IRF5N60
POWER MOSFET

GENERAL DESCRIPTION

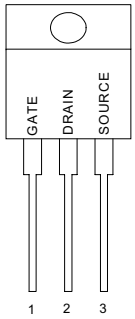
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and safety margin against unexpected voltage transients.

FEATURES

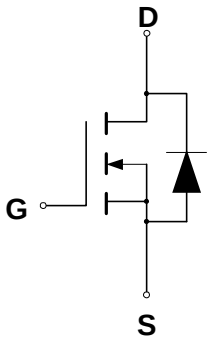
- Robust High Voltage Termination
- Avalanche Energy Specified
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} Specified at Elevated Temperature

PIN CONFIGURATION

TO-220FP
Front View



SYMBOL



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current — Continuous	I_D	5.0	A
— Pulsed	I_{DM}	20	
Gate-to-Source Voltage — Continue	V_{GS}	±20	V
— Non-repetitive	V_{GSM}	±40	V
Total Power Dissipation	P_D	35	W
Derate above 25℃		0.28	W/℃
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	℃
Single Pulse Drain-to-Source Avalanche Energy — T_J = 25℃ (V_{DD} = 100V, V_{GS} = 10V, I_L = 7A, L = 10mH, R_G = 25Ω)	E_{AS}	245	mJ
Thermal Resistance — Junction to Case	θ_{JC}	1.0	℃/W
— Junction to Ambient	θ_{JA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	℃

(1) Pulse Width and frequency is limited by TJ(max) and thermal response

ORDERING INFORMATION

Part Number	Package
IRF5N60	TO-220 Full Pak

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_J = 25℃.

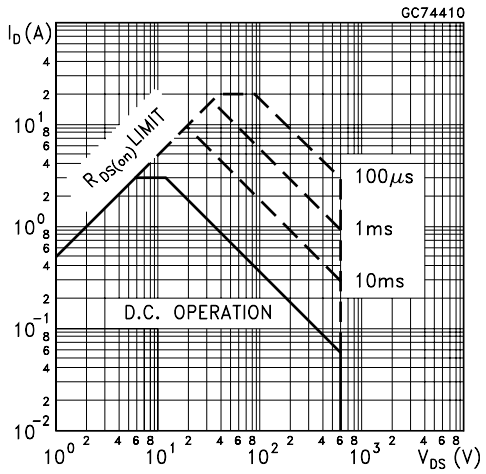
			IRF5N60			
Characteristic		**Symbol**	**Min**	**Typ**	**Max**	**Units**
Drain-Source Breakdown Voltage (V_{GS} = 0 V, I_D = 250 μA)		$V_{(BR)DSS}$	600			V
Drain-Source Leakage Current (V_{DS} = 600 V, V_{GS} = 0 V)		I_{DSS}			50	μA
(V_{DS} = 480 V, V_{GS} = 0 V, T_J = 125℃)					50	
Gate-Source Leakage Current-Forward (V_{gsf} = 30 V, V_{DS} = 0 V)		I_{GSSF}			100	nA
Gate-Source Leakage Current-Reverse (V_{gsr} = -30 V, V_{DS} = 0 V)		I_{GSSR}			-100	nA
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μA)		$V_{GS(th)}$	3.0		5.0	V
Static Drain-Source On-Resistance (V_{GS} = 10 V, I_D = 2.5A) *		$R_{DS(on)}$		1.8	2.0	Ω
Forward Transconductance (V_{DS} >$I_{D(ON)}$*$R_{DS(ON)max}$, I_D = 2.5A) *		g_{FS}	2.5	4.5		mhos
Input Capacitance	(V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}		680	884	pF
Output Capacitance		C_{oss}		103	139	pF
Reverse Transfer Capacitance		C_{rss}		11	15	pF
Turn-On Delay Time	(V_{DD} = 300 V, I_D = 2.5 A, V_{GS} = 10 V, R_G = 4.7Ω) *	$t_{d(on)}$		12	17	ns
Rise Time		t_r		10	14	ns
Turn-Off Delay Time		$t_{d(off)}$		36		ns
Fall Time		t_f		25		ns
Total Gate Charge	(V_{DS} = 480 V, I_D = 5.0 A, V_{GS} = 10 V)*	Q_g		21	30	nC
Gate-Source Charge		Q_{gs}		7.6		nC
Gate-Drain Charge		Q_{gd}		7.5		nC
Internal Drain Inductance (Measured from the drain lead 0.25” from package to center of die)		L_D		4.5		nH
Internal Drain Inductance (Measured from the source lead 0.25” from package to source bond pad)		L_S		7.5		nH
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage(1)	(I_{SD} =5.0 A,V_{DD}=100V d_{IS}/d_t = 100A/μs)	V_{SD}			1.6	V
Forward Turn-On Time		t_{on}		**		ns
Reverse Recovery Time		t_{rr}		610		ns

* Pulse Test: Pulse Width ≦300μs, Duty Cycle ≦1.5%

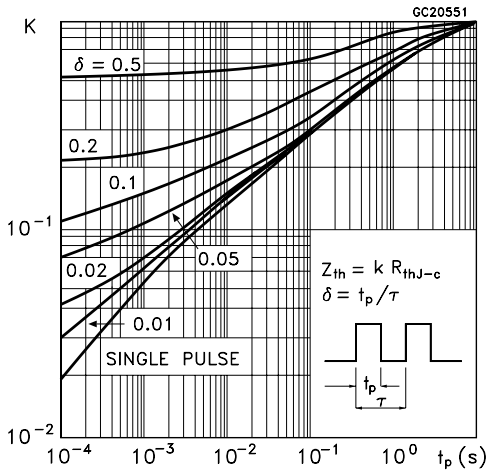
** Negligible, Dominated by circuit inductance

TYPICAL ELECTRICAL CHARACTERISTICS

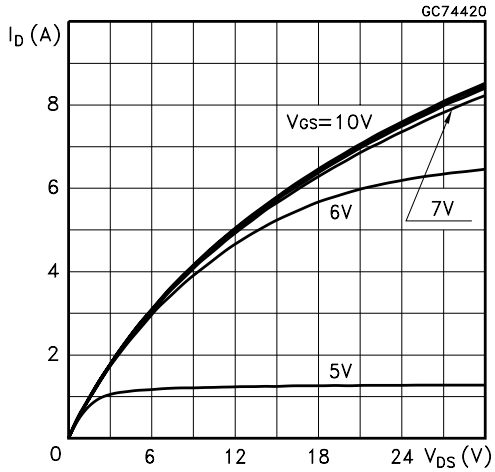
Safe Operating Area for TO-220FP



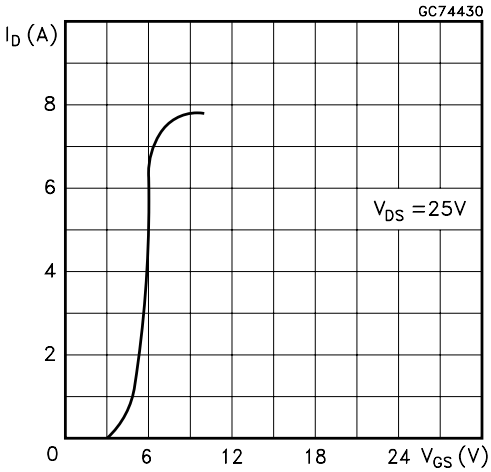
Thermal Impedance for TO-220FP



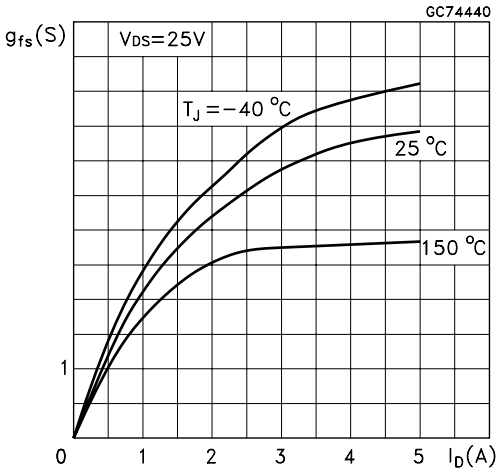
Output Characteristics



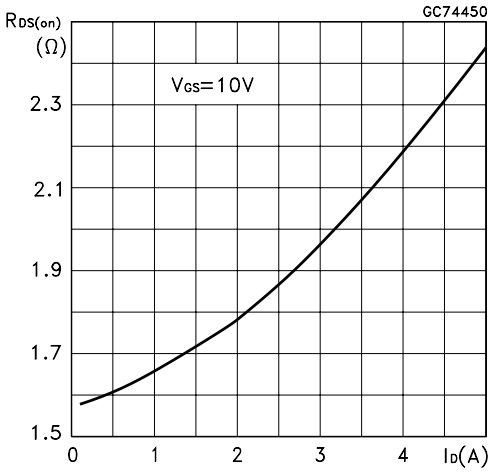
Transfer Characteristics



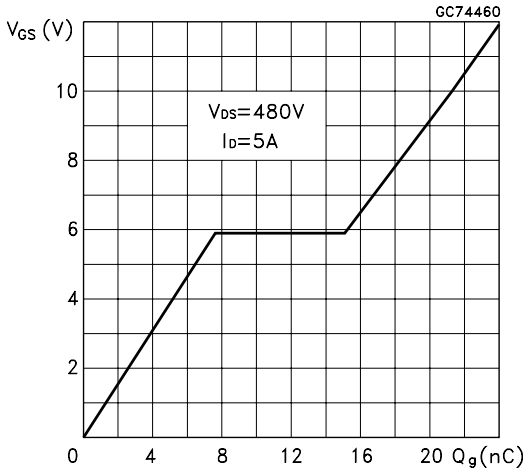
Transconductance



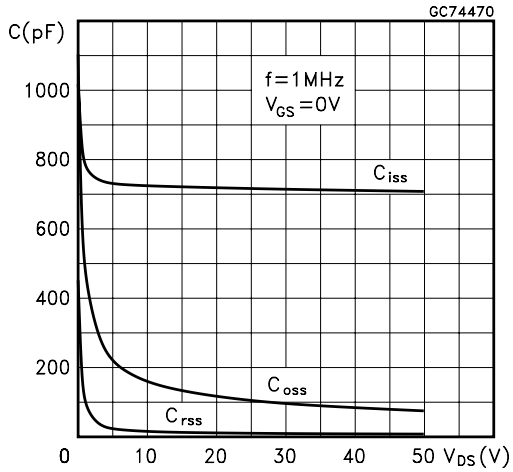
Static Drain-source On Resistance



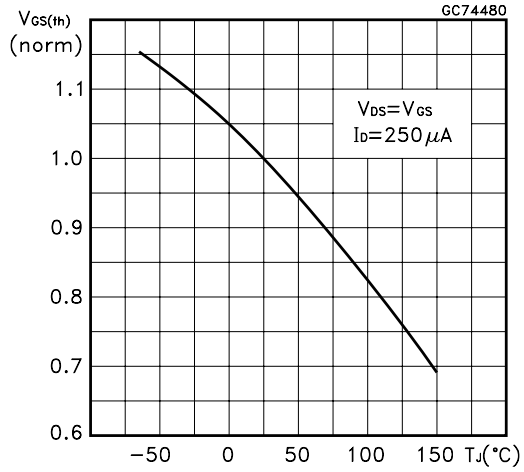
Gate Charge vs Gate-source Voltage



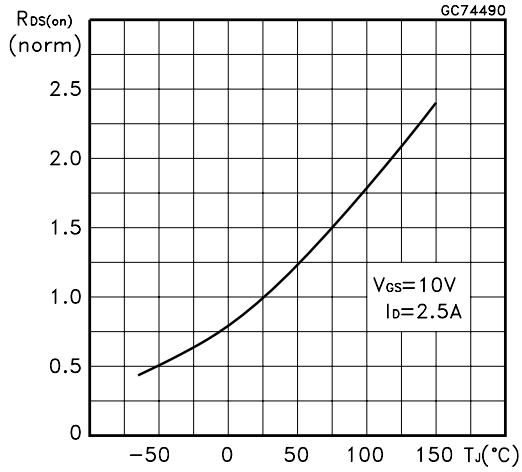
Capacitance Variations



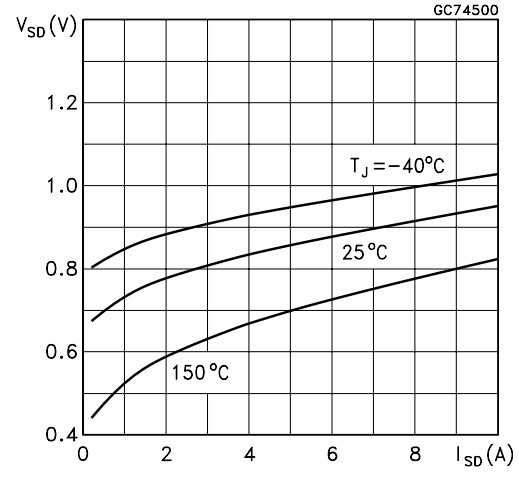
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



TO-220FP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126