FCP190N60 / FCPF190N60

N-Channel SuperFET® II MOSFET

600 V, 20.2 A, 199 mΩ

Features

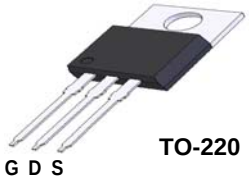
- 650 V @T_J = 150°C
- Max. $R_{DS(on)}$ = 199 mΩ
- Ultra low gate charge (Typ. Q_g = 57 nC)
- Low effective output capacitance (Typ. C_{oss}.eff = 160 pF)
- 100% avalanche tested

Applications

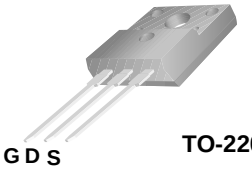
- LCD / LED / PDP TV Lighting
- Solar Inverter
- AC-CD Power Supply

Description

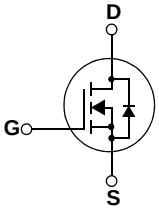
SuperFET®II MOSFET is Fairchild Semiconductor®'s first generation of high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance.This advanced technology is tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. Consequently, SuperFETII MOSFET is suitable for various AC/DC power conversion for system miniaturization and higher efficiency.



TO-220



TO-220F



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			FCP190N60	FCPF190N60	Unit
V_{DSS}	Drain to Source Voltage			600		V
V_{GSS}	Gate to Source Voltage	-DC		±20		V
		-AC	(f > 1 Hz)	±30		
I_D	Drain Current	-Continuous (T_C = 25°C)		20.2	20.2*	A
		-Continuous (T_C = 100°C)		12.7	12.7*	
I_{DM}	Drain Current	- Pulsed	(Note 1)	60.6	60.6*	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	400		mJ
I_{AR}	Avalanche Current		(Note 1)	4.0		A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	2.1		mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	20		V/ns
	MOSFET dv/dt			100		V/ns
P_D	Power Dissipation	(T_C = 25°C)		208	39	W
		- Derate above 25°C		1.67	0.31	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150		°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300		°C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FCP190N60	FCPF190N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.6	3.2	°C/W
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink (Typical)	0.5	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCP190N60	FCP190N60	TO-220	-	-	50
FCPF190N60	FCPF190N60	TO-220F	-	-	50

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS} = 0 V, I_D = 10 mA, T_J = 25°C	600	-	-	V
		V_{GS} = 0 V, I_D = 10 mA, T_J = 150°C	650	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C	-	0.67	-	V/°C
BV_{DS}	Drain-Source Avalanche Breakdown Voltage	V_{GS} = 0 V, I_D = 20 A	-	700	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 480 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 480 V, T_C = 125°C	-	-	10	
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 µA	2.5	-	3.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 10 A	-	0.17	0.199	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 10 A	-	21	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V f = 1 MHz	-	2220	2950	pF
C_{oss}	Output Capacitance		-	1630	2165	pF
C_{rss}	Reverse Transfer Capacitance		-	85	128	pF
C_{oss}	Output Capacitance	V_{DS} = 380 V, V_{GS} = 0 V, f = 1.0 MHz	-	42	-	pF
C_{oss} eff.	Effective Output Capacitance	V_{DS} = 0 V to 480 V, V_{GS} = 0 V	-	160	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 380 V, I_D = 10 A V_{GS} = 10 V (Note 4)	-	57	74	nC
Q_{gs}	Gate to Source Gate Charge		-	9	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	21	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz		1		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 380 V, I_D = 10 A V_{GS} = 10 V, R_g = 4.7 Ω (Note 4)	-	20	50	ns
t_r	Turn-On Rise Time		-	10	30	ns
$t_{d(off)}$	Turn-Off Delay Time		-	64	138	ns
t_f	Turn-Off Fall Time		-	5	20	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	20.2	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	60.6	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 10 A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 10 A dI_F/dt = 100 A/µs	-	280	-	ns
Q_{rr}	Reverse Recovery Charge		-	3.8	-	µC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 4 A, V_{DD} = 50 V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 10 A, di/dt ≤ 200 A/µs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

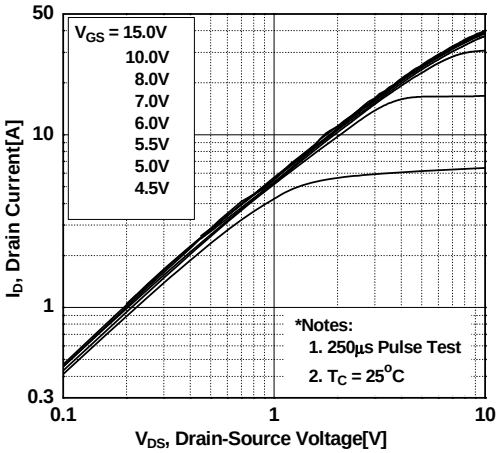


Figure 2. Transfer Characteristics

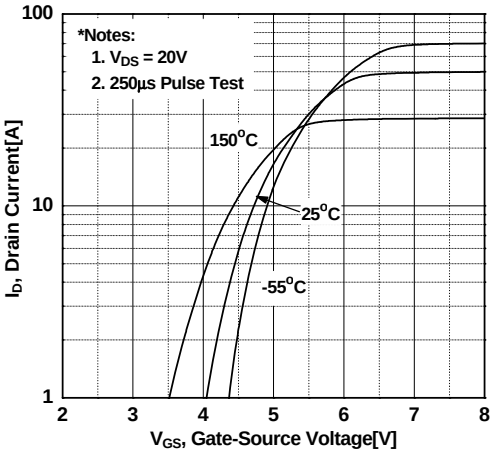


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

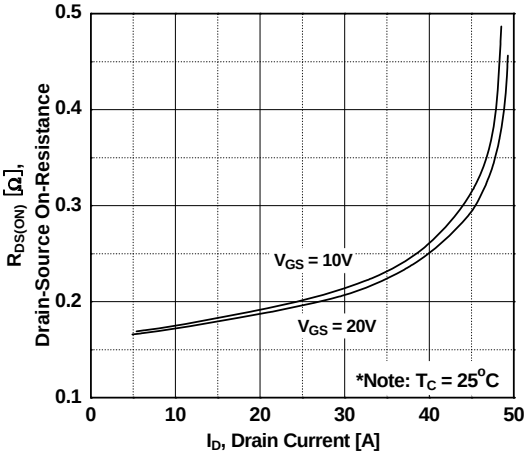


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

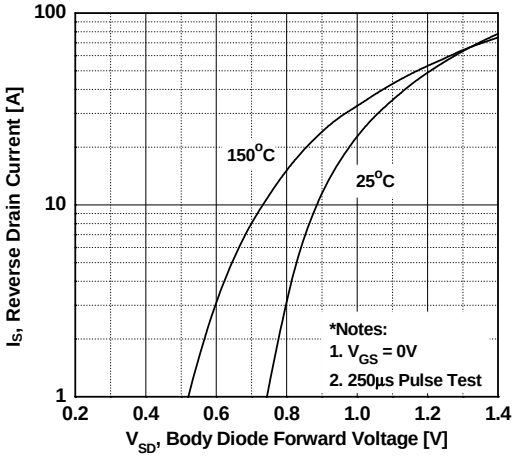


Figure 5. Capacitance Characteristics

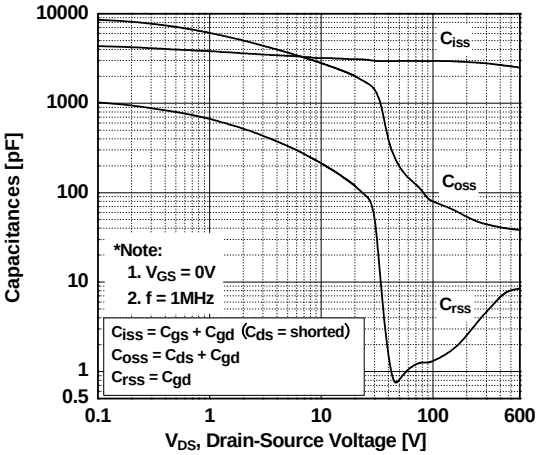


Figure 6. Gate Charge Characteristics