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#### ON Semiconductor®



## FCH067N65S3

# N-Channel SuperFET<sup>®</sup> III MOSFET 650 V, 44 A, 67 m $\Omega$

#### **Features**

- 700 V @ T<sub>J</sub> = 150 °C
- Typ.  $R_{DS(on)}$  = 59 m $\Omega$
- Ultra Low Gate Charge (Typ. Q<sub>q</sub> = 78 nC)
- Low Effective Output Capacitance (Typ. C<sub>oss(eff.)</sub> = 715 pF)
- 100% Avalanche Tested
- RoHS Compliant

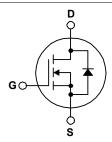
#### **Applications**

- Telecom / Sever Power Supplies
- · Industrial Power Supplies
- UPS / Solar

### **Description**

SuperFET® III MOSFET is ON Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate. Consequently, SuperFET III MOSFET is very suitable for various power system for miniaturization and higher efficiency.





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

Symbol	I	Parameter		FCH067N65S3_F155	Unit
$V_{DSS}$	Drain to Source Voltage			650	V
V	Gate to Source Voltage	- DC		±30	V
$V_{GSS}$	Gate to Source voltage	- AC	(f>1 Hz)	±30	V
1	Drain Current	- Continuous (T <sub>C</sub> = 25°C)		44*	Α
ID	Drain Current	- Continuous (T <sub>C</sub> = 100°C)		28*	A
I <sub>DM</sub>	Drain Current	- Pulsed	(Note 1)	110*	Α
E <sub>AS</sub>	Single Pulsed Avalanche Energy		(Note 2)	1160	mJ
I <sub>AS</sub>	Avalanche Current		(Note 1)	8.8	Α
E <sub>AR</sub>	Repetitive Avalanche Energy		(Note 1)	3.12	mJ
dv/dt	MOSFET dv/dt			100	\//no
αν/αι	Peak Diode Recovery dv/dt (Note 3)		20	V/ns	
D	Dower Dissination	$(T_C = 25^{\circ}C)$		312	W
$P_{D}$	Power Dissipation  - Derate Above 25°C			2.5	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature	Operating and Storage Temperature Range			οС
T <sub>L</sub>	Maximum Lead Temperature for Se	oldering, 1/8" from Case for 5 Sec	onds	300	οС

<sup>\*</sup>Drain current limited by maximum junction temperature.

#### **Thermal Characteristics**

Symbol	Parameter	FCH067N65S3_F155	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	- 0/00

## **Package Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH067N65S3_F155	FCH067N65S3	TO-247 G03	Tube	N/A	N/A	30 units

### **Electrical Characteristics** $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter	lest Conditions	win.	ıyp.	wax.	Unit
Off Chara	cteristics					
D\/	Drain to Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 1 \text{ mA}, T_J = 25^{\circ}\text{C}$	650	-	-	V
BV <sub>DSS</sub>	Drain to Source Breakdown voltage	$V_{GS} = 0 \text{ V}, I_D = 1 \text{ mA}, T_J = 150^{\circ}\text{C}$	700	-	-	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 1 mA, Referenced to 25°C	-	0.72	-	V/°C
I	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V	-	-	1	μА
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = 520 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	2.2	-	μΑ
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V	-	-	±100	nA

#### **On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 4.4$ mA	2.5	-	4.5	V
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 22 A	-	59	67	mΩ
9 <sub>FS</sub>	Forward Transconductance	$V_{DS} = 20 \text{ V}, I_{D} = 22 \text{ A}$	-	29	1	S

#### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0 V,	-	3090	-	pF
C <sub>oss</sub>	Output Capacitance	f = 1 MHz	-	68	-	pF
C <sub>oss(eff.)</sub>	Effective Output Capacitance	V <sub>DS</sub> = 0 V to 400 V, V <sub>GS</sub> = 0 V	-	715	-	pF
C <sub>oss(er.)</sub>	Energy Related Output Capacitance	V <sub>DS</sub> = 0 V to 400 V, V <sub>GS</sub> = 0 V	-	104	-	pF
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>DS</sub> = 400 V, I <sub>D</sub> = 22 A,	-	78	-	nC
$Q_{gs}$	Gate to Source Gate Charge	V <sub>GS</sub> = 10 V	-	18	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge	(Note 4)	-	30	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	0.6	-	Ω

#### **Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time			-	26	-	ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>DD</sub> = 400 V, I <sub>D</sub> = 22 A,		-	52	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_g = 4.7 \Omega$		-	89	-	ns
t <sub>f</sub>	Turn-Off Fall Time		(Note 4)	-	16	-	ns

#### **Source-Drain Diode Characteristics**

Is	Maximum Continuous Source to Drain Diode Forward Current			-	44	Α
I <sub>SM</sub>	Maximum Pulsed Source to Drain Diode Forward Current			-	110	Α
$V_{SD}$	Source to Drain Diode Forward Voltage V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 22 A		-	-	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 22 A,	-	435	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	9.2	-	μС

#### Notes:

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2.  $I_{AS}$  = 8.8 A,  $R_{G}$  = 25  $\Omega$ , starting  $T_{J}$  = 25°C.
- 3. I  $_{SD} \leq$  22 A, di/dt  $\leq$  200 A/µs, V  $_{DD} \leq$  380V, starting T  $_{J}$  = 25°C.
- 4. Essentially independent of operating temperature typical characteristics.

#### **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

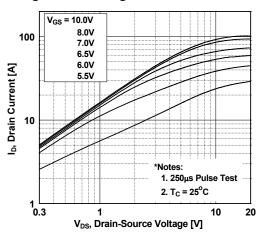


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

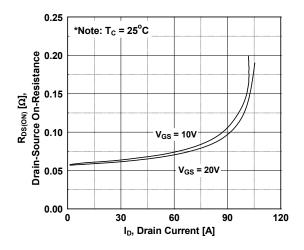


Figure 5. Capacitance Characteristics

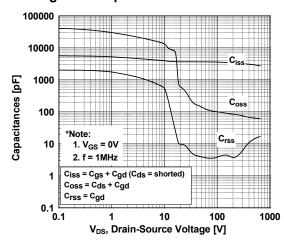


Figure 2. Transfer Characteristics

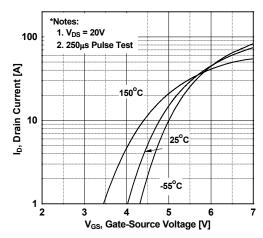


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

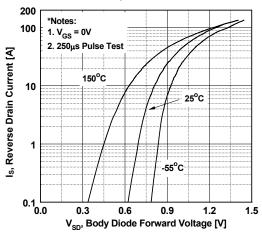
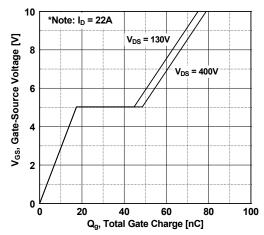


Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

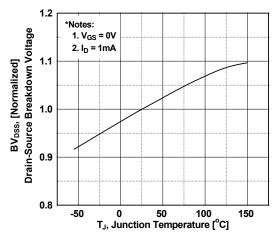


Figure 9. Maximum Safe Operating Area

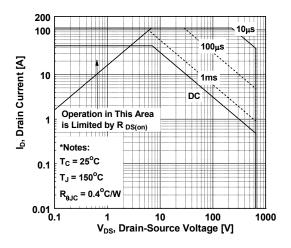


Figure 11. Eoss vs. Drain to Source Voltage

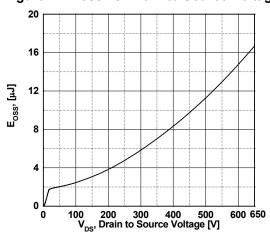


Figure 8. On-Resistance Variation vs. Temperature

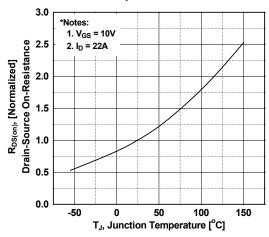
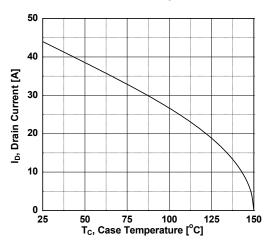
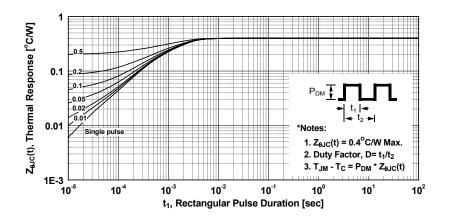


Figure 10. Maximum Drain Current vs. Case Temperature



## Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



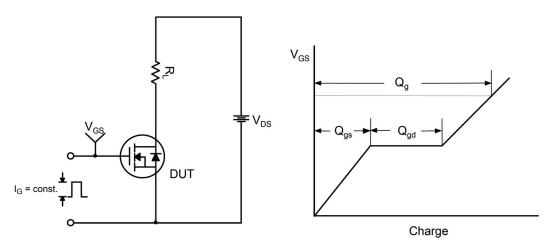


Figure 13. Gate Charge Test Circuit & Waveform

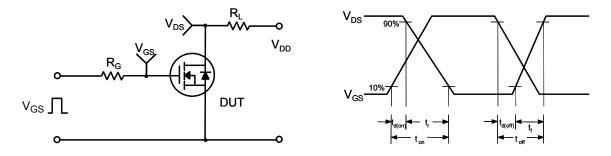


Figure 14. Resistive Switching Test Circuit & Waveforms

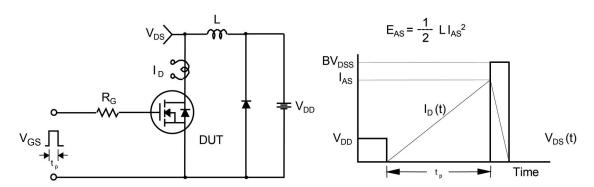
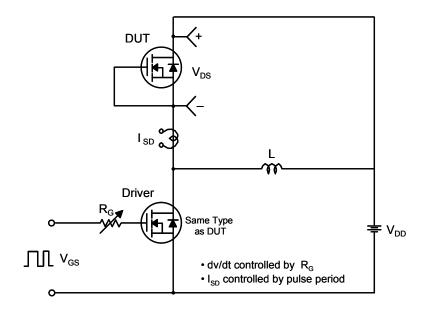


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms



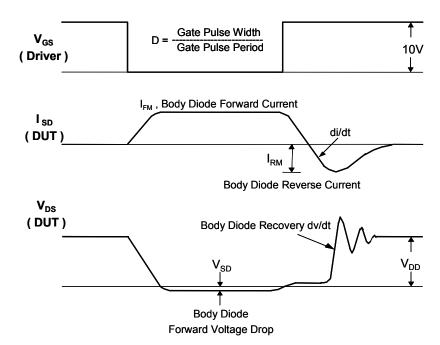
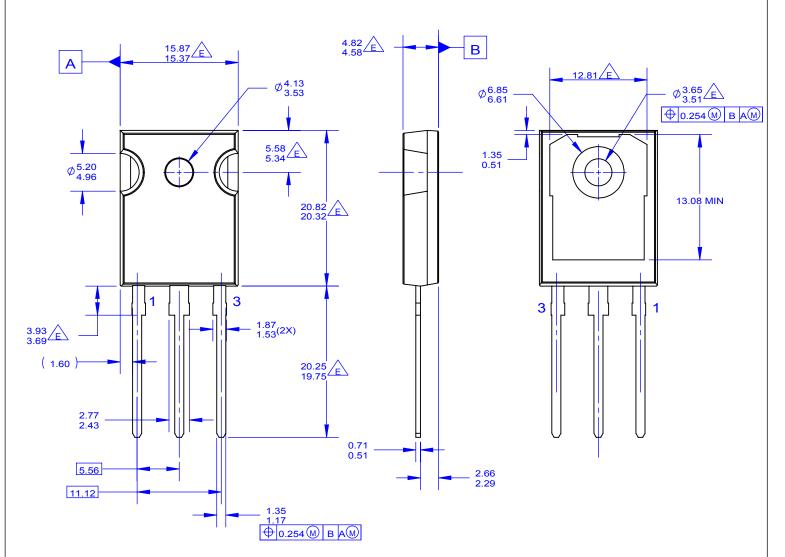


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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#### Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru\_6 moschip.ru\_4 moschip.ru\_9