



### Description

The HSS3409A is the high cell density trench P-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications.

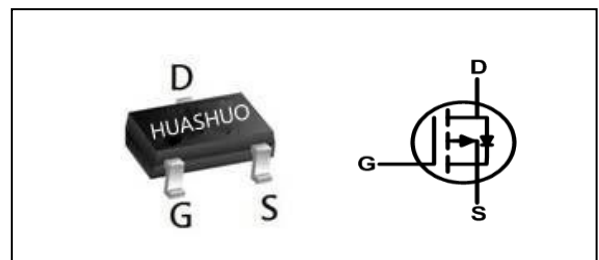
The HSS3409A meet the RoHS and Green Product requirement with full function reliability approved.

- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

### Product Summary

V <sub>DS</sub>	-30	V
R <sub>DS(ON),typ</sub>	43	mΩ
I <sub>D</sub>	-3.2	A

### SOT23s Pin Configuration



### Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		10s	Steady State	
V <sub>DS</sub>	Drain-Source Voltage	-30		V
V <sub>GS</sub>	Gate-Source Voltage	±20		V
I <sub>D</sub> @T <sub>A</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ -10V <sub>1</sub>	-3.6	-3.2	A
I <sub>D</sub> @T <sub>A</sub> =70°C	Continuous Drain Current, V <sub>GS</sub> @ -10V <sub>1</sub>	-2.9	-2.5	A
I <sub>DM</sub>	Pulsed Drain Current <sub>2</sub>	-13		A
P <sub>D</sub> @T <sub>A</sub> =25°C	Total Power Dissipation <sub>3</sub>	1.32	1	W
P <sub>D</sub> @T <sub>A</sub> =70°C	Total Power Dissipation <sub>3</sub>	0.84	0.64	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150		°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150		°C

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sub>1</sub>	---	125	°C/W
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sub>1</sub> (t ≤ 10s)	---	95	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sub>1</sub>	---	80	°C/W



**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-30	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BVDSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.02	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sub>2</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-3A	---	43	60	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.5A	---	63	90	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1	-1.5	-3	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	4.32	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	-5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A	---	4.8	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	24	48	Ω
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A	---	5.22	7.3	nC
Q <sub>gs</sub>	Gate-Source Charge		---	1.25	1.8	
Q <sub>gd</sub>	Gate-Drain Charge		---	2.3	3.2	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω I <sub>D</sub> =-1A	---	18.4	37	ns
T <sub>r</sub>	Rise Time		---	11.4	21	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	39.4	79	
T <sub>f</sub>	Fall Time		---	5.2	10.4	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz	---	463	650	pF
C <sub>oss</sub>	Output Capacitance		---	82	115	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	68	95	

**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sub>1,4</sub>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-3.2	A
I <sub>SM</sub>	Pulsed Source Current <sub>2,4</sub>		---	---	-13	A
V <sub>SD</sub>	Diode Forward Voltage <sub>2</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V

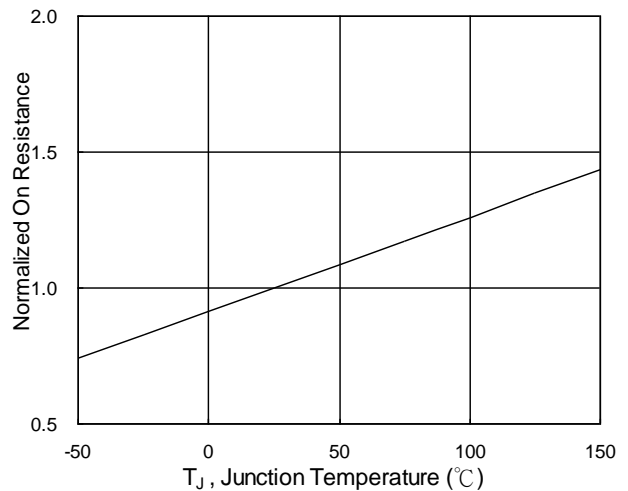
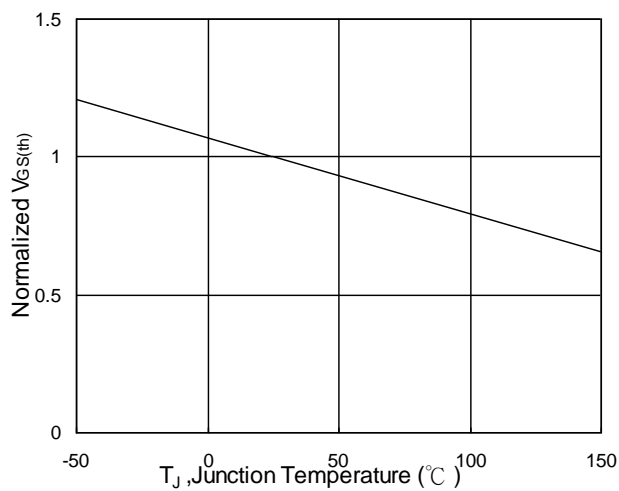
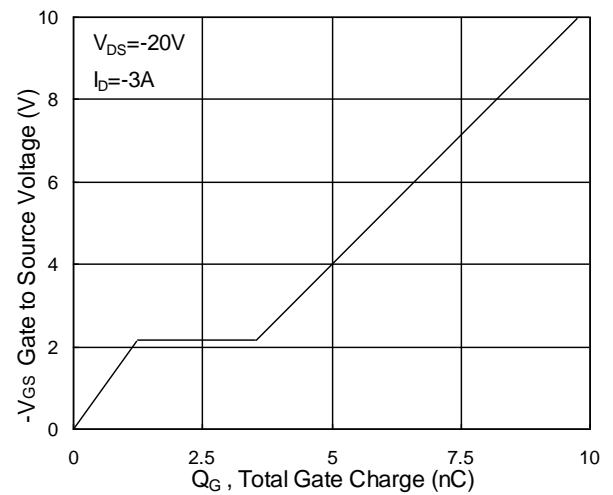
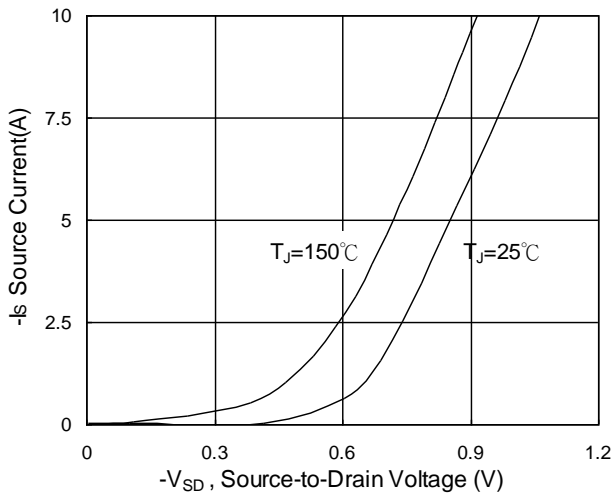
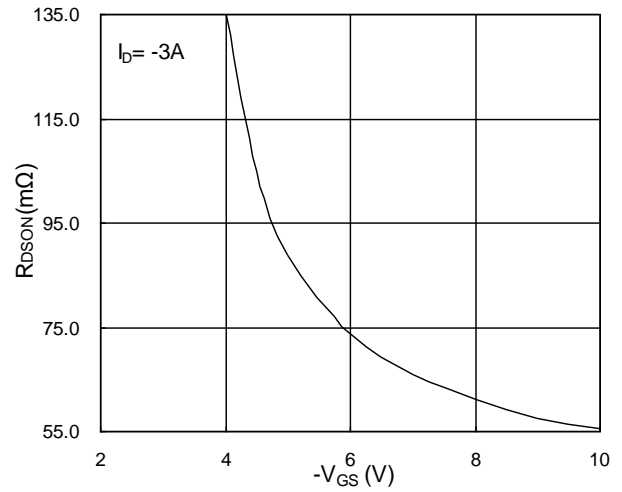
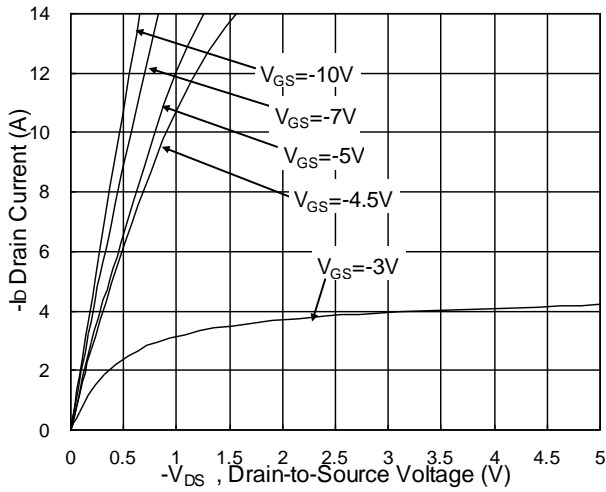
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> 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<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.



## P-Ch 30V Fast Switching MOSFETs

### Typical Characteristics





P-Ch 30V Fast Switching MOSFETs

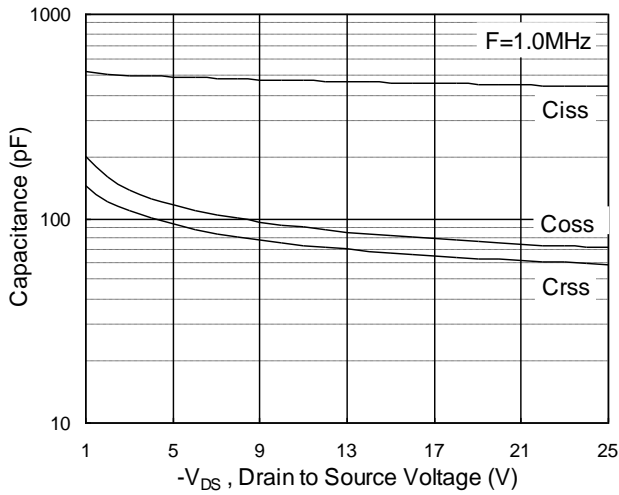


Fig.7 Capacitance

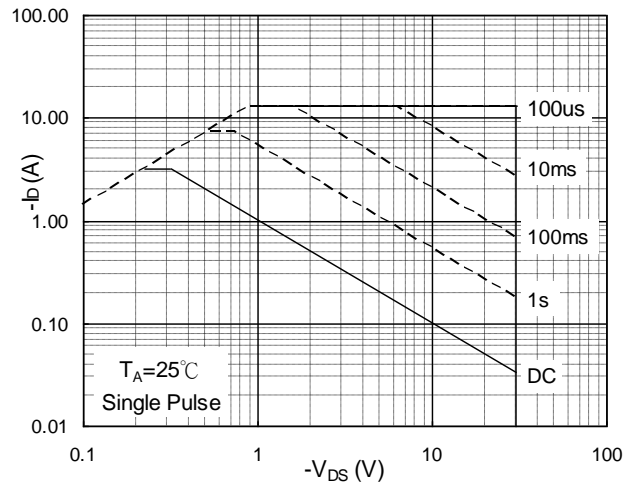


Fig.8 Safe Operating Area

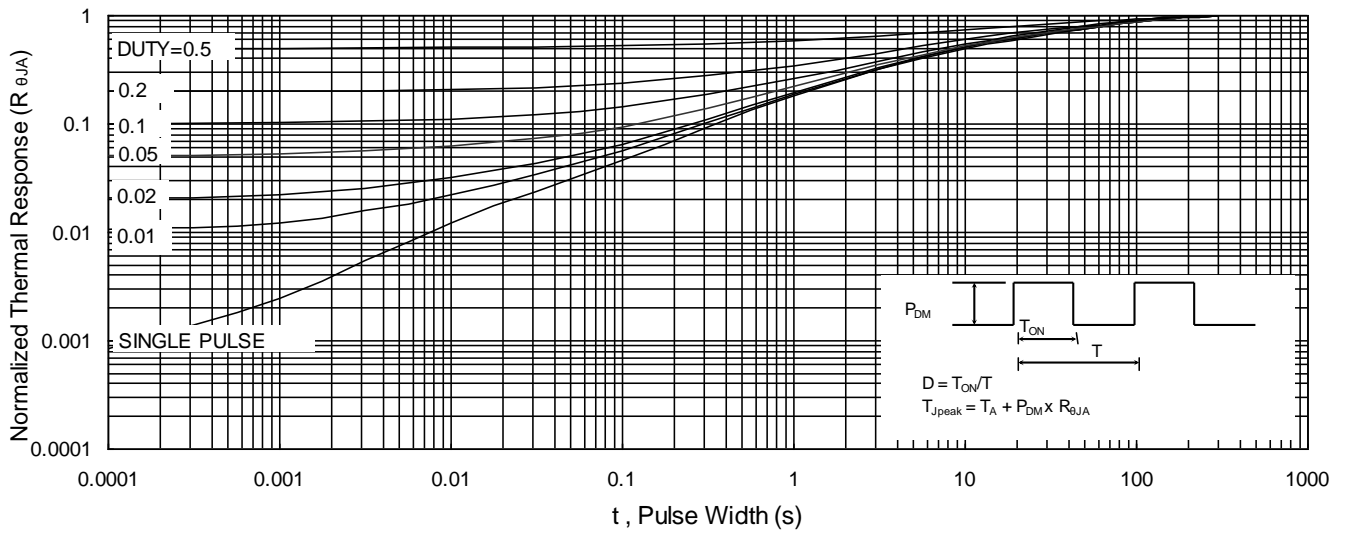


Fig.9 Normalized Maximum Transient Thermal Impedance

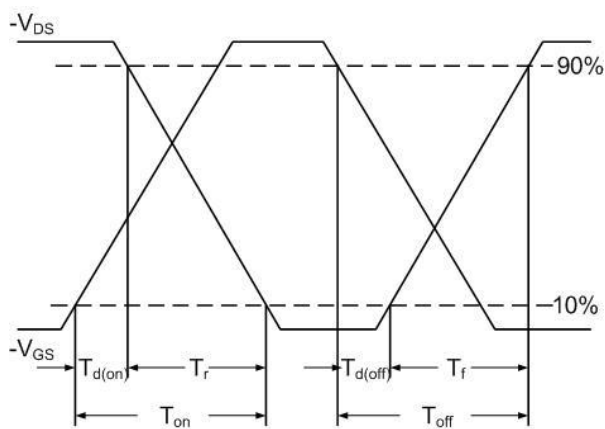


Fig.10 Switching Time Waveform

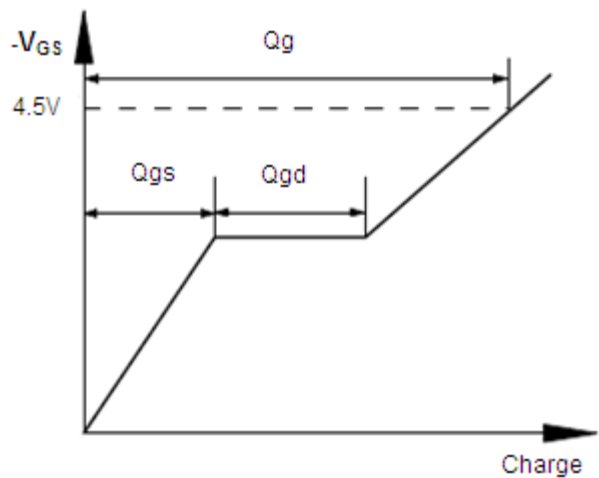
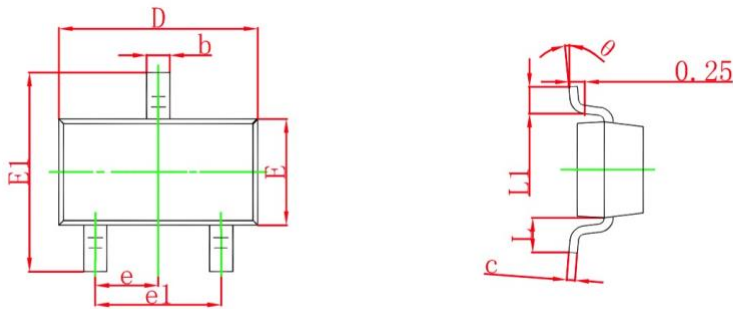


Fig.11 Gate Charge Waveform



## Ordering Information

Part Number	Package code	Packaging
HSS3409A	SOT-23	3000/Tape&Reel



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

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