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FCH47N60

N-Channel SuperFET® MOSFET

600 V, 47 A, 70 mΩ

Features

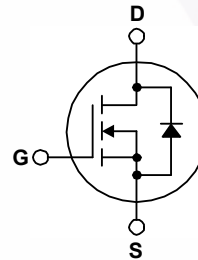
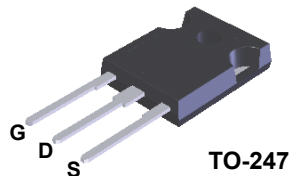
- 650 V @ $T_J = 150^\circ\text{C}$
- Typ. $R_{DS(on)} = 58\text{ m}\Omega$
- Ultra Low Gate Charge (Typ. $Q_g = 210\text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)} = 420\text{ pF}$)
- 100% Avalanche Tested
- RoHS Compliant

Applications

- Solar Inverter
- AC-DC Power Supply

Description

SuperFET® MOSFET is Fairchild Semiconductor's first generation of high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. Consequently, SuperFET MOSFET is very suitable for the switching power applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications.



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FCH47N60_F133	Unit
V_{DSS}	Drain to Source Voltage	600	V
I_D	Drain Current	Continuous ($T_C = 25^\circ\text{C}$)	47
		Continuous ($T_C = 100^\circ\text{C}$)	29.7
I_{DM}	Drain Current	Pulsed (Note 1)	141
V_{GSS}	Gate to Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1800
I_{AR}	Avalanche Current	(Note 1)	47
E_{AR}	Repetitive Avalanche Energy	(Note 1)	41.7
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	417
		Derate Above 25°C	3.33
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FCH47N60_F133	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Case-to-Sink, Typ.	0.24	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	41.7	$^\circ\text{C/W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH47N60_F133	FCH47N60	TO-247	Tube	N/A	N/A	30 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}, T_C = 25^\circ\text{C}$	600	-	-	V
		$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}, T_C = 150^\circ\text{C}$	-	650	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	-	0.6	-	$V/^\circ\text{C}$
BV_{DS}	Drain to Source Avalanche Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 47\text{ A}$	-	700	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$	-	-	10	
I_{GSS}	Gate-to-Body Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain-to-Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 23.5\text{ A}$	-	0.058	0.070	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 23.5\text{ A}$	-	40	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	-	5900	8000	pF
C_{oss}	Output Capacitance		-	3200	4200	pF
C_{rss}	Reverse Transfer Capacitance		-	250	-	pF
C_{oss}	Output Capacitance	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	-	160	-	pF
$C_{oss(eff.)}$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	420	-	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay	$V_{DD} = 300\text{ V}, I_D = 47\text{ A}, V_{GS} = 10\text{ V}, R_G = 25\ \Omega$	-	185	430	ns	
t_r	Turn-On Rise Time		-	210	450	ns	
$t_{d(off)}$	Turn-Off Delay		-	520	1100	ns	
t_f	Turn-Off Fall Time		(Note 4)	-	75	160	ns
$Q_{g(tot)}$	Total Gate Charge at 10 V		$V_{DS} = 480\text{ V}, I_D = 47\text{ A}, V_{GS} = 10\text{ V}$	-	210	270	nC
Q_{gs}	Gate to Source Gate Charge		(Note 4)	-	38	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	(Note 4)	-	110	-	nC	

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain-to-Source Diode Forward Current	-	-	47	A	
I_{SM}	Maximum Pulsed Drain-to-Source Diode Forward Current	-	-	141	A	
V_{SD}	Drain-to-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 47\text{ A}$	-	-	1.4	V
t_{rr}	Reverse-Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 47\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$	-	590	-	ns
Q_{rr}	Reverse-Recovery Charge	$V_{GS} = 0\text{ V}, I_{SD} = 47\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$	-	25	-	μC

Notes:

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2. $I_{AS} = 18\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 48\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Performance Characteristics

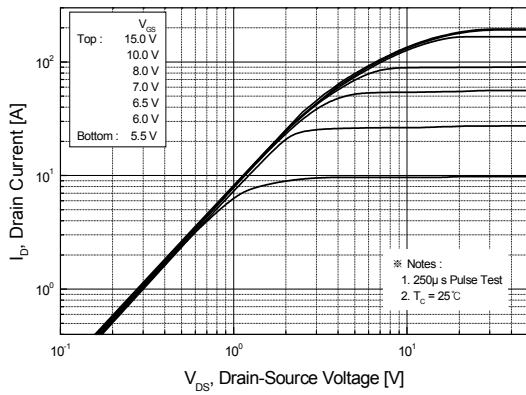


Figure 1. On-Region Characteristics

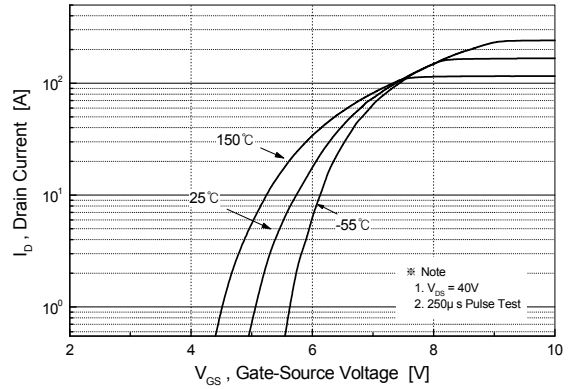


Figure 2. Transfer Characteristics

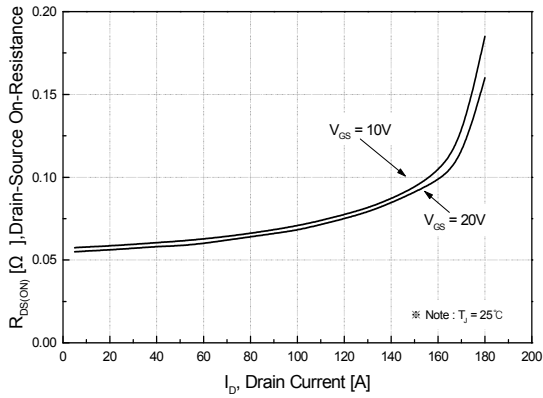


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

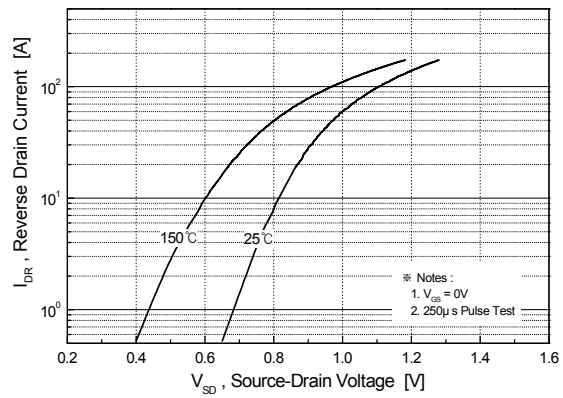


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

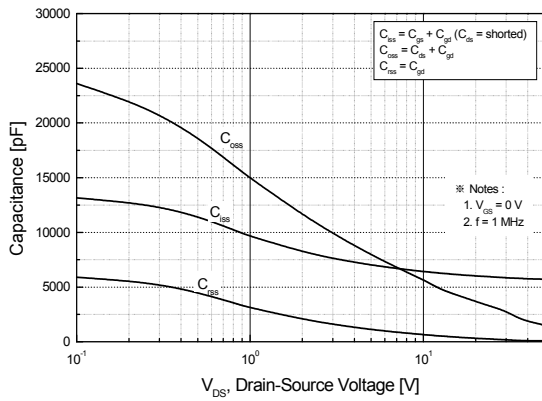


Figure 5. Capacitance Characteristics

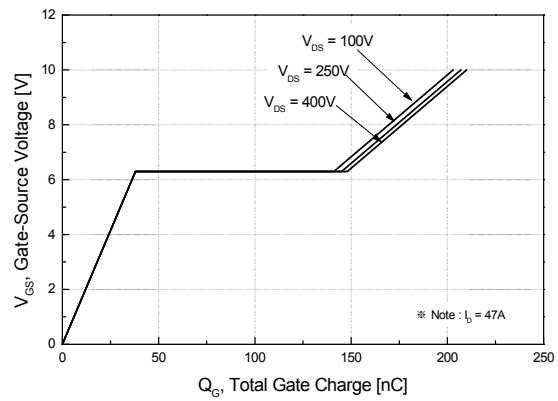


Figure 6. Gate Charge Characteristics

Typical Performance Characteristics (Continued)

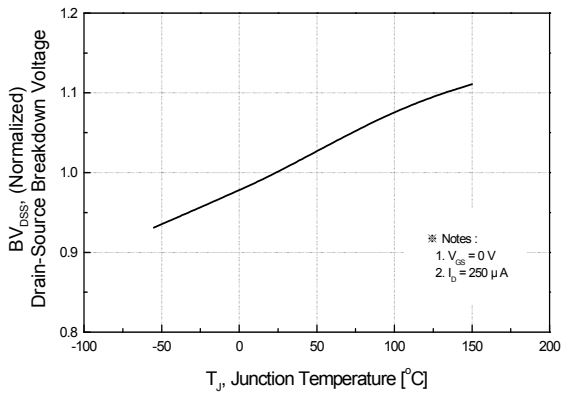


Figure 7. Breakdown Voltage Variation vs. Temperature

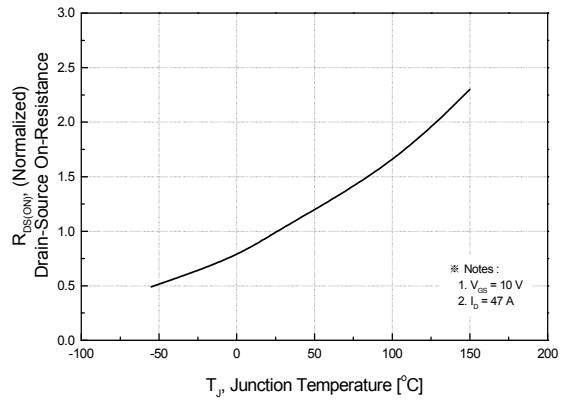


Figure 8. On-Resistance Variation vs. Temperature

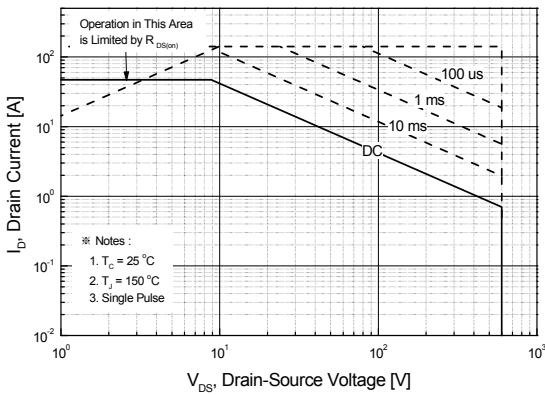


Figure 9. Safe Operating Area

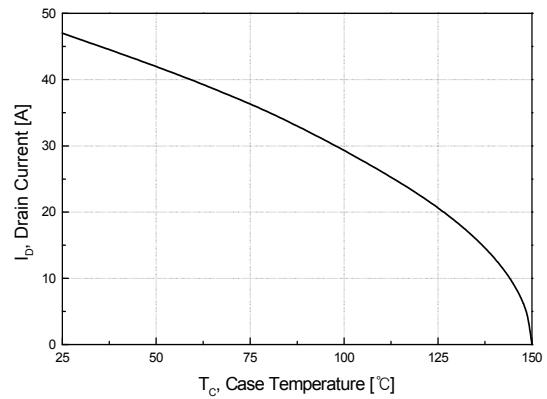


Figure 10. Maximum Drain Current vs. Case Temperature

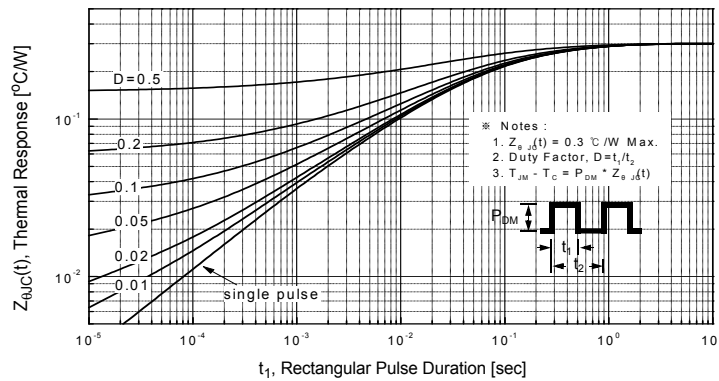


Figure 11. Transient Thermal Response Curve



Figure 13. Gate Charge Test Circuit & Waveform



Figure 14. Resistive Switching Test Circuit & Waveforms

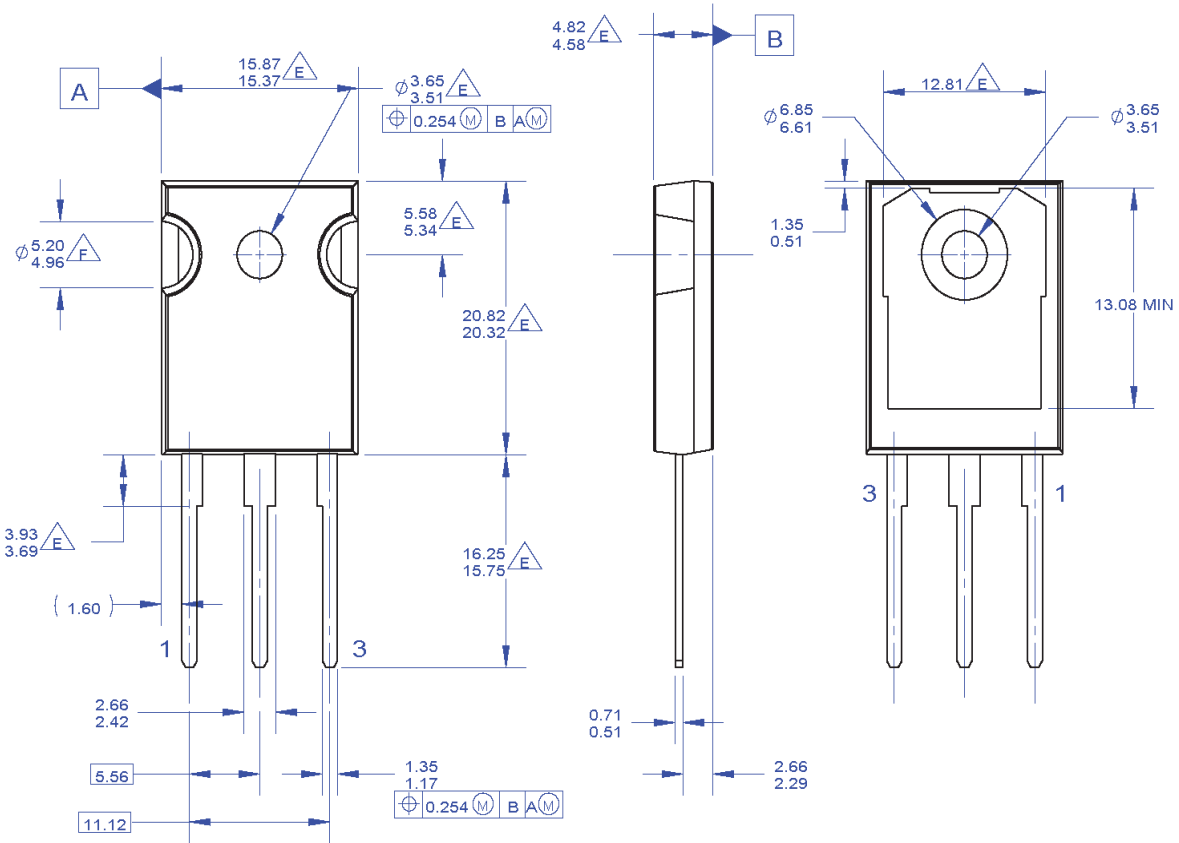


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms



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

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED.

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- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE 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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