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December 2013

FCD9N60NTM

N-Channel SupreMOS[®] MOSFET 600 V, 9 A, 385 m Ω

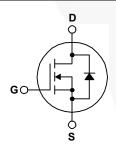
Features

- $R_{DS(on)} = 330 \text{ m}\Omega \text{ (Typ.)} @ V_{GS} = 10 \text{ V, } I_D = 4.5 \text{ A}$
- Ultra Low Gate Charge (Typ. Q_q = 17.8 nC)
- · Low Effective Output Capacitance
- 100% Avalanche Tested
- · RoHS Compliant

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

Symbol		Parameter		FCD9N60NTM	Unit
V_{DSS}	Drain to Source Volta	Drain to Source Voltage		600	V
V_{GSS}	Gate to Source Volta	ge		±30	V
	Drain Current	- Continuous (T _C	= 25°C)	9.0	A
ID	Diain Current	- Continuous (T _C	= 100°C)	5.7	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	27	A
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		135	mJ	
I _{AR}	Avalanche Current	Avalanche Current (Note 1)		9.0	Α
E _{AR}	Repetitive Avalanche	Repetitive Avalanche Energy (Note 1)		9.3	mJ
dv/dt	MOSFET dv/dt Rugg	edness		100	V/ns
av/at	Peak Diode Recover	y dv/dt	(Note 3)	15	V/IIS
В	Power Dissipation	$(T_C = 25^{\circ}C)$		92.6	W
P_{D}	Power Dissipation - Derate above 25°C		0.74	W/°C	
T _J , T _{STG}	Operating and Storag	orage Temperature Range		-55 to +150	°C
T _L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

Symbol	Parameter	FCD9N60NTM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.35	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	- 0/00

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCD9N60NTM	FCD9N60NTM	D-PAK	Tape and Reel	330 mm	16 mm	2500 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	$I_D = 1 \text{mA}, V_{GS} = 0 \text{V}, T_J = 25^{\circ} \text{C}$	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_{J}}$	Breakdown Voltage Temperature Coefficient	I _D = 1mA, Referenced to 25°C	-	0.8	-	V/°C
	Zana Cata Valtana Duain Cumant	V _{DS} = 480V, V _{GS} = 0V	-	-	10	μА
IDSS	Zero Gate Voltage Drain Current	$V_{DS} = 480V, V_{GS} = 0V, T_{C} = 125^{\circ}C$	-	-	100	μΑ
I _{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	±100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	3.0	-	5.0	٧
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10V, I _D = 4.5A	-	0.330	0.385	Ω
9 _{FS}	Forward Transconductance	$V_{DS} = 40V, I_{D} = 4.5A$	-	5.3	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V - 400V V - 0V	-	735	1000	pF
C _{oss}	Output Capacitance	$V_{DS} = 100V, V_{GS} = 0V$ f = 1MHz	-	40	53	pF
C _{rss}	Reverse Transfer Capacitance	I - HVII IZ		3.5	5.5	pF
C _{oss}	Output Capacitance	$V_{DS} = 380V, V_{GS} = 0V, f = 1MHz$	-\	23.7	-	pF
C _{oss(eff.)}	Effective Output Capacitance	V_{DS} = 0V to 380V, V_{GS} = 0V	- \	122	-	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	13.2	-	ns
t _r	Turn-On Rise Time	$V_{DD} = 380V, I_{D} = 4.5A$	-	9.6	-	ns
t _{d(off)}	Turn-Off Delay Time	$R_{GEN} = 4.7\Omega$	-	28.7	-	ns
t _f	Turn-Off Fall Time	(Note 4)	-	11.5	-	ns
Q _{g(tot)}	Total Gate Charge at 10V		-	17.8	-	nC
Q _{gs}	Gate to Source Gate Charge	$V_{DS} = 380V, I_D = 4.5A$	-/	4.2	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	$V_{GS} = 10V$ (Note 4)	-	7.6	-	nC
ESR	Equivalent Series Resistance(G-S)	f = 1MHz	-	2.65	-	Ω

Drain-Source Diode Characteristics

Is	Maximum Continuous Drain to Source Diod	Maximum Continuous Drain to Source Diode Forward Current		9.0	-	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	27	/ -	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _{SD} = 9A	-	-	1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _{SD} = 9A	-	322	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	-	5.04	-	μC

Notes:

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. I_{AS} = 3 A, R_G = 25 Ω , starting T_J = 25°C.
- $3.I_{SD} \le 9$ A, di/dt ≤ 200 A/ μ s, $V_{DD} \le 380$ V, starting T_J = $25^{\circ}C$.
- 4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

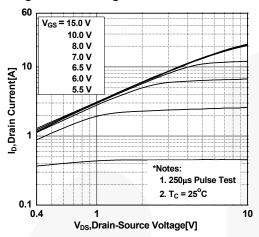


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

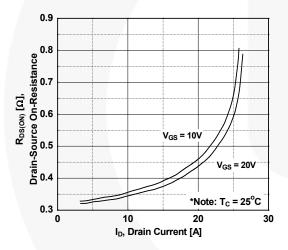


Figure 5. Capacitance Characteristics

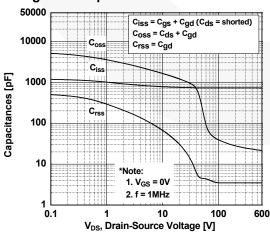


Figure 2. Transfer Characteristics

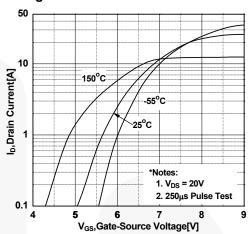


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

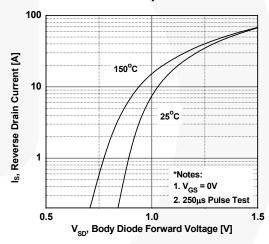
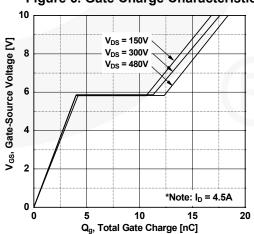


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

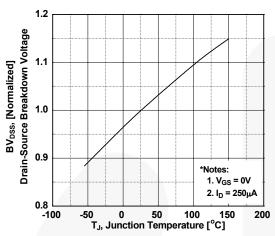


Figure 9. Maximum Safe Operating Area

vs. Temperature 3.0

Figure 8. On-Resistance Variation

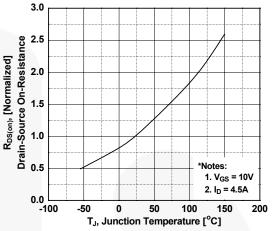
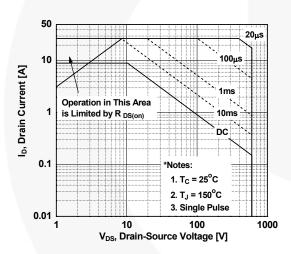


Figure 10. Maximum Drain Current vs. Case Temperature



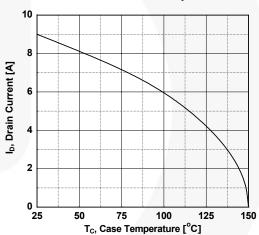
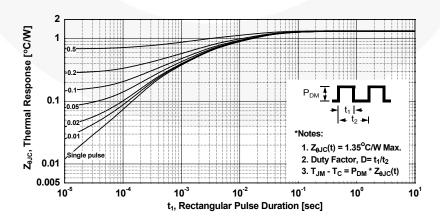


Figure 11. Transient Thermal Response Curve



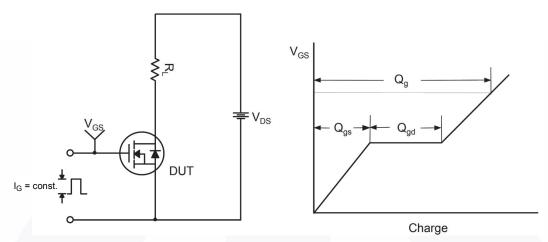


Figure 12. Gate Charge Test Circuit & Waveform

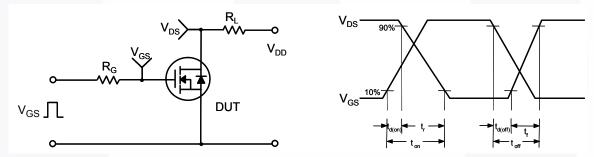


Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

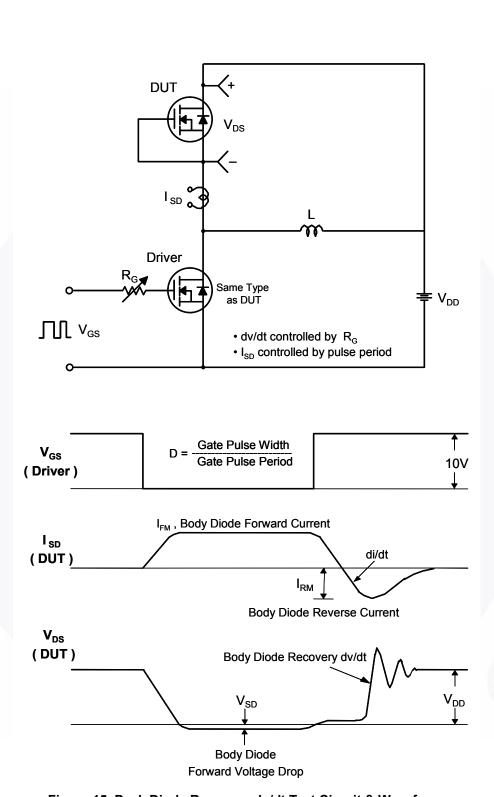


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

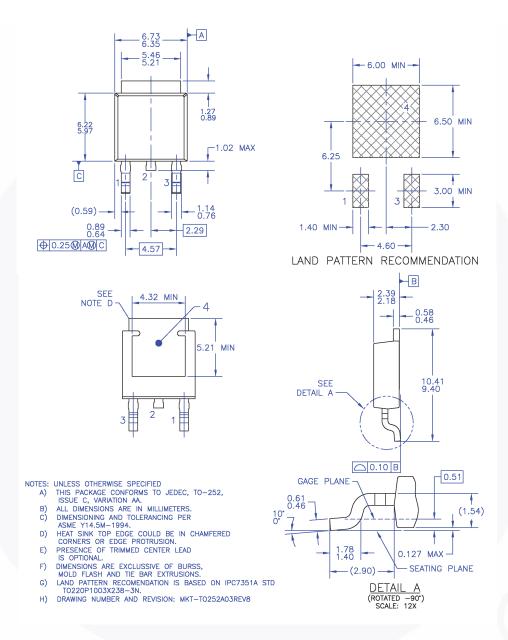


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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