General Description

The WSF09N20 is the highest performance trench N-Ch MOSFET with extreme high cell density,which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSF09N20 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
- Green Device Available

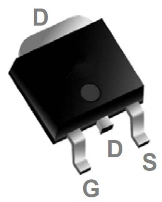
Product Summery

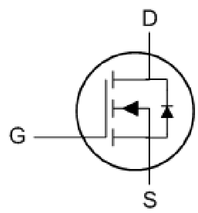
BVDSS	RDSON	ID
200V	0.21Ω	9A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch

TO-252 Pin Configuration





Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	200	V
V_{GS}	Gate-Source Voltage	±30	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	9	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	3.13	A
I_D@T_A=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	9	A
I_D@T_A=70℃	Continuous Drain Current, V_{GS} @ 10V[1]	5.8	A
I_{DM}	Pulsed Drain Current[2]	36	A
EAS	Single Pulse Avalanche Energy[3]	320	mJ
I_{AS}	Avalanche Current	9	A
P_D@T_C=25℃	Total Power Dissipation[3]	83	W
P_D@T_c=100℃	Total Power Dissipation[3]	47	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient [1]	---	30	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	1.6	℃/W

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	200	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.25	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=4.5A	---	0.21	0.25	Ω
		V_{GS}=6.0V , I_D=3.6A	---	0.26	0.29	Ω
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.8	2.5	V
$\triangle V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.63	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=200V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=160V , V_{GS}=0V , T_J=125℃	---	---	10	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±30V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=30V , I_D=4.5A	---	0.21	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	2	4	Ω
Q_g	Total Gate Charge (10V)	V_{DS}=160V , V_{GS}=10V , I_D=9A	---	11.8	---	nC
Q_{gs}	Gate-Source Charge		---	2.36	---	
Q_{gd}	Gate-Drain Charge		---	3.98	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=100V , V_{GS}=10V , R_G=10Ω I_D=9A R_L=10Ω	---	10.33	---	ns
T_r	Rise Time		---	10.7	---	
$T_{d(off)}$	Turn-Off Delay Time		---	29.1	---	
T_f	Fall Time		---	11.1	---	
C_{iss}	Input Capacitance	V_{DS}=25V , V_{GS}=0V , f=1MHz	---	509	---	pF
C_{oss}	Output Capacitance		---	51.2	---	
C_{rss}	Reverse Transfer Capacitance		---	3.2	---	

Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy[5]	V_{DD}=25V , L=0.1mH , I_{AS}=5A	---	320	---	mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,6]	V_G=V_D=0V , Force Current	---	---	9	A
I_{SM}	Pulsed Source Current[2,6]		---	---	36	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=5A , T_J=25℃	---	---	1.4	V
t_{rr}	Reverse Recovery Time	I_F=5A , dI/dt=100A/µs , T_J=25℃	---	201	---	nS
Q_{rr}	Reverse Recovery Charge		---	663	---	nC

Note :
1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper,t<10sec.
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}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=5A
4.The power dissipation is limited by 150℃ junction temperature
5.The Min. value is 100% EAS tested guarantee.
6.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics

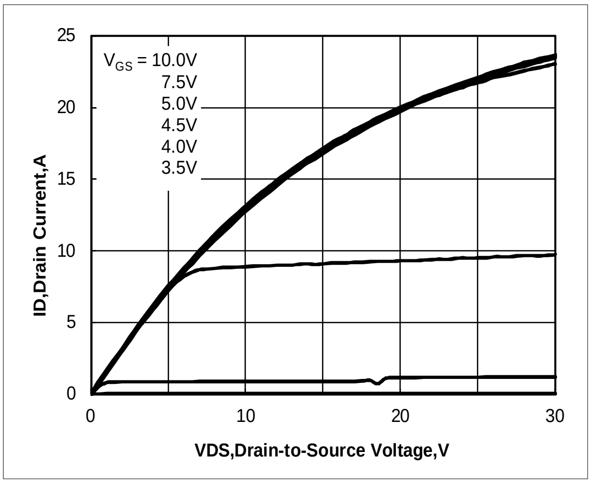


Figure 1. Output Characteristics

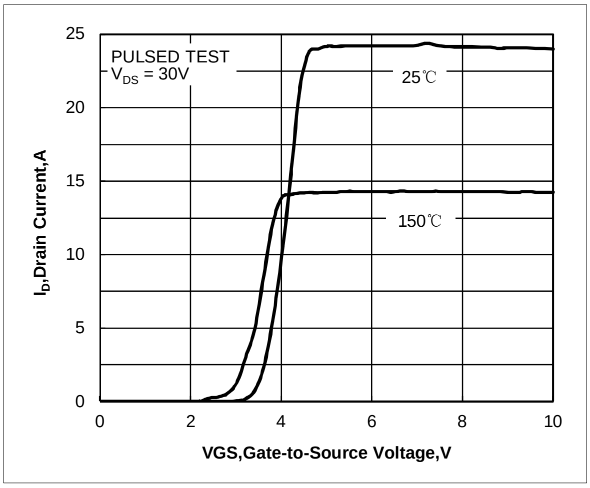


Figure 2. Transfer Characteristics

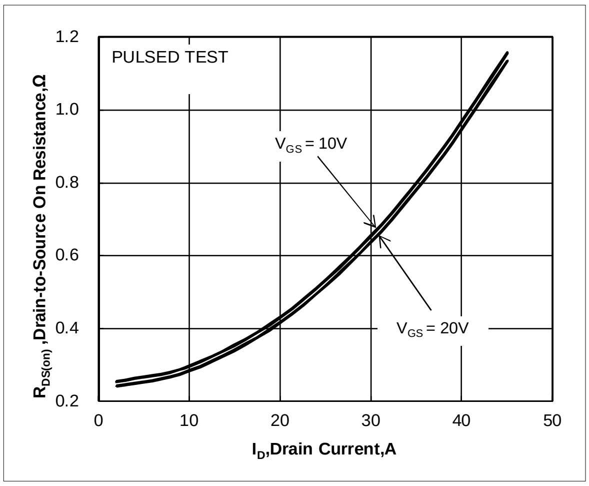


Figure 3. Drain-to-Source On Resistance vs. Drain Current and Gate Voltage

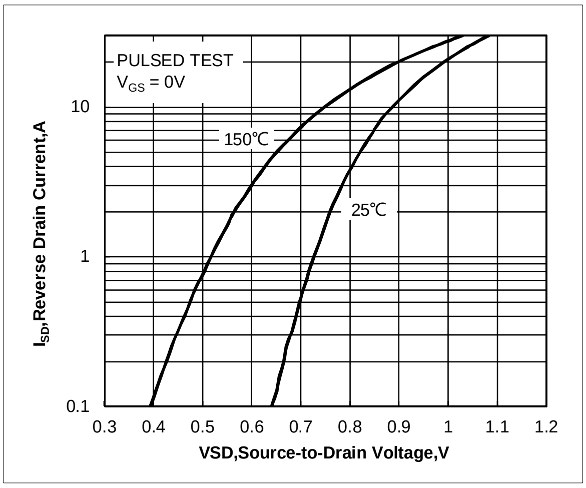


Figure 4. Body Diode Forward Voltage vs. Source Current and Temperature

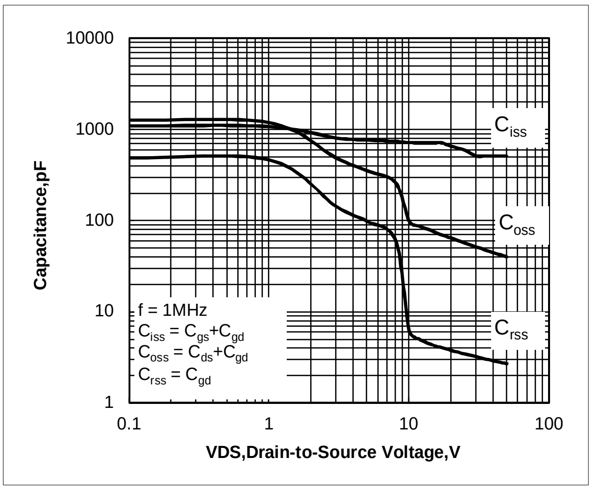


Figure 5. Capacitance Characteristics

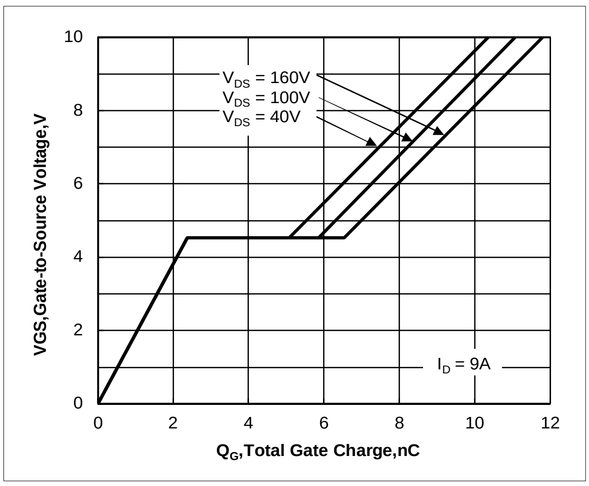


Figure 6. Gate Charge Characteristics

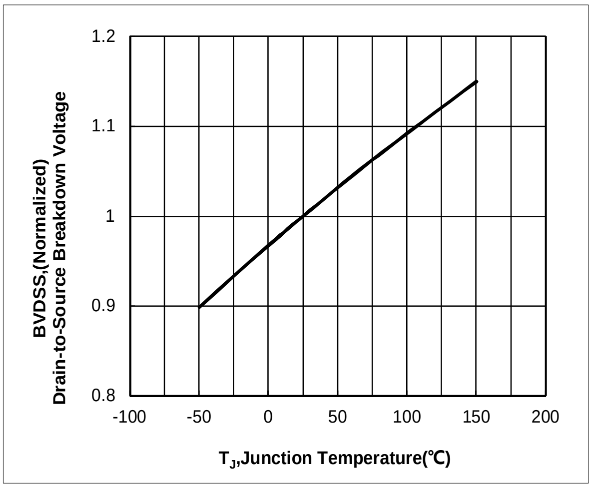


Figure 7. Normalized Breakdown Voltage vs. Junction Temperature

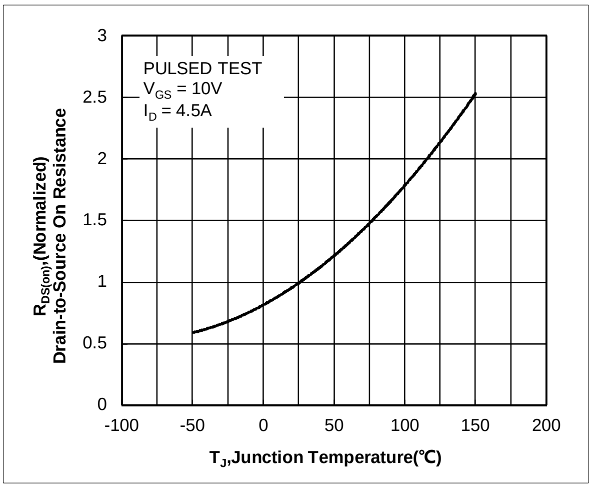


Figure 8. Normalized On Resistance vs. Junction Temperature

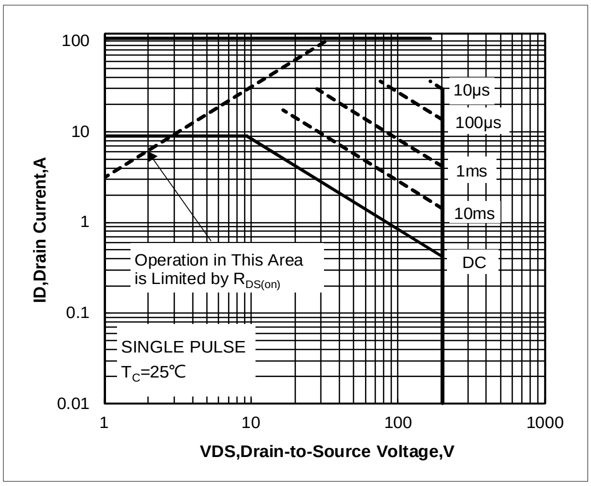


Figure 9. Maximum Safe Operating Area for RU9N20A

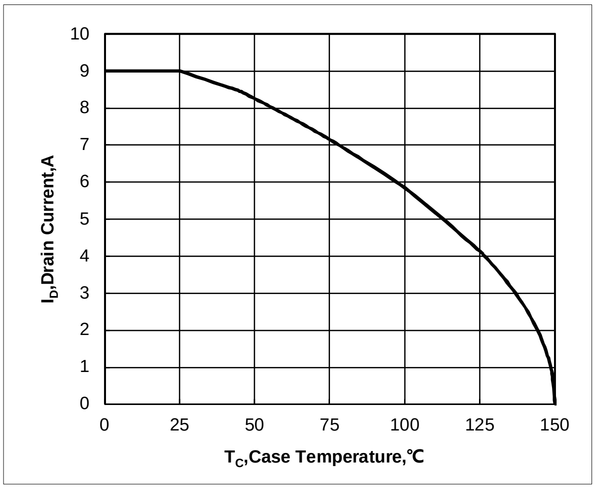


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

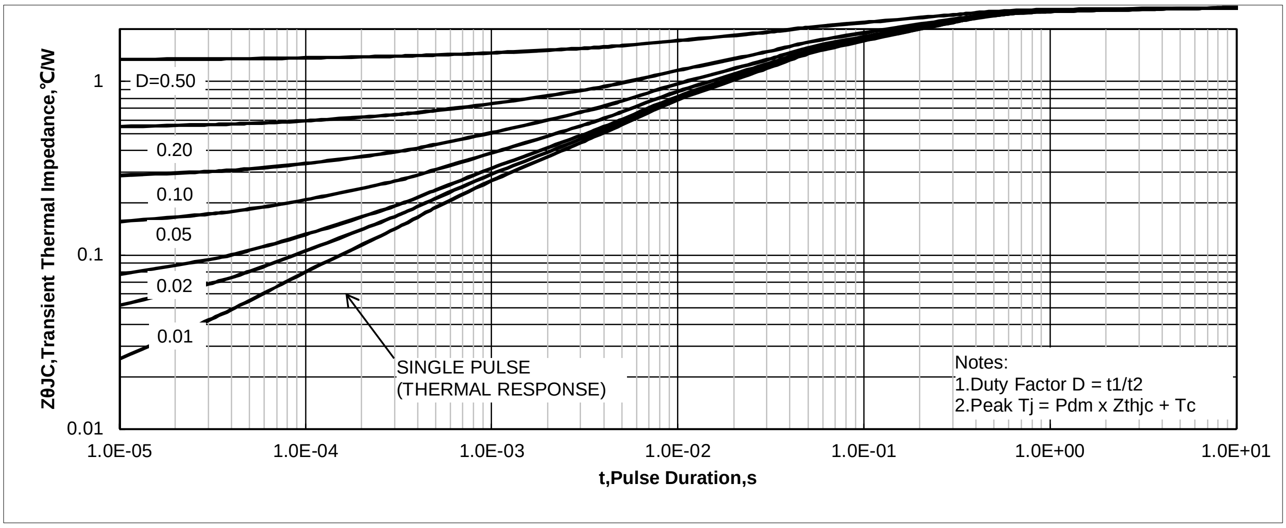


Figure 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case for RU9N20A

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