

## General Description:

The HMB4332 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.

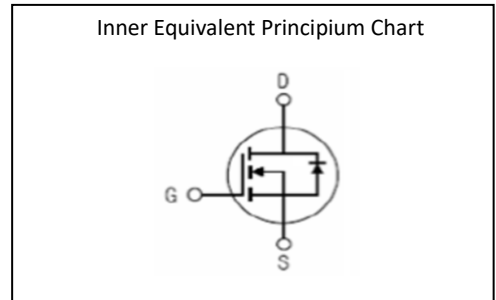
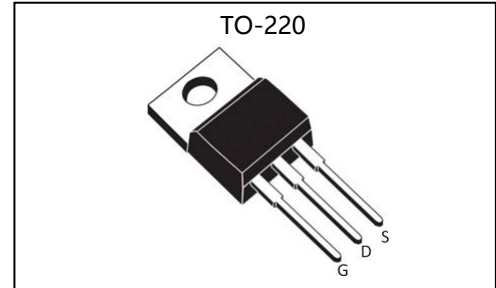
## Features:

- 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)

$V_{DSS}$	250	V
$I_D$	58	A
$P_D(T_C=25^\circ C)$	360	W
$R_{DS(ON)TYP}$	29	$m\Omega$



## Absolute Maximum Ratings (TA= 25°C unless otherwise specified):

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	250	V
$I_D$	Continuous Drain Current	58	A
	Continuous Drain Current $T_C=100^\circ C$	40	A
$I_{DM}^{a1}$	Pulsed Drain Current (pulse width limited by $T_{JM}$ )	230	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulse Avalanche Energy	300	mJ
$E_{AR}^{a1}$	Avalanche Energy, Repetitive	75	mJ
$I_{AR}^{a1}$	Avalanche Current	45	A
$dv/dt^{a2}$	Peak Diode Recovery $dv/dt$	5.0	V/ns
$P_D$	Power Dissipation	360	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) :

<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	250	--	--	V
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> =250V, V <sub>GS</sub> =0V, T <sub>a</sub> =25°C	--	--	1.0	μA
		V <sub>DS</sub> =250V, V <sub>GS</sub> =0V, T <sub>a</sub> =125°C	--	--	100	
I <sub>GSS(F)</sub>	Gate to Source Forward Leakage	V <sub>GS</sub> =+20V	--	--	100	nA
I <sub>GSS(R)</sub>	Gate to Source Reverse Leakage	V <sub>GS</sub> =-20V	--	--	-100	nA

<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> =35A	--	29	33	mΩ
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	3.6	--	5.0	V
g <sub>fs</sub>	Forward Trans conductance	V <sub>DS</sub> =10V, I <sub>D</sub> =35A	100	--	--	S
R <sub>g</sub>	Gate Resistance	V <sub>GS</sub> =0V V <sub>DS</sub> open f=1.0MHz		1.5		Ω

Pulse width < 380μs; duty cycle < 2%.

<b>Dynamic Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V V <sub>DS</sub> =25V f=1.0MHz	--	7000	--	pF
C <sub>oss</sub>	Output Capacitance		--	480	--	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	210	--	

<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> =35A, V <sub>DS</sub> =50V V <sub>GS</sub> =10V, R <sub>g</sub> =2.5Ω	--	45	--	ns
t <sub>r</sub>	Rise Time		--	70	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	110	--	
t <sub>f</sub>	Fall Time		--	90	--	
Q <sub>g</sub>	Total Gate Charge	I <sub>D</sub> =35A, V <sub>DD</sub> =100V V <sub>GS</sub> =10V	--	85	--	nC
Q <sub>gs</sub>	Gate to Source Charge		--	15	--	
Q <sub>gd</sub>	Gate to Drain ( "Miller" ) Charge		--	25	--	

**Source-Drain Diode Characteristics**

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_{SD}$	Continuous Source Current (Body Diode)		--	--	58	A
$I_{SM}$	Maximum Pulsed Current (Body Diode)		--	--	230	A
$V_{SD}$	Diode Forward Voltage	$I_S=35A, V_{GS}=0V$	--	--	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_S=30A, T_j=25^\circ C, V_{DD}=50V$	--	120	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt=100A/\mu s, V_{GS}=0V$	--	0.55	--	$\mu C$

**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:  $I_{SD}=35A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}, \text{Start } T_J=25^\circ C$

Test Circuits and Waveforms

Figure A: Gate Charge Test Circuit and Waveform

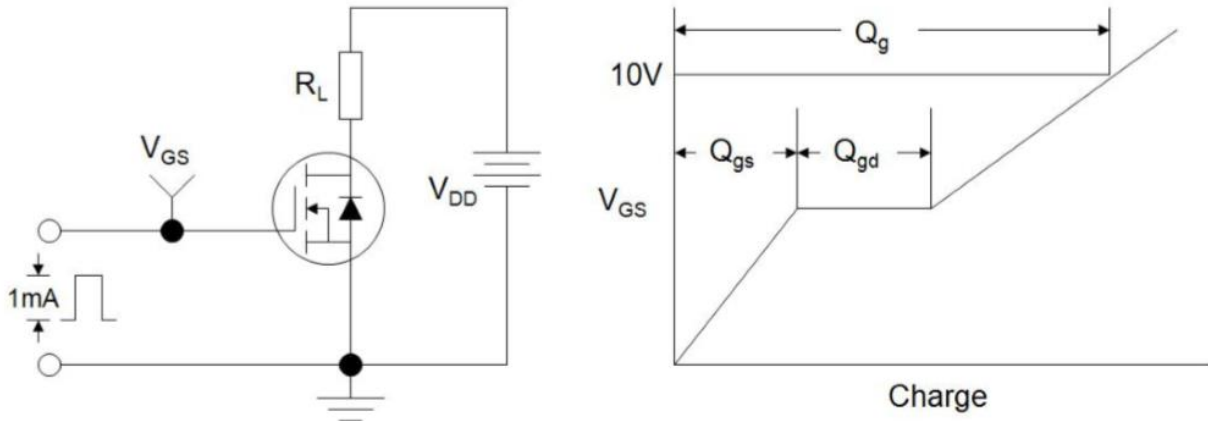


Figure B: Resistive Switching Test Circuit and Waveform

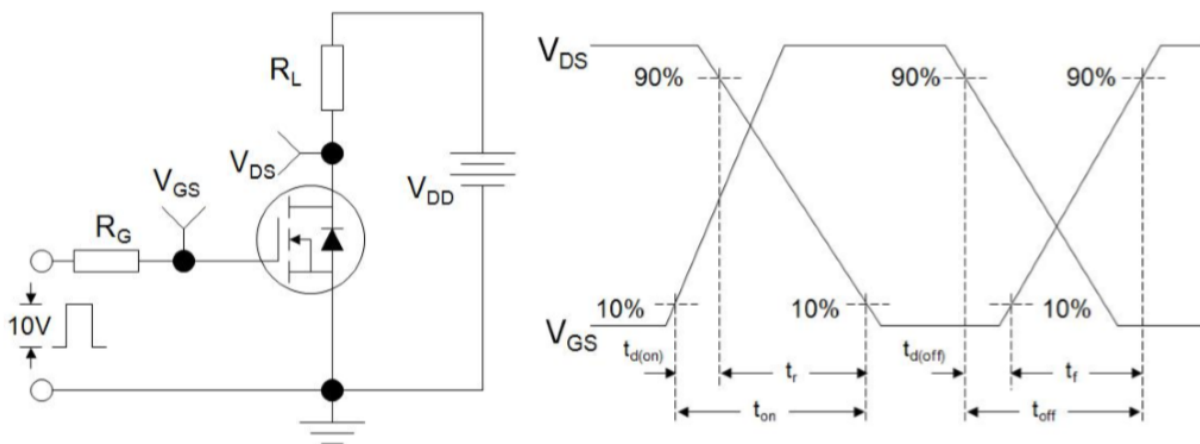
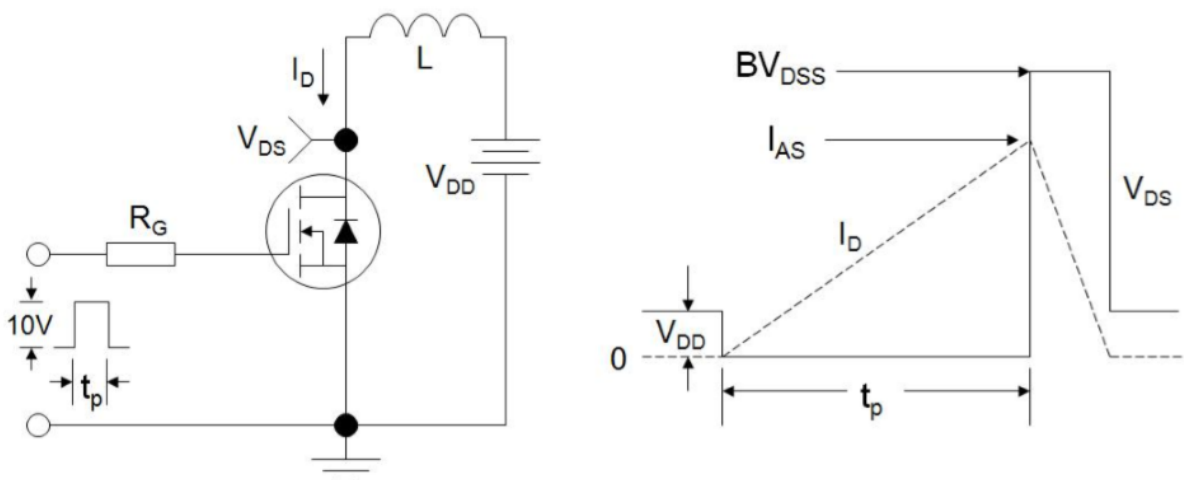
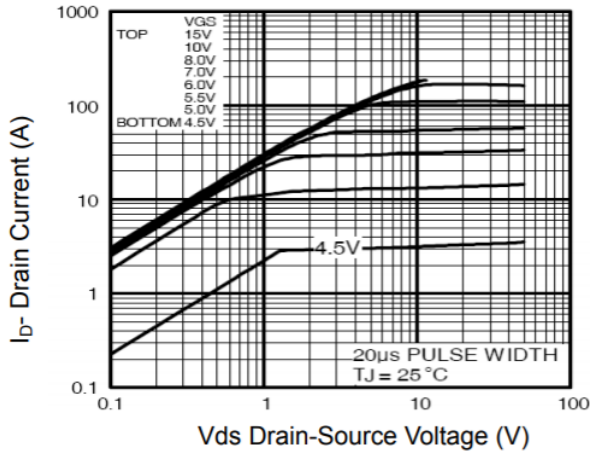


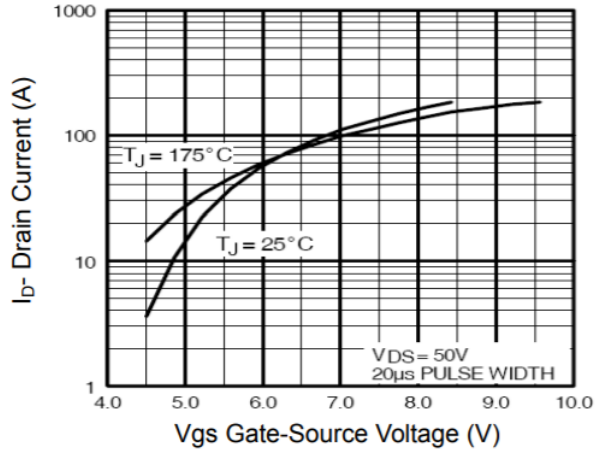
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



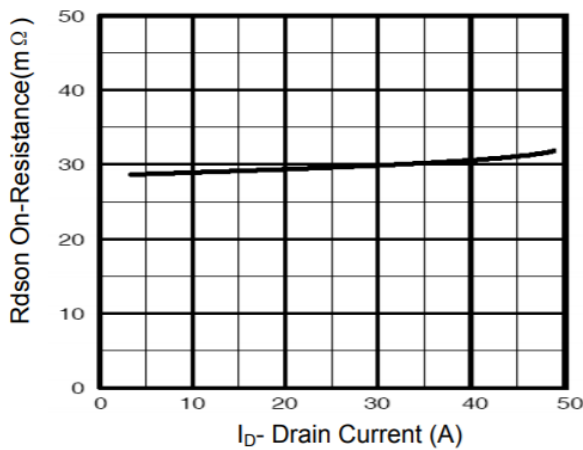
## Characteristics Curve:



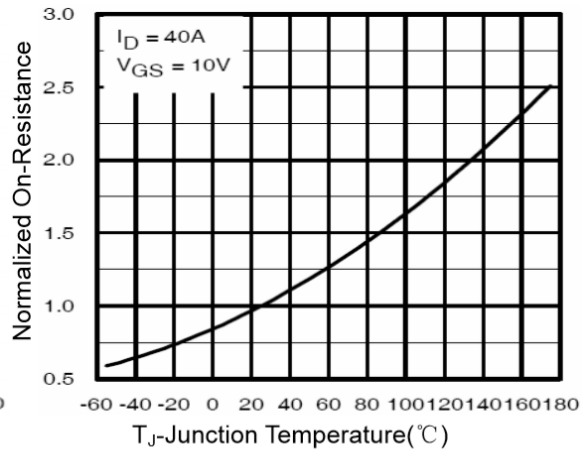
**Figure 1 Output Characteristics**



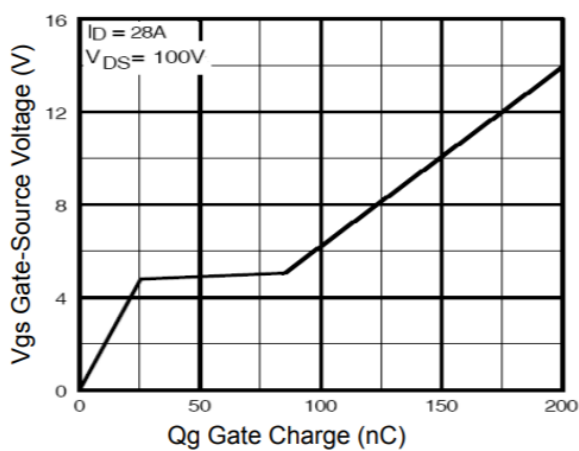
**Figure 2 Transfer Characteristics**



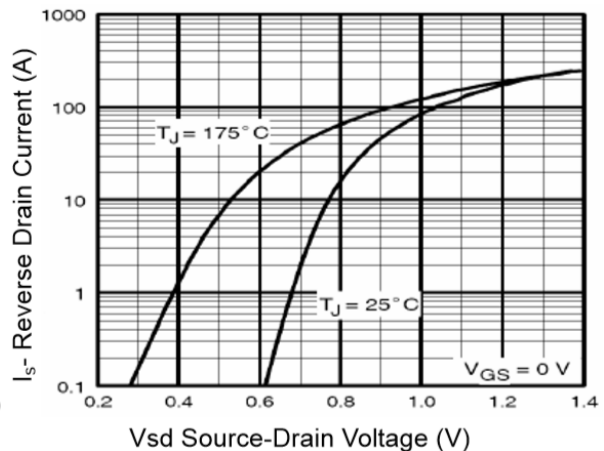
**Figure 3 Rdson- Drain Current**



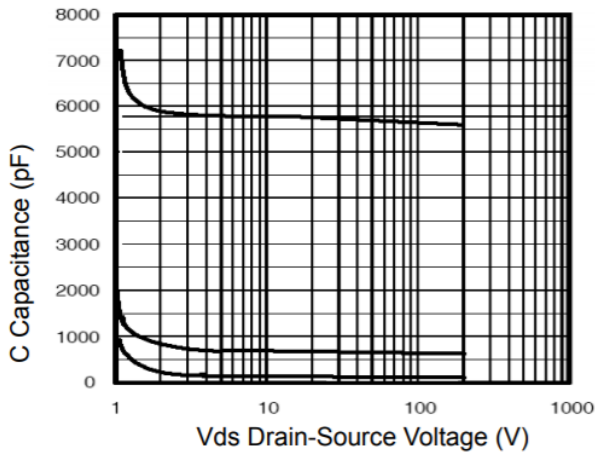
**Figure 4 Rdson-Junction Temperature**



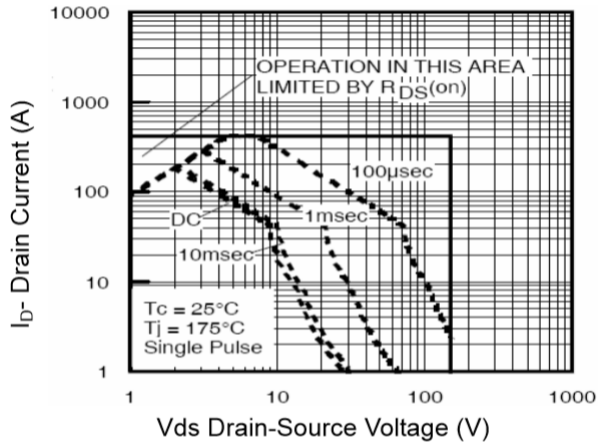
**Figure 5 Gate Charge**



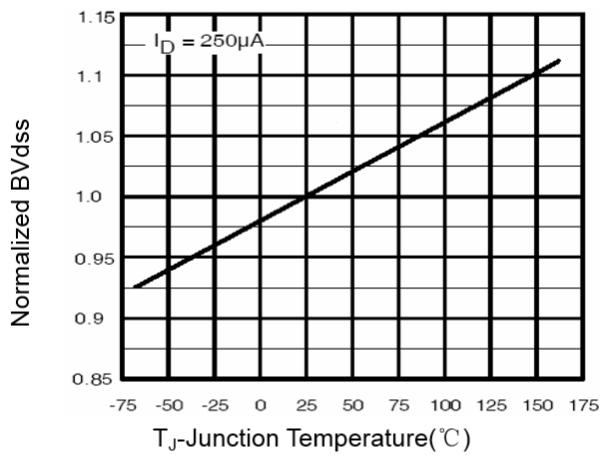
**Figure 6 Source- Drain Diode Forward**



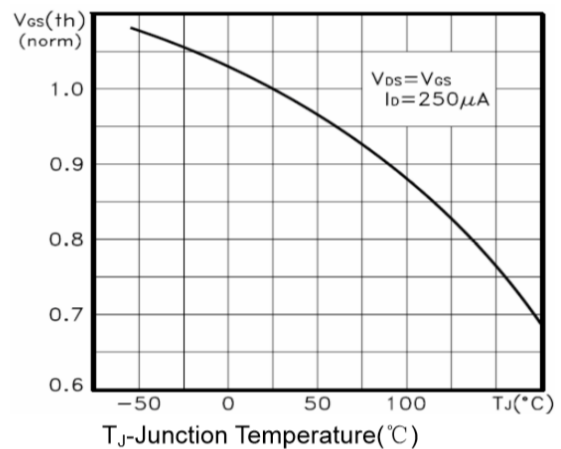
**Figure 7 Capacitance vs Vds**



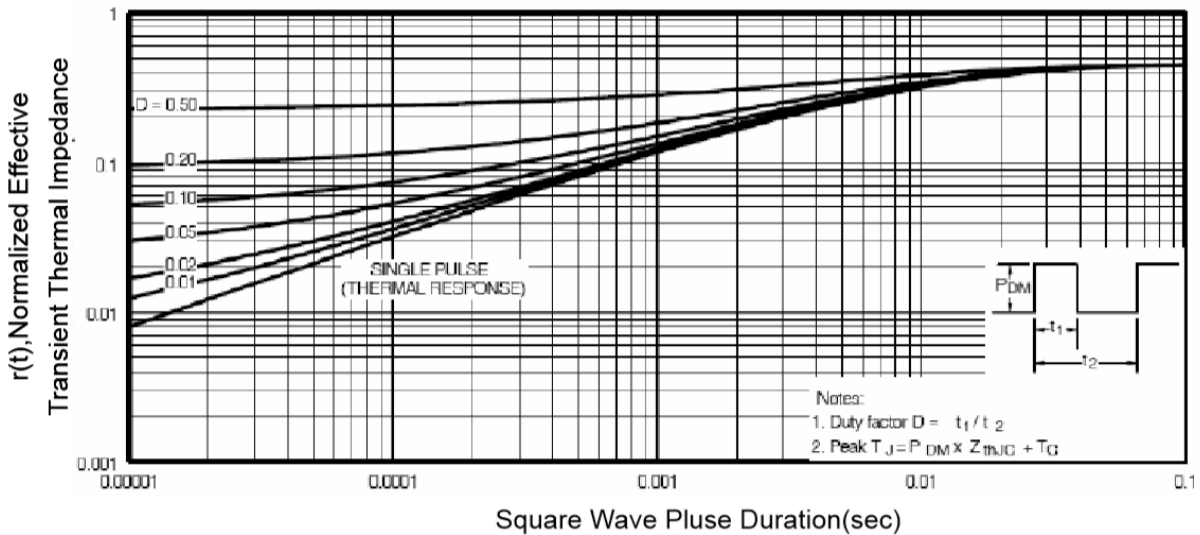
**Figure 8 Safe Operation Area**



**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**