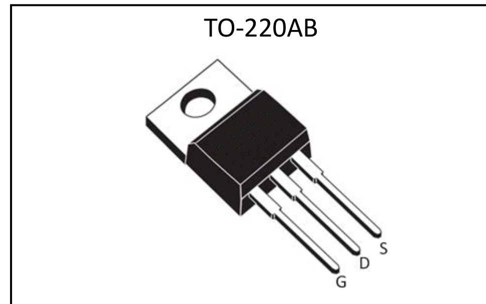
Silicon N-Channel Power MOSFET

General Description :

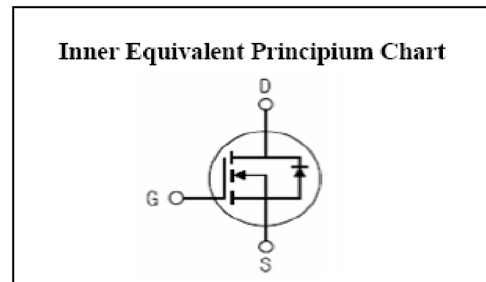
The HMB290N04 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications. The package form is TO-220AB, which accords with the RoHS standard.

V_{DSS}	40	V
I_D	290	A
P_D	242	W
$R_{DS(ON)type}$	1.6	mΩ



Features :

- $R_{DS(ON)}$ <2.3mΩ @ V_{GS}=10V (Typ1.6mΩ)
- 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 (Tc= 25℃ unless otherwise specified) :

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	40	V
I_D	Continuous Drain Current (Silicon Limited)	290	
	Continuous Drain Current(Package Limited)	80	A
I_{DM}	Pulsed Drain Current	1160	A
V_{GS}	Gate-to-Source Voltage	±20	V
P_D	Power Dissipation	250	W
E_{AS}	Single pulse avalanche energy	1300	mJ
T_J , T_{stg}	Operating Junction and Storage Temperature Range	175 , –55 to 175	℃

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=250μA	40	--	--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS}=32V, V_{GS}= 0V,T_a=25℃	--	--	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	--	1.6	2.3	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	2.0	--	4.0	V
Pulse width tp≤380μs,δ≤2%						

Dynamic Characteristics[a4]						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=20V f=1.0MHz	--	8400	--	pF
C_{oss}	Output Capacitance		--	1180	--	
C_{rss}	Reverse Transfer Capacitance		--	630	--	

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=1.6Ω,R_L=0.5Ω	--	30	--	ns
t_r	Rise Time		--	81	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	185	--	
t_f	Fall Time		--	91	--	
Q_g	Total Gate Charge	V_{DD}=20V, I_D=850A V_{GS}=10V	--	135	--	nC
Q_{gs}	Gate to Source Charge		--	36.0	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	23.5	--	

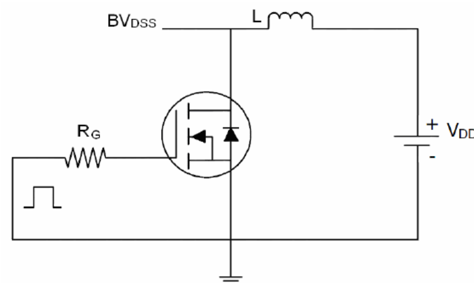
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t_{rr}	Reverse Recovery Time	I_S=80A,T_j=25℃ dI_F/dt=100A/μs,V_{GS}=0V	--	70	--	ns
Q_{rr}	Reverse Recovery Charge		--	67	--	μC
I_S	Continuous Source Current [a2](Body Diode)		--	--	80	A
V_{SD}	Diode Forward Voltage[a3]	I_S=80A,V_{GS}=0V	--	--	1.2	V

Symbol	Parameter	Typ.	Units
$R_{θJC}$	Junction-to-Case[a2]	0.60	℃/W

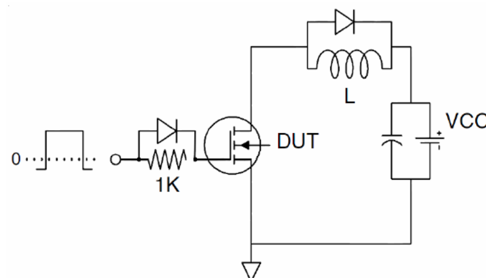
[a1] : Repetitive Rating: Pulse width limited by maximum junction temperature.
[a2] : Surface Mounted on FR4 Board, t≤10sec.
[a3] : Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%.
[a4] : Guaranteed by design, not subject to production

Test circurt

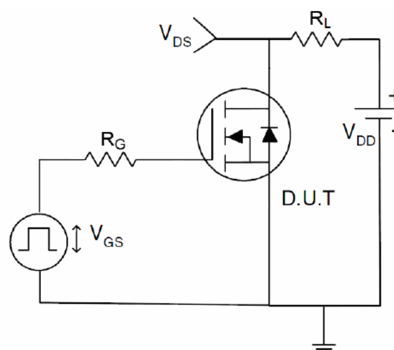
1) EAS test Circuit



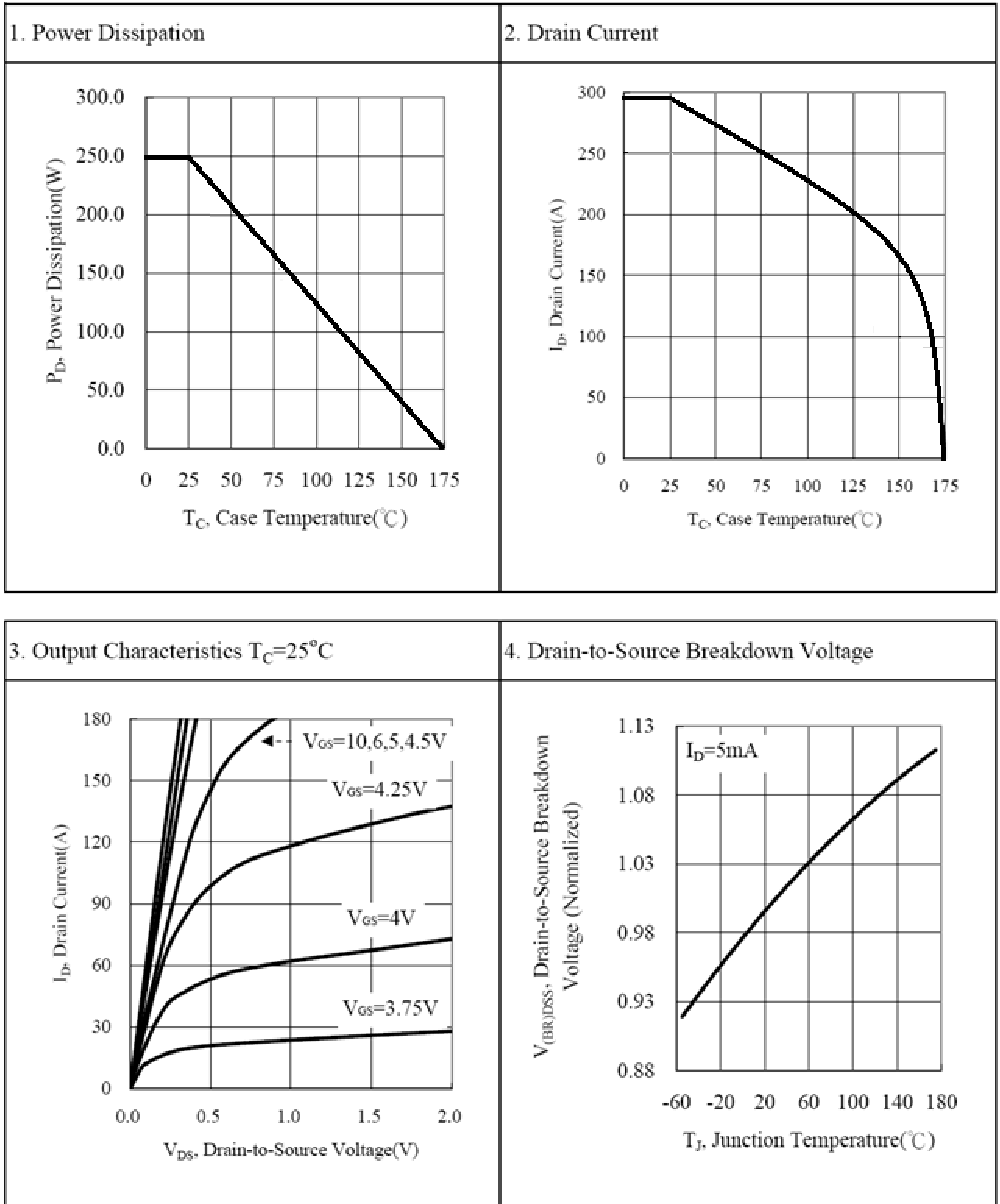
2) Gate charge test Circuit

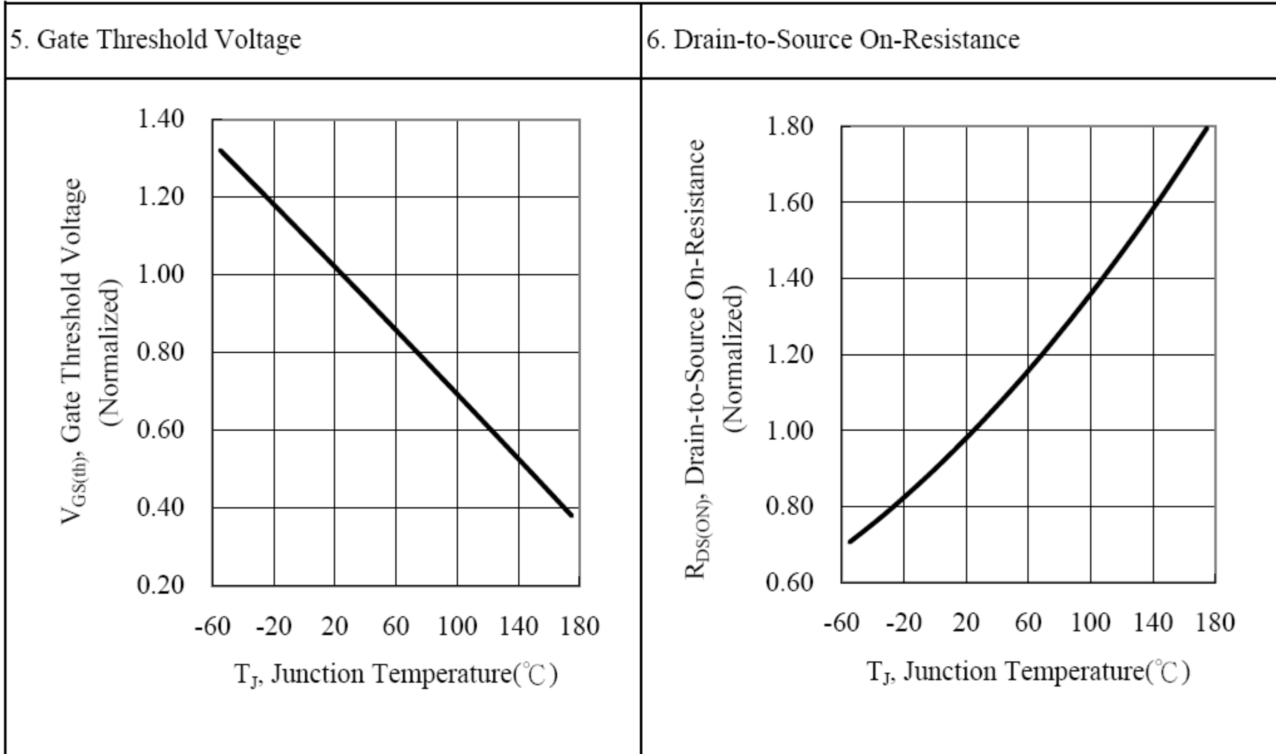


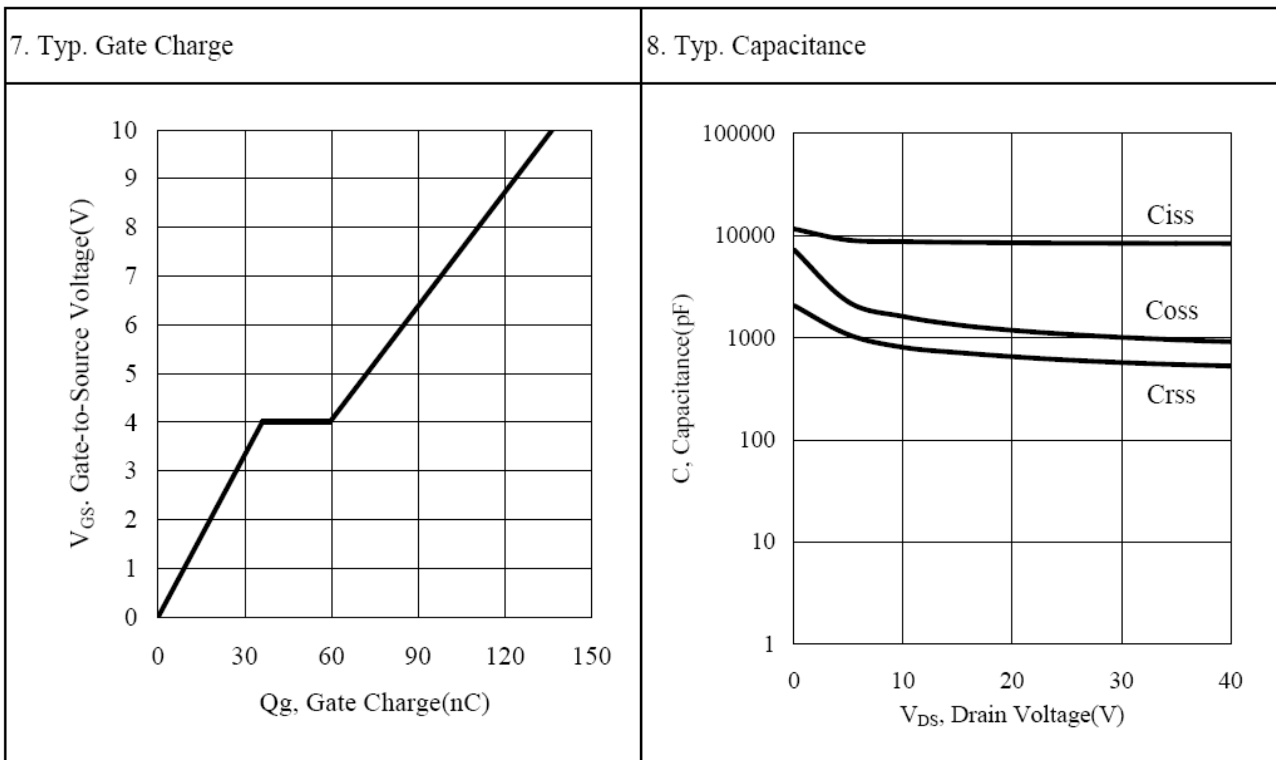
3) Switch Time Test Circuit



Characteristics Curve :




5. Gate Threshold Voltage
V_GS(th), Gate Threshold Voltage (Normalized)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-60 -20 20 60 100 140 180
T_J, Junction Temperature(℃)
6. Drain-to-Source On-Resistance
R_DS(ON), Drain-to-Source On-Resistance (Normalized)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
-60 -20 20 60 100 140 180
T_J, Junction Temperature(℃)


7. Typ. Gate Charge
V_GS, Gate-to-Source Voltage(V)
10 9 8 7 6 5 4 3 2 1 0
0 30 60 90 120 150
Qg, Gate Charge(nC)
8. Typ. Capacitance
C, Capacitance(pF)
100000
10000
1000
100
10
1
Ciss
Coss
Crss
0 10 20 30 40
V_DS, Drain Voltage(V)

9. Avalance Characteristics	10. Forward Characteristics of reverse diode