

Silicon N-Channel Power MOSFET

General Description :

The HMB4115 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-220AB, which accords with the RoHS standard.

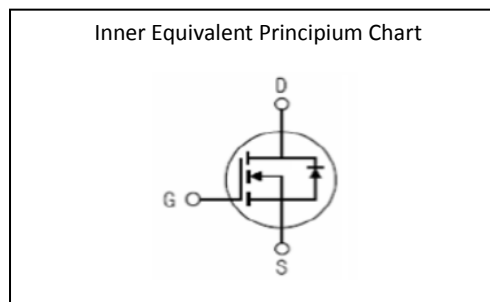
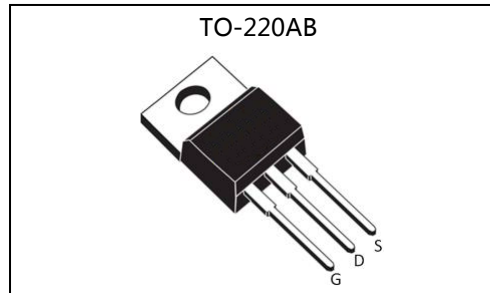
Features :

- Fast Switching
- ESD Improved Capability
- Low Gate Charge
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

Applications:

- Power switch circuit of POWER
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

V_{DSS}	150	V
I_D	105	A
$P_D(T_C=25^\circ C)$	380	W
$R_{DS(ON)TYP}$	9.8	m Ω



Package Marking and Ordering Information:

Device Marking	Device	Device Package	Quantity
HMB4115	HMB4115	TO-220AB	1000units

Absolute Maximum Ratings ($T_A= 25^\circ C$ unless otherwise specified) :

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	150	V
I_D	Continuous Drain Current	105	A
	Continuous Drain Current $T_C=100^\circ C$	75	A
I_{DM}^{a1}	Pulsed Drain Current (pulse width limited by T_{JM})	420	A
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy	1000	mJ
E_{AR}^{a1}	Avalanche Energy, Repetitive	250	mJ
I_{AR}^{a1}	Avalanche Current	90	A
dv/dt^{a2}	Peak Diode Recovery dv/dt	5.0	V/ns
P_D	Power Dissipation	380	W
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150 , -55 to 150	$^\circ C$
T_L	Maximum Temperature for Soldering	300	$^\circ C$

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

Electrical Characteristics (Tc=25°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 =250μA	150	--	--	V
I _{DSS}	Drain to Source Leakage Current	V _{DS} =150V, V _{GS} =0V, T _a =25°C	--	--	1.0	μA
		V _{DS} =150V, V _{GS} =0V, T _a =125°C	--	--	100	
I _{GSS(F)}	Gate to Source Forward Leakage	V _{GS} =+20V	--	--	100	nA
I _{GSS(R)}	Gate to Source Reverse Leakage	V _{GS} =-20V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R _{DS(ON)}	Drain-to-Source On-Resistance	V _{GS} =10V, I _D =60A	--	9.8	11	mΩ
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	3.6	--	5.0	V
g _{fs}	Forward Trans conductance	V _{DS} =50V, I _D =60A	100	--	--	S
R _g	Gate Resistance	V _{GS} =0V V _{DS} open f=1.0MHZ		1.5		Ω
Pulse width<380μs; duty cycle<2%.						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C _{iss}	Input Capacitance	V _{GS} =0V V _{DS} =25V f=1.0MHZ	--	7500	--	pF
C _{OSS}	Output Capacitance		--	500	--	
C _{rSS}	Reverse Transfer Capacitance		--	215	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t _{d(ON)}	Turn-on Delay Time	I _D =40A, V _{DS} =50V V _{GS} =10V, R _g =2.5Ω	--	45	--	ns
t _r	Rise Time		--	70	--	
t _{d(OFF)}	Turn-Off Delay Time		--	110	--	
t _f	Fall Time		--	90	--	
Q _g	Total Gate Charge	I _D =40A, V _{DD} =100V V _{GS} =10V	--	200	--	nC
Q _{gs}	Gate to Source Charge		--	28	--	
Q _{gd}	Gate to Drain ("Miller") Charge		--	60	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_{SD}	Continuous Source Current (Body Diode)		--	--	105	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	420	A
V_{SD}	Diode Forward Voltage	$I_S=60A, V_{GS}=0V$	--	--	1.2	V
t_{rr}	Reverse Recovery Time	$I_S=60A, T_j=25^{\circ}C, V_{DD}=50V$	--	90	--	ns
Q_{rr}	Reverse Recovery Charge	$dI_F/dt=100A/\mu s, V_{GS}=0V$	--	0.3	--	uC

Thermal Characteristics

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.45	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	60	$^{\circ}C/W$

a1 : $T_J = 25^{\circ}C, L = 0.3mH, R_G = 25\Omega, V_{DD}=50V, V_{GS}=10V$

a2 : $I_{SD}=40A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}, \text{Start } T_J=25^{\circ}C$

Test Circuits and Waveforms

Figure A: Gate Charge Test Circuit and Waveform

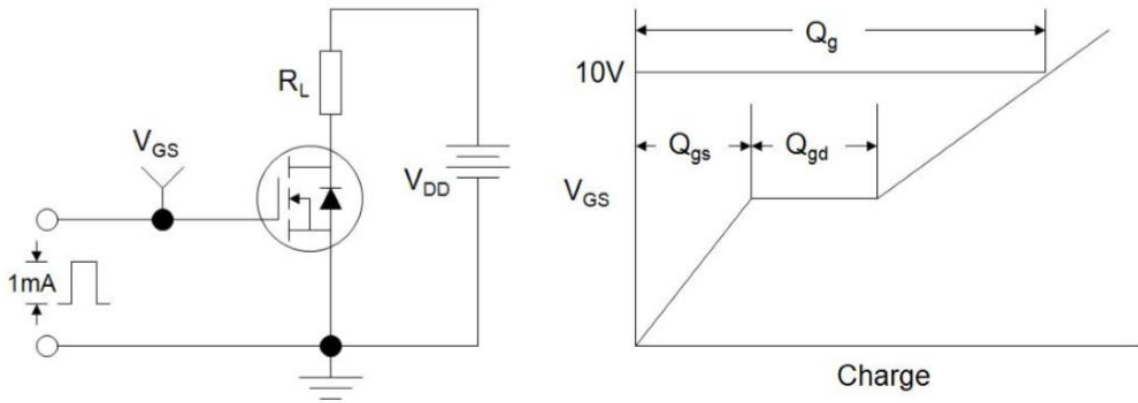


Figure B: Resistive Switching Test Circuit and Waveform

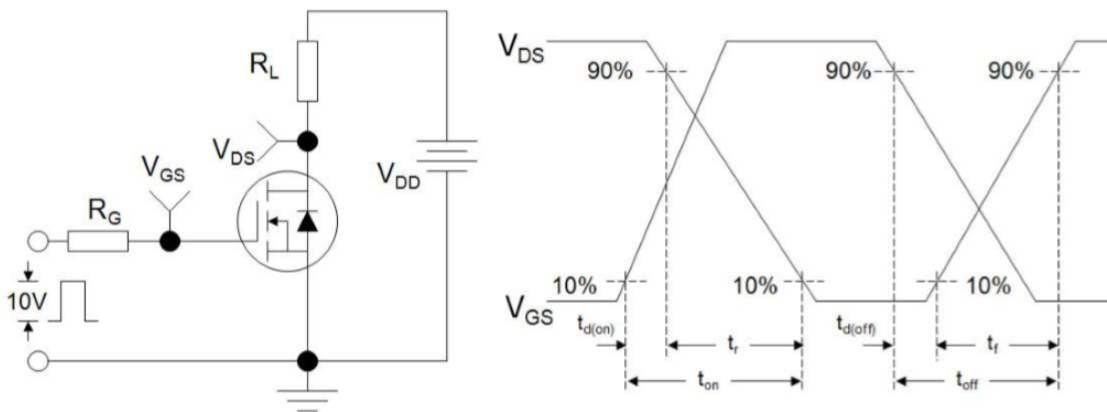
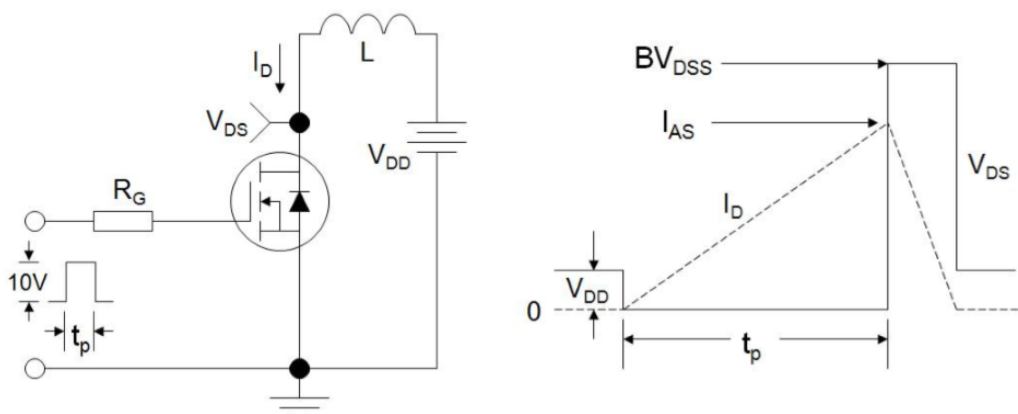


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



Characteristics Curve :

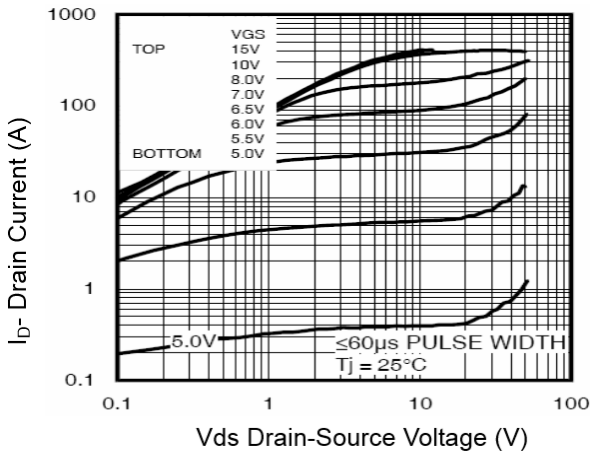


Figure 1 Output Characteristics

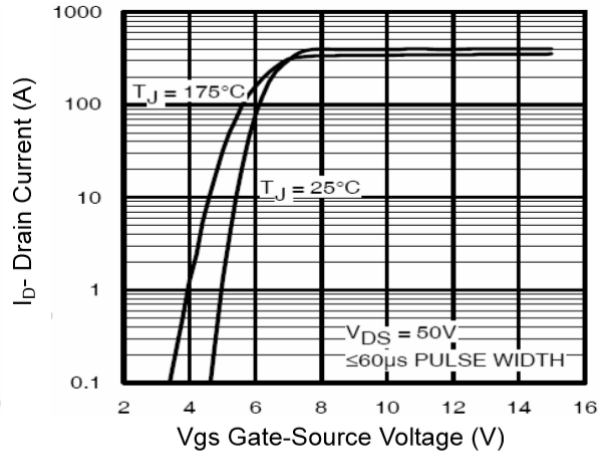


Figure 2 Transfer Characteristics

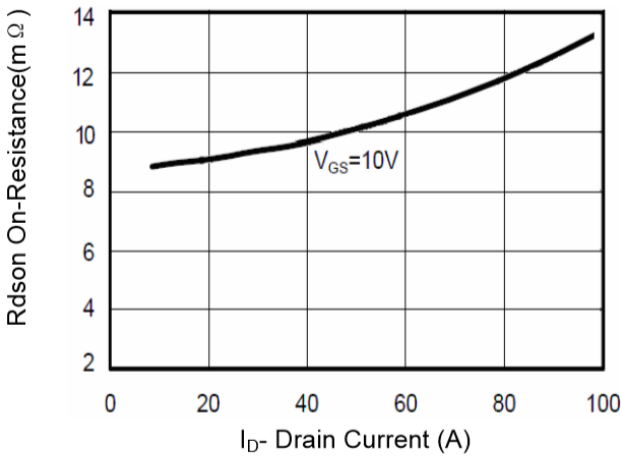


Figure 3 Rdson- Drain Current

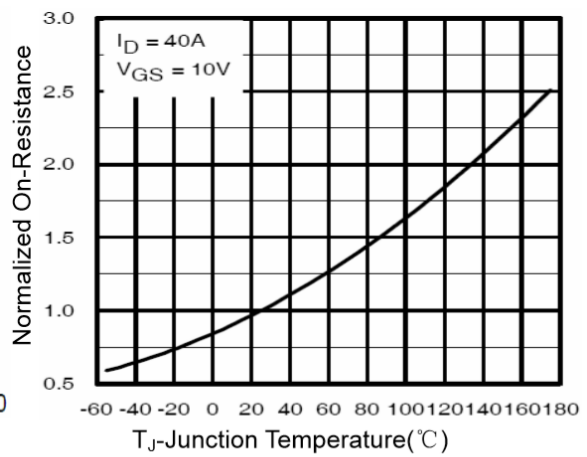


Figure 4 Rdson-Junction Temperature

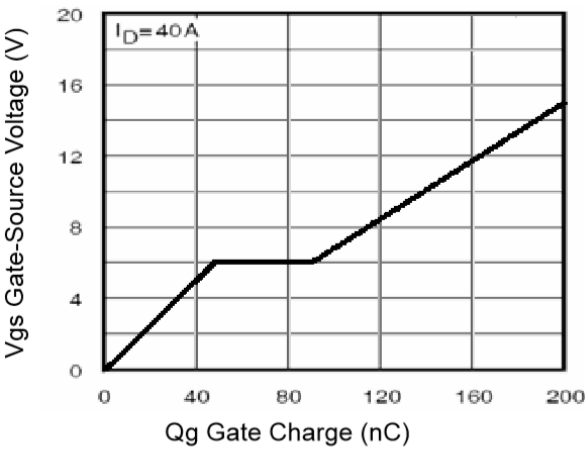


Figure 5 Gate Charge

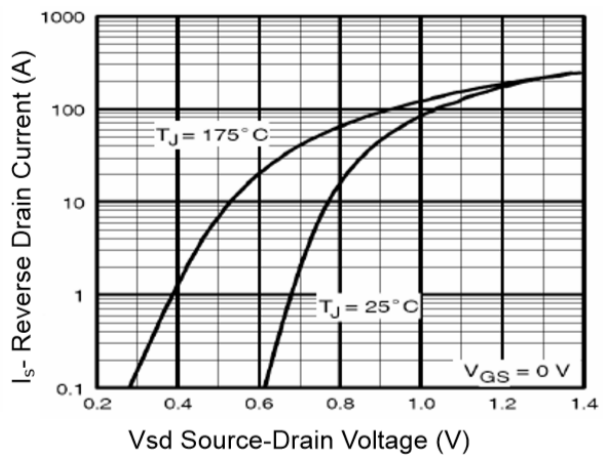


Figure 6 Source- Drain Diode Forward

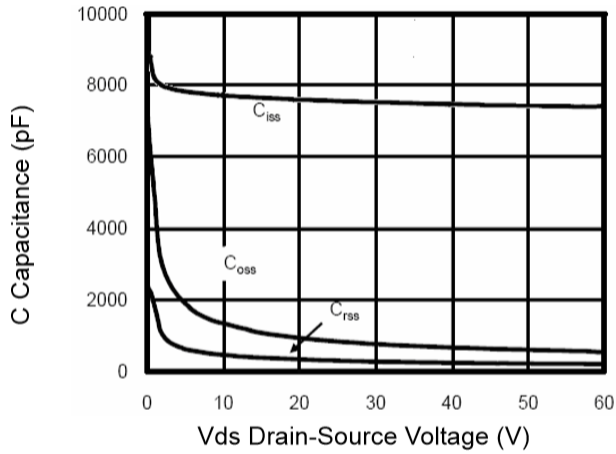


Figure 7 Capacitance vs Vds

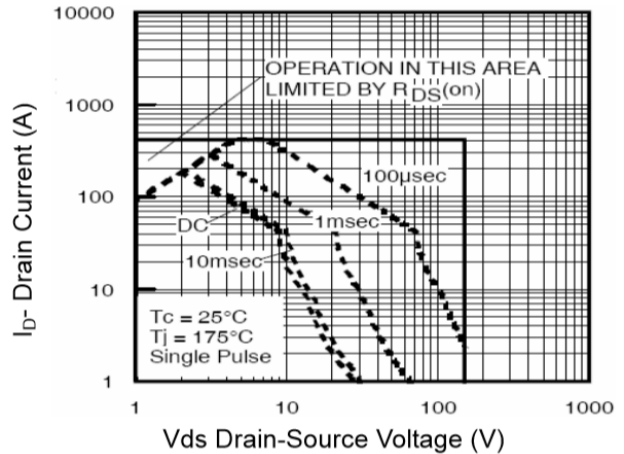


Figure 8 Safe Operation Area

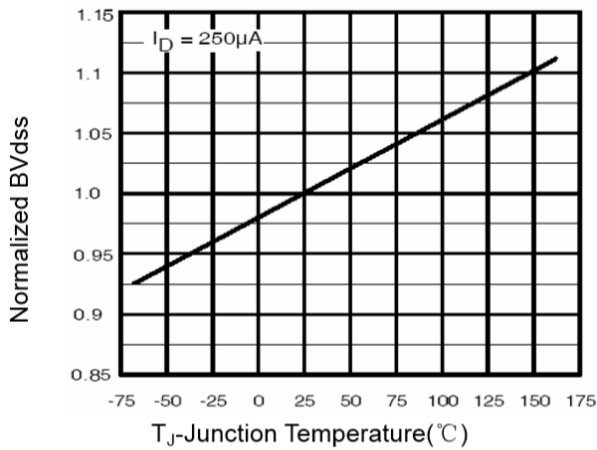


Figure 9 BV_{DSS} vs Junction Temperature

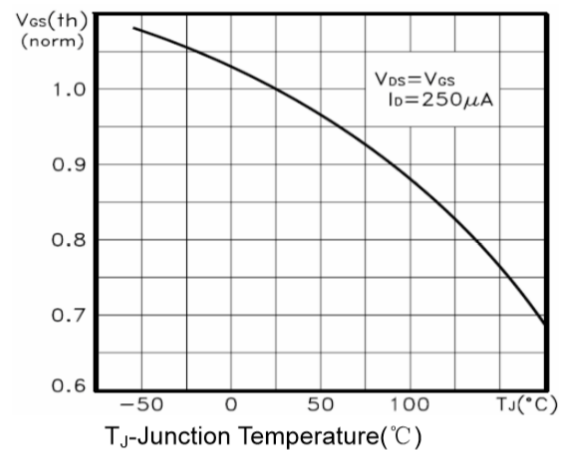


Figure 10 V_{GS(th)} vs Junction Temperature

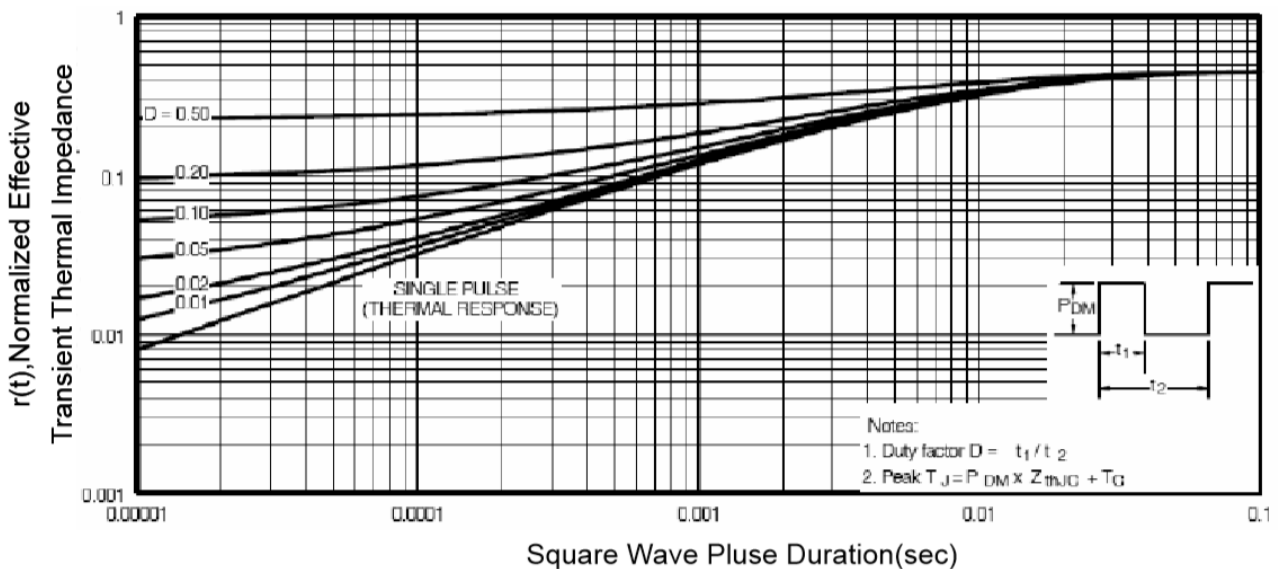


Figure 11 Normalized Maximum Transient Thermal Impedance