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November 2013

FCP380N60 / FCPF380N60

N-Channel SuperFET[®] II MOSFET 600 V, 10.2 A, 380 m Ω

Features

- 650 V @ T_{.1} = 150°C
- Typ. $R_{DS(on)}$ = 330 m Ω
- Ultra Low Gate Charge (Typ. Q_q = 30 nC)
- Low Effective Output Capacitance (Typ. C_{oss(eff.)} = 95 pF)
- · 100% Avalanche Tested
- · RoHS Compliant

Applications

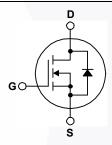
- · LCD / LED / PDP TV Lighting
- · Solar Inverter
- AC-DC Power Supply

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 technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. Consequently, SuperFET II MOSFET is very suitable for the switching power applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications.







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

Symbol		Parameter			FCPF380N60	Unit	
V_{DSS}	Drain to Source Voltage		6	V			
V	- DC			±20		.,	
V_{GSS}	Gate to Source Voltage	- AC	(f > 1 Hz)	±	30	V	
	Dunin Command	- Continuous (T _C = 25°C)		10.2	10.2*	^	
ID	Drain Current	- Continuous (T _C = 100°C)		6.4	6.4*	Α	
I _{DM}	Drain Current	- Pulsed	(Note 1)	30.6	30.6*	Α	
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		211.6		mJ		
I _{AR}	Avalanche Current		(Note 1)	2.3		Α	
E _{AR}	Repetitive Avalanche Energy		(Note 1)	1.06		mJ	
dv/dt	MOSFET dv/dt			100		Mag	
av/at	Peak Diode Recovery dv/dt		(Note 3)	20		V/ns	
Б	Dower Dissipation	(T _C = 25°C)		106	31	W	
P_{D}	Power Dissipation - Derate Above 25°C			0.85	0.25	W/°C	
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150		°C		
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		3	00	°С		

^{*}Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	FCP380N60	FCPF380N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.18	4	°C/W
$R_{\theta,JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	62.5	C/VV

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCP380N60	FCP380N60	TO-220	Tube	N/A	N/A	50 units
FCPF380N60	FCPF380N60	TO-220F	Tube	N/A	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Chara	cteristics					
BV _{DSS}	SS Drain to Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 10 \text{ mA}, T_J = 25^{\circ}\text{C}$	600	-	-	V
DVDSS		$V_{GS} = 0 \text{ V}, I_D = 10 \text{ mA}, T_J = 150^{\circ}\text{C}$	-	650	-	, v
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 10 mA, Referenced to 25°C	-	0.6	-	V/°C
BV _{DS}	Drain to Source Avalanche Breakdown Voltage	V _{GS} = 0 V, I _D = 10 A	-	700	-	V
	Zero Gate Voltage Drain Current	V _{DS} = 480 V, V _{GS} = 0 V	-	-	1	^
I _{DSS} Zero Ga	Zeio Gale vollage Dialii Cuiteili	$V_{DS} = 480 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	10	μΑ
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	$V_{GS} = 10 \text{ V}, I_D = 5 \text{ A}$	-	0.33	0.38	Ω
9 _{FS}	Forward Transconductance	$V_{DS} = 20 \text{ V}, I_{D} = 5 \text{ A}$	-	11	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V - 25 V V - 0 V	-	1250	1665	pF
C _{oss}	Output Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	905	1205	pF
C _{rss}	Reverse Transfer Capacitance	1 11112	-	45	60	pF
C _{oss}	Output Capacitance	V_{DS} = 380 V, V_{GS} = 0 V, f = 1 MHz	-	23	-	pF
C _{oss(eff.)}	Effective Output Capacitance	$V_{DS} = 0 V \text{ to } 480 V, V_{GS} = 0V$	-	95	-	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 380 V, I _D = 5 A,	-	30	40	nC
Q_{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	5	-	nC
Q _{gd}	Gate to Drain "Miller" Charge	(Note 4)	-	10	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	1	1	-	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		/ · -	14	38	ns
t _r		$V_{DD} = 380 \text{ V}, I_D = 5 \text{ A},$	-	7	24	ns
t _{d(off)}	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	45	100	ns
t _f	Turn-Off Fall Time	(Note 4)	-	6	22	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	10.2	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	30.6	Α
V _{SD}	Drain to Source Diode Forward Voltage V _{GS} =	0 V, I _{SD} = 5 A	-	-	1.2	V
t _{rr}	Reverse Recovery Time V _{GS} =	0 V, I _{SD} = 5 A,	-	240	_	ns
Q _{rr}		= 100 A/μs	-	2.7	-	μC

Notes

- ${\bf 1.} \ {\bf Repetitive} \ {\bf rating:} \ {\bf pulse-width} \ limited \ {\bf by} \ {\bf maximum} \ junction \ temperature.$
- 2. I_{AS} = 2.3 A, V_{DD} = 50 V, R_G = 25 Ω , starting T_J = 25°C.
- 3. $I_{SD} \le 5.1$ A, di/dt ≤ 200 A/ μ s, $V_{DD} \le BV_{DSS}$, starting T_J = 25°C.
- 4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

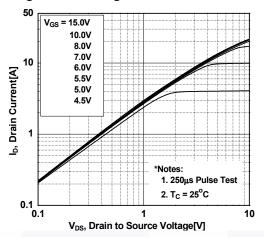


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

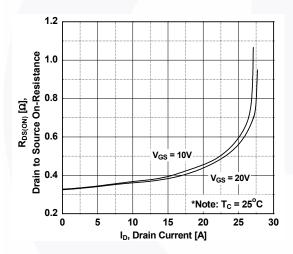


Figure 5. Capacitance Characteristics

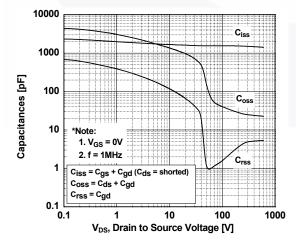


Figure 2. Transfer Characteristics

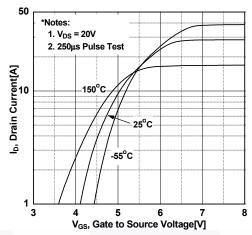


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

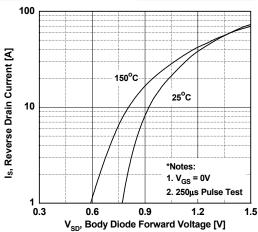
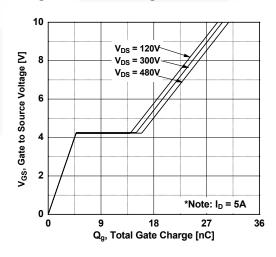


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

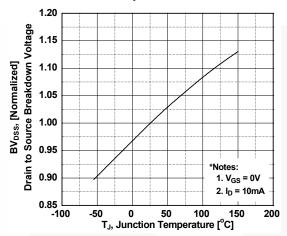


Figure 9. Maximum Safe Operating Area for FCP380N60

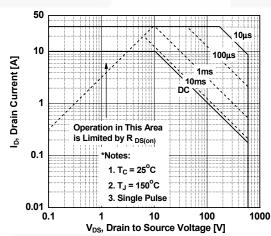


Figure 11. Maximum Drain Current vs. Case Temperature

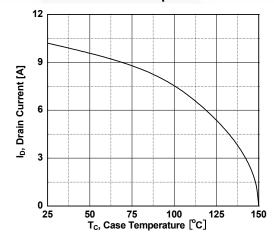


Figure 8. On-Resistance Variation vs. Temperature

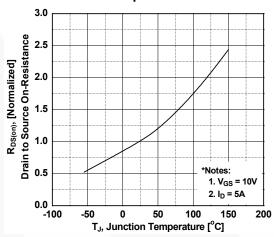


Figure 10. Maximum Safe Operating Area for FCPF380N60

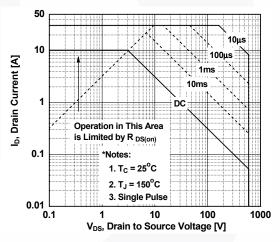
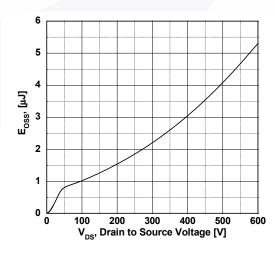


Figure 12. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve for FCP380N60

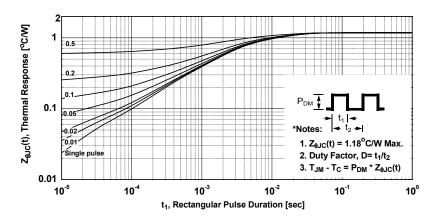
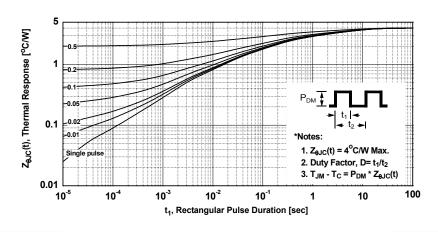


Figure 14. Transient Thermal Response Curve for FCPF380N60



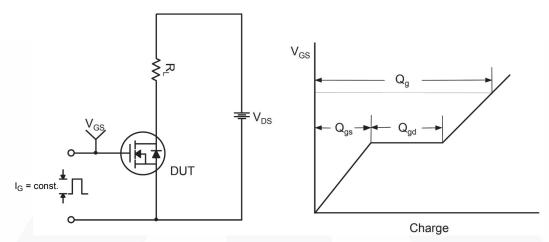


Figure 15. Gate Charge Test Circuit & Waveform

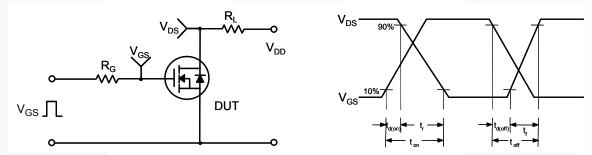


Figure 16. Resistive Switching Test Circuit & Waveforms

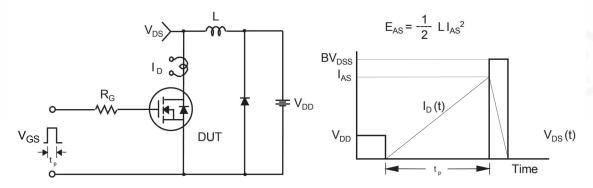


Figure 17. Unclamped Inductive Switching Test Circuit & Waveforms

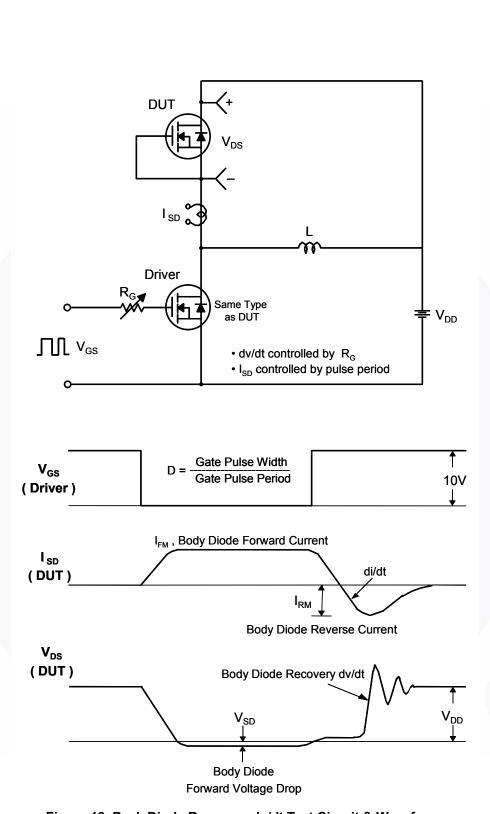
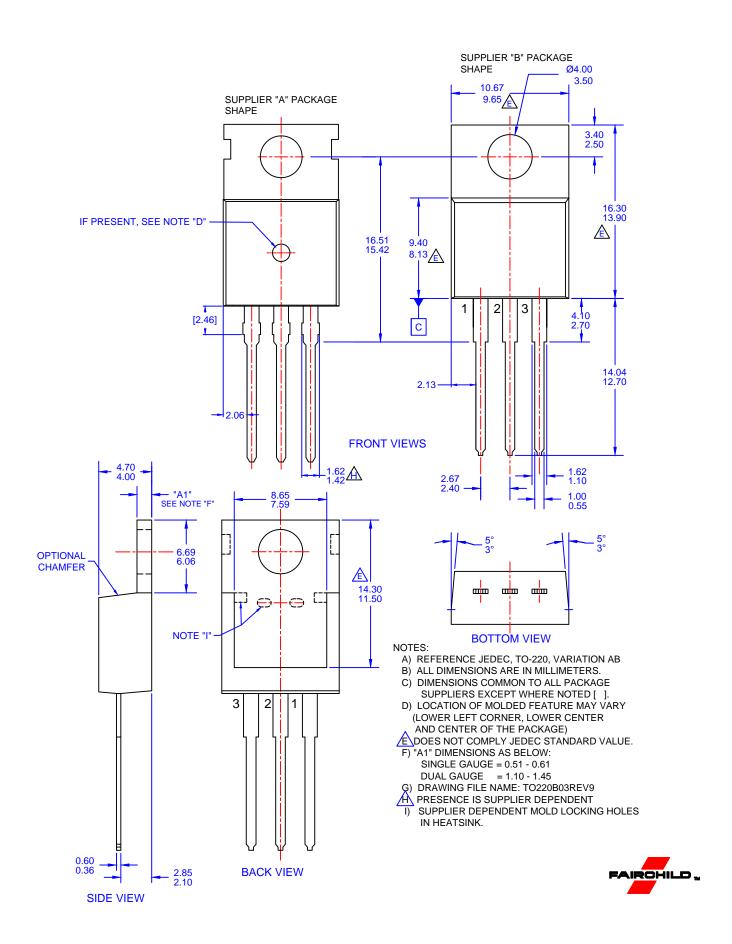
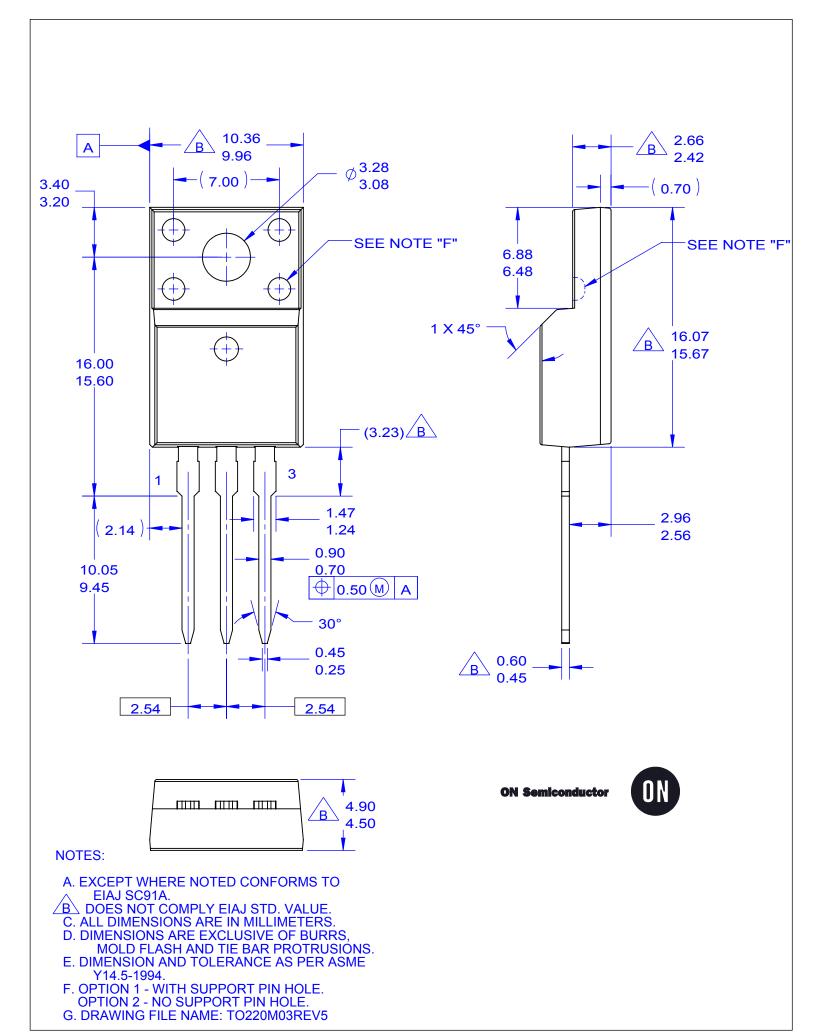


Figure 18. Peak Diode Recovery dv/dt Test Circuit & Waveforms





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