

General Description

The US3415 is the highest performance trench P-ch MOSFETs with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The US3415 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Features

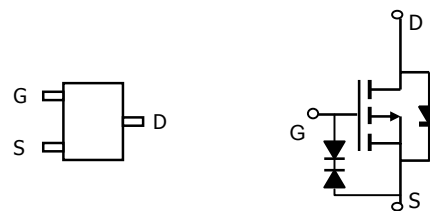
- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available
- ESD Rating:3000V HBM

Product Summary

BV_{DSS}	R_{DS(ON)}	ID
-20V	73mΩ	-4A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

SOT23 Pin Configuration

Absolute Maximum Ratings

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V _{DS}	-20	V
Gate-Source Voltage	V _{GS}	±8	V
Continuous Drain Current ^A	I _D	T _A =25°C	-4.0
		T _A =70°C	-3.5
Pulsed Drain Current ^B	I _{DM}	-30	A
Power Dissipation ^A	P _D	T _A =25°C	1.4
		T _A =70°C	0.9
Junction and Storage Temperature Range	T _J , T _{STG}	-55 to 150	°C

Thermal Data

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	R _{θJA}	t ≤ 10s	65	90
Maximum Junction-to-Ambient ^A		Steady-State	85	125
Maximum Junction-to-Lead ^C	R _{θJL}	43	60	°C/W

Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 4.5\text{V}$ $V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 1 ± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.3	-0.55	-1	
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-4\text{A}$ $T_J=125^\circ\text{C}$ $V_{GS}=-2.5\text{V}$, $I_D=-4\text{A}$ $V_{GS}=-1.8\text{V}$, $I_D=-2\text{A}$		35 48 56	43 60 73	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-4\text{A}$	8	16		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.78	-1	V
I_S	Maximum Body-Diode Continuous Current				-2.2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance			1450		pF
C_{oss}	Output Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		205		pF
C_{rss}	Reverse Transfer Capacitance			160		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		6.5		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge			17.2		nC
Q_{gs}	Gate Source Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-4\text{A}$		1.3		nC
Q_{gd}	Gate Drain Charge			4.5		nC
$t_{D(on)}$	Turn-On Delay Time			9.5		ns
t_r	Turn-On Rise Time	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=2.5\Omega$		17		ns
$t_{D(off)}$	Turn-Off Delay Time	$R_{GEN}=3\Omega$		94		ns
t_f	Turn-Off Fall Time			35		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-4\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		31		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-4\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		13.8		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any a given application depends on the user's specific board design. The current rating is based on the $\leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

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Typical Characteristics

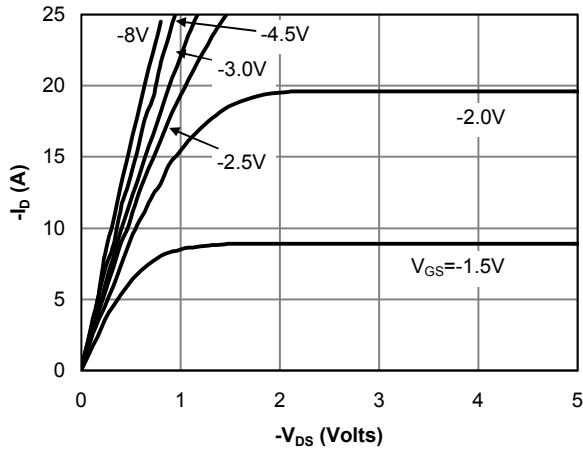


Fig 1: On-Region Characteristics

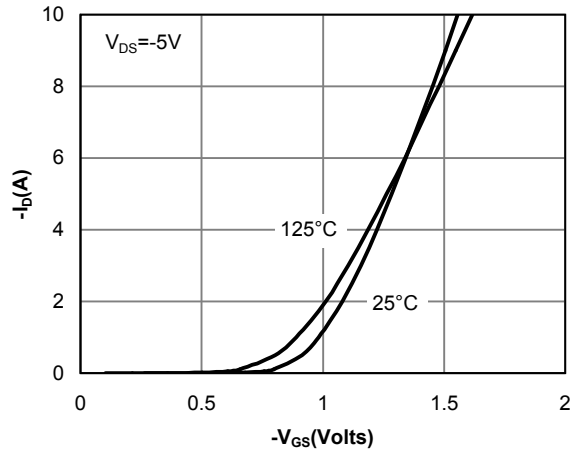


Figure 2: Transfer Characteristics

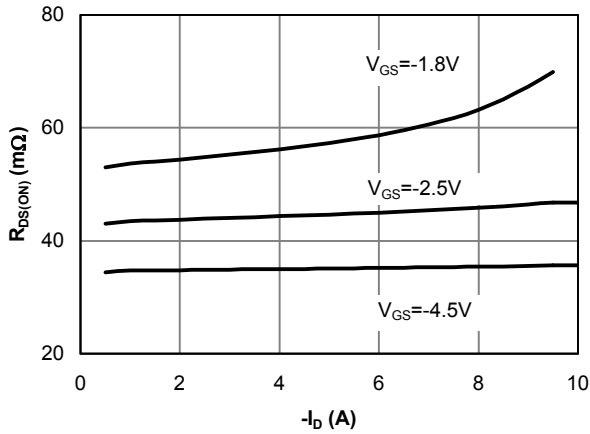


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

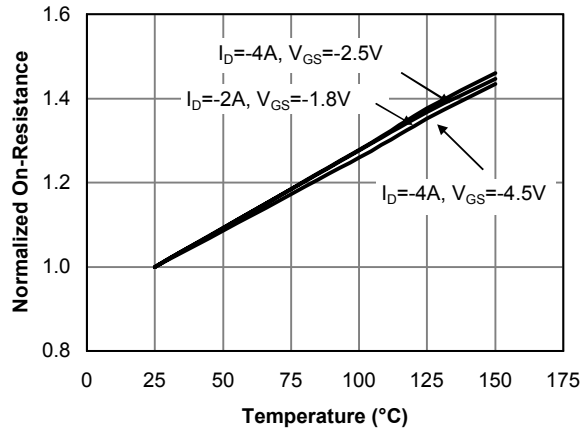


Figure 4: On-Resistance vs. Junction Temperature

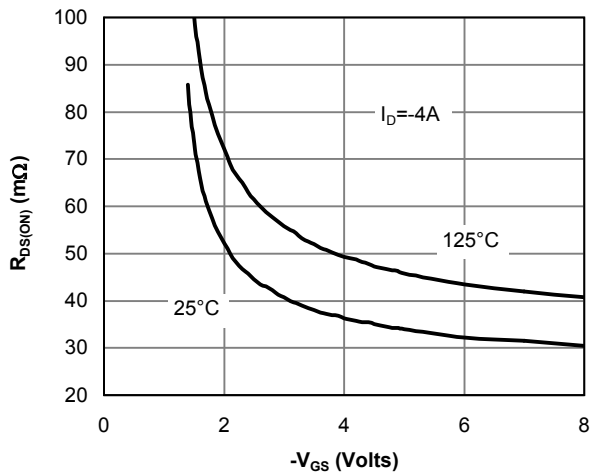


Figure 5: On-Resistance vs. Gate-Source Voltage

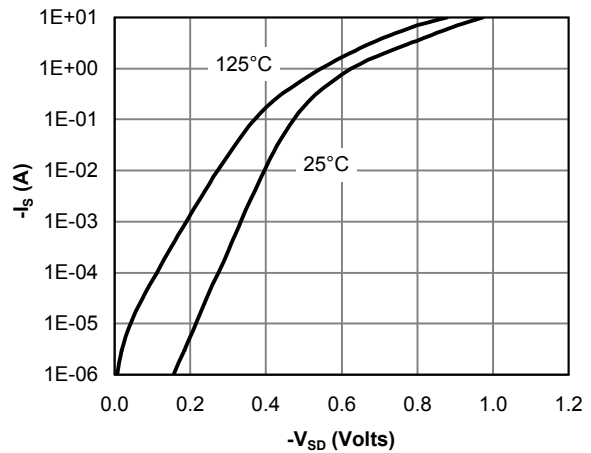


Figure 6: Body-Diode Characteristics

P-Ch 20V Fast Switching MOSFETs

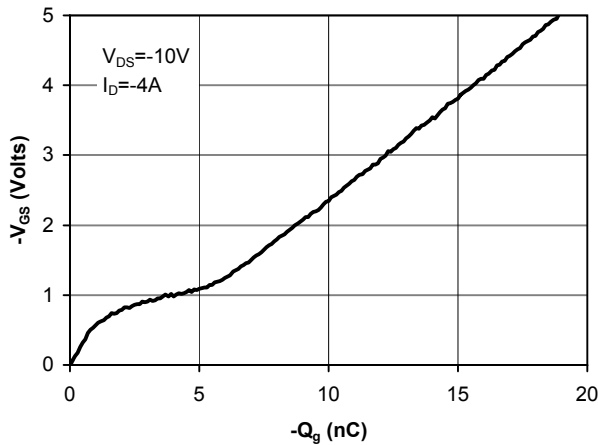


Figure 7: Gate-Charge Characteristics

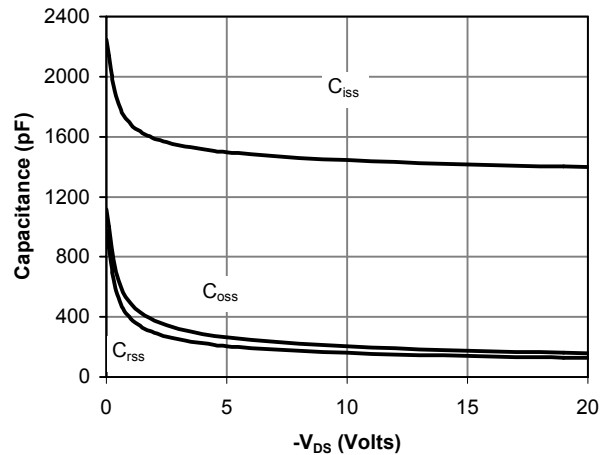


Figure 8: Capacitance Characteristics

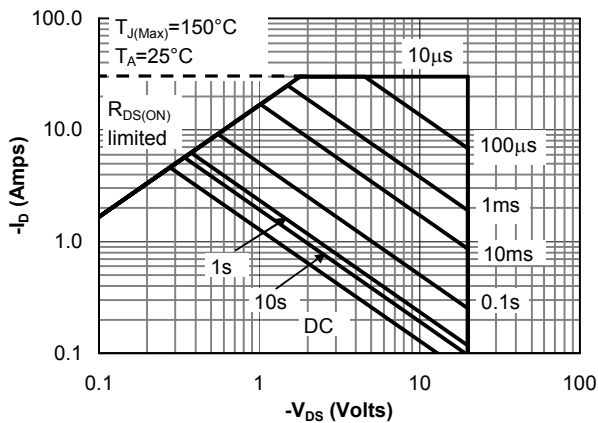


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

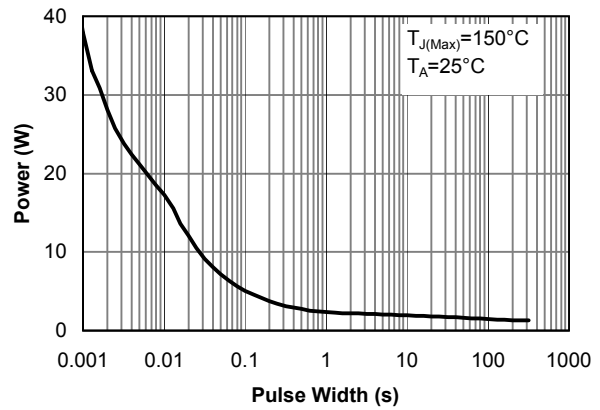


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

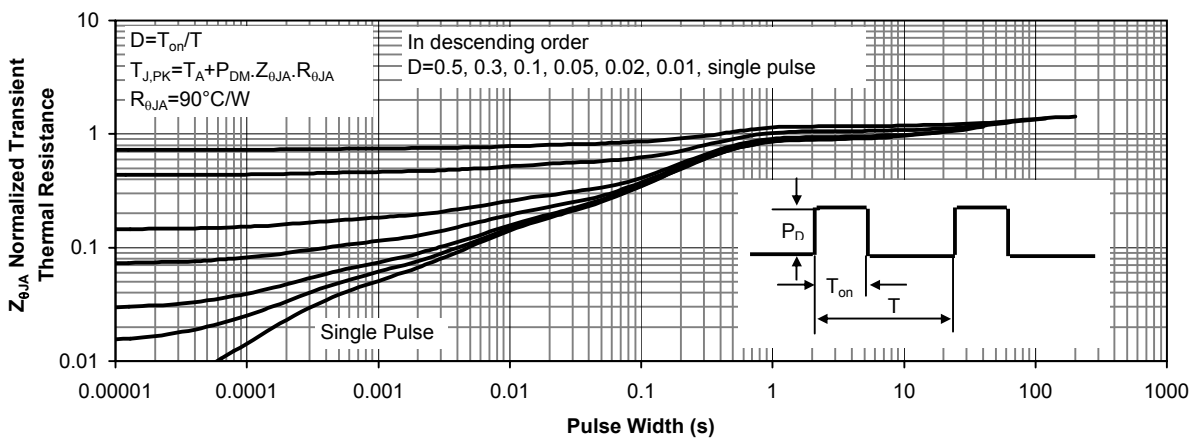


Figure 11: Normalized Maximum Transient Thermal Impedance