HMT13N90

Silicon N-Channel Power MOSFET

General Description：

HMT13N90 the silicon N-channel Enhanced VDMOSFETS, is obtained by the self-aligned HV-MOS 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-3P(N), which accords with the RoHS standard.

V_{DSS}	900	V
I_D	13	A
$P_D(T_C=25℃)$	300	W
$R_{DS(ON)TYP}$	0.73	Ω

TO-3P(N)

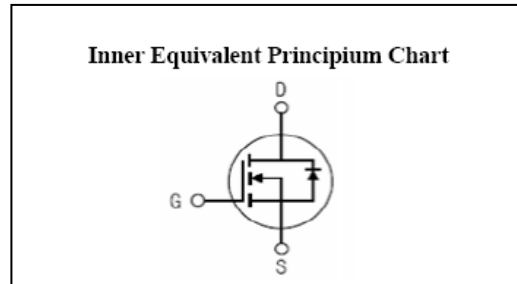**Features：**

- Fast Switching
- Low Gate Charge and Rdson
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

Inner Equivalent Principium Chart
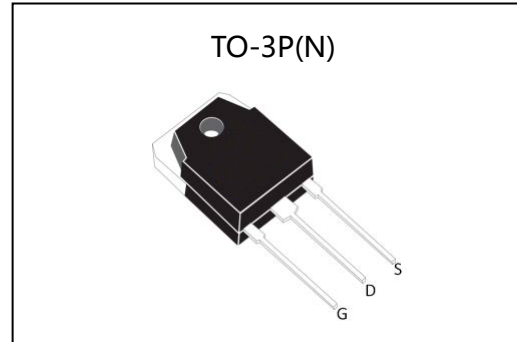
Applications：

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)

Absolute （Tc=25℃ unless otherwise specified）：

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	900	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	630	mJ
P_D	Power Dissipation	300	W
T_J，T_{stg}	Operating Junction and Storage Temperature Range	150，−55 to 150	℃
T_L	Maximum Temperature for Soldering	300	℃

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

Thermal Characteristics

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case	2.4	℃/W
$R_{\theta JA}$	Junction-to-Ambient	55	℃/W

Electrical Characteristics （Tc= 25℃ unless otherwise specified）:

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	900	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=900V, V_{GS}=0V, T_a= 25℃$	--	--	1.0	μA
		$V_{DS}=720V, V_{GS}=0V, T_a=150℃$	--	--	250	
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS} =+30V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS} =-30V$	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$[a3]	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=7A$	--	0.73	0.85	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.5	V

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}[a3]	Forward Transconductance	$V_{DS}=10V, I_D=7A$	--	12	--	S
C_{iss}	Input Capacitance	$V_{GS}=0V, V_D=25V$ f=1.0MHz	--	3500	--	pF
C_{oss}	Output Capacitance		--	300	--	
C_{rss}	Reverse Transfer Capacitance		--	150	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=350V, I_D=13A,$ $V_{GS}=10V\ R_g=25\Omega$	--	45	--	ns
t_r	Rise Time		--	90	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	66	--	
t_f	Fall Time		--	74	--	
Q_g	Total Gate Charge	$I_D =7A, V_{DD}=480V$ $V_{GS}=0\ to\ 10V$	--	130	--	nC
Q_{gs}	Gate to Source Charge		--	50	--	
Q_{gd}	Gate to Drain（"Miller"）Charge		--	28	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	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	$I_S=13A, V_{GS}=0V$	--	500	--	ns
Q_{rr}	Reverse Recovery Charge	$I_S=I_F, d_i/d_t=100A/us$	--	2.2	--	uC
Pulse width tp≤380μs,δ≤2%						

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

[a2] : $I_{AS}=10A, V_{DD}=50V, R_G=25Ω$, Starting $T_J= 25°C$

[a3] : Pulse Test: Pulse width≤380us, Duty Cycle≤2%

Typical Characteristics

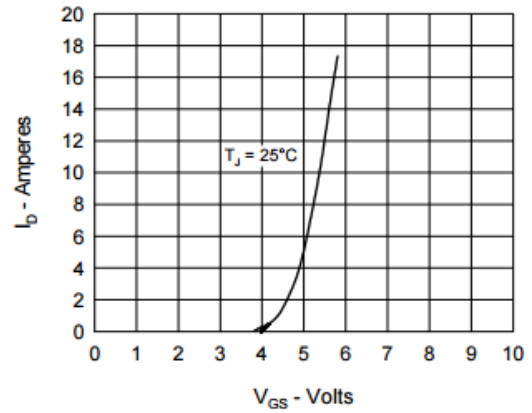Fig. 1. Output Characteristics
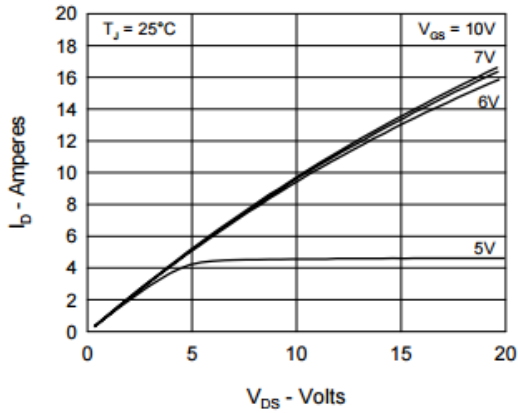
Fig. 2. Input Admittance

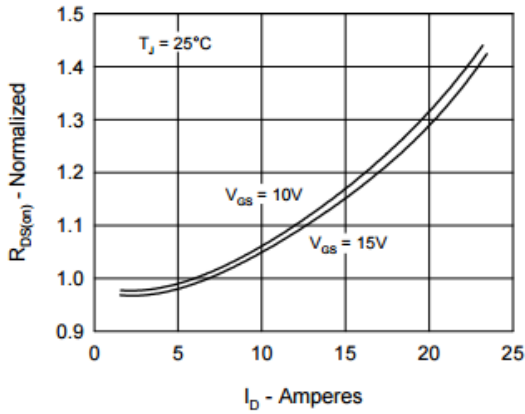Fig. 3. R_DS(on) vs. Drain Current

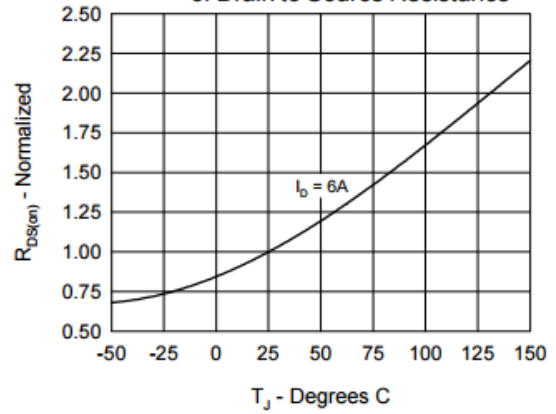Fig. 4. Temperature Dependence of Drain to Source Resistance
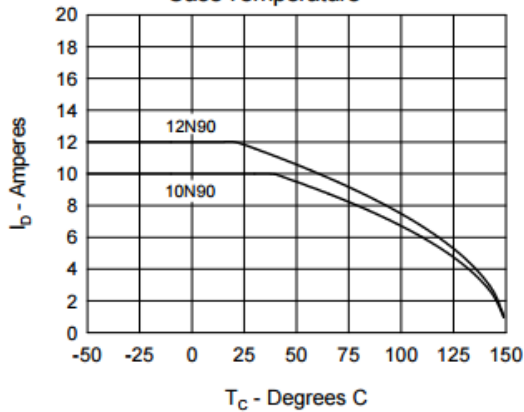

Fig. 5. Drain Current vs. Case Temperature

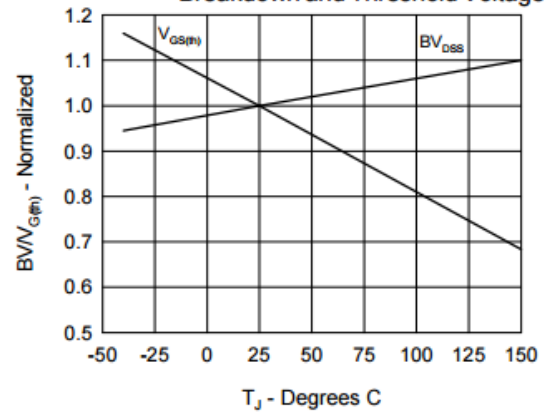Fig. 6. Temperature Dependence of Breakdown and Threshold Voltage
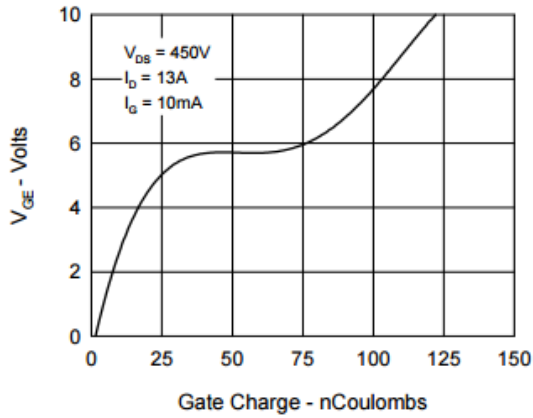
Fig.7. Gate Charge Characteristic Curve

$V_{DS} = 450V$
$I_D = 13A$
$I_G = 10mA$

V_{GE} - Volts

Gate Charge - nCoulombs

Fig.8. Capacitance Curves

C_{iss}

$f = 1 MHz$
$V_{DS} = 25V$

C_{oss}

C_{rss}

Capacitance - pF

V_{CE} - Volts
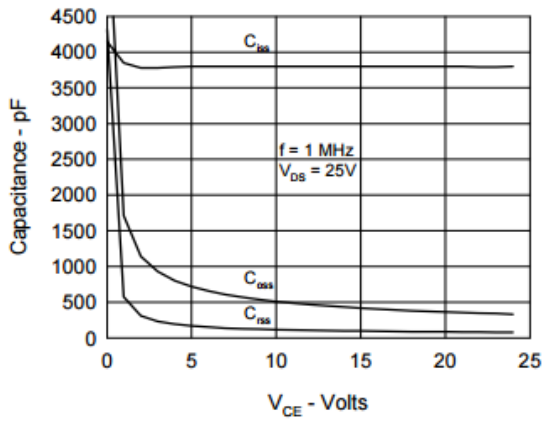
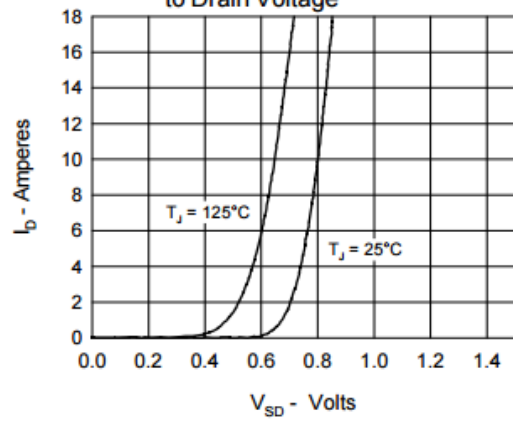Fig.9. Source Current vs. Source to Drain Voltage

$T_J = 125°C$

$T_J = 25°C$

I_D - Amperes

V_{SD} - Volts

Fig.10. Transient Thermal Impedance

D=0.5
D=0.2
D=0.1
D=0.05
D=0.02
D=0.01
Single Pulse

Thermal Response - KW

$D = t_p / T$

Pulse Width - Seconds