



# FCP16N60 / FCPF16N60

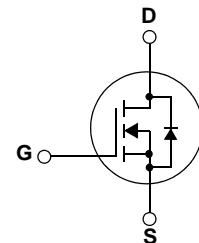
## 600V N-Channel MOSFET

### Features

- 650V @  $T_J = 150^\circ\text{C}$
- Typ.  $R_{ds(on)} = 0.22\Omega$
- Ultra low gate charge (typ.  $Q_g=55\text{nC}$ )
- Low effective output capacitance (typ.  $C_{oss,eff}=110\text{pF}$ )
- 100% avalanche tested
- RoHS Compliant

### 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	FCP16N60	FCPF16N60	Unit
$V_{DSS}$	Drain-Source Voltage	600		V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	16 10.1	16* 10.1*	A A
$I_{DM}$	Drain Current - Pulsed	(Note 1)	48	48*
$V_{GSS}$	Gate-Source voltage		$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	450	mJ
$I_{AR}$	Avalanche Current	(Note 1)	16	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 ( $T_C = 25^\circ\text{C}$ ) - Derate above 25°C	167 1.33	37.9 0.3	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	FCP16N60	FCPF16N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.75	3.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCP16N60	FCP16N60	TO-220	-	-	50
FCPF16N60	FCPF16N60	TO-220F	-	-	50

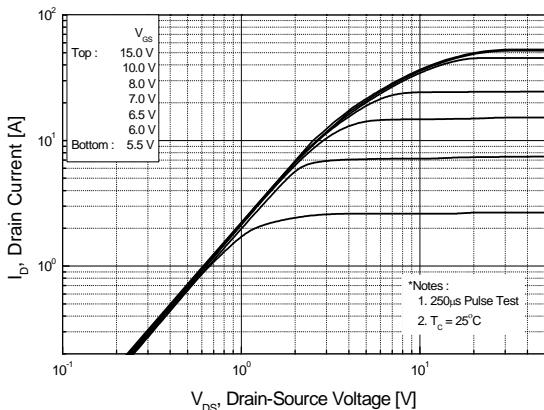
## Electrical Characteristics

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

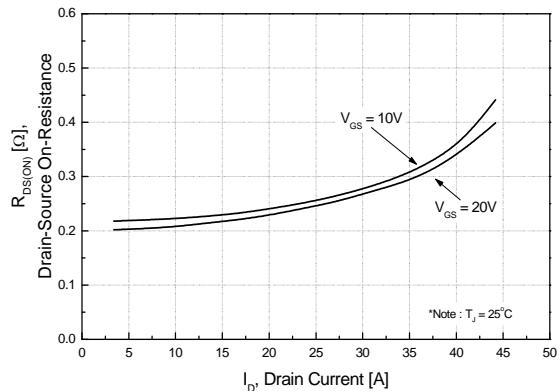
Symbol	Parameter	Conditions	Min	Typ	Max	Units	
<b>Off Characteristics</b>							
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$ , $T_J = 25^\circ\text{C}$	600	--	--	V	
		$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$ , $T_J = 150^\circ\text{C}$	--	650	--	V	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.6	--	V/ $^\circ\text{C}$	
$BV_{DSS}$	Drain-Source Avalanche Breakdown Voltage	$V_{GS} = 0\text{V}$ , $I_D = 16\text{A}$	--	700	--	V	
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{V}$ , $V_{GS} = 0\text{V}$ $V_{DS} = 480\text{V}$ , $T_C = 125^\circ\text{C}$	-- --	-- 10	1 10	$\mu\text{A}$	
$I_{GSSF}$	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	
<b>On Characteristics</b>							
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	3.0	--	5.0	V	
$R_{DS(\text{on})}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}$ , $I_D = 8\text{A}$	--	0.22	0.26	$\Omega$	
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{V}$ , $I_D = 8\text{A}$	(Note 4)	--	11.5	--	
<b>Dynamic Characteristics</b>							
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$	--	1730	2250	pF	
$C_{oss}$	Output Capacitance		--	960	1150	pF	
$C_{rss}$	Reverse Transfer Capacitance		--	85	--	pF	
$C_{oss}$	Output Capacitance	$V_{DS} = 480\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$	--	45	60	pF	
$C_{oss\ eff.}$	Effective Output Capacitance	$V_{DS} = 0\text{V}$ to $400\text{V}$ , $V_{GS} = 0\text{V}$	--	110	--	pF	
<b>Switching Characteristics</b>							
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300\text{V}$ , $I_D = 16\text{A}$ $R_G = 25\Omega$	--	42	85	ns	
$t_r$	Turn-On Rise Time		--	130	270	ns	
$t_{d(off)}$	Turn-Off Delay Time		--	165	340	ns	
$t_f$	Turn-Off Fall Time		--	90	190	ns	
$Q_g$	Total Gate Charge	$V_{DS} = 480\text{V}$ , $I_D = 16\text{A}$ $V_{GS} = 10\text{V}$	--	55	70	nC	
$Q_{gs}$	Gate-Source Charge		--	10.5	13	nC	
$Q_{gd}$	Gate-Drain Charge		--	28	--	nC	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>							
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	16	--	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	48	--	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_S = 16\text{A}$	--	--	1.4	V	
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}$ , $I_S = 16\text{A}$ $dI_F/dt = 100\text{A}/\mu\text{s}$	--	435	--	ns	
$Q_{rr}$	Reverse Recovery Charge		(Note 4)	--	7.0	--	
<b>NOTES:</b>							
1. Repetitive Rating: Pulse width limited by maximum junction temperature							
2. $I_{AS} = 8\text{A}$ , $V_{DD} = 50\text{V}$ , $R_G = 25\Omega$ , Starting $T_J = 25^\circ\text{C}$							
3. $I_{SD} \leq 16\text{A}$ , $dI/dt \leq 200\text{A}/\mu\text{s}$ , $V_{DD} \leq BV_{DSS}$ , Starting $T_J = 25^\circ\text{C}$							
4. Pulse Test: Pulse width $\leq 300\mu\text{s}$ , Duty Cycle $\leq 2\%$							
5. Essentially Independent of Operating Temperature Typical Characteristics							

## Typical Performance Characteristics

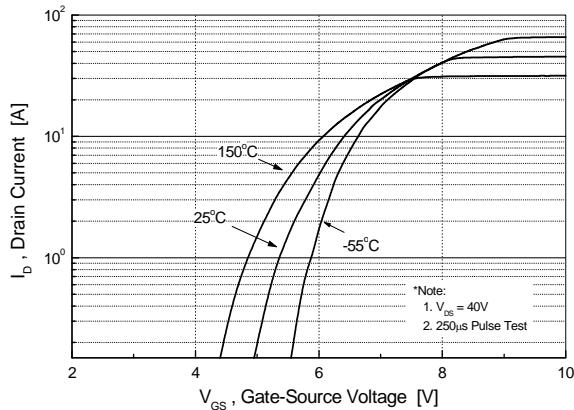
**Figure 1. On-Region Characteristics**



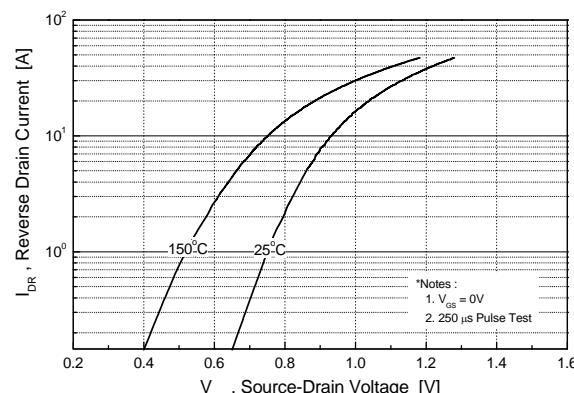
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



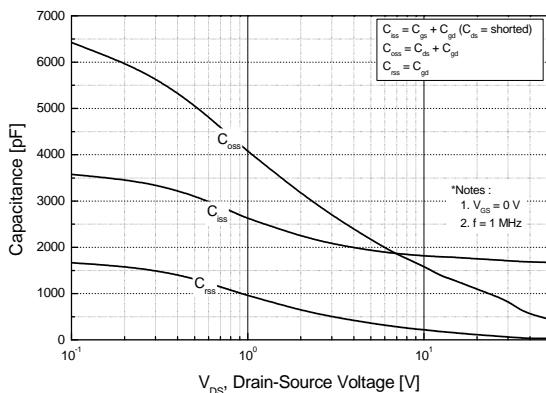
**Figure 2. Transfer Characteristics**



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



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

