

Silicon N-Channel Power MOSFET

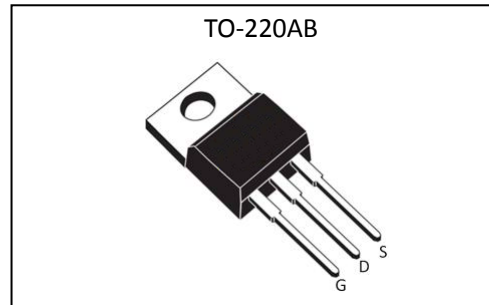
General Description :

The HMB250N04 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications. The package form is TO-220AB, which accords with the RoHS standard.

V_{DSS}	40	V
I_D	250	A
P_D	242	W
$R_{DS(ON)type}$	2.1	$m\Omega$

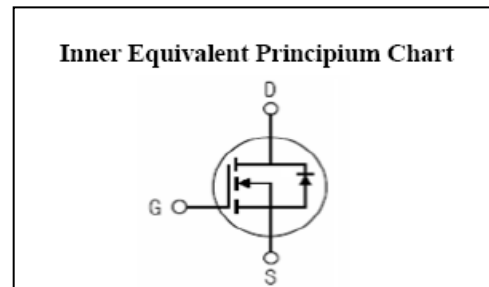
Features :

- $R_{DS(ON)} < 2.7m\Omega @ V_{GS}=10V$ (Typ2.1 $m\Omega$)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation



Applications :

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



Absolute ($T_c= 25^\circ C$ unless otherwise specified) :

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	40	V
I_D	Continuous Drain Current	250	A
I_{DM}	Pulsed Drain Current	1000	A
V_{GS}	Gate-to-Source Voltage	± 20	V
P_D	Power Dissipation	242	W
E_{AS}	Single pulse avalanche energy	2200	mJ
T_J , T_{stg}	Operating Junction and Storage Temperature Range	175 , -55 to 175	$^\circ C$

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	$V_{GS}=0V, I_D=250\mu A$	40	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=32V, V_{GS}=0V, T_a=25^\circ\text{C}$	--	--	1.0	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=+20V$	--	--	0.1	μA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=-20V$	--	--	-0.1	μA

ON Characteristics ^{a3}						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=80A$	--	2.1	2.7	$m\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V

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

Dynamic Characteristics ^{a4}						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=20V$ $f=1.0\text{MHz}$	--	5500	--	pF
C_{oss}	Output Capacitance		--	900	--	
C_{rss}	Reverse Transfer Capacitance		--	290	--	

Resistive Switching Characteristics ^{a4}						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=20V, I_D=80A$ $V_{GS}=10V, R_G=1.6\Omega, R_L=0.5\Omega$	--	19	--	ns
t_r	Rise Time		--	65	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	49	--	
t_f	Fall Time		--	31	--	
Q_g	Total Gate Charge	$V_{DD}=20V, I_D=80A$ $V_{GS}=10V$	--	75	--	nC
Q_{gs}	Gate to Source Charge		--	23	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	25	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t_{rr}	Reverse Recovery Time	$I_S=240A, T_j=25^{\circ}C$	--	77	--	ns
Q_{rr}	Reverse Recovery Charge	$dI_F/dt=100A/\mu s, V_{GS}=0V$	--	68	--	μC
I_S	Continuous Source Current ^{a2} (Body Diode)		--	--	250	A
V_{SD}	Diode Forward Voltage ^{a3}	$I_S=80A, V_{GS}=0V$	--	--	1.2	V

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case ^{a2}	0.62	$^{\circ}C/W$

^{a1} : Repetitive Rating: Pulse width limited by maximum junction temperature.

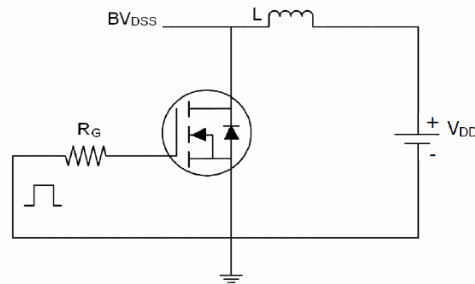
^{a2} : Surface Mounted on FR4 Board, $t \leq 10sec$.

^{a3} : Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.

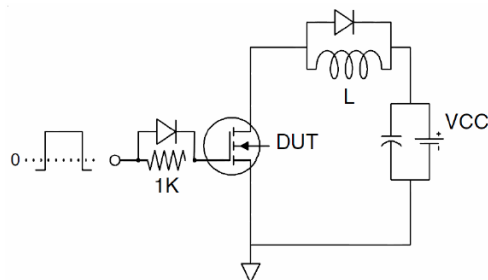
^{a4} : Guaranteed by design, not subject to production

Test circuit

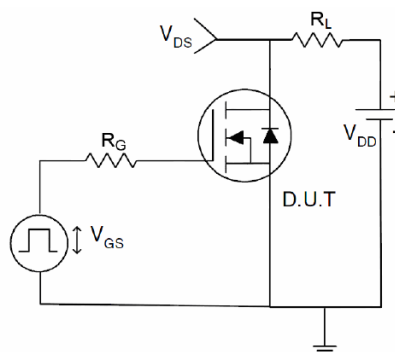
1) EAS test Circuit



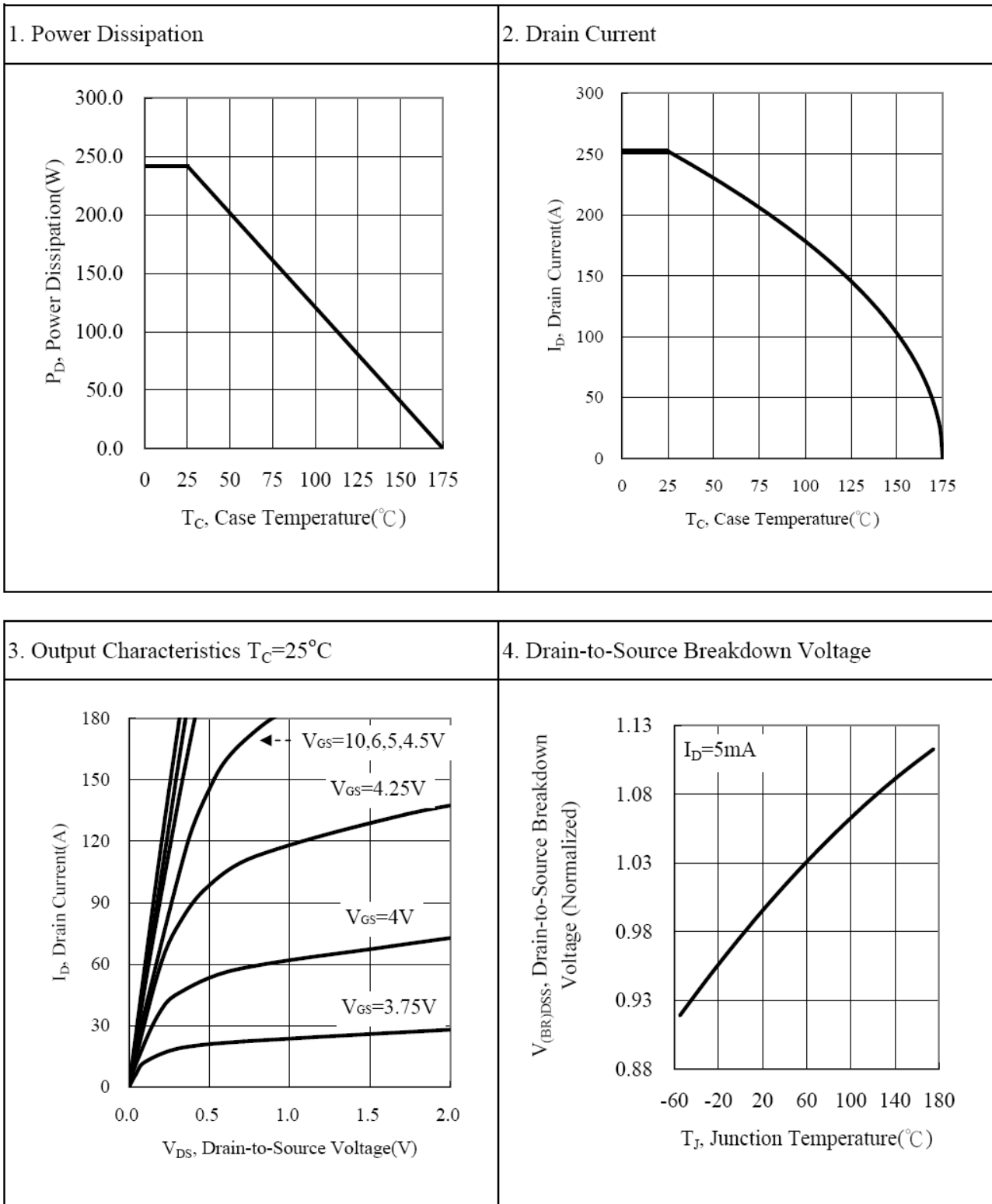
2) Gate charge test Circuit



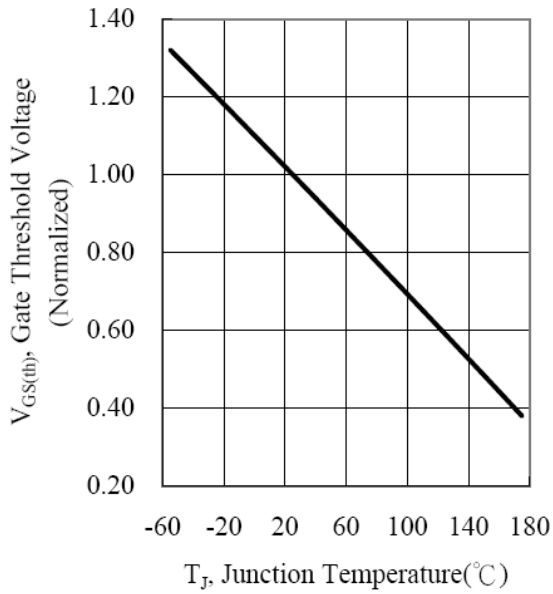
3) Switch Time Test Circuit



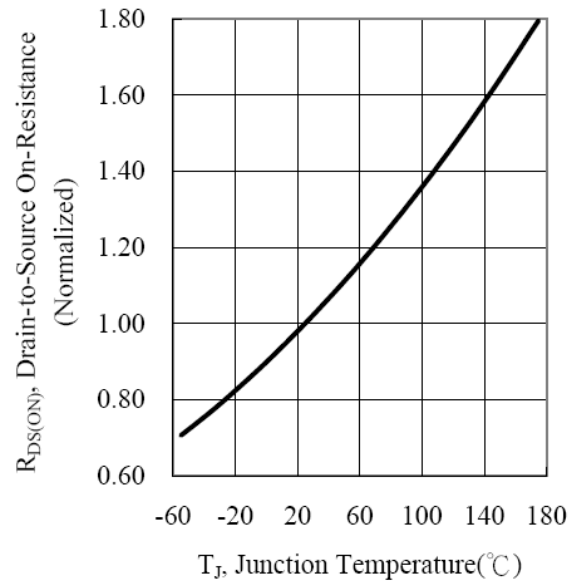
Characteristics Curve :



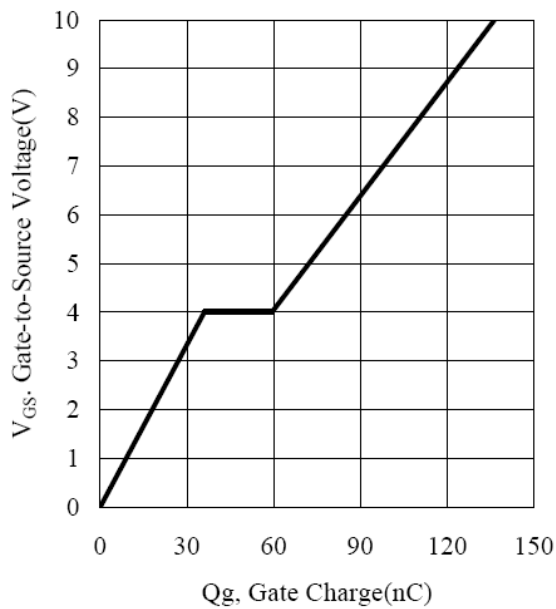
5. Gate Threshold Voltage



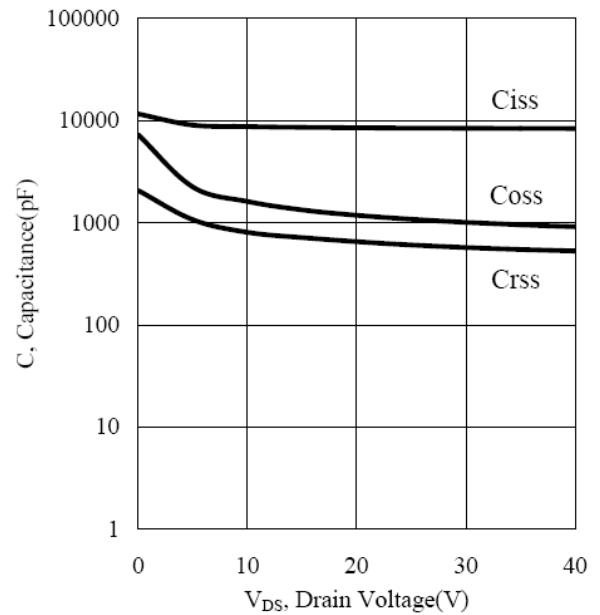
6. Drain-to-Source On-Resistance



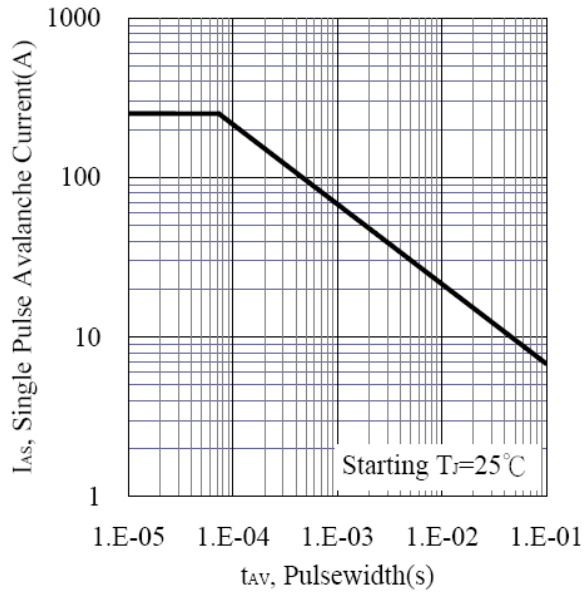
7. Typ. Gate Charge



8. Typ. Capacitance



9. Avalanche Characteristics



10. Forward Characteristics of reverse diode

