

Silicon N-Channel Power MOSFET

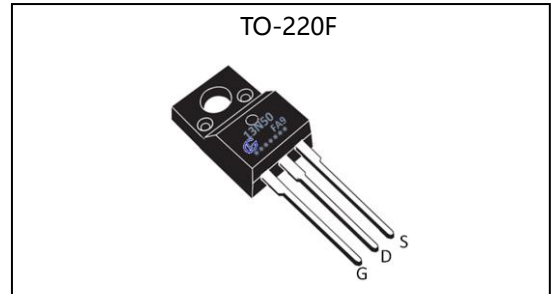
General Description :

GL13N50FA9, the silicon N-channel Enhanced VDMOSFET, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-220F, which accords with the RoHS standard.

V_{DSS}	500	V
I_D	13	A
$P_D(T_C=25^\circ\text{C})$	48	W
$R_{DS(ON).TYP.}$	0.34	Ω

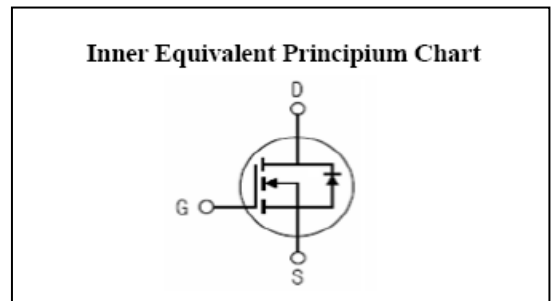
Features :

- Fast Switching
- Low ON Resistance($R_{dson} \leq 0.45\Omega$)
- Low Gate Charge
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test



Applications:

- Power switch circuit of adaptor and charger



Absolute ($T_C=25^\circ\text{C}$ unless otherwise specified) :

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	500	V
I_D	Continuous Drain Current	13	A
I_{DM}^{a1}	Pulsed Drain Current	52	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}^{a2}	Single Pulse Avalanche Energy	900	mJ
P_D	Power Dissipation	48	W
	Derating Factor above 25°C	0.38	W/ $^\circ\text{C}$
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering	300	$^\circ\text{C}$

Caution Stresses greater than those in the "Absolute Maximum Ratings" may cause permanent damage to the device



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Thermal Characteristics

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.6	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	100	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics ($T_c = 25^{\circ}\text{C}$ unless otherwise specified) :

OFF Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	500	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	$I_D=250\mu\text{A}, \text{Reference } 25^{\circ}\text{C}$	--	0.55	--	$\text{V}/^{\circ}\text{C}$
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=500\text{V}, V_{GS}=0\text{V}, T_a=25^{\circ}\text{C}$	--	--	1.0	μA
		$V_{DS}=400\text{V}, V_{GS}=0\text{V}, T_a=125^{\circ}\text{C}$	--	--	100	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+30\text{V}$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-30\text{V}$	--	--	-100	nA

ON Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10\text{V}, I_D=6.5\text{A}$	--	0.34	0.45	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.0	--	4.0	V
g_{fs}	Forward Trans conductance	$V_{DS}=30\text{V}, I_D=13\text{A}$	--	15	--	S

Pulse width < 380 μs ; duty cycle < 2%.

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=25\text{V}$ $f=1.0\text{MHz}$	--	2150	--	pF
C_{oss}	Output Capacitance		--	210	--	
C_{rss}	Reverse Transfer Capacitance		--	23	--	

Resistive Switching Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=10\text{A}, V_{DD}=200\text{V}$ $V_{GS}=13\text{V}, R_g=6.1\Omega$	--	15	--	ns
t_r	Rise Time		--	25	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	45	--	
t_f	Fall Time		--	35	--	
Q_g	Total Gate Charge	$I_D=13\text{A}, V_{DD}=250\text{V}$ $V_{GS}=10\text{V}$	--	45	--	nC
Q_{gs}	Gate to Source Charge		--	10	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	18	--	



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Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_{SD}	Continuous Source Current (Body Diode)		--	--	13	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	52	A
V_{SD}	Diode Forward Voltage	$I_S=13A, V_{GS}=0V$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=13A, T_J=25^{\circ}C$	--	500	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt=100A/\mu s, V_{GS}=0V$	--	4	--	μC

a1 : Repetitive rating; pulse width limited by maximum junction temperature

a2 : L=10mH, $I_D=13A$, Start $T_J=25^{\circ}C$



Characteristics Curve :

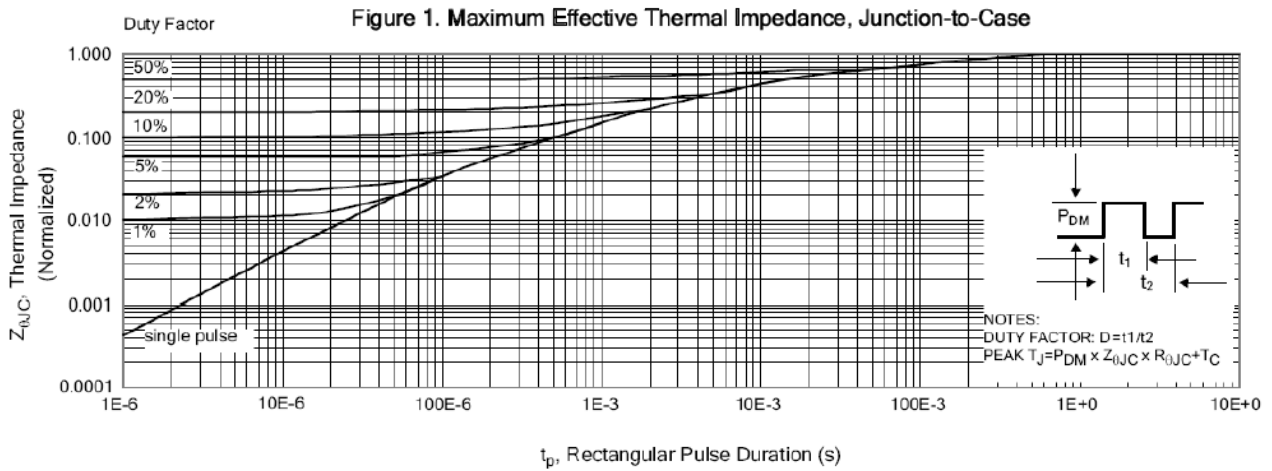


Figure 2. Maximum Power Dissipation vs Case Temperature

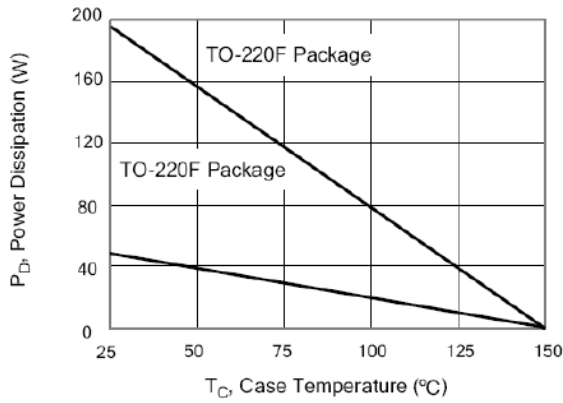


Figure 3. Maximum Continuous Drain Current vs Case Temperature

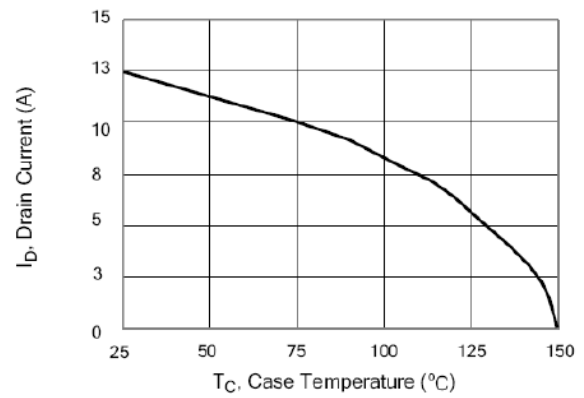


Figure 4. Typical Output Characteristics

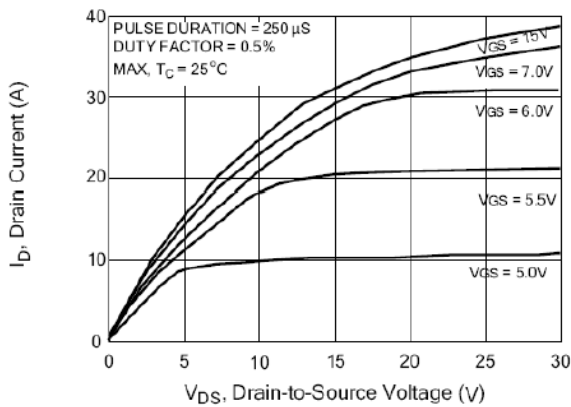
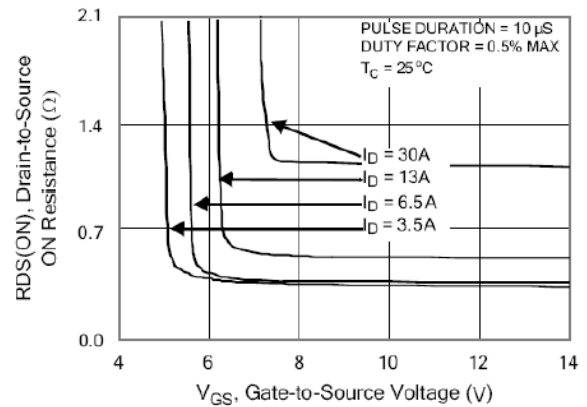


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current





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Figure 6. Maximum Peak Current Capability

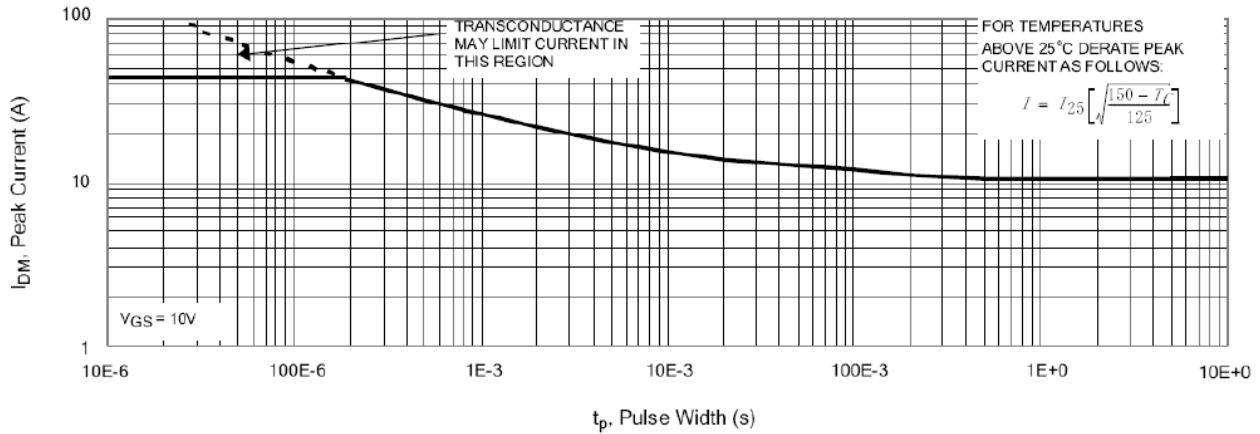


Figure 7. Typical Transfer Characteristics

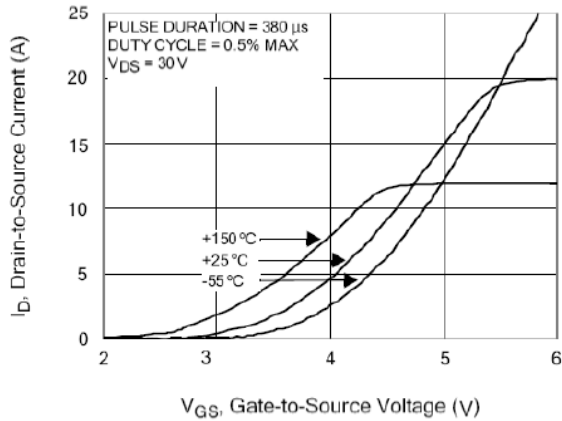


Figure 8. Unclamped Inductive Switching Capability

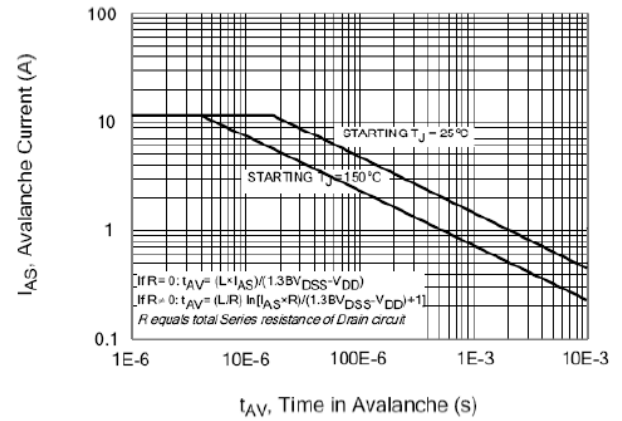


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

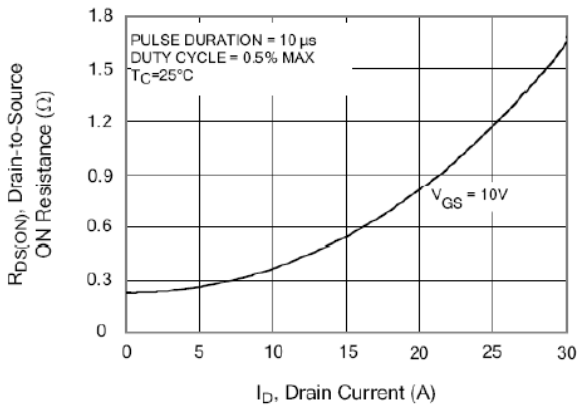
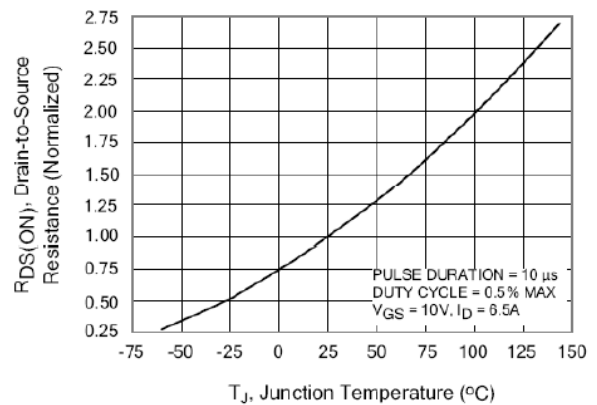


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature





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Figure 11. Typical Breakdown Voltage vs Junction Temperature

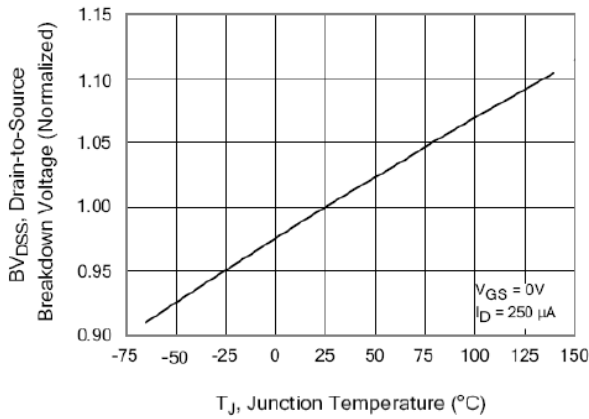


Figure 12. Typical Threshold Voltage vs Junction Temperature

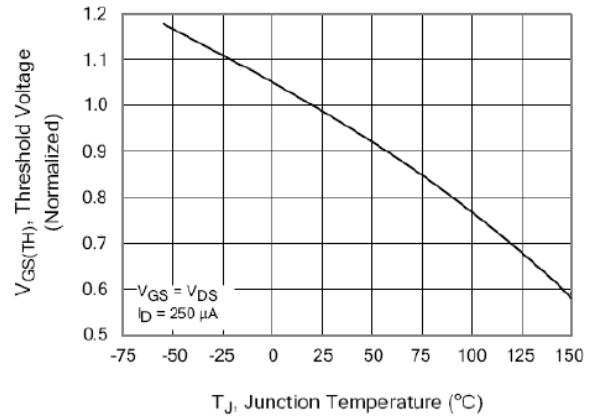


Figure 13. Maximum Forward Bias Safe Operating Area

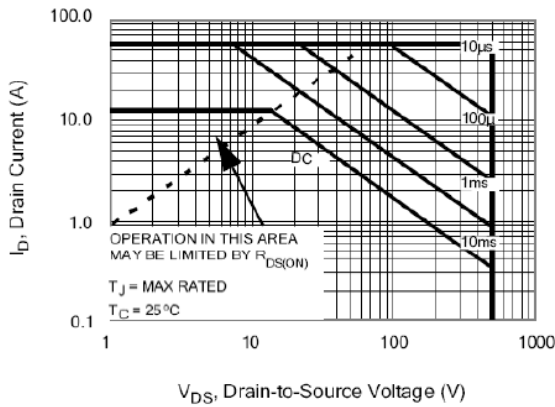


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

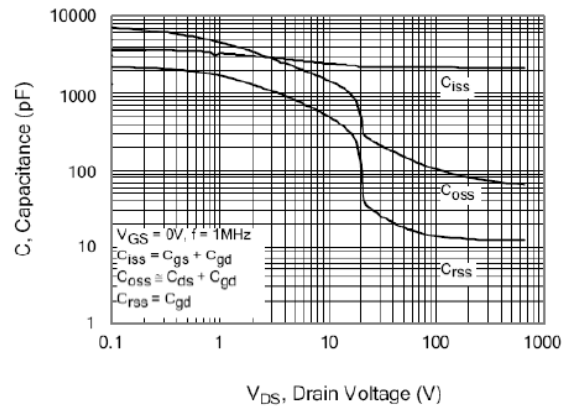


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

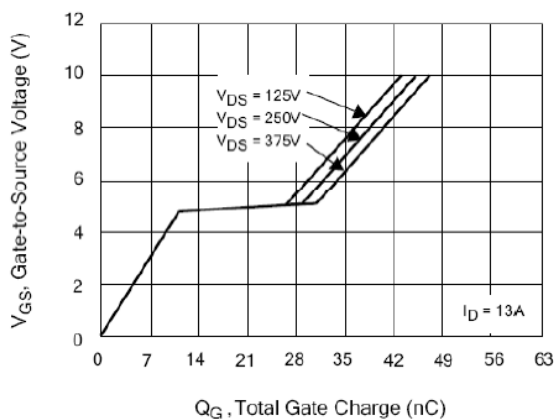
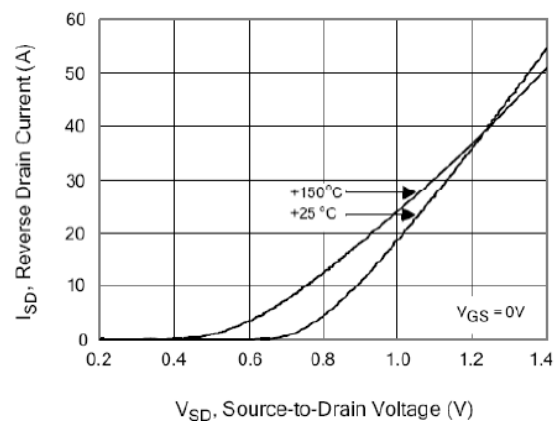


Figure 16. Typical Body Diode Transfer Characteristics



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