



**Description**

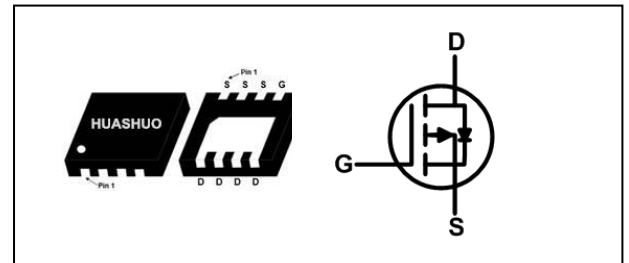
The HSCE2631 is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The HSCE2631 meet the RoHS and Green Product requirement with full function reliability approved.

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

**Product Summary**

V <sub>DS</sub>	-20	V
R <sub>DS(ON),typ</sub>	3.6	mΩ
I <sub>D</sub>	-50	A

**DFN3.3\*3.3 Pin Configuration**



**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	-20	V
V <sub>GS</sub>	Gate-Source Voltage	±12	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ -4.5V <sup>1</sup>	-50	A
I <sub>D</sub> @T <sub>C</sub> =70°C	Continuous Drain Current, V <sub>GS</sub> @ -4.5V <sup>1</sup>	-39	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	-200	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation <sup>3</sup>	83	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	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup>	55	°C/W
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤10s)	20	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	1.5	°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	-20	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.012	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A	---	3.6	5	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-20A	---	4.7	6.5	
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-20A	---	6.4	8.5	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-0.35	-0.5	-1.0	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	2.94	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V	---	---	±100	nA
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =-0V, V <sub>GS</sub> =0V, f=1MHz	---	5	---	Ω
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A	---	76	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	9.1	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	14	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-10V, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-20A	---	12	---	ns
T <sub>r</sub>	Rise Time		---	11	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	56	---	
T <sub>f</sub>	Fall Time		---	16	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz	---	4400	---	pF
C <sub>oss</sub>	Output Capacitance		---	509	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	331	---	

**Diode Characteristics**

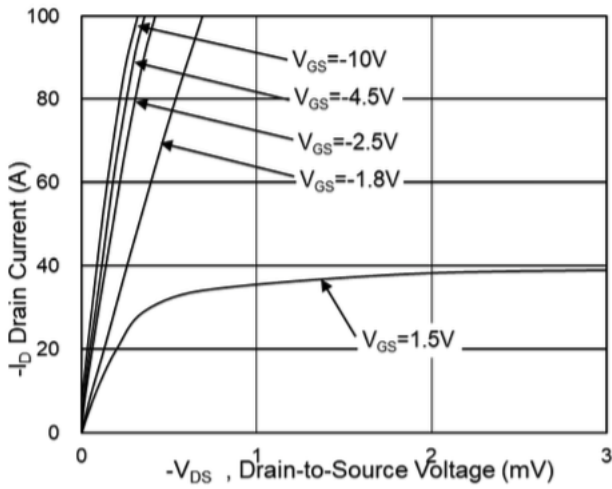
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-50	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub>  -20A, dI/dt=100A/μs, T <sub>J</sub> =25°C	---	55	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	365	---	nC

Note :

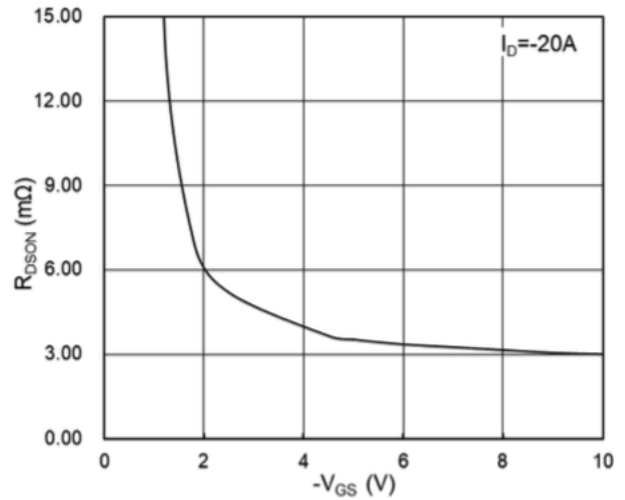
- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.



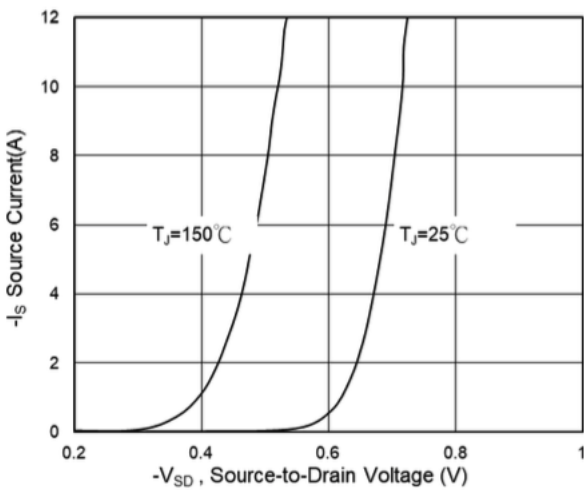
**Typical Characteristics**



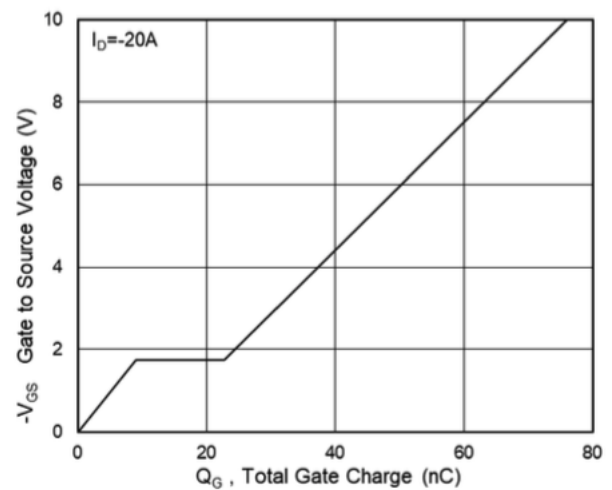
**Fig.1 Typical Output Characteristics**



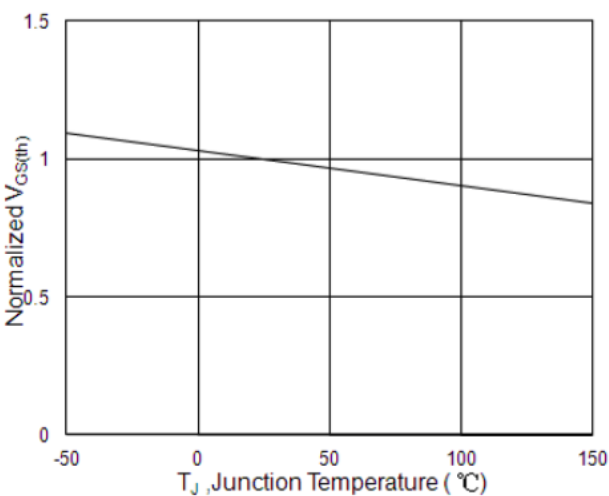
**Fig.2 On-Resistance vs. G-S Voltage**



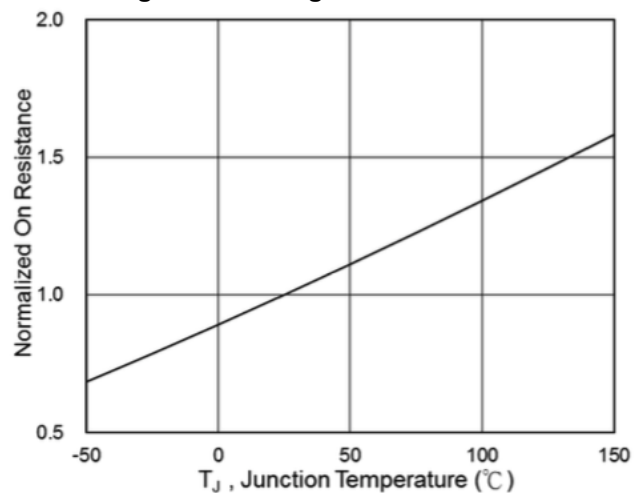
**Fig.3 Forward Characteristics of Reverse**



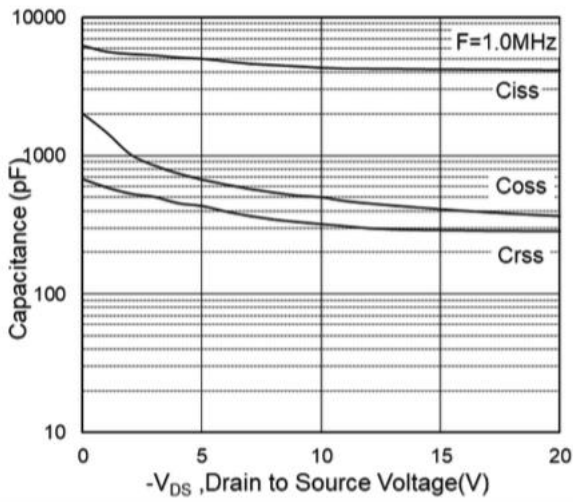
**Fig.4 Gate-charge Characteristics**



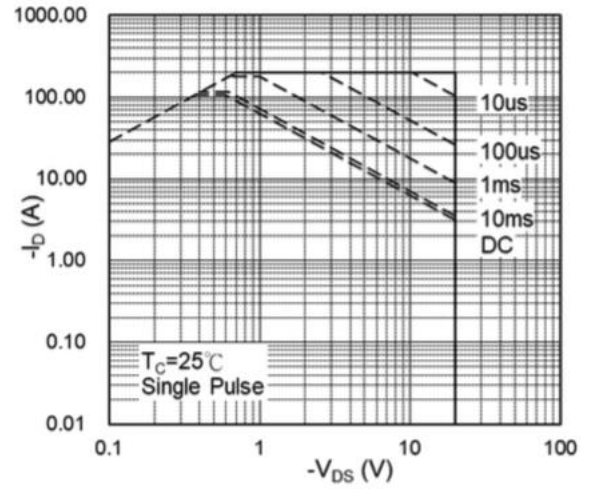
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



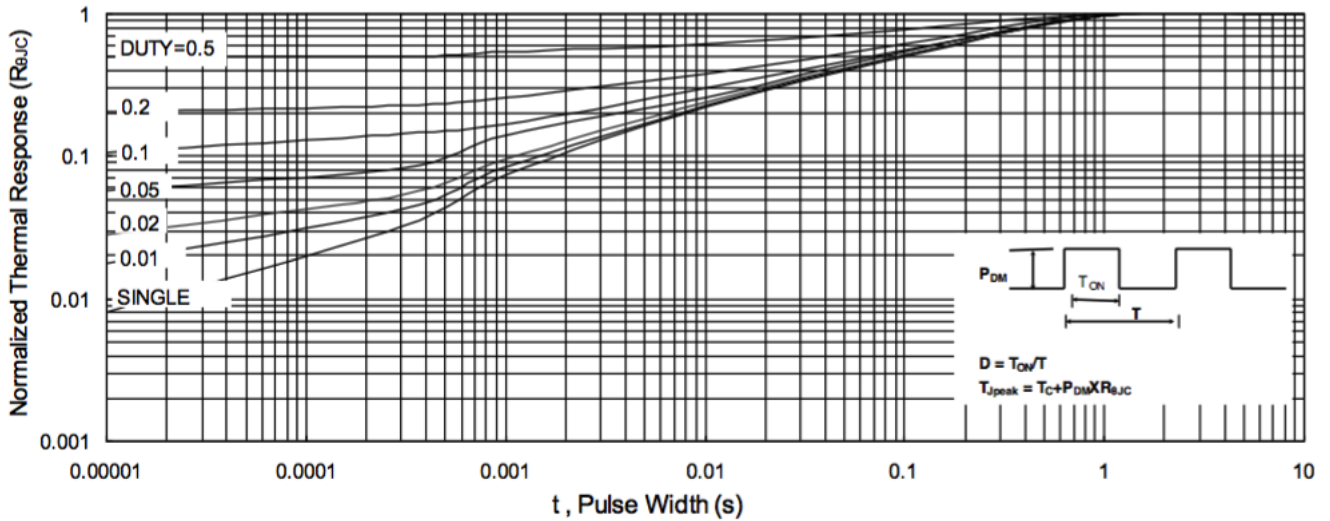
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



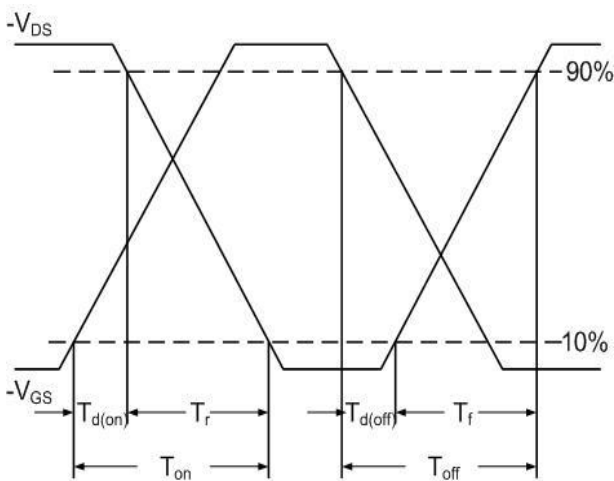
**Fig.7 Capacitance**



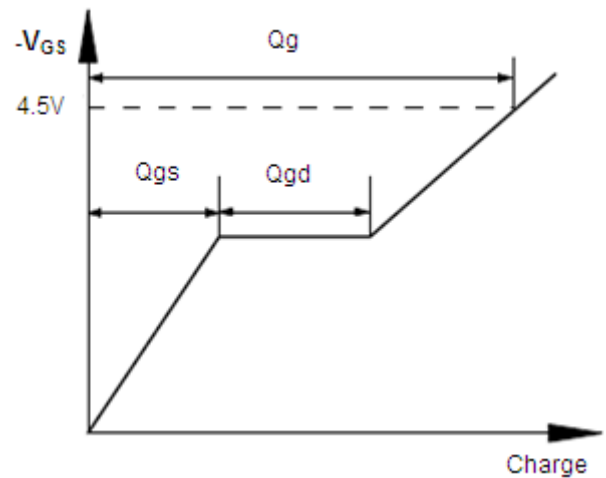
**Fig.8 Safe Operating Area**



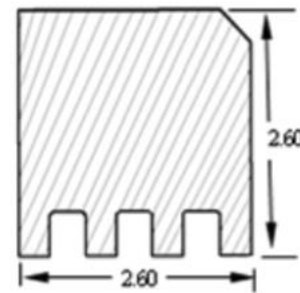
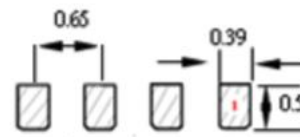
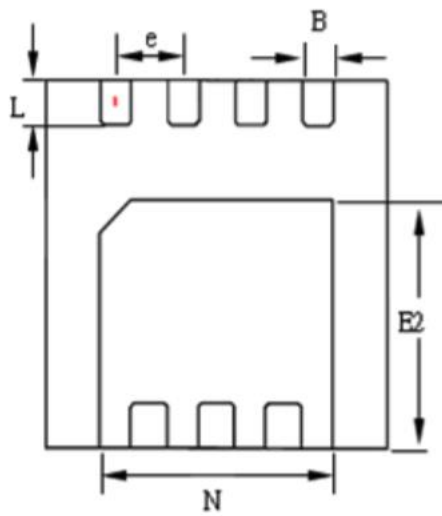
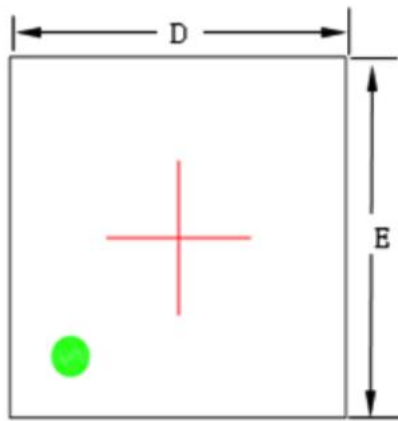
**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**



LAND PATTERN RECOMMENDATION

SYMBOLS	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
A2	0.00	--	0.05	0.000	--	0.002
B	0.24	0.30	0.35	0.009	0.012	0.014
C	0.10	0.15	0.25	0.004	0.006	0.010
D	3.15	3.30	3.40	0.124	0.130	0.134
E	3.15	3.30	3.40	0.124	0.130	0.134
E2	2.15	2.25	2.35	0.085	0.089	0.093
L	0.35	0.40	0.45	0.014	0.016	0.018
N	2.10	2.25	2.35	0.083	0.089	0.093
e	--	0.65	--	--	0.026	--

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