

General Description

The HSBB4600 uses advanced trench technology to provide excellent RDS(ON), low gate charge and high density cell Design for ultra low on-resistance. This device is suitable for use as a load switch or in PWM applications.

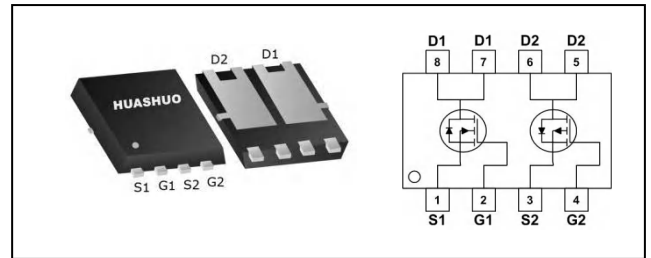
Applications

- PWM applications
- Load switch

Product Summary

BVDSS	RDS(on)	ID
20V	7.8mΩ	12A
-20V	10.5mΩ	-10A

PDFN3.3*3.3 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	20	-20	V
V_{GS}	Gate-Source Voltage	± 12	± 12	V
$I_D@T_A=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	12	-10	A
$I_D@T_A=70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	9.5	-8	A
I_{DM}	Pulsed Drain Current ²	48	-40	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation ⁴	40	40	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	62	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	3.2	$^\circ\text{C/W}$



N-Channel Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	20	---	---	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =4.5V, I _D =6A	---	7.8	10	mΩ
		V _{GS} =2.5V, I _D =6A	---	10	12	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	0.4	0.7	1.0	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =16V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =16V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	1.7	---	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =10V, V _{GS} =4.5V, I _D =6A	---	20	---	nC
Q _{gs}	Gate-Source Charge		---	4.5	---	
Q _{gd}	Gate-Drain Charge		---	3.2	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =10V, V _{GS} =4.5V, R _G =3Ω I _D =6A	---	4	---	ns
T _r	Rise Time		---	9	---	
T _{d(off)}	Turn-Off Delay Time		---	48	---	
T _f	Fall Time		---	13	---	
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1MHz	---	1650	---	pF
C _{oss}	Output Capacitance		---	225	---	
C _{rss}	Reverse Transfer Capacitance		---	203	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.



P-Channel Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-20	---	---	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-4.5V, I _D =-8A	---	17	26	mΩ
		V _{GS} =-2.5V, I _D =-5A	---	22	37	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-0.45	-0.7	-1.0	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-16V, V _{GS} =0V, T _J =25°C	---	---	-1	uA
		V _{DS} =-16V, V _{GS} =0V, T _J =55°C	---	---	-5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-3A	---	5	---	S
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-10V, V _{GS} =-4.5V, I _D =-5A	---	33	---	nC
Q _{gs}	Gate-Source Charge		---	3.8	---	
Q _{gd}	Gate-Drain Charge		---	11	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-10V, V _{GS} =-4.5V, R _G =10Ω, I _D =-5A	---	11	---	ns
T _r	Rise Time		---	41	---	
T _{d(off)}	Turn-Off Delay Time		---	33	---	
T _f	Fall Time		---	11	---	
C _{iss}	Input Capacitance	V _{DS} =-10V, V _{GS} =0V, f=1MHz	---	1250	---	pF
C _{oss}	Output Capacitance		---	194	---	
C _{rss}	Reverse Transfer Capacitance		---	158	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.



N-Channel Typical Characteristics

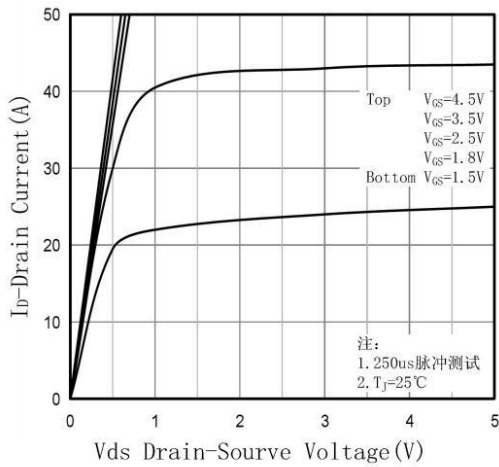


Fig.1 Output Characteristic

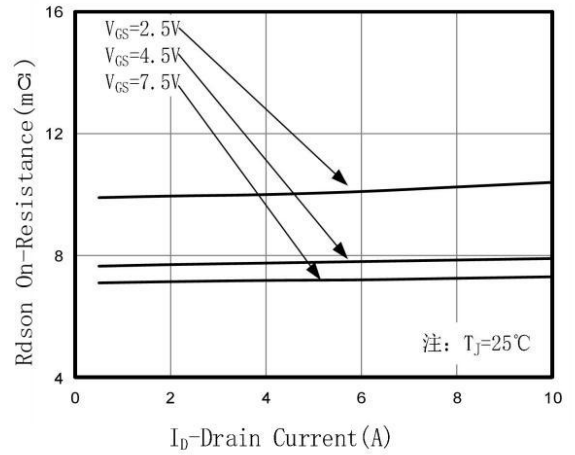


Fig.2 On-Resistance vs. Drain Current

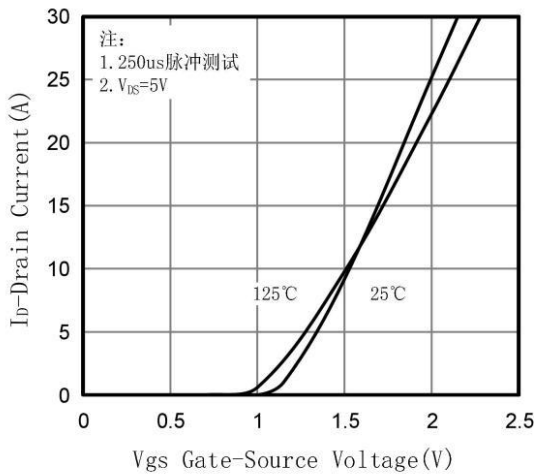


Fig.3 Transfer Characteristic

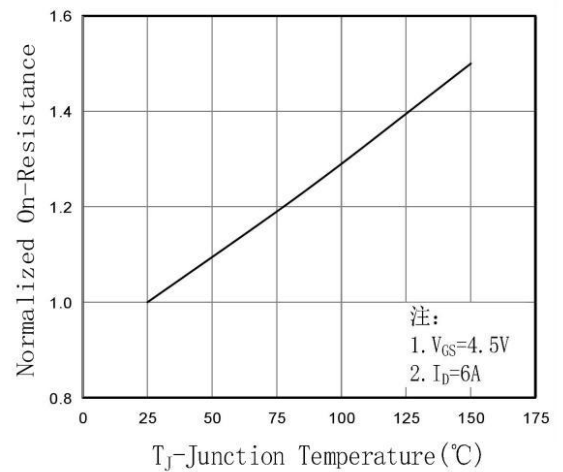


Fig.4 On-Resistance vs. Junction Temperature

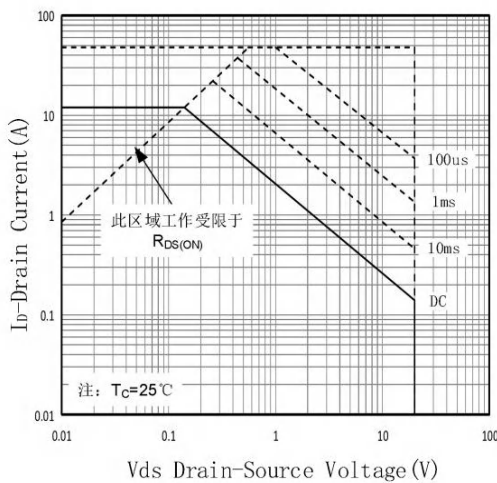


Fig.5 Safe Operation Area

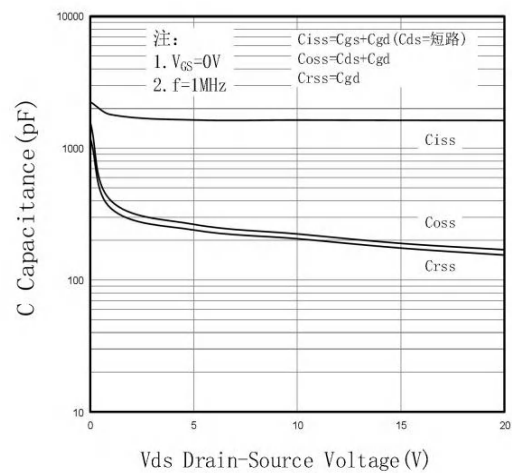


Fig.6 Capacitance Characteristic

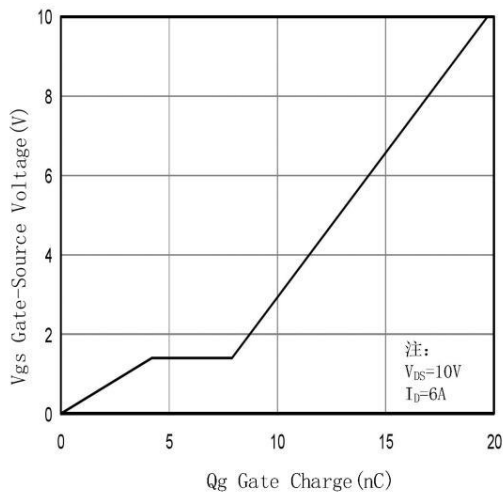


Fig.7 Gate-Charge Characteristic

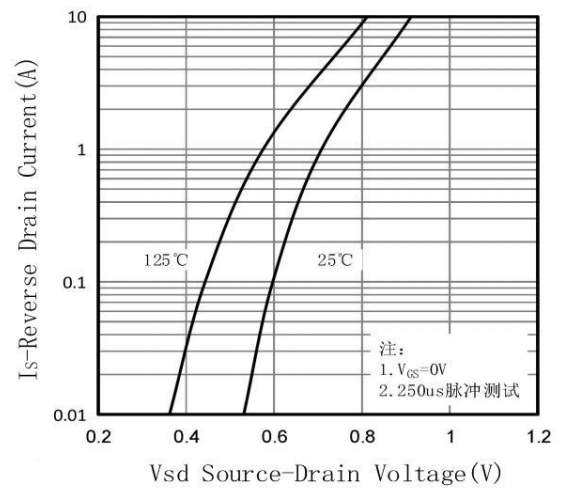


Fig.8 Body Diode Characteristic

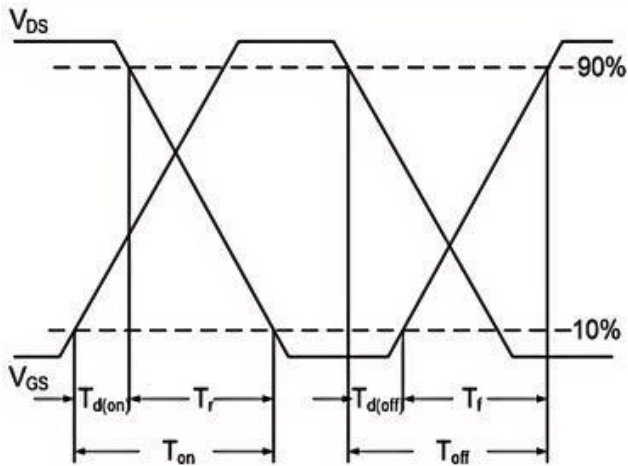


Fig.9 Switching Time Waveform

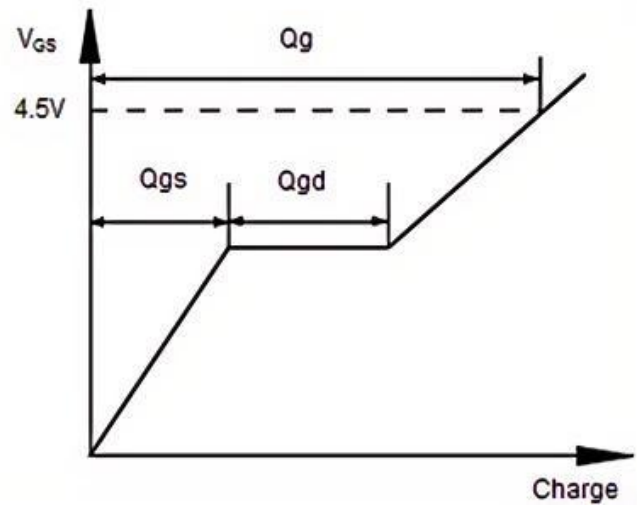


Fig.10 Gate Charge Waveform



P-Channel Typical Characteristics

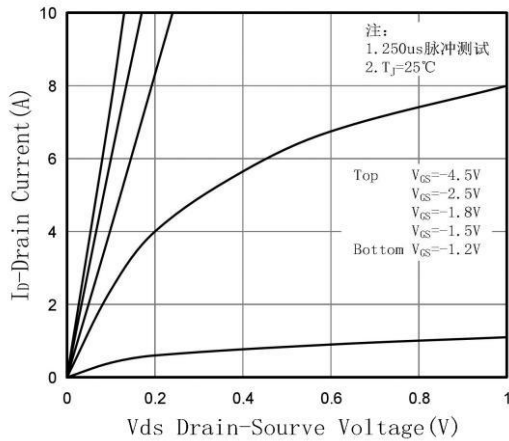


Fig.1 Output Characteristic

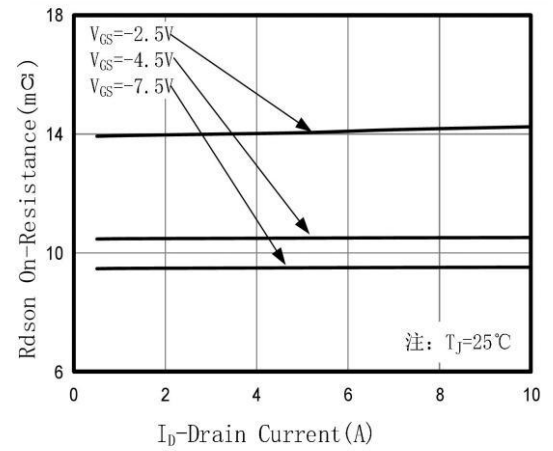


Fig.2 On-Resistance vs. Drain Current

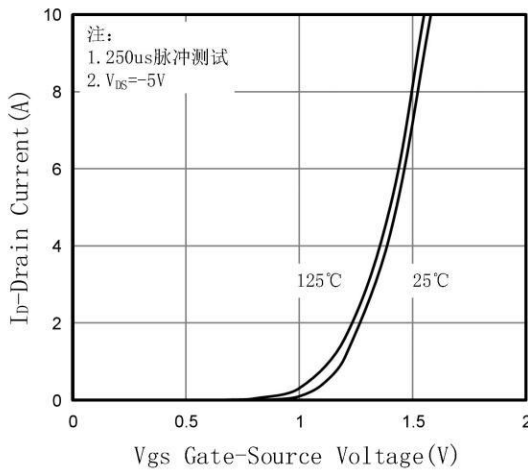


Fig.3 Transfer Characteristic

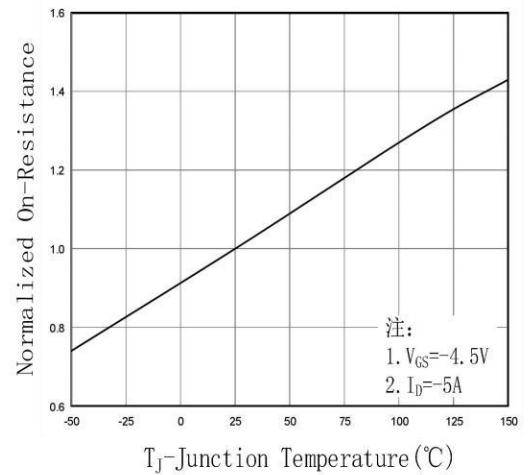


Fig.4 On-Resistance vs. Junction Temperature

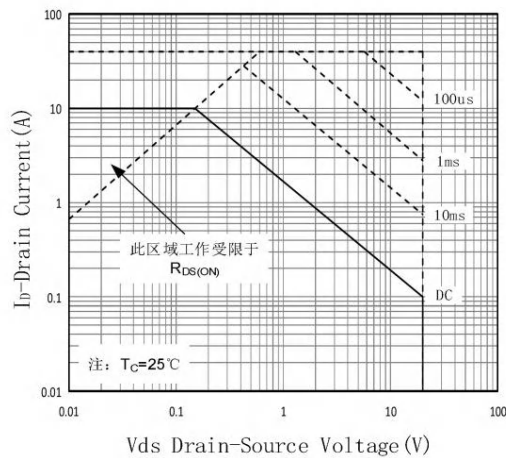


Fig.5 Safe Operation Area

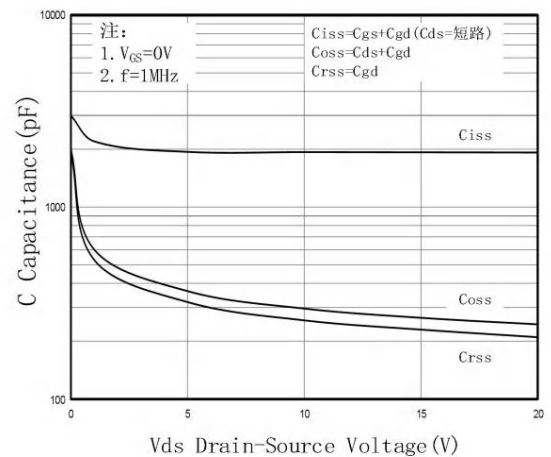


Fig.6 Capacitance Characteristic



N-Ch and P-Ch Fast Switching MOSFETs

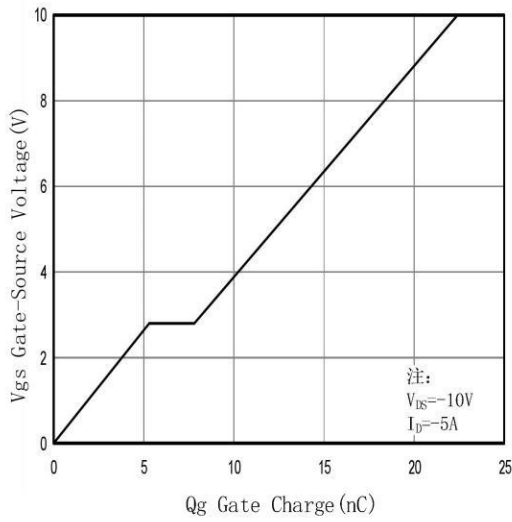


Fig.7 Gate-Charge Characteristic

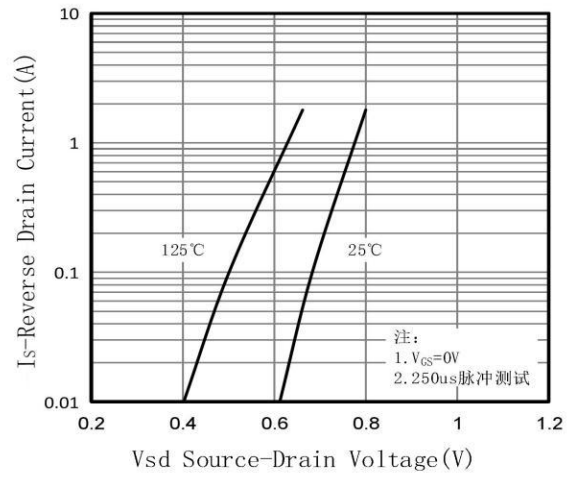


Fig.8 Body Diode Characteristic

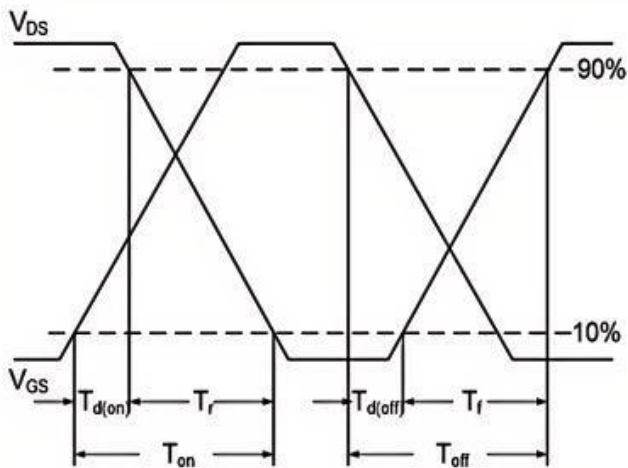


Fig.9 Switching Time Waveform

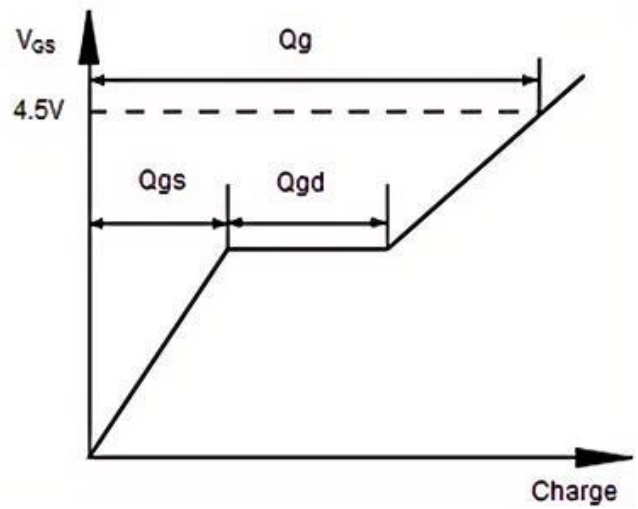


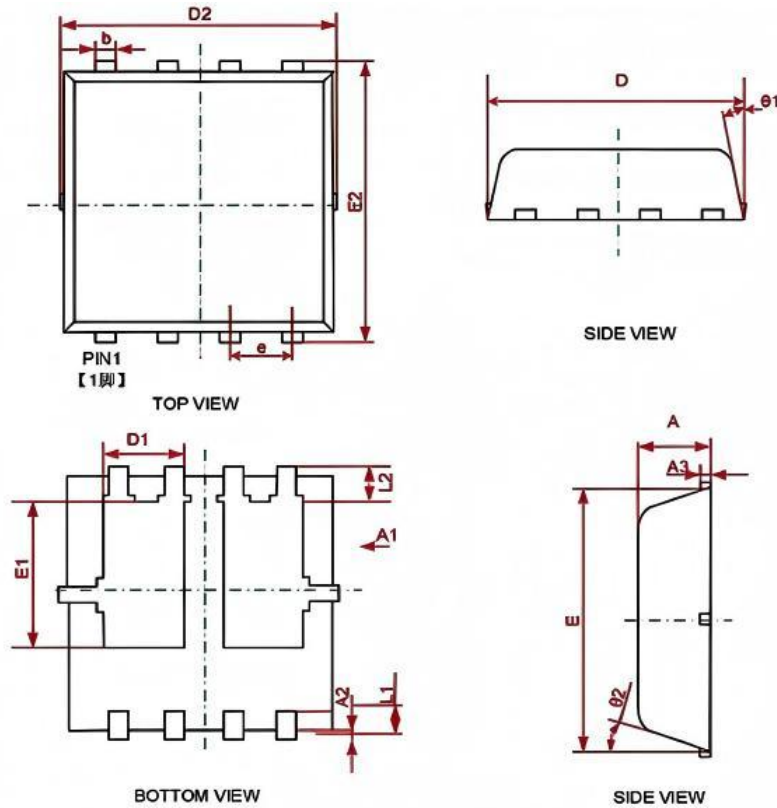
Fig.10 Gate Charge Waveform



Ordering Information

Part Number	Package code	Packaging
HSBB4600	PDFN 3.3*3.3-8L	3000/Tape&Reel

PDFN 3.3*3.3-8L Package Outline



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.750	0.850	0.030	0.033
A1	0.000	0.050	0.000	0.002
A2	0.100	0.200	0.004	0.008
A3	0.152 REF.		0.006 REF.	
b	0.200	0.400	0.008	0.016
D	3.050	3.250	0.120	0.128
D1	0.935	1.135	0.037	0.045
D2	3.200	3.400	0.126	0.134
E	2.900	3.100	0.114	0.122
E1	1.635	1.835	0.064	0.072
E2	3.150	3.350	0.124	0.132
e	0.625	0.675	0.025	0.027
L1	0.350	0.450	0.014	0.018
L2	0.365	0.465	0.014	0.018
θ1	10°	12°	10°	12°
θ2	10°	12°	10°	12°

HSBB4600 Marking:

