FCP7N60N / FCPF7N60NT

N-Channel SupreMOS® MOSFET

600 V, 6.8 A, 520 mΩ

Features

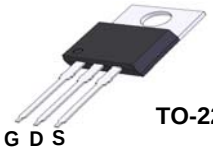
- $R_{DS(on)}$ = 460 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 3.4 A
- Ultra Low Gate Charge (Typ.Q_g = 17.8 nC)
- Low Effective Output Capacitance (Typ. C_{oss}.eff = 91 pF)
- 100% Avalanche Tested
- RoHS Compliant

Application

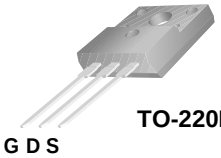
- LCD/LED TV and Monitor
- Lighting
- Solar Inverter
- AC-DC Power Supply

Description

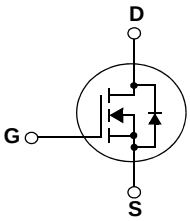
The SupreMOS® MOSFET is Fairchild Semiconductor®'s next generation of high voltage super-junction (SJ) technology employing a deep trench filling process that differentiates it from the conventional SJ MOSFETs. This advanced technology and precise process control provides lowest Rsp on-resistance, superior switching performance and ruggedness. SupreMOS MOSFET is suitable for high frequency switching power converter applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications.



TO-220



TO-220F



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FCP7N60N	FCPF7N60NT	Unit
V_{DSS}	Drain to Source Voltage		600		V
V_{GSS}	Gate to Source Voltage		±30		V
I_D	Drain Current	-Continuous (T_C = 25°C)	6.8	6.8*	A
		-Continuous (T_C = 100°C)	4.3	4.3*	
I_{DM}	Drain Current	- Pulsed (Note 1)	20.4	20.4	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	79.4		mJ
I_{AR}	Avalanche Current		6.8		A
E_{AR}	Repetitive Avalanche Energy		0.6		mJ
dv/dt	MOSFET dv/dt Ruggedness		100		V/ns
	Peak Diode Recovery dv/dt	(Note 3)	4.9		V/ns
P_D	Power Dissipation	(T_C = 25°C)	64.1	30.5	W
		- Derate above 25°C	0.51	0.24	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	FCP7N60N	FCPF7N60NT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.95	4.1	°C/W
$R_{\theta CS}$	Thermal Resistance, Case to Heak 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
FCP7N60N	FCP7N60N	TO-220AB	-	-	50
FCPF7N60NT	FCPF7N60NT	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	I_D = 1 mA, V_{GS} = 0 V, T_C = 25°C	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 1 mA, Referenced to 25°C	-	0.6	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 480 V, V_{GS} = 0 V	-	-	10	µA
		V_{DS} = 480 V, V_{GS} = 0 V, T_C = 125°C	-	-	100	
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	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 3.4 A	-	0.46	0.52	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 3.4 A	-	8.5	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 100 V, V_{GS} = 0 V f = 1 MHz	-	719	960	pF
C_{oss}	Output Capacitance		-	30	40	pF
C_{rss}	Reverse Transfer Capacitance		-	2.1	3.2	pF
C_{oss}	Output Capacitance	V_{DS} = 380 V, V_{GS} = 0 V, f = 1 MHz	-	17	-	pF
C_{oss}eff	Effective Output Capacitance	V_{DS} = 0 V to 380 V, V_{GS} = 0 V	-	91	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 380 V, I_D = 3.4 A V_{GS} = 10 V (Note 4)	-	17.8	35.6	nC
Q_{gs}	Gate to Source Gate Charge		-	3.2	6.3	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	6.0	11.9	nC
ESR	Equivalent Series Resistance (G-S)	Drain Open	-	2.5	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 380 V, I_D = 3.4 A R_G = 4.7 Ω (Note 4)	-	12	24	ns
t_r	Turn-On Rise Time		-	6	22	ns
$t_{d(off)}$	Turn-Off Delay Time		-	35	80	ns
t_f	Turn-Off Fall Time		-	12	24	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	6.8	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	20.4	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} =3.4 A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 3.4 A dI_F/dt = 100 A/µs	-	211	-	ns
Q_{rr}	Reverse Recovery Charge		-	1.8	-	µC

Notes:
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 2.3 A, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 6.8 A, di/dt ≤ 200 A/µs, V_{DD} ≤ 380 V, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

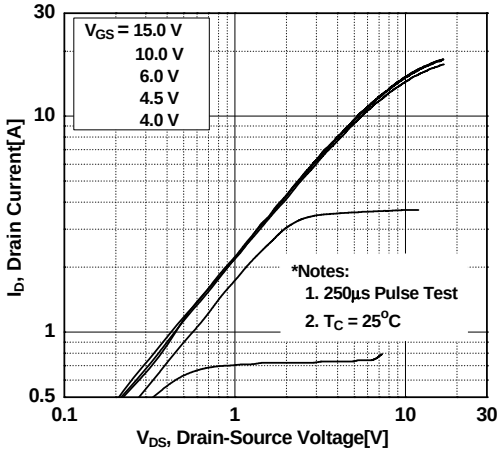


Figure 2. Transfer Characteristics

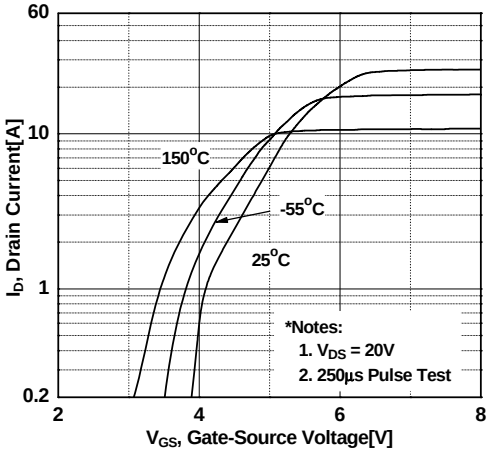


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

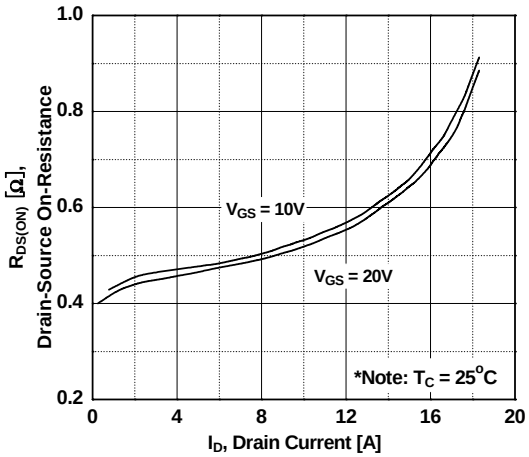


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

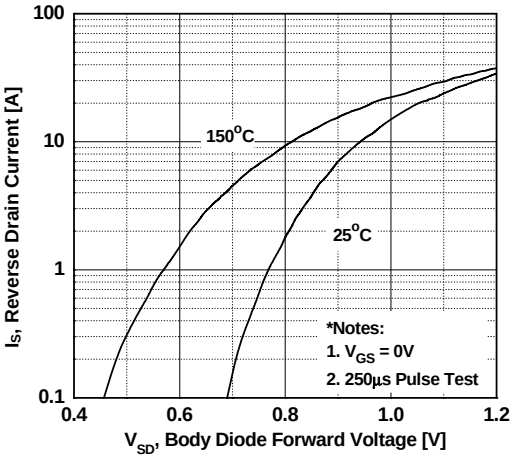


Figure 5. Capacitance Characteristics

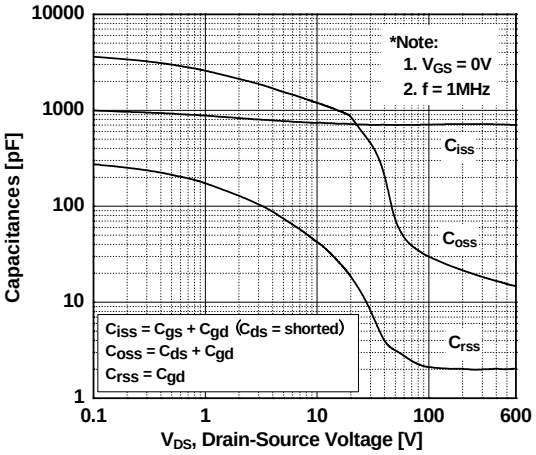


Figure 6. Gate Charge Characteristics