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FCH072N60

August 2014

N-Channel SuperFET® II MOSFET

600 V, 52 A, 72 mΩ

Features

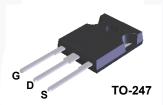
- 650 V @ T_J = 150°C
- Typ. $R_{DS(on)}$ = 66 m Ω
- Ultra Low Gate Charge (Typ. Q_g = 95 nC)
- Low Effective Output Capacitance (Typ. C_{oss(eff.)} = 421 pF)
- 100% Avalanche Tested
- · RoHS Compliant

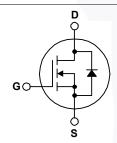
Applications

- · 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		FCH072N60	Unit
V _{DSS}	Drain to Source Voltage			600	V
	Cata ta Cauraa Valtana	- DC		±20	V
V_{GSS}	Gate to Source Voltage	- AC (f > 1	1 Hz)	±30	_ v
	Drain Current	- Continuous (T _C = 25°C)	1	52	Α
ID	Drain Current	- Continuous (T _C = 100°C)		33	_ A
I _{DM}	Drain Current	- Pulsed (No	ote 1)	156	Α
E _{AS}	Single Pulsed Avalanche Energy	(No	ote 2)	1128	mJ
I _{AR}	Avalanche Current	(No	ote 1)	9.5	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		ote 1)	4.8	mJ
	MOSFET dv/dt			100	1//20
dv/dt	Peak Diode Recovery dv/dt (Note 3)			20	V/ns
D	Davies Dissination	$(T_C = 25^{\circ}C)$		481	W
P_{D}	Power Dissipation	- Derate Above 25°C		3.85	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T _L	Maximum Lead Temperature for S	oldering, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FCH072N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.26	°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
FCH072N60	FCH072N60	TO-247	Tube	N/A	N/A	30 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Chara	cteristics					
D\/	Drain to Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 10 \text{ mA}, T_J = 25^{\circ}\text{C}$	600	-	-	V
BV _{DSS}	Drain to Source Breakdown voltage	$V_{GS} = 0 \text{ V}, I_D = 10 \text{ mA}, T_J = 150^{\circ}\text{C}$	650	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 10 mA, Referenced to 25°C	-	0.67	-	V/°C
ı	Zero Gate Voltage Drain Current	V _{DS} = 600 V, V _{GS} = 0 V	-	-	1	μA
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	4.1	-	μΑ
I _{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	±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	$V_{GS} = 10 \text{ V}, I_D = 26 \text{ A}$	-	66	72	mΩ
9 _{FS}	Forward Transconductance	$V_{DS} = 20 \text{ V}, I_{D} = 26 \text{ A}$	-	48	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 380 V, V _{GS} = 0 V, f = 1 MHz		4430	5890	pF
Coss	Output Capacitance			115	155	pF
C _{rss}	Reverse Transfer Capacitance			4.43	-	pF
C _{oss(eff.)}	Effective Output Capacitance	V _{DS} = 0 V to 480 V, V _{GS} = 0 V	-	421	-	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 380 V, I _D = 26 A,	-	95	125	nC
Q_{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	21	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	(Note 4)	-	24	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	0.93	-	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time			-	33	76	ns
t _r	Turn-On Rise Time	$V_{DD} = 380 \text{ V}, I_D = 26 \text{ A},$		- /	23	56	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_g = 4.7 Ω		-/	97	204	ns
t _f	Turn-Off Fall Time		(Note 4)	-	3.5	17	ns

Drain-Source Diode Characteristics

Is	Maximum Continuous Drain to Source Diode Forward Current			-	52	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	156	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 26 A	-	-	1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 26 A,	-	495	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	13	-	μС

Notes:

- 1. Repetitive rating: pulse width limited by maximum junction temperature.
- 2. I_{AS} = 9.5 A, R_{G} = 25 Ω , Starting T_{J} = 25°C
- 3. $I_{SD} \le$ 26 A, di/dt \le 200 A/ μ s, $V_{DD} \le$ 380 V, Starting T_J = 25°C
- 4. Essentially independent of operating temperature.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

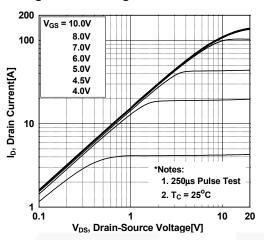


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

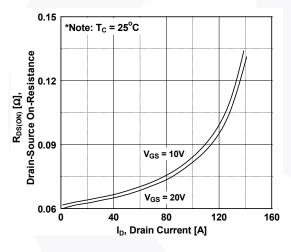


Figure 5. Capacitance Characteristics

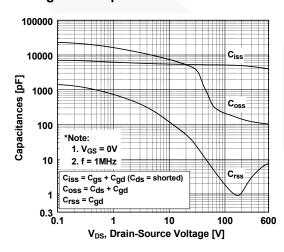


Figure 2. Transfer Characteristics

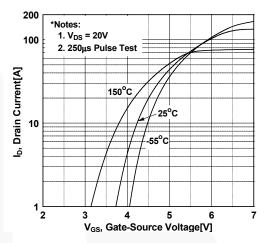


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

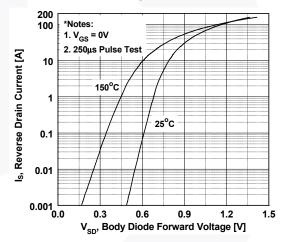
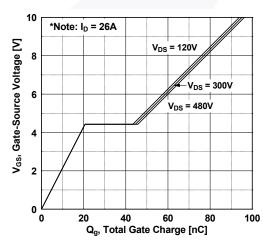


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

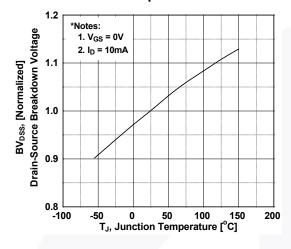


Figure 9. Maximum Safe Operating Area

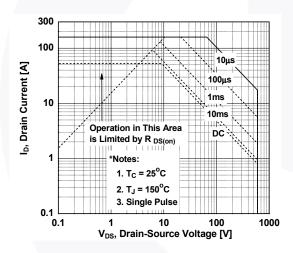


Figure 11. Eoss vs. Drain to Source Voltage

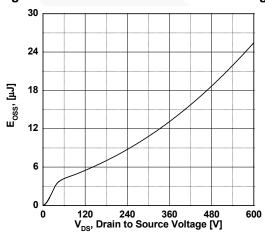


Figure 8. On-Resistance Variation vs. Temperature

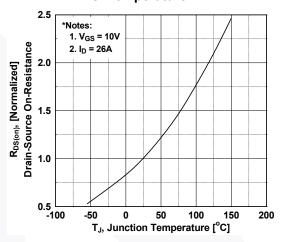
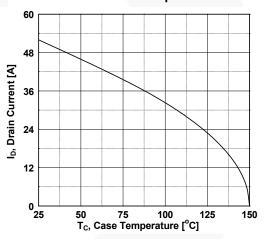


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve

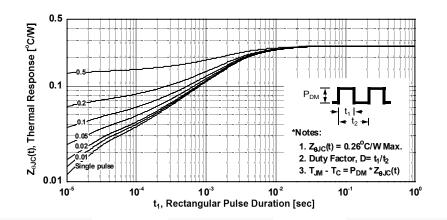


Figure 13. Gate Charge Test Circuit & Waveform

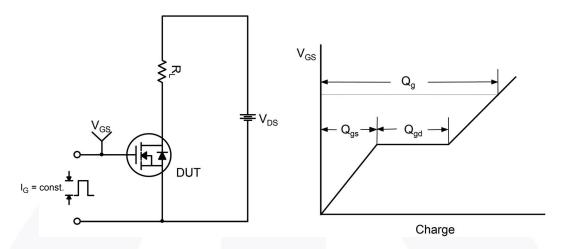


Figure 14. Resistive Switching Test Circuit & Waveforms

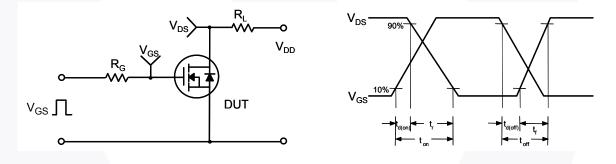
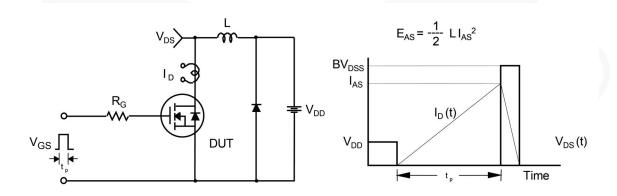


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms



Dut

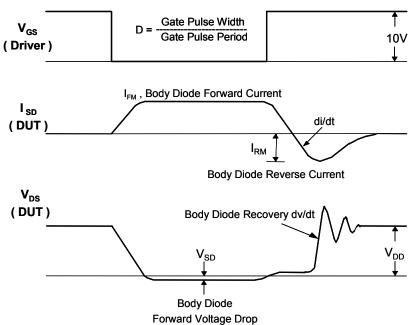
VDS

VDS

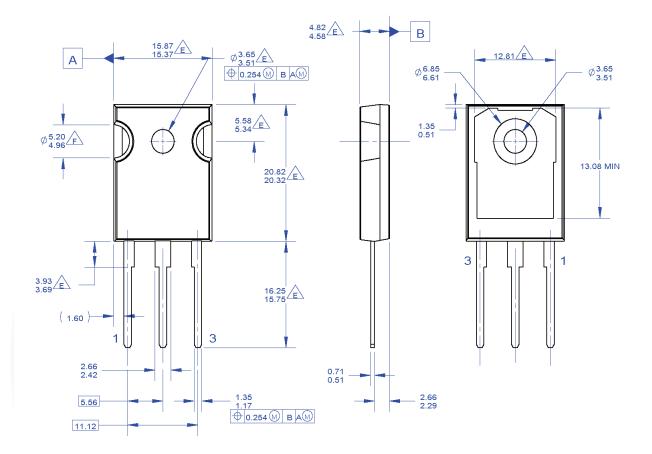
Same Type
as DUT

• dv/dt controlled by R_G
• l_{SD} controlled by pulse period

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



Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIF BAR EXTRUSIONS
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DRAWING CONFORMS TO ASME Y14.5 1994

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G. DRAWING FILENAME: MKT-TO247A03_REV03

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

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