HSU4600

N-Ch and P-Ch Fast Switching MOSFETs

General Description

The HSU4600 is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The HSU4600 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

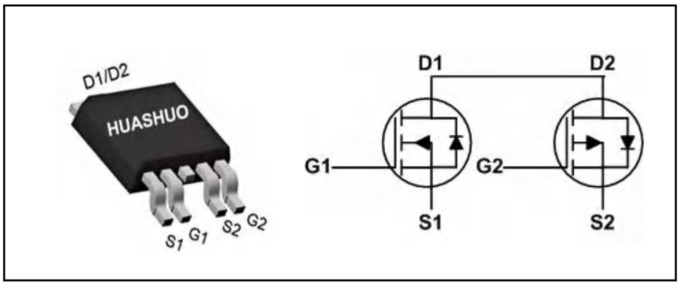
Product Summary

BVDSS	RDSON	ID
20V	5.6mΩ	45A
-20V	9.5mΩ	-25A

Features

- 100% EAS Guaranteed
- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench Technology

TO252-4L 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_C=25˚C	Continuous Drain Current, V_{GS} @ 10V[1]	45	-25	A
I_D@T_C=70˚C	Continuous Drain Current, V_{GS} @ 10V[1]	36	-20	A
I_{DM}	Pulsed Drain Current[2]	180	-100	A
EAS	Single Pulse Avalanche Energy[3]	100	56	mJ
I_{AS}	Avalanche Current	20	-15	A
P_D@T_C=25˚C	Total Power Dissipation[4]	35	35	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	˚C
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	˚C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	62	˚C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	3.6	˚C/W

N-Channel Electrical Characteristics (T_J=25 ℃, 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}=7.5V , I_D=10A	---	5.6	8	mΩ
		V_{GS}=4.5V , I_D=10A	---	6.2	9	
		V_{GS}=2.5V , I_D=6A	---	8	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}=20V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=20V , V_{GS}=0V , T_J=55℃	---	---	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=10A	---	20	---	nC
Q_{gs}	Gate-Source Charge		---	4.4	---	
Q_{gd}	Gate-Drain Charge		---	3.2	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=10V , V_{GS}=4.5V , R_G=3.3Ω, I_D=10A	---	21	---	ns
T_r	Rise Time		---	13	---	
$T_{d(off)}$	Turn-Off Delay Time		---	25	---	
T_f	Fall Time		---	19	---	
C_{iss}	Input Capacitance	V_{DS}=10V , V_{GS}=0V , f=1MHz	---	1572	---	pF
C_{oss}	Output Capacitance		---	221	---	
C_{rss}	Reverse Transfer Capacitance		---	205	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	45	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1.2	V

Note :

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is V_{DD}=10V,V_{GS}=4.5V,L=0.5mH,I_{AS}=20A

4.The power dissipation is limited by 150℃ junction temperature

5.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 ℃, 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}=-7.5V , I_D=-10A	---	9.5	12	mΩ
		V_{GS}=-4.5V , I_D=-10A	---	10.5	14	
		V_{GS}=-2.5V , I_D=-6A	---	15	20	
$V_{GS(th)}$	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}=-20V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=-20V , V_{GS}=0V , T_J=55℃	---	---	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	---	10	---	Ω
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-10V , V_{GS}=-4.5V , I_D=-10A	---	26	---	nC
Q_{gs}	Gate-Source Charge		---	4.2	---	
Q_{gd}	Gate-Drain Charge		---	19	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-10V , V_{GS}=-10V , R_G=3.3Ω, I_D=-10A	---	16.4	---	ns
T_r	Rise Time		---	26	---	
$T_{d(off)}$	Turn-Off Delay Time		---	35	---	
T_f	Fall Time		---	17	---	
C_{iss}	Input Capacitance	V_{DS}=-10V , V_{GS}=0V , f=1MHz	---	1905	---	pF
C_{oss}	Output Capacitance		---	198	---	
C_{rss}	Reverse Transfer Capacitance		---	165	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	-25	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1.2	V

Note :

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is V_{DD}=-10V,V_{GS}=-4.5V,L=0.5mH,I_{AS}=-15A

4.The power dissipation is limited by 150℃ junction temperature

5.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

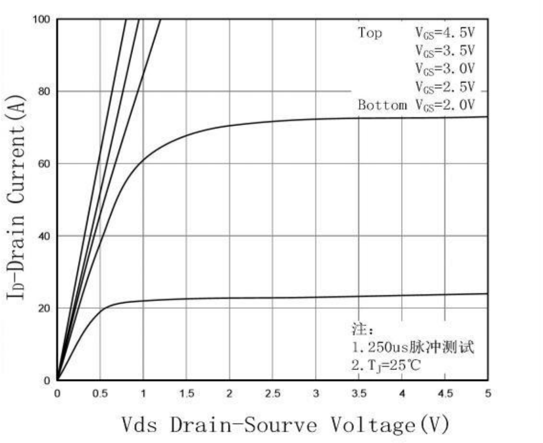


Fig.1 Output Characteristic

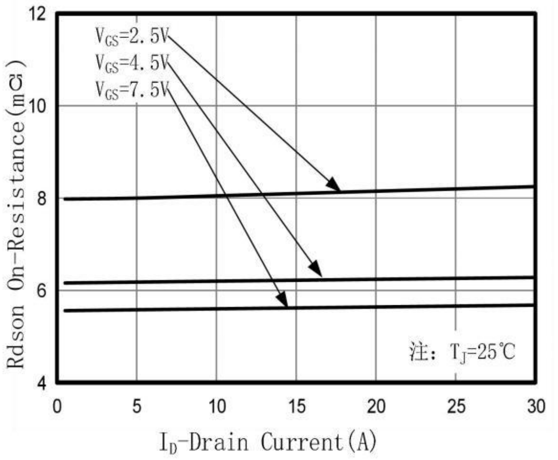


Fig.2 On-Resistance vs. Drain Current

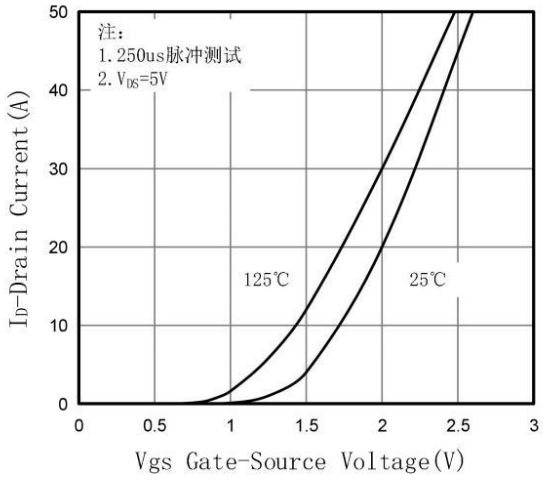


Fig.3 Transfer Characteristic

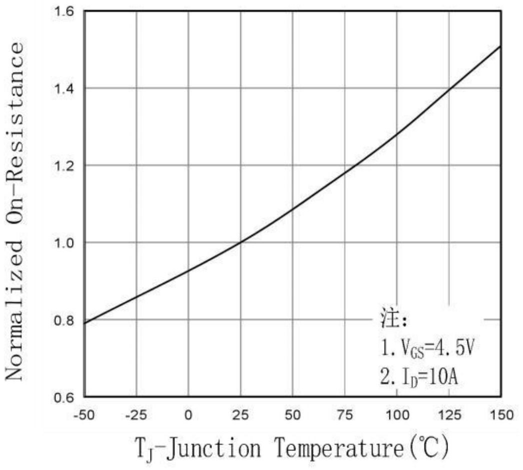


Fig.4 On-Resistance vs. Junction Temperature

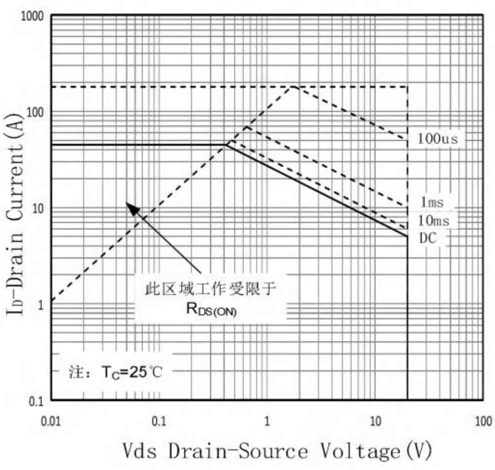


Fig.5 Safe Operation Area

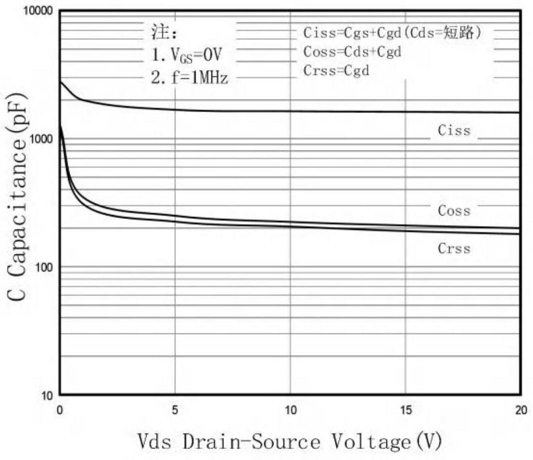


Fig.6 Capacitance Characteristic

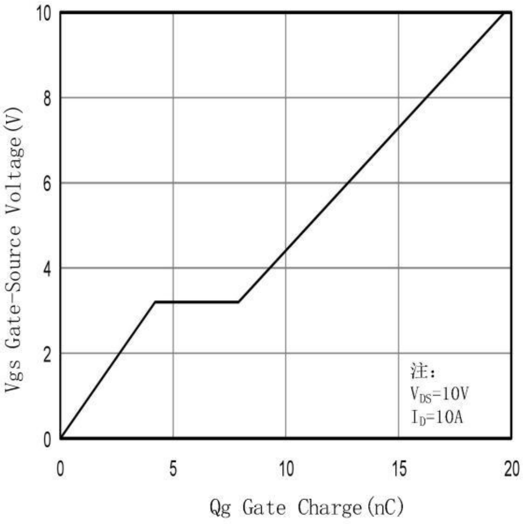


Fig.7 Gate-Charge Characteristic

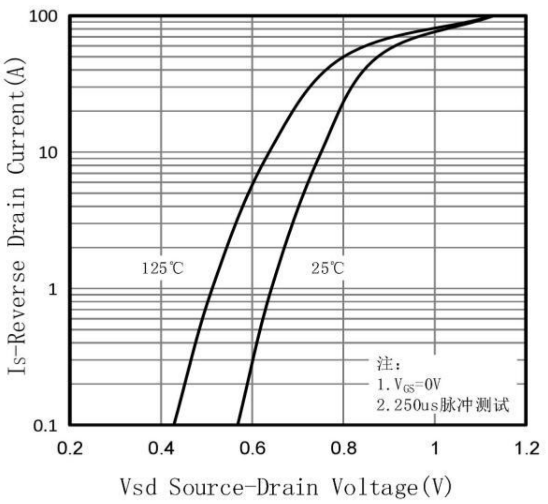


Fig.8 Body Diode Characteristic

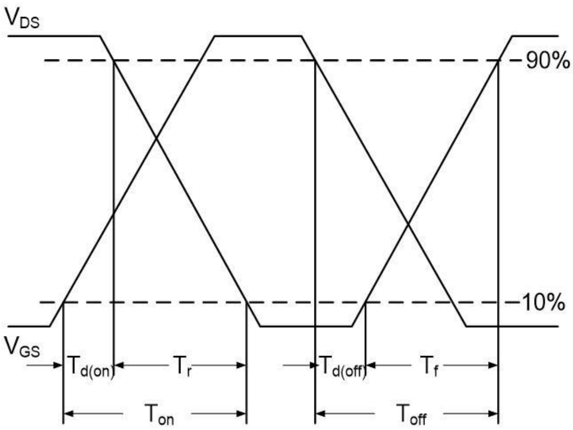


Fig.9 Switching Time Waveform

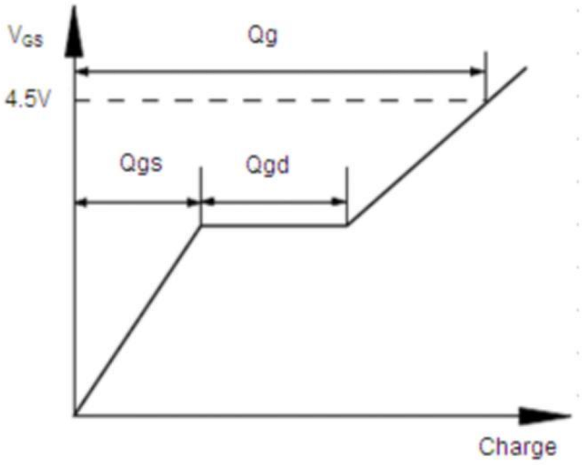


Fig.10 Gate Charge Waveform

P-Channel Typical Characteristics

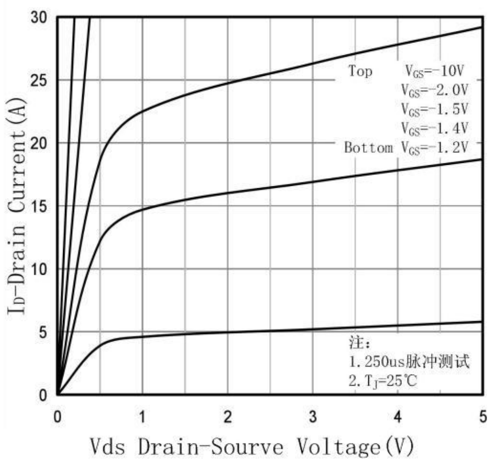


Fig.1 Output Characteristic

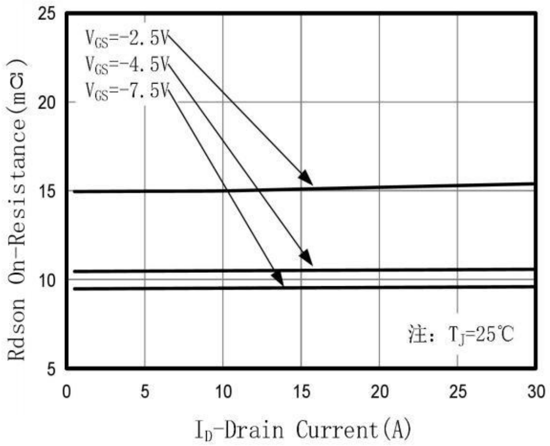


Fig.2 On-Resistance vs. Drain Current

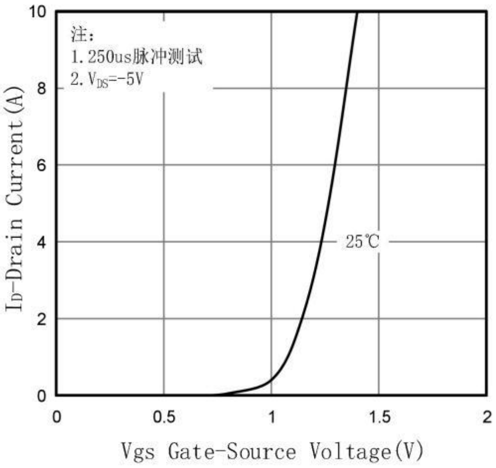


Fig.3 Transfer Characteristic

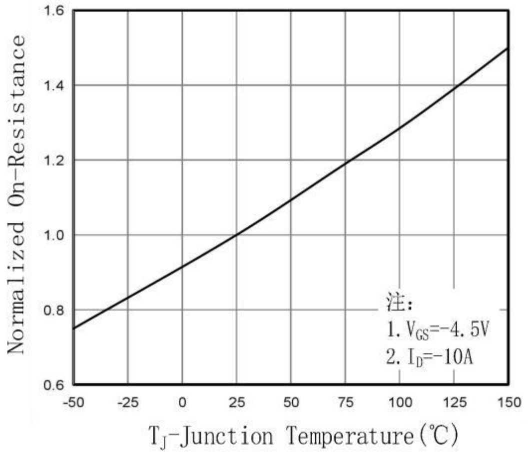


Fig.4 On-Resistance vs. Junction Temperature

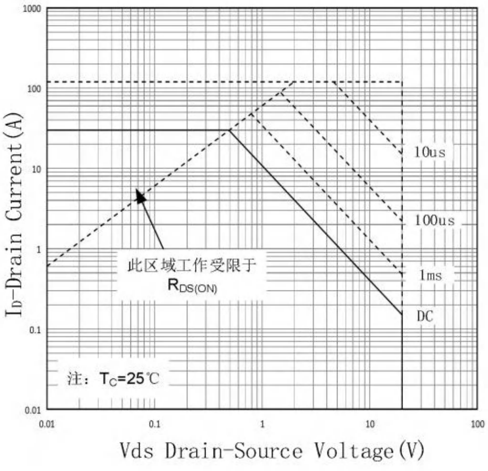


Fig.5 Safe Operation Area

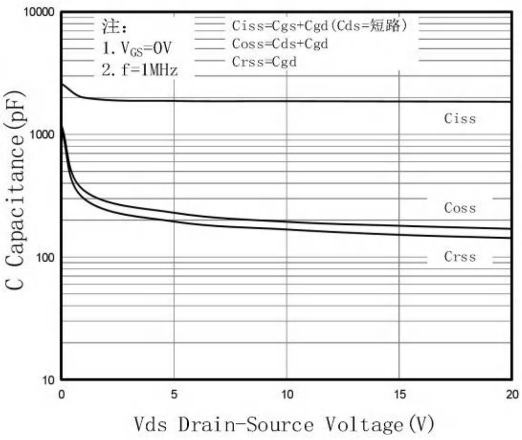


Fig.6 Capacitance Characteristic

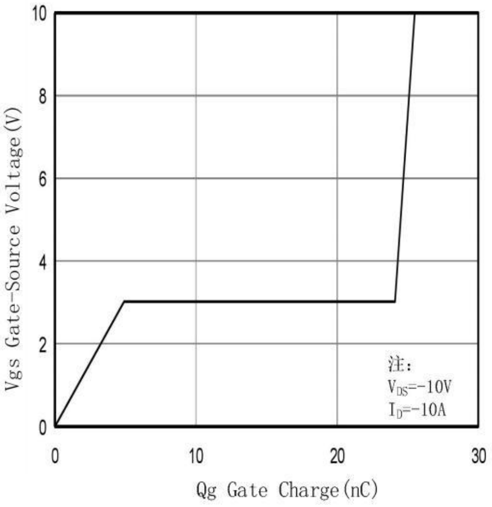


Fig.7 Gate-Charge Characteristic

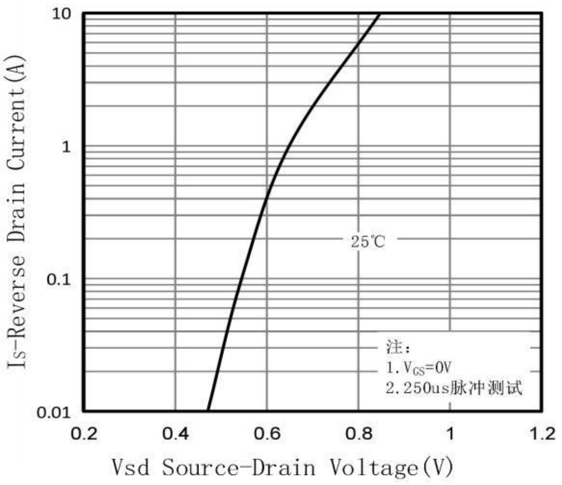


Fig.8 Body Diode Characteristic

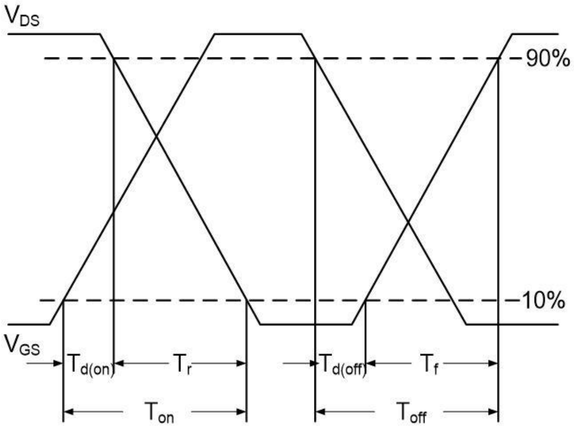


Fig.9 Switching Time Waveform

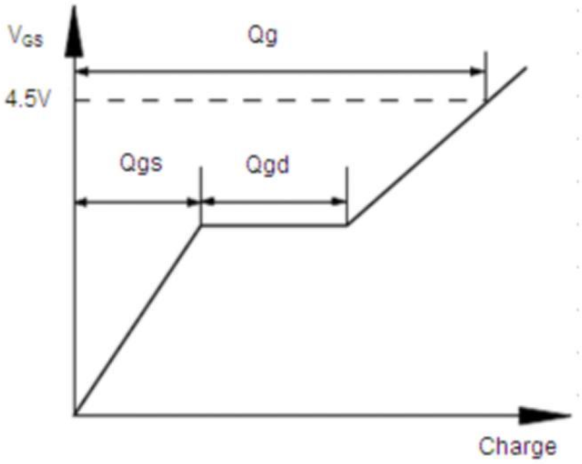
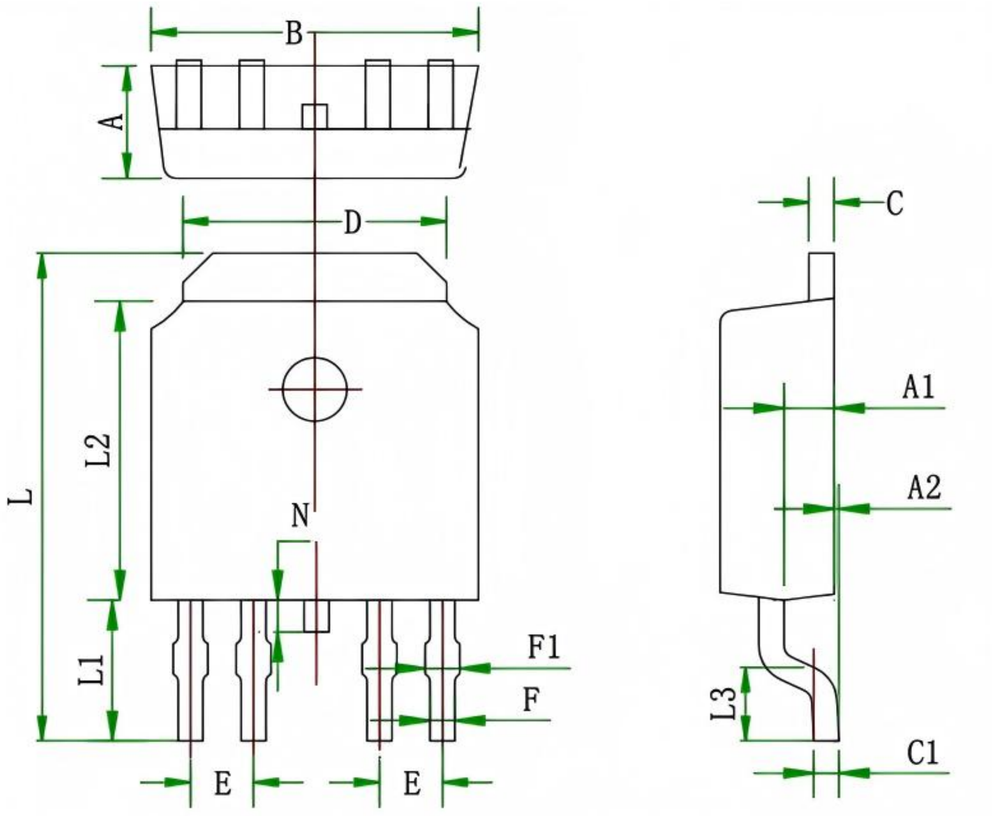


Fig.10 Gate Charge Waveform

Ordering Information

Part Number	Package code	Packaging
HSU4600	TO252-4L	2500/Tape&Reel

TO252-4L Package Outline



Symbol	Min(mm)	Typ(mm)	Max(mm)
A	2.22	2.30	2.38
A1	0.93	1.01	1.08
A2	0.02	0.10	0.15
B	6.52	6.60	6.68
C	0.48	0.50	0.54
C1	0.48	0.50	0.54
D	5.22	5.32	5.42
E	1.22	1.27	1.32
F	0.40	0.50	0.60
F1	0.50	0.60	0.70
L	9.77	9.97	10.17
L1	2.77	2.87	2.97
L2	6.02	6.10	6.18
L3	1.40	1.50	1.60
N	0.55	0.65	0.75

HSU4600 Marking：