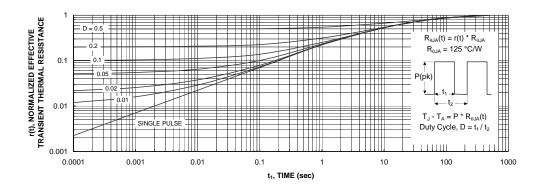


Figure 11. Transient Thermal Response Curve.

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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