

## Silicon N-Channel Power MOSFET

### General Description :

The HMB150N06 uses advanced trench technology and design to provide excellent RDS(ON) with low gate charge. It can be used in a wide variety of applications. The package form is TO-220, which accords with the RoHS standard.

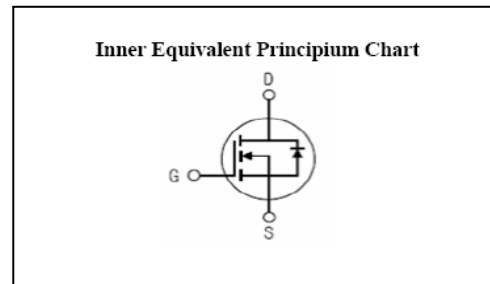
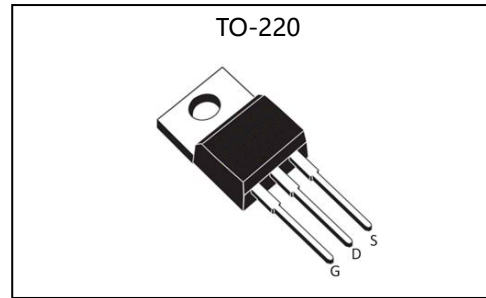
### Features :

- Fast Switching
- Low Gate Charge and  $R_{dson}$
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

### Applications :

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

$V_{DSS}$	60	V
$I_D$	150	A
$P_D$	220	W
$R_{DS(ON)type}$	3.5	$m\Omega$



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

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	60	V
$I_D$	Continuous Drain Current	150	A
	Continuous Drain Current $T_c = 100^\circ\text{C}$	105	A
$I_{DM}$	Pulsed Drain Current	600	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}^{a2}$	Single Pulse Avalanche Energy	1400	mJ
$E_{AR}^{a1}$	Avalanche Energy ,Repetitive	50	mJ
$I_{AR}^{a1}$	Avalanche Current	65	A
$dv/dt^{a3}$	Peak Diode Recovery $dv/dt$	5.0	V/ns
$P_D$	Power Dissipation	220	W
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	175 , -55 to 175	$^\circ\text{C}$
$T_L$	MaximumTemperature for Soldering	300	$^\circ\text{C}$

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

<b>OFF Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60	--	--	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Bvdss Temperature Coefficient	I <sub>D</sub> =250uA, Reference 25°C	--	0.1	--	V/°C
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> =60V, V <sub>GS</sub> = 0V, T <sub>a</sub> =25°C	--	--	1	μA
		V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>a</sub> =125°C	--	--	250	
I <sub>GSS(F)</sub>	Gate to Source Forward Leakage	V <sub>GS</sub> = +20V	--	--	1	μA
I <sub>GSS(R)</sub>	Gate to Source Reverse Leakage	V <sub>GS</sub> = -20V	--	--	-1	μA

<b>ON Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R <sub>DS(ON)</sub>	Drain-to-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =75A	--	3.4	4.5	mΩ
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	--	4.0	V
Pulse width tp ≤ 380μs, δ ≤ 2%						

<b>Dynamic Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =75A	180	--	--	S
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =30V f=1.0MHz	--	6500	--	pF
C <sub>oss</sub>	Output Capacitance		--	650	--	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	600	--	

<b>Resistive Switching Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t <sub>d(ON)</sub>	Turn-on Delay Time	I <sub>D</sub> =30A, V <sub>DD</sub> =30V V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω	--	26	--	ns
t <sub>r</sub>	Rise Time		--	25	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	90	--	
t <sub>f</sub>	Fall Time		--	40	--	
Q <sub>g</sub>	Total Gate Charge	I <sub>D</sub> =30A, V <sub>DD</sub> =30V V <sub>GS</sub> =10V	--	165	--	nC
Q <sub>gs</sub>	Gate to Source Charge		--	30	--	
Q <sub>gd</sub>	Gate to Drain ( "Miller" ) Charge		--	65	--	

### Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_S$	Continuous Source Current (Body Diode)		--	--	150	A
$I_{SM}$	Maximum Pulsed Current (Body Diode)		--	--	600	A
$V_{SD}$	Diode Forward Voltage	$I_S=50A, V_{GS}=0V$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S=40A, T_j=25^\circ C$	--	45	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt=100A/us, V_{GS}=0V$	--	70	--	nC

Pulse width  $t_p \leq 380\mu s, \delta \leq 2\%$

Symbol	Parameter	Typ.	Units
$R_{\theta JA}$	Junction-to-Ambient	1.8	$^\circ C/W$
$R_{\theta JC}$	Junction-to-Case	0.68	$^\circ C/W$

<sup>a1</sup> : Repetitive rating; pulse width limited by maximum junction temperature

<sup>a2</sup> : EAS condition :  $T_j=25^\circ C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega$

<sup>a3</sup> :  $I_{SD}=150A, di/dt \leq 100A/us, V_{DD} \leq BV_{DS}, Start T_j=25^\circ C$

### Test Circuit and Waveform

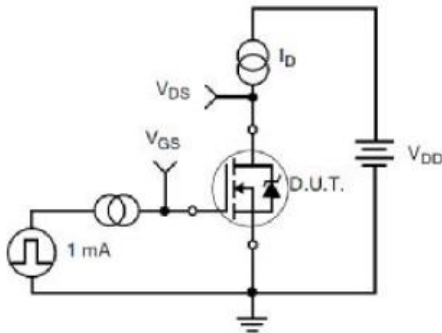


Figure 17. Gate Charge Test Circuit

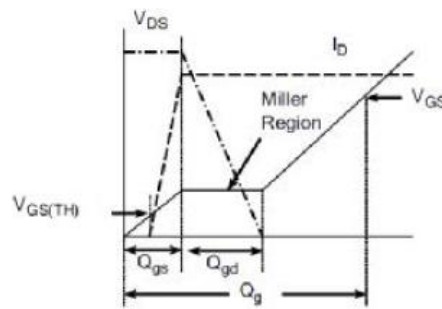


Figure 18. Gate Charge Waveform

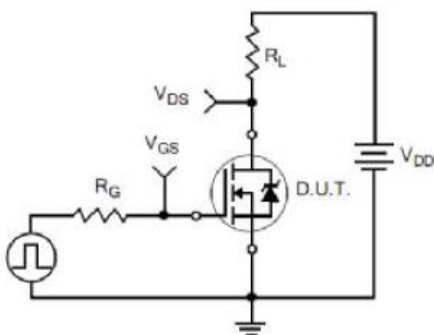


Figure 19. Resistive Switching Test Circuit

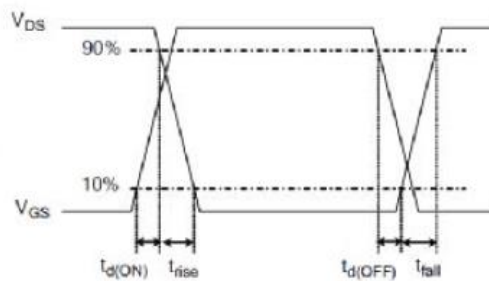
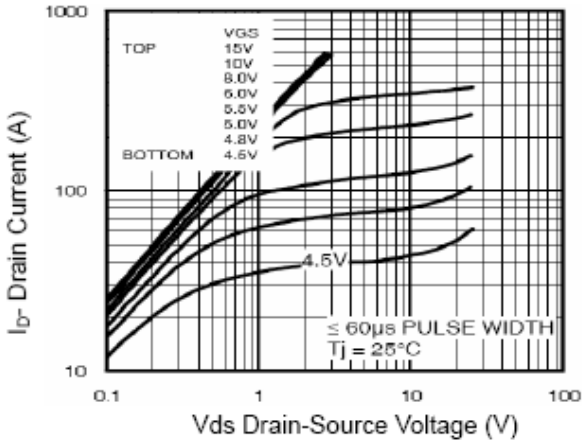
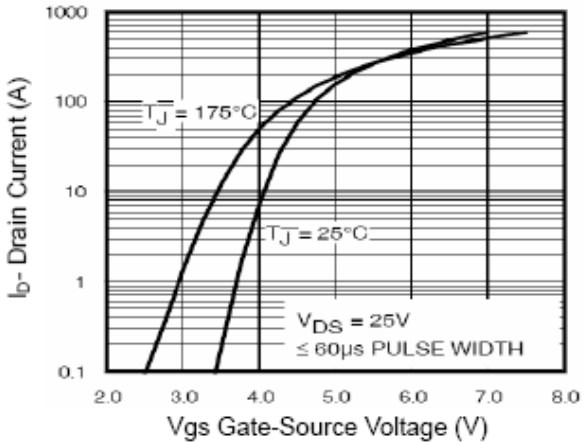


Figure 20. Resistive Switching Waveforms

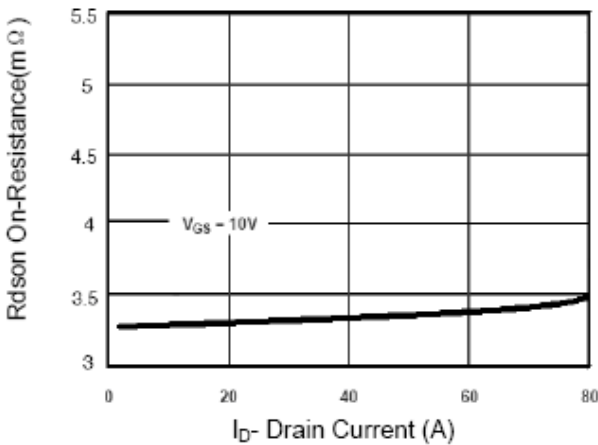
**Characteristics Curve :**



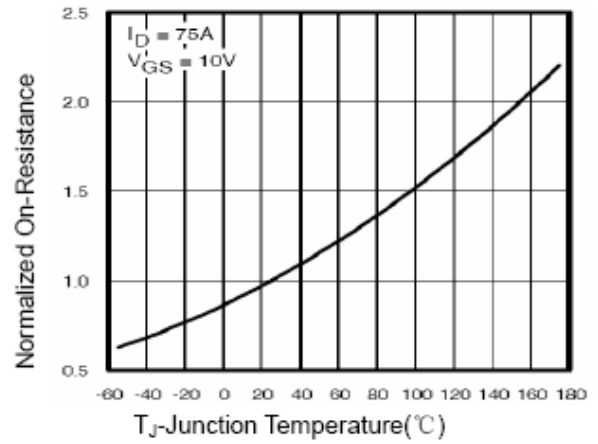
**Figure 1 Output Characteristics**



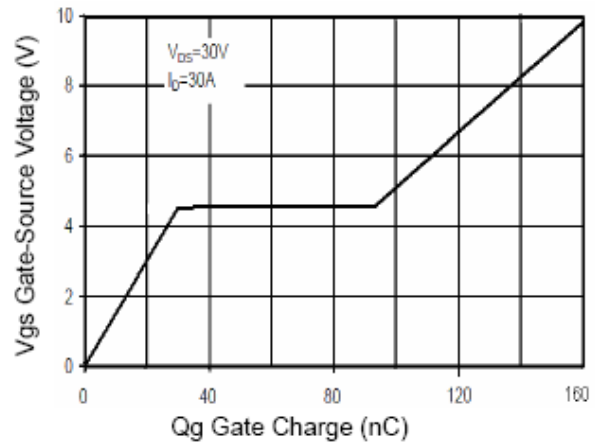
**Figure 2 Transfer Characteristics**



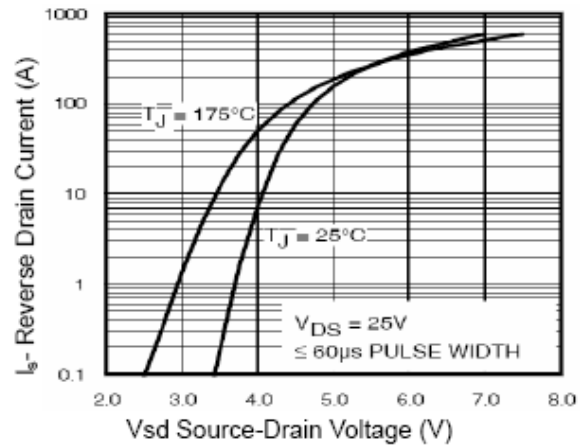
**Figure 3 Rdson- Drain Current**



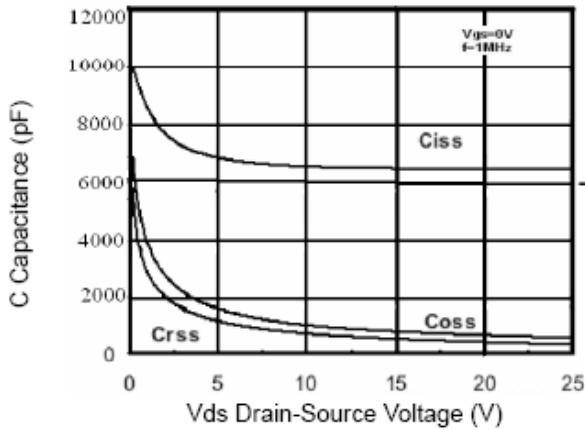
**Figure 4 Rdson-Junction Temperature**



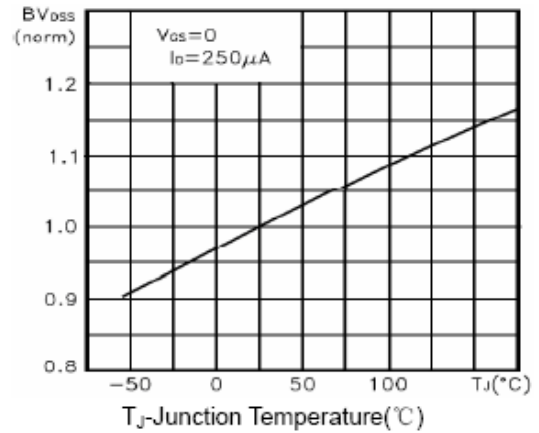
**Figure 5 Gate Charge**



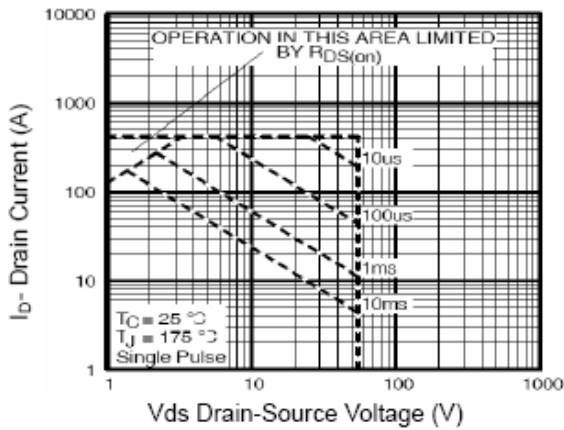
**Figure 6 Source- Drain Diode Forward**



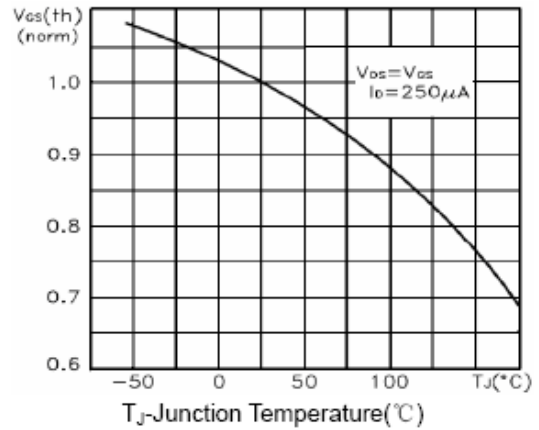
**Figure 7 Capacitance vs Vds**



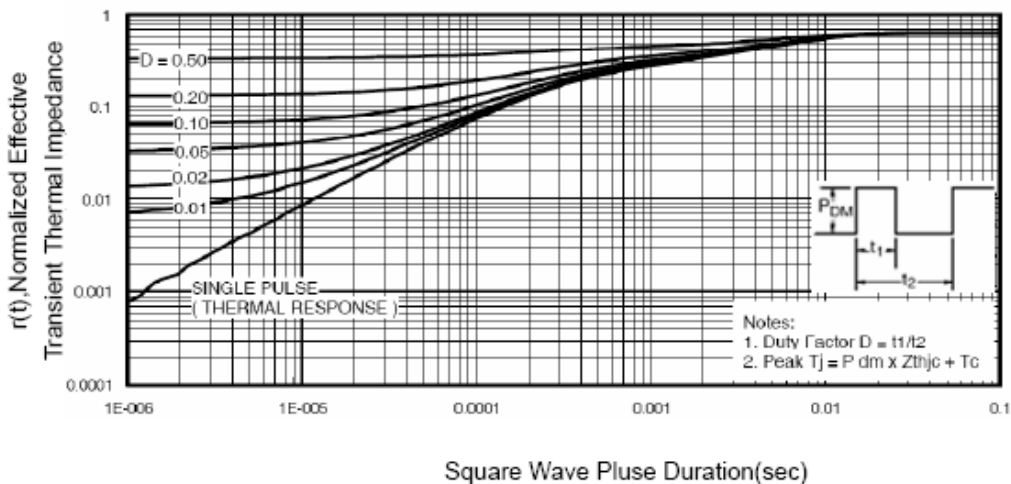
**Figure 9  $BV_{DSS}$  vs Junction Temperature**



**Figure 8 Safe Operation Area**



**Figure 10  $V_{GS(th)}$  vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**