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April 2014

FCH043N60

N-Channel SuperFET® II MOSFET

600 V, 75 A, 43 mΩ

Features

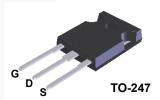
- 650 V @ T_J = 150°C
- Typ. $R_{DS(on)}$ = 37 m Ω
- Ultra Low Gate Charge (Typ. $Q_g = 163 \text{ nC}$)
- Low Effective Output Capacitance (Typ. C_{oss(eff.)} = 730 pF)
- 100% Avalanche Tested
- RoHS Compliant

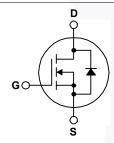
Applications

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

Description

SuperFET® II MOSFET is Fairchild 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 and higher avalanche energy. Consequently, SuperFET II MOSFET is suitable for various AC/DC power conversion for system miniaturization and higher efficiency.





Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol		Parameter		FCH043N60	Unit
V _{DSS}	Drain to Source Voltage			600	V
.,	Cata ta Causaa Valtaga	- DC		±20	V
V_{GSS}	Gate to Source Voltage	- AC	(f > 1 Hz)	±30	V
	Drain Current	- Continuous (T _C = 25°C)		75	Α
ID	Drain Current	- Continuous (T _C = 100°C)		47.5	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	225	Α
E _{AS}	Single Pulsed Avalanche Er	ergy	(Note 2)	2025	mJ
I _{AR}	Avalanche Current		(Note 1)	15	Α
E _{AR}	Repetitive Avalanche Energ	у	(Note 1)	5.92	mJ
dv/dt	MOSFET dv/dt			100	V/ns
uv/ul	Peak Diode Recovery dv/dt		(Note 3)	20	V/IIS
D	Dower Dissinction	(T _C = 25°C)		592	W
P_{D}	Power Dissipation	- Derate Above 25°C		4.74	W/°C
T _J , T _{STG}	Operating and Storage Tem	perature Range		-55 to +150	°C
T _L	Maximum Lead Temperature 1/8" from Case for 5 Second	•		300	°C

Thermal Characteristics

Symbol	Parameter FCH043N60			
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.21	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. 40		· C/VV	

Package Marking and Ordering Information

Ĭ	Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
Ī	FCH043N60	FCH043N60	TO-247	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	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}, T_C = 25^{\circ}\text{C}$	600	-	-	\/
BV _{DSS} Drain to Source Breakdown Voltage	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}, T_C = 150^{\circ}\text{C}$	650	-	-	V	
ΔBV _{DSS} / ΔΤ _J	Breakdown Voltage Temperature Coefficient	I _D = 10 mA, Referenced to 25°C	-	0.67	-	V/°C
1	Zero Gate Voltage Drain Current	V _{DS} = 600 V, V _{GS} = 0 V	-	-	1	μА
IDSS	Zero Gate Voltage Drain Gurrent	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	4.5	-	μΛ
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±20 V, V _{DS} = 0 V	-	-	±100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	2.5	-	3.5	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10 V, I _D = 38 A	-	37	43	$m\Omega$
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 38 A	-	73	- 1	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V - 400 V V - 0 V	-	9194	12225	pF
C _{oss}	Output Capacitance	V _{DS} = 400 V, V _{GS} = 0 V, f = 1 MHz	-	353	470	pF
C _{rss}	Reverse Transfer Capacitance	1 = 1 Wil 12	-	11	16	pF
C _{oss} eff.	Effective Output Capacitance	V _{DS} = 0 V to 480 V, V _{GS} = 0 V	-	730	-	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 380 V, I _D = 38 A,	-	163	215	nC
Q _{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	35	-	nC
Q _{gd}	Gate to Drain "Miller" Charge	(Note 4)	-	39	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	1.1	-	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	46	102	ns
t _r	Turn-On Rise Time	$V_{DD} = 380 \text{ V}, I_D = 38 \text{ A},$	-	36	82	ns
t _{d(off)}	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_{G} = 4.7 \Omega$	- /	162	334	ns
t _f	Turn-Off Fall Time	(Note 4)	-	6	-	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Did	Maximum Continuous Drain to Source Diode Forward Current			75	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current			-	225	Α
V_{SD}	Drain to Source Diode Forward Voltage V _{GS} = 0 V, I _{SD} = 38 A		-	-	1.2	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 38 \text{ A},$	-	605	-	ns
Q _{rr}	Reverse Recovery Charge dI _F /dt = 100 A/μs		-	16	-	μС

Notes

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. I_{AS} = 15 A, R_G = 25 Ω , starting T_J = 25°C.
- 3. I $_{SD} \leq$ 38 A, di/dt \leq 200 A/µs, V $_{DD} \leq$ 380V, starting T $_{J}$ = 25°C.
- 4. Essentially independent of operating temperature.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

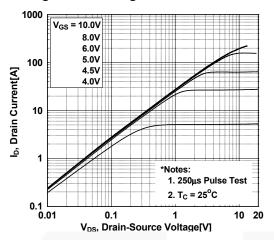


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

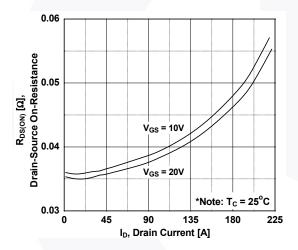


Figure 5. Capacitance Characteristics

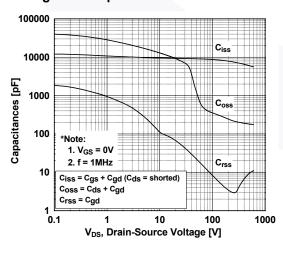


Figure 2. Transfer Characteristics

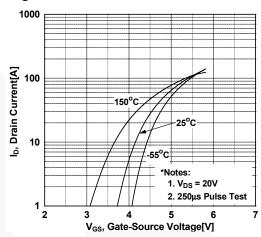


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

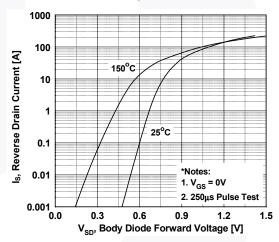
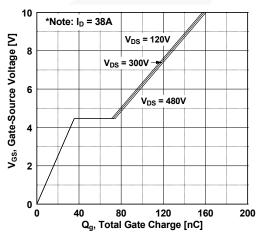


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

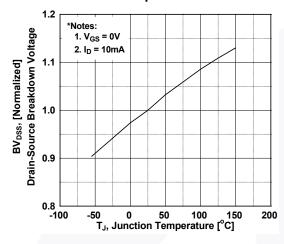


Figure 9. Maximum Safe Operating Area

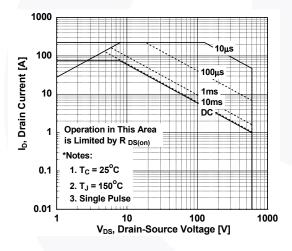


Figure 11. Eoss vs. Drain to Source Voltage Switching Capability

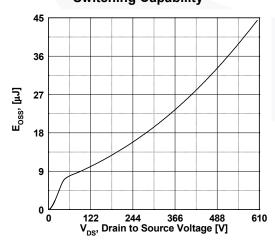


Figure 8. On-Resistance Variation vs. Temperature

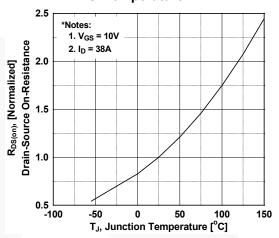
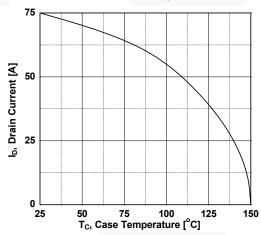


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve

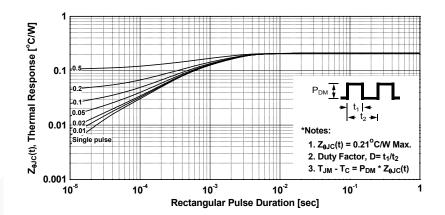


Figure 13. Gate Charge Test Circuit & Waveform

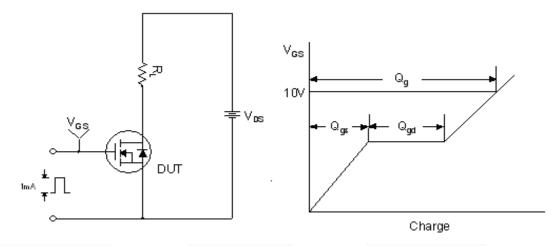


Figure 14. Resistive Switching Test Circuit & Waveforms

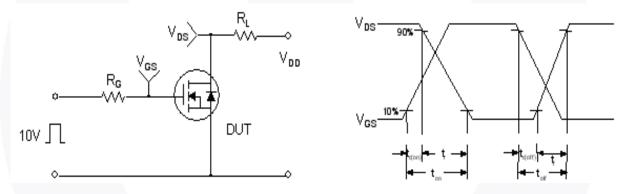
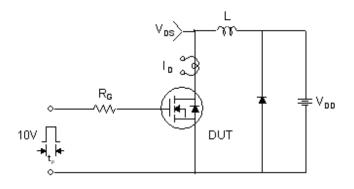
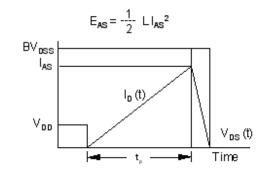


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms





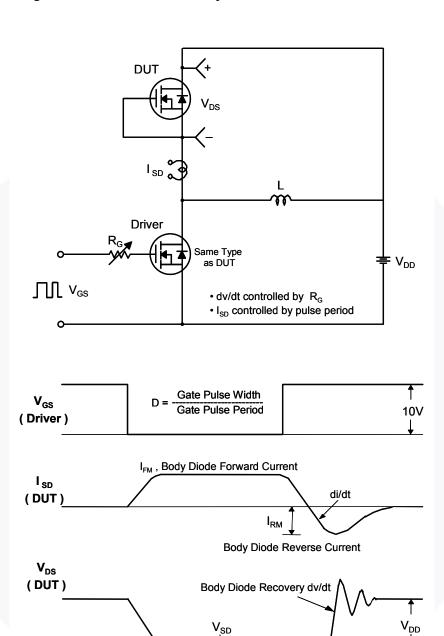
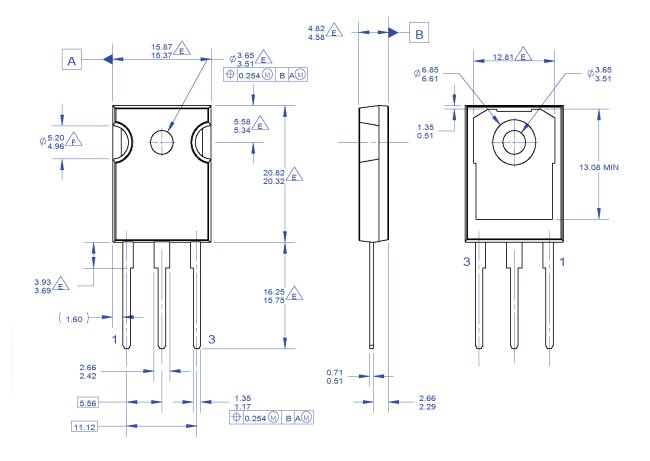


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Body Diode Forward Voltage Drop

Mechanical Dimensions

TO-247 3L



NOTES: UNLESS OTHERWISE SPECIFIED

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Figure 17. TO-247, Molded, 3 Lead, Jedec Variation AB

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