FCP20N60 / FCPF20N60

N-Channel SuperFET® MOSFET

600 V, 20 A, 190 mΩ

Features

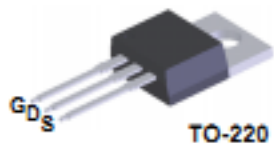
- 650V @ T_J = 150°C
- Typ. $R_{DS(on)}$ = 150 mΩ
- Ultra Low Gate Charge (Typ. Q_g = 75 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 165 pF)
- 100% Avalanche Tested

Applications

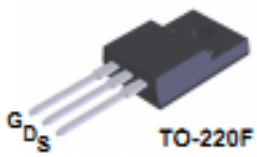
- Solar Inverter
- AC-DC Power Supply

Description

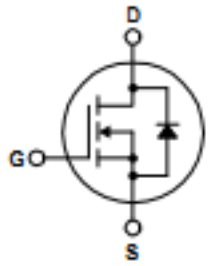
SuperFET® MOSFET is Fairchild Semiconductor's first generation of high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching 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.



TO-220



TO-220F



Absolute Maximum Ratings

Symbol	Parameter	FCP20N60	FCPF20N60	Unit
V_{DSS}	Drain-Source Voltage	600		V
I_D	Drain Current • Continuous (T_C = 25°C) • Continuous (T_C = 100°C)	20 12.5	20* 12.5*	A A
I_{DM}	Drain Current • Pulsed (Note 1)	60	60*	A
V_{GSS}	Gate-Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	690		mJ
I_{AR}	Avalanche Current (Note 1)	20		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	20.8		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation (T_C = 25°C) • Derate Above 25°C	208 1.67	39 0.3	W 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	300		°C

*Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	FCP20N60	FCPF20N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.6	3.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCP20N60	FCP20N60	TO-220	Tube	N/A	N/A	50 units
FCPF20N60	FCPF20N60	TO-220F	Tube	N/A	N/A	50 units

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	I_D = 250 μA, V_{GS} = 0 V, T_J = 25°C	600	-	-	V
		I_D = 250 μA, V_{GS} = 0 V, T_J = 150°C	-	650	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.6	-	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} = 600 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} = ±30 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 10 A	-	0.15	0.19	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 10 A	-	17	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	-	2370	3080	pF
C_{oss}	Output Capacitance		-	1280	1665	pF
C_{rss}	Reverse Transfer Capacitance		-	95	-	pF
C_{oss}	Output Capacitance	V_{DS} = 480 V, V_{GS} = 0 V, f = 1 MHz	-	65	85	pF
$C_{oss(eff.)}$	Effective Output Capacitance	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	-	165	-	pF
Q_g	Total Gate Charge at 10V	V_{DS} = 480 V, I_D = 20 A, V_{GS} = 10 V (Note 4)	-	75	98	nC
Q_{gs}	Gate to Source Gate Charge		-	13.5	18	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	38	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 300 V, I_D = 20 A, V_{GS} = 10 V, R_G = 25 Ω (Note 4)	-	62	135	ns
t_r	Turn-On Rise Time		-	140	290	ns
$t_{d(off)}$	Turn-Off Delay Time		-	230	470	ns
t_f	Turn-Off Fall Time		-	65	140	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	20	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	60	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 20 A	-	-	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 20 A, dI_F/dt = 100 A/μs	-	530	-	ns
Q_{rr}	Reverse Recovery Charge		-	10.5	-	μC

Notes:

1: Repetitive rating: pulse-width limited by maximum junction temperature.

2: I_{AS} = 10 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.

3: I_{SD} ≤ 20 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.

4: Essentially independent of operating temperature typical characteristics.