



FCD5N60 / FCU5N60

600V N-Channel MOSFET

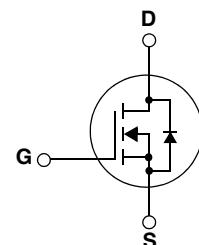
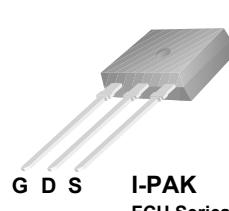
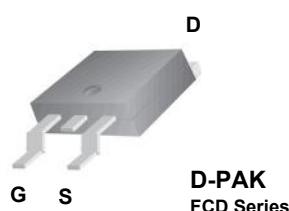
Features

- 650V @ $T_J = 150^\circ\text{C}$
- Typ. $R_{ds(on)}=0.81\Omega$
- Ultra low gate charge (typ. $Q_g=16\text{nC}$)
- Low effective output capacitance (typ. $C_{oss,eff}=32\text{pF}$)
- 100% avalanche tested

Description

SuperFET™ is, Fairchild's proprietary, new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance.

This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. Consequently, SuperFET is very suitable for various AC/DC power conversion in switching mode operation for system miniaturization and higher efficiency.



Absolute Maximum Ratings

Symbol	Parameter	FCD5N60 / FCU5N60	Unit
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	4.6 2.9	A A
I_{DM}	Drain Current - Pulsed	(Note 1)	A
V_{GSS}	Gate-Source voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	mJ
I_{AR}	Avalanche Current	(Note 1)	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	54 0.43	W W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FCD5N60/FCU5N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	83	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCD5N60	FCD5N60TM	D-PAK	380mm	16mm	2500
FCD5N60	FCD5N60TF	D-PAK	380mm	16mm	2000
FCU5N60	FCU5N60	I-PAK	--	--	70

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$, $T_J = 25^\circ\text{C}$	600	--	--	V
		$V_{GS} = 0\text{V}$, $I_D = 250\mu\text{A}$, $T_J = 150^\circ\text{C}$	--	650	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	--	0.6	--	$^\circ\text{C}$
BV _{DS}	Drain-Source Avalanche Breakdown Voltage	$V_{GS} = 0\text{V}$, $I_D = 4.6\text{A}$	--	700	--	V
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$ $V_{DS} = 480\text{V}$, $T_C = 125^\circ\text{C}$	--	--	1 10	μA μA
I _{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{V}$, $V_{DS} = 0\text{V}$	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{V}$, $V_{DS} = 0\text{V}$	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	3.0	--	5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}$, $I_D = 2.3\text{A}$	--	0.81	0.95	Ω
g _{Fs}	Forward Transconductance	$V_{DS} = 40\text{V}$, $I_D = 2.3\text{A}$	(Note 4)	--	3.8	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	$V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$, $f = 1.0\text{MHz}$	--	470	600	pF
C _{oss}	Output Capacitance		--	250	320	pF
C _{rss}	Reverse Transfer Capacitance		--	22	--	pF
C _{oss}	Output Capacitance	$V_{DS} = 480\text{V}$, $V_{GS} = 0\text{V}$, $f = 1.0\text{MHz}$	--	12	--	pF
C _{oss eff.}	Effective Output Capacitance	$V_{DS} = 0\text{V}$ to 400V , $V_{GS} = 0\text{V}$	--	32	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 300\text{V}$, $I_D = 4.6\text{A}$ $R_G = 25\Omega$	--	12	30	ns
t _r	Turn-On Rise Time		--	40	90	ns
t _{d(off)}	Turn-Off Delay Time		--	47	95	ns
t _f	Turn-Off Fall Time		--	22	55	ns
Q _g	Total Gate Charge	$V_{DS} = 480\text{V}$, $I_D = 4.6\text{A}$ $V_{GS} = 10\text{V}$	--	16	--	nC
Q _{gs}	Gate-Source Charge		--	2.8	--	nC
Q _{gd}	Gate-Drain Charge		--	7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current	--	--	4.6	A	
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	13.8	A	
V _{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = 4.6\text{A}$	--	--	1.4	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0\text{V}$, $I_S = 4.6\text{A}$ $dI/dt = 100\text{A}/\mu\text{s}$	--	295	--	ns
Q _{rr}	Reverse Recovery Charge		--	2.7	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 2.3A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 4.6A, di/dt ≤ 1200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

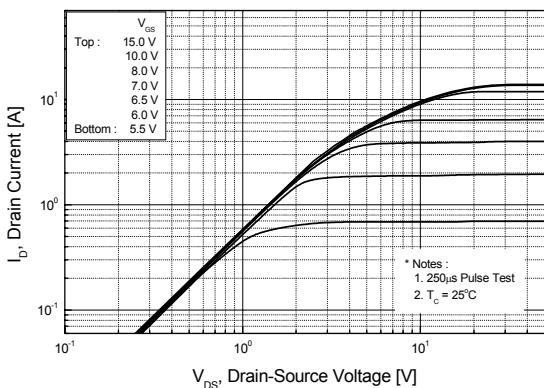


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

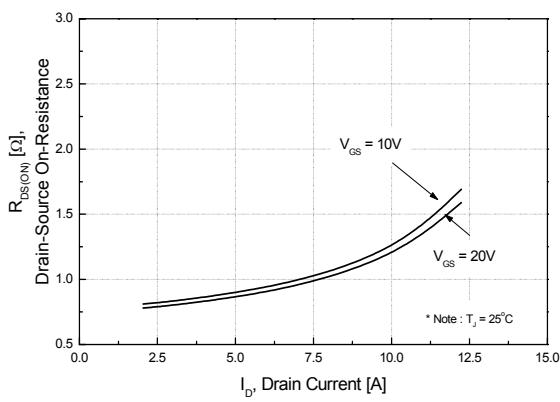


Figure 2. Transfer Characteristics

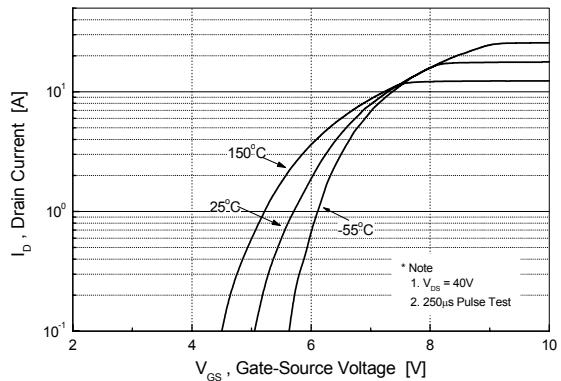


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

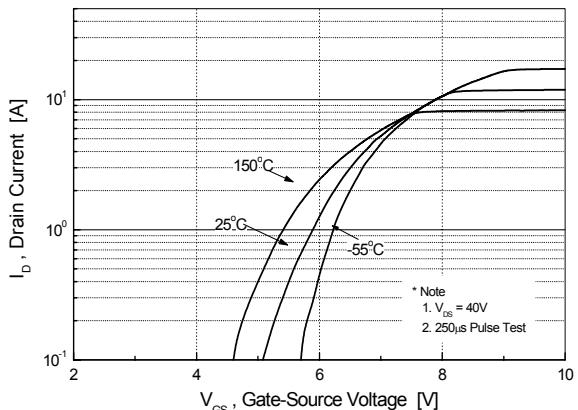


Figure 5. Capacitance Characteristics

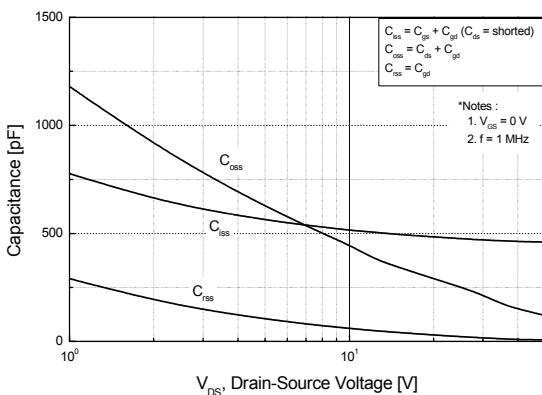


Figure 6. Gate Charge Characteristics

