

## Silicon N-Channel Power MOSFET

### General Description :

HMP50N30, 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-247, which accords with the RoHS standard.

### Features :

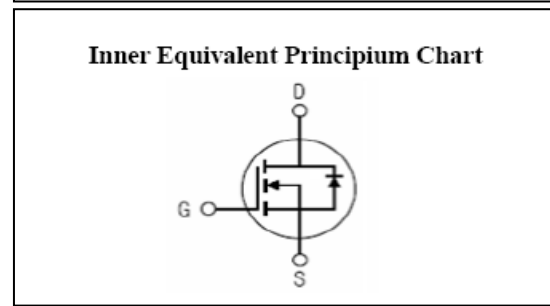
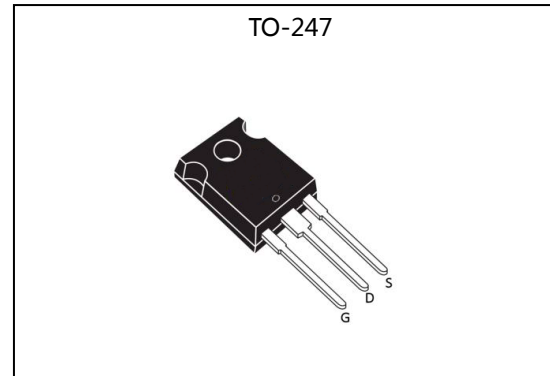
- Fast Switching
- Low ON Resistance ( $R_{ds(on)} \leq 60m\Omega$ )
- Low Gate Charge (Typical Data: 83nC)
- Low Reverse transfer capacitances (Typical: 100pF)
- 100% Single Pulse avalanche energy Test

### Applications:

- Power switch circuit of adaptor and charger

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

$V_{DSS}$	300	V
$I_D$	50	A
$P_D(T_c=25^\circ\text{C})$	400	W
$R_{DS(ON).TYP.}$	50	m $\Omega$



Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	300	V
$I_D$	Continuous Drain Current	50	A
	Continuous Drain Current $T_c=100^\circ\text{C}$	35	A
$I_{DM}^{a1}$	Pulsed Drain Current	200	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 30$	V
$E_{AS}^{a2}$	Single Pulse Avalanche Energy	1800	mJ
$E_{AR}^{a1}$	Avalanche Energy ,Repetitive	120	mJ
$I_{AR}^{a1}$	Avalanche Current	8.5	A
$dv/dt^{a3}$	Peak Diode Recovery $dv/dt$	5.0	V/ns
$P_D$	Power Dissipation	400	W
	Derating Factor above $25^\circ\text{C}$	3.2	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

**Thermal Characteristics**

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.315	°C/ W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	40	°C/ W

**Electrical Characteristics ( Tc= 25°C unless otherwise specified ) :**

<b>OFF Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$V_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	300	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	$I_D=250\mu A, \text{Reference } 25^\circ C$	--	0.2	--	V/°C
$I_{DSS}$	Drain to Source Leakage Current	$V_{DS}=300V, V_{GS}=0V, T_a=25^\circ C$	--	--	1.0	$\mu A$
		$V_{DS}=240V, V_{GS}=0V, T_a=125^\circ C$	--	--	100	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+30V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-30V$	--	--	-100	nA

<b>ON Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=20A$	--	50	60	m $\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V
$g_{fs}$	Forward Trans conductance	$V_{DS}=15V, I_D=25A$	--	38	--	S
Pulse width < 380 $\mu s$ ; duty cycle < 2%.						

<b>Dynamic Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=25V$ $f=1.0MHz$	--	4400	--	pF
$C_{oss}$	Output Capacitance		--	400	--	
$C_{rss}$	Reverse Transfer Capacitance		--	100	--	

<b>Resistive Switching Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=50A, V_{DD}=150V$ $V_{GS}=10V, R_g=12\Omega$	--	36	--	ns
$t_r$	Rise Time		--	85	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	190	--	
$t_f$	Fall Time		--	92	--	
$Q_g$	Total Gate Charge	$I_D=50A, V_{DD}=150V$ $V_{GS}=10V$	--	83	--	nC
$Q_{gs}$	Gate to Source Charge		--	20	--	
$Q_{gd}$	Gate to Drain ( "Miller" ) Charge		--	40	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_{SD}$	Continuous Source Current (Body Diode)		--	--	50	A
$I_{SM}$	Maximum Pulsed Current (Body Diode)		--	--	200	A
$V_{SD}$	Diode Forward Voltage	$I_S=50A, V_{GS}=0V$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S=50A, T_J=25^{\circ}C$	--	410	--	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt=100A/\mu s, V_{GS}=0V$	--	3.6	--	$\mu C$

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

a2 :  $L=10mH, I_D=18.5A, \text{Start } T_J=25^{\circ}C$

a3 :  $I_{SD}=40A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DS}, \text{Start } T_J=25^{\circ}C$

Characteristics Curve :

Fig. 1. Output Characteristics  
@ 25 Deg. C

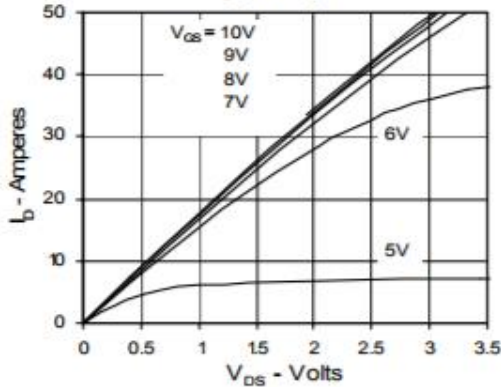


Fig. 2. Extended Output Characteristics  
@ 25 deg. C

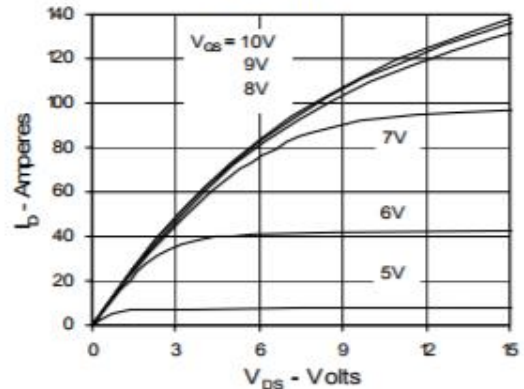


Fig. 3. Output Characteristics  
@ 125 Deg. C

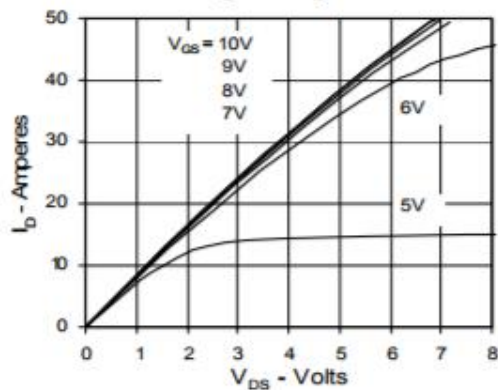


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs. Junction Temperature

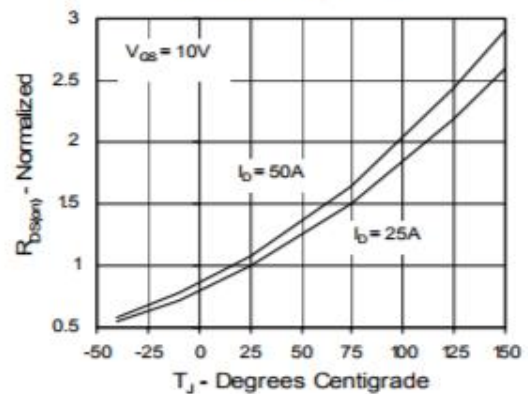


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  $I_D$

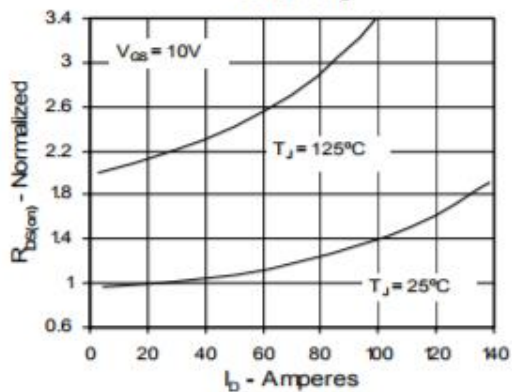


Fig. 6. Drain Current vs. Case Temperature

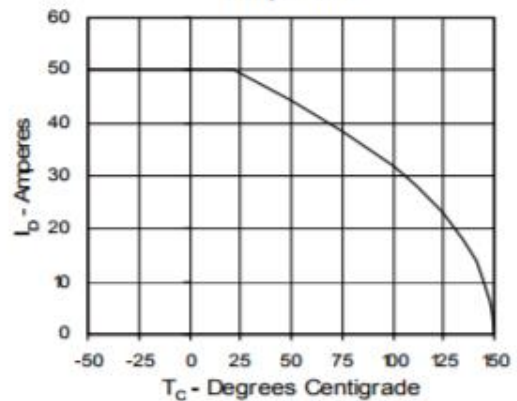


Fig. 7. Input Admittance

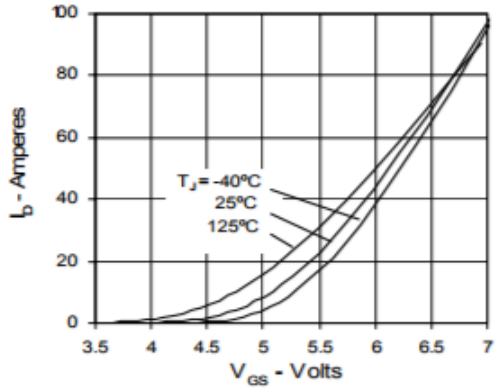


Fig. 8. Transconductance

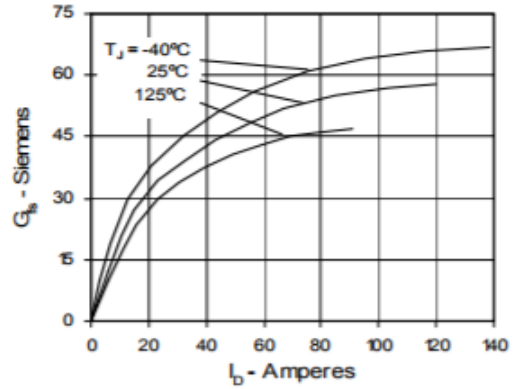


Fig. 9. Source Current vs. Source-To-Drain Voltage

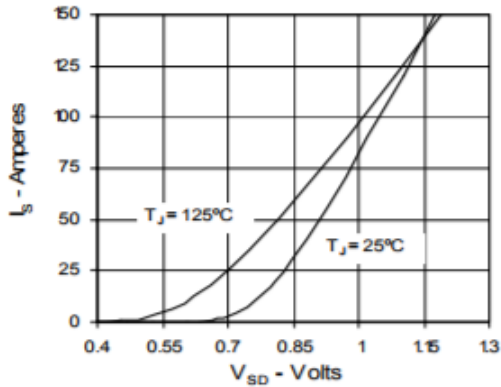


Fig. 10. Gate Charge

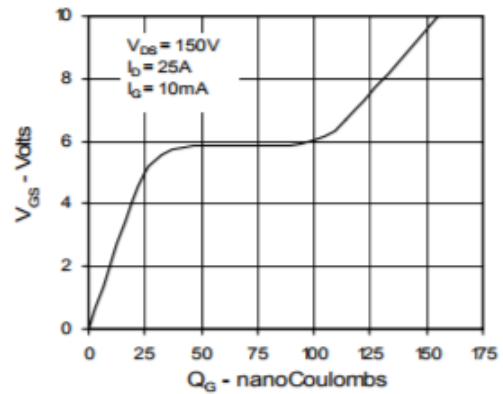


Fig. 11. Capacitance

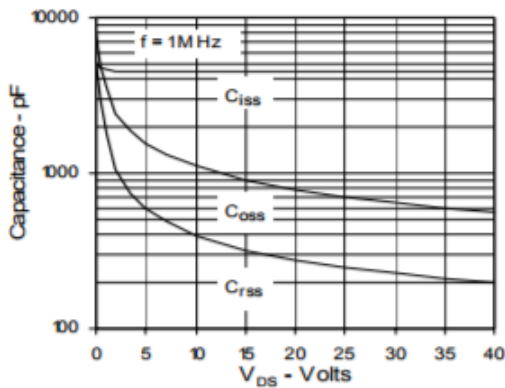


Fig. 12. Maximum Transient Thermal Resistance

