

### Description

The HSS3415E is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

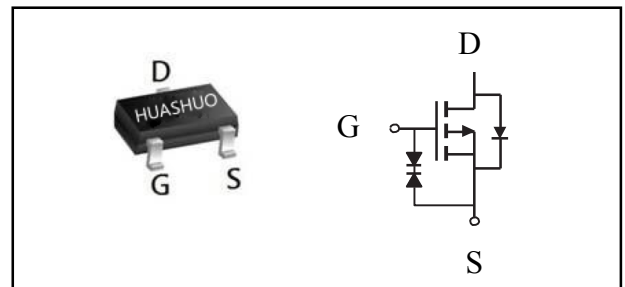
The HSS3415E meet the RoHS and Green Product requirement with full function reliability approved.

- Super Low Gate Charge
- Green Device Available
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology
- ESD Protect 2KV

### Product Summary

$V_{DS}$	-20	V
$R_{DS(ON),max}$	45	m $\Omega$
$I_D$	-4.3	A

### SOT 23 Pin Configurations



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 8$	V
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-4.3	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-3.5	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-14	A
$P_D@T_A=25^\circ C$	Total Power Dissipation <sup>3</sup>	1.25	W
$P_D@T_A=70^\circ C$	Total Power Dissipation <sup>3</sup>	0.84	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	100	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup> (t $\leq 10s$ )	---	95	$^\circ C/W$



**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	---	-0.014	---	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> =-3.5A	---	35	45	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A	---	47	55	
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A	---	67	80	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-0.45	---	-0.9	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	3.95	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	-5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	---	---	±100	nA
gfs	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A	---	12.8	---	S
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A	---	8.4	11	nC
Q <sub>gs</sub>	Gate-Source Charge		---	2.4		
Q <sub>gd</sub>	Gate-Drain Charge		---	1.5		
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> =-3A	---	9	20	ns
T <sub>r</sub>	Rise Time		---	4	10	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	42	85	
T <sub>f</sub>	Fall Time		---	5	10	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz	---	900		pF
C <sub>oss</sub>	Output Capacitance		---	155		
C <sub>rss</sub>	Reverse Transfer Capacitance		---	205		

**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	---	---	-4.3	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,4</sup>		---	---	-14	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	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =-3A, di/dt=100A/μs, T <sub>J</sub> =25°C	---	21.8	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	6.9	---	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.

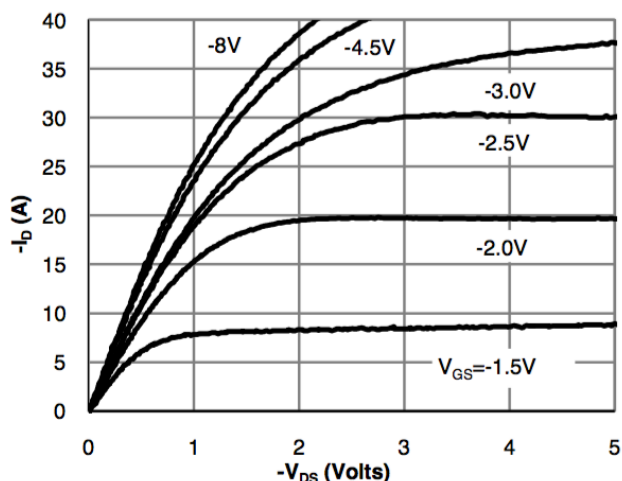


Fig 1: On-Region Characteristics (Note E)

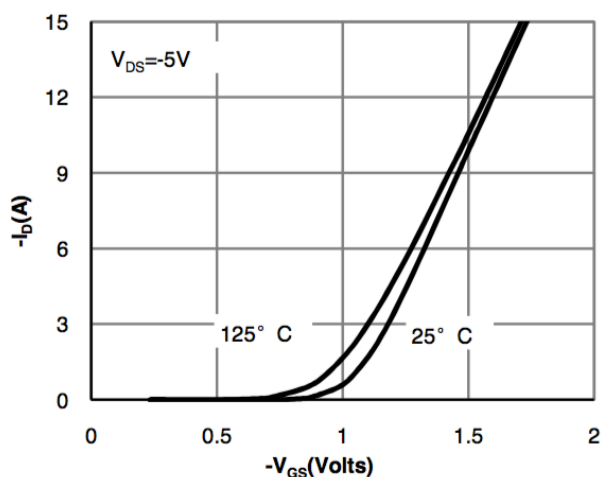


Figure 2: Transfer Characteristics (Note E)

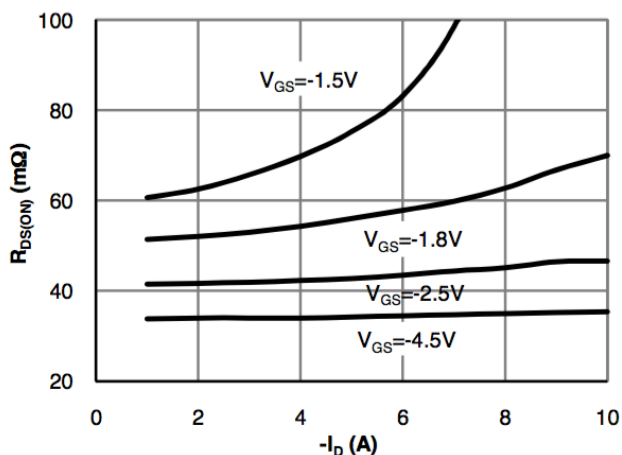


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

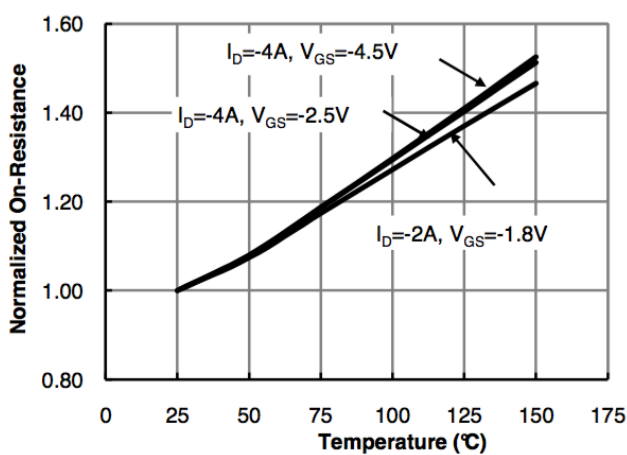


Figure 4: On-Resistance vs. Junction Temperature (Note E)

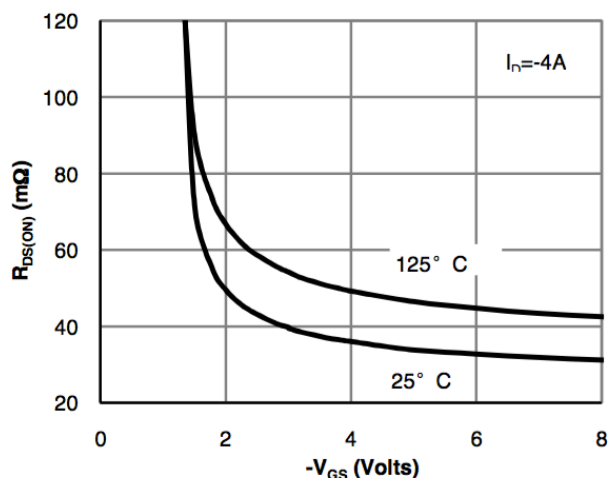


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

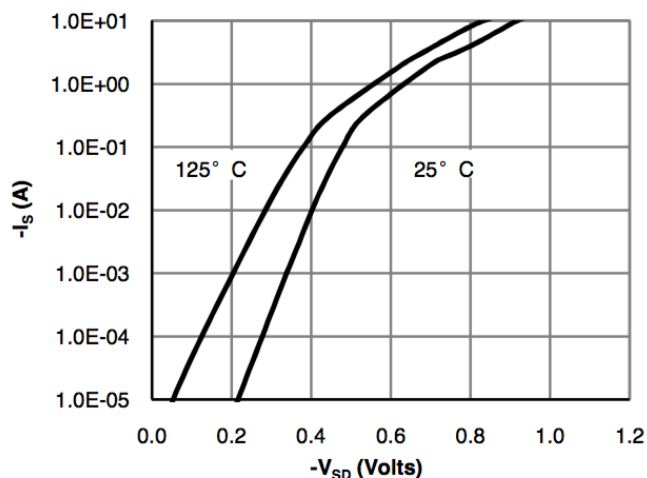


Figure 6: Body-Diode Characteristics (Note E)

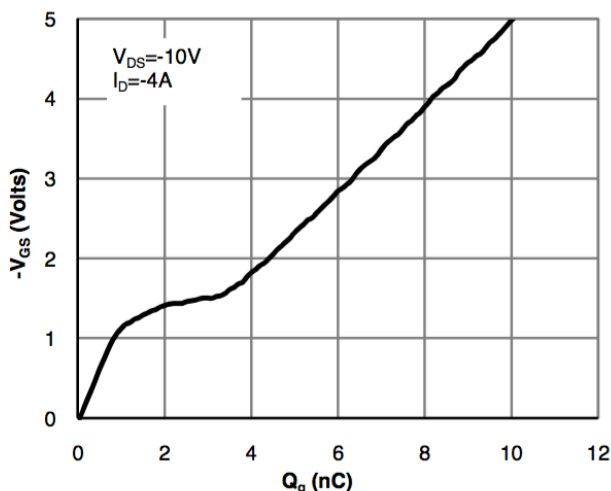


Figure 7: Gate-Charge Characteristics

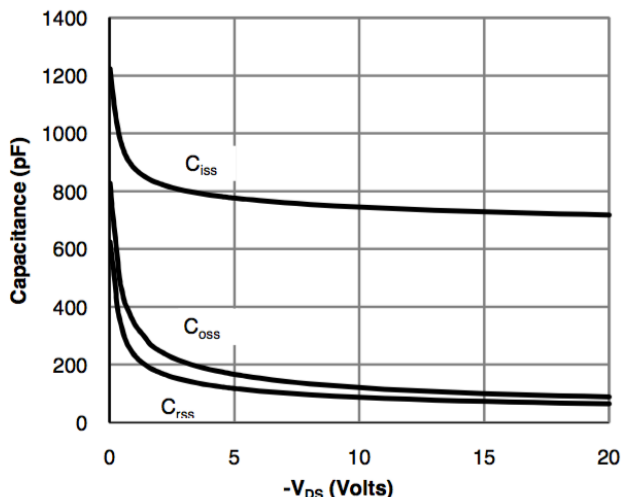


Figure 8: Capacitance Characteristics

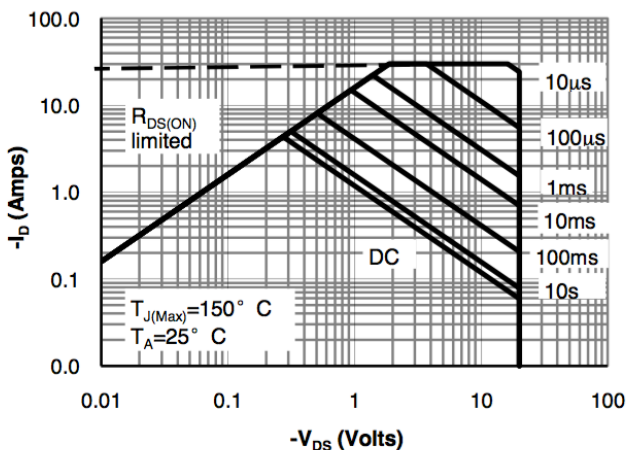


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

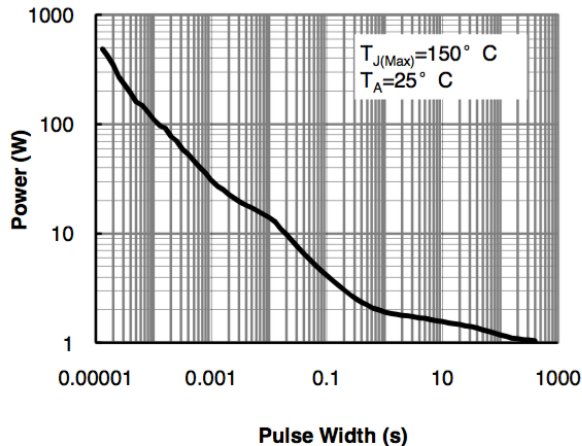


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

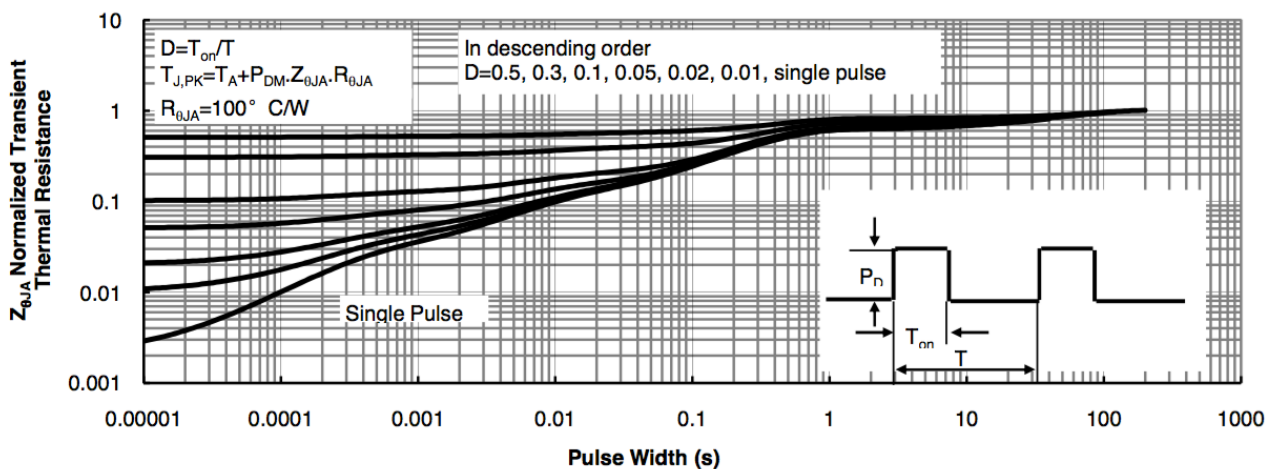
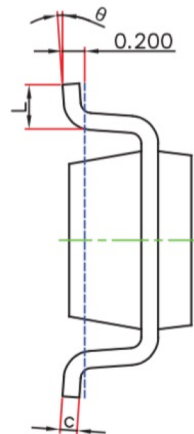
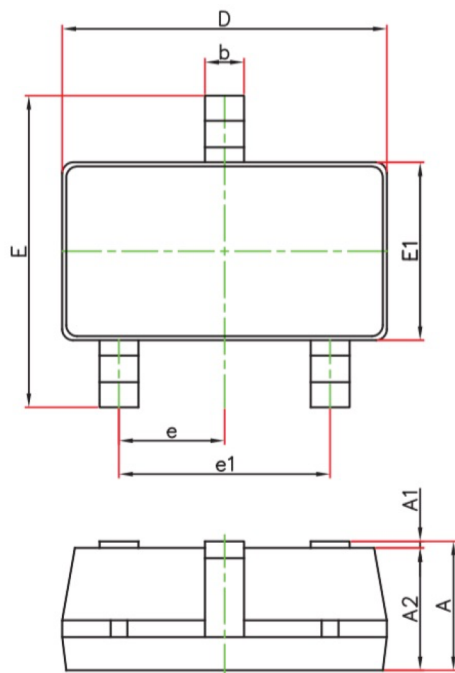


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)



## Ordering Information

Part Number	Package code	Packaging
HSS3415E	SOT-23L	3000/Tape&Reel



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°

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