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FCA16N60N

May 2014

N-Channel SupreMOS[®] MOSFET 600 V, 16 A, 199 m Ω

Features

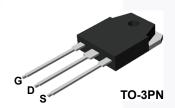
- $R_{DS(on)}$ = 170 m Ω (Typ.) @ V_{GS} = 10V, I_D = 8 A
- Ultra Low Gate Charge (Typ. Q_g = 40.2 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)} = 176 pF$)
- · 100% Avalanche Tested
- · RoHS Compliant

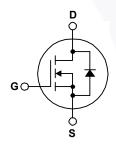
Application

- PDP TV
- · 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.





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

Symbol	Parameter			FCA16N60N	Unit
V _{DSS}	Drain to Source Voltage			600	V
V _{GSS}	Gate to Source Voltage			±30	V
	Drain Current	- Continuous (T _C = 25°C)	9	16.0	А
ID	Diam Current	- Continuous (T _C = 100°C)		10.1	A
I _{DM}	Drain Current	- Pulsed	- Pulsed (Note 1)		Α
E _{AS}	Single Pulsed Avalanche Energy (Note 2)			355	mJ
I _{AR}	Avalanche Current (Not		(Note 1)	5.3	Α
E _{AR}	Repetitive Avalanche Energy (Not			1.34	mJ
dv/dt	MOSFET dv/dt			100	V/ns
uv/ul	Peak Diode Recovery dv/c	It	(Note 3)	20	V/ns
D	Dower Dissination	(T _C = 25°C)		134.4	W
P _D Power Dissipation	Power Dissipation	- Derate Above 25°C		1.08	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	οС
TL	Maximum Lead Temperatu	ure for Soldering, 1/8" from Case for 5 Seco	nds	300	°C

Thermal Characteristics

Symbol	Parameter	FCA16N60N	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.93	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	5/44

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCA16N60N	FCA16N60N	TO-3PN	Tube	N/A	N/A	30 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	cteristics					
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 1 \text{ mA}, V_{GS} = 0 \text{ V}, T_C = 25^{\circ}\text{C}$	600	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 1 mA, Referenced to 25°C	-	0.73	-	V/°C
1	Zero Gate Voltage Drain Current	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}$	1	-	10	μА
I _{DSS} Zero	Zero Gate Voltage Drain Current	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}, T_{C} = 125^{\circ}\text{C}$	1	-	100	μΑ
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	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	2.0	-	4.0	V
R _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 8 \text{ A}$	-	0.170	0.199	Ω
g _{FS}	Forward Transconductance	$V_{DS} = 40 \text{ V}, I_{D} = 8 \text{ A}$	-	20	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 400 V V 0 V	-	1630	2170	pF
C _{oss}	Output Capacitance	V _{DS} = 100 V, V _{GS} = 0 V, f = 1 MHz		70	95	pF
C _{rss}	Reverse Transfer Capacitance			5	10	pF
Coss	Output Capacitance	$V_{DS} = 380 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	40	60	pF
C _{oss(eff.)}	Effective Output Capacitance	$V_{DS} = 0 \text{ V to } 480 \text{ V}, V_{GS} = 0 \text{ V}$	-	176	-	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 380 V, I _D = 8 A,	-	40.2	52.3	nC
Q_{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	6.7	-	nC
Q _{gd}	Gate to Drain "Miller" Charge	(Note 4)	-	12.9	-	nC
ESR	Equivalent Series Resistance (G-S)	f = 1 MHz	-	2.9	-	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	15.8	41.6	ns
t _r		$V_{DD} = 380 \text{ V}, I_D = 8 \text{ A},$	-/	15.5	41.0	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 4.7 Ω	-	60.3	130.6	ns
t _f	Turn-Off Fall Time	(Note 4)	-	20.2	50.4	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current			-	16	Α
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current			-	48	Α
V_{SD}	Drain to Source Diode Forward Voltage V _{GS} = 0 V, I _{SD} = 8 A		-	-	1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 8 A,	-	319	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	4.4	-	μС

Notes

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. I_{AS} = 5.3 A, R_{G} = 25 Ω , starting T_{J} = 25°C.
- 3. I $_{SD}$ \leq 16 A, di/dt \leq 200 A/ μ s, 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

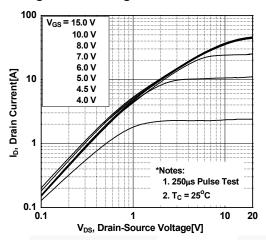


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

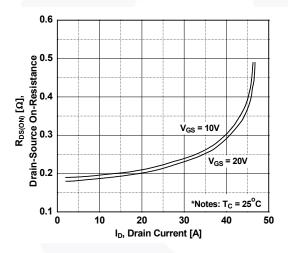


Figure 5. Capacitance Characteristics

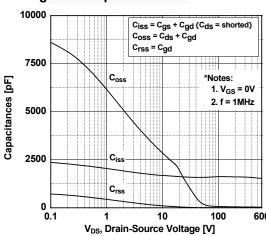


Figure 2. Transfer Characteristics

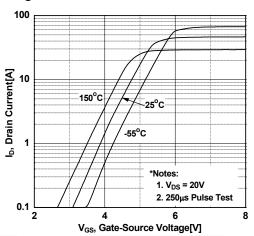


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

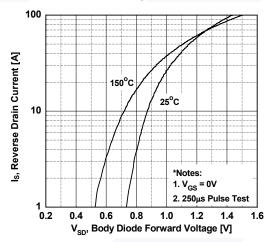
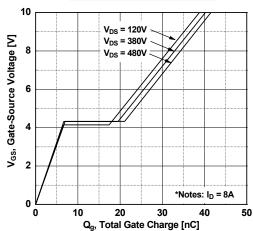


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

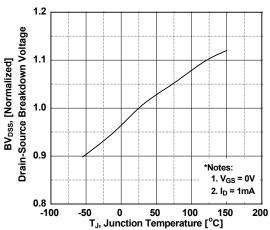


Figure 9. Maximum Safe Operating Area



Figure 8. On-Resistance Variation vs. Temperature

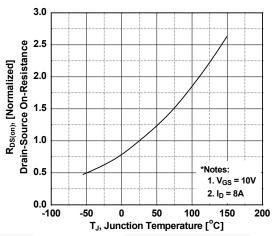
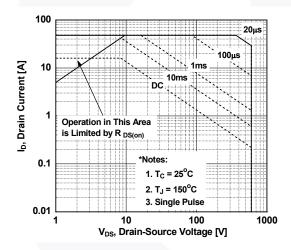


Figure 10. Maximum Drain Current vs. Case Temperature



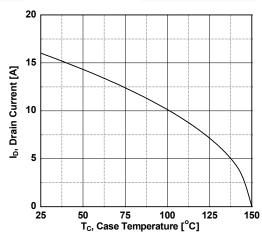
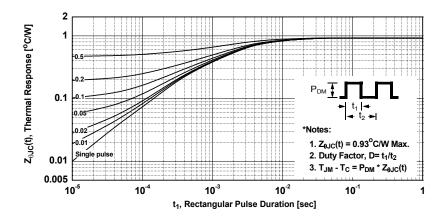


Figure 11. Transient Thermal Response Curve



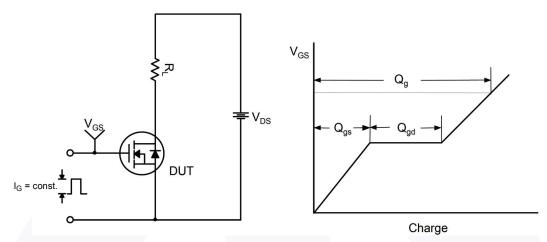


Figure 12. Gate Charge Test Circuit & Waveform

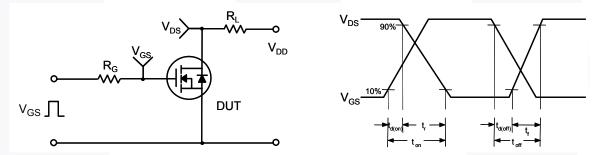


Figure 13. Resistive Switching Test Circuit & Waveforms

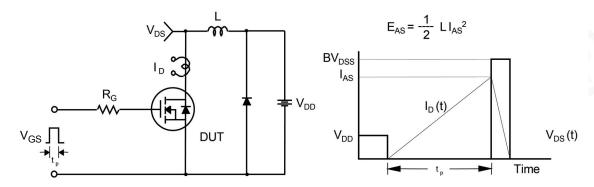


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

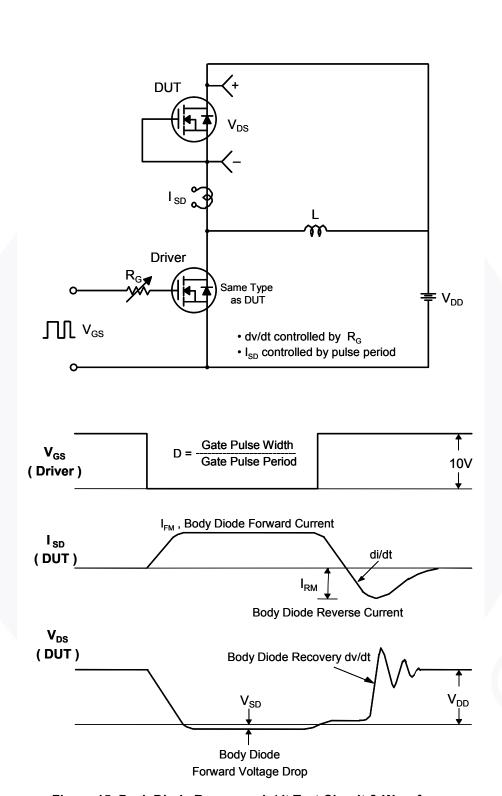


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

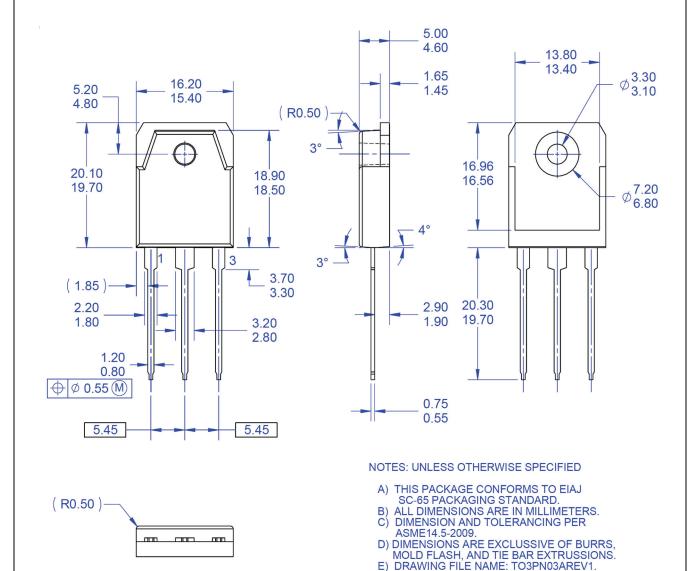


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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